Vol. 1

McIVOR LAKE COAL PROJECT

VOLUME I

PHASE I EXPLORATION REPORT

FEBRUARY, 1989

Coal Licence No's.:	8265 to 8273 inclusive
Land Districts:	Sayward Land District Comox Land District
Latitude & Longitude:	N 50 deg. 2' W. 125 deg. 17'
N.T.S.:	Map 92K/3 Map 92F/14
Owner:	Canadian Occidental Petroleum Ltd.
Operator:	Canadian Occidental Petroleum Ltd.
Date Completed:	February, 1989
Prepared by:	R.A. Swaren, P.Geol.

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SUMMARY AND RECOMMENDATIONS

The information obtained during the 1988 Phase I program, although somewhat widespread and in parts sketchy, does indicate the existence of a possible mineable deposit of coal. The coal could possibly be mined by underground methods on a small scale in the near term.

All of the information summarized below is based on the premise that Canadian Occidental obtains the acreage withheld in the first coal licence applications. Once this acreage is licenced the property will certainly warrant further exploration programs.

The following is a point form summary of the contents of each section of the report followed by recommendations on how it is perceived future work should be carried out and the possible timing of that work.

Summary

(a) The McIvor Lake property consists of 1508 hectares of land held as coal licences plus a further 340 hectares of land presently withheld from disposition by the British Columbia government.

(b) In the fall of 1988 Canadian Occidental drilled 8 rotary drill holes, 2 of which were core holes for a total of 1708.2 metres at a total cost of $149,239.30.

(c) During 1988 Canadian Occidental carried out an environmental program consisting of monthly surface water and dust monitoring and analysis at a cost of $51,536.79.

(d) In early 1989 a preliminary mining evaluation (Volume III of this report) was also completed at a cost of $9,662.40.

(e) Major structural features hypothesized at McIvor Lake are a anticline-syncline pair with dips varying from less than 5 deg. to 10 deg.

(f) Two coal seams were identified but more work is required to accurately extend them between drill holes. Coal thickness is variable from 1 metre to 3 metres for each seam.

(g) The seams vary in depth from 90 metres in the west to up to 400 metres in the extreme southeast of the property.

(h) Reserves were calculated using only one seam of 1.5 metres thickness and 1.4 S.G. Total in-situ reserves are in the order of 23 million tonnes of which 15 million tonnes is mineable and 8.5 million tonnes is considered recoverable.

(i) More work has to be done on coal quality in order to determine whether or not the coal is a marketable product in its raw state. Old quality data indicates ash of 11% - 15%, sulfur of 0.4% to 1.2% and heat content of 11,000 - 12,000 B.T.U's/lb.

(j) The area is overlain by a great amount of unconsolidated overburden material varying from 45 to 110 metres in thickness. The areas of the thickest material and greatest volumes of water were located in the northermost portions of the property.

(k) The most likely method of underground extraction would be panel and pillar. This would eliminate the concerns regarding subsidence and be the most economic means of removing the coal.

(l) Size of mine envisaged would be a maximum of 350,000 - 400,000 tonnes/year for a 20 year life.

(m) Transportation costs to port because of its tidewater location would be in the $10.00 - $14.00 (CAN.)/tonne range using trucks and barges.

Recommendations

In chronological order the recommendations are as follows: Some of the activities may overlap and some will not proceed unless results are positive with the first recommendations.

(a) That Canadian Occidental apply for and obtain coal licences on 3 application areas totalling 340 hectares. These applications will be made at the same time this report is submitted to the B.C. government.

(b) That a Phase II environmental program involving surface water monitoring be carried out on a quarterly basis throughout 1989 at a cost of $18,000.

(c) That a 6 hole Phase II program be carried out in late 1989 at a cost of $145,000 - $160,000 and that two of these holes be core holes to determine coal quality.

IF THE ABOVE WORK (A) TO (C) PROVIDES POSITIVE RESULTS, THE FOLLOWING COULD OCCUR IN 1990.

(d) Preliminary feasibility mining study.

(e) Prospectus to the B.C. government.

(f) Increased hydrogeologic studies of surface water and of groundwater in the unconsolidated overburden and in the bedrock.

(g) Continuous cores throughout the major mining areas for geotechnical data.

(h) Continued closer spaced drilling and coring.

(i) Closer spaced drilling in the area chosen as the most likely for access slopes.

The work which would follow the above or be carried out in conjunction with it such as environmental baseline, socio-economic etc. is fairly standard for development of underground projects and will be worked out in more detail once steps (a) through (c) have been carried out in 1989.

1.0 INTRODUCTION

In June of 1986 the acreage known as McIvor Lake was applied for by Canadian Occidental Petroleum Ltd. This acquisition was recommended in order to block off a possible underground mineable reserve of coal located near infrastructure and tidewater.

In October of 1987, coal licences on 1508 hectares of the 2349 hectares originally applied for were granted. Of the remaining 841 hectares, 240 was held under fee simple, 261 was dropped from application and approximately 340 hectares was withheld.

The 340 hectares was withheld until Canadian Occidental Petroleum carried out an environmentally acceptable Phase I exploration program and if the results of that program indicated that acquisition to the coal rights in the withheld areas was useful in achieving the successful development of the coal resources as well as indicating that the extraction would be by underground methods.

The Phase I exploration program and environmental studies were carried out in 1988. The purpose, scope and conclusions of this program are contained in this report and it is believed warrant the granting of the withheld acreage as well as the carrying out of a Phase II exploration program in 1989.

1.1 PURPOSE AND SCOPE

The Phase I drilling and environmental programs were carried out in order to:

(a) Prove that Canadian Occidental could carry out an environmentally sound drilling program with no detriment whatsoever on the fish rearing capabilities of the area.

(b) Determine the number, thickness and extent of the coal seams present.

(c) Determine the quality of any mineable seams of coal encountered.

(d) Determine the reserve potential, mineability and probable mining method.

(e) Decide on whether or not to proceed with a Phase II program and where to locate the drill holes.

(f) Satisfy the conditions outlined in the January 5, 1988 ministerial letter in order to reapply for the withheld acreage in the licence area.

1.2 LOCATION EXTENT AND ACCESS

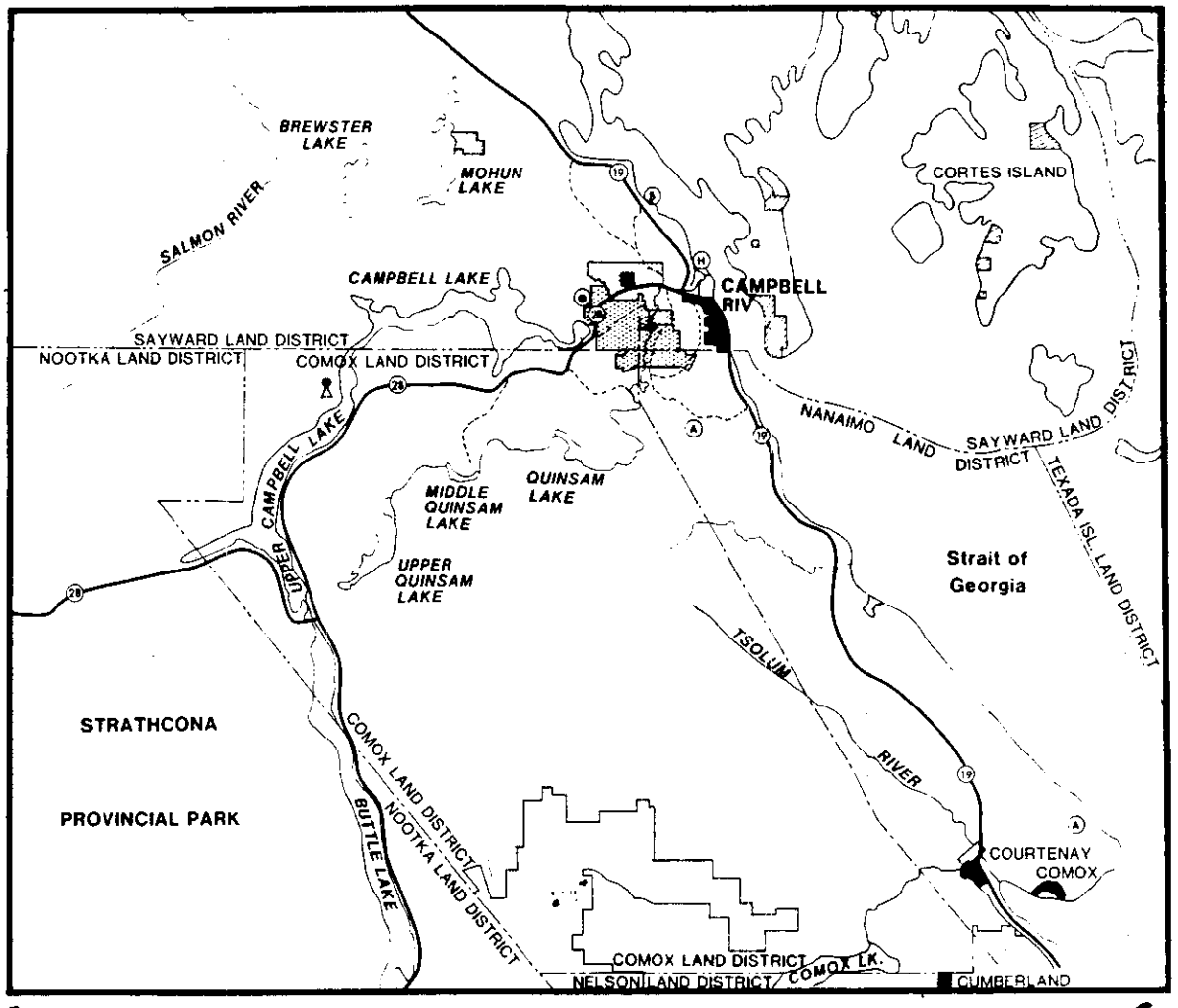
The McIvor Lake property is located in the east central portion of Vancouver Island, British Columbia (Map No.1). It is situated in the Sayward Land District, approximately 3 kilometers west of the town of Campbell River.

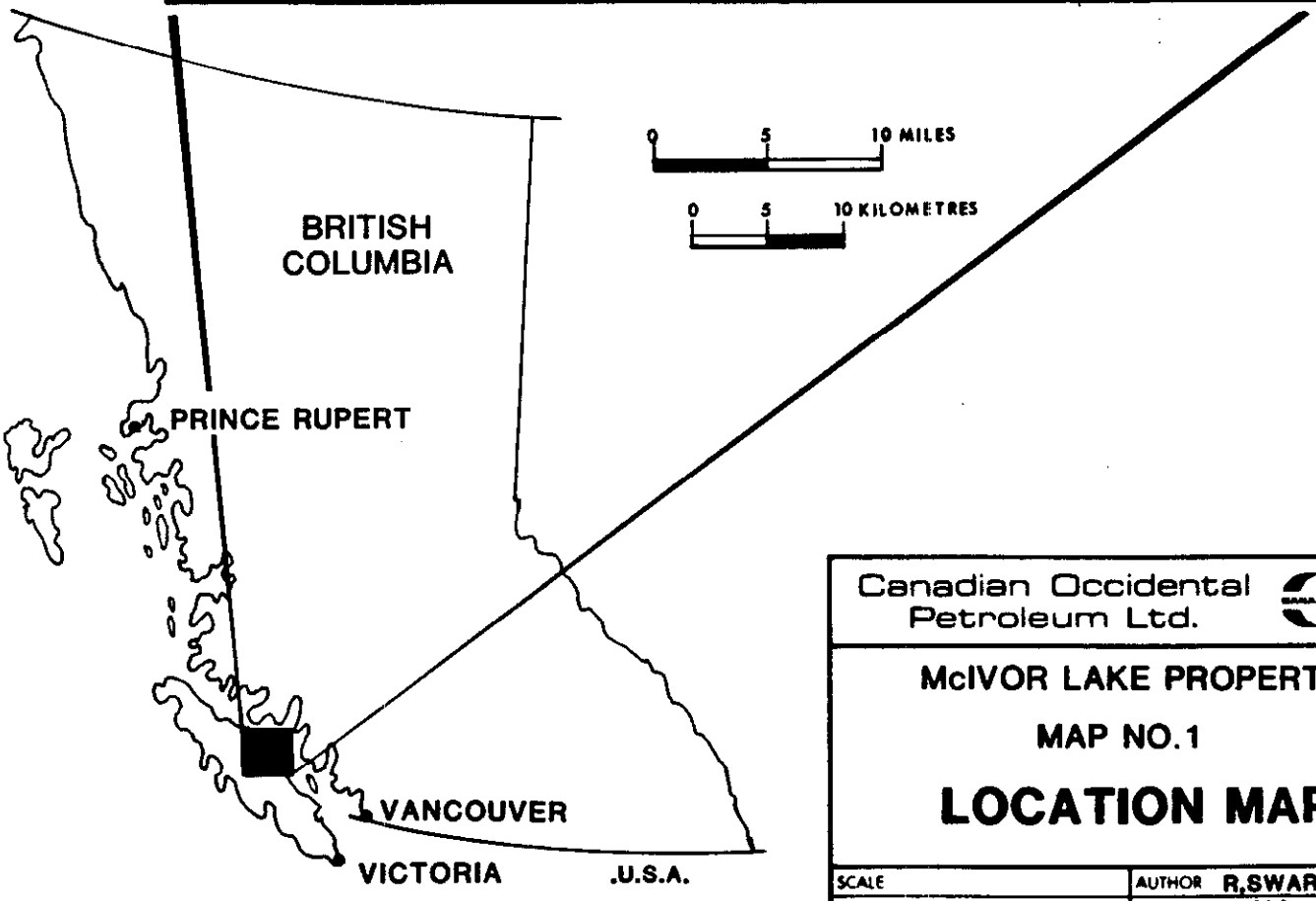
The aerial extent of the property is approximately 2088 hectares and is about 6 kilometers in length and 5 kilometers in width.

