GEOLOGIC MAP OF THE KLICKITAT 15′ QUADRANGLE, WASHINGTON

by

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WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES

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DESCRIPTION OF MAP UNITS

Surficial Deposits

Qal — ALLUVIUM - Stream deposits of silt, sand, and gravel composed primarily of basaltic and andesitic clasts with lesser mixed lithologies; confined to canyon bottoms; deposited by Klickitat River

Qas — ALLUVIUM, sidestream facies - Stream deposits of silt, sand, and gravel composed almost entirely of basalt with rare reworked quartzite and other durable lithologies; confined to canyon bottoms or local depressions on upland surfaces; upland accumulations include lacustrine, eolian, and paludal deposits containing ash layers; deposited by tributaries of the Klickitat River

Qt — TERRACE DEPOSITS - Yellowish-gray to grayish-orange stream deposits of silt, sand, and gravel composed primarily of basaltic and andesitic clasts but containing lesser mixed lithologies; confined to canyon bottoms; deposited by the Klickitat River and its tributaries

Qls — LANDSLIDE DEPOSITS - Consists of basalt and lesser underlying or interstratified sedimentary deposits displaced by gravity movement; composed mainly of large internally intact blocks in a matrix of finer debris; maximum block dimension measured in hundreds of meters; multiple retrogressive failures (Varnes, 1978) occurring primarily at interformational contacts; top of the Grande Ronde Basalt most common basal slip surface, with most dips less than 5°; maximum thickness approximately 70 m

Basalt of Camas Prairie

Qb, Qb_1,Qb_2 — OLIVINE BASALT - Medium-gray to medium dark-gray; weathers pale yellowish-brown; olivine-plagioclase phyric; diktytaxitic with magnetite restricted to mesostasis; medium-grained; occurs as intracanyon flows within the canyon of the Klickitat River; Qb_2 nested in channels cut into Qb_1; Qb_1 consists of a series of superimposed flows or flow lobes 3 to 10 m thick, with local cumulative thickness of more than 120 m; Qb_2 occurs in an isolated remnant approximately 20 m thick; both generally have fair to well-developed columnar jointing; probably erupted from the King

Mountain fissure zone or vicinity south of Mount Adams (Sheppard, 1967a, 1967b; Hammond, 1980); late Pleistocene age inferred on the basis of whole rock K/Ar dates from King Mountain (Kienle and Newcomb, 1973)

Olivine Basalt of Simcoe Mountains

Qbs — OLIVINE BASALT - Gray to medium dark-gray; weathers yellowish-brown to grayish-orange; sparsely plagioclase/olivine phyric to aphyric; fine-grained; includes two intracanyon flows and associated minor volcaniclastic deposits within the canyon of the Little Klickitat River and its tributaries, but is a laterally extensive unit on upland surfaces east of the Klickitat quadrangle; preserved as isolated nested remnants commonly less than 20 m thick; a two-flow sequence overlying basaltic boulder conglomerate along the Little Klickitat River is middle Pleistocene in age (0.85 +/- 0.14 and 0.89 +/- 0.12 Ma); flows in intracanyon exposures have well-developed colonnades and entablatures in contract to typical blocky columnar jointing on upland surfaces; the source vent for the older intracanyon flow of the Little Klickitat River sequence is Lorena Butte near Goldendale

Tpvs — VENT FACIES (undifferentiated) - Red to dark gray cinder and scoria of basaltic composition; product of vent and near vent eruptive processes; includes bombs, spatter, cowpie pahoehoe, breccia agglutinate; occurs in cinder cones up to 100 m tall; mostly unconsolidated and poorly sorted; Pliocene in age; vents occur along strike-slip faults or atop anticlinal uplifts of the Yakima Fold Belt

Tpbs — OLIVINE BASALT - Medium-gray to medium dark-gray; weathers light brown to pale yellowish brown; plagioclase phyric; commonly trachytic with early formed magnetite crystals; fine- to medium-grained, in places glassy; rare to abundant plagioclase and olivine phenocrysts; plagioclase phenocrysts commonly up to 1.5 cm long; generally occurs in stacked flow sequences; contains lesser interstratified volcaniclastic deposits; collective thickness up to 220 m; jointing highly varied among flows but relatively consistent within a single flow; most intracanyon flows have well-developed colonnade and entablature, while thinner flows capping upland surfaces tend to have columnar jointing; erupted from vents east of the Klickitat River (Sheppard, 1967a) from which flows spread out and filled channels ancestral to the present river; early to late Pliocene in age based upon whole rock K/Ar dates of 3.42 +/- 0.11 and 4.81 +/- 0.22 m.y.; includes flows with reversed and normal polarity (NRM*)

*NRM refers to natural remanent magnetization; determined in the field with a portable fluxgate magnetometer

