

300

MEMORANDUM

ESSO RESOURCES CANADA LIMITED  
RESEARCH DEPARTMENT

R03982  
Resources  
BC  
Reconnaissance  
Samples

82 08 13

Mr. A.R. Peach  
Esso Minerals Canada,  
Coal Department,  
Room 646, East Tower, Esso Plaza

AUG 13 1982

British Columbia Coal Reconnaissance

Processing and elemental analysis of the above samples has now been completed. The material is currently being examined for palynology, and it is hoped to complete this within the next two weeks.

In general, elemental analysis indicates that the sediments have quite similar chemical composition, suggesting that they were all formed under the same depositional regime and may be about the same age. Hopefully, this will be confirmed by palynological analysis. Three of the samples are significantly different from the remainder.

H 0013

This sample is rich in calcium (present in the form of  $CaCO_3$ , otherwise similar to the bulk of the samples submitted. This could be a primary feature or the result of later induration. In any case, it is probably of only local significance.

R 0001

This rock comprises 97% pure silicon dioxide with a little calcium and a trace of iron.

R 0002

This is a most interesting sample, being extremely rich (33%) in manganese. It is also abnormally rich in calcium(18%). Because of the abundance of manganese in this sample, which is most unusual for Canadian material, and because this element, in addition to having possible commercial value itself,

769

could be an indicator for other commercially valuable deposits, it is suggested that an assay be undertaken on this sample and further investigation of the locality be considered.



Stanley A.J. Pocock

SAP/sajp  
Attach.

Note: We have now completed programming of our elemental analysis equipment to express output in digital form standardised to 100%. All output is, therefore, comparable from sample to sample.

## B.C. Coal Reconnaissance - A.R. Peach

	Na	Mg	Al	Si	S	K	Ca	Ti	V	Mn	Fe	Ni	Cu	Ba
H00004A	.044	1.79	12.52	68.42	-6.3	3.2	4.8	0.75	0.3	0.14	7.4	0.68	-0.3	0.7
H00004B	.052	1.20	9.27	74.3	-0.2	4.3	2.32	0.74	-0.03	0.4	6.57	0.31	0.12	0.7
H00005	0.16	3.80	12.8	65.4	0.27	1.8	4.84	0.91	0.01	0.13	8.41	0.35	0.25	0.8
H00006	0.21	1.03	13.71	67.9	-0.06	3.1	6.11	0.72	0.18	0.43	5.66	0.12	0.08	0.74
H00007	0.08	1.65	12.6	70.58	-0.02	2.86	4.17	0.91	0.09	0.13	5.70	0.15	0.22	0.88
H00008	0.21	1.35	13.8	66.2	0.09	3.67	5.9	0.67	-0.07	0.51	7.00	0.11	0.34	0.58
H0010	0.24	1.52	13.99	60.17	0.04	2.84	9.4	0.81	0.20	0.20	9.64	0.12	0.13	0.74
H0011A	0.22	0.89	15.48	67.74	-0.02	4.61	3.77	0.61	0.1	-0.09	5.81	0.07	0.11	0.61
H0012	0.13	1.68	16.15	64.01	-0.12	2.63	5.27	0.99	0.11	0.25	8.74	0.24	-0.04	0.93
H0013	0.05	1.74	9.01	60.51	-0.01	2.48	17.74	0.62	0.30	0.58	6.02	0.22	0.20	0.53
H0014	0.17	1.19	14.3	66.1	0.2	2.6	4.26	1.17	0.15	0.05	8.47	0.25	-0.06	1.09
H0015	0.15	3.5	13.7	63.9	-0.08	2.12	5.99	0.81	0.32	0.11	8.46	0.17	0.06	0.74
H0017	0.15	0.66	17.8	61.36	0.07	4.45	5.65	1.05	0.16	0.21	7.23	0.23	0.09	1.01
H0019	0.13	0.96	15.94	64.3	-0.26	6.01	5.17	0.37	0.02	0.24	6.7	0.11	-0.04	0.33
H0010B	0.12	1.42	14.52	65.1	0.20	3.24	7.52	0.76	0.31	0.22	6.14	-0.04	-0.21	0.72
H0011B	0.14	1.32	17.8	62.7	0.07	2.34	6.13	1.34	-0.03	-0.14	6.90	-0.006	-0.004	1.42
R00001	-0.004	0.10	-0.27	97.0	0.02	0.18	2.60	-0.04	0.86	0.22	0.22	0.084	-0.11	-0.07
R00002	0.10	0.01	0.84	32.0	0.22	2.42	18.4	1.63	-0.34	33.11	2.22	0.08	0.04	1.72
R0014	0.25	4.04	12.55	64.4	0.07	2.13	5.55	0.77	0.28	0.19	8.52	0.26	0.11	0.8
R0024A	0.11	1.53	11.77	69.54	-0.01	2.93	2.38	0.84	0.24	0.45	9.10	0.25	0.07	0.8
R0024B	0.19	1.55	16.1	62.03	0.06	2.38	3.56	1.05	0.17	0.27	11.6	0.13	-0.08	1.00
R0025A	0.05	1.14	13.68	65.7	2.74	2.00	4.12	0.95	0.07	0.14	8.15	0.2	0.12	0.91
R0025B	0.06	1.01	14.73	64.16	11.59	1.59	2.28	0.89	0.17	-0.01	12.34	0.21	0.07	0.90
R0025C	0.05	0.79	12.81	65.03	3.23	1.75	4.57	1.07	0.04	0.09	9.20	0.33	-0.06	1.01
R0027	0.09	1.01	17.74	59.6	-0.08	1.66	7.41	1.63	0.23	-0.15	9.85	0.26	0.06	1.62
R0039	0.08	1.22	13.0	69.78	-0.06	3.00	4.50	0.56	0.03	0.39	6.63	0.19	0.14	0.57
R0040	0.09	1.15	13.89	68.82	0.25	3.06	3.83	0.50	-0.01	0.42	7.53	0.08	-0.06	0.42

DISK! STORE R0002 S0

R0002 Z=00

PR= S 62SEC 200000 INT

U=2048 H=10KEU 1-1H A0=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU XES 10.24KEU >



