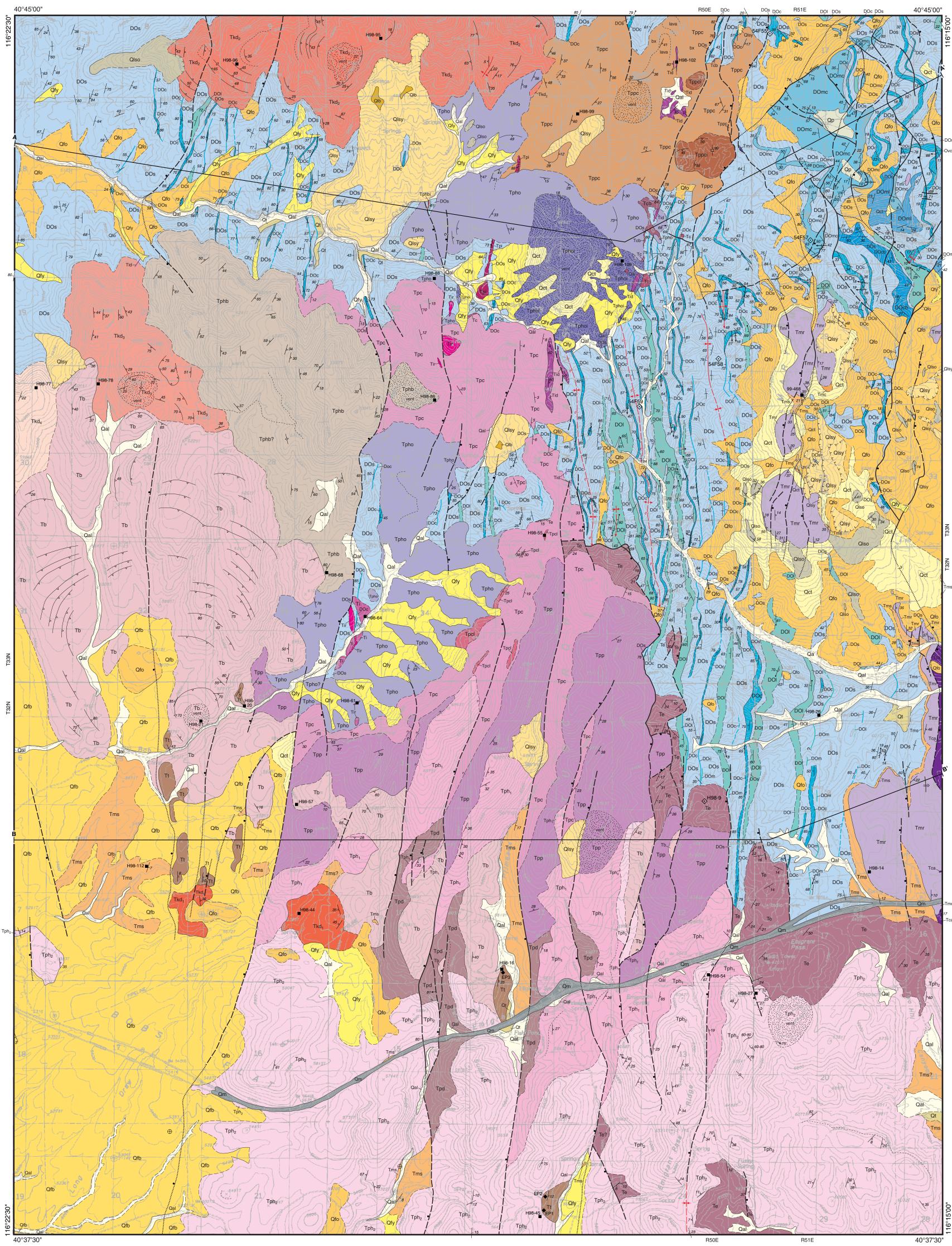
NEVADA BUREAU OF MINES AND GEOLOGY



PRELIMINARY GEOLOGIC MAP OF THE EMIGRANT PASS QUADRANGLE, EUREKA COUNTY, NEVADA

4000 1000 2000 3000 5000 feet CONTOUR INTERVAL 40 FEET

Scale 1:24,000

0.5

Base map: U.S. Geological Survey Emigrant Pass 7.5' Quadrangle, 1986 Digital Raster Graphic (DRG)

1 kilomete

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Prepared as part of the STATEMAP component of the National Cooperative Geologic Mapping Program in cooperation with the U.S. Geological Survey

SURFICIAL DEPOSITS

about 8 m thick overlain by asphalt and local concrete.

o boulder-sized clasts. Deposits along major drainages within highlands which indicates it was deposited before the episode(s) of extension that Phenocrysts (15-22%): plagioclase (5-10%, 1-7 mm), hornblende (6- consists of volcanic breccia that rests directly on Paleozoic rocks near are mostly $< \sim 10$ m thick.

