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DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF THE DELAMAR NW QUADRANGLE, LINCOLN COUNTY, NEVADA

By

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

DESCRIPTION OF MAP UNITS

[Ages of surficial units have not been determined by absolute dating techniques; ages are estimates based on field observations of degree of soil development and local surface dissection. The stage of carbonate development reported is a visual estimate using standards defined by Gile and others (1966). Colors of surficial and bedrock units are from the Rock Color Chart (Rock-Color Chart Committee, 1951). Descriptions of volcanic units are based largely upon megascopic identification and estimates of phenocryst abundances]

Qahl **Alluvium (late Holocene)**--Grayish-orange to pale-yellowish-brown sand, gravelly sand, and silty and clayey sand, weakly consolidated to unconsolidated; locally well compacted, poorly bedded to massive, and moderately well to poorly sorted. Gravel is angular to subrounded clasts of ash-flow tuff, lava, and sparse Paleozoic carbonate rock (derived from exposures in the Alamo NE quadrangle to the west). Gravel comprises as much as half of unit near bedrock sources and less than 5 percent near distal edges of fans. Gravel is mostly pebble size, but locally includes cobbles and boulders as large as 0.5 m in diameter. Unit forms large low-gradient fans bordering Delamar Valley, small steep fans flanking bedrock ridges, and channel deposits of active washes. Unit includes sparse debris-flow deposits that consist of low ridges of angular pebble to small cobble gravel without matrix. Surface of unit is smooth on large fans and very irregular in broad shallow washes where bar-and-swale topography is common. Deposit grades downstream locally into valley-floor alluvium (Qav). Soil development is limited to a thin sandy vesicular A horizon present in areas characterized by minor deposition and erosion. Unit ranges from 0 to thicker than 3 m

Qav **Valley-floor alluvium (late Holocene)**--Grayish-orange fine sand, silt, and clay with minor gravel; massive, poorly consolidated, and well compacted. Gravel occurs as scattered granules and pebbles and as sparse lenses and interbeds of pebble and small cobble gravel. Soil development is limited to a sandy vesicular A horizon about 2 cm thick. Unit thickness undetermined

Qahe **Alluvium (early Holocene and latest Pleistocene)**--Grayish-orange fine to coarse sand, gravelly sand, and sandy gravel, poorly to well sorted, poorly bedded to massive, unconsolidated to weakly consolidated. Gravel content is estimated at 10 percent and occurs as scattered angular to rounded pebbles and cobbles of ash-flow tuff and lava mostly less than 10 cm in diameter and as interbeds of gravel and gravelly sand. Locally includes subrounded boulders as much as 0.6 m in diameter. Unit forms fan remnants and small inset fans that stand 1-2 m above active washes. Near the heads of some fans, unit includes patches and trains of boulders that were probably deposited by debris flows. Surface of unit is generally smooth and a weakly developed rock pavement is locally present. Soil development consists of 2- to 3-cm-thick sandy vesicular A horizon, a 0.5-m-thick B horizon, and a 0.5-m-thick C horizon with stage I carbonate development in the upper part; no change in color relative to the parent material was observed in the B horizon. Unit ranges from 0 to thicker than 3 m

Qc **Colluvium (Quaternary)**--Unconsolidated to well consolidated talus; angular pebble- to boulder-size clasts and minor amounts of silt and sand. Colors are inherited from source rock. Unit is generally nonbedded and locally cemented by secondary carbonate; occurs along base of steep slopes developed on Tertiary volcanic rocks. Unit thickness undetermined

