B.C. Reconnaissance
Nechako 1984

NTS 93F/G J. Dunn

OPEN FILE

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MEMORANDUM

DATE: 1984 12 31

TO: A.R. Peach

FROM: J. Dunn

SUBJECT: Nechako Reconnaissance Summary (Sept.5 - Sept.14/84)

PURPOSE

The purpose of the program as stated in my memo of 1984 08 07 was as follows:

A) Delineation of Endako Group coal outcrops for coal-bearing sediments in the following areas:
   1) Nechako Canyon-Nechako River-Mt. Greer
   2) Big Bend-Finger Lake area
   3) Fraser Lake area
   4) Tyee Butte-Francois Lake area

B) Investigation of post-Hazelton/pre-Ootsa Lake Group sediments for coal-bearing potential in the following areas:
   1) Taiuk Creek
   2) Chedakuz Creek/Valley
   3) Tsacha Lake

OPEN FILE

PROGRAM RESULTS

The reconnaissance program generally followed the objectives as outlined above although not all areas were visited and some areas not mentioned above were visited. Overall, it is felt that given the time constraints of the program, a larger and fairly representative reconnaissance of the Nechako River mapsheet was achieved. Observations and conclusions made in various areas are listed below:

1) Dawson (1878) reported that a Mr. Broman ascended the Nechako River from Cheslatta Lake northward. He reported that the basalts are underlain by an extensive sedimentary formation, including lignites, of which one bed was found to be four feet in thickness. Dawson reported that the basaltic and other igneous rocks seem to have flowed out into pools containing earlier Tertiary deposits. He also reported that no coal exposures occur in the reach of the Nechako flowing due north toward Fraser Lake but the underlying rocks are, in all probability, those of the Tertiary series.

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2) Tipper (1963) noted large blocks of lignite strewn along the exposed Nechako River bottom north of the Kenny Dam but was unable to locate their source. However, he concludes that in all probability the lignite is inter-basalt.

3) Cameron and Birmingham (1970) reported the area to be underlain by Tertiary rocks which "contain lenses and thin seams of lignite although exposures are rare and most of the lignite seen is in the form of float along rivers and creeks". They reported a lignite outcrop at the east end of Murray Lake (Cheslatta Falls area) where they reported five "seamlets" of lignite in 30 feet of section. Rusty siltstone, greenish clay and coaly clay were among the interseam lithologies quoted.

4) Gulf Canada Resources 1980-1981 Mt. Greer Exploration Program -- This program was based on a reported four foot seam along the Nechako riverbank near Mount Greer (Dawson, 1978) and a reported coal seam measuring 9.8 metres in a E and B Exploration uranium drill hole E.N.-1 drilled near Mt. Greer. Gulf twinned this hole with one of its own and only one coal zone was intersected at a depth of 246.3 metres and was analyzed to be lignitic in rank. A total of 275 m of Endako Group sediments comprised of siltstone, sandstone, mudstone, carbonaceous claystone, conglomerate, and thin lignite beds was encountered. Gulf concluded that the E and B hole had probably been erroneously logged and subsequently surrendered its licenses. Gulf also mapped its licenses and very probably the whole Nechako Canyon-Mt. Greer area and located coal-bearing Endako sediments outcropping near Cheslatta Falls.

5) Hal Hopkins (Nechako 1983 Reconnaissance memo) in a fairly broad helicopter reconnaissance of the area, noted seven coal float locations in the area from Mt. Greer to Cheslatta Falls. The only coal outcrop noted is the Cheslatta Falls outcrop. Hopkins noted a total of 3.4 m of interbedded coal (excluding seams less than 30 centimetres in thickness) within a 14.5 metre interval. The largest seam measured was slightly over a metre in thickness.

The Cheslatta Falls outcrop and the area around the falls was revisited in 1984 (see slide in back pocket). It was estimated that the total thickness of sediments observed was probably less than 25 metres and is underlain and overlain by basalt. One observation made that differs from Hopkins 1983 outcrop description is that much of the material in the outcrop appeared to be tuff or water-lain ash as opposed to sandstone and siltstone as previously described. Crippen Consultants in their December 1982 report entitled "Kenny Dam, Cold Water Release Facility - Geotechnical Report" note that the bedrock material at the Kenny Dam site 7 km due south of the Cheslatta Falls outcrop consists of a series of Tertiary volcanic strata which are nearly horizontal.

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They go on to note:

> Although some interlayering occurs, the series comprises four distinctive formations. The lowest consists essentially of relatively weak tuffs and other ash rocks and lies about 50 m below the river. This formation is overlain by a formation of volcanic breccia up to about 50 m thick consisting of fragments of volcanic rock welded in a matrix of tuff. Overlying this is a formation of vesicular basalt. Results of the 1981 drill holes in the northeast bank indicate that this formation extends from about EL740 to at least EL859 m and that it consists of interlayered vesicular and non-vesicular basalt in roughly equal amounts. Above EL859 m, a formation of massive, generally non-vesicular basalt occurs. This formation is of unknown thickness extending far above the crest of the dam.

An examination of a topography map of the Kenny Dam-Cheslatta Falls area and a visit to the area strongly suggests that the material at the top of the dam site (previously the head of the Nechako Canyon) and the material at the top of Cheslatta Falls are correlatable. The drop in elevation below both of these points is the result of rapid downcutting through a recessive unit and it is suggested that the group of coal-bearing sediments at Cheslatta Falls is probably correlatable with the unit of relatively weak tuffs and other ash rocks mentioned above at Kenny Dam. The actual drop in elevation is about 30 m maximum suggesting that the maximum thickness of recessive sediments is about the same.

At this point, it is probably useful to very briefly review what is known about the Endako Group. Repeating what was said in the 1984 08 22 memo the Endako Group of Miocene-Pliocene age overlies the erosional surface at the top of the Upper Cretaceous Ootsa Lake Group. The Endako lavas were poured out upon a relatively flat surface above which hills projected and in which a few valleys were entrenched (Koch 1973). Sedimentary rocks are found associated with the volcanic rocks particularly where streams have cut through lavas that filled pre-Miocene valleys. Tipper (1960) notes that these sediments were observed to lie at the base of the group. It would seem then, accepting this type of model, that the type and thickness of sediments would vary widely. No doubt Gulf Canada did intersect 275 m of Endako Group sediments but we should not expect sediment package thicknesses as well as individual seams to remain consistent or predictable over the 40 km to Cheslatta Falls given the evidence of the conditions under which they were deposited.

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To conclude, it would appear that the Nechako Canyon-Mt. Greer area has very little potential. It is very possible that very thick coal seams may have developed in the area but their development would be very localized. In addition, the sheath of Endako basalt which covers much of the area would make recognition of these areas extremely remote. This was the conclusion after visiting the area, therefore little time was further devoted to searching for Endako Group coals.

BIG BEND ROAD AREA

This area was originally considered to be of interest as Tipper (1963) mapped part of the area as being underlain by Endako Group rocks. The area discussed lies in the southern part of map sheet 93F/10 and is indicated on the 93F/10 forestry road map (see back pocket) as the area marked by outcrops NC01 through NC08.

A large part of this area (see Nechako River Geology Map, Tipper 1963, in back pocket) is blanketed with Quaternary till and gravel and consequently outcrop is generally limited to areas of higher relief such as the Jurassic rocks of the Nechako Range which bisect the central part of the Big Bend Road area in a northwesterly trend.

Tipper (1963) states that this area was part of a northwesterly trending sedimentary basin. In this basin was deposited detritus derived from the erosion of the exposed Permian Cache Creek Group and Topley Intrusions on the northeast, detritus from volcanic islands on the southwest, and flow, tuffs and breccias of contemporaneous volcanism (Tipper, 1963). According to Tipper, in the earliest part of the Middle Jurassic chert pebbles accumulated along the shores of this basin. In later Middle Jurassic time, finer sediments accumulated that there was much admixing with volcanic tuffs and fine breccias. Volcanism continued intermittently in different parts of the basin. During Middle Jurassic time, the basin shifted to the east due to continuing uplift of a volcanic island arc on the southwest margin. During Late Jurassic time, basinal development continued with the deposition of limey shales. The whole area was then intruded, uplifted and eroded through to Late Cretaceous time.

