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CX - Ash River 84(1-36)
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ASH RIVER
Preliminary Mapping Program
and Evaluation
1984

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Date Completed: June, 1984
Prepared By: R.A. Swarn
Drafted By: D.L. MacKellar

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

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SUMMARY AND RECOMMENDATIONS

The information contained in this report was obtained from various sources. Conclusions arrived at from this information indicates that Ash River has potential to become an underground coal mine. It's nearness to tidewater and infrastructure is the properties most conspicuous asset.

The following is a point form summary of the contents of this report:

SUMMARY

- A) On May 1, 1984, Canadian Occidental Petroleum Ltd. obtained coal licences on 3,628 hectares (9,070 acres) of British Columbia coal licences. These are numbered from 7822 through 7835 inclusive. This land is controlled 100% by Canadian Occidental and is located on Vancouver Island.
- B) The Ash River property is ideally situated with regards to tidewater and infrastructure; being only 26 kilometers (16 miles) north of the deep sea port at the town of Port Alberni.
- C) Hudson's Bay Coal Co. drilled 14 holes on the property in 1979 and Canadian Occidental carried out a geologic mapping program in May of 1984. The mapping program cost a total of \$7,960.12 which amounts to \$2.19/hectare. A further \$19,264.68 or \$5.31/hectare in expenditure is required to complete the first years work committment.
- D) The coal at Ash River is found in the Comox formation of the Alberni Coal Basin.
- E) It is hypothesized that there is one main seam averaging 3.8 meters (12.5 feet) in thickness. This was taken from outcrop and drill hole information. However, there may be up to 3 seams of mineable thickness.
- F) Most of the property is a northeasterly tilted downdrop fault block with dips on the western outcrop edge averaging 10° to 15° decreasing eastwards to 5° to 10° to the NE. There is one smaller synclinal feature in the northern end of the property where the coal is shallowest. There is most likely more faulting throughout the basin.
- G) From outcrop to depth of 500 meters (1,600 feet) the Reserve potential is inferred as being 126 million tonnes of raw coal in place.

H) The only quality available was taken in 1951 from a 20 foot (6 meter) coal outcrop on the property. On an as received basis the following was analyzed; H₂O = 1.22%; Volatile Matter = 29.06%; Fixed Carbon = 39.81%; Ash = 29.91%; Heat Content = 9,548 B.T.U.'s/lb; Sulfur = 1.07%. This is a raw coal outcrop sample so some of the values will be lower than what they should actually be. In addition the coal had an F.S.I. of 3 and is ranked as High Volatile "A" Bituminous.

Coring and quality analysis is one of the most important things required in the next exploration drilling program.

RECOMMENDATIONS

In chronological order the following recommendations have been made:

- A) To present copies of this report to possible interested joint venture parties.
- B) To apply to the B.C. government form approval to carry out a drilling program in the fall of 1984.
- C) On Oct. 1/84 to commence drilling 15 holes of which 4 would be core holes. Total meterage would be 2,525 meters or 8,284 feet. This program would include quality analysis and geotechnical studies as to the best mining method. Total cost would be a maximum of \$287,000. It must be noted that if results in the first few drill holes are negative the program would be terminated at a greatly reduced cost.
- D) Future recommendations which should be considered if the program proves successful is aerial photography and topographic mapping at 1:5,000 and possibly seismic profiles of the basement to help identify faulting. Luscar carried out those type of studies on the Quinsam Lake property.

1.0 INTRODUCTION

In early 1984 the acreage known as 'Ash River' was applied for by Canadian Occidental Petroleum Ltd. This acquisition was recommended in order to block off an underground mineable reserve of export thermal coal located near existing infrastructure and tidewater.

After acquiring the Ash River property a preliminary mapping program was carried out in May of 1984. The purpose and scope of this program and this, the resulting report are as follows:

1.1 Purpose and Scope

- A) To carry out a preliminary geologic mapping program on the Ash River property.
- B) To compare all past work with direct field observations.
- C) To put together a report utilizing all known information on the area.
- D) To check on the access in the area and design a drilling program for the fall of 1984.


1.2 Location Extent and Access

The Ash River property is located in the west central portion of Vancouver Island, British Columbia. (Map No. 1) It is located mainly in the Newcastle Land District approximately 26 kilometers (16 miles) north of the town of Port Alberni.

The aerial extent of the property is approximately 3,628 hectares (9,070 acres). It extends approximately 18.5 kilometers (11.5 miles) in length and 3 kilometers (2 miles) width.

Two major roads provide access to the property. One route is by McMillan Bloedels all-weather logging road from Sproat Lake. This road can be reached by travelling west from Alberni via highway No. 4 for approximately 8 kilometers (5 miles) to the SPROAT LAKE PROVINCIAL PARK TURNOFF. This is a paved secondary highway which continues northwest for 8 kilometers (5 miles) to Great Central Lake. From Great Central Lake the gravelled logging road begins. The Ash River property is situated approximately 16 kilometers (10 miles) up this road. Accessibility throughout the lease block occurs on well maintained gravelled logging roads. The accessible roads are marked on Map No. 6.



Canadian Occidental Petroleum Ltd. 
Coal Exploration

ASH RIVER PROPERTY

LOCATION MAP

Map No. 1

Date June 84 NTS	Compiled By R.A. Sworen
Drawing AR-1 File	Drawn By L. Mackellar
	Revised Date

The second major access road is the Beaver Creek road. This road is a paved secondary road which runs northwest from Port Alberni for a distance of 14 kilometers (9 miles). The pavement turns into McMillan Bloedel logging roads on the property from this point north. This road provides good quick access to the southern and eastern portions of the property whereas the Sproat Lake road provides access to the west central and northwestern portions of the property. However either road can be used for access to the entire property.

The Beaver Creek road continues northwest and finally northeast from the property to the town of Courtenay. The author has not travelled this road by it appears to be passable.

1.3 Physiography

The Ash River property is situated in the Alberni Valley which is flanked to the east and west by the mountains of the Beaufort Range.

Relief in the valley is moderate, ranging from a low of 180 meters (600 feet) a.s.l. to a high of 420 meters (1,400 feet a.s.l.). Generally the valley is typified by gently rolling hills (Appendix II). In the northern end of the property the valley is narrower and hillier, broadening out to the south towards Port Alberni.

All of the streams and major rivers drain towards the southeast. Several lakes in the area; most notably Elsie and Dickson Lake receive water from streams flowing from the west. Streams flowing from the eastern mountains flow into the Ash River. This river also drains the Lakes and then carries the water southeast into the Stamp River which then enters the Somass River and finally flows into the Alberni Inlet at the town of Port Alberni.

The area has been forested once or probably twice in the past. Trees in the area vary in age, depending on when the logging took place. The oldest regenerated growth appears to be in the order of 30 to 40 years old.

Forest cover consists mainly of fir, spruce and cedar with some deciduous trees. Streams and marshy areas contain stands of Alder which is harvested by the public for fuel for fireplaces. Undergrowth is varied

and heavy. Streams are hazardous to walk because of large areas of devils club.

1.4 Mining History on Vancouver Island

Coal was first reported by natives on Vancouver Island in 1835. This coal was found in the Suquash coal field on the northern end of Vancouver Island.

In 1849 the Hudson's Bay Company imported 100 miners from England to mine coal in the Suquash coal field to supply fuel for steamships. In the same year (1849), Indians reported finding coal in the Nanaimo area of Vancouver Island. The Hudson's Bay Company operated mines in the Nanaimo field from 1852 until 1862 when they sold their holdings to the Vancouver Coal Mining and Land Company. They mined until 1902 when they sold out to the Western Fuel Company of California. This company operated until 1928 when they were purchased by Canadian Collieries (Dunsmuir) Ltd.

Canadian Collieries (Dunsmuir) Ltd., also controlled all of the other coal mines on the Island and in 1888 the first coal mine was started up in the Comox coal field. This company then controlled all the coal lands on the east coast of Vancouver Island under the Esquimalt and Nanaimo railway land grant.

In the productive years from 1836 to 1968, a total of approximately 74,650,000 short tons of coal was produced from Vancouver Island's coal fields. Of this total, approximately 22,000 tons was produced from Suquash, 54,087,860 tons from the Nanaimo field and 20,540,000 tons from the Comox coal field (Map No. 2).

There are three main seams which were mined in the Comox coal field in the past. Weldwood/Brinoc, Quinsam Lake mine will be mining these three main seams.

At Ash River past exploration has only identified one and possibly two major seams in the Comox formation.

Excerpts from Buckham's original field diary Circa. 1920's indicates four main coal outcrops discovered in the early 1920's by H.A. Rose, J.E. Gill, R. Strachen, G. Hanney, and Dennis Harris. Of the four

Ash River Property


VANCOUVER ISLAND

LEGEND

COAL BEARING FORMATIONS

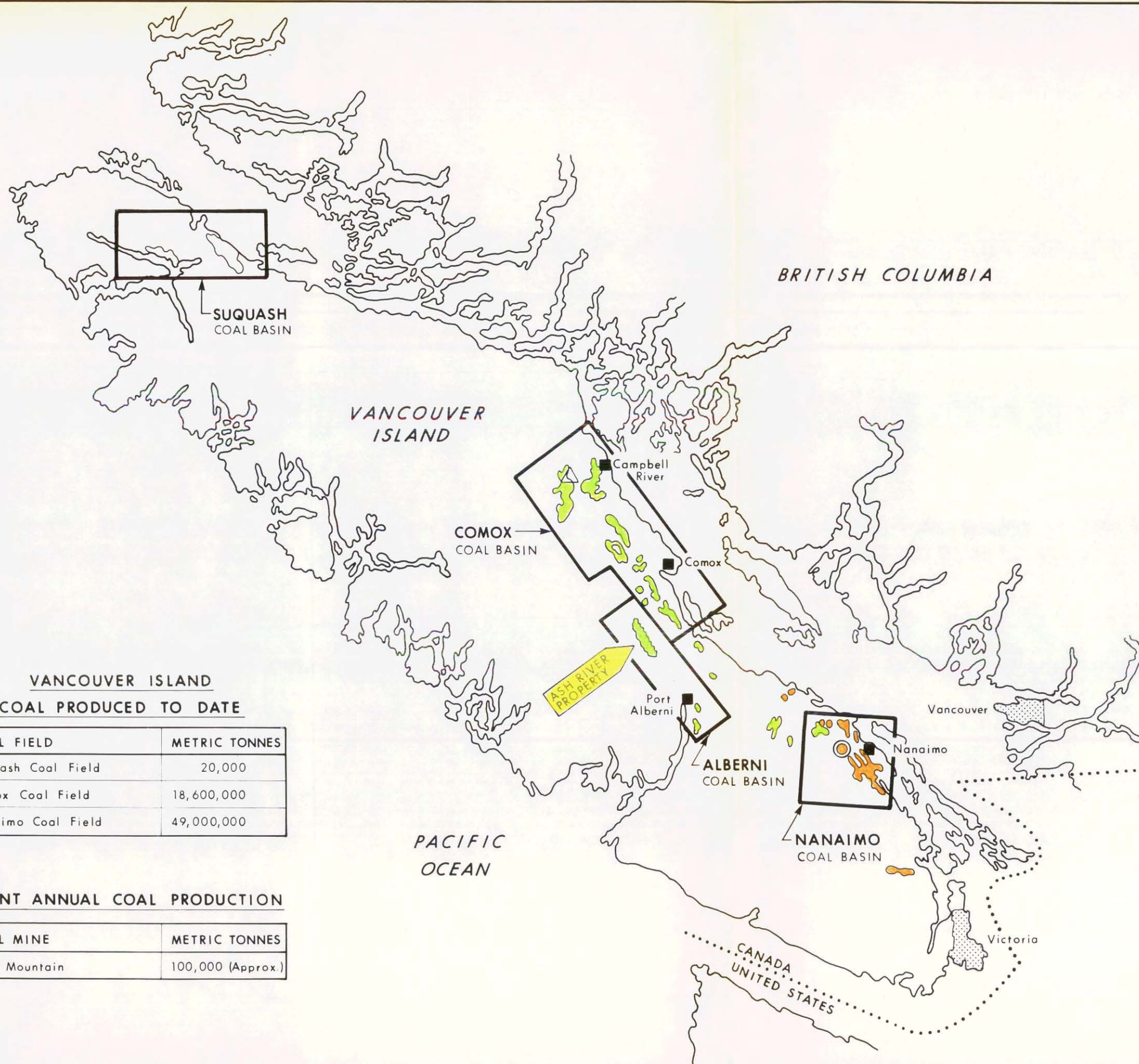
UPPER CRETACEOUS	NANAIMO GROUP	CEDAR DISTRICT FM.	NANAIMO COAL FIELD
		EXTENSION PROTECTION FM.	
		HASLAM FM.	
		COMOX FM.	COMMOX COAL FIELD
TRIA-SSIC		KARMUTSEN FM.	

- △ PROPOSED QUINSAM LAKE SURFACE MINE
- ⊙ OPERATING WOLFE MOUNTAIN UNDERGROUND MINE

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Title/Map No.

COAL BASINS/ VANCOUVER ISLAND



VANCOUVER ISLAND COAL PRODUCED TO DATE

COAL FIELD	METRIC TONNES
Suquash Coal Field	20,000
Comox Coal Field	18,600,000
Nanaimo Coal Field	49,000,000

PRESENT ANNUAL COAL PRODUCTION

COAL MINE	METRIC TONNES
Wolf Mountain	100,000 (Approx.)

outcrops one was of mineable thickness and coal from this outcrop was sent to Union Bay for analysis in 1951.

No mining has occurred in the Ash River area to date.

1.5 Exploration to Date

Exploration in the Ash River area has been spotty and inconclusive to date.

The first work was documented by Buckham in his personal diaries in the 1920's. Since the finding of the four outcrops described in the preceding section, little mapping work has been carried out until this year, 1984.

In 1979, Hudson's Bay Oil and Gas carried out an Exploratory Drilling Program on the Ash River property. This program was part of an option agreement with the owners of the coal licences; RAMM VENTURES. In 1979 HBOG drilled 14 holes for a total of 1,280 meters (4,200 feet) and a cost of \$115,000.00. One of the holes was a core hole but it only cored a thin 3 foot seam and no analysis was carried out on the coal.

As a result of this drilling program, Hudson's Bay Oil and Gas dropped their options with Ramm Ventures.

Subsequently, in 1982 Ramm Ventures dropped the coal licences on the Ash River area, since they did not have the available funds to carry out the work commitment and since no other companies wished to option the land after HBOG's discouraging report.

However, in 1984, Canadian Occidental applied for the coal licences for the area and carried out a preliminary geologic mapping and reconnaissance program. The program took 11 days, including travel, to complete and has led to the conclusions contained within this report.

1.6 Regional Development

To date there are only two other coal developments on Vancouver Island. One, is the Wolfe Mountain Coal Mine on Wolfe Mountain just west of the town of Nanaimo (Map No. 2). This mine is underground and is built to produce up to 100,000 tonnes/year of thermal coal. The coal is shipped out by barge to supply local cement and other companies. This mine started

production in 1984.

The second mine is the Brinco/Weldwood Quinsam Lake Mine, located near Quinsam Lake west of the town of Campbell River. This mine is to be a surface operation which would produce approximately 900,000 tonnes/year of bituminous thermal coal. Final approval was given in May of 1984, however, it is not known as to when the mine would actually begin construction or production.

