BASALTS OF THE KAMLOOPS GROUP IN SALMON RIVER AREA (82L/5)

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The Salmon River Valley is the site of several large landslides (Evans and Cruden, 1981) which are of some concern for road and power access to the Douglas Lake area to the west and regions beyond. Source of the slides appears to be mainly incompetent Tertiary basaltic units exposed on Douglas Lake Road 8.5 to 10.5 kilometres and 12.5 to 15 kilometres south from Westwold (*see* Fig. 26). This report considers the strati-stratigraphic setting and petrology of the basalts.

The total section of Tertiary rocks in the region exceeds 750 metres, comprising alternating lava flows and breccia. Reddish weathering augite porphyry, exposed on the upper faces of slide escarpments and in cliffs, is the uppermost unit in the local volcanic assemblage. This formation is approximately 450 metres thick north and west of the Salmon River and wedges out to the south where the unit laps onto pre-Tertiary formations. A grey aphanitic sequence of lavas and breccias below the augite porphyry thickens northerly toward Monte Hills, attaining maximum thickness of about 200 metres. The basal unit in the section is an assemblage of basaltic rocks 200 to 250 metres thick. It rests on pre-Tertiary argillites near the 17-kilometre marker on the Douglas Lake Road. The basalts are crumbly, dark brown, often highly vesicular, and occasionally rich in zeolites which fill cracks and amygdales. Tuffaceous bands with clay partings in the basaltic unit are glide surfaces for some of the landslide movement.

Correlation of the Salmon River volcanic rocks with other Tertiary sections is uncertain owing to the limited nature of detailed mapping in the area. The 'basalt assemblage' of this report is essentially the same as the 'basal beds and brown beds' of Evans and Cruden (1981). These appear to correlate with the Monte Lake Formation of Ewing (1981, p. 1472) and the Attenborough Creek Formation of Church (1980, 1982). The age of two samples of Salmon River basalt (Table 1) was determined by J. Harakal (University of British Columbia), by K/Ar analysis of whole rock specimens, as 48.6 and 49.4 Ma. These values are comparable to the results of 48±2 Ma reported by Mathews (1964) for the Attenborough Creek ash.

TABLE 1. WHOLE ROCK K/AR ANALYSIS OF TWO SALMON RIVER BASALT SAMPLES

Field No.	Latitude North	Longitude West	K %	Ar^{*40} (cc/gm)	Ar^{*40} %	Age (Ma)
EV-3	50°26.6'	119°54.3'	2.31	4.497	93.8	49.4±1.7
EV-5	50°22.4'	119°52.2'	1.88	3.597	95.2	48.6±1.7

