GEOMORPHOLOGICAL, GEOECOLOGICAL, GEOARCHEOLOGICAL, AND SURFICIAL MAPPING STUDY OF McGREGOR GUIDED MISSILE RANGE, FORT BLISS, NEW MEXICO

VOLUME II

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The scope of the study is reflected in its title: to provide a general geomorphologic, soil, geoarcheologic, and surficial mapping study of the McGregor Range. The purpose is to produce an explanatory model of Quaternary landscape evolution. The study is also intended to provide baseline information on the geology, water resources, landforms, and soils of the McGregor Range, plus explore new and old concepts and background information as a collective intellectual resource base for future environmental assessments, for resource management, and for mitigation and compliance considerations. In one sense this is geoarcheological study, but in another it is a geoecological study, one that focuses on the dynamic processes that have operated to produce the modern landscape of McGregor Range and environs.

This study began in July 1995 during a visit to Fort Bliss by the author in the company of Dr. GalerBurgett, R. Joe Brandon, and Kelly Poché of Fort Bliss Directorate of Environment (DOE). The visit was arranged by Dr. Jim Zeidler of United States Army Construction Engineering Research Laboratories (USACERL), Champaign, Illinois, and included a three-day connaissance of parts of the McGregor Range. Detailed fieldwork began in September 1995 and continued intermittently into July 1996.

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TABLE OF CONTENTS

PART I
INTRODUCTION

BACKGROUND

While Defense Mapping Agency maps at 1:25,000 scale were originally planned as basemaps for the mapping phase of this study, complete coverage for McGregor Range was unavailable when mapping commenced. Consequently, rather than produce a set of geomorphic maps with mixed scales, a decision was made to use U.S. Geological Survey (USGS) topographic 7.5-minute series quadrangle maps at 1:24,000 scale for which complete coverage exists (the switch was coordinated with and approved by Fort Bliss DOE personnel). Further, mapping originally was to be augmented by and structured around use of NASA flown Atlas Multiband Imagery, but this imagery was not georeferenced, and much proved to be of insufficient quality for detailed mapping purposes.

The decision to switch to 7.5-minute topographic maps proved to be a boon because it was later learned that matching black and white USGS orthophotoquads (26) and orthophotomosaics (2) covered the McGregor Range, as did White Sands Missile Range color air photos, both at the same scale as the topographic maps (1:24,000). Having maps and air photos at the same scale makes surface mapping several orders of magnitude easier than without them. Color infrared (CIR) air photos at 1:40,000 scale were also acquired, as were black and white air photos at both 1:40,000 and 1:80,000 scales. The combination of contoured topographic maps, the georeferenced and accurate orthophotoquads and orthophotomosaics, and color, CIR, and black-and-white air photos greatly improved the accuracy, detail, and integrity of the geomorphic maps produced for this report.

MAPS PRODUCED

Of the 30-plus maps produced for this report, 29 are in and comprise most of Volume II, while the remainder are presented as figures in the text of Volume I. The 29 maps in Volume II include: (1) an index map that places the 28 maps in the context of the McGregor Range (Figure 1); and (2) 28 topographic-geomorphic maps at 1:24,000 scale that are modified USGS 7.5-minute topographic quadrangle maps.

Maps produced as figures in Volume I include a general color-shaded (selected contour) relief map for the entire southern Tularosa Basin that is a collage of multiple USGS 15 minute (1:62,500 scale) topographic maps. The 15-minute relief map served as a base map for another that shows long-term (prevailing) surface wind directions in the Tularosa Basin. Wind directions were determined by orientations of playa lake lunettes, by ripples and rounded fronts of slowly advancing dune trains, and by the location of dune trains and dune piles in general.

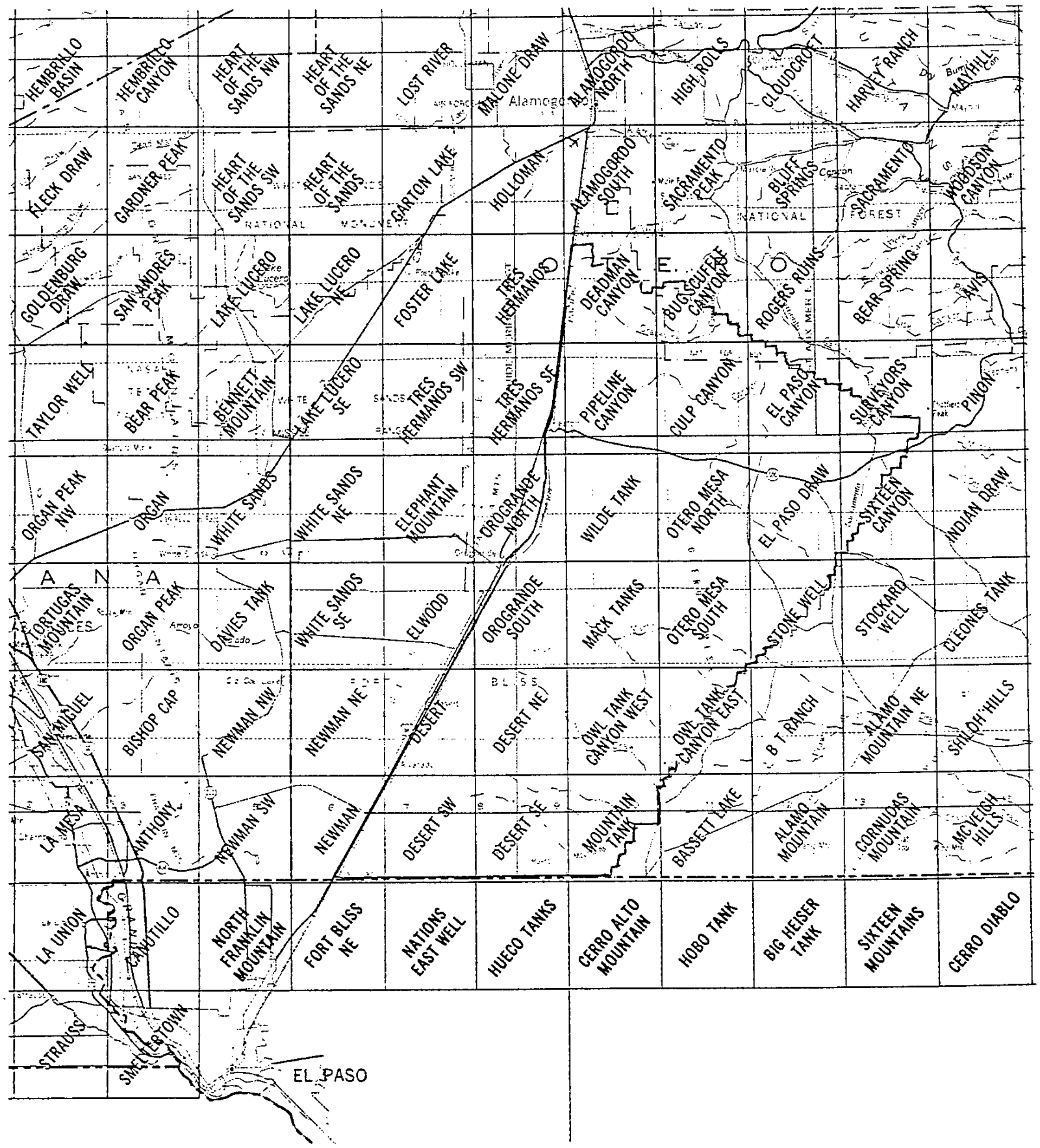


Figure 1. Index map for the 7.5-minute geomorphic-topographic (quadrangle) maps produced for this report.

METHODS OF MAP CONSTRUCTION

Topographic-Geomorphic Maps at 1:24,000 Scale

A set of 28 USGS 7.5-minute topographic maps and an equivalent set of 26 USGS 7.5-minute orthophotoquads and two orthophotomaps were acquired from the USGS. Inasmuch as each orthophotoquad was made from a single 1:80,000-scale, high-altitude air photo enlarged to 1:24,000, each serves as an excellent minimum-distortion basemap on which to genetically differentiate and map landforms (playas, alluvial fans, pediments, etc.). (The two orthophotomaps were made from two orthophotomosaics of air photos). Inasmuch as the orthophotoquad base air photos, the color air photos, and the CIR air photos used in this report were taken at different months and years, and are at different scales, the relative amounts and detail of useful geomorphic information vary among them. All the maps and air photos used—including the scale of each, map dates of execution, and when the air photos were taken—are listed at the beginning of Part II of this volume.

Once mapping on the 26 orthophotoquads and two orthophotomaps was reasonably complete, the color and CIR air photos were used where necessary to modify and refine mapping boundaries. In those cases where the 1:24,000 color air photos revealed more mapping detail than the orthophotoquads, they too were used as underlays for the topographic master maps. To produce the master topographic-geomorphic maps, the 7.5-minute topographic maps were first photocopied onto translucent vellum using a large format copier. Using a light table, the vellum copies were then used as tracing overlays on the orthophotoquads and, in some cases, the 1:24,000 color air photos. The final maps are paper copies of the vellum topographic-geomorphic master maps. Accuracy of landform differentiation was enhanced by constant checking against the color and infrared air photos, and by several periods of extensive field reconnaissance on the ground. Accuracy was also aided by a two-hour helicopter overflight. Most mapped features such as landforms, mapping units, cultural features, and most faults were defined on the basis of direct map and air photo interpretation augmented by ground truthing, but several, such as the Camp Rice sediments and Hot Well and Lake Tank faults, were partly based on previously published materials by Seager et al. (1987). All field sites mentioned in the text are located on the topographic-geomorphic maps.

Index Map of the Topographic-Geomorphic Maps

An index map that shows all 28 topographic-geomorphic maps in a regional context was produced by modifying the USGS Primary Map Series, 1:24,000 scale, Index Map for New Mexico. The outline of McGregor Range is overprinted on the index map, showing the locations of the 28 pertinent maps.

General Elevation-Drainage Color Map of Southern Tularosa Basin, NM, at 1:62,500 Scale

To facilitate fieldwork, a general elevation field map for the southern Tularosa Basin and adjacent uplands was produced by piecing together multiple USGS 15 minute (1:62,500 scale) topographic maps (see Volume I, Figures 10 and 31). Select elevations were then color-shaded to show local and regional relief. The resulting large map-collage measured 4-x-6 ft, and proved invaluable as a field aid. Its coverage extends from the Alamogordo-White Sands National Monument-Lake Lucero latitude south to the Texas-New Mexico border (the latter coincident with the southern border of the McGregor Range). The collage very usefully shows the intrabasinal drainage relationships of the Tularosa Basin, including its lowlands, playas, mega-depressions, pluvial lake basins, and alluvial fans relative to their upland runoff-sediment source areas. It also shows locally and regionally where surface runoff accumulates during great storms and wet periods (e.g., 1941), and where water ultimately ended up during wet periods of the Quaternary. Inasmuch as it shows many regional things that 7.5-minute quads simply cannot because of their larger scale, it was photoreduced and included with this report, even though it was initially intended only for field use. A copy of it was also used to show prevailing wind patterns for the southern Tularosa Basin based on orientation and locations of dune forms (lunettes, dune piles, dune trains).

MAPPING UNITS: PHILOSOPHY AND RATIONALE

Early in this project thought was given to age assessing and mapping McGregor Range sediments and surfaces using the Desert Project as a model. That highly respected study was conducted in and around the Organ Mountains over many years by L. Gile, J. Hawley, R. Grossman and their colleagues (Gile et al. 1981; Hawley 1975b). We planned to correlate the McGregor soils and surfaces to those of the Desert Project, as Monger had done in his recent study of the Fort Bliss Maneuver Areas (Monger 1993). After fieldwork and mapping commenced, however, it gradually became clear that such a strategy would be inadvisable to pursue for several reasons. One is that far more time and resources would be needed for soil-geomorphic work, age dating surfaces, and map ground truthing to enable useful correlations to the Desert Project than was available for the McGregor Range project. The McGregor Range is much larger than the Desert Project theater of study, and that study absorbed many years' work and enormous federal and state resources involving many people and support staff. Further, the Desert Project area was selected for study because the sediments are derived from both carbonate and noncarbonate rocks, especially the latter, whereas McGregor sediments are almost exclusively carbonate derived (Camp Rice fluvial facies excepted). Hence the two areas are not exactly comparable. Paleargids, for example, are common in the Desert Project area, but less so on McGregor alluvial units, pediments, and uplands (Camp Rice fluvial sediments, some Jarilla fans, and old dunal terrains excepted). Also, biotic landscape disturbance vectors (ants, termites, other insects, ground squirrels, gophers, kangaroo rats, badgers, etc.) significantly impact the McGregor landscape, but these processes are accorded far less genetic significance, and therefore, are much less stressed in the Desert Project areas. Further, the philosophical underpinnings of USDA, SCS (now known as the Natural Resources Conservation Service), soil geomorphic work are the 'five factors approach' (cf., Simonson 1997), and, while viable as a framework, it is fundamentally different from the unified 'soil evolution, biomantle, dynamic denudation' process approach employed here (Johnson 1990, 1993). It is a fundamental fact in science that different frameworks yield different views and different results. Applying the Desert Project model to McGregor would mean locking most aspects of the mapping and soil-geomorphic work into an existing structured framework—regardless of that framework's justifiably exalted status—that could limit intellectual and interpretive flexibility. Reference and comparison were, nevertheless, readily made to the Desert Project throughout this study, though not necessarily through emulation of emphasis and procedure. Finally, since in the first instance this is a geomorphic, geoecologic, and geoarcheologic assessment and mapping study, it was deemed important to produce maps and mapping units that would be both simple and reasonably accurate, and at the same time optimally useful to a wide field of specialists in resource allocation, management, planning, and mitigation. The mapping strategy and units adopted below should fulfill these user-friendly goals. The landform mapping units used in this report are as follows:

Landform/Material	Mapping Unit	Landform/Material	Mapping Unit
Alluvium (recent)	A1	Dune Pile	DP
Alluvium (relict)	A2	Dune Sheet	DS
Alluvium (older relict)	A3	Dune Sheet, Coppiced	DSC
Bedrock	B	Dune Sheet, Gypsiferous	DSG
Bolson Floor Complex	BFC	Fault	---
Camp Rice (Rio Grande) Sediments	CR	Pediment	P
Dune, Local	DL	Playa	Pl
		Playa Lunette	PlL

The first element of any mapping complex on the topographic-geomorphic maps in this report is the most common surface geomorphic element observed in that unit. For example, in the mapping unit DSC/P/A1-A2, coppice dunes formed on sheet sand are most common, but shallow pediments that are overlain by alluvial pedisediment in which weak to moderately strong calcic soils have formed also occur within the complex. This mapping unit would apply along bedrock outliers that front the Tularosa Basin where coppiced dune sheets have migrated up onto pediment slopes of the bedrock outliers. A mapping unit designated A1 means that only recent alluvium is present at the surface.

The reader should know that these mapping units are placed on the maps as best judgements as established by air photos, contour maps, orthophotomaps, and ground truthing. By their very nature, most mapping boundaries are informed estimates or inferred approximations of what is actually there. Centers of mapping units have the highest accuracies, boundaries least (hopefully *all* are accurate). Such are the problems that attend efforts to spatially delimit natural phenomena on maps.

Mapping Unit A1 (Recent Alluvium)

This alluvium, like essentially all alluvial units of McGregor—excepting original Camp Rice Rio Grande sediments—is highly calcareous and consists dominantly of gravelly and or nongravelly limestone derived sediment, though minor amounts of sandstone and shale sediments are sometimes present. Recent Alluvium, which derives from upland, mainly carbonate-rich rocks of late Paleozoic age, has been deposited during the last several hundreds to several thousands of years and is still is deposited during storm flow periods. Soils in the A1 mapping unit range from those that show minimal development (no secondary or pedogenic carbonate), to minor or modest development (filamentous and or thin surface caliche coatings on grains, bridges between grains, etc.). On orthophotoquads and air photos this unit shows up conspicuously as both darkish vegetation-rich and whitish vegetation-free zones in active washes, gullys, and barrancas, especially where they debouch onto alluvial toeslope flats and bolson floors. Such areas have received recent alluvium and therefore recent moisture, and have produced recent plant growth.

The A1 Recent Alluvium mapping unit is present in most areas of the McGregor Range, except on the Newman quad and on the western and central portions of Desert and Desert SW quads that are underlain by Camp Rice Rio Grande (CR) sediments. The A1 unit merges with the Bolson Floor Complex (BFC) of the Tularosa Basin, and in places makes up part of it. In some areas the A1 mapping unit is combined with A2, A3, DSC, P, and/or other mapping units, to form mapping complexes such as A1-A2, A1-A3, P/A1-A3, DSC/A1-A2, etc.

Because pedogenic carbonate is variable in the A1 unit, it is difficult to correlate it, and for that matter the A2 and A3 mapping units and their variably expressed soils, to the mapping units and soils of the Desert Project sequence centered around the Organ Mountains. It is also daunting to correlate these units to the Fort Bliss maneuver areas south and west of McGregor that were studied by Monger et al. (1993). Reasons are given in sections below.

Mapping Unit A2 (Relict Alluvium)

This alluvium, like A1 alluvium, was also highly calcareous when deposited, and consists of both gravelly and nongravelly sediment from limestone and carbonate rich sandstones and shales derived from upland rocks of mainly late Paleozoic age. The relict alluvium that makes up the A2 mapping unit may range in age from several to many thousands of years old, and probably spans the age range of the Organ II-Isaacks Ranch surfaces of the Desert Project. In addition to original primary calcium carbonate deposited with the lime-rich sediments across most of the McGregor Range (Camp Rice Rio Grande sediments excepted), relict surfaces of A2 alluvium, like A1 surfaces, regularly receive infalls of calcareous dust from winds and dust devils, and possibly carbonate from occasional overbank floods from nearby, slightly lower lying washes and stream channels. A2 surfaces thus have variable caliche (pedogenic carbonate) expressions that range from none where badgers have recently burrowed, to thick continuous envelopes and bridges across grains, to partially and even wholly cemented subsoils (in some pedons). Where subsoils are cemented, cementation is less than that expressed by soils in the less common and older A3 alluvium mapping unit.

It should be emphasized that, apart from Camp Rice Rio Grande sediments, the amount of pedogenic carbonate expressed in any relict alluvial unit on the McGregor Range may vary significantly on surfaces of the same or similar age. Reasons are several. One is that McGregor alluvial fans and pedisediments are carbonate-rich, the latter often shallow to limestone rock (pediment). Soils appear to form rapidly in terms of pedogenic carbonate accumulation, though not uniformly. Pedogenic carbonate on similar or equivalent McGregor fan segments may range from slight carbonate accumulations to cemented calcic horizons. Further, badgers and other vertebrate bioturbators on McGregor often disturb calichified subsoils, even petrocalcic horizons, sometimes to the point of locally destroying them in one, several, or even many adjacent pedons. Such disturbance may slightly, largely, or completely reset the pedogenic carbonate clock, so to speak (e.g., site 2 at Sulphur, Orogrande S quad). Finally, Gile (1995) recently reported that pedogenic carbonate, the main age indicator in soils developed on Isaacks Ranch surfaces in the Las Cruces area, may vary as much as fivefold depending on landscape position and texture of sediment. For these collective reasons correlation of McGregor fan surfaces with the Desert Project sequence based on pedogenic carbonate accumulation—other than in very general terms—could be misleading. If strength of caliche development on McGregor fan segments is used as an index of time, tight chronometric control must be established for each fan segment studied.

The A2 mapping unit on the McGregor alluvial fans commonly occurs in three situations: as relict island surfaces a meter or two above active stream washes in upper toeslope and lower midslope-alluvial fans; as pedisediment on pediments; and as fanglomerate aprons downslope from pediments and bedrock outcrops. Examples are on west-directed footslope-toeslope fans emanating from the Otero Escarpment (Wilde Tank quad), on the south-directed mid and lower slopes on the north side of El Paso Draw (El Paso Draw quad), and along the mid-lower slope pediment-fanglomerate aprons emanating from bedrock highs east and west of Lake Tank Playa (Desert SE quad). In some areas the A2 mapping unit is combined with A1 and or A3 mapping units as A1-A2, A1-A3, or A2-A3 complexes. Other combinations are P/A1, DSC/A1, and so on.

Mapping Unit A3 (Older Relict Alluvium)

As with the A1 and A2 mapping units, this originally calcareous alluvium also derived mainly from late Paleozoic upland limestones, but also from limited sources of redbed sandstones and shales. The relict alluvium that makes up this mapping unit ranges in age from tens to hundreds of thousands of years, and probably spans the ages of earliest Isaacks Ranch to earliest Jornada (Jornada I) surfaces of the Desert Project. Where the pedogenic clock is not reset via badger and rodent bioturbation, old relict surfaces of A3 alluvium are strongly overprinted by pedogenic carbonates, with subsoils characterized by caliche stages III and IV, including laminar and plugged caliches that approach the La Mesa (Doña Ana) soil caliches in strength of expression.

On the other hand, the caliche clock is indeed commonly reset by badgers and rodents on many A3 and younger surfaces, within and between pedons, as evidenced at various McGregor sites (site 1, Sulphur, near Sulphur Tank, Orogrande S quad).

The A3 mapping unit usually, though not always, occurs at higher topographic and higher fan positions than A2 surfaces, though they are commonly associated with the latter. They are most frequent at mid and upper slope positions on dissected alluvial fans and pediment-fanglomerate aprons, with good examples on the Wilde Tank, El Paso Draw, and Desert SE quads. In some areas the A3 mapping unit is combined with A1 and/or A2 mapping units as A1-A3, or A2-A3 complexes. Other complexes may be P/A1-A3, P/A3, and DSC/P/A1-A3, and so on.

Mapping Unit B (Bedrock)

This unit is common to predominant in most of the McGregor Range except the Tularosa Basin lowlands (Bolson Floor Complex). The criteria for mapping bedrock is almost exclusively whether bedrock structure (stratigraphy, bedding, etc.) is visible on the orthophotoquads and/or air photos. If visible it means that soil cover is nonexistent or so thin that bedrock structure easily shows through. In several cases where structure could not be observed because of optical abberancies or shading on air photos but where slopes were so steep that bedrock is almost certain, it was mapped as bedrock.

Mapping Area, Bolson Floor Complex

This mapping area was defined exclusively for the Tularosa Basin portion of McGregor because it is a complex of sediments and geomorphic surfaces, and it should be viewed as a complex. Its boundary is set off by a *dashed*, heavier than usual line weight that is labeled Bolson Floor Complex. The boundary very generally coincides in most places with the 4,100-foot contour line in the McGregor portion of the Tularosa Basin. An exception is northeast of the Jarilla Mountains where it is slightly lower than 4,100 ft. The Bolson Floor Complex dashed boundary is in a few cases a delimiter for certain mapping units. Camp Rice fluvial facies are a special part of the Bolson Floor Complex, and are themselves set off by a *dotted* line of heavier than usual line weight.

Mapping symbols do not identify the Bolson Floor Complex as such except along its boundary where, as indicated, it is spelled out as Bolson Floor Complex. It is also, as indicated, a complex of various surfaces and sediments, so that depending on location it may include Camp Rice gravels (CR), playa depressions and sediments (Pl), playa lunettes (PlL), distal toeslope sediments (A1), coppice dunes and associated dune sheets (DSC), dune sheets alone (DS), and dune piles (DP). Typical mapping designator symbols may be, for example, DSC/A1/Pl, or DS/A1, or DP/Pl, and so on.

Mapping Unit CR (Camp Rice [Rio Grande] Sediments)

The Camp Rice fluvial sediments, as noted above, are a special element in the Bolson Floor Complex. The sediments, which were originally largely noncalcareous, consist of both high energy sands and gravels and low energy slack water clays and silts. The high energy clasts have mixed lithologies of fluvially rounded and polished exotic elements, such as basalt, pumice, and other extrusive and intrusive igneous clasts, plus other rock types. According to Strain (1966) they were deposited by the ancestral Rio Grande in early-mid Pleistocene time when it flowed through the Franklin-Organ mountains (Fillmore) gap area and meandered across the southern Tularosa Basin. They are thus relict, unlike most other sediments on McGregor that are on actively evolving fans and slopes. For these reasons Camp Rice fluvial facies sediments are fundamentally different from other sediments on the McGregor Range.

Camp Rice (Rio Grande) fluvial sediments occur only in the southwestern Tularosa Basin portion of the McGregor Range, specifically on Desert, Desert NE, Desert SE, Desert SW, Elwood, and Newman quads. Except for Newman, the eastern boundary of the Camp Rice fluvial facies is present on these quads and is indicated by a continuous dotted line labeled 'Camp Rice (Rio Grande) Sediments' at select places (the CR symbol is used as a mapping unit within the Camp Rice boundary). The northeastern boundary of Camp Rice gravels north of Three Buttes (east side of easternmost butte, Desert quad) was taken from Seager et al. (1987), but its southern boundary in this study was placed on top of the Lake Tank fault-line scarp (Desert SE and Desert SW quads) rather than at its base, as was indicated on the Seager et al. map: Geologic Map 57, Sheet 1). The changed position was based on the intuitive reasoning that any Camp Rice Rio Grande sediments on the downthrown side of Lake Tank Fault would now be buried under an unknown thickness of calcareous playa and A1 toeslope fan sediments derived from the eastern escarpments.

The strongly developed, petrocalcic horizon-bearing soil (La Mesa soil, Doña Ana Series) that has formed in Camp Rice sediments in the southern Tularosa Basin has been correlated to the La Mesa surface, whose type locality is on the high mesa above the Rio Grande in the Las Cruces area (Gile et al. 1981; Monger 1993; Seager et al. 1987). The general natures of the La Mesa soil and the Camp Rice sediments are observed in backhoe-dressed borrow pits along the McGregor Entrance Blacktop and along Meyer Range Road (north side of both roads). The calcium carbonate that has overprinted the originally (mainly) noncalcareous Camp Rice unit, and which forms the petrocalcic horizon of the La Mesa soil, is largely owed to airborne carbonate-rich dust (Gile et al. 1981; Monger 1993). The insoluble residue of the dust has left residual sediment in some playas (e.g., Vertisol Playa), but in others it has been removed or partly removed by deflation (many playas on the La Mesa surface have lunettes formed on their downwind NE borders, indicating eolian scour).

As with all other alluvial surfaces of the McGregor Range, badgers and other vertebrates have left significant bioturbational signatures on the La Mesa (Doña Ana) soil. Borrow Pit 1 at the Missile Gate entrance to McGregor Base Camp, for example, shows abundant evidence of bioturbation, which has resulted in caliche expressions that range from strong petrocalcic horizons to almost none where it has been destroyed by badgers. Quantitative estimates of the role of vertebrate bioturbators in regressing calcic horizons of desert soils that might be used for comparative purposes are, unfortunately, largely lacking. In fact, bioturbation processes have received scant attention in models of desert soil genesis.

Mapping Unit DL (Dune, Local)

This mapping unit is different from other dunal units in that the reddish colored dunes defined are localized and of limited areal extent. They are also relatively thin, usually a meter or two, or less. The mapping unit is mainly along the lower reaches of El Paso Draw (Otero Mesa N and El Paso Draw quads), though such dune patches do occur elsewhere on the Mesa. In El Paso Draw the brownish-reddish dunes cover distal toeslopes of alluvial fans emanating from the Sacramento Mountains and surrounding west and south parts of Otero Mesa, or occur as small dunes along the floor of the draw. This unit is important archeologically because artifacts were (are) observed on nearly every local dune encountered in the draw, some mixed with caliche on badger burrow spoils and obviously cycled up from below. Sandy areas occur elsewhere on Otero Mesa, for example near Camaleche Tanks south of Bassett Lake. According to Charlie Lee, proprietor of Hat Ranch, the sand is blown out of the Tularosa Basin by strong southwest and west winds. Some readers may doubt the ability of saltating sand grains to move long distances up canyons and headlands under strong winds, sometimes without leaving a trail of sand dune patches to document the process. However, abundant literature on dune-forming processes, and wide personal experience along coasts and deserts, confirms the ease by which such 'up escarpment' sand migration can be accomplished.

The ultimate source of dune sands on the McGregor Range and the Tularosa Basin, however, are Paleozoic redbeds, many of which are paleosols, some of which outcrop on Otero Mesa (e.g., Bassett Lake). They derive mainly from the reddish Abo and Yeso formations of Permian age, and the reddish Bliss Sandstone of Cambrian-Ordovician age. They locally and regionally outcrop here and there in the surrounding uplands, including the Sacramento Mountains-Otero Escarpment and Mesa-Hueco Mountains, the Franklin-Organ-San Andres mountains, and the westernmost of the Tres Hermanos Buttes (Twin Buttes). Conspicuous Permian redbeds outcrop for several miles all along the lower midslopes of the Otero Escarpment east of Jarilla Bolson, from Rough Canyon north to County Road 506. Red silt and sand weathered from the outcrops are visible as in transit sediment along washes that drain from such areas. In fact, the entire area downslope of the redbeds has a pinkish hue, from the old McGregor Ranch north to and beyond Wilde Well.

Reddish sands eroded from these rocks can be observed in transit in many small washes draining into El Paso Draw from both the Sacramento Mountains and Otero Escarpment. Reddish sands also erode from the Otero Escarpment and wash west into the Jarilla Bolson. Fieldwork confirmed these redbed source areas, and it is clear that enormous quantities have washed into the Tularosa Basin during the Tertiary and Quaternary. The process is active today as a visit to any redbed outcrop will attest. It is a fundamental fact worth underscoring that the reddish color of the Tularosa Basin sands is, in the first instance, due to pedogenic weathering, originally and primarily in Paleozoic soils, but also color augmented by additional pedogenetic iron oxide overprints in modern oxic soils.

Mapping Unit DP (Dune Pile)

Dune piles are either thick (many meters) accumulations of sand, *or* multiple buried sand sheets (distinguished in that each has experienced a degree of pedogenesis prior to burial), *or both*. They often exhibit lobate geometries on air photos, which apparently reflect their recent historic development and movement downwind (they are in slow transit). They also often exhibit a rippled or mega-rippled appearance on air photos, a further indication of recent movement by wind. Examples are the thick dune piles which occur intermittently from the BLM site on the Tres Hermanos quad (mile markers 44-45, Hwy 54) south of Escondida Siding east to the Sacramento Mountains escarpment on the Grapevine-Sand-Culp canyon fans (Pipeline and Culp Canyon quads), and which even extend up onto the escarpment above the fanheads. Such dune piles also occur extensively in the Jarilla Bolson, from Jarilla Gap through the Benton-Wilde-Cox wells areas north onto Culp Canyon fan (Orogrande N & S, Wilde Tank, and Pipeline Canyon quads), and in the Davis Dome area (Desert SE quad).

Some dune piles are shown on air photos as sandy areas with vegetation-free light-colored spots, almost whitish in some cases. Ground truthing has confirmed that many of these are active or formerly active mounds of harvester ants (*Pogonomyrmyx apache* [Wheeler] and *P. rugosa* [Emery]). The ants typically harvest (remove) vegetation from around their mounds, and may armor them with sand-sized pieces of whitish caliche bioturbated up from a residual subjacent (buried) soil. As a consequence, the mound and surrounding vegetation-free areas are clearly visible on color air photos as ant spots. Many of the dune piles in and adjacent to the Bolson Floor Complex, and those associated with the Lake Tank Fault scarp near Davis Dome, exhibit ant spots. Possibly the presence of ants in thick dune piles reflects their preference for deep sand as habitat. So, ant spots, in addition to ripples and lobate forms, are another diagnostic criterion for recent dune piles. Such vegetation harvesting activity by ants may keep dune piles destabilized and augment wind deflation and dune migration.

As indicated, dune piles can be differentiated from sand sheets on air photos by their ant spots and by their large scale ripples and crescentic-lobate forms. Mega-ripples and crescentic lobate forms are particularly common in the sand piles of the Jarilla Bolson and lower midslopes of the Grapevine Canyon fan (Orogrande N-S Wilde Tank and Pipeline Canyon quads).

Dune piles and dunes in general are extremely important though complicating elements in the geomorphology of the McGregor Range. Their concentration on the east side of Tularosa Basin, and the strong paleosols formed in the lower sedentary (nonmobile) dune sheets, proves that they have been accumulating for long periods of the late Quaternary (at least) and that the wind pattern has been mainly SW to NE. In fact, to fully appreciate the rationale behind the Dune Pile (DP) and other dune mapping units (DS, DSC) requires an understanding of the age and origin of the sand in the Tularosa Basin, and the age and origin of the dune piles that form part of the sand. First, as noted, the ultimate sources for Tularosa Basin sands are Paleozoic redbeds in bordering uplands, mainly Bliss Sandstone and Yeso Formation rocks, which doubtless have been shedding sand into the basin for as long as exposures have existed. Indeed, dune sheets and dune piles were accumulating here long before Europeans or Native American ever arrived in North America. When the Rio Grande abandoned the lower Tularosa Basin in mid Pleistocene time and left Camp Rice river sediments behind, soil began forming in them, and has been forming in them since. Sediment from upland redbeds made its way onto the margins of this early La Mesa surface via stream wash, and ultimately onto playas.

When basin footslopes and playas dry out after storms, the fluvially deposited sediment is deflated by wind. Dust is blown away, and dunes form from the coarse fraction left behind. The process has occurred repeatedly in many basins and plains of western North America, and occurs in many of these same areas today, including the Tularosa Basin.

Dunes tend to accumulate on basin floors because that is where sediment is ultimately washed, and from which dune sand derives. If unanchored, dunes migrate in the prevailing wind direction, which in the Tularosa Basin is southwest to northeast. Dune sand consequently forms from basin sediments as eolian lag, then migrates downwind—sometimes upslope onto escarpments—and piles up. It has long done this along the east side of the Tularosa Basin, but it received a huge impetus by overgrazing stock animals in the period 1886-1900, a process which destabilized formerly stabilized dune sheets across much of the Tularosa Basin (Kenmotsu [1977] documented the process on McGregor). Its ultimate destination is in downwind areas, either where wind is strongest, as in the Culp-Grapevine canyons fanhead area, or where topographic obstructions like the Jarilla Mountains create lee side windshadows, like the Jarilla Bolson (most all are historic).

But, primary sand washes into the Jarilla Bolson from extensive Yeso redbeds exposed below the Otero Escarpment. Most sand, however, is secondary and blows into the bolson from the southwest around the Jarillas, through the Jarilla Gap (a wind gap) on the south and the Moody Lowlands wind gap on the north. Both wind gaps have significant SW-NE attenuated lobate and mega-rippled historic dune piles that are migrating over polygenetic sedentary basal dunal soils (e.g., the BLM site). The basal pedogenetized dunes indicate that dunes have long been accumulating, though episodically, probably during much of the mid-late Quaternary, if not earlier. These dune accumulations, however, were probably dune sheets, and nowhere near the magnitude of historic dune pile accumulations that we witness today. Historic dune piles migrate downwind as slowly moving dune trains. Ironically, and interestingly, their ultimate common destination is high ground on and between the Grapevine-Culp canyons fanheads. A Venturi effect has apparently channeled winds and sand up into this part of the Sacramento Mountains for a long time back into the Quaternary. Eventually the sand is washed back down into the basin, some of which is re-entrained by the wind and blown back up to renew the cycle, a process made evident by abundant reddish fluvial sand exposed in the channel and walls of Sand and Culp canyons. However, some sand is also buried by alluvium and removed from the cycle.

Exposures at the BLM site in the Moody Lowlands reveal the polygenetic and multiple dune sheet character of dune piles in that area (see Appendix D soil-sediment descriptions, and Tres Hermanos quad). Multiple dune sheets that form reddish dune piles also are apparent in borrow pits and road cuts along the Shorad Gate-Benton Well Blacktop.

A local historic source of the reddish sand on McGregor, but which of course also derives ultimately from Paleozoic redbeds, is the extensively eroded A horizon of the La Mesa soil upwind, west and southwest, of the McGregor Range, especially from the Doña Ana Range between Highway 54 and Old Coe Lake. This point was noted earlier, but should be stressed because much sand from eroded La Mesa (Doña Ana) soil does indeed contribute to McGregor sand dunes.

The difference between a dune pile and a dune sheet is that dune piles are thick, or consist of multiple dune sheets, or both, whereas dune sheets are thin. Dune piles and dune sheets invariably grade into one another and often occur together, and some dune piles are merely over-thickened dune sheets, and may or may not be coppiced.

Mapping Units DS (Dune Sheet) and DSC (Dune Sheet, Coppiced)

As defined here, a dune sheet is a dynamic layer of sand of variable thickness, but which is generally relatively thin, often less than 2 m (syn., sand sheet). Theoretically it may be as thin as a few centimeters, or even millimeters at its expanding downwind frontal edge where it is expressed primarily as saltating grains of sand. In practical terms of mapping, however, dune sheets are mapped only where they are apparent on color air photos, and where they do not exhibit mega-ripples or lobate forms (otherwise such are mapped as dune piles). Consequently the centimeter-to-millimeter thin frontal edge of a dune sheet, which may be areally extensive, is omitted from mapping units.

Dune sheets may or may not be coppiced. Coppiced dune sheets are more conventionally called coppice dunes, a practice followed here. A coppice dune is an accumulation of wind-deposited sand or sandy soil about the base of an anchoring shrub (syn., coppice mound). If a dune sheet is uncoppiced, the mapping unit is DS, whereas if coppiced it is DSC.

Mesquite is far and away the most common anchoring shrub for coppice dunes in the Tularosa Basin, and coppices anchored by them tend to be large. Creosotebush is a much less common anchoring species, and coppices anchored by them are smaller. A yucca-grass association, on the other hand, is more typical for uncoppiced dune sheets.

It is important to note that as defined here coppice dunes are a special manifestation of dynamic, on-the-move dune sheets. Inasmuch as the downwind distal front of a dune sheet often attenuates and expands via saltating sand blown from its leading edge, incipient coppicing often begins there and at scales only sand grains thick.

Coppice dunes vary significantly in their character and geometries. In fact, they span a spectrum from subtle sandy or sandy soil accumulations at the bases of creosotebush on the one hand, to spectacular, discrete, 3-5-m-high hemispherical mesquite-anchored mounds on the other. The latter may be surrounded by bare and eroded though thick and indurated caliche, and joined to one another only by the sand that saltates between them. Examples on McGregor occur on the Camp Rice (La Mesa) surface along the north-south Water Road between the McGregor Entrance Blacktop and Meyer Range Road. Maximal examples also typify parts of the Doña Ana Range west of McGregor that are underlain by the La Mesa (Doña Ana) soil. Beneath the mounds, intact sandy A horizon of the La Mesa soil is preserved, but stripped down to the petrocalcic horizon elsewhere, showing that much of the coppiced sand came from the nearby eroded intermound La Mesa topsoil itself. But while both minimal and maximal coppice mounds are present on the McGregor Range, intermediate members are the overwhelming rule.

As indicated earlier, multiple dune sheets with contained paleosols often make up dune piles. In such cases the mapping designation is DP. Also as indicated, dune sheets and dune piles invariably grade into each other and often occur together, and are thus difficult to precisely map.

Mapping Unit DSG (Dune Sheet, Gypsiferous)

This mapping unit is in the northwestern part of McGregor. It is the probable floor of intermittent Lake Jarilla, which when full stretched from near Wilde Well north to the Great Wall of China Playa and beyond. The area in between has been largely buried by mainly historic quartzose sand piles and dune sheets, with the exception of the area north of the Dunal Escarpment at mile marker 47 along Hwy 54, and a few dunal windows in between (e.g., Cox and Salt Cedar playas).

Faults

Faults are common on McGregor, and there are undoubtedly far more present than were recognized and mapped in this study. The Newman, Hot Well, Hueco Nos. 1 and 2, and Coyote Fan faults were mapped by Seager et al. (1987), and they and other faults were given names in this study to facilitate communication. New faults mapped in this study were based on one or more morphologic indicators: lineaments, offset bedrock spurs, offset streams, truncated fans, scarps, depressions, tonal differences and lineations on air photos, and or some combination of them. Normal faults are indicated by a ball on the downthrown side, and monoclinal axes are indicated by double arrows—for example, Hot Well Fault-Monocline (movement on most faults, however, is not inferred in this study). Faults are shown as a bold solid line where one or more of these criteria are met, and dashed where faults are inferred on or below the surface. Normally subsurface inferred faults are indicated by a dotted line, but to avoid confusing such with dotted lines that are used to indicate lobate dune fronts—Pipeline Canyon quad—and to indicate recent historic wind eroded lands—Mountain Tank quad—a dashed line indicates *both* inferred faults at the surface or in the subsurface.

Mapping Unit P (Pediment)

Pediments, as used and defined in this study, are solutional- and/or abrasional-bedrock surfaces generally overlain by a thin (1-3 m) veneer or mantle of soil and or sediment (so called pedisediment). Pediments occur as debris-mantled footslope aprons around bedrock areas, and along washes and other drainageways. Often the pedisediment that buries them is a mix of A1-A3 alluvium in which residual soil has formed. Pediments are widespread on Otero Mesa, along the broadly dissected Otero Mesa Escarpment, and in the Hueco and Sacramento mountains, being almost the rule in these areas where bedrock is not directly exposed at the surface. Conversely, pediments are absent in the Bolson Floor Complex of the Tularosa Basin, except as buried aprons around bedrock residuals (e.g., Desert and Orogrande S quads).

Mapping Unit Pl (Playa)

Playas are common throughout the Tularosa Basin, as well as on Otero Mesa. Normally, though not always, depressional contours on topographic maps designate playas, and these are designated as either permanent or temporary. A permanent playa generally occurs in the lowest part of the landscape, either in a lowland site of the Tularosa Basin, or in an upland site on Otero Mesa. Permanent playas periodically collect runoff waters that contain suspended silts and clays, and salts in solution. When the water evaporates or slowly drains downward, or both, the fines and precipitates are left behind as a mix of playa sediment. Upon drying, this sediment often shrinks and cracks into playa curls, or puffs up owing to salt efflorescences, which the prevailing SW wind deflates, saltates, and comminutes to sand-sized pellets. These then often form lunettes on the downwind (lee) sides of playas, at least in the Tularosa Basin (most playas in the Tularosa Playa of McGregor have lunettes, a major exception being Lake Tank; most Otero Mesa playas also lack them). Many of these playas with bordering downwind lunettes are deflation playas. A permanent playa can thus also be a deflation playa. Some playas are precipitation-deflation, alkali-rich playas (described in next section).

Temporary playas, on the other hand, are flattish or low slope surfaces, often dune-dammed, in which water is temporarily stored during storm periods. During great storms water may overtop the dams, or seep through, and flow to another lower lying temporary playa, or eventually to a permanent playa at the lowest point locally or regionally on the landscape. Examples of temporary playas are the various sand-dammed, playas in the vicinity of Benton and Wilde wells in the Jarilla Bolson (Orogrande N quad), and the playa depressions along the eastern downthrown side of the Lake Tank fault (which coalesce and drain into Lake Tank Playa—a permanent playa—during great storms). The numerous small interdunal and very ephemeral depressions in the various dune piles and dune sheets of the Tularosa Basin, which due to their small size and brief existence lack playa sediment, are not considered playas here.

Mapping Unit PlL (Playa Lunette)

Lunettes in this study were identified by air photo analysis and by depressional contours on topographic maps. Many were ground truthed. They range from prominent crescentic sediment plumes deposited by wind downwind of playas (and from which the sediment derived), that are very distinct, to low subtle ones that are barely perceptible on the ground. Both, however, may be apparent on color air photos. This mapping unit includes lunettes ranging from those that are gypsum-rich (calcium sulphate) and calcite-rich (calcium carbonate) to those composed largely of quartzose sands. The gypsum may be either massive or crystalline (selenite) in form. The gypsum dunes at White Sands National Monument are a classic example of the latter, the Great Wall of China the former. Gypsite lunettes form, among other places, on the downwind sides of precipitation-deflation playas. Examples are in far northwestern McGregor, east of Hwy 54 and downwind of the Great Wall of China and Lone Butte playas on the Tres Hermanos quad (mile marker 50, Hwy 54). In these playas shallow and/or artesian fed brackish ground water evaporates at the surface, causing a gypsum-calcite rich effloresced soil to form that is easily deflated by wind, especially if disturbed by ungulates. Over a long period the process removes considerable soil and sediment, causing slow lowering of the playa floor concomitant with the formation of a gypsiferous-calcareous soil dune on the downwind side. Such gypsum- and carbonate-rich soil dunes, doubtless containing a variable quartzose element, are called gypsite lunettes in this report, though they are not differentiated as such on the maps.

Gypsite lunettes also form when playas fill with gypsum-rich runoff waters, and when upon evaporation calcite and sulphate are precipitated as an efflorescence at the surface. Wind then piles the playa sediment downwind as a lunette.

Gypsum-rich runoff derives from gypsiferous late Paleozoic redbeds and other beds in upland rocks, and from gypsum dust deflated from gypsum-rich playas in the western Tularosa Basin (Lake Lucero, White Ranch Lake, Parker Lake, etc.) that periodically blows across McGregor. To this latter point, it is notable that several times during the spring and summer of 1996 large plumes of gypsiferous dust blown from the Tres Hermanos gypsite flats crossed northern McGregor. Twice the author drove through them. And during one day while driving from Alamogordo to El Paso, the entire central and southern Tularosa Basin was so dust-laden that the sky was noticeably darkened, whereupon the sun appeared as an indistinct yellowish and lustrous orb. Consequently, some of the playas in central and northern McGregor are gypsum-bearing, and all are calcareous. Examples are the lunettes on the northeast of Vertisol and Gypsum playas.

Under the right conditions, a low lobate type of gypsite lunette can form that may attenuate considerable distances downwind of the slowly deepening playa source area. Essentially these are gypsite longitudinal lunettes. Examples are in the north McGregor area, east and northeast of the Great Wall of China gypsite-quartzose lunette and north of the dunal escarpment at mile marker 47 on Hwy 54 (Tres Hermanos and Deadman Canyon quads). (cf., coppice dune, dune, dune sheet, lunette, alkali lunette, quartzose lunette in Glossary).

An example of a quartzose lunette is Benton Well Playa in the Jarilla Bolson (0.5 km north of the Shorad Gate-Benton Well Blacktop and 50 m east of the Benton Well-Sulphur Tank Road). (cf., coppice dune, dune, dune sheet, lunette, alkali lunette, gypsite lunette in Glossary).

PART II
MAPS

LIST OF INDEX MAPS

Map Types, Scales, Names, and Dates of Maps and Orthophotos Used

Base Maps

Topographic (T) and orthophotoquad (O), both at 1:24,000 scale:

Map Name	*Type*	*Map Date*	*Constructed from Air Photos Taken*
Bassett Lake	T	1980	1974
Bassett Lake	O	1977	1977
Bug Scuffle Canyon	T	1981	1972
Bug Scuffle Canyon	O	1977	1977
Culp Canyon	T	1981	1972
Culp Canyon	O	1977	1977
Deadman Canyon	T	1981	1972
Deadman Canyon	O	1976	1976
Desert	T	1955	1954
Desert	O	1976	1976
Desert NE	T	1955	1954
Desert NE	O	1976	1976
Desert SE	T	1955	1954
Desert SE	O	1976	1976
Desert SW	T	1955	1954
Desert SW	O	1976	1976
El Paso Canyon	T	1965	1964
El Paso Canyon	O	1977	1977
El Paso Draw	T	1980	1974
El Paso Draw	O	1977	1974
Elwood	T	1955	1954
Elwood	O	1976	1976
Mack Tanks	T	1979	1974
Mack Tanks	O	1977	1977

Map Name	*Type*	*Map Date*	*Constructed from Air Photos Taken*
Mountain Tank	T	1980	1974
Mountain Tank	O	1977	1977
Newman	T	1955	1954
Newman	O	1976	1976
Orogrande N	T	1955	1954
Orogrande N	O	1976	1976
Orogrande S	T	1955	1954
Orogrande S	O	1976	1976
Otero Mesa N	T	1980	1974
Otero Mesa N	O	1977	1977
Otero Mesa S	T	1979	1974
Otero Mesa S	O	1977	1977
Owl Tank Canyon E	T	1980	1974
Owl Tank Canyon E	O	1977	1977
Owl Tank Canyon W	T	1980	1974
Owl Tank Canyon W	O	1977	1977
Pipeline Canyon[1]	O-T	1982	1971-72
Rogers Ruins	T	1965	1964-65
Rogers Ruins	O	1976	1976
Sixteen Canyon	T	1980	1974
Sixteen Canyon	O	1976	1976
Stone Well	T	1980	1974
Stone Well	O	1977	1977
Surveyors Canyon	T	1965	1964
Surveyors Canyon	O	1976	1976
Tres Hermanos	T	1982	1972
Tres Hermanos	O	1976	1976
Tres Hermanos SE	O-T	1982	1971-72
Wilde Tank	T	1980	1974
Wilde Tank	O	1977	1977

Air Photos

Color (C), Color Infrared (CIR), Black and White (BW)

Photo Name	*Type*	*Scale*	*Date(s) Flown*
White Sands MR	C	1:24,000	11/24/85, 11/28/85, 12/01/85, 12/07/85, 12/11/85, 12/13/85, 02/28/86, 03/01/86
NAPP[2]	CIR	1:40,000	10/02/82, 06/20/83, 05/26/84, 06/09/84, 09/08/84, 07/12/86
NAPP	BW	1:40,000	03/03/91
NHAP[3]	BW	1:80,000	03/03/91

[1] Pipeline Canyon and Tres Hermanos SE are USGS orthophotomaps-topographic (O-T) constructed from orthophotomosaics.

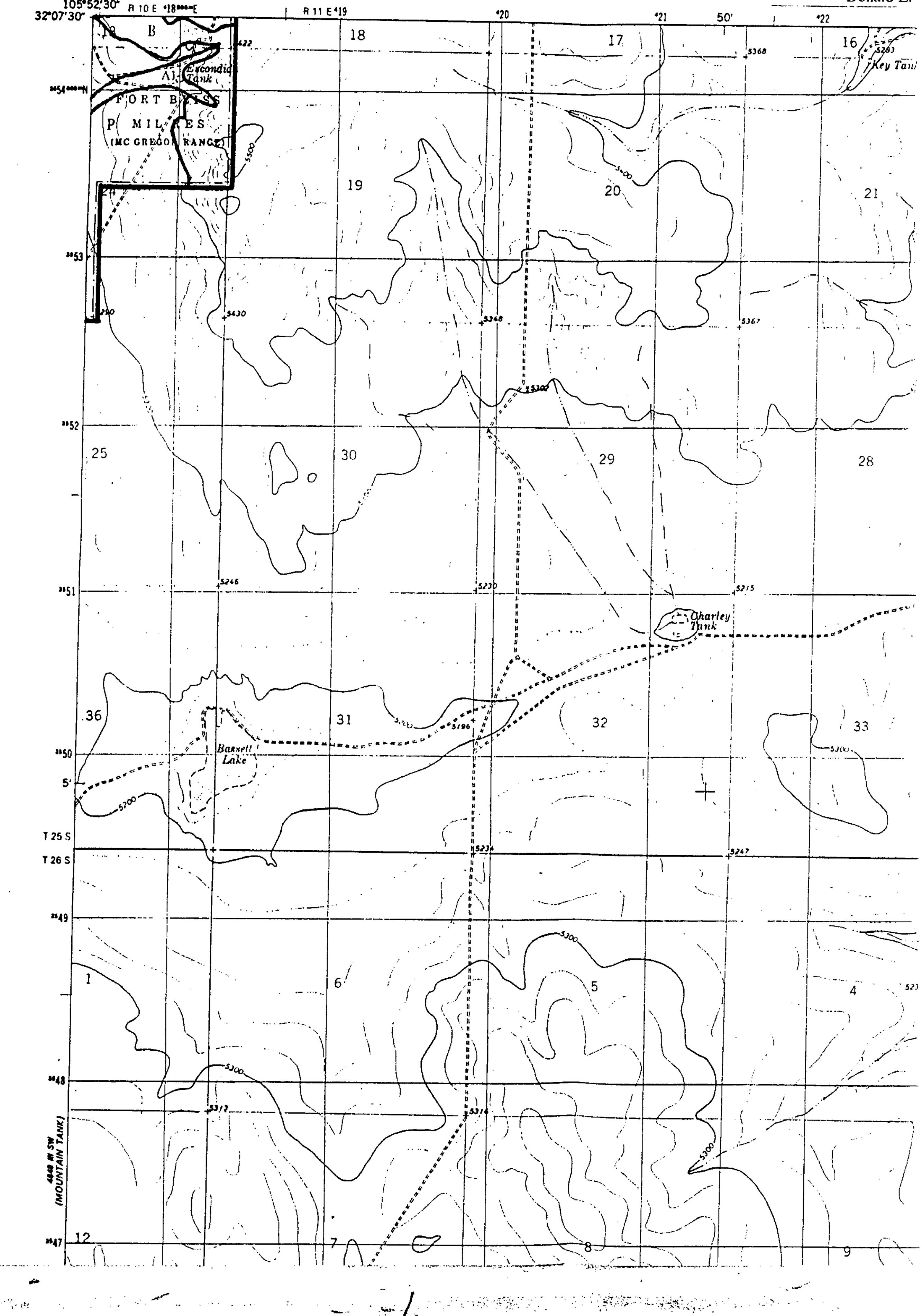
[2] NHAP = National High Altitude Photography Program.

[3] NAPP = National Aerial Photography Program.

LIST OF GEOMORPHIC MAPS

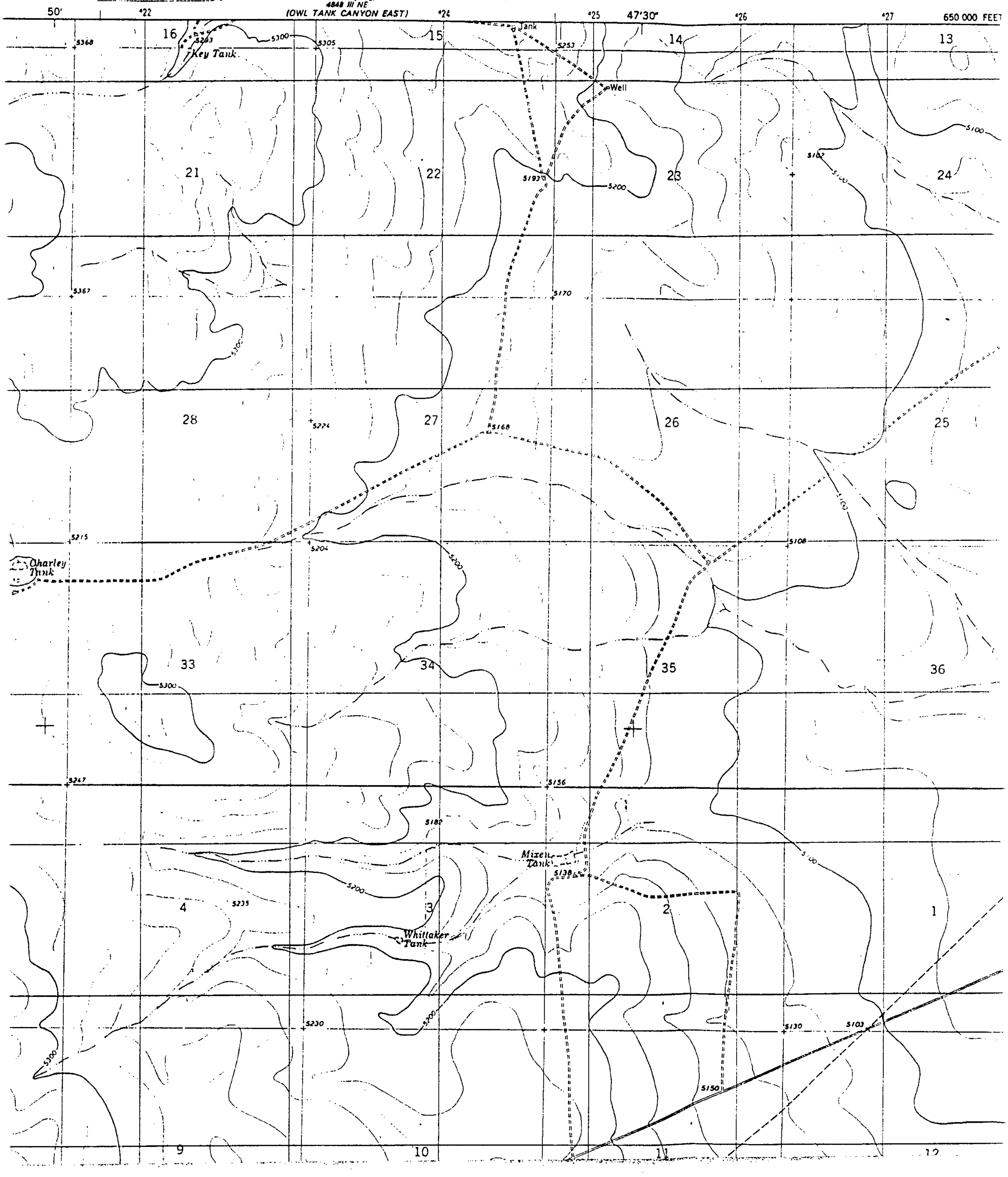
Bassett Lake Quad
Bug Scuffle Canyon Quad
Culp Canyon Quad
Deadman Canyon Quad
Desert Quad
Desert NE Quad
Desert SE Quad
Desert SW Quad
El Paso Canyon Quad
El Paso Draw Quad
Elwood Quad
Mack Tanks Quad
Mountain Tank Quad
Newman Quad
Orogrande North Quad
Orogrande South Quad
Otero Mesa North Quad
Otero Mesa South Quad
Owl Tank Canyon East Quad
Owl Tank Canyon West Quad
Pipeline Canyon Quad
Rogers Ruins Quad
Sixteen Canyon Quad
Stone Well Quad
Surveyors Canyon Quad
Tres Hermanos Quad
Tres Hermanos SE
Wilde Tank Quad

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



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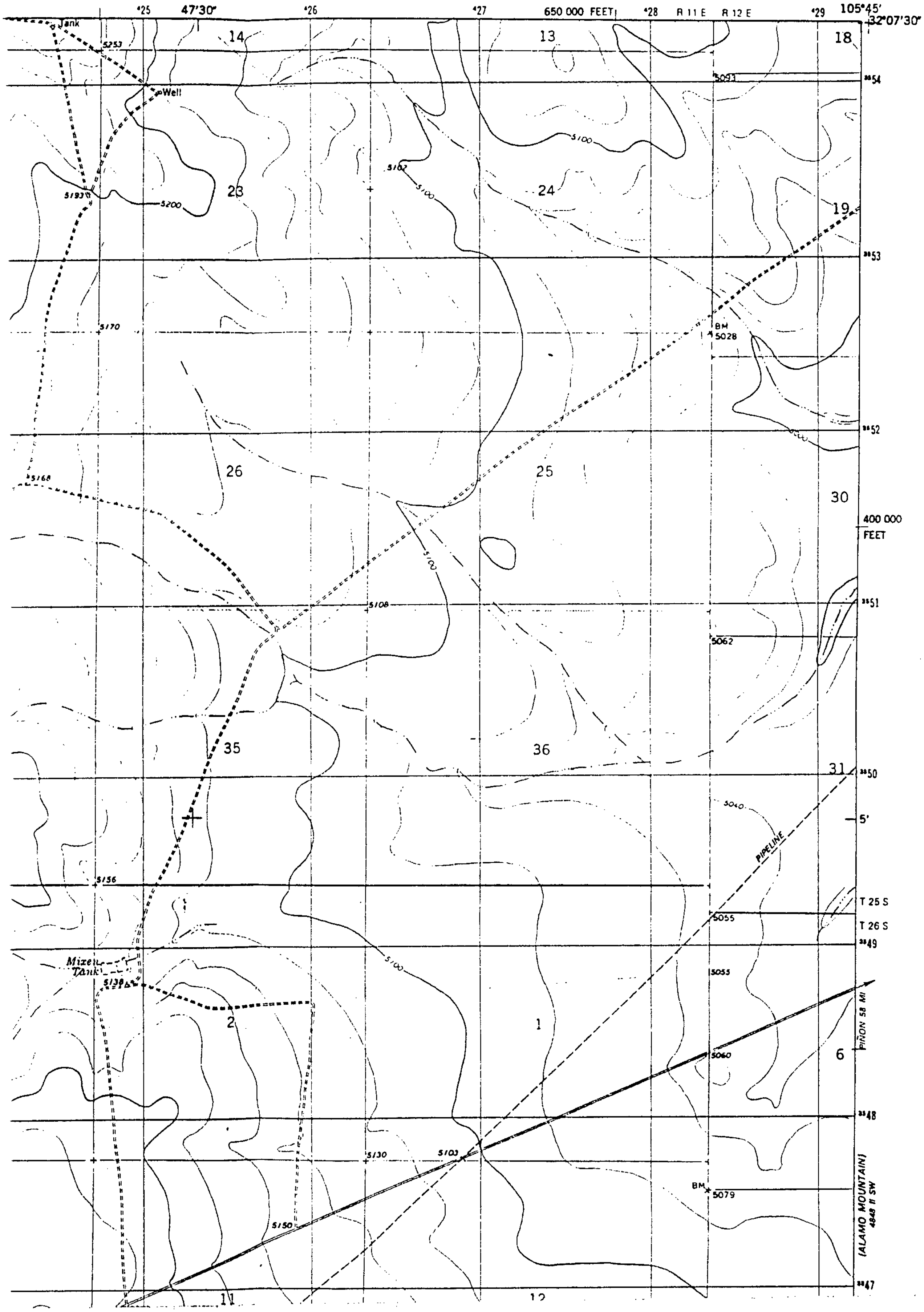
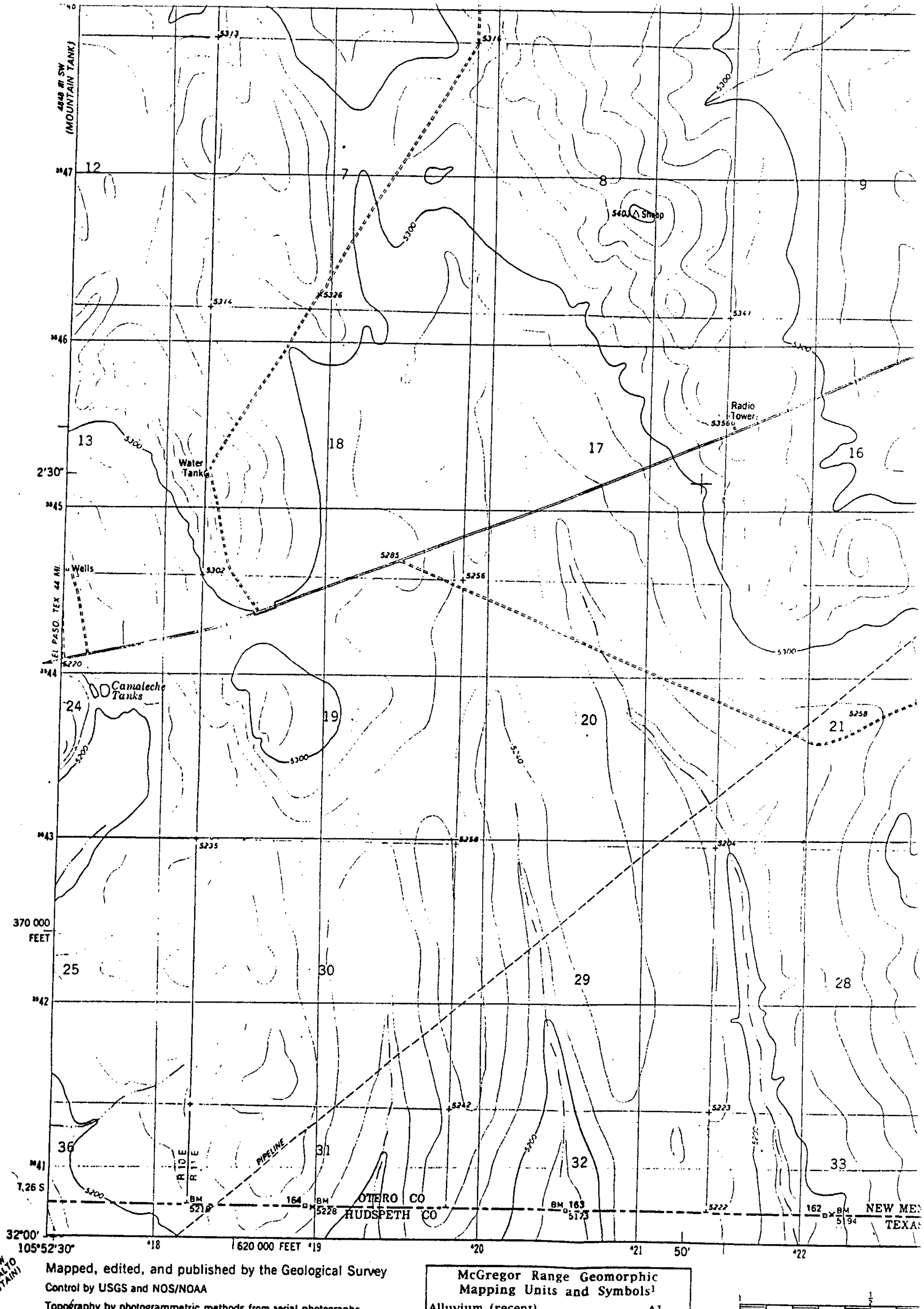
nd Surficial Mapping
Bliss, New Mexico
)-0014, 1997

