GEOLOGIC MAP GM-40

GEOLOGIC MAP OF SOUTHEASTERN ASOTIN COUNTY, WASHINGTON

by
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WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES
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INTRODUCTION

The geologic map of southeastern Asotin County, Washington, comprises the Anatone, Weissenfels Ridge, Fields Spring, Black Butte, Captain John Rapids, and Limekiln Rapids 7½-minute quadrangles, plus a narrow strip at the north end of the Jim Creek Butte 7½-minute quadrangle. Only the parts of these maps that cover areas in Washington are included in this report (Fig. 1).

This study area covers the southern part of the Lewiston basin, an asymmetrical graben in southeastern Washington that began subsiding in the Miocene during the eruption of the Columbia River Basalt Group. The greatest density of feeder dikes for the flows of the Columbia River Basalt Group in Washington is in the area of this map along the Grande Ronde River. A map of the Clarkston area by Hooper and others (1985) adjoins this map to the north. Together, these two maps and cross sections provide a north–south transect through the Washington portion of this major crustal feature. The axis and lowest portion of the Lewiston basin is on the Clarkston map area (Hooper and others, 1985); the northern boundary of the structure is marked by the faulted anticline north of the cities of Lewiston, Idaho, and Clarkston, Washington. The southern boundary of the structure is on this map and is marked by the Limekiln fault, a nearly vertical fault with approximately 1,800 ft of structural relief where it crosses the Snake River. Vertical offset on the fault decreases both northeast and southwest. Structure contour maps for two Columbia River Basalt Group units are shown in Figures 2 and 3.

Sources Used in Mapping

The sources of information and individuals responsible for mapping the study area are indicated in Figure 1. The northern part of the area was initially mapped by Camp (1976) and the southern part by Reidel (1978). A study of the Columbia River Basalt Group dikes in the area was completed by Price (1977). In 1983 and 1984, the present,

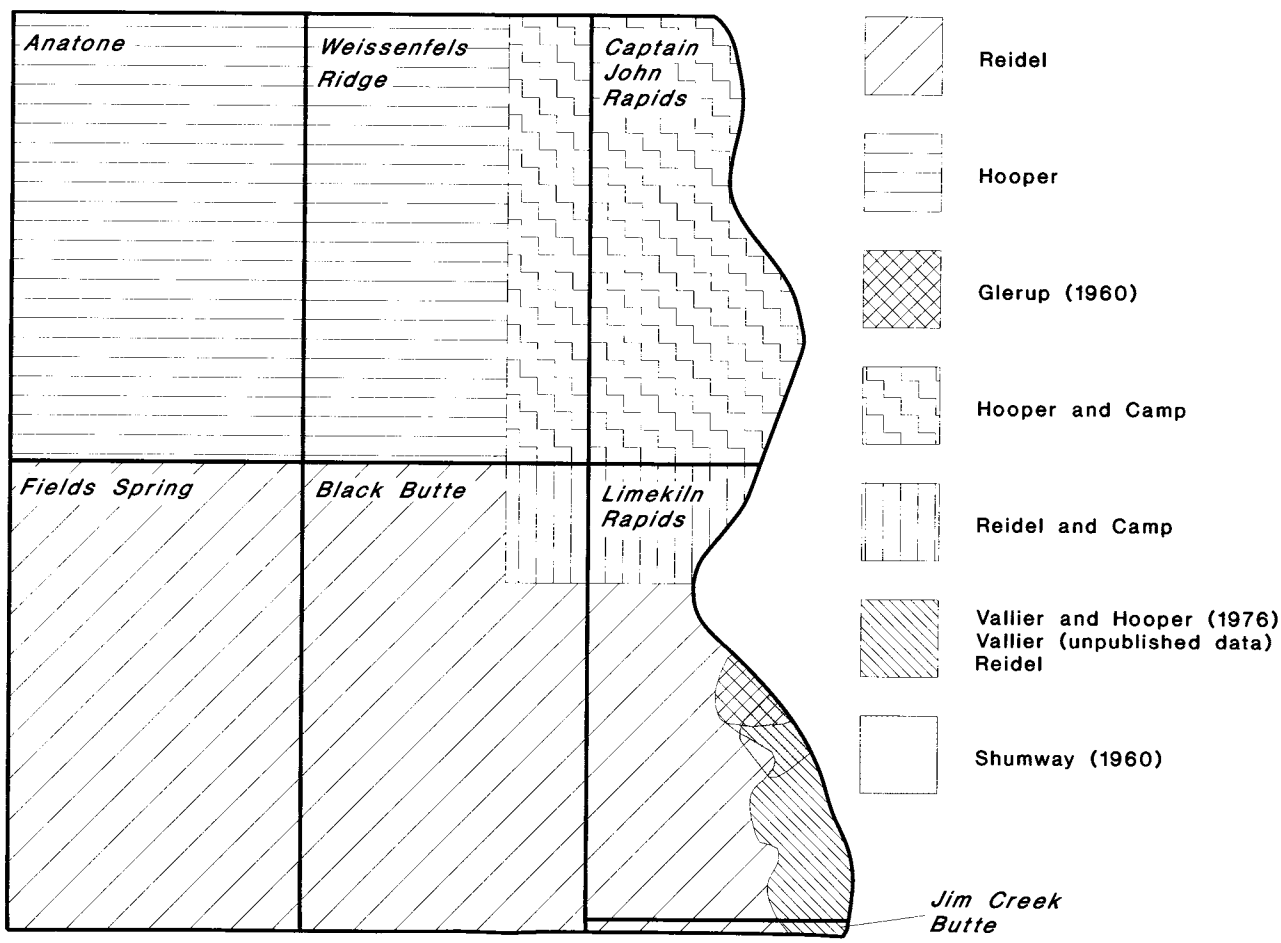

Figure 1. Location of component 7½-minute quadrangles for southeastern Asotin County, Washington, and sources of mapping data. All late Cenozoic sedimentary units were mapped by G. D. Webster.

more detailed map was made by Hooper (northern portion, Fig. 1) and by Reidel (southern portion, Fig. 1). Mapping was supported by XRF-determined basalt analyses from the present and previous studies (Table 1) and by field (fluxgate) and laboratory-determined paleomagnetic analyses. The surficial sediments were mapped by G. D. Webster, with emphasis on the Pleistocene catastrophic flood deposits and other late Cenozoic sedimentary units (Webster and others, 1982). The Mesozoic rocks of the Blue Mountains Province exposed along the Snake River were examined, and mapping of these units was compiled from sources as shown in Figure 1.

Stratigraphic nomenclature

The stratigraphic nomenclature used in this report (see also the correlation diagram and explanation on Plate 1) is based on the formal nomenclature for the Columbia River Basalt Group units (Swanson and others, 1979) and informal names for the sedimentary units. The nomenclature for the Grande Ronde Basalt follows the informal names of Reidel and others (1989).

DESCRIPTION OF MAP UNITS

Surficial deposits

Qz **Mazama Ash** – Small outcrops of clean ash 4 to 6 in. thick and overlain by varied mixtures of ash and loess as much as 5 ft thick; age 6,600 yr B.P. The unit is typically found in roadcuts or stream banks along valley floors and is well exposed in the Grande Ronde River canyon.

Qf **Alluvial fans** – Stream deposits whose composition ranges from nearly pure reworked loess to mixtures of loess and angular to rounded clasts of basalt, rarely containing gravel or reworked pebbles and cobbles from sedimentary interbeds between basalt flows. The fans occur where tributaries enter major valleys in the Snake River drainage.

Qa **Alluvium** – Stream sediments of varied composition, commonly reworked loess or mixtures of loess and basalt, especially at higher elevations and in major tributary canyons to the Snake River. Along the Snake River canyon the sediments contain abundant pebbles and cobbles of granitic, metamorphic, and volcaniclastic rocks derived from exposures outside the map area and from reworking of older gravel deposits outside of and in the map area. The clasts consist principally of Grande Ronde Basalt.

Ql **Palouse Formation** – Loess composed predominantly of quartz and feldspar derived from sources to the southwest throughout Pleistocene and Holocene time. The thickness varies (Ringe, 1970); it is thickest in the north part of the map area and thins to the south. Most deposits on the plateau above the canyon rim in the southern part of the map area are less than a meter thick.

Qm **Missoula floods backwater deposits** – Rhythmite deposits of cross-bedded, dark-gray, basalt-rich gravels grading upward into quartz- and feldspar-rich tan sands and silts. Exposures commonly display cut-and-fill structures and sandstone dikes. These deposits are found along tributaries of the Snake River to elevations of approximately 1,200 ft but are generally not extensive above 1,000 ft. They were first recognized in the Lewiston–Clarkston area by Bretz (1929). The unit is correlative with the Touchet Beds of the Walla Walla area (Waitt, 1980) and ranges in age from 15,000 to 13,000 yr (Mullineaux and others, 1978).

Qb **Bonneville flood deposits** – Gravels and sandy gravels containing high percentages of basalt and lesser amounts of granitic rocks and greenschist-facies volcaniclastic rock; contains ash clasts of pebble and cobble size. These deposits are thought to be approximately 15,000 yr old (Scott and Shroba, 1980); they were recognized to be of Bonneville flood origin and reported in the Lewiston–Clarkston area by Stearns (1962), although Bretz (1929), unaware of the Bonneville flood origins, had previously described some of these deposits.

TQs **Slump blocks** – Blocks of Columbia River Basalt Group and older sediments. Deposits resulted from landslides composed of basalt sliding on less competent sedimentary interbeds. The unit is generally confined to the areas where the Saddle Mountains Basalt is exposed.

Gravels of the Grande Ronde River area

TQg **Unnamed gravels, undifferentiated** – Consists of two types that are not differentiated on the map:

Type 1 – Well-rounded pebbles to cobbles of basalt (approximately 40 percent), granitic rocks, metamorphic rocks (dominantly quartzite), and red and green volcaniclastic rocks. Basalt clasts are angular in part, and some are deeply weathered. The matrix is gray-green, medium to coarse sand that is rich in basalt grains. The deposits are overlain by Missoula floods backwater deposits and alluvial fans. The unit is commonly present as lateral and point bars in the Snake River Canyon. It is coeval with the TQg unit of Hooper and others (1985).

Type 2 – Angular to well-rounded cobbles of basalt (approximately 50 percent) and metamorphic rocks, including red and green volcaniclastic clasts derived from strata of the Seven Devils Group, in a fine to coarse sand matrix. Basalt and granitic cobbles are deeply weathered. The age is uncertain but is less than 12 Ma; the unit is older

than type 1 on the basis of its stratigraphic position. It is probably reworked from deposits in an ancestral Salmon River drainage.

Tgg **Grande Ronde River gravel** – Angular to well-rounded cobbles to small boulders of basalt and metamorphic rock in a fine to medium sand matrix. Metamorphic rock cobbles are well rounded. The largest cobbles and small boulders are basalt and well rounded. Smaller basalt clasts are moderately to deeply weathered. The gravel clasts are imbricated, indicating a downstream current direction parallel to that of the modern drainage. The gravel underlies terraces and point bars in the Grande Ronde River valley. In many places it is overlain or covered by backwater deposits of the Missoula floods (to elevations of 1,200 ft) and by modern colluvium. The late Cenozoic age of the gravel is uncertain, but the unit is believed to be younger than 6 Ma and older than the Missoula floods. The unit is probably correlative with the Asotin gravel, Clarkston Heights gravel, and Clearwater gravel (Webster and others, 1982; Hooper and others, 1985) in the Asotin quadrangle, Lewiston area.

Columbia River Basalt Group

Yakima Basalt Subgroup

Saddle Mountains Basalt (Swanson and others, 1979; see Tolan and others, 1989) – A series of flows erupted between 6.0 Ma and 14.5 Ma.

Tb **Buford Member** (Walker, 1973; Swanson and others, 1979) – A medium-grained aphyric flow that forms many small, isolated outcrops across the Weissenfels Ridge quadrangle and the eastern halves of the Anatone and Fields Spring quadrangles (Fig. 1), where it overlies the flows of the Weissenfels Ridge Member. Farther south, in the Fields Spring quadrangle, where intervening flows pinch out, it overlies the Tenmile Creek flow and Umatilla Member. The Buford Member has reversed magnetic polarity (Price, 1977; Ross, 1978; Swanson and others, 1979) and is compositionally similar to the Grande Ronde Basalt. A feeder dike is exposed in the Grande Ronde River canyon (NE¼ sec. 35, T7N, R45E) and in Joseph Canyon in northeastern Oregon (south of the map area).

Tem **Elephant Mountain Member** (Waters, 1955; Swanson and others, 1979) – An aphyric to microphyric flow that forms a thin veneer of dark, dense basalt on top of the plateau at Meyer Ridge along the north margin of the Anatone quadrangle (Fig. 1); it includes a series of isolated but thicker outcrops that may represent a shallow channel fill in Grande Ronde Basalt (unit T_{gR2}) around the northeast edge of Big Butte in the southwest corner of the Anatone quadrangle. In the latter outcrops, the flows are coarser grained and have a lighter gray color. Laths of plagioclase and small grains of olivine and clinopyroxene are set in dark-gray glass containing incipient pyroxene grains and ilmenite blades. The member has transitional to normal magnetic polarity (Choiniere and Swanson, 1979) and has been dated at approximately 10.5 Ma (McKee and others, 1977; Stoffel, 1984). Elephant Mountain dikes are present 5 km west of Troy, Oregon (Ross, 1978; Stoffel, 1984), and in the headwaters of Cache Creek, a tributary to the Snake River just south of the Oregon–Washington border (Reidel, 1978).

Weissenfels Ridge Member (Camp, 1976; Swanson and others, 1979) – Four similar holocrystalline flows with varied olivine contents form the uppermost bedrock unit over much of the map area.

Tws **Basalt of Slippery Creek** (Swanson and others, 1979) – Fine-grained flow with varied jointing habit. Olivine grains are larger and more conspicuous than in other flows of the member and commonly poikilitically enclose plagioclase laths. This is the youngest of the four flows and the most extensive in the map area, forming the plateau surface over most of the Black Butte, Weissenfels Ridge, Captain John Rapids, and Anatone quadrangles (Fig. 1). It underlies the Buford Member and overlies the Umatilla Member in the Fields Spring quadrangle.

Twt **Basalt of Tenmile Creek** (Hooper and others, 1985) – Fine-grained, sparsely porphyritic flow with well-developed colonnade. This flow is indistinguishable from the Roza Member flow in its major and minor element composition, but is distinguished from other Weissenfels Ridge flows by its higher P_2O_5 and TiO_2 contents. It is present beneath the Slippery Creek flow on the east side of the map area. Overlap of this flow and the Lewiston Orchards and Cloverland flows occurs only locally in the map area; the Tenmile Creek flow overlies the Cloverland flow near Shumaker Creek (NW¼NW¼ sec. 12, T7N, R45E, Black Butte quadrangle, Fig. 1) and appears to be younger than the Lewiston Orchards flow farther north (Hooper and others, 1985). Dikes are present in the Grande Ronde River canyon and Joseph Canyon (NE¼ sec. 17, T6N, R46E to SW¼ sec. 32, T7N, R46E, continuing as two dikes en echelon, SW¼ sec. 29, T7N, R46E to NW¼ sec. 20, T7N, R46E), to the north on the Lewiston structure (Hooper and others, 1985), and farther north near Pullman (Hooper and Webster, 1982).

Twl **Basalt of Lewiston Orchards** (Camp, 1976; Hooper and others, 1985) – Coarse-grained flow containing plagioclase microphenocrysts. In outcrop, the flow has a well-developed colonnade and entablature. The flow is present only at the northeast edge of the Weissenfels Ridge quadrangle

(Fig. 1), where it forms the top flow at the east end of Weissenfels Ridge (sec. 26, T8N, R45E); it is absent in the Anatone area. The flow has a chemical composition similar to that of the Sprague Lake flow near Spokane, Washington (Swanson and others, 1979), and to that of a small dike and vent near Riggins, Idaho (Hooper, 1982). A dike is present in NE¼ sec. 24, T9N, R46E.

Twc **Basalt of Cloverland** (Hooper and others, 1985) – A finer grained and typically more glassy flow than the other flows of the member. This flow is confined to the west side of the map area in the Anatone and Fields Spring quadrangles. Dikes are in the NE¼ sec. 14, T6N, R45E to SE¼ sec. 27, T7N, R46E and (two en echelon) in the N½ sec. 24, T7N, R45E. Another crops out in Asotin Creek, north of the map area (Hooper and others, 1985). Two miles east of Puffer Butte on the Shumaker Creek road, the Cloverland flow underlies the Tenmile Creek flow. Exposures of the basalt with a slightly different composition are present on higher ground along the northwest boundary of the Anatone quadrangle and may represent a linear vent system for the flow.

Ta **Asotin Member** (Camp, 1976; Swanson and others, 1979; Reidel and Fecht, 1981, 1987; Hooper, 1985) – A dense, aphyric flow with small, fresh olivine crystals. The flow forms cliffs in many of the north- to north-northeast-trending canyons and pinches out south of a line joining Big Butte and Puffer Butte (Fields Spring quadrangle). It has normal natural remanent magnetism (Swanson and others, 1979; Reidel and Fecht, 1981). The composition is varied; there are distinct end member compositions: the Asotin, the Lapwai, and the Wilbur Creek compositions (Reidel and Fecht, 1981, 1987; Hooper, 1985). Reidel and Fecht (1987) have shown that the three end-member flows were erupted nearly simultaneously and mixed together in the Pasco Basin.

Tw **Wilbur Creek Member** (Swanson and others, 1979; Reidel and Fecht, 1981, 1987; Hooper, 1985) – A dense, dark-gray aphyric flow lacking obvious olivine in hand samples (Hooper and others, 1985). It lies immediately below the Asotin Member along the north edge of the map area. A flow locally present between the Wilbur Creek flow and the Asotin Member (Hooper, 1985; Reidel and Fecht, 1987) was named the Lapwai flow (Wilbur Creek Member) by Camp (1981) and Hooper and Webster (1982). The Lapwai flow has normal natural remanent magnetism and is a mixture of Asotin and Wilbur Creek end-member compositions (Hooper, 1985; Reidel and Fecht, 1987). The Lapwai flow is not mapped in this map area because of its compositional variation.