the guadrangle. Consists mainly of matrix supported conglomerate the southwest (Gromme and others, 1972; Stewart and McKee, 1979). 37.59±0.09 Ma, potassium feldspar, H98-95. containing locally derived subangular to subrounded clasts. Matrix is a Phenocrysts (2%): sanidine (1%, 0.5-2 mm), quartz (<1%, 1 mm), and containing locally derived subargular to subrounded clasts. Matrix is a memocrysis [276]: samuline (176, 0.5-2 min), qualiz (<176, 1 min), and the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the fan is widespread. Ranges from undissected to the upper surface of the target in two, nearby areas in the southwestern part of the upper surface of the target in two, nearby areas in the southwestern part of the upper surface of the target in two in deeply dissected, and probably spans a wide age range from recently characteristic remanent magnetization of: Declination=339.4°; the quadrangle. This flow is petrographically similar to porphyritic dacite3 produced most of the older hornblende and esite lavas. Flow bands and - and Perry, 1991). They were later thrust eastward over continental shelf Fleck, R.J., Theodore, T.J., Sarna-Wojcicki, A., and Meyer, C.E., 1998, Landslide headwall scarp Ticks point down slope, dashed active to late Pliocene in the subsurface. Maximum thickness is uncertain inclination=57.5°; 95=11.9°; k=109. Age: 24.98±0.06 Ma, sanidine, H98±16. (Tkd₃) but is mapped separately because they are 5 km apart. The lava is ramps in lavas north and west of the intrusion are consistent with the deposits (lower Paleozoic carbonate platform) of the eastern assemblage Age and possible source of air-fall tuffs of the Miocene Carlin where approximately located. but probably at least as much as 50 m.

deeply weathered material that accumulated along steep to noderate slopes. Typically developed on the steep flanks of Marys Outcrop over most of the Emigrant Pass Quadrangle consists of plagioclase (28%, 1-5 mm), hornblende (10%, to 5 and may not indicate hydrothermal alteration of the host rock. ountain, where blocks of Miocene rhyolite (Tmr) cover Paleozoic rocks Eccene volcanic and volcanic lastic rocks and related shallow intrusions, mm), quartz (trace, 1 mm), orthopyroxene (1.5%, 0.75 mm), Phenocrysts (35-42%): plagioclase (25-30%, 2 mm), hornblende (6-8%, has yielded early Silurian radiolaria (P. Noble, personal commun.). In Tertiary ash-flow sheets in the eastern Great Basin, Nevada and or on the sides of peaks in Eocene volcanic rocks. Commonly gradational which we divide into four distinct sequences. From youngest to oldest, clinopyroxene (1%, 0.5 mm), and opaques (1.5%, 0.5 mm). o active alluvial fans, such as along the flanks of peak 7196T in the these are late porphyritic rhyolite and dacite dikes (Tir and Tid), Bob neadwaters of Mack Creek.

Landslide basins Small (up to a few hundred meters petrography. **Qib** across), cosed or formerly closed basine of methods are distinguished from Primeaux lavas by several features. In addition to provide a standing water during much of the year.

massive concerve of Miocene volcanic rock veriles soft Paleozies via data diverse via data diverse vie veriles ver scarp. Probably as much as 50 m thick.

Qiso Older landslide deposits Similar to younger landslide quadrangle. is unrecognizable or nearly so. May include some rock-avalanche adjacent to the Emigrant Pass Quadrangle and constitute the "Emigrant Association of deposits on the east flank of southern Marys Mountains, where large Pass volcanic field." Similar lavas and intrusions extend into adjacent flows are about 5 to as much as 120 m thick. Volcanic breccias are conglomerate reworked from lavas or breccia. The unit rests variably on moderately preserved radiolaria; gray shale locally contains upper Middle Petroleum Geologists Bulletin, v. 42, p. 2813-2857 blocks of flow-banded Miocene rhyolite as much as 30 m in length dominate. Thickness may locally approach 30 m. = Sale or upper flow breccias, which were mapped as (Bobs Flat). Rocks of this volcanic field range compositionally from west (Bobs Flat). Rocks of this volcanic field range compositionally from and mineral resources of Eureka County, Nevada: Nevada Bureau of

sand- to boulder-sized clasts and now being dissected. 1 to 5 m thick. Older alluvial fan deposits Deeply dissected alluvial fan remnants in highlands. Composed of sand- to boulder-sized Late Porphyritic Dikes clasts. Commonly form isolated remnants capping ridges or adjacent to more recently active fans (Qfv) or alluvium (Qal). Probably represent a more recently active fans (diy) of allowum (dai). Probably represent as the many onthe intrusions Coarsely porphytic myolite intrusions coarsely p clasts. Matrix is a medium to coarse-grained sand. Locally includes as aligned series of discontinuous dike segments. The two clusters align Primeaux lavas. They form one or a few flows adjacent to and south of

Lavas, Tuffs, and Tuffaceous Sedimentary Rock

rocks occur as scattered outcrops throughout the southern part of the and Boden, 1998), Phenocrysts (10-15%); plagioclase (5-10%, 1-6 mm). rocks occur as scattered outcrops throughout the southern part of the quadrangle. The tuffaceous rocks are mapped as Carlin Formation (Tca) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they overlie rhyolite lava or as tuffaceous sedimentary rock (Tms) where they underlie lava or in the western part of the quadrangle where Age: 35.89±0.08 Ma, sanidine, H98-61; 35.98±0.08 Ma, sanidine, H98-87. some primary volcanic breccia. Debris-flow deposits are massive to very Altered dikes Several hydrothermally altered, moderately porphyritic, dikes cut Paleozoic rocks and the lower parts of a single lava type in most deposits. These are of the Emigrant Pass Quadrangle, where lava is particularly thick. A in several clusters in upper Marys Creek. The dacite intrusions are interpreted as debris-flow deposits from constructional volcanic highs. moderately silicified, oxidized, and bleached. Former plagioclase is preserved; chalcedony infilling of spumellarians is common. Chert is single dike (Tmri) on the west flank of Marys Mountain may be a feeder similar to but less silicic than and more abundantly porphyritic than the Minor parts are better bedded and may have been reworked by fluvial altered to clay minerals, calcite, and sericite, and maric phenocrysts (in generally cryptocrystalline but includes traces of very fine-grained o the lavas; otherwise no sources are known within the quadrangle. rhyolitic intrusions (Tir); the dacites also contain more plagioclase and processes. Some parts of the mapped unit may be primary volcanic part biotite?) are altered to chlorite, opaques, sericite, and a silica titanomagnetite, hematite, hematite, and white mica. Beds are generally 1 to 15 cm Much of the tuff may be derived from more distant sources, including hornblende but less quartz and lack sanidine in comparison to the breccia shed from the flanks of active lavas, although these were mineral. The dikes strike north and dip steeply, approximately parallel to thick, but finally laminated sequences occur locally; wavy bedding is some in southeastern Oregon or southwestern Idaho (Fleck and others, rhyolites. SiO₂ contents of three samples range from 65 to 71%. The generally mapped as parts of the lavas.