An all weather paved provincial highway (No. 28) passes from Campbell River in the east through the northern and western portions of the property on its way to Gold River in the west.

Argonaut Road, a graveled all weather road passes through the north central portion of the property going from Campbell River in the east to meet with Highway 28 near McIvor Lake in the west.

The southern portions of the property are served by a B.C. Forest Products graveled logging road. This road starts at the lumber mill in Campbell River and runs west to highway 28 where B.C. Forest Products Camp 8 is located.





Canadian Occidental Petroleum Ltd.

McIVOR LAKE PROPERTY

MAP NO. 1

LOCATION MAP

SCALE	AUTHOR R.SWAREN
DATE MARCH 1989	DRAWN A.ALI
REVISED	FILE No. 1493A

There are in addition, many arterial logging roads, B.C. Hydro access roads and private local roads branching off from these 3 major access routes.

1.3 PHYSIOGRAPHY

The McIvor Lake Property is located in the low lying coastal flats of eastern Vancouver Island. Elevations range from 213 metres a.s.l. in the volcanic hills on the northwestern edge of the property to 60 metres in the east (Map No.3). Generally however, the relief is low and the area quite flat except for where water courses have cut valleys down into the topography.

The Quinsam River flows from south to north through the property and drains into the Campbell River 2 kilometres before the Campbell River drains into the Strait of Georgia.

Two major creeks flow from west to east into the Quinsam River in the north central portions of the property. The northern most creek is Flintoff Creek and the southern creek is Cold Creek. Cold Creek supplies the water used in the Quinsam Fish Hatchery and is the drainage area of most concern when identifying possible environmental conflicts between fish habitats and exploration drilling. The care and methods used by Canadian Occidental in the Phase I exploration program eliminated the possibility of any of these concerns arising.

The entire area has been logged in the past, but regrowth has brought most of the forests back to mature status. The central areas north of the Sayward/Comox land district boundary and west of the Quinsam River are composed of fir and hemlock regrowth over 50 years in age.

The areas south of the Comox/Sayward Land District boundary have been logged quite recently and contain regrowth of 5 to 10 years age.

The area east of the Quinsam River has been logged extensively in the last 3 years. The logged forest in this area had been mainly secondary growth Alder. The area as yet has not been extensively replanted.

Other vegetation in the area not as predominate as the fir, hemlock and alder are cedar, maple and spruce.

1.4 EXPLORATION TO DATE

The first recorded work in the McIvor Lake area is that of J. John (1910) for the Western Fuel Company of San Francisco. Details of the work are given in a report by Bonthrone and Galloway (1911). Six diamond core holes were drilled all north of latitude 50 north. Drilling commenced in 1908 and was completed in 1910 for a total of 1672 metres. These holes are numbered No.1 through No.6 on the accompanying maps in this report. Holes No.3 and No.6 encountered coal of mineable thickness and provided the basis for the acquisition by Canadian Occidental.

In the early 1920's, surface exploration only was done by A.M. MacKenzie on behalf of Canadian Collieries (Dunsmuir) Limited of Victoria. A summary report on this area was made by H.A. Rose (1922).

The coal rights were eventually acquired by R.W. Wylie of Vancouver (Priest 1948) who tried unsuccessfully to option it to Canadian Collieries in 1949. He then managed to option it to Utah

Construction Company of San Francisco. Utah's subsidiary, Argonaut Company drilled one hole, No.7 in 1953 for 165.8 metres. This hole encountered coal with many thin shale bands, and Utah subsequently dropped their option.

From 1954 to 1956 Canadian Collieries (Dunsmuir) Limited carried out the drilling of 29 diamond core holes totalling 3750 metres. These holes were drilled south of the 50th parallel on the property encompassed by the Esquimalt and Nanaimo railway land grant. Only one hole No.16 was drilled on the McIvor Lake property, although most of the other holes were used in compiling the geologic maps in this report.

In 1975 Weldwood of Canada drilled several rotary holes south of the 50th parallel, 2 of which are immediately south of the McIvor Lake property.

In 1979, Esso Resources Canada made application for coal licences covering the McIvor Lake property area. However, in 1979 the B.C. government froze all applications along the east coast of Vancouver Island.

In 1986 Esso dropped their applications which Canadian Occidental subsequently applied for, also in 1986. In 1987 coal licences were granted to Canadian Occidental and in 1988 they carried out an exploration program consisting of 8 rotary drill holes. The results of that program are contained in this report.

1.5 EXISTING INFRASTRUCTURE

The major industries in the Campbell River area are: tourism, sport and commercial fishing, lumber and pulp mills and mining.

The major mining activities in the area at the present time are the Westmin Mine near Buttle Lake which produces copper lead and zinc and the Quinsam Mine, located 32 kilometres west of Campbell River which produces coal (Map No. 1A).

The Westmin Mine produces 1,000 tonnes of concentrate/day out of their plant right in Campbell River.

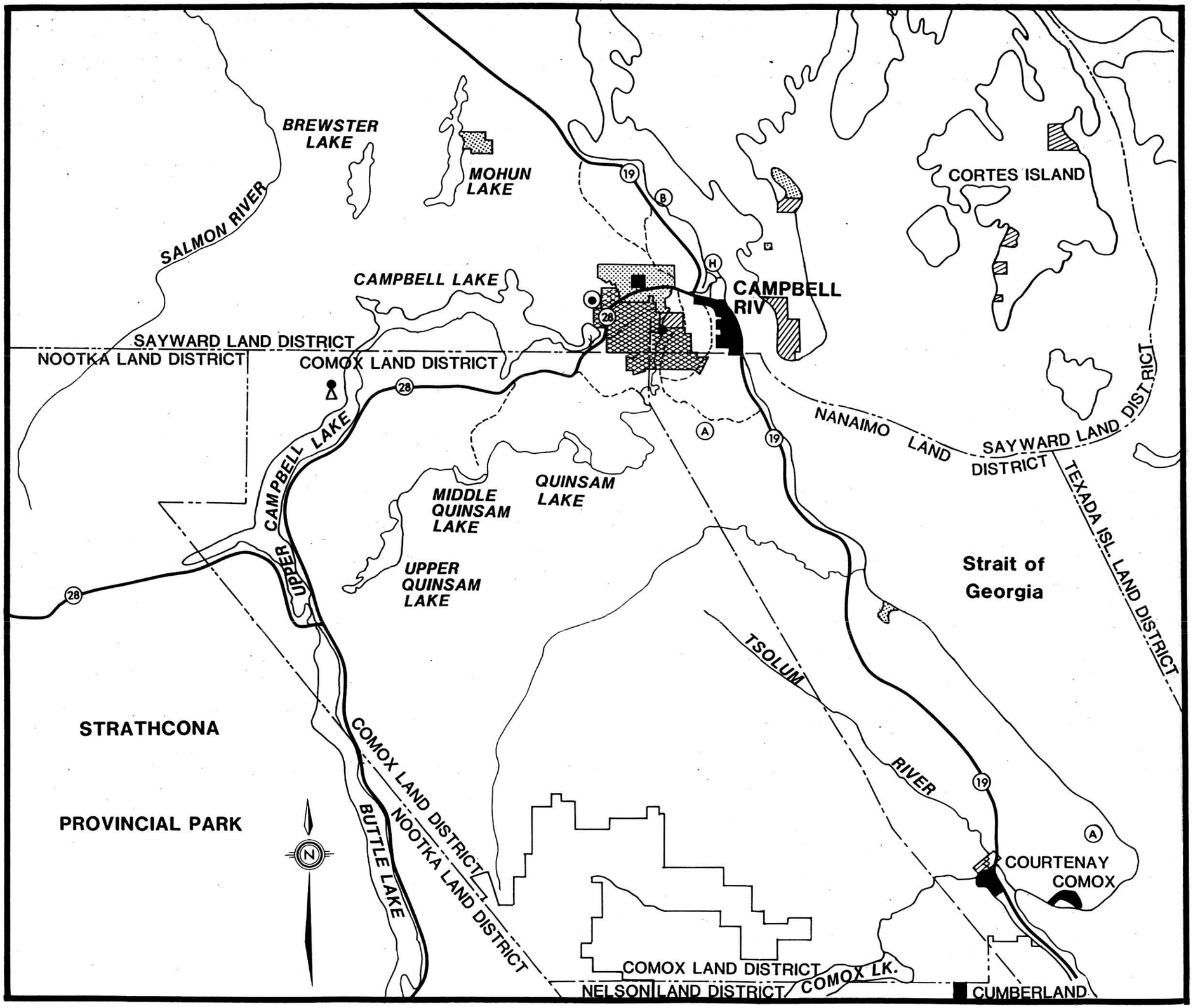
The Quinsam Mine which obtained approval in 1984 is only operating at 20% capacity and is shipping approximately 180,000 tonnes of steam coal in a raw state at the present time.

The Quinsam Mine is supplying various small local markets mainly in the pulp and paper and cement industries, but are presently securing overseas markets in the thermal power generating industry.

Quinsam is presently mining the coal by surface methods but is also looking at the possibility of going underground in the near term.

Once mined, the coal is crushed, screened and trucked to the barge loadout at Middle Point, north of Campbell River and barged to Roberts Bank.

The facilities already in place to support these mines as well as the other major industries are sufficient to support an additional workforce for a small underground coal mine such as McIvor Lake.



LEGEND

- POWER TRANSMISSION
- PAVED PROVINCIAL HIGHWAY
- MAJOR LOGGING ROADS (LICENCE AREA)
- MAJOR TOWNS
- PROVINCIAL PARKS
- INDIAN RESERVES
- McIVOR LAKE PROPERTY
- FISH HATCHERY
- FORESTRY LOOKOUT TOWER
- COMMUNICATION TOWER
- POWER STATION
- BARGE LOADOUT FACILITY
- HARBOUR

0 5 10 Miles

0 5 10 Kilometres

Canadian Occidental Petroleum Ltd.

McIVOR LAKE PROPERTY
MAP NO.1A

INFRASTRUCTURE

SCALE	AUTHOR R.SWAREN
DATE MARCH 1989	DRAWN A.ALI
REVISED	FILE No. 4004T543

In addition to the present industries and their related services which could benefit McIvor Lake, there is also on site power with the B.C. Hydro transmission line running through the property, all weather access, government barge loadout facilities at Middle Point and possible local markets such as pulp mills.

It is believed that all of the present industries in the Campbell River area can coexist using existing infrastructure at no detriment to the environment or the quality of life.

2.0 LAND DISPOSITION

2.1 COAL RIGHTS DISPOSITION

In June of 1986 Canadian Occidental Petroleum Ltd. applied for coal licences on 2349 hectares of land named the McIvor Lake Property. Subsequently, in October of 1987 coal licences were granted on 1508 hectares of the total area applied for. These coal licences are numbered 8265 through 8273 inclusive (Map No.2).