TABLE 2. CHEMICAL ANALYSES AND NORMATIVE COMPOSITION OF TERTIARY VOLCANIC ROCKS IN THE SALMON RIVER AREA

	1	2	3	4	5	6	7	8	9	10	11	12	13
SiO_2	50.71	54.86	51.60	55.93	51.09	49.72	48.13	51.27	52.67	53.70	49.84	44.97	50.00
TiO_2	0.89	0.97	1.00	1.01	0.90	0.96	0.81	0.84	0.94	1.04	0.94	0.83	0.93
Al_2O_3	13.43	14.65	15.57	16.19	13.74	13.76	12.30	13.57	14.15	15.59	12.28	11.96	14.11
Fe_2O_3	1.55	2.30	3.37	3.14	1.48	6.26	6.23	7.44	3.39	3.01	1.81	5.46	6.66
FeO	6.65	5.31	4.28	4.41	6.59	1.60	1.79	0.86	4.05	4.05	7.23	3.04	1.16
MnO	0.15	0.12	0.17	0.13	0.15	0.12	0.14	0.11	0.14	0.12	0.16	0.14	0.11
MgO	10.09	5.78	6.32	4.37	10.14	6.73	10.07	7.07	7.33	5.11	13.29	10.31	5.80
CaO	8.26	6.50	8.53	6.91	8.26	7.78	6.48	7.22	6.82	7.76	8.29	8.05	8.03
Na_2O	2.99	2.41	3.17	2.93	2.63	1.69	2.82	2.66	2.66	3.01	2.35	1.28	1.72
K_2O	2.31	3.90	2.66	3.35	2.34	3.19	2.55	2.60	3.08	3.02	2.14	1.99	3.41
$+H_2O$	1.75	1.21	1.63	0.77	2.12	4.81	5.02	2.51	1.90	1.30	1.45	6.20	4.44
$-H_2O$	0.73	0.98	0.74	0.89	0.89	3.39	4.26	2.39	2.99	1.69	0.51	5.43	2.97
CO_2	0.20	0.35	0.19	0.20	0.25	0.10	0.47	0.33	0.79	0.77	0.26	0.84	0.30
S	0.012	0.012	<0.008	<0.008	0.008	<0.008	0.008	0.008	0.008	0.008	<0.008	<0.008	<0.008
P_2O_5	0.44	0.44	0.54	0.32	0.43	0.61	0.30	0.52	0.30	0.39	0.16	0.32	0.66
BaO	0.15	0.20	0.18	0.21	0.16	0.15	0.18	0.16	0.19	0.17	0.16	0.24	0.17
SrO	0.10	0.09	0.11	0.11	0.13	0.12	0.05	0.08	0.08	0.08	0.09	0.11	0.22
NiO	0.015	Tr.	Tr.	Tr.	0.015	Tr.	0.015	0.01	0.01	Tr.	0.015	0.015	Tr.
Cr_2O_3	0.025	0.01	0.01	Tr.	0.03	0.01	0.05	0.03	0.015	Tr.	0.05	0.05	0.01
					Molecular Norm								
Qt	-	2.93	-	4.37	-	5.06	-	3.83	1.32	2.07	-	1.51	5.38
Or	13.82	23.84	16.16	20.33	14.00	20.65	16.26	16.43	18.99	18.51	12.57	13.32	22.10
Ab	27.17	22.37	29.26	27.01	23.86	16.58	27.24	25.54	24.93	28.03	20.99	13.01	16.99
Ne	-	-	-	-	-	-	-	-	-	-	-	-	-
An	16.62	18.25	20.99	21.67	19.02	22.56	14.44	18.59	18.37	20.81	16.58	23.77	22.74
Wo	9.95	6.04	9.01	5.40	8.97	7.90	8.08	7.87	6.78	7.63	9.74	8.57	8.40
En	6.08	16.51	11.17	12.38	11.26	20.37	18.87	20.86	21.14	14.62	8.74	32.21	17.59
Fs	2.01	6.81	2.74	4.76	3.69	0.00	0.00	0.00	4.09	4.33	2.37	0.00	0.00
Fo	16.59	-	5.08	-	12.80	-	8.32	-	-	-	20.84	-	-
Fa	5.49	-	1.25	-	4.20	-	0.00	-	-	-	5.65	-	-
Il	1.25	1.40	1.43	1.44	1.26	1.47	1.22	1.25	1.37	1.50	1.30	1.30	1.42
Mt	1.64	2.55	3.62	3.37	1.56	1.88	2.65	0.27	3.70	3.26	1.88	6.04	0.82
He	0.00	0.00	0.00	0.00	0.00	3.53	2.91	5.36	0.00	0.00	0.00	0.27	4.55
Cor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Key to Analyses

1. Olivine basalt core from drill hole on north side of the Salmon River at 5.6 metres depth.
2. Platy jointed basaltic andesite from Shell Creek slide on B.C. Hydro access road.
3. Basal basalt east of Twig Creek (K/Ar dated).
4. Andesite from Adelphi Creek at Ford's water intake.
5. Olivine basalt from Campbell's road cut (K/Ar dated).
6. Altered lava in upper part of basalt section.
7. Oxidized olivine basalt from Campbell's road cut.
8. Oxidized basalt from base of section.
9. Andesite from road cut at Monte Lake.
10. Andesite from road cut at Monte Lake.
11. Olivine basalt on Woods Lake Road.
12. Pyroxene basalt from exposure on Salmon River.
13. Amygdaloidal basaltic andesite, near top of basaltic section.

The augite porphyry and grey aphanitic sequences overlying the basaltic formation correspond to the 'red beds and salmon beds' of Evans and Cruden (1981). They may correlate in part with the Tuktakamin Formation of Ewing (1981) near Monte Lake but there is no clear tie with the Tertiary section in the Terrace Mountain area.

Petrographic study of the basalts shows a predominance of small (less than 0.25-millimetre) laths of plagioclase along with an ample admixture of olivine, pyroxene, and magnetite grains; accessory biotite and apatite; scattered olivine and, less commonly, pyroxene phenocrysts. Amygdales and cracks are commonly filled with calcite, brown chlorite, and zeolites such as heulandite, chabazite, thomsonite, stilbite, and less frequently, stevensite, levyne, and offretite.

Except for the most felsic rock in the collection (No. 4), chemical analyses of volcanic rocks from the Salmon River area show relatively low alumina content, averaging 13.5 per cent (Table 2). Sample No. 4 is similar to an andesite (No. 10), from the Monte Lake area. Sample Nos. 1, 5, 7, and 11 are typical olivine basalts; No. 12 is pyroxene rich. These basalts tend to weather and disintegrate readily, especially the breccias and highly vesicular phases.