and air-fall tuff occur nearby. However, the altered dikes only cut the lowernost similar to some of the quadrangle where similar to some of the Mack Creek lava domes but are distinctly younger. The unit consists of several flows totaling about 200 m in million to some of the Nack Creek lava domes but are distinctly younger. The unit consists of several flows totaling about 200 m in million to some of the Nack Creek lava domes but are distinctly younger. The unit consists of several flows totaling about 200 m in million to some of the Nack Creek lava domes but are distinctly younger. The unit consists of several flows totaling about 200 m in million to some of the Nack Creek lava domes but are distinctly younger. quadrangle and roadcuts along Interstate 80 to the east indicate massive Phenocrysts (20-25%): plagioclase (10-15%, 1-6 mm), quartz (trace-1%, analyses ranges narrowly between 61 and 62%. Phenocrysts (28-30%): Mack Creek rocks. Phenocrysts (15%): plagioclase (10-12%, to 4 mm, units is as much as 50 m. sittstone and massive air-fall tuff lenses. Clasts are pumice and individual inditione individual i glass shards and mineral fragments with prominent biotite. Deposits are 36.22±0.17 Ma, plagioclase, H98-102. nostly poorly cemented, but lenses of common opal are locally present and indicate significant glass solution.

1 mm), clinopyroxene (<1%, 0.5 mm), sanidine (1%, ~1 mm), and clinopyroxene (2-3%, 0.5-1.5 mm), orthopyroxene (1-2%, 1 mm), deposits contain partly matrix-supported clasts up to 5 m in diameter, thickness varies considerably along strike. Breccia in the northernmost pagues (trace, 0.1 mm). A hydrated vitrophyre of this flow contains plagioclase (trace glassy grains to 1 cm; 10% microphenocrysts, 0.05-0.2 and some have reversely graded bases. These are likely debris-flow outcrops is intensely silicified with a matrix of chalcedonic to opaline ountain. Age: 15.22±0.08 Ma. sanidine. 99-468.

ffaceous sedimentary rock Sequence of white to light aceous sedimentary rock, air-fall tuff, and minor pebbly the unit consists of pumiceous to pebbly bedded tuff. Finer deposits are dominantly dacites. Mack Creek lavas, the younger of the two most voluminous packages is as much as 160 m. Thickness is as much as 160 m. Thickness is as much as 160 m. massive to well-bedded, coarse to fine tuffaceous sandstone and distinctly more silicic and coarsely porphyritic than Primeaux lavas. Each silicate conglomerate. Andesite lavas (Tpcl), petrographically similar to overlying as 15 m thick, thickly planar bedded, and silica- to rarely iron-cemented. silicate conglomerate and easily provide and consist of moderately angular to moderately angular to moderately angular to moderately and easily and easil nterstate 80 and on the southern part of Marys Mountain, where it was landslide (Qls), so their ages can not be resolved either. apped separately (Tmc). The basal conglomerate is 1 to 2 m thick and there they rest on Eocene volcanic rocks. An isolated deposit of west. Unit Tkd4 is the least porphyritic of the Mack Creek lavas, and its incresistant poorly exposed volcaniclastic conglomerate about 5 m thick irrectly underlies Tmr on the southern part of Marys Mountain; clasts are (66% SiO₂) show that it is the most silicic. The flow is at least 120 m

of Marvs Mountain.

resorbed; hornblende phenocrysts are as much as 1 cm in length.

2,000 Thin surficial units omittee

discontinuous distribution and abrupt termination against Primeaux lavas (Tppc) at the eastern end. Extremely well-developed flow bands and rocks or pre-volcanic conglomerate (Tc). However, all but the lowermost ? (5%, 1-2 mm). Younger alluvial fan deposits Deposits of active to recently or Bob Creek dome indicate the tuff filled modest paleovalleys eroded ramp structures indicate that all flows radiated outward from a vent part of the unit ramps against pyroxene andesite lavas (Tppc) on the active alluvial fans along major drainages. Composed of sand- into the older rocks. However, the tuff is as tilted as the underlying rocks, beneath peak 7082T, approximately in the middle of their distribution. south flank of Carlin Peaks and is therefore younger. The lowermost part Paleozoic Strata tilted the entire Ecceic anorth of Mack Creek; the breccia north o Alluvial fans of Bobs Flat An extensive series of fan lobes

Colluvium and talus Coarse talus and finer, commonly Emigrant Pass (Mary's Mountain) Volcanic Field

Creek lava dome (Tb), Mack Creek lavas (Tk), and Primeaux lavas (Tp). Rocks of the Primeaux Lava Sequence (Lavas, Domes, Debris Pediment gravel of Marvs Mountain Thin lag deposit of and northeastern part of the guadrangle. Unit Tb consist of a single.