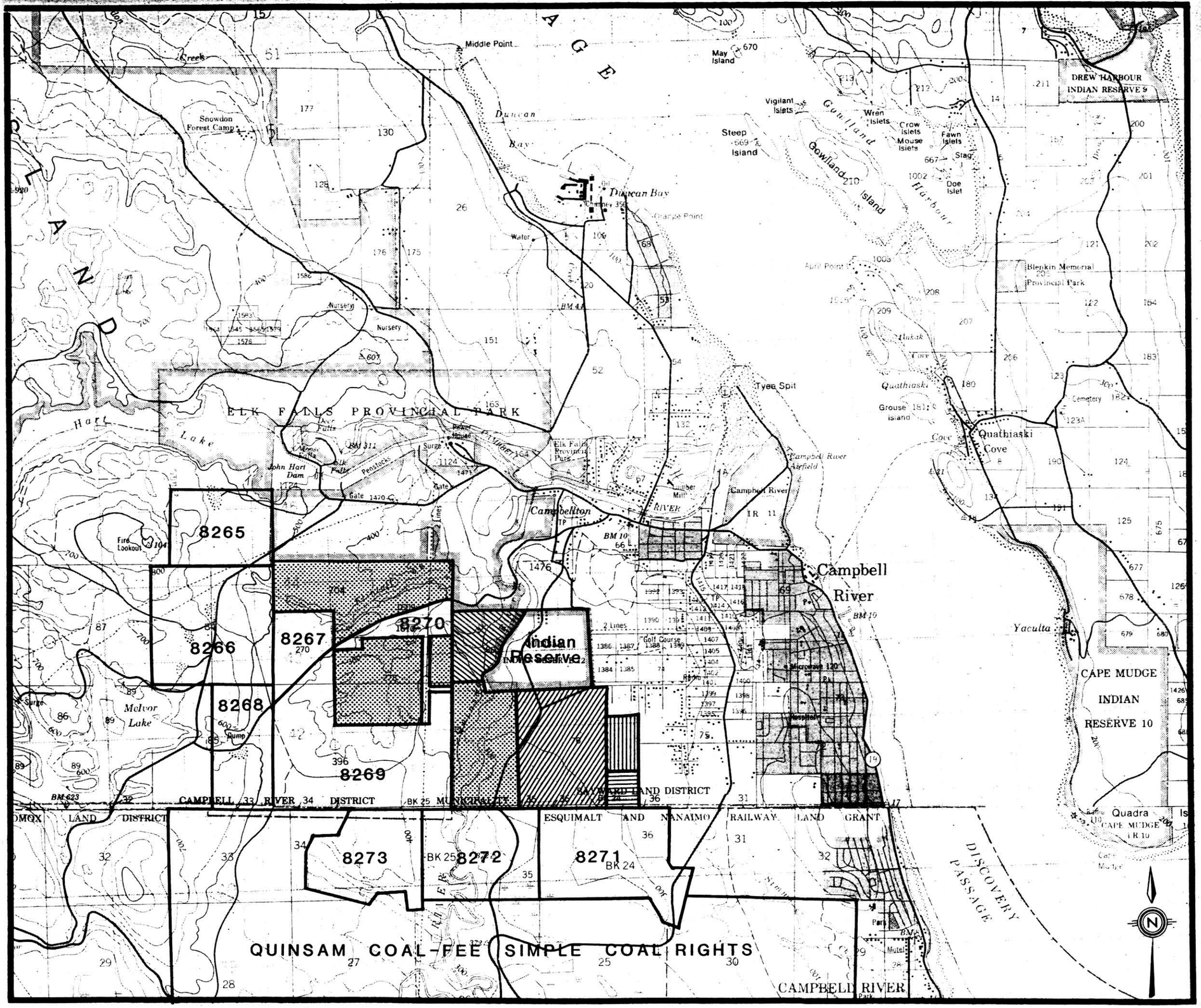
Of the remaining 841 hectares, approximately 240 hectares is held under fee simple coal rights by B.C. Forest Products, Pallan Lumber Products Ltd. and Donald James Hathaway and the remaining 600 hectares is crown coal rights which has been withheld until the completion of Canadian Occidental's Phase I exploration program.

Other major coal rights holders in the area are Indian Reserve 12 and Quinsam Coal who is the owner in Fee Simple of the coal rights immediately south of McIvor Lake.

2.2 SURFACE RIGHTS DISPOSITION

In carrying out the Phase I exploration program, it was necessary to obtain approval from various land owners to enter onto their lands for the purpose of drilling exploration holes.

As can be seen on Map No.2A, the area in the central portion of the property has been subdivided into smaller acreages. These acreages are just off Argonaut Road and Highway 28. It was necessary to gain right of entry onto these lands for drilling and in no cases was entry refused, and as a matter of fact, the landowners were very helpful in regards to access.



McIVOR LAKE PROPERTY

Legend

- B.C. FOREST PRODUCTS. FEE SIMPLE LAND.
- PALLAN TIMBER PRODUCTS LTD. FEE SIMPLE LAND.
- DONALD JAMES HATHAWAY. FEE SIMPLE LAND.
- FEDERAL GOVERNMENT GRANT.
- 8269 — CANADIAN OCCIDENTAL PETROLEUM LTD. COAL LICENCES.
- WITHELD CROWN LAND TO BE APPLIED FOR BY CANADIAN OCCIDENTAL PETROLEUM LTD.

Scale = 1:50 000

MAP SHEETS 92K / 3 & 92F / 14

Miles 1 — 0
Metres 1000 — 0
Yards 1000 — 0

Canadian Occidental Petroleum Ltd.

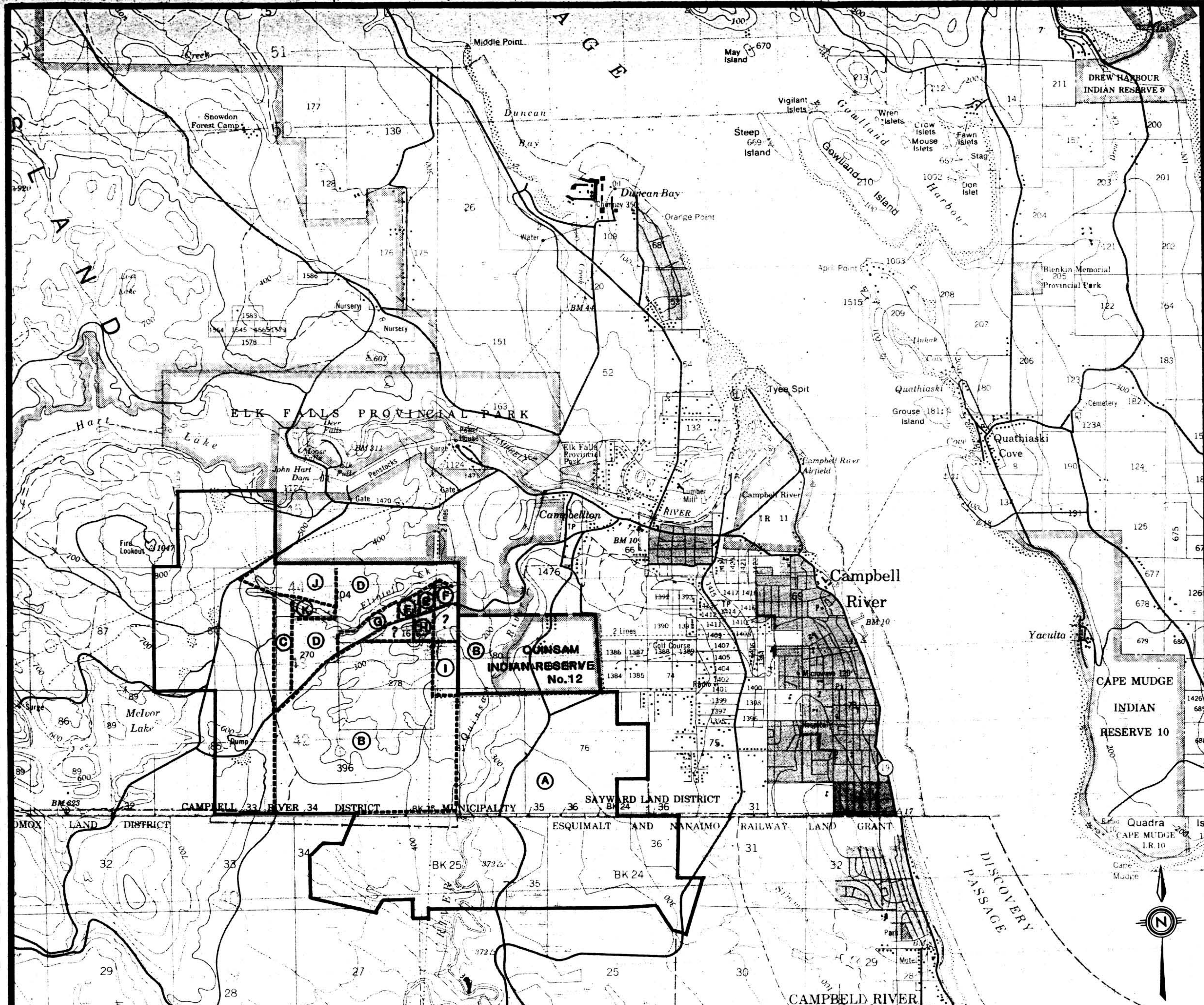
McIVOR LAKE PROPERTY
MAP NO.2
COAL RIGHTS DISPOSITION

SCALE	1 : 50 000	AUTHOR	R.SWAREN
DATE	MARCH 1989	DRAWN	A.ALI
REVISED		FILE No.	4001T542

Then, there are the two major surface rights owners in the area. One of these, B.C. Forest Products, as with the private individual land owners, was very helpful and allowed us access for drilling.

The other major holder of surface rights is the Federal Department of Fisheries and Oceans. During the year access was allowed for the purpose of dust and water sampling, but access was denied for the drilling program. Three holes had been planned along the B.C. Hydro right-of-way and all holes were east of the Cold Creek watershed which supplies the water to the Hatchery.

In the next Phase II program access will have to be obtained to drill two holes and thus supply continuity in seam and geological data between the northern and southern portions of the property. As has already been proved, this can be done at no detriment to the fish habitat or environment.



McIVOR LAKE

Legend

- (A) BRITISH COLUMBIA FOREST PRODUCTS (FLETCHER CHALLENGE)
- (B) DEPARTMENT OF FISHERIES & OCEANS
- (C) EARL MARTINELLI
- (D) CARL KOLONSKY
- (E) GARY KNOWLES
- (F) MRS. KNOWLES
- (G) GEORGE KNOWLES
- (H) JACK KNOWLES
- (I) MR. McDONALD
- (J) GARNET COULTER
- (K) MUNICIPALITY OF CAMPBELL RIVER

Scale : 1 : 50 000

MAP SHEETS 92K / 3 & 92F / 14

Miles 1 — 0
Metres 1000 — 0
Yards 1000 — 0

Canadian Occidental Petroleum Ltd.

McIVOR LAKE
MAP NO. 2A

SURFACE OWNERSHIP DISPOSITION

SCALE	1 : 50 000	AUTHOR	R.SWAREN
DATE	MARCH 1989	DRAWN	A.ALI
REVISED		FILE No.	4002T542

3.0 PROPOSED ACQUISITION

In order to provide continuity throughout the McIvor Lake property and allow proper development of the underground mine, it is necessary that Canadian Occidental obtain coal licences in three of the withheld areas of crown owned coal rights (Figure 4).

At the back of this section is the legal description of the 3 application areas as well as the ministerial letter of January 5, 1988 which followed the issuance of the present coal licences.

In this letter it was indicated that proof of Canadian Occidental's ability to operate exploration drilling in an environmentally sound manner as well as exploration results showing that acquisition of these coal rights is necessary in order to develop an underground mine, would further the issuance of coal licences in the withheld areas.

The total area of proposed application is 340 hectares in three application areas, as described at the back of this section.

Application 1 is required mainly for development of underground main and submain roadways (figures 5-1 to 5-3, Volume III) and even if parts are mined, there is not going to be any subsidence due to the type of mining system chosen i.e., panel and pillar. This application is also required in order to allow access to the adjacent Fee Simple lands, and for exploration drilling as outlined in the Phase II section.

Application 2 is required to mine out mining Block D in an orderly fashion.

Application 3 This application is perhaps the least necessary as in this, our first preliminary assessment, it appears that the coal subcrops somewhere along the line of Flintoff Creek, however we may require some infill drilling and core for quality analysis from north of Argonaut Road, so this acreage should be acquired in order to block off the reserve for exploration purposes.

CANADIAN OCCIDENTAL PETROLEUM LTD.

McIVOR LAKE PROPERTY

COAL LICENCE APPLICATIONS

FIGURE 4

MAP SHEET 92K/3

0 500 1000

scale (meters)

At the time of completion of this report, the applications for coal licences in these three areas is also being made. The cost of applying for these three areas is $2,455.00, broken down into $75.00 application fee @ $25.00/application and first years licence rental on 340 hectares at $7.00/hectare.

The licences are required prior to commencement of a Phase II exploration program.

Notice is hereby given that Pursuant to Section 15 of the Coal Act, the following coal lands in the Sayward Land District on Vancouver Island are applied for by Canadian Occidental Petroleum Ltd., 1500, 635 - 8th Ave. S.W., Calgary, Alberta T2P 3Z1.

Licence 1

Sayward Land District, Map Sheet 92K/3 Lot 81.

Total Area 124 hectares more or less.

Licence 2

Sayward Land District, Map Sheet 92K/3 Lot 278, Block A except that portion of the northwest corner already contained in coal licence 8270.

Total Area 120 hectares more or less.

Licence 3

Sayward Land District, Map Sheet 92K/3. Commencing at a point at the northeast corner of Lot 276 (coal licence 8267) and proceeding north 510 metres to the southern boundary of Elk Falls Provincial Park, thence proceeding east for a distance of 1300 metres along the southern park boundary to the eastern edge of the B.C. hydro right of way, thence proceeding south 520 meters to the southern boundary of Lot 1609 which is also the southern boundary of the Argonaut Road allowance, (also the northern boundary of Coal Licence 1610), thence proceeding west along the southern boundary of Lot 1609 to the southeastern corner of Lot 276, for a distance of 1300 metres, thence proceeding north 570 metres along the eastern boundary of Lot 276 to the point of origin.

Total area 96 hectares more or less.

Total area of the additional McIvor Lake application is approximately 340 hectares (850 acres).

RS/lw

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Energy, Mines and Petroleum Resources

Parliament Buildings
Victoria
British Columbia
V8V 1X4

January 5, 1988

Mr. R. A. Swaren
Manager - Coal
Canadian Occidental Petroleum Ltd.
1500, 635 - 8th Avenue South West
Calgary, Alberta
T2P 3Z1

Dear Mr. Swaren:

A number of coal licences have been requested by Canadian Occidental Petroleum Ltd. in the Campbell River area of Vancouver Island. As you are aware, coal tenures have not been issued in northeast Vancouver Island for some years due to concerns raised by the general public and by government agencies when the initial applications were made.

These concerns relate to possible social and environmental disruptions in the area should coal developments take place. While the Quinsam coal development has helped to lessen such concerns, it is apparent that the views of other agencies of government must be taken into account when considering such applications.

