3D geologic map of the Deer Park 7.5-minute quadrangle, Spokane County, Washington

Disclaimer

Citation and link

This 3D geologic map is derived from previously published geologic mapping and analysis. Some of the borehole data are considered preliminary and have not been examined for accuracy of either location or lithologic identification. While lithologic identification for all wells was made by the author of the published geologic map, not all of the wells shown in this 3D product were necessarily used to construct the geologic cross section. The map, cross section, and the borehole data within the 3D model are not intended for analytical use. Instead, the published map and (or) pamphlet should be consulted for original data and interpretation.

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WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

3D PDF INSTRUCTIONS

NAVIGATION
(1 of 2)

- Click inside the window to manipulate the 3D view—the compass will rotate to point towards north
- Hold the left mouse button and move the mouse to tilt the view
- Use the mouse wheel to zoom
- Hold both the right and left mouse buttons to pan the view
- Toggle individual layers in the lower left corner
- Change the vertical scaling or layer separation in the lower toolbar
- Selecting an object will display its data below

OBJECT DATA

undefined

undefined

undefined

undefined

Layer001

Layer002

No Separation | 5% | 50% | 100%

5

Probe

1x Z-Scale | 10x Z-Scale | Default Scale | 10

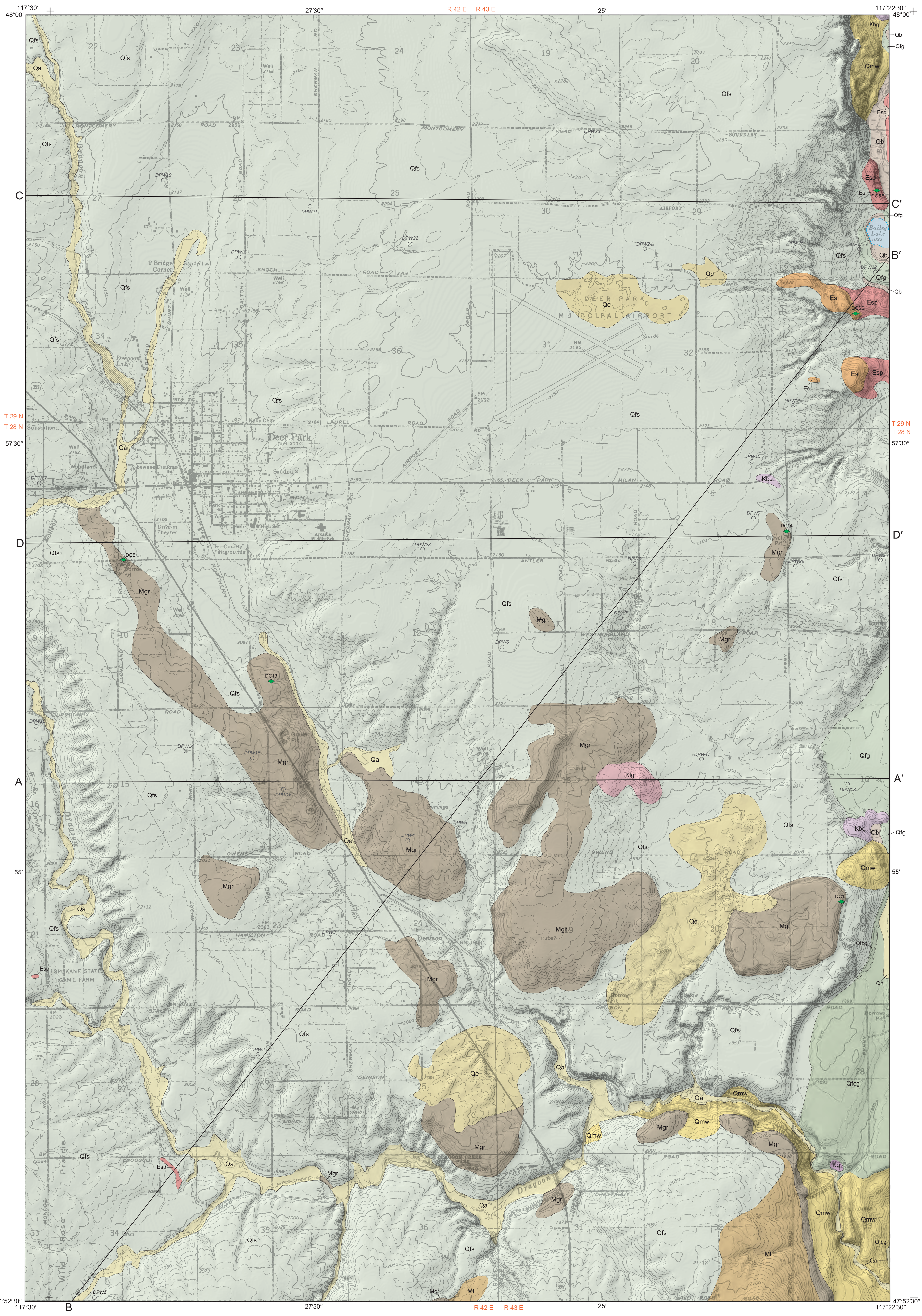
Web tutorial

PDF3D

3D model creation: Daniel W. Eungard

Editing and production: Alexander N. Steely

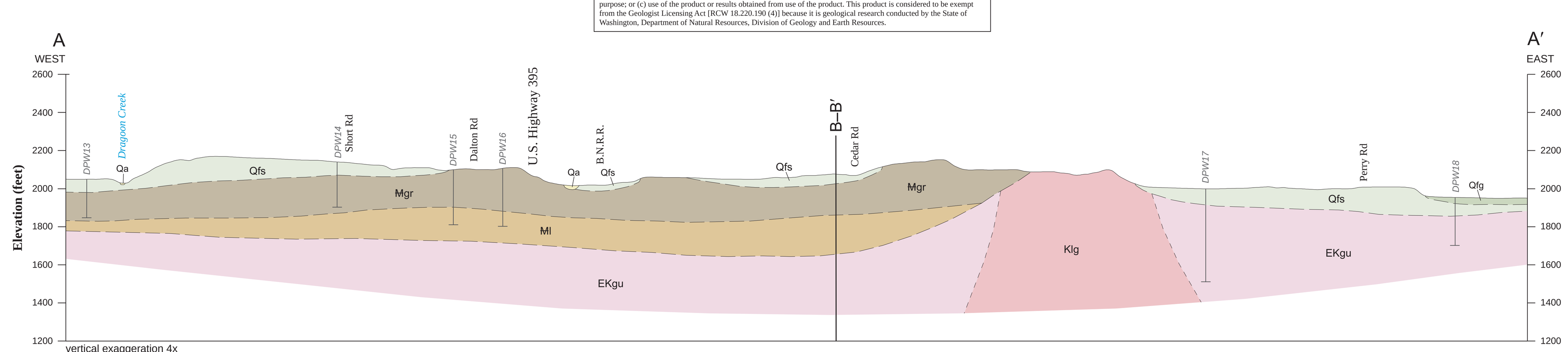
WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland · Commissioner of Public Lands
Division of Geology and Earth Resources
Ron Teissere · State Geologist