Umatilla Member (Laval, 1956; Schmincke, 1964, 1967; Atlantic Richfield Hanford Co., 1976; Swanson and others, 1979; Hooper, 1981; Hooper and Webster, 1982; Reidel and Fecht, 1981) – Two flows of this member are exposed in the map area: the Sillusi flow (unit Tus) and the Umatilla flow (unit Tuu). A possible third flow, the Bear Creek flow, has been identified in the Troy basin, northeastern Oregon (Ross, 1989). All are fine-grained, aphyric flows enriched in the incompatible elements, including Ti and P (Table 1).

Tus **Basalt of Sillusi** (Laval, 1956; Reidel and Fecht, 1981; previously called Umatilla flow by Hooper, 1981, and Hooper and others, 1985, but relabelled here to be consistent with original work by Laval, 1956; Hooper and Webster, 1982) – An aphyric, very fine grained to glassy flow separating the older Umatilla flow from younger Saddle Mountains Basalt. Puffer Butte is a vent for this flow; P_2O_5- and TiO_2-enriched variants of this flow occur within several kilometers of the vent. This flow is distinguished from the Umatilla flow by its higher P_2O_5 and lower TiO_2 content. Feeder dikes are exposed in the Grande Ronde River canyon (NW¼ sec. 10, T7N, R45E to SE¼ sec. 21, T7N, R45E and in the W½ sec. 35, T7N, R45E). The flow has normal natural remanent magnetism (Swanson and others, 1979).

Tuu **Basalt of Umatilla** (Laval, 1956; Reidel and Fecht, 1981) – A fine-grained to glassy flow that underlies the Sillusi flow throughout the Columbia Plateau. The flow is distinguished by lower P_2O_5 and higher TiO_2 contents than the Sillusi flow, but also includes TiO_2-enriched variants. It has normal natural remanent magnetism. A possible vent has been found near Troy, Oregon (Ross, 1978; P. R. Hooper, unpub. data). A quartzite xenolith has been found in this unit (S. P. Reidel, unpub. data).

Wanapum Basalt (Swanson and others, 1979; see Tolan and others, 1989) – A series of flows erupted between 14.5 Ma and 15.6 Ma.

Tprl **Priest Rapids Member, basalt of Lolo** (Bingham and Grolier, 1966; Swanson and others, 1979) – A medium- to coarse-grained flow with prominent microphenocrysts of plagioclase and olivine. It is present only along the north edge of the map area, pinching out to the south. The flow has reversed natural remanent magnetism and is of the Lolo chemical type (Wright and others, 1973; Swanson and others, 1979). Feeder dikes are exposed to the east in the Clearwater embayment (Camp, 1981).

Tr **Roza Member** (Mackin, 1961; Bingham and Grolier, 1966; Swanson and others, 1979) – A fine- to medium-grained flow with large, discrete plagioclase phenocrysts that has been mapped over a large part of the Columbia Plateau. The member's composition is similar to that of the Frenchman Springs chemical type, but it can be subdivided into five chemical subtypes representing phases of the eruption (Martin, 1989); it has transitional to reversed natural remanent magnetism (Rietman, 1966; Choiniere and Swanson, 1979). Big Butte is one of the more southerly of the many vents for the Roza flow, but the flow cannot be traced far beyond the margins of the butte, except in the northwest part of the map area. A dike is present beneath the vent in the Grande Ronde River canyon (SW¼ sec. 6, T6N, R45E to N½ sec. 25, T7N, R44E). Other dikes and vents are present to the north and south (Swanson and others, 1975).

Eckler Mountain Member (Swanson and others, 1979) – Two flows in the map area belong to this member: the Shumaker Creek and the Dodge.

Tes **Basalt of Shumaker Creek** (Swanson and others, 1979) – A fine-grained, aphyric flow physically resembling the Grande Ronde Basalt, but similar in composition to the Umatilla flow, except that it has lower TiO_2 and much lower Ba contents. The flow crops out on the north rim of the Grande Ronde River canyon east as far as Shumaker Creek. From its scattered outcrop pattern, this flow appears to have covered most of the area north and east of Big Butte. The flow has normal natural remanent magnetism (Swanson and others, 1979). A feeder dike is present in Joseph Canyon south of the map area.

The basalt of Shumaker Creek has been thought to lie above the basalt of Dodge, Eckler Mountain Member, and below the Frenchman Springs Member (Swanson and others, 1979; Tolan and others, 1989, fig. 1), but in the area where the basalt of Shumaker Creek was first mapped and defined, the Shumaker Creek area of this report, the Frenchman Springs Member is absent. In 1991, P. R. Hooper (unpub. data) found the basalt of Shumaker Creek lying above the basalt of Sentinel Gap, Frenchman Springs Member, and below the Roza Member; he noted this stratigraphic relation to the northwest of the present map area in Richman Gulch, Alpowa Ridge 7½-minute quadrangle, about 5 mi southeast of Pomeroy, sec. 13, T11N, R42E. Hooper's finding will necessitate a redefinition of the basalt of Shumaker Creek.

Ted **Basalt of Dodge** (Swanson and others, 1979) – A very coarse grained, plagioclase-phyric flow with characteristically rounded, yellow-weathering outcrops. This flow forms a useful marker horizon throughout the map area. It occurs above and in places below a saprolite and at some locations is with associated sediments. A feeder dike is present in Joseph Canyon (NW¼NE¼ sec. 18, T6N, R46E). The flow extends only a few miles north and east from Big Butte, but it is exposed on the north and south rims of the Grande Ronde River canyon in the Fields Spring quadrangle. The flow pinches out east of Puffer Butte. Other Dodge dikes and flows are known farther west in northeastern Oregon and southern Washington (Ross, 1978; Swanson and others, 1980; Swanson and Wright, 1983; Tolan and others, 1989).

Grande Ronde Basalt (Swanson and others, 1979; Reidel, 1983; Reidel and others, 1989) – A thick sequence of generally aphyric flows present over most of the Columbia Plateau. This formation forms 87 percent by volume of the Columbia River Basalt Group (Reidel and others, 1982, 1989). Mineralogy is dominated by groundmass plagioclase and clinopyroxene (augite and pigeonite) with sparse phenocrysts of plagioclase and rare microphenocrysts of orthopyroxene, pigeonite, and olivine (Reidel, 1983). It is divided into four magnetostratigraphic units: T_{gR1} (bottom), T_{gN1}, T_{gR2}, and T_{gN2} (top). All four magnetostratigraphic units are present in the map area. Stratigraphy in the map area is divided into 20 local chemical subgroups (Reidel, 1983) that are represented at the Grande Ronde Basalt type section (Table 1; NW¼ sec. 23, N½ sec. 22, NE¼ sec. 21, T7N, R46E) (Camp, 1976; Reidel, 1978, 1983). The Grande Ronde Basalt can be subdivided into 17 regional units (Reidel and others, 1989), nine of which are present in the map area: Fields Spring (youngest), Meyer Ridge, Wapshilla Ridge, China Creek, Downey Gulch, Center Creek, Rogersburg, Teepee Butte, and Buckhorn Springs. The Downey Gulch, China Creek, and Buckhorn Springs flow units are locally interfingered. (See Table 1.) Only the Fields Spring, Meyer Ridge, and Rogersburg units are shown on the map. Two other measured sections in the Grande Ronde Basalt are indicated on the map: the Schoolhouse Draw section of Camp (1976) in sec. 25, T9N, R47E, and the Green Gulch section of Reidel (1978) in sec. 2, T6N, R46E. Many Grande Ronde dikes are also present. The sequence is dated at between 15.6 and 17.0 Ma (McKee and others, 1981; Reidel and others, 1989).

Tgd **Grande Ronde basalt dike, undifferentiated** – Fine-grained aphyric basalt with glassy, chilled selvage zones along the dike/host rock contact; undifferentiated because chemical composition data are not available. Dikes are in the N½ sec. 31, T7N, R46E to N½ sec. 30, T7N, R46E and NE¼ sec. 8, T6N, R46E.

T_{gN2fs} **Upper normal magnetostratigraphic unit, Fields Spring flow** (Reidel and others, 1989) – Typically fine- to medium-grained, aphyric flow with blocky jointing pattern. It is the only flow of the N_2 magnetostratigraphic unit present in the map area. It is well exposed in the northwest part of the Fields

Spring quadrangle. The flow has a chemical composition (Table 1) that is very similar to that of the basalt of Dodge, except for its much higher SiO_2 content. A large dike is exposed in the Grande Ronde River canyon (center N½ sec. 17, T6N, R45E to SW¼ sec. 18, T7N, R45E).

Tg_{R2} **Flows of the upper reversed magnetostratigraphic unit** – A typically fine-grained and aphyric unit that thickens west from the Grande Ronde type section (Reidel and others, 1989). Flows consist of both the high-Mg and low-Mg chemical types of Wright and others (1973); the six compositional subgroups present in the map area (Reidel, 1983) fall into two of the regional units (Meyer Ridge and Wapshilla Ridge; Reidel and others, 1989). The magnetostratigraphy has been defined by Watkins and Baksi (1974) in the Rattlesnake Grade area. Probable dikes are those in NE¼ sec. 18, T6N, R46E to NE¼ sec. 7, T6N, R46E, a second segment of this dike from SE¼ sec. 30, T7N, R46E to NW¼ sec. 19, T7N, R46E; NE¼ sec. 3, T6N, R45E; SE¼NE¼ sec. 4, T6N, R45E; two near the center sec. 31, T7N, R45E (two parts); and S½ sec. 33, T7N, R45E.

Tg_{R2mr} **Basalt of Meyer Ridge** (Camp, 1976; Reidel, 1978, 1983; Reidel and others, 1989) – Fine-grained, aphyric flow with abundant olivine; forms the top flow or flow units of the R_2 magnetostratigraphic unit in the map area. It is distinguished by the high-Mg composition of the Meyer Ridge chemical type (Reidel, 1983; Reidel and others, 1989). A possible feeder dike extends from the Grande Ronde River canyon to Joseph Canyon (a doublet, west edge NW¼ sec. 9, T6N, R46E to NE¼ sec. 21, T7N, R46E); other dikes are in the W½ sec. 12, T6N, R44E to SW¼SW¼ sec. 25, T7N, R44E, and SE¼NE¼ sec. 4, T6N, R45E.

Tg_{N1} **Flows of the lower normal magnetostratigraphic unit** – Fine-grained, aphyric flows of nearly constant thickness in the map area. The flows are dominated by the low-Mg chemical type of Swanson and others (1979) and consist of nine compositional subgroups characterized by low TiO_2 and P_2O_5 and high MgO contents (Reidel, 1978, 1983) that fall into two regional units: China Creek unit and Downey Gulch unit (Reidel and others, 1989). Possible dikes are those in NW¼ sec. 17, T6N, R46E to NW¼ sec. 8, T6N, R46E; near center sec. 35, T7N, R46E to SW¼ sec. 14, T7N, R46E; and NW¼ sec. 15, T6N, R46E to NE¼ sec. 9, T6N, R46E.

Tg_{R1} **Flows of the lower reversed magnetostratigraphic unit** – Typically fine-grained and aphyric flows; contain several plagioclase-phyric (unit Tg_{R1r}) and rare coarse-grained, olivine-bearing flows (C group of Reidel, 1983; Teepee Butte unit of Reidel and others, 1989; Teepee Butte Member of Reidel and Tolan, in press). The flows are exposed above Imnaha Basalt in Joseph Canyon and the Grande Ronde River canyon. They are composed of both the low-Mg and high-Mg chemical types of Wright and others (1973). The unit consists of nine chemical subgroups in the area that are characterized by high TiO_2 contents (Reidel, 1978, 1983) and that fall into four regional units (Center Creek, Rogersburg, Teepee Butte, and Buckhorn Springs; Reidel and others, 1989). Some flows of the high-Mg chemical type are present (C group of Reidel, 1983; Teepee Butte unit, Reidel and others, 1989; Reidel and Tolan, in press). A flow–dike connection for a Teepee Butte flow is exposed in Joseph Canyon (SW¼ sec. 2, T7N, R46E to SE¼SE¼ sec. 34, T7N, R46E; Reidel and others, 1987). Another dike is in SE¼ sec. 1, T6N, R46E.

Tg_{R1r} **Basalt of Rogersburg** (Price, 1977; Reidel, 1983; Reidel and others, 1989) – Two highly plagioclase-phyric flows of the R_1 magnetostratigraphic unit that can be traced throughout the map area.

Imnaha Basalt

Ti **Imnaha Basalt** (Hooper, 1974; Swanson and others, 1979; Hooper and others, 1984) – Typically plagioclase-phyric flows with sporadic sparsely phyric flows. This unit is poorly exposed in the lower reaches of Joseph Canyon and eastern part of the Grande Ronde canyon. (See Reidel and others, 1987.) It has normal natural remanent magnetism and consists of both Rock Creek and American Bar compositional subgroups (Hooper and others, 1984). These flows are older than about 17 Ma. Dikes are exposed farther southeast in the Imnaha Canyon area, Oregon (Hooper and others, 1984). The location of the Joseph Creek measured section of Reidel (1978) and Hooper and others (1984) is shown on the map in secs. 3 and 10, T6N, R46E.

Sedimentary deposits interbedded with or older than the Columbia River Basalt Group

Ts **Sediments, undifferentiated** – Interbedded with basalt flows of the Columbia River Basalt Group; equivalent to the Ellensburg Formation. The unit includes at least three thin deposits in the map area. The youngest deposit lies between the Buford Member and basalt of Sillusi in the southern part of the map area and was probably deposited by a river flowing west along the southern margin of the Elephant Mountain Member. It is generally less than 1 m thick and consists of sand and gravel composed of Columbia River Basalt Group clasts and clasts of the Seven Devils Group. The second unit is equivalent to unit Ts_3 of Hooper and others (1985); sand and gravel are made up of Columbia River Basalt Group clasts and clasts of the Seven Devils Group. This unit lies between the Weissenfels Ridge Member and the Asotin Member and pinches out toward the canyon of the Grande

Ronde River. The oldest unit is similar in composition to the second unit but is older than the Umatilla Member and is also locally invaded by it. This unit is possibly coeval with the Mabton interbed of Laval (1956). A fourth possible unit consists of light yellow to cream-colored silty clay to clay and is overlain by a medium sand dominated by quartz and feldspar with mica and hornblende. A local bituminous coal caps the sequence. The unit is locally present between the Asotin Member and the basalt of Lolo, Priest Rapids Member, and it probably represents side-stream and overbank deposits.

Tg **Sediments of Lime Hill** – Alluvial deposit that is conformably overlain by the Imnaha Basalt and unconformably overlies the Martin Bridge Limestone and Doyle Creek Formation. It is principally composed of silt and sand and contains well-rounded quartzite cobbles. Its age is unknown. The unit is interpreted to have been deposited by west-flowing streams prior to eruption of the Columbia River Basalt Group

Blue Mountains Province granitic and sedimentary rocks

JKi **Intrusive rock** (See Vallier, 1974, 1977) – Granodiorite, quartz diorite, and gabbro that are unmetamorphosed or slightly metamorphosed.

Jch **Coon Hollow Formation** (Vallier, 1974, 1977) – Black shale and argillite, brown sandstone, pebble conglomerate, and rare, thin limestone beds.

Ŧmb **Martin Bridge Limestone** (Vallier, 1974, 1977) – Massive limestone and dolomite, some very carbonaceous beds; includes coarse reef debris.

Ŧdc **Doyle Creek Formation** (Seven Devils Group; Vallier, 1974, 1977) – Maroon and green volcanic breccia, metabasalt, keratophyre, and volcanic sandstone interbedded with shale, tuff, conglomerate, and thin limestone beds.

Ŧws **Wild Sheep Creek Formation** (Seven Devils Group; Vallier, 1974, 1977) – Metabasalt, pillow basalt, and pillow breccia with coarse volcanic breccia and volcanic sandstone overlain by argillite, volcaniclastic rocks, limestone, and metabasalt. Metabasalt is abundant in the map area.