Accordingly, the Environment and Land Use Committee of Cabinet directed that Canadian Occidental's applications for coal licences be reviewed by the Vancouver Island Reclamation Advisory Committee. Representatives of this Ministry and other resource agencies of Government, including the Federal Department of Fisheries and Oceans, sit on this latter committee, and they were directed to examine the applications and, where appropriate, present reasons in principle why coal development should not take place in the area.

These comments were received in October 1987, and recommendations were made to issue a number of coal licences. In addition, it was recommended that certain areas containing watersheds of extremely high fish spawning and rearing capability be presently excluded from the area of coal licencing. These areas include the lots which contain the Quinsam River and salmon hatchery, i.e. lots 80 and 81, and the two major watersheds which drain into the Quinsam River, lots 278 and 1609.

/2

Following negotiations between representatives of this Ministry, Canadian Occidental and representatives of the Reclamation Advisory Committee, additional lands were added to the areas recommended for issuance of coal licences. These additions will allow exploratory holes to be drilled in areas deemed to be important by your company in proving coal reserves in the area.

The initial drilling program will be most important since its undertaking will demonstrate the fact that an exploration program of this nature can be undertaken without environmental degradation.

If the results of the program indicate that acquisition to the coal rights of lots 278 and 1609 is useful in achieving the successful development of the coal resources in the area and indicate that extraction would be by underground methods, I would feel confident in promptly issuing coal licences on those lots, provided the Crown owns the coal rights in question.

Should surface mining methods be indicated by the exploration program then a further review could be anticipated prior to licence issuance, in order that the previously identified concerns be addressed. Such a review should not be viewed as precluding either the issuance of coal licences or the possibility of mining by surface methods.

I trust you find the above satisfactory and shall anticipate receiving the data obtained from the planned exploratory drilling program. May I also offer you my best wishes for success in exploring and ultimately developing this project.

Yours sincerely,

Honourable Jack Davis
Minister

4.0 GEOLOGY

Because of its marginal continental location, the geologic history of Vancouver Island is chiefly related to plate tectonics and massive crustal movements on the Pacific margin of North America. Vancouver Island represents submarine and later terrestrial vulcanism associated with rifting along an ocean floor subduction zone, formed from the Pacific oceanic plate colliding with the western edge of the North America continental plate and being subducted beneath the continental margin. These crustal movements began in Paleozoic time and have continued to the present. Most of the vulcanism associated with the rifting took place in early Mesozoic time. [1] During Jurassic and Triassic time, massive outpourings of pillow and flow lavas, and aquagene tuffs formed volcanic island arcs which eventually formed the Insular Mountain Belt, which covers Vancouver Island, the Queen Charlotte Islands, the Alaska Panhandle and the Wrangell and St. Elias ranges of Alaska. These volcanic buildups are represented on Vancouver Island by the thick basalts of the Triassic Karmutsen Formation, and the major batholiths of the acidic Island Intrusions. These volcanic and intrusive complexes form the basement rock upon which later clastic sediments of Cretaceous Age were deposited.

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[1]. Mueller, J.E., "Evolution of the Pacific Margin, Vancouver Island and Adjacent Regions", Can. Journal of Earth Science, Vol. 14, 1977.

4.1 REGIONAL STRATIGRAPHY

In the Comox basin, Cretaceous sediments of the Nanaimo Group occur in unconformable contact with the volcanic basement rock of the Triassic Karmutsen Formation and Jurassic Island Intrusions. These Nanaimo Group sediments are mainly Comox Formation sandstones, siltstones, shales and coal seams. In addition to these sediments, the Benson basal conglomerate member of the Comox Formation is evident in some areas, marking the beginnings of Late Cretaceous sedimentary deposition in the region. The Comox Formation is variable in thickness and lateral continuity but can usually be found between 100 to 800 metres in thickness.

The McIvor Lake property occupies the northwestern corner of the Comox basin.

4.1A REGIONAL DESCRIPTION OF THE COAL MEASURES

In the Comox area, five seams are present within the Comox section - only three of these were economically mined in the past. In the Tsable River area, only the lowermost seam in the stratigraphic sequence was mined. No mining has been carried out in the Campbell River areas, although at least two seams have been identified. In the Quinsam area west of Campbell River, five seams have been identified and three of these (including the lowermost seam) are of sufficient thickness to warrant mining.

FIGURE 5

TABLE OF FORMATIONS OF VANCOUVER ISLAND*

	PERIOD		STAGE	GROUP	FORMATION	SYM-BOL	AVERAGE THICKNESS IN m.±	LITHOLOGY
CENOZOIC					late Tert. volc's of Port McNeill	Tvs		
					SOOKE BAY	mpTSB		conglomerate, sandstone, shale
			EOCENE to		CARMANAH	eoTC	1,200	sandstone, siltstone, coglomerate
			OLIGOCENE		ESCALANTE	eTE	300	conglomerate, sandstone
			early EOCENE		METCHOSIN	eTM	3,000	basaltic lava, pillow lava, breccia, tuff
MESOZOIC		LATE	MAESTRICHTIAN	NANAIMO	GABRIOLA	uKGA	350	sandstone, conglomerate
					SPRAY	uKS	200	shale, siltstone
			CAMPANIAN		GEOFFREY	uKG	150	conglomerate, sandstone
					NORTHUMBERLAND	uKN	250	siltstone, shale, sandstone
					DE COURCY	uKDC	350	conglomerate, sandstone
					CEDAR DISTRICT	uKCD	300	shale, siltstone, sandstone
					EXTENSION - PROTECTION	uKEP	300	conglomerate, sandstone, shale, coal
					HASLAM	uKH	200	shale, siltstone, sandstone
			SANTONIAN		COMOX	uKC	350	sandstone, conglomerate, shale, coal
		EARLY	CENOMANIAN ALBIAN APTIAN?	QUEEN CHARLOTTE	conglomerate unit	lKQc	900	conglomerate, greywacke
					siltstone shale unit	lKQp	50	siltstone, shale
			VALANGINIAN BARREMIAN		LONGARM	lKL	250	greywacke, conglomerate, siltstone
	JURASSIC	MID to LATE	TITHONIAN CALLOVIAN		Upper Jurassic sediment unit	uJS	500	siltstone, argillite, conglomerate
		EARLY	TOARCIAN?	BONANZA	volcanics	lJB	1,500	basaltic to rhyolitic lava, tuff, breccia, minor argillite, greywacke
			PLIENSBACHIAN SINEMURIAN		HARBLEDOWN	lJH		argillite, greywacke, tuff
	TRIASSIC	LATE	NORIAN	VANCOUVER	PARSON BAY	uTrPB	450	calcareous siltstone, greywacke, silty-limestone, minor conglomerate, breccia
			KARNIAN		QUATSINO	uTrQ	400	limestone
					KARMUTSEN	muTrK	4,500	basaltic lava, pillow lava, breccia, tuff
		MID	LADINIAN		sediment - sill unit	Trds	750	metasiltstone, diabase, limestone
PALEOZOIC	PENN. and ? PERM.			SICKER	BUTTLE LAKE	CPBL	300	limestone, chert
					sediments	CPSs	600	metagreywacke, argillite, schist, marble
					volcanics	CPSv	2,000	basaltic to rhyolitic metavolcanic flows, tuff, agglomerate
	DEV. or EARLIER							

* Courtesy: Muller, J.E., "Geology of Vancouver Island"
G.S.C. No. O.F. 463, 1977

4.1B CONDITIONS THAT AFFECT SEAM DEPOSITION

Irregular basement topography - The unconformable paleotopographic surface of volcanics and intrusives has a direct effect on seam development and especially development of the lowermost, or main seam. This seam is subject to thinning and pinching over paleotopographic 'highs', in some instances disappearing completely, only to reappear some distance from the buried hill.

Glacial erosion - Pleistocene and recent glacial scour has removed near surface coal occurrences from many areas, replacing and covering the bedrock formations with thicknesses of glacial till overburden, sometimes as much as 300 ft. (100 metres) thick.

Depositional thinning - It has been demonstrated that the Comox Formation coal measures were deposited in a lagoonal or swamp environment. This lagoonal environment was generally separated from the coastline by beaches or barrier bars. The location and duration of these old swamps and lagoons allowed coal seams up to 15 ft. (4.6 m) thick to generate, however their areal extent was relatively limited.

4.2 REGIONAL STRUCTURE

The most dominate structural features of the Comox coal basin of east-central Vancouver Island are the major normal faults that in many instances form bounding features of the sedimentary areas. These major normal faults generally strike northwest to southeast and displacements can vary from 100 to 500 ft. (30 to 150 metres). Secondary cross faults and small displacement reverse thrust faults are also common, striking at numerous azimuths, according to specific areas. Broad synclinal features characterize many of the sedimentary sub-basins - these synclinal folds are usually of

shallow dip on the southwest limbs, terminating in rather abrupt, steeply dipping northeast limbs, giving the folds an asymmetrical configuration. Anticlines, although present in some areas, are rather uncommon.

4.3 McIVOR LAKE UNCONSOLIDATED OVERBURDEN

The McIvor Lake property is overlain by a mantle of glacial and fluvioglacial deposits of sand, gravel, clay, silt and in some cases boulders.

There are extensive gravel pits on the western edge of the property as seen on Map No.3, however, these gravels have given over to silts, sands and clays with minor gravel and boulders going easterly.

The thickness of this unconsolidated material varies from 45 to 110 metres in thickness over the property. As can be seen on Map No.3, the area around holes 88-01 and 88-10 with Argonaut Road as the axis is the area of greatest thickness. This was also the area as evidenced by the drillers logs in Appendix 2, of greatest water discharge. Holes 88-01 and 88-10 made considerable volumes of water (up to 100 gal./minute) although hole 88-04, only 400 metres from 88-10 made very little water if any.

From the thick overburden in this area and the significant amounts of water, there are indications that this may be an area of a buried bedrock channel. This channel may extend westward and then south again to the vicinity of holes C.R.2 and No. 20. However, more information would be required before this could be done with any certainty. Future programs will address this possible mining hazard and define how mining and the possible channel would affect one another.

Going southeast from this channel area, across the property, drilling indicates fairly uniform unconsolidated overburden thickness of from 40 to 70 metres and no significant amounts of water.

When drilling the program, this great thickness of unconsolidated material caused concern regarding the setting of casing. However, due to the composition of the material, it went quite smoothly with the only problems arising from the tight nature of the clays in hole 88-04, the layer of boulders on the bedrock in holes 88-01 and 88-10 and the surficial boulders in holes 88-08 and 88-05. Only the one drill hole at 88-08 had to be moved a few feet for a second try.

4.4 McIVOR LAKE STRATIGRAPHY

As was previously stated, the McIvor Lake property is located in the northwest corner of the Late Cretaceous Comox Basin. The Cretaceous rocks vary in thickness from 0 at the outcrop edge in the west to 800 metres in depth at the coastline of the Strait of Georgia. The thickest sections of sediments encountered in the Phase I drilling program were at holes 88-08 and 88-05. In 88-05, 366 metres were drilled without encountering basement rocks. It is expected from Map No.5 that the greatest thickness of sediments will be 400 to 450 metres in the very southeastern corner of the property.

The cretaceous sediments at McIvor Lake belong to the Comox formation of Santonian age. The Comox formation lies unconformably on the basalts of the basic volcanic rocks of the Karmutsen formation which is Triassic in age. These rocks form the basement underlying the property as well as the low lying hills to the west which identify the western edge of the property.

The Comox formation has been informally divided into three units as suggested by J.E. Hughes (in Curcio, 1975):

COMOX FORMATION

UPPER SANDSTONE UNIT: Mainly white and grey arkosic sandstone with minor interbeds of red and green shale, sandy shale, conglomerate and thin coal beds. It's base is marked by an erosive conglomerate 0.6 to 25 metres thick. This unit is in evidence in the McIvor Lake area. It was encountered in hole 88-04 in the north (the other northern holes penetrated the middle unit) and it was most likely encountered in hole 88-05 for most of its depth. The major anomaly as will be seen throughout this report is hole 88-08, where there is a conglomerate unit at 230 metres depth, occurring below the coal seams. Are these coal seams some upper seams and are the main two seams at greater depth than the 311 metres total depth? Hole 88-08 unfortunately did not reach basement and this is an area that should be concentrated on in the Phase II program.

MIDDLE COAL MEASURES: These are composed mainly of dark grey, brown and black shale, sandy shale and minor conglomerate. Two potentially mineable seams are present No. 2 and No. 1 from the top down. Throughout most of the drill holes in the north, this unit lies directly on the basement volcanics. In the McIvor Lake area this unit is up to 50 metres thick.

BENSON MEMBER: This unit is the basal portion of the Comox formation. It usually consists of red shales, sandy shales, conglomerate and pebbly sandstone. Where present, the Benson Member can be up to 112 metres in thickness. It may be present in the basal part of hole 88-09 and of course, in hole 88-08, depending on what is encountered at greater depth, coal or basement.

It is unfortunate that the entire area is covered with such a thick layer of unconsolidated sediments as this eliminates the added information that surface geologic mapping would provide. This would help to some extent the interpretation of the sedimentary geology, but would be of much greater use in determining the structural geology.

