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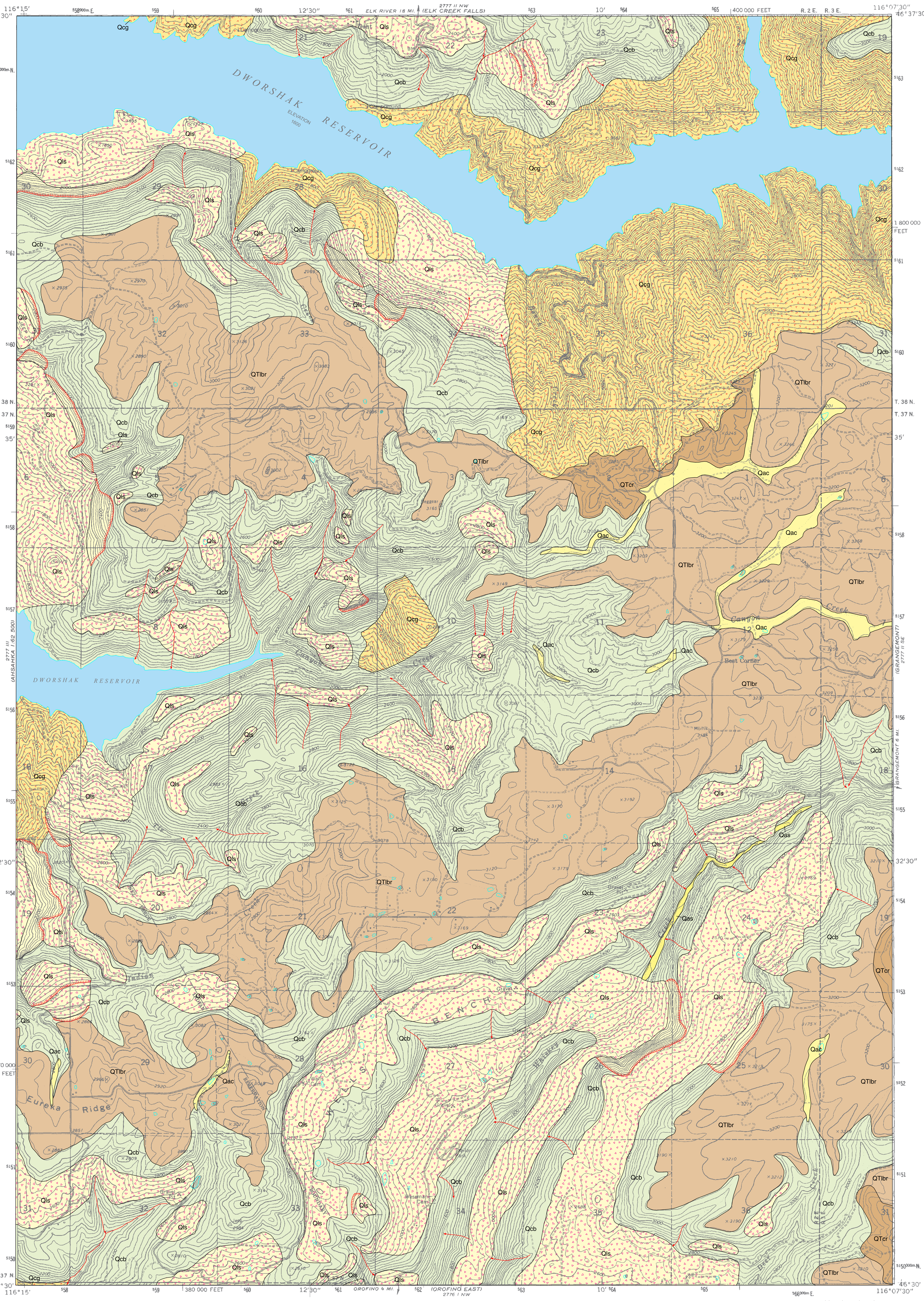
Surficial Geologic Map of the Dent Quadrangle, Clearwater County, Idaho

Kurt L. Othberg, Daniel W. Weisz, and Roy M. Breckenridge

2002



Base map from USGS digital raster graphic 1969.