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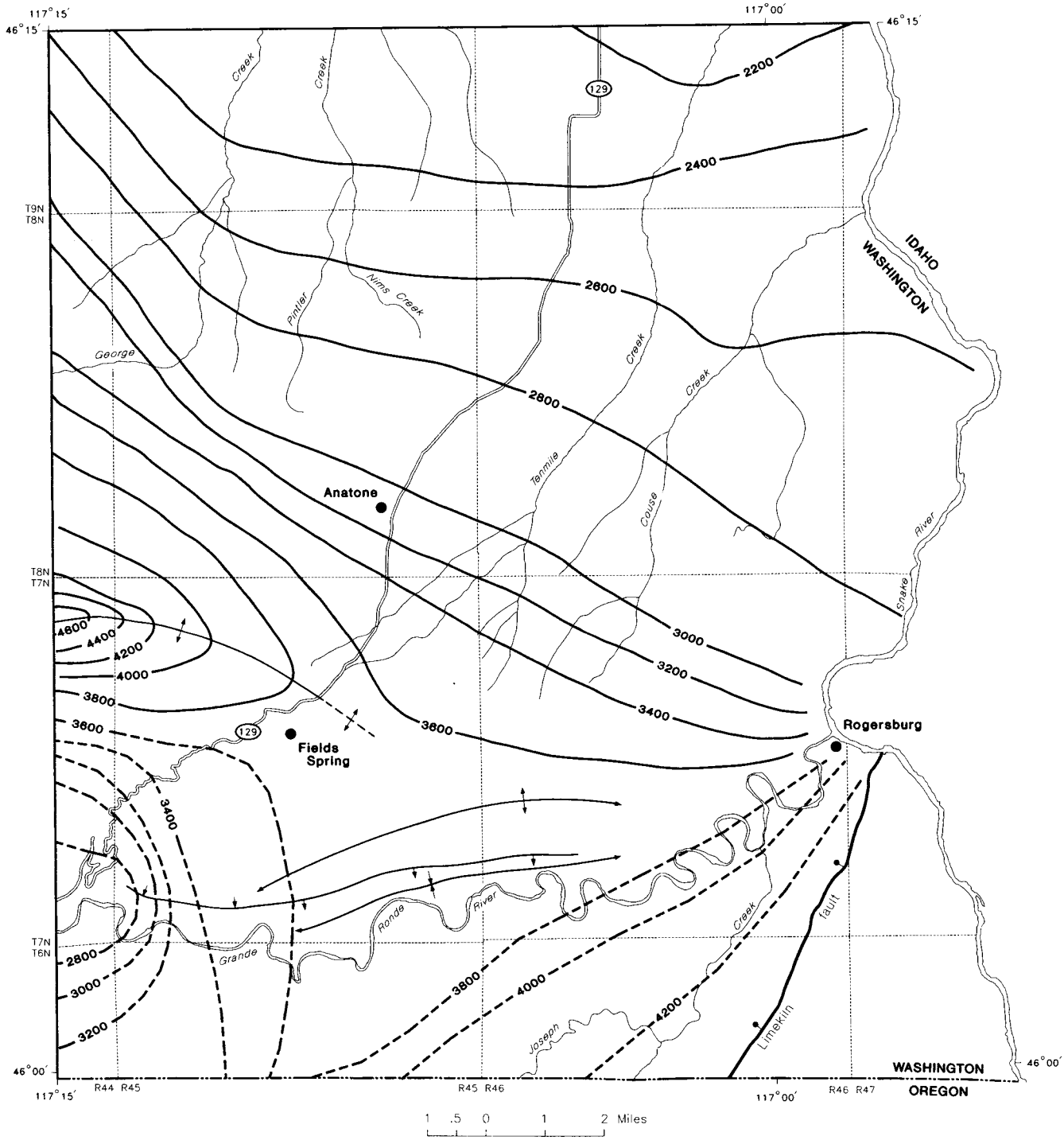


Figure 2. Structure contours, in feet above mean sea level, on the surface of the Grande Ronde Basalt, Columbia River Basalt Group, in southeastern Asotin County, Washington. Contours are dashed where approximately located.

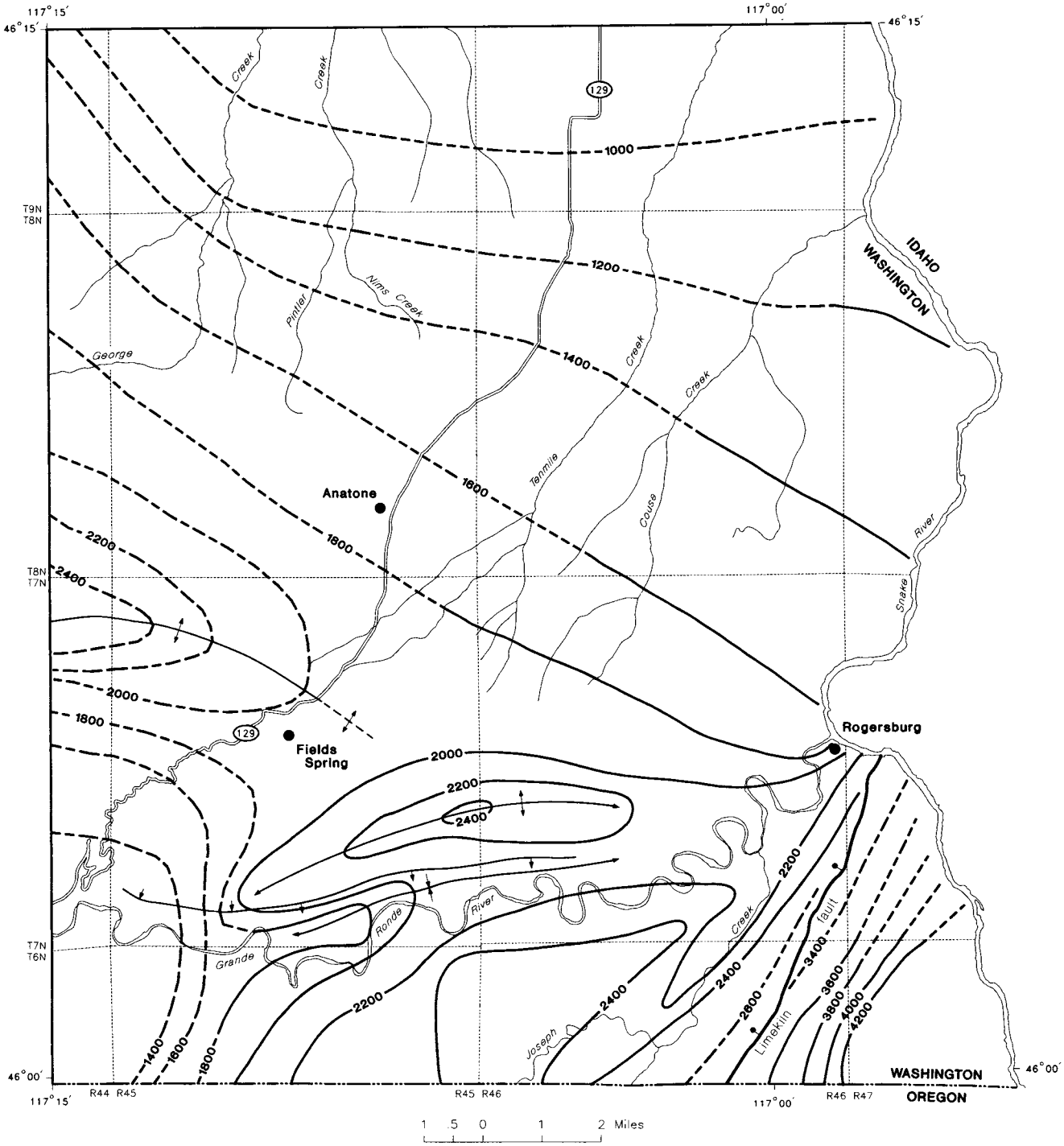


Figure 3. Structure contours, in feet above mean sea level, on the surface of the lower reversed magnetostratigraphic unit (R_1) of the Grande Ronde Basalt, Columbia River Basalt Group, in southeastern Asotin County, Washington. Contours are dashed where approximately located.

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington. Analyses with WSHB sample numbers are from Wright and others, 1979. Those with WSBO sample numbers are from Wright and others, 1980. These analyses do not add to 100 percent because the analyses are incomplete, un-normalized, or both. All other analyses are X-ray fluorescence analyses performed at the Geology Department, Washington State University, Pullman, WA 99164, under the direction of P. R. Hooper. Fe_2O_3 is arbitrarily set at 2.00 weight percent. Analyses are normalized on a volatile-free basis. A description of the method and estimates of the precision and accuracy of the analyses are given in Hooper and others (1976). Values are reported in weight percent. Sample collectors: PRH, P. R. Hooper; SPR, S. P. Reidel; SW, D. A. Swanson and T. L. Wright; SMP, S. M. Price; VEC, V. E. Camp. Samples without map location numbers are not shown on the map because their exact locations are not known. GRJ samples are from the Joseph Creek measured section of Reidel (1978), and GRSR samples are from the Grande Ronde measured and type section of Reidel (1978) and Reidel and others (1989)

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
1	SR84-004	Tb	54.49	15.09	2.07	2.00	9.34	0.21	8.33	4.78	1.38	2.01	0.29	99.99	NW/4SE/4	7	6N	45E	SPR
--	WSHB76-273	Tb	53.50	13.90	2.20	3.00	8.60	0.15	8.40	4.90	1.40	2.80	0.38	99.23	NE/4SW/4	12	6N	45E	SW
2	SR83-005	Tb	54.97	15.52	2.35	2.00	8.10	0.19	8.44	4.73	1.45	1.93	0.32	100.00	NE/4NW/4	18	6N	45E	SPR
3	SR84-062	Tb	54.67	15.61	2.27	2.00	7.77	0.19	8.51	4.98	1.37	2.31	0.32	100.00	SE/4SW/4	2	7N	45E	SPR
4	SR84-054	Tb	54.21	15.39	2.23	2.00	8.62	0.20	8.39	4.92	1.52	2.19	0.31	99.98	SE/4SE/4	5	7N	45E	SPR
5	SR84-040	Tb	53.03	15.87	2.32	2.00	9.59	0.19	8.40	4.85	1.16	2.26	0.32	99.99	NW/4NW/4	8	7N	45E	SPR
6	WSHB76-217	Tb	54.60	14.10	2.20	2.80	7.60	0.13	8.30	4.60	1.50	2.90	0.36	99.09	SE/4SW/4	8	7N	45E	SW
7	SR84-049	Tb	53.84	15.17	2.20	2.00	9.63	0.19	8.23	4.82	1.22	2.40	0.30	100.00	SE/4NE/4	10	7N	45E	SPR
8	WSHB76-212	Tb	55.02	12.44	2.72	---	13.68	---	7.55	3.10	1.84	1.76	0.37	98.48	SE/4NE/4	10	7N	45E	glass only; SW
9	SR84-063	Tb	54.72	15.44	2.26	2.00	7.74	0.18	8.59	4.86	1.47	2.44	0.31	100.01	SE/4SW/4	11	7N	45E	SPR
10	WSHB76-255	Tb	53.60	14.30	2.20	3.40	8.20	0.14	8.50	5.00	1.40	2.70	0.38	99.82	SE/4SW/4	20	7N	45E	SW
11	HAN-089	Tb	53.59	14.71	2.17	2.00	9.94	0.18	8.39	4.86	1.59	2.28	0.29	100.00	NW/4NE/4	35	7N	45E	dike; PRH
12	PRH85-003	Tb	54.09	15.08	2.20	2.00	9.91	0.17	8.02	5.01	1.27	1.96	0.29	100.00	NW/4NE/4	35	7N	45E	dike; PRH
13	SPSR-296	Tb	53.52	14.92	2.13	2.00	9.86	0.19	8.36	4.74	1.61	2.36	0.30	99.99	NW/4NE/4	35	7N	45E	dike; SPR
14	SPSR-298	Tb	53.14	14.84	2.12	2.00	10.01	0.20	8.58	4.74	1.69	2.39	0.29	100.00	NW/4NE/4	35	7N	45E	dike; SPR
15	HAN-013R	Tb	53.80	15.18	2.24	2.00	8.84	0.18	8.69	4.97	1.25	2.54	0.31	100.00	SW/4NE/4	9	8N	45E	PRH
16	HAN-007	Tb	54.21	15.13	2.21	2.00	10.08	0.18	8.10	4.57	1.22	2.01	0.30	100.01	NW/4NW/4	35	8N	45E	PRH
17	HWE-003	Tb	54.27	15.49	2.25	2.00	8.43	0.17	8.54	4.72	1.13	2.67	0.33	100.00	SW/4NE/4	5	8N	46E	PRH
--	WSHB72-146	Tb	54.02	14.73	2.04	11.47	0.00	0.17	8.76	4.81	1.30	2.83	0.28	100.41	SW/4NE/4	5	8N	46E	SW
18	HWE-038R	Tb	53.91	15.12	2.21	2.00	9.33	0.19	8.44	4.90	1.22	2.38	0.29	99.99	NW/4NE/4	19	8N	46E	PRH
19	HWE-046	Tb	54.05	14.79	2.23	2.00	9.43	0.20	8.52	4.76	1.30	2.42	0.30	100.00	NE/4NE/4	19	8N	46E	PRH
20	HWE-050	Tb	53.96	14.83	2.21	2.00	9.49	0.19	8.39	4.87	1.30	2.47	0.30	100.01	SE/4NW/4	19	8N	46E	PRH
--	WSHB76-240	Tb	53.60	13.90	2.20	3.10	8.00	0.15	8.70	4.70	1.30	2.70	0.31	98.66	SE/4NW/4	19	8N	46E	SW
21	HWE-065	Tb	54.10	15.06	2.25	2.00	9.08	0.18	8.48	4.78	1.47	2.27	0.33	100.00	NE/4NE/4	21	8N	46E	PRH
22	HWE-019	Tb	53.73	15.03	2.23	2.00	9.26	0.20	8.63	4.84	1.50	2.28	0.31	100.01	SW/4NW/4	20	9N	46E	PRH
23	HAN-111	Tem	51.80	13.81	3.53	2.00	12.41	0.21	8.25	4.37	1.08	2.08	0.48	100.02	SE/4NE/4	25	8N	44E	PRH
24	HAN-072	Tem	51.48	13.88	3.50	2.00	12.49	0.22	8.36	4.19	1.19	2.21	0.47	99.99	SE/4NE/4	31	8N	45E	PRH
25	HAN-104	Tem	51.44	13.96	3.48	2.00	12.68	0.21	8.28	4.16	1.16	2.16	0.48	100.01	SE/4NE/4	31	8N	45E	PRH
26	HAN-105	Tem	51.63	14.09	3.55	2.00	12.13	0.20	8.28	4.15	1.25	2.22	0.49	99.99	SW/4NE/4	31	8N	45E	PRH
--	WSHB74-310	Tem	50.04	13.25	3.40	16.18	0.00	0.21	8.26	4.30	1.31	2.60	0.56	100.11	SW/4NW/4	19	9N	47E	SW
--	WSHB75-165	Tws	54.86	13.97	2.21	---	11.72	---	9.26	4.62	1.21	2.52	0.37	100.74	NW/4SW/4	1	8N	44E	glass only; SW
27	HAN-102	Tws	52.10	15.40	2.66	2.00	9.41	0.20	9.63	4.85	0.69	2.65	0.41	100.00	SW/4SW/4	36	9N	44E	PRH
28	HAN-067	Tws	52.46	14.91	2.56	2.00	9.49	0.18	9.84	4.86	0.70	2.60	0.41	100.01	SE/4NW/4	7	8N	45E	PRH

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
29	HAN-066	Tws	52.03	14.67	2.53	2.00	10.44	0.19	9.34	5.39	0.68	2.32	0.40	99.99	NW/4SW/4	8	8N	45E	PRH
30	HAN-104R	Tws	52.05	14.79	2.47	2.00	9.93	0.19	9.31	5.77	0.81	2.27	0.40	99.99	NE/4NW/4	9	8N	45E	PRH
31	HAN-112	Tws	52.05	14.67	2.56	2.00	10.71	0.20	9.18	5.16	0.78	2.28	0.41	100.00	SE/4SE/4	9	8N	45E	PRH
32	HWE-051	Tws	52.00	14.67	2.49	2.00	9.86	0.19	9.64	5.45	0.89	2.41	0.40	100.00	SW/4SW/4	12	8N	45E	PRH
33	HAN-113	Tws	51.97	14.68	2.47	2.00	10.25	0.19	9.42	5.45	0.70	2.46	0.40	99.99	NW/4SW/4	15	8N	45E	PRH
34	HAN-030	Tws	51.79	14.99	2.57	2.00	9.89	0.19	9.31	5.59	0.79	2.46	0.41	99.99	SE/4NE/4	16	8N	45E	PRH
35	HAN-047	Tws	51.85	14.69	2.51	2.00	10.46	0.21	9.12	5.63	0.94	2.19	0.39	99.99	SW/4SE/4	17	8N	45E	talus; PRH
36	HAN-045	Tws	52.34	14.85	2.55	2.00	9.58	0.19	9.36	5.36	0.80	2.55	0.42	100.00	NE/4NE/4	20	8N	45E	PRH
37	HAN-053	Tws	52.07	14.86	2.55	2.00	9.68	0.18	9.31	5.48	0.92	2.52	0.42	99.99	NE/4NW/4	21	8N	45E	PRH
38	HAN-031	Tws	51.99	14.86	2.56	2.00	9.87	0.20	9.42	5.56	0.86	2.27	0.42	100.01	NE/4SE/4	23	8N	45E	PRH
39	HWE-055	Tws	51.72	14.80	2.57	2.00	10.36	0.20	9.23	5.53	0.75	2.41	0.42	99.99	NE/4SW/4	25	8N	45E	PRH
40	HWE-052	Tws	52.22	15.05	2.63	2.00	9.14	0.25	9.89	5.11	0.65	2.64	0.41	99.99	NE/4NE/4	26	8N	45E	PRH
41	HWE-053	Tws	52.69	15.11	2.60	2.00	9.08	0.18	9.46	5.08	0.95	2.43	0.42	100.00	NE/4NE/4	26	8N	45E	PRH
42	HWE-045	Tws	52.53	14.86	2.48	2.00	9.82	0.19	9.29	5.40	0.82	2.20	0.41	100.00	SE/4SW/4	25	9N	45E	PRH
43	CA-011	Tws	52.37	14.80	2.55	2.00	9.79	0.20	9.73	4.96	0.83	2.36	0.42	100.01	NW/4SE/4	30	9N	45E	VEC
44	HAN-002	Tws	52.25	15.81	2.61	2.00	8.96	0.19	9.66	4.71	0.86	2.49	0.43	99.97	SE/4NW/4	30	9N	45E	PRH
45	HAN-020	Tws	52.58	15.34	2.60	2.00	8.58	0.18	9.69	5.23	0.90	2.47	0.42	99.99	NE/4SW/4	33	9N	45E	PRH
46	HBB-001R	Tws	51.96	15.01	2.52	2.00	9.50	0.20	9.41	5.87	0.71	2.44	0.40	100.02	SE/4NE/4	3	7N	46E	PRH
47	HBB-002R	Tws	52.47	15.16	2.60	2.00	9.00	0.20	9.59	5.34	0.70	2.51	0.42	99.99	SE/4SE/4	6	7N	46E	PRH
48	GRSR-060	Tws	50.17	14.31	2.52	2.00	11.02	0.21	10.04	5.33	0.94	3.03	0.42	99.99	NW/4NE/4	21	7N	46E	SPR
49	HWE-066	Tws	51.97	14.85	2.55	2.00	9.69	0.22	9.53	5.41	0.90	2.46	0.42	100.00	SE/4NW/4	2	8N	46E	PRH
50	CA-005	Tws	53.12	14.70	2.44	2.00	8.43	0.21	9.45	5.31	0.99	2.92	0.44	100.01	NE/4NW/4	5	8N	46E	VEC
51	HWE-002	Tws	51.66	15.47	2.49	2.00	10.10	0.19	9.45	5.08	0.83	2.32	0.40	99.99	NE/4SW/4	5	8N	46E	PRH
--	WSHB72-147	Tws	51.61	14.44	2.42	12.82	0.00	0.19	9.52	5.58	0.85	2.76	0.43	100.62	CENTER	5	8N	46E	SW
52	CA-001	Tws	51.09	14.12	2.50	2.00	10.61	0.21	9.58	5.66	0.98	2.85	0.40	100.00	NW/4SE/4	19	8N	46E	VEC
53	HWE-039R	Tws	52.16	14.88	2.53	2.00	9.86	0.19	9.11	5.57	0.87	2.42	0.41	100.00	SE/4NW/4	19	8N	46E	PRH
54	HWE-036R	Tws	52.34	15.09	2.51	2.00	9.27	0.19	9.45	5.53	0.90	2.31	0.41	100.00	SW/4SE/4	22	8N	46E	PRH
55	HCJ-004	Tws	52.19	15.16	2.60	2.00	9.43	0.19	9.74	5.25	0.83	2.19	0.41	99.99	SW/4SE/4	24	8N	46E	PRH
56	HWE-013	Tws	52.09	14.82	2.39	2.00	10.54	0.23	9.42	5.09	0.91	2.09	0.42	100.00	SW/4NW/4	28	8N	46E	PRH
57	HWE-061	Tws	52.24	14.75	2.53	2.00	10.03	0.19	9.20	5.39	0.88	2.38	0.41	100.00	SE/4NE/4	30	8N	46E	PRH
58	HWE-014	Tws	52.20	14.76	2.53	2.00	10.40	0.20	9.24	5.32	0.94	2.00	0.41	100.00	SW/4NE/4	32	8N	46E	PRH
59	HWE-018	Tws	51.95	14.74	2.58	2.00	10.19	0.20	9.26	5.31	1.04	2.30	0.42	99.99	SW/4NW/4	20	9N	46E	PRH
60	HAS-051	Tws	48.95	15.05	2.63	2.00	10.07	0.19	10.90	6.62	0.52	2.52	0.55	100.00	NW/4NW/4	24	9N	46E	PRH
61	SR84-061	Twt	49.82	14.00	3.23	2.00	12.44	0.22	9.05	5.25	1.12	2.26	0.61	100.00	NE/4SW/4	2	7N	45E	SPR
62	SR84-067	Twt	49.67	13.74	3.25	2.00	12.85	0.26	9.02	5.01	1.08	2.51	0.61	100.00	NE/4SW/4	2	7N	45E	SPR
63	SR84-050	Twt	50.06	14.21	3.28	2.00	12.02	0.24	9.22	5.05	1.05	2.26	0.61	100.00	NW/4NW/4	11	7N	45E	SPR
64	SR84-064	Twt	51.35	15.22	3.42	2.00	10.09	0.18	9.46	4.35	0.73	2.56	0.63	99.99	NE/4SW/4	11	7N	45E	SPR
65	SR84-065	Twt	49.94	13.99	3.21	2.00	12.70	0.27	9.06	4.93	1.00	2.29	0.61	100.00	NW/4NE/4	11	7N	45E	SPR
66	HAN-095	Twt	50.65	14.08	3.17	2.00	12.31	0.23	8.83	5.01	0.98	2.15	0.60	100.01	NW/4NW/4	12	7N	45E	PRH
67	SR83-015	Twt	53.02	15.48	3.45	2.00	8.65	0.17	9.41	3.62	1.14	2.41	0.66	100.01	SW/4NW/4	12	7N	45E	SPR