Younger landslide deposits Coarse, unconsolidated debris composed of local bedrock, developed especially where hard, Primeaux lavas are dominantly andesite with lesser dacite (60 to 65 % bar than those of the Mack Creek lavas, in part reflecting their more mafic orthopyroxene (1%, 1 mm), biotite (0.5%, to 2 mm), and opaques (2%, property ~30 km north of the quadrangle (Cluer and others, 1997).

andesite to low-silica rhyolite, similar to Eocene volcanic rocks regionally resulting from contemporaneous erosion of lava flows and domes. These hornblende andesite is older, the pyroxene dacite of Carlin Peaks is the exposed; good exposures are generally restricted to deeply dissected Mines and Geology Bulletin 64, 152 p. Terrace deposits Older alluvial deposits adjacent to but (Brooks and others, 1995; Henry and Boden, 1998; Henry and Boden, 1998; Henry and Separate units where sufficiently thick and well exposed. oldest major volcanic unit in the northeastern part of the quadrangle and drainages; total thickness is difficult to estimate due to folding but is at Ross, R.J., and Berry, W.B.N., 1963, Ordovician graptolites of the Basin above active channels of major drainages. Composed of 1998; Ressel and others, 1998; M. Ressel, personal commun.). Emigrant Most rocks have finely crystalline groundmasses, but vitrophyre is probably in the entire quadrangle. The unit thins away from, and flow least 500 m.

Rhvolitic intrusions Coarsely porphyritic rhvolite forms

of hornblende.

Ministry for the former of the state of the and tuffaceous sedimentary rocks and air-fall tuff (Tms and Tca). Lava is dacitic) dikes continue northward into the Welches Canyon Quadrangle, biotite (trace, to 3 mm), and opaques (1-2%, 0.5 mm). Coarse biotite is shallow stocks that cut vertically through surrounding rocks to feed now silicification. Moreover, high MgO (5.6%), Cr (222 ppm), and Ni (123 O.D., and Wilton, D.T., 1995, Eccene-Oligocene model for Carlinpresent only along the eastern edge of the quadrangle, where it caps the southern part of Marys Mountain and ridges to the south. Tuffaceous southern part of Marys Mountain and ridges to the south. Tuffaceous Southern part of Marys Mountain and ridges to the south. Tuffaceous Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene) Southern part of Marys Mountain and altered mafic (probably pyroxene)

dacite intrusions form an approximately north-striking band, east of but Carlin Formation White to cream-colored, poorly inducated intrusions form an approximately north-striking data, east of but of mack Creek about 1.5 km east of the western edge in the south-central part of the and site on the south-central part of the and site on the south-central part of the south-central part of the south-central part of the control contr

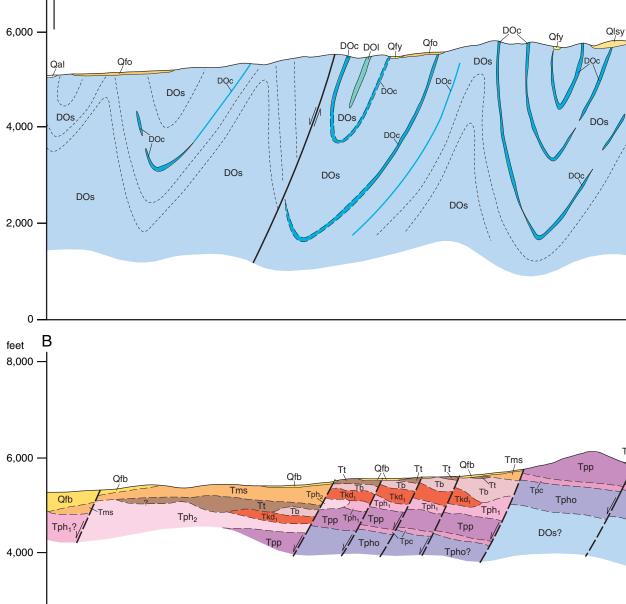
rphyritic rhyolite lava flow or series of flows caps the quadrangle and crops out in east-tilted fault blocks almost as far east as quadrangle. The unit consists of numerous individual flows totaling about peak 7196T. Southern outcrops in this area consist of conglomerate (Tc) commonly cross bedded; locally includes calcareous pebble uthern part of Marys Mountain and ridges to the south. Resistant, Emigrant Pass. At ~57% SiO₂, it is the most mafic of the Eocene igneous 200 m thick. Source areas are not well known, but a possible dome lies containing well-rounded clasts of Paleozoic rocks and some Elko conglomerate containing subrounded to subangular pebbles <1 cm in generally cliff-forming, light gray to purplish-gray, weathering reddish-brown or dark brown, flow-banded to locally massive vesicular stony lava that appears to be a single flow over an approximately 30 km² area. lavas along the ridge west of Primeaux Canyon suggests possible clasts up to 30 cm in diameter and of Elko Formation conglomerate as andy or pebbly units; coarser-grained units contain as much as 50% hyolite; black to gray, flow-banded, vitrophyric (perlitic) breccia is locally Maximum thickness is at least 120 m. Basal breccia is exposed locally magma mixing. Two analyses show 60 and 61% SiO₂, the lowest of the much as 1.5 m in diameter along the contact of Eocene volcanic rocks detrital quartz and lesser feldspar grains, siltstone clasts, and shell posed along the base. Two flow types at Mary's Mountain contain 3 to where lava flowed over somewhat irregular topography developed on Primeaux lavas. Phenocrysts (40-43%): plagioclase (30-34%, 2 mm), with Paleozoic rocks. Thickness of the unit is uncertain but no greater fragments. Units are characterized by significant lateral thickness 5% and 15% phenocrysts of sanidine, plagioclase, lesser quartz, and older lavas. At its northern end, the flow partly abuts clinopyroxene (2-4%, 1 mm), than about 10 m. The presence of coarse Elko Formation clasts indicates variations and abrupt pinchouts; some units appear to fill channels. cessory biotite, titanomagnetite, and zircon; biotite is largely altered to steep flanks of older lavas and lava domes of the Mack Creek and hornblende (0.1-1.5%, 1 mm), and opaques (1.5-4%, 0.5 mm). The lower flows are more abundantly porphyritic: phenocrysts (~15%); sanidine (10%, mm), quartz (2.5-3%, mm), plagioclase flows are less porphyritic: phenocrysts (3-5%): sanidine (1-2%, mm), plagioclase (1-2%, mm), minor titanomagnetite and altered biotite, rare to probable Paleozoic rocks, and is cut by dikelets of felsic porphyry. Clasts range up to 2 m in diameter, are moderately rounded to slightly older Eocene igneous rocks to the north. Near its northernmost absent quartz, and traces of sphene and zircon. Flow banding in the Paleozoic rock clasts include calc-silicate marble and strongly moderately angular, and are clast-supported in a matrix of pebbly to outcrop, breccia containing only Paleozoic chert is observed to rest stylolitic. Beds are generally 1 to 10 cm thick. Crops out only in the lower flows dips more steeply than that in the upper. A single lava flow recrystallized quartzite up to 30 cm in diameter. Granitic inclusions up to sandy grains. Finer lenses of moderately well-bedded, pebble to cobble directly on chert and is apparently a regolith developed on the Paleozoic northeastern part of the quadrangle as a very resistant, prominent cliffexposed along and south of Marys Creek more closely resembles the upper lavas on Marys Mountain: phenocrysts (5-8%); plagioclase (4-6%, in distal parts. Phenocrysts (15-17%): hornblende (10-12%, 1-8 mm), present, as are a few channels as much as 1 m deep. Thick, massive