Tpb OLIVINE BASALT - Older basalt of probable Cascadian affinity; petrologically and chemically similar to Qb_1 and Q_{h2}, but interstratified with Olivine Basalt of Simcoe Mountains of early Pliocene age at Grayback Mountain

Ellensburg Formation

Teu UPPER ELLENSBURG FORMATION - Gravel, sand, silt, and clay; light-brown to yellowish-gray; weakly to moderately indurated fluvial and volcaniclastic deposits; conglomerate is most abundant; predominantly basaltic and andesitic clasts but contains a small fraction of metamorphic clasts including quartzite; the last are numerically significant in some areas; conglomerate has sandy matrix that is mostly nonmicaceous; maximum thickness approximately 15 m; strong Cascadian component suggests that sediment was deposited by streams tributary to the ancestral Columbia River located to the south. Conformably overlies Columbia River Basalt Group and is unconformably overlain by Olivine Basalt of the Simcoe Mountains, suggesting a late Miocene age

Ter RATTLESNAKE RIDGE member of Schmincke (1967) - Conglomerate, sandstone, and siltstone; light-brown to yellowish-gray; moderately to well-indurated fluvial deposits; bedded to cross-bedded micaceous quartzitic sandstone overlain by pebble to cobble quartzite-bearing conglomerate; combined thickness approximately 20 m; sandstone is well cemented and stands in relief in natural exposures; main channel deposit confined to the canyon of the ancestral Columbia River; only known exposure is in the Klickitat River canyon north of Grayback Mountain

Columbia River Basalt Group

Yakima Basalt Subgroup

Saddle Mountains Basalt

Tem ELEPHANT MOUNTAIN MEMBER - Dark-gray; weathers light brownish-gray to light olive-gray; fine-grained to glassy; aphyric; well-developed colonnade and entablature; Elephant Mountain chemical type (Wright and others, 1973); normal magnetic polarity (NRM); occurs as an intracanyon flow within channel of ancestral Columbia River; less than 15 m thick; appears to be conformable above underlying Rattlesnake Ridge Member and Pomona Member; did not overtop canyon rim; age approximately 10.5 m.y. (McKee and others, 1977)

Tp POMONA MEMBER - Dark-gray; weathers light brownish-gray to light olive-gray; fine-grained; abundant to rare white to colorless phenocrysts of plagioclase up to 1 cm long but generally less than 5 mm; rare phenocrysts of olivine up to 0.5 mm across; plagioclase phenocrysts commonly occur as prismatic single crystals but also occur as glomerocrysts; well-developed colonnade and entablature; latter has a characteristic vertical, narrow columnar texture; Pomona chemical type (Wright and others, 1973); reversed magnetic polarity (NRM); occurs exclusively as an intracanyon flow along the north side of Grayback Mountain; occupies a paleochannel, at least 120 m deep, of the ancestral Columbia River (Bentley and others, 1980); thickness is more than 50 m (base not exposed); age approximately 12 m.y. (McKee and others, 1977)

Wanapum Basalt

Tpr PRIEST RAPIDS MEMBER - Medium dark-gray; weathers light-brown but locally yellowish-gray; medium-grained; generally aphyric but contains scattered plagioclase glomerocrysts 0.5-1.0 cm long; blocky columns to vertically platy; pillowed at base locally; Rosalia chemical type (Swanson and others, 1979); reversed magnetic polarity (NRM); age approximately 13.6 m.y.

Tr ROZA MEMBER - Medium dark-gray; weathers pale brown to yellowish-gray; fine- to medium-grained; abundant plagioclase phenocrysts usually less than 1 cm long, with single crystals more numerous than glomerocrysts;flow top is aphyric locally; pillowed at base in some areas; usually has well-developed colonnade, but entablature is present where flow thins near its margins; closely resembles the basal Frenchman Springs flow; Frenchman Springs chemical type; usually has normal magnetic polarity (NRM) (TRM is transitional, according to Swanson and others, 1979)

FRENCHMAN SPRINGS MEMBER, undifferentiated - Consists of a sequence of three to five flows that are individually distinguishable but are not formally named; these flows are categorized here under the general headings, upper, middle, and lower; most sections contain three to four flows with all three types represented. The descriptions presented here and supporting geochemistry are intended to facilitate correlation with formally named units when established

Tfu UPPER SEQUENCE - medium dark-gray, with blue tint in some areas; weathers moderately yellowish-brown to light-brown, top locally pale reddish-brown; fine- to coarse-grained; generally aphyric but contains rare plagioclase phenocrysts up to 1.5 cm long; irregularly columnar to vertically platy jointing; mostly 1 flow approximately 16 m thick, but a second flow occurs in the southern part of the area