DISK! STORE R0001 S0

R0001

Z=00

PR= 200KI

72SEC

200000 INT

U=2048

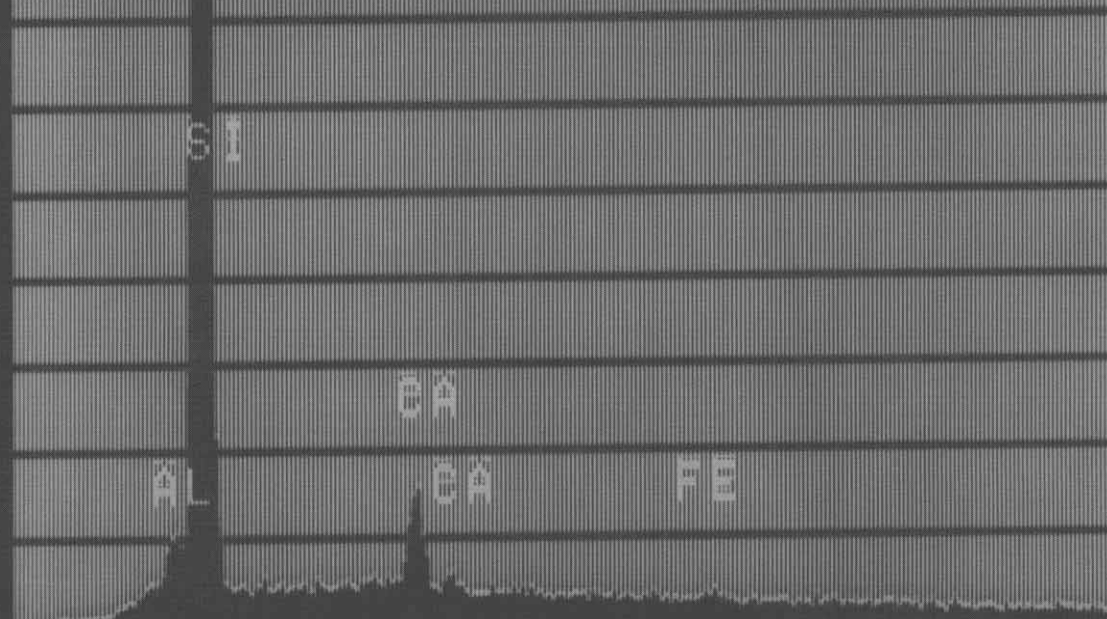
H=10KEU

1 1H

A0=10KEU

1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >

DISK! STORE H0013 S0

H0013

Z=00

PR= 200KI

57SEC

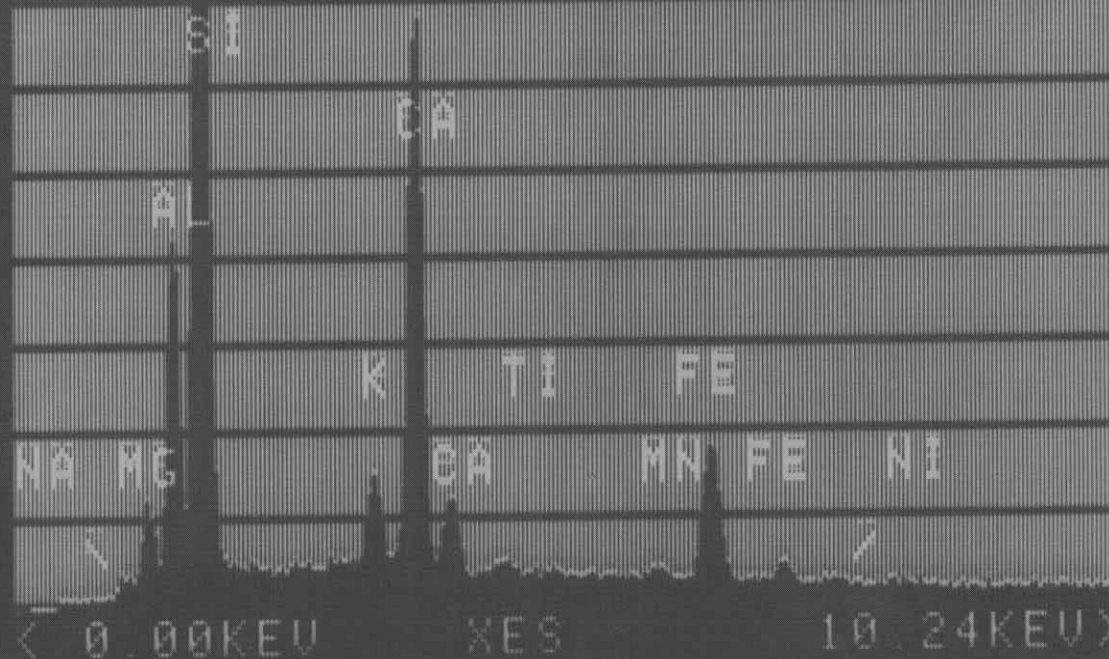
200000 INT

U=2048

H=10KEU 1 1H

AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



DISK! STORE H0006 S0

H0006

Z=00

PR= 200KI

49SEC

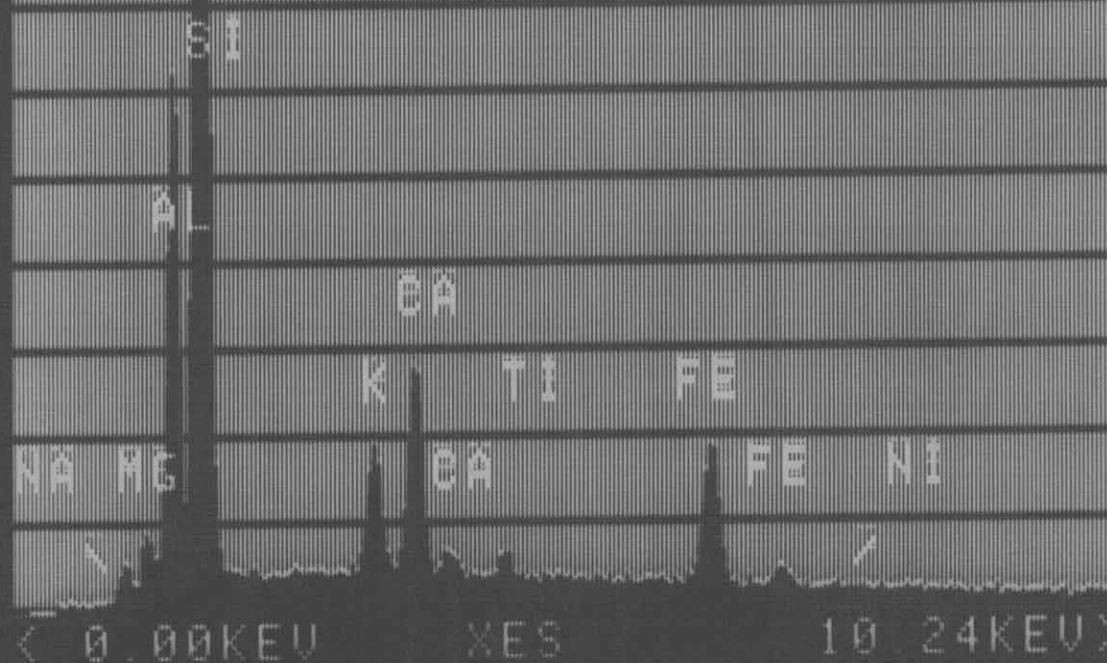
200000 INT

U=2048

H=10KEU 1 IH

AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >



DISK! STORE H0005 S0

H0005

Z=00

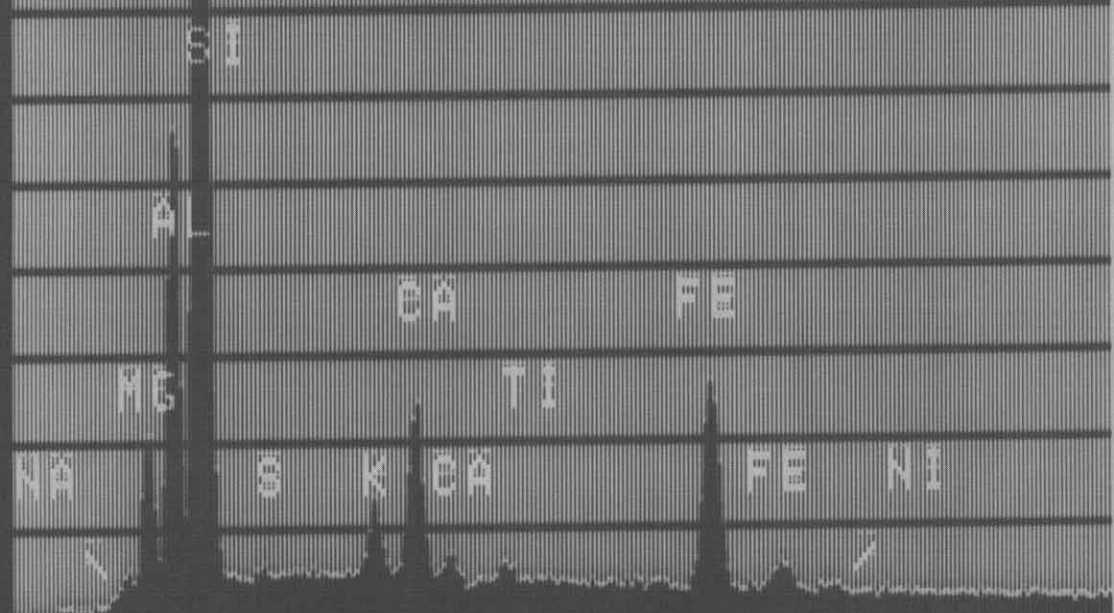
PR= 200KI

77SEC

200000 INT

U=2048 H=10KEV I=1H AD=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >

DISK! STORE H0004B 50

H0004B

Z=00

PR= 200KI

58SEC

200000 INT

U=2048

H=10KEV 1-1H

A0=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



DISK! STORE R0040 50

R0040

Z=00

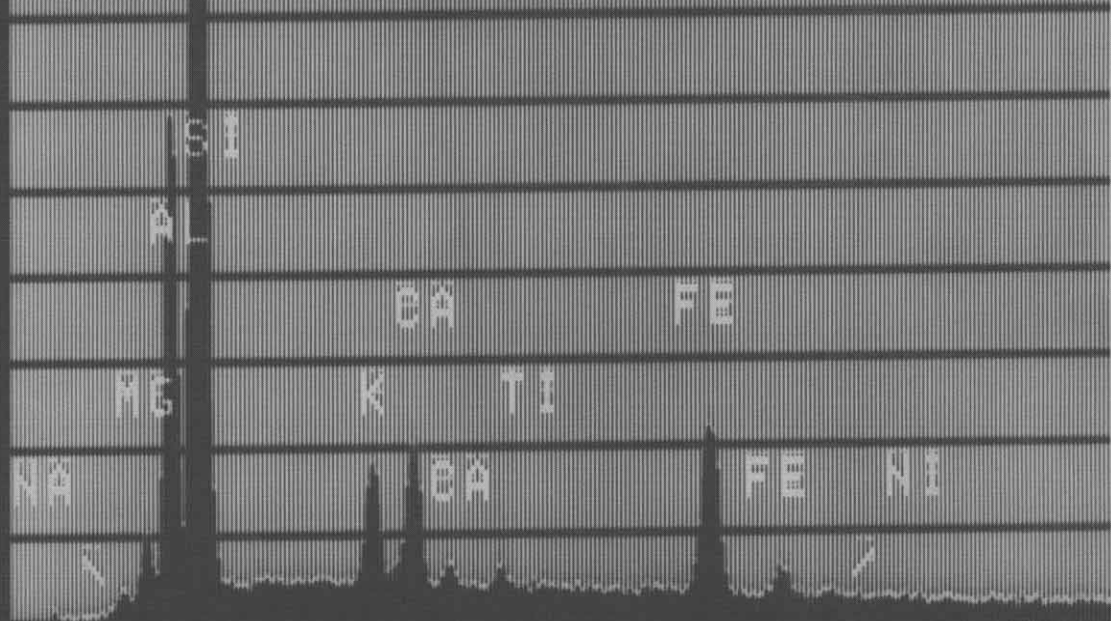
PR= 200KI

46SEC

200000 INT

U=2048 H=10KEV 1:1H AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >



DISK! STORE R0039 S0

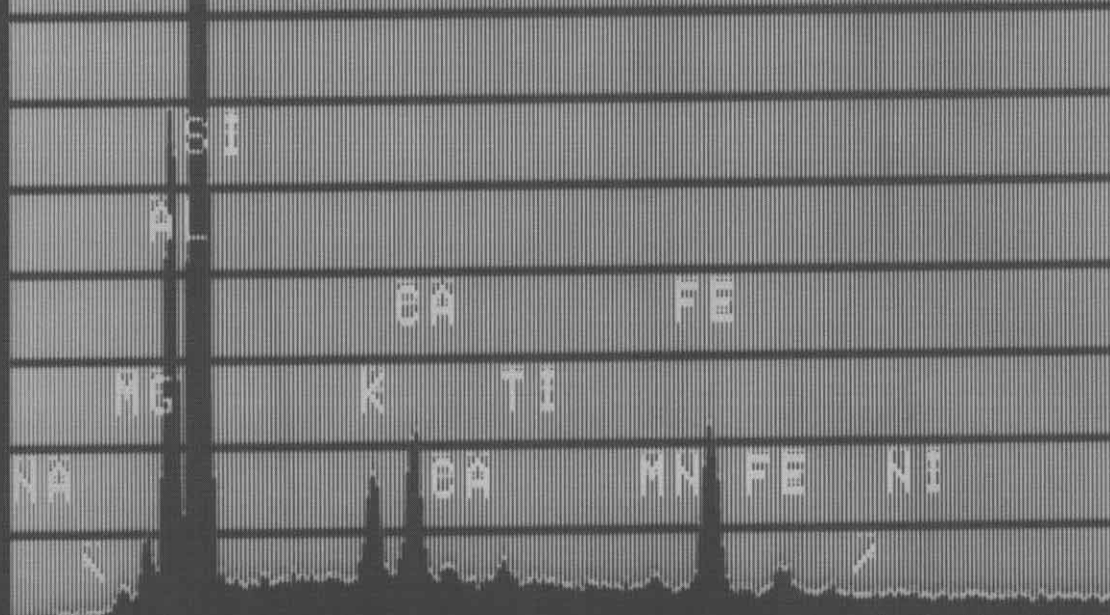
R0039

Z=00

PR= 200KI 36SEC 200000 INT

U=2048 H=10KEU 1:1H A0=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >

DISK! STORE R0027 S0

R0027

Z=00

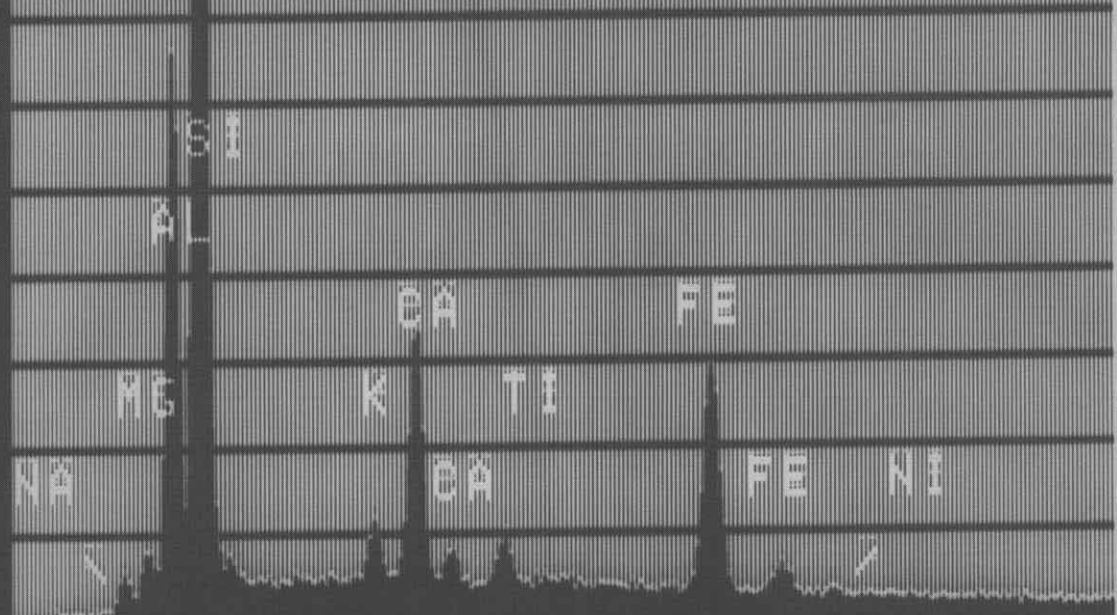
PR= 200KI

43SEC

200000 INT

U=2048 H=10KEU 1 1H AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10 24KEU >



