UR1984-39 118

1984/39. Chemistry of Tertiary basalt and palynology of interbedded sediments from B.H.P. drill holes, E.L. 33/79.

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Abstract

The following study was undertaken, in co-operation with B.H.P. Exploration who provided the drill core, to get an understanding of the time-framework of the basalt flows, from palynology studies, and the chemical evolution of the basalts up the sequence, so that future exploration programmes, looking for mineralised horizons below the Tertiary basalt cover in the Burnie-Waratah area, can gauge the thickness of basalt cover before determining future drilling targets. An interpretative geological cross-section is included.

INTRODUCTION

As part of B.H.P.'s exploration programme over E.L. 33/79, numerous diamond-drill holes were drilled through the Tertiary basalt plateau to the east of Waratah.

After the 1981-82 summer season the authors were given access to the core of eight of these drill holes. The purpose of obtaining core samples was two-fold:

(1) to get an indea of the chemical variation within the Tertiary basalt;

(2) to obtain an age for the lava flows based on palynological data.

This preliminary report includes the chemical analyses of basalt samples collected (Table 1, 2) and a summary of the palynology. A schematic geological cross-section (fig. 2) is also included. This section is based on a combination of drill log data and surface mapping from the St Valentines Quadrangle.

PALYNOLOGY

Preliminary palynological investigation suggests two microfloras of different ages are present. The older microflora was recorded only from DDH WA1 at 224.0 m, but the younger microflora was found in sediments from DDH WA2, WA3, WA4, WY1, and WY2. The sediments in which the younger microflora occurs lie within a limited topographic interval and may form a continuous sedimentary deposit.