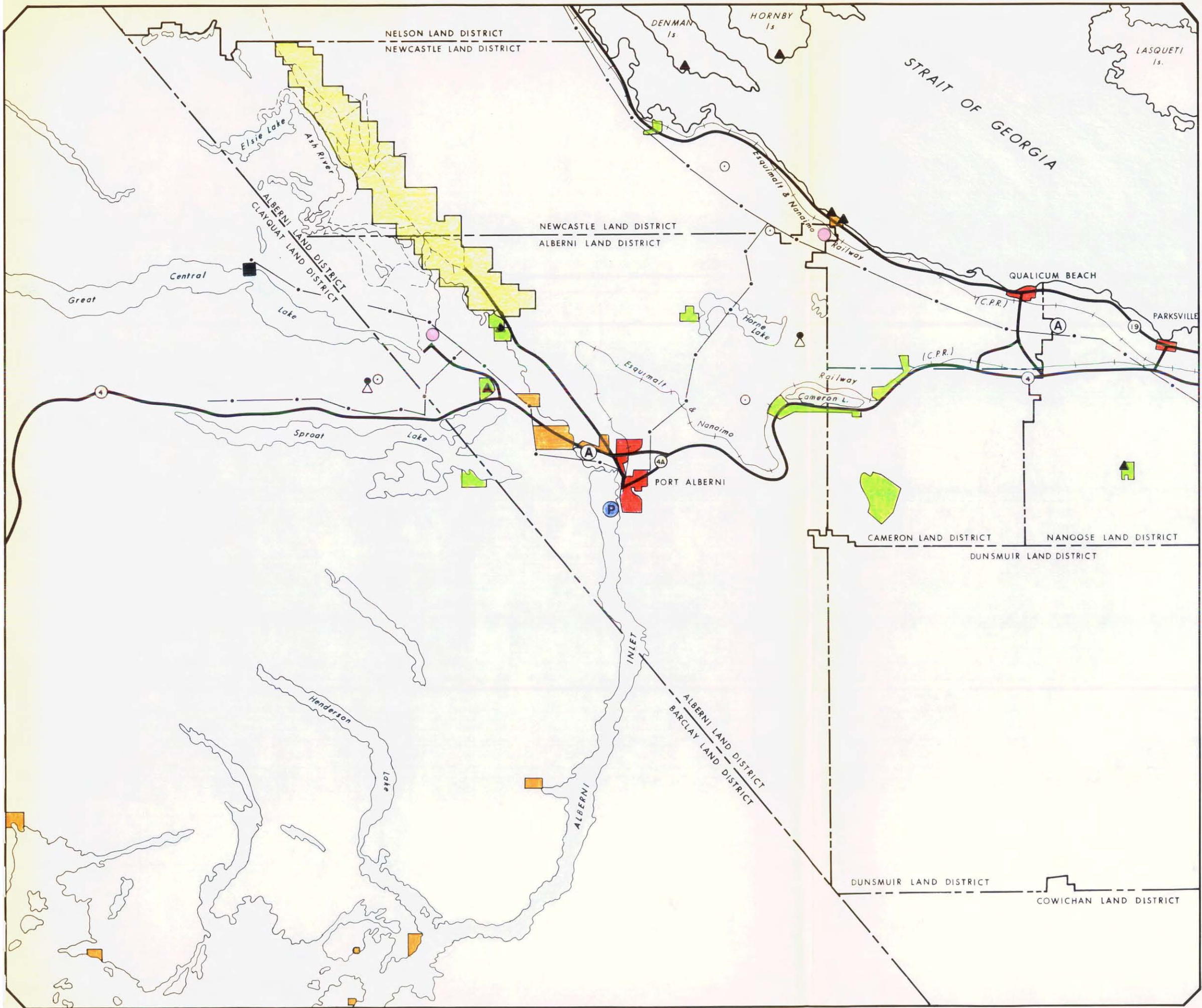
It is foreseeable that if the Ash River property contains reserves of coal economically mineable by underground methods that a mine could be built in this area which would produce somewhere between 100,000 and 1 million tonnes/year, by underground mining methods.

1.7 Existing Infrastructure

The Ash River property is situated in close proximity to major roads, rail, seaport, utilities and services as illustrated on Map No. 3. The TransCanada Highway No. 4, the main highway serving the region passes within 8 kilometers (5 miles) of the southern boundary of the property. This highway runs from highway No. 19 at Parksville to the east, westwards to Tofino on the west coast of Vancouver Island. There are two other paved roads in the area. Both of these run north towards Ash River from highway No. 4. One road runs to the fish hatchery at Great Central Lake and the other is the Beaver Creek Road which passes Stamp Falls Provincial Park. Other main roads are MacMillan Bloedel logging roads which provide excellent access throughout the area.

A Canadian Pacific Railway line (old Esquimalt & Nanaimo Railways) runs from the mainline at Parksville to Port Alberni, passing within 8 Km (5 miles) of the southern boundary of the property.

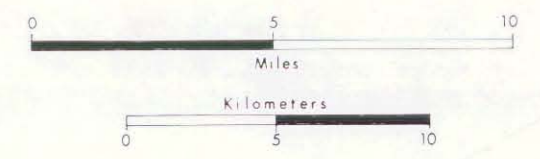
A deepwater port at Port Alberni is a first class harbour at the end of the 'fiord-like' Alberni Inlet which provides access (48 km., 30 miles) to the open Pacific Ocean and the Pacific Rim trading Countries. The Alberni Inlet averages 1.6 kilometers (1 mile) in width encountering depths of 200 fathoms (366 meters) (1,200 feet). The port is serviced by three stevedoring companies and is governed by the Port Alberni Harbour Commission. The Harbour Commission owns and operates three



Ash River Property VANCOUVER ISLAND

LEGEND

- ELECTRICAL TRANSMISSION LINE
- PROVINCIAL HIGHWAYS (PAVED)
- LAND DISTRICT BOUNDARIES
- MAJOR LOGGING ROADS (COAL LICENCE AREA)
- MAJOR TOWNS
- PROVINCIAL PARKS
- INDIAN RESERVE
- ASH RIVER COAL LICENCE BOUNDARY (CDN OXY)
- FISH HATCHERY
- COMMUNICATIONS TOWER
- AIRFIELD
- CAMPGROUND
- POWER STATION
- FORESTRY LOOKOUT TOWER
- DEEP WATER SEA PORT



Prepared For
Canadian Occidental Petroleum Ltd.

Title/Map No.

EXISTING INFRASTRUCTURE

deep sea berths capable of handling ships up to 315 meters (1,050 feet) in length.

The City and area of Port Alberni contains a population of approximately 32,560 persons (1983). The services provided in this area for the people, such as recreation, education, medical, shopping, etc. are adequate to handle an increased population due to the possible construction of a mine.

The economic base at Port Alberni has developed mainly around the forestry and fishing industries. MacMillan Bloedel Ltd. operates Canada's largest integrated forest products complex. This includes two sawmills, a plywood plant and a pulp and paper mill. Most of the products produced are exported.

More than 300 fishing vessels operate in the District. These account for 20% of British Columbia's Salmon yield. Fish processing is carried out and two companies rear Salmon on the inlet for commercial marketing. Secondary manufacturing in support of the above two industries supports the bulk of the population of the area.

Tourism is fast becoming another industry of the area. This was sparked by the opening of the Pacific Rim National Park on the west coast in 1971.

Utilities in the area include power supplied by the B.C. Hydro and Power authority and Natural Gas is supplied by pipeline by Cigas Products Ltd. and Valley Rock Gas.

In summary the area contains all of the desirable infrastructure required to support a coal mine with the added advantage of a deep sea port.

LAND
DISPOSITIONS

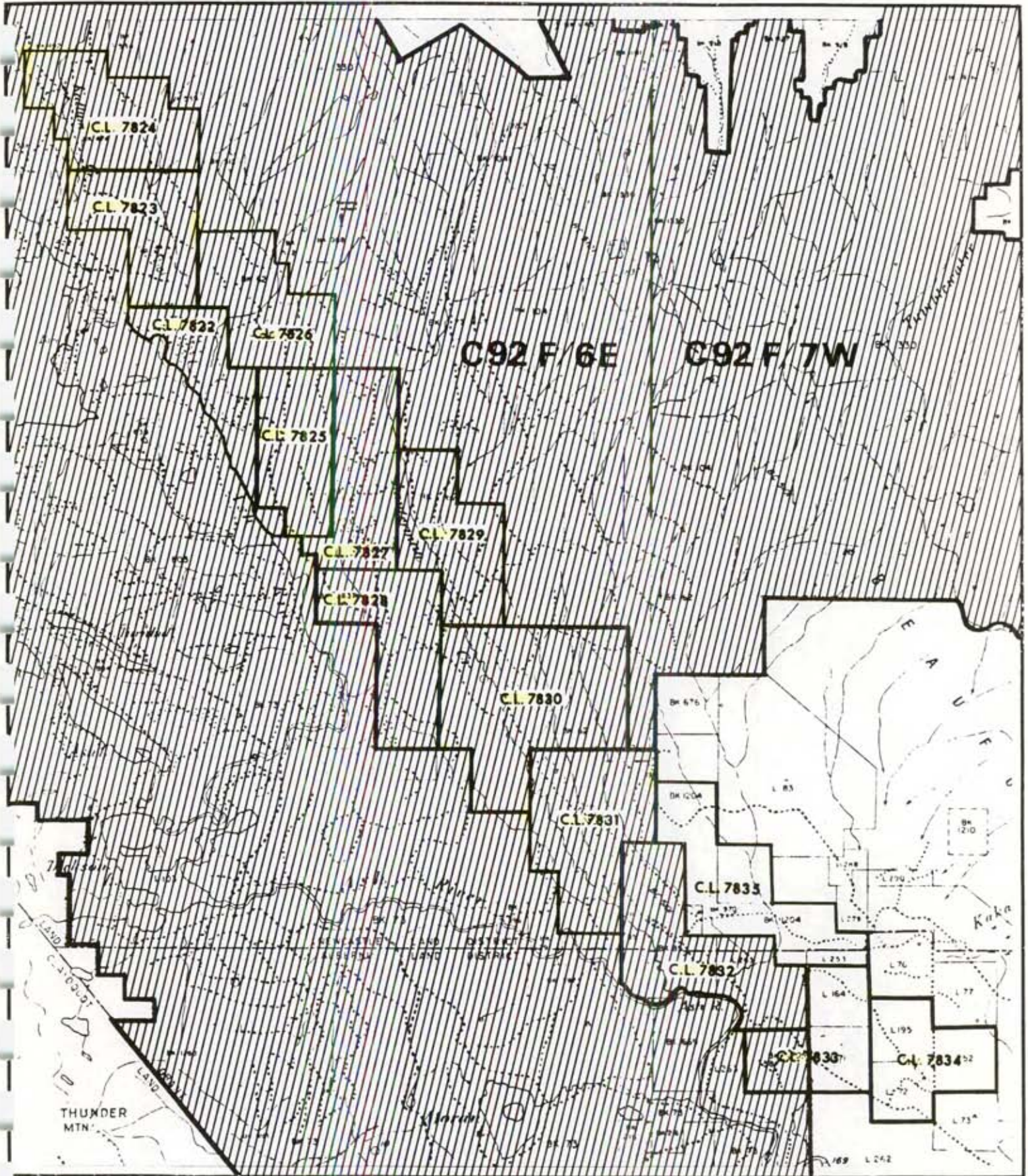
2.0 LAND DISPOSITIONS



In 1977, Ramm Venture Corporation first acquired coal licences in the Ash River area. They carried out very minimal work and finally optioned their acreage to HudBay Coal Company in 1979. After completing the 14 hole drilling program in 1979, HudBay subsequently decided not to exercise their option and the land reverted wholly back to Ramm Venture Corporation.

By 1982 work commitments were again required on the Ash River property. Since Ramm Venture Corporation could not find more partners to option the land and did not want to expend the money themselves they dropped their coal licences.

On February 7, 1984 Canadian Occidental Petroleum Ltd. made application on 3628 hectares (9070 acres) of land in the Ash River area. These coal licences were granted on May 1, 1984. (Map No. 4)

The program to which this report applies cost a total of \$7,960.12, which represents a work commitment expenditure of \$2.19/hectare. Therefore a further \$5.31/hectare work commitment is still required to complete the first years obligation. This expenditure will be made durring the fall drilling program.



-  CANADIAN OCCIDENTAL PETROLEUM LTD. COAL LICENCE
-  MACMILLAN BLOEDEL - SPROAT LAKE DIVISION TIMBER LICENCE

ASH RIVER PROPERTY

LAND DISPOSITIONS

GEOLOGY

3.0 Geology

3.1 Regional Stratigraphy

The Upper Cretaceous sediments of the Nanaimo Group outcrop along the east coast of Vancouver Island from south of Nanaimo, for approximately 200 kilometers (125 miles) to a point north of Campbell River (Map No. 2). The coal bearing Nanaimo Group comprises a succession of Lithologies, which with the exception of coal seams, are clastic and range from boulder conglomerate to shale with most of the intervening spectrum presented.

There are five clearly defined basins composed of the Nanaimo Group of sediments. These are; from south to north; Cowichan, Nanaimo, Comox, Suquash and the one we are concerned with, the Alberni Basin. All of the basins have some indications of coal, but only the Comox, Nanaimo and possibly the Alberni Basins are believed to have coal reserves of economic importance.

The sediments of the Nanaimo Group rest unconformably on metavolcanics and argillites of the Jurassic and Triassic Vancouver Group. The main formation of this group in the Comox and Alberni coal fields being the basic volcanic rocks of the Triassic Karmutsen formation. This formation forms the eastern and western boundaries of the Alberni Basin as well as the basement.

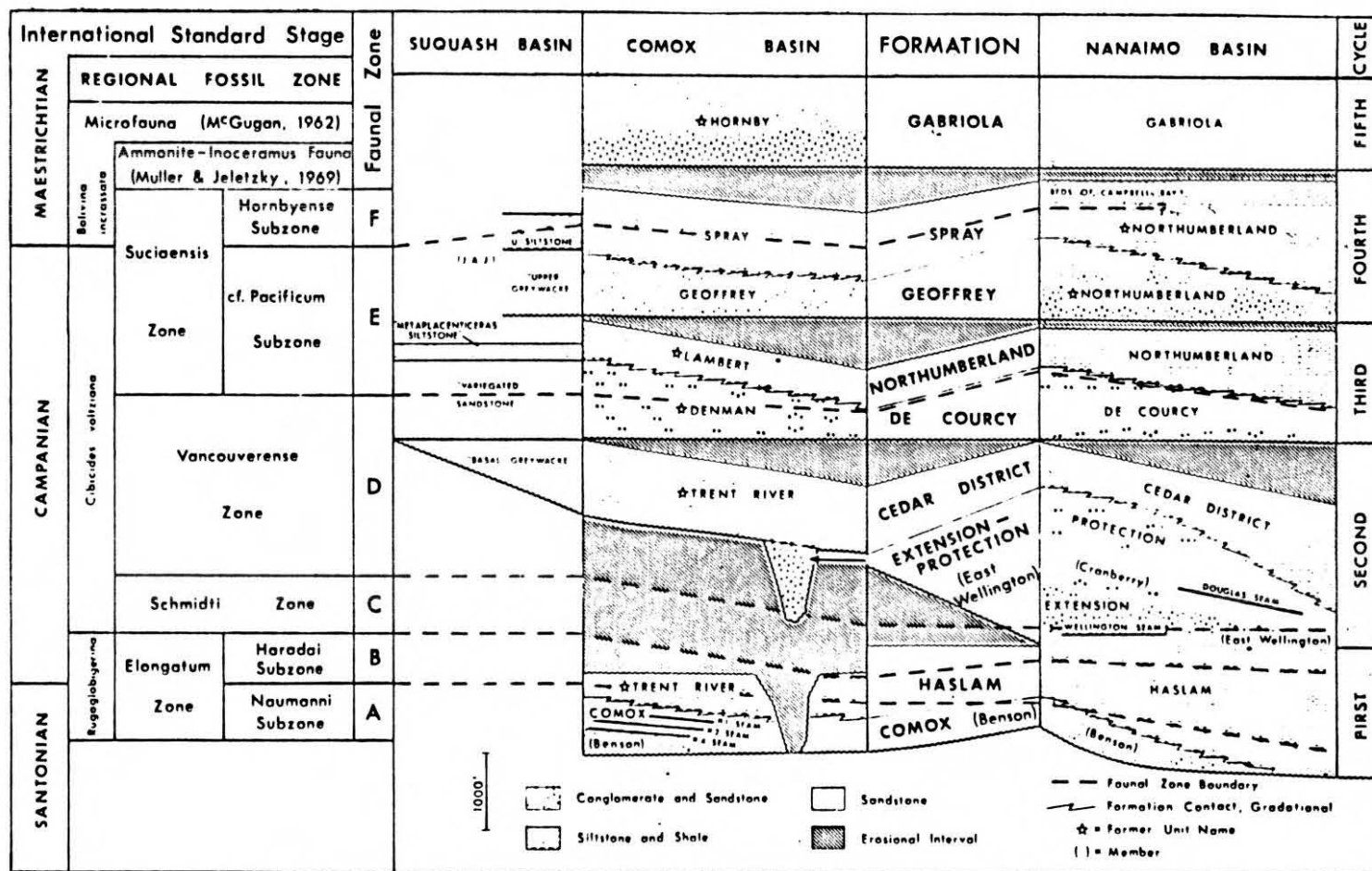
The Nanaimo group is about 2150 meters (7000 feet) thick in the Nanaimo basin; 600 meters (2000 feet) in the Comox basin and an estimated 600 meters (2000 feet) in the Alberni basin where the Ash River property is located. Within this thickness of sediments are two main formations which are coal bearing. These formations are the Comox and Extension-Protection formations. Both are found in the Nanaimo and Comox coal basins but only the former is coal bearing in the Comox basin and the latter in the Nanaimo basin. In the Alberni basin only the Comox and Haslam formations were encountered in the field, however, the Extension-Protection may be present. The Comox formation is the coal bearing formation at Ash River in the Alberni basin. Although both formations are of late Cretaceous age, the Extension-Protection is younger than the Comox (Figure 1).

The Nanaimo Group coal seams were probably deposited in a paralic-basin (i.e. a coal basin formed in a coastal lowland area), and the environment was probably a lagoon, separated from the sea by sand bars (Mueller-1971).

What we are concerned with in this report is the possible economic importance of the coal seams present in the Comox formation in the Alberni coal basin.



ASH RIVER PROPERTY - TABLE OF FORMATIONS



Biochronological and lithological divisions of Nanaimo Group (after Muller and Jeletzky, 1970).

3.2 Regional Structure

The Nanaimo strata in the Comox coal field and to some extent in the Alberni coal field are contained by down faulting depression and tilting to the north east.

Linear faults trend northeast and northwest with oblique faults of intermediate trends. The dominant faults are linear.

These linear faults have greater displacement overall, and they exerted major control over the distribution of outcrops. The tectonic pattern is one of block faulting in response to the prevailing northeast tilt.

The Ash River property exhibits this prevailing northeast tilt as seen on the Geology Map No. 5.

3.3 Ash River Surficial Deposits

The Ash River property is overlain by a mantle of glacial and fluvioglacial deposits of clay, silts, gravels and till.

