

INTER-OFFICE MEMORANDUM

SUBJECT: Petrographic Description of Selected Surface Rocks and Core Samples Alum Area, Nevada (4106A) DATE: June 1, 1983
TO: J. E. Deymonaz cc: H. J. Olson
W. Lodder
FROM: H. D. Pilkington W. M. Dolan

A-1 NWSWSec22T1SR39E Pumiceous Lithic Tuff

The specimen comes from Unit G (Teg) of the upper Esmeralda Formation at the southern end of the Monocline. The rocks conformably underlie the basalts which cap the Monocline. Biotite from a tuff in Unit G has been dated at 6.9 m.y. The rock consists of about 90 percent pumice fragments up to 10 mm long and lithic clasts of black shale, chert and rhyolite averaging about 4 mm diameter.

Microscopically the pumice fragments range from fresh glassy pumice to partially devitrified clasts composed of montmorillonite which in some instances has been replaced by calcite. Secondary calcite partially cements the rather weakly welded pumiceous tuff. The rhyolitic clasts have been strongly altered to an undistinguishable clay mass whereas the sedimentary clasts do not show much alteration.

A-5 NENESec32T1NR381/2E Ashflow Tuff

The rock is a strongly iron stained crystal lithic ashflow tuff (Taf) which appears to rest unconformably upon Unit F of the lower Esmeralda Formation. Megascopically the rock consists of 20 percent crystal fragments and 5 percent lithic fragments set in a matrix of partially devitrified glass.

Under the microscope the crystal fragments consist of feldspars and minor amounts of quartz. The feldspars are dominantly sanidine and/or orthoclase with some altered plagioclase. The crystal fragments constitute 25 percent of the rock and the k-spars make up over 90 percent

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of the crystal fragments. The matrix consists of partially devitrified volcanic glass with a typical vitroclastic texture. The rock exhibits a moderate degree of welding. Biotite constitute less than one percent of the crystal fragments. Lithic fragments of altered crystal tuff comprise about 5 percent of the rock.

A-8 NWSESec29T1NR381/2E Chert Conglomerate

The rock sample was taken from a well cemented chert conglomerate of Unit G which unconformably overlies the siltstones of Unit F on the hill north of the Alum Mine. The clasts range from 3 to 10 mm in diameter and are set in a sand size matrix.

Microscopically the rock is a volcanoclastic rock comprised of lithic clasts and crystal fragments which are well rounded in a matrix of microcrystalline silica. The lithic fragments comprise about 40 percent of the rock and are made up of nearly equal amounts of chert, crystal tuff, and crystal lithic tuff. The volcanic fragments show pronounced clay alteration within the groundmass but most of the crystal fragments within the volcanic fragments are unaltered.

Crystal fragments, some well rounded, constitute about 40 percent of the rock. Much of what appears to be sand sized grains in the matrix are in fact crystal fragments. Quartz, plagioclase and k-spar make up the fragments. The feldspars are present in nearly equal amounts and comprise about 90 percent of the crystal fragments.

A-10 SENWSESec29T1NR381/2E Quartz Alunite Rock

The rock was collected from a prospect shaft approximately one third of a mile northeast of the Alum Mine. The shaft is approximately 15 feet deep vertically and another 15 feet inclined to the south parallel to bedding. The altered rocks are siltstones and vitric tuffs of Unit F of the Esmeralda Formation.

Microscopically the rock consists of chalcedonic silica, alunite, kaolinite and perhaps montmorillonite. The rock is so strongly altered that none of the primary minerals can be identified.

A-16 NENESec2ST1NR38E Crystal Lithic Tuff

The sample was collected from near the border of a tuff pipe which intrudes rocks of both Unit F and Unit G of the Esmeralda Formation. The rock shows varying degrees of oxidation with moderate to strong iron oxide staining.

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Under the microscope the crystal fragments consist of quartz, plagioclase and k-spar. The crystal fragments are subhedral and show very little alteration. Crystal fragments constitute about 30 percent of the rock. Lithic fragments of chert, rhyolite flow rock and ashflow tuff comprise another 20-30 percent of the total rock. The volcanic fragments are altered to masses of clay minerals and iron oxides. The original glassy groundmass appears to be replaced with cryptocrystalline silica.

A-17 NENEsec2SR38E Silicified Sediment

Silicified volcanoclastic conglomerate of Unit G of the Esmeralda Formation a few feet from the tuff pipe border. Within the pipe a number of xenoliths of the same material were observed. The rocks are weakly iron stained in outcrop.

Microscopically the rock is composed of crystal fragments, lithic fragments, and a matrix of partially devitrified ash with some cryptocrystalline silica replacement. The crystal fragments are dominantly feldspar with nearly equal amounts of plagioclase and k-spar. Quartz accounts for 5-10 percent of the crystal fragments. All the crystal fragments are fresh and unaltered. The lith fragments consist of some chert, ashflow tuff and rhyodacite flow material. The volcanic fragments are altered to masses of kaolinite, alunite, and silica.