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
68	HWE-054	Twt	51.20	14.46	3.24	2.00	12.00	0.18	8.45	4.50	0.97	2.40	0.60	100.00	SE/4NE/4	26	8N	45E	PRH
69	HWE-044R	Twt	50.89	14.27	3.07	2.00	11.12	0.20	9.28	5.49	0.85	2.25	0.58	100.00	SE/4SW/4	25	9N	45E	PRH
70	K-6183	Twt	49.76	14.38	3.05	2.00	12.61	0.23	9.08	5.06	0.95	2.32	0.57	100.01	SW/4NE/4	8	6N	46E	dike; SPR
71	K-6185	Twt	50.10	14.34	3.12	2.00	12.27	0.22	9.06	5.18	0.98	2.14	0.58	99.99	SW/4NE/4	8	6N	46E	dike; SPR
72	SP83-185	Twt	51.22	13.95	3.23	2.00	12.11	0.23	8.65	5.12	0.97	1.87	0.64	99.99	SW/4NE/4	8	6N	46E	dike; SMP/SPR
73	HBB-003R	Twt	50.94	14.39	3.11	2.00	11.73	0.22	8.77	5.14	0.76	2.37	0.57	100.00	NW/4NW/4	8	7N	46E	PRH
74	HWE-047	Twt	50.93	14.03	3.15	2.00	12.20	0.22	8.88	4.79	0.96	2.26	0.58	100.00	SW/4NE/4	19	8N	46E	PRH
75	HWE-048	Twt	50.82	13.95	3.12	2.00	12.18	0.23	8.67	5.08	0.98	2.37	0.60	100.00	SW/4NE/4	19	8N	46E	PRH
76	HWE-063	Twt	51.14	14.21	3.08	2.00	11.35	0.21	9.25	5.24	0.85	2.08	0.59	100.00	SE/4SW/4	21	8N	46E	PRH
77	HCJ-003	Twt	51.02	14.15	3.09	2.00	11.46	0.21	9.47	4.79	0.79	2.44	0.60	100.02	NW/4SE/4	24	8N	46E	PRH
78	HCJ-014	Twt	51.66	14.89	3.16	2.00	9.02	0.18	10.97	4.38	0.76	2.45	0.62	100.09	NW/4SE/4	24	8N	46E	PRH
79	HAN-068	Twc	53.67	15.78	1.84	2.00	8.40	0.16	9.70	4.57	1.08	2.45	0.37	100.02	NW/4NW/4	12	8N	44E	PRH
80	HAN-003	Twc	52.91	16.55	1.79	2.00	8.15	0.15	9.30	5.23	1.22	2.33	0.37	100.00	SW/4SW/4	25	9N	44E	PRH
81	SP83-287	Twc	50.81	15.30	1.80	2.00	8.40	0.17	10.83	8.16	0.46	1.72	0.35	100.00	SW/4NW/4	2	6N	45E	dike; SMP/SPR
82	SPSR-019	Twc	48.97	15.56	1.79	2.00	9.01	0.18	11.40	8.09	0.49	2.15	0.36	100.00	SW/4NW/4	2	6N	45E	dike; SMP/SPR
--	WBSO76-271	Twc	49.69	15.60	1.90	0.00	10.54	0.18	11.70	7.14	0.30	2.31	0.41	99.77	SE/4SE/4	11	6N	45E	SW
--	WBSO76-272	Twc	49.15	15.85	1.73	0.00	10.82	0.18	11.38	7.81	0.32	2.18	0.35	99.77	SE/4SE/4	11	6N	45E	SW
83	SR83-009	Twc	50.53	15.57	1.83	2.00	8.73	0.18	11.01	8.06	0.20	1.54	0.35	100.00	NW/4SW/4	12	6N	45E	SPR
84	SR84-041	Twc	49.66	15.41	1.85	2.00	9.41	0.19	11.12	7.42	0.29	2.28	0.37	100.00	SE/4NE/4	8	7N	45E	SPR
85	SR84-047	Twc	50.91	16.07	1.83	2.00	8.20	0.17	10.24	7.93	0.32	1.95	0.35	99.97	NW/4SE/4	10	7N	45E	SPR
--	WSHB76-213	Twc	48.80	15.10	1.80	1.50	8.80	0.14	11.00	7.90	0.38	2.40	0.44	98.26	SW/4SW/4	10	7N	45E	SW
86	SR84-066	Twc	49.00	15.31	2.01	2.00	9.55	0.21	11.13	7.83	0.19	2.38	0.39	100.00	NE/4NE/4	11	7N	45E	SPR
87	HAN-090	Twc	50.17	15.46	1.83	2.00	8.66	0.18	10.87	7.95	0.27	2.26	0.36	100.01	NE/4NW/4	24	7N	45E	dike; PRH
88	K-6050	Twc	49.82	16.15	1.79	2.00	8.63	0.19	11.11	7.63	0.42	1.90	0.36	100.00	NE/4NW/4	24	7N	45E	dike; SMP
89	K-6052	Twc	49.34	15.94	1.80	2.00	8.79	0.19	11.28	7.93	0.42	1.94	0.36	99.99	NE/4NW/4	24	7N	45E	dike; SMP
90	SP83-052	Twc	50.62	15.82	1.82	2.00	8.47	0.18	10.64	8.18	0.43	1.47	0.37	100.00	SW/4NE/4	24	7N	45E	dike; SMP/SPR
91	HAN-101	Twc	49.65	15.58	1.98	2.00	8.54	0.18	11.43	7.77	0.23	2.25	0.40	100.01	SE/4NW/4	6	8N	45E	PRH
92	HAN-012R	Twc	50.89	15.68	1.89	2.00	8.32	0.16	10.83	7.74	0.13	2.00	0.36	100.00	NW/4SW/4	15	8N	45E	PRH
93	HAN-046	Twc	49.83	15.86	1.81	2.00	8.60	0.17	11.08	7.73	0.13	2.34	0.45	100.00	NE/4NE/4	20	8N	45E	PRH
94	HAN-052	Twc	49.32	15.18	1.94	2.00	9.10	0.19	11.30	7.96	0.19	2.42	0.41	100.01	NE/4NW/4	21	8N	45E	PRH
95	HAN-008R	Twc	49.91	15.28	2.03	2.00	8.51	0.18	11.35	7.75	0.34	2.24	0.41	100.00	SW/4SE/4	27	8N	45E	PRH
96	HAN-009R	Twc	50.15	15.41	2.01	2.00	8.37	0.17	11.20	7.67	0.27	2.33	0.42	100.00	NW/4SE/4	28	8N	45E	PRH
97	SR84-060	Twc	49.72	15.01	2.15	2.00	9.45	0.18	10.89	7.43	0.44	2.31	0.42	100.00	NE/4SE/4	34	8N	45E	SPR
98	HAN-021	Twc	50.01	15.66	1.93	2.00	8.80	0.17	10.12	8.47	0.32	2.15	0.37	100.00	NE/4SW/4	33	9N	45E	PRH
99	HAN-103	Ta	51.84	16.12	1.52	2.00	7.96	0.15	10.38	7.09	0.45	2.26	0.23	100.00	SW/4SW/4	36	9N	44E	PRH
100	HAN-001	Ta	49.93	16.52	1.51	2.00	7.64	0.16	11.10	7.75	0.48	2.51	0.20	99.80	NW/4SW/4	19	9N	45E	PRH
101	HWE-040R	Ta	50.91	16.07	1.59	2.00	7.65	0.16	10.69	8.14	0.36	2.22	0.21	100.00	NW/4NW/4	25	9N	45E	PRH
102	HWE-043R	Ta	51.07	16.27	1.52	2.00	7.24	0.15	10.85	8.23	0.39	2.09	0.19	100.00	SW/4SW/4	25	9N	45E	PRH
103	CA-012	Ta	50.87	16.05	1.36	2.00	7.45	0.20	11.75	7.84	0.45	1.84	0.18	99.99	SE/4NW/4	30	9N	45E	VEC

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
104	HAN-022	Ta	52.68	16.54	1.51	2.00	7.44	0.16	8.58	8.19	0.40	2.30	0.21	100.01	NE/4SW/4	33	9N	45E	PRH
105	HBB-004	Ta	52.46	16.63	1.48	2.00	7.11	0.15	10.64	7.24	0.44	1.65	0.19	99.99	SE/4NW/4	6	7N	46E	PRH
106	HWE-001	Ta	52.65	16.28	1.40	2.00	7.34	0.16	10.49	6.49	0.68	2.31	0.19	99.99	NE/4SW/4	5	8N	46E	PRH
107	HWE-025	Ta	53.08	16.07	1.39	2.00	7.10	0.17	11.06	6.58	0.47	1.91	0.19	100.02	SW/4NW/4	16	8N	46E	PRH
108	HWE-049	Ta	51.18	16.01	1.46	2.00	7.46	0.15	10.65	8.23	0.43	2.25	0.19	100.01	SW/4NE/4	19	8N	46E	PRH
109	HWE-062	Ta	51.16	16.10	1.52	2.00	7.61	0.16	10.57	8.15	0.36	2.18	0.19	100.00	SE/4SW/4	21	8N	46E	PRH
110	HWE-034R	Ta	51.16	16.23	1.52	2.00	7.23	0.15	10.77	8.16	0.43	2.16	0.20	100.01	SE/4SW/4	22	8N	46E	PRH
111	HWE-035R	Ta	53.16	15.89	1.39	2.00	6.73	0.15	10.53	7.03	0.64	2.30	0.18	100.00	SE/4SW/4	22	8N	46E	PRH
--	WSHB76-234	Ta	52.02	14.59	1.88	---	11.09	---	11.21	6.00	0.60	2.45	0.26	100.10	SW/4NE/4	24	8N	46E	glass only; SW
112	HWE-029R	Ta	51.19	16.24	1.52	2.00	7.45	0.16	10.66	8.13	0.43	2.03	0.19	100.00	SW/4NW/4	26	8N	46E	PRH
113	HWE-012	Ta	52.95	15.78	1.39	2.00	7.48	0.17	10.68	6.84	0.64	1.89	0.18	100.00	SW/4NW/4	28	8N	46E	PRH
114	HWE-060	Ta	51.39	16.08	1.51	2.00	7.40	0.16	10.62	8.05	0.38	2.23	0.19	100.01	NE/4SE/4	30	8N	46E	PRH
115	HWE-037R	Ta	51.23	16.24	1.51	2.00	7.28	0.15	10.77	7.88	0.42	2.31	0.20	99.99	SW/4NE/4	32	8N	46E	PRH
116	HWE-026R	Ta	51.28	16.32	1.53	2.00	7.06	0.15	10.75	8.10	0.47	2.14	0.19	99.99	NE/4NW/4	35	8N	46E	PRH
--	WSHB74-311	Ta	48.77	15.86	1.37	10.66	0.00	0.16	11.29	8.20	0.41	2.06	0.16	98.94	SW/4NE/4	25	9N	46E	SW
117	HCJ-009	Ta	51.37	16.58	1.49	2.00	7.57	0.17	10.99	7.58	0.48	1.56	0.21	100.00	NW/4NE/4	19	8N	47E	PRH
118	HAN-064	Tus	54.75	15.38	3.21	2.00	8.45	0.19	7.01	2.69	2.45	2.97	0.89	99.99	NW/4NW/4	13	8N	44E	PRH
119	K-6025	Tus	54.64	15.04	2.55	2.00	10.39	0.20	5.97	2.61	2.82	2.93	0.84	99.99	NW/4NW/4	3	6N	45E	dike; SMP
120	K-6026	Tus	54.01	14.75	2.72	2.00	10.81	0.21	6.16	2.87	2.68	2.98	0.80	99.99	NW/4NW/4	3	6N	45E	dike; SMP
121	K-6027	Tus	54.11	14.82	2.74	2.00	10.45	0.22	6.18	2.92	2.71	3.05	0.81	100.01	NW/4NW/4	3	6N	45E	dike; SMP
122	SP83-020	Tus	54.66	14.51	2.79	2.00	10.94	0.20	5.97	3.05	2.64	2.42	0.83	100.01	NW/4NW/4	3	6N	45E	dike; SMP/SPR
123	SP83-029	Tus	55.03	14.40	2.82	2.00	10.89	0.18	6.02	2.96	2.66	2.18	0.85	99.99	NW/4NW/4	3	6N	45E	dike; SMP/SPR
124	SRP83-025	Tus	55.42	15.03	2.52	2.00	10.45	0.21	5.60	2.63	2.93	2.35	0.86	100.00	NW/4NW/4	3	6N	45E	dike; SMP/SPR
125	SR84-044	Tus	56.28	16.46	3.08	2.00	7.89	0.12	5.79	1.82	2.78	2.79	0.98	99.99	NW/4SW/4	3	7N	45E	SPR
126	SR84-045	Tus	54.47	14.97	2.70	2.00	10.40	0.24	6.12	2.81	2.91	2.51	0.89	100.02	SE/4SW/4	3	7N	45E	SPR
127	SR84-043	Tus	54.95	15.81	2.95	2.00	10.08	0.14	6.10	2.09	2.44	2.54	0.91	100.01	SW/4SE/4	4	7N	45E	SPR
128	SR84-053	Tus	54.33	14.93	2.72	2.00	10.83	0.38	6.34	2.41	2.80	2.41	0.86	100.01	NE/4NW/4	4	7N	45E	SPR
129	SR84-033	Tus	53.34	15.65	3.01	2.00	8.51	0.12	6.05	1.82	2.82	2.78	0.91	100.01	NE/4SE/4	6	7N	45E	SPR
130	SR84-035	Tus	56.62	15.72	2.93	2.00	9.03	0.11	5.34	1.79	2.85	2.70	0.89	99.98	NE/4SE/4	6	7N	45E	SPR
131	SR84-037	Tus	54.37	15.04	2.69	2.00	11.10	0.19	5.54	3.08	2.65	2.48	0.86	100.00	NE/4NE/4	7	7N	45E	SPR
132	SR84-038	Tus	54.84	15.25	2.76	2.00	10.12	0.19	5.71	2.69	2.76	2.80	0.89	100.01	SW/4NW/4	8	7N	45E	SPR
133	SR84-039	Tus	55.15	15.02	2.70	2.00	11.02	0.19	5.48	2.29	2.71	2.56	0.88	100.00	NW/4NW/4	8	7N	45E	SPR
134	SR84-042	Tus	54.24	14.86	2.69	2.00	11.13	0.75	5.69	2.55	2.66	2.56	0.86	99.99	NW/4SW/4	9	7N	45E	SPR
--	PH9-001R	Tus	55.29	15.62	2.82	2.00	12.69	0.24	4.46	1.85	3.10	1.12	0.81	100.00	NW/4	21	7N	45E	vent complex; PRH
--	PH9-002	Tus	55.13	14.89	2.67	2.00	11.34	0.19	5.76	2.29	2.84	2.01	0.89	100.01	NW/4	21	7N	45E	vent complex; PRH
--	PH9-003	Tus	54.64	14.78	2.65	2.00	11.52	0.20	5.42	2.24	2.85	2.83	0.88	100.01	NW/4	21	7N	45E	vent complex; PRH
135	WSHB76-231	Tus	55.05	13.19	2.22	---	11.29	---	5.72	2.20	2.74	2.07	1.08	95.56	SW/4NE/4	21	7N	45E	glass only; SW
136	HAN-100	Tus	54.80	14.91	2.76	2.00	10.42	0.19	5.86	2.75	2.69	2.74	0.88	100.00	SW/4NE/4	6	8N	45E	PRH
137	HAN-065	Tus	54.60	14.64	2.71	2.00	10.77	0.20	6.02	2.66	2.89	2.66	0.86	100.01	NW/4SW/4	8	8N	45E	PRH
138	HAN-054	Tus	54.35	14.65	2.67	2.00	10.88	0.22	5.99	2.97	2.74	2.67	0.86	100.00	SW/4SW/4	10	8N	45E	PRH