McIVOR LAKE STRUCTURE

Due to the spacing of the Phase I drill holes of 1988 (not allowed to drill on D.F.O. land), it was necessary to use all of the old drill hole information available. Fairly accurate diamond core logs and summaries of these holes are found in the Appendices, however, the accuracy of their locations is somewhat in question. Therefore, the structural geology of the area is still quite an unknown factor over a large portion of the property and has been interpreted in a highly speculative manner in this report with regards to contour maps and cross-sections.

The information available was used to generate the contour maps found in Appendix 9, Volume II as well as the cross-sections, Figure 1 and 2 found in this section of the report.

As can be seen on structure contour Map No.5 of the basement, the major features identified have been a synclinal structure in the vicinity of Argonaut Road in the north and a gentle anticlinal feature in the vicinities of holes 88-08 and 88-09.

These two structural features have also been defined in a more pronounced manner on the structure contour map of the No.2 seam, Map No.6. These maps have been the major basis for the resulting cross-sections and for the conceptual mining potential in Volume III.

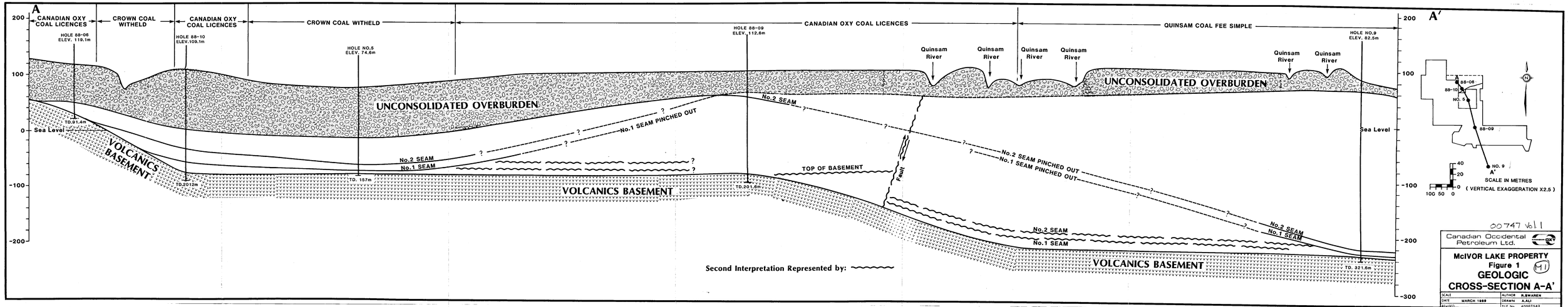
It is realized that anticlinal features are uncommon in the Comox basin and in this case is based on the premise that the coal seams in hole 88-08 and 88-09 are the seams of the middle coal measures.

If this is not the case, a possible second interpretation would be that these seams are some additional seams in the upper sandstone unit. If this is the case, a possible second interpretation has been incorporated into cross-sections A-A' and B-B' (Figures 1 and 2). In this interpretation the 2 coal seams of the middle coal measures would be deeper yet in hole 88-08 and may be pinched out in the vicinity of hole 88-09. In order for this to happen there would have to be a normal fault located between holes 88-09 and 88-08 with 88-08 in the downdrop block.

The fault would trend south at about 245 deg. and run to the north of hole No.20 to the southwest of the property.

For the purpose of this report, the first interpretation as shown on the structure contour maps and cross-sections will be used. This is dependent on the coal seams in holes 88-08 and 88-09 being the same as those in the northern portions and south of the property.

The dips along this syncline anticline pair are quite gentle and the cross-sections can be deceptive as there is a vertical exaggeration of 2.5X.



00747 Vol 1

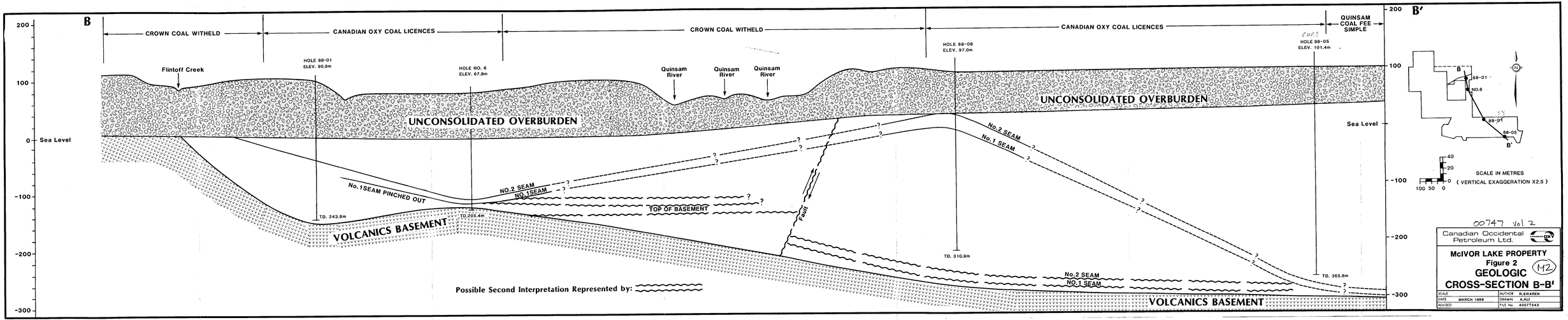
Canadian Occidental Petroleum Ltd.

McIVOR LAKE PROPERTY

Figure 1 (M1)

GEOLOGIC CROSS-SECTION A-A'

SCALE		AUTHOR	R.SWAREN
DATE	MARCH 1988	DRAWN	A.ALI
REVISED		FILE No.	40087543



00747 Vol 2

Canadian Occidental Petroleum Ltd.

McIVOR LAKE PROPERTY

Figure 2 (MZ)

GEOLOGIC CROSS-SECTION B-B'

SCALE		AUTHOR	R.SWAREN
DATE	MARCH 1989	DRAWN	A.ALI
REVISED		FILE No.	400TT643

The dips on the limbs of the syncline are to a maximum of 5 deg. and on the anticline they vary from 5 deg. to 10 deg. off the nose and southeast limb (taken from Map No.6).

Hole 88-09 has many fracture zones as indicated in the Phase I drilling section of the report. This would most likely be associated with the formation of the anticlinal structure or possibly with a nearby fault as hypothesized in the second interpretation.

Despite the fact that this section of the report has not finalized the definition of the structural geology of the area and it is admitted that there are probably many more different interpretations which could be made, it is believed that the synclinal feature in the northern portion of the property is a fact. What is indicated, is that a Phase II program is required to delineate the structural trends in the vicinity of holes 88-08 and 88-09 and join up the structure and stratigraphy in the northern and southern portions of the property.

4.5 McIVOR LAKE COAL MEASURES

Out of the 8 holes drilled in 1988, 5 encountered coal seams. One of the major outcomes of the Phase I drilling program was to prove that there was no coal in the northwestern portions of the property (Map No. 6) and shift emphasis to the southeast and east of the Quinsam River.

As can be seen on the E-logs in Appendix 8 Volume II, it is extremely difficult to correlate seams even between drill holes as close together as 88-01, 88-10 and 88-04. However, it has been recognized that there are two coal seams that vary in thickness and lithology, that extend over much of the property.

Coal thicknesses are generally greater in the northern and southern portions of the property and as can be seen on Map No.6 and Map No.7 they tend to pinch out and thin down in the area of the proposed anticlinal structure.

The No.2 seam tends to subcrop against the bottom of the unconsolidated overburden layer and the No.1 seam against the basement as indicated between drill holes 88-10 and 88-04.

The identifications placed on the coal seams in the drill hole summaries of Appendix 1 are speculative and will most likely change once more drilling has been carried out.

The major problem in identification of seams is the lack of new drill holes between 88-01 and 88-09 and the fact that there are not enough holes east of the river near 88-08 and 88-05 and that these two did not reach basement. Drilling is also required in the area immediately north and northeast of hole 88-08 as this is a very prospective area, along the southern limb of the synclinal structure.

It appears from the old and new drilling results that the No. 2 seam varies considerably in thickness, from 1.3 metres in hole 88-04 to 2.9 metres in hole No.6. The No. 1 seam is also quite variable from 1.3 metres in hole 88-10 to 2.63 metres in hole No. 6 to 3.4 metres in hole No. 9 to the south of the property. With these great variations in thickness of coal and the amount and thickness of partings, it is evident that considerable exploration drilling is still required.

Holes 88-09 and 88-08 encountered seams in the very top of the bedrock, where casing was set partially into coal and shale beds. Therefore, good E-logs for comparison purposes are unavailable for these two seams which were in each case called the No. 2 seam. It may be found that the seam called the No. 1 in hole 88-08 is actually the No. 2 and that the upper seam is a different seam. This has possibilities as the density of this seam looks vaguely similar to the No. 2 seam density in hole 88-10, however, the gamma's do not match very well.

What has been concluded about the coal on the McIvor Lake property is that conservatively, there is at least one seam of coal of about 1.5 metres in thickness and that there is sufficient encouragement to warrant a further Phase II program which is required to address the major areas of question.

5.0 RESERVES

Reserve estimates using the information available are at best highly speculative. However, an attempt has been made to come up with a conservative estimate of in-place geologic reserves.

To provide a reasonably conservative reserve estimate, only one coal seam was used and this one was given an average thickness of 1.5 metres, and a specific gravity of 1.4.

The area involved was determined by the subcrop limit of the No. 2 seam on Map No. 6 and it included (besides the existing coal licences) the new licence applications 1, 2 and 3 and the fee simple lands immediately adjacent to and east of application 1 (figure 4).

These in-situ reserves come to a total of approximately 23 million tonnes.

This reserve has been further broken down in Volume III to a total of 15,041 million tonnes of mineable coal of which a total of 8,567 tonnes is considered recoverable.

It may be that one seam may be mineable in certain parts of the property and the other seam in others. This will depend on coal thickness and quality which will have to be more accurately determined in future drilling programs.

CANADIAN OCCIDENTAL PETROLEUM LTD.

McIVOR LAKE PROPERTY

COAL LICENCE APPLICATIONS

FIGURE 4

MAP SHEET 92K/3

0 500 1000

scale (meters)

6.0 QUALITY

6.1 PHASE I COAL QUALITY

During the 1988 Phase I drilling program coring was carried out at two hole locations, 88-04 and 88-05. At 88-05 a guess was made as to the possible depth to begin coring at, based on the seams being higher in the stratigraphic section as at 88-08. This was not the case and the two intervals of core taken, although encountering minor coal stringers, did not encounter any coal worth doing quality analysis on.

At drill hole 88-04 it was hoped that both the No. 1 and No.2 seams would be cored. Again depths were guessed at since there was no pilot hole. In this instance, coring was started 2.24 metres above the No. 2 seam. Coring continued through the No. 2 seam and down into the basement.

The No. 1 seam was not encountered since it subcrops against the basement between 88-04 and hole 88-10 which is located approximately 500 metres to the east.

The interval of the No. 2 seam was cored and the coal sent to Idemitsu Kosan's office in Tokyo for analysis. Hole 88-04 is located quite close to the subcrop of the No. 2 seam and comparing the E-log of the No. 2 seam in this hole and in holes 88-10 and 88-01, it appears that the seam in this local has become thinner and dirtier.

Figure 3 shows the lithology of the No. 2 seam and the intervals sampled, numbered 880401 to 880403. Detailed descriptions of the entire cores along with photographs for holes 88-04 and 88-05 are found in Appendix 6.