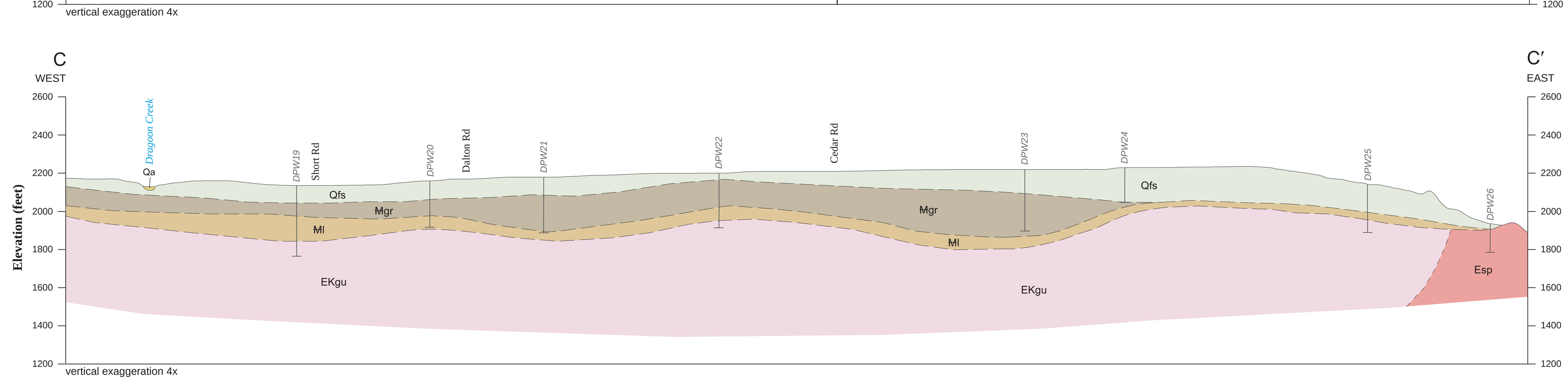


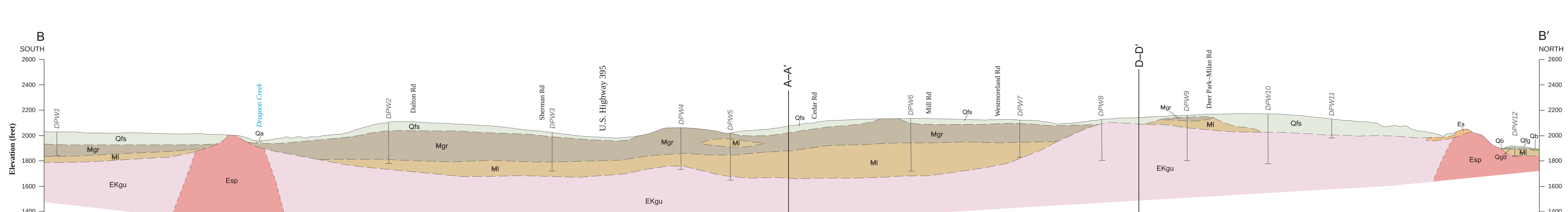
Lambert conformal conic projection
North American Datum of 1927; to place on North American Datum of 1983, move the projection lines 12 meters north and 79 meters east as shown by crosshair corner ticks
Base map from scanned and rectified U.S. Geological Survey 7.5-minute Deer Park quadrangle, 1973
Shaded relief generated from U.S. Geological Survey 10-meter digital elevation model; vertical exaggeration 4x
Digital cartography by Charles G. Caruthers and Anne C. Heinitz
Editing and production by Jaretta M. Roloff and J. Eric Schuster

SCALE 1:24,000

contour interval 10 feet







Geologic Map of the Deer Park 7.5-minute Quadrangle, Spokane County, Washington

by Robert E. Derkey, Michael M. Hamilton, and Dale F. Stradling

June 2005

INTRODUCTION

The earliest geologic mapping in the Spokane area (including the Deer Park quadrangle) was by Pardee and Bryan (1926). Griggs (1966) completed a 1:125,000-scale geologic map of the western half of the Spokane 1- by 2-degree quadrangle. He later extended his mapping eastward to encompass the entire Spokane 1- by 2-degree quadrangle (Griggs, 1973). Joseph (1990) compiled a 1:100,000-scale map of the Spokane quadrangle that incorporated more detailed interpretations of Pleistocene glacial features, based on Kiver and others (1979), and basalt stratigraphy, based on Swanson and others (1979). Two reports prepared for Spokane County and the Spokane County Conservation District reported results of investigations into groundwater availability problems in Deer Park (Emcon Northwest, Inc., 1992) and water flow on Dragoon Creek (Lundgren, 1998). Two cross sections from the Emcon report were modified for cross sections C and D. The right adjacent Chattaroy 7.5-minute quadrangle (Derkey and others, 2005) was mapped in conjunction with this quadrangle.

DESCRIPTION OF MAP UNITS

Quaternary Sedimentary Deposits

Qa — **Alluvium (Holocene)**—Predominantly silt, sand, and gravel deposits in present-day stream channels and on flood plains; consists of reworked glacial flood deposits (units Qfcg, Qfg, and Qfs) and loess; may include small alluvial fans and some mass-wasting deposits that extend onto the flood plain.

Qb — **Bog deposits (Holocene and Pleistocene)**—Peat, silt, ash, marl (bog lime), and gyttja (freshwater mud with abundant organic matter) deposits (Milne and others, 1975); located predominantly in depressions over bedrock and fine-grained sediments where a drainage system is poorly developed.