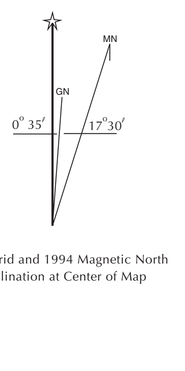
Topography by photogrammetric methods from aerial photographs taken 1968. Field checked 1969. Photorevised 1984.

Polyconic projection. 1927 North American Datum.

10,000-foot grid ticks based on Idaho coordinate system, west zone.

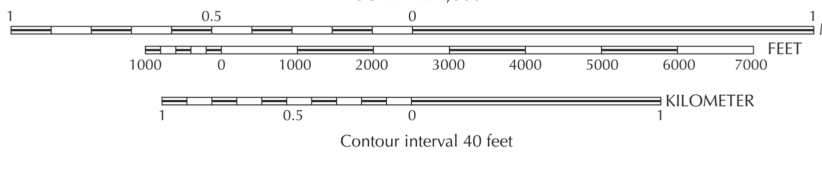
1000-meter Universal Transverse Mercator grid ticks, zone 11.

National geodetic vertical datum of 1929.



UTM Grid and 1994 Magnetic North Declination at Center of Map

SCALE 1:24,000



Contour interval 40 feet

QUADRANGLE LOCATION

Field work conducted 2001.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

Digital cartography by B. Benjamin E. Studer and Loudon R. Stanford at the Idaho Geological Survey's Digital Mapping Lab.

Map version 7-8-2003.

DESCRIPTION OF MAP UNITS

INTRODUCTION

The surficial geologic map of the Dent quadrangle identifies earth materials on the surface and in the shallow subsurface. It is intended for those interested in the area's natural resources, urban and rural growth, and private and public land development. The information relates to assessing diverse conditions and activities, such as slope stability, construction design, sewage drainage, solid waste disposal, and ground-water use and recharge.

The geology was intensively investigated during a one-year period. Natural and artificial exposures of the geology were examined and selectively collected. In addition to field investigations, aerial photographs were studied to aid in identifying boundaries between map units through photogeologic mapping of landforms. In most areas map-unit boundaries (contacts) are approximate and were drawn by outlining well-defined landforms. It is rare that contacts between two units can be seen in the field without excavation operations which are beyond the purpose and scope of this map. The contacts are inferred where landforms are poorly defined and where lithologic characteristics grade from one map unit into another. The precision of a contact with respect to actual topography also depends on the accuracy and scale of the topographic base. Details depicted at this scale, therefore, provide an overview of the area's geology. Further intensive analyses at specific locations should be arranged through independent geotechnical specialists.

Dent, located on the shores of Dworshak Reservoir in the canyon of the North Fork Clearwater River, is near the boundary between the Columbia River Plateau and the northern Rocky Mountains. The canyon exposes the plateau's Miocene basalt flows of the Columbia River Basalt Group and the underlying pre-Miocene granitic and metamorphic rocks that compose the basement rocks of the foothills and mountains. During the Miocene, lava flows of the Columbia River Basalt Group filled ancestral stream valleys eroded into the basement rocks. The flows created volcanic embayments that now form the eastern edge of the Columbia River Plateau where the relatively flat region meets the mountains. Sediments of the Latah Formation are interbedded with the basalt flows, and landslide deposits occur where major sedimentary interbeds are exposed along the valley sides. Pleistocene loess forms a thin discontinuous mantle on deeply weathered surfaces of the basalt plateau and mountain foothills.

The bedrock geology of this area is mapped by Lewis and others (2001) and shows details of the basement rocks and the Miocene basalt flows and sediments. The bedrock map's cross sections are especially useful for interpreting subsurface conditions suitable for siting water wells and assessing the extent and limits of ground water.

SURFICIAL DEPOSITS

Qas **Alluvium of sidestreams (Holocene)**—Channel deposits of Whiskey Creek. Primarily coarse channel gravels deposited during high-energy stream flows. Subrounded to rounded pebbles, cobbles, and boulders of basalt in a sand matrix. Moderately stratified and sorted. Includes intercalated colluvium and debris-flow deposits from steep side slopes.

Qac **Alluvium and colluvium (Holocene)**—Stream, slope-wash, and gravity deposits. Predominantly beds of silt, clay, and sand derived from erosion of adjacent units. Stream deposits typically are thin and interfinger with laterally thickening deposits of slope wash and colluvium derived from local loess deposits and weathered basalt. Soils developed in these deposits include the Grasshopper and Teneb series (Glenn Hoffman, written comm., 2001).