Some concept of geological history in the area is important when we try to understand the relationship of lithologies observed in the field, particularly the coal described at outcrop NC01 which will be described later. At outcrops NC06 - NC08, Hazelton Group basalts and andescites of probable Middle Jurassic age were noted. At outcrop NC05 approximately 3.5 km to the N.W., fine-grained salt and pepper sandstone intermixed with volcanic was noted. This general area has been mapped as Upper Jurassic Hazelton Group argillaceous limestone by Tipper but it would seem this outcrop more probably represents near-shore Middle Jurassic deposition. What is believed to be marine shale was noted at

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outcrop NC03. Fossils were observed in this shale but unfortunately none were kept for identification purposes. Further west at outcrop NC02 fine grained large scale/rough bedded sandstone is in sharp contact with a chert pebble conglomerate. This conglomerate along with a similar one observed at NC04 may be indicative of a Middle Jurassic shoreline environment. The conglomerate closely matches a description of Hazelton chert pebble conglomerate on page 25 of his 1963 report. At outcrop NC01 a number of lithologies were described. The description of the outcrop is given below.

At the north end of the outcrop what appears to be a metamorphosed mudstone/schist was found. Chalcopyrite and an unidentified bronze mineral can be seen throughout. Beds oriented 120°/28°.

The rest of the outcrop appears to be unaffected by metamorphism. The northern part of the outcrop is characterized by abundant interbedded fine grained sandstone. The sandstone weathers to an iron color and is typically light olive grey fresh. The individual grains seem to be slightly stretched or elongated perhaps suggesting some degree of metamorphism. Quartz veining less the than .03 cm is abundant.

Interbedded with the sandstone is a black shale. What are believed to be stem imprints were occasionally observed. Towards the centre of the outcrop the sandstone appears to be even finer grained (very fine sandstone to siltstone) and is highly weathered. The sandstone is argillaeous and numerous concretions were observed.

At the southern part of the outcrop fine grained clastics and coal appear to be predominant. Black noncarbonaceous shale with hackly fracture is common. The coal appears to be interbedded with a greenish-dark grey rust weathering mudstone. The coal does not appear to be in-place so no orientation was recorded; however, it appears to be quite steeply dipping probably consistent with the rest of the outcrop (see photographs in back pocket).

Outcrop NC01 is very probably Hazelton Group and therefore, of Middle Jurassic or Upper Jurassic age. It would seem unlikely to be Endako Group as Tipper (1963) has mapped nearby.

Three points reinforce this conclusion:

1) The sediments do not resemble Endako Group sediments observed at Cheslatta Falls, 17 km to the northwest.

2) Endako Group sediments are generally flat-lying whereas outcrop NC01 is parallel to the local strike and is fairly steep dipping consistent with Hazelton Group sediments mapped by Tipper (1963).

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3) Reflectance analysis of the coal and quality analysis indicated it to be high rank anthracite and has probably been metamorphosed. The only coals previously reported in the Nechako Basin have been unmetamorphosed Endako Group lignites (see appendices).

A sample of NC01 coal was also sent for palynological analysis in an attempt to provide an age date for the coals. However, the sample was barren of spore material, therefore the age of the coal could not be ascertained. Interestingly some of the woody material is well preserved. If spores were present they probably would have been preserved. Consequently, Stanley Pocock believes the coal may have formed in situ having been transported to its present location. If this is the case, the likelihood that the deposit is regionally extensive would be small. In any case further palynological analysis will be performed shortly to determine if there is any identifiable spore material in shale from the same outcrop.

Whatever the outcome, the outcrop is significant in that it is the only known occurrence of anthracite in the Nechako Basin. If the coal is of Middle or Upper Jurassic age it may have formed in swamps around a slowly retreating sea in the Nechako Range area. The close proximity of the coal at NC01 to Middle Jurassic conglomerates is persistent then perhaps these conglomerates could be used in locating coal around the margins of this ancient sea. Figure 2 illustrates the location of coal at NC01 and conglomerate at NC02 and NC04 with relation to the position of Middle Jurassic strand lines suggested by Tipper (1963).

OTHER AREAS

1) Chidakuz Creek

   This area proved to be Quaternary till and gravel and no outcrop was observed.

2) Finger Lakes - Tutuk Lake Area

   This area proved to be covered by Quaternary till and gravel and no outcrop was observed.

3) Jerryboy Hills - Sucha Lake - Sucha Lake Area

   No sediments observed. Outcrops observed were vesicular basalt, basalt, andesite and flow-banded volcanics.

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4) Fawnie Range

No sediments observed.

5) Tatelkuz Lake - Kuakuz Lake - Euchiniko Lakes - Blackwater River

No sediments observed - helicopter traverse (see slides in Appendix)

6) Kluskoil Lake - Blackwater River - Redwater Creek - Nazko River - Enchiniko River - Batnuni Lake (S.W. portion of 93G)

No sediments observed - helicopter traverse. Checked old homestead at Redwater Creek for reported coal occurence by local resident.

7) Knewstubb Lake - Natalkuz Lake (N.W. portion of 93F)

Saw small exposure of quartzite and nearby flow-banded volcanics near Lucas Lake. Mapped as Ootsa Lake Group by Tipper.

Exposure of medium to coarse-grained sandstone with pebble conglomerate and some mudstone was examined in southern part of 93F/11 near Natulkuz Lake. The section was noncarbonaceous and no coal was observed. Mapped as Hazelton Group by Tipper.

The only other recognizable sediments were seen near False Hill in 93/F/12. The outcrop consists of a very dark, noncarbonaceous mudstone unit of probable marine origin (see picture in appendix). Mapped as Ootsa Lake Group by Tipper.

8) Tyee Butte - Holy Cross Lake - Target Creek

No sediments observed - helicopter traverse

CONCLUSIONS

No further work should be done in the Endako Group for the following reasons:

1) Poor quality low rank lignite.

2) Coals have not been identified to reach thicknesses of greater than one metre.

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3) Coals are very probably only very localized and the existence of a regionally extensive seam or coal package is doubtful.

4) Exploration is strictly a hit and miss drilling proposition as Endako Group basalts and Quaternary tills and gravel covers much of the area.

One wildcat drill hole is recommended in the vicinity of outcrop NC01. It is probable that this outcrop represents a coal occurrence in the very thick Hazelton Group which previously was not thought to contain coal measures. If the coal could definitely be proved to be of Middle or Upper Jurassic age and thicknesses are favourable, a regional mapping program of Hazelton Group sediments might be warranted.