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
139	HAN-048	Tus	54.24	14.62	2.65	2.00	11.13	0.21	5.96	2.95	2.63	2.73	0.89	100.01	NE/4NE/4	20	8N	45E	PRH
140	HAN-010	Tus	55.37	15.00	2.85	2.00	11.31	0.24	5.18	1.73	2.81	2.61	0.90	100.00	SW/4SE/4	21	8N	45E	PRH
141	HAN-011R	Tus	55.28	15.04	2.76	2.00	9.30	0.25	6.31	2.51	2.75	2.90	0.90	100.00	SE/4NW/4	22	8N	45E	PRH
142	HAN-035	Tus	55.42	15.51	2.99	2.00	8.14	0.23	6.77	2.20	2.93	2.92	0.89	100.00	SW/4SE/4	29	8N	45E	PRH
143	HAN-038	Tus	53.99	15.14	2.78	2.00	10.17	0.21	6.34	2.89	2.62	2.94	0.93	100.01	SE/4NW/4	29	8N	45E	PRH
144	HAN-039	Tus	54.52	14.69	2.67	2.00	10.67	0.20	6.02	2.86	2.73	2.77	0.87	100.00	SE/4NW/4	29	8N	45E	PRH
145	HAN-043	Tus	54.85	14.81	2.70	2.00	10.12	0.19	6.07	2.66	2.72	3.00	0.89	100.01	NE/4NE/4	30	8N	45E	PRH
146	HAN-077	Tus	54.04	14.68	2.88	2.00	11.02	0.35	6.37	2.63	2.70	2.50	0.84	100.01	NE/4NW/4	30	8N	45E	PRH
147	HAN-069	Tus	54.74	14.61	2.71	2.00	10.58	0.19	5.91	2.77	2.70	2.92	0.87	100.00	NW/4NW/4	32	8N	45E	PRH
148	SR84-057	Tus	54.44	14.78	2.71	2.00	11.03	0.21	5.66	2.84	2.67	2.79	0.88	100.01	NE/4SW/4	32	8N	45E	SPR
149	SR84-058	Tus	55.05	15.41	2.83	2.00	10.86	0.17	5.11	2.17	2.75	2.74	0.91	100.00	NE/4SW/4	32	8N	45E	SPR
150	HAN-033	Tus	56.27	16.26	3.08	2.00	10.06	0.08	4.39	0.83	3.06	2.94	1.02	99.99	NW/4NE/4	33	8N	45E	PRH
151	HAN-041	Tus	55.11	15.16	2.83	2.00	10.46	0.17	5.56	2.18	2.81	2.81	0.90	99.99	NE/4NW/4	33	8N	45E	PRH
152	HAN-085	Tus	55.14	14.85	2.75	2.00	10.39	0.20	5.63	2.37	2.76	3.00	0.91	100.00	SW/4SE/4	33	8N	45E	PRH
153	SR84-052	Tus	54.83	15.41	2.78	2.00	10.31	0.18	5.55	2.53	2.79	2.72	0.89	99.99	SW/4SE/4	33	8N	45E	SPR
154	SR84-056	Tus	55.54	15.17	2.75	2.00	9.51	0.21	6.13	2.52	2.95	2.33	0.89	100.00	SE/4SE/4	33	8N	45E	SPR
155	HWE-021	Tus	54.56	14.79	2.80	2.00	10.63	0.19	6.35	2.52	2.71	2.61	0.84	100.00	SE/4NE/4	24	9N	45E	PRH
156	HWE-042R	Tus	55.12	15.08	2.73	2.00	9.47	0.17	6.31	2.53	2.77	2.93	0.89	100.00	NW/4NW/4	25	9N	45E	PRH
157	HAN-023	Tus	54.09	14.68	2.70	2.00	10.86	0.21	6.22	2.86	2.82	2.73	0.84	100.01	NW/4SW/4	33	9N	45E	PRH
158	HAN-024	Tus	54.14	14.75	2.69	2.00	10.61	0.21	6.38	2.88	2.86	2.62	0.86	100.00	NW/4SW/4	33	9N	45E	PRH
159	HWE-016	Tus	54.13	14.37	2.88	2.00	10.96	0.22	6.38	2.95	2.84	2.47	0.80	100.00	NE/4NE/4	19	9N	46E	PRH
160	HWE-017	Tus	54.27	14.63	2.76	2.00	10.38	0.21	6.57	2.81	2.91	2.64	0.82	100.00	NW/4NW/4	20	9N	46E	PRH
161	HWE-007	Tus	56.80	16.70	3.46	2.00	9.87	0.11	3.53	0.91	3.09	2.49	1.03	99.99	SW/4SW/4	23	9N	46E	Umatilla chemical variant; PRH
162	HWE-008	Tus	54.88	15.63	3.07	2.00	8.32	0.29	7.02	2.14	2.86	2.92	0.87	100.00	NW/4NW/4	26	9N	46E	PRH
163	HWE-009	Tus	54.06	14.49	2.78	2.00	10.95	0.22	6.15	2.87	2.94	2.72	0.83	100.01	NE/4NE/4	35	9N	46E	PRH
164	HCJ-008	Tus	52.39	16.21	3.07	2.00	10.04	0.16	8.90	3.43	0.57	2.18	1.04	99.99	NE/4NE/4	19	8N	47E	PRH
165	SR83-003	Tuu	54.92	14.55	2.96	2.00	10.44	0.21	6.34	2.81	2.74	2.25	0.77	99.99	NW/4NW/4	8	6N	45E	SPR
166	SR84-059	Tuu	53.31	14.87	3.11	2.00	11.00	0.20	6.54	3.51	2.53	2.22	0.69	99.98	NW/4NE/4	5	7N	45E	SPR
167	SR84-030	Tuu	53.75	14.65	3.15	2.00	11.15	0.24	6.57	3.04	2.50	2.26	0.69	100.00	NW/4SE/4	6	7N	45E	SPR
168	SR84-034	Tuu	56.31	15.69	3.25	2.00	6.60	0.20	7.01	2.80	2.86	2.47	0.80	99.99	NE/4NW/4	6	7N	45E	SPR
169	SRFS84-011	Tuu	53.95	14.99	3.27	2.00	11.87	0.16	6.09	2.30	1.91	2.77	0.68	99.99	SW/4SW/4	10	7N	45E	SPR
170	WSHB76-215	Tuu	53.85	13.09	2.69	---	12.94	---	6.25	2.93	2.55	2.48	0.70	97.48	SW/4SW/4	10	7N	45E	glass only; SW
171	SRFS84-010	Tuu	55.58	15.20	3.29	2.00	8.39	0.14	6.84	2.23	2.75	2.82	0.76	100.00	NW/4NW/4	15	7N	45E	SPR
172	SRFS84-012	Tuu	54.08	14.67	3.29	2.00	9.86	0.48	6.71	2.99	2.49	2.75	0.67	99.99	NE/4NE/4	16	7N	45E	SPR
173	SRFS84-005	Tuu	55.19	14.84	2.81	2.00	10.42	0.16	5.88	2.31	2.79	2.78	0.83	100.01	SE/4NE/4	21	7N	45E	SPR
174	SRFS-004	Tuu	54.44	14.92	2.56	2.00	11.11	0.26	6.33	2.92	1.89	2.77	0.81	100.01	NW/4SE/4	21	7N	45E	SPR
--	WSHB72-172	Tuu	52.00	14.80	2.80	9.60	4.70	0.12	4.90	1.80	2.50	3.10	0.88	97.20	SW/4SE/4	21	7N	45E	SW
174a	HAN-098	Tuu	53.38	14.68	3.20	2.00	11.00	0.20	6.57	3.36	2.27	2.65	0.69	100.00	SW/4NE/4	6	8N	45E	PRH
175	HAN-099	Tuu	53.87	14.89	2.99	2.00	11.08	0.17	6.52	2.77	2.32	2.62	0.77	100.00	NW/4SE/4	6	8N	45E	PRH
176	HAN-044	Tuu	53.52	14.47	3.13	2.00	10.85	0.21	6.72	3.34	2.37	2.71	0.68	100.00	SW/4NW/4	19	8N	45E	PRH

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
177	HAN-042	Tuu	54.08	14.65	3.06	2.00	10.34	0.18	6.56	3.02	2.39	2.98	0.72	99.98	SE/4SE/4	20	8N	45E	PRH
178	HAN-049	Tuu	53.33	14.43	3.23	2.00	11.24	0.20	6.75	3.31	2.35	2.49	0.68	100.01	NE/4NE/4	20	8N	45E	PRH
179	HAN-034	Tuu	53.47	14.56	3.16	2.00	10.85	0.20	6.75	3.35	2.49	2.49	0.68	100.00	SE/4SE/4	29	8N	45E	PRH
180	HAN-036	Tuu	53.74	14.68	3.19	2.00	10.57	0.19	6.72	3.15	2.36	2.71	0.70	100.01	NE/4SW/4	29	8N	45E	PRH
181	HAN-037	Tuu	53.46	14.73	3.24	2.00	10.62	0.21	6.90	3.05	2.39	2.71	0.69	100.00	NE/4NW/4	29	8N	45E	PRH
182	HAN-040	Tuu	53.15	14.81	3.26	2.00	10.78	0.26	6.72	3.39	2.28	2.65	0.70	100.00	SE/4NW/4	29	8N	45E	PRH
183	HAN-076	Tuu	53.44	14.40	3.16	2.00	11.23	0.21	6.59	3.25	2.47	2.55	0.69	99.99	NE/4NW/4	30	8N	45E	PRH
184	HAN-078	Tuu	53.64	14.57	3.17	2.00	10.91	0.20	6.70	3.08	2.38	2.65	0.71	100.01	NW/4NE/4	30	8N	45E	PRH
185	HAN-070	Tuu	53.67	14.43	3.15	2.00	11.22	0.19	6.49	3.32	2.33	2.50	0.70	100.00	NW/4NW/4	32	8N	45E	PRH
186	HAN-071	Tuu	54.11	15.52	3.50	2.00	9.13	0.16	6.94	2.64	2.22	3.00	0.78	100.00	NW/4SW/4	32	8N	45E	PRH
187	SR84-055	Tuu	54.29	15.02	3.27	2.00	10.17	0.15	6.82	2.79	2.28	2.47	0.74	100.00	NW/4SE/4	33	8N	45E	SPR
188	HAN-032	Tuu	53.42	15.54	3.21	2.00	11.00	0.30	6.82	3.05	2.52	2.46	0.68	101.00	NW/4NW/4	34	8N	45E	PRH
189	HAN-006R	Tuu	54.23	14.67	3.08	2.00	10.62	0.18	6.38	3.25	2.33	2.54	0.72	100.00	SW/4NE/4	23	9N	45E	PRH
190	HWE-041R	Tuu	53.89	14.70	3.06	2.00	10.63	0.20	6.59	3.21	2.37	2.60	0.74	99.99	NW/4NW/4	25	9N	45E	PRH
191	CA-013	Tuu	53.42	14.25	2.99	2.00	10.82	0.23	6.79	3.28	2.57	2.94	0.72	100.01	SE/4NW/4	30	9N	45E	VEC
192	HAN-025	Tuu	53.83	14.73	3.15	2.00	10.32	0.19	6.66	3.24	2.39	2.79	0.71	100.01	NW/4SW/4	33	9N	45E	PRH
193	HWE-020	Tuu	53.62	14.38	3.09	2.00	11.25	0.22	6.62	3.07	2.44	2.56	0.75	100.00	SW/4NW/4	19	9N	46E	PRH
194	HWE-006	Tuu	53.34	14.59	3.05	2.00	11.11	0.23	6.63	3.14	2.70	2.49	0.72	100.00	SW/4SW/4	23	9N	46E	PRH
195	HAN-005	Tprl	49.74	14.35	3.25	2.00	11.00	0.31	10.48	4.71	1.12	2.34	0.71	100.01	SW/4NE/4	23	9N	45E	PRH
196	HWE-022	Tprl	50.85	14.49	3.22	2.00	10.90	0.22	9.14	5.10	1.03	2.36	0.67	99.98	NW/4NE/4	24	9N	45E	PRH
197	SR84-028	Tr	50.71	14.21	3.35	2.00	12.53	0.20	8.61	4.40	1.03	2.33	0.64	100.01	SE/4SW/4	1	7N	44E	SPR
198	K-6039	Tr	52.14	15.17	3.22	2.00	9.67	0.28	9.42	3.70	1.27	2.54	0.59	100.00	SW/4SE/4	25	7N	44E	dike; SMP
199	SRP83-044	Tr	51.93	14.80	3.08	2.00	11.48	0.21	8.59	4.11	1.28	1.95	0.56	99.99	SW/4SE/4	25	7N	44E	dike; SPR
200	HAN-063	Tr	52.85	14.95	3.38	2.00	8.93	0.19	8.88	4.26	1.18	2.74	0.64	100.00	NW/4NW/4	13	8N	44E	PRH
201	SR83-002	Tr	50.29	13.86	3.27	2.00	13.00	0.25	8.61	4.69	1.29	2.13	0.60	99.99	NW/4NW/4	8	6N	45E	SPR
202	SR84-031	Tr	50.76	14.02	3.33	2.00	12.76	0.22	8.14	4.50	1.27	2.39	0.62	100.01	SW/4NW/4	6	7N	45E	SPR
203	HAN-075	Tr	51.31	14.08	3.20	2.00	12.23	0.23	8.16	4.45	1.16	2.58	0.60	100.00	NE/4NW/4	30	8N	45E	PRH
204	SR84-023	Tes	53.57	14.45	2.53	2.00	11.82	0.28	6.75	2.97	1.98	2.86	0.79	100.00	SE/4SE/4	12	7N	44E	SPR
205	SR84-032	Tes	54.58	14.73	2.61	2.00	11.44	0.22	6.38	3.04	1.95	2.24	0.80	99.99	NW/4NW/4	6	7N	45E	SPR
206	SR83-014	Tes	54.87	14.48	2.65	2.00	11.66	0.25	6.47	2.80	1.81	2.20	0.82	100.01	SE/4SE/4	11	7N	45E	SPR
207	HAN-093	Tes	54.45	14.57	2.62	2.00	10.58	0.26	6.86	2.93	1.93	2.97	0.83	100.00	NW/4SW/4	12	7N	45E	PRH
208	SRSF84-013	Tes	54.29	14.46	2.53	2.00	11.18	0.32	6.85	2.79	1.97	2.74	0.86	99.99	NW/4NE/4	16	7N	45E	SPR
209	SRFS84-004	Tes	54.44	14.92	2.56	2.00	11.11	0.26	6.33	2.92	1.89	2.77	0.81	100.01	SE/4NE/4	21	7N	45E	SPR
210	SRFS84-006	Tes	54.88	14.70	2.51	2.00	11.02	0.29	6.77	2.47	1.78	2.77	0.82	100.01	NW/4NE/4	29	7N	45E	SPR
211	HAN-050	Tes	53.98	14.26	2.53	2.00	11.67	0.28	6.81	3.10	2.04	2.51	0.81	99.99	NW/4NE/4	20	8N	45E	PRH
212	HAN-004R	Tes	54.49	14.74	2.62	2.00	10.71	0.26	6.43	3.20	1.84	2.90	0.81	100.00	SW/4NE/4	23	9N	45E	PRH
213	HAN-026	Tes	53.99	14.55	2.56	2.00	11.20	0.26	6.93	3.06	1.88	2.78	0.79	100.00	NW/4SW/4	33	9N	45E	PRH
214	HWE-010	Tes	53.18	14.24	2.49	2.00	12.82	0.53	6.66	2.94	2.00	2.36	0.78	100.00	NE/4SW/4	2	8N	46E	PRH