Tfm MIDDLE SEQUENCE - medium dark-gray; weathers pale yellowish-brown to moderate yellowish-brown; medium-grained; aphyric to phyric; phenocrysts are rare to abundant where present, with individual crystal clusters up to 2.5 cm; commonly has well-developed blocky to platy lower colonnade; center of flow commonly vertically platy; one flow approximately 60 m thick except in southern Swale Creek canyon where a second thin flow is present

Tfl LOWER SEQUENCE - medium dark-gray; weathers light-brown or pale-brown to yellowish-gray; medium-grained; phyric with abundant phenocrysts of plagioclase; glomerocrysts are commonly 1 to 1.5 cm in diameter; mostly one flow but two flows locally present with a collective thickness of approximately 60 m. Lowest flow commonly has well-developed colonnade and entablature and lithologically resembles the Roza Member; only intermittently present with distribution noncoincident with present structural low areas; in many places overlies sediment and is commonly pillowed at its base. Uppermost flow is generally aphyric at its top to a depth of 5 to 10 m, has blocky to platy columnar jointing, and is present throughout the area. Sediment underlying these flows usually consists of tuff or sandstone of the Vantage Member of the Ellensburg Formation; it is usually less than 2 m thick and therefore was not shown as a separate map unit

Grande Ronde Basalt

Aphyric to very sparsely plagioclase phyric; generally fine- to very fine grained with relatively uniform lithologic and petrographic characteristics; thickest formation of units thus far discussed; maximum exposed section occurs in the Klickitat River area at Grayback Mountain where 14 flows have a combined thickness of over 700 m; no formal members but divisible informally on the basis of MgO content into two chemical types, high and low MgO; also divisible into informal magnetostratigraphic units on the basis of paleomagnetic polarity (Swanson and others, 1979)

Tgn_2h Flows of high MgO content and normal magnetic polarity, upper part of N_2 of Swanson and others (1979) - Medium dark-gray to dark gray; weathers light-brown to pale yellowish-brown; many flows are phyric with prismatic plagioclase phenocrysts less than 3 mm long; fine- to medium-grained; includes five to seven flows of high MgO chemical type with a cumulative thickness of approximately 200 m; many flows consist of a series of flow lobes; fair to well- developed blocky to platy colonnades are characteristic and entablatures rare

Tgn_2l Flows of low MgO content and normal magnetic polarity; lower part of N_2 of Swanson and others (1979) - Dark gray; weathers light brownish-gray to light olive-gray but locally yellowish-gray; aphyric except for the uppermost flow which contains sparse to abundant plagioclase glomerocrysts less than 5 mm long; fine- to very fine grained; Grayback Mountain section includes three flows with a cumulative thickness of approximately 190 m; elsewhere in the Klickitat area, this unit is restricted to the cores of anticlinal folds; all flows have well-developed hackly entablatures comprising 75 percent or more of the overall flow thickness; colonnades are well-developed with prismatic and in places platy jointing

Tgr_2 Flows of reversed magnetic polarity; R_2 of Swanson and others (1979) - Dark-gray; weathers light brownish-gray to light olive-gray but locally yellowish-gray; mostly aphyric with some flows containing rare phenocrysts less than 5 mm long; fine- to very fine grained; exposed only at Grayback Mountain where section includes four major flows and two thin flow lobes with a total thickness of approximately 230 m; jointing is varied; colonnades well-developed in some flows and entablatures in others; entablatures absent in some flows; vertical and horizontal platy joints present; pillows at the base of some flows; vesicles are commonly zeolitized

Tgn_1 Older flows of normal polarity; N_1 of Swanson and others (1979) - Medium dark-gray to dark-gray, with slight green tint; weathers light brownish-gray to light olive-gray but locally yellowish-gray; aphyric and fine-grained; exposed only within the anticlinal core of Grayback Mountain; appears to be a single flow of uncertain overall thickness (base not exposed); pervasively fractured; jointing patternless; somewhat altered and vesicles zeolitized