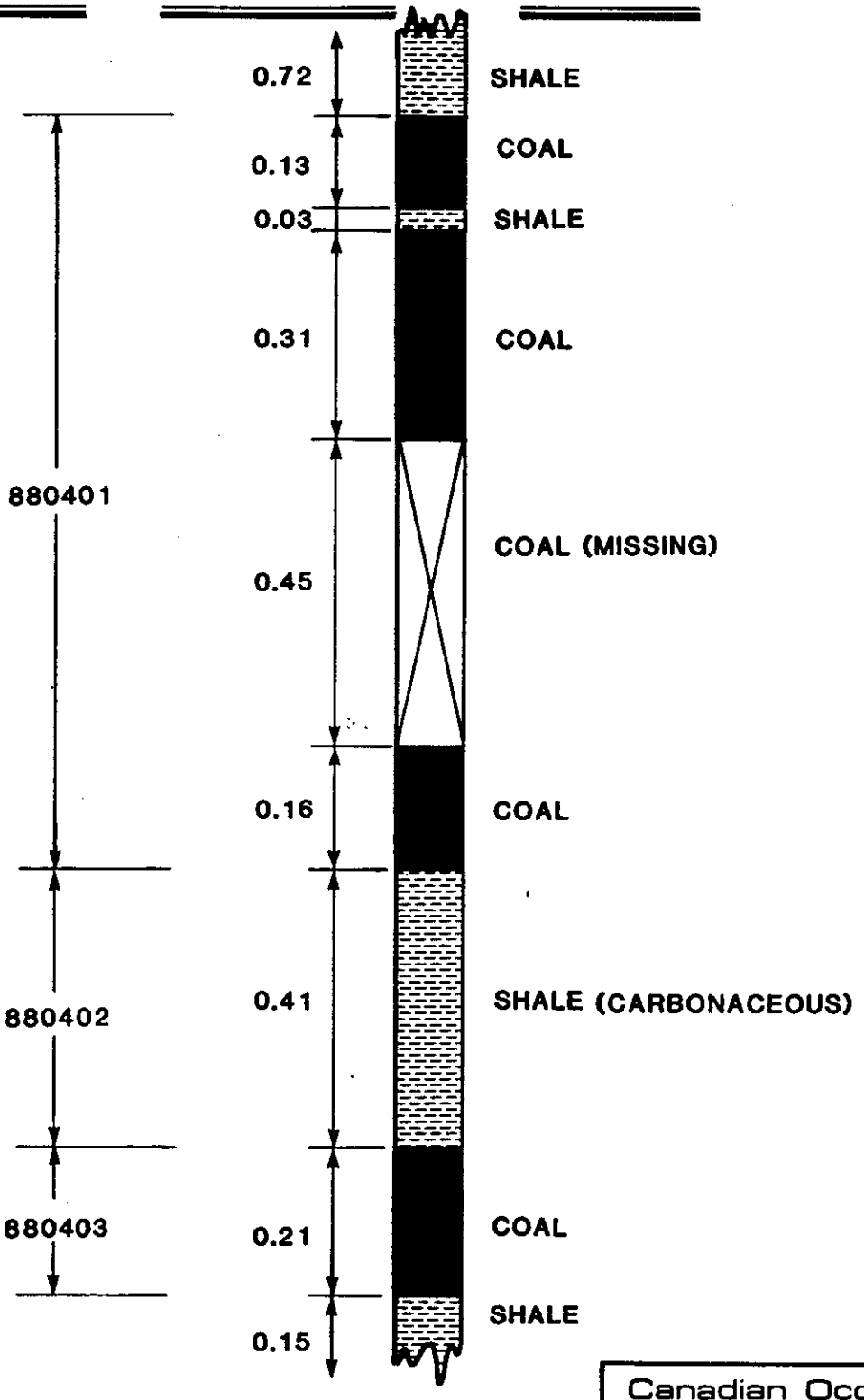
As can be seen in Figure 3, the entire sampled interval is 1.72 metres. The thickest portion of the seam is represented by the sample 880401 which is 1.1 metres thick. Unfortunately, 0.45 metres was missing. This was followed by sample 880402 of 0.41 metres of shale and 880403 of 0.21 metres of coal with a shale parting.

In this particular case, the mineable interval, if it attains greater thickness, is the upper coal interval numbered 880401. The other two intervals would be left as floor and in the case of Quinsam coal, the highest sulfur values are usually found in these riders of coal and shale.

Therefore, the upper mineable interval should be sampled and analyzed as one and the bottom two intervals should be combined as another sample.

Unfortunately, all three samples were combined together and the missing coal interval of 0.45 metres or 26% of the sample was not weighted in. The quality values therefore are almost 50% coal and 50% shale and coal with partings and are not representative of an interval one may wish to mine.

As can be seen on the two sheets of quality analysis at the end of section 6.1, the sulfur values are unacceptably high ranging from 2.68 in Lot No. 881206 which represents the quality of the coal floated at 1.5 S.G. to 4.96 in Lot No. 881205 which is the analysis on a raw basis.



HOLE 88-04

Canadian Occidental Petroleum Ltd.

McIVOR LAKE PROPERTY

FIGURE 3

LITHOLOGY & SAMPLE INTERVALS-HOLE 88-04

SCALE	AUTHOR R.SWAREN
DATE MARCH 1989	DRAWN A.ALI
REVISED	FILE No. 1492A

Since Canadian Occidental is looking for a mineable reserve of Raw Coal, only Lot No. 881205 results should be considered, but, the sample intervals 880402 and 880403 should not have been included in this Lot. Therefore, the quality results from hole 88-04 are not representative of what the raw coal would be and cannot be used to judge the quality of the mineable reserve.

In the next program and all future programs, the mineable interval of raw coal will be analyzed separately on an as received basis. Roof and floor samples will also be analyzed separately and if thought necessary, will later be composited.

IDEMITSU KOSAN CO., LTD.

COAL RESEARCH LABORATORY

3-1 NAKASODE, SODEGAURA,
KIMITSU, CHIBA, JAPAN

PHONE:0438-62-9511

No. C890001

CERTIFICATION OF ANALYSIS

Sample Name : McIvor Lake (Product)

Shipper, Country : Canadian Occidental Petroleum LTD.

Issue Date : 1989.1.23 Lot. No. : 881206

Analytical Method : J I S (Japanese Industrial Standard)

I T E M S	BASIS	D A T A
TOTAL MOISTURE %	as	—
CAL. VALUE kcal/kg	chb	6390
HGI	adb	—
PROXIMATE %		
Moisture	chb	5.8
Ash	〃	10.0
Vol. Matter	〃	37.2
Fixed Carbon	〃	47.0
ULTIMATE %		
Carbon	daf	76.8
Hydrogen	〃	5.3
Nitrogen	〃	0.8
Oxygen	〃	14.9
Sulfur	〃	2.32
Total Sulfur	db	2.68
Chlorine	〃	0.02
SIZE DISTRIBUTION%		
～ 50 mm	adb	
～ 25 mm	〃	
～ 15 mm	〃	
～ 10 mm	〃	
～ 5 mm	〃	
～ 2 mm	〃	
～ 1 mm	〃	
～ .5 mm	〃	
～ .25 mm	〃	
.25 mm ～	〃	
C. S. N.		0

I T E M S		D A T A
ASH FUSION TEMPERATURE℃		
OXID.	Ini. Deform.	1210
	Hemisphere	1260
	Flow	1310
RED.	Ini. Deform.	1070
	Hemisphere	1100
	Flow	1120
ASH COMPOSITION %		
ACID	SiO_2	24.89
	Al_2O_3	16.59
	TiO_2	1.77
BASE	Fe_2O_3	18.53
	CaO	15.95
	MgO	1.00
	Na_2O	1.54
	K_2O	0.24
MISC.	P_2O_5	0.13
	MnO	< 0.05
	V_2O_5	0.08
	SO_3	14.38
	NiO	

chb : Equilibrium moisture basis of coal at 75% relative humidity and room temp.

T. Yamada

T. Yamada, Manager

SIGNATURE AND TITLE

IDEMITSU KOSAN CO., LTD.

COAL RESEARCH LABORATORY

3-1 NAKASODE, SODEGAURA,
KIMITSU, CHIBA, JAPAN

PHONE:0438-62-9511

No. C890002

CERTIFICATION OF ANALYSIS

Sample Name : McIvor Lake (ROM)

Shipper, Country : Canadian Occidental Petroleum LTD.

Issue Date : 1989.1.23 Lot. No. : 881205

Analytical Method : J I S (Japanese Industrial Standard)

I T E M S	BASIS	D A T A
TOTAL MOISTURE %	as	8.7
CAL. VALUE kcal/kg	chb	4400
HGI	adb	60
PROXIMATE %		
Moisture	chb	5.2
Ash	〃	34.0
Vol. Matter	〃	29.3
Fixed Carbon	〃	31.5
ULTIMATE %		
Carbon	daf	73.1
Hydrogen	〃	5.5
Nitrogen	〃	0.8
Oxygen	〃	15.6
Sulfur	〃	4.96
Total Sulfur	db	3.81
Chlorine	〃	0.02
SIZE DISTRIBUTION%		
～ 50 mm	adb	
～ 25 mm	〃	
～ 15 mm	〃	
～ 10 mm	〃	
～ 5 mm	〃	
～ 2 mm	〃	
～ 1 mm	〃	
～ .5 mm	〃	
～ .25 mm	〃	
.25 mm ～	〃	
C. S. N.		0

I T E M S		D A T A
ASH FUSION TEMPERATURE℃		
OXID.	Ini. Deform.	1350
	Hemisphere	1390
	Flow	1410
RED.	Ini. Deform.	1240
	Hemisphere	1280
	Flow	1380
ASH COMPOSITION %		
ACID	SiO_2	46.13
	Al_2O_3	24.42
	TiO_2	2.13
BASE	Fe_2O_3	12.26
	CaO	4.46
	MgO	0.90
	Na_2O	0.98
	K_2O	0.62
MISC.	P_2O_5	0.06
	MnO	< 0.05
	V_2O_5	0.07
	SO_3	4.41
	NiO	

chb : Equilibrium moisture basis of coal at 75% relative humidity and room temp.

T. Yamada

T. Yamada, Manager

SIGNATURE AND TITLE

6.2 PREVIOUS QUALITY RESULTS

There are two series of past quality results for the McIvor Lake area. The most recent are those of Canadian Collieries (Dunsmuir) Ltd., who sent cores from diamond core hole No. 9 to Commercial Testing and Engineering in Chicago. Copies of these assays are found at the back of this Section (6.2). This drill hole and the quality given should be comparable to that found in the Phase II drilling to be done in the southern portions of the property to the east of the Quinsam River.

The following summary of assays and the sample intervals have been compiled by G.L. Hoffman in 1987 based on documentary evidence found in the Buckham papers (PABC 436/63/1).

Section (from log of Hole No.9)

994.34 ft.		Sample No.	Ash (d.b.)	Sulphur (d.b.)	B.T.Us /lb.
Coal	1.5 ft.				
Shale & Coal	0.25 ft.				
Shale, Brown	2.60 ft.				
Coal & Shale	0.33 ft.	2033	26.22	1.61	9.798
Coal	0.50 ft.	2032	18.04	0.82	11,060
Coal & Shale	0.25 ft.	2031	31.62	9.99	8,923
Shale	16.0 ft.				
1015.67 ft. Top of No. 1 Seam					
Coal	4.83 ft.	2030	14.11	1.60	11,858
		2029	15.64	1.12	11,685
Coal & Shale	0.33 ft.	2028	34.33	0.45	8,664
Coal	6.17 ft.	2027	12.81	0.39	11,976
		2026	11.45	0.51	12,193
Shale	0.75 ft.				
Shale & Coal	0.50 ft.				
1028.25 ft.					

The average moist mineral-matter-free calorific value of this coal is 13,166 BTU/lb. indicating high volatile 'B' bituminous rank. Free swelling indices range from 0 to 1, not of coking quality.

Assays which are available for the older 1910 holes No. 6 and No. 3 which are both located on the McIvor Lake property are found in the Bonthrone and Golloway (1911) report. These are as follows:

No. 2 Seam		M	V.M.	F.C.	Ash	S
Hole No. 6	581.50-585.58 ft.	5.0	34.6	42.1	17.5	0.8
Hole No. 6	590.58-596.75 ft.	4.5	39.2	44.7	11.0	0.6
No. 2 Seam						
Hole No. 3	466.50-467.16 ft.	5.0	39.2	39.2	16.0	0.6
Hole No. 3	467.16-468.75 ft.	4.5	37.6	41.1	16.0	0.8
No. 1 Seam (34% recovery)						
Hole No. 6	635.50-644.25 ft.	4.5	30.0	32.0	32.5	1.0

These coals were assayed by J. O'Sullivan of Vancouver in August of 1911. They were non-coking.

These coals resemble the quality of coal at the Quinsam mine. The raw sulfur values in these older analyses appear to be somewhat lower than Quinsams.

The potential of finding a good quality coal which will be sold on a raw basis definitely does exist. Obviously, considerable coring and quality work will have to be carried out on all of the mineable intervals encountered in drilling.

63/1

CHARLESTON 10, W. VA. | TOLEDO 2, OHIO | CLEVELAND 18, OHIO | TERRE HAUTE, IND. | NORFOLK 4, V

COMMERCIAL TESTING & ENGINEERING CO.

SINCE 1908

COAL ANALYSIS
PROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
ULTIMATE ANALYSIS
BY-PRODUCT TESTS
WASHABILITY INVESTIGATIONS
OIL ANALYSIS
WATER ANALYSIS

GENERAL OFFICES
228 NORTH LA SALLE STREET
PHONE RANDOLPH 6-8434
CHICAGO 1

FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2026

Kind of Coal reported to us: ---

Sample taken at: ---

Sample taken by: Yourselves

Date Sampled: ---

ANALYSIS REPORT No. 250551

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.79	XXXXX
% Ash	10.90	11.45
% Volatile	36.07	37.88
% Fixed Carbon	48.24	50.67
	100.00	100.00
Btu	11609	12193
% Sulfur	0.49	0.51

12193

FUSION TEMPERATURE OF ASH XXXXX (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 1 Non agglomerating

Respectfully submitted,

CHECKED

COMMERCIAL TESTING & ENGINEERI

W. D. LANGTRY, President

CHARLESTON 23, W. VA. TOLEDO 2, OHIO CLEVELAND 15, OHIO TERRE HAUTE, IND. NORFOLK 4, VA.

COMMERCIAL TESTING & ENGINEERING CO.

63/1

COAL ANALYSIS
PROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
ULTIMATE ANALYSIS
BY-PRODUCT TESTS
WASHABILITY
INVESTIGATIONS
OIL ANALYSIS
WATER ANALYSIS

SINCE 1908

GENERAL OFFICES
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PHONE RANDOLPH 6-8434
CHICAGO 1

FIELD SERVICES
INSPECTION—SAMPLING
AT MINES, LAKE DOCKS
AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Kind of Coal Reported to us ---

Sample taken at ---

Sample taken by Yourselves

Date Sampled ---

Sample #2027

ANALYSIS REPORT No. 250552

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.68	xxxxx
% Ash	12.21	12.81
% Volatile	36.11	37.88
% Fixed Carbon	47.00	49.31
	100.00	100.00
Btu	11416	11976
% Sulfur	0.37	0.39

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 1 Non agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

...LESTON 23, W. VA. TOLEDO 2, OHIO CLEVELAND 15, OHIO TERRE HAUTE, IND. NORFOLK 4, VA.