BASSETT LAKE QUADRANGLE
NEW MEXICO—TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 BASSETT LAKE 15' QUADRANGLE

4848 II NW
(B T RANCH)





Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 8 meters south and 49 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC

CO
DOTTED L
NATIONAL

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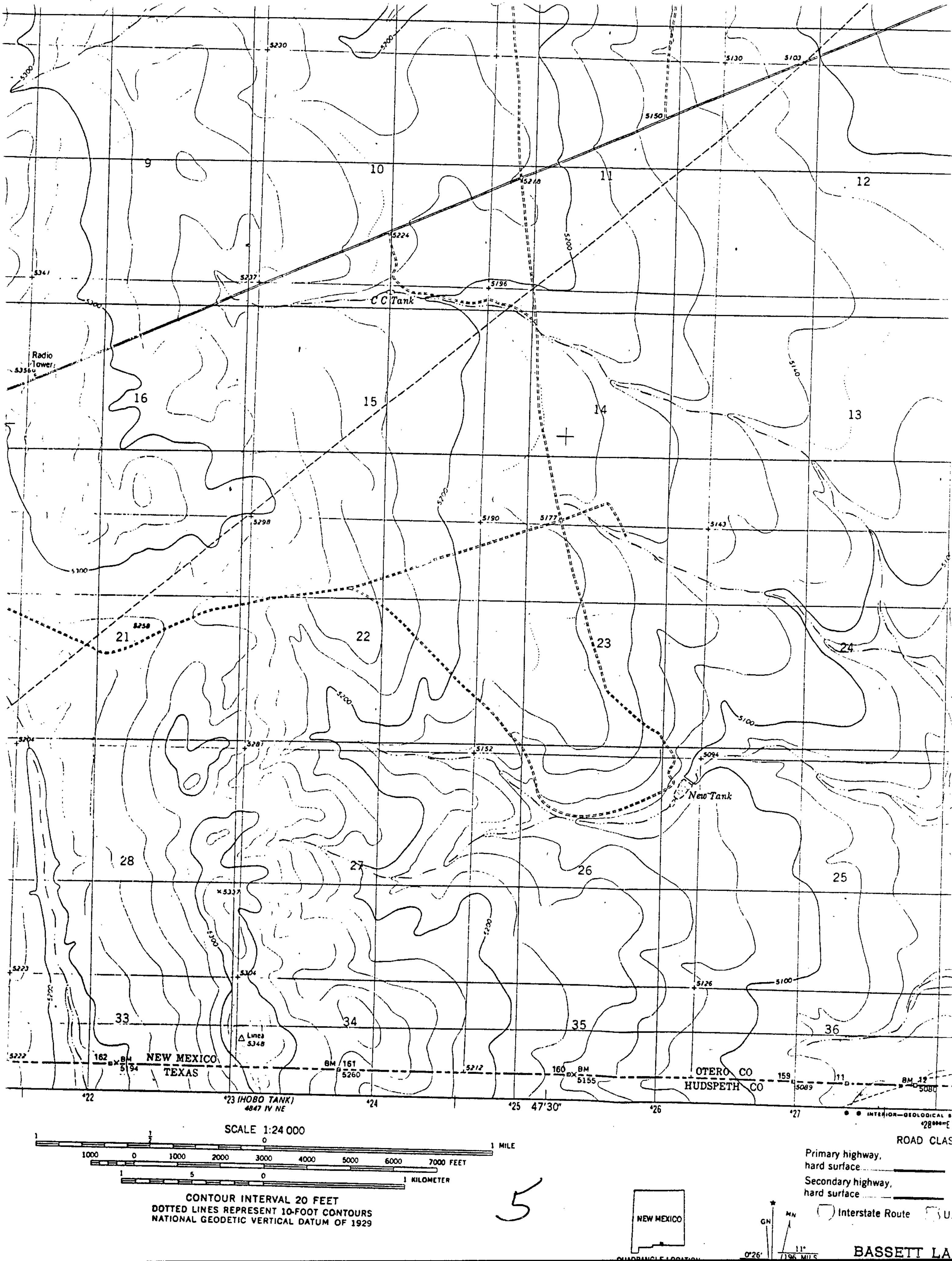
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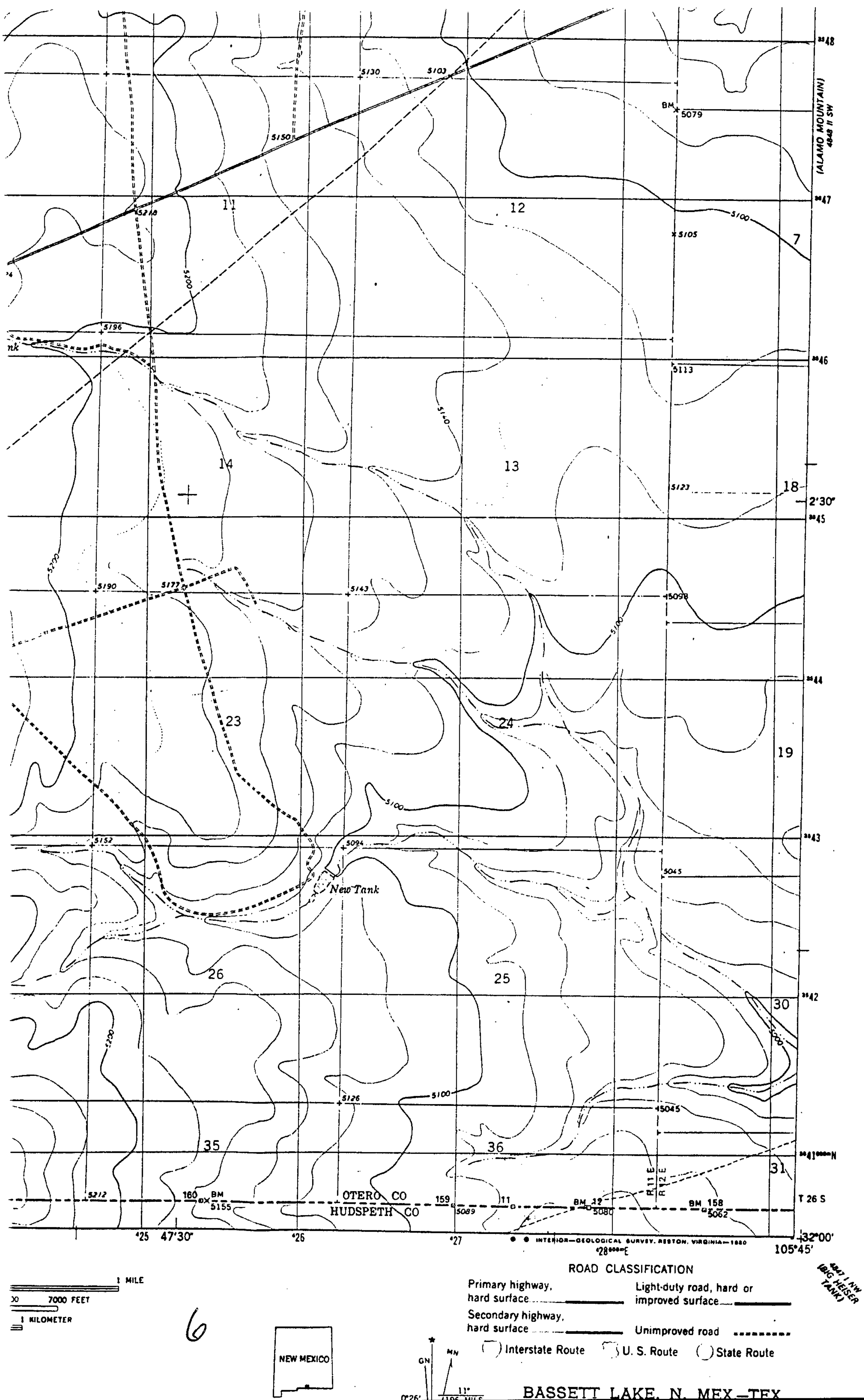
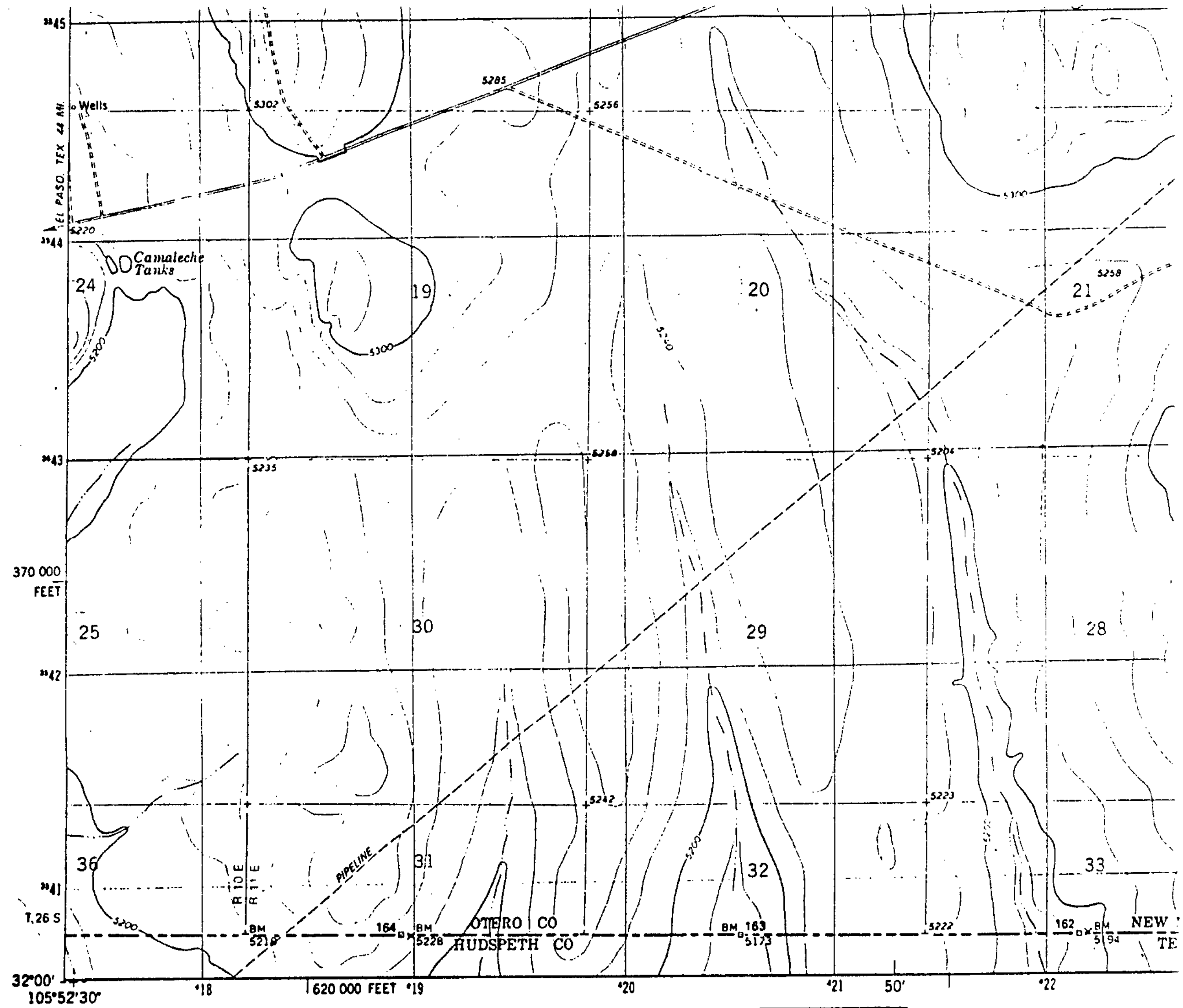
C C Tank
Radio Tower
New Tank
NEW MEXICO
TEXAS
OTERO CO
HUDSPETH CO
Linea 5348
5230
5130
5103
5150
5218
5224
5237
5196
5341
5356
5200
5300
5140
5190
5177
5143
5298
5258
5287
5152
5094
5100
5337
5304
5223
5222
5126
5212
BM 5194
BM 5260
BM 5155
BM 5080
5089
162
161
160
159
11
12
22
23 (HOBO TANK) 4847 IV NE
24
25
47'30"
26
27
28
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
QUADRANGLE LOCATION
ROAD CLAS
Primary highway, hard surface
Secondary highway, hard surface
Interstate Route
GN
MN
0°26'
11°
196 MILS
BASSETT LA
INTERIOR—GEOLOGICAL S


(ALAMO MOUNTAIN) 4848 II SW
New Tank
OTERO CO
HUDSPETH CO
T 26 S
R 11 E
R 12 E
2'30"
32°00'
105°45'
47'30"
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980
4847 I NW (BIG HEISER TANK)
1 MILE
7000 FEET
1 KILOMETER
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
NEW MEXICO
GN
MN
BASSETT LAKE, N. MEX.—TEX.

6



4847 IV NW (CERRO ALTO MOUNTAIN)

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 8 meters south and 49 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬▬
Pediment	P
Playa	P1
Playa Lunette	P1L

[1]See text for explanation

1000 0 1

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FOR SALE BY U. S. GEOLOGICAL
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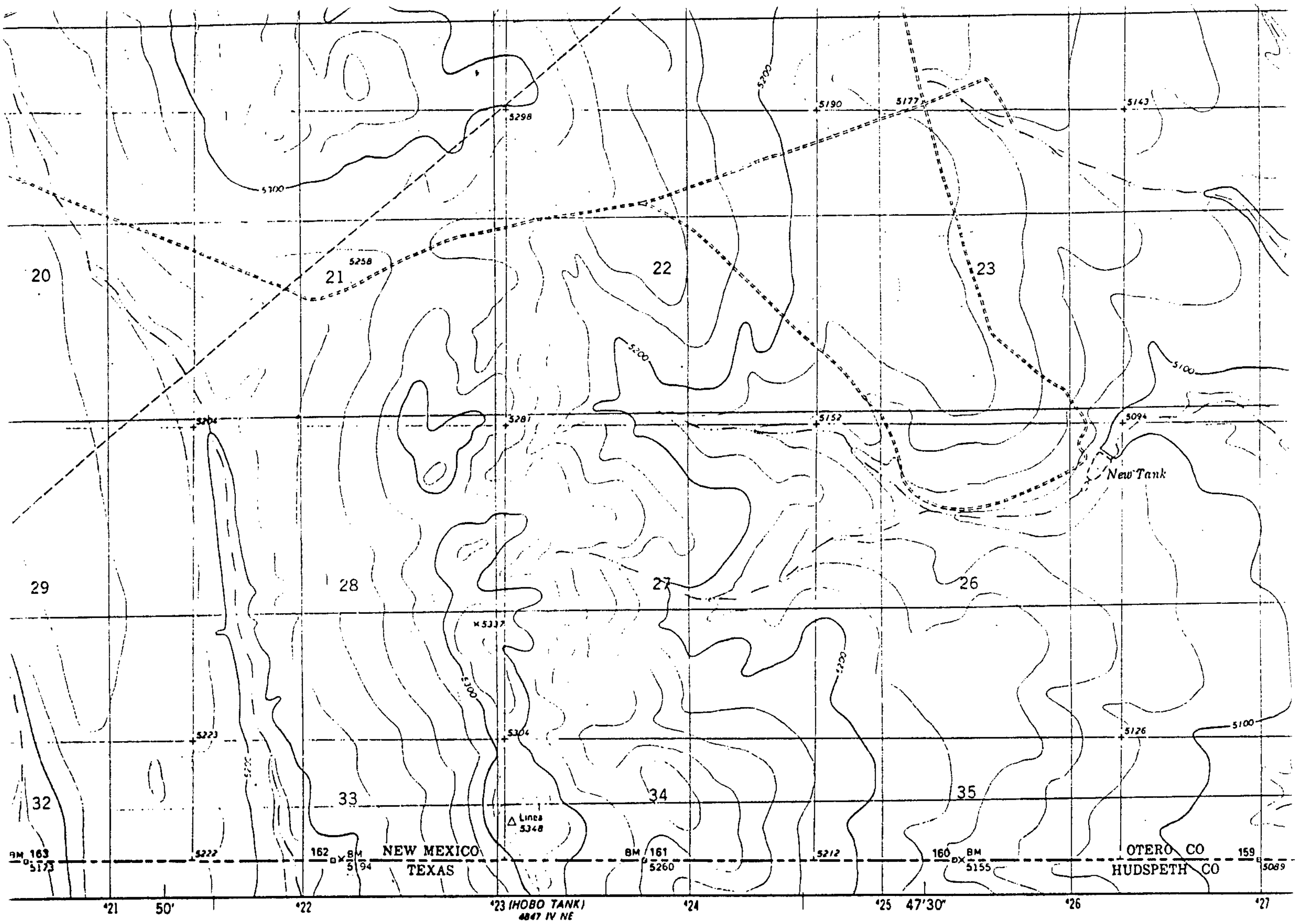

ige Geomorphic
s and Symbols[1]

	A1
	A2
t)	A3
	B
de) Sediments	CR•••
	DL
	DP
	DS
	DSC
ous	DSG
	P
	P1
	P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

3205–221

GN MN

0°26'
8 MILS

11°
196 MILS

UTM GRID AND 1980 MAGNETIC
DECLINATION AT CENTER OF S

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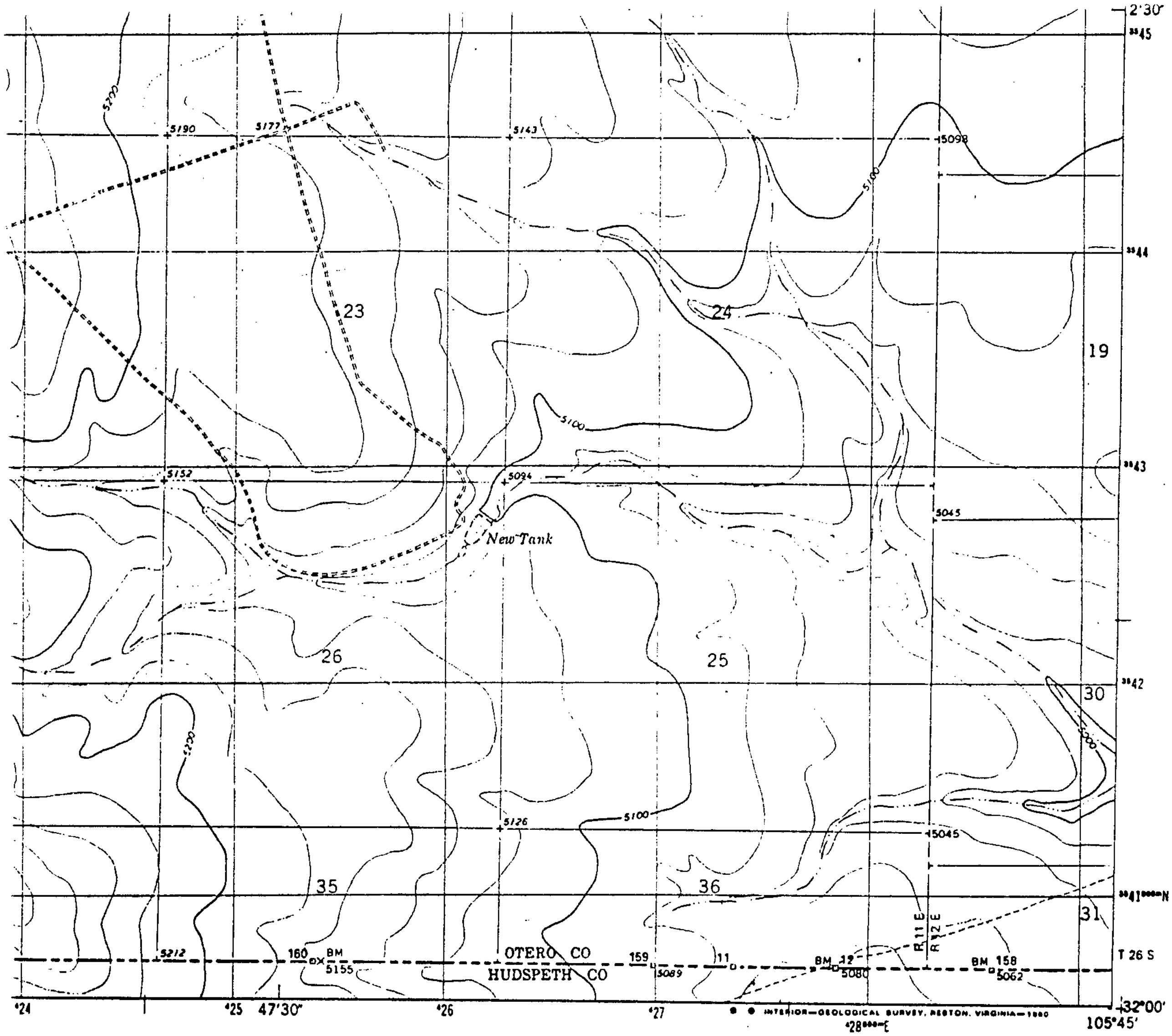
8



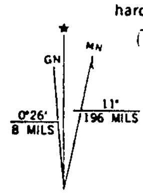
1 MILE
6000 7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

ʀS
ʔ9

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

BASSETT LAKE, N. MEX.–TEX.
SE/4 BASSETT LAKE 15' QUADRANGLE
N3200—W10545/7.5

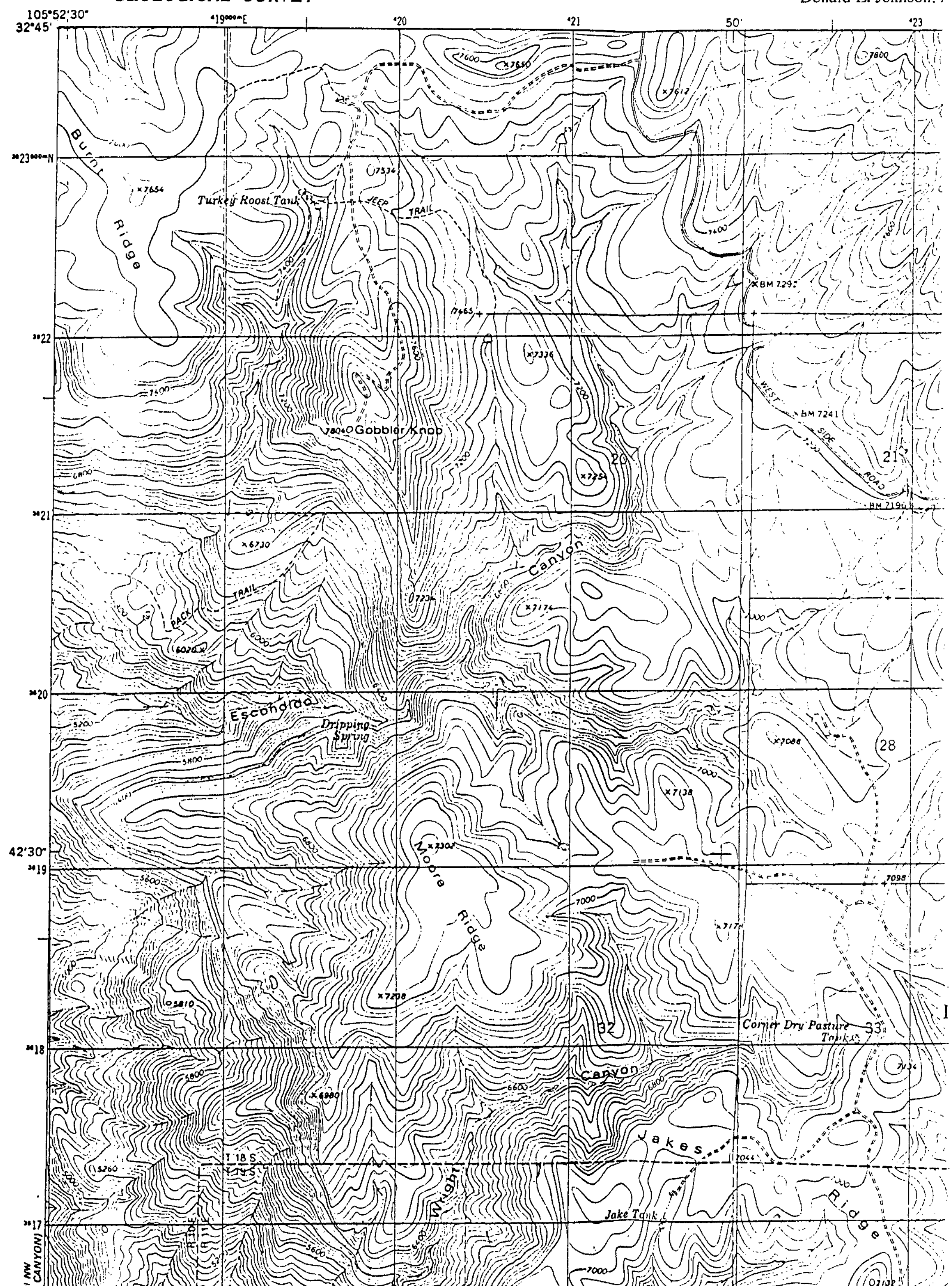
1980

NDARDS
OR RESTON, VIRGINIA 22092
LABLE ON REQUEST

3205–221

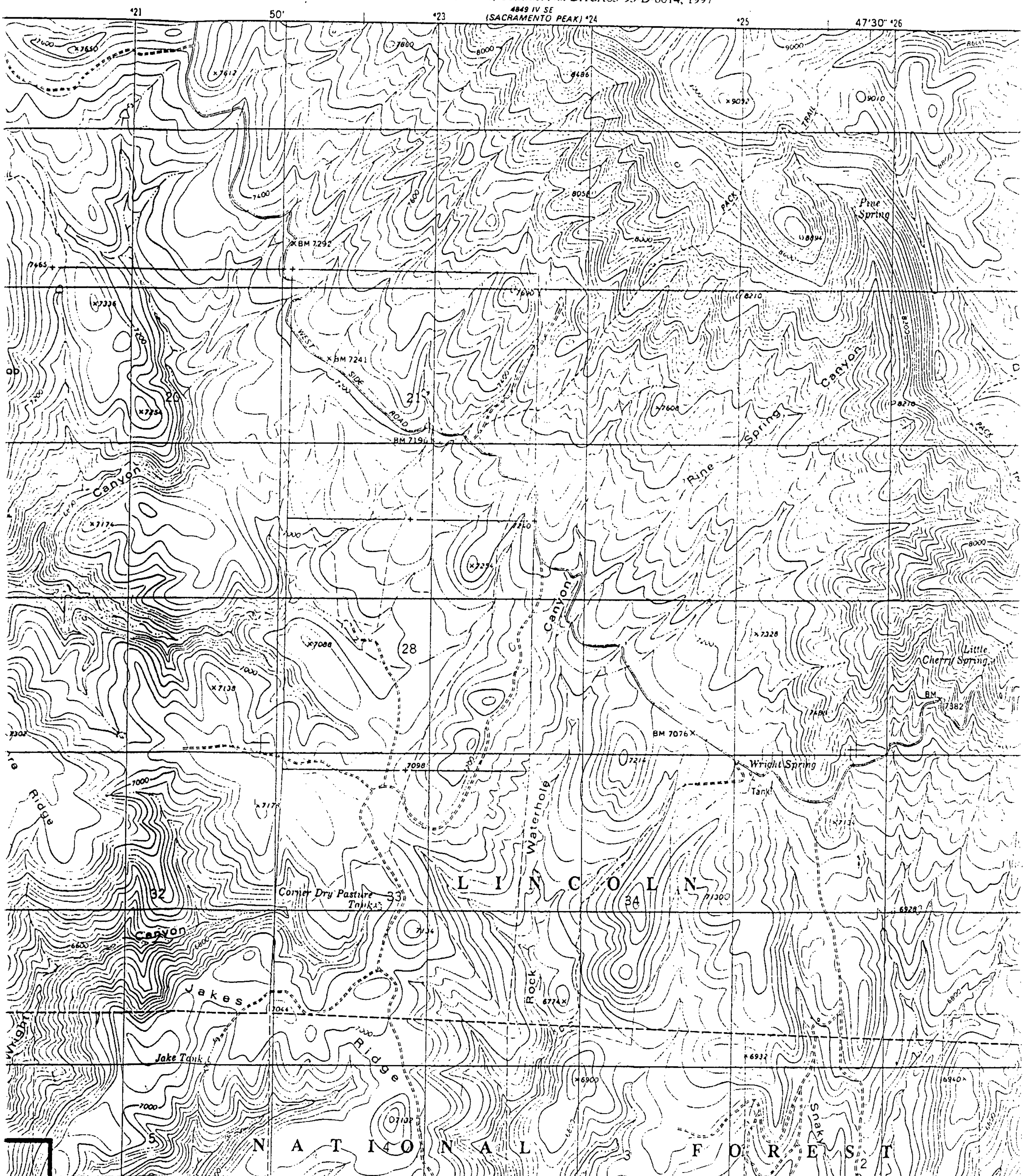
DMA 4848 III SE—SERIES V881

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

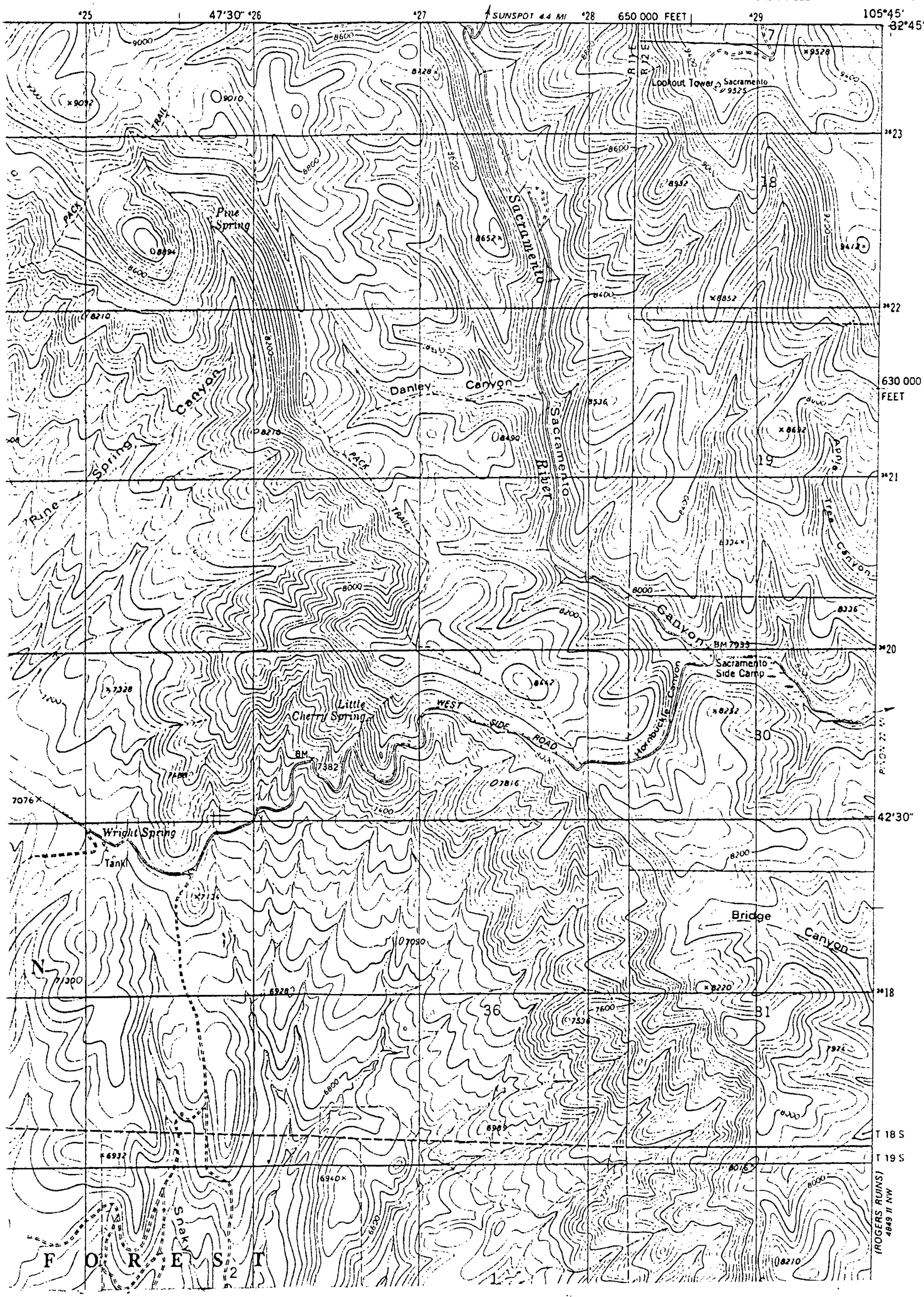
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



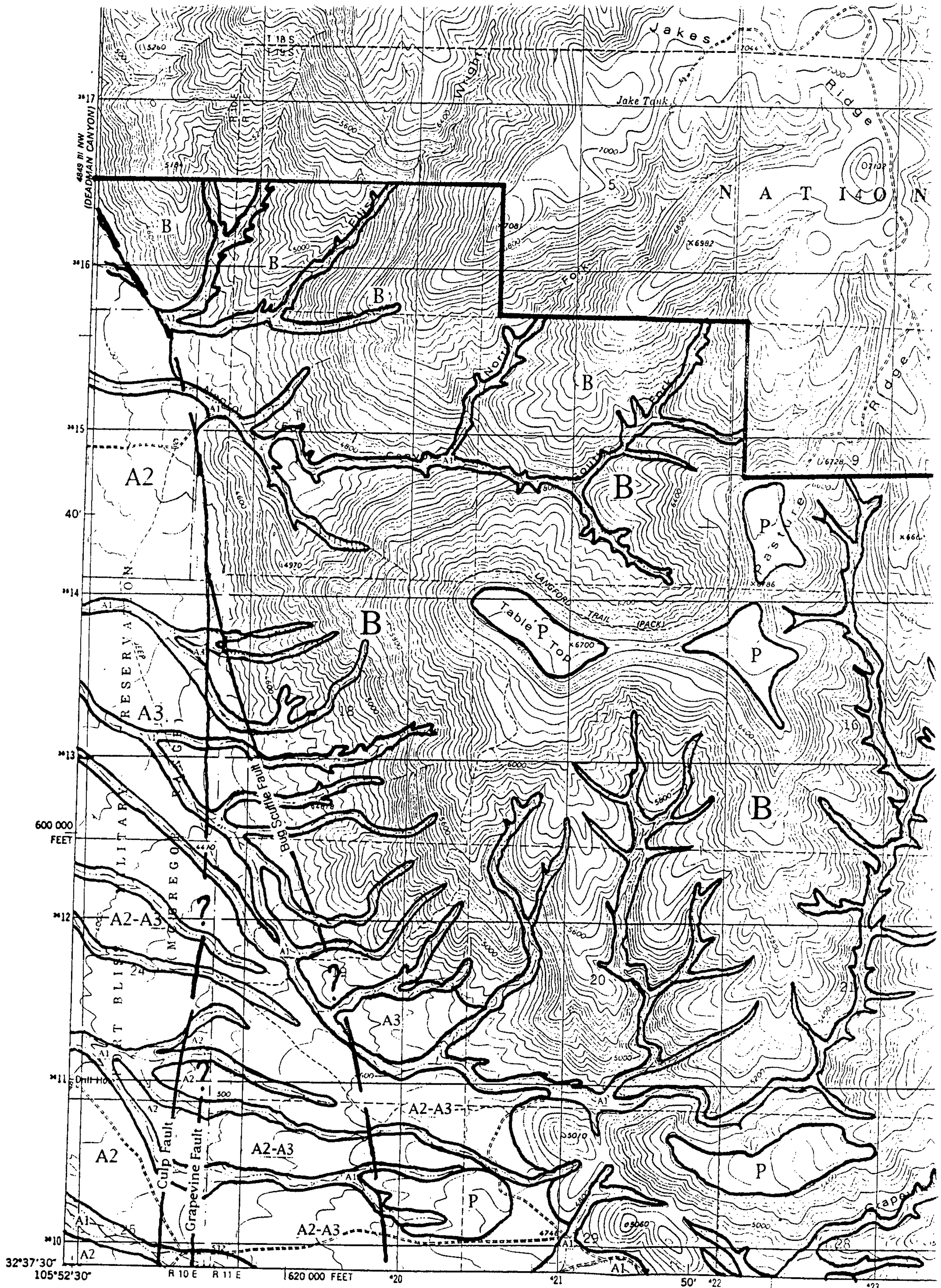
Surficial Mapping
s, New Mexico
14, 1997

BUG SCUFFLE CANYON QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 ESCONDIDO CANYON 15' QUADRANGLE

4849 I SW
(BLUFF SPRINGS)



3



4

(PIPELINE CANYON) 4849 III SW

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1972. Field checked 1975. Map edited 1981

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

To place on the predicted North American Datum 1983

McGregor Range Geomorphic Mapping Units and Symbols[1]	
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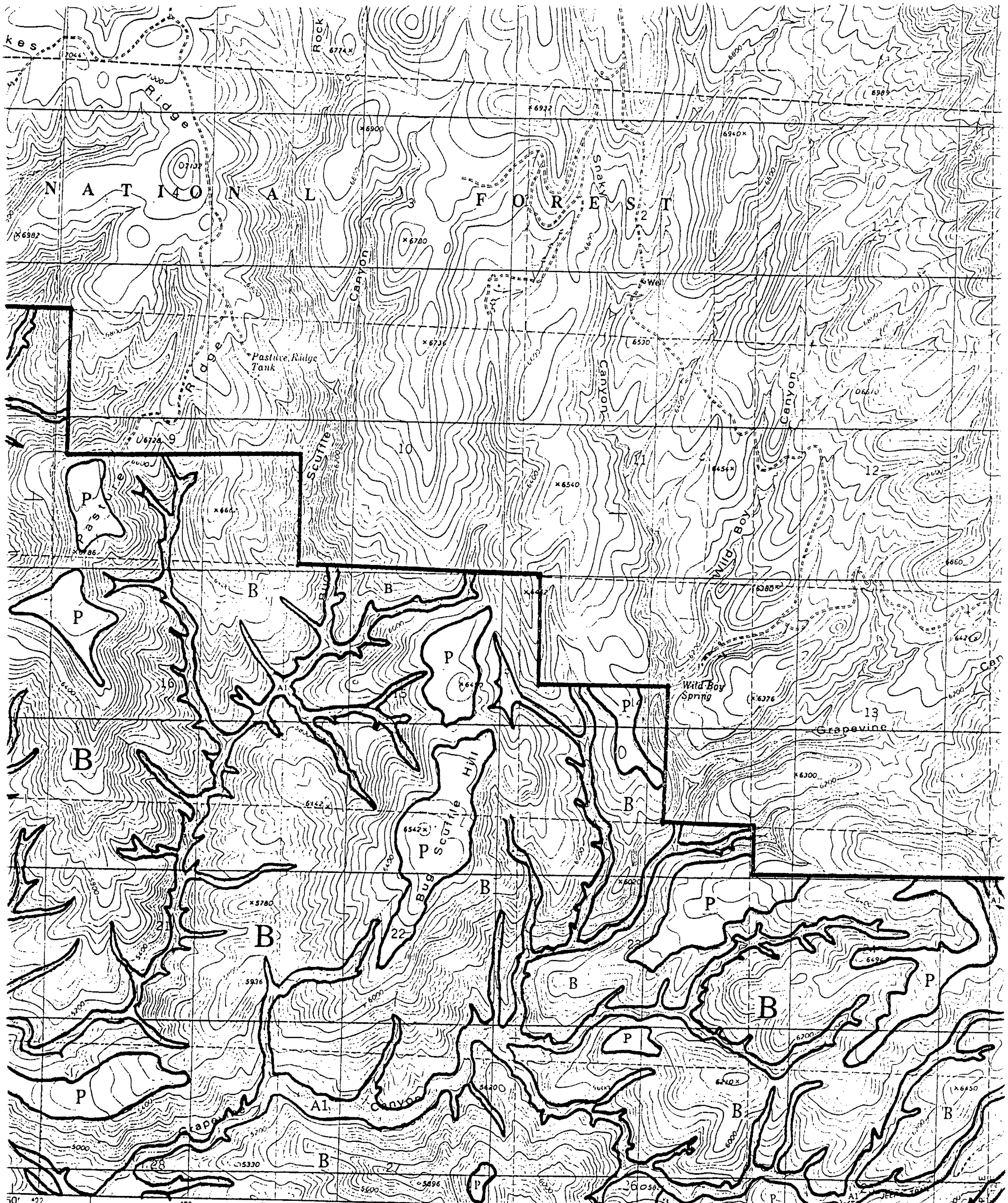
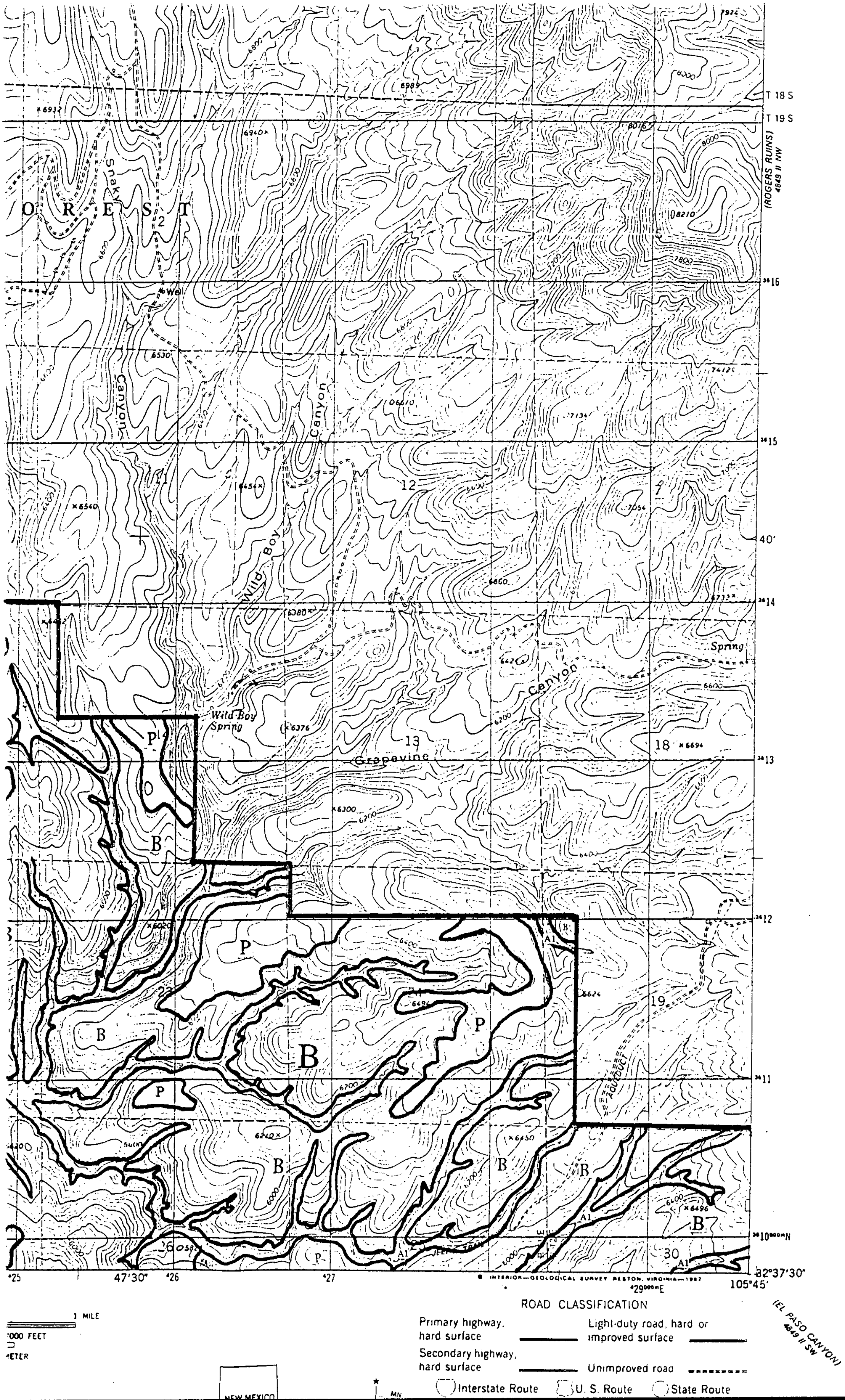
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL

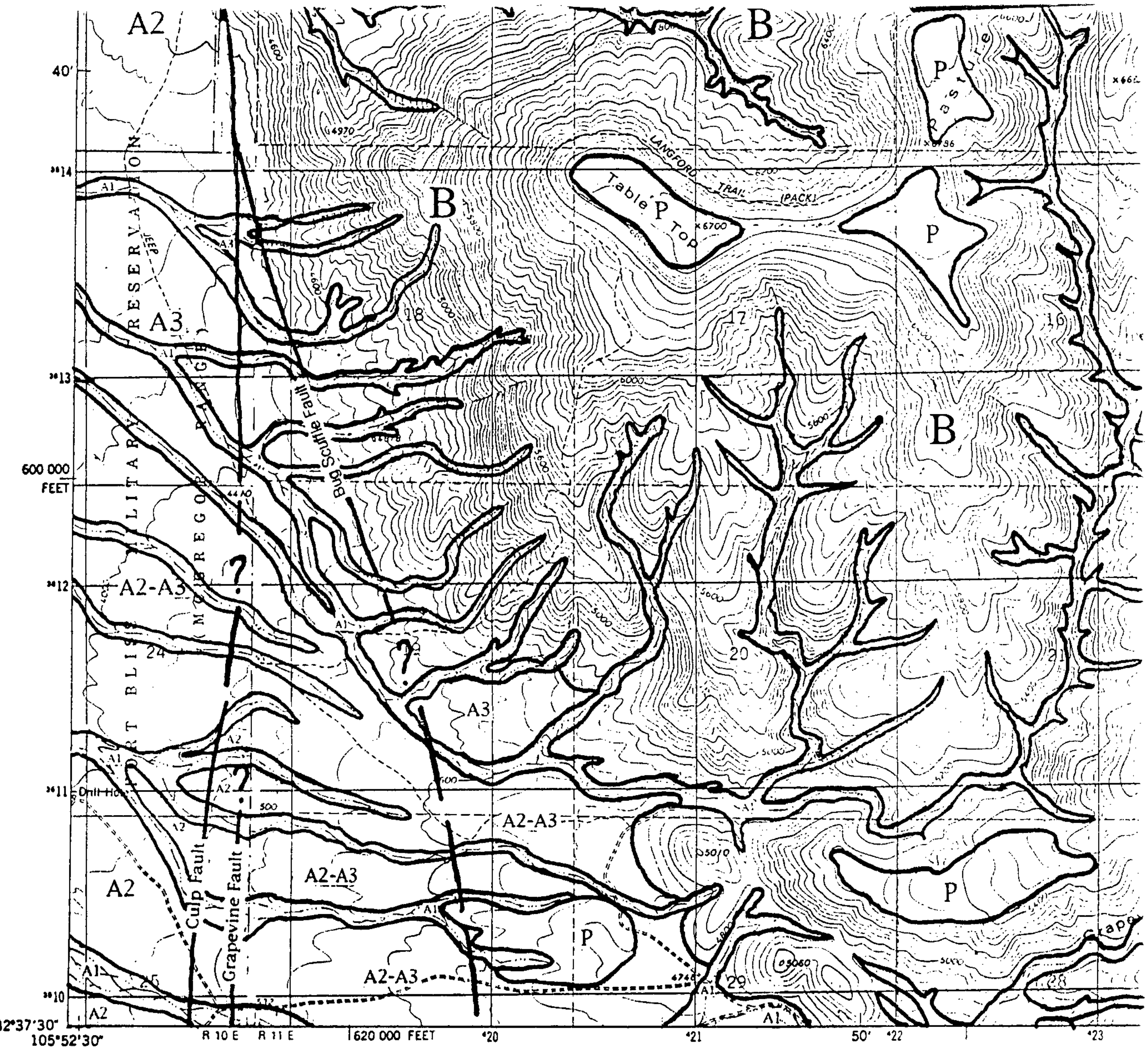
CONT
NATIONAL GE


N A T I O N A L F O R E S T
Ridge
Rock
Snake
Canyon
Pasture Ridge Tank
Scuffle
Wild Boy
Canyon
Wild Boy Spring
Grapevine
Bug Scuffle Hill
Grapevine
Canyon
Well
B
P
A1
(CULP CANYON)
4849 III SE
47'30"
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ROAD C
Primary highway, hard surface
Secondary highway, hard surface



T 18 S
T 19 S
(ROGERS RUINS) 4849 II NW
O R E S T
Snaky Canyon
Wild Boy Canyon
Wild Boy Spring
Grapevine Canyon
Spring
Well
AQUEDUCT
P
B
A1
47'30"
105°45'
32°37'30"
40'
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1987
(EL PASO CANYON) 4849 II SW
1 MILE
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
NEW MEXICO
MN

6



(PIPELINE CANYON)
4849 III SW

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1972. Field checked 1975. Map edited 1981

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

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Fine red dashed lines indicate selected fence lines

Where omitted, land lines have not been established or are not shown because of insufficient data

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McGregor Range Geomorphic Mapping Units and Symbols[1]	
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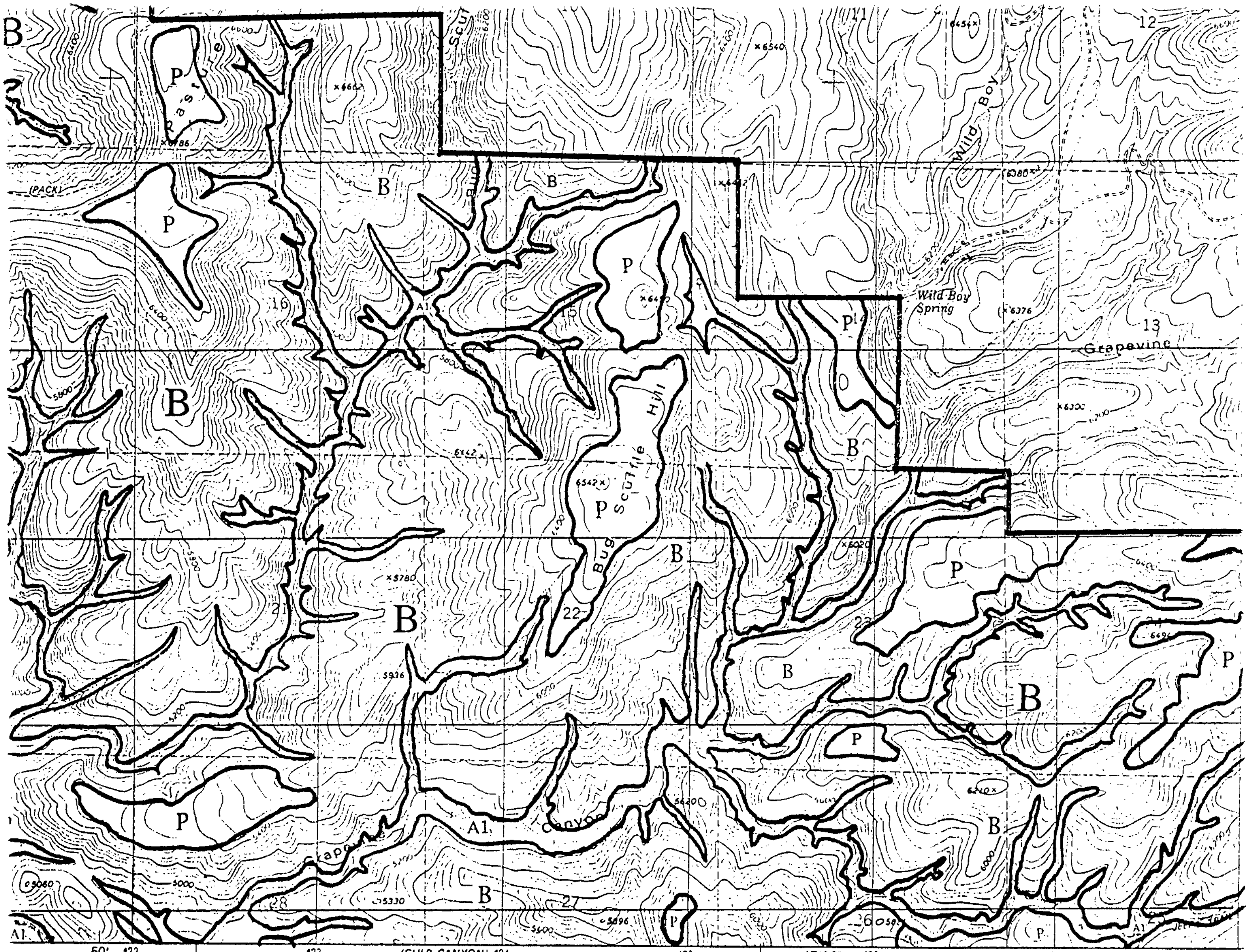
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	— —
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	——
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

1 ½
1000 0 100
1

NATION

THIS MAP CO
FOR SALE BY U. S. GEOLOGICAL
A FOLDER DESCRIBING TO



orphic
nbols[1]

A1
A2
A3
B
its CR•••
DL
DP
DS
DSC
DSG
P
P1
P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

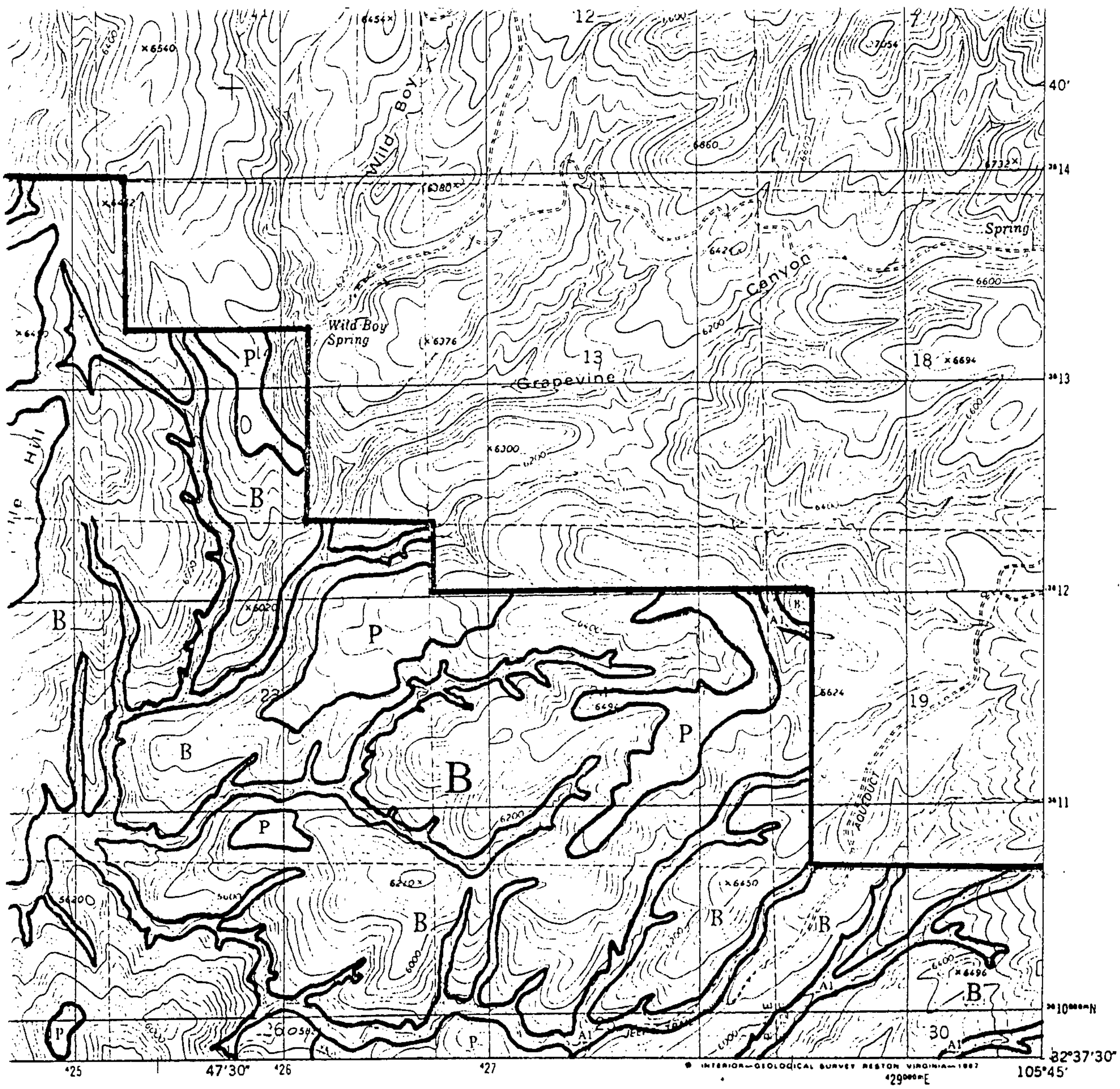
NEW MEXICO
QUADRANGLE LOCATION

GN MN
0°26' 8 MILS
11° 196 MILS

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

Primary highw
hard surface
Secondary hig
hard surface
Intersta

BU(



1 MILE
7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

(EL PASO CANYON) 4849 II SW

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°26' 8 MILS

11° 196 MILS

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

BUG SCUFFLE CANYON, N. MEX.