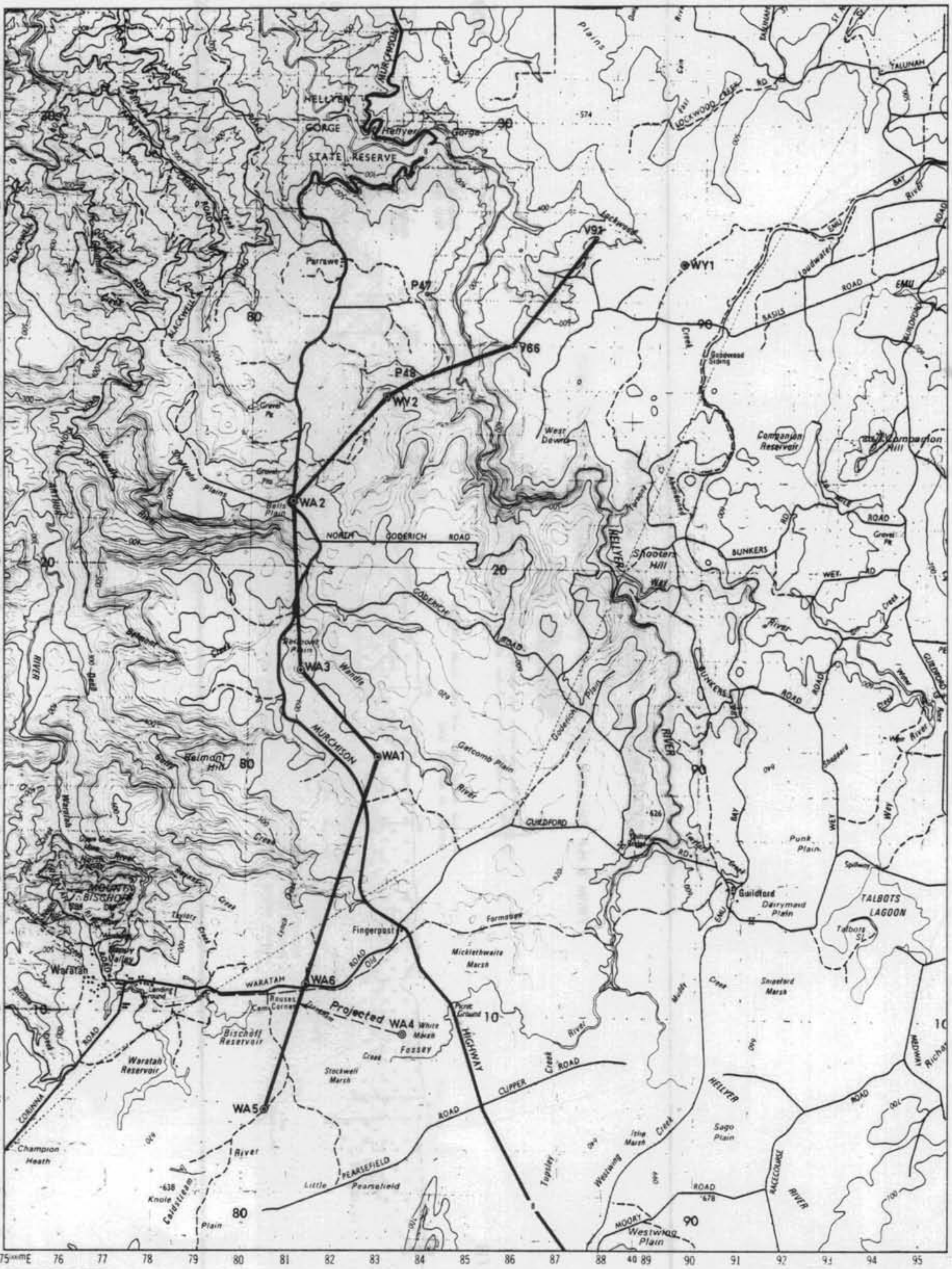
OLDER MICROFLORA - WA1, 224.0 m

Significant species occurring in this microflora include:

Nothofagidites falcatus (Cookson) Stover and Evans, 1973
Proteacidites tuberculatus Cookson, 1950
cf. *Ischyosporites gremius* Stover, 1973
Stereisporites (Tripunctisporis) sp.

In the Gippsland Basin *N. falcatus* appears first at the base of the

1 : 50 000 PROVISIONAL EDITION WARATAH SHEET No: 8015-III



CROWN COPYRIGHT RESERVED CONTOUR INTERVAL 20 METRES

LINE OF SECTION

SCALE 1: 50 000

∘ SPORE SAMPLE SITE ◉ B.H.P. DRILLHOLE

FIG. 1

DEPARTMENT OF MINES, TASMANIA

5039

[39-1a]

5 cm

[39-1b]

SCHEMATIC GEOLOGICAL SECTION

(LOOKING WEST)

FROM B.H.P. DRILLING AND DEPT. OF MINES ST. VALENTINES 1:50000 SHEET

HORIZONTAL SCALE 1:50000
VERTICAL SCALE 1:10000

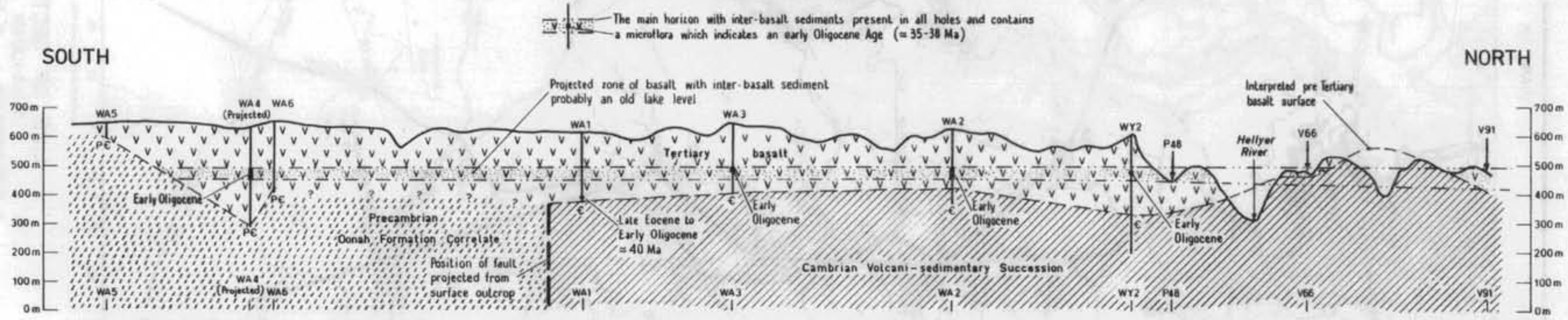


FIG. 2

DEPARTMENT OF MINES, TASMANIA

5040

5 cm

3/8

Lower *Nothofagidites asperus* Zone (middle Eocene) (Stover and Partridge, 1973), whereas in the Bass Basin the first occurrence of *N. falcatus* is at a slightly younger horizon (Partridge, 1973). *P. tuberculatus* first appears in the Upper *N. asperus* Zone of the Gippsland Basin and in the Middle *N. asperus* Zone of the Bass Basin close to the middle/late Eocene boundary. *I. gremius* does not range above the Upper *N. asperus* Zone. *S. (Tripunctisporis)* sp. similarly is not found above the Upper *N. asperus* Zone of the Gippsland Basin, but in the Bass Basin it ceases to be common at the top of the Middle *N. asperus* Zone, but ranges up into the *P. tuberculatus* Zone. The microflora therefore probably belongs to the Middle or Upper *N. asperus* Zones and an age of late Eocene into earliest Oligocene is indicated. This is supported by the absence of *Cyatheacidites annulatus* Cookson, 1947 from the microflora.