A-21 SENEsec2ST1NR38E Crystal Lithic Tuff

A-24 NESEsec2ST1NR38E Crystal Lithic Tuff

Bleached and altered crystal lithic tuff from within a tuff pipe. The lithic fragments consist of 3 to 5 mm clasts of quartzite, black siltstone, ashflow tuff and pumice. Crystal fragments of quartz and feldspar and the lithic fragments set in a partially welded groundmass. The pumice fragments are strongly altered to a green substance which is probably montmorillonite.

Under the microscope the ashy matrix comprises about 50 percent of the rock. Crystal fragments of quartz, plagioclase, k-spar and hornblende constitute 30 percent of the rock. The hornblende crystal fragments are partially oxidized and show chloritic alteration. The remaining crystal

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fragments are fresh and unaltered. The lithic fragments comprise about 20 percent of the rock and consist of nearly equal amounts of ashflow tuff, phyllitic siltstone, quartzite and pumice. The lithic fragments are altered to some degree especially the volcanic clasts which exhibit devitrification and clay alteration. The strongest alteration is the development of montmorillonite from the pumice clasts.

The ashy matrix still has shards preserved and shows a moderate to weak welding.

A-23 NWSWSec30T1NR381/2E Crystal Lithic Tuff

Oxidized iron stained biotite bearing crystal lithic tuff similar to the upper most unit at Fish Lake. Lithic fragments of siltstone, quartzite and ashflow tuff. The rocks appear to be from the upper part of Unit F of the Esmeralda Formation. Under the microscope the rocks consists of approximately 40 percent crystal fragments of quartz, plagioclase, biotite and hornblende. Many of the biotite grains are bent by compaction. The lithic fragments observed in thin section include phyllitic siltstone and crystal tuffs. The lithic fragments comprise 10 to 15 percent of the rock. The matrix consists of devitrified ash. Minor pyrite is disseminated throughout the rock as is magnetite.

Representative thin sections were also taken from core samples from well 31-32 and one section was made from the core interval from well 51-29. The first group of descriptions will be for the samples from well 31-32. The section number corresponds with the depth interval in feet.

Section 320 Well 31-32 Siltstone

The rock is a gray-green, fine-grained siltstone with minor fractures coated with sulfides - could be either marcasite or pyrite. The siltstone is from Unit F of the Esmeralda Formation.

Microscopically the rock is a very fine-grained siltstone composed of clasts of quartz, plagioclase and sanidine (?). There are a few identifiable devitrified remnants of volcanic shards. The matrix of the rock is dominantly clay minerals probably montmorillonite.

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Section 830 Well 31-32 Edgewise Conglomerate

Megascopically the rock is a gray-green edgewise conglomerate with angular clasts of black siltstone, chert, gray-green siltstone and ashy Tertiary sediments in a fine-grained matrix of volcanoclastic debris. Pyrite mineralization can be seen in the Paleozoic clasts but none was observed in the Tertiary sedimentary clasts. The rock is thought to be from Unit E of the Esmeralda Formation.

In thin section the rock consists of lithic fragments of Paleozoic siltstones, shales and cherts and a more limited number of Tertiary siltstone and crystal tuff fragments. The lithic fragments occur in a volcanoclastic matrix composed of crystal fragments of quartz and feldspar in a epiclastic matrix of silt and clay. Calcite occurs of fracture fillings and also as scattered grains in the clayey matrix.

Pyrite occurs as disseminated grains within the Paleozoic rock fragments and also along grain boundaries as a late stage mineralization.

Section 1554 Well 31-32 Paleozoic (?) Limestone

The rock is a dark gray, fine-grained, dense limestone with some cross-cutting calcite veinlets. The rock shows some silicification parallel with bedding.

Under the microscope the rock is a fine-grained dense limestone made up of microcrystalline calcite. Some recrystallization has occurred. Pyrite occurs as disseminated cubes.

Section 1641 Well 31-32 Skarn

Tan to dark green calc-silicate skarn rock with some cross-cutting calcite veins.

Microscopically the rock consists of a mixture of quartz, diopside, idocrase, grossularite, phlogopite, epidote, calcite, plagioclase. Several cross-cutting veinlets of calcite are present. Some disseminated pyrite. The mineral assemblage is indicative of the pyroxene hornfels assemblage of contact metamorphism.

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Section 1700 and 1705 Well 31-32 Granite

Megascopically the rock is a coarse-grained quartz muscovite granite.

Under the microscope the rock consists of 5-10 percent quartz, 40-50 percent plagioclase (An 15), 30-40 percent orthoclase, and 5-10 percent muscovite. Much of the plagioclase has myrmekitic intergrowths of quartz. The feldspars show weak to moderate alteration to kaolinite and sericite.

Section 1970 Well 31-32 Silicified Dolomite (?)

Dark gray to black silicified dolomite or skarn. Distinct solution cavities lined with silica with a botryoidal form.

Under the microscope the rock is over 90 percent silica with some muscovite and phlogopite. Considerable disseminated pyrite.

Section 1850 Well 51-29 Edgewise Conglomerate

Dark gray edgewise conglomerate or breccia with angular clasts up to 20 millimeters long in a calcareous matrix.

Under the microscope the lithic fragments include black siltstone, gray phylitic siltstone and chert which are cemented by very fine-grained microcrystalline calcite and some macrocrystalline calcite.



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