NE/4 ESCONDIDO CANYON 15' QUADRANGLE

N3237.5–W10545/7.5

1981

DMA 4849 III NE–SERIES V881

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ESTON, VIRGINIA 22092

ON REQUEST

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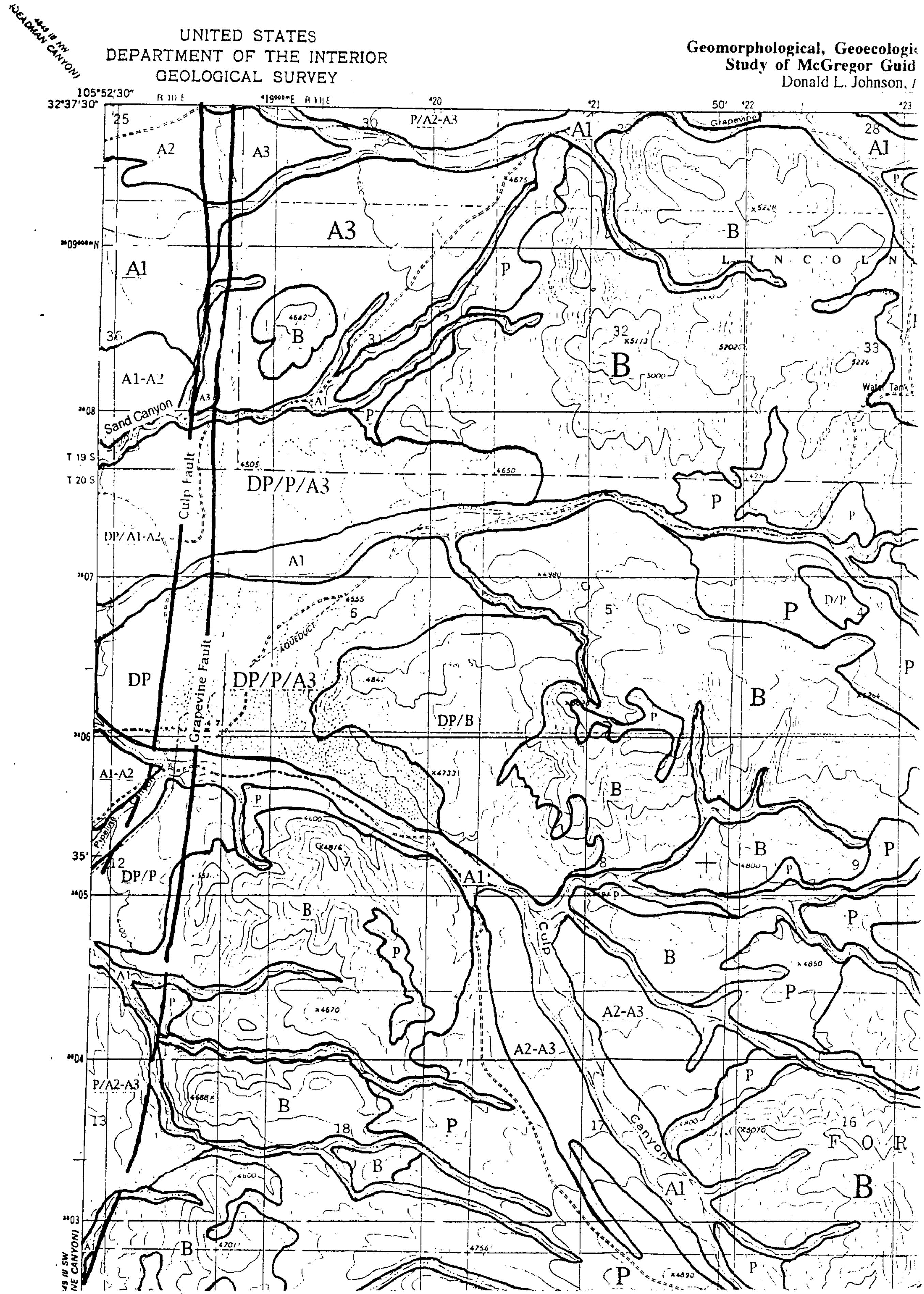
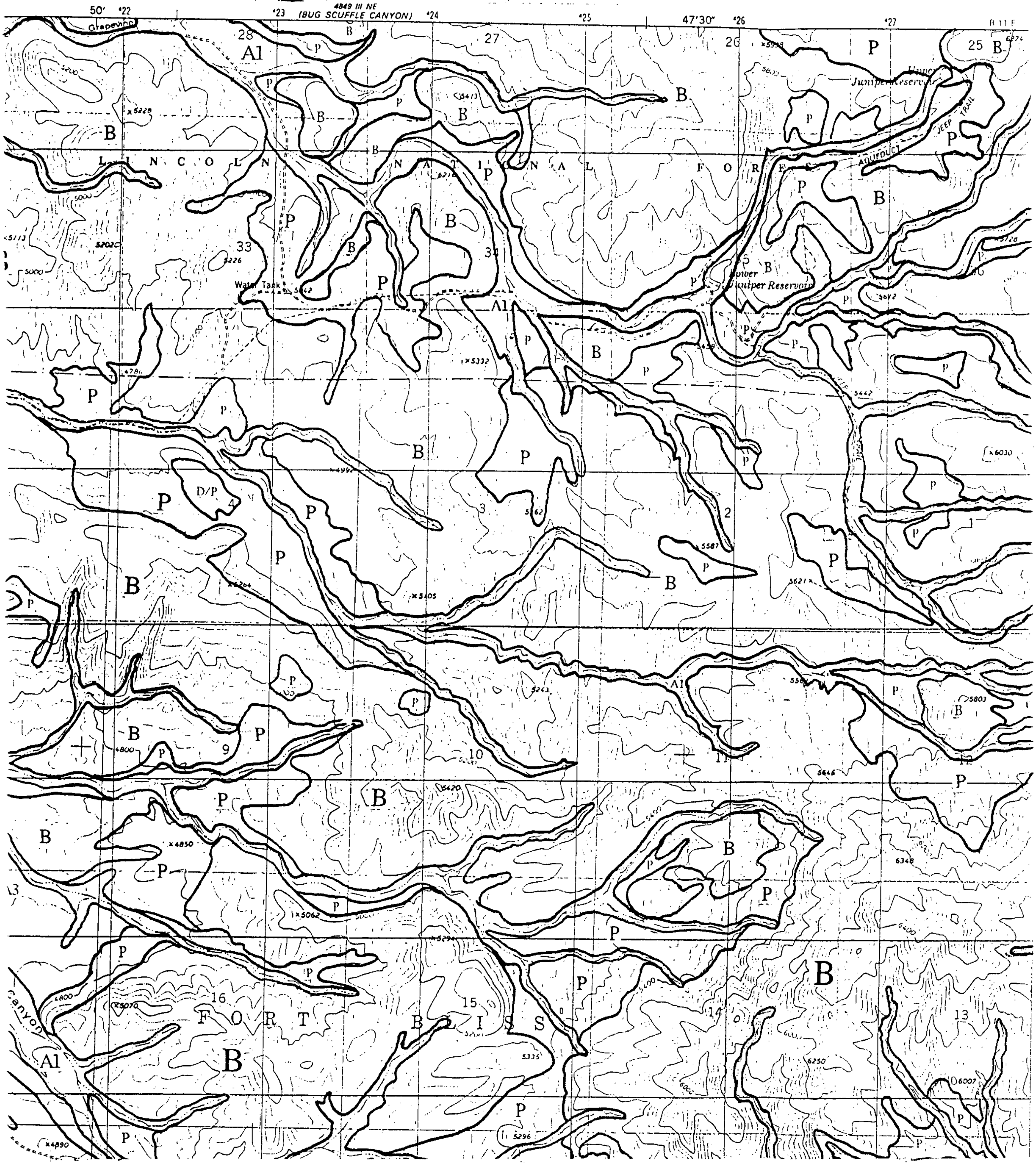

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
105°52'30"
32°37'30"
Sand Canyon
Culp Fault
Grapevine Fault
Culp
Canyon
AQUEDUCT
Water Tank
Grapevine
L I N C O L N
F O R
T 19 S
T 20 S
A1
A2
A3
B
P
A1-A2
DP/P/A3
DP/A1-A2
DP
DP/B
D/P
DP/P
A2-A3
P/A2-A3

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

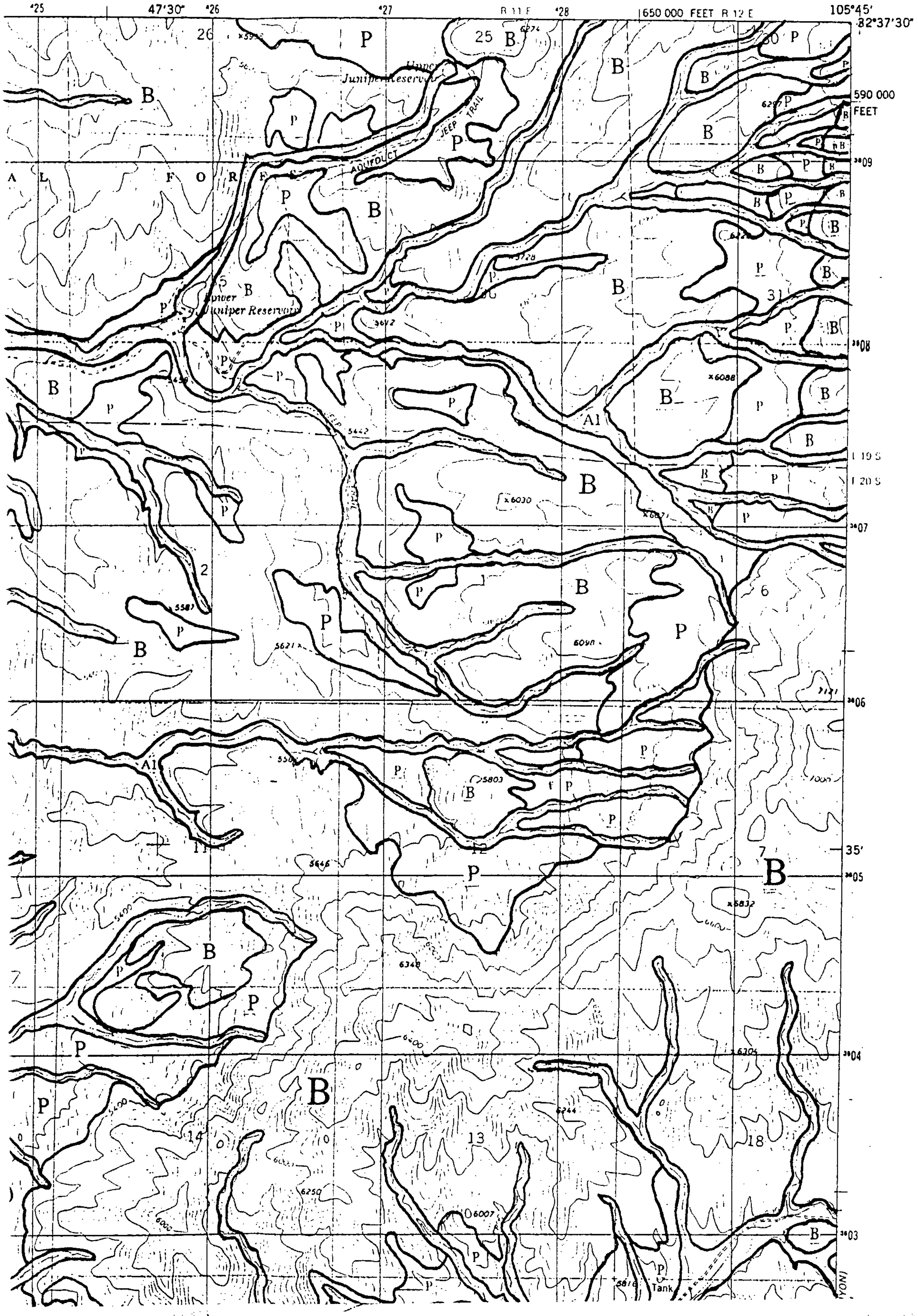


2

l Mapping
Mexico

CULP CANYON QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 ESCONDIDO CANYON 15' QUADRANGLE

4849 II NW
(ROGERS RUINS)



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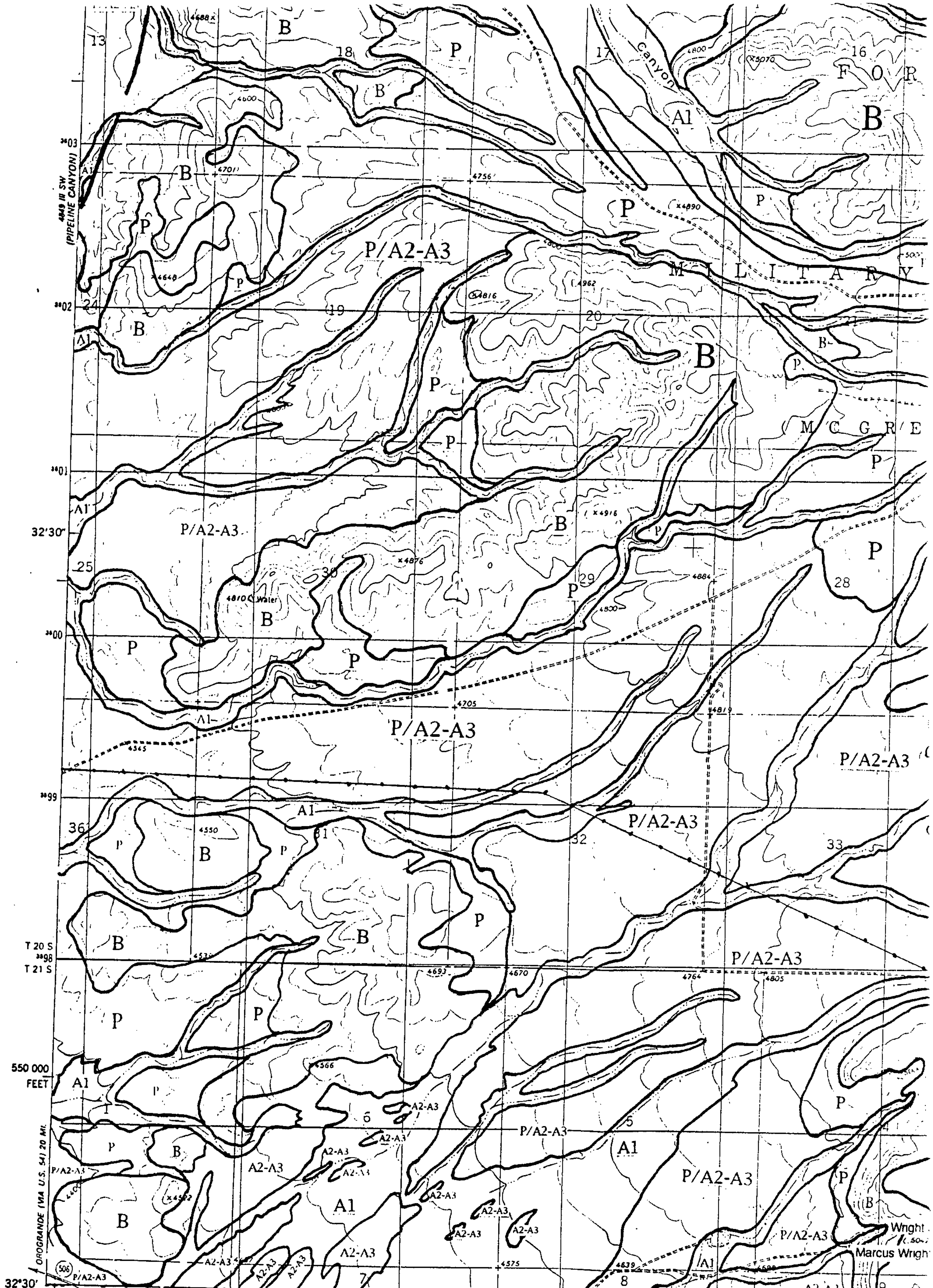

4

Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1972. Field checked 1975. Map edited 1981

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

McGregor Range Geomorphic Mapping Units and Symbols[1]

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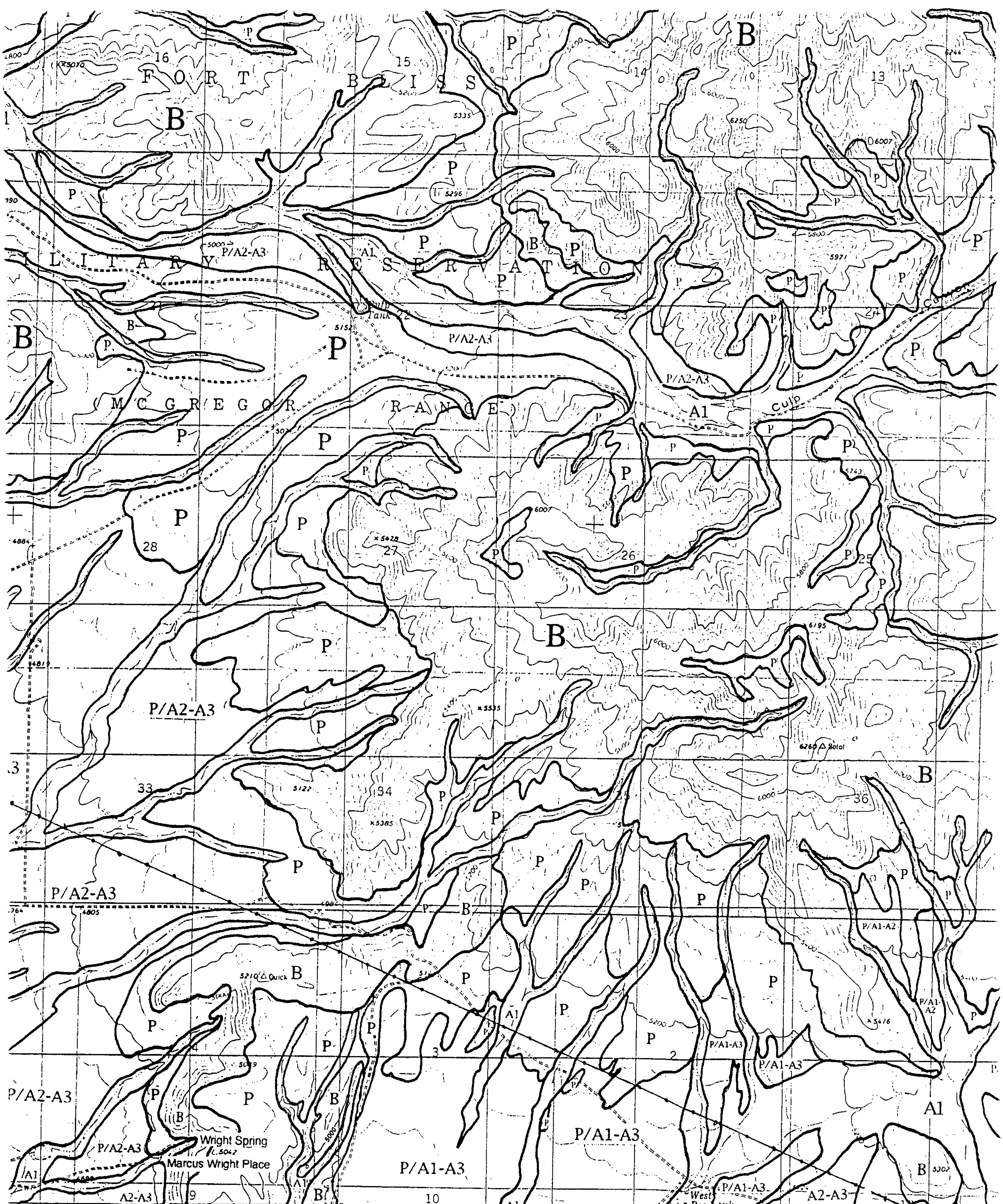
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR• • •



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

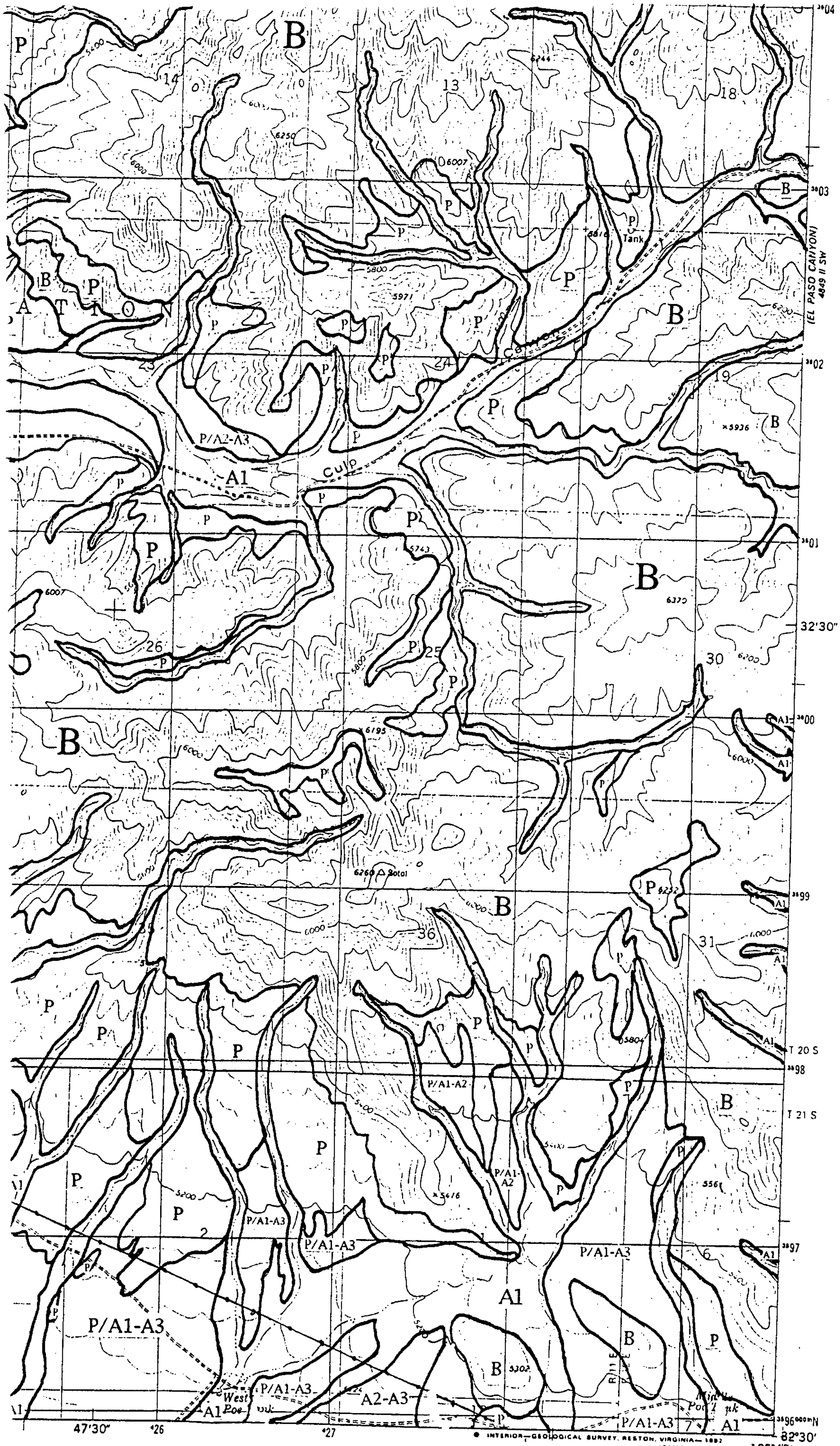
CONTOUR INTERVAL 40 FEET

5

ROAD CLASSIFICATION

Primary highway, hard surface

Secondary highway, hard surface



1 MILE

ROAD CLASSIFICATION

Primary highway, hard surface

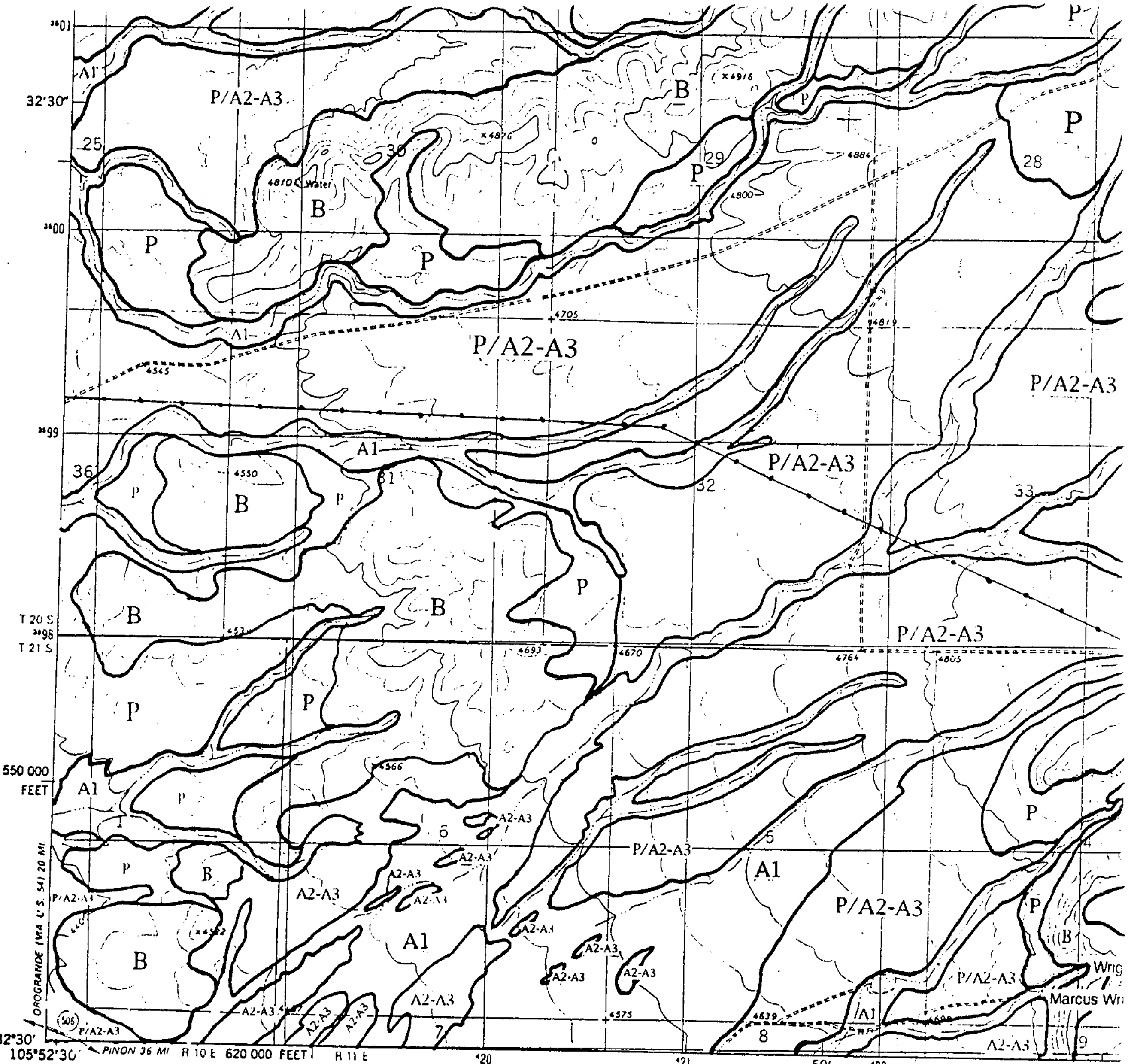
Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

(EL PASO DRAW) 4848 I NW

6



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Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

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Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬▬
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

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NATIONAL

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FOR SALE BY U. S. GEOLOGICAL SUR
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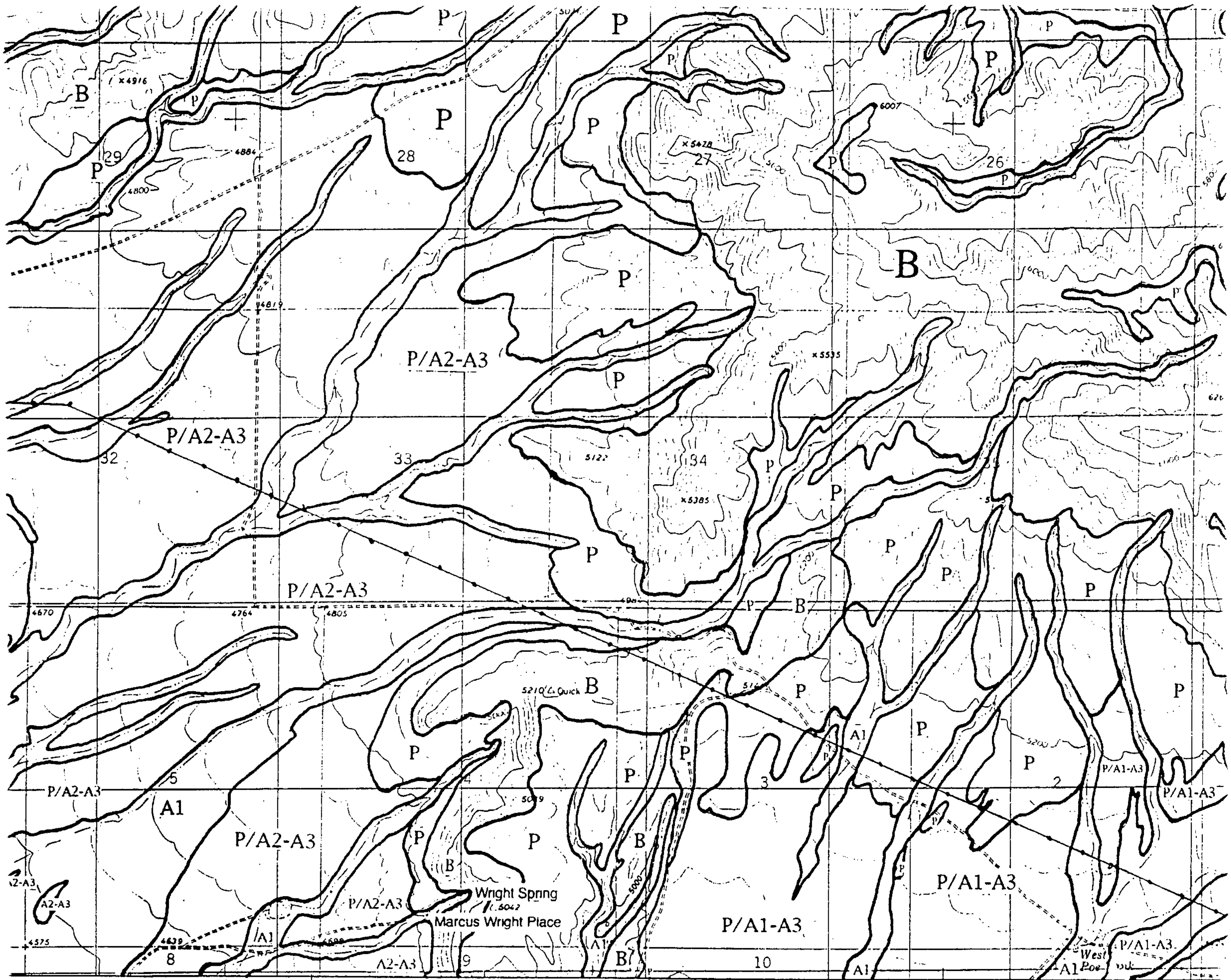

;or Range Geomorphic
ıg Units and Symbols[1]

ecent)	A1
elict)	A2
der relict)	A3
	B
Complex	
Rio Grande) Sediments	CR
	DL
	DP
	DS
Coppiced	DSC
Gypsiferous	DSG
	P
	P1
e	P1L
explanation	

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

0°26'
8 MILS

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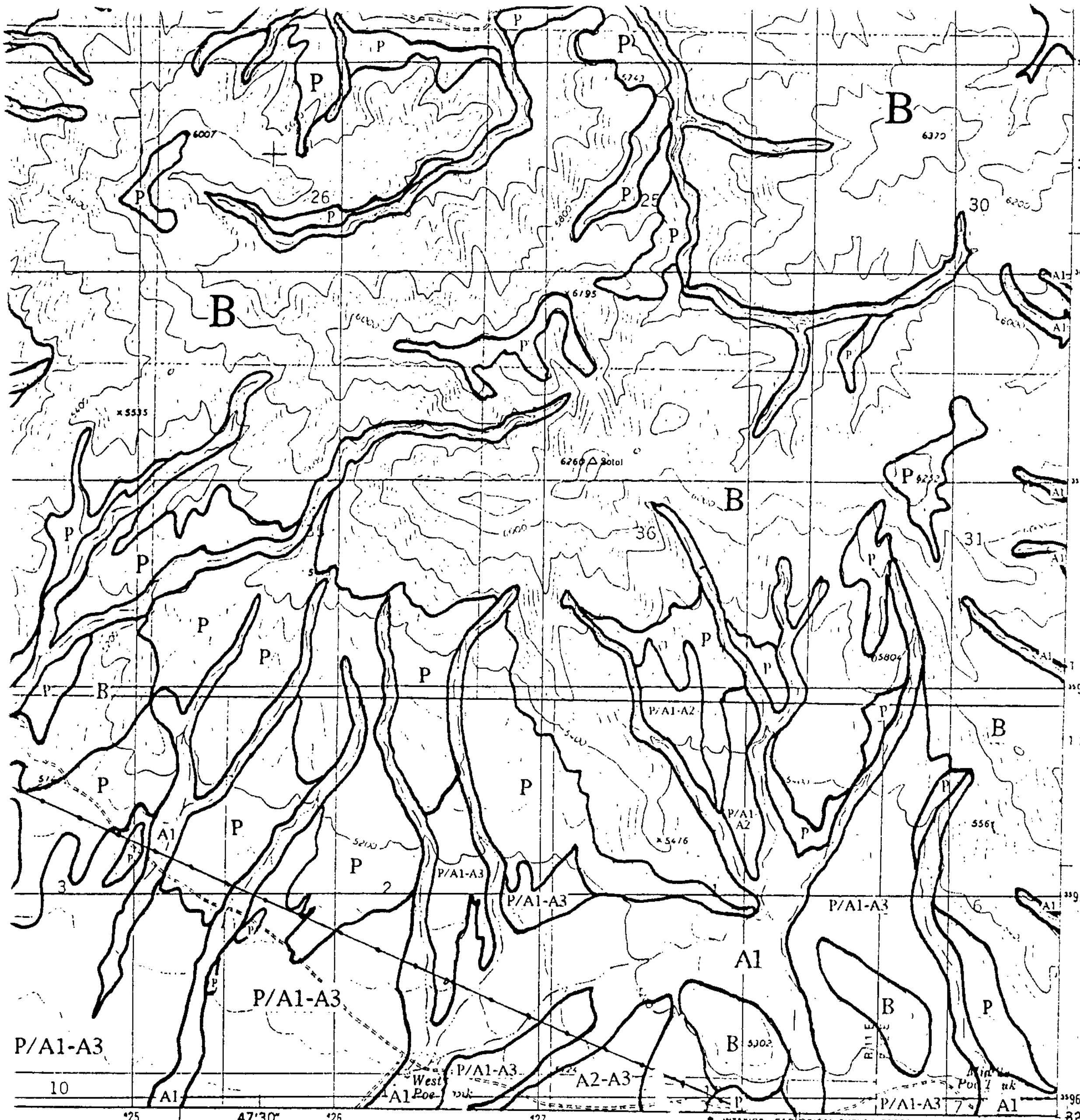
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UTM GRID AND 198
DECLINATION AT



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route   U. S. Route   State Route

1 MILE

6000   7000 FEET

1 KILOMETER

NEW MEXICO

QUADRANGLE LOCATION

GN   MN

0°26'
8 MILS

11°
196 MILS

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

(EL PASO DRAW)
4848 I NW

CULP CANYON, N. MEX.

SE/4 ESCONDIDO CANYON 15' QUADRANGLE

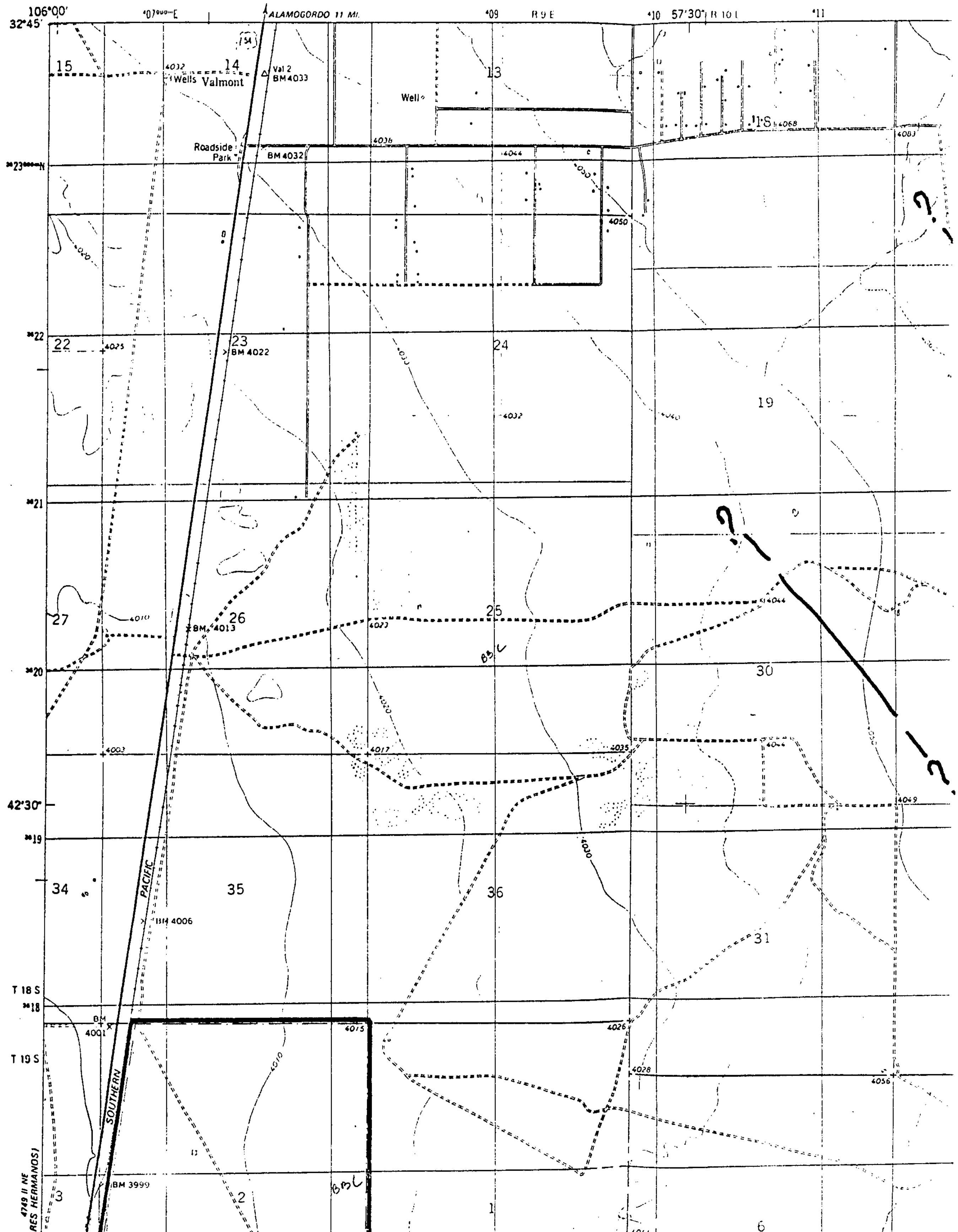
N3230—W10545/7.5

1981

DMA 4849 III SE—SERIES V881

NDARDS
)R RESTON, VIRGINIA 22092
.ABLE ON REQUEST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

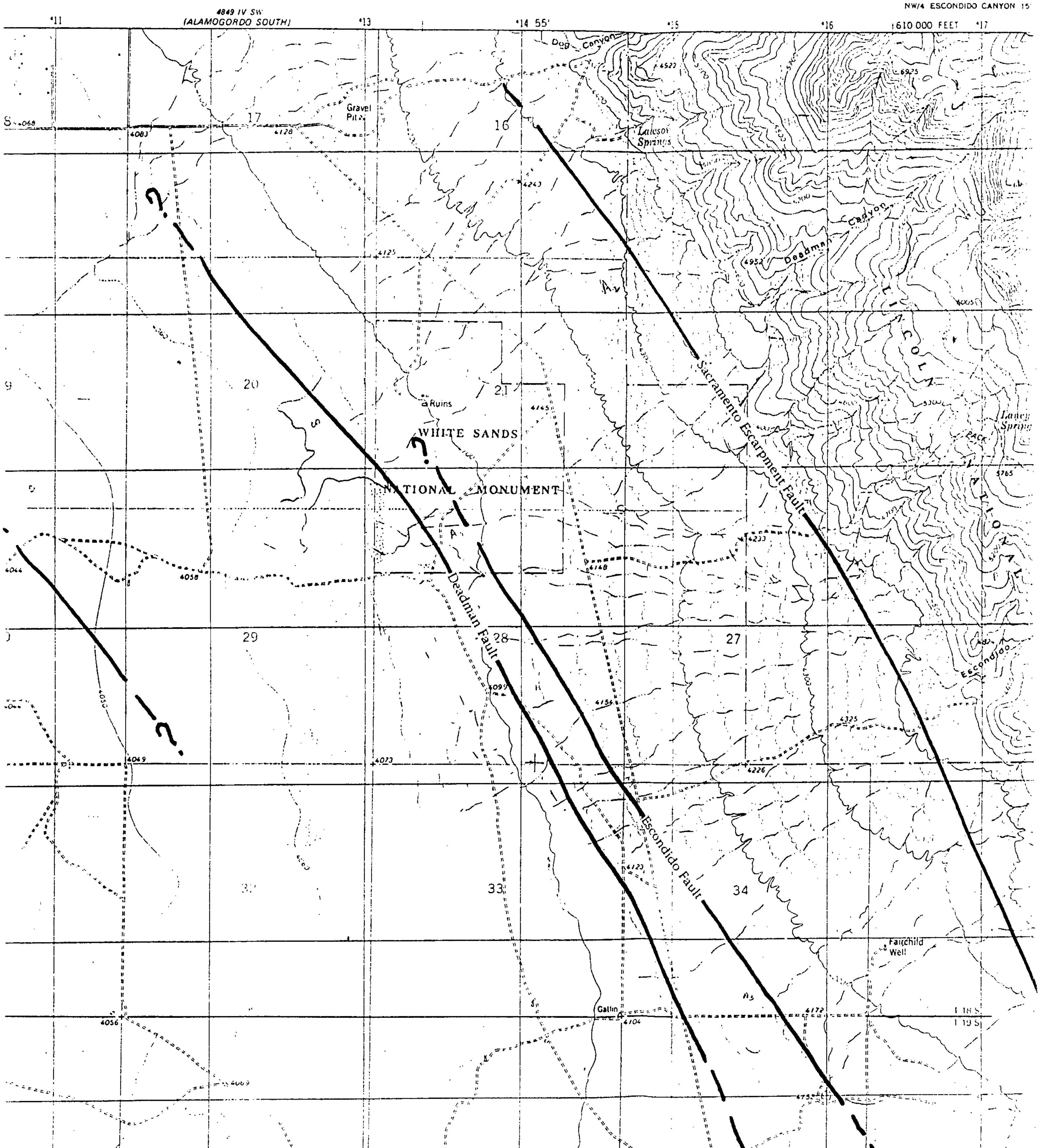


11

2

rphological, Geoecological, Geoarchaeological and Surficial Mapping
udy of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

DEADMAN CANYON C
NEW MEXICO-OTE
7.5 MINUTE SERIES (T
NW/4 ESCONDIDO CANYON 15'



Mapping
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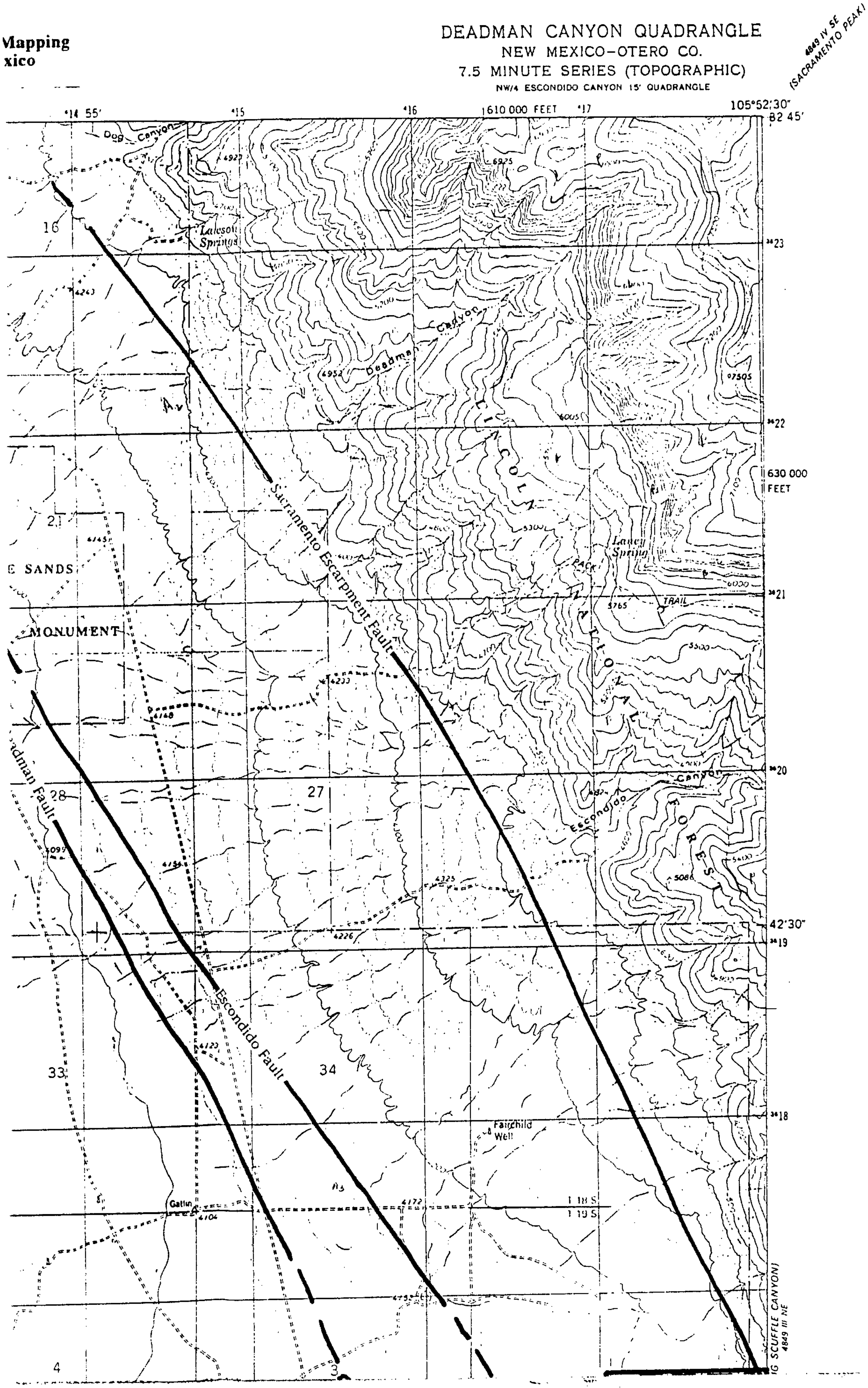

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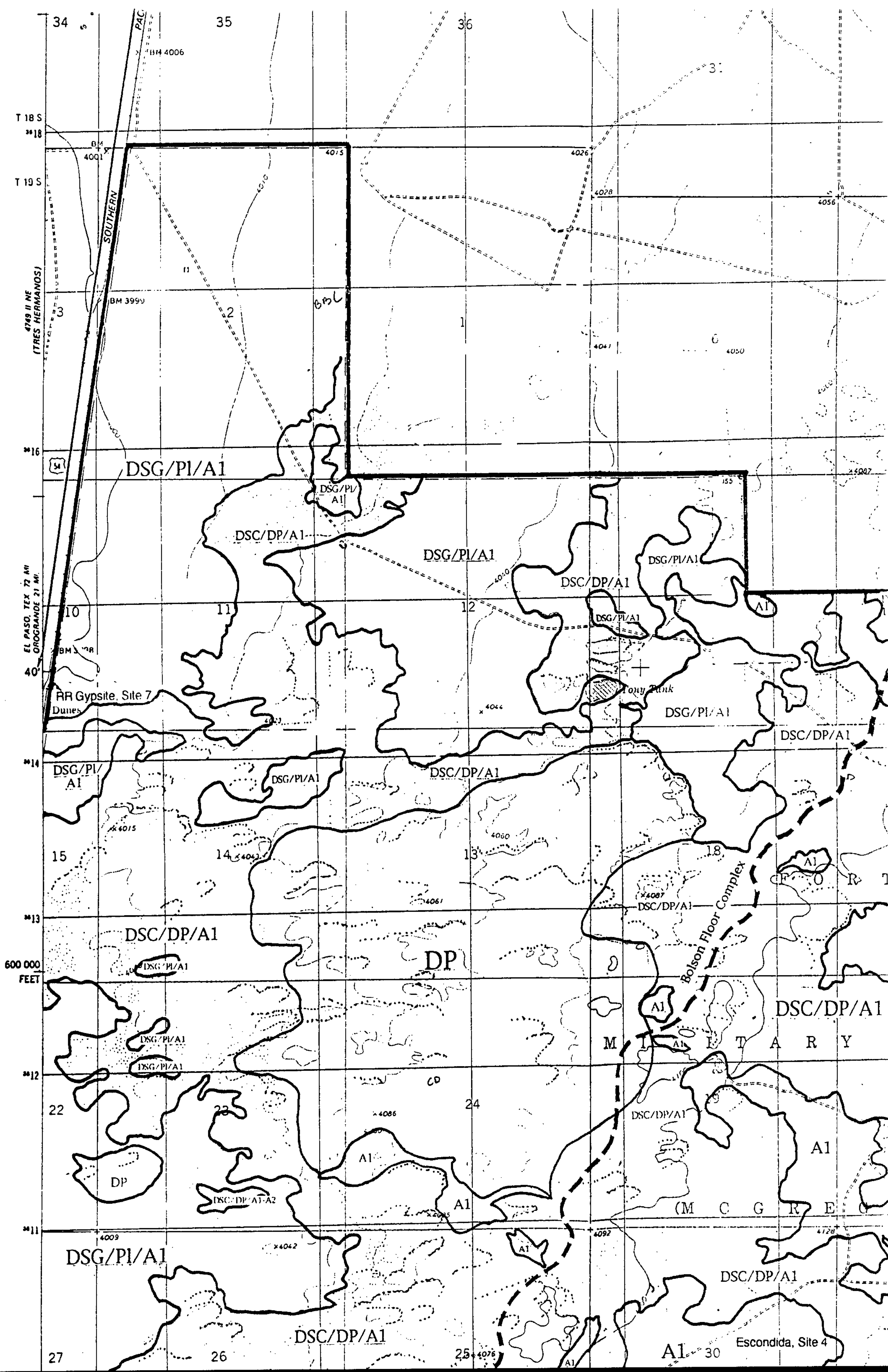
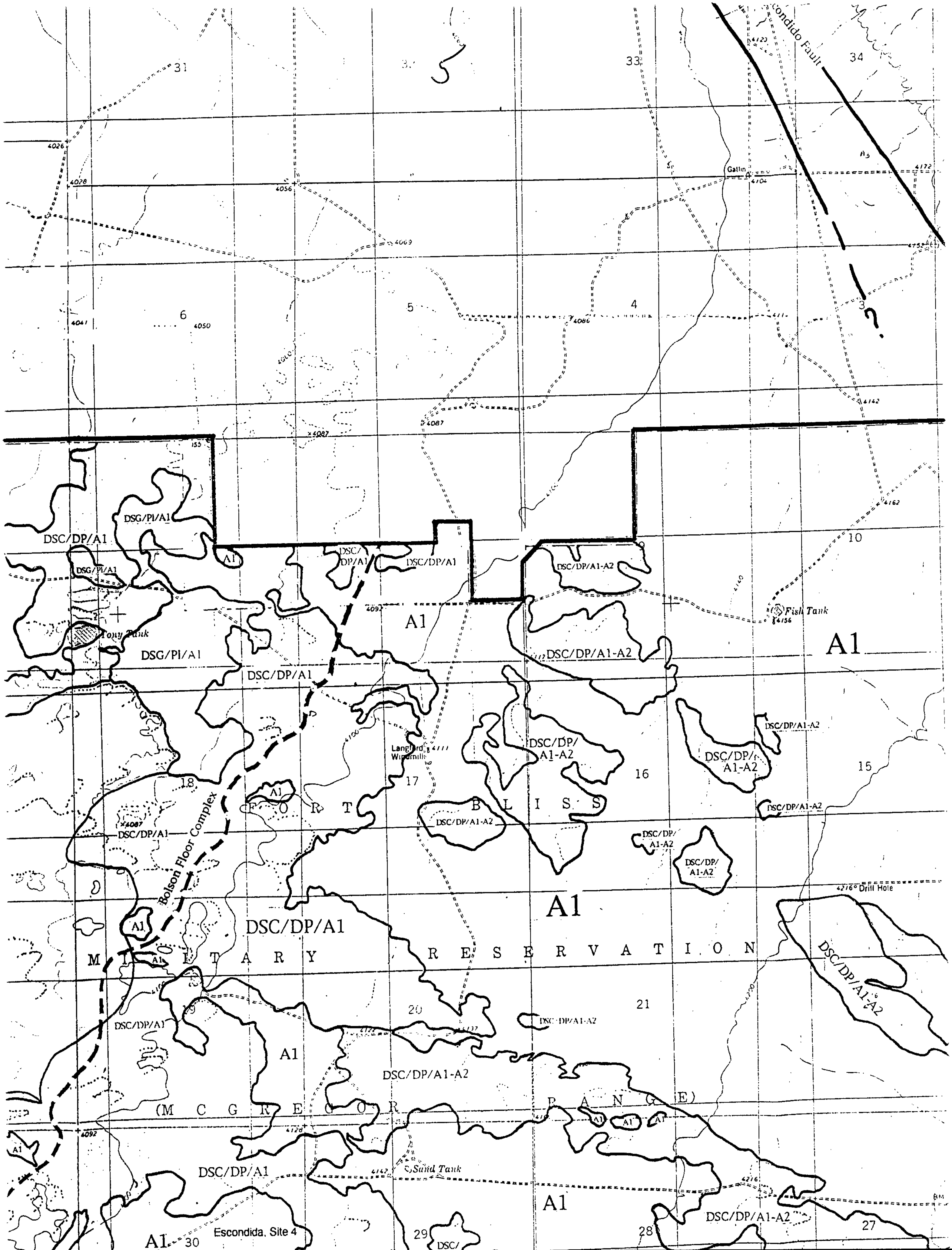


T 18 S
T 19 S
SOUTHERN
4749 II NE (TRES HERMANOS)
EL PASO, TEX. 72 MI. OROGRANDE 21 MI.
600 000 FEET
RR Gypsite, Site 7
Dunes
DSG/Pl/A1
DSC/DP/A1
DP
A1
DSC/DP/A1-A2
Tony Tank
Bolson Floor Complex
F O R T
M I L I T A R Y
(M C G R E G
Escondida, Site 4

4


condido Fault
Gallin
31
33
34
4
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3
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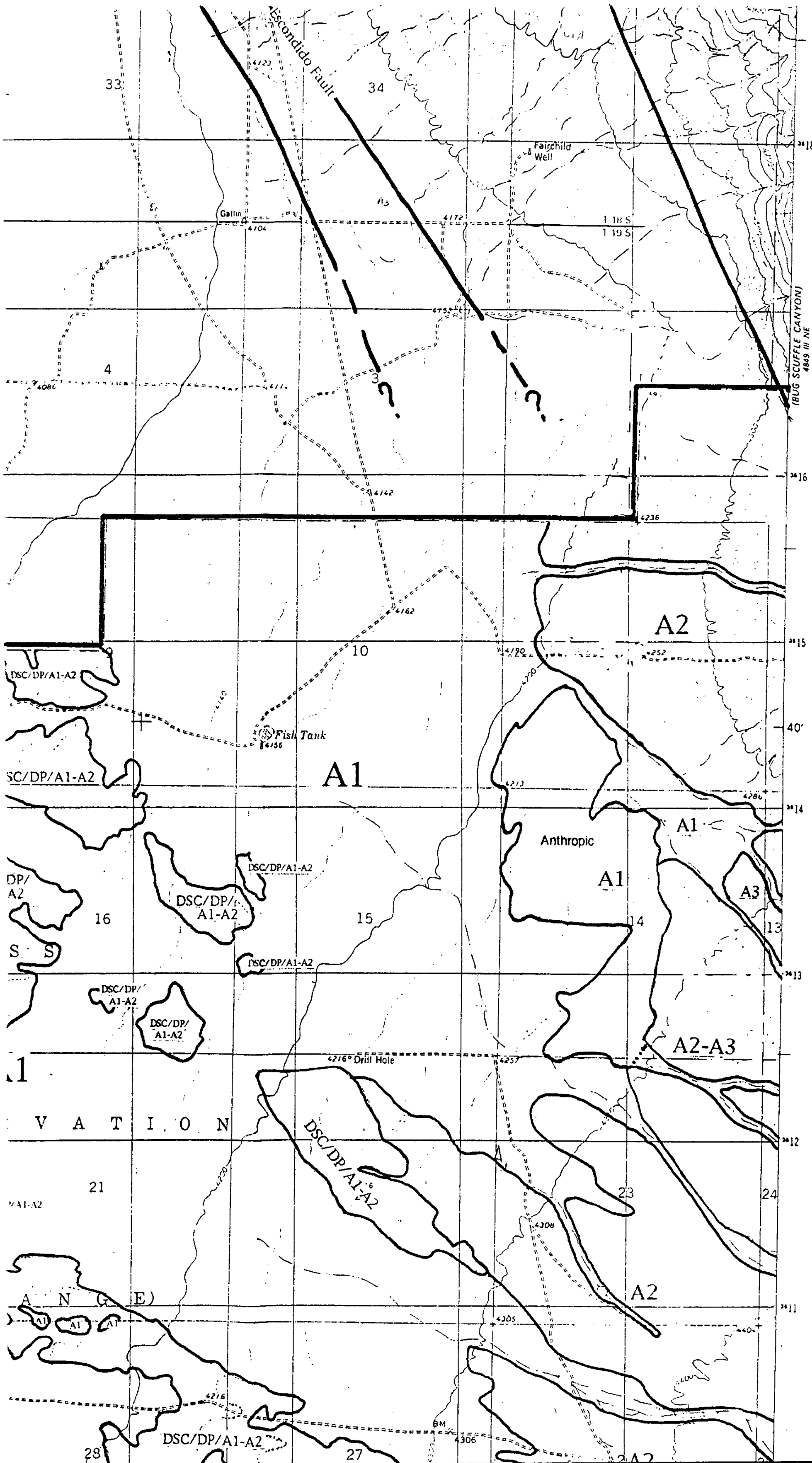
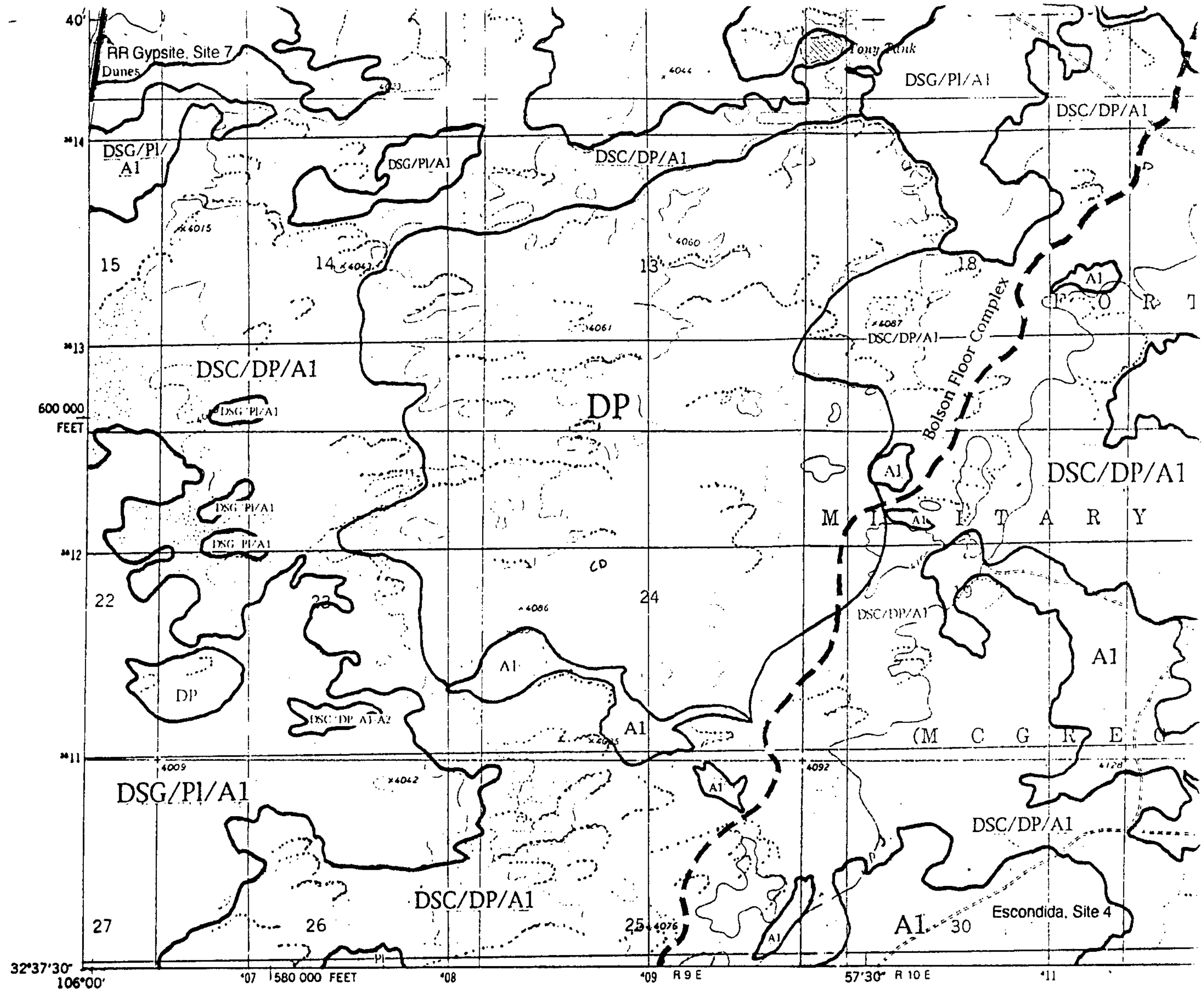
16
17
18
20
21
27
28
29
30
DSG/PI/A1
DSC/DP/A1
DSC/DP/A1-A2
A1
Tony Tank
Fish Tank
Langford Windmill
Bolson Floor Complex
4216° Drill Hole
F O R T B L I S S
M I L I T A R Y R E S E R V A T I O N
(M C G R E G O R R A N G E)
Sand Tank
Escondida, Site 4



Escondido Fault
33
34
Fairchild Well
Gatlin
T 18 S
T 19 S
4
(BUG SCUFFLE CANYON) 4849 III NE
DSC/DP/A1-A2
10
A2
Fish Tank
A1
Anthropic
A1
A3
15
16
14
13
A2-A3
Drill Hole
V A T I O N
21
23
24
A2
A N G E)
28
27

6



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Control by USGS, NOS/NOAA, and DMA

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1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 6 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

Where omitted, land lines have not been established

There may be private inholdings within the boundaries of the National or State reservations shown on this map

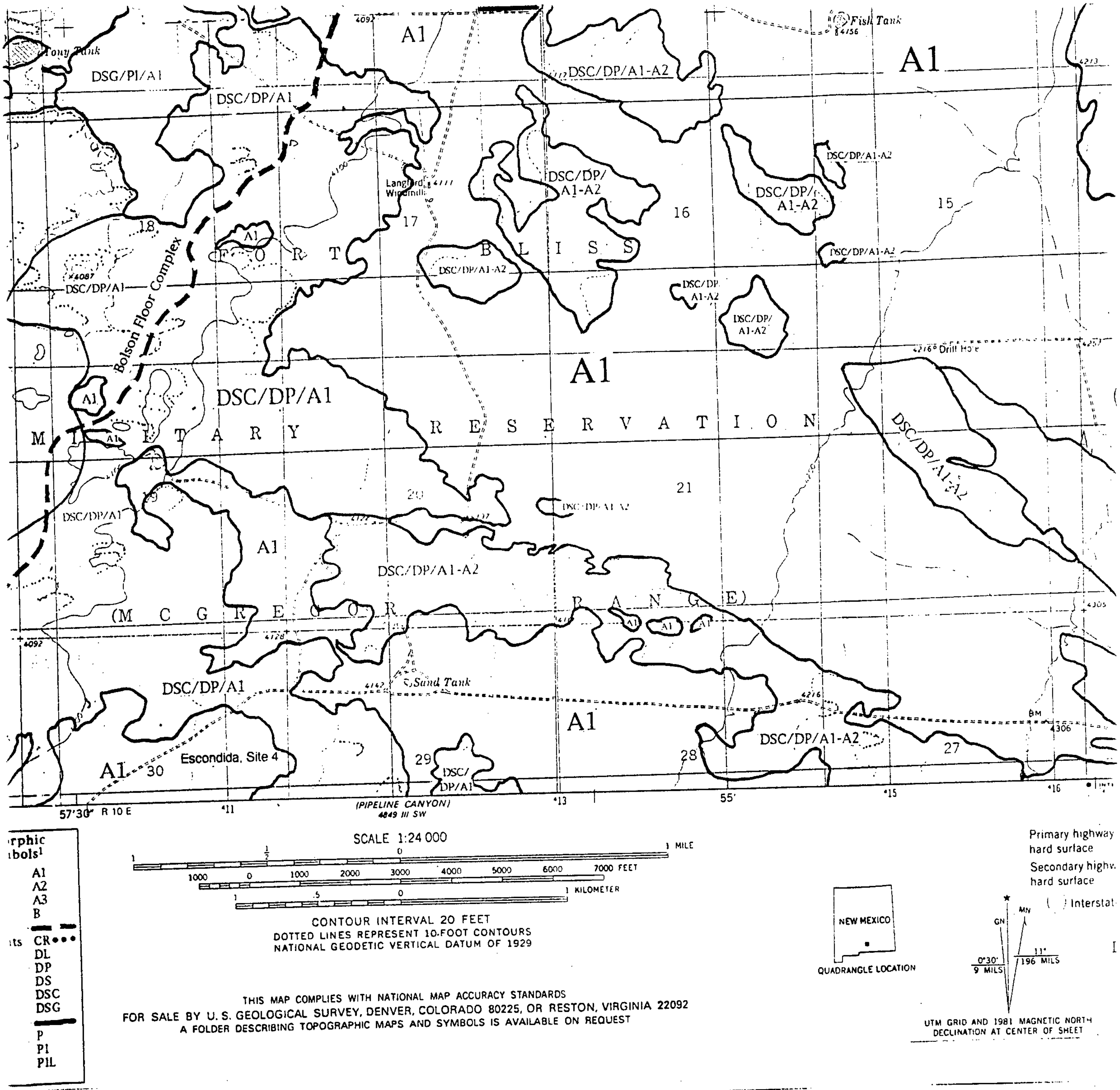
McGregor Range Geomorphic Mapping Units and Symbols[1]

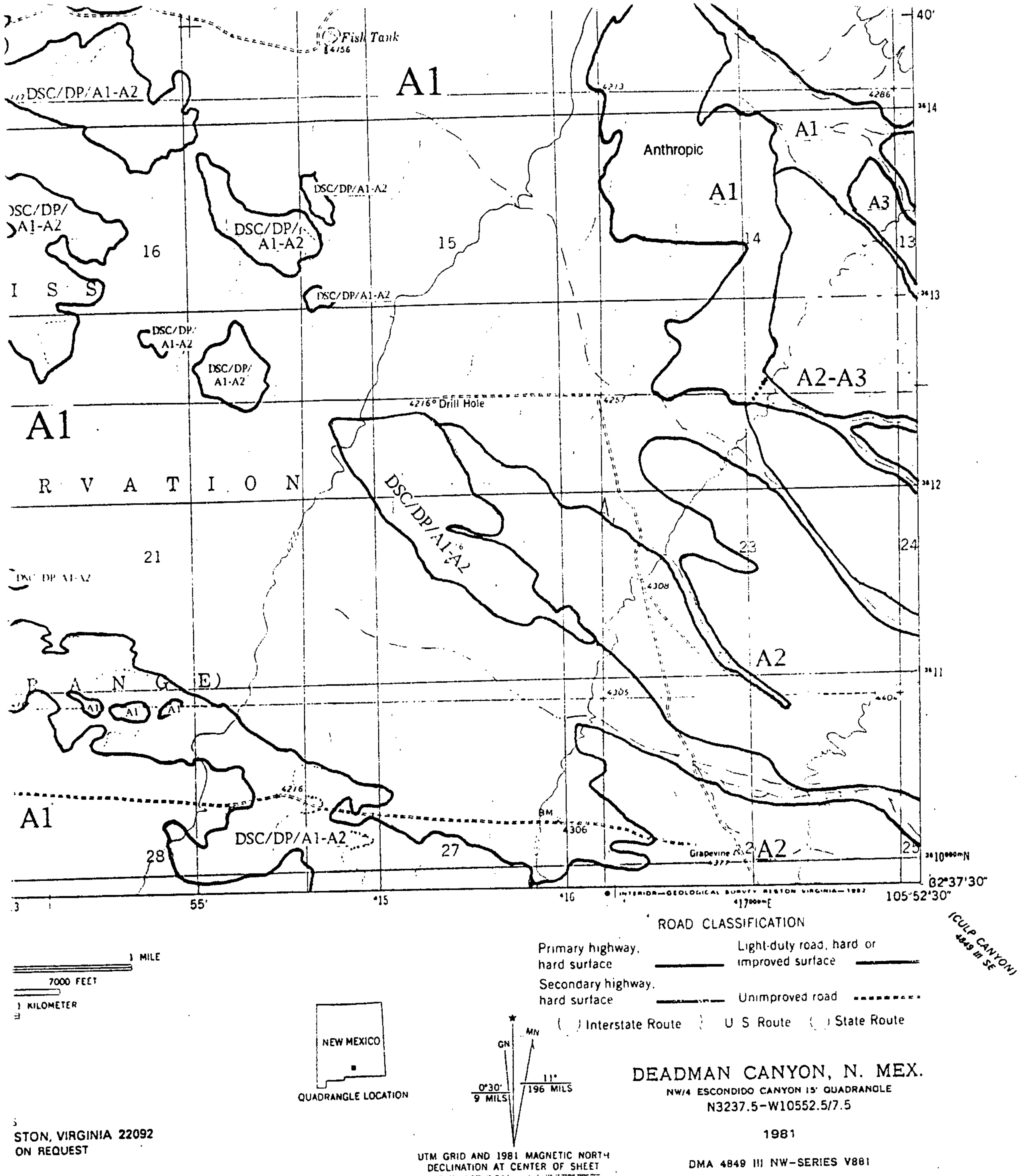
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