Of the samples collected for palynological study only three others were considered to be stratigraphically low enough to contain the older microflora. Unfortunately each of the three samples proved to be barren.

YOUNGER MICROFLORA

This microflora is characterised by the presence of *C. annulatus*. To test the significance of the absence of this species from the older microflora a large number of samples thought to contain the younger microflora was routinely prepared but not thoroughly scanned. Of 34 samples prepared, 29 contained *C. annulatus*. Of the remaining five samples, two were barren, one almost barren, one contained wood fragments but very few palynomorphs, and only one contained a diverse microflora from which *C. annulatus* was absent.

Some other palynomorphs present included:

Foveosporites palaequetrus Partridge, 1973
Foveosporites sp. nov.
Verrucosisporites kopukuensis (Couper) Stover, 1973
Verrucosisporites cristatus Partridge, 1973
Beaupreaidites verrucosus Cookson, 1950
Nothofagidites falcatus
Nothofagidites flemingii (Couper) Potonié, 1960
Triporopollenites chnosus Partridge, 1973
Periporopollenites vesicus Partridge, 1973

C. annulatus indicates the microflora is no older than the *P. tuberculatus* Zone and based on the Gippsland and Bass Basin sequences *F. palaequetrus*, *N. flemingii*, *B. verrucosus* and *P. vesicus* indicate the microflora is no younger than the *P. tuberculatus* Zone. Further, *N. flemingii* and *P. vesicus* suggest an upper age limit of the middle division of the *P. tuberculatus* Zone, and *B. verrucosus* an upper age limit of the lower division of the *P. tuberculatus* Zone (Stover and Partridge, 1973). The extent to which the zonal scheme developed by Stover and Partridge for the Gippsland Basin is applicable to Tasmania is not known, particularly for upland areas, however correlation with the Gippsland Basin suggests an Oligocene or early Oligocene age (based on *B. verrucosus*).

There are indications that in sub-alpine areas *N. flemingii* may have continued into the upper division of the *P. tuberculatus* Zone (early Miocene) or perhaps younger horizons (S.M. Forsyth, unpublished data) and it should be noted that *Nothofagus gunnii* Hooker, also a producer of *Nothofagus fusca* type pollen, still grows in Tasmania.

Although only preliminary studies have been undertaken on the samples no species were recorded that first appear in the middle or upper division of the *P. tuberculatus* Zone of the Gippsland Basin. This is in contrast to the presence of such species in the near-shore marine early Miocene rocks at Fossil Bluff, Wynyard.

Other features of the younger microflora include the presence of fern sporangia in one sample and the presence of palynomorphs reworked from the Lower Parmeener Super-Group, including the first record of *Dulhuntyispora dulhuntyi* Potonié amend. (WY2, 119.5 m) from Tasmania. *Dulhuntyispora* indicates the Lower Parmeener Super-Group upper marine rocks as a contributor to the sediment supply, whereas *Tasmanites* sp. and other palynomorphs are consistent with, although do not conclusively show, Lower Parmeener lower marine rocks forming part of the provenance.

CONCLUSIONS REGARDING AGE OF MICROFLORAS

The older microflora from 224.0 m, hole WA1, is pre *P. tuberculatus* Zone and probably late Eocene or earliest Oligocene in age. The younger microflora belongs to the *P. tuberculatus* Zone (early Oligocene - early Miocene) and is probably Oligocene, most likely early Oligocene in age.

REFERENCES

PARTRIDGE, A.D. 1973. Revision of the spore-pollen zonations in the Bass Basin. *Unpubl.palaeont.Rep.Esso Aust.Ltd.* 1973/4.

STOVER, L.E.; PARTRIDGE, A.D. 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proc.R.Soc.Vict.* 85:237-286.