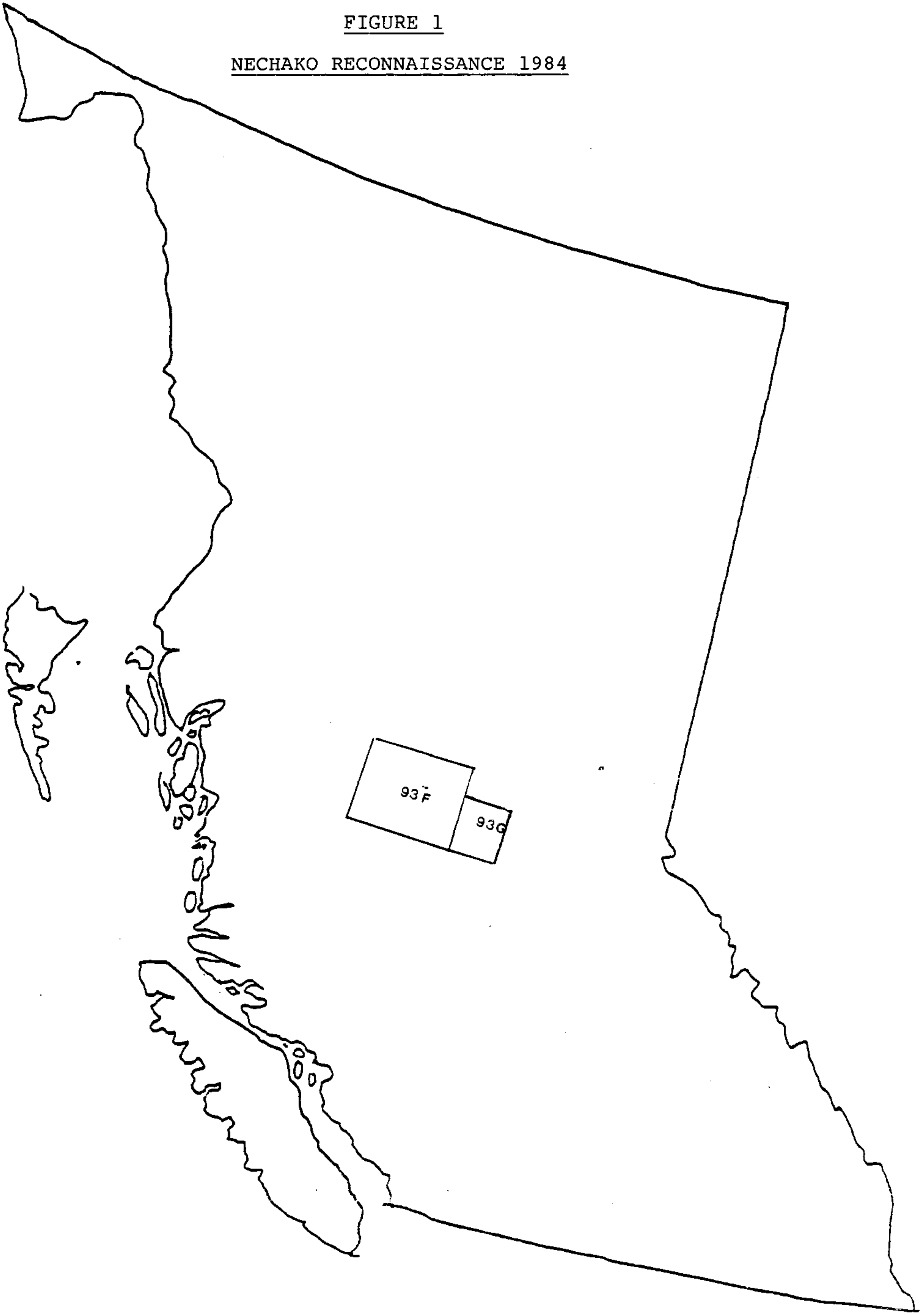
JD:cyg/pp John Dunn/PP

cc: G.J. Ockert
L. Klatzel Mudry
J. Horgan

4610K

FIGURE 1

NECHAKO RECONNAISSANCE 1984



CODM QUALITY DATA

NECHAKO NC01

Parr Formula

DMMF FC = 83.77

CARD COLUMN:

PROS	HOLE	TOP (F/M)	BASE (F/M)	F/M	SCREEN SIZE (MM)		S. G. RANGE			ID
					MAX	MIN	MIN	MAX		
										B1

01 04 12 19 26 27 32 37 41 45 71

LAB	LAB NUM	C	T	DATE		UNIT NAME	WT % OF TTL	WT % OF SCREENED			ID
				M	YR			SINK	FLT		
	26888			09	84		100				B2

20 22 27 28 29 31 33 40 44 48 52 71

SAMPLE NUMBERS										ID
										B3
										B4

20 24 28 32 36 40 44 48 52 56 71

BASIS A,R,D	PROXIMATE ANALYSIS					UNITS=1=BTU/LB 2=CAL/GM 3=KJ/KG	ID
	MSTR	ASH	VOL MATTER	CALORIFIC CONTENT	UNITS		
A	5.84	23.79	12.27	8982	1		B5
R	16.24						B5
D							B5

20 21 26 31 36 41 42 71

BASIS A,R,D	ULTIMATE ANALYSIS							ID
	S %	C %	H %	N %	CL %	O %		
A	.37							B6
R								B6
D								B6

20 21 26 31 36 41 46 51 71

FREE SWELLING INDEX	GIESLER PLASTICITY					ID
	SOFT (F)	FLUID (F)	SOLID (F)	MAX DDPM		
						B7

20 23 28 33 38 41 71

HARDGROVE GRINDABILITY		EQUILIB MSTR	SURFACE MSTR	SPEC GRAV		ID
	MSTR					
		14.8		1.75		B8

20 25 30 35 40 45 71

BASIS A,R,D	SULFUR TYPES		SOLUBLE COAL ALKALIES					ID
			ACID		WATER			
	PYRITIC	SULFATE	NA	K	NA	K		
A								B9
R								B9
D								B9

20 21 26 31 36 41 46 51 71

FUSION TEMPERATURE (F)									ID
REDUCING ATMOSPHERE				OXIDIZING ATMOSPHERE					
INIT	H=W	H=W/2	FLUID	INIT	H=W	H=W/2	FLUID		
									C1

20 24 28 32 36 40 44 48 52 71

ASH ALKALIDES WATER SOLUBLE		CO	T250	ASH CRITICAL VISCOCITY			ID
NA	K			(F)	POISES		
							C2

20 26 32 37 41 45 49 71

MINERAL ANALYSIS OF ASH								ID
SIO	ALO	TIO	FEO	CAO	MGO	NAO		
								C3

20 25 30 35 40 45 50 55 71

MINERAL ANALYSIS OF ASH					ID
KO	PO	SO	UNDTR		
					C4

20 25 30 35 40 71

KEYPUNCHER: KEEP CARDS IN ORDER B1,B2,B3,B4,B5,B6,B7,B8,B9,C1,C2,C3,C4.
LEFT JUSTIFY ALL FIELDS.

COOM QUALITY DATA

CHILCOTIN BB-84-008

PROS	HOLE	TOP (F/M)	BASE (F/M)	F/M	SCREEN SIZE (MM)		S. G. RANGE			ID
					MAX	MIN	MIN	MAX		
										B1

CARD COLUMN: 01 04 12 19 26 27 32 37 41 4571

LAB	LAB NUM	C	T	DATE		UNIT NAME	WT % OF TTL	WT % OF SCREENED			ID
				M	YR			SINK	FLT		
	26888			09	84		100				B2

20 22 27 28 29 31 33 40 44 48 52 71

SAMPLE NUMBERS										ID
										B3
										B4

20 24 28 32 36 40 44 48 52 56 71

BASIS A,R,D	FROXIMATE ANALYSIS						ID
	MSTR	ASH	VOL MATTER	CALORIFIC CONTENT	UNITS	UNITS=1=BTU/LB 2=CAL/GM 3=KJ/KG	
A	2.67	58.99	20.01	3522	1		B5
R	3.20						B5
D							B5

20 21 26 31 36 41 42 71

BASIS A,R,D	ULTIMATE ANALYSIS							ID
	S %	C %	H %	N %	CL %	O %		
A	.13							B6
R								B6
D								B6

20 21 26 31 36 41 46 51 71

FREE SWELLING INDEX	GIESLER PLASTICITY					ID
	SOFT (F)	FLUID (F)	SOLID (F)	MAX DDPM		
						B7

20 23 28 33 38 41 71

HARDGROVE GRINDABILITY		EQUILIB MSTR	SURFACE MSTR	SPEC GRAV		ID
	MSTR					
		7.6		1.91		B8

20 25 30 35 40 45 71

BASIS A,R,D	SULFUR TYPES		SOLUBLE COAL ALKALIES					ID
			ACID		WATER			
	PYRITIC	SULFATE	NA	K	NA	K		
A								B9
R								B9
D								B9

20 21 26 31 36 41 46 51 71

FUSION TEMPERATURE (F)									ID
REDUCING ATMOSPHERE				OXIDIZING ATMOSPHERE					
INIT	H=W	H=W/2	FLUID	INIT	H=W	H=W/2	FLUID		
									C1

20 24 28 32 36 40 44 48 52 71

ASH ALKALIDES WATER SOLUBLE		CO	T250	ASH CRITICAL VISCOCITY			ID
NA	K			(F)	POISES		
							C2

20 26 32 37 41 45 49 71

MINERAL ANALYSIS OF ASH								ID
SIO	ALO	TIO	FEO	CAO	MGO	NAO		
								C3

20 25 30 35 40 45 50 55 71

MINERAL ANALYSIS OF ASH					ID
KO	PO	SO	UNDTR		
					C4

20 25 30 35 40 71

KEYPUNCHER: KEEP CARDS IN ORDER B1,B2,B3,B4,B5,B6,B7,B8,B9,C1,C2,C3,C4.
LEFT JUSTIFY ALL FIELDS.