Qapl **Alluvium (late Pleistocene)**--Brownish-gray to grayish-orange gravelly sand and sandy gravel; generally poorly sorted, poorly to moderately well bedded, and weakly consolidated. Gravel is angular to subrounded clasts of ash-flow tuff and lava; chiefly pebbles and small cobbles with sparse to locally common boulders generally less than 1 m across. Unit forms a large, partly dissected, gravelly sand fan near the northeast corner of the quadrangle and small sandy gravel and gravelly sand fan remnants adjacent to bedrock ridges. Fan remnants typically stand 2-3 m above active washes; depositional surfaces of fans are largely intact but have been moderately dissected. A loosely packed stone pavement is locally developed; some surface clasts have a weakly developed rock varnish. Typical soil development includes a 3- to 5-cm-thick sandy vesicular A horizon, a 30-cm-thick dark-yellowish-orange B horizon, and a 0.5- to 0.7-m-thick carbonate horizon that has stage II to II^+ carbonate development in the upper part. On many fan remnants the soil has been eroded down to the top of the carbonate horizon and the fan surface is littered with sparse to common chips of pedogenic carbonate. Thickness ranges from 0 to more than 8 m

QTa **Alluvium (early Pleistocene and Pliocene?)**--Grayish-brown gravel and sandy gravel; degree of consolidation, sorting, and bedding is unknown; only reworked surface debris is exposed. Gravel is angular to rounded clasts of ash-flow tuff and lava; boulders as large a 1 m across are common. Unit forms small, poorly exposed fan remnants flanking bedrock ridges in the north-central part of the quadrangle. Typically expressed as debris covered slopes and rounded ridges littered with boulders and abundant pedogenic carbonate chips. Unit is deeply eroded; depositional surface of fan is not preserved. No soil was observed. Unit thickness may reach 20 m

QTs **Landslide debris and gravity-slide block complex (Quaternary to Pliocene?)**--Complex mixture of unconsolidated to moderately consolidated debris and coherent blocks that consist of volcanic units. Slide unit occurs near the base of steep slope. Thickness is as great as 25 m in the only exposure, 5.8 km west of the east border and 2 km south of the north border of the quadrangle. (Unit is shown by a stippled pattern and by fault trace with open teeth on the slide body. Where individual rock units in slides are mappable, rock units are shown with unit symbols and symbol QTs is not used; where individual rock units are unmappable, the slide is designated by the symbol QTs)

Ta **Alluvium (Pliocene or Miocene)**--Brownish-gray gravel, poorly sorted; consisting of angular to subrounded clasts of brownish-gray ash-flow tuff, andesitic lava, and Paleozoic quartzite (closest exposures of these lithologies are in the Delamar Mountains about 15 km east of the unit in the Delamar quadrangle). Clasts are mostly pebble size but include some cobbles and sparse boulders as much as 0.7 m across. Unit forms one 100-m-wide, poorly exposed, fan remnant 5.3 km west of the east border and 2.7 km north of the south border of the quadrangle. Typical exposure consists of rounded, rubble-covered slope littered with sparse to common chips of pedogenic carbonate. No soil development observed. Thickness unknown

Tt **Tuff (Miocene?)**--Tuff, grayish-pink, nonwelded; containing about 2 percent biotite and sparse sanidine phenocrysts. Matrix consists of devitrified glass shards. Massive with no bedding but alignment of biotite flakes forms a weak foliation. Exposed in one locality 5.7 km west of the east boundary and 0.2 km south of the north boundary of the quadrangle. Unit less than 5 m thick

Basalt (Miocene?)--Basalt, dark-gray to grayish-black; containing about 10 percent plagioclase phenocrysts. Scoriaceous and amygdaloidal to massive. Although unexposed in the quadrangle, cobbles and boulders occur in two fan remnants of late Pleistocene alluvium (Qapl) located about 6.9 km west of the east boundary and 5.2 km south of the north boundary of the quadrangle. Stratigraphic position assigned by stratigraphic relationships exposed in adjoining quadrangles (R. B. Scott, unpublished mapping; Scott and others, 1990); the probable source of the basalt clasts is the stratigraphic level above the Gregerson Basin unit of the Kane Wash Tuff (Tkb); Tkb is exposed in this quadrangle 2 km north of the fan along the drainage that deposited the fan. Also, 1-m-diameter basalt boulder, apparently a lag boulder, was found 5.5 km west of the east boundary and 1.6 km south of the north boundary of the quadrangle on bedrock exposures, just south of exposures of Quaternary-Tertiary alluvium (QTa)