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Major Element Analyses of rocks from the Klickitat 15 minute quadrangle, Klickitat County, Washington
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SAMPLE NO.	GEOLOGIC UNIT	SiO2	Al2O3	Fe2O3	FeO	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	TOTAL	QSEC	SEC	TWP	RGE
JA81-078	Qb1	50.78	17.43	2.00	8.22	8.11	9.71	1.92	0.20	1.28	0.17	0.17	99.82	NE/4,SW/4	31	6N	14E
JA81-095	Qb2	51.47	17.01	2.00	8.13	8.37	9.36	1.73	0.31	1.29	0.17	0.17	99.84	SW/4,NE/4	25	6N	13E
JA83-046	QTb	50.55	16.84	2.00	10.62	5.15	6.96	2.85	1.36	2.77	0.73	0.17	99.83	NW/4,NW/4	20	4N	14E
JA83-058	QTb	51.49	16.79	2.00	8.43	5.39	6.53	3.77	2.31	2.40	0.73	0.16	99.84	NE/4,SW/4	10	4N	14E
JA79-179	Tpbs	49.18	16.00	2.00	11.37	4.89	7.92	3.09	1.30	2.80	0.64	0.18	99.19	NW/4,NW/4	2	5N	14E
JA79-203	Tpbs	50.81	16.45	2.00	9.18	5.47	9.04	2.87	0.96	2.70	0.36	0.16	99.84	SE/4,NE/4	23	6N	13E
JA79-204	Tpbs	50.89	16.52	2.00	9.08	5.16	9.13	2.79	1.16	2.74	0.36	0.16	99.83	SW/4,NW/4	24	6N	13E
JA79-208	Tpbs	50.32	16.65	2.00	8.89	7.67	9.16	2.45	0.94	1.49	0.26	0.17	99.83	SW/4,NW/4	24	6N	13E
JA81-083	Tpbs	52.19	16.68	2.00	8.44	5.83	8.69	1.94	0.99	2.72	0.36	0.15	99.84	NW/4,NW/4	30	6N	14E
JA81-086	Tpbs	51.72	17.21	2.00	8.54	5.50	8.78	2.19	0.86	2.69	0.35	0.15	99.84	SW/4,NE/4	25	6N	13E
JA81-090	Tpbs	49.34	16.83	2.00	9.92	6.86	8.67	2.19	0.93	2.69	0.39	0.17	99.82	NE/4,NE/4	25	6N	13E
JA81-092	Tpbs	48.98	16.84	2.00	10.19	6.77	8.52	2.34	0.99	2.79	0.40	0.17	99.82	SW/4,NW/4	24	6N	13E
JA83-016	Tpbs	50.60	15.91	2.00	11.23	4.89	7.74	2.91	1.10	2.86	0.58	0.18	99.82	SW/4,NE/4	5	5N	14E
JA83-025	Tpbs	49.72	16.66	2.00	10.98	6.06	6.69	2.48	1.48	3.16	0.59	0.18	99.82	SW/4,NW/4	25	6N	14E
JA83-044	Tpbs	50.73	15.58	2.00	9.70	6.66	8.60	2.42	0.91	2.77	0.46	0.18	99.83	NW/4,SW/4	19	4N	14E
JA83-054	Tpbs	51.20	15.76	2.00	9.94	5.80	8.74	2.41	0.87	2.69	0.41	0.18	99.82	NE/4,SE/4	11	4N	14E
JA83-069	Tpbs	48.87	15.36	2.00	10.70	6.46	8.40	3.03	1.34	3.08	0.57	0.18	99.81	NW/4,SW/4	2	5N	14E
JA81-088	Tpb	51.30	16.86	2.00	9.31	8.27	8.89	1.64	0.29	1.13	0.14	0.17	99.83	NW/4,NE/4	25	6N	13E
JA81-089	Tpb	51.05	17.37	2.00	9.84	7.51	9.09	1.62	0.15	1.04	0.15	0.18	99.82	NE/4,NE/4	25	6N	13E
JA81-093	Tpb	50.23	16.74	2.00	9.60	8.26	9.45	2.12	0.14	1.12	0.15	0.18	99.81	SW/4,NW/4	24	6N	13E
JA83-008	Tpr,Rosalia	51.26	13.48	2.00	13.11	4.40	7.86	2.07	1.32	3.57	0.68	0.25	99.75	SW/4,SE/4	20	5N	13E
JA83-009	Tpr,Rosalia	51.26	13.69	2.00	12.96	4.41	8.11	1.88	1.23	3.53	0.66	0.27	99.73	NE/4,NW/4	28	5N	13E
JA83-012	Tpr,Rosalia	50.29	13.33	2.00	13.38	4.55	8.23	2.26	1.26	3.73	0.69	0.27	99.72	SE/4,NE/4	25	5N	12E
JA83-045	Tpr,Rosalia	50.96	13.64	2.00	13.21	4.38	8.23	1.63	1.37	3.66	0.67	0.25	99.75	SE/4,SE/4	29	4N	14E
JA79-205	Tf	51.92	14.71	2.00	10.69	3.77	9.06	2.60	1.52	2.98	0.51	0.23	99.76	SE/4,NW/4	24	6N	13E
JA83-003	Tf	52.82	14.12	2.00	11.79	4.25	7.97	2.01	1.34	2.97	0.48	0.24	99.75	NE/4,NE/4	7	5N	13E