-75% SiO₂. The flows filled relatively smooth topography developed on mm), quartz (<1%, to 5 mm), and opaques (<1%, 0.1 mm). Quartz is adeposits. The voccur throughout the geographic distribution of the unit but probably xenocrystic, as may be the glassy plagioclase. Glomerocrysts are particularly coarse and make up most of the unit in the north, near bleached white. nat filled shallow valleys. The unit is as much as 50 m thick on Marys or inclusions consisting of hornblende, plagioclase, clino- and the dome of hornblende-biotite andesite (Tphb); debris deposits there or inclusions consisting of norhibende, plagoclase, clino- and rare muscovire and rare muscovire also inclusions deposits integration of norhibende-biolite and series in the dome of norhibende-biolite gray, poorly indurated and generally poorly exposed Rocks of the Mack Creek Lava Sequence (Lavas, Domes, and Dikes) conglomerate are dominantly hornblende-biotite andesite in the north, Formation. The formation in the Emigrant Pass Quadrangle consists in quadrangle; thickest on the southeast flank of the northern part of Marys

0.5-m thick air-fall tuff at the east edge of Bobs Flat contains 76% SiO₂. a related series of lava flow lobes from a single lava dome. Vent areas headwaters of Bob Creek and are mapped separately. carser deposits are thickly or poorly bedded pebbly tuff composed of are recognized within the quadrangle for units Tkd2 and Tkd3 on the basis consistence of plagioclase and sanidine, as well as lithic fragments of andesite. The tuffaceous rocks are uncemented to locally weakly silica bands. Sources probably underlie the other two units but have not been andesite. The tuffaceous rocks are uncemented to locally weakly silica recognized. Relative ages between the four mapped Mack Creek lavas or andesite (Tpc). The lavas are petrographically similar to pyroxene sandstone about 10 m thick. The nonresistant sandstone is composed of andesite (Tpc) and are probably early lavas of that sequence. However, well-rounded chert grains, mostly cemented with coarse calcite and semented or, in Emigrant Canyon near the south edge of the quadrangle, lava domes are uncertain because most are not in contact. Only units the one analyzed sample shows slightly higher SiO₂, 62%. Individual commonly ferruginous. (3) The uppermost part of the formation, probably cemented by coarse calcite. Massive conglomerate occurs at base near Tkd₃ and Tkd₄ adjoin, but their contact is covered by a Quaternary lavas are 10 to about 30 m thick. Lavas within the unit are discontinuous more than 100 m thick, consists of light brown to white, massive to thick consists of moderately rounded clasts in a sandy matrix. Clasts are dominantly Paleozoic chert up to 5 cm long, where the deposits rest on thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the thick flow or lava dome along the western edge of the the dome along the western edge of the the dome along the dome along the western edge of the the dome along Paleozoic rocks, or Eocene andesite or dacite up to 15 cm in length, quadrangle and is more extensive in the Bobs Flat Quadrangle to the (0.5%, 1 mm), and opaques (1-2%, 0.5 mm).