In the 1979 HBOG drilling program the 14 holes encountered till thickness varying from 5 meters (16 feet) to 37 meters (120 feet). Therefore, a casing hammer could prove useful in the proposed drilling program.

These deposits cover most of the outcrop on the property. The majority of the outcrop was found in river and creek beds; in steep road cuts and on the steep hill sides in the northern end of the property.

As can be seen on Map 5., the area covered by the Haslam Shales is quite barren of outcrop. This is probably due to the low flat hills which were formed due to the poorly resistant shales and silty shales and the ease with which they are eroded.

3.4 Ash River Stratigraphy

As described in HUDBAY COAL COMPANIE^R REPORT, the stratigraphic units of interest in the Ash River property area are those clastic continental rocks contained within the Nanaimo Group. This group represents four transgressive cycles grading upwards from non-marine coarse clastic to marine fine clastic sediments and a fifth cycle with only non-marine coarse clastics.

It has been stated that the three units within the Ash River area are the Comox, Haslam and Extension-Protection formations from the base upwards. The field mapping program only encountered the Comox and Haslam formations which represent the first depositional cycle. However, there may be some evidence of the Extension-Protection formation on the eastern edge of the property which is covered by glacial till and where outcrops are scarce Map No. 5.

COMOX FORMATION

In the Ash River coal field this formation has been deposited directly upon the pre-Cretaceous unconformity with the Karmutsen Volcanics which forms the boundary of the basin as well as the basement (Map No. 5).

As can be seen in the cross-sections of Appendix III, the Comox formation varies in thickness from 200 meters in the north at section F-F' to over 400 meters in thickness in section A-A' in the south. Therefore, the formation thins from south to north. This was also found to be true on CdnOxy's Tsolum river property located between Courtenay and Campbell River in the Comox basin to the east.

The Comox formation has a basal fluvial conglomerate called the Benson member. However this conglomerate is usually of only local extent and is found in low areas and stream channels of the paleotopographic relief of the erosional surface of the Karmutsen Volcanics. This Benson member was only found in the southern end of the property in cross-section A-A' on the Ash River at outcrop No. 32 and No. 34 on Map No. 5. The conglomerate which is dark green and brown colored and poorly bedded varied in thickness, but at one point it forms water falls on the river and the stratigraphic thickness was at least 5 meters. The components of the conglomerate are unsorted subangular boulders, pebbles and grit composed mainly of pre-Cretaceous material.

The sandstones overlying this conglomerate at Outcrop No. 31 also contained widely scattered boulders and pebbles inclusions formed by pre-Cretaceous basement rocks.

The Comox facies overlies this Benson member in the southern portion of the property and seems to lie unconformably directly on the Karmutsen Volcanics in the northern portions of the property. These sandstones are quartz feldspathic in nature and vary in hardness and grain size. Within these sandstone

units are beds of coal, shale and conglomerate.

It is this formation which contains the economic seams of coal within the Ash River property area.

Lying directly and conformably upon the Comox formation, is the Haslam formation.

HASLAM FORMATION

This formation varies from 200 - 300 meters in thickness on the property.

As can be seen in the cross-section and on Map No. 5, the formation is confined to the east-central portion of the property since it has been eroded away in the north and the south. The formation was located at Outcrop No. 5 and possibly at Outcrop No. 6. However, Outcrop 6 has been called Comox formation in this report.

The Haslam formation is composed of sandy shales and shaley sandstones which are thinly bedded and soft to medium hard.

Immediately above this formation is supposed to exist the EXTENSION-PROTECTION formation.

EXTENSION-PROTECTION

This formation is the basal portion of the second deposited cycle. It was not encountered in the field reconnaissance but some of the formation may be present in the far east-central portions of the property. As with the Comox basin this formation would be barren of coal in this, the Alberni Basin.

This formation is usually composed of coarse clastic facies where conglomerate, pebbly sandstone and arkosic sandstones are interbedded.

3.5 Ash River Structure

The Ash River property is most likely more structurally complex than indicated on Map No. 5 and cross-sections A-A' to F-F'. Some assumptions can be made after compiling all of the existing information with field observations.

It appears that the Alberni valley is a downdrop fault block which has protected much of the basal portion of the Nanaimo Group from erosion.

The western edge of the basin does not appear to be fault controlled as indicated

by J.E. Muller's 1977 geologic map of the southern half of Vancouver Island. Outcrop 34 on the Ash River which is also PLATE 13 in Appendix II shows the unconformable contact of the Basal Benson conglomerate with the Karmutsen volcanics. Faulting is not in evidence.

To the north, the coal seam at outcrop No. 41 is in the very basal portion of the Comox formation and is located very near the unconformable Karmutsen contact. Faulting again does not appear to be evident.

The eastern edge of the basin appears to be fault controlled. The basin is a downdrop block and the entire basin dips, on the average, to the northeast. This structural feature is common in the Comox and Nanaimo coal basins of the east side of the Island.

In the far northern portion of the property a synclinal feature was identified by HUDBAY COAL COMPANY in their 1979 drilling program. They postulated that this syncline extended down the length of the property to the south.

The syncline was identified in the north by surface mapping, however the southern 3/4 of the property did not contain surface evidence of this structure (cross sections, Appendix III).

Dips along the western edge of the property average 10° to 15° to the northeast. These dips shallow out in the central and eastern portions of the basin to 5° to 10° .

Strikes are variable suggesting smaller fault blocks in the Nanaimo Group sediments. One such fault has been postulated in the central portion of the basin near section B-B'. This fault brings the Comox formation and Haslam formation up again causing a widening in the basin east wards.

The relatively shallow dips are conducive to underground mining the coal seams. Drilling will help to determine whether or not more complicated faulting does or does not exist within the coal measurers.

3.6 Ash River Coal Measurers

As was discussed in previous sections of the report, the coal seams on the Ash River property are found in the Comox formation of the Nanaimo Group.

HudBay Coal Company discusses several coal seams in their 1979 report. For the purposes of this report and to remain on the conservative side we have

decided to address only one main seam. There may however be up to three major coal seams within the formation.

In three separate areas of the property significant coal has been found. In the north, section F-F', Hole No. ARR-7905 encountered 3.0 meters (9.8 feet) of coal.

Further south at Outcrop No. 41 5.5 meters (18 feet) of coal and bony coal is exposed in the bank of a creek. This is drawn on section D-D'.

In the far south on section A-A' hole No. ARR-7912 encountered 3.4 meters (11 feet) of shaly coal.

Now, are these three the same seams or different seams. The next round of drilling should help with correlations.

HBOG did core one hole; ARR-7914, but this was only a 3 foot seam which was stratigraphically lower than the coal seam outcropping at Outcrop No. 41.

From the information available when compiling the cross-section it appears that this seam is in the lower 1/3 of the Comox formation in the northern part of the property and is higher, approximately in the middle of the Comox in the lower half. This could be related to the addition of the Benson conglomerate in the southern areas.

However, the coal seams present do not appear to be low enough in the formation to be affected by palotopographic highs in the basement. In other words the coal should be fairly continuous.

There may be lower seams, but the existence of upper seams is unlikely as most of HBOG's drill holes were in the upper 1/2 of the Comox formation.

The outcrop/subcrop of this possible coal zone has been hypothesized on Map No. 5. As can be seen this zone wraps around the northern synclinal feature which plunges southeast.

As can be seen, more land will have to be aquired to control all of the outcrop. However, this land can be applied for after the results of the fall drilling program are examined.

RESERVES

4.0 RESERVES

The 1979 HudBay Coal Company report indicated that there are no reserves of mineable coal. This is based mainly on assumptions regarding the coal quality in the area. The HudBay assumptions could be correct, but the section 5.0 quality will explain why Canadian Occidental Petroleum believes there is upside potential in the area.

Assuming, therefore, that an acceptable coal product can be economically produced, an attempt has been made to broadly assign an in place resource tonnage to the Ash River property.

Actually only one hole on the property encountered coal of a mineable thickness. This hole was ARR-7905 which intersected 3.0 meters (9.8 feet) of coal which is dipping at about 33° to the southwest. Therefore, the corrected thickness of the coal would be about 2.5 meters (8.2 feet). This Hole is located in the very northernmost portion of the property. (Map No. 4A)

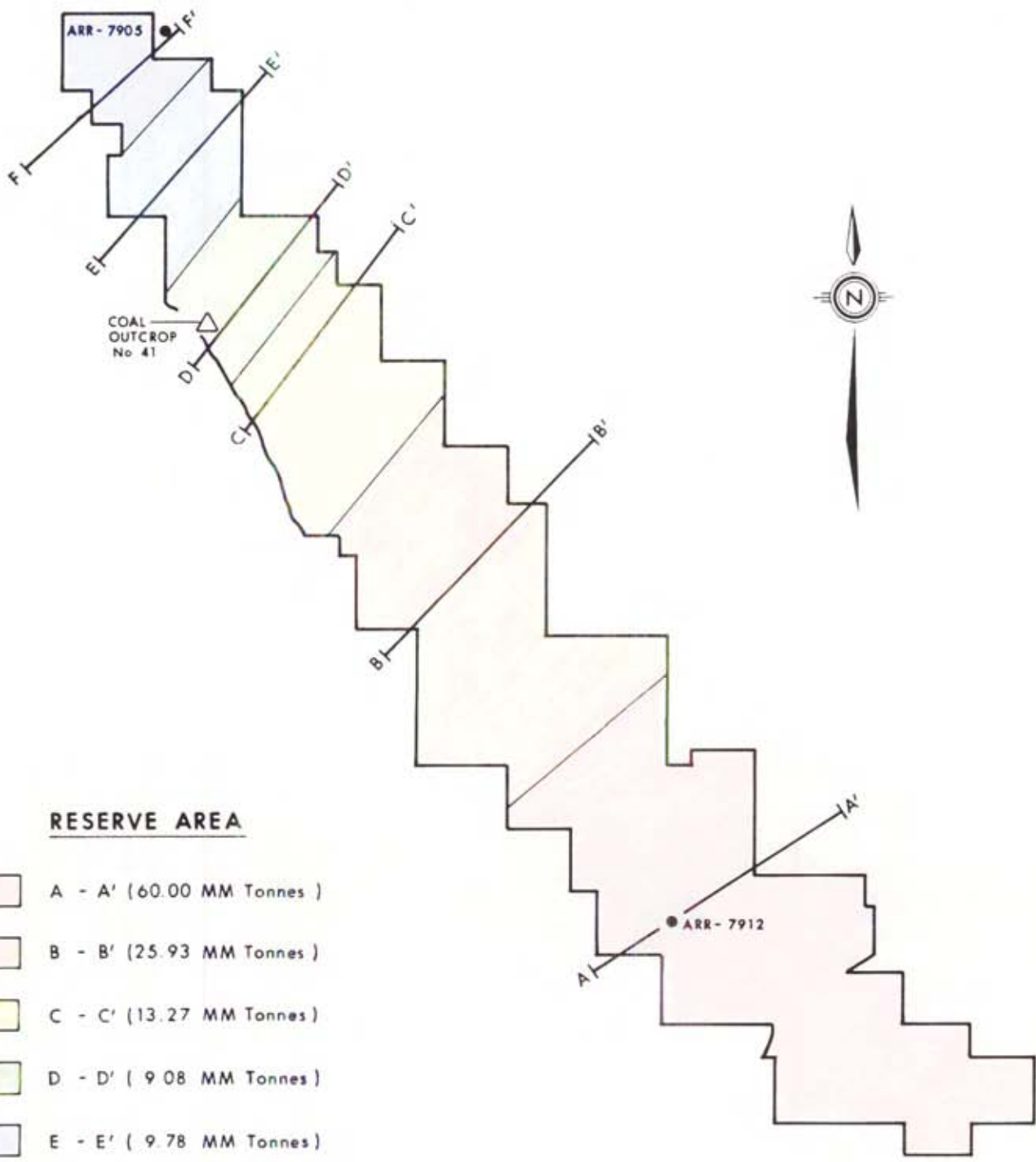
Further south at outcrop No. 41 another coal seam is exposed. It may or may not be the same, but it covers an interval of approximately 5.5 meters (18 feet) of coal, bony coal and shale. (Map No. 4A)

In the southern portion of the Ash River property Hole No. ARR-7912 encountered 3.4 meters (11 feet) of shaly coal. This may or may not be the same seam.

Until the next round of drilling is carried out it will be assumed that all of these coaly intervals represent one coal seam, even though these may be more than one and that this seam is structurally situated as indicated on the Cross-Sections in Appendix III.

Keeping this in mind, the following broad assumptions have been used in calculating the reserves:

- 1) Reserves were calculated from the $1\text{cm} = 100\text{ meters}$ cross-sections in Appendix III.
- 2) Only one coal seam was presumed economically mineable and its thickness was taken as 3.8 meters (12.5 feet). This is the average of the three coal seams encountered in drilling and mapping as described in the preceding section.
- 3) Area of influence of each cross-section was taken as half way between adjoining cross-sections (Map No. 4A).
- 4) Depth to the coal over the property varies from surface in the west to



RESERVE AREA

- A - A' (60.00 MM Tonnes)
- B - B' (25.93 MM Tonnes)
- C - C' (13.27 MM Tonnes)
- D - D' (9.08 MM Tonnes)
- E - E' (9.78 MM Tonnes)
- F - F' (7.95 MM Tonnes)

TOTAL RESERVES - 126.01 MM TONNES

Canadian Occidental Petroleum Ltd.		
Coal Exploration		
ASH RIVER PROPERTY		
RESERVES BY CROSS SECTION		
Map No. 4A		
Date	June 84 NTS	Compiled By R. Sworen
Drawing	File	Drawn By L. M.
		Revised Date

to 500 meters (1600 feet) in the east.

- 5) Average dip over most of the property is from 6° to 15° to the northeast.
- 6) All of the reserves are RAW COAL IN PLACE.
- 7) The following system has been used to classify these reserves.

RESERVES					
Measured			Indicated	Inferred	Speculative
Clean	R.O.M. Recoverable	In Place			

Since there has been some drilling carried out and since there is one good outcrop in the field these reserves have been classified as inferred.

- 8) Calculations used were:

Metric tonnes of coal = length of influence x thickness of coal x length of coal downdip.

Where: length of influence is the influence of each cross-section.
Lengths were taken from halfway points between sections on Map No. 4A and Map No. 5.

Length of coal downdip is the length from where it subcrops/ outcrops in the west to the eastern property boundary for each section.

The reserves by area of influence for each cross-section are summarized in TABLE 1 which follows.

The total in place, inferred, reserves of Raw Coal is approximately 126.01 million tonnes. This coal is considered underground mineable.

TABLE 1
ASH RIVER
RESERVES BY CROSS-SECTION

Cross-Section	Average Seam Thickness (m)	Length of Coal	Length of Section Influence (m)	Reserves millions metric tonnes
A-A'	3.8	2180 m	7242 m	60.00
B-B'	3.8	1600 m	4265 m	25.93
C-C'	3.8	1550 m	2253 m	13.27
D-D'	3.8	1650 m	1448 m	9.08
E-E'	3.8	1600 m	1609 m	9.78
F-F'	3.8	1300 m	1609 m	7.95

NOTE: All reserves are raw coal in place
: Reserves are classified as inferred

Total	126.01 Million Tonnes
-------	--------------------------

QUALITY

5.0 QUALITY

The only coring carried out to date in the Alberni Valley was done in 1979 by Hudsons Bay Coal Company. They cored 3 feet of coal in hole No. ARR-7914. Presumably no analysis was carried out on this core, as there are no results published in their report. However, the report does give the indication that each seam encountered is composed of only 25% coal. This assumption was made by examining the E-Logs from their 1979 drilling program.

The above could in fact be true, but, it is possible that laboratory analysis of the main seam may delineate a mineable interval of good quality coal within that seam.

Further information which indicates that there may be coal of good quality at Ash River was obtained from Buckham's Field Diary. The outcrop sampled was the coal seam encountered at outcrop No. 41 on Map No. 5.

At this outcrop a 20 foot (6 meters) seam was encountered which consisted of interbedded coal, bony coal and shale. It is not known how the seam was sampled so the coal may or may not be oxidized. Also, the sampler may have high graded the sample and taken only good bright coal for analysis.

A Mr. Geo Hannay took a sample from this outcrop, which was received at Union Bay, June 1, 1951 and analyzed June 7 by P.F. Grundy; No.51-770. The results of the analysis are as follows:

Report Marked "Air Dry Sample"
As Received

H ₂ O	= 1.22%
Volatile Matter	= 29.06%
Fixed Carbon	= 39.81%
Ash	= <u>29.91%</u>
	100.00%

Heat Content	= 9,548 B.T.U.'s/lb.
Sulfur	- 1.07%

Coke Dense - Free Swelling Index = 3

Dry Mineral Matter Free Fixed Carbon = 60.6%

Moist Mineral Matter Free B.T.U.'s = 14,250 B.T.U.'s/lb.

Rank = High Volatile "A" Bituminous

This quality looks very interesting and could hold many possibilities. It is hoped that a coring program in which unoxidized coal would be analyzed would raise the heat content and possibly the F.S.I. The Ash is quite high but it will remain to be seen upon analysis as to how easily the Ash content can be lowered and at what yield. The sulfur is quite acceptable as compared to Quinsam Mine Coal which is high and becomes a deterrent in marketing the product.