JA83-005	Tf	52.21	14.26	2.00	11.98	4.36	8.02	2.31	1.19	2.94	0.51	0.22	99.78	SE/4,NW/4	18	5N	13E
JA79-173	Tfu,Sent. Gap	51.39	14.07	2.00	12.66	4.08	7.82	2.87	1.40	2.95	0.54	0.22	99.78	NW/4,NW/4	33	6N	14E
JA79-180	Tfu,Sent. Gap	51.55	14.18	2.00	12.38	4.16	8.04	2.58	1.33	2.99	0.56	0.23	99.77	NE/4,NW/4	34	6N	14E
JA79-191	Tfu,Sent. Gap	51.13	14.04	2.00	12.90	4.32	7.78	2.82	1.40	2.83	0.54	0.23	99.76	SW/4,NW/4	11	4N	13E
JA81-098	Tfu,Sent. Gap	51.86	14.41	2.00	12.72	4.39	7.60	1.98	1.27	3.02	0.54	0.22	99.79	NE/4,NE/4	17	5N	14E
JA83-015	Tfu,Sent. Gap	52.39	14.00	2.00	12.30	4.26	7.94	2.02	1.23	3.06	0.54	0.26	99.74	NW/4,NW/4	25	5N	13E
JA83-024	Tfu,Sent. Gap	52.56	13.82	2.00	12.32	4.22	7.58	2.32	1.33	3.07	0.56	0.23	99.78	SW/4,NW/4	25	6N	14E
JA83-039	Tfu,Sent. Gap	52.47	13.90	2.00	12.60	4.04	7.78	2.11	1.20	3.12	0.55	0.23	99.77	NE/4,NW/4	12	4N	12E
JA83-042	Tfu,Sent. Gap	52.89	14.20	2.00	11.73	3.73	8.06	2.30	1.20	3.10	0.56	0.22	99.77	NW/4,SW/4	5	4N	13E
JA83-064	Tfu,Sent. Gap	52.49	14.08	2.00	11.88	4.13	7.75	2.39	1.45	3.07	0.54	0.22	99.78	SW/4,SE/4	10	4N	14E
JA83-065	Tfu,Sent. Gap	52.67	14.11	2.00	12.15	3.94	7.72	2.12	1.45	3.04	0.58	0.23	99.78	SE/4,SE/4	10	4N	14E
JA83-068	Tfu,Sent. Gap	52.12	14.10	2.00	12.23	4.00	8.00	2.24	1.44	3.09	0.56	0.22	99.78	NE/4,SW/4	11	5N	14E
JA79-175	Tfm,Sand Hol.	51.71	14.25	2.00	12.02	4.44	8.14	2.60	1.31	2.85	0.48	0.22	99.80	SW/4,NW/4	29	6N	14E
JA79-213	Tfm,Sand Hol.	51.25	14.14	2.00	12.68	4.46	8.08	2.49	1.27	2.90	0.49	0.22	99.76	SW/4,NW/4	28	6N	13E
JA79-216	Tfm,Sand Hol.	51.04	14.21	2.00	12.52	4.58	8.21	2.54	1.31	2.87	0.49	0.23	99.77	SW/4,NW/4	27	6N	13E
JA81-097	Tfm,Sand Hol.	52.52	14.41	2.00	12.30	4.60	7.73	1.69	1.16	2.92	0.48	0.20	99.81	SW/4,SE/4	8	5N	14E
JA83-063	Tfm,Sand Hol.	52.46	13.99	2.00	11.94	4.45	7.78	2.49	1.22	2.94	0.50	0.23	99.77	NE/4,SW/4	10	4N	14E
JA83-087	Tfm,Sand Hol.	52.77	14.14	2.00	11.94	4.27	7.92	2.23	1.16	2.87	0.49	0.21	99.79	SW/4,NE/4	14	4N	14E
JA79-183	Tfl	50.17	15.77	2.00	10.06	5.70	8.83	2.98	1.02	2.81	0.48	0.19	99.82	NE/4,NW/4	16	4N	14E
JA81-096	Tfl,Silver F.	50.55	14.27	2.00	13.28	4.48	8.23	1.93	1.27	3.20	0.56	0.23	99.77	NE/4,SW/4	8	5N	14E
JA83-061	Tfl,Silver F.	52.49	14.00	2.00	12.37	4.21	7.69	2.14	1.23	3.10	0.55	0.22	99.78	NE/4,SW/4	10	4N	14E
JA83-062	Tfl,Silver F.	51.88	13.97	2.00	12.70	4.37	7.83	2.08	1.34	3.06	0.54	0.23	99.77	SW/4,NE/4	10	4N	14E
JA79-217	Tfl,Ginkgo	51.08	14.14	2.00	13.00	4.08	7.94	2.40	1.57	2.95	0.61	0.25	99.75	NE/4,SW/4	32	6N	13E
JA81-079	Tfl,Ginkgo	52.16	14.45	2.00	12.08	4.36	7.98	1.63	1.40	3.11	0.59	0.22	99.76	NW/4,NE/4	28	6N	13E
JA83-001	Tfl,Ginkgo	52.55	13.94	2.00	12.43	4.14	7.73	2.03	1.30	3.07	0.57	0.23	99.76	SE/4,SW/4	4	5N	13E
JA83-011	Tfl,Ginkgo	52.20	13.99	2.00	12.37	4.25	7.82	2.38	1.27	3.10	0.60	0.24	99.78	NW/4,NW/4	19	5N	14E
JA83-050	Tfl,Ginkgo	52.11	14.06	2.00	12.40	4.12	7.99	1.98	1.37	3.13	0.61	0.24	99.75	NE/4,NW/4	18	4N	14E
JA83-060	Tfl,Ginkgo	52.22	13.83	2.00	12.84	4.09	7.75	2.20	1.12	3.14	0.59	0.23	99.78	SW/4,SW/4	10	4N	14E