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
215	HWE-023	Tes	54.18	14.59	2.57	2.00	10.94	0.29	6.91	3.09	1.97	2.64	0.81	99.99	SE/4NW/4	16	8N	46E	PRH
216	HWE-033R	Tes	54.67	14.87	2.60	2.00	11.01	0.33	6.33	3.01	1.75	2.63	0.81	100.01	SW/4SE/4	22	8N	46E	PRH
217	SR84-024	Ted	52.90	16.09	1.39	2.00	8.25	0.20	9.97	5.97	0.33	2.60	0.30	100.00	SE/4SE/4	12	7N	44E	SPR
218	HAN-062	Ted	51.88	15.44	1.37	2.00	9.00	0.16	10.10	6.69	0.47	2.63	0.26	100.00	NW/4NW/4	13	8N	44E	PRH
219	HAN-092	Ted	51.58	14.46	1.34	2.00	9.35	0.17	9.91	7.18	0.31	2.45	0.25	99.00	SE/4SE/4	11	7N	45E	PRH
220	SR84-013	Ted	52.60	15.93	1.35	2.00	8.28	0.15	10.41	6.59	0.39	2.02	0.27	99.99	SE/4SE/4	11	7N	45E	SPR
221	HAN-051	Ted	51.82	15.36	1.37	2.00	9.19	0.19	9.99	6.61	0.45	2.76	0.26	100.00	NW/4NE/4	20	8N	45E	PRH
222	HAN-027	Ted	51.54	15.58	1.39	2.00	8.99	0.20	10.10	6.90	0.36	2.66	0.27	99.99	NW/4SW/4	33	9N	45E	PRH
223	HAN-029	Ted	51.73	15.85	1.31	2.00	8.56	0.18	10.23	6.91	0.39	2.60	0.25	100.01	NW/4SW/4	33	9N	45E	PRH
224	K-6162	Ted	51.61	15.95	1.24	2.00	8.97	0.20	10.23	6.71	0.48	2.34	0.25	99.98	NW/4NE/4	18	6N	46E	dike; SMP
225	K-6164	Ted	51.47	16.30	1.25	2.00	7.71	0.20	11.45	6.26	0.43	2.68	0.25	100.00	NW/4NE/4	18	6N	46E	dike; SMP
226	SRP83-160	Ted	51.68	15.74	1.32	2.00	8.83	0.19	10.37	7.04	0.44	2.13	0.26	100.00	NW/4NE/4	18	6N	46E	dike; SMP/SPR
227	SR84-026	TgN2fs	54.43	16.06	1.31	2.00	7.46	0.15	9.15	5.75	0.70	2.71	0.28	100.00	NW/4SW/4	1	7N	44E	Fields Spring unit; SMP/SPR
228	SR84-071	TgN2fs	54.36	15.56	1.91	2.00	9.37	0.18	8.44	4.45	0.99	2.43	0.30	99.99	NW/4SW/4	1	7N	44E	Fields Spring unit; SMP/SPR
229	HAN-079	TgN2fs	53.76	15.38	1.29	2.00	7.69	0.18	9.81	6.14	0.67	2.81	0.26	99.99	SE/4NW/4	25	8N	44E	Fields Spring unit; PRH
230	HAN-088	TgN2fs	53.67	15.55	1.33	2.00	7.57	0.20	9.87	6.14	0.69	2.69	0.29	100.00	NW/4NW/4	36	8N	44E	Fields Spring unit; PRH
231	SPSR-091	TgN2fs	53.56	15.51	1.19	2.00	7.83	0.20	10.00	6.06	0.97	2.42	0.27	100.01	NW/4NW/4	5	6N	45E	dike; Fields Spring unit; SMP/SPR
232	SPSR-095	TgN2fs	53.24	15.56	1.19	2.00	7.92	0.21	10.10	6.00	0.85	2.68	0.26	100.01	NW/4NW/4	5	6N	45E	dike; Fields Spring unit; SMP/SPR
233	SPSR-096	TgN2fs	53.44	15.47	1.15	2.00	7.68	0.19	9.91	6.29	1.07	2.56	0.25	100.01	NW/4NW/4	5	6N	45E	dike; Fields Spring unit; SMP/SPR
234	SPSR-102	TgN2fs	53.71	15.42	1.16	2.00	7.71	0.18	9.90	6.32	1.02	2.33	0.26	100.01	NW/4NW/4	5	6N	45E	dike; Fields Spring unit; SMP/SPR
235	SR84-020	TgN2fs	53.70	15.62	1.31	2.00	7.60	0.19	9.63	6.09	0.85	2.73	0.29	100.01	NW/4SW/4	7	7N	45E	Fields Spring unit; SMP/SPR
236	K-6084	TgN2fs	53.98	15.73	1.16	2.00	7.32	0.21	10.02	5.90	1.03	2.39	0.27	100.01	NE/4NW/4	19	7N	45E	dike; Fields Spring unit; SMP
237	K-6086	TgN2fs	53.91	15.70	1.13	2.00	7.43	0.20	10.03	6.10	1.00	2.26	0.26	100.02	NE/4NW/4	19	7N	45E	dike; Fields Spring unit; SMP
238	SP83-084	TgN2fs	54.73	15.50	1.27	2.00	7.36	0.20	9.69	5.96	0.97	2.06	0.27	100.01	NE/4NW/4	19	7N	45E	dike; Fields Spring unit; SMP/SPR
239	SRP83-086	TgN2fs	53.82	15.73	1.21	2.00	7.54	0.18	9.83	6.43	0.94	2.04	0.27	99.99	NE/4NW/4	19	7N	45E	dike; Fields Spring unit; SMP/SPR
240	SR84-027	TgR2mr	53.25	15.57	1.82	2.00	9.48	0.18	9.03	5.36	0.74	2.32	0.25	100.00	SW/4SE/4	1	7N	44E	Meyer Ridge unit; SPR
241	SR84-029	TgR2mr	53.29	15.73	1.69	2.00	8.77	0.16	9.40	5.66	0.65	2.41	0.25	100.01	SW/4NE/4	1	7N	44E	Meyer Ridge unit; SPR
242	SR84-070	TgR2mr	52.19	15.52	1.77	2.00	9.27	0.19	9.85	5.92	0.64	2.40	0.25	100.00	SW/4SW/4	1	7N	44E	Meyer Ridge unit; SPR
243	SPSR-016	TgR2mr	53.99	15.16	1.76	2.00	9.54	0.21	8.19	4.67	1.48	2.70	0.30	100.00	NW/4NW/4	36	7N	44E	dike; Meyer Ridge unit; SMP/SPR
244	HAN-060	TgR2mr	53.55	15.26	1.74	2.00	8.70	0.17	9.06	5.59	0.97	2.70	0.26	100.00	SW/4NW/4	13	8N	44E	Meyer Ridge unit; PRH
245	HAN-061	TgR2mr	53.12	15.16	1.68	2.00	8.77	0.19	9.55	5.77	0.83	2.70	0.24	100.01	SW/4NW/4	13	8N	44E	Meyer Ridge unit; PRH
246	HAN-084	TgR2mr	53.67	15.31	1.76	2.00	8.44	0.22	9.35	5.18	1.01	2.81	0.26	100.01	NW/4NW/4	25	8N	44E	Meyer Ridge unit; PRH
247	HAN-108	TgR2mr	53.21	15.21	1.70	2.00	9.17	0.18	9.41	5.61	0.79	2.47	0.25	100.00	SW/4NE/4	25	8N	44E	Meyer Ridge unit; PRH
248	HAN-109	TgR2mr	53.17	15.47	1.79	2.00	9.55	0.17	9.08	5.35	0.65	2.50	0.26	99.99	SW/4NE/4	25	8N	44E	Meyer Ridge unit; PRH
249	SPSR-117	TgR2mr	53.41	14.84	1.85	2.00	10.18	0.21	8.83	4.85	1.15	2.39	0.27	99.98	SE/4NE/4	4	6N	45E	dike; Meyer Ridge unit; SMP/SPR
250	SPSR-120	TgR2mr	53.09	15.01	1.88	2.00	10.03	0.21	8.90	4.84	1.45	2.32	0.28	100.01	SE/4NE/4	4	6N	45E	dike; Meyer Ridge unit; SMP/SPR
251	SPSR-218	TgR2mr	53.58	14.90	1.83	2.00	9.86	0.19	8.47	5.11	1.2	2.58	0.28	100.00	SE/4NE/4	4	6N	45E	dike; Meyer Ridge unit; SMP/SPR
252	SPSR-219	TgR2mr	53.14	14.93	1.86	2.00	10.07	0.20	8.95	4.98	1.24	2.35	0.27	99.99	SE/4NE/4	4	6N	45E	dike; Meyer Ridge unit; SMP/SPR

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
253	SPSR-222	TgR2mr	53.07	15.03	1.87	2.00	9.98	0.21	8.78	5.04	1.27	2.44	0.30	99.99	SE/4NE/4	4	6N	45E	dike; Meyer Ridge unit; SMP/SPR
254	SR83-007	TgR2mr	54.15	14.88	2.19	2.00	9.70	0.19	8.41	4.98	1.39	1.75	0.36	100.00	SE/4NW/4	12	6N	45E	Meyer Ridge unit (?); SPR
255	SR83-008	TgR2mr	54.38	15.06	2.19	2.00	9.59	0.19	8.12	4.67	1.41	2.08	0.31	100.00	SE/4NW/4	12	6N	45E	Meyer Ridge unit (?); SPR
256	SR84-021	TgR2mr	53.25	15.47	1.69	2.00	8.48	0.17	9.61	5.69	0.73	2.65	0.25	99.99	NW/4SW/4	7	7N	45E	Meyer Ridge unit; SPR
257	SR84-022	TgR2mr	53.14	15.32	1.73	2.00	9.00	0.19	9.28	5.49	0.86	2.73	0.26	100.00	NW/4SW/4	7	7N	45E	Meyer Ridge unit; SPR
258	HAN-091	TgR2mr	53.66	15.08	1.84	2.00	9.14	0.19	8.89	4.99	1.19	2.74	0.28	100.00	NW/4NW/4	13	7N	45E	Meyer Ridge unit; PRH
259	SR83-012	TgR2mr	54.50	15.18	1.84	2.00	8.91	0.18	8.95	4.78	1.15	2.23	0.29	100.01	NE/4NE/4	14	7N	45E	Meyer Ridge unit; SPR
260	PRH85-004	TgR2mr	53.27	15.65	1.67	2.00	8.90	0.18	9.59	5.62	0.61	2.26	0.24	99.99	SE/4NW/4	16	7N	45E	Meyer Ridge unit; PRH
261	SRFS84-015	TgR2mr	53.56	15.64	1.69	2.00	8.42	0.17	9.55	5.58	0.82	2.33	0.25	100.01	SE/4NW/4	16	7N	45E	Meyer Ridge unit; SPR
262	SRFS84-016	TgR2mr	53.38	15.40	1.66	2.00	8.77	0.25	9.49	5.40	0.75	2.71	0.24	100.05	SE/4NW/4	16	7N	45E	Meyer Ridge unit; SPR
263	SRFS84-017	TgR2mr	53.14	15.26	1.71	2.00	8.67	0.17	9.63	5.67	0.78	2.73	0.24	100.00	SE/4NW/4	16	7N	45E	Meyer Ridge unit; SPR
264	SRFS84-003	TgR2mr	53.79	15.39	1.78	2.00	8.49	0.18	9.02	5.24	1.08	2.74	0.27	99.98	SW/4NW/4	22	7N	45E	Meyer Ridge unit; SPR
265	SRFS84-007	TgR2mr	53.61	15.15	1.62	2.00	8.60	0.19	9.38	5.48	0.99	2.73	0.24	99.99	NW/4NE/4	29	7N	45E	Meyer Ridge unit; SPR
266	HAN-097	TgR2mr	54.11	14.84	2.60	2.00	9.44	0.26	7.95	4.34	1.53	2.48	0.45	100.00	NE/4NW/4	5	8N	45E	Meyer Ridge unit; PRH
267	HAN-074	TgR2mr	53.50	15.06	1.76	2.00	9.42	0.20	8.93	5.22	0.98	2.67	0.26	100.00	NE/4NW/4	30	8N	45E	Meyer Ridge unit; PRH
268	HAN-073	TgR2mr	53.10	15.17	1.65	2.00	8.98	0.21	9.47	5.82	0.89	2.46	0.25	100.00	SE/4NW/4	31	8N	45E	Meyer Ridge unit; PRH
269	HAN-028	TgR2mr	53.10	15.33	1.71	2.00	8.78	0.17	9.56	5.79	0.78	2.52	0.26	100.00	NW/4SW/4	33	9N	45E	Meyer Ridge unit; PRH
270	K-6001	TgR2mr	53.69	15.23	1.68	2.00	9.04	0.20	8.91	5.05	1.20	2.75	0.26	100.01	NW/4NW/4	9	6N	46E	dike; Meyer Ridge unit; SMP
271	K-6003	TgR2mr	53.51	15.31	1.67	2.00	9.00	0.20	9.00	5.22	1.24	2.60	0.24	99.99	NW/4NW/4	9	6N	46E	dike; Meyer Ridge unit; SMP
272	SPSR-004	TgR2mr	53.54	15.25	1.71	2.00	9.39	0.19	8.71	5.08	1.23	2.63	0.27	100.00	NW/4NW/4	9	6N	46E	dike; Meyer Ridge unit; SMP/SPR
273	SPSR-005	TgR2mr	54.67	14.85	1.97	2.00	9.84	0.19	7.65	4.15	1.63	2.77	0.29	100.01	NW/4NW/4	9	6N	46E	dike; Meyer Ridge unit; SMP/SPR
274	GRSR-059	TgR2mr	52.83	14.91	1.61	2.00	8.46	0.19	10.16	5.99	0.95	2.64	0.26	100.00	NE/4NE/4	21	7N	46E	Meyer Ridge unit; SPR/VEC/PRH
275	GRSR-058	TgR2mr	53.33	15.05	1.80	2.00	10.51	0.22	8.62	4.17	1.21	2.81	0.28	100.00	NE/4NE/4	21	7N	46E	Meyer Ridge unit; SPR/VEC/PRH
276	HWE-031R	TgR2mr	53.05	15.40	1.65	2.00	8.12	0.18	9.58	6.16	0.87	2.74	0.24	99.99	SW/4SE/4	22	8N	46E	Meyer Ridge unit; PRH
277	HWE-032R	TgR2mr	53.25	15.55	1.72	2.00	9.31	0.16	9.23	5.36	0.79	2.38	0.25	100.00	SW/4SE/4	22	8N	46E	Meyer Ridge unit; PRH
278	HWE-030R	TgR2mr	53.15	15.26	1.71	2.00	9.22	0.23	9.26	5.59	0.81	2.51	0.26	100.00	SE/4NW/4	26	8N	46E	Meyer Ridge unit; PRH
279	HWE-057	TgR2mr	53.59	15.46	1.73	2.00	8.57	0.17	9.29	5.44	0.89	2.62	0.26	100.02	SE/4SE/4	30	8N	46E	Meyer Ridge unit; PRH
280	HWE-059	TgR2mr	53.59	15.27	1.71	2.00	8.75	0.20	9.59	5.56	0.75	2.53	0.26	100.21	NE/4SE/4	30	8N	46E	Meyer Ridge unit; PRH
281	HWE-005	TgR2mr	53.42	15.41	1.70	2.00	9.52	0.20	9.64	5.03	0.79	2.02	0.26	99.99	SE/4SE/4	22	9N	46E	Meyer Ridge unit; PRH
282	HWE-004	TgR2mr	53.23	15.36	1.74	2.00	9.43	0.19	9.12	5.31	0.97	2.41	0.26	100.02	NE/4NE/4	27	9N	46E	Meyer Ridge unit; PRH
283	HCJ-007	TgR2mr	53.06	15.07	1.63	2.00	9.33	0.18	9.75	5.69	0.73	2.32	0.24	100.00	NE/4NE/4	19	8N	47E	Meyer Ridge unit; PRH
284	SR84-025	TgR2	54.33	14.88	2.41	2.00	10.87	0.19	7.16	3.66	1.53	2.56	0.40	99.99	SE/4NW/4	1	7N	44E	Wapshilla Ridge unit; SPR
285	HAN-058	TgR2	53.58	14.68	2.29	2.00	11.71	0.26	7.46	3.98	1.17	2.51	0.36	100.00	SW/4NW/4	13	8N	44E	Wapshilla Ridge unit; PRH
286	HAN-059	TgR2	54.09	14.66	2.41	2.00	11.28	0.19	7.05	3.65	1.53	2.72	0.41	99.99	SW/4NW/4	13	8N	44E	Wapshilla Ridge unit; PRH
287	HAN-083	TgR2	53.71	14.98	2.51	2.00	11.28	0.18	7.54	3.57	1.21	2.66	0.36	100.00	NW/4NW/4	25	8N	44E	Wapshilla Ridge unit; PRH
288	HAN-086	TgR2	54.63	14.78	2.42	2.00	10.50	0.20	7.19	3.60	2.08	2.16	0.44	100.00	SW/4NE/4	36	8N	44E	Wapshilla Ridge unit; PRH
289	HAN-087	TgR2	54.78	14.91	2.46	2.00	9.56	0.20	7.32	3.64	1.86	2.85	0.42	100.00	NW/4SE/4	36	8N	44E	Wapshilla Ridge unit; PRH
290	SR84-036	TgR2	55.01	15.29	2.45	2.00	8.79	0.20	7.43	3.93	1.81	2.66	0.42	99.99	NE/4SW/4	36	8N	44E	Wapshilla Ridge unit; SPR
291	SP83-285	TgR2	54.56	14.43	2.44	2.00	11.11	0.20	6.94	3.69	1.88	2.31	0.44	100.00	SW/4NE/4	3	6N	45E	dike; Wapshilla Ridge unit; SMP/SPR
292	SRP83-281	TgR2	54.78	14.58	2.45	2.00	10.98	0.21	6.91	3.64	1.84	2.18	0.42	99.99	SW/4NE/4	3	6N	45E	dike; Wapshilla Ridge unit; SPR