CONTO
DOTTED LINES
NATIONAL GEO

THIS MAP COMPLIES W
FOR SALE BY U. S. GEOLOGICAL SURVEY
A FOLDER DESCRIBING TOPOGRAPH

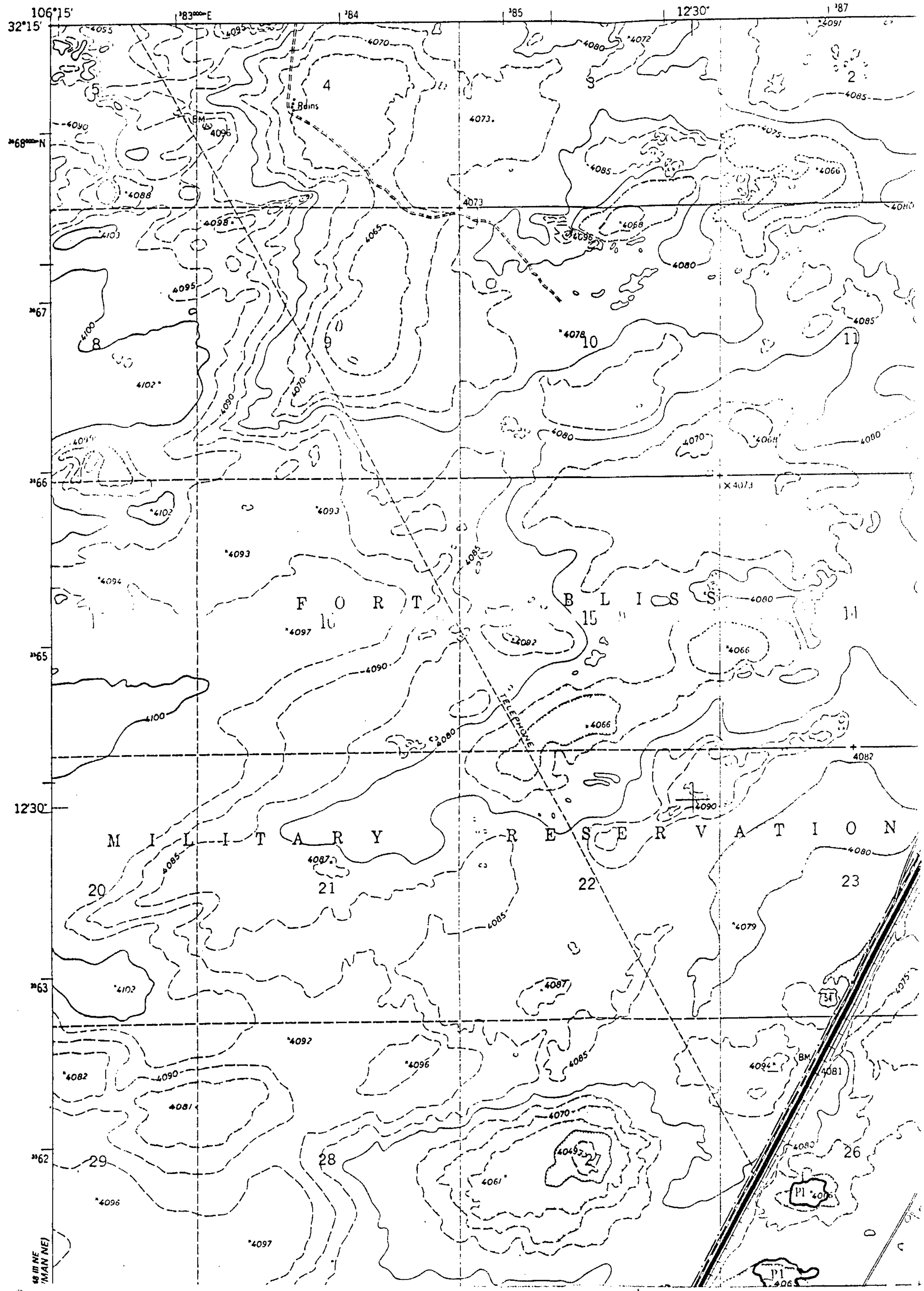

Tony Tank
DSG/PI/A1
DSC/DP/A1
A1
DSC/DP/A1-A2
Fish Tank
Langford Windmill
17
18
16
15
F O R T B L I S S
Bolson Floor Complex
DSC/DP/A1-A2
Drill Hole
DSC/DP/A1
M I L I T A R Y R E S E R V A T I O N
21
20
(M C G R E G O R R A N G E)
Sand Tank
Escondida, Site 4
30
29
28
27
BM 4306
57'30" R 10 E
(PIPELINE CANYON) 4849 III SW
55'
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°30' 9 MILS
11° 196 MILS
UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
Primary highway hard surface
Secondary highw. hard surface
Interstat
rphic
bols[1]
A1
A2
A3
B
CR
DL
DP
DS
DSC
DSG
P
PI
PIL



Fish Tank
A1
DSC/DP/A1-A2
Anthropic
A3
A2-A3
Drill Hole
R V A T I O N
DSC/DP/A1-A2
A2
Grapevine
I S S
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U S Route
State Route
1 MILE
7000 FEET
1 KILOMETER
NEW MEXICO
QUADRANGLE LOCATION
UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
DEADMAN CANYON, N. MEX.
NW/4 ESCONDIDO CANYON 15' QUADRANGLE
N3237.5-W10552.5/7.5
1981
DMA 4849 III NW-SERIES V881
(CULP CANYON) 4849 III SE
STON, VIRGINIA 22092
ON REQUEST

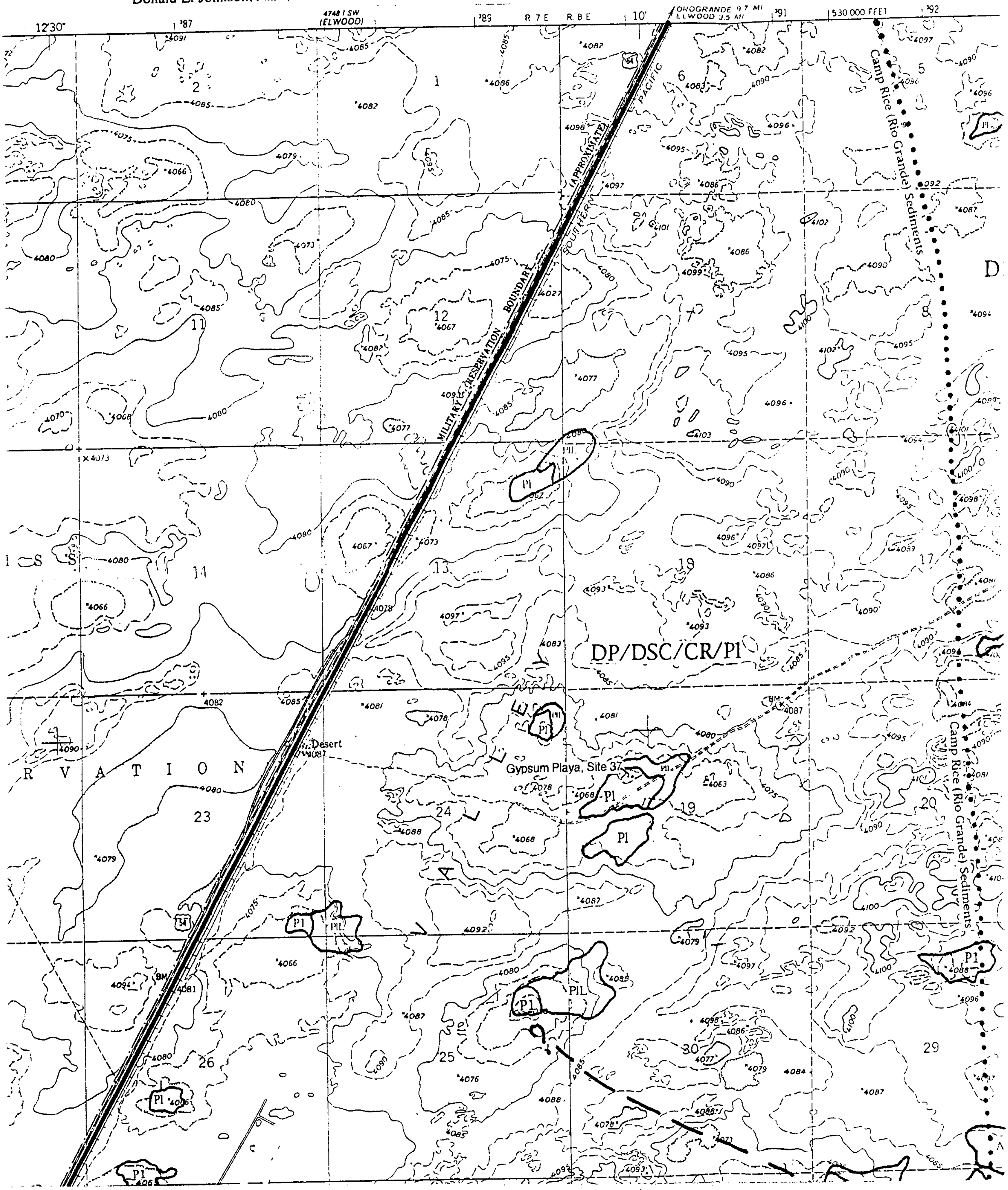
(4)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



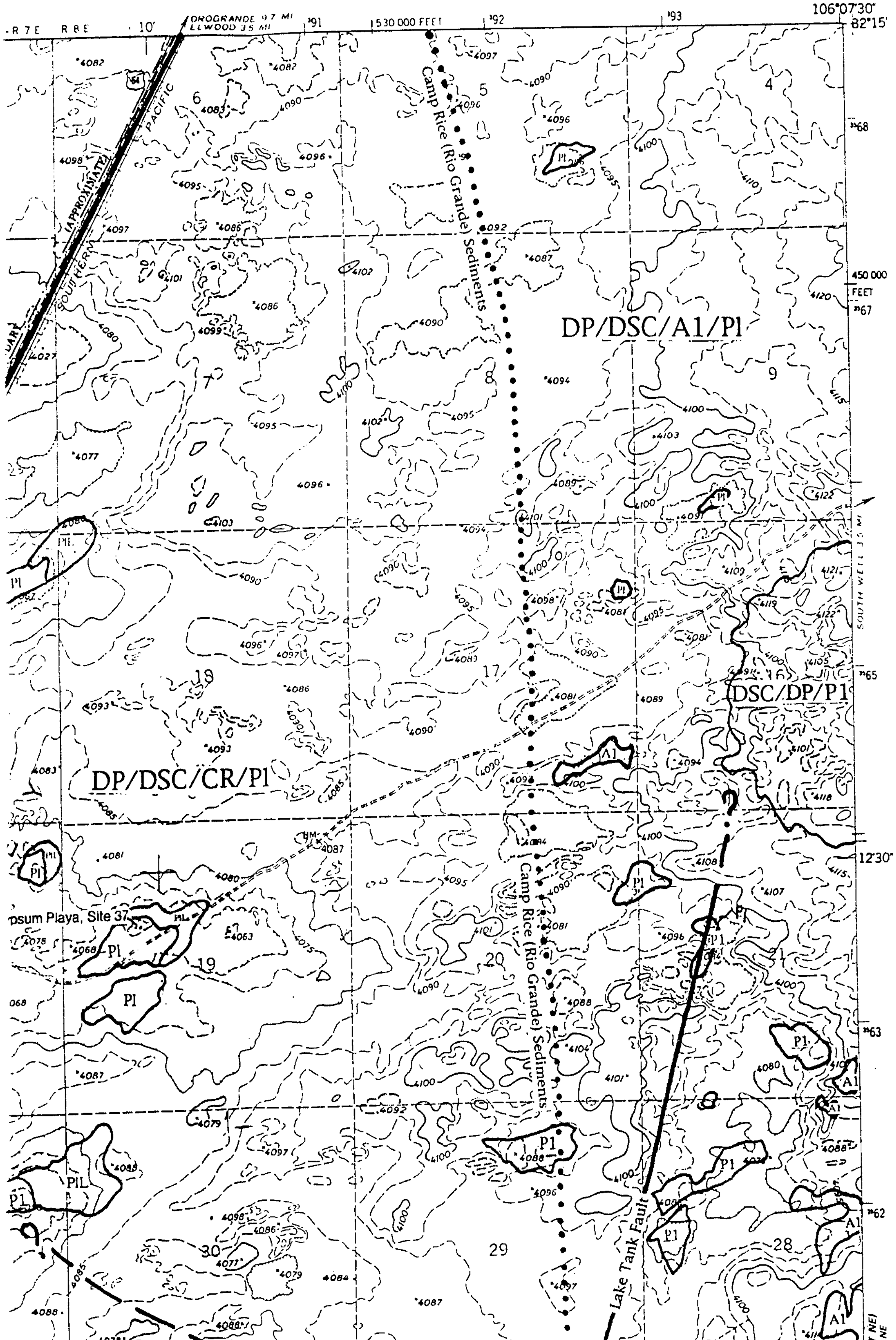
Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



l Mapping
Mexico

NEW MEXICO-OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



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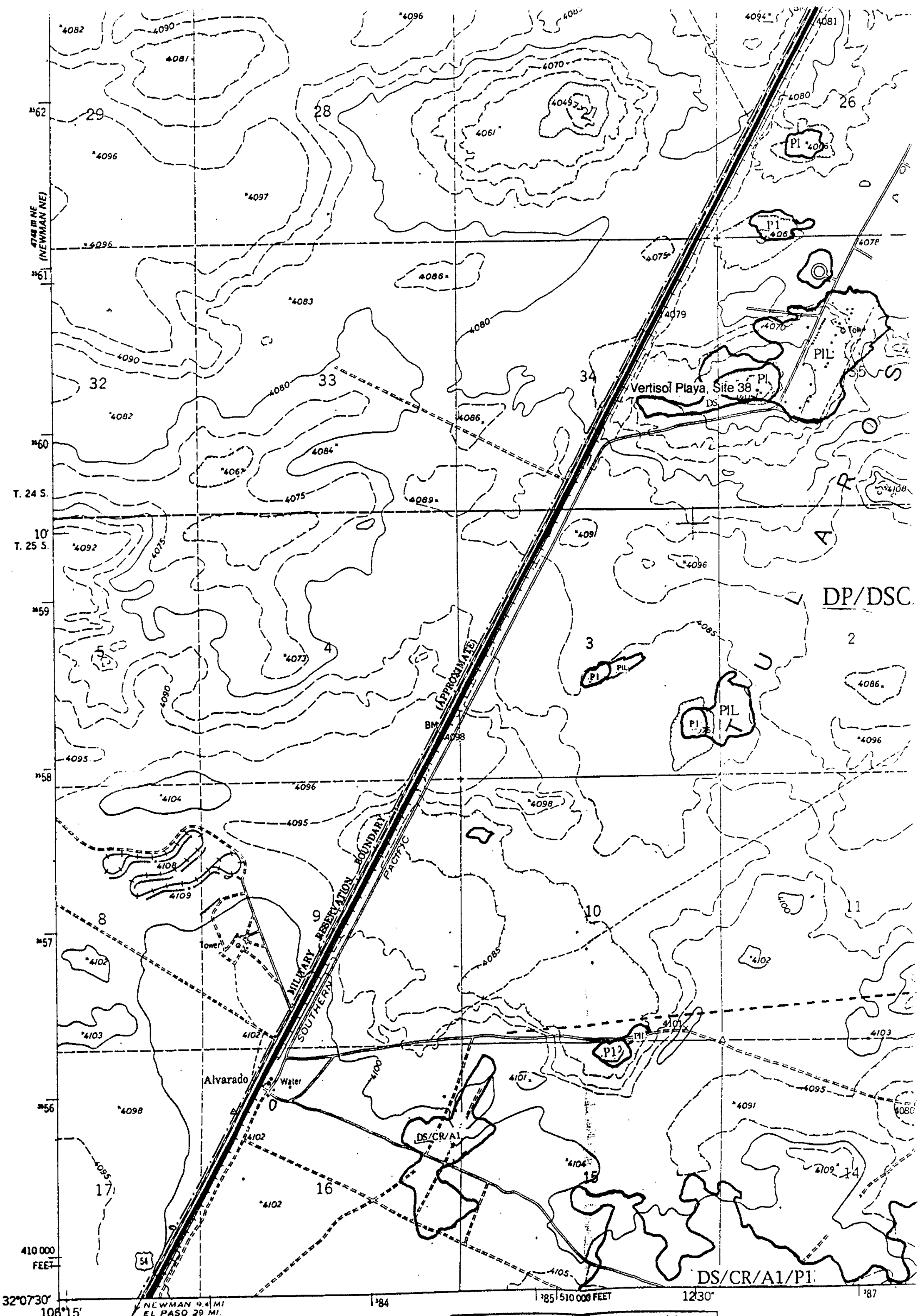


4

Mapped by the Army Map Service
Published for civil use by the Geological Survey

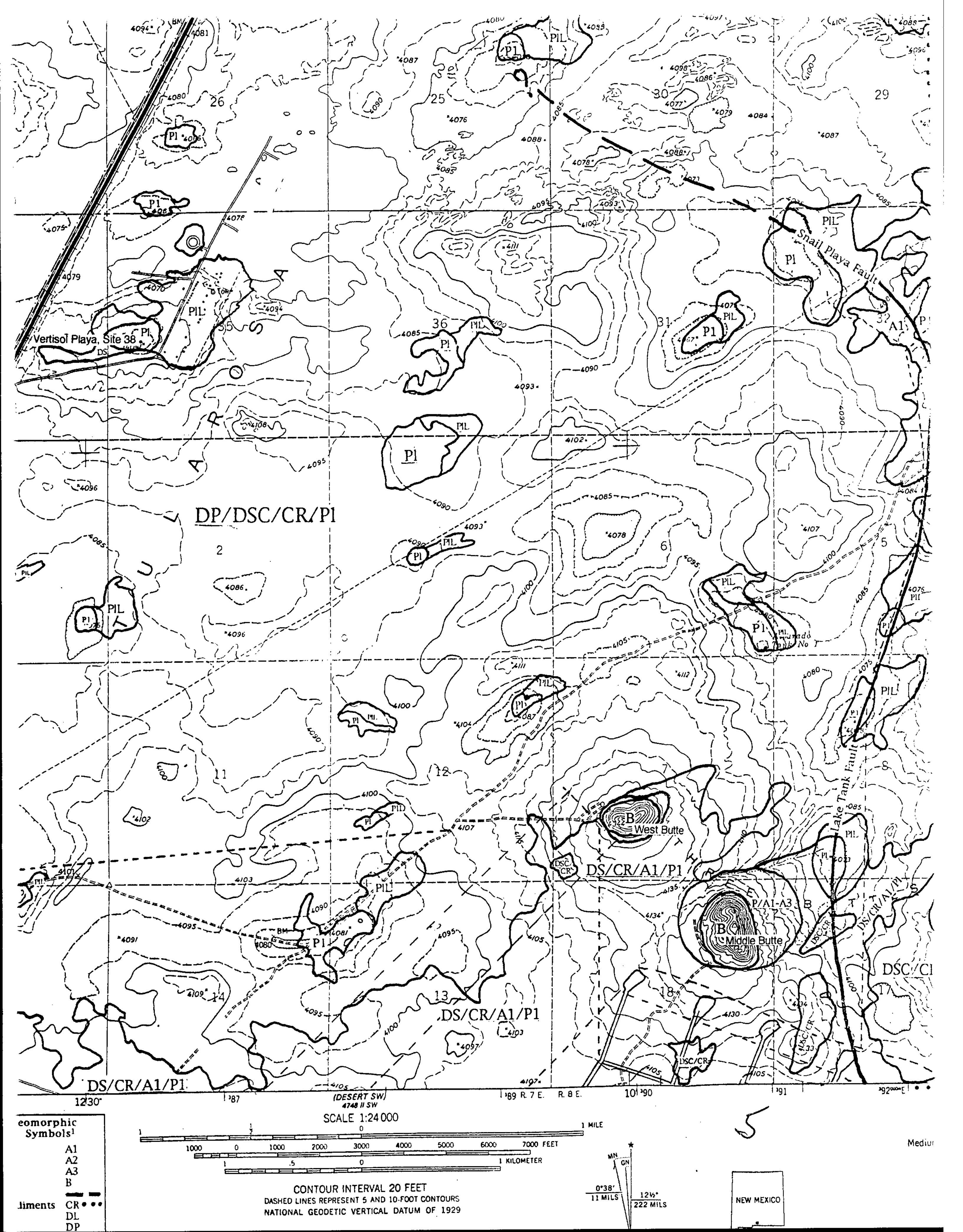
Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

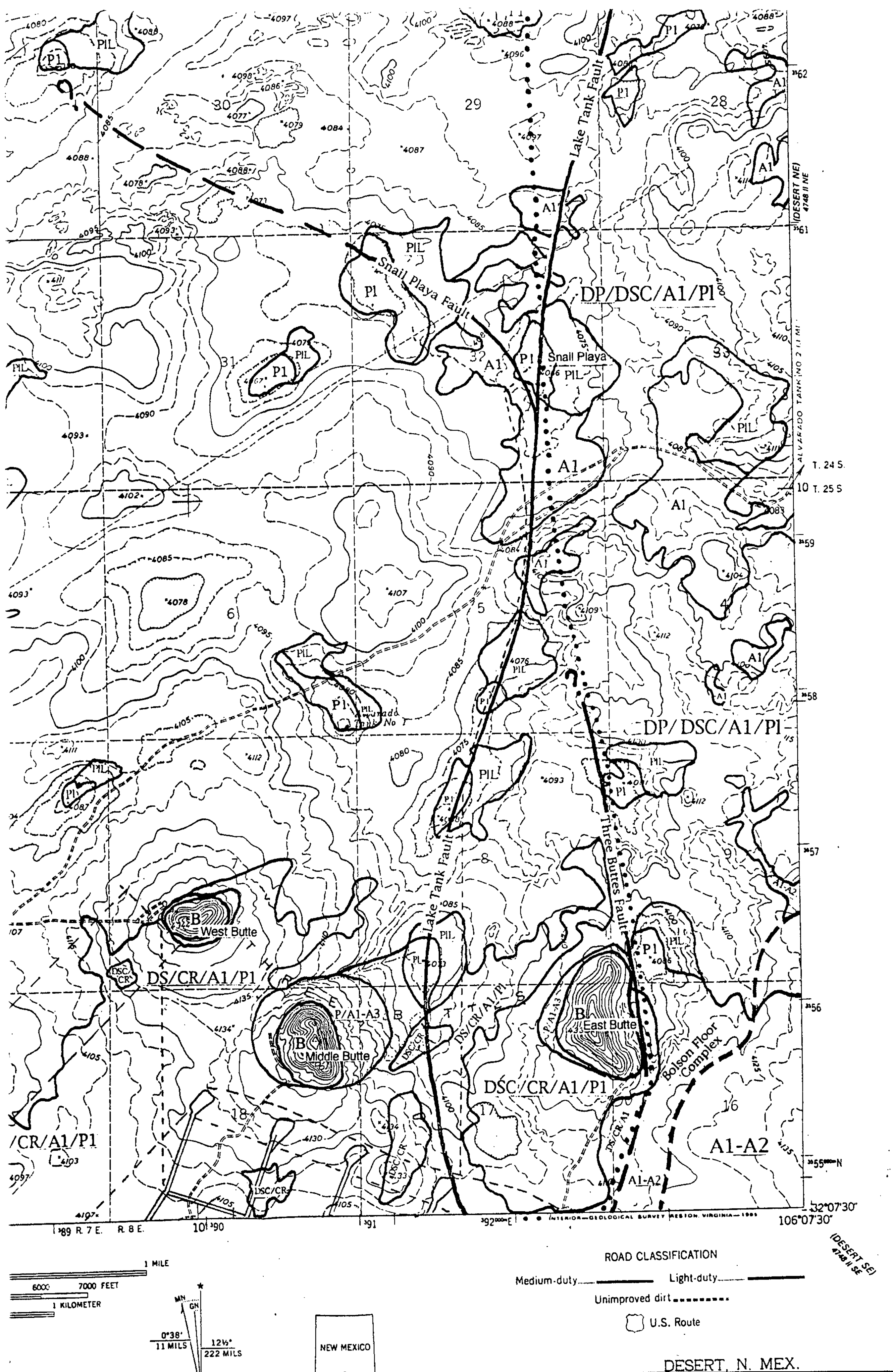
Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system, central zone

McGregor Range Geomorphic Mapping Units and Symbols[1]

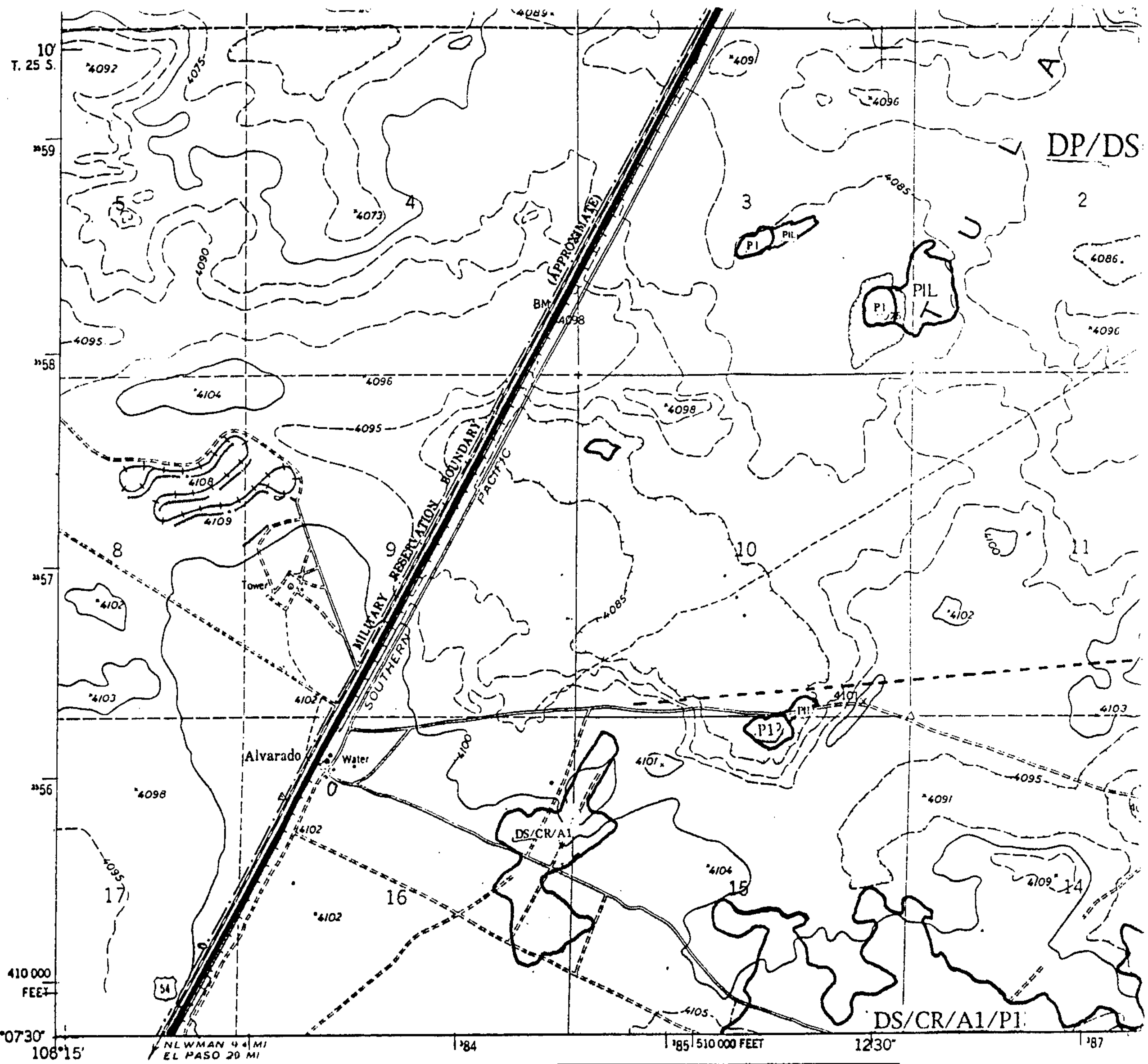
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP



Vertisol Playa, Site 38
Snail Playa Fault
Lake Tank Fault
West Butte
Middle Butte
DP/DSC/CR/P1
DS/CR/A1/P1
DS/CR/A1/P1
DS/CR/A1/P1
P/A1-A3
DSC/CR
DSC/CR
DSC/CR
DSC/Cl
PlL
Pl
A1
B
26
25
30
29
35
36
31
32
2
6
5
11
12
7
8
14
13
18
17
12°30'
(DESERT SW)
4748 II SW
R. 7 E.
R. 8 E.
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
0°38'
11 MILS
12½°
222 MILS
MN
GN
NEW MEXICO
eomorphic
Symbols[1]
A1
A2
A3
B
liments
CR
DL
DP
Mediur
5


Lake Tank Fault
Snail Playa Fault
Snail Playa
DP/DSC/A1/P1
DP/ DSC/A1/P1
Three Buttes Fault
West Butte
Middle Butte
East Butte
DS/CR/A1/P1
DSC/CR/A1/P1
/CR/A1/P1
Bolson Floor Complex
A1-A2
P/A1-A3
PlL
Pl
A1
T. 24 S.
T. 25 S
R. 7 E.
R. 8 E.
32°07'30"
106°07'30"
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
U.S. Route
1 MILE
6000
7000 FEET
1 KILOMETER
0°38'
11 MILS
12½°
222 MILS
NEW MEXICO
DESERT, N. MEX.
(DESERT NE)
(DESERT SE)
ALVARADO TANK NO 2 1.1 MI.

6



(NEWMAN) 4748 III SE

Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations

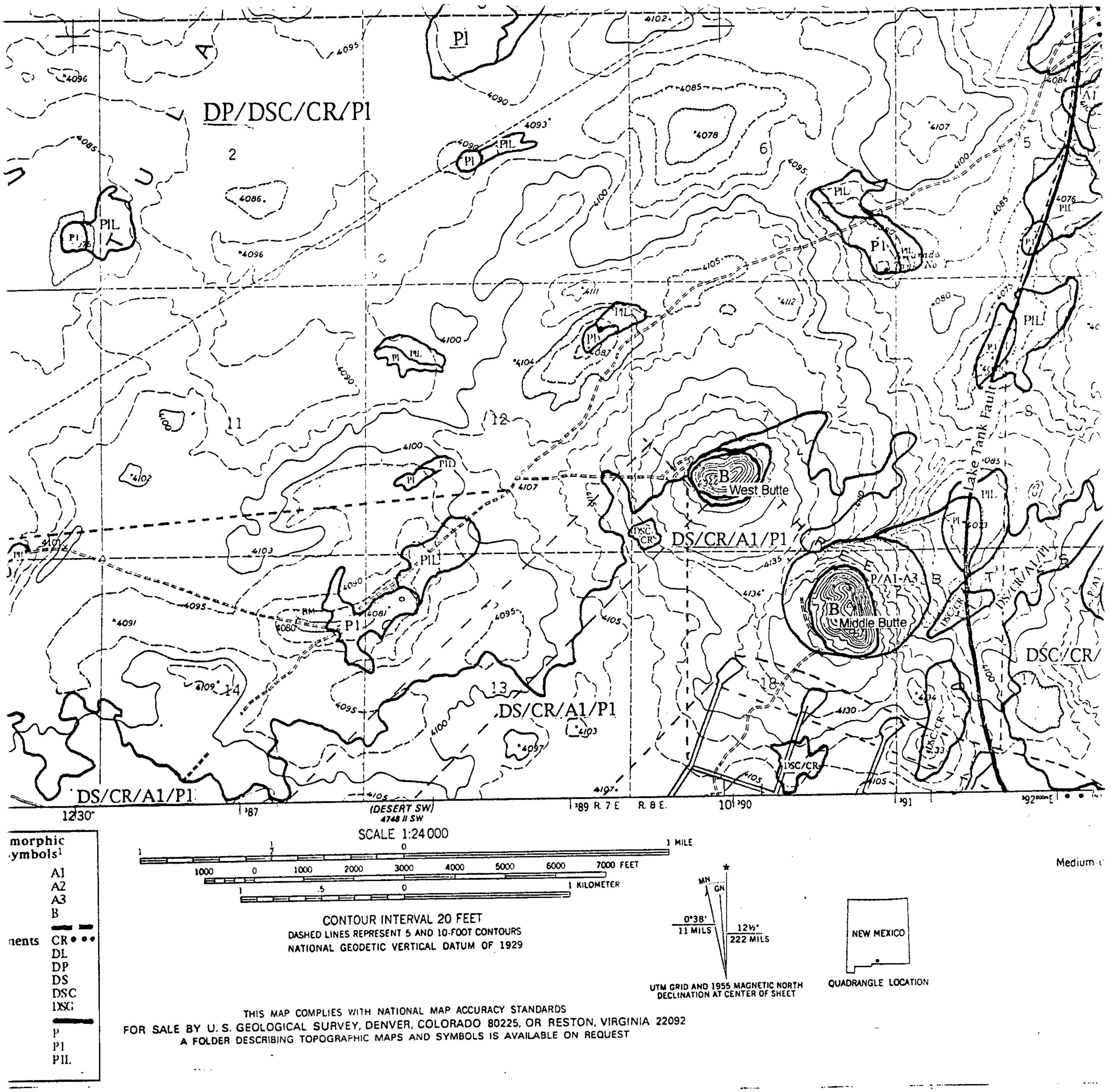
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

McGregor Range Geomorphic Mapping Units and Symbols[1]

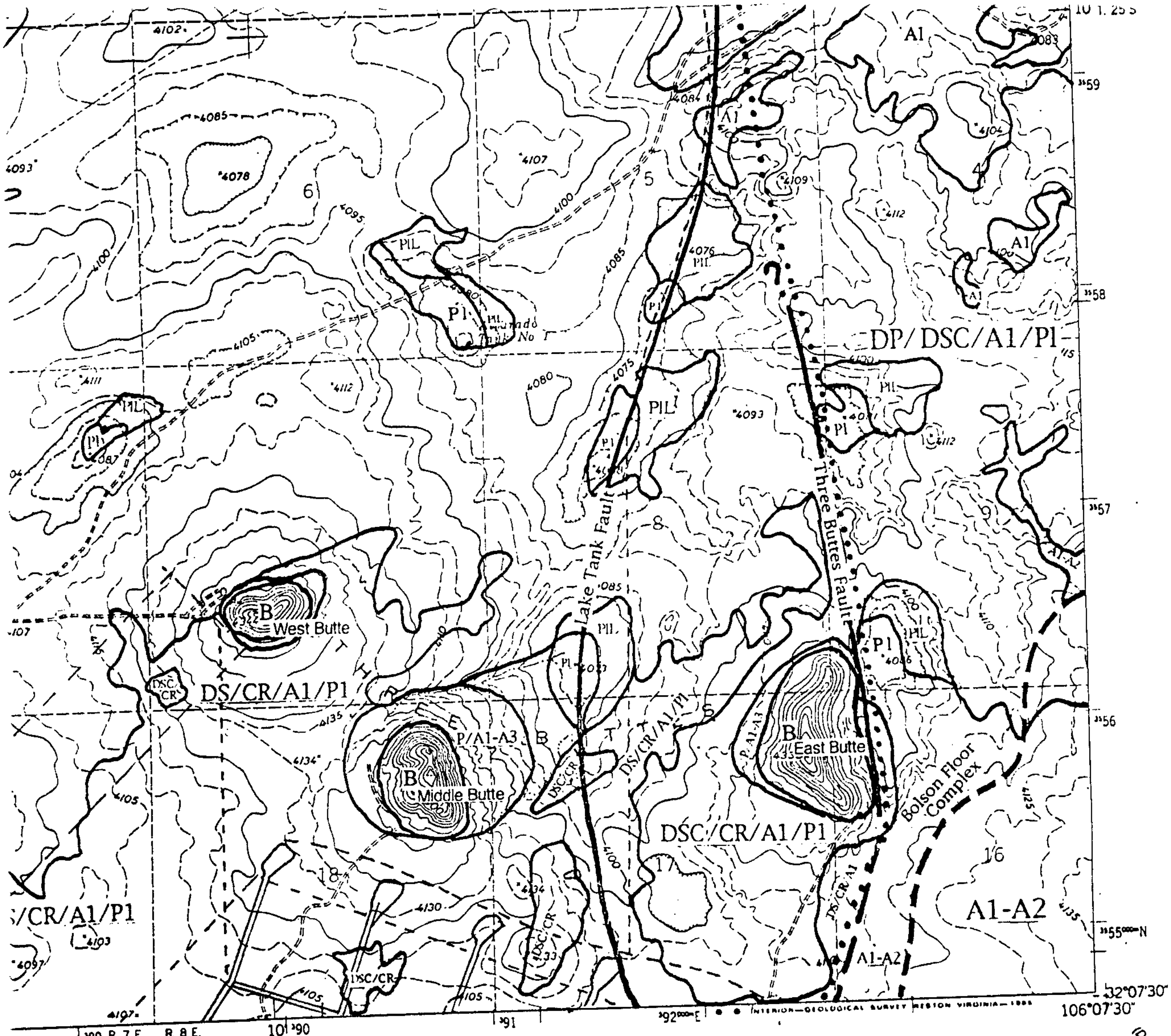
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	P1
Playa Lunette	PIL

[1]See text for explanation

THIS MAP
FOR SALE BY U. S. GEOLOGIC
A FOLDER DESCRIBIN



DP/DSC/CR/Pl
Pl
PlL
DS/CR/A1/Pl
P/A1-A3
B
West Butte
Middle Butte
Lake Tank Fault
DSC/CR
DS/CR/A1/Pl
12°30'
(DESERT SW)
4748 II SW
R. 7 E.
R. 8 E.
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
0°38'
11 MILS
12½°
222 MILS
UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
NEW MEXICO
QUADRANGLE LOCATION
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
morphic
ymbols[1]
A1
A2
A3
B
nents
CR
DL
DP
DS
DSC
DSG
P
Pl
PlL
Medium



(DESERT SE)
4748 II SE

1 MILE
6000 7000 FEET
1 KILOMETER

MN GN
0°38'
11 MILS
12½°
222 MILS

UTM GRID AND 1955 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Medium-duty .... Light-duty ....

Unimproved dirt

U.S. Route

DESERT, N. MEX.

32106–B2–TF–024

1955

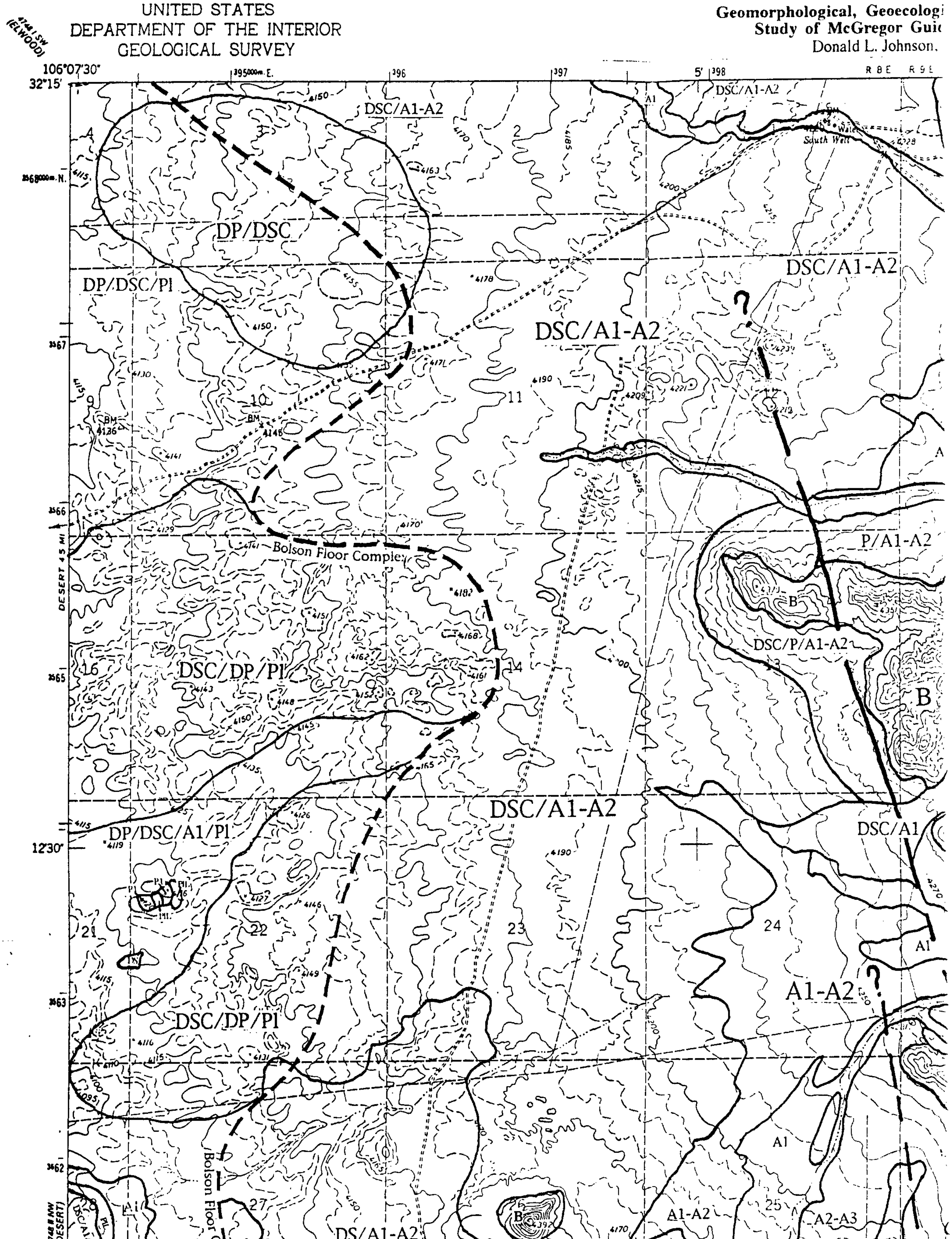
DMA 4748 II NW–SERIES V881

STANDARDS
S, OR RESTON, VIRGINIA 22092
AVAILABLE ON REQUEST

5

9

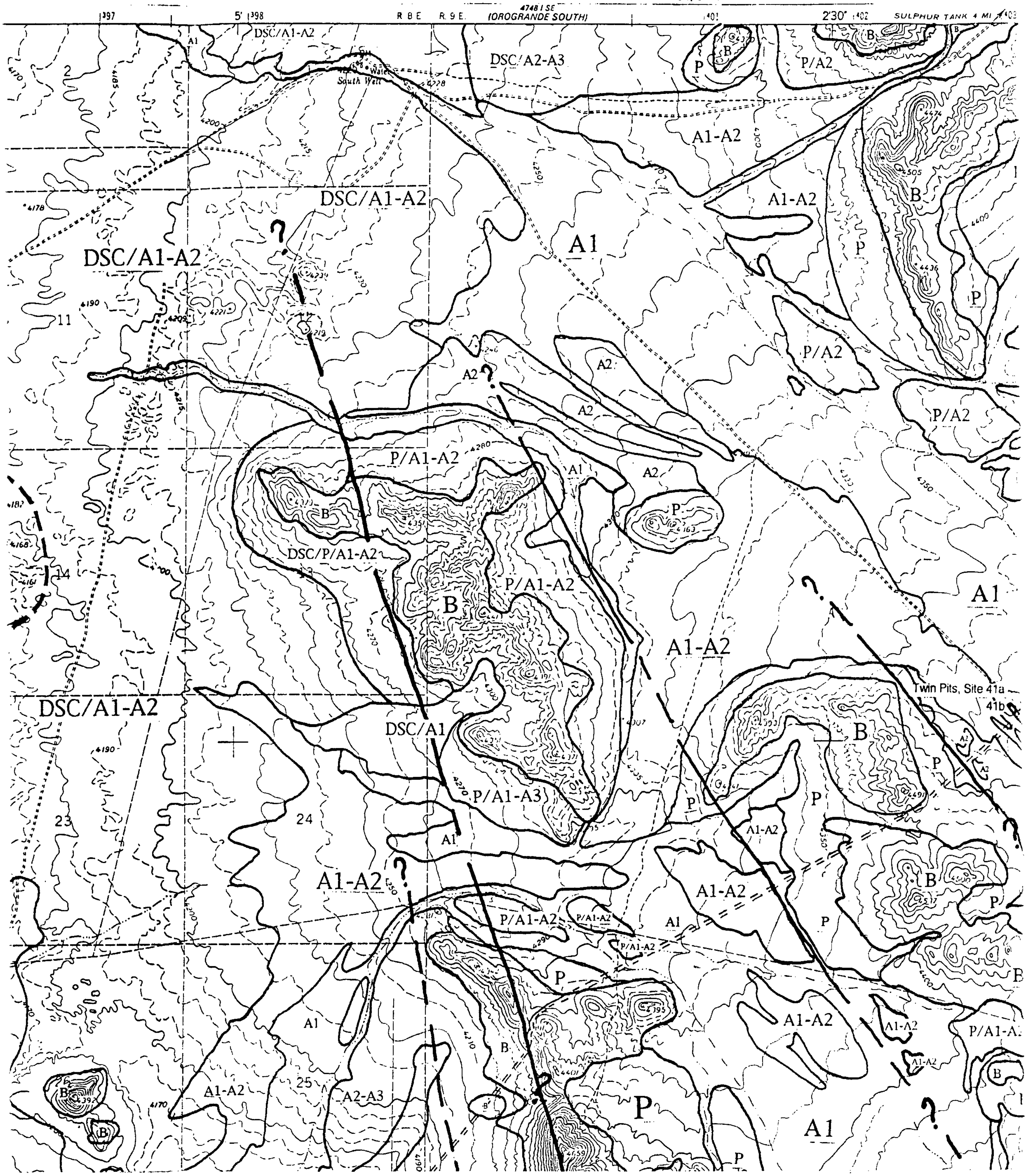
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



1

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

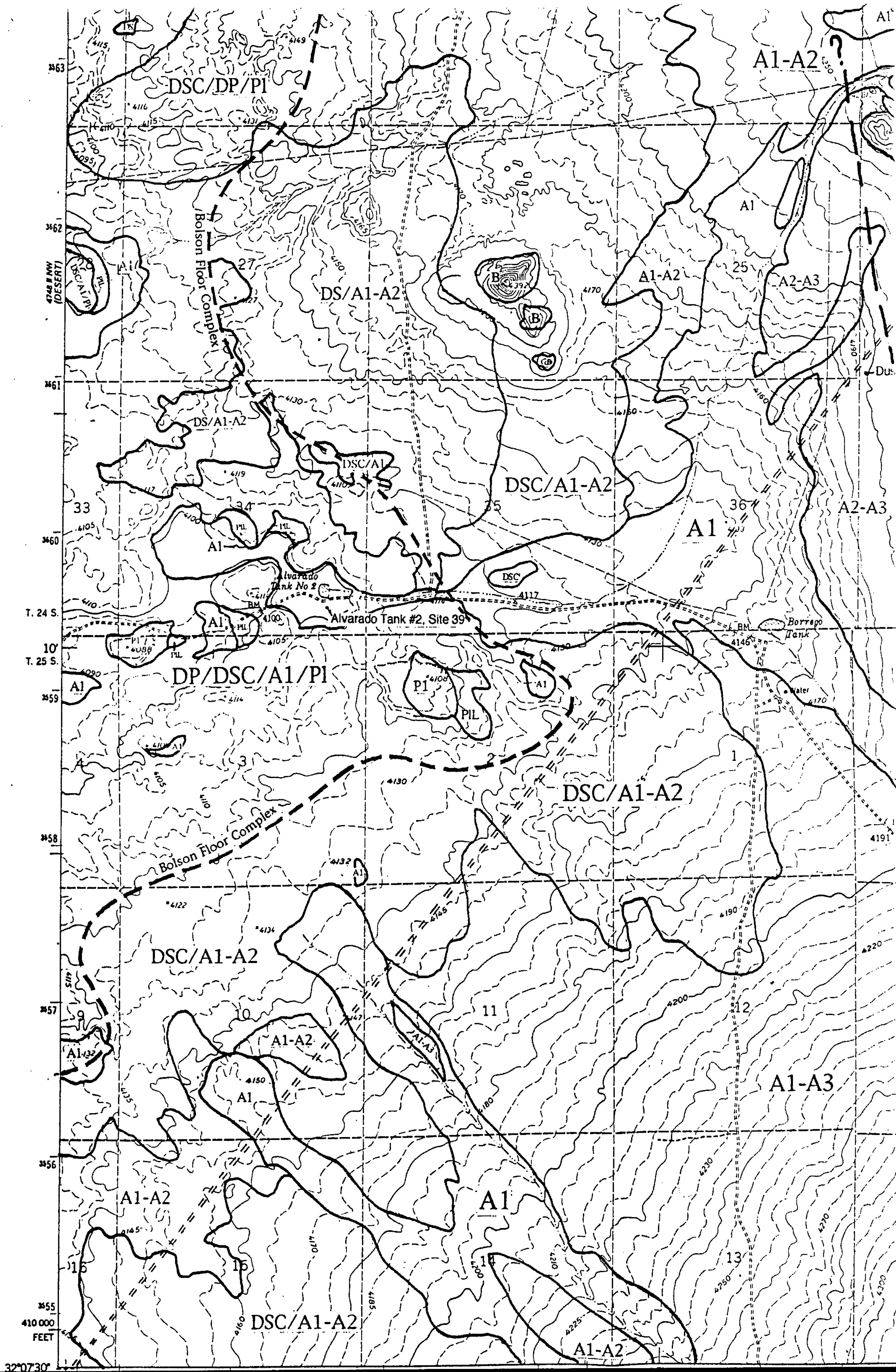
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



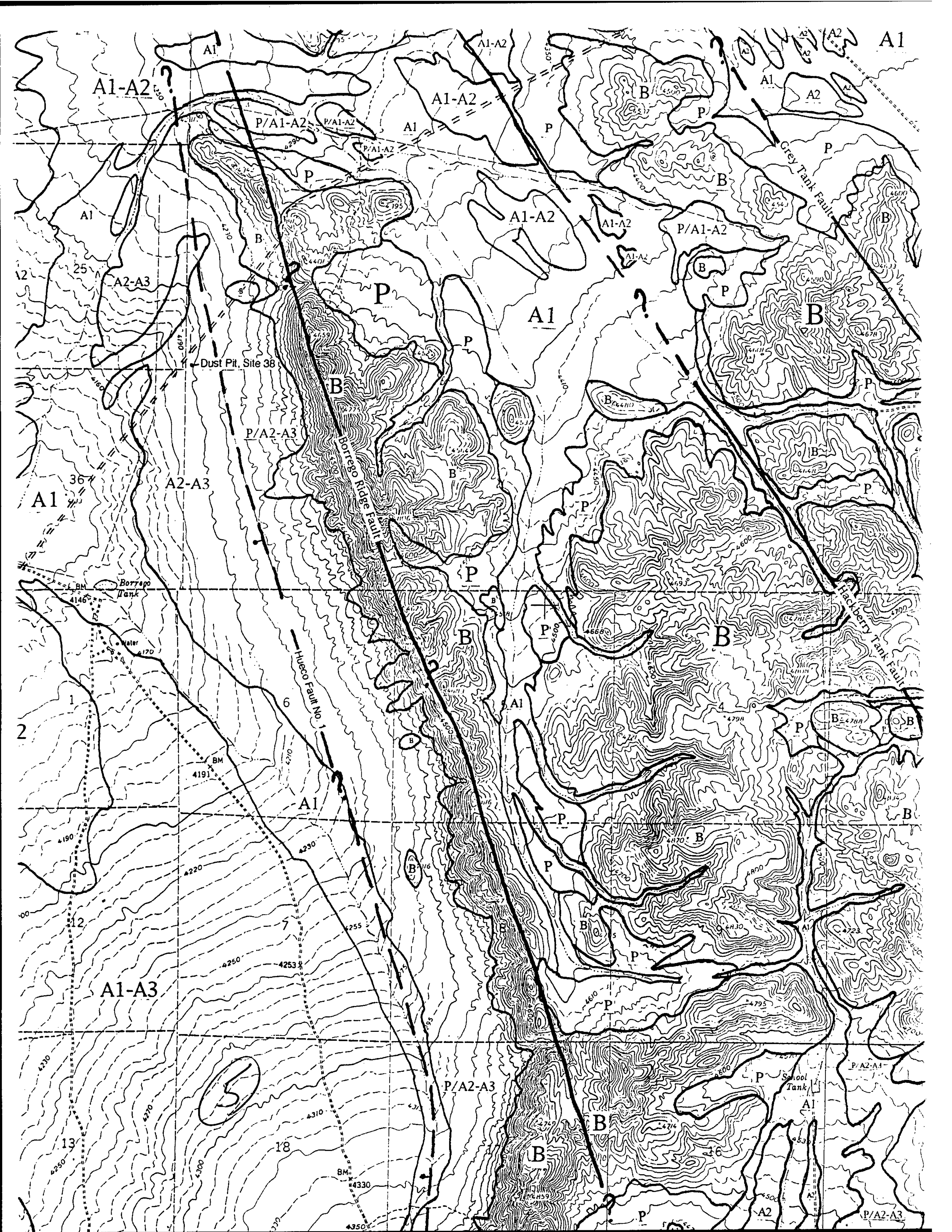
urficial Mapping
New Mexico
1997

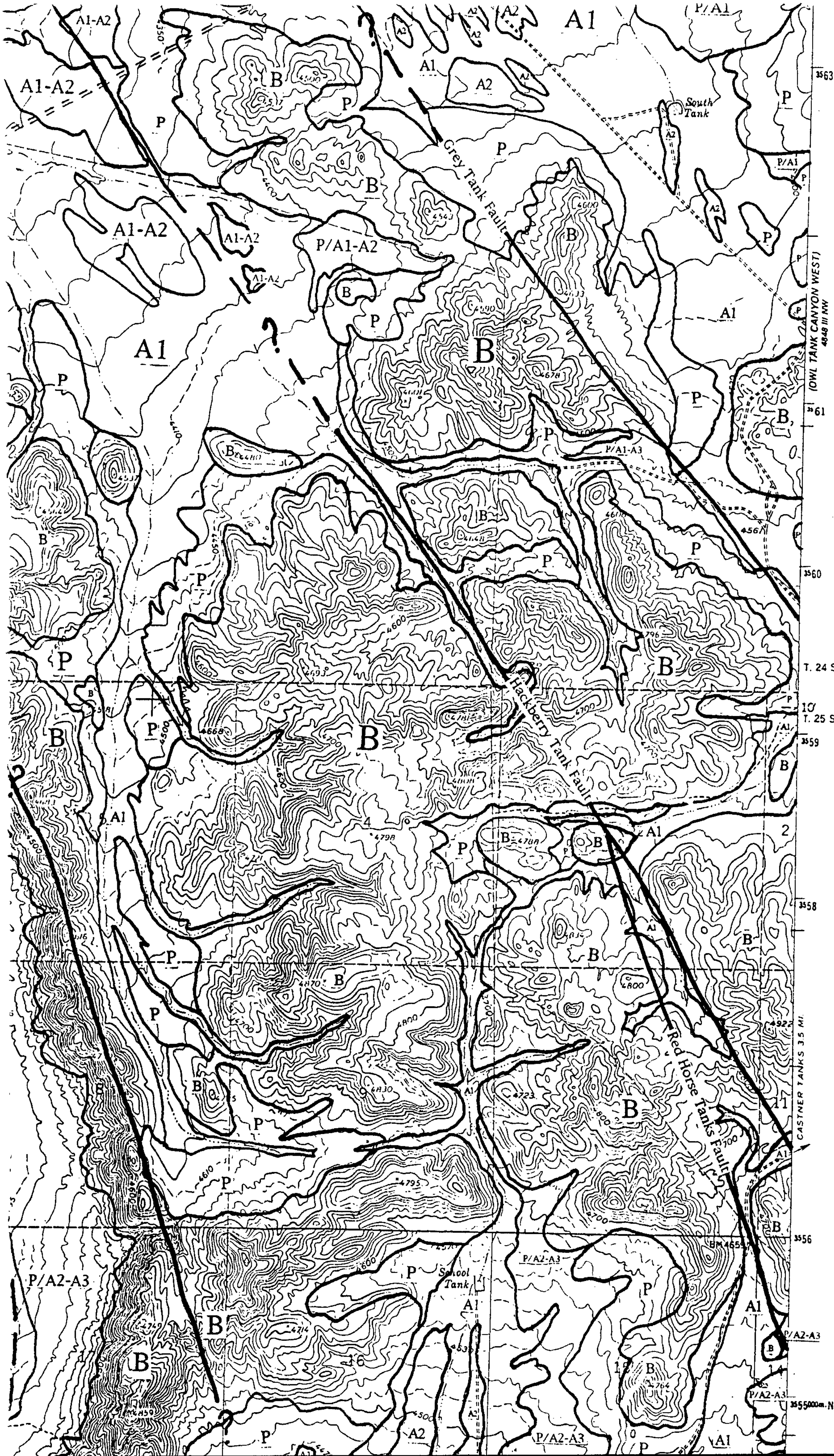
DESERT NE QUADRANGLE
NEW MEXICO-OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

3

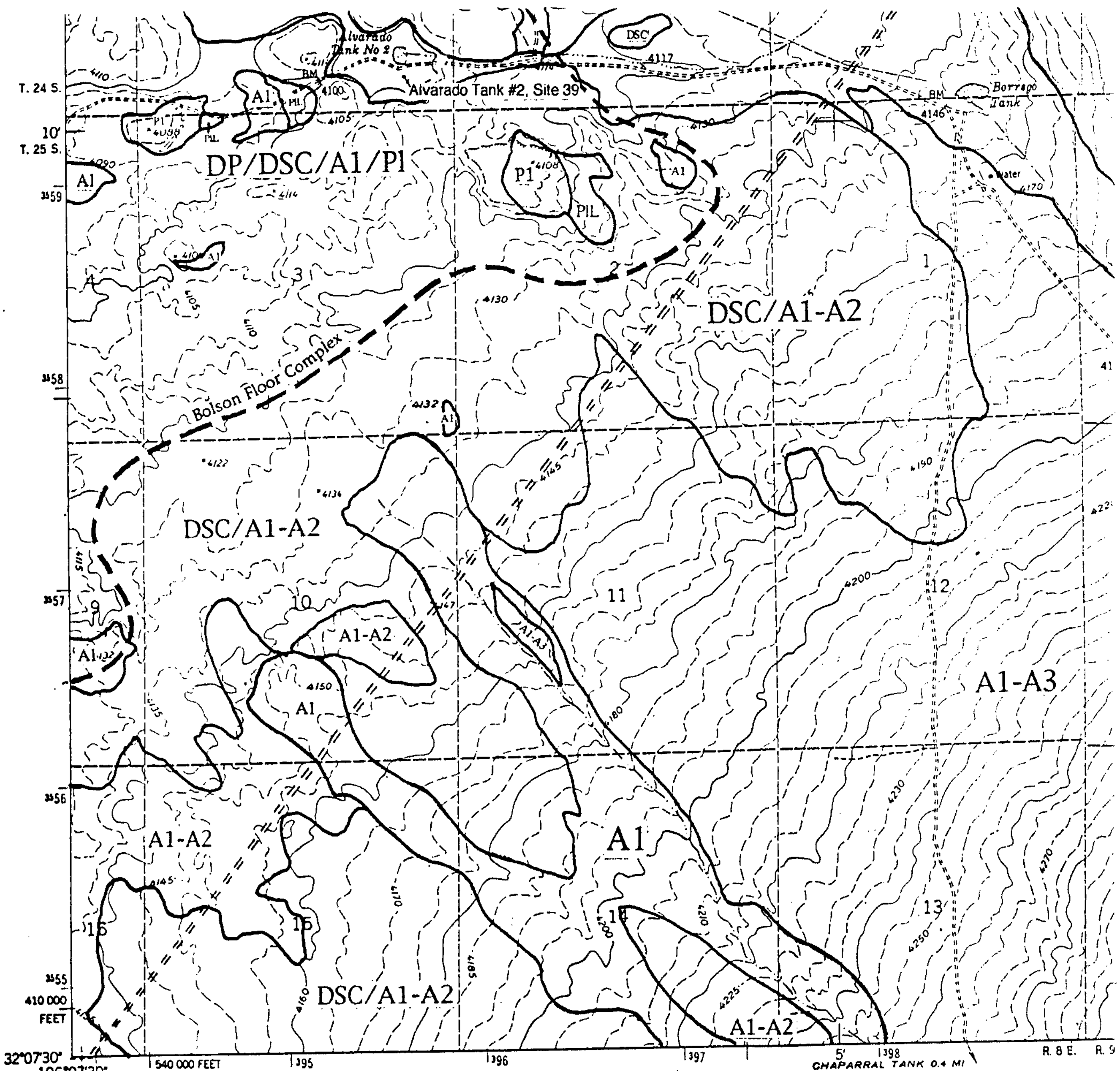

DSC/DP/Pl
A1-A2
Bolson Floor Complex
DS/A1-A2
A1
25
A2-A3
27
DSC/A1
DSC/A1-A2
33
34
35
36
A2-A3
DSC
Alvarado Tank No 2
Alvarado Tank #2, Site 39
Borrego Tank
T. 24 S.
T. 25 S.
DP/DSC/A1/Pl
P1
PlL
3
2
1
DSC/A1-A2
Bolson Floor Complex
DSC/A1-A2
10
11
12
A1-A2
A1-A3
A1
A1-A2
A1
16
15
14
13
DSC/A1-A2
A1-A2
3563
3562
3561
3560
3559
3558
3557
3556
3555
410 000 FEET
32°07'30"
4748 II NW (DESERT)

H


A1-A2
A1
P/A1-A2
P
B
A2
A2-A3
P/A2-A3
A1-A3
Grey Tank Fault
Hackberry Tank Fault
Borrego Ridge Fault
Hueco Fault No. 1
Dust Pit, Site 38
Borrego Tank
BM 4146
Water
BM 4191
BM 4330
School Tank
25
36
1
2
6
7
12
13
18


Grey Tank Fault
Hackberry Tank Fault
Red Horse Tanks Fault
South Tank
School Tank
(OWL TANK CANYON WEST)
4848 III NW
CASTNER TANKS 3.5 MI.
T. 24 S.
T. 25 S.
3555000m. N.
BM 4655
A1-A2
P/A1-A2
P/A1-A3
P/A2-A3
P/A1
A1
A2
B
P

6



(DESERT SW) 4744 II SW

Mapped by the Army Map Service
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Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations
Land lines omitted in T.24 S.-R.9 E. because of insufficient data

Fine red dashed lines indicate selected fence lines

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

DASHED
NAT

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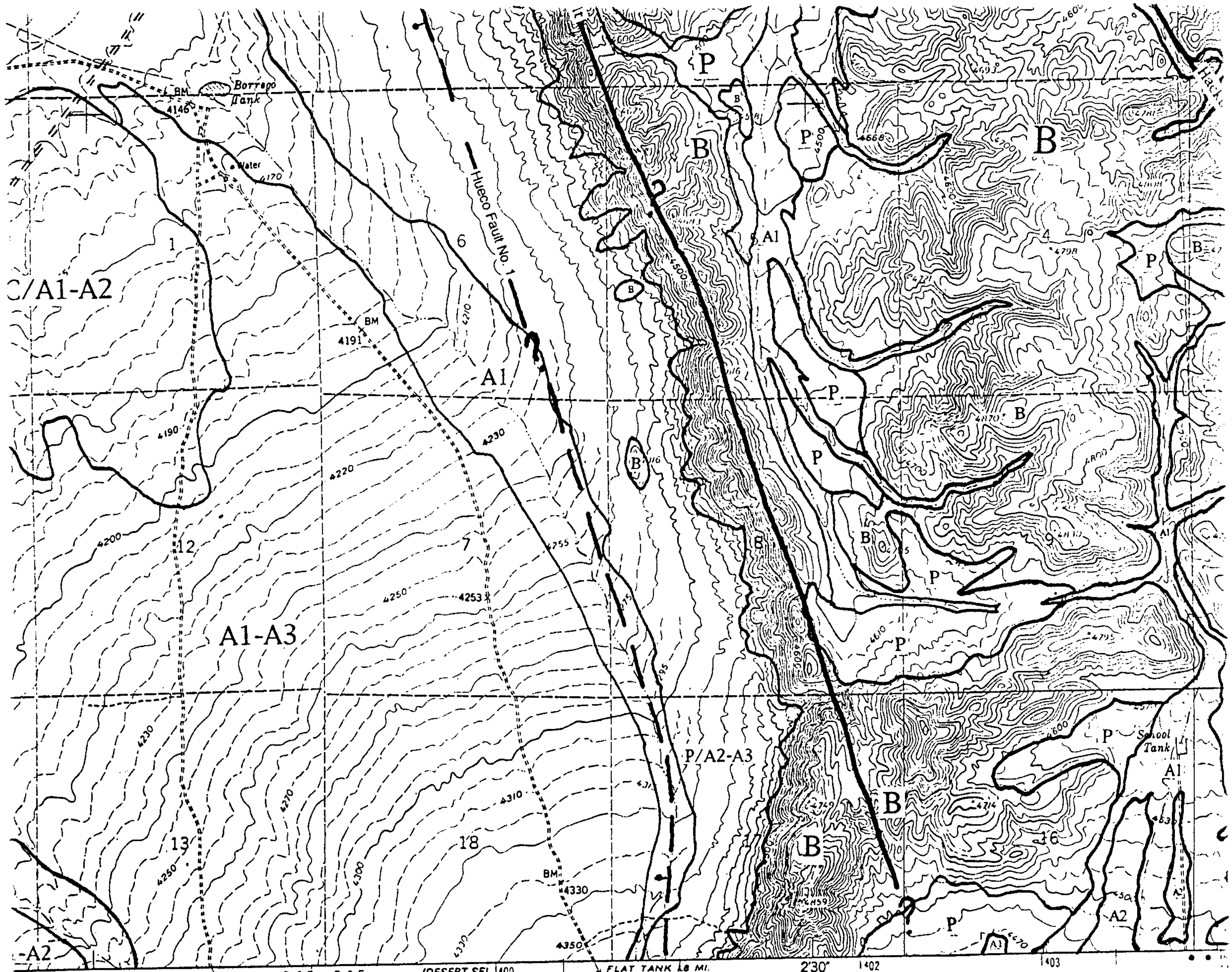
A FOLDER DESCRIBING TC



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GN MN 0°34' 10 MILS 12½° 222 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