Major Element Analyses of rocks from the Klickitat 15 minute quadrangle, Klickitat County, Washington
Revised February 9, 1990

SAMPLE NO.	GEOLOGIC UNIT	SiO2	Al2O3	Fe2O3	FeO	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO	TOTAL	QSEC	SEC	TWP	RGE
JA79-102	Tgn2h	53.47	15.06	2.00	10.20	4.86	8.67	2.26	1.11	1.89	0.27	0.20	99.79	NE/4,SW/4	20	6N	14E
JA79-167	Tgn2h	54.10	14.96	2.00	9.43	4.74	8.42	2.90	1.19	1.76	0.30	0.20	99.80	SE/4,NE/4	19	4N	14E
JA79-168	Tgn2h	54.56	15.14	2.00	8.95	4.67	8.62	2.53	1.27	1.75	0.32	0.19	99.81	SE/4,SW/4	20	4N	14E
JA79-171	Tgn2h	53.91	14.99	2.00	9.40	4.78	8.97	2.41	1.25	1.75	0.33	0.22	99.79	SW/4,SW/4	4	4N	14E
JA79-174	Tgn2h	54.44	14.97	2.00	9.41	4.52	8.26	2.77	1.29	1.79	0.34	0.20	99.79	SE/4,NE/4	27	6N	14E
JA79-177	Tgn2h	53.32	14.83	2.00	10.44	4.79	8.48	2.73	1.03	1.86	0.30	0.21	99.78	NE/4,NE/4	30	6N	14E
JA79-192	Tgn2h	53.83	15.03	2.00	9.73	4.68	8.61	2.53	1.34	1.77	0.29	0.20	99.81	NE/4,SE/4	18	4N	14E
JA79-193	Tgn2h	54.02	15.21	2.00	9.55	4.65	8.53	2.56	1.23	1.75	0.30	0.20	99.80	SE/4,SE/4	9	4N	14E
JA79-202	Tgn2h	54.18	15.56	2.00	8.85	4.75	8.62	2.62	1.18	1.75	0.29	0.21	99.80	NE/4,SW/4	24	6N	13E
JA79-214	Tgn2h	54.01	14.96	2.00	9.82	4.67	8.15	2.73	1.31	1.82	0.32	0.20	99.79	SW/4,SE/4	22	6N	13E
JA82-053	Tgn2h	54.41	15.56	2.00	9.16	4.47	8.32	2.49	1.24	1.84	0.31	0.21	99.80	NW/4,SW/4	9	3N	14E
JA83-002	Tgn2h	55.22	15.32	2.00	8.73	4.63	8.41	2.12	1.27	1.78	0.33	0.19	99.81	SW/4,SW/4	31	6N	13E
JA83-004	Tgn2h	54.74	15.22	2.00	9.53	4.61	8.12	2.10	1.31	1.84	0.34	0.19	99.81	SW/4,NE/4	24	5N	13E
JA83-010	Tgn2h	55.01	15.24	2.00	9.09	4.78	8.16	2.26	1.12	1.84	0.31	0.19	99.81	NE/4,NW/4	19	5N	14E
JA83-014	Tgn2h	54.92	15.02	2.00	9.66	4.23	7.91	1.96	1.46	2.26	0.37	0.21	99.79	NE/4,NE/4	25	5N	13E
JA83-021	Tgn2h	54.44	14.51	2.00	10.72	4.31	7.65	2.46	1.21	2.15	0.33	0.21	99.78	NE/4,NE/4	30	6N	14E
JA83-023	Tgn2h	53.89	14.69	2.00	10.49	4.71	8.41	2.19	1.03	2.06	0.32	0.21	99.79	NW/4,SW/4	21	6N	14E
JA83-027	Tgn2h	54.77	15.15	2.00	9.39	4.80	8.39	1.85	1.27	1.88	0.31	0.18	99.81	SE/4,NE/4	27	6N	14E