dominated by purplish-gray porphyritic dacite containing ~40% thick, and its top is eroded. Most of the flow is devitrified, but vesicular notable phenocryst phase and pyroxene is minor forms a thick pile south and a single samara (winged seed pod) of *Acer sp.* (maple; identification of Mack Creek. The total unit, which consists of numerous separate flows, by Thomas Lugaski) demonstrate deposition in a shallow, lacustrine ninor quartz, and accessory sphene. Hornblende and pyroxene are along the ridge at the west edge of the quadrangle (e.g., sample H98- is as much as 250 m thick at its eastern end near a probable source environment and possibly in streams feeding into a lake in an area of almost entirely altered to iron oxides; quartz is generally partially 77). No vent area is recognized within the Emigrant Pass Quadrangle, dome and thins westward. However, the top is nowhere preserved, and lush vegetation. Although these rocks were tentatively considered late nornblende phenocrysts are as much as 1 cm in length. **Rhyolite dike** Pale brown to light gray rhyolite dike containing ~5% phenocrysts of sanidine, quartz, and **Control of the data set of the set of the data set of the set of the data set of the data** accessory sphene. Limited to an isolated exposure in the uppermost part 0.5 mm), clinopyroxene (0.5%, 1 mm), and opaques. Age: 37.40±0.34, crystalline core and vitrophyric margin. Outcrop around and east of the approximately equivalent White Sage Formation in western Utah of the Marys Creek drainage on the lower west flank of the northern part hornblende, H98-1 of thick dike in Bobs Flat Quadrangle. Porphyritic dacite 3 Abundantly porphyritic dacite forms a not spread eastward, but that considerable slumping and erosion of the the southeast, suggesting a slight angular unconformity with overlying kda short, thick lava dome in the northwestern part of the dome reworked the dacite into debris deposits or conglomerate in that Eocene volcanic rocks. The unit thins to the north, mostly by loss of the quadrangle south of Mack Creek. The preserved body is about 2.5 by 1 direction. The hornblende-biotite andesite unit is somewhat more upper sandstone and siltstone part. Thinning probably in part reflects

> idistinguishable lavas separated by coarse flow breccia along the 64% SiO₂, among the highest of the Primeaux lavas. Phenocrysts (32- conglomerate (Tc) in the northeastern part of the guadrangle indicates stern edge of its outcrop suggest several flow lobes. The flow piled up 38%): plagioclase (20-24%, 2 mm), hornblende (6-10%, to 5 mm), some erosion. This combination of tilting and erosion probably resulted against the steep margin of a Primeaux lava dome (Tphb) on the east. A biotite (<1-2%, 1-3 mm), clinopyroxene (0-0.5%, 1 mm), orthopyroxene from an episode of pre-volcanic extension. robable 500-m diameter vent is at peak 6232T, where an open, (0-0.5%, 1 mm), and opaques (1.5-3%, 0.5 mm). emicircular basin is partly surrounded by concentrically flow-banded dges. Crudely concentric ramp structures in distal parts of the strongly low-banded lava support a vent at that location. Unit Tkda is compositionally only slightly less silicic (65% SiO2) than unit Tkd Phenocrysts (45%): plagioclase (32%, 1-5 mm), hornblende (8%, to 7 nm), biotite (3%, to 3 mm), quartz (0.5%, to 2 mm), orthopyroxene (0.5%, 1 mm), clinopyroxene (0.5%, 1 mm), sanidine (??), and ppaques. Age: 37.32±0.36 Ma, hornblende; 37.07±0.24 Ma, plagioclase



ramp structures are commonly concentric to these vents.

km and at least 210 m thick. Most of the flow is crystalline, but distal parts are glassy and, locally, finely vesicular. Petrographically and biotite contents between different lavas. Two analyses show 63 and presence of conglomerate clasts reworked into pre-volcanic

 Porphyritic dacite 2
 Moderately porphyritic and somewhat petrographically variable dacite forms a series of related lava
 The photometric dacite dike
 A single, north-striking dike of hornblende-biotite andesite cuts
 Diorite(?) intrusion, age uncertain
 A massive, red-brown REFERENCES

are distinguished from Primeaux lavas by several features. In addition to being younger, they are more silicic, being dominantly quartz-phyric daring is cast a witoprist energy and have continued using its cast a witoprist energy and have continued using its cast a witoprist energy and have continued using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast a witoprist energy and have contained using its cast and and errors and and and errors and

Pass rocks are distinctive in the universal presence and great abundance common, especially in upper breccias and on the margins of domes. bands and ramps are consistent with, a vent centered on Carlin Peaks.

hornblende (3-4%, 3 mm), biotite (trace, 1 mm), and opagues (1.5-2%, (1-2%, 0.5-2 mm),

along strike, giving way to flow breccia and then to conglomerate. These bedded to finely laminated, fine sandstone and siltstone. The lavas may have filled channels within conglomerate. Phenocrysts (35%): nonresistant rock rarely crops out; surface developed on the unit part, are so silicified as to resemble chert. Some beds appear to have a uffaceous component, although no shards or other obvious volcanic andesite is the dominant clast type. This distribution indicates lavas did Formation generally strikes northeast and dips gently to moderately to

Bend in Sectio

Ash-flow tuff A light brown, non- to poorly welded, finely flows or flow lobes at the norther and of the quadrangle. Distanct flows within same unit. and sparsely porphyritic ash-flow tuff crops out are separated by marginal vitrophyres and thick breccias composed of about 200 m. The dike is interpreted as an intrusive phase of the cut overlying rocks of the Primeaux lava sequence. Alteration has ages and tectonic setting of the middle Eocene northeast Nevada surrounding interpreted vent areas, or form lines on cross Man-made deposits Highway fill and highly disturbed ground along Interstate 80. Consists of compacted fill up to a 20 m thick and grades from a nonwelded base to a poorly welded, locally silicified interior, to a nonwelded and commonly eroded top. The tuff is everywhere devitrified and has generally undergone (20%, to 2 mm), hornblende (8%, to 7 mm), biotite Alluvium of active channels Unconsolidated alluvium up to 15 m thick in active channels of major drainages. Composed of poorly sorted silt- to boulder-sized clasts. The upper part of the alluvium in Marys Creek contains a conspicuous, fine-grained -20-cm-alluvium in Marys Creek contains a conspicuous, fine-grained -20-cm-bubles alluvium in Marys Creek contains a conspicuous, fine-grained -20-cm-alluvium in Marys Creek contains a conspicuous, fine-grained -20-cm-bubles alluvium in Marys Creek to the base desite, nearly dacite, hat crop out in the upper part of this location overlies of thi thick white ash layer, as exposed in numerous cutbanks; this ash may correlate with the Mt. Mazama ash. (84%) is a result of silicification; primary SiO₂ was probably not local. The and ramps against the margin of pyroxene andesite (Tpho) where it crops out just southeast of Bob Creeks are some of the tuff is unknown but probably not local. The Bob Creeks Phenocrysts (5%): clinopyroxene (1%, 0.5-1 mm) and altered