DISK! STORE R00250 50

R00250

Z=00

PR= 200KI

50SEC

200000 INT

V=2048

H=10KEU

1:1H

AQ=10KEU

1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >

DISK! STORE R0025B S0

R0025B

Z=00

PR= 200KI 77SEC 200000 INT

U=2048 H=10KEU 1:1H AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >

DISK! STORE R0025A S0

R0025A

Z=00

PR= 200KI 72SEC 200000 INT

V=2048 H=10KEV 1:1H A0=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >



DISK! STORE R0024B S0

R0024PB

Z=00

PR= 200KI 51SEC 200000 INT

U=2048 H=10KEU 1:1H A0=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU XES 10.24KEU >

DISK! STORE R0024A S0

R0024PA

Z=00

PR= S 64SEC 200000 INT

U=2048 H=10KEV 1:1H AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >

DISK! STORE R0014 50

R0014

Z=00

PR= 200KI

68SEC

200000 INT

U=2048

H=10KEV 1-1H

AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >



DISK! STORE H0004A S0

H0004A

Z=00

PR= 200KI 64SEC 200000 INT

U=2048 H=10KEV 1:1H AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV>

DISK! STORE H0007 S0

H0007

Z=00

PR= 200KI

71SEC

200000 INT

V=2048

H=10KEV 1:1H

AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.





DISK! STORE H0010 S0

H0010

Z=00

PR= 200KI

51SEC

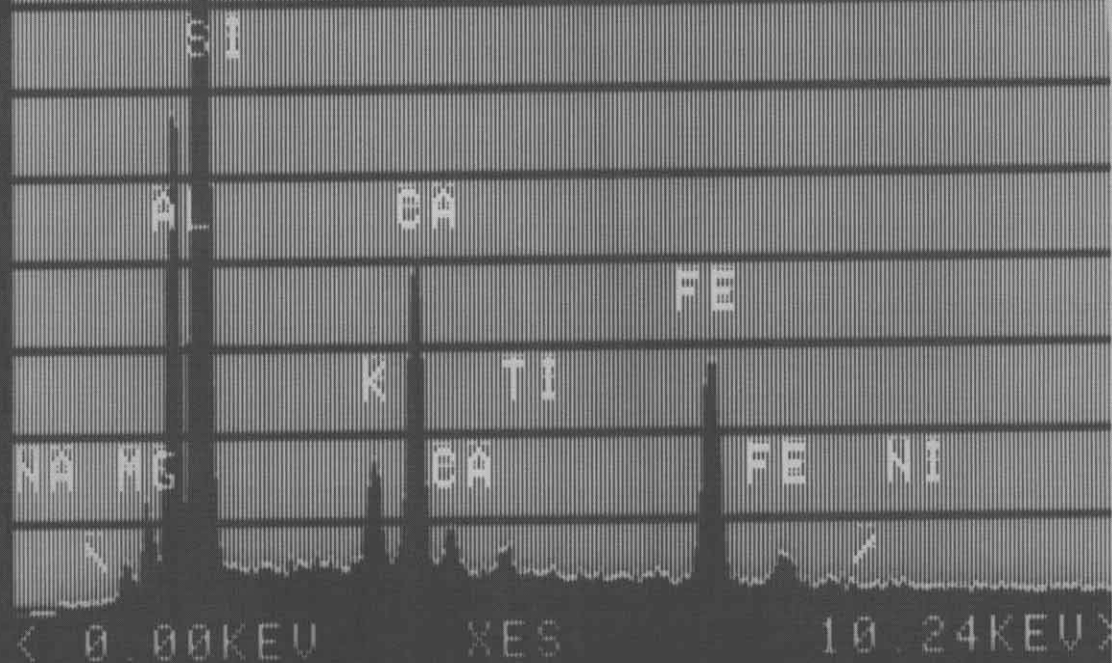
200000 INT

U=2048

H=10KEU 1 1H

A0=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



DISK! STORE H0008 S0

H0008

Z=00

PR= 200KI

56SEC

200000 INT

U=2048

H=10KEU

1:1H

AQ=10KEU

1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >

DISK! STORE H0012 S0

H0012

Z=00

PR= 200KI

56SEC

200000 INT

V=2048

H=10KEU

1:1H

A0=10KEU

1H

BRITISH COLUMBIA COAL RECONN.





DISK! STORE H0011A S0

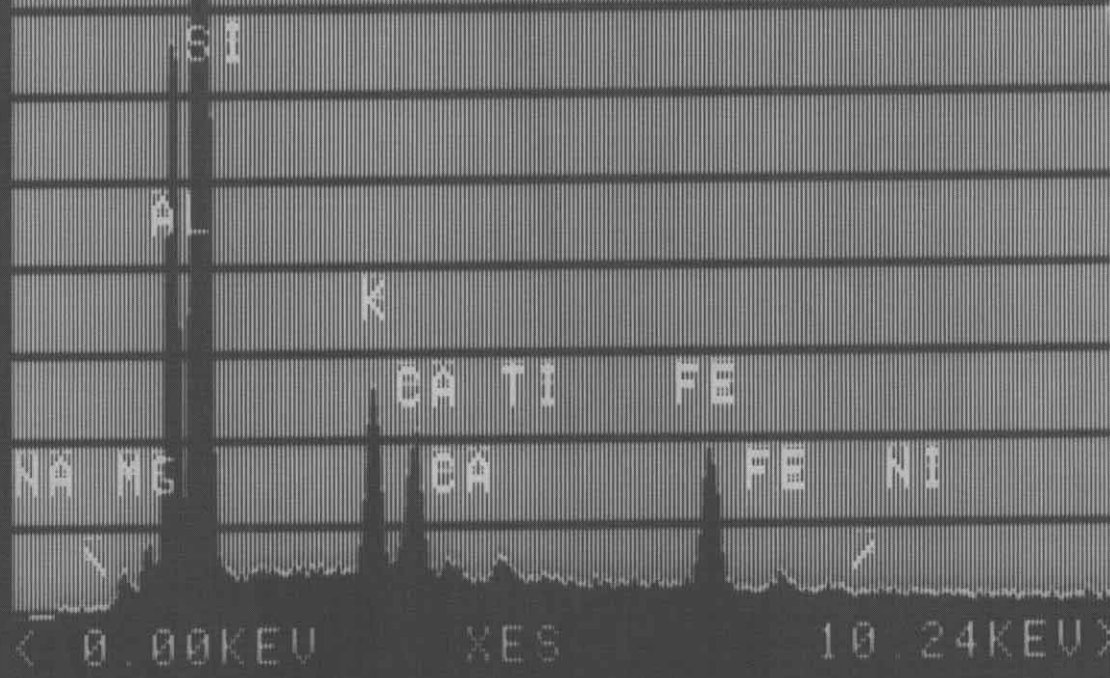
H0011A BOTT

Z=00

PR= 200KI 44SEC 200000 INT

U=2048 H=10KEU 1 1H A0=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU XES 10.24KEU >

DISK! STORE H0011B S0

H0011B

Z=00

PR= 200KI

59SEC

200000 INT

U=2048

H=10KEV 1:1H

A0=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

YES

10.24KEV >

DISK! STORE H0010B S0

H0010B

Z=00

PR= 200KI

42SEC

200000 INT

U=2048

H=10KEU

1:1H

AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEU

XES

10.24KEU >



DISK! STORE H0019 S0

H0019

Z=00

PR= 200KI

50SEC

200000 INT

U=2048

H=10KEU 1 IH

AQ=10KEU 1H

BRITISH COLUMBIA COAL RECONN.