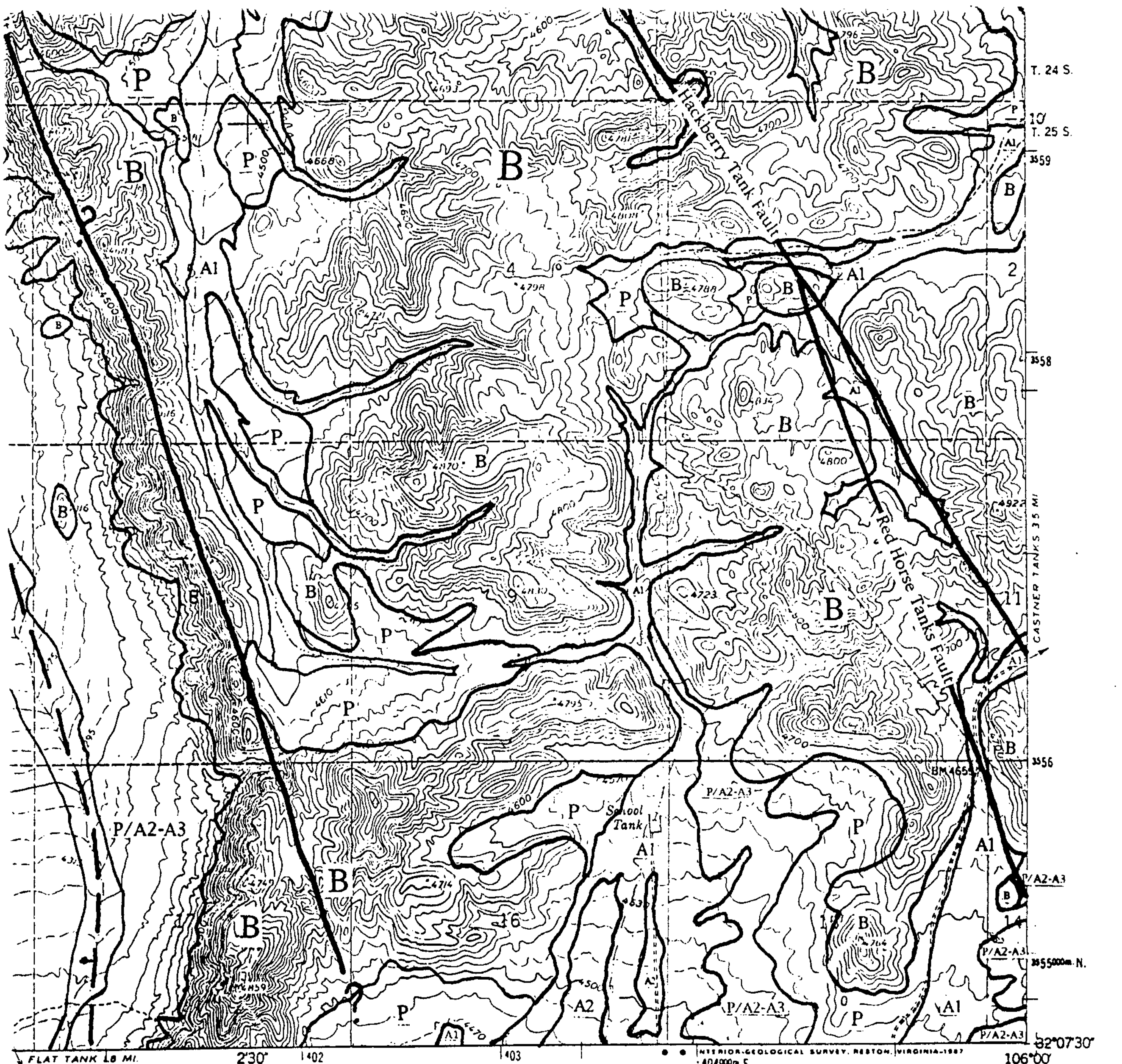
orphic
mbols[1]

A1
A2
A3
B

nts CR
DL
DP
DS
DSC
DSG

P
P1
PIL

8



1 MILE

6000 7000 FEET

1 KILOMETER

GN MN

0°34' 10 MILS

12½° 222 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Unimproved dirt

ANDARDS
OR RESTON, VIRGINIA 22092
ILABLE ON REQUEST

DESERT NE, N. MEX.
32106–B1–TF–024

1955

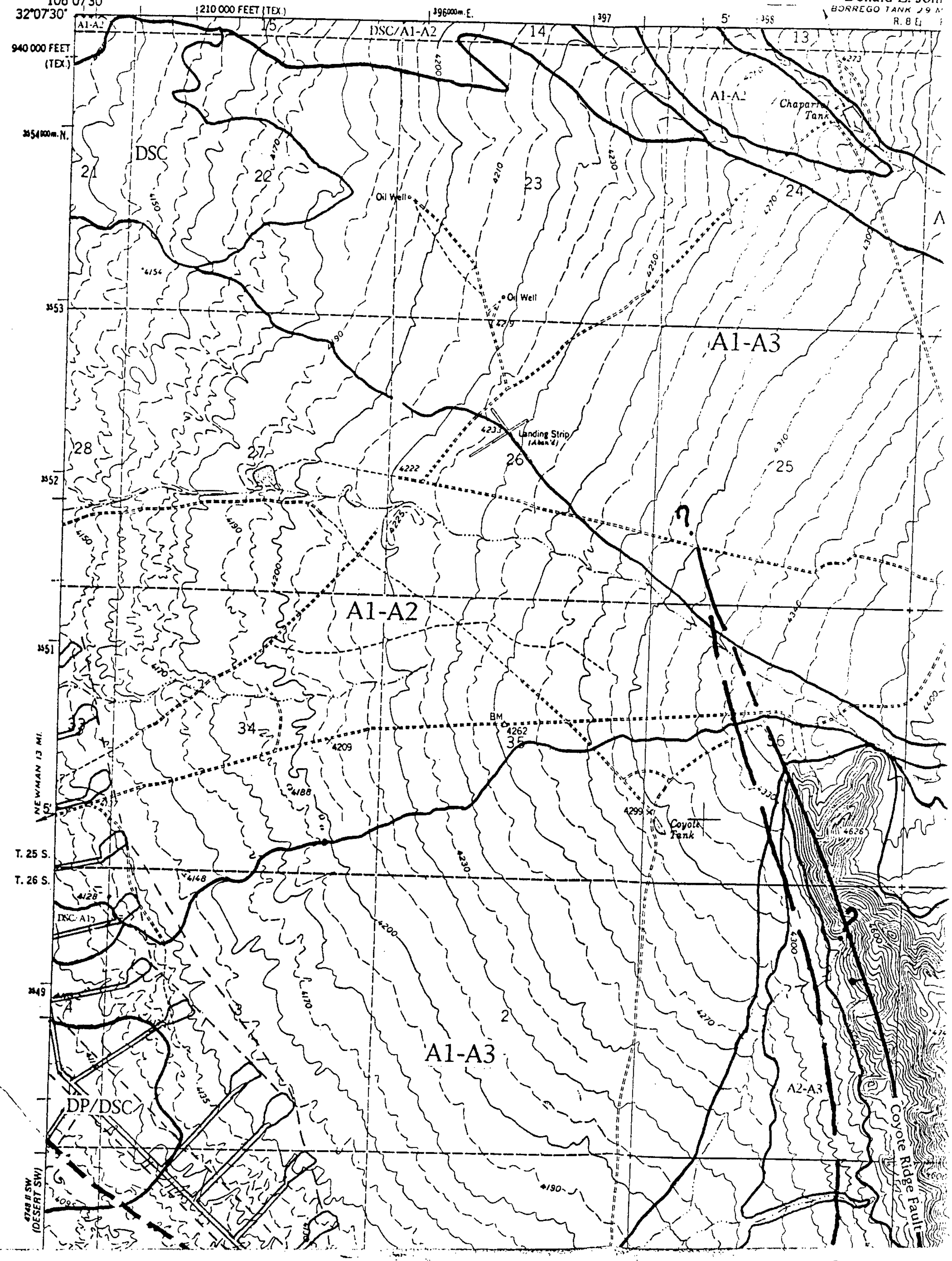
DMA 4748 II NE–SERIES V881

(5)

9

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoec
Study of McGregor
Donald L. Johi

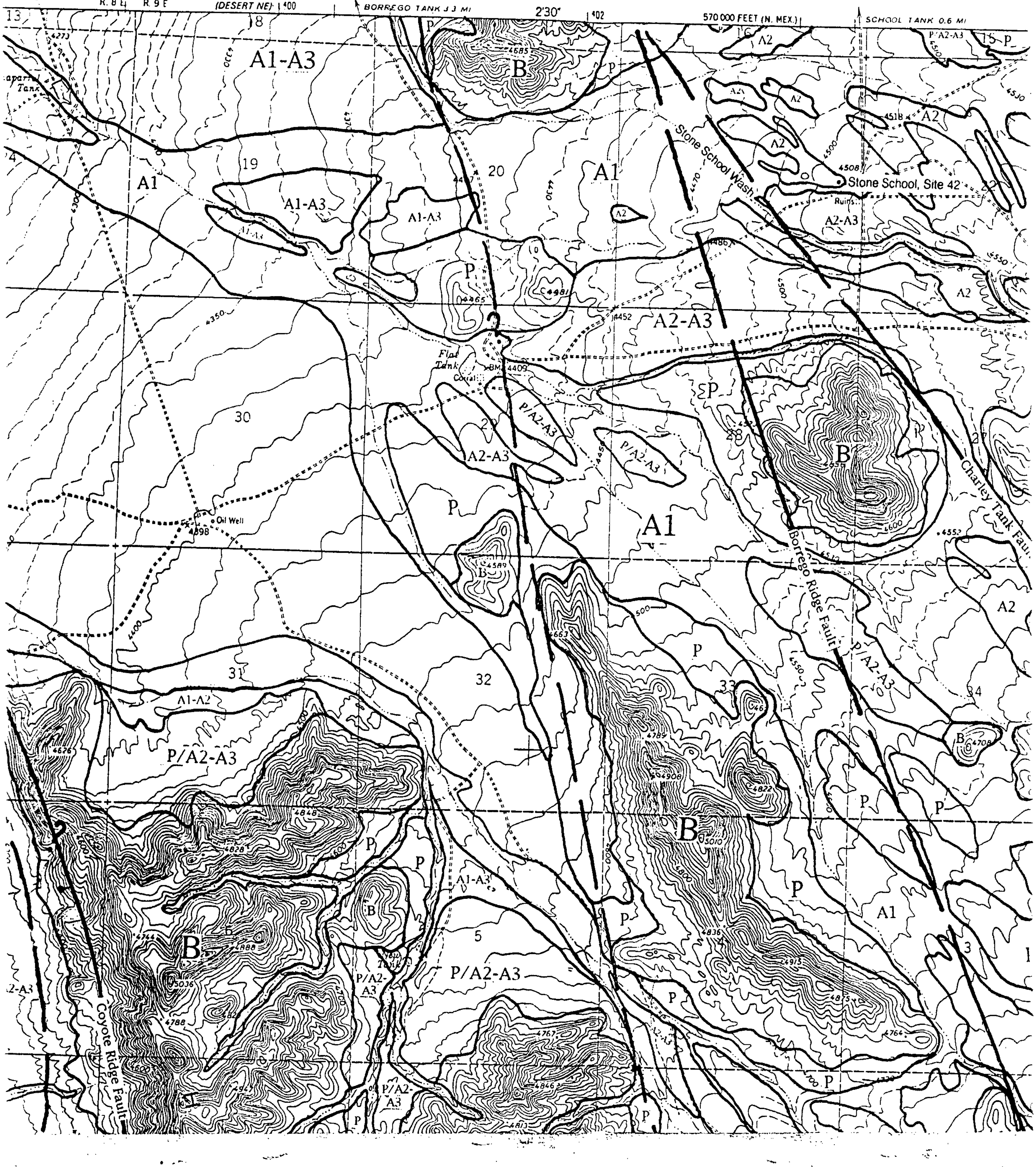


1

2

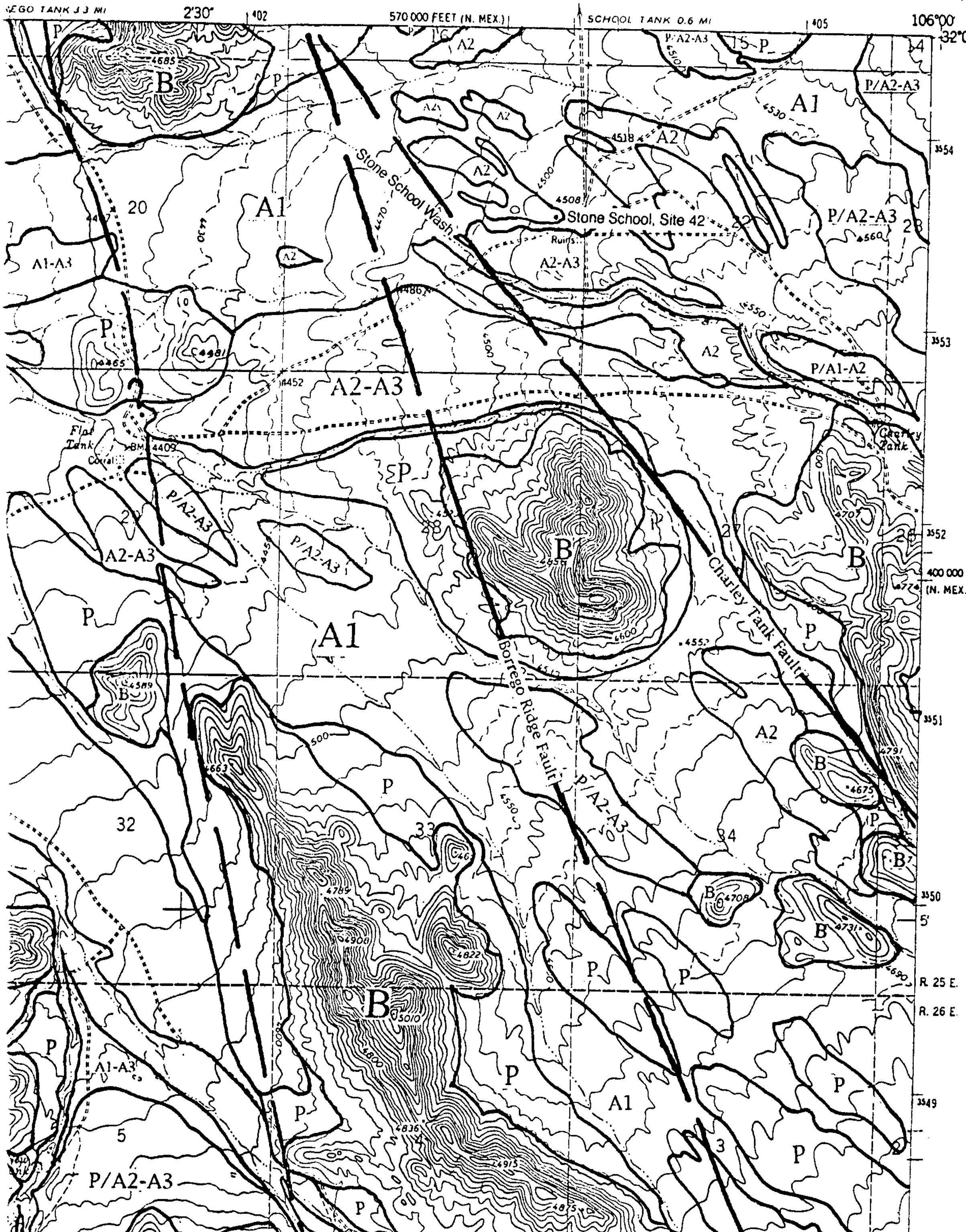
ıorphological, Geoecological, Geoarchaeological and Surficial Mapping
Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

DESERT SE (
NEW MEX
7.5 MINUTE SERII

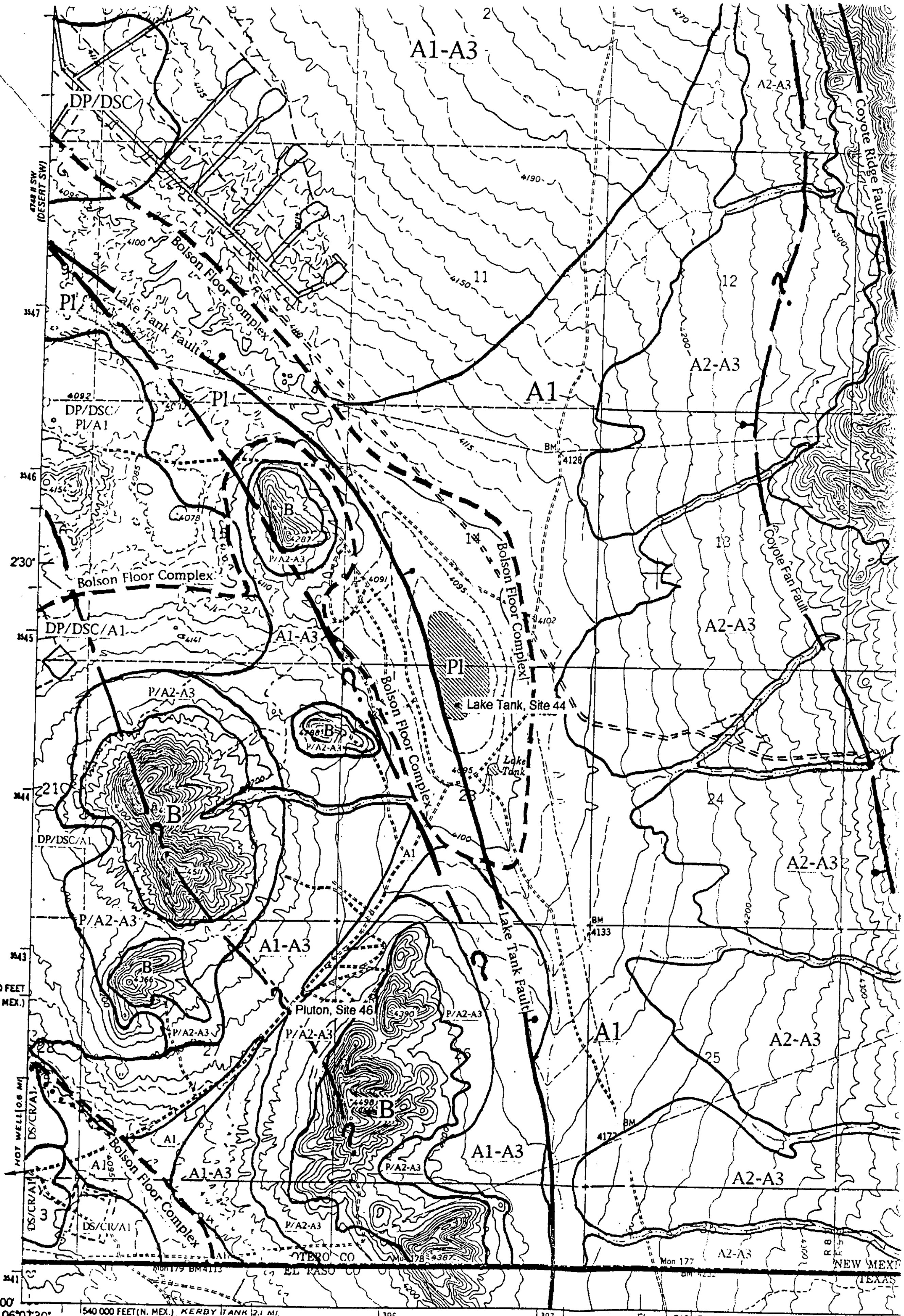


Surficial Mapping
›s, New Mexico
›14, 1997

DESERT SE QUADRANGLE
NEW MEXICO-TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)



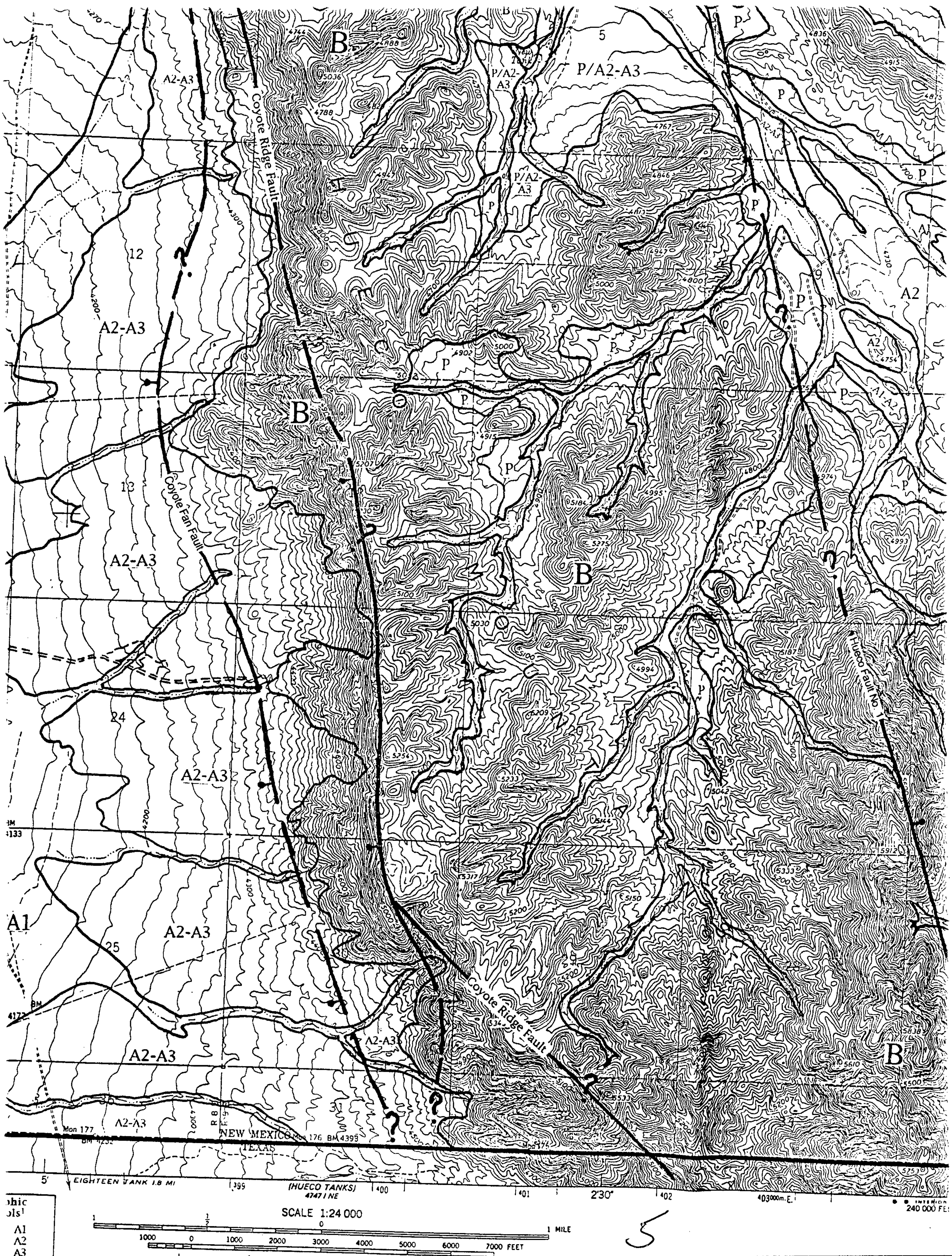
3

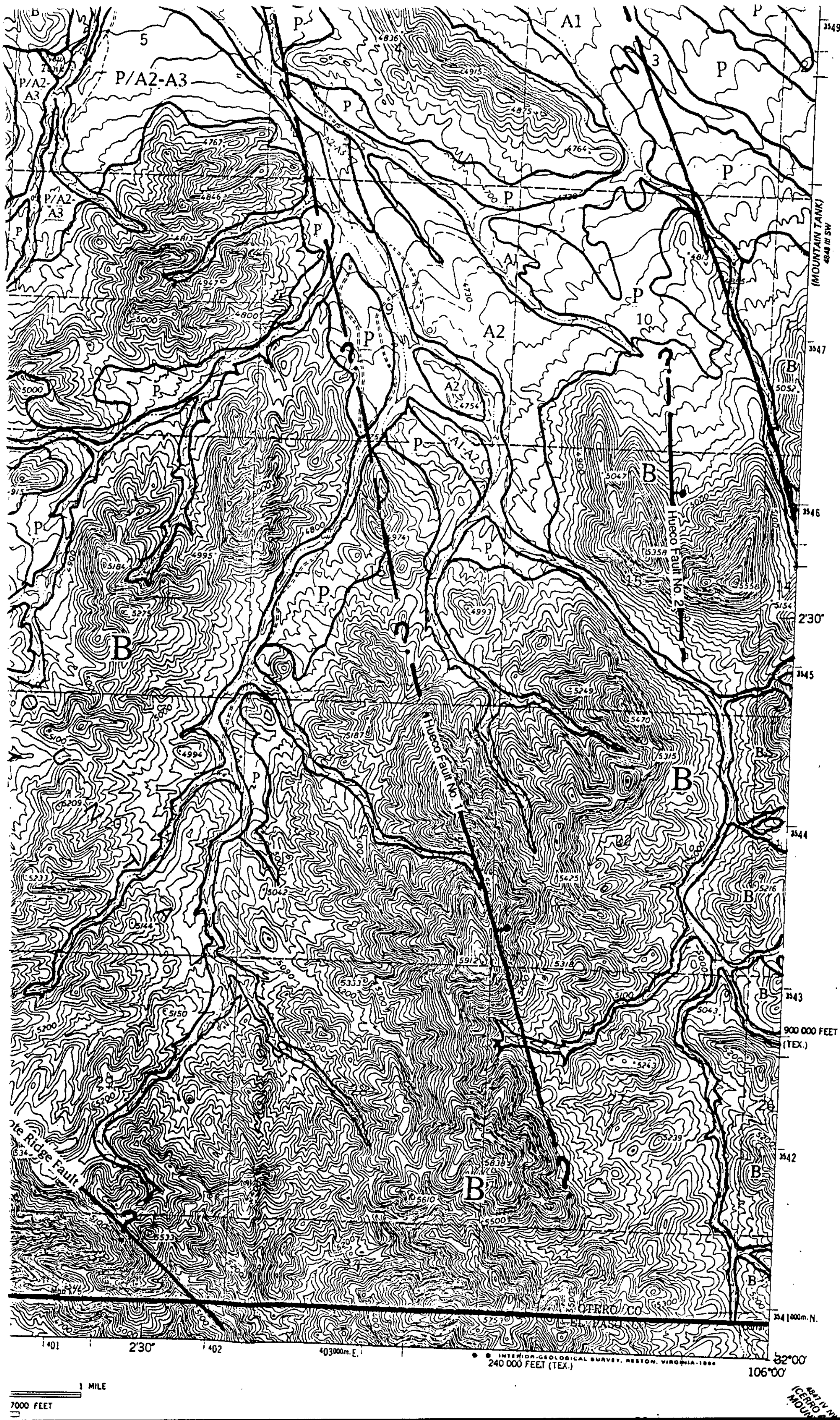


4

Mapped by the Army Map Service
Published for civil use by the Geological Survey
Control by USGS, USC&GS, and USCE
Topography from aerial photographs by photogrammetric methods

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3


Coyote Ridge Fault
Coyote Fan Fault
Coyote Ridge Fault
Hueco Fault No. 1
B
P/A2-A3
A2-A3
A1
A2
A1-A2
P
12
13
24
25
31
NEW MEXICO
TEXAS
Mon 177
BM 4252
Mon 176 BM 4395
BM 4133
BM 4172
EIGHTEEN TANK 1.8 MI
(HUECO TANKS)
4747 I NE
2'30"
403000m E.
240 000 FEET
SCALE 1:24 000
1 MILE
7000 FEET
phic
ols¹
A1
A2
A3



P/A2-A3
A1
A2
A1-A2
A2-A3
P
B
Hueco Fault No. 1
Hueco Fault No. 2
Ote Ridge Fault
(MOUNTAIN TANK)
4848 III SW
OTERO CO
EL PASO CO
3549
3547
3546
2'30"
3545
3544
3543
3542
3541000m. N.
900 000 FEET
(TEX.)
401
2'30"
402
403000m. E.
INTERIOR-GEOLOGICAL SURVEY, RESTON, VIRGINIA-1986
240 000 FEET (TEX.)
32°00'
106°00'
1 MILE
7000 FEET

6

Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system, central zone and Texas coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations

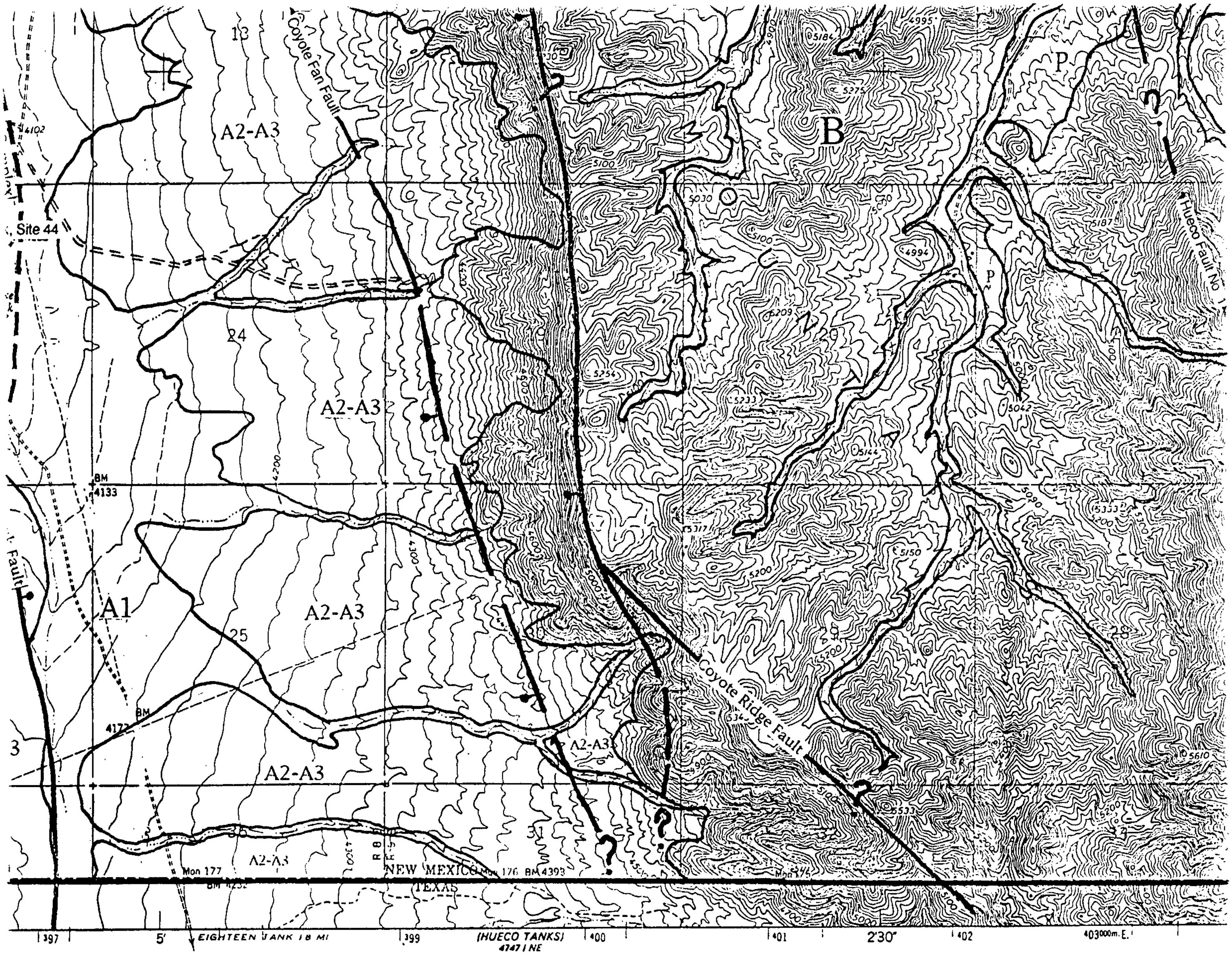
Fine red dashed lines indicate selected fence lines

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

THIS MAP COMPLIES
FOR SALE BY U. S. GEOLOGICAL SURV
A FOLDER DESCRIBING TOPOGR



ınge Geomorphic	
ıts and Symbols[1]	
	A1
	A2
ict)	A3
	B
ːx	
nde) Sediments	CR • • •
	DL
	DP
heet)	DS
·d	DSC
·rous	DSG
	P
	PI
	PIL
tion	

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

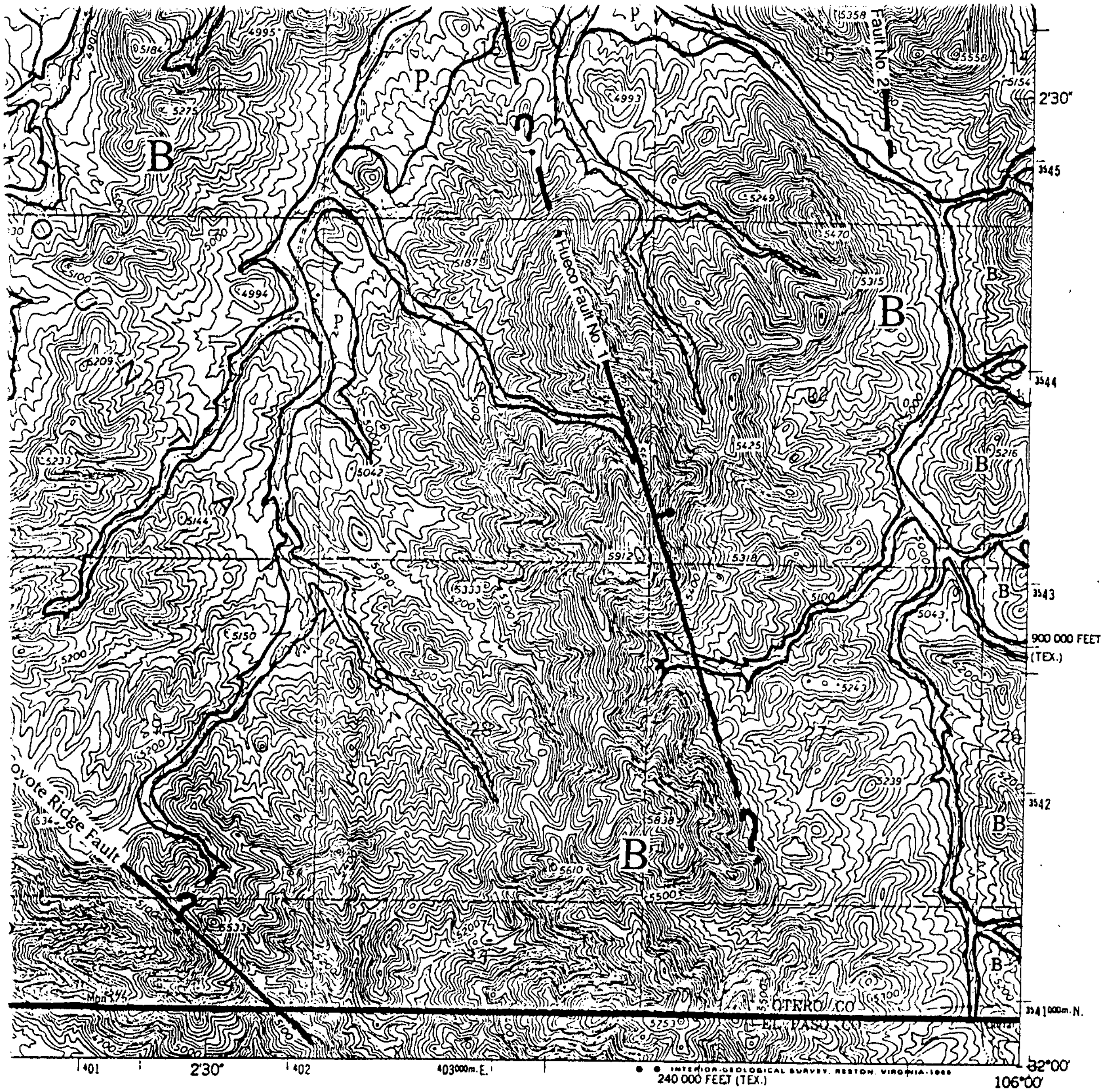
QUADRANGLE LOCATION

0°34'
10 MILS

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UTM GRID AND 19
DECLINATION A

8



1 MILE

7000 FEET

KILOMETER

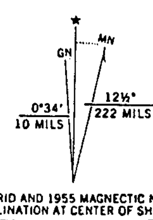
4847 IV NW (CERRO ALTO MOUNTAIN)

ROAD CLASSIFICATION

Unimproved dirt

D

QUADRANGLE LOCATION



UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

DESERT SE, N. MEX.-TEX.

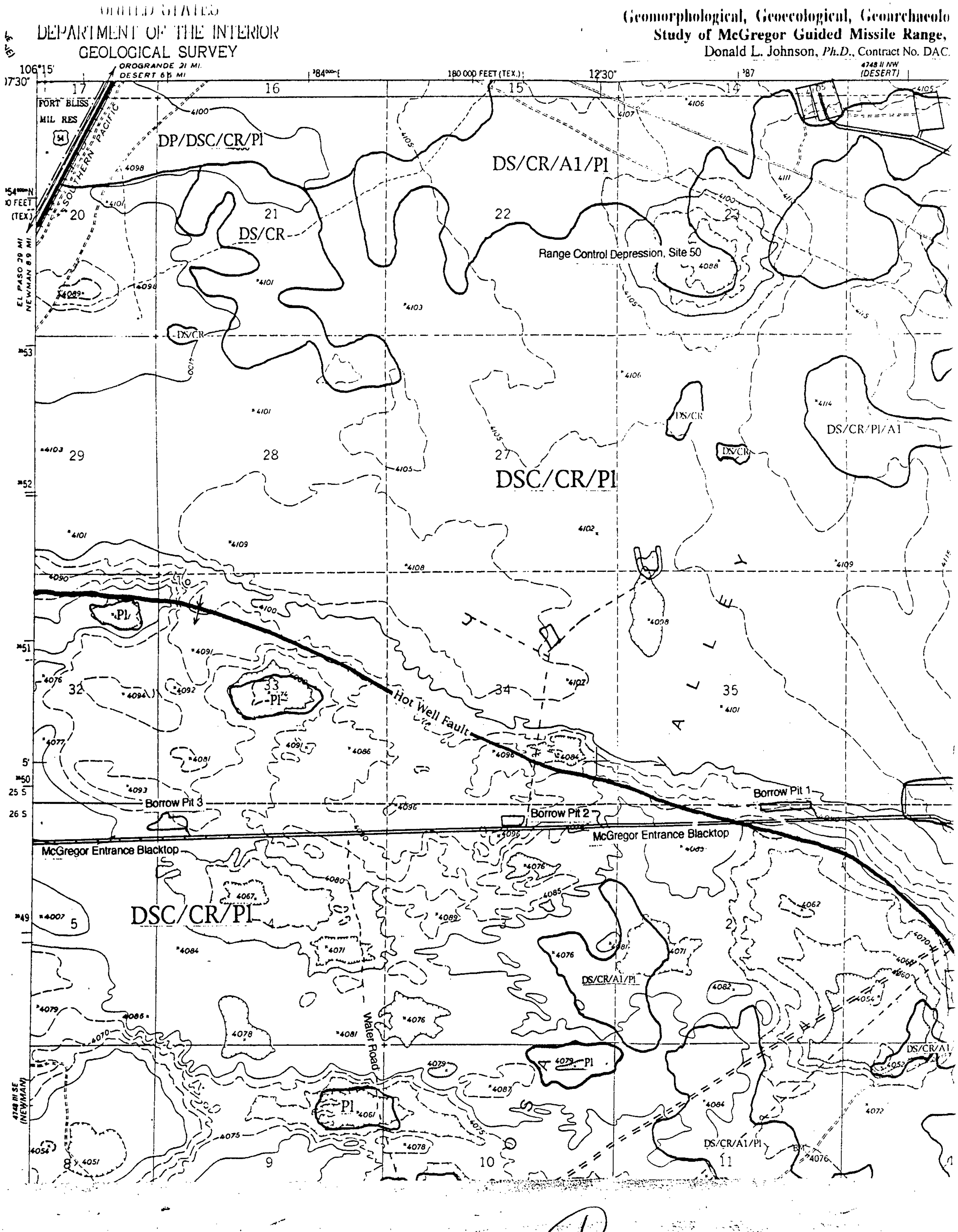
32106-A1-TF-024

1955

DMA 4748 II SE-SERIES V881

ON, VIRGINIA 22092
REQUEST

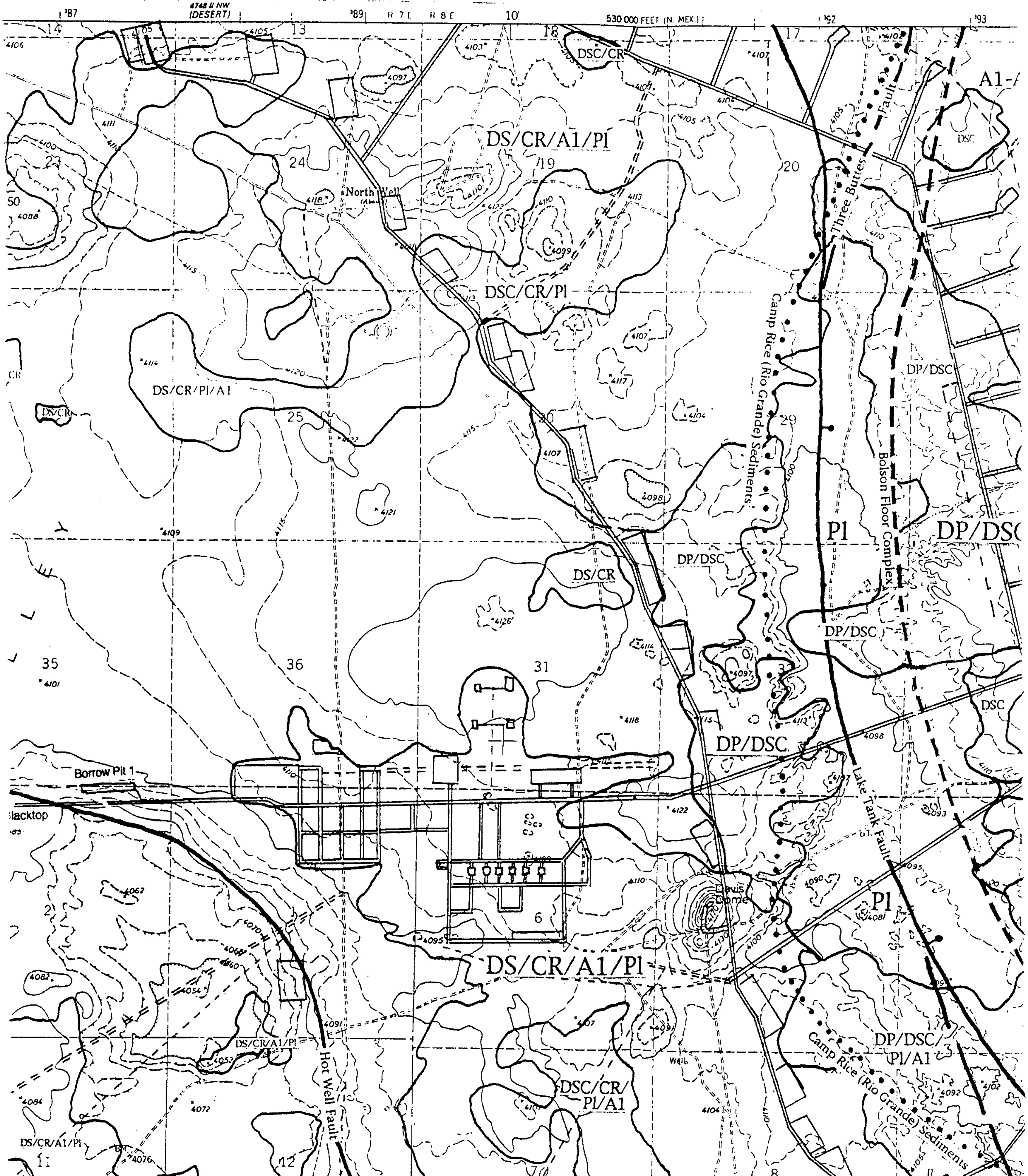
Geomorphological, Geoecological, Geoarchaeolo
Study of McGregor Guided Missile Range,
Donald L. Johnson, *Ph.D.*, Contract No. DAC



1

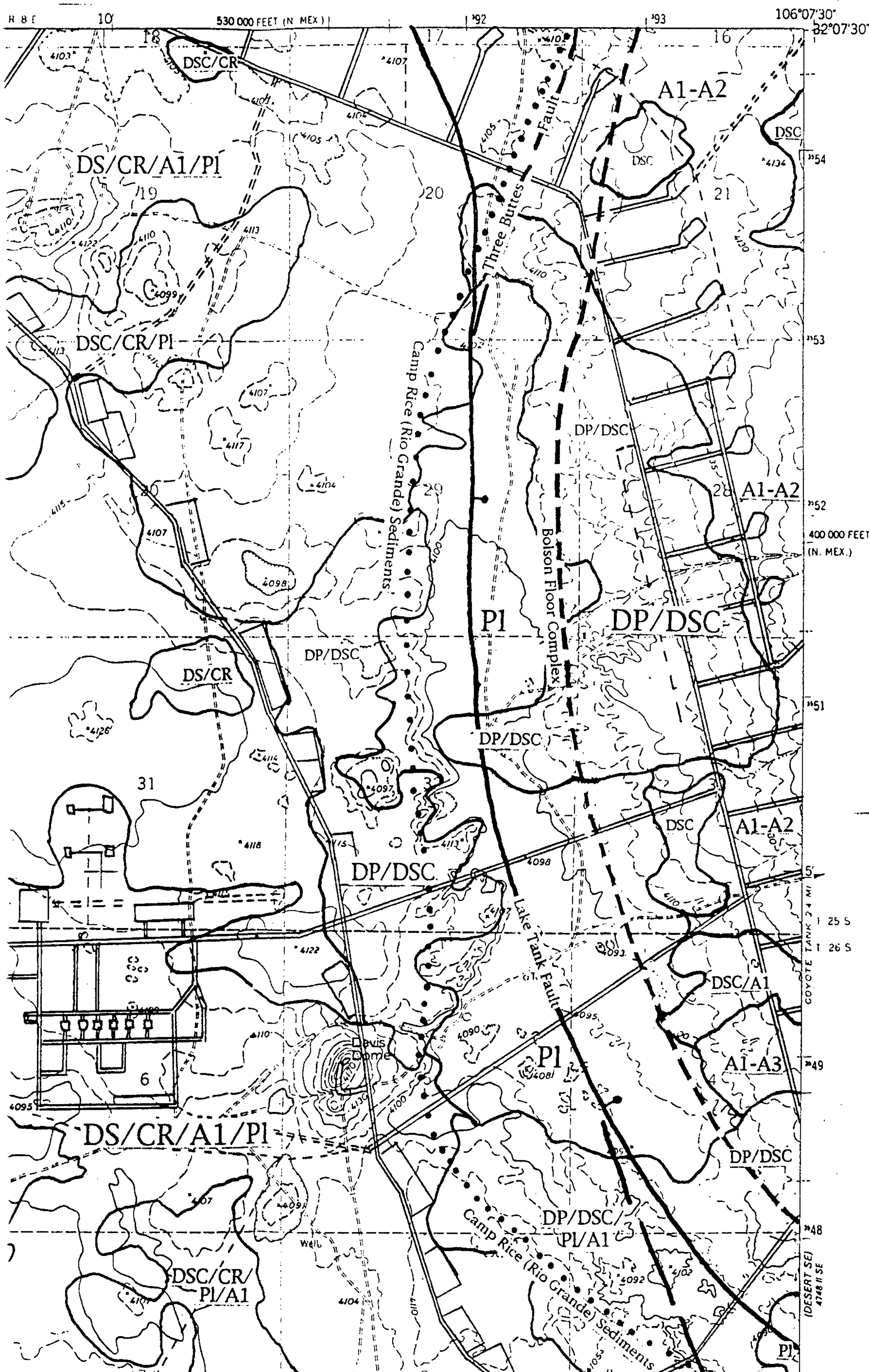
hological, Geoecological, Geoarchaeological and Surficial Mapping
y of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

DESERT SW QUA
NEW MEXICO-
7.5 MINUTE SERIES (T



Mapping
exico

DESERT SW QUADRANGLE
NEW MEXICO-TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)



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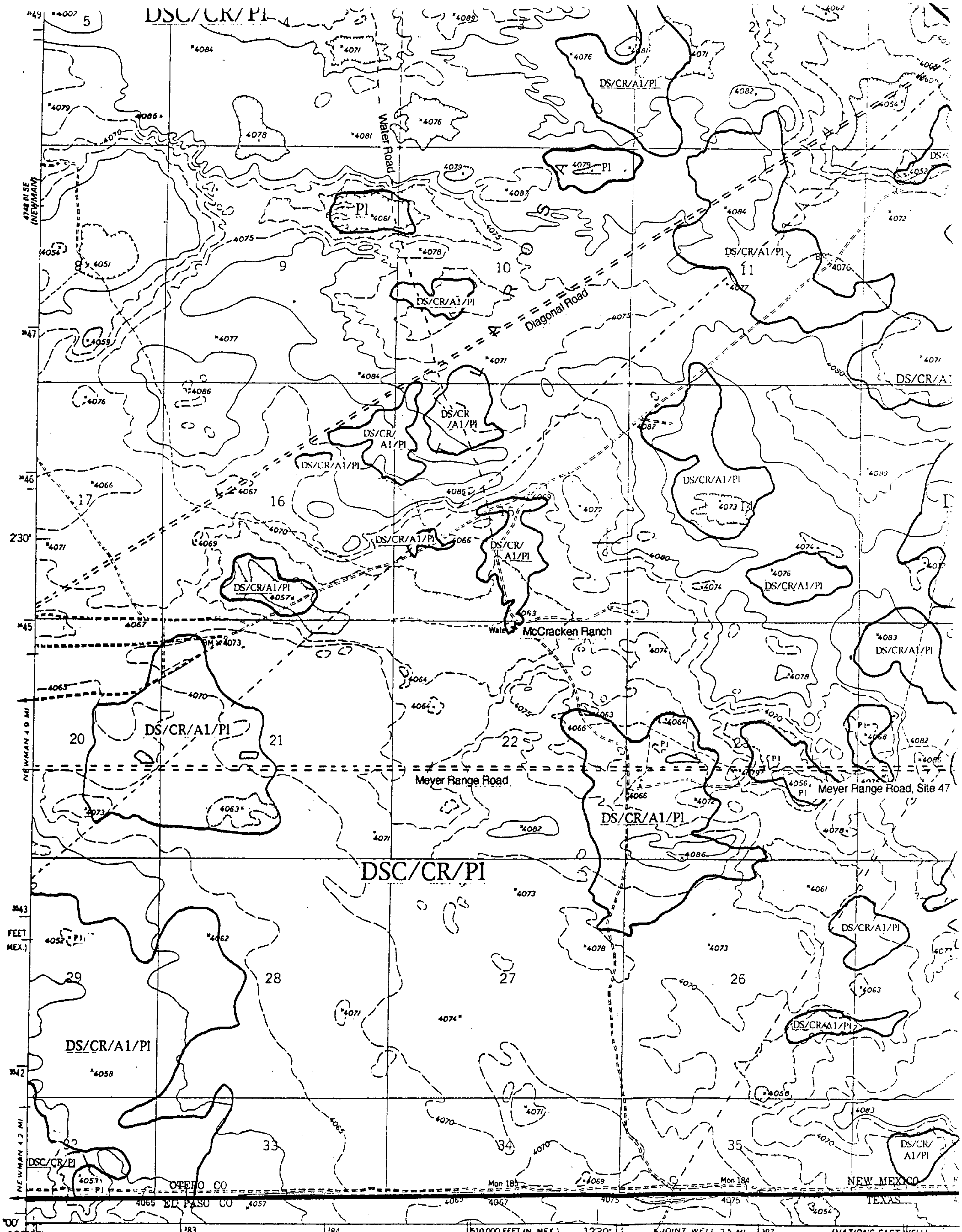
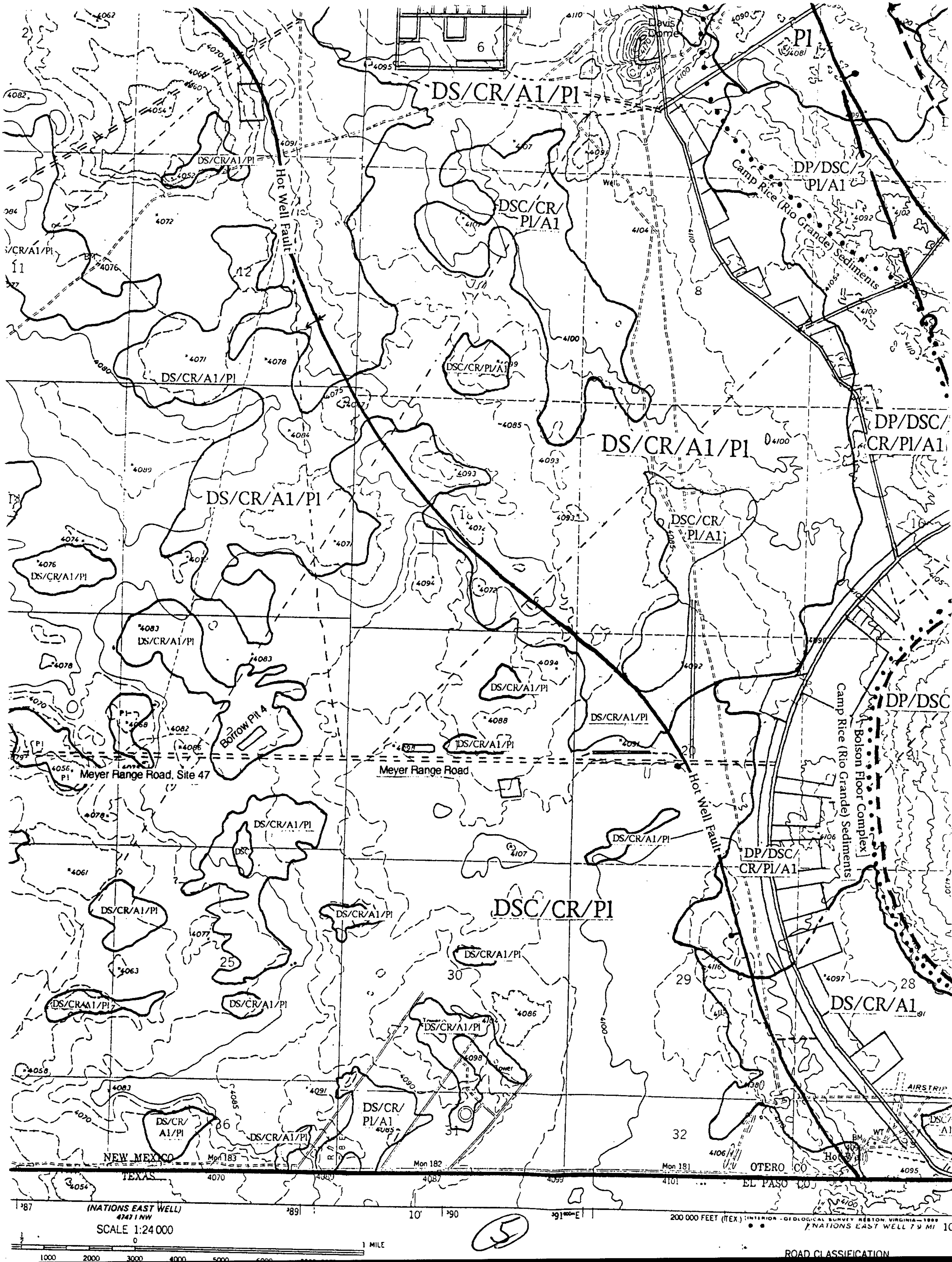


Mapped by the Army Map Service
Published for civil use by the Geological Survey
Control by USGS, USC&GS, and USCE

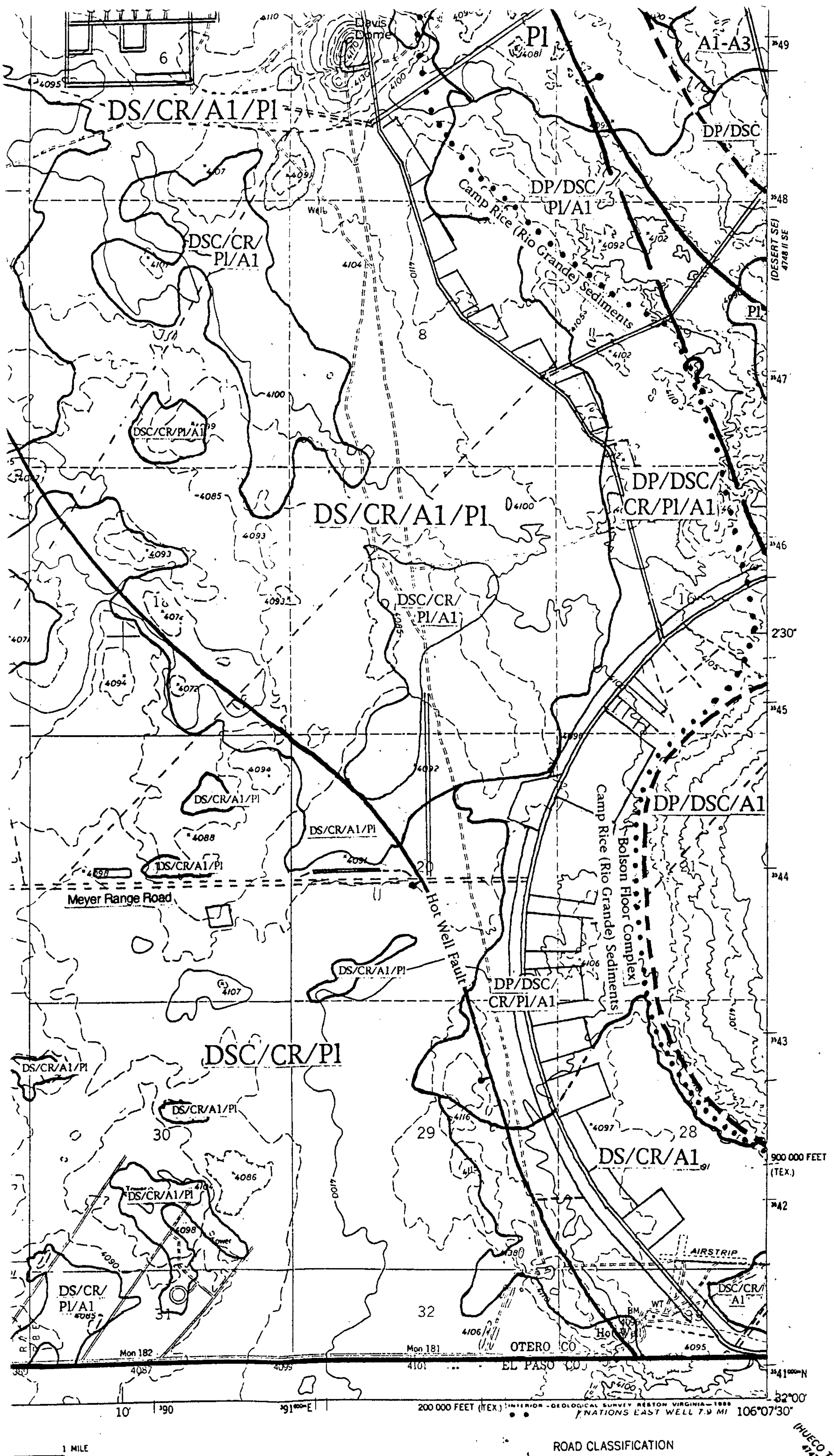
(4)

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2



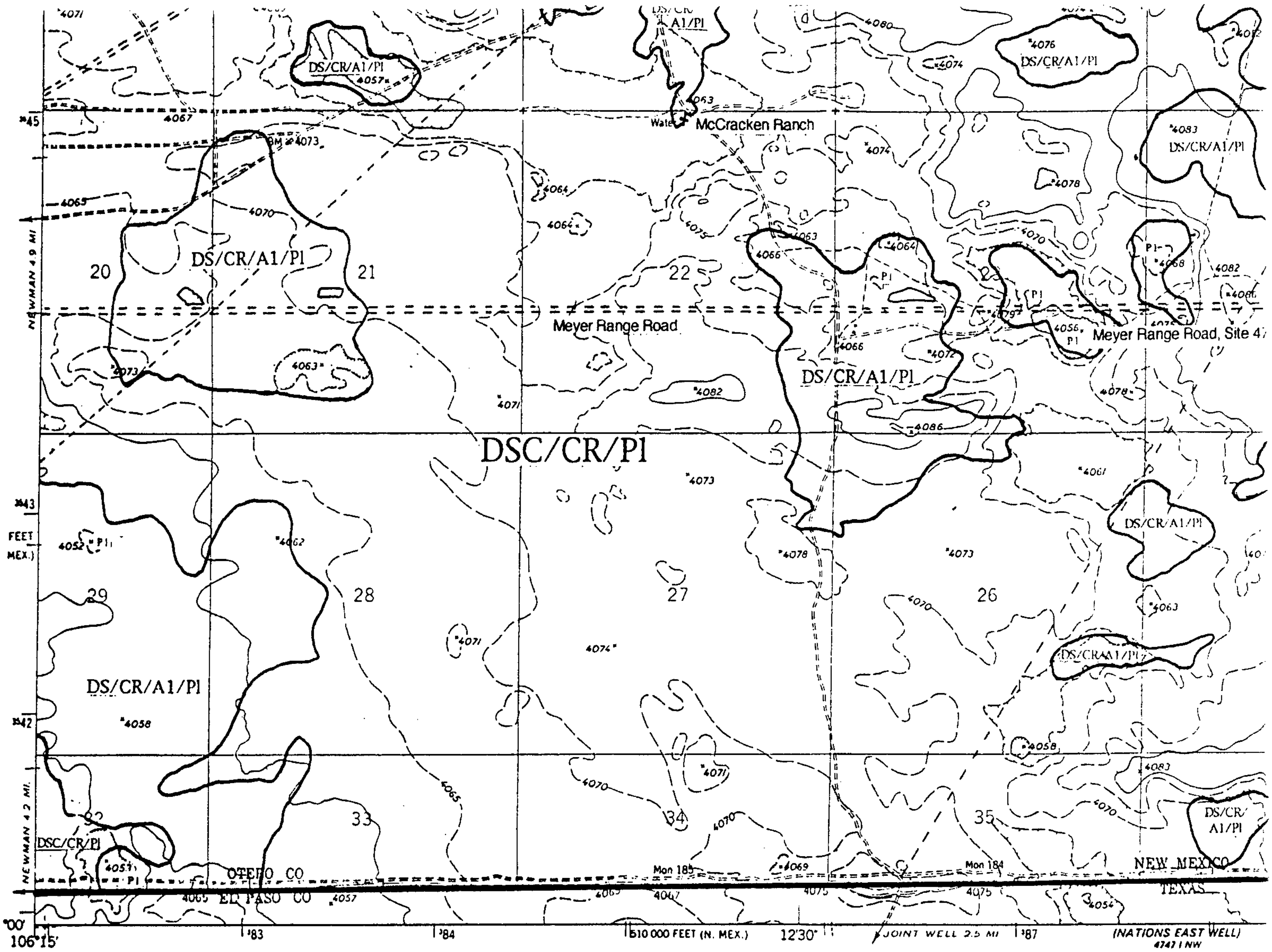
Davis Dome
Pl
DS/CR/A1/Pl
DP/DSC/Pl/A1
Camp Rice (Rio Grande) Sediments
DSC/CR/Pl/A1
Hot Well Fault
DSC/CR/Pl/A1
DP/DSC/CR/Pl/A1
DS/CR/A1/Pl
DSC/CR/Pl/A1
Borrow Pit 4
DP/DSC
Camp Rice (Rio Grande) Sediments
Bolson Floor Complex
Meyer Range Road, Site 47
Meyer Range Road
DP/DSC/CR/Pl/A1
DSC/CR/Pl
DS/CR/A1
DS/CR/Pl/A1
AIRSTRIP
NEW MEXICO
TEXAS
OTERO CO
EL PASO CO
Hot Well
Mon 183
Mon 182
Mon 181
(NATIONS EAST WELL)
4747 I NW
SCALE 1:24 000
1 MILE
200 000 FEET (TEX.)
NATIONS EAST WELL 7.9 MI
ROAD CLASSIFICATION

5



Davis Dome
Pl
A1-A3
DS/CR/A1/Pl
DP/DSC
DP/DSC/Pl/A1
Camp Rice (Rio Grande) Sediments
DSC/CR/Pl/A1
DSC/CR/Pl/A1
DP/DSC/CR/Pl/A1
DS/CR/A1/Pl
DSC/CR/Pl/A1
DP/DSC/A1
DS/CR/A1/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
Meyer Range Road
Hot Well Fault
Bolson Floor Complex
Camp Rice (Rio Grande) Sediments
DS/CR/A1/Pl
DP/DSC/CR/Pl/A1
DSC/CR/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
DS/CR/A1
DS/CR/A1/Pl
DS/CR/Pl/A1
DSC/CR/A1
AIRSTRIP
Hot Well
OTERO CO
EL PASO CO
Mon 182
Mon 181
900 000 FEET (TEX.)
200 000 FEET (TEX.)
106°07'30"
32°00'
2'30"
(DESERT SE) 4748 II SE
NATIONS EAST WELL 7.9 MI
1 MILE
ROAD CLASSIFICATION

