Base map from photomosaics of Soil Conservation Service, United States Department of Agriculture

Geology of Fort Defiance Quadrangle by Robert Balk, Tohatchi Quadrangle by John Eliot Allen; assisted by Brewster Baldwin, Wayne Bundy, John Hill, and John Schilling. Surveyed in 1952-53

EXPLANATION

QUATERNARY — Recent

- **Qal** — Qal, alluvium; Qs, soil cover; Qt, talus
- **Qn** — Nokaito formation. *Gray to yellow silt, stratified or compact. Some sand lenses, pebbles, and lenses of black mud or peat*
- **Qtp** — Terrace and pediment gravels
- **Ql** — Landslide debris

TERTIARY — Pliocene and Recent

- **Ttb / Tm** — Trachybasalt flows, Minette, breccia and agglomerate. *Tm, gray or greenish, fine-grained, compact or vesicular rocks; locally contain phenocrysts of hypersene or biotite, breccia consisting of fragments of igneous and sedimentary rocks in a vesicular, igneous groundmass. Ttb, presumably extrusive phase*

TERTIARY — Pliocene (?)

- **Tk / Tl** — Kimberlite tuff, Lapilli tuff. *Tk, green or brown, fine-grained aggregate of partly altered crystals of olivine, pyroxene, and garnet, and fragments of crystalline rocks. Tl, rock fragments more abundant in lapilli tuff*
- **Tc** — Chuska sandstone. *White, pale yellow, and gray, massive, medium- to coarse-grained poorly cemented sandstone. Some minor lenses of siltstone and zeolite cement*

UNCONFORMITY

CRETACEOUS — Upper Cretaceous — Mesaverde group

- **Kt** — Tohatchi formation. *Upper part, light olive to yellow-gray bentonitic shale; lower part, yellow, tan, or white, well-bedded, cross-bedded sandstone and silty, gray, carbonaceous claystone, shale, and impure lignite*
- **Kmf** — Menefee formation. *Olive-brown, yellowish-gray, and gray, fissile siltstone and shale. Subordinate yellowish-gray, fine-grained silty sandstone; carbonaceous shale and coal mostly confined to basal 500 feet. • • • unconformity sandstone*
- **Kpl** — Point Lookout sandstone. *Yellowish-gray to reddish-orange, massive, cross-laminated, medium- to coarse-grained sandstone. In northern part contains Dalton tongue of Mancos shale*
- **Kccg / Kccdg / Kccdl** — Crevasse Canyon formation. *Kccg, Lower Gibson member, reddish-brown to yellowish-gray, silty sandstone, sandy siltstone, and carbonaceous shale and coal. Kccdg, Dalton sandstone tongue, white, pinkish to yellowish-gray, massive, coarse- to fine-grained sandstone. Kccdl, Dilco member, tan to white and gray, poorly sorted, laminated siltstone, silty shale and clay. Some cross-bedded silty sandstone and thin coal seams*
- **Kq** — Gallup sandstone. *Grayish-yellow, massive, poorly-sorted sandstone and interbedded fine conglomerate, variicolored siltstone and shale, and thin coal*
- **Km** — Mancos shale. *Gray, thinly-laminated silty shale and shale • • • yellow, fine-grained fossiliferous sandstone*
- **Kd** — Dakota (?) sandstone. *Gray, yellow, or tan coarse- to fine-grained sandstone and gray shale; rarely conglomeratic. Some thin coal seams*

UNCONFORMITY

JURASSIC — Upper Jurassic — San Rafael group

- **Jmwc / Jmr** — Morrison formation. *Jmwc, Westwater Canyon sandstone member, white, pink, yellow, and reddish friable sandstone. Some lenses of conglomerate and thin shale interbeds. Jmr, Recapture shale member, green and purple shale. Lenses of white or pink friable sandstone (Cow Springs member of some authors)*
- **Js** — Summerville (?) formation. *Alternating gray and pink medium-grained sandstone*
- **Jt** — Todilto limestone. *Gray, thick- and thin-bedded limestone, sandy in part*
- **Je** — Entrada sandstone. *Pink, tan, or reddish, medium- to fine-grained cross-laminated sandstone. Notably cliff-forming. Lower more silty part is Carmel formation of some authors*

JURASSIC — Lower Jurassic — Glen Canyon group

- **Jw** — Wingate sandstone. *Pink, medium- to fine-grained sandstone, thin- to thick-bedded, in places silty. Subordinate cross-lamination*

UNCONFORMITY (?)

TRIASSIC — Upper Triassic

- **Trc** — Chinle formation. *Brown, purple, gray, white, or greenish shale. • • lenses of gray or tan fine-grained sandstone or siltstone, mottled limestone, and limestone pellet conglomerate*
- **Trs** — Shinarump conglomerate. *Yellow, brown, or gray conglomerate, locally ferruginous or silicified*

DISCONFORMITY

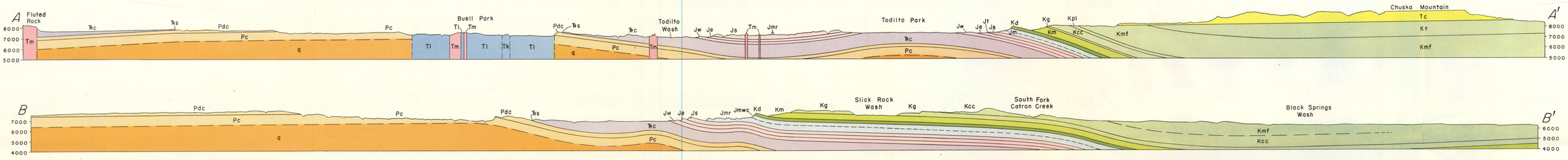
PERMIAN

- **Pdc** — De Chelly sandstone. *Tan or pinkish, fine-grained feldspathic sandstone, showing large scale cross-lamination*
- **Pc** — Cutler formation. *Brick-red, thin-bedded, evenly-stratified sandy shale and sandstone. Sparse interbeds of gray sandstone, calcareous sandstone, and pebble conglomerate*

UNCONFORMITY

PRECAMBRIAN (?)

- **q** — quartzite. *Gray or purple, well-bedded, fine-grained siliceous quartzite. Some ripple-marks and slate-pebble conglomerate lenses*



GEOLOGIC MAP AND SECTIONS OF FORT DEFIANCE AND TOHATCHI QUADRANGLES ARIZONA AND NEW MEXICO

Prepared under contract for

United States Department of the Interior
Bureau of Indian Affairs

By New Mexico Bureau of Mines and Mineral Resources

SCALE 1:48,000

0 1 2 3 4 5 6 MILES

1953

APPROXIMATE MEAN DECLINATION, 1952

TRUE NORTH
MAGNETIC NORTH

- Accurately determined boundary
- Approximate boundary
- Top and bottom contacts of Tohatchi formation
- Strike and dip of beds
- Strike and dip of boundary
- Horizontal beds
- Approximate direction of dip of beds
- Coal beds over 40 inches thick, dashed where inferred
- Burned coal beds
- Paved highway
- All weather road
- Fair weather road

NMBGMR Map No. 12242