DISK! STORE H0017 S0

H0017

Z=00

PR= 200KI

63SEC

200000 INT

U=2048

H=10KEV 1:1H

A0=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10 24KEV >



DISK! STORE H0015 S0

H0015

Z=00

PR= 200KI

57SEC

200000 INT

V=2048

H=10KEV 1 1H

AQ=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



< 0.00KEV

XES

10.24KEV >

DISK! STORE H0014 50

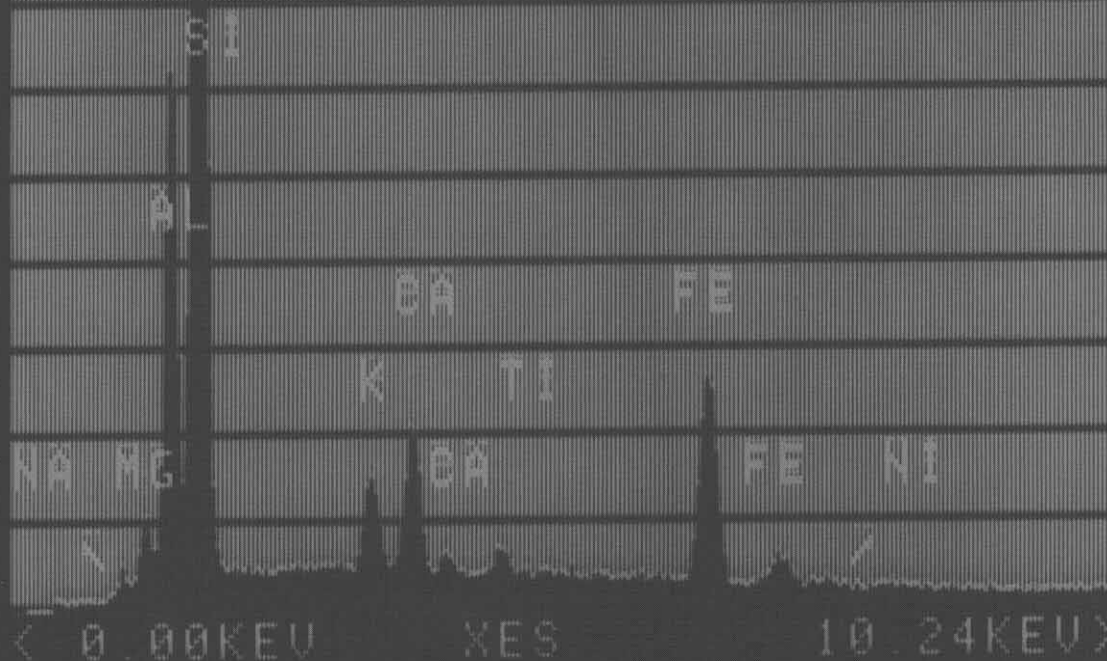
H0014

Z=00

PR= 200KI 64SEC 200000 INT

U=2048 H=10KEV 1 1H A0=10KEV 1H

BRITISH COLUMBIA COAL RECONN.



MEMORANDUM

ESSO RESOURCES CANADA LIMITED  
RESEARCH DEPARTMENT

82 10 21

92 H1  
92 H2  
92 I10

Mr. A.R. PEACH,

Esso Minerals Canada, Coal Department,  
Room 686, East Tower, Esso Plaza.

British Columbia Coal Reconnaissance

RECEIVED

OCT 26 1982

COAL DEPT.

The samples submitted for palynological examination have now been processed and examined and the following report is an account of our findings.

1. General Comments

The Tertiary sediments of southern British Columbia have been known for for many years, but there has been surprisingly little agreement regarding their geological age, or mode of emplacement. This is partly due to the fact that the sediments tend to occur in isolated, local, basins resting on older strata and partly because the sediment, in terrestrial facies, has yielded only plant fossils whose ranges are not so precisely known as organisms living in marine environments. Most of the sediments appear, in fact, to be stream or fresh water lake deposits or swamps associated with lows on the underlying surface.

Samples used for control purposes in the present study were collected by the author in connection with a field trip of the 9th International Botanical Congress in 1959 and added to in 1962 when investigating the Mesozoic sediments of the Chilcotin - Williams Lake area (Imperial Oil Field Party PR62-62).

L.V. Hills, in an unpublished Thesis of the University of Alberta, Edmonton (Palynology and age of Early Tertiary Basins, Interior British Columbia) in 1965, established a palynological zonation for these beds into which the control samples can be fitted reasonably satisfactorily and it is into this framework that I have attempted to fit the samples collected in connection with the present coal reconnaissance. While this has proved reasonably satisfactory.

769

it has become apparent during the course of the study that the zonation is so precise as Hills imagined, or as one could wish for and that more research is needed before a completely satisfactory means of palynological dating and correlation is devised.. Azolla, a fresh water fern, for example, is quite common in sediments of the Pistilipollenites McGregori zone and, conversely, the latter pollen is not unknown in the Azolla beds. Also, the dominance of saccate pollen in a sample is a function of environment and season of year and while the zonation on the basis of saccate dominance is all right in very general terms, it does not always apply in detail and isolated samples do not always fit in the general pattern.

## 2. Results

Twenty seven samples were submitted for determination, divided into two series, one prefixed with "H", the other with "R". These will be discussed individually under their sample numbers. Organic matter data are included on appended sheets.

H0004A

Organic matter dominantly woody, including 5% fungal hyphae. As with a majority of samples a significant amount of the organic material appears to be highly altered material derived from the basement. Thermal alteration index 1.5. Fossils include:

*Alnus crispa*  
*Azolla primaeva*  
*Acer quilchensis*  
*Betula sp.*  
*Larix sp*  
*Deltoidospora sp.*  
*Fungal hyphae and spores.*

A stream deposit, possibly correlating with the upper part of the

Azolla zone

H0005

This sample is crowded with fungal hyphae and wood fragments and would

as a maceral, be termed sclerotinite. No other fossils present. The organic matter was from a conglomerate matrix and the fungal remains possibly represent a mycorrhysal association with wood in a soil zone. Abundant fungal remains are somewhat more common in the Pistilipollenites Zone than in the Azolla beds, but their distribution is controlled by local environment and definite correlation on this basis only would be dangerous.

H0006

Organic matter 60% woody, including 10% fungal hypheae. 30% biodegraded terrestrial. Thermal index 1.6. Fossils include:

*Azolla*  
*Piceapollenites* sp.  
*Pityosporites* sp.  
*Alnus quadripollenites*  
Fungal hypheae abundant  
Bisaccate pollen common.