Basal basaltic rocks of the Kamloops Group in the Salmon River section bear greatest lithostatic pressure. Consequently, landslides occur along tuffaceous bands and other incompetent zones, particularly where the volcanic rocks are altered, highly vesicular, or fragmental. Weak zones are commonly intensely fractured and consist of red oxidized rocks with clay on slip surfaces and abundant calcite or zeolite in cracks and joint sets.

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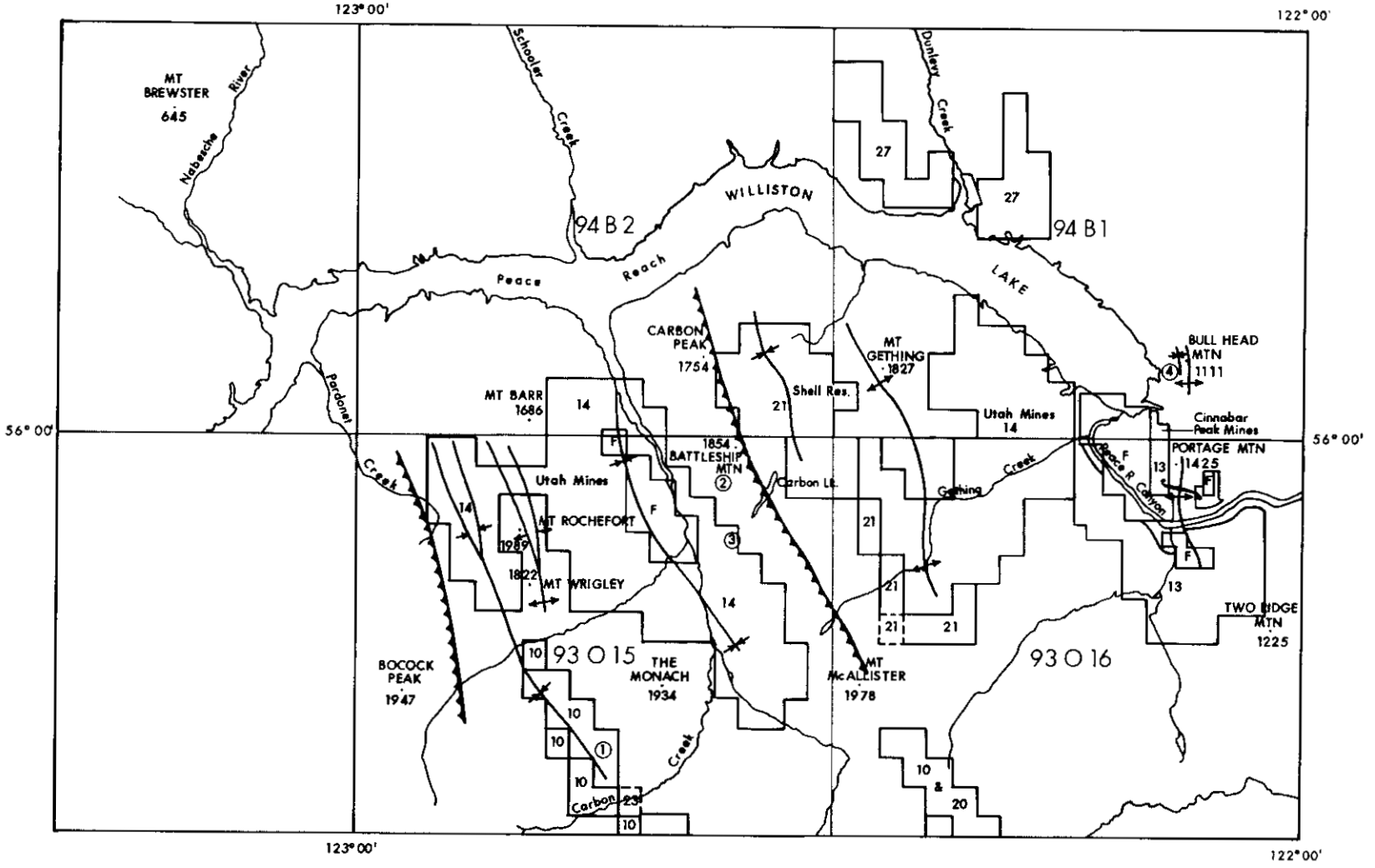

Figure 27. Coal licence boundaries, elements of structure, and locations of sections for Bullhead Mountain-Pardonet Creek area.