Qe — **Eolian deposits, predominantly dunes (Holocene to Pleistocene)**—Predominantly fine- to medium-grained sand and silt; grains are subangular to subrounded; mostly composed of quartz, feldspar, and lithic fragments; deposited as dunes and sheets; primary sand source is glacial flood deposits, predominantly sand (unit Qfs).

Qmw — **Mass-wasting deposits (Holocene and late Pleistocene)**—Landslide debris with lesser amounts of debris-flow and rockfall deposits; consists mostly of a mixture of basalt blocks and Latah Formation (unit Ml) sediments. Basalt blocks range in size from several feet to hundreds of feet in diameter; alternatively, basalt may occur as irregularly distributed invasive bodies. Mass wasting that occurred during glacial flooding incorporated flood materials. Most mass wasting occurred during or shortly after Pleistocene catastrophic floods, but some mass wasting continues to the present.

Qgd — **Glacial drift (Pleistocene) (cross sections only)**—Unsorted and unstratified deposits of pebble- to large boulder-size clasts in a matrix of sand, silt, and clay. The only exposure in the Deer Park quadrangle is in a construction trench and is shown only on cross section B. Catastrophic flood events have modified surface exposures of glacial drift, resulting in removal of the matrix clasts and leaving a residuum of large boulders. This modified drift is mapped as flood gravel (unit Qfg) in the valley of the Little Spokane River in the northeastern corner of the quadrangle.

The following units are outburst flood deposits from glacial Lake Missoula. They are a composite of numerous flood events and do not represent deposits from any single flood event.

Qfs — **Glacial flood deposits, predominantly sand (Pleistocene)**—Fine- to coarse-grained sand and granules with sparse pebbles, cobbles, and boulders; contains beds of glaciolacustrine deposits of glacial Lake Columbia as much as 3 ft thick and local beds and lenses of gravel; composed mainly of granitic and metamorphic detritus from local sources and sources to the north; gray, yellowish gray, or light brown; subrounded to well rounded; poorly to moderately well sorted; medium bedded to massive; uneven distribution and thickness due to irregular underlying topography and varying degrees of erosion; mostly deposited when glacial Lake Missoula outburst floods flowed into a high stand of glacial Lake Columbia.

Qfg — **Glacial flood deposits, predominantly gravel (Pleistocene)**—Thick-bedded to massive mixture of boulders, cobbles, pebbles, granules, and sand; contains beds and lenses of sand and silt; gray, yellowish gray, or light brown; poorly to moderately sorted; both matrix and clast supported; locally composed of boulders and cobbles in a matrix of mostly pebbles and coarse sand; boulders and cobbles consist predominantly of local bedrock units and units found to the north and northeast of the quadrangle.

Qfcg — **Glacial flood-channel deposits, predominantly gravel (Pleistocene)**—Thick-bedded to massive mixture of boulders, cobbles, pebbles, granules, and sand; contains beds and lenses of sand and silt; gray, yellowish gray, or light brown; poorly to moderately sorted; both matrix and clast supported; locally composed of boulders and cobbles in a matrix of mostly pebbles and coarse sand; boulders and cobbles consist predominantly of local bedrock units and units found to the north and northeast of the quadrangle. Boundaries between this unit and unit Qfg are based on location of principal flood channels rather than clast-size differences.

Pre-Quaternary Rocks

Mgr — **Grande Ronde Basalt, magnetostratigraphic units R_2 and N_2 (middle Miocene)**—Dark gray to dark greenish gray, fine-grained basalt consisting of pale green augite and pigeonite grains and plagioclase laths and sparse phenocrysts in a matrix of black to dark brown glass and opaque minerals; locally vesicular with plagioclase laths tangential to vesicle boundaries; some vesicles contain botryoidal carbonate and red amorphous secondary minerals; thickness is quite variable due to irregular underlying topography. Identified in the map area on the basis of chemical analyses; between 15.6 and 16.5 m.y. old (Reidel and others, 1989).

Ml — **Latah Formation (middle Miocene)**—Lacustrine and fluvial deposits of finely laminated siltstone, claystone, and minor sandstone; light gray to yellowish gray and light tan; commonly weathers brownish yellow with stains, spots, and seams of limonite; poorly indurated; easily eroded and commonly blanketed by colluvium, talus, and residual soils; floral assemblages indicate a Miocene age (Knowlton, 1926; Griggs, 1976).