It is hoped that the coring program will be carried out this fall at the end of the drilling program. It will consist of approximately 4 holes, two in the north, one in the centre and one in the southern portions of the property.

In summary, the conclusions in the 1979 Hudson Bay Coal Company report may be correct, but there is further evidence that indicates that detailed laboratory analysis is required on any seams of mineable thickness encountered, especially on the seam at Outcrop No. 41.

MAPPING
PROGRAM/84

6.0 Mapping Program - 1984

This program was carried out over 11 days in May of 1984. Two of the days were spent in travelling from Calgary to Port Alberni and return, therefore, 9 days were spent in the field. The work was carried out by a 2 man field crew with the use of a rental Van for transportation. It rained during the entire length of the program.

6.1 Work Completed

During the 9 field days all of the MacMillan Bloedel logging roads were driven, outcrops taken and notes made as to whether or not the roads were accessible to wheeled drilling rigs (Map No. 6). Where ever possible creeks and the Ash River were walked in order to narrow down the location of the sedimentary/volcanic unconformable contact and to trace the major coal outcrop/subcrop.

This program was not meant to be an in depth detailed mapping program and the inclement weather caused the program to be completed sooner than was anticipated. However, it was felt that the 9 days of fieldwork were sufficient to provide enough information to devise a drilling program for the fall of 1984. The program provides the basis for this report.

6.2 Program Cost

The following is a cost breakdown of the May 1984 preliminary reconnaissance and mapping program on the Ash River property:

<u>Item</u>	<u>Cost</u>
Wages Supervisor (88 hours @ \$28.4090/hour)	\$ 2,500.00
Wages Assistant (88 hours @ \$16.3238/hour)	<u>1,436.50</u>
Sub-Total	\$ 3,936.50
Payroll Burden = 16.9% of \$3,936.50	= \$ 665.26
Expenses Supervisor (Includes Room, Board, and Plane Fare)	= 929.63
Expenses Supervisor (Includes Room, Board, and Plane Fare)	= 872.58
Truck Rental (Budget Van)	= 420.00
Road Use Cost (MacMillan Bloedel)	= 300.00
* Fuel/Oil	= <u>112.50</u>
Sub-Total	\$ 7,236.47
Overhead (report writing, drafting, reproductions) @ 10%	<u>723.65</u>
Total	\$ <u><u>7,960.12</u></u>

NOTE * All charges except fuel/oil are on Canadian Occidental Petroleum Ltd's corporate AFE #990403. The fuel/oil was put on the Corporate credit card and the Budget licence # entered.

The total cost for the mapping program and this the resulting report is approximately \$7,960.12.

PROPOSED
EXPLORATION

7.0 PROPOSED EXPLORATION

A drilling program has been proposed for the fall of 1984. It would consist of approximately 15 holes of which four would be core holes. Total meterage would amount to 2,525 meters (8,284) feet). The purpose of this program would be:

- A) To drill through and core the major coal seam at outcrop No. 41.
- B) To extend this major seam to the north and south and determine if it is the same one as encountered in drill holes ARR-7905 and ARR-7912.
- C) To determine whether or not there are other economic seams above or below this seam.
- D) To core the major seam in the north, central and southern portions of the lease block and send the coal away for analysis.
- E) To determine the thickness and continuity of all main seams and evaluate the properties reserve potential.
- F) To carry out geotechnical work on roof and floor samples from the core holes to determine which underground mining method may become practical.

In order to obtain the above information a program as shown on Map No. 6 has been proposed the following is a list of the holes and their proposed depth.

<u>Hole No.</u>	<u>Depth m(ft.)</u>
AR-8401	152 (500)
AR-8402	152 (500)
AR-8403	152 (500)
AR-8404	152 (500)
AR-8405	152 (500)
AR-8406	152 (500)
AR-8407	152 (500)
AR-8408	152 (500)
AR-8409 (core)	100 (328)
AR-8410	152 (500)
AR-8411	152 (500)
AR-8412	152 (500)
AR-8413 (core)	125 (410)
AR-8414 (core)	100 (328)
AR-8415 (core)	100 (328)
	<u>(2,525)(8,284)</u>

If the results from this program prove favourable further programs will of course be proposed. Drilling programs following this one will be designed

to continue the trend of the coal downdip (to the east), which will require deeper holes and updip (to the west) shallower holes. This will define the outcrop subcrop line, firm up the reserve figure, indicate faulting if present and test the coal quality to depth.

In order to carry out this first round of exploration, a startup date of October 1, 1984 has been proposed. Probably one wheeled rig will be used. This rig will be equipped with a downhole hammer and have coring capabilities. It will most likely be contracted from a drilling company on Vancouver Island. All holes will be logged using gamma, density, resistivity, neutron and caliper logs. Crews will be accomodated in Port Alberni and will travel to the job and back each day. The job should take at the maximum 45 days. The following is a cost breakdown of the proposed program:

<u>ITEM</u>	<u>COST</u>
<u>DRILLING COSTS (INCLUDES BITS, FUEL AND DRILLING ADDTIVIES)</u>	
Mobilization and Demobilization	\$ 600.00
Setting Casing (\$22.00/ft x 1,500 feet)	\$ 33,000.00
Drilling Rock (\$9.00/ft x 8,284 feet)	\$ 74,556.00
Coring (\$12.00/ft x 240 feet)	\$ 2,880.00
Standby (logging, moving, pulling pipe, \$125.00/hr x 75 hrs.)	\$ 9,375.00
Room and board (\$50.00/man/day x 3 x 45 days)	\$ 6,750.00
Cementing holes (\$3.50/foot x 8,284 feet)	\$ 28,994.00
Sub-Total	<u>\$156,155.00</u>
<u>LOGGING COSTS</u>	
Mobilization and Demobilization	\$ 1,100.00
Logging 2,525 meters @ \$5.50/meter	\$ 13,887.00
Room and Board, 45 days @ 65.00/day	\$ 2,600.00
Fuel/Oil	\$ 1,400.00
Sub-Total	<u>\$ 18,987.00</u>
<u>QUALITY ANALYSIS</u>	
Four Core Holes @ \$4,000.00/hole	<u>\$ 16,000.00</u>
<u>SURVEYING</u>	
15 drill holes	<u>\$ 10,000.00</u>

<u>ITEM</u>	<u>COST</u>	
<u>ROAD RENTAL</u>		
Use of MacMillan Bloedel logging roads	\$ <u>300.00</u>	
<u>HELICOPTER TIME</u>		
Aerial observation of property + Port Alberni + Photographs	\$ <u>1,000.00</u>	
<u>SUPERVISOR WAGES (CdnOxy)</u>	\$ <u>10,000.00</u>	
<u>SUPERVISOR EXPENSES</u>		
Room, board, phone, etc.	\$ <u>4,000.00</u>	
<u>SUPERVISOR VEHICLE, FUEL, OIL, ETC.</u>		
Includes CdnOxy truck leasing, fuel and oil	\$ <u>2,500.00</u>	
<u>GEOTECHNICAL STUDIES</u>		
5 field days logging core + collecting field data		
Uniaxial strength tests		
Assessment of roof support, standup time		
Application of all data versus mining methods	\$ <u>15,000.00</u>	
<u>RECLAMATION COSTS</u>		
Seeding + fertilizing drill sites	\$ <u>3,000.00</u>	
	Sub-Total	\$ <u>236,942.00</u>
Miscellaneous @ 10%		\$ 23,694.00
	Sub-Total	\$ <u>260,636.00</u>
10% Overhead		\$ <u>26,064.00</u>
	Total	\$ <u>286,700.00</u>

The above costs are subject to change in certain areas. These are:

- 1) Cost decrease if drilling does not encounter sufficient coal thickness to warrant coring some or all of the core holes.
- 2) Cost decrease because of 1) would affect Quality Analysis, Geotechnical and all other aspects of the program.
- 3) Cost decrease if cementing of all the drill holes is not required.
- 4) Cost increase if the SUPERVISOR is a CONSULTANT rather than a CdnOxy employee.
- 5) Cost increase if rental truck is used rather than company vehicle.
- 6) Cost decrease if only partial geotechnical is done.

It must also be noted that company vehicle cost and CdnOxy employee cost will be put on this AFE for contribution to the work committment. However, the coal departments G&A will decrease.

In summary the total amount of funds required to carry out this program should be in the order of \$286,700.00 maximum.

This expenditure will complete the 5.31/hectare or \$19,264.68 required as the first years work committment as well as the \$45,350.00 (\$12.50/hectare) required for the second year; the \$45,350.00 (\$12.50/hectare) required for the third year; the \$90,700.00 (\$25.00/hectare) required for the fourth year and a portion of the fifth years expenditures; the fifth year also being \$25.00/hectare.

It may be that some acreage will be acquired as coal licences along the northern and western edges of the property to insure full coverage of the property. The above expenditure will certainly cover the four years of work committments which will be until May 1, 1988 as well as a good portion of the 1988/89 years expenditures, even with the acquisition of the additional acreage.

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- SWAREN, R.A.; 1980; Comox Coal Field, Tsolum River Preliminary Evaluation: In House Report Prepared For Canadian Occidental Petroleum Ltd.
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APPENDIX I
1979 Drillers Logs for Hudson's Bay Oil and
Gas Drill Holes
(Holes #ARR. 79-1 through ARR. 79-14)

Hudbay Coal Company
ROTARY (Reverse Circulation) DRILL HOLE LOG

COAL FIELD <u>Ash River</u>	HOLE NUMBER <u>ARR-7902</u>
COMPANY <u>Ken's Drilling</u>	LOCATION <u>Vancouver Island</u>
DATE <u>1979-06-17</u>	SURVEYED LOCATION <u>548060N 5025N</u>
LOGGING COMPANY <u>Roke Oil</u>	ELEVATION <u>1125 ft (343 m)</u>
LOG RUN <u>GR-Res., N. Density, Caliper</u>	ANGLE / BEARING <u>Vertical</u>
DEPTH (TEST) _____	WATER HORIZON <u>94.1 ft (28.7 m)</u>
COMMENTS <u>Hole caved at 180 ft (55 m). Hole making 80 to 100 gallons per minute.</u>	
<u>Could not be logged open hole pass 180 ft - kept caving. Drillers log.</u>	

FROM	TO	LOG	REMARKS
0.0	3.9 m	Overburden (Gravels and Boulders)	
3.9	4.3	Clay and Tills	
4.3	7.3	Sandy Clay	
7.3	7.6	Coaly Shale	
7.6	35.4	Shale	
35.4	35.7	Soft Coal	
35.7	54.8	Shale	
54.8	70.1	Soft Shale	
70.1	73.8	Sandstone	
73.8	78.0	Shale	
78.0	86.8	Sandstone	
86.8	95.7	Shale (Water flowing at approximately 80 - 100 GPM)	
95.7	130.8	Sandstone	
130.8	139.0	Shaley Saltstone	
139.0	140.2	Shale	
140.2	143.9	Sandstone	
143.9	145.7	Shale	
145.7	146.9	Sandstone	<i>Never reached completion</i>
		T.D. 482.0	

Hudbay Coal Company
ROTARY (Reverse Circulation) DRILL HOLE LOG

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AL FIELD <u>Ash River</u>	HOLE NUMBER <u>ARR-7905</u>
MI <u>Ken's Drilling</u>	LOCATION <u>Vancouver Island</u>
TE <u>1979-06-23</u>	SURVEYED LOCATION <u>548435N 4838E</u>
GC <u>Roke Oil Enterprises</u>	ELEVATION <u>2010 ft (612.8 m)</u>
GS <u>GR-N, Density, Caliper, FBL</u>	ANGLE / BEARING <u>Vertical</u>
VI <u>ION (TEST)</u>	WATER HORIZON <u>93.8 m</u>
REMARKS <u>13.5 ft of casing. Hole in good condition. Drillers Log.</u>	
<u>Hole making water at 112.5 m (2 - 3 GPM).</u>	

FROM	TO	LOG	REMARKS
0	.3 m	Overburden	
.3	8.2	Sandstone	
8.	19.8	Shaley Sandstone	
19	20.4	Sandstone	
20.4	21.0	Shaley Sandstone	
21	36.3	Sandstone	
36.3	37.2	Shaley Sandstone (Water 2 - 3 GPM)	
37	38.4	Sandstone	
38.4	58.2	Sandstone and Shale	
58	58.5	Sandstone	
58.5	58.8	Shale	
58	63.7	Sandstone	
63.7	67.4	Shale and Sandstone	
67	93.6	Sandstone	
93.6	102.1	Shale	
102.1	105.5	Sandstone	
105.5	108.5	Coal	<i>3.0 meters coal</i>
108.5	109.1	Shale	
109.1	110.4	Sandstone	
110.4	110.6	Shale	
110.6	117.4	Sandstone	
117.4	124.7	Shale	
124.7	131.7	Sandstone (10 - 15 GPM)	
131.7	133.8	Shale and Coal	<i>2.1 meters</i>

Hudbay Coal Company
ROTARY (Reverse Circulation) DRILL HOLE LOG

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PROPERTY FIELD <u>Ash River</u>	HOLE NUMBER <u>ARR-7906</u>
DRILLER <u>Ken's Drilling</u>	LOCATION <u>Vancouver Island</u>
DATE <u>1979-06-25</u>	SURVEYED LOCATION <u>548300N 4868E</u>
LOGGING COMPANY <u>Roke Oil Enterprises</u>	ELEVATION <u>1525 ft (464.9 m)</u>
LOGS RUN <u>GR-N, Density, Caliper, FBL</u>	ANGLE / BEARING <u>Vertical</u>
DEPTH INTERVAL (TEST) _____	WATER HORIZON <u>28.3 m</u>
REMARKS <u>Casing to 20 ft. Water hit at 45 ft (2 - 3 GPM). Drillers Log.</u>	

DEPTH (M)	TO	LOG	REMARKS
0	2.7 m	Overburden	
2	5.8	Sandstone	
5	19.2	Interbedded Shale and Sandstone	
19.2	20.4	Shale	
20.4	22.6	Sandstone	
22.6	26.8	Shale	
26.8	29.9	Sandstone	
29.9	34.8	Shale	
34.8	37.2	Sandstone	
37.2	42.4	Shale	
42.4	57.0	Sandstone (at 85.9 m - 10 - 15 GPM)	
57.0	123.5	Interbedded Shale and Sandstone	
123.5	134.7	Conglomerate	<i>H. J. J. J. J.</i>
134.7	140.2	Sandstone	
140.2	142.7	Sandstone and Conglomerate	
142.7	150.0	Sandstone	
150.0	157.0	Volcanics	
		T.D. 157.0 m	

Hudbay Coal Company
ROTARY (Reverse Circulation) DRILL HOLE LOG

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COAL FIELD <u>Ash River</u>	HOLE NUMBER <u>ARR-7910</u>
COMPANY <u>Ken's Drilling</u>	LOCATION <u>Vancouver Island</u>
DATE <u>1979-07-01</u>	SURVEYED LOCATION <u>547700N 5235E</u>
LOGGING COMPANY <u>Roke Oil Enterprises</u>	ELEVATION <u>1050 ft (320.1 m)</u>
LOGS RUN <u>GR-N, Density, Caliper</u>	ANGLE / BEARING <u>Vertical</u>
DEVIATION-(TEST) _____	WATER HORIZON <u>20.3 m</u>
COMMENTS <u>Hole in good condition. Hole making 10 GPM.</u>	

FROM	TO	LOG	REMARKS
0 m	17.9 m	Overburden (Till and Gravel)	
17.9	40.5	Shale	
40.5	41.2	Sandstone	
41.2	44.8	Shale	
44.8	71.3	Sandstone	
71.3	77.7	Shale	
77.7	80.8	Sandstone	
80.8	82.9	Shale	
82.9	107.3	Sandstone	
107.3	108.2	Conglomerate	
108.2	111.3	Sandstone	
111.3	121.9	Sandstone (Water at 10 GPM)	
121.9	125.6	Siltstone	
125.6	126.5	Sandstone	
126.5	127.7	Shale	
127.7	132.9	Shaley Sandstone	
132.9	133.8	Conglomerate	
133.8	134.8	Sandstone and Shale	
134.8	135.1	Conglomerate	
135.1	143.3	Shale	
143.3	144.2	Shale and Sandstone	
144.2	153.9	Sandstone	
		T.D. 153.9 m	

Hudbay Coal Company
ROTARY (Reverse Circulation) DRILL HOLE LOG

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FIELD	Ash River	HOLE NUMBER	ARR-7912
MAN	Ken's Drilling	LOCATION	Vancouver Island
	1979-07-06	SURVEYED LOCATION	547328N 5474E
SIN COMPANY	Roke Oil Enterprises	ELEVATION	149.4 m (490 ft)
REC'D	GR-N, Density, Caliper	ANGLE / BEARING	Vertical
ATION (TEST)		WATER HORIZON	19.3 m
MEM'S	Hole in good condition. Hole making water (5 GPM) at 38.7 m (127 ft). Drillers log. Set 22.9 m (75 ft) of casing.		