MEMORANDUM

ESSO RESOURCES CANADA LIMITED
RESEARCH DEPARTMENT

RECEIVED
OCT -2 1984
EMC-COAL
RESOURCES GROUP

84 10 01
File: 2647

93F,3

Letter No. 45139

TO: A. R. Peach

FROM: J. Allan

RE: Nechako Sample NC01

The sample labelled NC01 is a high-rank anthracite, with a mean reflectance of 5.64%. At this high rank, I would expect the sample to be in a metamorphosed section. Petrographically, the sample is fairly homogeneous, as many macerals have similar reflectances - only occasional fusinite fragments are recognisably distinct in the uniform groundmass.

Disseminated clays are still visible, and seem to be regularly distributed through much of the coal. These are possibly the source of the 'volatiles' determined in your proximate analysis. True coal volatiles for a coal with a reflectance of 5.64% should be only about 2-4%.

JA/mpa

Outcrop NC01

This very large o/c is composed of a variety of lithologies

At the north end of the o/c what appears to be a metamorphosed mudstone / schist was found. Chalcopyrite and a bronze mineral can be seen throughout

120/28 sample taken

The rest of the o/c appears to be relatively unmetamorphosed and is entirely sedimentary. The northern part of the o/c is characterized by abundant interbedded upper fine grained sandstone → siltstone The sandstone weathers to an iron colour and is typically light olive grey (5Y5/2) fresh.
The individual grains seem to be slightly stretched or elongated suggesting some metamorphism.
Quartz veining < 0.03 cm is abundant.
Interbedded with the sandstone is a black shale What are believed to be stem imprints were occasionally observed.
Towards the centre of the o/c the sandstone appeared to be finer grained (- very fine to siltstone) and is highly weathered. Some pieces ~~are~~ may be quartzite. The SS is argillaceous and numerous concretions were observed

Again the sandstone is characterized by its fresh green hue
In the southern part of the o/c finer grained clastics appear to predominate — Shale (non carbonaceous) and dirty coal. The coal does not appear to be in place so no orientation was recorded however it appears to be quite steeply dipping. The coal is interbedded with mudstone & greenish rust weathering.

Coal sample taken NC01

	joint	strike/dip
O/C NC02	10°/50°	165/32

fine grained sandstone interbedded with pebble conglomerate
- at least two sandstone interbeds.

Sandstone - very fine grained - almost quartzite - light olive grey 5Y 5/2
- hard resistant weathers pink/cream colour ~2m thick slightly rusty
- large scale trough X bedding.

sharp contact.
Conglomerate - sample taken
poorly sorted, moderately rounded
- extremely hard, chert pebble conglom
<20% dark quartzite 80% light pebb ,
- non calcareous - see sample
- contorted bedding
not well imbricated.
- well developed jointing 90° to bedding.

NC03 - shale/ mudstone described on map

NC04 - conglom sample taken yesterday.

NC05 salt and pepper light
5Y6/1 olive grey sandstone
- appears fine grained
- O/C not in place.
5Y5/2 chlorite?
samples taken - intermixed with volcanics

NC06 - volcanics - andesite?
sample taken

NC07 - basalt? sampletaken

NC08 - same as NC07 - sample taken

Sept
~~August~~ 7. Weather - Cooly. Rainy in afternoon

AM investigate Cheslatta Falls area Endako group seds. Concluded o/c is probably isolated - seds don't appear to be continuous. Alcan data indicates no Endako group seds — ie, assuming beds are flat lying at Kenney dam - stratigraphically equivalent seds should have been intersected but were not.

PM Drove Big Bend Rd through what we believe to be Lower/middle Jurassic conglomerate unit and marine shales. Proximity of bright hard coal of unknown thickness at Km 25 perhaps suggests equivalent terrestrial seds - could this coal be Lower/middle Jurassic?
Aug 8 will attempt to investigate further.
Conglom sample matches closely description given by Tipper p 25.
See also Tipper p 47-49.
Rocks of Hazelton age are not known in Honolulu Nazko well (Koch p 50)

Sept
~~August~~ 8. Weather - cool/overcast

AM Investigated Hazelton Gp volcanics and seds. O/C NC01 described - concluded section is slightly metamorphosed - presence of schists and quartzite. Coal sample is mapped as Endako Gp but it may in fact be Hazelton. Seds do not appear to resemble Cheslatta Falls area seds. Coal was not in place so no thickness was determined. Sample taken.

PM. Drove south along Kluskus Forest Rd. through Hazelton volcanics, till, Post Hazelton - Pre Ootsa Lake intrusives. Checked out road access along Chedakuz Ck. - will investigate tomor .

(2)

Sept 9 — Weather Overcast / rain

Bought 25 gallons gas off Herb.

Drove down to Chedakuz Ck wagon trail.

Talked to Roy Bunke (Homesteader) and asked him if he seen any coal in the area. He replied not in the Chedakuz Ck area, however he mentioned that a Colonel Peterson - a homesteader from the 1920s had some coal on his property on "Red Ck" near the confluence of the Nazko and Blackwater Rivers. He also mentioned that "Red Ck" also had Mn float. A check of the Prince George geology map by Tipper (1959-1960) indicates a small Endako group on Redwater Ck and a Mn mineral occurrence in Pliestocene till. Redwater Ck occurs in the southern part of 93 G 4. A brief investigation is probably warranted, either by helicopter or truck out of Prince George.

map sheet 93 F 7

The Chedakuz Ck area proved to be till dominated with no o/c seen as Tippers map indicates. We had hoped the wagon trail continued all the way up to Chedakuz Arm on Knewstubb Lake, however it is impassable at a point ~ ½ the way from the main road. Instead we veered off to the North hoping to link up with Free Valley Ranch and then on to Big Bend Rd where we reported coal earlier. However we made it onto the S. end of the Free Valley R. property - got stuck ~3:00 PM, free at 6:30 returned back out to main road @ 8:00 PM

Back to Nechako Lodge @ 9:00 PM.

Sept
~~Aug~~ 10. Weather. Rainy / mild

Drove Kluskus Lavoie Forest Rd area, mapped as mostly Endako Gp. by Tipper. Volcanics - vesicular basalt, basalt, andesite, flow banded volcanic rocks (sample taken) were the only lithologies observed. Very sparse O/C. Returned to camp @ 8:00 pm.

Aug 10. Will drive roads in N. Kluskus Forest area - NTS maps sheets 93 F/8 and 93 F/1. If we can get this area covered early we will try the roads in 93 F/6 and 93 F/3.

Sept
~~Aug~~ 11. Drove into Jerryboy Hills area - Suscha Lake/Suscha Ck. Weather raining in 93 F/8. Couldn't get as far as we wanted to. Then proceeded past Chedakuz down to the Fawnie Range / Fawnie Ck. No seds were seen all day but volcanics abundant as usual.

Sept
~~Aug~~ 12 Weather AM rain PM mild overcast

Drove west from camp across Kenney Dam to log load out facilities on Knewstubb Lake, then followed logging road to S.W down

mapped as Ootsa Lake { to Natalkuz Lake, then along Natalkuz Lake to NW. Saw small exposure of quartzite and nearby flow banded volcanics near Lucas Ck. Exposure of medium grained to coarse sandstone

mapped by Tipper as Hazelton Gp { with pebble conglomerate and some mudstone was examined in S. part of F11 near Natalkuz Lake. The section was non carbonaceous. The only other recognizable seds were

mapped as Ootsa Lake { seen near False Hill in 93 F12. The O/C consisted of what appeared to be a marine mudstone - very dark / non carbonaceous picture taken.