JA83-051	Tgn2h	55.84	15.80	2.00	8.07	4.54	8.42	1.96	1.01	1.87	0.31	0.18	99.82	NE/4,NW/4	16	4N	14E
JA79-103	Tgn2l	55.38	14.51	2.00	11.07	3.23	6.77	2.63	1.72	2.14	0.35	0.21	99.80	NE/4,SE/4	19	6N	14E
JA79-109	Tgn2l	55.44	14.95	2.00	9.98	3.79	7.15	2.55	1.78	1.86	0.30	0.20	99.80	SE/4,SE/4	24	6N	13E
JA79-110	Tgn2l	55.34	14.75	2.00	10.22	3.44	7.10	2.66	1.96	2.00	0.32	0.20	99.79	SE/4,SE/4	24	6N	13E
JA79-120	Tgn2l	55.28	15.07	2.00	9.57	3.57	7.30	2.73	1.92	2.02	0.33	0.21	99.79	NE/4,NW/4	19	6N	14E
JA79-197	Tgn2l	55.24	14.39	2.00	10.66	3.27	6.97	3.15	1.70	2.06	0.35	0.21	99.79	NE/4,NW/4	18	5N	14E
JA83-013	Tgn2l	55.75	14.52	2.00	10.33	3.55	7.07	2.40	1.64	2.17	0.35	0.22	99.78	NE/4,NE/4	25	5N	13E
JA83-022	Tgn2l	56.19	14.96	2.00	9.38	3.52	7.06	2.33	1.78	2.21	0.35	0.22	99.78	NW/4,NE/4	30	6N	14E
JA79-111	Tgr2	55.76	14.99	2.00	9.89	3.37	6.81	2.88	1.84	1.97	0.29	0.20	99.80	SE/4,SE/4	24	6N	13E
JA79-112	Tgr2	55.31	14.59	2.00	10.47	3.34	6.93	2.82	2.01	2.02	0.31	0.20	99.80	NE/4,SE/4	24	6N	13E
JA79-113	Tgr2	54.86	14.87	2.00	10.18	3.68	7.20	2.71	1.95	2.00	0.33	0.21	99.78	NE/4,SE/4	24	6N	13E
JA79-114	Tgr2	54.87	14.69	2.00	10.35	3.56	7.23	2.88	1.90	2.00	0.33	0.20	99.81	NE/4,SE/4	24	6N	13E
JA79-115	Tgr2	56.60	14.48	2.00	10.22	2.68	6.11	3.02	2.13	2.21	0.34	0.22	99.79	NE/4,SE/4	24	6N	13E
JA79-206	Tgr2	55.23	14.93	2.00	10.02	3.58	7.16	2.91	1.67	2.01	0.31	0.18	99.82	SE/4,SW/4	24	6N	13E
JA79-209	Tgr2	56.25	14.87	2.00	9.33	3.28	6.89	2.77	2.09	2.02	0.31	0.20	99.81	NE/4,SW/4	24	6N	13E
JA79-210	Tgr2	55.59	14.74	2.00	9.54	3.62	7.28	2.75	1.92	2.03	0.33	0.20	99.80	NE/4,SW/4	24	6N	13E
JA79-116	Tgn1	55.11	15.15	2.00	9.83	3.73	7.61	2.69	1.24	2.12	0.33	0.18	99.81	NE/4,SE/4	24	6N	13E
JA79-207	Tgn1	54.33	14.84	2.00	10.68	3.61	7.25	2.40	1.91	2.40	0.37	0.21	99.79	SE/4,SW/4	24	6N	13E
JA79-233	Tgn1	53.61	14.72	2.00	11.27	3.66	7.47	2.36	1.89	2.42	0.37	0.22	99.77	NE/4,SE/4	24	6N	13E
JA79-234	Tgn1	55.96	14.70	2.00	10.48	3.12	6.67	2.34	1.99	2.18	0.35	0.20	99.79	NE/4,SE/4	24	6N	13E