developed in the Bobs Flat area of the southwestern part of Bates Mountain Tuff, which is widespread in Lander County 100 km to Potassium feldspar is perthite. Age: 37.61±0.18 Ma, hornblende, gyroxene, and biotite section resides within the upper plate of the Roberts Mountains thrust, or Finney, S.C., and Perry, B.D., 1991, Depositional setting and Synform axial trace Showing plunge, dashed where vary between different flows in the unit. Hornblende is abundant in all, but pyroxene varies from about 1 to 3 %, and biotite is present in only half of or facies (e.g., Roberts and others, 1958). These rocks were probably approximately located, queried where uncertain. about 25 m thick, with the top eroded, and has a basal vitrophyre and intrusion being their source. Two smaller intrusions east and northeast of during the Antler orogeny, which presumably induced the folding Formation, northern Carlin trend, *in* Tosdal, R. M., ed.: Contributions breccia. Although porphyritic dacite1 abuts the Bob Creek lava dome (Tb), their relative ages are uncertain. This is the only Mack Creek lava that may be younger than the Bob Creek lava. Phenocrysts (43%): breccia is contained in clasts of diorite(?) intrusion (Ti?) within breccia Ross and Berry (1963) found Middle to Upper Ordovician graptolites in Grommé, C.S., McKee, E.H., and Blake, M.C., Jr., 1972, Monocline axial trace Arrows indicate direction of dip. mm), clinopyroxene (0.5-1%, 1.5 mm), orthopyroxene (1-2%, 1 mm), addition, Evans (1974) reported Devonian conodonts from similar Utah: Geological Society of America Bulletin, v. 83, p. 1619-1638. limestone units in the Welches Canyon Quadrangle, which lies directly Henry, C.D., and Boden, D.R., 1998, Geologic map of the Mount north of the Emigrant Pass Quadrangle. Without more comprehensive Blitzen Quadrangle, Elko County, northeastern Nevada: Nevada The dikes for the subvolcanic core of vents of the quadrangle. Unit to consist of a single, the oldest centration includes Ordovican through become and esite intrusions that to the older hornblende and esite intrusions includes Ordovican through become and esite of the e Mountain; rhyolite has 15-20% phenocrysts of feldspar, which are largely altered to sericite, and accessory quartz and biotite; < 3 m thick. The largest, more than 1 km in diameter, forms a distinct peak (7196T) in in Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 20, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Finney and Perry (1991) 26, p. 1067-1070. In Nevada (e.g., Murphy and others, 1984), Fin are composite units made up of numerous individual lavas and separated straining intrustive and the host of the control into several map units on the basis of stratigraphic position and deposits, and a few dikes. They are uniformly finely and abundantly intervalence of sitteen and the basis of the Ordovicia graptolites the prevalence of sitteen and the basis of the Ordovicia graptolites the prevalence of sitteen and the basis of the Ordovicia graptolites the prevalence of sitteen and the basis of the Ordovicia graptolites the prevalence of sitteen and leve fits and abundantly intervalence of sitteen and leve fits and l porphyritic with abundant plagioclase and varying proportions of either crosscuts or is faulted against Paleozoic rocks along part of its and chert, and lack of a sandstone interval, we conclude that at least part Nevada: in Tosdal, R. M., ed., Contributions to the gold metallogen

northwestern parts of the quadrangle, whereas the youngest of the overall Primeaux lava lavas are most abundant through the central and northeastern part of the guadrangle. Composite thickness, which commonly weathers pale brown to yellowish-brown; commonly consists Older landslide deposits Similar to younger landslide deposits Similar to younger landslide deposits (Qlsy) but deeply dissected. Original headwall scarp All of the Eocene rocks erupted from vents within or immediately location is at least 500 m in the south central part of the quadrangle. All of the guadrangle and extending into the feldspar and muscovite, and trace zircon in clay-rich, partly Roberts, R.J., Hotz, P.E., Gilluly, J., and Ferguson, H.G., 1958,

like bodies, can be identified for several of the flows. Flow bands and lavas. This unit is petrographically somewhat similar to the pyroxene andesite(?) makes a series of lava flows or sills within the Ordovician Nevada, in Cenozoic paleogeography of the western United States andesite lavas (Tpp) in having abundant pyroxene but has distinctly more sedimentary sequence. Some layers can be tracked continuously for as Society of Economic Paleontologists and Mineralogists, Pacific hornblende and higher SiO₂ content (~65% vs 60%). Phenocrysts (32- much as 1 km, and similar layers commonly reappear discontinuously Section, Pacific Coast Paleogeography Symposium 3, p. 75-88. surrounding sedimentary rocks. They range from massive to abundantly Stewart, J.H., and McKee, E.H., 1979. Geology and mineral deposits of clasts. Matrix is a medium to coarse-grained sand. Locally includes as much as 2 m of calcrete in the Mack Creek area. Generally 1 to 20 m thic. **TERTIARY ROCKS** Tertiary continuous dike segments. The two clusters align more north-northeast. Dikes are 100 to 300 m long and a few meters up to about 100 m wide. Other intrusions are circular to elliptical and to trophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along the flank of one dike in Bob Creek. and vitrophyre is present along Rhyolitic intrusions are distinguished from dacitic intrusions, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and sedimentation: Society States, in Dickinson, W.R., ed., Tectonics and States, in Di being more silicic (two different dikes contain about 75% SiO₂) and more thick, and this may be for a single flow. Phenocrysts (28-31%): east of Carlin Peaks. The subcircular body is massive but strongly jointed altered to biotite, chlorite, and iron oxides), and accessory zircon, with of Econonic Paleontologists and Mineralogists Special Publication