An attempt was made to investigate Endako seds in the vicinity of Tyee Butte but the old wagon trail that continues from the present gravel road is impassable by truck. Drove north into Burns Lake via Cheslatta, Takysie Lake, Grassy Plains, Francois Lake - no O/C seen.

Sept
~~Aug~~ 13

Weather sunny and warm.

Flew Big Bend River area, Chedakuz Ck, Blackwater River, Nazko, Redwater Ck, Tsinik Lk, Euchiniko Lk – all mapped on flight plan map. No sign of coal or coal bearing environment. However we saw no less than 30 bald eagles and a similar number of golden eagles and osprey, + 5 big bull moose.

Also flew Tyee Butte area, Holy Cross Lake, Tangee Ck.

MEMORANDUM

DATE: 1984 08 22

TO: A.R. Peach

FROM: J. Dunn

SUBJECT: 1984 Nechako Pre-Reconnaissance Report

The Nechako reconnaissance area was visited July 25-26, 1984 by Bob Tamaki and myself. Our objectives as outlined in Nechako memo 1984 07 19 were:

1) to check outcrop potential and to delineate the area where work should be concentrated.

2) to check topography and terrain for future access.

Conclusions made from the July 1984 pre-reconnaissance are outlined below. However, a brief but necessary review of Nechako Basin geology, known coal occurrences and exploration history is presented first.

GEOLOGY OVERVIEW

The Nechako reconnaissance area is centered in NTS map sheet 93/F and also includes parts of NTS map sheets 93B/C/G. The boundaries of the reconnaissance program are generally defined by the boundaries of the large Nechako Basin, one of three major intermontaine strike basins* of British Columbia (McCrossan and Porter, 1973). The Nechako Basin is situated between the Pinchi Geanticline on the east and the Tyaughton Trough on the west and is about 400 km long and 120 km wide (see Figure 1).

The rocks in the Nechako River (93/F) Prince George (93/G) and the Quesnel (93/B) map sheets as mapped by Tipper (1949-1953, 1958-1960, 1957) range in age from Late Palaeozoic to Miocene. Two tables of formations, one by Tipper 1963 and the other by Koch 1973 are provided below (see Figures 2 and 3).

*The other two major intermontaine strike basins being the Whitehorse Basin and Bowser Basin (see Figure 1).

.../2

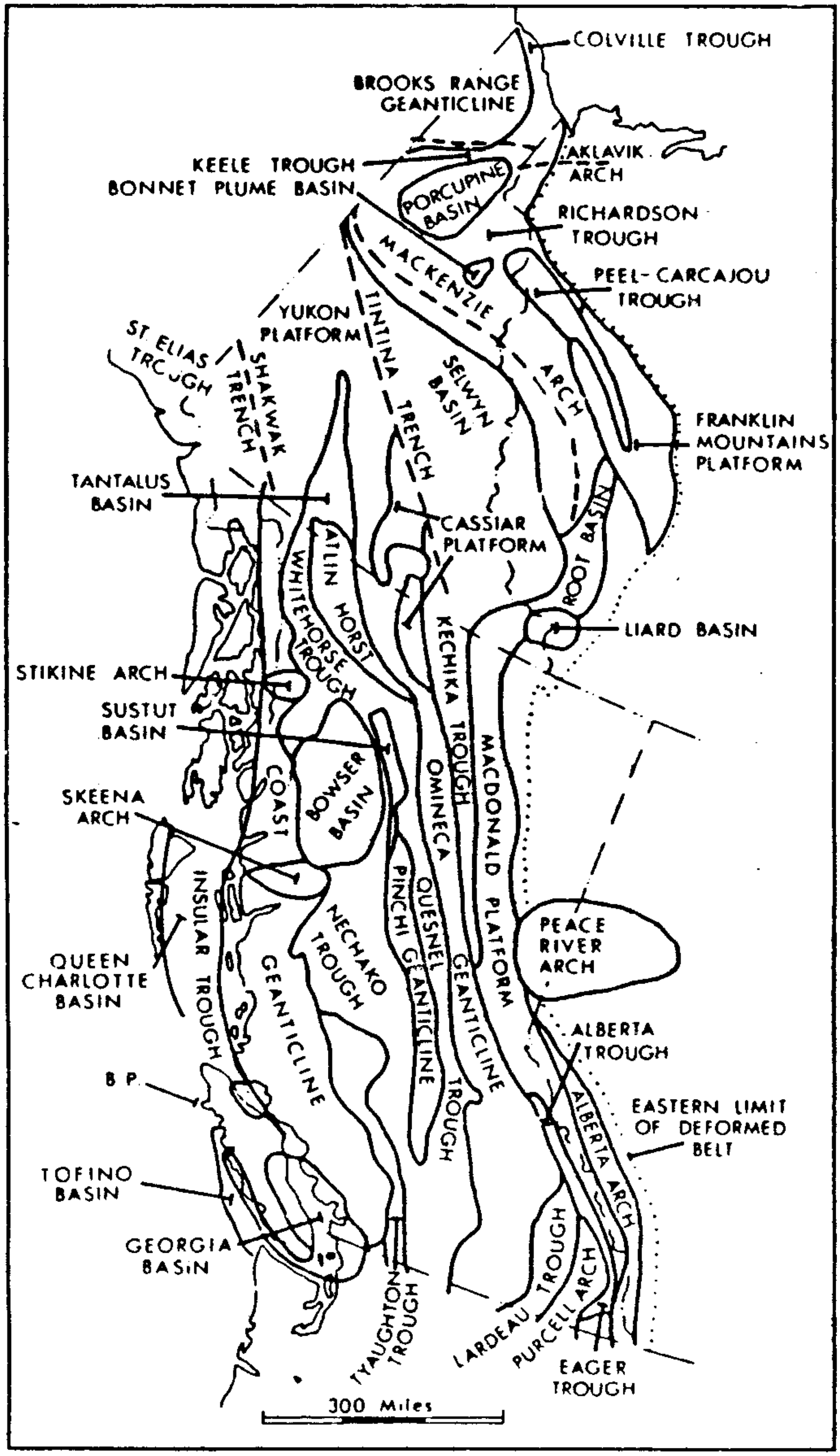

COLVILLE TROUGH
BROOKS RANGE GEANTICLINE
KEELE TROUGH
BONNET PLUME BASIN
PORCUPINE BASIN
AKLAVIK ARCH
RICHARDSON TROUGH
PEEL-CARCAJOU TROUGH
MACKENZIE ARCH
YUKON PLATFORM
TINTINA TRENCH
SELWYN BASIN
ST. ELIAS TROUGH
SHAKWAK TRENCH
FRANKLIN MOUNTAINS PLATFORM
TANTALUS BASIN
CASSIAR PLATFORM
ATLIN HORST
WHITEHORSE TROUGH
ROOT BASIN
LIARD BASIN
KECHIKA TROUGH
STIKINE ARCH
SUSTUT BASIN
BOWSER BASIN
COAST
OMINECA
MACDONALD PLATFORM
SKEENA ARCH
PINCHI GEANTICLINE
QUESNEL
GEANTICLINE
INSULAR TROUGH
NECHAKO TROUGH
GEANTICLINE
QUEEN CHARLOTTE BASIN
PEACE RIVER ARCH
TROUGH
ALBERTA TROUGH
B P.
EASTERN LIMIT OF DEFORMED BELT
ALBERTA ARCH
TOFINO BASIN
GEORGIA BASIN
TYAUGHTON TROUGH
LARDEAU TROUGH
PURCELL ARCH
EAGER TROUGH
300 Miles

FIGURE 1

The oldest rocks exposed in the Nechako Basin are those of the Permian Cache Creek Group. These rocks occur along the eastern margins of the Nechako Basin but pinch out to the west underneath the Basin (Koch 1973). They consist of massive shallow water limestones and deeper water shales, cherts, volcanics and their metamorphic equivalents. It has a probable thickness of 1800 metres (Duffell and McTaggart, 1952 in Koch 1973).