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
293	SPSR-212	TgR2	53.17	14.62	2.26	2.00	11.67	0.24	7.58	3.73	1.54	2.80	0.38	99.99	SE/4NE/4	4	6N	45E	dike; Wapshilla Ridge unit; SMP/SPR
294	SPSR-214	TgR2	53.97	14.57	2.27	2.00	11.18	0.22	7.56	3.63	1.50	2.71	0.39	100.00	SE/4NE/4	4	6N	45E	dike; Wapshilla Ridge unit; SMP/SPR
295	SPSR-216	TgR2	53.68	14.47	2.28	2.00	11.33	0.23	7.58	3.70	1.59	2.75	0.39	100.00	SE/4NE/4	4	6N	45E	dike; Wapshilla Ridge unit; SMP/SPR
296	SRP-294	TgR2	53.66	14.30	2.51	2.00	11.28	0.24	7.72	4.30	1.51	2.07	0.42	100.01	SE/4NE/4	4	6N	45E	dike; Wapshilla Ridge unit; SMP/SPR
297	SR83-010	TgR2	54.91	14.61	2.68	2.00	10.99	0.18	6.56	3.29	1.74	2.62	0.42	100.00	NE/4NE/4	14	7N	45E	Wapshilla Ridge unit; SPR
298	SR83-011	TgR2	54.25	14.98	2.41	2.00	10.90	0.22	7.31	3.72	1.79	2.01	0.41	100.00	NE/4NE/4	14	7N	45E	Wapshilla Ridge unit; SPR
299	SRFS84-018	TgR2	55.74	15.22	2.29	2.00	8.70	0.23	7.25	3.33	2.10	2.77	0.36	99.99	NW/4SW/4	16	7N	45E	Wapshilla Ridge unit; SPR
300	SRFS84-001	TgR2	54.51	14.75	2.44	2.00	10.90	0.20	6.76	3.63	1.65	2.75	0.40	99.99	SW/4NW/4	22	7N	45E	Wapshilla Ridge unit; SPR
301	SRFS84-002	TgR2	54.79	14.71	2.28	2.00	10.52	0.19	6.95	3.49	1.95	2.76	0.35	99.99	SW/4NW/4	22	7N	45E	Wapshilla Ridge unit; SPR
302	SRFS84-008	TgR2	54.45	15.13	2.32	2.00	10.60	0.18	7.23	3.42	1.51	2.74	0.41	99.99	NW/4NE/4	29	7N	45E	Wapshilla Ridge unit; SPR
303	SRFS84-009	TgR2	54.31	14.59	2.50	2.00	10.25	0.20	7.46	3.55	1.96	2.76	0.42	100.00	NW/4NE/4	29	7N	45E	Wapshilla Ridge unit; SPR
304	K-6088	TgR2	54.39	14.91	2.23	2.00	10.67	0.21	7.36	3.30	1.93	2.66	0.35	100.01	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP
305	K-6090	TgR2	53.96	14.93	2.22	2.00	10.75	0.21	7.43	3.84	1.75	2.54	0.35	99.98	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP
306	SPSR-009	TgR2	53.26	14.63	2.21	2.00	11.49	0.21	7.47	3.87	1.77	2.73	0.36	100.00	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
307	SPSR-030	TgR2	53.89	14.71	2.22	2.00	10.71	0.21	7.53	3.89	2.00	2.46	0.38	100.00	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
308	SPSR-088	TgR2	53.76	14.69	2.23	2.00	10.94	0.21	7.41	3.80	2.05	2.54	0.36	99.99	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
309	SPSR-090	TgR2	53.60	14.66	2.27	2.00	11.23	0.21	7.43	3.75	1.79	2.68	0.37	99.99	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
310	SPSR-092	TgR2	53.17	14.92	2.25	2.00	11.26	0.22	7.64	3.82	1.79	2.59	0.35	100.01	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
311	SPSR-191	TgR2	53.58	14.72	2.23	2.00	11.13	0.22	7.48	3.78	1.88	2.60	0.38	100.00	NE/4SE/4	31	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
312	SPSR-018	TgR2	53.98	14.61	2.24	2.00	11.00	0.20	7.03	3.81	1.98	2.74	0.41	100.00	NW/4SE/4	33	7N	45E	dike; Wapshilla Ridge unit; SMP/SPR
313	HAN-106	TgR2	54.53	14.93	2.45	2.00	10.97	0.19	7.03	3.36	1.57	2.56	0.41	100.00	SW/4NW/4	31	8N	45E	Wapshilla Ridge unit; PRH
314	HAN-107	TgR2	54.52	15.11	2.44	2.00	9.66	0.20	7.32	3.82	1.84	2.67	0.42	100.00	NW/4NW/4	31	8N	45E	Wapshilla Ridge unit; PRH
315	GRSR-057	TgR2	54.76	14.97	2.47	2.00	9.35	0.21	7.61	3.58	1.91	2.74	0.41	100.01	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
316	GRSR-056	TgR2	53.05	14.29	2.22	2.00	11.25	0.21	8.00	4.01	1.82	2.77	0.38	100.00	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
317	GRSR-055	TgR2	52.79	14.30	2.25	2.00	11.70	0.21	7.88	4.06	1.72	2.72	0.37	100.00	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
318	GRSR-054	TgR2	52.52	14.62	2.68	2.00	12.18	0.21	7.32	3.49	1.93	2.64	0.40	99.99	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
319	GRSR-053	TgR2	54.47	14.82	2.34	2.00	10.23	0.21	7.36	3.54	2.06	2.61	0.37	100.01	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
320	GRSR-052	TgR2	54.09	14.17	2.39	2.00	11.22	0.21	7.29	3.36	2.22	2.60	0.43	99.98	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
321	GRSR-051	TgR2	55.00	14.79	2.30	2.00	11.08	0.19	6.57	3.09	1.81	2.76	0.41	100.00	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
322	GRSR-050	TgR2	55.04	14.44	2.22	2.00	10.64	0.19	6.98	3.40	1.94	2.79	0.36	100.00	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
323	GRSR-049	TgR2	54.45	14.48	2.33	2.00	10.27	0.23	7.25	3.31	1.97	3.34	0.36	99.99	NE/4NW/4	22	7N	46E	Wapshilla Ridge unit; SPR/VEC/PRH
324	HCJ-001	TgR2	55.07	14.85	2.26	2.00	10.72	0.21	6.76	3.47	1.84	2.45	0.38	100.01	NE/4SW/4	24	8N	46E	Wapshilla Ridge unit; PRH
325	HCJ-005	TgR2	53.15	14.79	2.43	2.00	12.08	0.21	7.40	3.86	1.23	2.43	0.40	99.98	NE/4NW/4	24	8N	46E	Wapshilla Ridge unit; PRH
326	HCJ-010R	TgR2	55.02	14.96	2.65	2.00	9.43	0.18	7.43	3.61	1.77	2.54	0.41	100.00	NE/4SW/4	24	8N	46E	Wapshilla Ridge unit; PRH
327	HCJ-011R	TgR2	54.49	14.67	2.28	2.00	10.06	0.22	7.64	4.02	1.51	2.73	0.38	100.00	NE/4SW/4	24	8N	46E	Wapshilla Ridge unit; PRH
328	HCJ-012R	TgR2	54.38	14.94	2.42	2.00	10.74	0.18	7.04	3.75	1.43	2.72	0.39	99.99	SE/4NW/4	24	8N	46E	Wapshilla Ridge unit; PRH
329	HCJ-013R	TgR2	53.83	14.96	2.47	2.00	11.37	0.19	7.25	3.88	1.20	2.45	0.39	99.99	SE/4NW/4	24	8N	46E	Wapshilla Ridge unit; PRH
330	K-6187	TgR2	49.61	15.97	1.85	2.00	8.64	0.19	11.23	7.75	0.37	2.04	0.36	100.01	SE/4SE/4	7	6N	46E	dike; olivine-rich; unclassified; SMP
331	K-6190	TgR2	49.86	16.02	1.83	2.00	8.94	0.21	11.40	7.29	0.17	1.92	0.36	100.00	SE/4SE/4	7	6N	46E	dike; olivine-rich; unclassified; SMP
332	SP83-190	TgR2	51.01	15.75	1.91	2.00	8.83	0.20	11.32	6.99	0.16	1.45	0.38	100.00	SE/4SE/4	7	6N	46E	dike; olivine-rich; unclassified; SMP/SPR

Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
333	K-6165	TgR2	49.69	16.19	1.82	2.00	8.99	0.19	10.72	7.67	0.37	1.99	0.37	100.00	NE/4NE/4	18	6N	46E	dike; olivine-rich; unclassified; SMP
334	K-6167	TgR2	49.65	15.90	1.87	2.00	8.94	0.19	11.05	7.72	0.38	1.93	0.36	99.99	NE/4NE/4	18	6N	46E	dike; olivine-rich; unclassified; SMP
335	SP83-169	TgR2	50.87	16.06	1.82	2.00	8.54	0.18	10.72	7.96	0.29	1.19	0.37	100.00	NE/4NE/4	18	6N	46E	dike; olivine-rich; unclassified; SMP/SPR
336	SRP83-168	TgR2	49.79	15.66	1.94	2.00	9.31	0.19	10.87	7.97	0.33	1.55	0.39	100.00	NE/4NE/4	18	6N	46E	dike; olivine-rich; unclassified; SPR
337	SPSR-006	TgN1	53.02	14.97	1.92	2.00	10.21	0.21	8.54	4.86	1.31	2.64	0.32	100.00	NW/4SW/4	8	6N	46E	dike; China Creek unit; SMP/SPR
338	GRSR-044	TgN1	53.69	15.58	1.77	2.00	9.48	0.20	8.95	4.94	0.57	2.60	0.21	99.99	NW/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
339	GRSR-043	TgN1	54.70	15.39	1.69	2.00	8.75	0.18	8.48	4.71	1.45	2.40	0.25	100.00	NW/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
340	GRSR-042	TgN1	54.39	14.55	1.97	2.00	9.80	0.21	8.14	4.17	1.56	2.86	0.34	99.99	NW/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
341	GRSR-041	TgN1	53.74	14.65	1.92	2.00	10.66	0.19	7.90	4.22	1.46	2.96	0.31	100.01	NW/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
342	GRSR-040	TgN1	53.72	14.92	1.87	2.00	10.56	0.22	7.97	4.41	1.32	2.70	0.31	100.00	NW/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
343	GRSR-031	TgN1	53.08	15.07	1.78	2.00	9.66	0.21	9.18	5.14	1.19	2.43	0.26	100.00	NE/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
344	GRSR-030	TgN1	55.95	14.90	1.70	2.00	9.00	0.19	7.87	4.22	1.61	2.35	0.22	100.01	NE/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
345	GRSR-029	TgN1	55.33	15.22	1.70	2.00	9.26	0.19	7.89	4.36	1.39	2.42	0.23	99.99	NE/4NE/4	22	7N	46E	China Creek unit; SPR/VEC/PRH
346	SPSR-027	TgN1	53.46	14.39	2.12	2.00	11.35	0.22	7.50	3.98	1.71	2.88	0.39	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
347	SPSR-031	TgN1	53.42	14.53	2.15	2.00	11.39	0.22	7.53	3.86	1.66	2.84	0.39	99.99	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
348	SPSR-099	TgN1	53.52	14.68	2.16	2.00	11.18	0.22	7.54	3.93	1.73	2.66	0.38	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
349	SPSR-100	TgN1	53.63	14.70	2.18	2.00	10.84	0.22	7.63	3.97	1.70	2.74	0.38	99.99	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
350	SPSR-101	TgN1	53.56	14.48	2.16	2.00	11.38	0.23	7.62	3.93	1.59	2.68	0.37	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
351	SPSR-104	TgN1	53.45	14.51	2.16	2.00	11.30	0.23	7.63	3.87	1.66	2.8	0.39	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
352	SPSR-202	TgN1	53.61	14.50	2.17	2.00	11.28	0.22	7.62	3.90	1.64	2.68	0.38	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
353	SPSR-203	TgN1	53.42	14.53	2.18	2.00	11.31	0.22	7.63	3.90	1.66	2.77	0.38	100.00	SW/4SE/4	32	7N	45E	dike; Downey Gulch unit; SMP/SPR
354	SPSR-003	TgN1	54.88	14.82	2.06	2.00	10.07	0.20	7.56	3.86	1.36	2.90	0.29	100.00	NE/4SE/4	9	6N	46E	dike; Downey Gulch unit; SMP/SPR
355	GRSR-048	TgN1	53.08	14.43	2.26	2.00	11.47	0.20	8.04	3.94	1.45	2.79	0.34	100.00	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
356	GRSR-047	TgN1	52.96	14.61	2.29	2.00	10.75	0.22	8.27	4.29	1.41	2.84	0.35	99.99	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
357	GRSR-046	TgN1	53.25	14.85	2.35	2.00	11.16	0.20	7.94	3.72	1.32	2.83	0.39	100.01	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
358	GRSR-944	TgN1	52.65	14.43	2.37	2.00	11.65	0.21	7.89	3.92	1.45	3.01	0.43	100.01	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
359	GRSR-039	TgN1	52.88	14.95	2.14	2.00	11.58	0.22	8.15	4.00	1.14	2.58	0.36	100.00	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
360	GRSR-038	TgN1	51.97	14.39	2.15	2.00	12.07	0.22	8.32	4.29	1.50	2.72	0.36	99.99	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
361	GRSR-037	TgN1	53.75	14.56	2.02	2.00	11.22	0.22	7.88	4.05	1.22	2.74	0.34	100.00	NW/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
362	GRSR-036	TgN1	53.32	14.81	2.07	2.00	10.69	0.22	8.20	4.17	1.45	2.73	0.34	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
363	GRSR-035	TgN1	53.73	14.41	2.25	2.00	11.33	0.18	7.87	3.80	1.51	2.54	0.38	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
364	GRSR-034	TgN1	53.04	14.31	2.23	2.00	11.54	0.22	7.88	3.83	1.72	2.87	0.37	100.01	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
365	GRSR-033	TgN1	53.08	14.72	2.29	2.00	11.17	0.24	7.98	3.93	1.62	2.56	0.41	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
366	GRSR-032	TgN1	54.47	14.97	1.64	2.00	9.39	0.20	8.80	4.99	1.09	2.18	0.25	99.98	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
367	GRSR-028	TgN1	54.46	14.38	2.08	2.00	11.12	0.20	7.55	3.79	1.69	2.43	0.30	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
368	GRSR-027	TgN1	55.11	14.89	2.12	2.00	10.35	0.18	7.10	3.72	1.42	2.74	0.38	100.01	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
369	GRSR-026	TgN1	53.81	14.72	2.12	2.00	10.59	0.22	7.77	4.12	1.72	2.56	0.37	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
370	GRSR-025	TgN1	54.33	14.35	2.10	2.00	10.80	0.20	7.87	4.01	1.57	2.49	0.28	100.00	NE/4NE/4	22	7N	46E	Downey Gulch unit; SPR/VEC/PRH
371	GRSR-005	TgN1	53.44	14.67	2.17	2.00	11.40	0.20	7.84	3.91	1.68	2.33	0.35	99.99	NE/4NW/4	23	7N	46E	dike; Downey Gulch unit; SPR/VEC/PRH

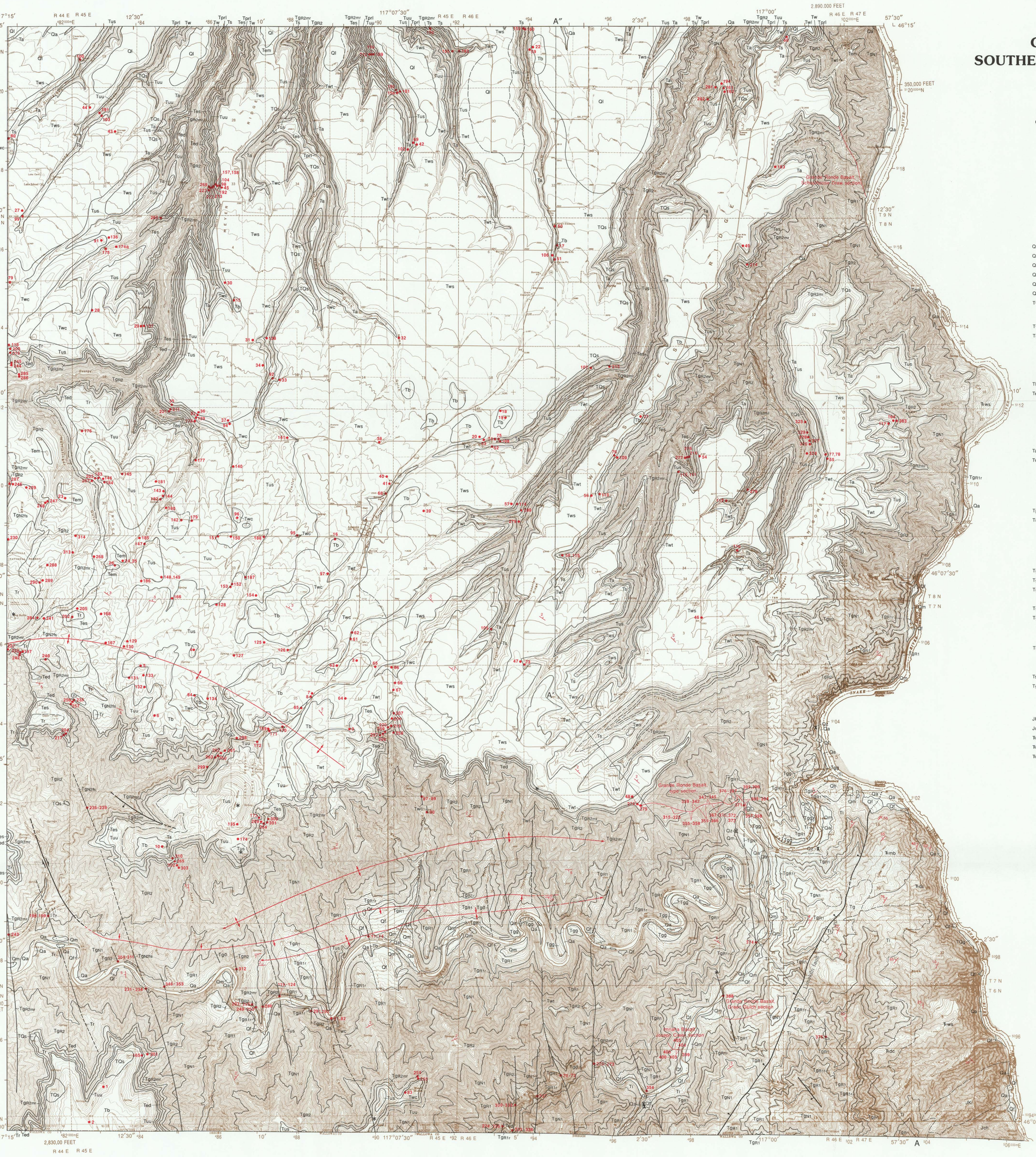
Table 1. Major element analyses of rocks from southeastern Asotin County, Washington *(continued)*

