

DESCRIPTION OF GEOLOGIC MAP UNITS

This map is constructed for the study of F, REE, U/Th and other mineral resources in the region. The map shows the distribution of geologic units north of the Big Bend National Park in the Christmas Mountains area, east of Highway 118 in the White Hills quadrangle. Geologic units were mapped, and structural measurements were taken in the field, where bedrock units are covered by surficial units and vegetation, or access is limited, units were interpreted using aerial imagery, soil data, well-drilling records, and previous mapping.

BEDROCK UNITS

QUATERNARY	Qal	Qal—Alluvium: River and stream floodplain deposits, silty sand, mud, channel gravel, rounded pebbles, and cobbles.
	Qac	Qac—Undivided alluvium and colluvium: Angular bedrock fragments, gravel, silt, sand, and clay; increasing amounts of igneous material around Tertiary intrusive units. These deposits are mostly above flood level across the desert plain, except along the river and stream channels prone to flash floods. Fluvial characteristics, such as point bars, oxbows, and abandoned channel segments, are well preserved.
TERTIARY	Tqs	Tqs—Quartz syenite: Laccolithic sills and feeder dikes of brown to maroon red; massive, pervasively jointed, slightly to moderately quartz-feldspar porphyritic, with hypabyssal textures and geochemically representative of more evolved compositions derived from magmatic differentiation of trachytic basalt. The quartz syenite is 80–85% alkali-feldspar, 5% ferroaugite, and 5% quartz with accessory hyalitic olivine, magnetite, limonite, apatite, zircon, pyrrhotite and pyrite. The quartz syenite has a maximum emplacement age around 56.4 ± 0.8 Ma (K–Ar age from biotite in a hawaiite sill crosscut by quartz syenite; Bobeck, 1985).
	Tb	Tb—Trachyte, quartz trachyte and hawaiite: Intrusive stocks, dikes and sills primarily comprised of quartz trachyte. These intrusions are peralkaline, porphyritic, with phenocrysts of alkali-feldspar (25%, commonly in aggregates or glomerocrysts), ferroaugite (<3%), aegerine augite in the groundmass, and accessory arfvedsonite, magnetite, limonite, apatite, zircon and euxenite (niobate oxides). The quartz trachyte has been previously dated by K–Ar methods with ages of 40.6, 43.5 and 46.4 Ma by Henry and others (1989) and Bobeck (1985).
	Ti	Ti—Stocks, laccoliths, sills and dikes: Undifferentiated, massive, gray and pink to black and dark red; slightly porphyritic to medium-grained, with phenocrysts of alkali-feldspar or plagioclase, and compositions ranging from basalt, trachyte, quartz trachyte, trachyandesite to rhyolite, and coarser-grained equivalents. Intrusions are locally restricted, rarely gradational, and presumed to be formed through internal differentiation processes and separate eruptive pulses of different compositions.
CRETACEOUS	Kag	Kag—Aguja Formation: Thick beds of gray to tan, fossiliferous, calcareous sandstone, with thin interbeds of yellow, gray, and brown clay, siltstone, and shale. The sandstone is often indurated, argillaceous, platy, ripple-marked, and cross-bedded.
	Kp	Kp—Pen Formation: Thick, massive, fossiliferous beds of gray limestone chalk, with thin interbeds of shale and sandstone. Sandstone is yellow to beige, and interbedded with bluish-gray chalk beds that weather gray and yellow. <i>Exogyra ponderosa</i> fossils are common.
	Kbse	Kbse—Boquillas Formation: Thin- to medium-bedded, chalky, argillaceous, fossiliferous limestone with gray to yellow-gray marl. Thin, yellow to blue-gray, weathering yellow, fossiliferous, calcareous siltstone and clay interbeds are common.

MAP SYMBOLS

BODY OF WATER	NORMAL FAULT—Showing sense of motion. U, upthrown block; D, downthrown block
INTERMITTENT STREAM/CREEK	GEOCHEMICAL SAMPLE LOCALITY—Location of sample taken for analytical work
HIGHWAY	BEDDING—Sedimentary bedding plane showing strike and dip
ROAD/STREET	VEIN FILLED FRACTURE—Fracture plane showing strike and dip
NORMAL FAULT (concealed)	SILL—Sill orientation showing strike and dip
NORMAL FAULT (inferred)	



Tertiary rhyolite sill intruding Cretaceous limestone strata in the southwest part of the White Hills quadrangle (Photo by Brent A. Elliott, 02/17/2016)