Es — **Dacitic crystal tuff of the Sanpoil Volcanics (Eocene)—C**onsists of 20 to 40 percent crystals of mostly white plagioclase (3–5 mm long) and lesser biotite (<2 mm long) in a gray, greenish gray, or brown matrix; matrix consists of devitrified glass and ash that has recrystallized to a microcrystalline mass of potassium feldspar and quartz; thickness probably does not exceed 60 ft; exposures are probable remnants of a more extensive bed; contact between this unit and underlying Silver Point Quartz Monzonite (unit Esp) not observed. Whole rock analysis of samples DC58 and DC66 indicate dacitic composition.

Esp — **Silver Point Quartz Monzonite (Eocene)**—Quartz monzonite consisting of distinct microperthitic orthoclase phenocrysts up to 1 in. long, accompanied by smaller, zoned-plagioclase, hornblende, biotite, and quartz crystals in a fine-grained groundmass; generally light gray with a greenish tinge near contact with host rocks; hornblende has a long dimension of as much as 0.4 in. and is associated with biotite; orthoclase phenocrysts are euhedral; other phenocrysts range from euhedral to anhedral, most are subhedral; titanite is the most common accessory mineral, followed by magnetite, apatite, zircon, and rare allanite (Miller and Clark, 1975); as much as 50 percent of the rock is groundmass; consists of dikes and irregularly shaped intrusive bodies. Two samples from the Chewelah 1:100,000-scale quadrangle to the north gave whole-rock Rb-Sr ages of 39.4 Ma and 46.2 Ma (Armstrong and others, 1987); recalculated K-Ar ages on rocks from the Chewelah 1:100,000-scale quadrangle were 51 Ma on biotite and 62 Ma on hornblende (Miller and Clark, 1975).

EKgu — **Unknown granitic rocks (Eocene or Cretaceous) (cross sections only)**—Extensive areas of unexposed rocks shown in cross sections are believed to be granitic in composition and could be one of four known granitic rocks in the area: Eocene Silver Point Quartz Monzonite (unit Esp), leucocratic granitic rocks (unit Klg), biotite granite (unit Kbg), or Mount Spokane granite (unit Kg).

Kbg — **Biotite granite of Bear Lake (Cretaceous)**—Massive, medium- to coarse-grained, biotite-muscovite granite to quartz monzonite; consists of microcline and albite in microperthitic combination, quartz, biotite, and muscovite; microcline and albite content are nearly equal; biotite and muscovite are generally less than 5 percent, muscovite subordinate to biotite. This unit may be the biotite-bearing equivalent of leucocratic intrusive rocks (unit Klg).

Klg — **Leucocratic intrusive rocks (Cretaceous)**—Medium-grained muscovite quartz monzonite; consists of microcline and albite in microperthitic combination, quartz, and muscovite; microcline and albite content are nearly equal; muscovite can range up to 10 percent but is generally less than 5 percent; rarely contains a trace to 2 percent biotite; pink to cream colored; leucocratic dikes cut biotite granite (unit Kbg). Miller and Clark (1975) reported that exposures of leucocratic granitic rocks noted by Griggs (in Miller and Clark, 1975) south of Clayton (~3 mi west of the map area) were the same unit as their leucocratic muscovite quartz monzonite and that because the plagioclase is albite the rock could be classified chemically as granite.

Kg — **Biotite-muscovite granite of Mount Spokane (Cretaceous)**— Medium- to coarse-grained, massive, muscovite-biotite granite to quartz monzonite; contains medium-gray anhedral quartz that commonly forms graphic intergrowths with feldspar; potassium feldspar and plagioclase are present in a ratio of about 2:3; large crystals of potassium feldspar in some exposures enclose small biotite grains; plagioclase is commonly altered; subhedral biotite comprises as much as 10 percent of the rock and forms clots; muscovite ranges from 0 to 10 percent of the rock and is present as single euhedral crystals, in clots, or with biotite; undisturbed outcrops are medium gray due to lichen cover; light gray in roadcuts and fresh exposures; weathers yellow with limonitic staining. Yielded discordant K-Ar ages of 48 Ma on biotite and 53 Ma on muscovite (Miller and Engels, 1975), which are probably reset.