6



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Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system, central zone and Texas coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations

To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

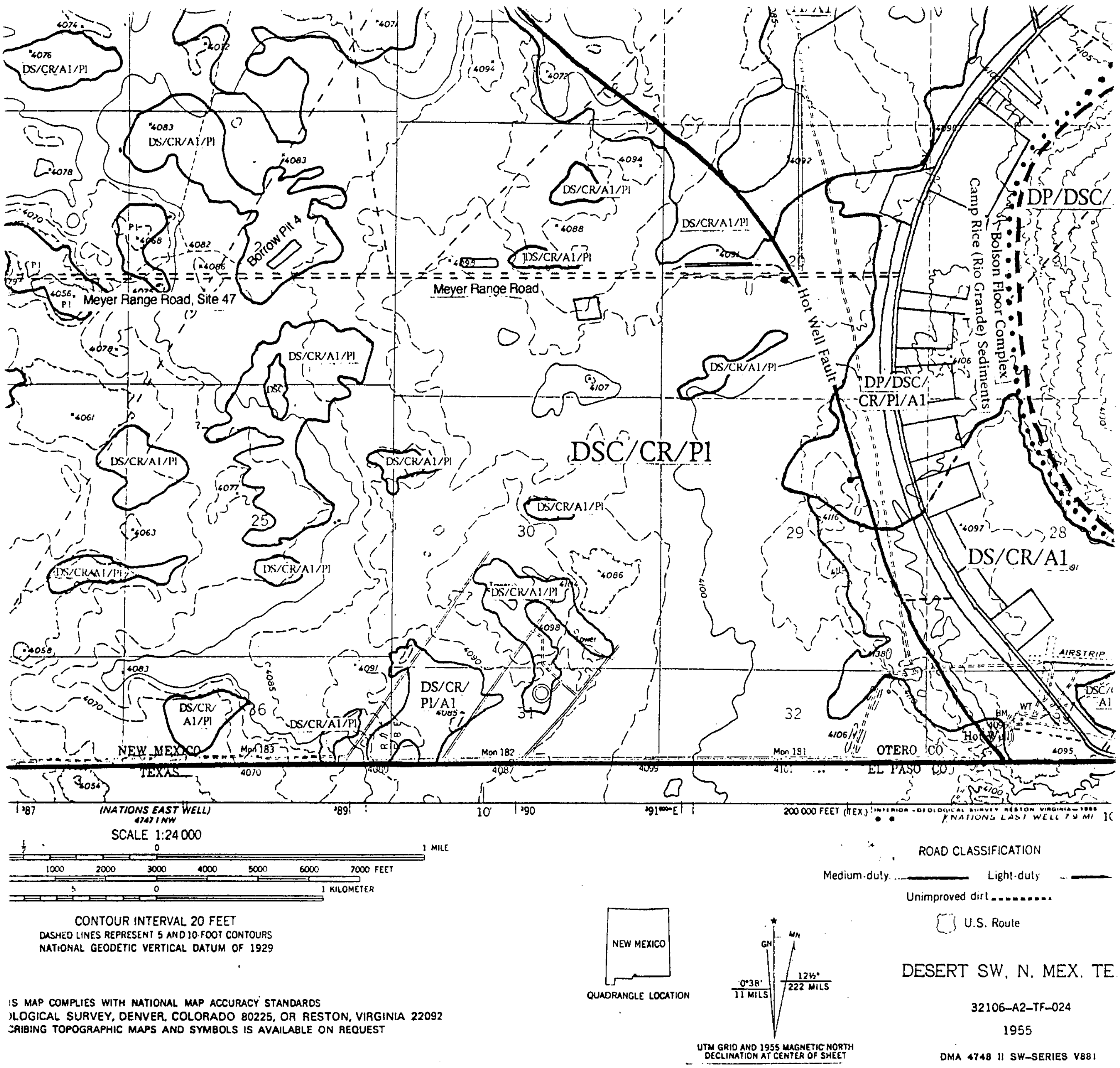
[1]See text for explanation

SCALE 1:24 000

1000 0 1000 2000 3000 4000

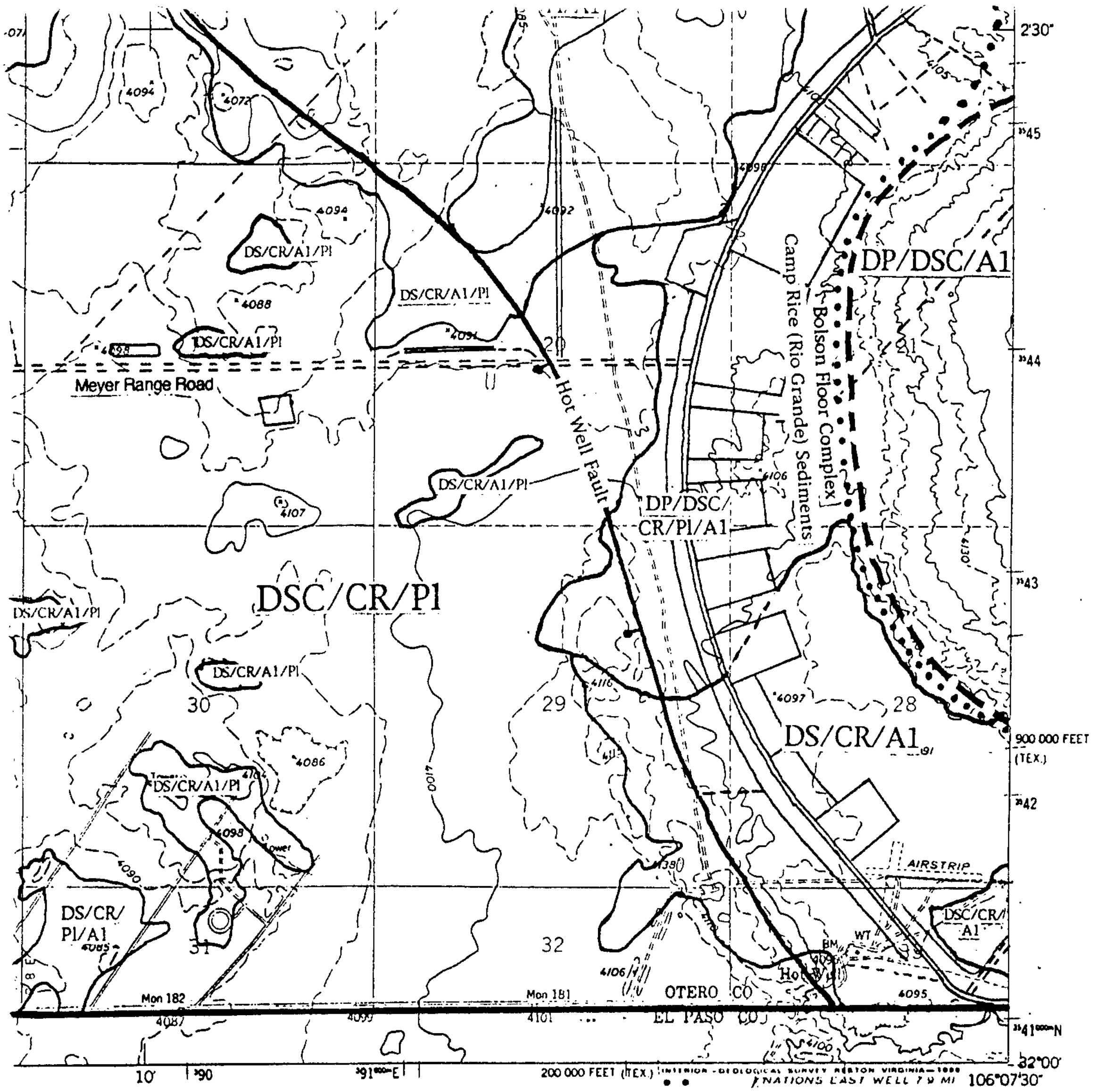
CONTOUR INTERVAL 20 FEE
DASHED LINES REPRESENT 5 AND 10 FOOT C
NATIONAL GEODETIC VERTICAL DATUM

THIS MAP COMPLIES WITH NATIONAL MAP ACCU
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOL



DS/CR/A1/PI
DS/CR/A1/PI
Borrow Pit 4
Meyer Range Road, Site 47
Meyer Range Road
DS/CR/A1/PI
DS/CR/A1/PI
DS/CR/A1/PI
Hot Well Fault
DP/DSC/
CR/PI/A1
Camp Rice (Rio Grande) Sediments
Bolson Floor Complex
DP/DSC/
DSC/CR/PI
DS/CR/A1/PI
DS/CR/A1/PI
DS/CR/A1/PI
DS/CR/A1/PI
DS/CR/A1/PI
DS/CR/A1
DS/CR/
PI/A1
DS/CR/
A1/PI
DS/CR/A1/PI
AIRSTRIP
Hot Well
NEW MEXICO
TEXAS
OTERO CO
EL PASO CO
Mon 183
Mon 182
Mon 181
(NATIONS EAST WELL)
4747 I NW
200 000 FEET (TEX.)
SCALE 1:24 000
1 MILE
1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
IS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
)LOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
CRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°38'
11 MILS
12½°
222 MILS
UTM GRID AND 1955 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
U.S. Route
DESERT SW, N. MEX. TE
32106–A2–TF–024
1955
DMA 4748 II SW–SERIES V881

8



1 MILE

ROAD CLASSIFICATION

Medium-duty ——— Light-duty ———

Unimproved dirt - - - - -

U.S. Route

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°38' 11 MILS

12½° 222 MILS

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

DESERT SW, N. MEX. TEX.

32106–A2–TF–024

1955

DMA 4748 II SW–SERIES V881

NIA 22092

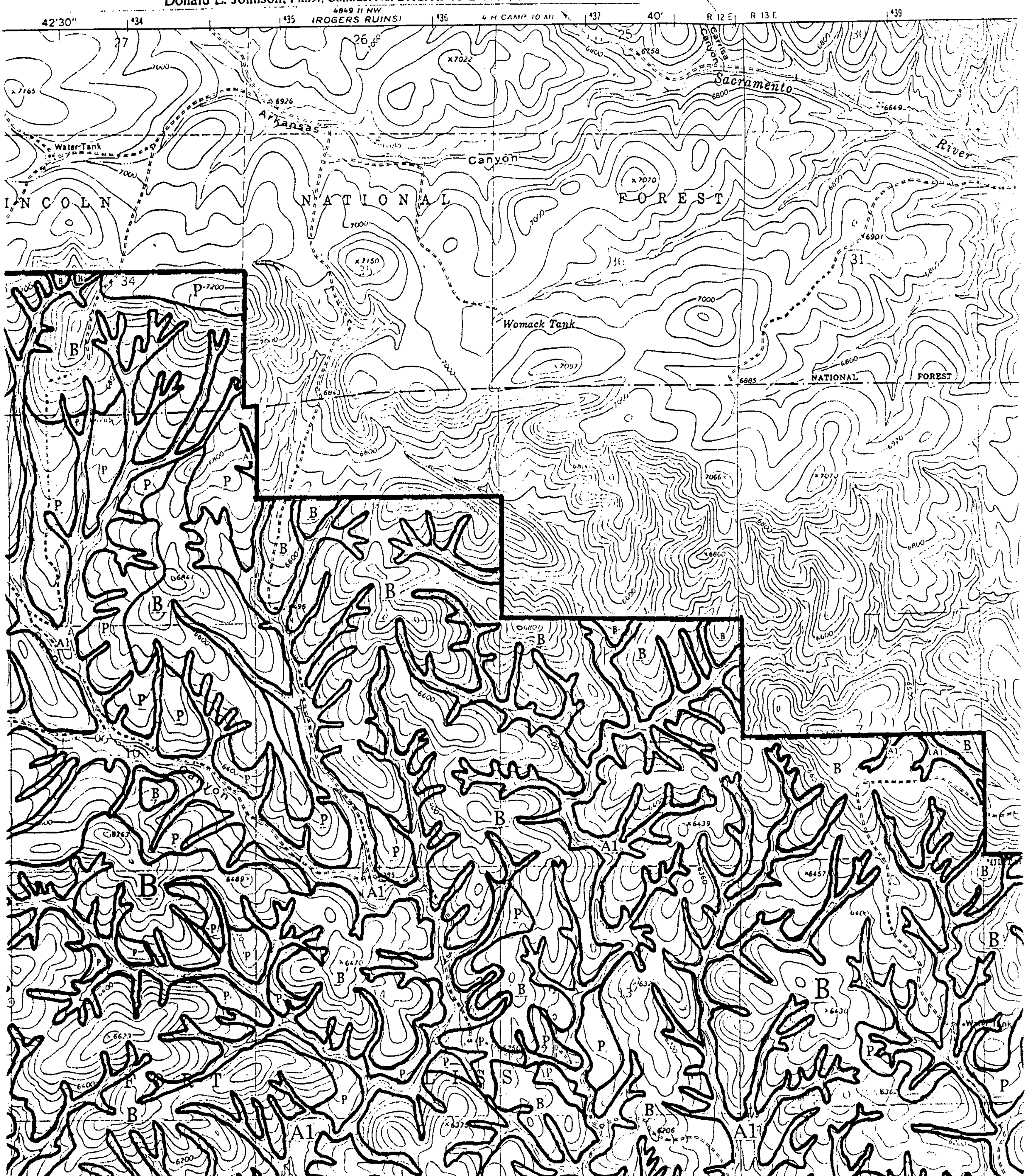
8

9

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

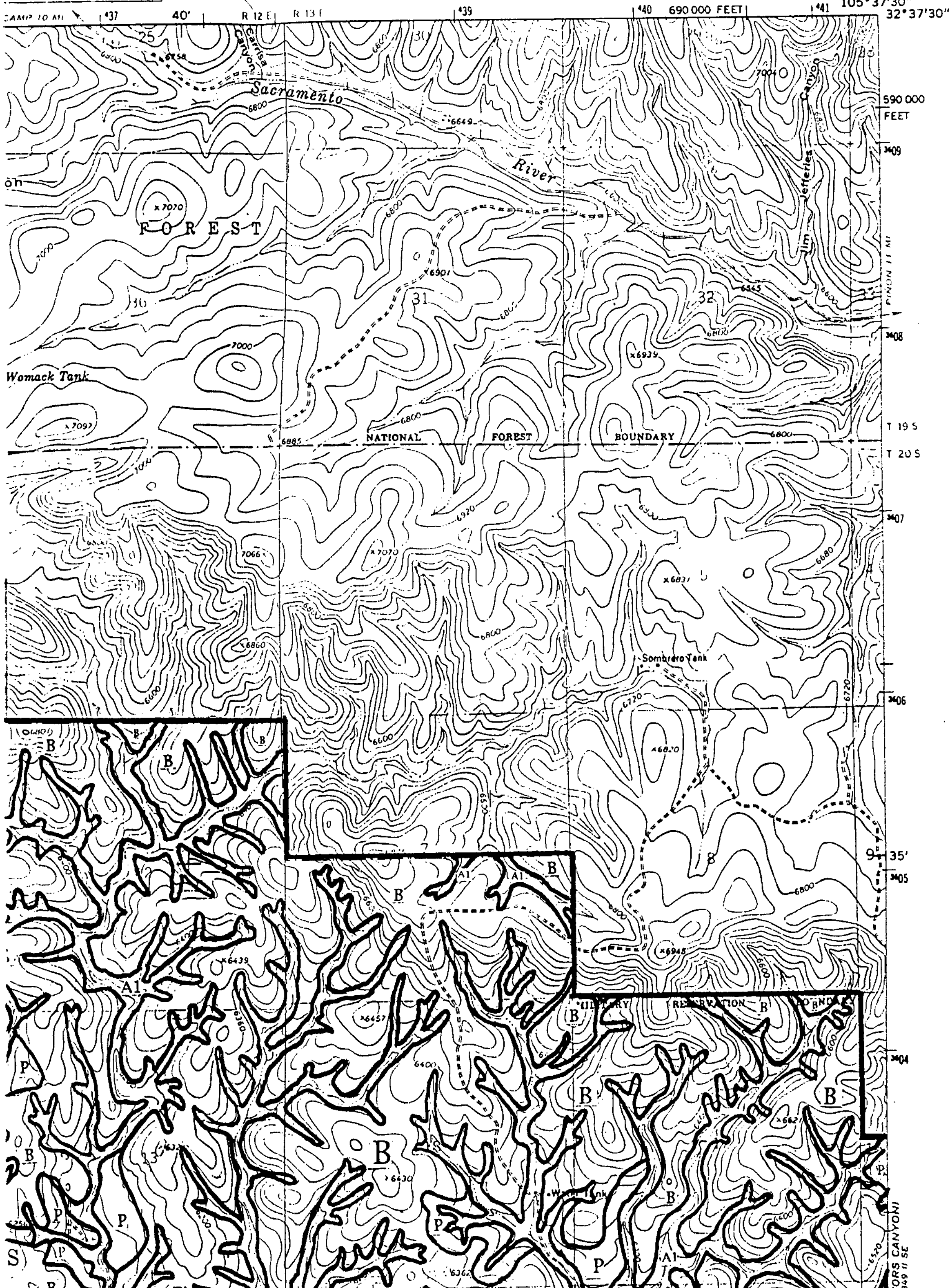
Geomorphological, Geoecol
Study of McGregor G
Donald L. Johns

1


EL P
7.5 M
42'30"
4849 II NW
(ROGERS RUINS)
4 H CAMP 10 MI
40'
R 12 E
R 13 E
Arkansas
Canyon
Sacramento
River
Carrisa Canyon
Water Tank
LINCOLN
NATIONAL
FOREST
Womack Tank
NATIONAL
FOREST
FORT
BLISS
Canyon
B
P
A1

Surficial Mapping
, New Mexico
4, 1997

EL PASO CANYON QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



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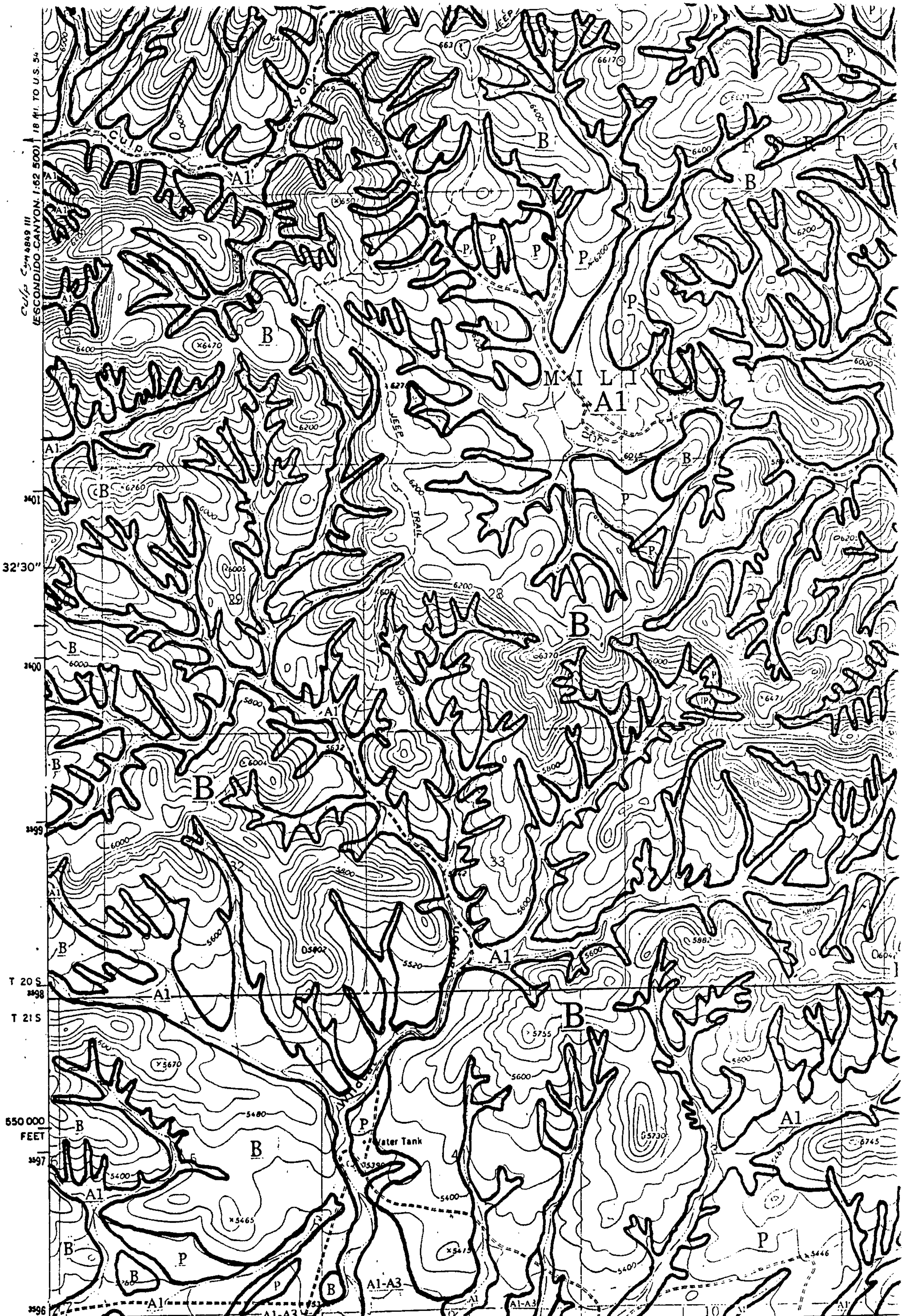


Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1964. Field checked 1965

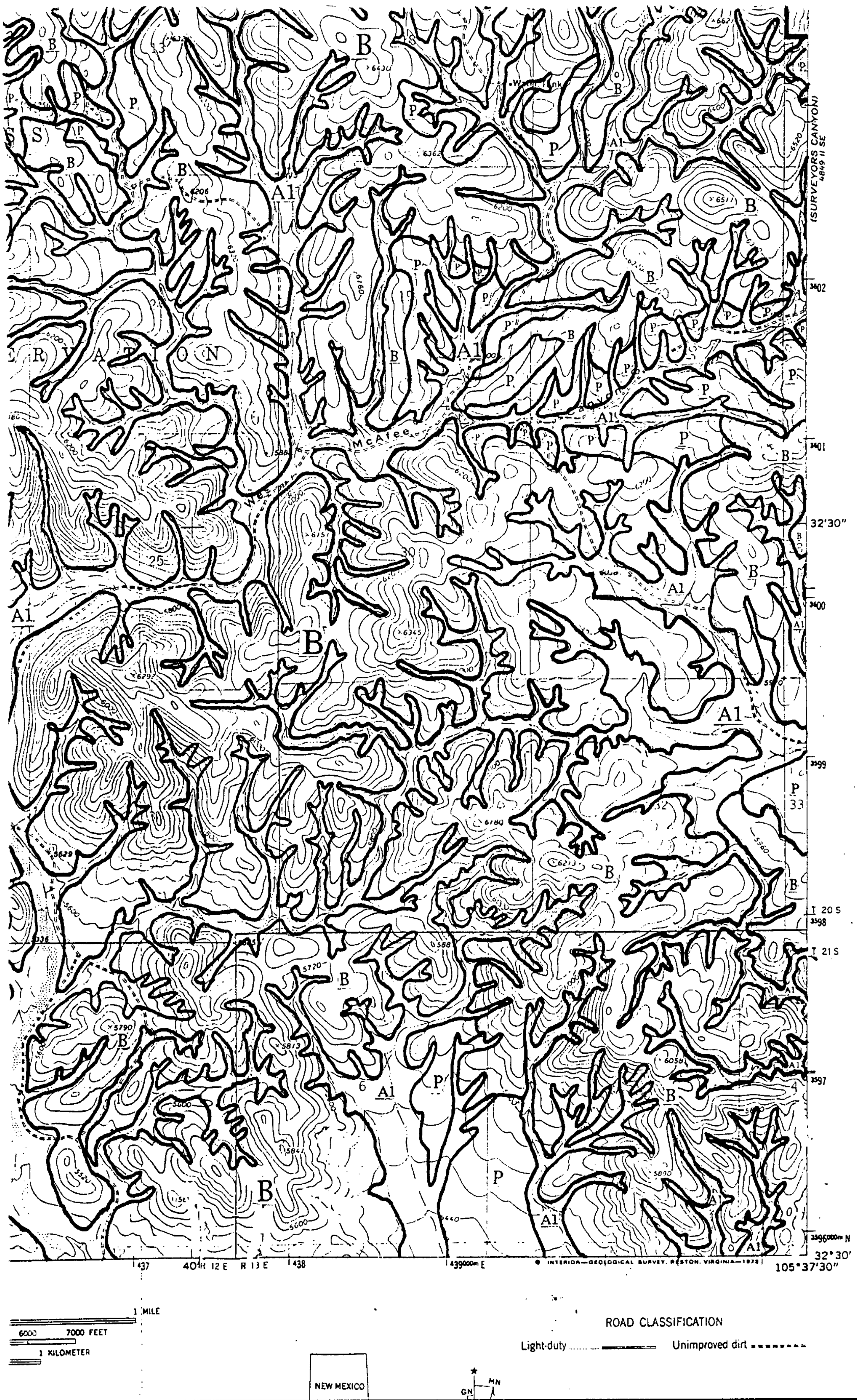
Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system,

McGregor Range Geomorphic Mapping Units and Symbols[1]

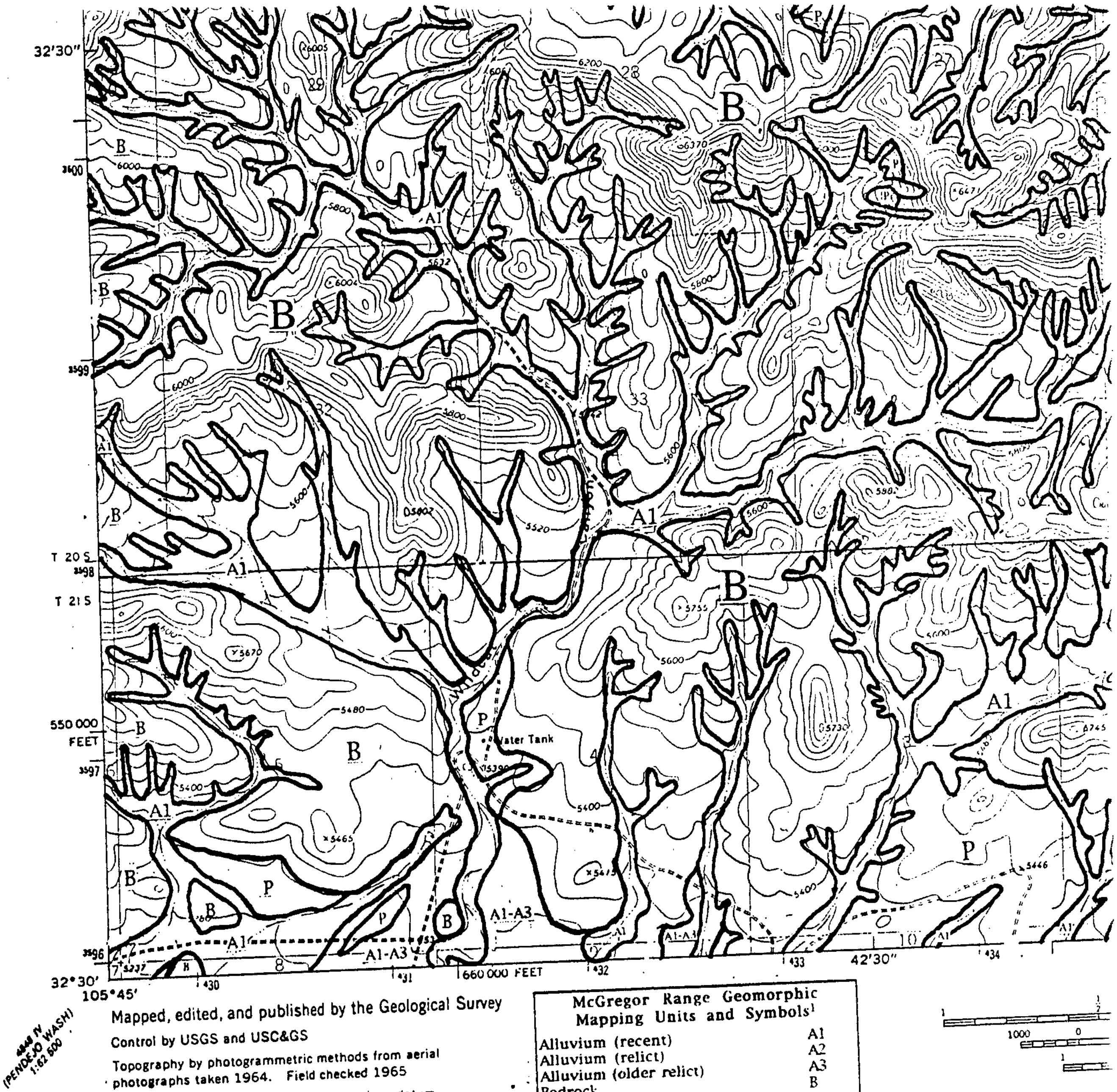
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	

H


RESERVATION
McAfee
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 40 FEET
R 12 E R 13 E
439000m E
Light-duty
NEW MEXICO


(SURVEYORS CANYON)
4849 II SE
R Y A T I O N
McAfee
A1
B
P
S
3602
3601
32'30"
3600
3599
3598
T 20 S
T 21 S
3597
3596000m N
32°30'
105°37'30"
437
40 R 12 E
R 13 E
438
439000m E
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1972
1 MILE
7000 FEET
1 KILOMETER
ROAD CLASSIFICATION
Light-duty
Unimproved dirt
NEW MEXICO
MN
GN

6



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1964. Field checked 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	P1
Playa Lunette	PlL

[1]See text for explanation

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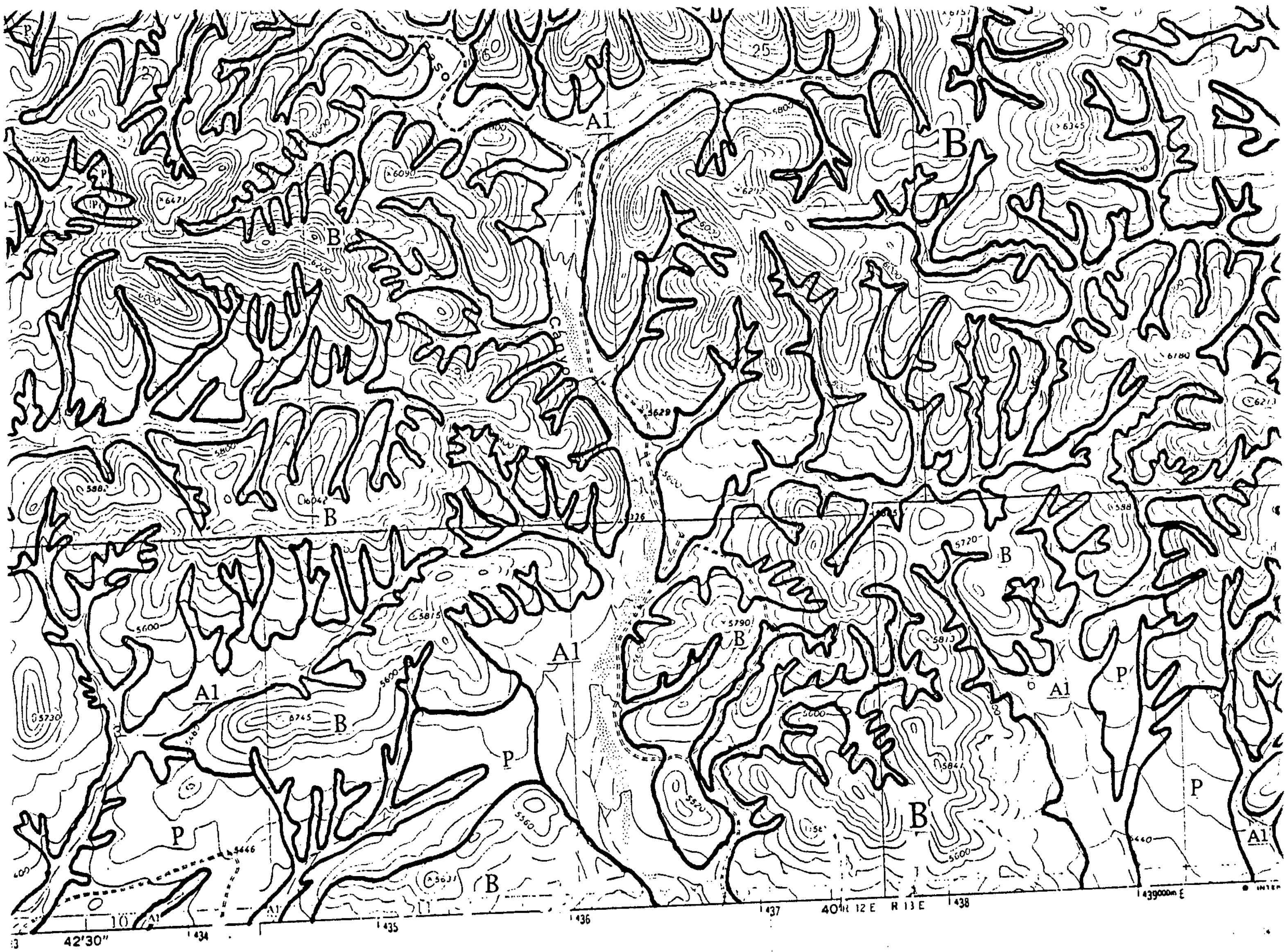
FOR SALE BY U. S. GEOLO

A FOLDER DESCRIB



ric
ls[1]
A1
A2
A3
B
CR
DL
DP
DS
DSC
DSG
P
P1
P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

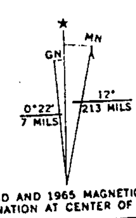
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

Light-duty

QUADRANGLE LOCATION



UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1 MILE

5000 6000 7000 FEET

1 KILOMETER

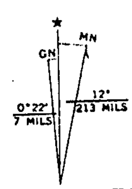
EET
JM OF 1929

CURACY STANDARDS
)O 80225, OR RESTON, VIRGINIA 22092
)LS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION

Light-duty ——— Unimproved dirt - - - - - -

QUADRANGLE LOCATION



UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

EL PASO CANYON, N. MEX.
N3230—W10537.5/7.5

1965

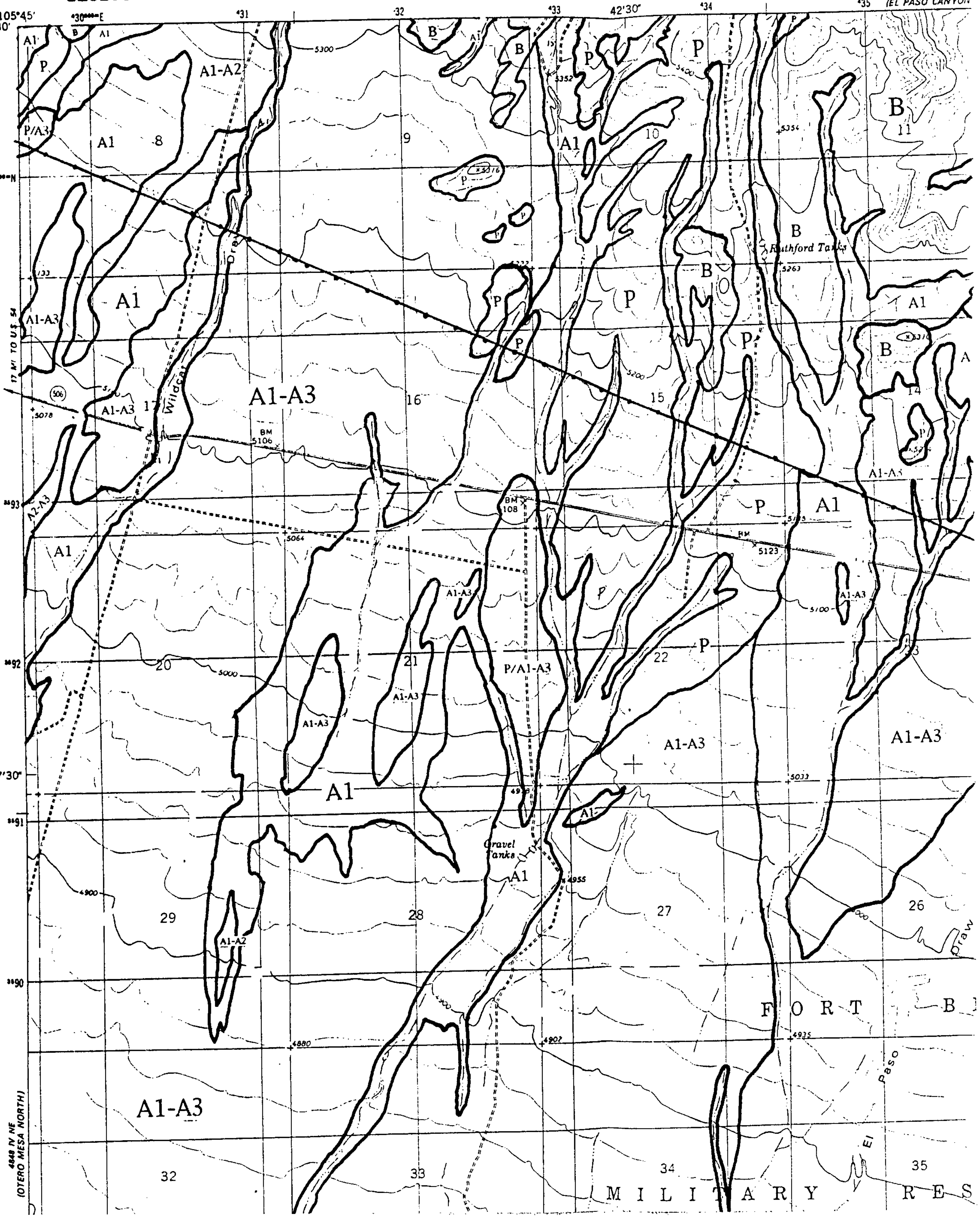
DMA 4849 II SW—SERIES V881

6

9

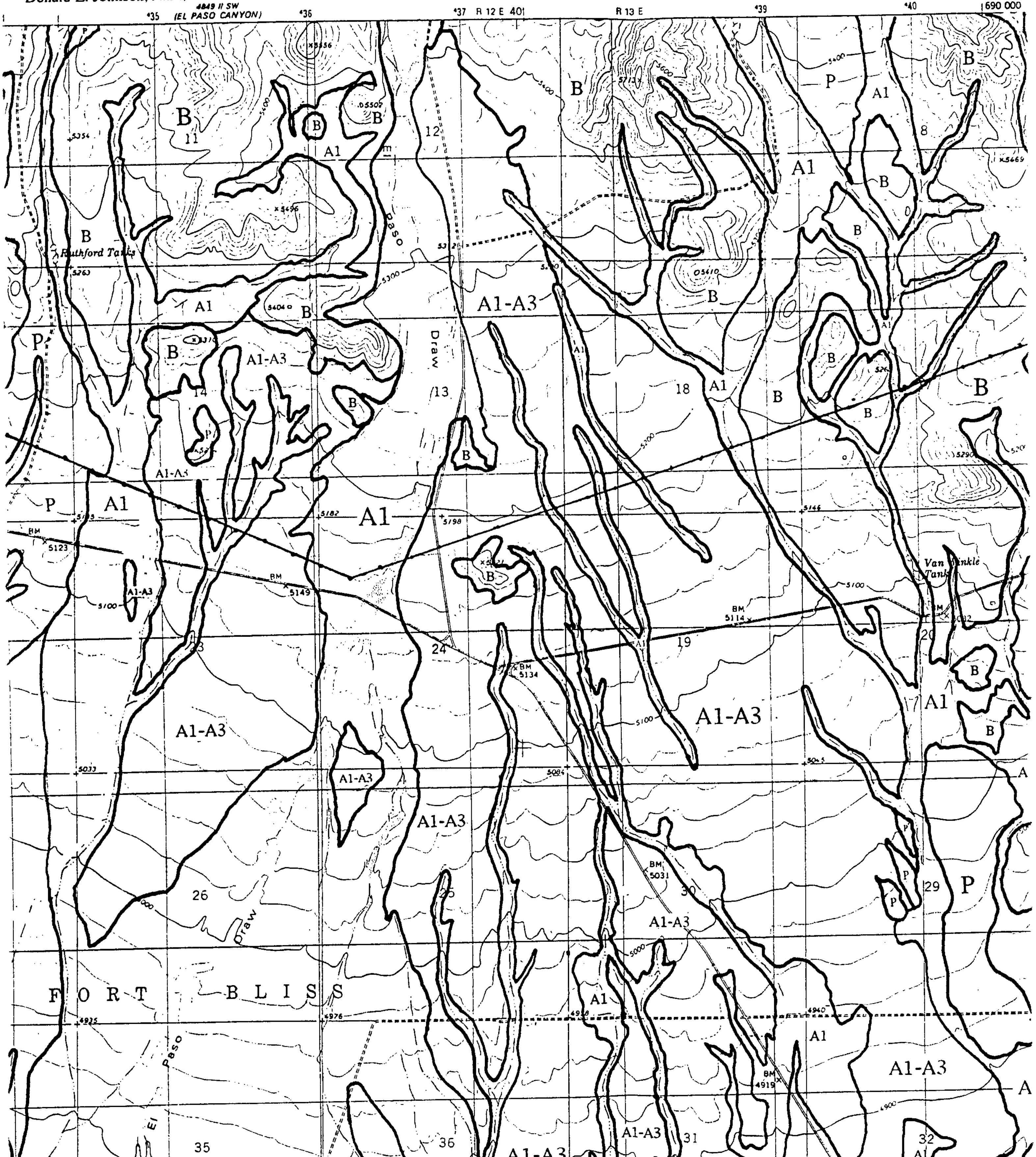
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoecological, Georcha
Study of McGregor Guided Missile Ra
Donald L. Johnson, *Ph.D.*, Contract No.



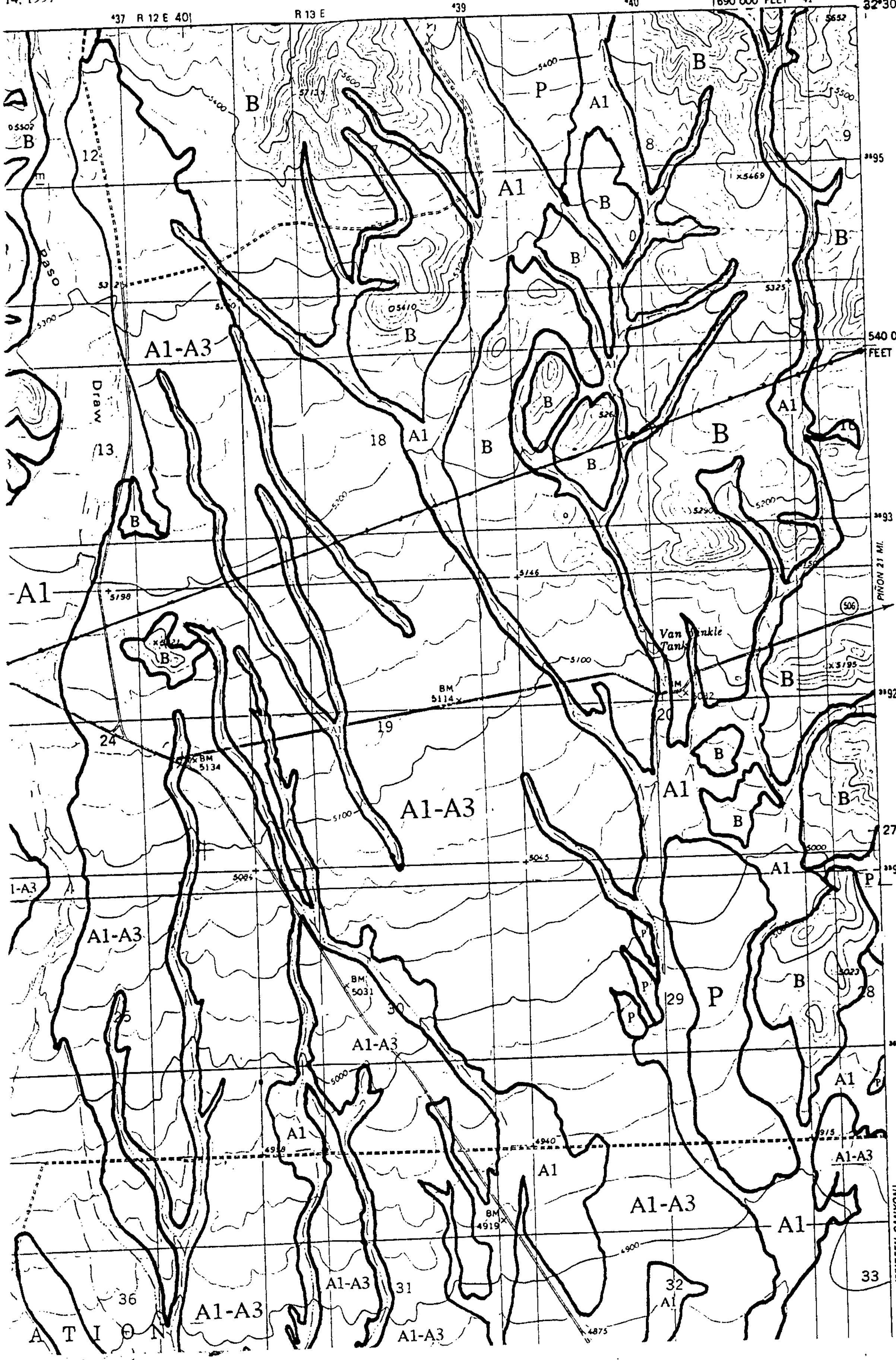
ıological, Geoecological, Geoarchaeological and Surficial Mapping
y of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

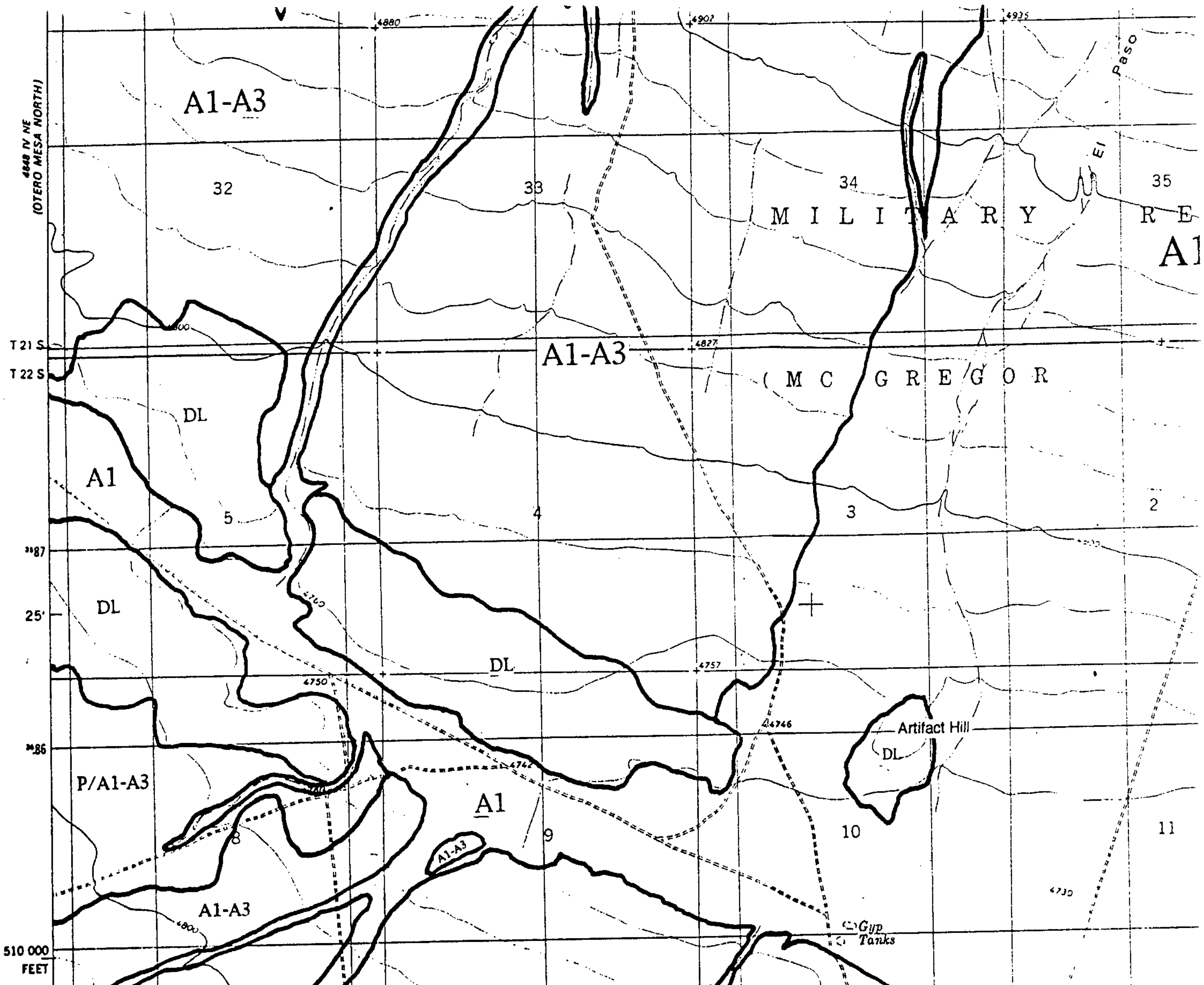
EL PASO DRAW QUA
NEW MEXICO—OTEI
7.5 MINUTE SERIES (TOI



Surficial Mapping
s, New Mexico
14, 1997

EL PASO DRAW QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)





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Topography by photogrammetric methods from aerial photographs taken 197? Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and

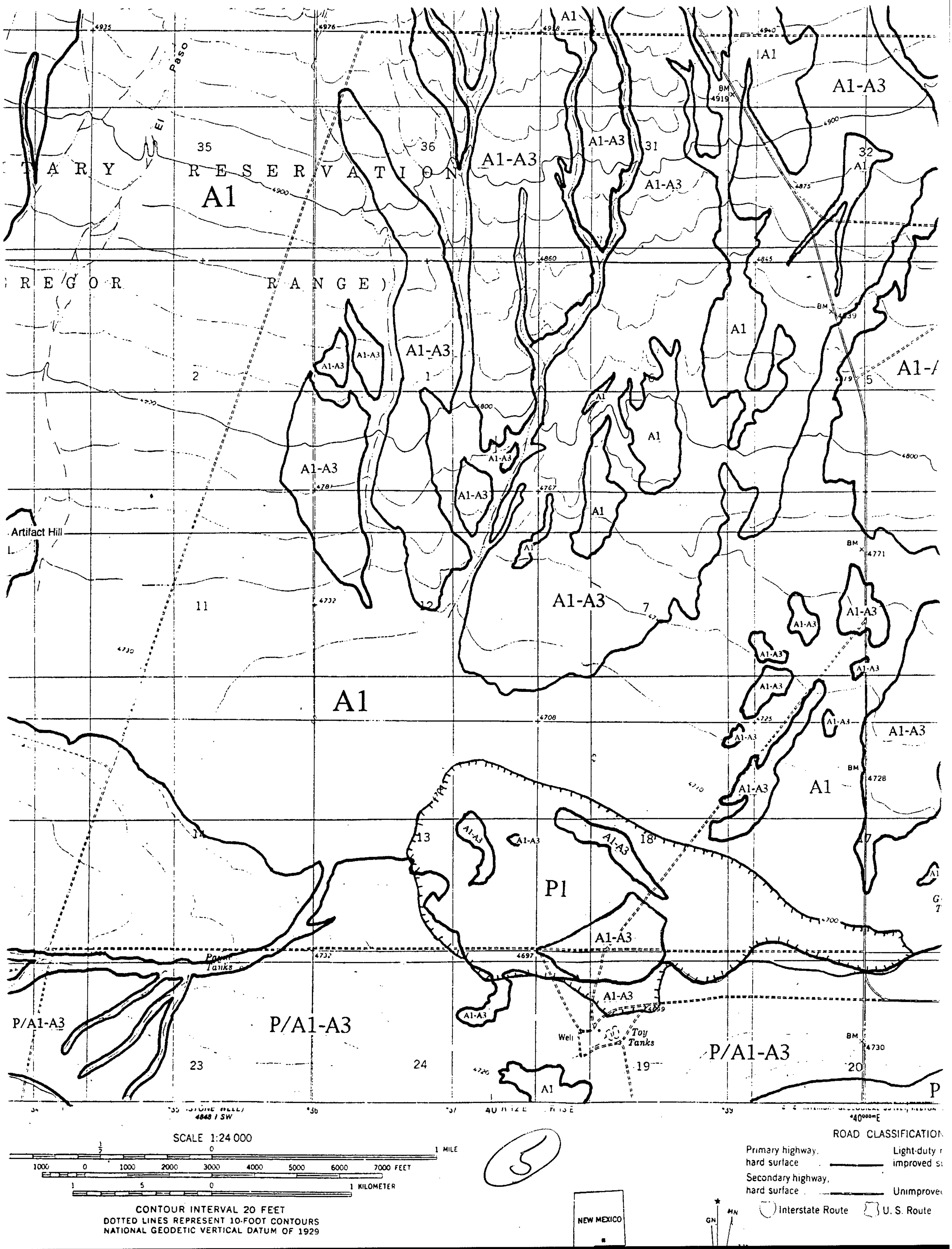
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS

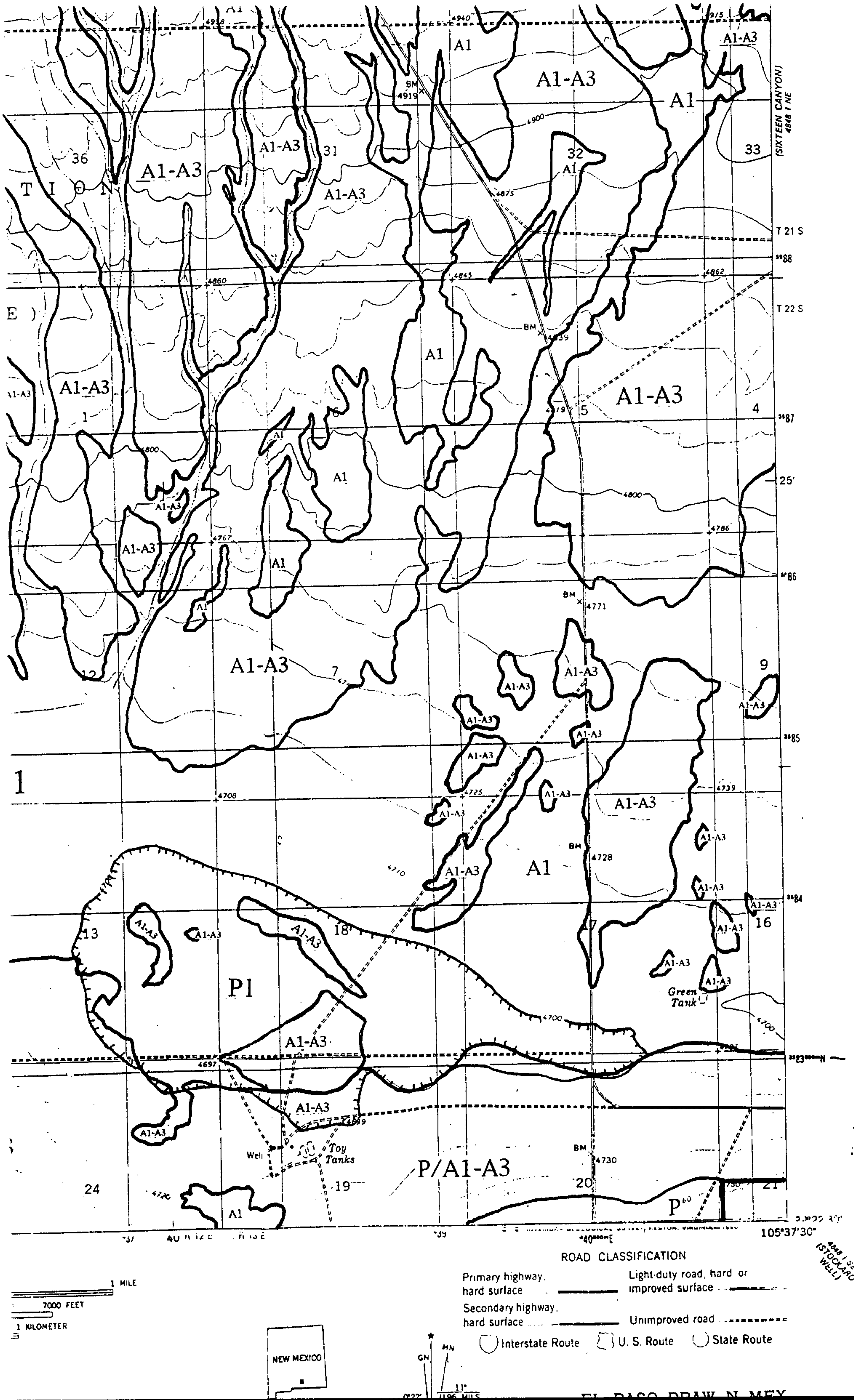
SCALE 1:2

4

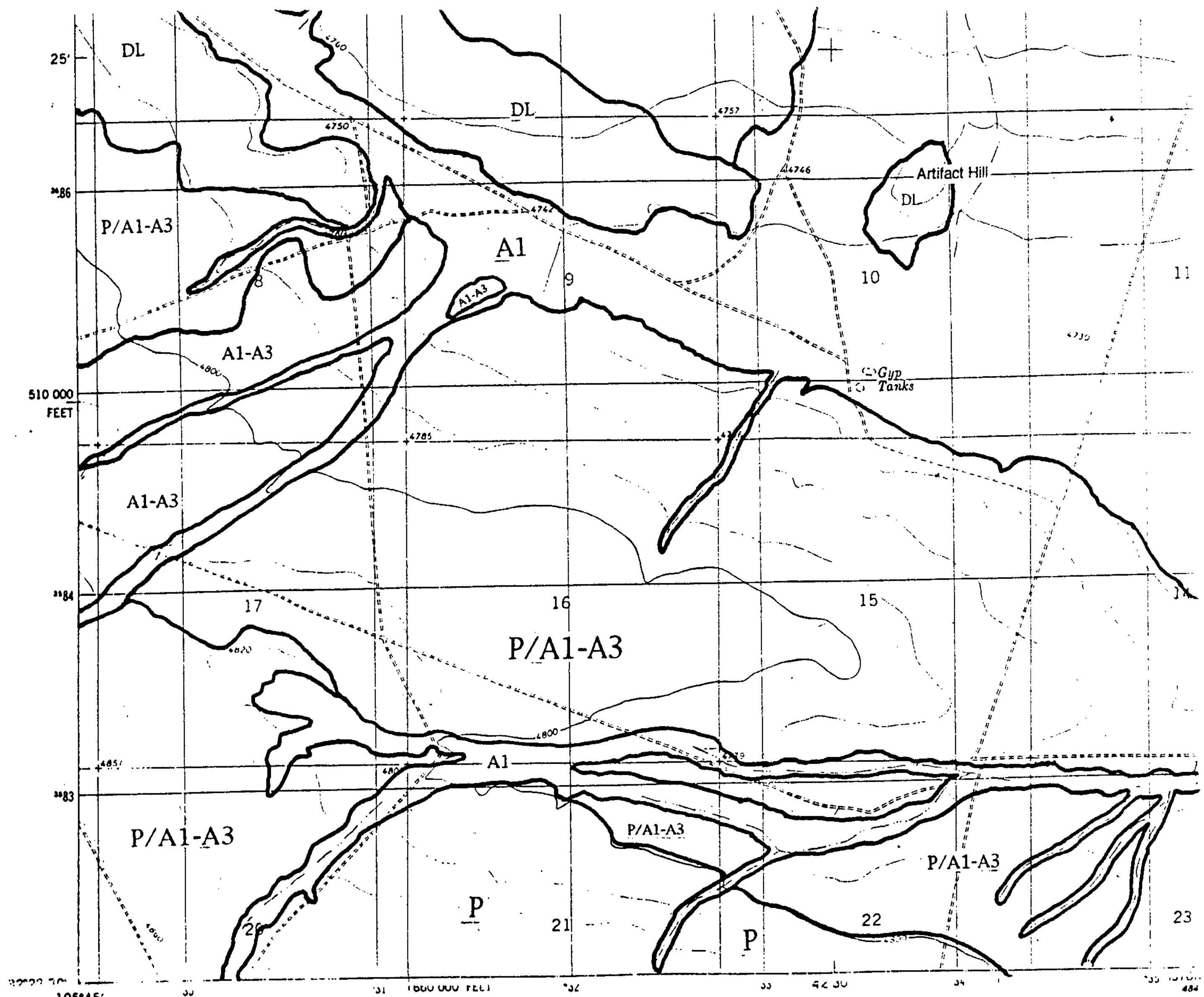
CONTOUR INTERV
DOTTED LINES REPRESENT
NATIONAL GEODETIC VERT



A1
A1-A3
P1
P/A1-A3
El Paso
TARY RESERVATION
REGOR RANGE)
Artifact Hill
Point Tanks
Toy Tanks
Well
BM 4919
BM 4839
BM 4771
BM 4728
BM 4730
4935
4976
4940
4900
4875
4860
4845
4800
4781
4767
4732
4730
4725
4708
4700
4697
4699
4720
35
36
31
32
2
1
6
5
11
12
7
14
13
18
17
23
24
19
20
35 STONE WELL
4848 I SW
40°°°°mE
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
ROAD CLASSIFICATION
Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, improved surface
Unimproved
Interstate Route
U. S. Route
GN
MN
5


A1
A1-A3
(SIXTEEN CANYON)
4848 I NE
36
31
32
33
T 21 S
T 22 S
4919
4900
4875
4865
4862
4860
4739
4800
4786
4771
4767
4728
4725
4719
4708
4700
4697
4730
5
4
1
7
9
12
13
16
17
18
19
20
21
24
P1
P/A1-A3
Green Tank
Toy Tanks
Well
105°37'30"
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
1 MILE
7000 FEET
1 KILOMETER
NEW MEXICO
GN
MN
(STOCKARD WELL)

6



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 19 . Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 49 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

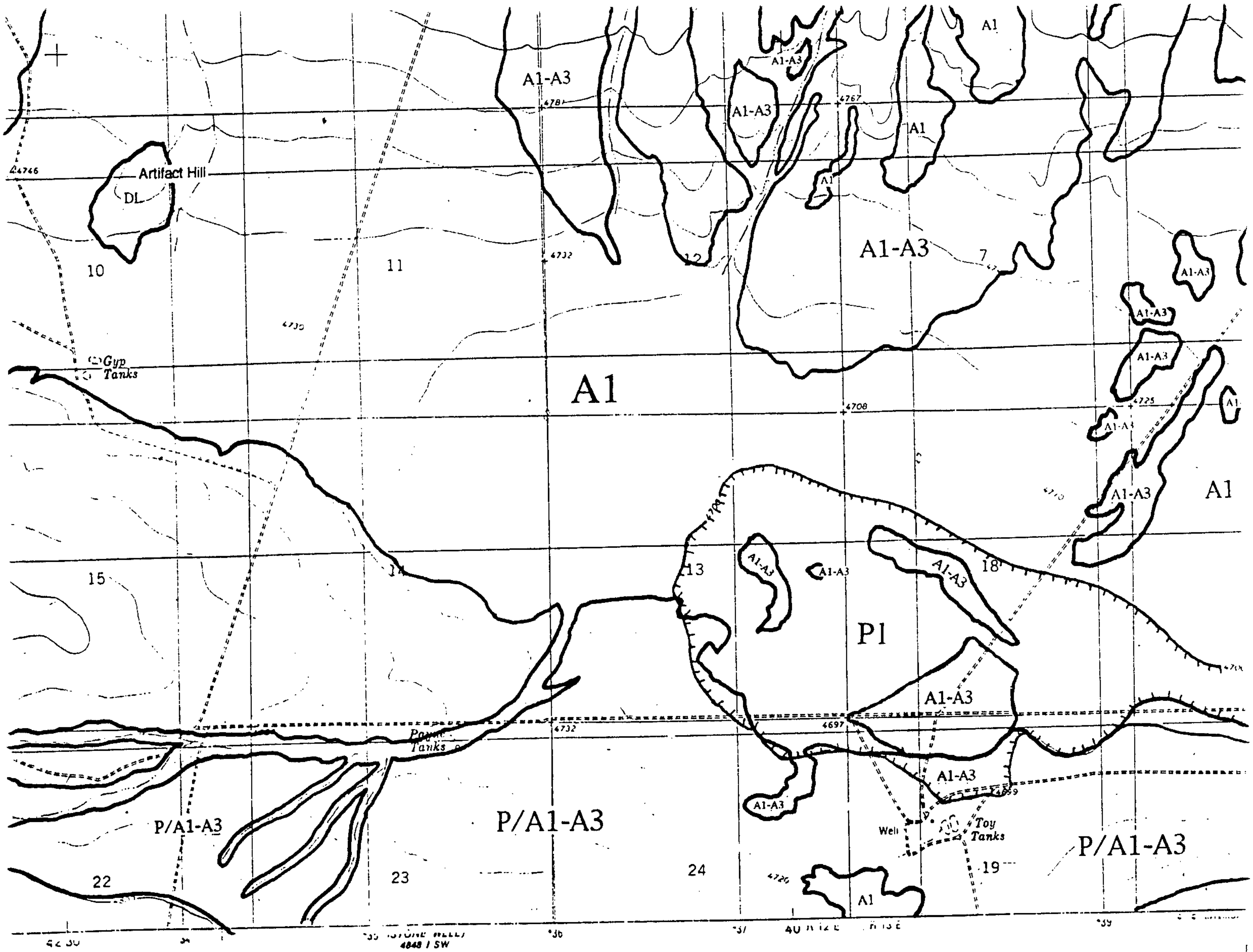
SCALE

1000 0 1000 2000

CONTOUR INT

DOTTED LINES REPRES
NATIONAL GEODETIC V

THIS MAP COMPLIES WITH NAT
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENV
A FOLDER DESCRIBING TOPOGRAPHIC MAP



phic
ools[1]