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AL ANALYSIS
ROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
ULTIMATE ANALYSIS
BY-PRODUCT TESTS
ASHABILITY
INVESTIGATIONS
OIL ANALYSIS
ATER ANALYSIS

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PHONE RANDOLPH 6-8434
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FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC ROCHESTER, N. Y.

June 9, 1955

ame CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2028

ind of Coal reported to us ---

ample taken at ---

ample taken by Yourselves

ate Sampled ---

ANALYSIS REPORT No. 250553

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.13	xxxxx
% Ash	32.91	34.33
% Volatile	30.41	31.72
% Fixed Carbon	32.55	33.95
	100.00	100.00
Btu	8306	8664
% Sulfur	0.43	0.45

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 0 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

Form TEC 4M 2-55

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COMMERCIAL TESTING & ENGINEERING CO.

631

COAL ANALYSIS
PROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
ULTIMATE ANALYSIS
BY-PRODUCT TESTS
WASHABILITY
INVESTIGATIONS
OIL ANALYSIS
WATER ANALYSIS

SINCE 1905

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PHONE RANDOLPH 6-8434
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FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Kind of Coal reported to us: ---

Sample #2029

Sample taken at: ---

Sample taken by: Yourselves

Date Sampled: ---

ANALYSIS REPORT No. 25055⁴

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.44	xxxxx
% Ash	14.95	15.64
% Volatile	35.27	35.91
% Fixed Carbon	45.34	47.45
	100.00	100.00
Btu	11166	11685
% Sulfur	1.07	1.12

1321

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX-- 0 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

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6-1

COAL ANALYSIS
OXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
ULTIMATE ANALYSIS
BY-PRODUCT TESTS
WASHABILITY
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FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2030

Kind of Coal reported to us ---

Sample taken at ---

Sample taken by Yourselves

Date Sampled ---

ANALYSIS REPORT No. 250555

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.60	xxxxx
% Ash	13.46	14.11
% Volatile	36.05	37.79
% Fixed Carbon	45.89	48.10
	100.00	100.00
Btu	11313	11858
% Sulfur	1.53	1.60

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 1 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

CHARLESTON 33, W. VA. TOLEDO 2, OHIO CLEVELAND 16, OHIO TERRE HAUTE, IND. NORFOLK 4, VA.

COMMERCIAL TESTING & ENGINEERING CO.

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COAL ANALYSIS
PROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
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PHONE RANDOLPH 6-8434
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FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2031

Kind of Coal reported to us ---

Sample taken at ---

Sample taken by Yourselves

Date Sampled ---

ANALYSIS REPORT No. 250556

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	3.03	xxxxx
% Ash	30.66	31.62
% Volatile	31.95	32.95
% Fixed Carbon	34.36	35.43
	100.00	100.00
Btu	8653	8923
% Sulfur	9.69	9.99

1979

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 0 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

Form 137 45M 2-55

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COAL ANALYSIS
PROXIMATE ANALYSIS
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BY-PRODUCT TESTS
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FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2032

Kind of Coal reported to us: ---

Sample taken at: ---

Sample taken by: Yourselves

Date Sampled: ---

ANALYSIS REPORT No. 250557

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.96	xxxxx
% Ash	17.15	18.04
% Volatile	33.44	35.19
% Fixed Carbon	44.45	46.77
	100.00	100.00
Btu	10511	11060
% Sulfur	0.78	0.82

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 0 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

W. D. LANGTRY, President

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COAL ANALYSIS
PROXIMATE ANALYSIS
FUSION TEMPERATURE OF ASH
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BY-PRODUCT TESTS
WASHABILITY
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PHONE RANDOLPH 6-8434
CHICAGO 1

FIELD SERVICES
INSPECTION—SAMPLING AT MINES, LAKE DOCKS AND DESTINATION

AFFILIATION
COMMERCIAL TESTING CO., INC
ROCHESTER, N. Y.

June 9, 1955

Name: CANADIAN COLLIERIES (Dunsmuir) Ltd.
Exploration Department
Address: Cumberland, B.C.
Canada

Sample Identification by Yourselves

Sample #2033

Kind of Coal reported to us ---

Sample taken at ---

Sample taken by Yourselves

Date Sampled ---

ANALYSIS REPORT No. 250558

PROXIMATE ANALYSIS

	As Rec'd In Lab.	Dry Basis
% Moisture	4.15	xxxxx
% Ash	25.13	26.22
% Volatile	31.57	32.94
% Fixed Carbon	39.15	40.84
	100.00	100.00
Btu	9391	9798
% Sulfur	1.54	1.61

FUSION TEMPERATURE OF ASH xxxxx (Softening Temperature)
U.S.B. of M. and A.S.T.M. Definition

FREE SWELLING INDEX -- 0 Non-agglomerating

Respectfully submitted,

COMMERCIAL TESTING & ENGINEERING CO.

M. D. LANGTRY, President

7.0 PHASE I COSTS

The Phase I program consisted of four main areas of expenditure; exploration drilling, environmental work, preliminary mining evaluation and coal licence rental. The total cost for the Phase I program was $220,994.49 and is broken down and summarized in the following:

PHASE I COSTS

EXPLORATION DRILLING (A.F.E. 418004)

Drilling Contractor	
Mobilization/Demobilization	$ 6,000.00
2224 ft. cased hole @ $22.00/ft.	$48,928.00
1949 ft. open hole @ $8.00/ft.	$15,592.00
720 ft. open hole @ $9.00/ft.	$ 6,480.00
400 ft. open hole @ $10.00/ft.	$ 4,000.00
220 ft. open hole @ $12.00/ft.	$ 2,640.00
72 regular hrs. @ $180.00/hr.	$12,960.00
3 standby hrs. @ $120.00/hr.	$ 360.00
5699 ft. @ $1.25/ft. fuel change	$ 7,123.75
95 man days room + board @ $55/day	$ 5,225.00
10-6" drive shoes @ $50.00 ea.	$ 500.00
11 gal. polyfoam @ $25/gal.	$ 275.00
1 well cap @ $25.00	$ 25.00
64 ft. steel casing @ $7.50/ft.	$ 480.00
1 tungsten carbide core bit $900+15%	$ 1,035.00
2-2 piece inner tube shoes $115/ea+15%	$ 264.00
2 core lifters @ $120 ea. + 15%	$ 276.00
Inner tube tape	$ 20.00
Drilling Contractor Total	$112,184.25
Trucking costs (Hauling casing)	$ 950.00
E-Logging Contractor	$ 15,109.25
Cat work, site preparation, cleanup etc.	$ 2,860.38
Storage and loading casing	$ 215.00
Cementing Drill Holes	$ 1,907.06
Supervisor Expenses	$ 3,833.75

Fuel/Oil/Repairs	$ 1,407.12
Surveying Drill Holes	$ 6,701.73
Coal Quality Analysis	$ 3,946.30
Core Photos	$ 124.46
Total Exploration Drilling (A.F.E. 418004)	$149,239.30

Environmental Work (AFE 418002)

Monitoring 9 surface water sampling locations once a month, 4 water well locations quarterly and 8 dust sampling locations once a month and the resulting analysis.

Total Environmental Work (AFE 418002)	$ 51,536.79

Preliminary Mining Evaluation (AFE 419002)

Consulting engineering fees to evaluate the mining potential of the property from an engineering viewpoint.

Total Preliminary Mining Evaluation (AFE 419002)	$ 9,662.40
Coal Licence Rental 1988/1989	$ 10,556.00
Total Phase I Costs =	$220,994.49

8.0 PHASE I DRILLING, 1988

The McIvor Lake Phase I drilling program was commenced on October 15, 1988 and completed on November 11, 1988, during which a total of 8 holes were drilled for 1708.2 metres. Time was spent prior to this period in gaining access approvals and preparing drill locations. The surveying and reclamation work extended into December, but was completed before the new year.

One rig was used, a T.H. 60 cyclone. All of the holes were drilled using an Ingersol Rand downhole hammer with air. No mud or drilling additives were used in the course of the program. Coring was carried out using a Norton Christensen wireline string which produced a 3" core. The core was taken in 10 foot runs using a split tube inner core barrel.

The largest costs were incurred setting casing which averaged 90 metres per hole. The greatest depths of till cover were encountered along Argonaut Road in the north at up to 110 metres. These depths decrease to below 70 metres southeast of the Quinsam River in the southern portions of the property.

Casing was set using a drill-thru casing hammer. The process went quite smoothly and the only problems encountered were boulders in holes 88-01 and 88-10 just above bedrock and in the top 6 to 10 metres of the drill holes east of the Quinsam River, 88-08 and 88-05. In the Phase II program, problems could arise east of the Quinsam River in the top portions of the holes.

Each drill hole took approximately 3 days to complete and when finished, were logged and cemented from top to bottom.

The following is a breakdown of the meterage drilled and cored for each hole:

Hole No.	Cased(m)	Drilled(m)	Cored(m)	Total(m)
88-01	98.1	146.1	-	244.2
88-04	106.3	28.9	23.3	158.5
88-05	67.5	276.2	22.1	365.8
88-06	69.7	21.7	-	91.4
88-08	78.1	232.8	-	310.9
88-09	56.4	144.8	-	201.2
88-10	90.5	111.6	-	202.1
88-11	75.8	58.3	-	134.1
Total	642.4	1020.4	45.4	1708.2

From the information available before drilling, the coal zone appeared to be located near the bottom of the formation or near basement. Therefore, all of the drill holes were intended to drill into the volcanic basement.

Drill holes 88-04, 88-06, 88-09, 88-10 and 88-11 all encountered basement. Hole 88-01 may or may not have reached basement, but is believed to have been very close. This hole had to be terminated due to the presence of large volumes of water which slowed down drilling and could possibly, if drilling had continued, caused some of the water and cuttings to reach a tributary of Cold Creek.

Hole 88-05 had to be terminated short of the basement and probably short of the coal. We only had 366 metres of drill stem with the rig so this was the depth this hole ended at. In the Phase II program, greater depth capabilities will be required for the drill holes east of the Quinsam River.

In drill hole 88-08 two seams of coal were encountered in the upper portions of the hole. One of these seams looks very much like the No. 2 seam, but in this case has been called the No. 1 seam due to

a higher seam in the casing which we were unable to obtain an E-log on. These seams occurred in the top 100 metres, but it was decided to continue drilling down to basement. The hole was finally stopped at 310.9 meters, encountering neither coal seams nor basement. The hole possibly should have been continued to 366 metres, the total depth capability.

The Phase II program drill holes near this location should be carried on down to basement.

The drill holes that encountered basement encountered basic volcanic rock which is green in colour. (Core hole 88-04, Appendix 6).

Minor fracture zones were encountered in holes:

Hole		Fracture Depths
88-01	at	195m
88-10	at	170m
88-11	at	75m

These holes all made fairly large quantities of water from these fractures.

Many fracture zones were encountered in one drill hole:

Hole	Fracture Depths
88-09	96.62 - 103.94m
	135.94m
	141.43m
	173.13 - 176.17m

None of these fractures produced any significant amounts of water and they probably indicate an area of structural disturbances. In the case of this report as seen in the geology section, this may be related to the proposed anticlinal feature in this area or it may be related to faulting.

All of the drill holes were logged geophysically with Gamma, Density, Resistivity and Caliper tools. The resistivity did not work well in hole 88-01 as the water turned saline in the bottom portions of the hole. (Appendix 8, Volume II). The drilling information is summarized on the summary sheets in Appendix 1 and the drillers lithologs in Appendix 2.

The actual drilling of the program could be deemed a success, however, the fact that we were not able to gain access to drill in the centre of the property, did detract from the information required to determine the continuity and identification of seams and structure across the property.

The proposed Phase II program is designed to provide the missing infill data to better interpret the geology of the area.

9.0 PHASE II PROPOSED DRILLING

It is proposed that a Phase II program consisting of 5 to 6 holes and costing in the order of $150,000 be carried out in the fall of 1989.

The implementation of this second program will depend on:

(a) Obtaining coal licences on the areas applied for in 1989, as outlined in the proposed acquisition section (3.0).

(b) Obtaining approval from the department of fisheries and oceans to drill two holes 89-01 and 89-02 on their surface rights, along the B.C. Hydro right-of-way.

The purpose of this Phase II program will be to:

(a) Provide quality data on the No. 1 and No. 2 coal seams on the west side and the east side of the Quinsam River. (Holes 89-01 and 89-05).

(b) Identify the number, character and thickness of coal seams between the north end of the property and hole 88-09. These two holes 88-01 and 89-02 on D.F.O. land are proposed for this purpose (Map No. 8, Appendix 9). These holes will also provide structure details of the syncline.

(c) Extend the seam information regarding number, thickness and depth across the Quinsam River to the east and southeast. In so doing, the unknowns concerning the structure near hole 88-09 will hopefully be cleared up.

The thickness of overburden and the depths to basement make drilling quite costly, however, if there is money to spare at the end of the program, hole 88-06 will also be drilled. Drill hole 88-07 has been added to the list but being the greatest in depth will probably be left to a later date.