[10 July 1984]

Table 1. LIST OF SAMPLES COLLECTED

Analysis no.	Drill Hole	Depth (m)	Field no.	Rock type
830755	WA4	140.0	C1724	Tertiary tholeiitic basalt
756	WA4	195.7	C1725	Tertiary tholeiitic basalt
757	WA4	105.0	C1716	Tertiary tholeiitic basalt
758	WA3	163.5	C1727	Tertiary transitional basalt (alkali/tholeiitic)
759	WA3	196.0	C1728	Tertiary alkali olivine basalt
760	WA3	278.7	C1729	Cambrian picritic lava
761	WA3	284.2	C1730	Cambrian picritic lava
762	WA6	150.0	C1731	Tertiary tholeiitic basalt
763	WA6	197.5	C1733	Tertiary transitional basalt
764	WY2	175.0	C1734	Tertiary tholeiitic basalt
765	WY2	218.0	C1735	Tertiary tholeiitic basalt
766	WY2	272.0	C1736	Tertiary alkali olivine basalt
767	WA2	113.0	C1737	Tertiary tholeiitic basalt
768	WA2	154.0	C1738	Tertiary tholeiitic basalt
769	WA2	186.0	C1739	Tertiary tholeiitic basalt
770	WY1	137.5	C1740	Tertiary tholeiitic basalt
771	WA1	221.0	C1741	Tertiary alkali olivine basalt
772	WA1	179.0	C1742	Tertiary tholeiitic basalt
773	WA1	144.0	C1743	Tertiary transitional basalt
774	WA1	96.0	C1744	Tertiary tholeiitic basalt

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Table 2. CHEMICAL ANALYSES OF BASALT SAMPLES. Analyses by Department of Mines Laboratories, Launceston

Reg. No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	TiO_2	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3	CO_2	H_2O^-	H_2O^+	NiO	Cr_2O_3
830755	48.01	13.17	3.76	6.49	1.49	0.13	8.09	8.77	0.34	2.10	0.25	0.10	0.17	3.18	3.22	0.02	0.03
756	49.85	13.64	1.77	8.43	1.45	0.14	8.59	7.74	0.57	2.76	0.28	0.11	0.87	1.45	1.88	0.02	0.04
757	47.06	13.27	3.28	7.85	1.38	0.16	7.56	9.81	0.39	1.85	0.24	0.07	0.18	2.59	3.53	0.02	0.04
758	49.21	13.54	2.98	7.43	1.75	0.13	8.57	7.39	1.11	2.65	0.32	0.07	1.03	1.39	2.16	0.01	0.04
759	45.72	13.36	1.09	10.21	1.73	0.16	9.07	7.47	0.83	2.96	0.38	0.14	5.32	0.23	1.11	0.02	0.03
760	36.84	7.30	1.93	5.60	0.27	0.13	7.43	22.58	0.00	0.42	0.05	0.10	3.50	5.18	8.52	0.17	0.41
761	39.97	8.75	2.01	6.49	0.40	0.16	5.43	23.51	0.06	0.23	0.05	0.13	0.34	4.28	8.27	0.15	0.41
762	47.10	13.22	3.31	7.77	1.52	0.14	7.01	9.50	0.72	1.83	0.25	0.18	0.15	2.24	4.49	0.02	0.03
763	48.62	13.53	3.14	7.79	1.55	0.14	7.85	8.47	0.86	2.53	0.40	<0.05	0.23	1.32	3.17	0.02	0.03
764	48.33	13.31	1.68	8.72	1.50	0.17	9.94	6.88	0.30	2.15	0.23	1.05	2.70	1.50	2.14	0.02	0.03
765	43.96	13.20	0.79	10.38	1.62	0.16	7.97	9.26	0.97	2.13	0.32	4.03	2.38	1.30	2.11	0.02	0.03
766	47.08	13.11	1.65	8.87	1.91	0.16	8.41	10.84	1.29	2.44	0.44	0.17	0.21	0.78	2.36	0.03	0.04
767	48.84	13.68	2.54	7.94	1.45	0.15	8.81	7.65	0.17	2.26	0.20	<0.05	0.11	3.24	2.17	0.02	0.03
768	49.39	13.26	1.00	9.79	1.62	0.15	8.92	7.50	0.82	2.51	0.25	<0.05	1.59	0.91	1.26	0.02	0.03
769	47.01	12.88	0.68	9.59	1.38	0.15	8.91	6.48	0.47	2.11	0.19	<0.05	7.16	0.50	1.57	0.02	0.03
770	46.53	13.05	3.43	7.51	1.56	0.15	8.62	8.55	0.36	1.91	0.26	<0.05	0.20	3.81	3.54	0.03	0.03
771	46.63	12.62	3.05	7.84	1.79	0.15	9.04	8.86	1.06	2.49	0.38	<0.05	1.05	1.17	3.03	0.03	0.04
772	49.05	13.64	3.42	6.75	1.55	0.16	9.32	6.47	0.33	2.56	0.29	<0.05	0.73	2.95	2.14	0.02	0.03
773	46.71	13.38	4.15	6.65	1.51	0.20	8.17	7.65	0.77	2.03	0.30	<0.05	0.70	3.29	3.63	0.02	0.04
774	50.56	14.04	1.23	9.37	1.73	0.15	8.86	7.80	0.98	2.86	0.31	0.09	0.07	0.68	0.94	0.01	0.04