Analyses by XRF, Dept. of Geology, Washington State University.
All analyses are normalized on a volatile free basis with Fe2O3 arbitrarily set at 2.00.
Details of the methods used, the precision of the analyses, and estimates of error may be obtained from P. R. Hooper, Department of Geology, Washington State University, Pullman, Washington 99164.

WASHINGTON STATE DEPARTMENT OF
Natural Resources
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WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
RAYMOND LASMANIS, STATE GEOLOGIST

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GEOLOGICAL SURVEY

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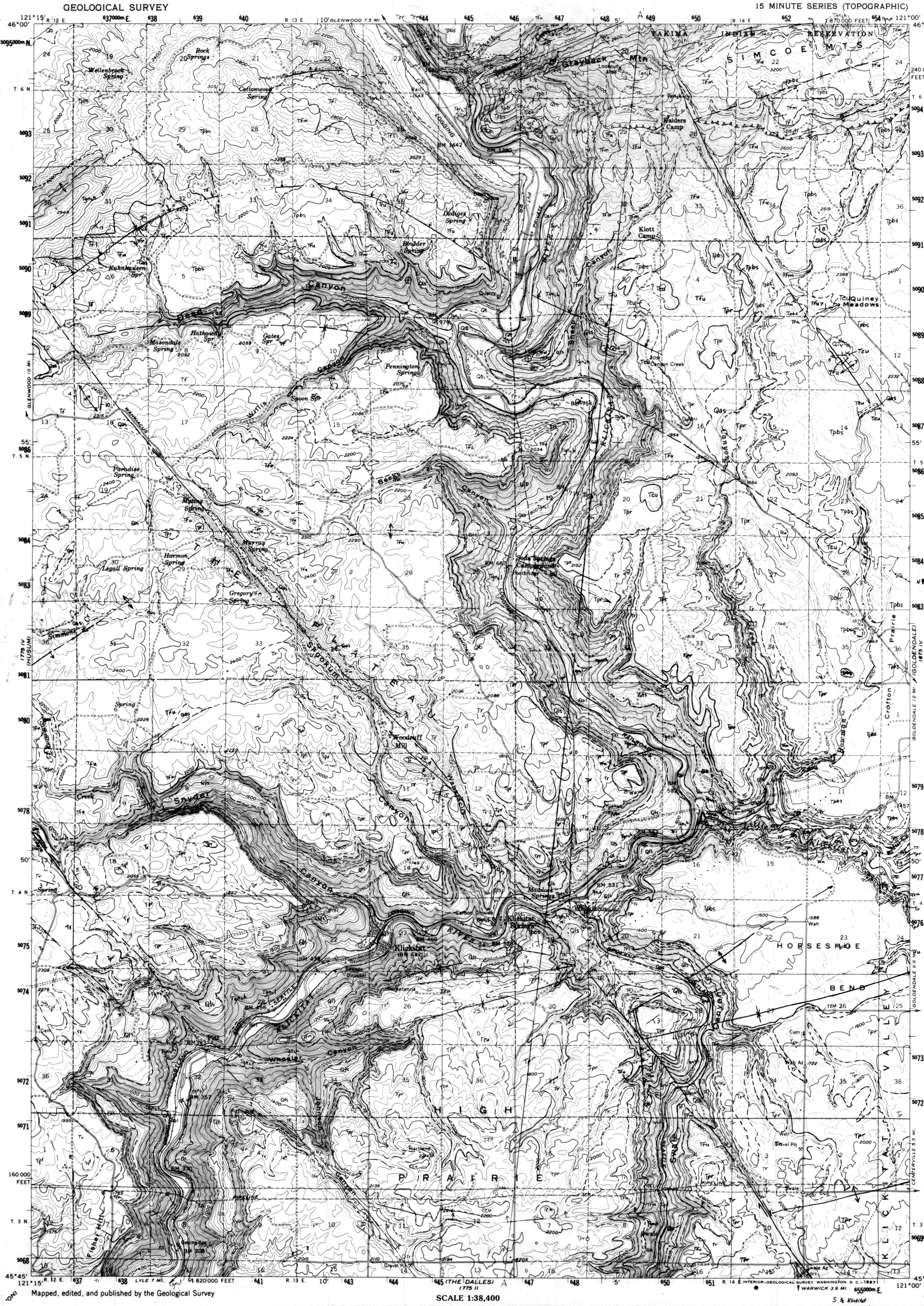

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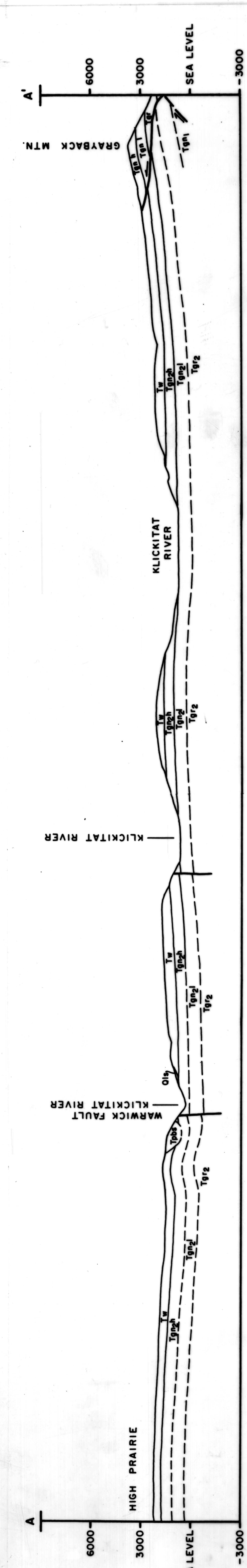

GEOLOGIC MAP OF THE KLICKITAT 15′ QUADRANGLE, WASHINGTON

by

J. L. ANDERSON

1987

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Plate 1