A stream deposit, possibly correlating with the upper part of the *Azolla* zone.

H0007

75% biodegraded, terrestrially sourced, material and 15% structured terrestrial. Thermal index 1.6. Fossils include:

*Pityosporites* (common)  
*Taxodiaceapollenites* (rare)  
*Alnus quadripollenites*  
*Alnus quinquipollenites* (abund.)

A stream deposit, probably correlating with the upper part of the *Azolla* zone.

H0008

Organic matter very rare. 95% structured terrestrial and 3% fungal spores. Thermal index 1.6. No fossils apart from fungal spores and hypheae. Age and correlation indeterminate.

H0010A

90% woody with considerable pyrite. Much metamorphosed material

and some Pine pollen, which probably represents Recent contamination, this sample is barren of fossils. Dating and environmental interpretation impossible.

H0011A

Sample 98% woody and highly oxidised. Thermal index 2.0+, suggesting the proximity of volcanic intrusions. Fossils include *Polypodiisporites* and some fungal spores.

H0012

Organic matter very rare. A few fungal hyphae and spores seen, but little else.

H0013

Two states of preservation in this sample which appear to be in place Tertiary material contaminated with Recent pollen, spores and organic matter. 60% biodegraded terrestrial. Thermal index 2.6. Fossils include:

*Taxodiaceapollenites* sp  
*Rimaesporites* sp.  
*Pityosporites* sp  
*Abiespollenites*  
*Osmundacidites wellmannii*  
*Laevigatosporites ovatus*  
*Ericaceous* tetrads  
Bisaccate pollen abundant.

The assemblage appears to be similar to that from the coal at Lamont Creek. The relatively high thermal alteration index suggests proximity to volcanic intrusion.

H0014

Two states of preservation. Highly altered and partly metamorphosed material from the bedrock and indigenous Tertiary organic matter. Biodegraded terrestrial material 60%. Woody material 10%. Thermal index 1.5. Fossils include:

*Laevigatosporites ovatus*  
*Alnipollenites* spp.

*Betula*  
*Azolla*  
Fungal hyphae and spores  
Bisaccate conifer pollen.

Azolla is very rare in this sample and the remainder of the fossils suggest a correlation somewhat higher in the section.

H0019

Very woody organic matter that appears to have been thermally altered. Much Recent contamination.

H00106

Organic matter very rich (50%) in pollen and spores. 25% structured terrestrial and 20% biodegraded terrestrial. Thermal alteration index

1.4. Fossils include:

*Pistilipollenites mcgregori* (common)  
*Laevigatosporites ovatus*  
*Ulmipollenites* sp.  
*Alnipollenites* spp  
*Sequoiapollenites palaeocenicus*  
*Tiliaepollenites*  
*Betula* sp.  
*Iliacidites* sp.  
*Lycopodiumsporites* sp.  
*Taxodiaceapollenites* sp.  
*Larix* sp.  
Bisaccate conifer pollen scarce

This sample appears to correlate with the lower half of the *Pistilipollenites mcgregori* zone. It appears to represent a swamp environment, possibly in the vicinity of swamp forest.

H00116

Organic matter 70% structured terrestrial and somewhat pyritic. The organic residue comprises nothing but wood fragments and grey amorphous material and represents, at least in part, a reducing environment.

R0001

Organic matter 100% wood fragments. A few grains of *Taxodiaceapollenites*.

The sediment is probably a stream deposit, the organic matter representing drifted wood in a point bar situation.

R0002P

98% structured terrestrial (mainly fungi) and 1% biodegraded terrestrial.

Thermal alteration index 1.4. Fossils rare, including:

*Laricipites* sp.  
*Rimaesporites* sp.  
*Alnipollenites* spp.

The organic matter in this sample is rich enough in fungi to be termed sclerotinite and possibly represents a fossil soil horizon.

R0004B

Organic matter mixed structured (43%) and biodegraded (20%) material with 20% pollen and spores. Thermal alteration index 1.5. Fossils include:

*Tilia crassipites*  
*Rimaesporites alipollenites*  
*Pityosporites* sp. B.  
*Betula* spp.  
*Laevigatosporites ovatus*  
*Polypodiisporites pellucidus*  
*Tsugaepollenites* sp.  
Ericaceous tetrads  
Bisaccate conifer pollen abundant  
Fungal hyphae and spores common

The absence of *Pistilipollenites* from this sample suggests it is possibly from the bisaccate zone. It probably represents a stream deposit.

R0014

Organic matter 60% pollen and spores, 20% structured terrestrial material and 20% charcoal. Thermal alteration index 1.0. Fossils include:

*Rugubivesiculites* sp (reworked Cretaceous)  
*Pinus* spp. (Dominant)  
*Abies*  
*Tsuga*  
*Larix*  
*Alnus*  
*Taraxacum*  
*Polypodium*



These spores and pollen, apart from the first mentioned genus, are recent in origin and the sediment must be of penecontemporaneous origin.

R0024 PB

Organic matter 40% structured terrestrial, 30% biodegraded terrestrial and 5% fungal spores. Thermal alteration index 1.6. Fossils comprise many fungal hyphae and spores and a few bisaccate pollen. Nothing else. This sediment may represent a fossil soil horizon and is probably from the *Pistillipollenites mcgregori* zone.

R0024 PA

Organic matter 50% structured terrestrial (woody) and including 10% bacterial amorphous material. Otherwise essentially the same as the previous sample.

R00025A

Organic matter 30% structured terrestrial and 65% biodegraded terrestrial. Thermal index 1.4. Fossils include:-

*Pesavis tagluensis*  
*Phragmosporites quilchenii*  
*Ctenosporites eskerensis*  
*Rimaesporites alipollenites*  
*Pistillipollenites mcgregori*  
*Ulmipollenites* sp.  
*Carpinus aceripites*  
*Laevigatosporites ovatus*  
*Alnipollenites quinquaeapollenites*  
*Sequoiapollenites paleocenicus* (scarce)  
*Taxodiaceaeapollenites* (rare)

This very rich fossil assemblage is of probable Lower Eocene age. It is from the 'bisaccate dominant' part of the *Pistillipollenites mcgregori* zone and was deposited in fresh water conditions, probably in a swamp environment.

R2025B

Organic matter somewhat less biodegraded than in the previous

sample. Thermal index 1.4. Fossils include:

*Ctenosporites eskerensis*  
*Tsugaepollenites* sp.  
*Rimaesporites alipollenites*  
*Carpinus* sp.  
*Taxodiaceapollenites* sp.  
*Umbosporites* sp.  
? *Azolla* sp.  
*Betula species*  
*Laevigatosporites ovatus*

Age and environment appear to be essentially the same as for the previous sample. The occurrence of *Azolla* in this sample is not in accord with Hills' zonal concept, but the author has observed on a number of occasions that the occurrence of this genus in the *Pistillipollenites mcgregori* zone in the Princeton area.

R0025 C

Organic matter exactly as for sample R0025 A. Thermal index 1.4. Fossils less varied. *Azolla* and *Rimaesporites alipollenites*, together with abundant fungal hyphae and spores, are common. Coniferous tracheids are very abundant in this sample. The sample appears to have been deposited in a fresh water, low energy, environment and appears to represent, in large part, drifted wood.

R0027P

Organic matter 85% bacterial amorphous, with a little fungus. No spores or pollen. This sediment was deposited in a low energy, reducing, environment and is typical of sediment formed in stagnant water.