Ts **Sedimentary tuff**--Light-gray to yellowish-gray bedded ash-fall(?) and reworked tuff containing subordinate layers of light-greenish-gray nonwelded ash-flow tuff. Ash-flow tuff contains sparse phenocrysts of quartz and sanidine and abundant zeolitized pumice fragments. Unit is exposed only in northeastern part of area of bedrock exposure and stratigraphically occurs between Gregerson Basin unit (Tkb) and the orange cooling unit of the Delamar Lake unit (Tkdo) of the Kane Wash Tuff. Unit thickness is less than 50 m

Kane Wash Tuff (Miocene)--Peralkaline ash-flow tuff sequence including four informally named units

Tkb **Gregerson Basin unit**--Informally named, comenditic ash-flow tuff consisting of one cooling unit. Map unit probably correlates with unit V2 of Novak (1984). The cooling unit grades downward from an upper to a lower zone. The upper zone is devitrified, moderately to densely welded, and light gray to medium gray. Upper zone has less than one percent flattened lenticules that probably are flattened pumices; no lithophysal cavities are present. Upper zone contains between 20 and 25 percent phenocrysts that consist of 25 percent quartz, 60 percent sanidine, and 15 percent altered mafic minerals. Upper zone is partly removed by erosion but thicknesses as great as 30 m remain. The lower zone is partly devitrified, moderately to densely welded, and ranges from light bluish gray to light olive gray. Lower zone contains between 10 and 25 percent phenocrysts that consist of 25 percent quartz, 60 percent sanidine, and 15 percent hedenburgite, fayalite, and ilmenite. The lower zone is 1 to 5 m thick. The K-Ar age of the Gregerson Basin unit is 14.1 Ma (Novak, 1984). Unit forms slight ridges where exposed in tilted fault blocks. The Gregerson Basin unit is as thick as 35 m

Tkg **Grapevine Spring unit**--Informally named, rhyolitic ash-flow tuff consisting of one cooling unit. Grapevine Spring unit is unit V1 of Novak (1984). Exposed part of unit is devitrified, moderately to densely welded, and light brownish gray. Unit contains 25 percent phenocrysts that consist of 25 percent quartz, 60 percent sanidine, and 15 percent hedenburgite, fayalite and titano-magnetite. About 20 percent flattened pumice fragments, less than one percent lithic fragments, and no lithophysal cavities occur in the unit. Less welded part of the unit are unexposed. The only exposure occurs 2.65 km east of the west boundary along the southern boundary of the quadrangle. The K-Ar age of the unit is 14.1 Ma (Novak, 1984). Unit thickness is less than 10 m

Sunflower Mountain unit--Informally named rhyolitic ash-flow tuff, consisting of a compound cooling unit and containing two mappable zones. The Sunflower Mountain unit is unit W of Novak (1984). The K-Ar age of the unit is 14.7 Ma (Novak, 1984). The unit pinches out abruptly about 3 km north of the south border of the quadrangle and is about 85 m thick

Tksu **Upper zone**--More welded part of the Sunflower Mountain unit consisting largely of moderately welded ash-flow tuff. Upper zone is devitrified, pinkish gray, and mottled. Mottling consists of distinctive pale-purple pumice fiamme in a pinkish-gray matrix that contains altered very pale orange blotches surrounding phenocrysts or lithic fragments. Upper zone contains as much as 20 percent pumice fiamme and sparse lithophysal cavities. Rock contains as much as 20 percent phenocrysts that consist of subequal amounts of quartz and sanidine and sparse altered mafic minerals. Volcanic lithic fragments are commonly as large as 0.5 cm across and form about 5 percent of the rock. Unit forms cap rock that protects less resistant lower zone (Tksl). Upper zone is about 20 m thick