A1
A2
A3
B
CR
DL
DP
DS
DSC
DSG
P
P1
P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°22' 7 MILS

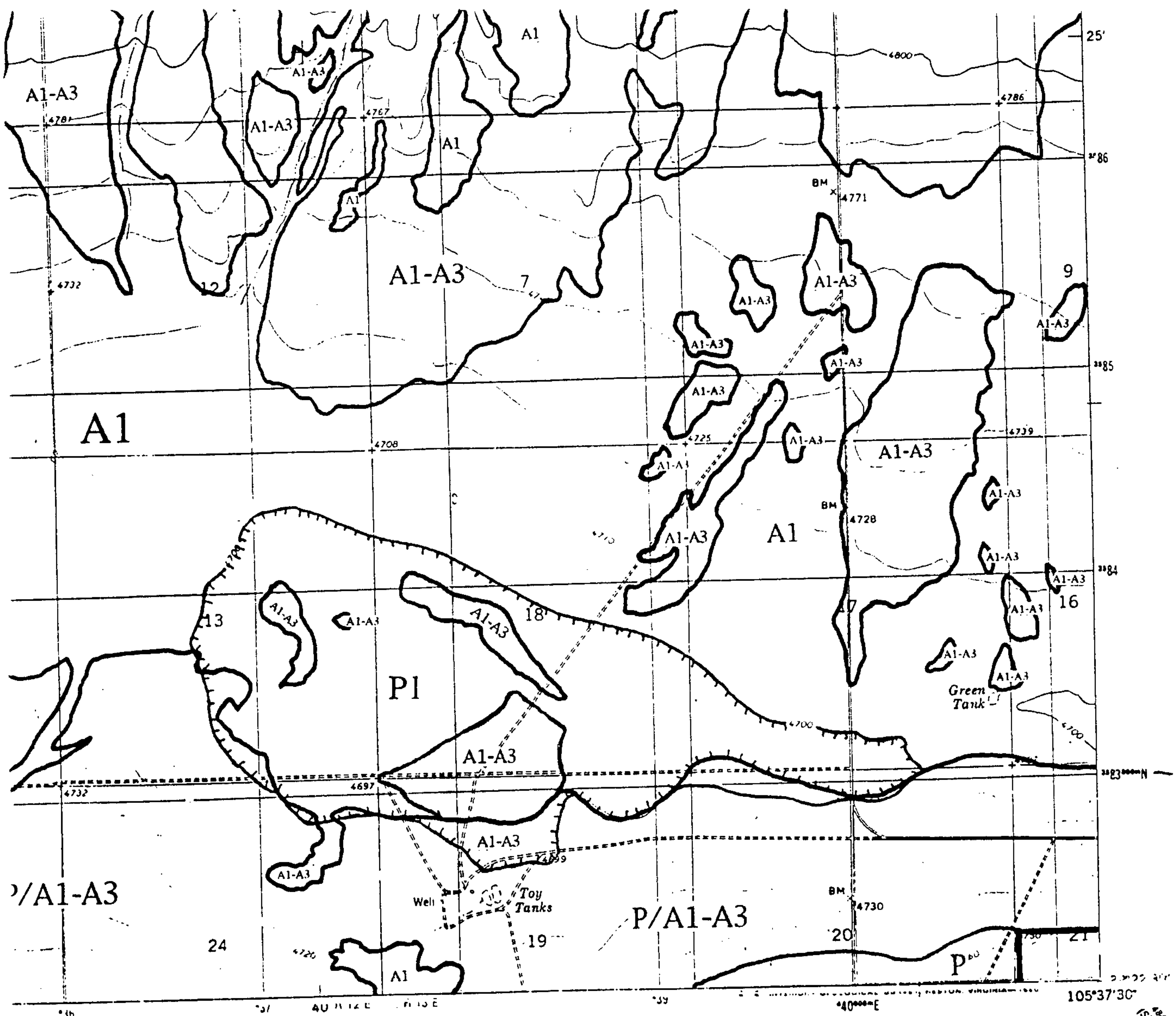
11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Primary highway, hard surface

Secondary highway, hard surface

Interstate Ro



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route

U. S. Route

State Route

1 MILE

5000 6000 7000 FEET

1 KILOMETER

ET
CONTOURS
M OF 1929

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°22' 7 MILS

11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

4848 I SE (STOCKARD WELL)

EL PASO DRAW, N. MEX.
N3222.5—W10537.5/7.5

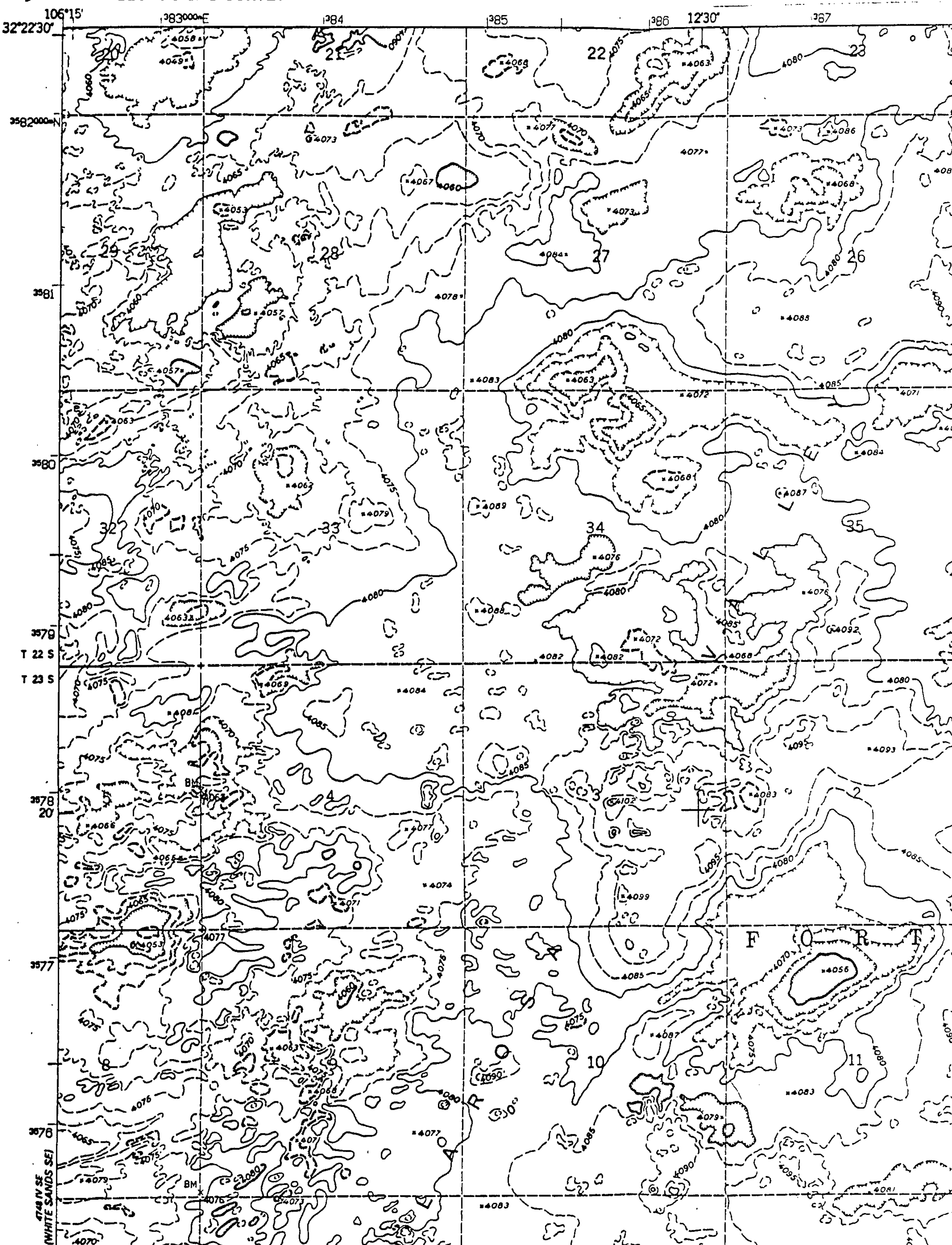
1980

DMA 4848 I NW—SERIES V881

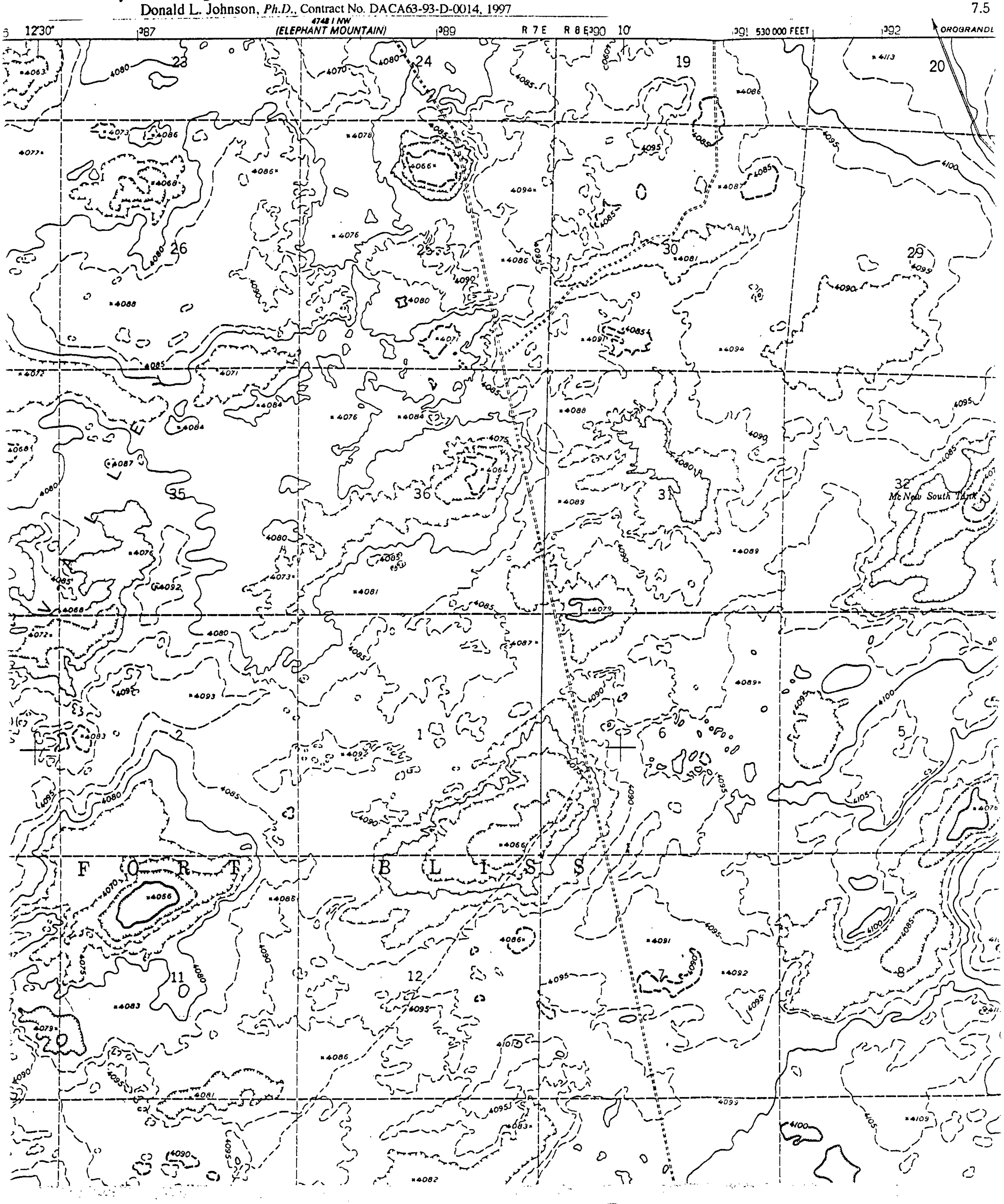
'URACY STANDARDS
'O 80225, OR RESTON, VIRGINIA 22092
'LS IS AVAILABLE ON REQUEST

81

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

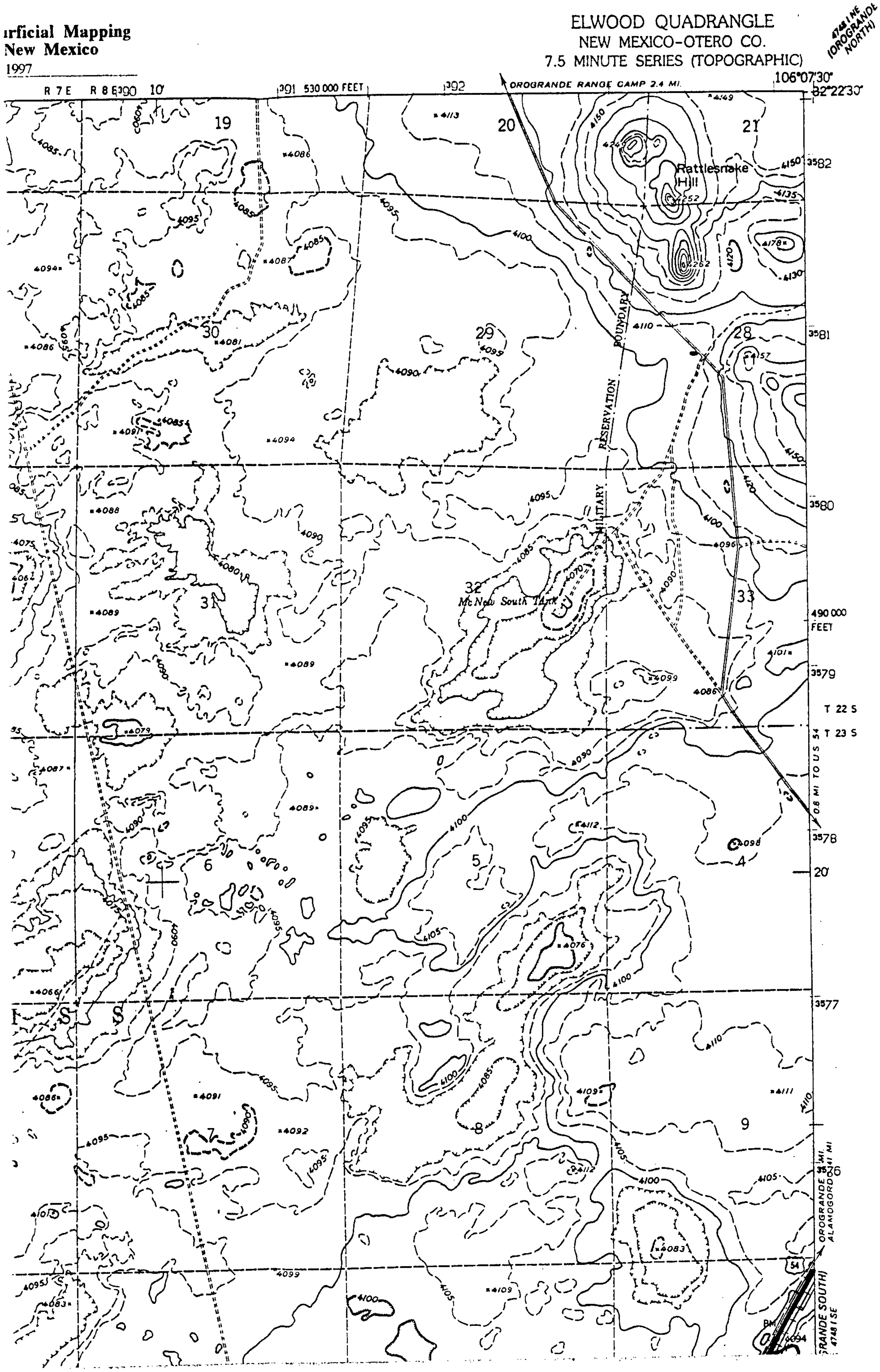


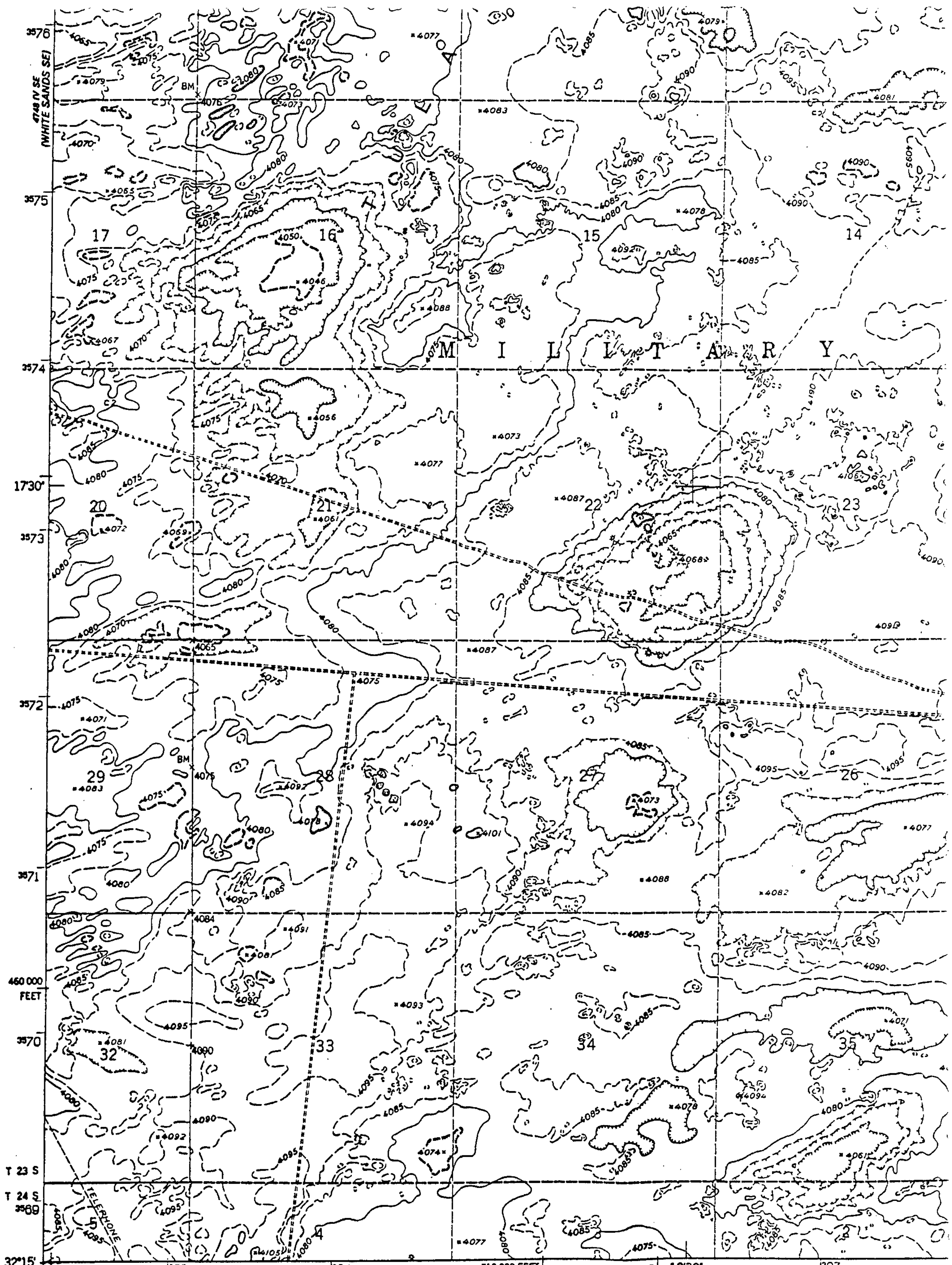
Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping
Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



(2)

ırficial Mapping
New Mexico
1997





4

(NEWMAN NE) 4748 III NE

Mapped by the Defense Mapping Agency
Produced by the United States Geological Survey

Control by USGS, NOS/NOAA and USCE

Compiled from aerial photographs taken 1954. Photography field annotated 1955

North American Datum of 1927 (NAD 27). Projection and 10 000-foot ticks: New Mexico Coordinate System, central zone (Transverse Mercator)
Blue 1000-meter Universal Transverse Mercator ticks, zone 13

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic

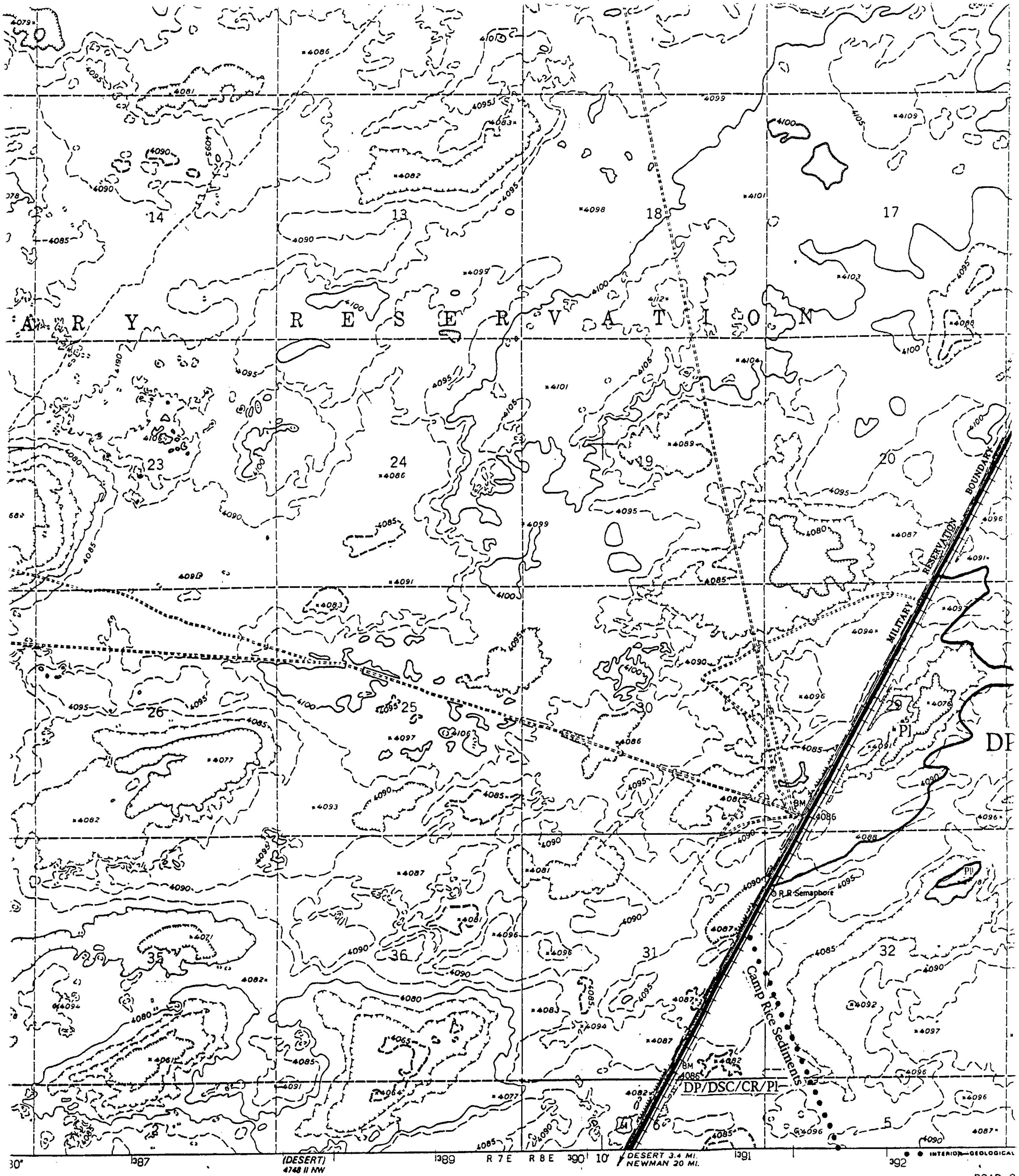
McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC

1000 0 1000

CON

SUPPLEMENTAR
NATIONAL G

THIS MAP COMPLIES W



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

SUPPLEMENTARY CONTOUR INTERVAL 5 AND 10 FOOT
NATIONAL GEODETIC VERTICAL DATUM OF 1929

5

NEW MEXICO

QUADRANGLE LOCATION

ROAD C

Primary highway, hard surface

Secondary highway, hard surface

Interstate Route

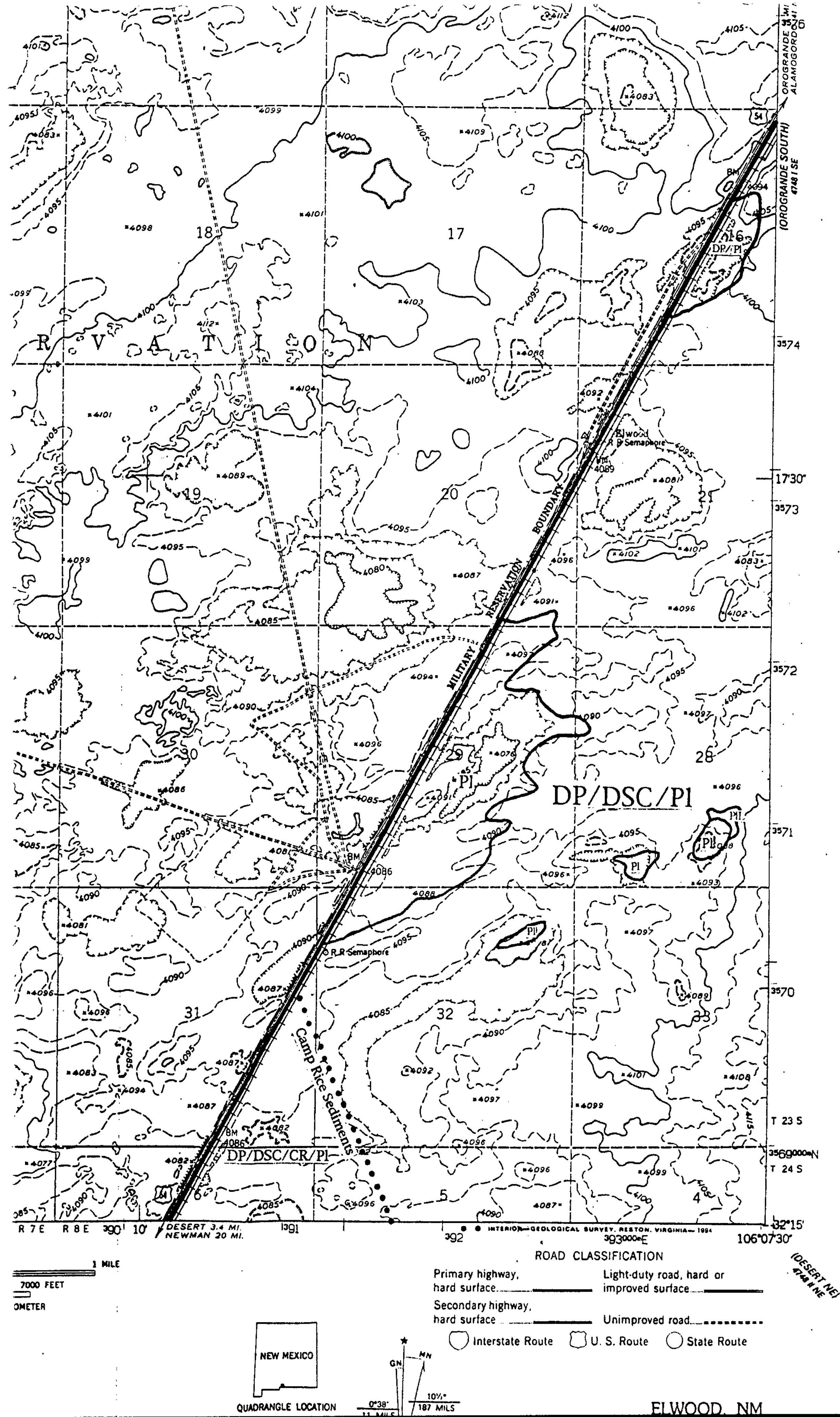
GN MN

0°38' 11 MILS

10½° 187 MILS

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

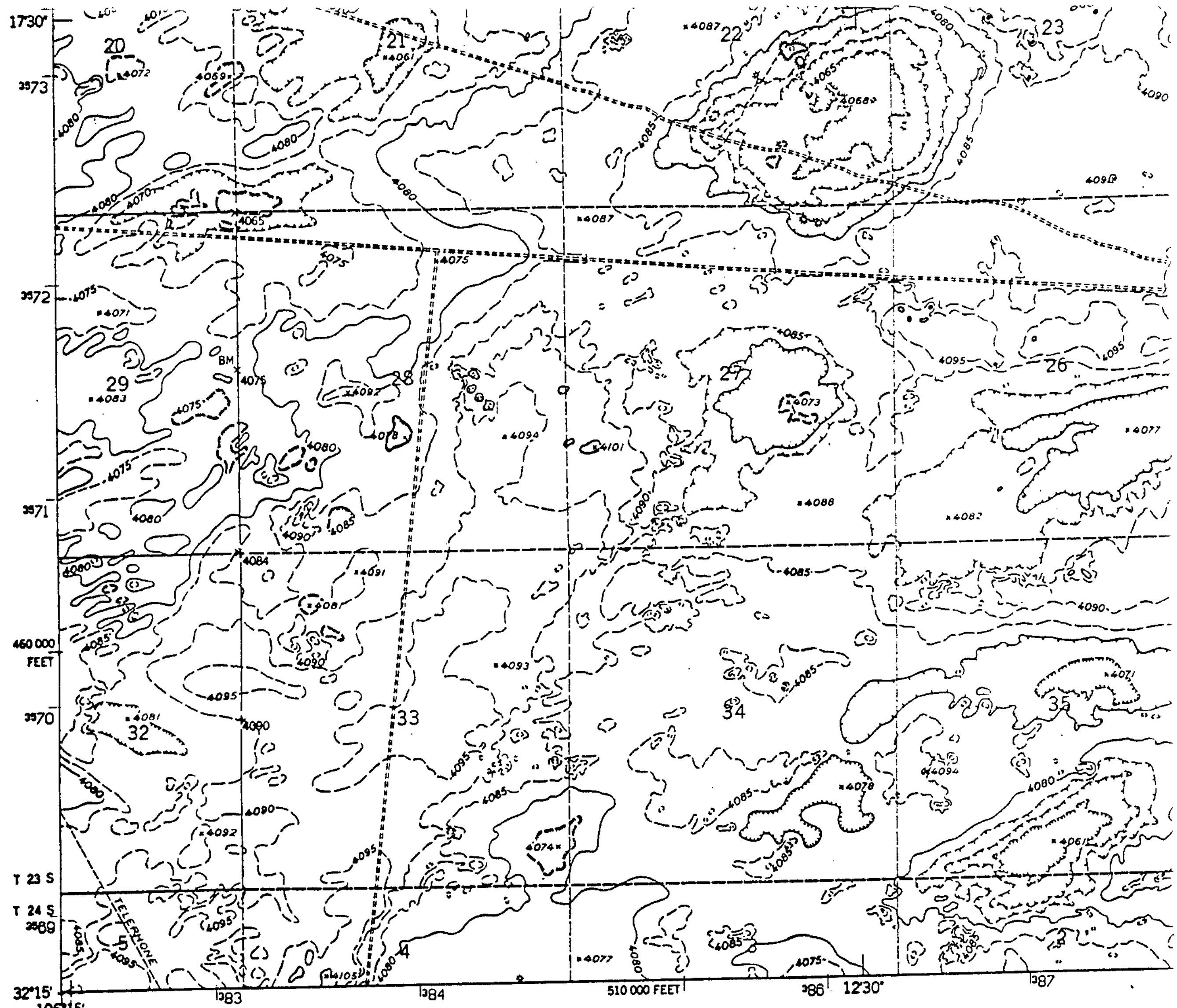
7?



R V A T I O N
MILITARY RESERVATION BOUNDARY
18
17
19
20
21
29
28
30
31
32
33
5
4
6
16
DP/Pl
DP/DSC/Pl
DP/DSC/CR/Pl
Pl
Camp Rice Sediments
Elwood
R R Semaphore
BM
4086
4089
54
OROGRANDE 3 MI.
ALAMOGORDO 41 MI.
(OROGRANDE SOUTH)
4748 I SE
3576
3574
17'30"
3573
3572
3571
3570
T 23 S
3569000m N
T 24 S
32°15'
R 7 E
R 8 E
390
10'
DESERT 3.4 MI.
NEWMAN 20 MI.
391
392
393000m E
106°07'30"
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1984
(DESERT NE)
4748 II NE
1 MILE
7000 FEET
OMETER
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°38'
11 MILS
10½°
187 MILS
ELWOOD, NM

6

11



(NEWMAN NE) 4748 III NE

Mapped by the Defense Mapping Agency
Produced by the United States Geological Survey

Control by USGS, NOS/NOAA and USCE

Compiled from aerial photographs taken 1954. Photography field annotated 1955

North American Datum of 1927 (NAD 27). Projection and 10 000-foot ticks: New Mexico Coordinate System, central zone (Transverse Mercator)
Blue 1000-meter Universal Transverse Mercator ticks, zone 13

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Photoinspected from 1990 source; no major culture or drainage changes observed. Boundaries and names verified 1994

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬▬
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

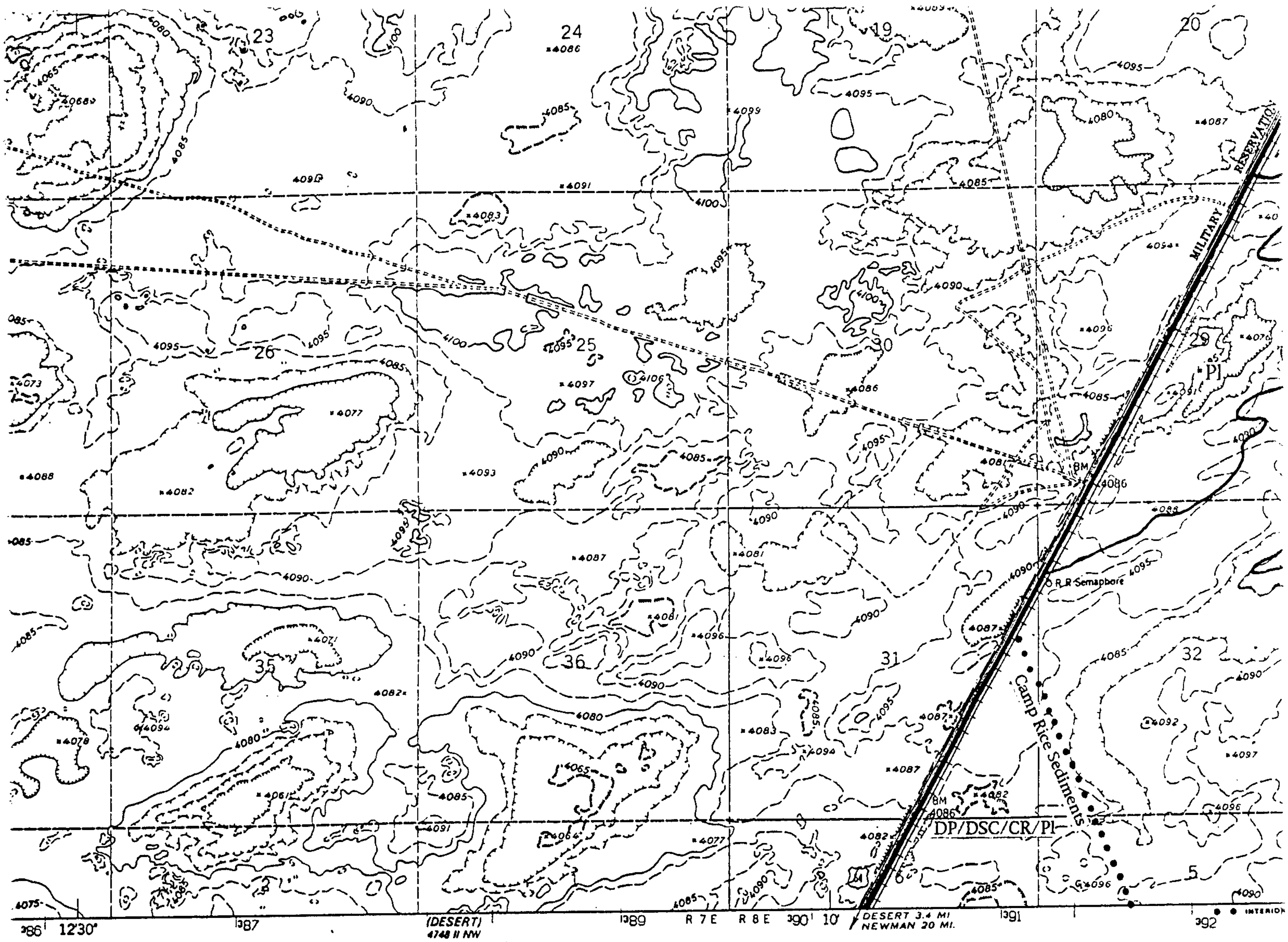
1 ½
1000 0 1000
1 .5

C

SUPPLEMEN
NATIONA

THIS MAP COMPLIE
FOR SAL
DENVER, COLOR
A FOLDER DESCRIBING TOPOG

1



hic
ls[1]
A1
A2
A3
B
CR
DL
DP
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DSC
DSG
P
P1
P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 AND 10 FOOT
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

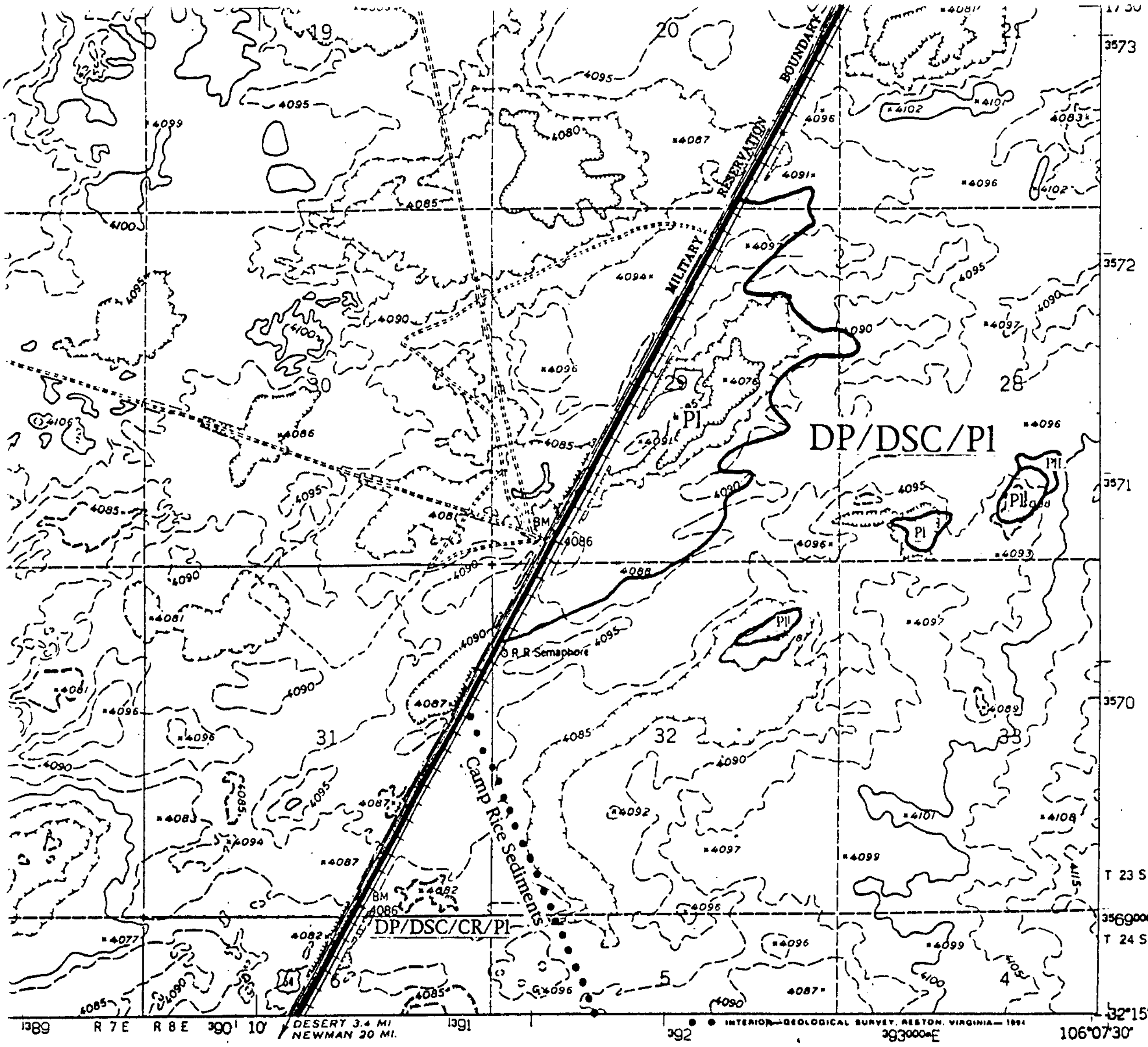
NEW MEXICO

QUADRANGLE LOCATION

GN MN
0°38' 11 MILS
10½° 187 MILS

UTM GRID AND 1994 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Primary highway, hard surface.
Secondary highw. hard surface
Interstate



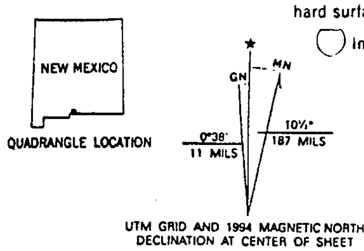
1 MILE
6000 7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

(DESERT NE) 4748 II NE

T



DARDS

22092
BLE ON REQUEST

ELWOOD, NM
32106-C2-TF-024

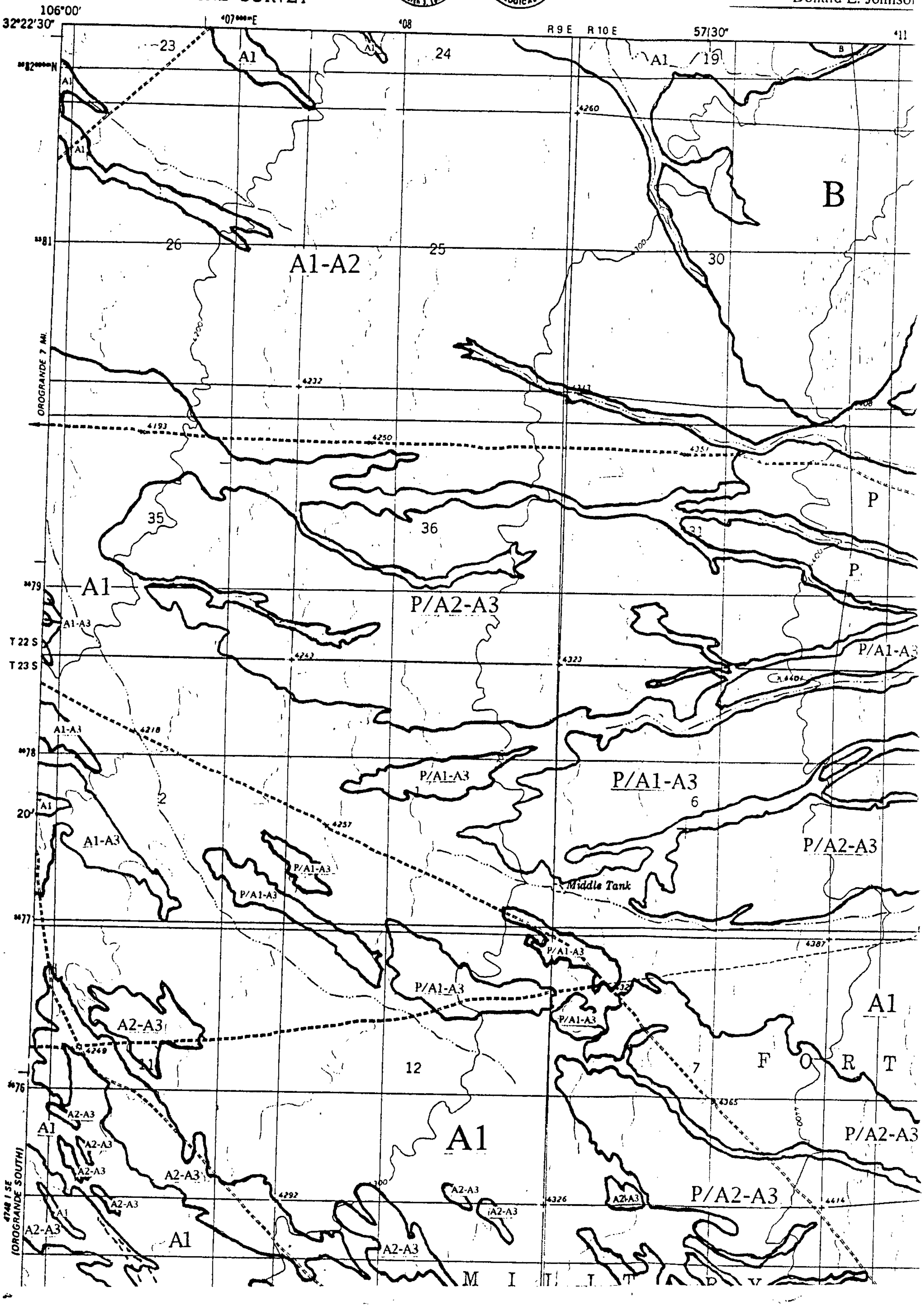
1955
MINOR REVISION 1994
DMA 4748 I SW-SERIES V881

11

9

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

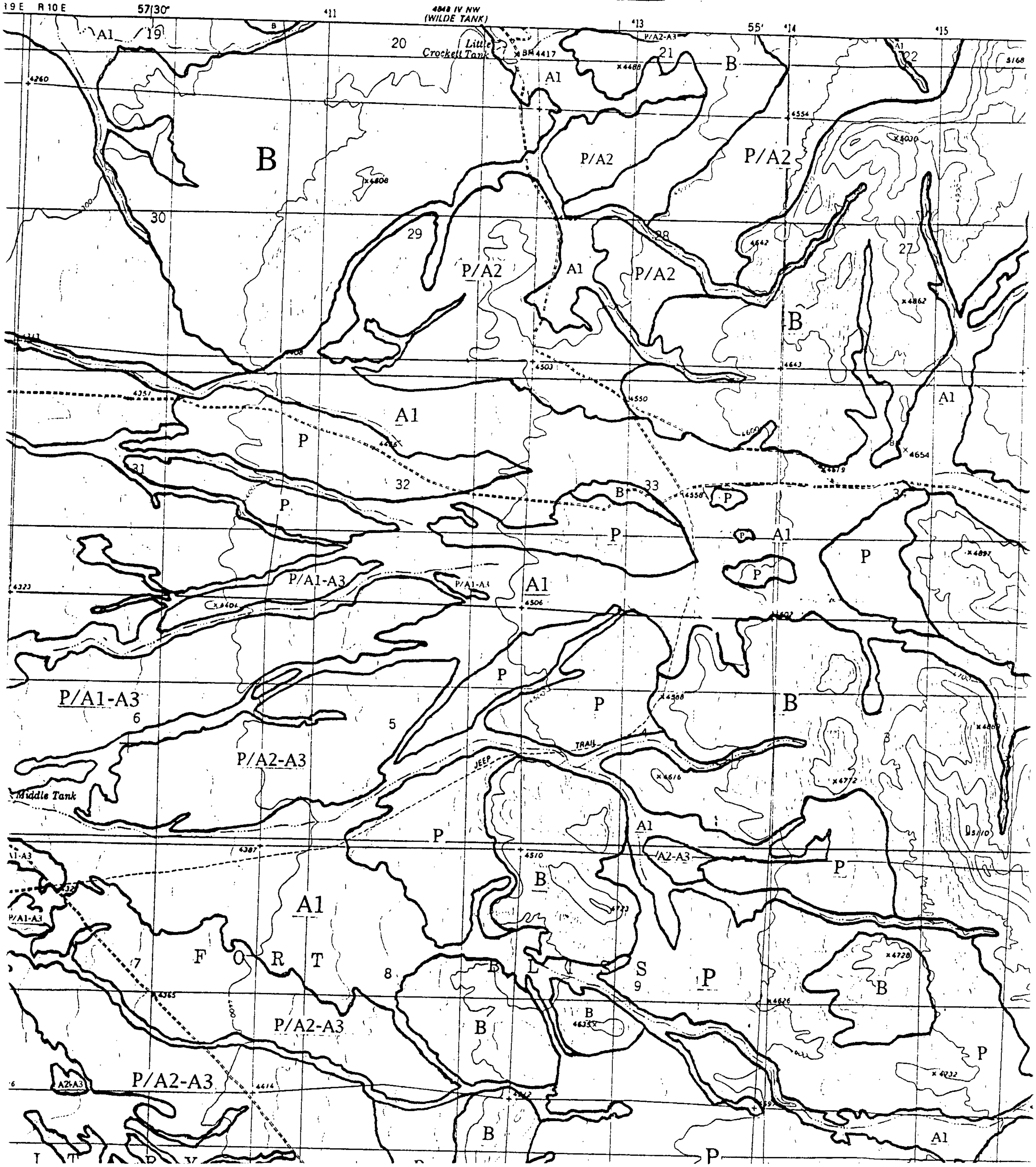
Geomorphological, Geoecolo
Study of McGregor G
Donald L. Johnso



1

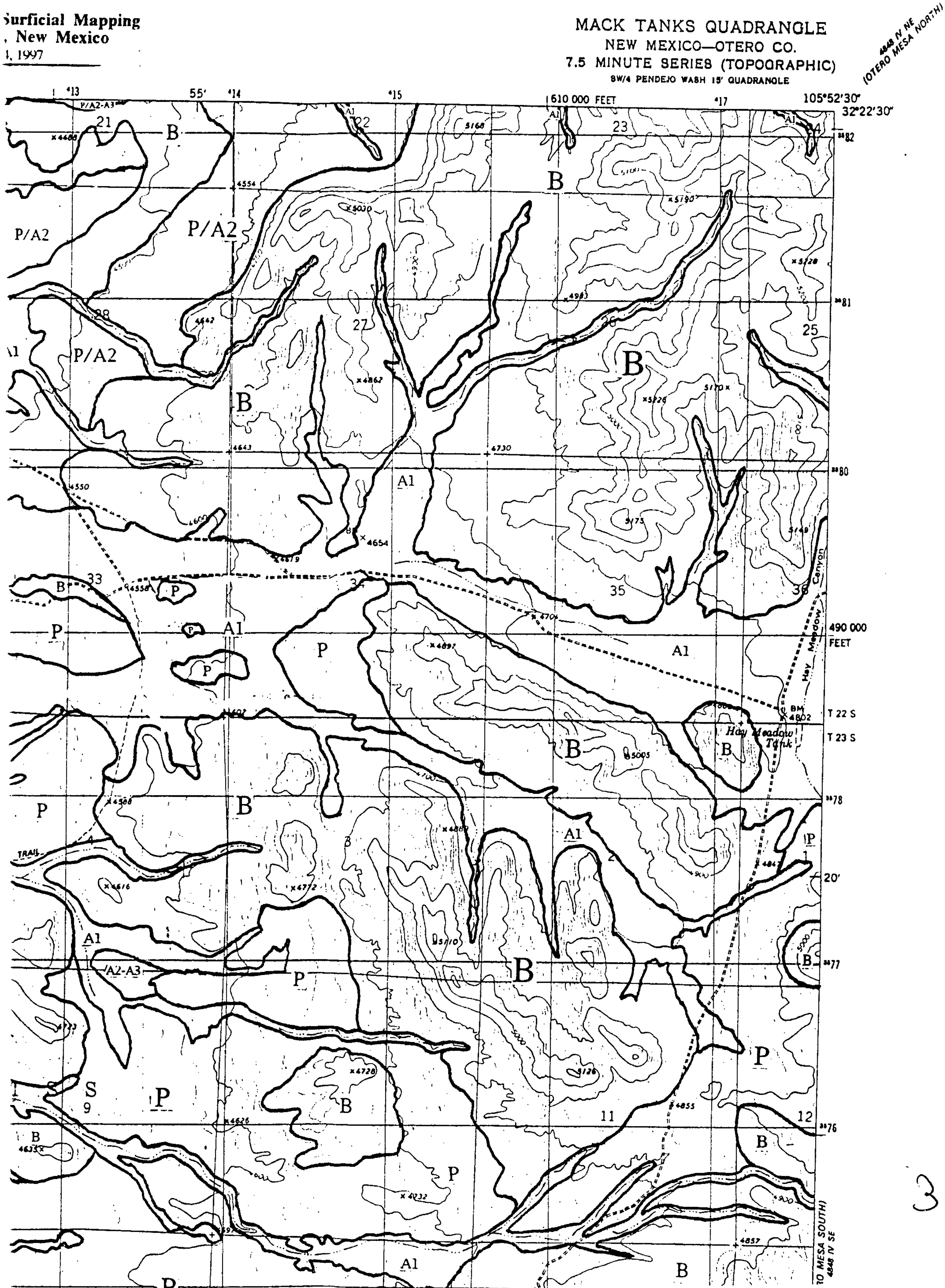
Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



2

ɟurficial Mapping
, New Mexico
ı, 1997



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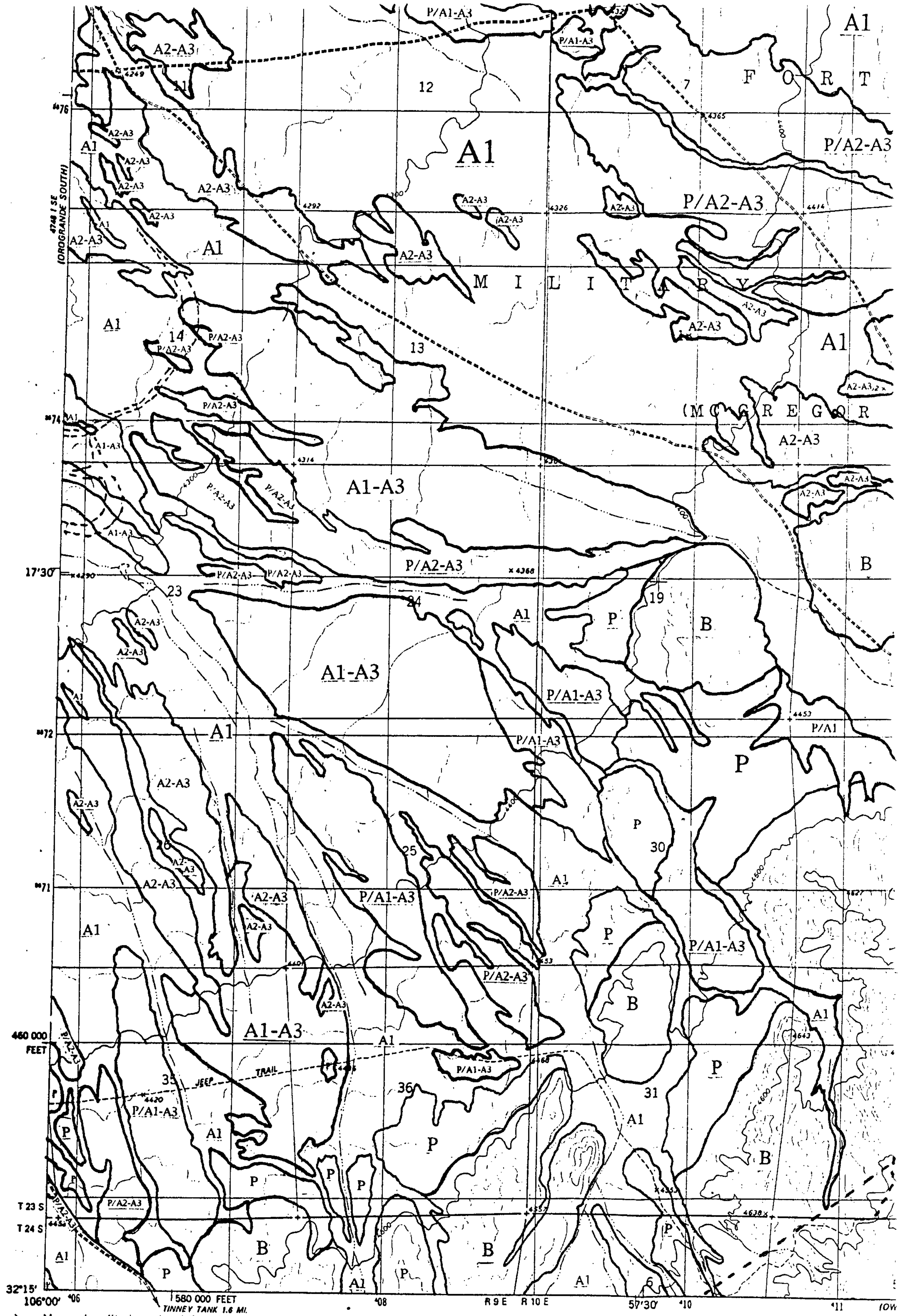


4

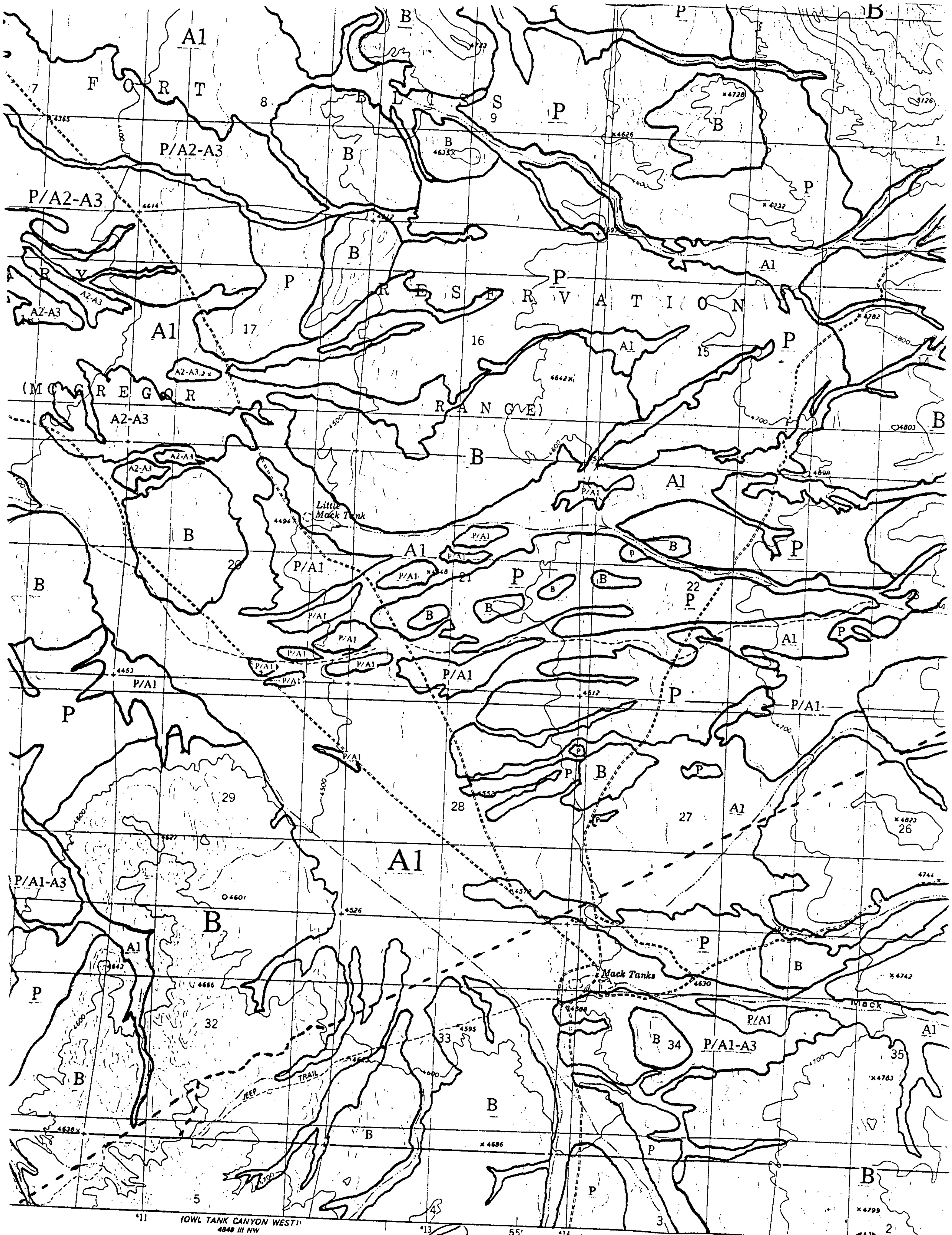
Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

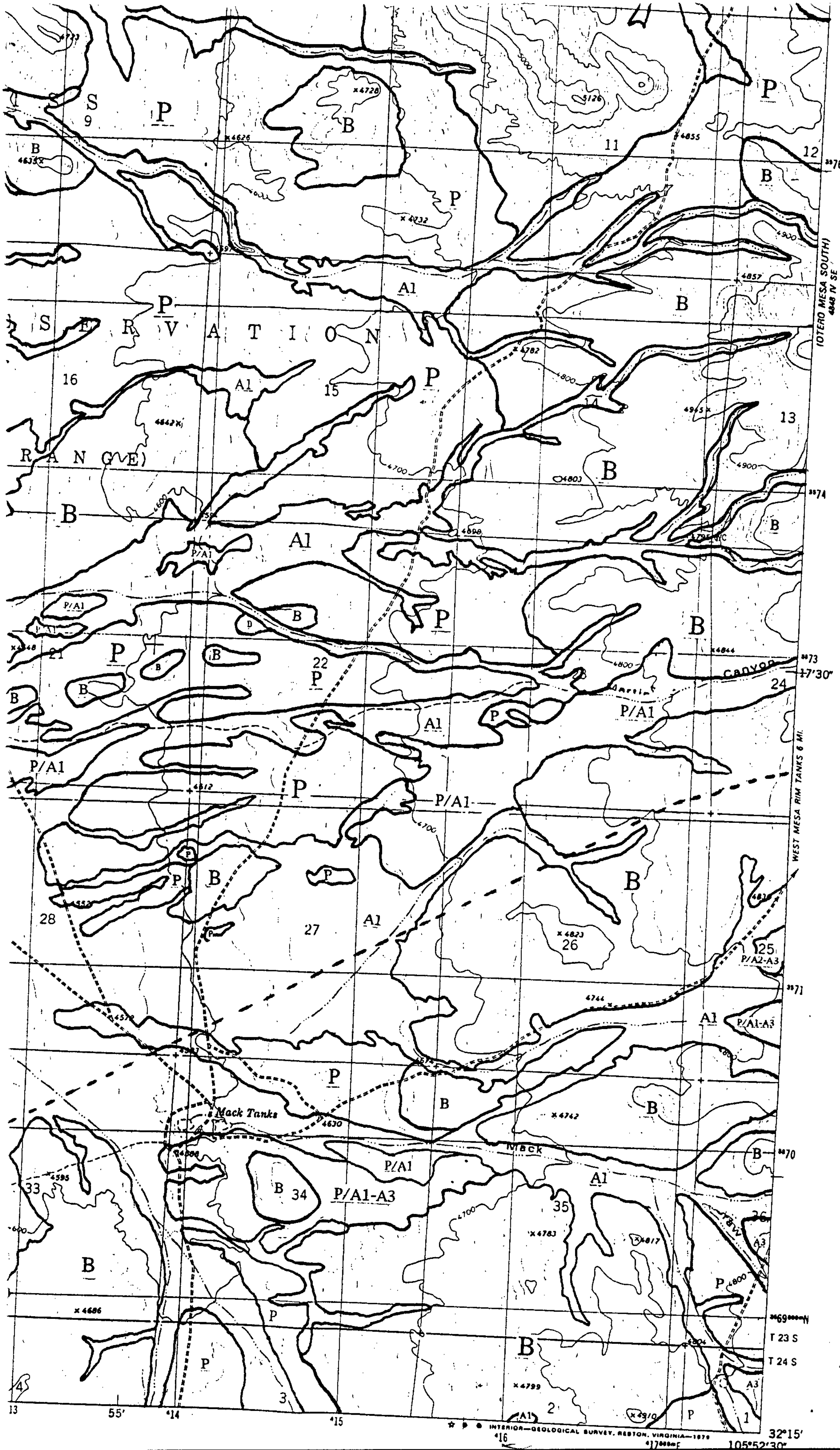
Topography by photogrammetric methods from aerial photographs