<sup>0</sup>  
R0039P

Organic matter 100% bacterial amorphous and very similar to that from the previous sample. Environmental interpretation as for that sample. Thermal alteration index indeterminate in the absence of spores or pollen.

Zonation of the Eocene Sediments of the Princeton Group and  
Radiometric age determinations

Palynological Zones

Preparations in Authors Collection

PISTILIPOLLENITES MCGREGORII ZONE Bisaccates dominant		Bramley #1	R0025A
		Parr Railroad Locality	R0025B R0025C
Taxodium dominant			? R0024
			H00116
COAL ZONE	PRINCETON BLACK COAL	Lamont Creek Coal	H0013
	Collins Gulch Bentonite 46.8my.	Princeton Coal	H0014
AZOLLA ZONE	Princeton Ash 48 - 50my.	Vermilion Bluffs	H0004 H0006 H0007
	Tranquille dolerite 49 + 2my		
BISACCATE ZONE		Asp Creek	? R0039P ? R0040P
	Tranquille Ash 48 - 50my.	Tranquille locality	
			R0004B
	Princeton Biotite Rhyolite 50my.		

R0040P

Organic matter carries 65% fungal remains, 1% fungal spores and 23% bacterial amorphous material. Thermal index ? 1.4.. No other fossils. This sample is possibly about the same age as the lower part of the *Azolla* zone, since the organic composition and fungal content appear to be about the same.

### Conclusions

Apart from sample R0014, which carries a palynological assemblage indicating a Recent age, all of the samples examined are Tertiary in age, and all can be included within the Allenby Formation of the Princeton area of southern British Columbia. All assemblages that can be dated with any confidence, fall within the lower portion of the Middle Eocene to the upper part of the Lower Eocene, an age range that is in agreement with the 46.8 - 50 m.y. age range determined by radiometric dating.

Environmentally, the sequence is of terrestrial to fresh-water origin, including fresh water stream and swamp deposits and, possibly, soil horizons. It appears possible that, in the area in Tertiary time, there was significant topography and that delta systems drained relatively small catchment areas into lakes and swamps, in much the same manner that we observe at the present. The floras indicate that the climate may have been a little warmer than at the present, but that it was no warmer than temperate. A suggested tentative correlation chart including the submitted samples is attached and organic matter determinations are appended.



Stanley A.J. Pocock

SAJP/sajp.

AREA: B.C. Coal Reconnaissance

SAMPLE NUMBER	R0004B	R0001	R0002
LOCATION/AGE			
AMORPHOUS MAR.	} 04	} 03	} 02
TERR.			
GREY	01	00	00
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	20	00	+
BIODEGRADED TERR.	30	00	01
STRUC. TERR.	43(finely commin.)	97	98 (fungi)
INERT	02	00	00
T. A. I.	1.5	Indeterminate	1.4

SAMPLE NUMBER	R0004A	R0014P	R0024PA
LOCATION/AGE		Recent	
AMORPHOUS MAR.	} 03	00	} 03
TERR.			
GREY	01	00	10(bacterial)
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	02	60	02(fungal spores)
BIODEGRADED TERR.	15	00	15
STRUC. TERR.	53(5% fungi)	20	50
INERT	25	20	20(pyritic)
T. A. I.	1.5	1.0	1.6

SAMPLE NUMBER	R0024PB	R0025A	R0025B
LOCATION/AGE		Lower Eocene	Lower Eocene
AMORPHOUS MAR.	} 03	} 02	} 03
TERR.			
GREY	02	00	00
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	05(fungal spores)	03	02
BIODEGRADED TERR.	30	65	20
STRUC. TERR.	40	30	75
INERT	20	00	00
T. A. I.	1.6	1.4	1.4

AREA:  
P.C. Coal Reconnaissance

SAMPLE NUMBER	R0025C	R0027P	R0039P
LOCATION/AGE	Lower Eocene		
AMORPHOUS MAR.	} 02	10	00
TERR.			00
GREY	00	85 (Bacterial)	100(Little O.M.)
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	03	+	00
BIODEGRADED TERR.	65	00	00
STRUC. TERR.	30	00	00
INERT	00	05	00
T. A. I.	1.4	Indeterminate	Indeterminate

SAMPLE NUMBER	H0004A	H0006	H0007
LOCATION/AGE			
AMORPHOUS MAR.	} 03	} 07	} 05
TERR.			
GREY	01	01	01
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	02	01	03
BIODEGRADED TERR.	15	30	75
STRUC. TERR.	53(5% fungi)	60 (10% fungi)	15
INERT	25	01	01
T. A. I.	1.5	1.6	1.6

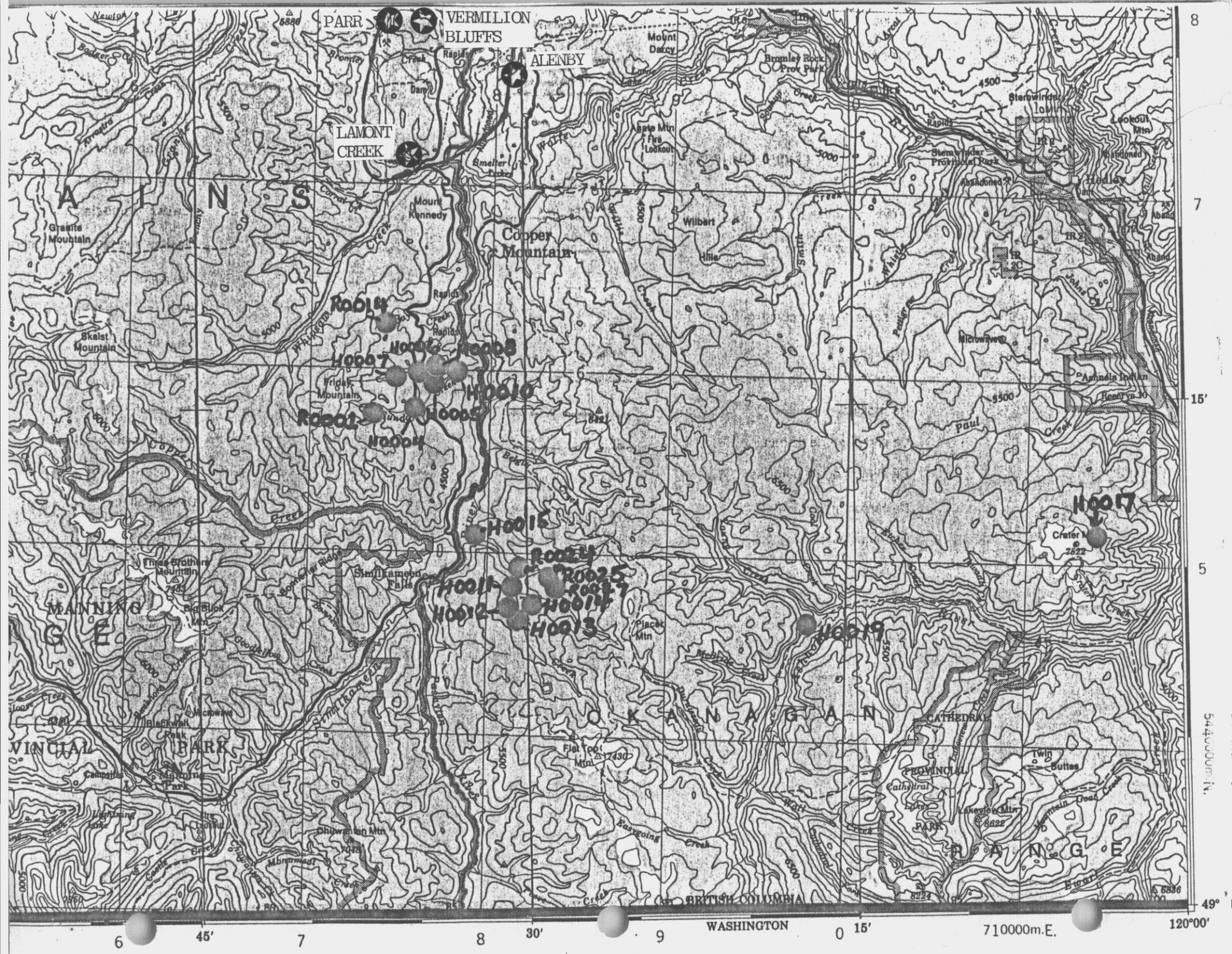
SAMPLE NUMBER	H0008	H0010	H0011A
LOCATION/AGE			
AMORPHOUS MAR.	00	} 02	} 00
TERR.	00		
GREY	00	04	00
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	00	00	+
BIODEGRADED TERR.	03 (fungal hyphae)	00	02
STRUC. TERR.	95	04	48 (woody)
INERT	02	90 (pyritic)	50(woody)
T. A. I.	1.5	1.6	2.0+