Tksl **Lower zone**--Less welded part of the Sunflower Mountain unit consisting of devitrified, nonweled to partially welded, grayish-pink ash-flow tuff. Pumice fragments form 20 percent of the rock, are slightly flattened in the plane of foliation where degree of welding in greater, and range from 0.1 to 1 cm long. The lower zone contains about 10 percent phenocrysts that consist of subequal amounts of quartz and sanidine and sparse altered mafic minerals. Volcanic lithic fragments are commonly as large as 1 cm across and form about 10 percent of the rock. Map unit forms gentle slopes below cap rock and is about 60 m thick

Delamar Lake unit--Informally named rhyolitic ash-flow tuff consisting of four simple cooling units. The Delamar Lake unit is unit O of Novak (1984) and has a K-Ar age of 15.6 Ma (Novak, 1984). No unfaulted section of the unit exists and unit thickness is estimated to range between about 100 m in the southern part to as much as 260 m in the central part of the quadrangle

Tkdo **Orange cooling unit**--Simple cooling unit consisting primarily of moderate-orange, moderately welded, devitrified upper part grading downward to a dark-reddish-brown, moderately welded, vitrophyric lower part. Locally the vitrophyre is blackish red. Pumice fiamme range from 0.2 to 2 cm in length and form about 10 percent of the tuff. Rock contains about 15 percent phenocrysts that consist of 25 percent quartz, 70 percent sanidine, and 5 percent fayalite and titano-magnetite. Sparse lithophysal cavities and less than 5 percent lithic fragments are present. Cooling unit forms small ridges in tilted fault blocks, and thickness ranges from 0 in the south part to as much as 65 m in the north part of the quadrangle

Tkdp **Pumice-rich cooling unit**--Nonwelded yellowish-gray to very light gray lapilli-sized pumice-flow tuff containing pumice fragments as large as 30 cm in diameter with little ash matrix. Slightly sintered. Phenocrysts of quartz and sanidine form 10 percent of the pumice fragments. Includes discontinuous layers of pinkish-gray ash-fall tuff that contain no pumice and nodular light-gray reworked vitric tuff that contain coarse-sand-sized glass shards. Unit exposed only in west-central part of quadrangle, forms distinct erosional bench, and ranges from 0 to 25 m thick

Tkdc **Crystal-rich cooling unit**--Compound cooling unit containing multiple layers of alternating moderately welded and moderately to densely welded ash-flow tuff. Unit is devitrified and grayish orange pink, pale red purple, to light brownish gray. Sparse vitrophyre near the base of cooling unit has a dark-gray matrix with light-brownish-gray pumice fiamme. Pumice fiamme range from 0.1 to 5 cm long and are lighter in color than the matrix and form 25 percent of the rock. Tuff contains 25 percent phenocrysts that consist of about 20 percent quartz, 75 percent sanidine, and 5 percent fayalite and other mafic minerals. The tuff contains about 5 percent volcanic lithic fragments. Map unit forms bold cliffs and is as thick as 125 m in the central part of the quadrangle

Tkdl **Lowest cooling unit**--Simple cooling unit consisting of nonwelded to moderately welded, light-browish-gray to pale-red, devitrified ash-flow tuff. Pumice fiamme form 15 percent of the rock, are distinctive grayish red purple, and are 0.1 to 2 cm long. Tuff contains about 15 percent phenocrysts that consist of about 35 percent quartz, 60 percent sanidine, and 5 percent fayalite and other mafic minerals. The nonwelded base of the lowest cooling unit forms an erosional bench between the overlying crystal-rich cooling unit (Tkdc) and the underlying Hiko Tuff (Th). Map unit ranges from 0 in the northwest part to as much as 60 m thick in the southern part of the quadrangle