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular basalt cobbles and boulders mixed with silt and clay. Landslide deposits include debris slides as well as blocks of basalt, sedimentary interbeds, and pre-Miocene rocks that have been rotated and moved laterally. Debris slides mainly composed of unstratified, unsorted gravel rubble in a clayey matrix. In addition to the landslide deposit, the unit may include the landslide scarp and the headwall (steep area adjacent to and below the landslide scarp) from which material broke away (see Symbols). The headwall area may include talus formed after landslide movement. Location of landslide deposits in canyons is controlled by the presence of sedimentary interbeds, the hydrogeologic regime, and the occurrence of basalt overlying clay-rich weathered basement rocks. The largest landslides occur where canyon-cutting has exposed landslide-prone sediments to steep topography. Slope failures have occurred where the fine-grained sedimentary interbeds and weathered basement rocks are saturated by ground water moving toward the valleys. This relationship is so prevalent that the major sedimentary interbeds may be traced by locating landslide deposits along the valley sides. The landslides range in age from ancient, relatively stable features, to those that have been active within the past few years. The factors that cause landslides have been prevalent in the region for thousands of years. The frequency of landsliding may have been greater in the Pleistocene. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper parts of canyon slopes can transform into high-energy debris flows that endanger roads, buildings, and people below (see *Debris-flow chute* under Symbols). Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.

Qcb **Colluvium from basalt (Holocene and Pleistocene)**—Primarily poorly sorted brown muddy gravel composed of angular and subangular pebbles, cobbles, and boulders of basalt in a matrix of silt and clay. Emplaced by gravity movements on steep-sided canyons and gullies cut into Columbia River basalt. Includes outcrops of basalt that are common on steep, dry, southerly aspects where colluvium is thinner and the more erosion-resistant basalt flows form laterally traceable ledges. More gently sloping areas are mantled with thin loess (typically 1-5 feet thick), especially near boundaries with loess mantling basalt residuum (*QTlbr*). Distribution and thickness of colluvium is dependent on slope aspect, upper and lower slope position, basalt and sediment stratigraphy, and association with landslides. Colluvium is thin and associated with many basalt outcrops on dry, southerly facing slopes, and may exhibit patterned-ground features (see Symbols). Colluvium is thicker on north- and east-facing slopes, and is associated with landslides (*Qls*) and debris-flow chutes (see Symbols), especially where more moisture is retained and where sedimentary interbeds are present. Areas of thicker colluvium have fewer outcrops of basalt, and the surface may have a patterned ground of crescent-shaped lobes of colluvium, probably relicts of Pleistocene solifluction. Unit includes landslides too small to map separately, and talus below cliffs and ledges of basalt. Colluvium typically increases in thickness toward the base of slopes where it interfingers with alluvium in valley bottoms. May include all of valley-bottom sediment where streams have little discharge or are ephemeral. Soils developed in basalt colluvium include the Agatha, Bandmill, Elkridge, Klickson, Longpen, Riswold, and Seddow series (Glenn Hoffman, written comm., 2001).

Qcg **Colluvium from granitic and metamorphic rocks (Holocene and Pleistocene)**—Primarily poorly sorted muddy gravel composed of angular and subangular pebbles, cobbles, and boulders in a matrix of sand, silt, and clay. Emplaced by gravity movements in canyons where there are outcrops of pre-Miocene schist, gneiss, quartzite, and granitic rocks. Includes local debris-flow deposits and isolated rock outcrops. Along the shores of Dworshak Reservoir slopes of 40-70% are common within this unit. These steep slopes are prone to active gravity movements and erosion which are in part exhibited by debris chutes too numerous to map. During severe climatic conditions, such as thunderstorms and rain-on-snow events, there is a hazard of high-energy, short duration floods and debris flows in these areas. May include colluvium and debris-flow deposits from the upslope basalt section, and areas of thin loess (typically less than 5 feet). Grades laterally, as slope gradients decrease, into areas where thin loess and clayey saprolite mantle bedrock. Distribution and thickness of colluvium depend on slope, aspect, upper and lower slope position, and association with landslide deposits. Colluvium typically increases in thickness toward the base of slopes and may interfinger with alluvium in valley bottoms. Soils developed in these deposits include the Johnson, Rettig, Swayne, Township, and Uvi series (Glenn Hoffman, written comm., 2001).