The program will all be carried out on existing access and the holes will be cased to bedrock and drilled with air. Every precaution will be taken to prevent environmental damage as was done in the 1988 Phase I program. All holes will be cemented from top to bottom upon completion.

The following is a breakdown of the hole depths for the five holes of most importance and then for holes 89-06 and 89-07 of which 89-06 may be drilled.

PHASE II
DRILL HOLE SUMMARY

Hole No.	Cased(m)	Drilled(m)	Cored(m)	Total(m)
89-01	90	80	40	210
89-02	80	130	-	210
89-03	80	290	-	370
89-04	80	320	-	400
89-05	80	290	30	400
Total	410	1110	70	1590
Possible Additional Holes				
89-06	80	320	-	400
89-07	80	350	-	430
Total	160	670		830

All of these holes are located on Map No. 8 in Appendix 9, Volume II.

The following is a detailed cost breakdown of the proposed Phase II drilling program:

PHASE II EXPLORATION

ESTIMATED COSTS

Drilling Cost		Cost
Mobilization/Demobilization	$ 7,000	
Setting Casing 410m (1350 ft. @ $22./ft.)	29,700	
Drilling 492m (1615 ft. @ $8./ft.)	12,920	
Drilling 210m (689 ft. @ $9./ft.)	6,200	
Drilling 180m (591 ft @ $10/ft.)	5,910	
Drilling 228m (750 ft. @ $12./ft.)	9,000	
Fuel for 5217 ft. @ 1.25/ft.	6,522	
Room & Board, 100 man days @ $55/man dy.	5,500	
Coring	15,000	
Consummables	4,000	
Total Drilling		$101,752
Logging Costs		
Mobilization/Demobilization	$1,500	
Fuel/Oil	800	
Logging 1590m @ 5.50/m	8,745	
Standby $100/day x 25	2,500	
Room @ Board 25 days @ $65/day	1,625	
Total Logging		$ 15,170
Trucking		$ 1,000
Reclamation, Cleanup		$ 2,500
Load and Storing Casing		$ 500
Cementing		$ 2,500

Surveying		$ 6,000
Quality Analysis		$ 10,000
Supervisor Expenses		$ 4,000
Fuel/Oil		$ 1,500
	Total	$144,922

The total cost for the Phase II exploration drilling program is $145,000 and the cost for the Phase II environmental, a further $18,000 bringing the total Phase II costs for 1989 to $163,000.

10.0 PHASE I ENVIRONMENTAL

The McIvor Lake property is located in an area containing watersheds of extremely high fish spawning and rearing capabilities. The two main watersheds which drain into the Quinsam River are Flintoff Creek and to a greater extent Cold Creek. (Map No. 9, Appendix 9, Volume II). Cold Creek obtains its water from groundwater and remains at a fairly constant temperature throughout the year. For this reason, the Quinsam Hatchery uses almost entirely Cold Creek water in its facility.

Canadian Occidental being aware of the concerns, took certain steps to minimize any adverse environmental effects as a result of exploration drilling and also undertook a water and dust monitoring program throughout 1988.

10.1 DRILLING PRECAUTIONS

In planning the 1988 Phase I program, all drill holes were located downstream from the Cold Creek head waters and Fisheries dam to ensure no contamination of the groundwaters.

To further protect the groundwater regime, all drill holes were cased through the unconsolidated sands and gravels and the casing solidly set into the bedrock. Also, air was used as a drilling medium so that there would be no contamination of the water from drilling muds or fluids.

At the completion of the program, the holes were cemented from top to bottom.

To prevent any silt from the drill cuttings reaching any surface water drainage, the cuttings were picked up and trucked to dump sites for most of the drill holes.

All of the sites were seeded with grass at the completion of cleanup.

No environmental damage was expected and none occurred due to the precautions taken throughout the length of the program.

10.2 DUST MONITORING

Canadian Occidental undertook a dust monitoring program which started in February of 1988 and was continued throughout the year on a monthly basis.

A total of eight sites numbered M.L.-1 through M.L.-8 on Map No. 9 were chosen.

The sample locations were chosen for proximity to paved versus gravel roads, and industrial activity as compared to relatively undisturbed areas.

All of the dust samples were analyzed by A.S.L. Analytical Service Laboratories Ltd. in Vancouver, B.C. This laboratory also carried out our water sample analysis and they have done, and still do the analysis for the Quinsam Mine. The results of the dust analysis are summarized in Appendix 4. Copies of the original results from dust and water were sent to both the Quinsam Hatchery and the B.C. Ministry of the Environment in Nanaimo as they were received throughout the year.

The following is a summary of the dust fall sites:

M.L.-1 This site experienced very low total dustfall throughout the year. It was located on a high hill to the northwest of the property and was used to indicate what the dustfall would be like at a relatively undisturbed (natural) location.

M.L.-2 This site has quite low values. It was located on the side of highway 28 near the Elkfalls Park boundary in an area of very little industrial activity. Higher values in the drier month occurred as expected, probably related to dust raised by highway traffic.

M.L.-3 This site has higher values, the highest again being in the summer months. It was located next to the same highway as M.L.-2, but in an area of extensive gravel quarrying. The dustfall for this sample would be directly related to the dryness of the ground and the amount of quarrying being carried out.

M.L.-4 This site has very high values for all of the year except the wettest winter months. The site is located on the gravelled Argonaut Road near the municipal dump. There is very heavy traffic on this road because of the dump, a cement plant, lumber mill and gravel quarries. This sample had the highest year round values of all of the sites as was expected.

M.L.-5 This site had fairly low values, just a little higher than M.L.-1 and M.L.-2. It was located in the middle of the D.F.O. land in trees. Most of the dustfall was in the driest months and much of it would be associated with plant material from the surrounding frost.

M.L.-6 This site had very low values, much the same as M.L.-1 which was chosen as our natural state sample site. This site was located at the D.F.O. dam and pond from which their water is obtained for the Quinsam Hatchery. The sample container was suspended from the fence and would not receive much in the way of plant fragments.

M.L.-7 This site was located on Argonaut Road where it is graveled, but further east form site M.L.-4 (at the dump) and just inside the boundary of Elk Falls Park. The values are fairly low in the wet months increasing considerably in the dry summer months. This is directly related to dust raised from traffic on Argonaut Road.

M.L.-8 This last site was located in the trees beside Cold Creek near the Quinsam Hatchery. The values are quite low in the wet months, rising considerably in the dry months. Much of the material causing the rise in values would be organic from the surrounding forest. The dust container was missing for two sample periods in the fall when fishermen were abundant.

10.3 WATER WELL MONITORING

The value of the results of the monitoring of these four water wells may be questionable due to the fact that all of these wells are very shallow at a depth of less than 6 metres, except for WWIII. It is therefore likely that their water quality will be related to surface water run off and will vary depending on the time of year.

In the future, it will be necessary to put wells to greater depth in the unconsolidated material to monitor water flow unaffected by immediate surface conditions.

It has been hypothesized in the Quinsam Mine environmental reports that water from McIvor Lake flows through the sediments to make up the water supplying Cold Creek. In that case, this water would have to flow below the elevation of the gravel pits and city dump in order to supply pure water. Locals have said that the city dump is located in a gravel pit that was up to 45 metres in depth. There is also a septic dump located at the northwest end of the city dump.

The results of the analyses for water wells W.W.1 through W.W.IV are found in Appendix 5.

In all of these water wells, values for dissolved solids and turbidity went up in the wettest months (December) which is most likely related to surface runoff.

Water Well IV at Mr. Coulters on highway 28 is very good all year round.

The two worst water wells are W.W.I at George Knowles and W.W.II at Martinellis. The W.W.I and W.W.II high copper values may be related to copper plumbing, but W.W.IV also had copper plumbing and the tap was allowed to run for some time in all cases prior to sampling. Mr. Knowles owns a scrap metal salvage business and the high metal contents may be related to the fact that 5 acres of his yard is covered by various metals. Mr. Martinelli's well runs dry in the summer months and his well at W.W.II is the closest sample location down hill from the dump. His higher metal values may be related to the dump. Water Well III is located south of the cement plant and the dump, but it is in the bottom of a ravine. Higher zincs may be attributable to the dump or possibly to the plumbing fittings where the cement trucks are washed as this is where the samples were obtained.

10.4 SURFACE WATER MONITORING

Nine surface water sampling locations were chosen as shown on Map No. 9 and results from the analysis are summarized in Appendix 5.

Most of the samples had higher values of solids and metals in the winter months due to the surface runoff. All values were still found to be below the acceptable limits.

On Flintoff Creek metal values were seen to increase between location M.L.-I on highway 28 and M.L.-F near where it enters the Quinsam River. This is due to the fact that it passes through various acreages and close by the metal salvage business of G. Knowles.

As stated previously, results of these analysis have been provided to the Quinsam Hatchery, Ministry of Environment of B.C. and also to the Federal Government water quality officers that are carrying out a long term Quinsam River Water study.

10.5 WILDLIFE SIGHTINGS

During the monthly trips for water sampling, a record was kept of wildlife sightings which are summarized as follows:

March 2, 1988 - Two blacktail deer on D.F.O. road where it forks south and north to the B.C. Hydro line.

March 3, 1988 - Four elk on B.C. Hydro line near water sampling location M.L.-A.

March 4, 1988	-	One grouse on D.F.O. road west of dust monitoring location M.L.-4.
	-	One grouse on B.C. Hydro line south of M.L.-A and just north of the logging road.
May 5, 1988	-	Between 5:30-7:30 a.m. 4 blacktail deer on B.C.F.P. road east of Quinsam River.
	-	Three blacktail deer on B.C.F.P. road just east of B.C. Hydro line south of water sampling location M.L.-A.
	-	Two blacktail deer at junction of Argonaut Road and fish hatchery road.
June 2, 1988	-	In the p.m., one blacktail deer and one fawn west of dust location M.L.-5 on D.F.O. road.
	-	Two blacktail deer at junction of Argonaut and D.F.O. road.
	-	Two blacktail deer on B.C.F.P. road south of Indian Reserve 12 on east side of Quinsam River.
July 11, 1988	-	One blacktail deer on D.F.O. road south of gate to Argonaut Road, mid-afternoon.
July 12, 1988	-	Between 5:30-8:30 a.m., one blacktail doe on D.F.O. road south of gate at Argonaut Road.

- One blacktail deer where road branches south and north to hydro line, D.F.O. road.

- One blacktail deer 1/2 mile before site M.L.-5 on D.F.O. road.

- One blacktail deer at D.F.O. dam site.

- Four blacktail deer north side of Argonaut road east of Earl Martinelli's residence.

- One blacktail deer 1/2 mile east of G. Knowles' residence.

- One blacktail deer near site M.L.-7 on Argonaut Road.

August 8, 1988 - One black bear at 6:30 a.m. on D.F.O. road south of gate on Argonaut Road.

September 19, 1988 - Two blacktail deer on D.F.O. road south of gate at Argonaut Road.

11.0 PHASE II ENVIRONMENTAL

In the Phase I program (Map No. 9, Appendix 9), nine surface water samples were taken on a monthly basis, 8 dust samples also on a monthly basis and 4 ground water (water well) samples on a quarterly basis.

The dust samples have been eliminated from Phase II as have the 4 water well samples. The water well samples were from very shallow depth (less than 5 metres) and one site tended to go dry in the summer so are more related to surface water than ground water.

The 9 surface water samples will be taken from the same locations as in Phase I to retain continuity of the monitoring process, but will be reduced to a quarterly basis beginning with the first sample period at the end of March, 1989. The sample periods are related to the seasons.

The total cost for the Phase II environmental work in 1989 will not exceed $18,000.

If the Phase II program provides encouraging results and if prior to the program we have managed to obtain all required coal licences, 1990 will be the year in which more attention is spent on the ground water regimes in the area. This will involve monitoring the water zones in the overlying unconsolidated overburden material as well as complete lithologic descriptions of that material. It will also involve monitoring and analysis of the bedrock groundwater regimes.

Detailed monitoring programs will be developed pending the results of the Phase II program.

REFERENCES

Bonthrone, B. and Galloway, C.F.J., 1911 Report on Campbell River coal property; for McGowan & Company; in PABC, Additional Manuscript 436, Box 77, File 1.

Canadian Occidental Petroleum Ltd., September 1985, Geologic Evaluation of Vancouver Island Coal Properties - Comox Coal Basin - In-house report, Calgary.

Curceo, M.P., 1975, Coal Resource study of Comox Basin - Nanaimo Series, Vancouver Island, British Columbia; for Weldwood of Canada Limited.

Hoffman, G.L. May 1987, Preliminary Assessment of the McIvor Lake Coal Prospect; prepared for Idemitsu Kosan Co. Ltd.

John J., 1910, Report on Campbell River coal property; for McGowan & Company; in PABC, Additional Manuscript 436, Box 77, File 1.

McCammon, J.W., 1977, Surficial Geology and Sand and Gravel Deposits of Sunshine Coast, Powell River, and Campbell River area, Ministry of Mines and Petroleum Resources, Bulletin 65.

Muller, J.E. and Atchison, M.E., 1971, Geology, History and Potential of Vancouver Island coal deposits; Geologic Survey of Canada Paper 70-53.

Muller, J.E., "Evolution of the Pacific Margin, Vancouver Island and Adjacent Regions", Journal of Earth Science, Vol. 14, 1977.