Hiko Tuff (Miocene)--Rhyolitic ash-flow tuff consisting of one compound cooling unit locally containing as many as six mappable zones. The $^{40}Ar/^{39}Ar$ age of the Hiko Tuff is 18.6 Ma (Taylor and others, 1989). The Hiko Tuff is estimated to be as much as 370 m thick

Thn **Nonwelded zone**--Upper part of compound cooling unit grading downward from nonwelded tuff to partially welded tuff. Tuff is grayish orange pink, devitrified, and weakly layered. Layering formed by small differences in the abundance and size of pumice and lithic fragments. Map unit contains about 10 percent pumice fragments generally less than 0.1 cm in diameter. Contains less than 20 percent phenocrysts that consist of subequal amounts of quartz, sanidine, and plagioclase, and about 10 percent biotite and other mafic minerals. Lithic fragments form about 10 to 15 percent of the rock. The nonwelded zone forms gentle slopes and is about 120 m thick in the northeastern part of the area of bedrock but is apparently eroded or not deposited elsewhere in areas that expose the more densely welded part of the Hiko Tuff

Th **Undivided zone**--Central part of compound cooling unit ranging from moderately welded to densely welded ash-flow tuff. Laterally equivalent to the upper cliff zone (Thuc), slope-forming zone (Ths), double cliff zone (Thd), and light-colored cliff zone (Thlc). Tuff is devitrified and very light gray to medium gray. Pumice fiamme are indistinct, are as large as 4 cm long, and form about 10 percent of the rock. Rock contains about 35 percent phenocrysts that consist of 25 percent very pale purple quartz, 25 percent sanidine, 35 percent plagioclase, 10 percent biotite, and less than 5 percent hornblende and pyroxene. Less than one percent lithic fragments are present. The undivided zone of the Hiko Tuff forms bold massive cliffs and is at least 200 m thick; base of unit is not exposed

Thuc **Upper cliff zone**--Stratigraphically highest zone in area of subdivided part of Hiko Tuff. Lithologically similar to undivided zone (Th); occurs in southwest part of quadrangle. Map unit about 90 m thick

Ths **Slope-forming zone**--Distinguished by relatively gentle slope between cliffs in area of subdivided part of Hiko Tuff. Lithologically similar to undivided zone (Th). Map unit characterized by lighter gray colors, occurs in southwest part of quadrangle, and is about 35 m thick

Thd **Double cliff zone**--Zone distinguished by two minor cliffs separated by a narrow bench in cliffs. Lithologically similar to undivided zone (Th). Map unit occurs in southwest part of quadrangle and is about 75 m thick

Thlc **Light-colored cliff zone**--Stratigraphically lowest zone in area of divided part of Hiko Tuff above the vitrophyre. Lithologically similar to undivided zone (Th). Map unit occurs in southwest part of quadrangle and is about 50 m thick

Thv **Vitrophyric zone**--Partly vitric, moderately welded and moderately to densely welded medium-gray to grayish-black ash-flow tuff exhibiting eutaxitic texture of pumice fiamme. Lenticular pumice fiamme are a darker shade of gray than the matrix, range from 0.2 to 4 cm long, and form 30 percent of the rock. Otherwise, the vitrophyric zone is lithologically similar to the undivided zone (Th), forms bold cliffs, is discontinuous, is exposed only in the southern part of the quadrangle, and is locally as thick as 7 m

Thp **Partially welded zone**--Lowest zone in the Hiko Tuff consisting of pinkish-gray to very pale orange, partially welded to nonwelded, partly altered and partly vitric ash-flow tuff. Pumice fragments are nearly white, exhibit original lineated tubular structure, form 30 percent of the rock, and are 0.1 to 1 cm across. The phenocryst mineralogy is indistinguishable from that of the undifferentiated zone (Th). Lithic fragments form 10 percent of the rock and are about 0.5 cm across. The partially welded zone forms gentle slopes and is 110 m thick in the southwest part but as thin as 30 m in the northwest part of the quadrangle