QTlbr **Loess mantling basalt residuum (Quaternary and Tertiary)**—Thin Quaternary loess mantling Tertiary residuum on remnant surfaces of the basalt plateau. Loess 1-6 feet thick mantles basalt which is spheroidally weathered and commonly grades upward into a thoroughly decomposed zone of clayey saprolite. Most weathered spheroids have indurated cores of basalt which grade outward into yellowish and reddish sand, silt, and clay. Original fracture patterns in the basalt can be seen as veins of secondary accumulation of clay, iron oxides, and, locally, opal. The saprolite varies from yellowish brown to dark red in color and predominantly consists of silty clay and clay. The saprolite mineralogy consists predominantly kaolinite clay and oxides of iron, especially goethite and hematite. The basalt residuum is laterally discontinuous, probably as a result of erosion of the Miocene land surface, so that near drainages and canyon rims fresh basalt is often near or at the present surface. Where thickest, the clayey saprolite is as much as 20 feet thick and spheroids may not be seen in road cuts or near the land surface. Elsewhere, the saprolite is thinner, and spheroidally weathered basalt is seen in road cuts and lag boulders of weathered spheroids are encountered in fields. The weathering of the basalt probably can be attributed to the eastward increase in precipitation and to the Miocene age of this remnant basalt surface. Includes gravelly basalt colluvium on local steeper slopes where stream incision has occurred and local deposits of thin alluvium too small in area to show at this scale. Soils in this unit include the Bandmill, Carlinton, Kauder, Reggear, and Taney series (Glenn Hoffman, written comm., 2001).

QTcr **Colluvium and residuum from metamorphic rocks (Quaternary and Tertiary)**—Primarily poorly sorted muddy gravel composed of angular and subangular pebbles, cobbles, and boulders in a matrix of sand, silt, and clay. Parent rocks include schist, gneiss, quartzite, and granitic rocks. Grades laterally, as slope gradients decrease, into areas where matrix predominates and areas of saprolite associated with Tertiary sediments. Residuum is a reddish yellow clay-rich saprolite weathered in place by the warm- and wet-climate of the late Tertiary. Quartz grains are present in the saprolite, and exposures may show foliation, veins, and other parent-rock textures. On valley sides includes isolated outcrops of metamorphic rocks and debris-flow deposits from the upslope basalt section. Distribution and thickness depend on degree of weathering of parent rock, slope, aspect, and upper and lower slope positions. Rock outcrops and gravelly colluvium are more common on steep slopes and at higher elevations, and rare at lower elevations and gentle slopes. At lower elevations a mantle of thin loess is common (typically less than 5 feet). Soils developed in these deposits include the Hugus, McCrosket, Scaler and Taney series (Glenn Hoffman, written comm., 2001).

SYMBOLS

Contact: Line showing the approximate boundary between one map unit and another. The apparent ground width of the line representing the contact is about 80 feet at this scale (1:24,000).

Landslide scarp: Ticks show top of scarp.

Debris-flow chute in canyons. Thin and discontinuous alluvial fan and debris flow deposits (*Qad*) may be present, but are not mappable at this scale. High-energy, short duration floods and debris flows may occur in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. These events are historically infrequent, dependent on weather, with a recurrence cycle on the order of years to decades. Debris flows can also be triggered by landslides. The most prominent debris-flow chutes are shown on the map, but any steep-gradient valley sides and canyon bottoms have the potential for these catastrophic events.

REFERENCES

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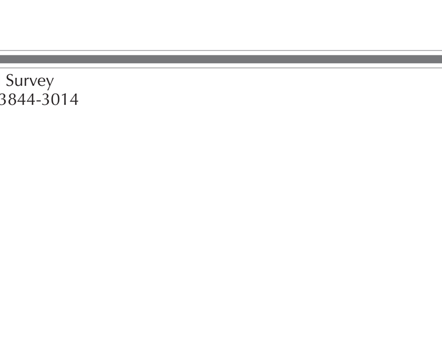
CORRELATION OF MAP UNITS



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