DOM	TO	LOG	REMARKS
	22.9 m	Overburden (Clays & Gravels)	
1.9	41.2	Shaley Sandstone	
2.2	41.8	Sandstone	
3.8	42.4	Shaley Sandstone	
4.4	43.3	Sandstone	
5.3	54.3	Green Sandstone (53.4 - hole making 50 to 100 GPM)	
6.3	55.8	Grey Sandstone	
7.8	124.1	Sandstone	
8.4	127.7	Shaley Coal	3.4 meters shaley coal
9.7	128.7	Sandstone	
10.8	138.4	Shale	
11.8	139.9	Sandstone	
12.9	140.8	Shale	
13.0	142.1	Shaley Sandstone	
14.1	143.5	Sandstone	
15.3	146.3	Conglomerate	2.8 meters cong.
		T.D. 146.3 m	

APPENDIX II.

PHOTOGRAPHIC PLATES NO. 1 THROUGH 13



Plate 1: Outcrop 2. Bridge over Ash River
Comox formation is below the bridge in the river.



Plate 2: Outcrop 2. Note condition of bridge.
Impassable for drilling rigs.



Plate 3: Outcrop 32. Falls located downstream from bridge at Outcrop 2. Comox formation, basal Benson conglomerate forms the falls.



Plate 4: Outcrop 32. Just downstream from Falls

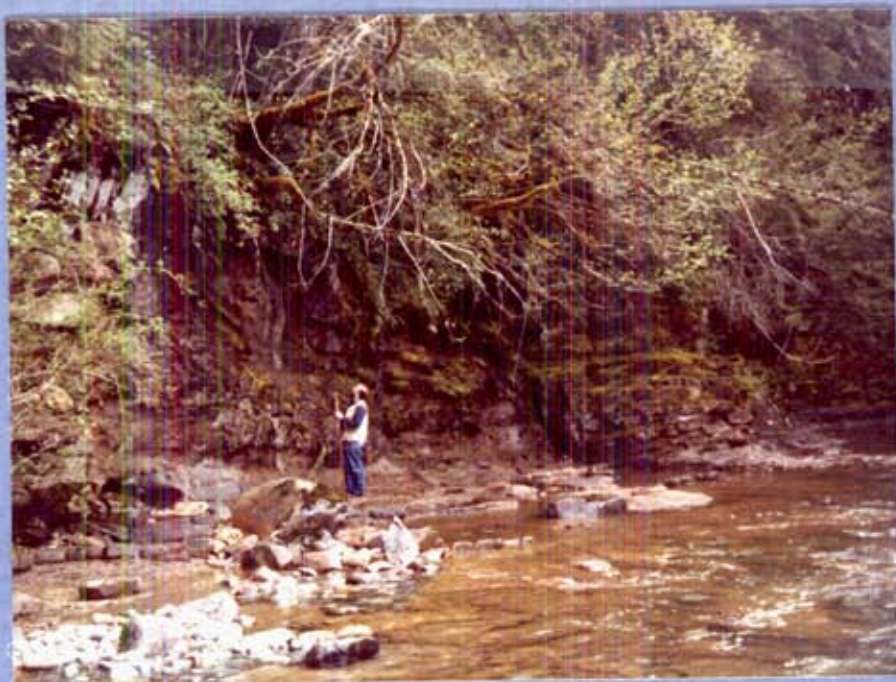


Plate 5: Outcrop 31. Comox sandstones located where
Lanternman Creek flows into the Ash River.
Dip is 12° into the picture.



Plate 6: Outcrop 31. Comox formation at same
location as Plate 5.



Plate 7: Outcrop 39. Looking northwest at sediments
overlying Karmutsen Volcanics.
Volcanics are where photographer is.



Plate 8: Outcrop 39. looking southeast at Karmutsen Volcanics.



Plate 9: Outcrop 40. Looking west Elsie Lake
Note gentle undulating hills.



Plate 10: Outcrop 40. Looking southwest at Elsie Lake.



Plate 11: Outcrop 40. Looking southeast towards Port Alberni.
Can barely see pulp mill smoke in the distance to the left.
If it was a clear day you could. Note how the Alberni
Valley opens up and flattens southwards.



Plate 12: Outcrop 40. Looking northwest.
Note how the Alberni Valley gets narrower
and hillier to the north.
Northern property boundary ends at the small lake.






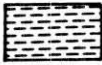




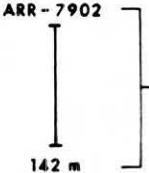
Plate 13: Outcrop 34. Contact with Comox formation
Benson conglomerate on left side of Ash River and
Karmutsen Volcanics on the right bank.
Comox formation dips gently at 14° to the left of the photo.

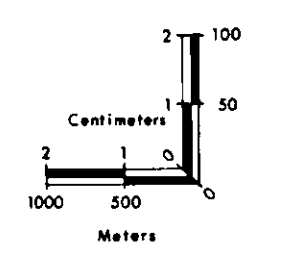
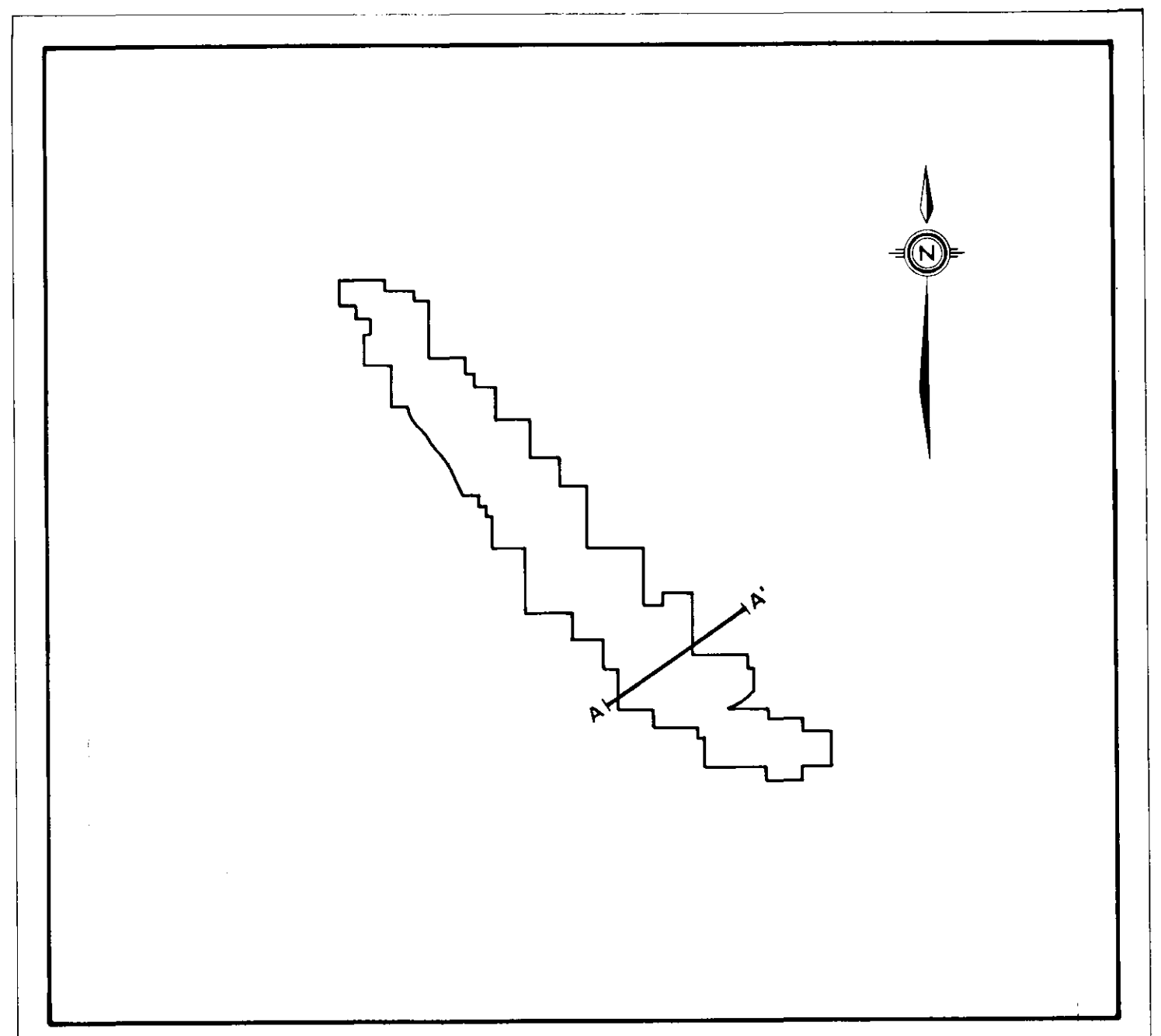
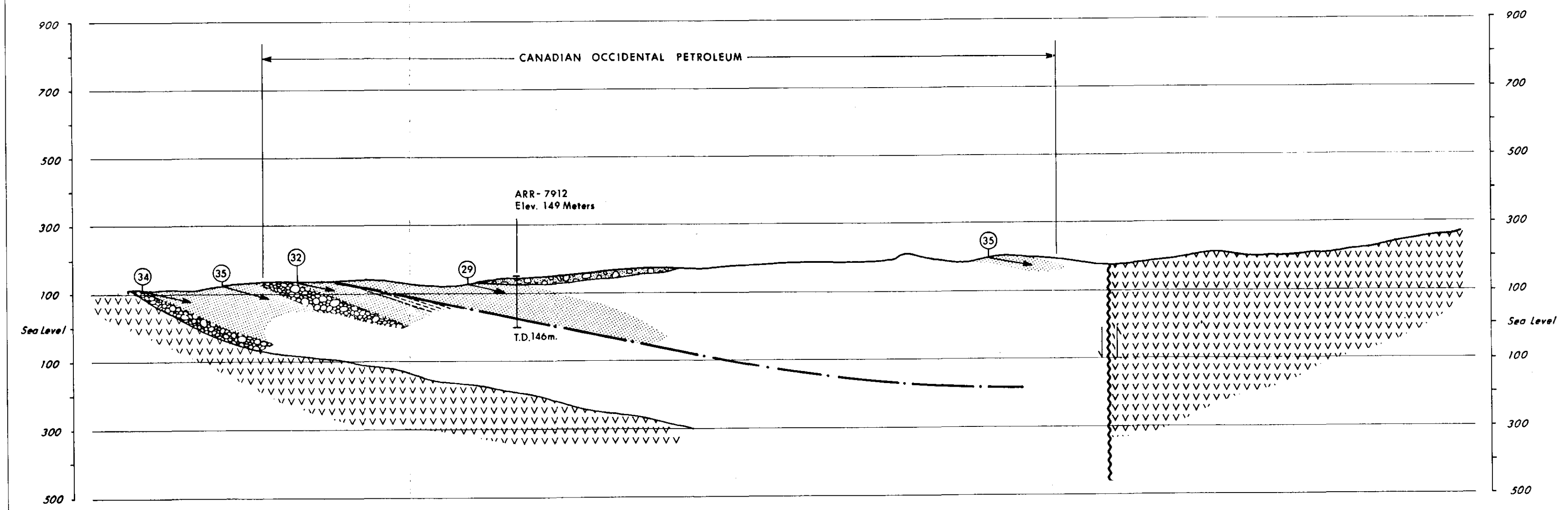
APPENDIX 111

GEOLOGIC CROSS - SECTIONS


(A-A' - F-F' INCLUSIVE)

LEGEND

-  COAL SEAM (ASSUMED)
-  GLACIAL TILL
-  KARMUTSEN VOLCANICS
-  SHALE
-  SANDSTONE
-  CONGLOMERATE
-  OUTCROP No. DIP DIRECTION
-  FAULT, UPWARDS / DOWNWARDS
-  HOLE NUMBER
DRILL HOLE
TOTAL DEPTH



041 (M)

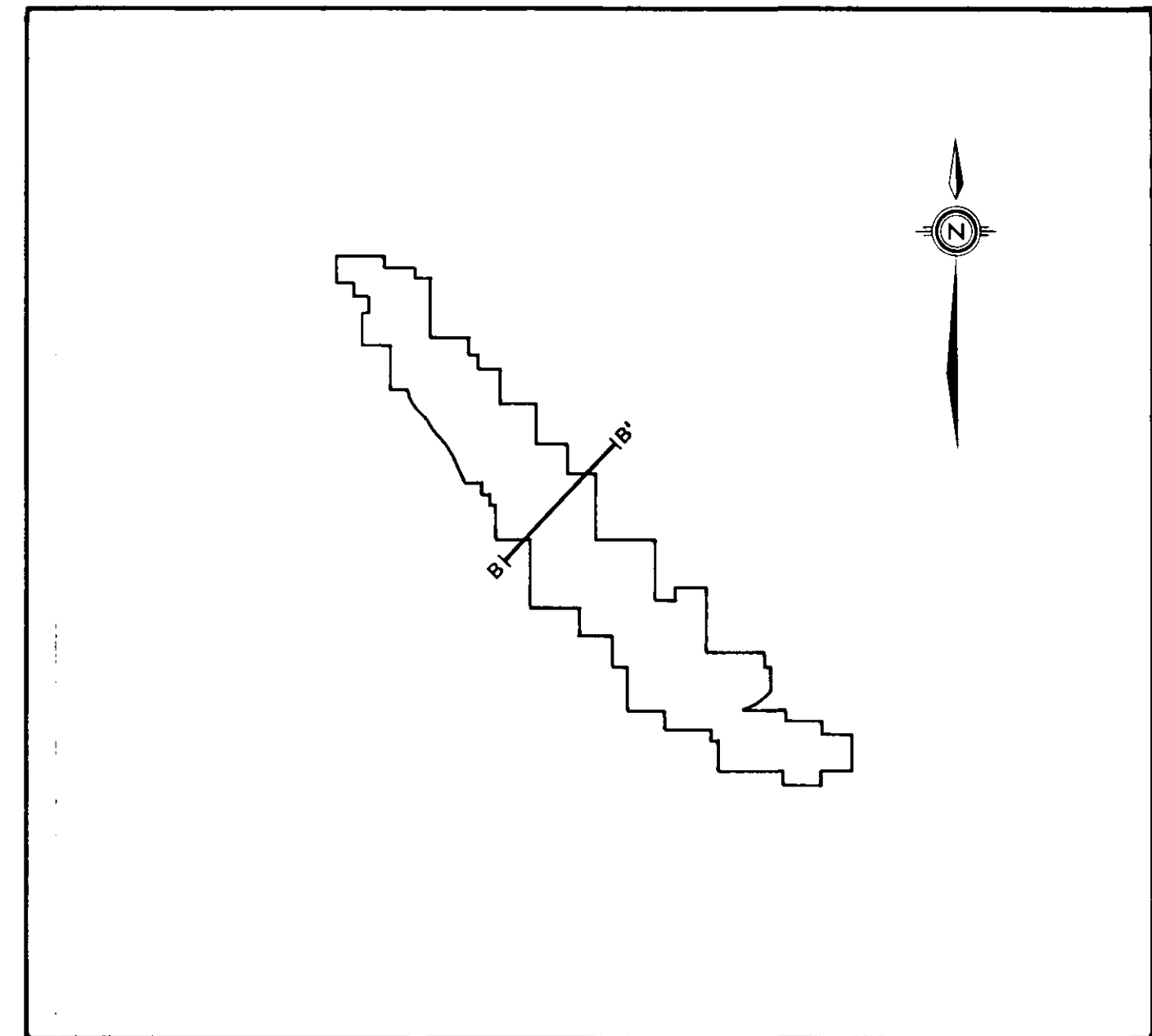
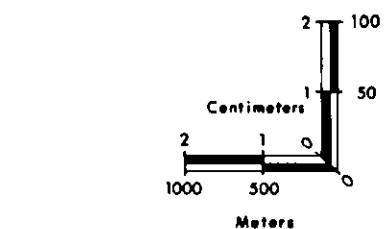
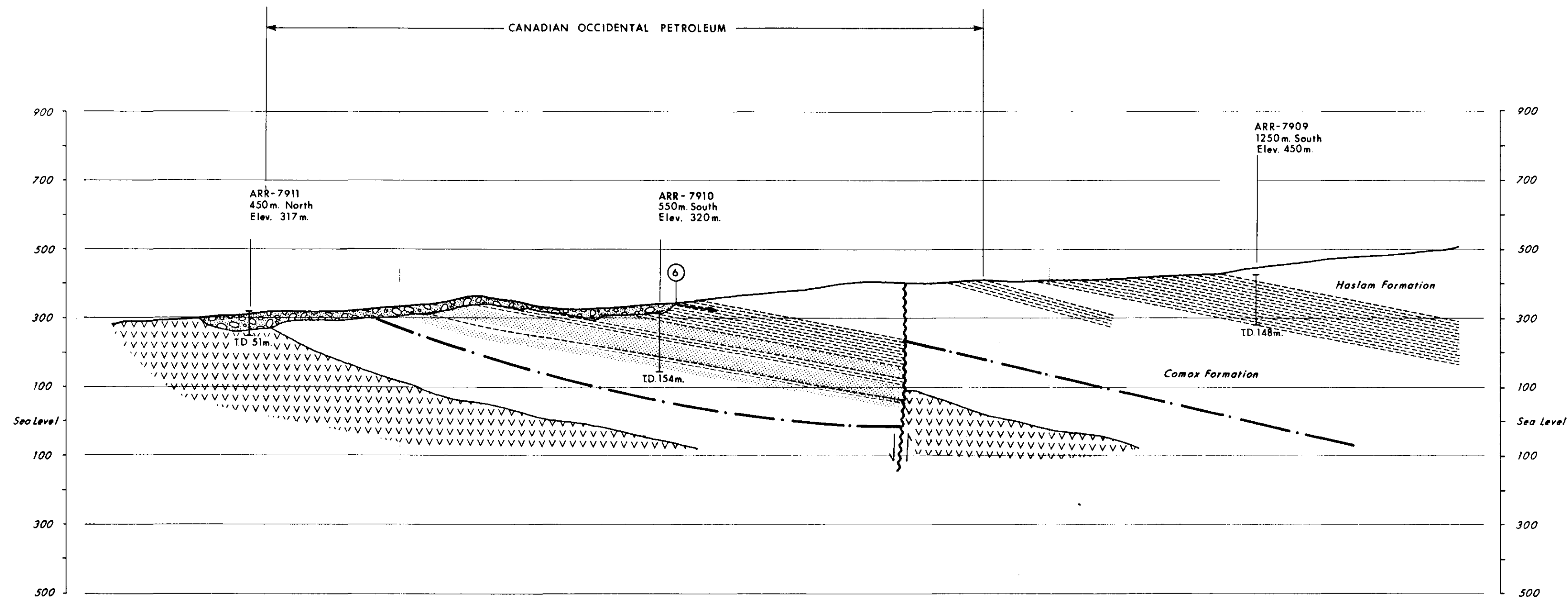
Canadian Occidental Petroleum Ltd. 