The Triassic Takla Group rests unconformably on the Cache Creek Group in the northern part of the Nechako Basin and is described as a sequence of marine and non-marine interlayered flow, breccias and sedimentary rocks including red beds. Tipper (1963) describes the Takla Group as typically eugeosynclinal; practically all the rocks are volcanic flows and breccias, or rocks derived directly or indirectly from active volcanism. Well-bedded black argillite, argillaceous tuff and argillaceous limestone are the more important sediments. In outcrop, the sequence has a combined total thickness of 1500 metres.

The main lower unit Takla Group rocks are intruded by the Topley Batholith. In the northern part of the Nechako Basin, the Topley intrusions lie between the Takla Group and the overlying Hazelton Group. Elsewhere the Takla Group is overlain unconformably by the Hazelton Group.

The Hazelton Group includes Middle Jurassic and, in some cases, Lower Jurassic rocks. Tipper (1963) divides the Group into a lower chert-pebble conglomerate unit and an Upper Middle Jurassic unit. The lower chert pebble unit includes conglomeratic sedimentary rocks, volcanic flows and pyroclastics. Some conglomerates are poorly cemented with limonite or calcite and the rock is very porous and permeable where weathered. Shales and argillites form an important part of the sedimentary section of the chert-pebble conglomerate unit. These rocks are invariably dark grey or black, banded or massive and are commonly sheared, contorted or drawn out (excerpted from Koch 1973). Thickness of the Lower Hazelton Unit is estimated to be greater than 2100 metres. The Middle Jurassic unit is primarily a sedimentary unit with some interlayered flows, breccias and tuffs. The rock types are conglomerate, greywacke, arkose, shale, tuff and breccia. Green andesitic greywacke with abundant wood fragments and carbonaceous imprints were found by Tipper (1963) along Taiuk Creek in the northern portion of the Nechako Basin. The Middle Jurassic unit is thought to have been laid down under marine or near shore conditions and has an estimated thickness in excess of 1500 metres.

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Table of Formations

Era	Period or epoch	Formation	Lithology
Cenozoic	Recent		Stream and lake deposits, talus, soil
	Pleistocene		Glacial and glacio-fluvial deposits
	Erosion interval		
	Miocene and (?) later	Endako Group	Basalt, andesite; related tuff and breccia; minor shale and greywacke
Angular unconformity			
Mesozoic and Cenozoic	Upper Cretaceous to Lower Miocene	Ootsa Lake Group	Rhyolitic and dacitic tuff and breccia; shale, sandstone, conglomerate
			Rhyolite, dacite, trachyte, andesite; minor basalt; related tuff and breccia
			Basalt, andesite; minor rhyolite, sandstone, and conglomerate
Erosion interval			
Mesozoic	Post-Middle Jurassic-pre-Upper Cretaceous		Biotite granite, granodiorite, quartz diorite, diorite; minor gabbro
	Not in contact		
	Upper Jurassic (Callovian)		Argillite, argillaceous limestone
	Relations not known; intrusive contact with younger granitic rocks		
	Middle Jurassic (Bajocian)	Hazelton Group	Greywacke, argillite, conglomerate tuff, breccia, andesite, and arkose; minor rhyolite
			Andesite, related tuffs and breccias, chert-pebble conglomerate, shale, and sandstone
	Unconformity; erosional interval		
Mesozoic cont.	Lower Jurassic mainly or entirely	Topley Intrusions	Granite, granodiorite, diorite, and quartz diorite
	Intrusive contact with lower part of Takla Group		
	Upper Triassic and Lower Jurassic	Takla Group	Red and brown shale, conglomerate, and greywacke
			Andesitic and basaltic flows, tuffs, and breccias; interbedded argillite and minor limestone
	Not in contact; intrusive contact with Topley Intrusions		
	Post-Upper Permian-pre-Lower Jurassic		Serpentinized peridotite, talc schists, anthophyllite schists
Not in contact; intrusive contact between Topley Intrusions and Cache Creek Group			
Paleozoic	Pennsylvanian (?) and Permian	Cache Creek Group	Limestone

(TIPPER, 1963)

FORMATIONS TYAUGHTON - NECHAKO BASINS

AGE	FORMATION	LITHOLOGY	THICKNESS	COMMENTS
Tertiary – Upper Cretaceous	Endako Group	Volcanics	2000' •	Miocene and later Mainly basaltic.
	Ootsa Lake Group	Volcanics	1000' - 3000'	Eocene and later Mainly rhyolitic.
		GRANITIC INTRUSIONS		
Upper Cretaceous	Kingsvale Group	Volcanics	6000' +	Breccias and tuff. Restricted to Tyaughton.
		Siltstone, Sandstone and Conglomerate	5400' •	Non marine clastics. Restricted to Tyaughton.
Late Lower Cretaceous	Jackass Mtn. Group Taylor Creek Group	Sandstone, Siltstone and Conglomerate. Shale to Chert pebble Conglomerate.	10000' – 15000' (maximum)	Fraser Grp. E9 Non marine clastics Marine clastics
Lower Cretaceous – Upper Jurassic	Relay Mountain Group	Fine Clastics	3290 – 9000' +	Marine arkosic clastics in Tyaughton Region.
		GRANITIC INTRUSIONS		
Middle and Lower Jurassic	Hazelton Group	Shale, Sandstone Conglomerate	3000' – 7000'	Marine Clastics
(Lower Jurassic?) Upper Triassic	Takla Group	Clastics & Limestone	5000' ±	Marine sequence. Main reservoir potential.
		Volcanics	7000' +	Effective basement to West.
		ANGULAR UNCONFORMITY		
Permian and Penn?	Cache Creek Group	Limestone, Shale, Chert, Volcanics	6000' ±	Shelf Carbonates. Not known in Tyaughton region.
		ANGULAR UNCONFORMITY		
Precambrian and Younger	Kaza and Cariboo Groups	Metasediments		Basement to east.

FIGURE 3 (McCrossan and Porter, 1973)

In the Tyaughton Basin, the Upper Jurassic - Lower Cretaceous Relay Mountain Group unconformably overlies the Hazelton Group. The Relay Mountain Group consists of a thick sequence of predominantly argillaceous clastic sediments containing many interbeds of fine to coarse greywacke and relatively few interbeds of grit and pebble conglomerate. Insignificant interbeds, bands or concretions of impure limestone and intercalated beds of volcanic rock occur locally (Koch 1973). The Relay Mountain Group is overlain, probably disconformably, by a thick sequence of Upper Lower Cretaceous clastics known as the Jackass Mountain/Taylor Creek Groups. The two groups are believed by Tipper (in Koch 1973) to have been formed semicontemperaneously in the same basin; the Taylor Creek Group in a marine part of the basin and the Jackass Mountain in a non-marine part, with the Jackass Mountain sedimentation beginning earlier--(possibly because the sediments prograded into the marine condition).

Both Relay Mountain Group and Jackass Mountain Group equivalents are believed to be present in at least the east-central part of the Nechako Basin. In the Honolulu Nazko well 93 B11 A 4 L (discussed later) drilled in 1960 the Relay Mountain Group is estimated to reach 1/3 to 1/2 the estimated maximum thickness that it reaches in the Tyaughton Basin. The sequence can generally be described as being composed of red, green, grey and brown shale, tuff, chert and minor amounts of sandstone of non-marine origin. The 1600 metres of section in the well lying above the Relay Mountain Group is correlated with the Jackass Mountain Group. The sequence can generally be described as a sequence of marine and non-marine sandstones and shales with minor conglomerate.

Tipper (1963) on the other hand, has mapped argillite and argillaceous limestone of Upper Jurassic age as overlying the Hazelton Group in the northern portion of the Nechako Basin. Tipper (1963) initially mapped these rocks as an Upper Jurassic part of the Hazelton Group but he notes since Hazelton Group rocks are now considered to be pre-Upper Jurassic, they are considered to be a separate unit. He notes that it would seem logical therefore, to map these rocks as Bowser Group but as there is no known direct connection with the Bowser Basin and little information on the extent, thickness and lithology of these Upper Jurassic rocks, it seems better to map them as an unnamed unit. In the central part of the Nechako Basin however, Tipper (1959) has mapped a unit of at least 200 metres thickness of conglomerate, greywacke and argillite. No fossils were reported in the unit. Very possibly this could represent Jackass Mountain equivalent sediments.