Reg. No.	Sr	Rb	Y	Zr	Nb	Ni	Ba	Cr	V	Sc	Pb	As	Zn	Cu	Co
830755	330	10	20	95	13	140	145	230	125	17	23	<10	110	54	38
756	340	21	19	96	13	145	160	250	130	17	15	<10	110	38	40
757	250	12	16	93	8	190	110	240	130	16	10	<10	110	25	47
758	370	25	17	125	15	115	200	250	145	16	<4	<10	105	29	39
759	420	13	19	105	13	175	180	210	140	18	5	<10	125	51	46
760	51	6	8	10	<3	1300	25	2800	105	20	<4	<10	55	31	66
761	31	5	13	16	<3	1150	27	2800	145	28	<4	<10	63	58	69
762	240	20	17	92	11	165	115	210	125	13	<4	<10	115	40	43
763	350	19	20	110	17	180	180	240	140	18	<4	<10	115	47	45
764	270	12	18	87	6	155	83	210	130	18	<4	<10	115	41	43
765	570	16	18	110	14	190	105	230	140	15	<4	<10	110	40	46
766	470	26	20	145	29	210	220	270	160	18	<4	<10	100	39	49
767	250	7	19	84	4	160	60	240	130	18	<4	<10	110	47	38
768	280	20	21	105	9	155	110	230	145	19	<4	<10	115	43	46
769	230	15	17	80	4	155	105	230	130	18	<4	<10	105	38	39
770	260	11	20	96	9	200	120	230	150	17	<4	<10	110	44	47
771	470	25	19	120	25	230	280	270	155	15	<4	<10	99	43	42
772	350	10	19	92	12	125	105	230	135	18	<4	<10	105	36	43
773	280	21	20	100	13	160	125	250	135	16	<4	<10	105	29	41
774	360	22	19	120	14	115	180	260	150	19	<4	<10	105	36	43

Table 3. LIST OF SAMPLES FOR PALYNOLOGICAL EXAMINATION

Sample no.	Drill hole	Depth (m)	Microflora*
P439	WA1	224.0	O
P440	WA1	224.9	B
P441	WA2	134.4	Y
P442	WA2	135.3	Y
P443	WA2	135.5	Y
P444	WA2	137.45	Y
P445	WA2	139.4	Y
P446	WA2	142.5	Y
P447	WA2	146.6	Y
P448	WA2	163.8	Y
P449	WA3	150.4	Y
P450	WA3	151.4	Y
P451	WA3	151.8	Y
P452	WA4	144.55	Y
P453	WA4	149.2	Y
P454	WA4	149.4	Y
P455	WA4	150.0	Y
P456	WA4	166.4	Y
P457	WA4	167.4	Y
P458	WA4	168.4	Y
P459	WA4	169.4	Y
P460	WA4	170.4	Y
P461	WA4	171.4	B
P462	WY1	87.5	Y
P463	WY1	95.7	Y
P464	WY1	101.4	Y
P465	WY1	102.1	Y
P466	WY1	111.6	Y
P467	WY1	113.5	Rare Palynomorphs
P468	WY2	119.5	
P469	WY2	124.2	Y
P470	WY2	127.7	Y
P471	WY2	129.7	Y
P472	WY2	131.0	Y
P473	WY2	136.3	B
P474	WY2	137.1	Wood fragments, rare palynomorphs
P475	WY2	238.3	B
P476	WY2	143.1	B
P477	WY2	242.4	B
P33†	V66	Surface sample	Y
P34†	V91	Surface sample	Y
P47†		Surface sample	Y
P48†		Surface sample	Y

* O = older microflora, Y = younger microflora, B = barren

† Samples P33 and P34 collected by P. Lennox, Tasmania Department of Mines, 1979.
Samples P47 and P48 collected by P. Williams, Tasmania Department of Mines, 1979.