GEOLOGIC SYMBOLS

Contact—Long dash where approximately located; short dash where inferred or indefinite

CW5 — Water well—Numbers correspond to well numbers on cross sections

DC9 — Whole rock geochemistry sample location—Numbers correspond to sample numbers in Table 1

ACKNOWLEDGMENTS

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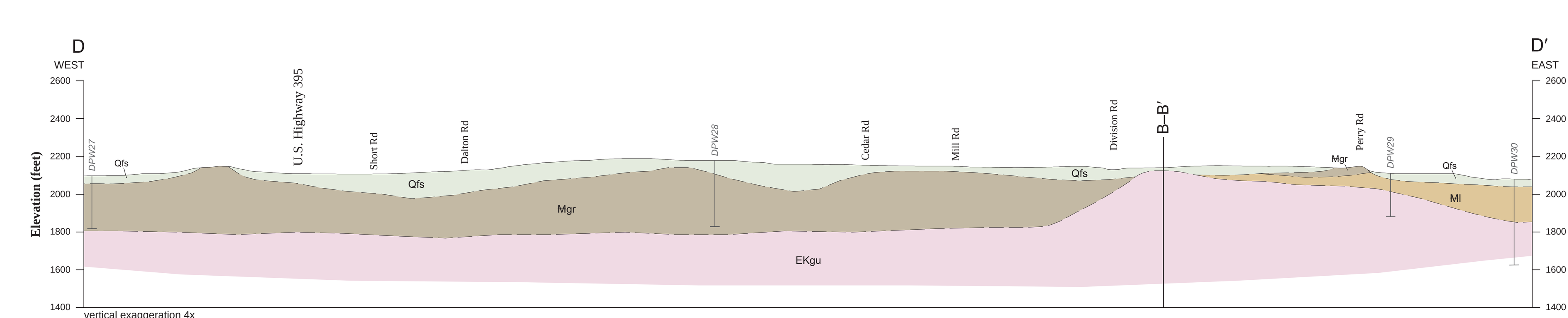

Table 1. Geochemical analyses of six samples from the Deer Park quadrangle were preformed at the Washington State University GeoAnalytical Laboratory. Instrumental precision is described in Johnson and others (1999). Total Fe is expressed as FeO. Four samples of basalt (DC1, DC5, DC13, DC14) are from the Grande Ronde Basalt. Two samples (DC58, DC66) are considered to be dacitic tuff of Sanpoil Volcanics (unit Es)

MAJOR ELEMENTS–UNNORMALIZED (in weight percent)

Sample	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	Total
DC1	56.36	2.211	13.88	10.74	0.181	3.13	6.78	3.05	1.67	0.409	98.41
DC5	54.67	2.398	13.37	12.28	0.202	2.94	7.07	3.09	1.65	0.437	98.09
DC13	55.55	2.125	13.49	11.39	0.197	3.20	6.83	3.13	1.82	0.375	98.08
DC14	55.77	2.429	13.71	10.47	0.315	2.98	6.99	3.11	1.86	0.430	98.06
DC58	62.84	0.705	15.34	4.42	0.067	2.61	3.27	3.61	4.29	0.334	97.49
DC66	63.04	0.629	15.46	4.05	0.071	2.35	3.78	3.34	4.35	0.323	97.38

TRACE ELEMENTS (in parts per million)

Sample	Ni	Cr	Sc	V	Ba	Rb	Sr	Zr	Y	Nb	Ga	Cu	Zn	Pb	La	Ce	Th	Nd
DC1	0	6	33	303	907	48	342	186	38	11.9	23	10	130	10	30	60	7	32
DC5	1	3	34	347	776	44	329	178	40	11.9	22	8	133	10	29	60	6	35
DC13	0	6	31	299	728	48	318	181	38	12.4	21	10	125	10	26	57	6	31
DC14	1	2	35	350	1229	46	372	185	41	12.4	21	7	140	10	26	59	6	32
DC58	26	50	11	90	1509	144	823	211	17	9.9	23	17	66	28	60	113	15	45
DC66	24	45	10	81	1839	136	1258	216	15	9.1	22	4	59	21	65	118	16	47