AREA: B.C. Coal Reconnaissance

SAMPLE NUMBER	H0013	H0015	H0017
LOCATION/AGE			
AMORPHOUS MAR.	} 06	NO ORGANIC MATTER	NO ORGANIC MATTER
TERR.			
GREY	02		
STRUC. AQUEOUS	00		
POLLEN & SPORES	02		
BIODEGRADED TERR.	60(2 pres. states)		
STRUC. TERR.	10		
INERT	20		
T. A. I.	2.6		

SAMPLE NUMBER	H0014	H00106	H0116
LOCATION/AGE			
AMORPHOUS MAR.	} 00	} 05	00
TERR.			00
GREY	01	20	00
STRUC. AQUEOUS	00	00	00
POLLEN & SPORES	+	50	00
BIODEGRADED TERR.	40	20	10
STRUC. TERR.	40 (Matrix)	25	70
INERT	1.5	00	00
T. A. I.		1.4	Indeterminate

SAMPLE NUMBER	H0014		
LOCATION/AGE			
AMORPHOUS MAR.	00		
TERR.	00		
GREY	01		
STRUC. AQUEOUS	00		
POLLEN & SPORES	+		
BIODEGRADED TERR.	19		
STRUC. TERR.	40		
INERT	40 (Matrix)		
T. A. I.	1.5		



PARR VERMILION BLUFFS

ALLENBY

LAMONT CREEK

Copper Mountain

Rob 14

Rob 07

Rob 06

Rob 08

Rob 01

Rob 04

Rob 05

Rob 15

Rob 24

Rob 25

Rob 11

Rob 12

Rob 14

Rob 13

Rob 19

Rob 17

A T N S

MANNING G E

VINCIA PARK

O K A N A G A N

CATHEDRAL

PROVINCIAL

R A N G E

BRITISH COLUMBIA

WASHINGTON

6

45'

7

8

30'

9

0

15'

710000m.E.

120°00'

8

7

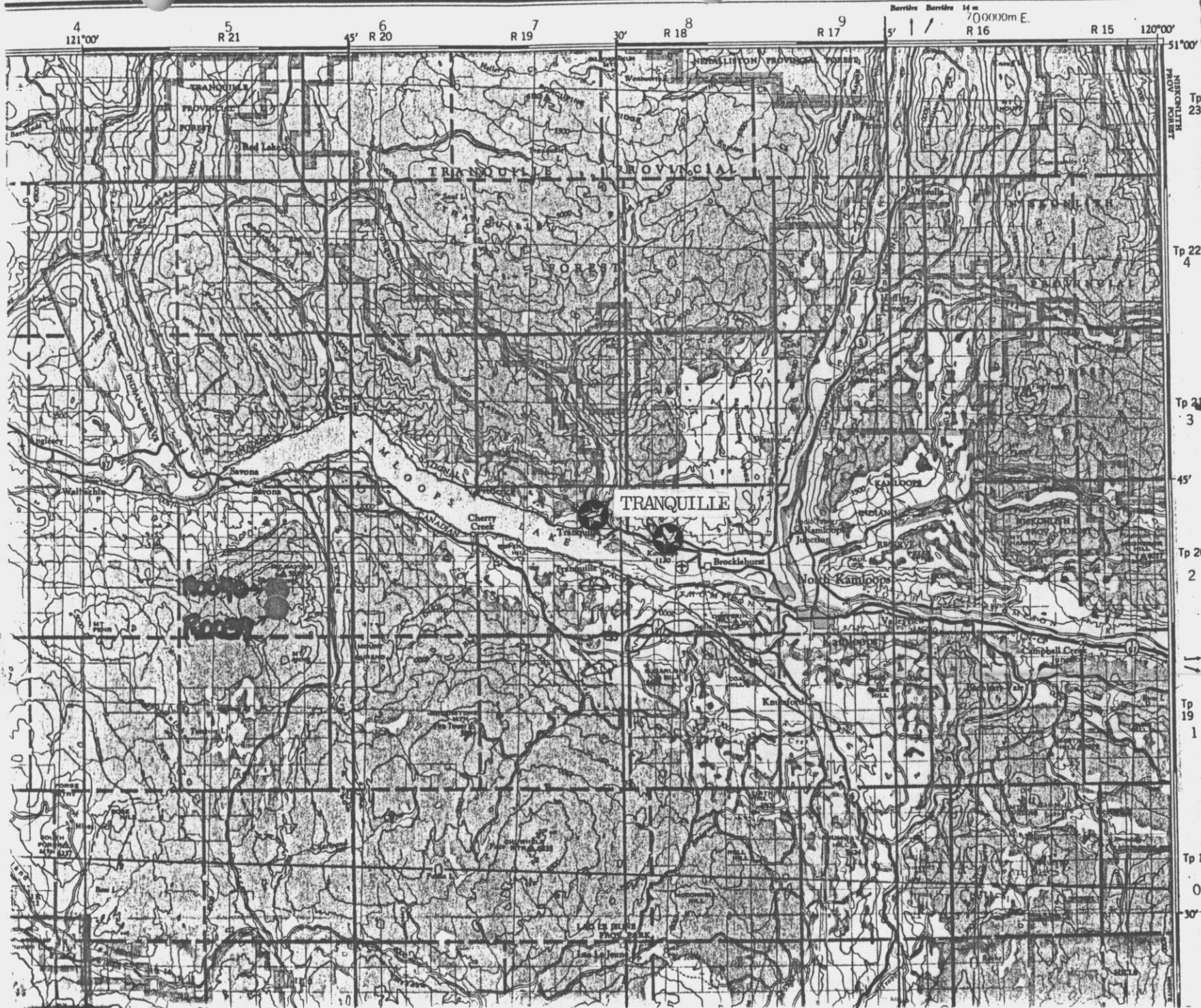
15'

5

49°

5440000m.N.





Military users,  
refer to this map as:  
Référence de cette carte  
pour usage militaire:

SERIES A 502  
MAP 92-I  
EDITION 2 MCE

N.B.  
75% RED.

Tp 23  
Tp 22  
Tp 21  
45'  
Tp 20  
Tp 19  
Tp 18  
0  
30'