Coal Exploration

ASH RIVER PROPERTY - VANCOUVER ISLAND

GEOLOGIC CROSS-SECTION
A - A'

Date July 84	NTS	Compiled By: R. A. Swaren
		Drawn By: L. MacKellar
Drawing:	File:	Revised Date:



041 (M2)

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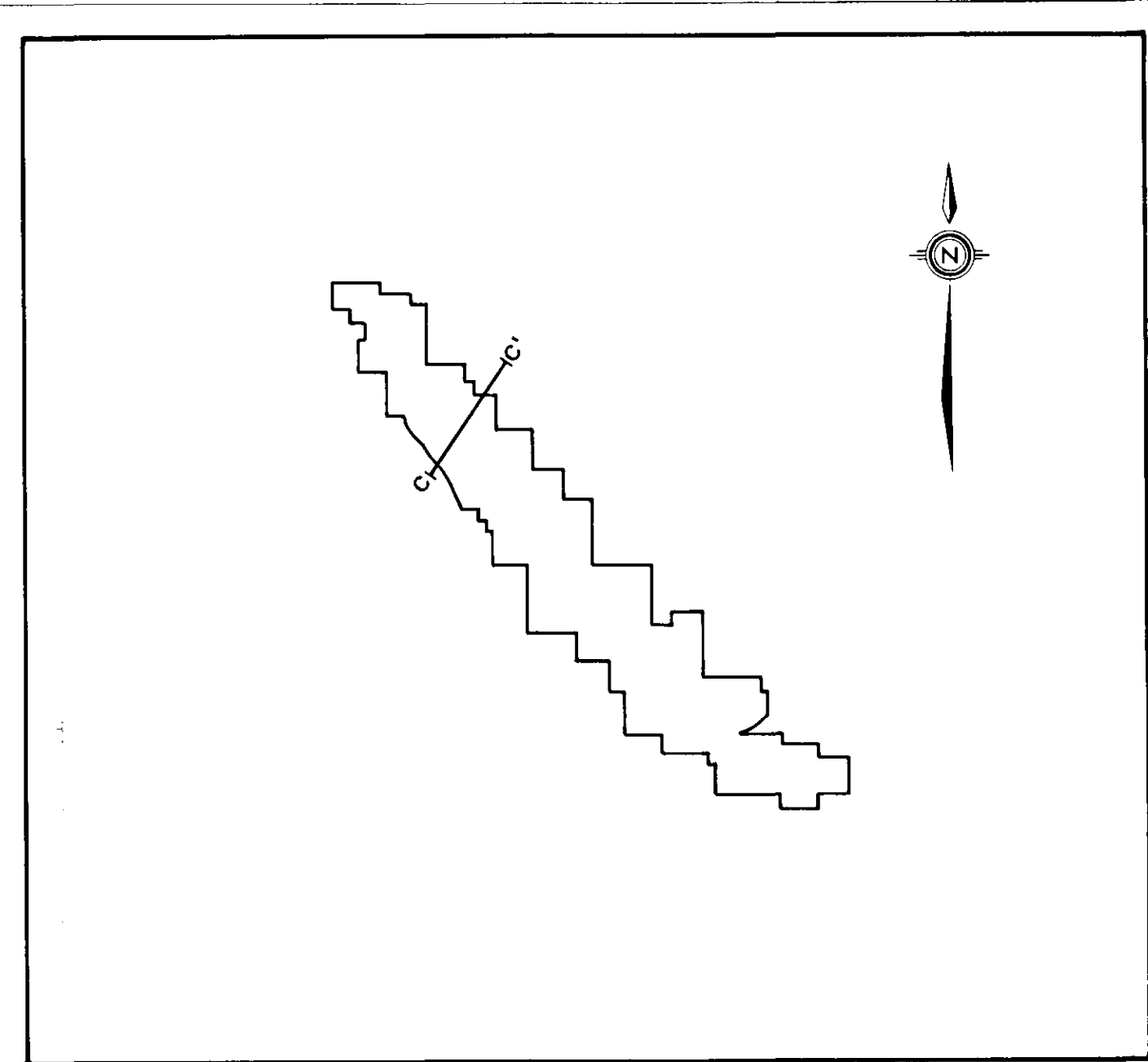
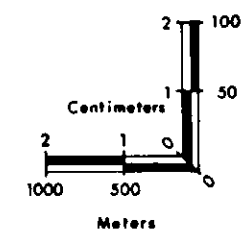
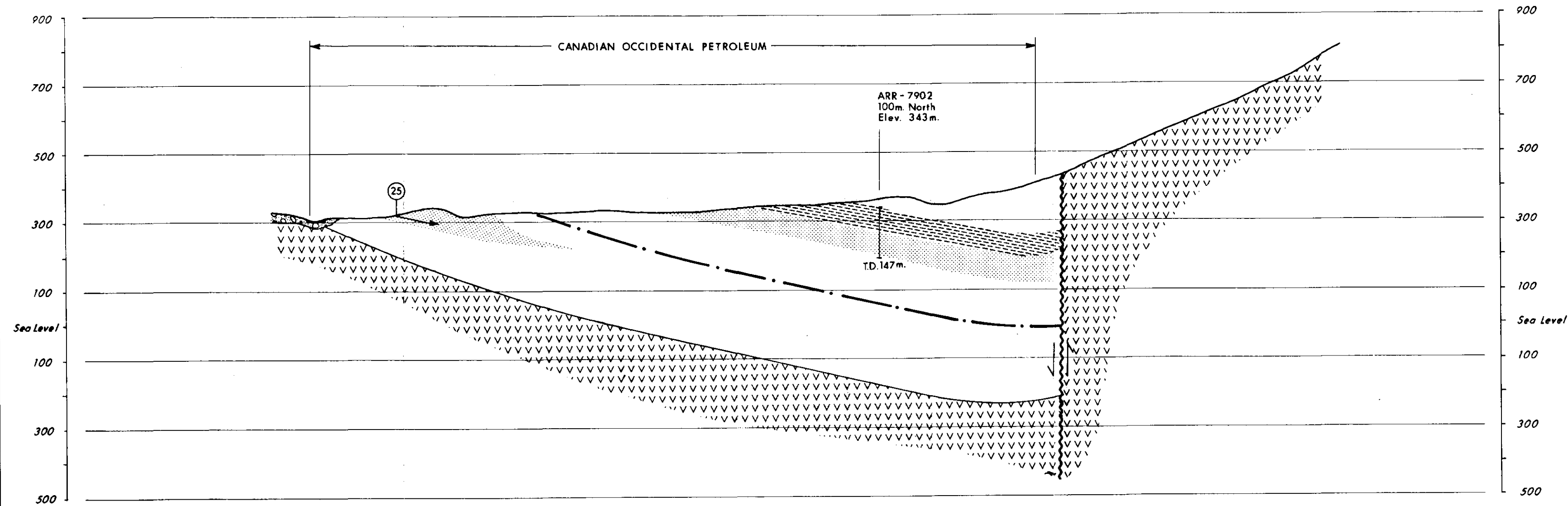
Coal Exploration

ASH RIVER PROPERTY - VANCOUVER ISLAND


GEOLOGIC CROSS-SECTION

B-B'

Date July 84	NTS	Compiled By R. A. Swaren
Drawing	File	Drawn By: L. MacKellar
		Revised Date:



041 (M3)

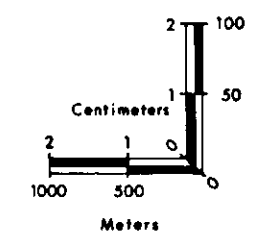
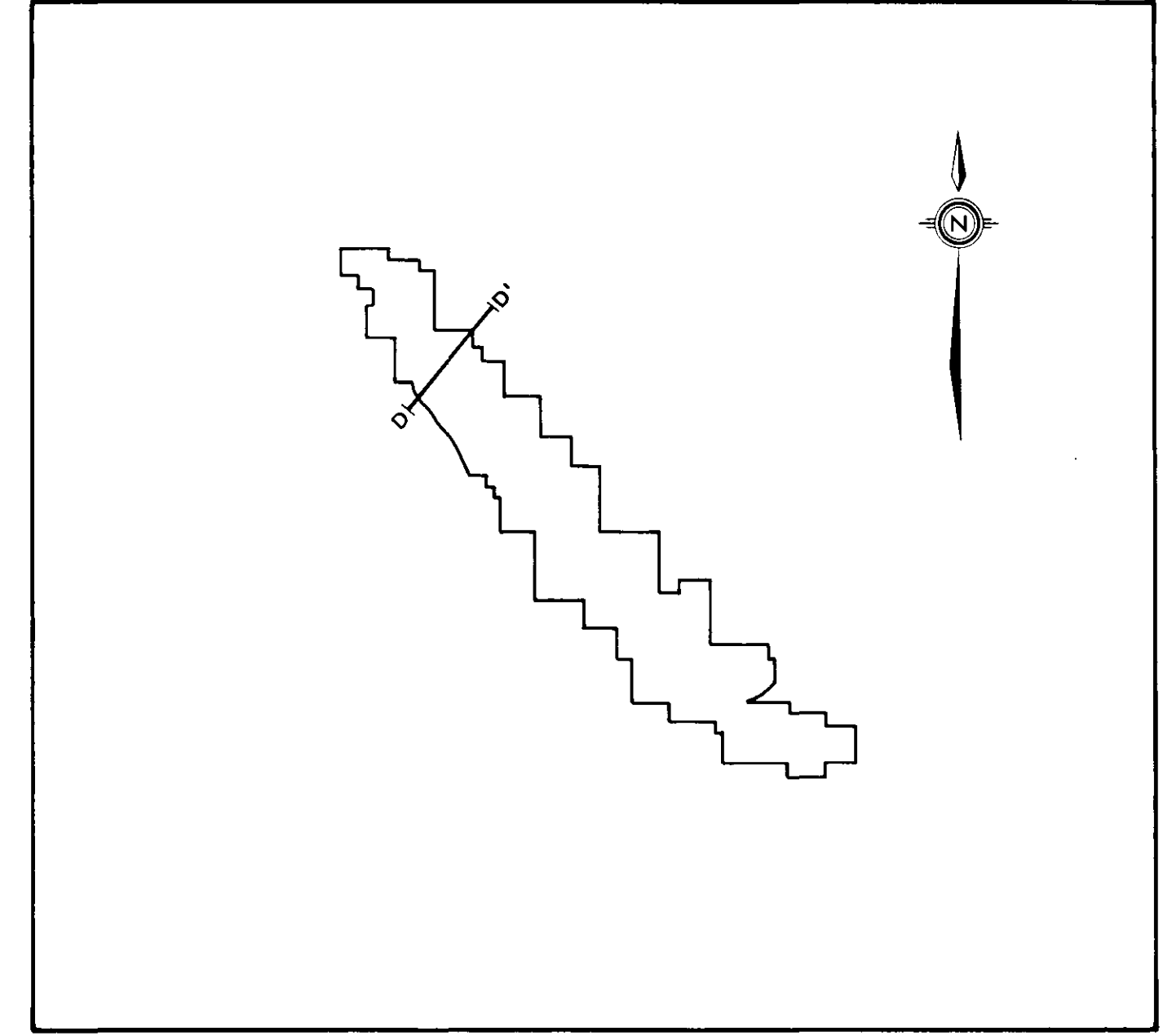
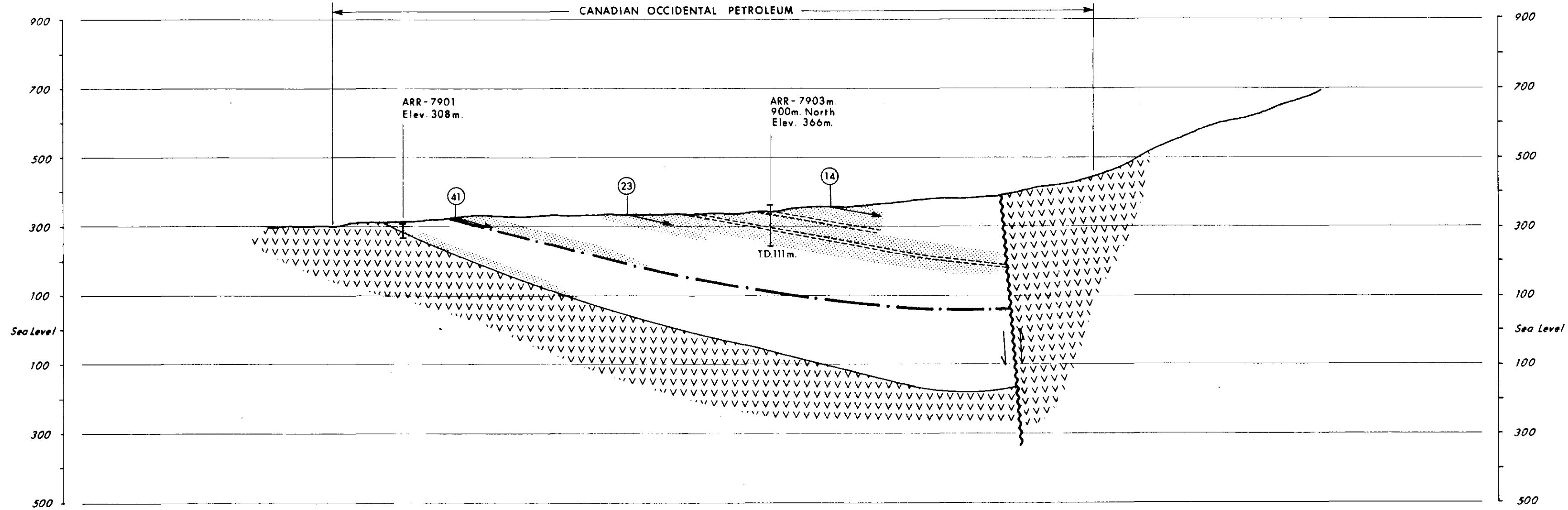
Canadian Occidental Petroleum Ltd. 