(Relay Mountain?)

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The Upper Jurassic - Lower Cretaceous time period of the Nechako Basin then is poorly understood. This period is of obvious interest for if the Nechako Basin developed in a similar fashion during this time as the Bowser Basin to the north and the Tyaughton Basin to the south, it may include facies favourable to or indicative of coal development. However, analysis of Relay Mountain Group equivalent rocks in the Honolulu Nazko well indicate an Early Cretaceous age. Koch (1673) suggests that this may be indicative of sea development during the Late Jurassic being restricted to the deeper Tyaughton Basin and becoming more widespread to the Nechako Basin in the Early Cretaceous. This seems to reinforce Al Peach's idea of uplift of a portion or all of the Nechako Basin with the regional affect of the Pacific Orogen advance creating a residual high; conceivably during Late Jurassic time the Nechako Basin was peneplained with likely transport of sediment to the Tyaughton Trough.

The Ootsa Lake Group, of Early Tertiary age, rests with angular unconformity on the Mesozoic rocks. A lower mafic volcanic and pyroclastic unit is succeeded by acid volcanics and tuffs, many members of which are characterized by a creamy or chalky colour (excerpted from Marr 1973). It is probable that the uppermost volcanic rocks of the Upper Cretaceous Kingsvale Group of the Tyaughton Basin are in part equivalent to, or at least merge with, the Ootsa Lake Group (Koch 1973). However, the lower part of the Kingsvale Group which is described as a thick sedimentary section of non-marine siltstone, sandstone and conglomerate and is described as one of the most predominant coal-bearig units in south-central British Columbia (Hopkins 1984), does not appear to have an equivalent in the Nechako Basin (Koch 1973).

The Endako Group of Miocene-Pliocene age overlies the erosional surface at the top of the Ootsa Lake Group. The Endako lavas were poured out upon a relatively flat surface above which hills projected and in which a few valleys were entrenched (Koch 1973). Sedimentary rocks are found associated with the volcanic rocks particularly ~~while~~ where streams have cut through lavas that filled pre-Miocene valleys. Tipper (1960) notes that these sediments were observed to lie at the base of the group. He describes the sediments as consisting of poorly consolidated coarse sandstone and conglomerate, minor siltstone and lignite.

KNOWN COAL OCCURRENCES

Known coal occurrences in the Nechako Basin are referred to in Tipper (1957, 1960), Cameron and Birmingham (1970), Flynn and Swarsburgson (1982) and Hopkins (1984). All reported coals are lignitic to subbituminous C in rank. A map and corresponding table by Cameron and Birmingham (1970) which documents all the known coal occurrences in the northern part of the Nechako Basin is reproduced below.

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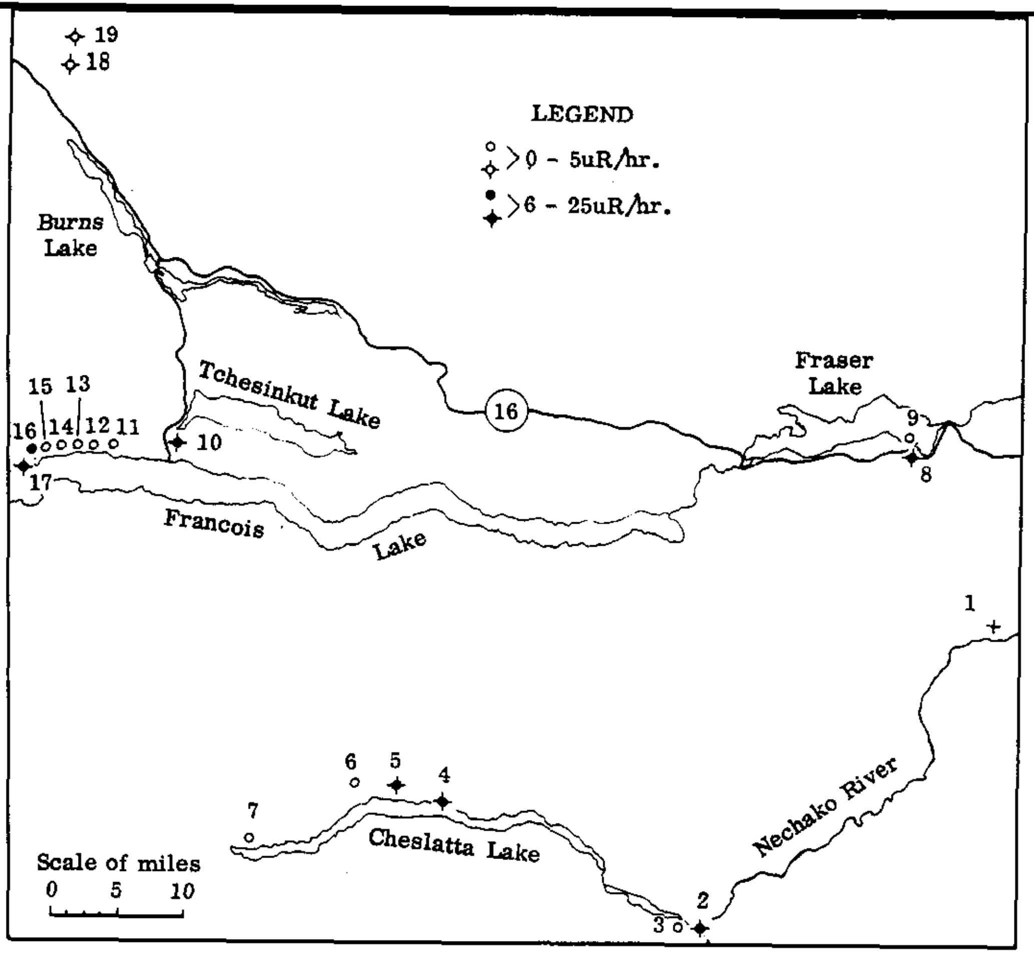

Francois Lake - Cheslatta Lake area, British Columbia.

Stn.	Sample	Location		Remarks
		NTS Map	UTM Grid	
1	CQ 150	93 F	DQ 01 73	Lignite float collected along Nechako River
2	CQ 138	93 F	CQ 72 46	Five seamlets of lignite exposed in 30 feet of section at east end of Murray Lake. Second from bottom was sampled (CQ 138); in ascending order above this bed rusty siltstone (CQ 139), greenish clay (CQ 140) and coaly clay (CQ 141) were sampled. Top seam (CQ 142) and bottom seam (CQ 144) also sampled. In addition coal and clay below top seam was sampled (CQ 143).
2	CQ 139	93 F	CQ 72 46	
2	CQ 140	93 F	CQ 72 46	
2	CQ 141	93 F	CQ 72 46	
2	CQ 142	93 F	CQ 72 46	
2	CQ 143	93 F	CQ 72 46	
2	CQ 144	93 F	CQ 72 46	
4	CQ 145	93 F	CQ 45 58	Light coloured amygdoloidal volcanics on shore of lake
5	CQ 146	93 F	CQ 42 60	Two beds of lignite exposed along creek, lower one sampled (CQ 146), coaly fragments from fossilized stump (CQ 147) and two samples of lignite float (CQ 148 and 149) along creek were collected.
5	CQ 147	93 F	CQ 42 60	
5	CQ 148	93 F	CQ 42 60	
5	CQ 149	93 F	CQ 42 60	
8	CQ 137	93K/2E	928 913	Rusty agglomerate exposed in railway cut
10	CQ 128	93K/4W	200 947	Ten or 12 coaly layers in road cut, best one sampled (CQ 128), sandy layer below it (CQ 129) dark shale above (CQ 130); Tuff layer over shale (CQ 131). Coaly material from fossilized tree trunk (CQ 133 and 134). Second tuff layer lower down in section (CQ 132).
10	CQ 129	93K/4W	200 947	
10	CQ 130	93K/4W	200 947	
10	CQ 131	93K/4W	200 947	
10	CQ 132	93K/4W	200 947	
10	CQ 133	93K/4W	200 947	
10	CQ 134	93K/4W	200 947	
17	CQ 136	93K/4W	067 924	Coarse tuffaceous rock with carbonaceous(?) blebs
18	CQ 126	93K/5W	115 318	Coaly lenses in conglomerate and shale along creek
19	CQ 127	93K/5W	116 324	Black shale exposed along same creek as CQ 126

COAL EXPLORATION HISTORY

G.M. Dawson of the Geologic Survey of Canada first reported coal in the Nechako area in 1878. He made brief mention of a four foot seam along the Nechako River bank near Mt. Greer. H.W. Tipper, also of the G.S.C., mapped the region in the early 1950's and produced the only geologic map of the area to date. The Dawson seam was not delineated though large lignitic boulders were recorded along the Nechako River (excerpted from Gulf Canada Resources, Mt. Greer Coal Project Geological Report, 1981).