> Oc Chert Light to medium gray to locally greenish-gray or bluishgreen, weathering reddish to yellowish brown, thin to medium bedding in the host rocks, so they are nearly sills. The relationship of common. Chert locally includes minor porcellanite and siliceous these dikes to either Primeaux or Mack Creek rocks is uncertain. With mudstone and siltstone: stylolites are locally common. Chert sequences

Pre- and early volcanic conglomerate Conglomerate (Tc) and mining and entry block between the series of common opal are locally present ignificant glass solution. yolite of Marys Mountain An extensive, sparsely yolite of Marys Mountain An extensive An extensive Andrea (Tob) and yolite of Marys Mountain An extensive An extensive Andrea (Tob) and yolite of Marys Mountain An extensi

> Limestone of Marvs Mountain Dark grav to pale pinkish-DOmi Limestone or marys incention and international devices of the second secon and rare muscovite; also includes shell fragments (e.g., crinoids and but clasts of other hornblende and pyroxene andesite are common and ascending stratigraphic order of (1) basal conglomerate, (2) commonly Mountain but pinches out northward on the east flank of Marys Mountain.

Chert conglomerate Light gray to greenish-gray. generally clast-supported, chert conglomerate and breccia, containing rounded pebbles of dark to white chert and lesser well-cemented angular to subangular pebbles composed primarily of chert and lesser sandstone up to 8 cm in diameter. Outcrop of the variably resistant siltstone; crops out only in the northeastern part of the map area between punce and mineral fragments. The tuff typically contains 1-2% occupied by an early circular stock-like body with steep, concentric flow

consisting of topographically high areas containing roughly circular plug-petrographically similar and are probably subvolcanic feeders to these

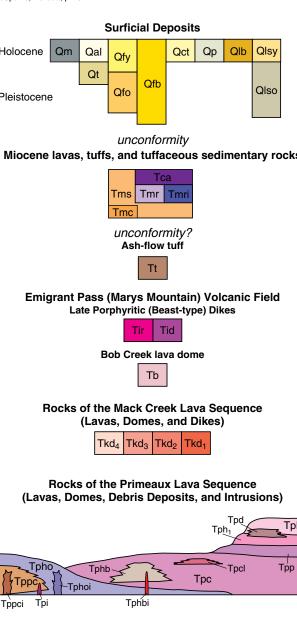
Limestone Light gray to pale brown thinly laminated to thinly

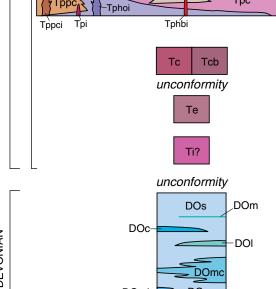
Formation, eastern Great Basin, in Beratan, K.K., ed., Reconstructing the history of Basin and Range extension using sedimentology and stratigraphy: Boulder, Colorado, Geological Antiform axial trace Showing plunge, dashed where Society of America Special Paper 303, p. 1-14. to the gold metallogeny of northern Nevada, U.S. Geological Survey

Murphy, M.A., Power, J.D., and Johnson, J.G., 1984, Evidence for late

Ranges in California, Nevada, Utah, and Idaho: U.S. Geologica Survey Bulletin 1134, 177 p

Inclined — Vertical → C Inclined minor folds H98-16





Marvs Mountair

Bend in Section

showing top

OPEN-FILE REPORT 99-9 (rev. 07-02-01) PRELIMINARY GEOLOGIC MAP OF THE EMIGRANT PASS QUADRANGLE, EUREKA COUNTY, NEVADA

Contact Long dashes where approximately located, show sections; gueried where uncertain.

approximately located, dotted where concealed.

Inclined ---- Inclined, facing upright • Overturned, • Vertical, showing top

Continous curving flowbands

Inclined minor antiform, showing bearing and ²⁶ plunge of hingeline, and dip of axial plane Inclined minor synform, showing bearing and ¹⁴ plunge of hingeline, and dip of axial plane

Sample location for ⁴⁰Ar/³⁹Ar date or chemical analysis

(those from Ross and Berry, 1963 or Roberts and others, 1967 are very approximately located).



-1,000

Field work done in 1998 DRAFT liminary geologic map. las not undergone office or field review lav be revised before publication First Edition, first printing, 1999 (OF Printed by Nevada Bureau of Mines and Geology Cartography by Robert Chaney

ogic mapping was supported by the U.S. Geological St EMAP Program (Agreement No. 98-HQ-AG-2036). We also ank Newmont Gold Company for access to the TS Ranch a tensive discussions about geology Nevada Bureau of Mines and Geology University of Neveda Market University of Nevada, Mail Stop 178 Reno, Nevada 89557-0088 (775)784-6691, ext. 2; www.nbmg.unr.edu; nbmgsales@unr.ed