Coal Exploration


ASH RIVER PROPERTY - VANCOUVER ISLAND

GEOLOGIC CROSS-SECTION
C - C'

Date July 84	NTS	Compiled By: R. A. Swaren
		Drawn By: L. MacKellar
Drawing	File:	Revised Date:



041 (M4)

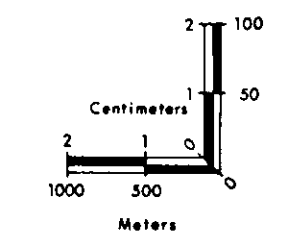
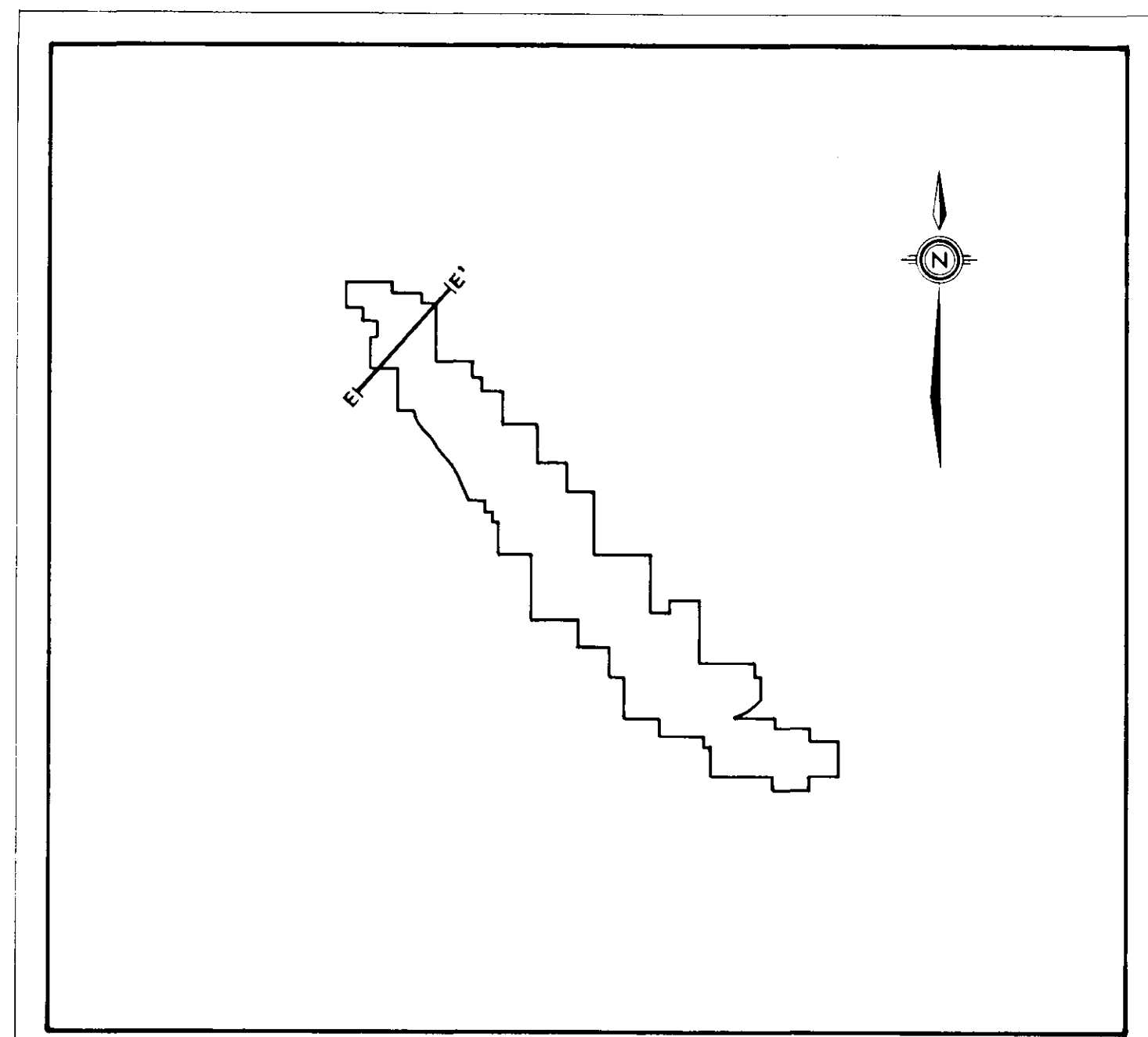
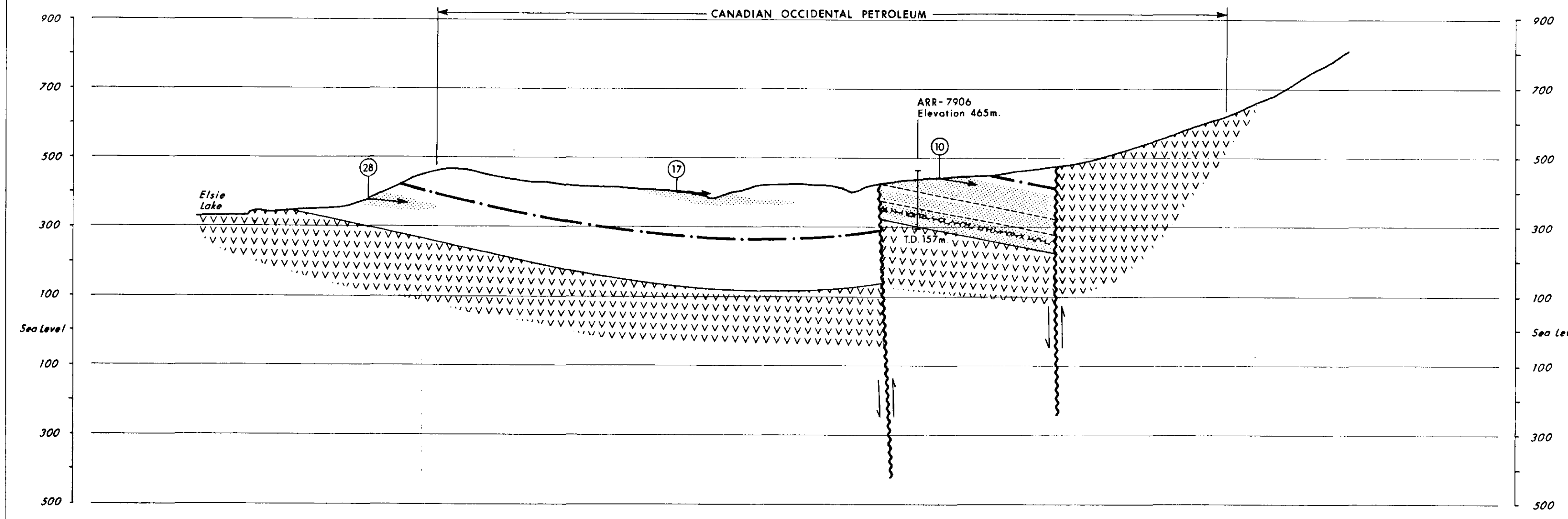
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ASH RIVER PROPERTY - VANCOUVER ISLAND


GEOLOGIC CROSS-SECTION

D - D'

Date July 84	NTS	Compiled By R. A. Swaren
Drawing	File:	Drawn By: L. MacKellar
		Revised Date:



041 (M5)

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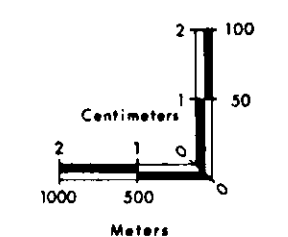
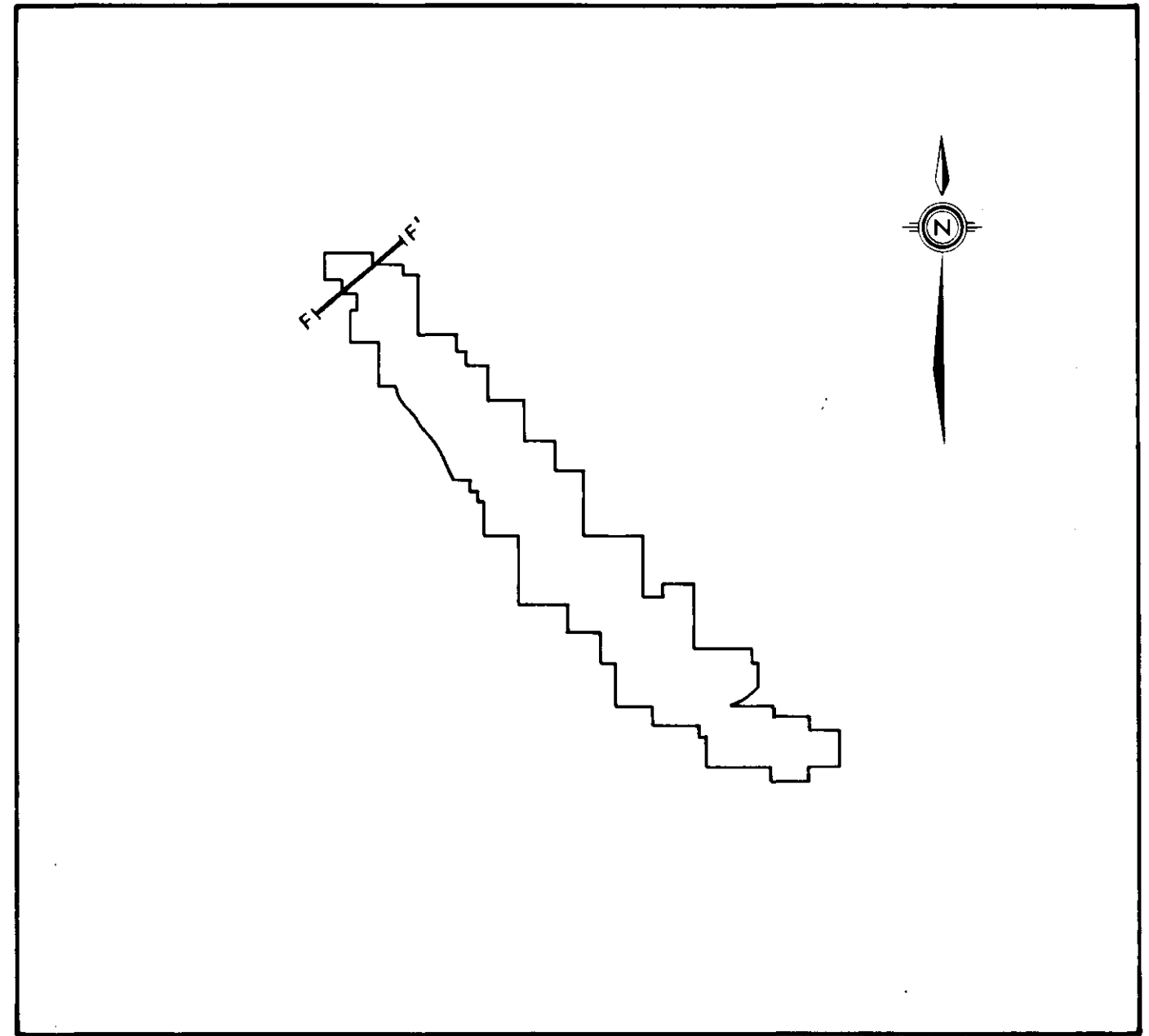
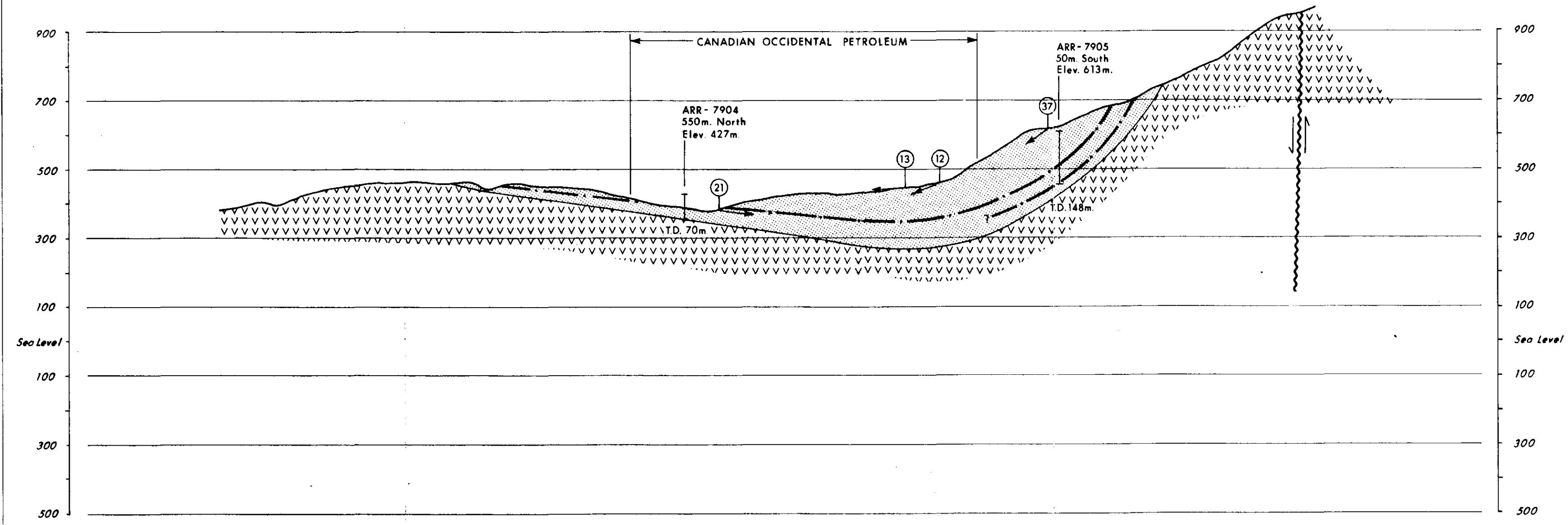
Coal Exploration

ASH RIVER PROPERTY - VANCOUVER ISLAND

GEOLOGIC CROSS-SECTION

E - E'

Date July 84	NTS	Compiled By R. A. Swaren
		Drawn By L. MacKellar
Drawing	File	Revised Date:



041 Mb

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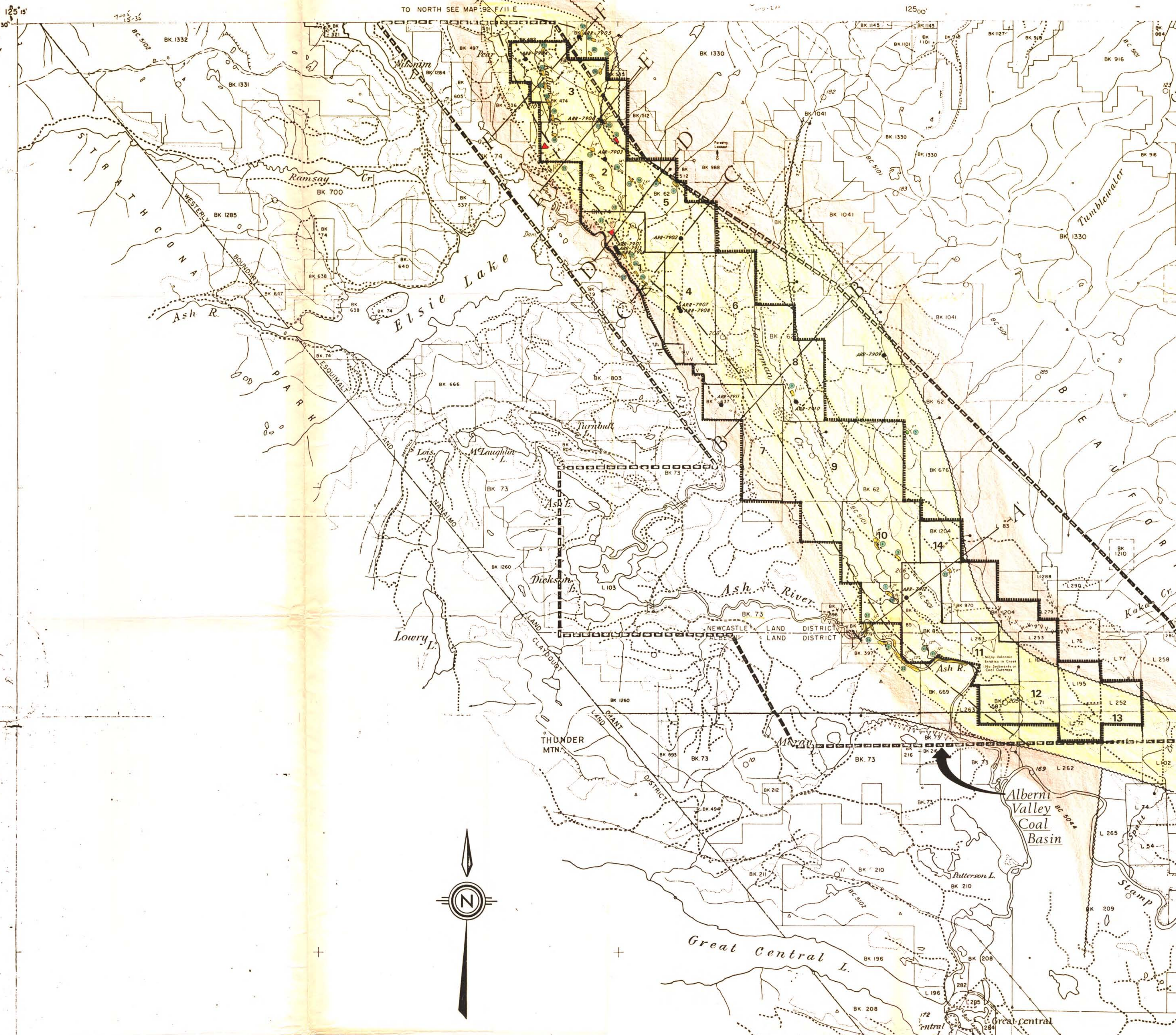
Coal Exploration

ASH RIVER PROPERTY - VANCOUVER ISLAND

GEOLOGIC CROSS - SECTION

F - F'

Date July 84	NTS	Compiled By R.A. Swaren
		Drawn By L. MacKellar
Drawing	File	Revised Date