Tbt **Bedded tuff (Miocene)**--Light-gray to pinkish-gray bedded tuff; poorly exposed in southwest part of quadrangle. Age of map unit relative to rhyolitic lava flow domes (Tpf and Tdf) and to Bauers Member of the Condor Canyon Tuff (Tcb) uncertain. Base of map unit unexposed. Map unit forms gentle slopes and may be more than 50 m thick locally

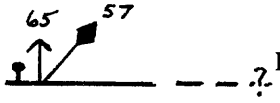
Rhyolite lava flow (Miocene)--At least two rhyolite lava flow domes exist below the Hiko Tuff; these domes are assumed to be part of the same or similar magmatic events because of phenocryst similarities. One dome is largely perlitic and the other is largely devitrified. Age of rhyolite domes relative to bedded tuff (Tbt) and Bauers Member of the Condor Canyon Tuff (Tcb) uncertain

Tpf **Perlitic lava flow**--Light-brownish-gray to light-gray rhyolite lava flow containing about 5 percent phenocrysts of quartz, sanidine, and biotite in a matrix of perlitic glass. Small areas of devitrified rhyolite are present locally within the perlitic dome-shaped body. Base of flow not exposed. Thickness may reach 230 m locally near the central part of the quadrangle

Tdf **Devitrified lava flow**--White to light-brownish-gray and brownish-gray rhyolite lava flow containing about 5 percent phenocrysts of quartz, sanidine, and biotite in a devitrified matrix. Parts of the dome-shaped flow contain spherulitic devitrification centers that have been deformed by flowage. Base of flow not exposed. Thickness is as much as 70 m locally in the northwestern part of the quadrangle

Tcb **Bauers Tuff Member of the Condor Canyon Formation (Miocene)**--Rhyolitic ash-flow tuff consisting of one simple cooling unit. Exposed tuff is devitrified, moderately to densely welded, and pale red. Grayish-orange-pink lenticules typically 5 cm long and 0.2 cm thick probably are flattened pumice fragments; lenticules form about 10 percent of the rock. Lithophysal cavities locally form as much as 15 percent of the rock and are about 3 cm long; other zones contain no lithophysae. Rock contains 15 percent phenocrysts that consist of 35 percent sanidine, 65 percent plagioclase, 5 percent biotite, and a trace of hornblende. Lithic fragments are sparse. Although the Bauers Member of the Condor Canyon Tuff was included in the Quichapa Group (Cook, 1957; Williams, 1967; Anderson and Rowley, 1975), the group name will not be used here because the source(s?) of the ash-flow tuffs in the group have not been recognized. The $^{40}Ar/^{39}Ar$ age of the tuff is 22.8 Ma (Best and others, 1989). Base of unit unexposed; about 170 m of the upper part of map unit is exposed at one locality in the south-central part of the quadrangle

Contact



High-angle normal fault--Showing amount of dip (barbed arrow) and trend and plunge of lineation (diamond-shaped arrow). Dashed where approximately located; dotted where concealed; queried where uncertain. Bar and ball on downthrown side

Low-angle normal fault beneath landslide and gravity-slide block--Sawteeth on upper plate. Dashed where approximately located; dotted where concealed. Stippled pattern on upper plate

Fault scarp along which younger unit had been deposited--Hachures on side of post-fault deposit

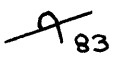
Fissure--Includes open and partly sediment-filled fissures. Apparent offset is perpendicular to fissure walls of open vertical fissures

Strike and dip of sedimentary beds and compaction foliation of ash-flow tuffs

Inclined

Horizontal

Vertical



Overturned

Strike and dip of flow foliation

Shaft

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Preliminary Geologic Map of the Delamar NW Quadrangle Lincoln County, Nevada

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Correlation of Map Units