The only known coal exploration in the area has been conducted by Gulf Canada Resources and this was concentrated around Mt. Greer in the northern portion of the Nechako Basin. Field mapping of the Endako Group verified the existance of lignite. A follow-up drilling program on their Mt. Greer license consisted of one 300m rotary hole. The location of the hole was immediately beside a 308 m drill hole (EN-1) drilled by E&B Exploration in 1978 which reported 9.8 m of coal at a depth of 218.2 m. Gulf cored the interval reported by E&B to contain the coal and found no coal. Gulf concluded that the hole had either been erroneously logged or that they had intersected a local washout. Of the two possibilities, Gulf considered the former more likely and therefore did not pursue further drilling and dropped their licenses. One coal zone 0.8 m thick was intersected at a depth of 246.3 m and was analyzed to be lignitic in rank. The coal outcrop at Cheslatta Falls (see Hopkins 1984 Nechako memo), 10 km to the S.W. of the Gulf Mt. Greer property, may repesent an equivalent group of sediments.

OTHER EXPLORATION

The Nechako Basin has been explored fairly extensively by most major Canadian mineral companies. A lack of outcrop and the extensive nature of the Miocene volcanics which obscures much of the underlying rocks is quoted as one of the major reasons why few major economic prospects have been found in the area. Esso conducted a regional exploration program in 1971 for Late Jurassic-Tertiary porphry type (Mo) ore deposits and massive sulphide type mineralization (Cu). Also extensive exploration for Endako Group uranium placer deposits was conducted in the 1970's by a number of companies.

Hydrocarbon exploration in the Nechako Basin was attempted by Honolulu Oils and Hudson Bay Oil & Gas in the late 1950's/early 1960's with the Lower Cretaceous being the primary target formation. Lows in the Honolulu Nazko well showed black pyrobitumen or graphite in the Lower Cretaceous. The only available information found to date on these two wells and two previously drilled wells, Kersley #1 and #2 (1951, 1953), is found in Koch 1973 and McCrossan and Porter, 1973.

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The largest hydrocarbon exploration program to date was initiated in 1979 by CanHunter, with B.C.R.I.C. and Imperial Oil as minor joint venture partners. Four dry holes were drilled, three of which are known to have penetrated down to the Cache Creek Group. Two zones in the Hazelton and 4 zones in the Jackass Mountain Group are known to have been tested in CanHunter et al Nazko, so these very likely represent the targets in the other 3 wells. A further memo on this work will be forthcoming once more information is acquired. Extensive gravity surveys and mini-sosie seismic was also carried out as part of the oil and gas exploration program.

PRELIMINARY EXPLORATION PRIORITIES

As a result of the brief July 1984 reconnaissance and office investigation, a number of recommendations are outlined below. A map showing area covered in July 1984 reconnaissance is forthcoming.

(1) Delineation of Cheslatta Falls Endako Group coal outcrop. This includes investigation of the possibility of there being more than one package of coal-bearing sediments in the Cheslatta Falls-Mt. Greer area Endako Group sediments. Perhaps we can establish how persistant the coals are—was their development very local, perhaps controlled by ~~to~~ local volcanic activity?

Endako Group areas recommended in a first pass of the area are listed below:
(1) Nechako Canyon--Nechako River--Mt. Greer.
(2) Big Bend--Finger Lake area.
(3) Fraser Lake area.
(4) Tyee Butte--Francois Lake area.

Investigation of these areas will probably be road intensive and probably will take 1 1/2 to 2 weeks field work.

(2) Investigation of post-Hazelton/pre-Ootsa Lake Group sediments. The Upper Jurassic-Middle Cretaceous period in the Nechako Basin is poorly understood and some Bowser Group-Jackass Mountain Group equivalent sediments may be present. Areas of possible interest on the 93/F map sheet include: (1) Taiuk Creek,
(2) Chedakuz Creek/Valley,
(3) Tsacha Lake.

Investigation of these areas and follow-up areas in map sheet 93/B in the central part of the Nechako Basin will probably be helicopter intensive and initially will take 1 to 1 1/2 weeks.

Field work is tentatively scheduled to run from September 5 through 25.

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(3) Further literature search - mineral exploration reports and CanHunter program information should be more thoroughly reviewed.

PROJECTED RECONNAISSANCE COST BREAKDOWN

Anticipated expenditures of the Nechako reconnaissance from September 5, 1984 to September 25, 1984.

GASOLINE	$ 500.00
ACCOMMODATION	800.00
FOOD	350.00
FIELD PURCHASES	300.00
HELICOPTER @ $395/hr	9,875.00
HELICOPTER FUEL @ 56¢/litre and 65¢/litre	1,650.00
TRUCK RENTAL @ $40/day	840.00
CHARGE-OUTS: 21 days follow-up @ $463/day	9,723.00
ANTICIPATED 10 days follow-up @ $463/day	4,630.00
MISCELLANEOUS	250.00
TOTAL EXPENDITURES	$28,918.00

JD/cyg
2632K

NECHAKO RECONNAISSANCE 1984 MAP LIST

TOPOGRAPHIC MAPS - 1:50,000

1. 93B/12,13,14
2. 93C/1-16 and 93C/5-16
3. 93D/9,16
4. 93E/1,2,3,6,7,8,9,10,11,14,15,16
5. 2 sets of 93F/1-16 and 2 sets of 93F/1-16 reproductions
   1 set of 93F/5-8 & 1 set of 93F/9,11,13 & 1 set of 93F/1,3,4
6. 93G/11,12,13,14 and 2 sets of 93G/3,4,5,6,10 reproductions
   93G/3,4,5,6 and 2 sets of 93G/11,12,13E,14 reproductions
   3 sets of 93G/11 & 2 sets of 93G/6 & 3 sets of 93G/14
   2 sets of 93G/13E & 1 set of 93G/13W
7. 93J/3,4,5
8. 93K/1,2,3,4,5,6,7,8 and 93K/1,2,3,4
9. 93L/1,2,8

TOPOGRAPHIC MAPS - 1:250,000

4 copies of 93B
3 copies of 93L
2 copies of 93F & 93G
1 copy of 93D, 93E, 93K, 93J and 93C

GEOLOGY MAPS - 1:253,440

1 copy of 93B and 3 reproductions
1 copy of 93C and 3 reproductions
1 copy of 93F and 3 reproductions
2 copies of 93G and 3 reproductions
1 copy of 93E, 93J and 93K/East

GEOLOGY MAP - 1:250,000

1 copy of 93D

GEOLOGY MAP - 1:380,160

1 copy of 93K

ROAD ACCESS MAPS

2 copies of 93F/SE,SW,NW and NE 1:100,000
2 copies of 93G/SE 1:100,000
2 copies of 93G/SW 1:125,000
2 copies of 93G/NE 1:125,000
1 copy of 93G/SW and 93G/NW 1:125,000
1 copy of 93F,93K,93C and 93A/SW 1:250,000