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GEOLOGY

JULY 1984

MAP NO. 5

**VANCOUVER ISLAND
ALBERNI BASIN
ASH RIVER AREA
LEGEND**

- | | | |
|--|--|---|
| <p>OUTCROP</p> <p>INTERNATIONAL BOUNDARY</p> <p>PROVINCIAL BOUNDARY</p> <p>PARK BOUNDARY</p> <p>HEIGHT OF LAND</p> <p>LOT BOUNDARY, SURVEYED</p> <p>LOT BOUNDARY, UNSURVEYED OR UNCERTAIN</p> <p>LOT NUMBER</p> <p>SURVEYED RIGHT-OF-WAY</p> <p>RAILWAY</p> <p>ABANDONED RAILWAY</p> <p>HIGHWAY, MAIN OR ALONG SECTION LINES</p> <p>OTHER ROADS</p> <p>TRAIL, TRUCK OR LOGGING ROAD</p> <p>POWER TRANSMISSION LINE</p> <p>PIPELINE</p> <p>CULTIVATED AREA</p> <p>EDGE OF LOGGING OR BURN</p> | <p>LEASE BOUNDARY</p> <p>BRIDGE</p> <p>TUNNEL</p> <p>BUILDING</p> <p>FENCE</p> <p>CUTTING</p> <p>EMBANKMENT</p> <p>CLIFF OR STEEP BANK</p> <p>EDGE OF DROP</p> <p>LOW RIDGE</p> <p>BOUNDARY OF SWAMP, FLAT, GLACIER ETC.</p> <p>IRRIGATION CANAL OR FLUME</p> <p>TRIANGULATION STATION</p> <p>SURVEY MONUMENT</p> <p>AIR PHOTO CENTRES</p> <p>FLIGHT NUMBERS</p> <p>STREAM, PERENNIAL, INDEFINITE</p> <p>STREAM, INTERMITTENT OR DRY</p> <p>CITY OR MUNICIPAL BOUNDARY</p> | <p>SYNCLINAL AXIS</p> <p>FAULT, APPROXIMATE, DOWNWARD SLIDE</p> <p>FORMATION CONTACT (ASSUMED)</p> <p>DIP, DIP DIRECTION</p> <p>COAL SEAM OUTCROP (ASSUMED)</p> <p>CROSS SECTION LOCATION</p> <p>OUTCROP - COMOX FORMATION / 1984</p> <p>OUTCROP - HASLAM FORMATION / 1984</p> <p>OUTCROP - COMOX FORMATION WITH COAL</p> <p>DRILL HOLE - HUDSONS BAY OIL & GAS</p> <p>OUTCROP - KARMUTSEN FORMATION / 1984</p> <p>OUTCROP NUMBER (FIELD NOTES)</p> |
|--|--|---|

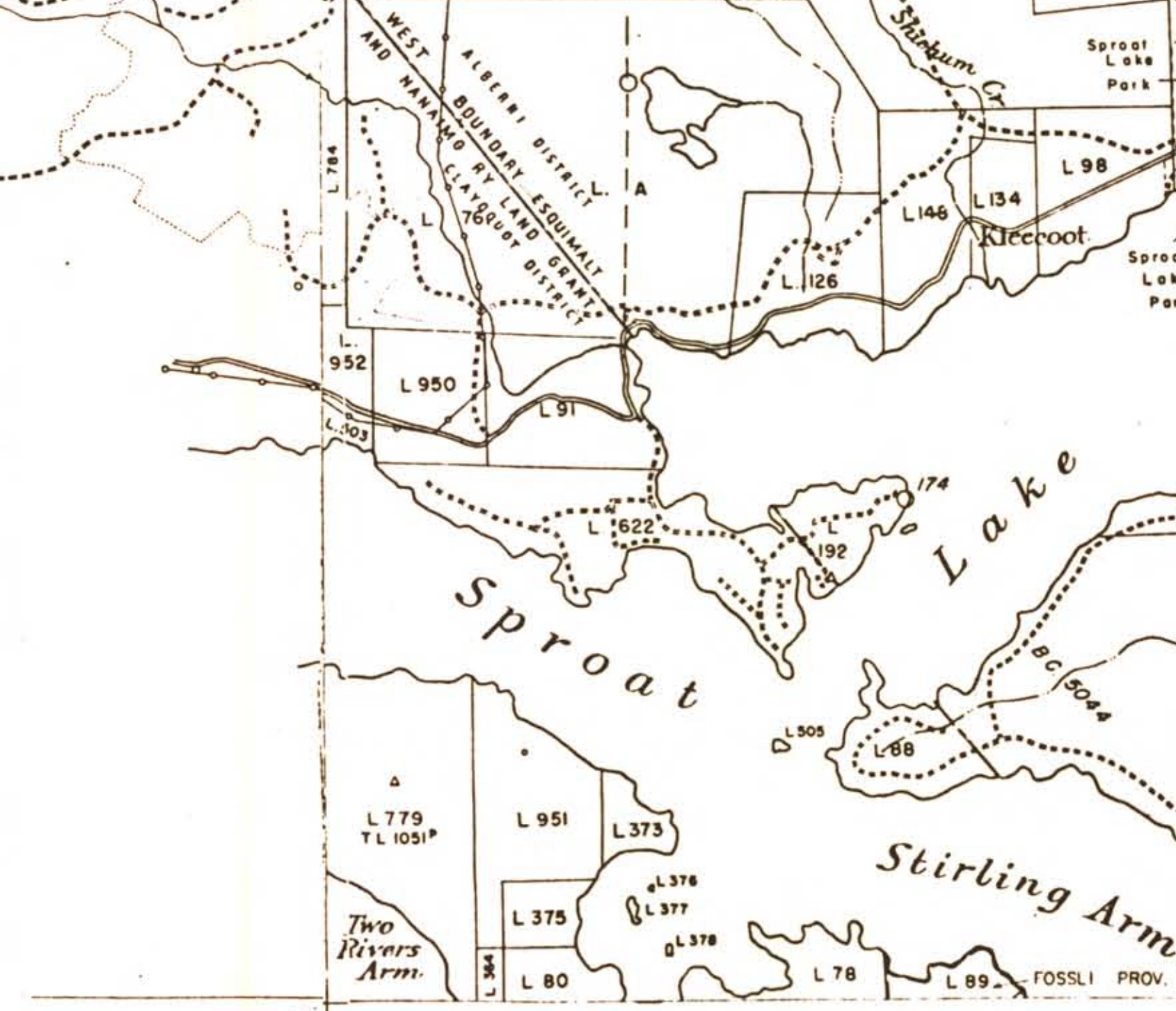
BRITISH COLUMBIA
DEPARTMENT OF LANDS, FORESTS
AND WATER RESOURCES
SURVEYS AND MAPPING BRANCH
AIR DIVISION
VICTORIA, B.C.

41 (M7)
**INTERIM MAP 92 F/7 W
INTERIM MAP 92 F/6 E**

SCALE: 1 INCH = 1/2 MILE DATE: MAY 1977

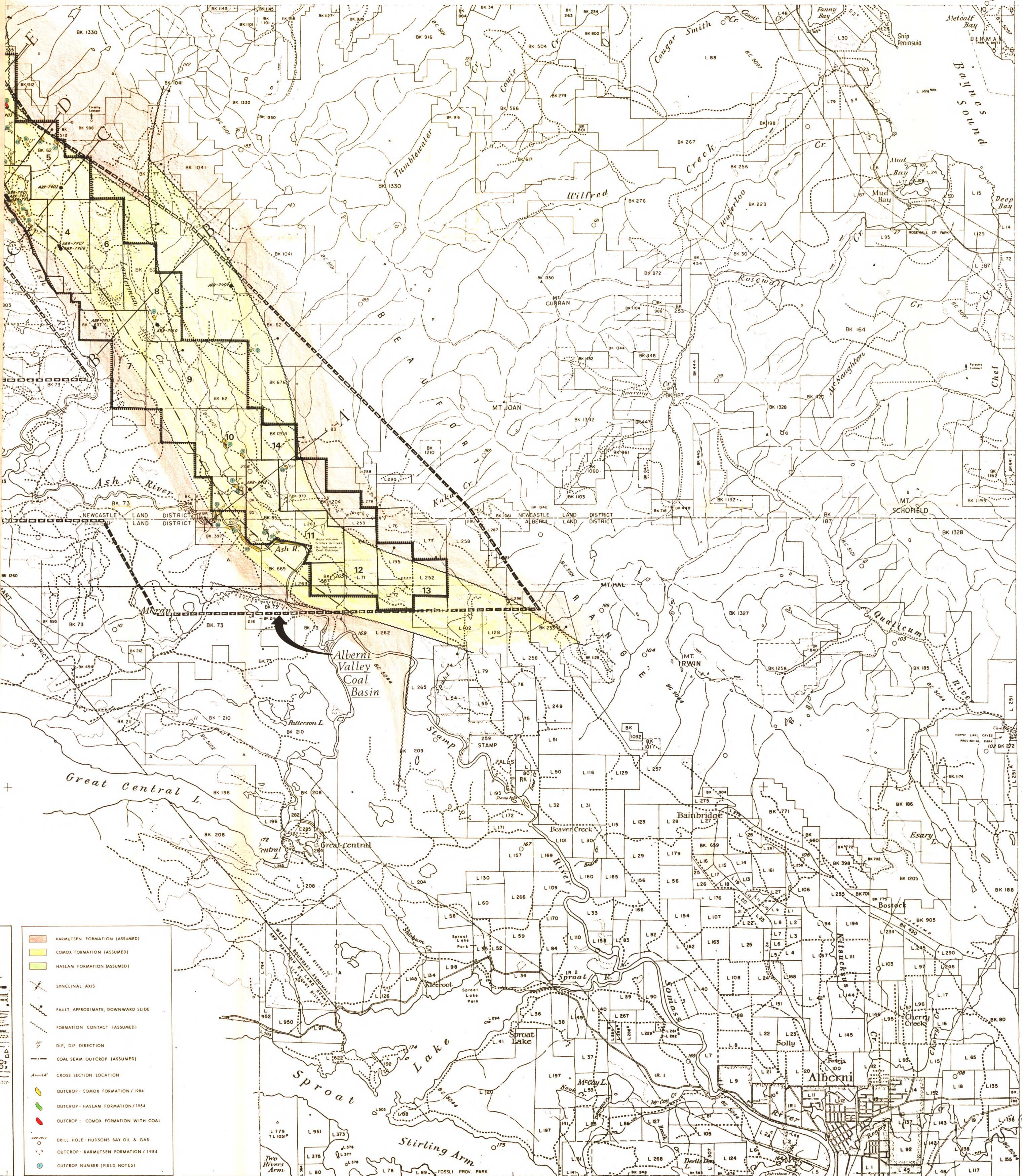
CR - Ash River 84 (1) A (2)

- | |
|---|
| <p>KARMUTSEN FORMATION (ASSUMED)</p> <p>COMOX FORMATION (ASSUMED)</p> <p>HASLAM FORMATION (ASSUMED)</p> <p>SYNCLINAL AXIS</p> <p>FAULT, APPROXIMATE, DOWNWARD SLIDE</p> <p>FORMATION CONTACT (ASSUMED)</p> <p>DIP, DIP DIRECTION</p> <p>COAL SEAM OUTCROP (ASSUMED)</p> <p>CROSS SECTION LOCATION</p> <p>OUTCROP - COMOX FORMATION / 1984</p> <p>OUTCROP - HASLAM FORMATION / 1984</p> <p>OUTCROP - COMOX FORMATION WITH COAL</p> <p>DRILL HOLE - HUDSONS BAY OIL & GAS</p> <p>OUTCROP - KARMUTSEN FORMATION / 1984</p> <p>OUTCROP NUMBER (FIELD NOTES)</p> |
|---|



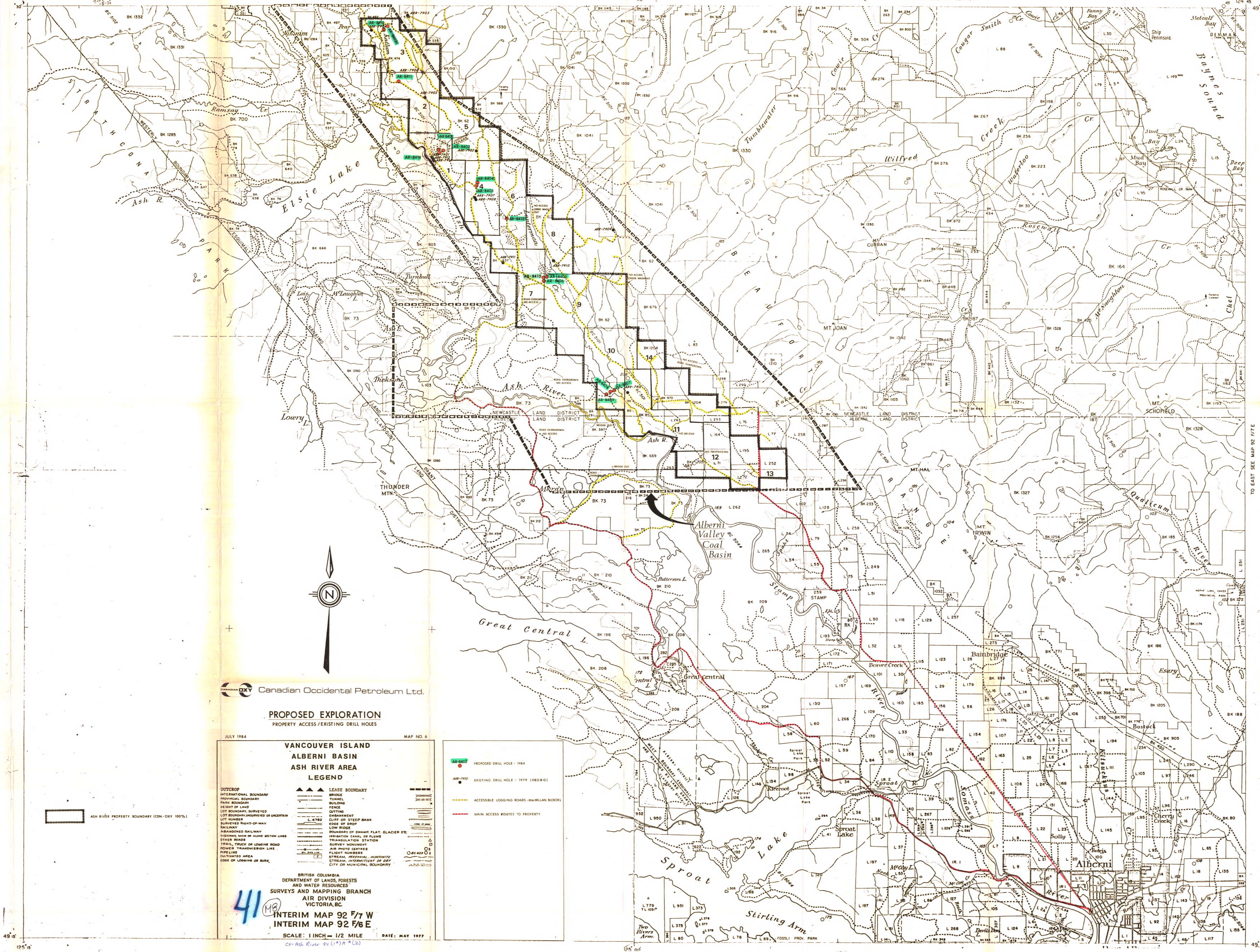
125° 15'

125° 00'



- KARMUTSEN FORMATION (ASSUMED)
- COMOX FORMATION (ASSUMED)
- HASLAM FORMATION (ASSUMED)
- SYNCLINAL AXIS
- FAULT, APPROXIMATE, DOWNWARD SLIDE
- FORMATION CONTACT (ASSUMED)
- DIP, DIP DIRECTION
- COAL SEAM OUTCROP (ASSUMED)
- CROSS SECTION LOCATION
- OUTCROP - COMOX FORMATION / 1984
- OUTCROP - HASLAM FORMATION / 1984
- OUTCROP - COMOX FORMATION WITH COAL
- DRILL HOLE - HUDSONS BAY OIL & GAS
- OUTCROP - KARMUTSEN FORMATION / 1984
- OUTCROP NUMBER (FIELD NOTES)

TO EAST SEE MAP 92 F/7 E



Canadian OXY Canadian Occidental Petroleum Ltd.

PROPOSED EXPLORATION
PROPERTY ACCESS/EXISTING DRILL HOLES

JULY 1984 MAP NO. 6

**VANCOUVER ISLAND
ALBERNI BASIN
ASH RIVER AREA
LEGEND**

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> OUTCROP INTERNATIONAL BOUNDARY PROVINCIAL BOUNDARY PARK BOUNDARY HEIGHT OF LAND LOT BOUNDARY, SURVEYED LOT BOUNDARY, UNSURVEYED OR UNCERTAIN LOT NUMBER SURVEYED RIGHT-OF-WAY RAILWAY ABANDONED RAILWAY HIGHWAY MAIN OR ALONG SECTION LINES OTHER ROADS TRAIL, TRUCK OR LOGGING ROAD POWER TRANSMISSION LINE PIPELINE CULTIVATED AREA EDGE OF LOGGING OR BURN | <ul style="list-style-type: none"> LEASE BOUNDARY BRIDGE TUNNEL BUILDING FENCE CUTTING EMBANKMENT CLIFF OR STEEP BANK EDGE OF DROP LOW RIDGE BOUNDARY OF SNOW FLAT, GLACIER ETC. IRRIGATION CANAL OR FLUME TRIANGULATION STATION SURVEY MONUMENT AIR PHOTO CENTRES FLIGHT NUMBERS STREAM, PERENNIAL, INTERMITTENT OR DRY CITY OR MUNICIPAL BOUNDARY | <ul style="list-style-type: none"> PROPOSED DRILL HOLE - 1984 EXISTING DRILL HOLE - 1979 (HBO & O) ACCESSIBLE LOGGING ROADS - MIN-MILL BIODEL MAIN ACCESS ROUTES TO PROPERTY |
|--|---|--|

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AIR DIVISION
VICTORIA, B.C.

41 (MB)

**INTERIM MAP 92 F/7 W
INTERIM MAP 92 F/6 E**

SCALE: 1 INCH = 1/2 MILE DATE: MAY 1977
CX-Ash River 84 (1/1)R*(2)