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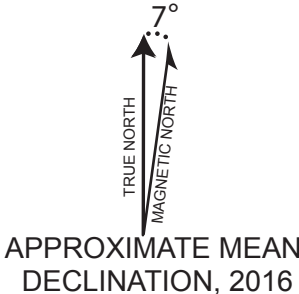
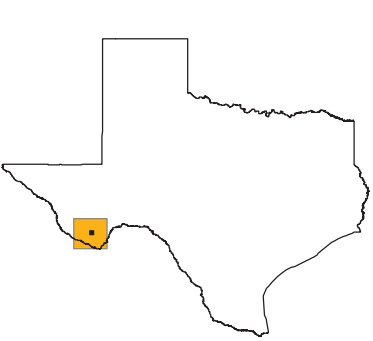
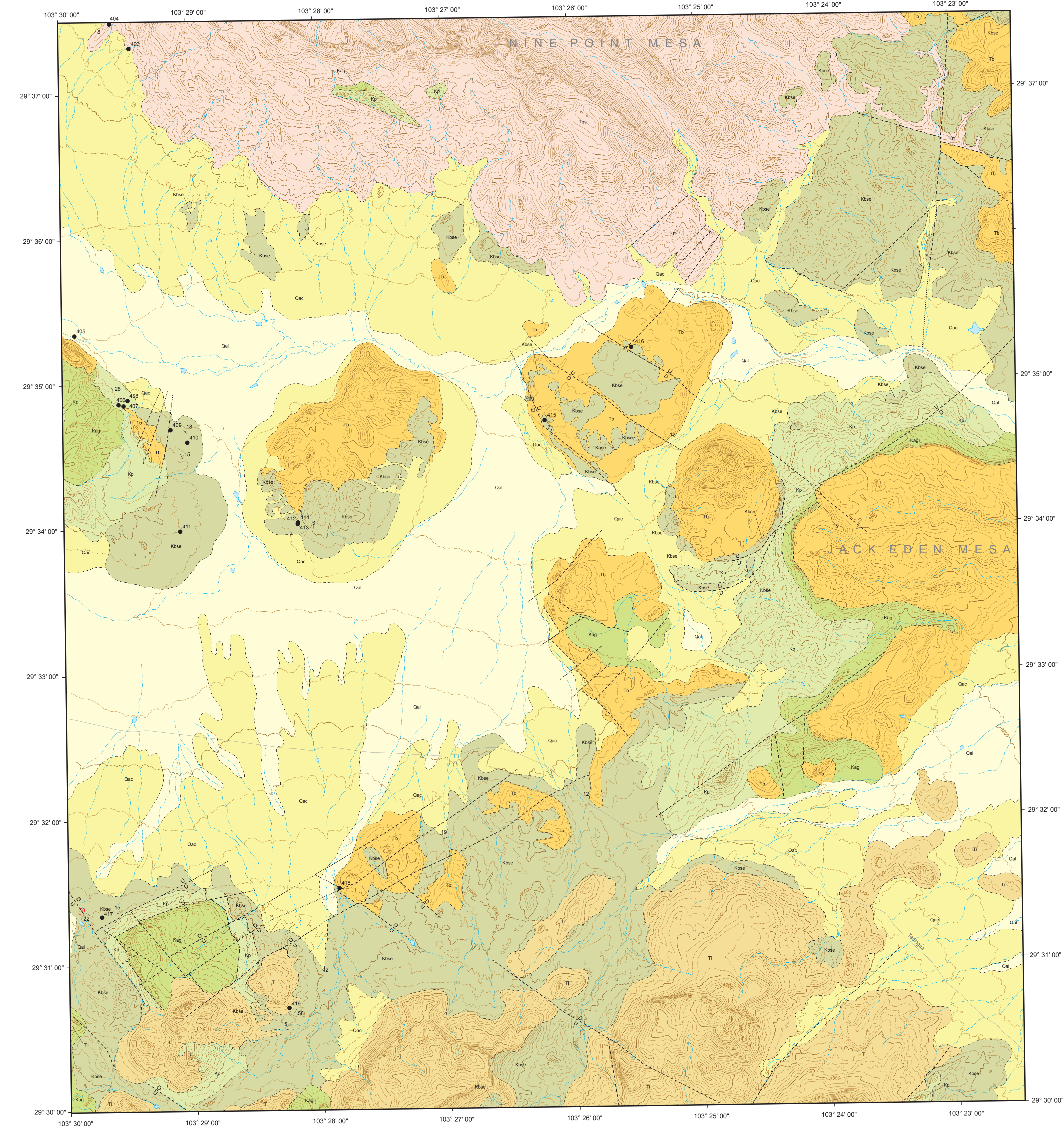
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SCALE 1:24,000

UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 13N, NAD 83
CONTOUR INTERVAL 40 FT
DATUM IS MEAN SEA LEVEL

GEOLOGIC MAP OF THE WHITE HILLS QUADRANGLE, TEXAS

Brent A. Elliott

2017

Topographic base map from:
U.S. Geological Survey (1983—photorevised 1974; field checked 1976)

Projection:
Universal Transverse Mercator Zone 13N

Datum:
North American Datum of 1983

Previous bedrock geologic field investigations by:
Bobeck, 1985
Brown and others, 1979
Henry and others, 1989
Price and others, 1986

Previous faults mapped by:
Bobeck, 1985
Brown and others, 1979
Henry and others, 1986
Henry and others, 1989
Muehlberger, W.R., 1980
Price and others, 1986