Map loc.	Sample no.	Map unit	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	TOTAL	¼¼ sec.	Sec.	Twp.	Rge.	Comment/collector
372	GRSR-024	TgN1	55.29	15.26	2.06	2.00	9.82	0.17	7.35	4.03	1.59	2.15	0.27	99.99	NW/4NW/4	23	7N	46E	Downey Gulch unit; SPR/VEC/PRH
373	GRSR-023	TgN1	56.23	14.79	2.17	2.00	9.96	0.19	6.67	3.05	1.98	2.68	0.28	100.00	NW/4NW/4	23	7N	46E	Downey Gulch unit; SPR/VEC/PRH
374	SPSR-001	TgN1	54.59	14.81	2.09	2.00	10.56	0.19	7.04	3.75	1.73	2.88	0.35	99.99	SW/4NE/4	35	7N	46E	dike; Downey Gulch unit; SMP/SPR
375	SR83-001	TgR1	53.36	13.51	2.35	2.00	11.76	0.21	7.79	3.98	1.72	2.87	0.43	99.98	SW/4SE/4	1	6N	46E	dike; Center Creek unit; SPR
376	GRSR-022	TgR1	55.99	14.62	2.20	2.00	10.17	0.20	6.72	3.14	2.22	2.46	0.28	100.00	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
377	GRSR-021	TgR1	54.07	14.48	2.14	2.00	10.61	0.20	7.89	4.18	1.57	2.55	0.31	100.00	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
378	GRSR-020	TgR1	54.37	14.20	2.34	2.00	10.89	0.22	7.37	3.51	1.90	2.79	0.40	99.99	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
379	GRSR-061	TgR1	53.51	14.46	2.32	2.00	10.18	0.22	7.42	3.61	2.26	2.68	0.37	99.03	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
380	GRSR-019	TgR1	54.58	14.64	2.13	2.00	10.05	0.20	7.80	4.22	1.41	2.63	0.34	100.00	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
381	GRSR-018	TgR1	54.22	14.77	2.19	2.00	10.32	0.23	7.52	4.13	1.43	2.81	0.39	100.01	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
382	GRSR-017	TgR1	53.51	14.62	2.15	2.00	10.18	0.19	8.39	4.64	1.46	2.56	0.30	100.00	NW/4NW/4	23	7N	46E	Center Creek unit; SPR/VEC/PRH
383	GRSR-016	TgR1r	53.04	14.59	2.23	2.00	10.29	0.22	8.70	4.74	1.36	2.53	0.30	100.00	NW/4NW/4	23	7N	46E	Rogersburg unit; SPR/VEC/PRH
384	GRSR-015	TgR1r	53.45	14.77	2.21	2.00	9.85	0.18	8.51	4.83	1.34	2.57	0.29	100.00	NW/4NW/4	23	7N	46E	Rogersburg unit; SPR/VEC/PRH
385	GRSR-014	TgR1r	53.53	14.95	2.30	2.00	9.99	0.25	8.37	4.29	1.46	2.49	0.36	99.99	NE/4NW/4	23	7N	46E	Rogersburg unit; SPR/VEC/PRH
386	GRSR-013	TgR1r	53.12	14.44	2.37	2.00	10.56	0.20	8.40	4.51	1.38	2.66	0.35	99.99	NE/4NW/4	23	7N	46E	Rogersburg unit; SPR/VEC/PRH
387	GRSR-012	TgR1r	52.92	14.37	2.37	2.00	10.73	0.20	8.34	4.44	1.42	2.84	0.37	100.00	NE/4NW/4	23	7N	46E	Rogersburg unit; SPR/VEC/PRH
388	SPSR-002	TgR1	51.74	14.83	2.27	2.00	10.55	0.20	9.15	5.27	0.88	2.79	0.31	99.99	NW/4NW/4	2	6N	46E	dike; Teepee Butte unit; SMP/SPR
389	GRSR-009	TgR1	52.37	15.18	1.90	2.00	9.71	0.22	9.60	5.25	0.91	2.58	0.27	100.00	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
390	GRSR-008	TgR1	51.39	15.01	2.32	2.00	10.70	0.23	9.41	5.29	0.90	2.45	0.30	100.00	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
391	GRSR-007	TgR1	51.42	15.33	2.47	2.00	10.58	0.21	9.18	4.92	1.08	2.49	0.32	100.00	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
392	GRSR-006	TgR1	51.88	14.44	2.38	2.00	10.67	0.22	9.25	5.26	1.11	2.48	0.31	100.00	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
393	GRSR-004	TgR1	52.48	15.02	2.43	2.00	9.62	0.21	9.35	4.89	1.23	2.41	0.35	99.99	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
394	GRSR-003	TgR1	52.65	14.87	2.38	2.00	10.11	0.21	8.85	4.91	1.25	2.45	0.32	100.00	NE/4NW/4	23	7N	46E	Teepee Butte unit; SPR/VEC/PRH
395	GRSR-011	TgR1	52.80	14.38	2.34	2.00	11.50	0.23	8.06	4.13	1.44	2.77	0.35	100.00	NE/4NW/4	23	7N	46E	Buckhorn Springs unit; SPR/VEC/PRH
396	GRSR-010	TgR1	53.32	14.62	2.25	2.00	10.73	0.26	8.13	4.21	1.37	2.76	0.35	100.00	NE/4NW/4	23	7N	46E	Buckhorn Springs unit; SPR/VEC/PRH
397	GRSR-002	TgR1	52.80	14.84	2.17	2.00	10.81	0.22	8.54	4.48	0.97	2.81	0.37	100.01	NE/4NW/4	23	7N	46E	Buckhorn Springs unit; SPR/VEC/PRH
398	GRSR-001	TgR1	52.84	14.74	2.31	2.00	11.27	0.23	7.94	4.43	1.18	2.67	0.38	99.99	NE/4NW/4	23	7N	46E	Buckhorn Springs unit; SPR/VEC/PRH
399	GRJ-1	Ti	49.59	16.50	1.88	2.00	9.64	0.19	9.43	7.15	0.97	2.42	0.22	99.99	NE/4NW/4	10	6N	46E	creek level; SPR
400	GRJ-2	Ti	50.01	16.16	2.08	2.00	9.93	0.19	9.51	6.62	0.61	2.64	0.25	100.00	NE/4NW/4	10	6N	46E	SPR
401	GRJ-3	Ti	50.64	16.34	2.25	2.00	10.25	0.23	8.20	5.86	0.28	3.69	0.26	100.00	NE/4NW/4	10	6N	46E	SPR
402	GRJ-4	Ti	49.18	16.40	2.39	2.00	10.82	0.20	8.74	6.62	0.63	2.76	0.28	100.02	NE/4NW/4	10	6N	46E	SPR
403	GRJ-5	Ti	50.67	14.93	2.69	2.00	11.49	0.22	9.06	4.73	0.88	2.97	0.35	99.99	NE/4NW/4	10	6N	46E	SPR
404	GRJ-6	Ti	51.27	16.33	2.26	2.00	9.33	0.19	9.17	5.53	0.89	2.76	0.28	100.01	NE/4NW/4	10	6N	46E	SPR
405	GRJ-7	Ti	51.96	14.55	2.75	2.00	11.98	0.24	7.97	4.06	1.06	3.02	0.43	100.02	NE/4NW/4	10	6N	46E	SPR
406	GRJ-8	Ti	49.61	16.30	1.93	2.00	9.45	0.19	9.25	6.94	2.24	1.85	0.23	99.99	NE/4NW/4	10	6N	46E	below Grande Ronde Basalt; SPR

Washington Division of Geology and Earth Resources
Geologic Map GM-40

GEOLOGIC MAP OF SOUTHEASTERN ASOTIN COUNTY, WASHINGTON

by
Stephen P. Reidel, Peter R. Hooper,
Gary D. Webster, and Victor E. Camp
1992



MAP UNITS

Surficial Deposits

- Qz — Mazama ash
- Qf — Alluvial fans
- Qa — Alluvium
- Ql — Palouse Formation
- Qm — Missoula floods backwater deposits
- Qb — Bonneville flood deposits
- TQs — Slump blocks (basalt and younger sediments)

Gravels of the Grande Ronde River Area

- TQg — Unnamed gravels, undifferentiated
- Tgg — Grande Ronde River gravel

Columbia River Basalt Group

Yakima Basalt Subgroup

Saddle Mountains Basalt

- Tb — Buford Member
- Tem — Elephant Mountain Member
- Weissenfels Ridge Member
  - Tws — Basalt of Slippery Creek
  - Twt — Basalt of Tenmile Creek
  - Twl — Basalt of Lewiston Orchards
  - Twc — Basalt of Cloverland
- Ta — Asotin Member
- Tw — Wilbur Creek Member
- Umatilla Member
  - Tus — Basalt of Sillusi
  - Tuu — Basalt of Umatilla

Wanapum Basalt

- Tprl — Priest Rapids Member, Basalt of Lolo
- Tr — Roza Member
- Eckler Mountain Member
  - Tes — Basalt of Shumaker Creek
  - Ted — Basalt of Dodge

Grande Ronde Basalt

- Tgd — Grande Ronde Basalt dikes
- T_{gN2fs} — Fields Spring flow, upper normal magnetostratigraphic unit
- T_{gR2} — Flows of the upper reversed magnetostratigraphic unit
- T_{gR2mr} — Basalt of Meyer Ridge
- T_{gN1} — Flows of the lower normal magnetostratigraphic unit
- T_{gR1} — Flows of the lower reversed magnetostratigraphic unit
- T_{gR1r} — Basalt of Rogersburg

Imnaha Basalt

- Ti — Imnaha Basalt

Sedimentary Deposits Interbedded with or older than the Columbia River Basalt Group

- Ts — Sediments, undifferentiated
- Tg — Sediments of Lime Hill

Blue Mountains Province Granitic and Sedimentary Rocks

- JKi — Intrusive rock
- Jch — Coon Hollow Formation (shale, argillite, sandstone)
- T_{rimb} — Martin Bridge Limestone (limestone and dolomite)
- T_{rdc} — Doyle Creek Formation (volcaniclastics and metabasalt)
- T_{rws} — Wild Sheep Creek Formation (metabasalt and volcaniclastics)

EXPLANATION

Contact — *Dashed where approximately located*

Fault — *Showing relative movement; dashed where approximately located*

Normal fault — *Dashed where approximately located; dotted where concealed; bar and ball on downthrown block*

Anticline — *Showing trace of axis and direction of plunge; dashed where approximately located*

Syncline — *Showing trace of axis and direction of plunge*

Monocline — *Dashed where approximately located; arrows on steeper limb*

x — Outcrop (unit Qz)

Strike and dip of beds

Strike and dip of overturned beds

* — Vent

Dikes of units Tb, Twt, Twl, Twc, Tus, Tr, Ted, Tgd, T_{gN2fs}, T_{gR2}, T_{gR2mr}, T_{gN1}, T_{gR1} — *Dashed where approximately located; dotted where concealed*

225 — Geochemical sample locality

Base map from U.S. Geological Survey Anatone, Weissenfels Ridge, Fields Spring, Captain John Rapids, Black Butte, Limekiln Rapids, and Jim Creek Butte 7½-minute quadrangles, Washington, Idaho, and Oregon
1927 North American Datum

Prepared in cooperation with the U.S. Department of Energy under contract DE-AC06-81RL10297 and grant DE-FG06-91ER14172

Cartography by Keith G. Ikerd and Carl F. T. Harris

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Brian Boyle - Commissioner of Public Lands
Art Stearns - Supervisor
Division of Geology and Earth Resources
Raymond Lasmanis, State Geologist

N — MN — 20°

Scale 1:48,000

0 ½ 1 2 3 Miles

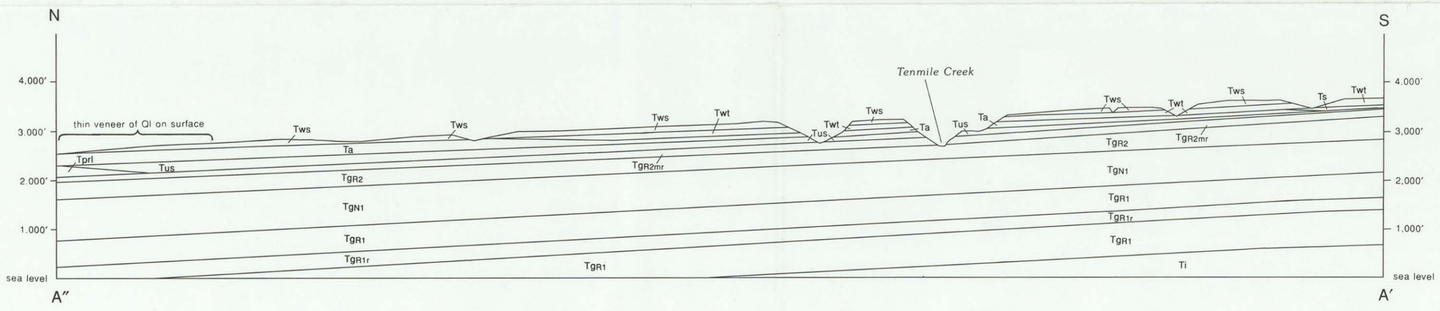
0 2000 4000 6000 8000 Feet

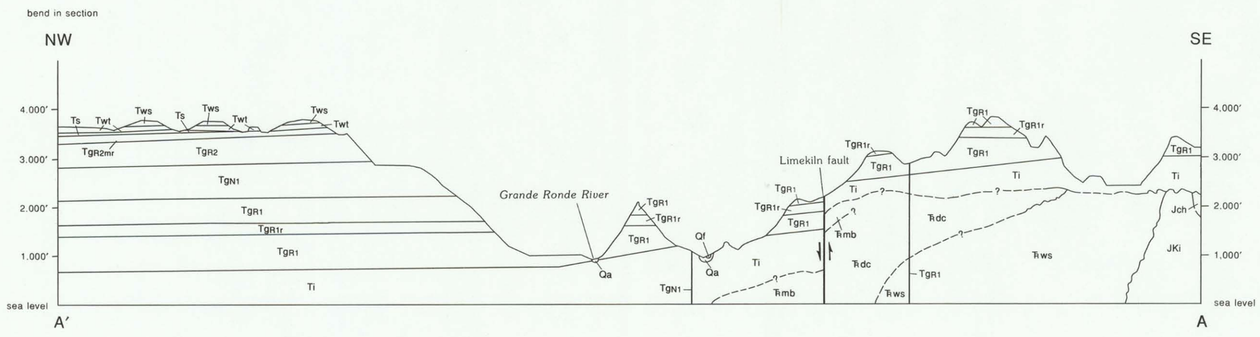
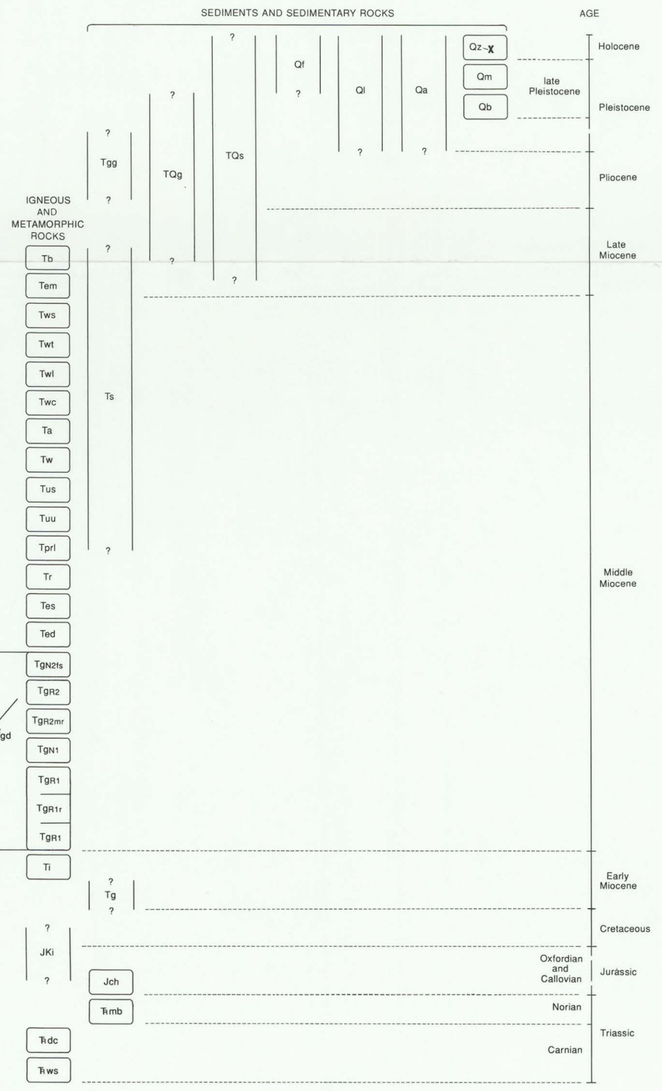
0 ½ 1 2 Kilometers

CONTOUR INTERVAL 40 feet

WASHINGTON
QUADRANGLE LOCATION

CROSS SECTION





CORRELATION OF MAP UNITS