McGregor Range Geomorphic Mapping Units and Symbols[1]

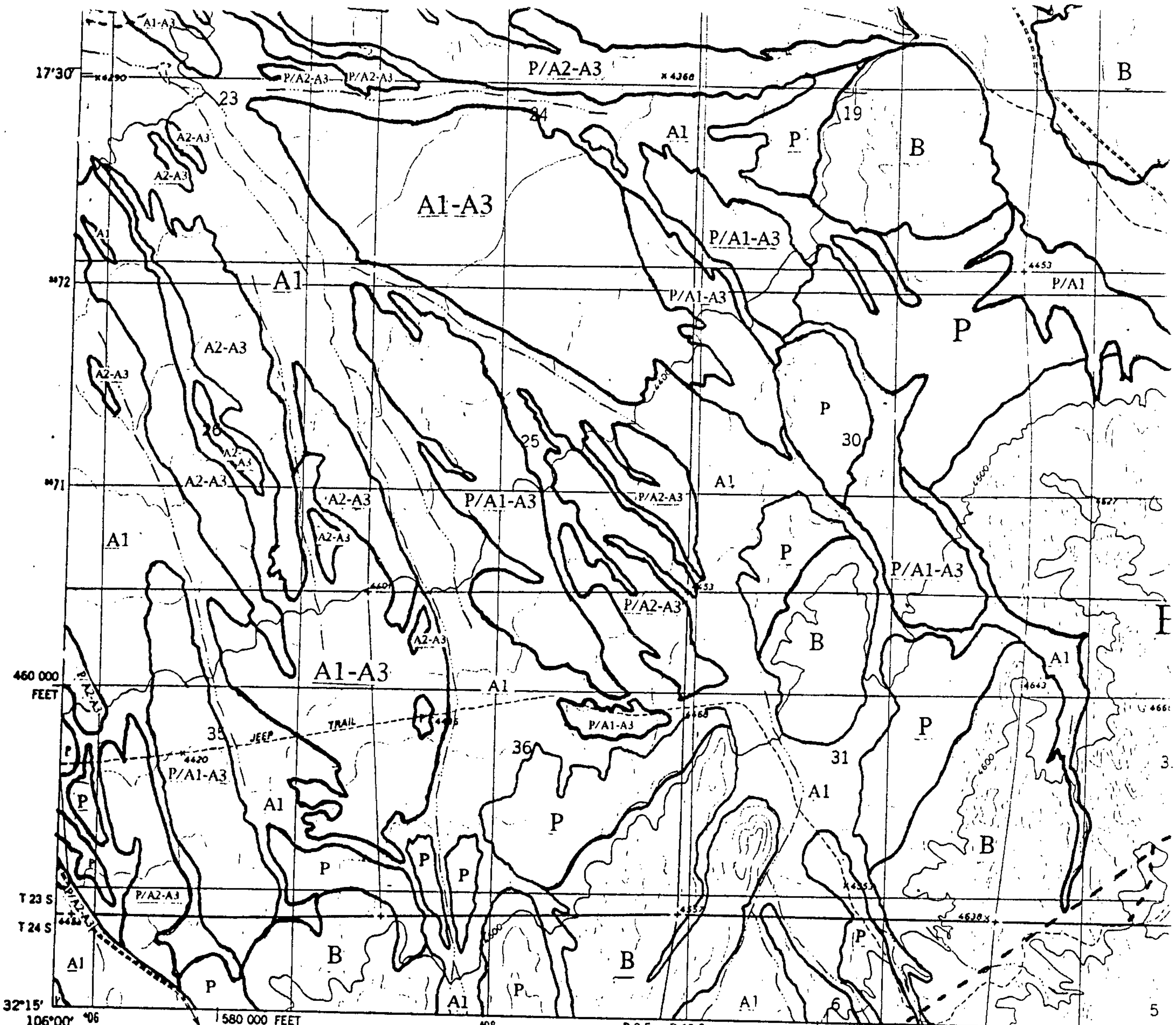
Alluvium (recent)



SCALE 1:24 000


P
B
A1
P/A1
P/A1-A3
P/A2-A3
A3
S E R V A T I O N
R A N G E)
Canyon
Martin
Mack Tanks
Mack
(OTERO MESA SOUTH)
4848 IV SE
WEST MESA RIM TANKS 6 MI.
17'30"
T 23 S
T 24 S
55'
32°15'
105°52'30"
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1979

6



(DESERT NE)
4748 II NE

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1979

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

Certain land lines are omitted because of insufficient data

There may be private inholdings within the boundaries of the National or State reservations shown on this map

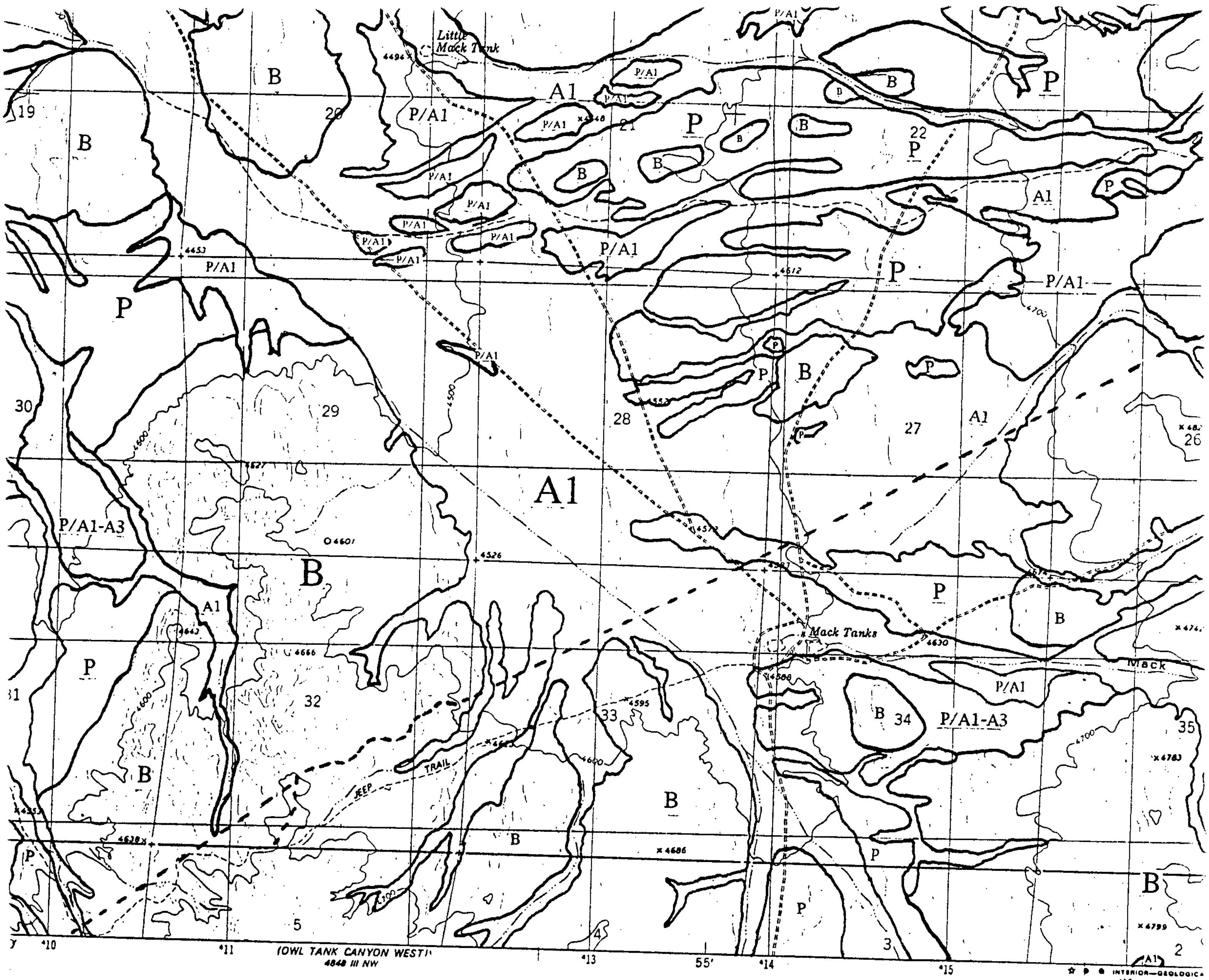
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬▬
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

SC
1 ½
1000 0 1000 2000
1 .5
CONTOUR
NATIONAL GEODE

THIS MAP COMPLIES WITH
FOR SALE BY U. S. GEOLOGICAL SURVEY, DE
A FOLDER DESCRIBING TOPOGRAPHIC



SCALE 1:24 000

1 MILE

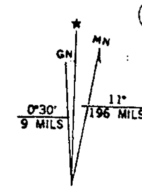
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION



UTM GRID AND 1979 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

ROAD CL

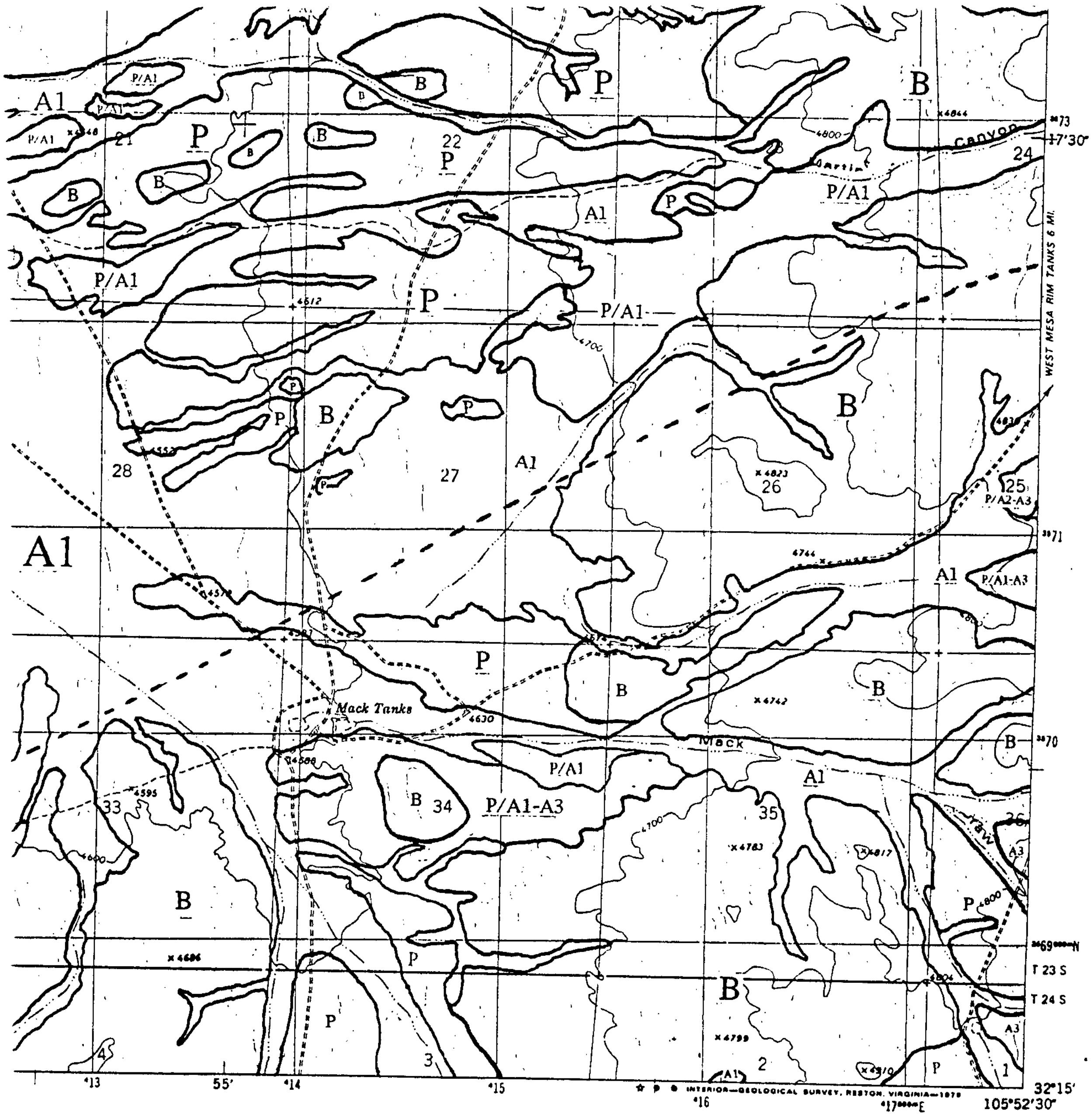
Primary highway, hard surface

Secondary highway, hard surface

Interstate Route

MAC

SW/4



1 MILE

7000 FEET

1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

(OWL TANK CANYON EAST
4848 III NE

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°30' 9 MILS

11° 196 MILS

UTM GRID AND 1979 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

STON, VIRGINIA 22092
ON REQUEST

MACK TANKS, N. MEX.

SW/4 PENDEJO WASH 15' QUADRANGLE

N3215—W10552.5/7.5

1979

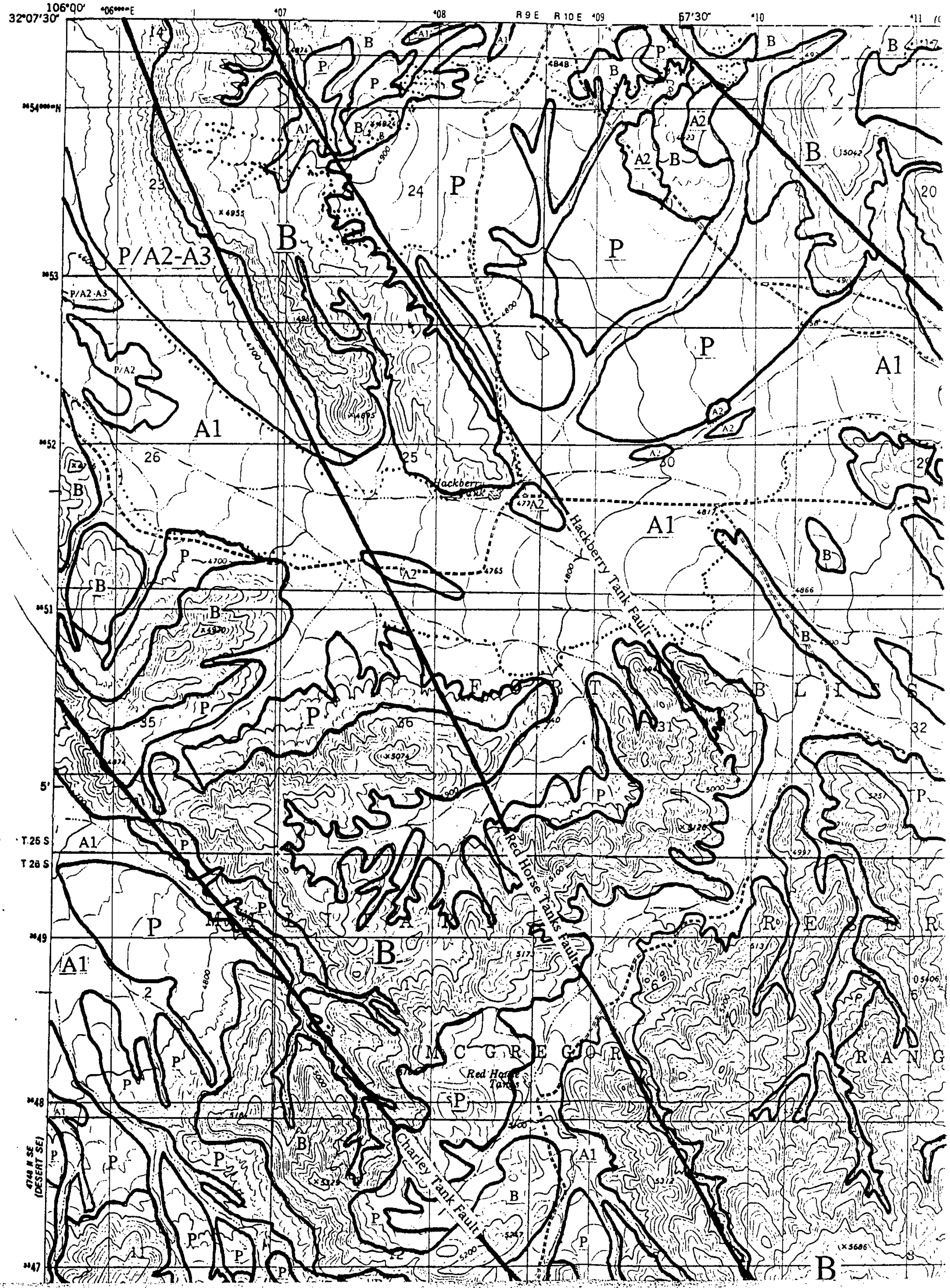
DMA 4848 IV SW—SERIES V881

21

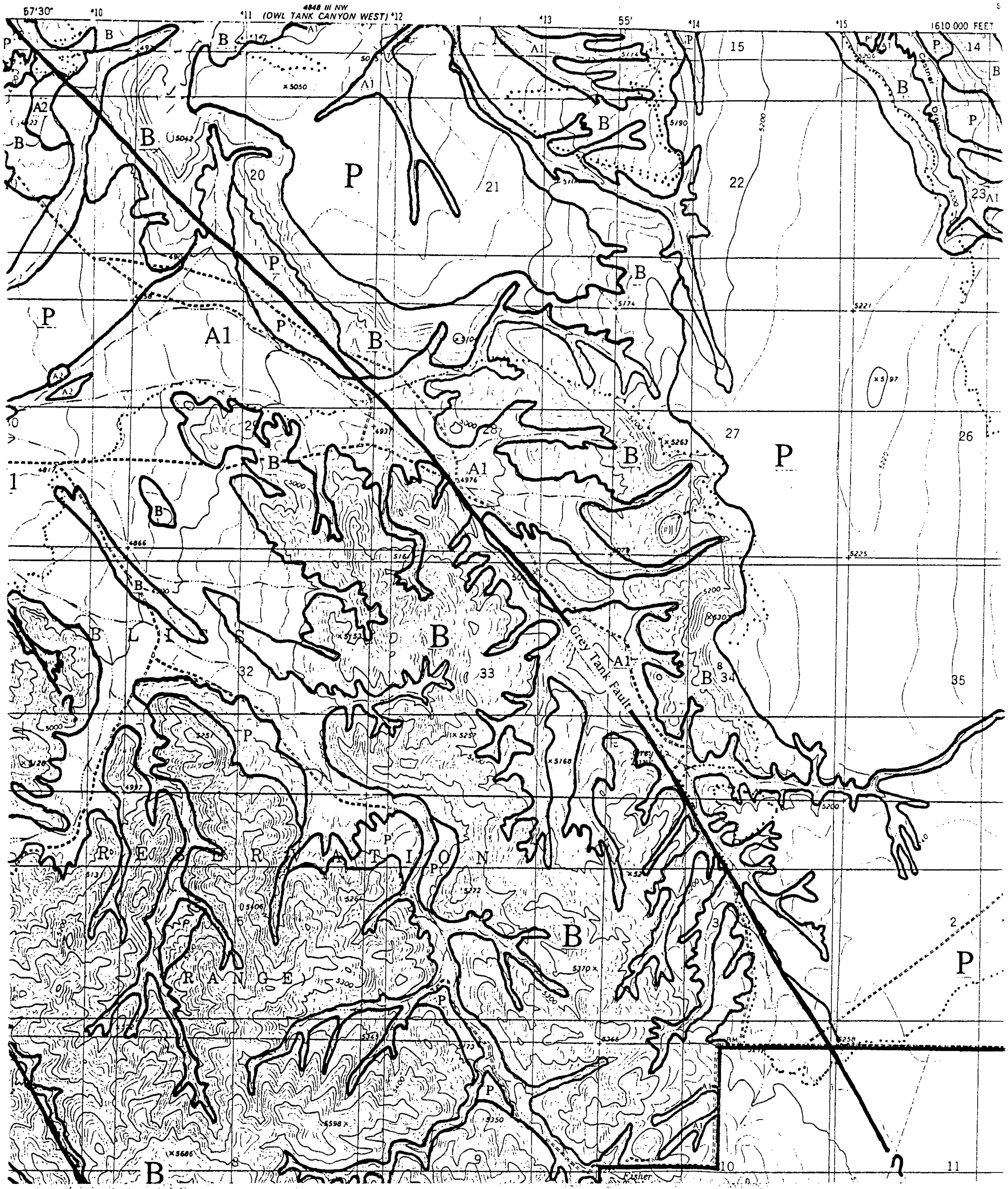
9

DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Study of McGregor Guide
Donald L. Johnson, P.



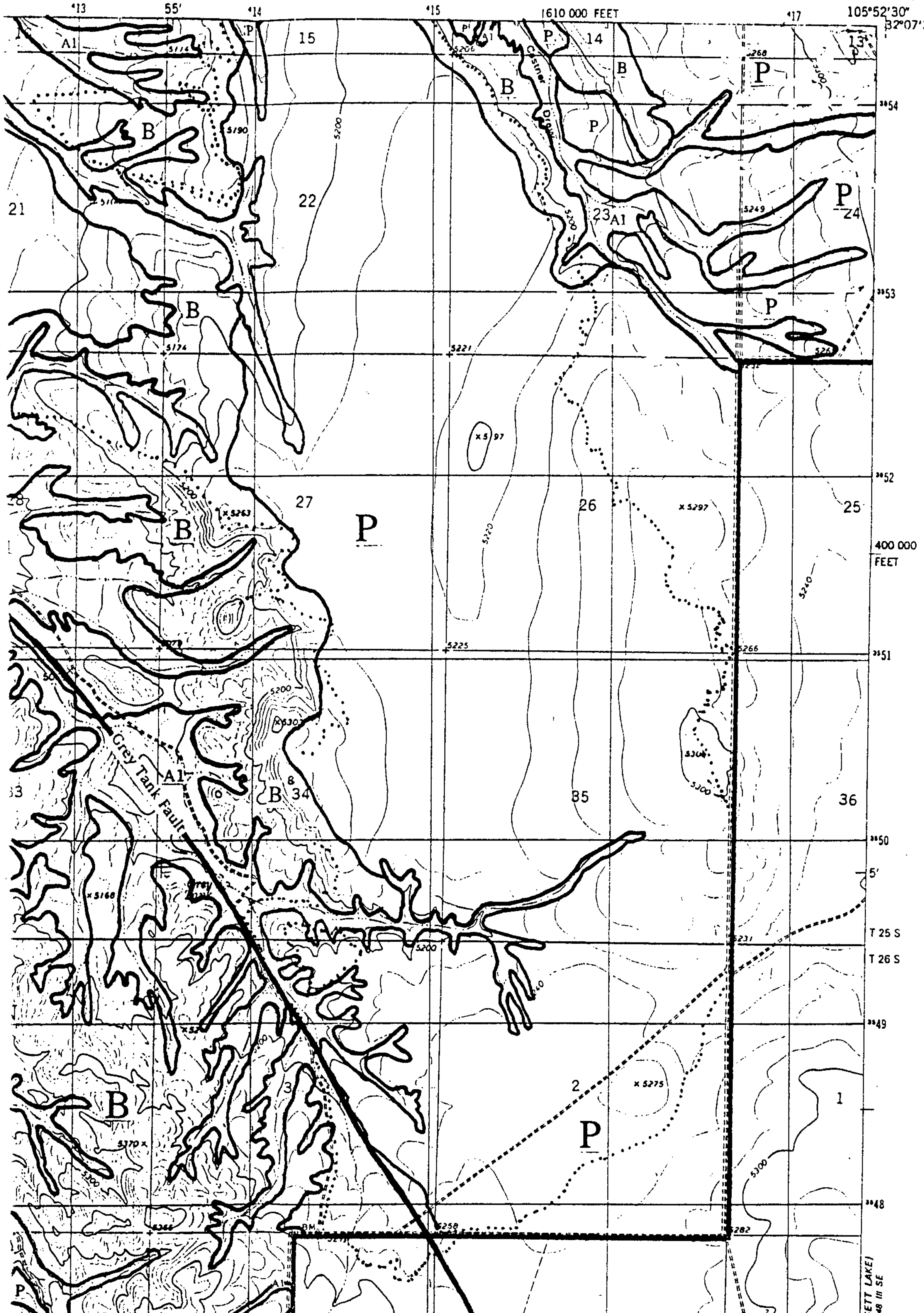
Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



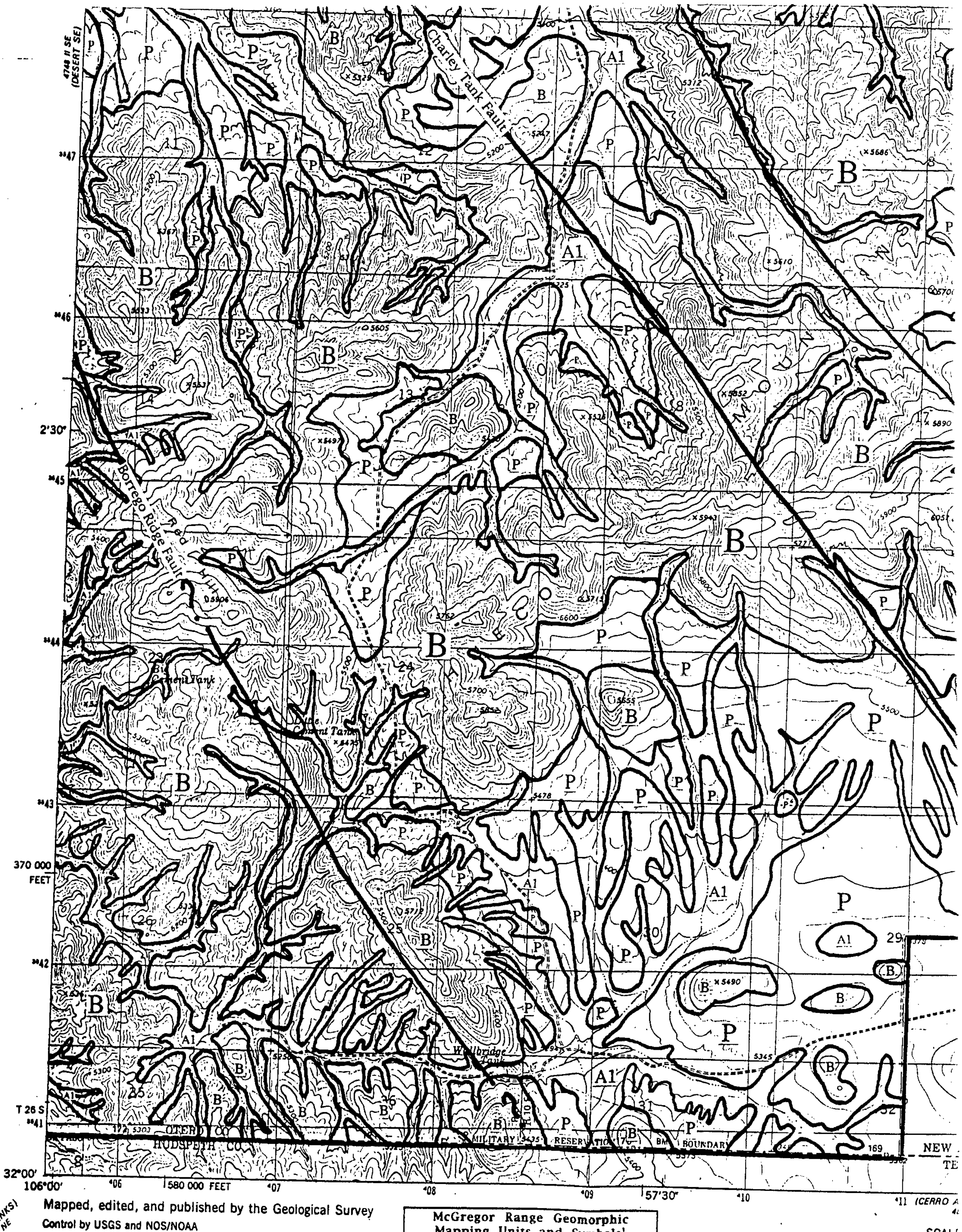
rficial Mapping
New Mexico
1997

MOUNTAIN TANK QUADRANGLE
NEW MEXICO—TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 BASSETT LAKE 15' QUADRANGLE

4848 III NE
(OWL TANK
CANYON EAST)



3



(HUECO TANKS) 4747 I NE

4

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations...

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P

SCALE

1 ½ 0

1000 0 1000 2000

1 .5 0

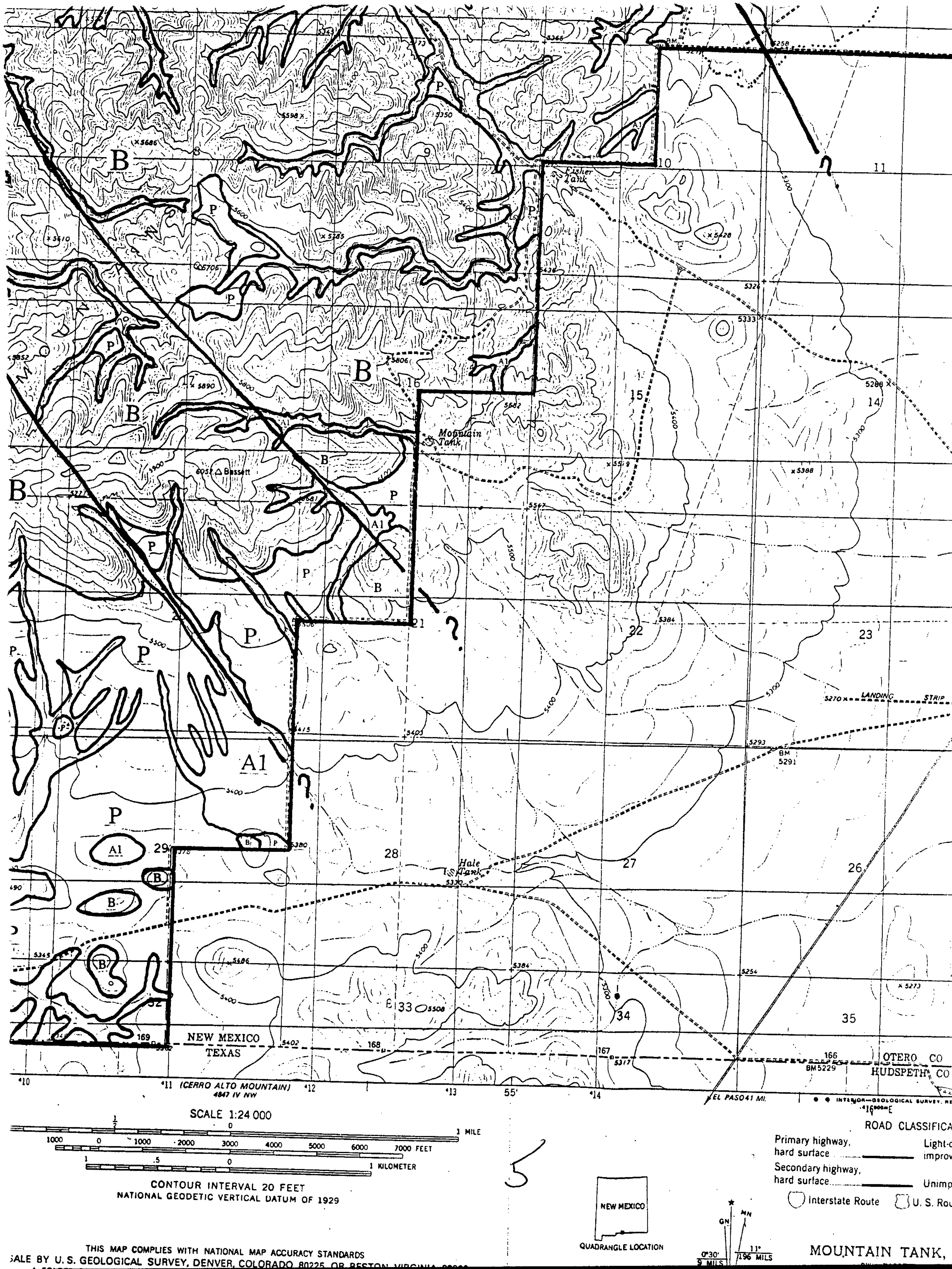
CONTOUR IN

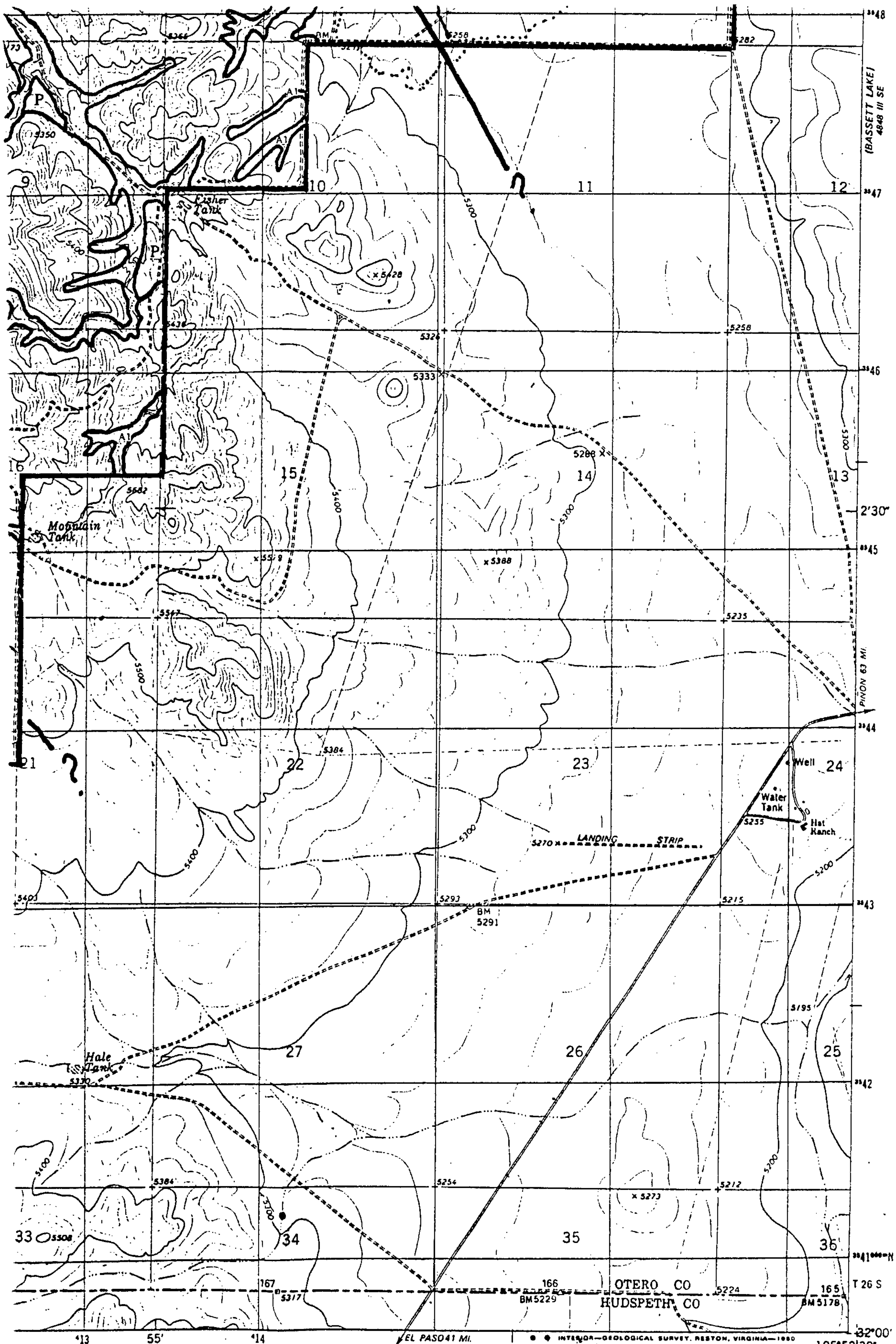
NATIONAL GEODETIC V

THIS MAP COMPLIES WITH NAT

FOR SALE BY U.S. GEOLOGICAL SURVEY, DENV

A FOLDER DES


B
P
A1
Fisher Tank
Mountain Tank
Bassett
Hale Tank
LANDING STRIP
BM 5291
NEW MEXICO
TEXAS
OTERO CO
HUDSPETH CO
(CERRO ALTO MOUNTAIN) 4847 IV NW
EL PASO 41 MI.
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
5
NEW MEXICO
QUADRANGLE LOCATION
ROAD CLASSIFICAT
Primary highway, hard surface
Light-du improve
Secondary highway, hard surface
Unimpro
Interstate Route
U. S. Rout
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA
MOUNTAIN TANK, N



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

(HOBO TANK) 4847 IV NE

1 MILE

7000 FEET

METER

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°30' 9 MILS

11° 196 MILS

VIRGINIA 22092

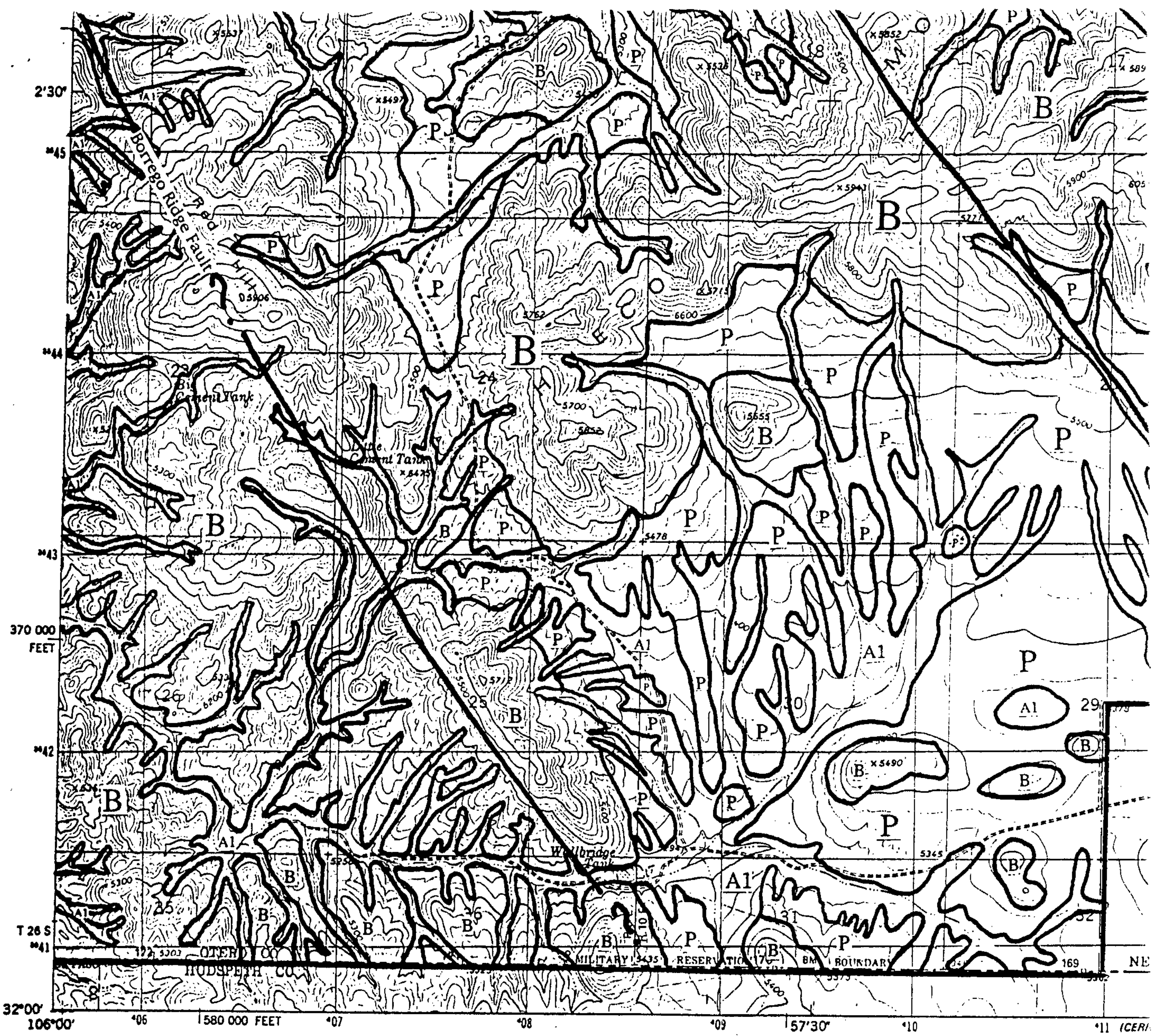
MOUNTAIN TANK, N. MEX.–TEX.

SW/4 BASSETT LAKE 15' QUADRANGLE

N3200–W10552.5/7.5

6

21



(HUECO TANKS) 4747 I NE

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
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Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL
Wind Erosion (fire induced)	

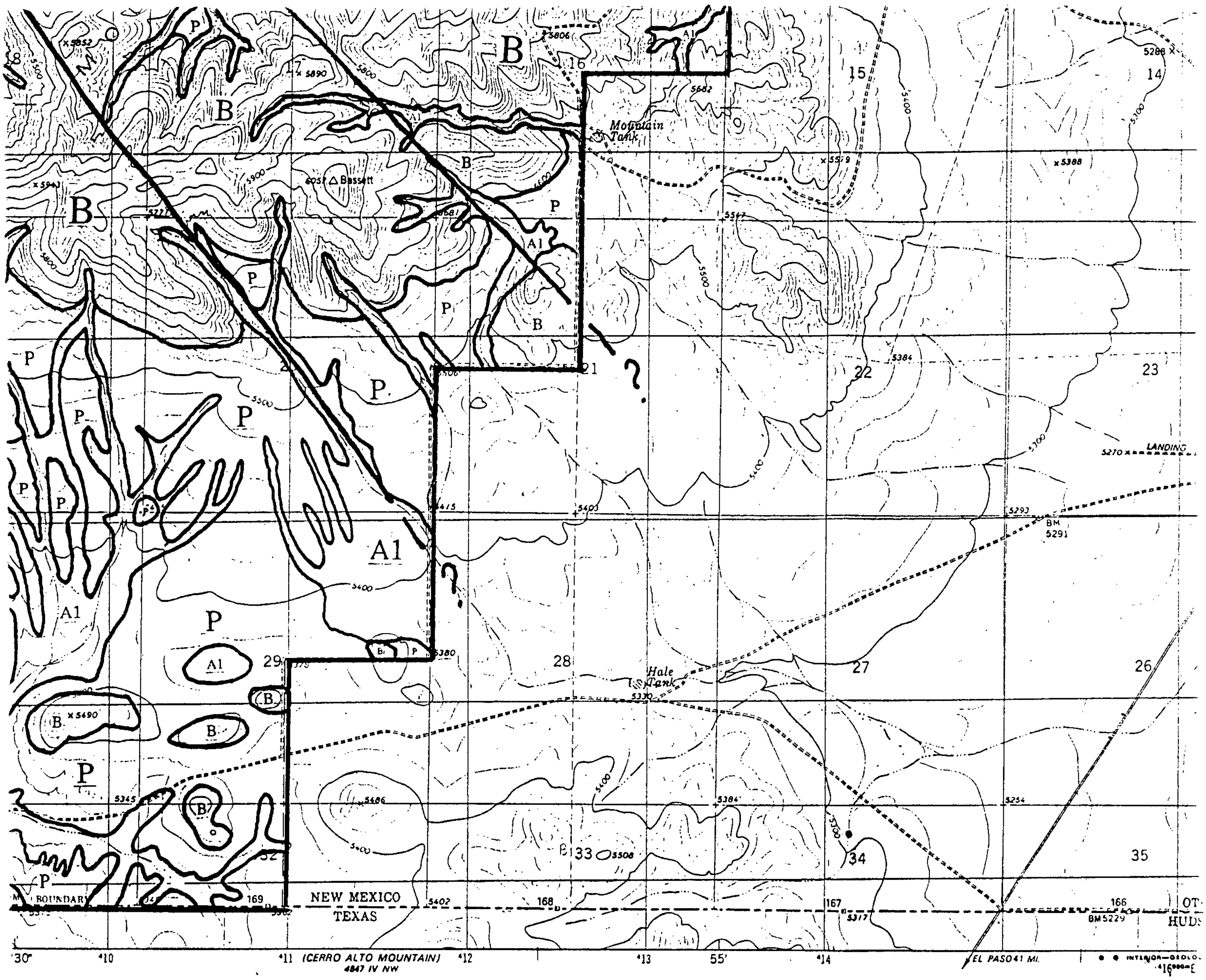
[1]See text for explanation

SC

1 ½
1000 0 1000 2000
1 .5

CONTOUR
NATIONAL GEODE

THIS MAP COMPLIES WITH
FOR SALE BY U. S. GEOLOGICAL SURVEY, D
A FOLDER DESCRIBING TOPOGRAPHIC



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

3205–222

GN MN

0°30' 9 MILS

11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD

Primary highway, hard surface

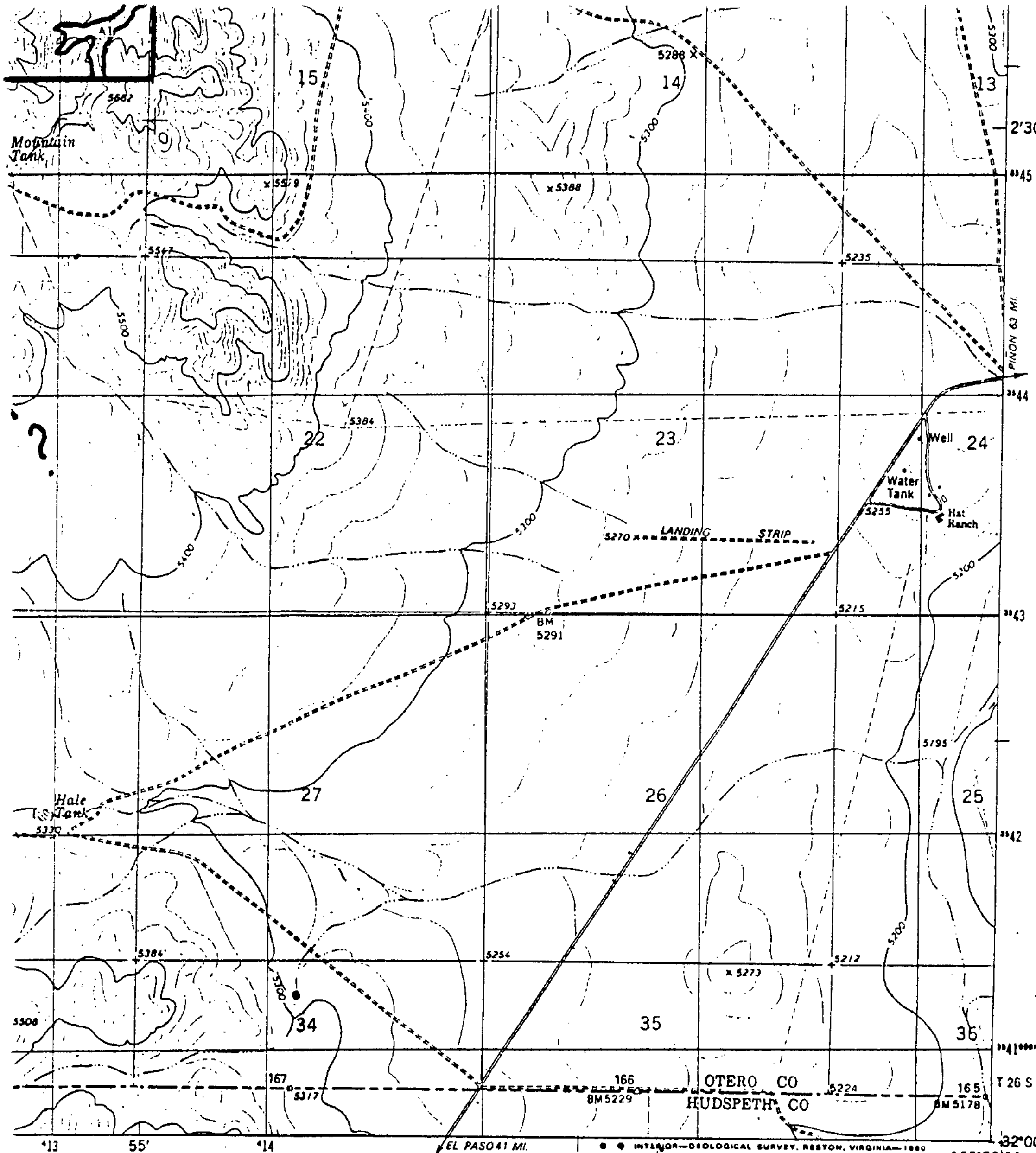
Secondary highway, hard surface

Interstate Route

MOUNTAIN

SW/4 BA

DMA 4



ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty road, hard or improved surface
Secondary highway, hard surface	Unimproved road

Interstate Route   U. S. Route   State Route

1 MILE

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°30' 9 MILS   11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MOUNTAIN TANK, N. MEX.–TEX.

SW/4 BASSETT LAKE 15' QUADRANGLE

N3200–W10552.5/7.5

1980

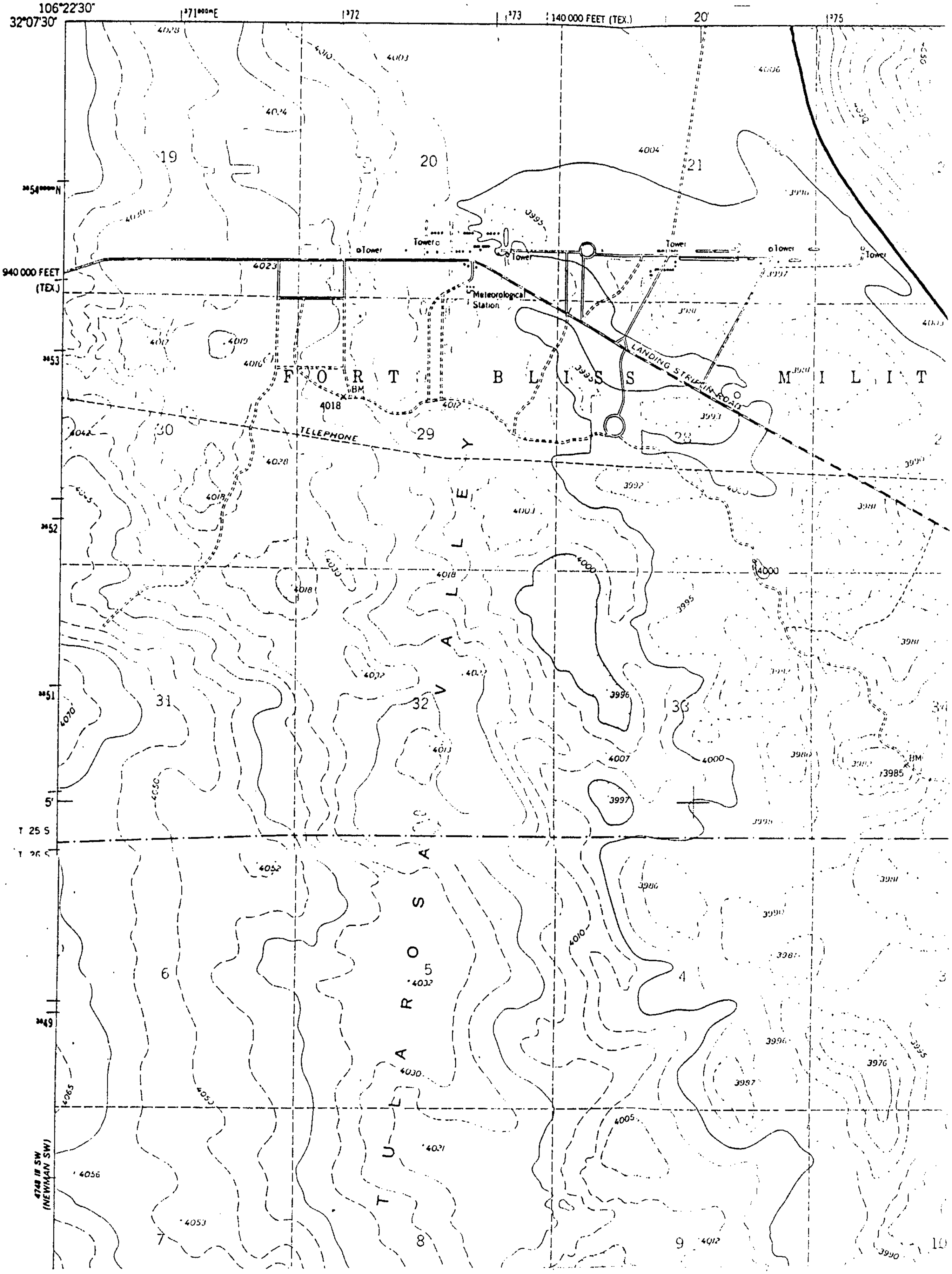
DMA 4848 III SW–SERIES V881

IA 22092

3205–222

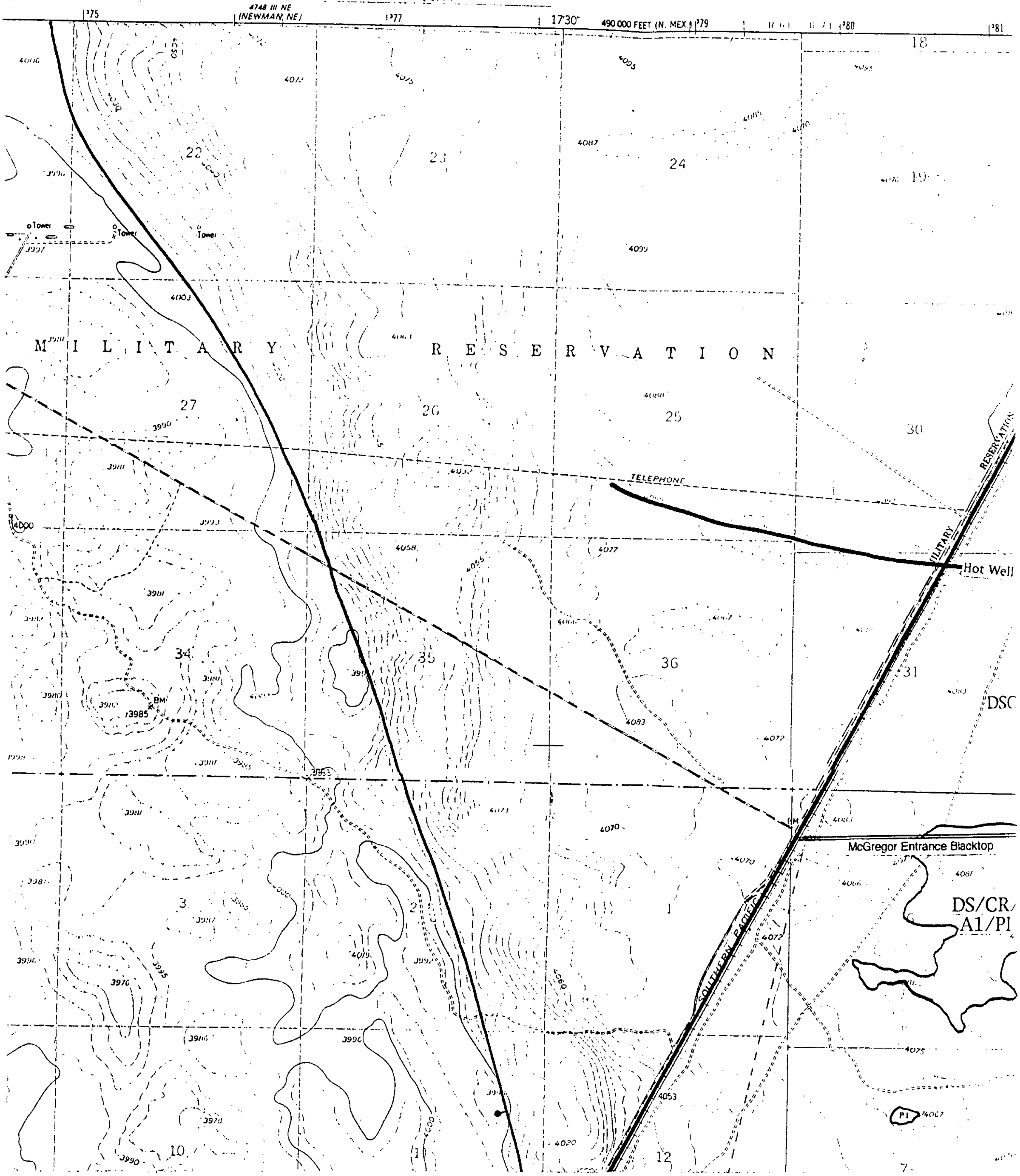
E1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



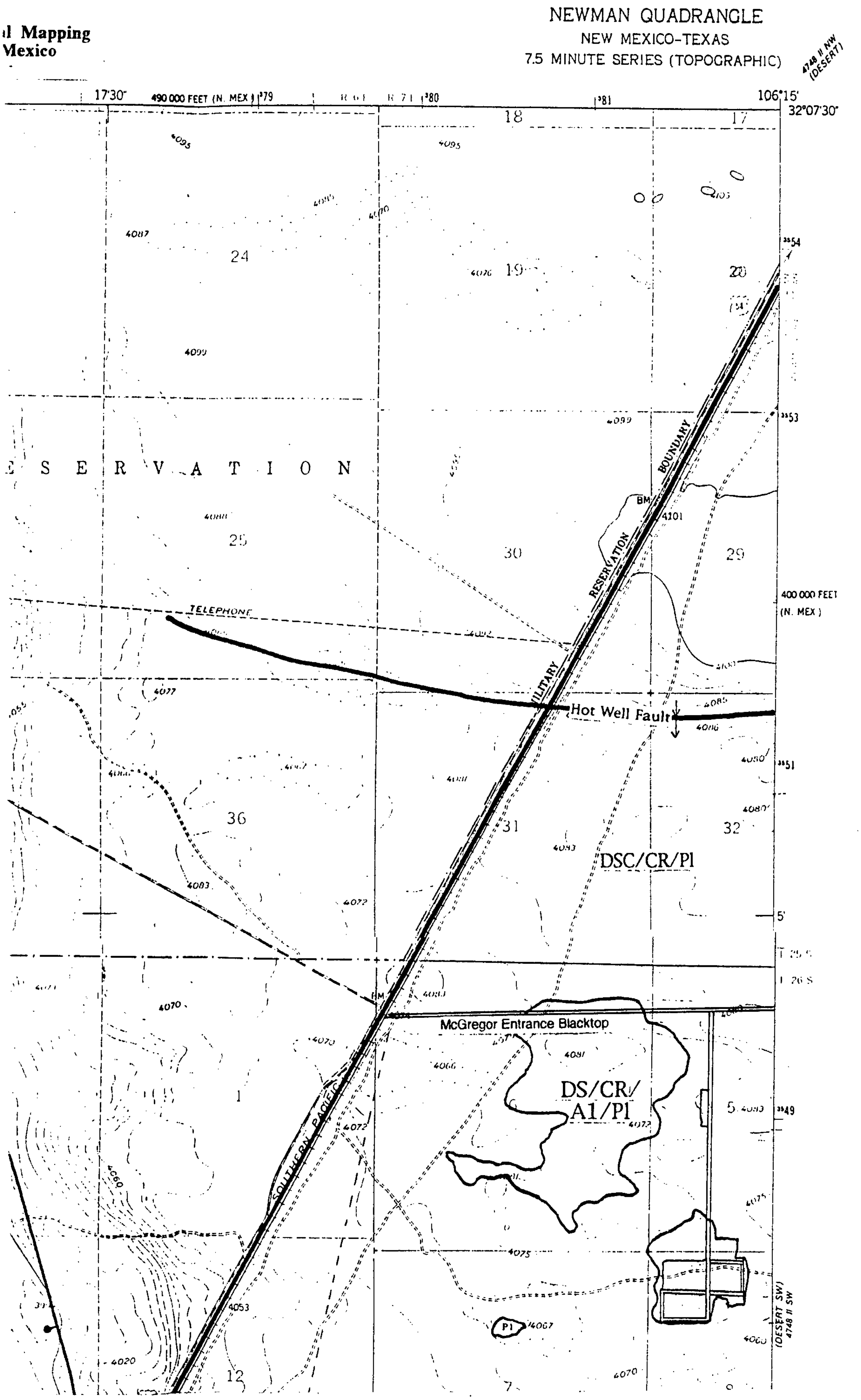
(1)

eomorphological, Geoecological, Geoarchaeological and Surficial Mapping
Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



2

l Mapping
Mexico



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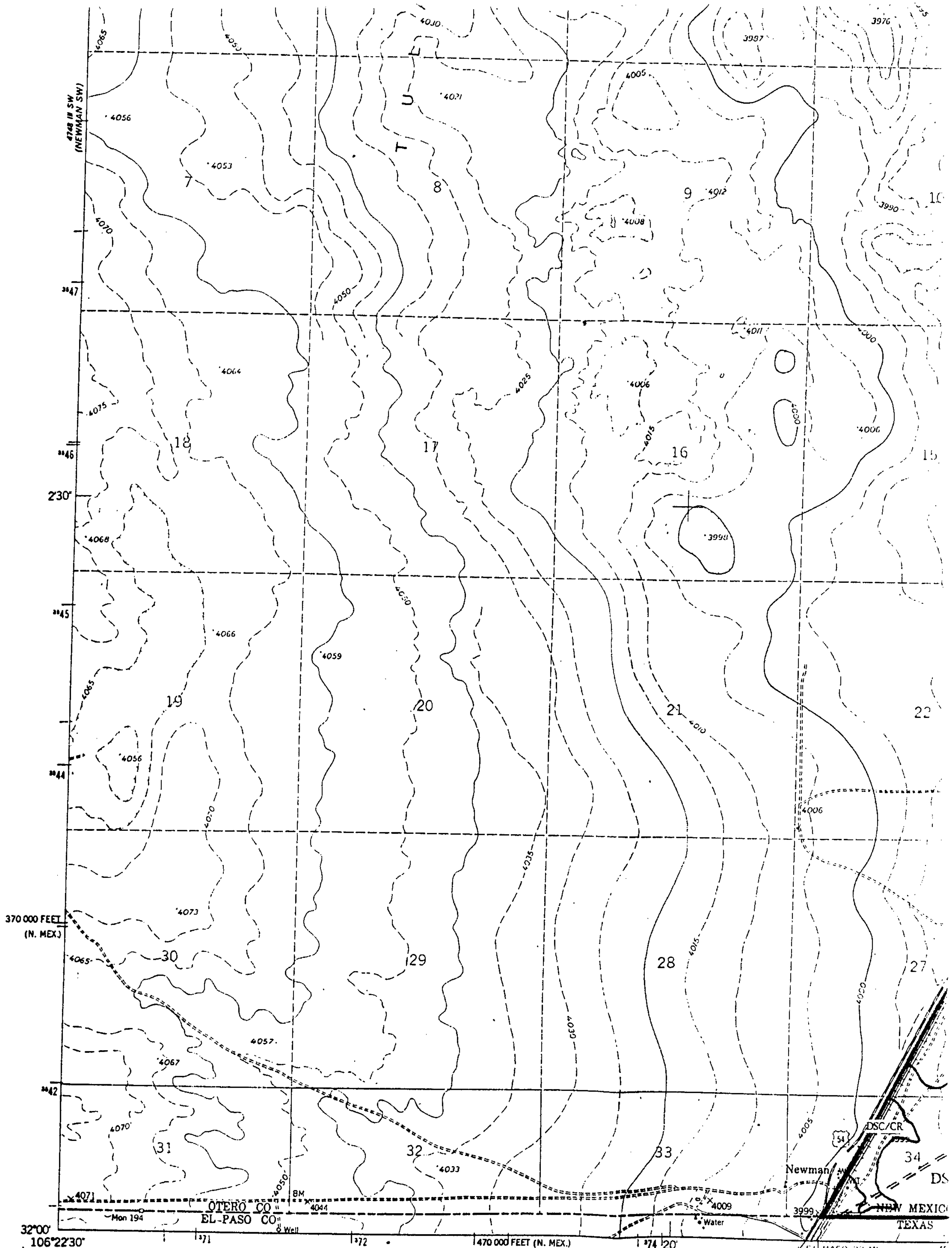


(NORTH FRANKLIN MOUNTAIN) 4747 IV NW

4

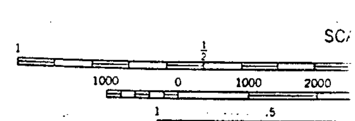
Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

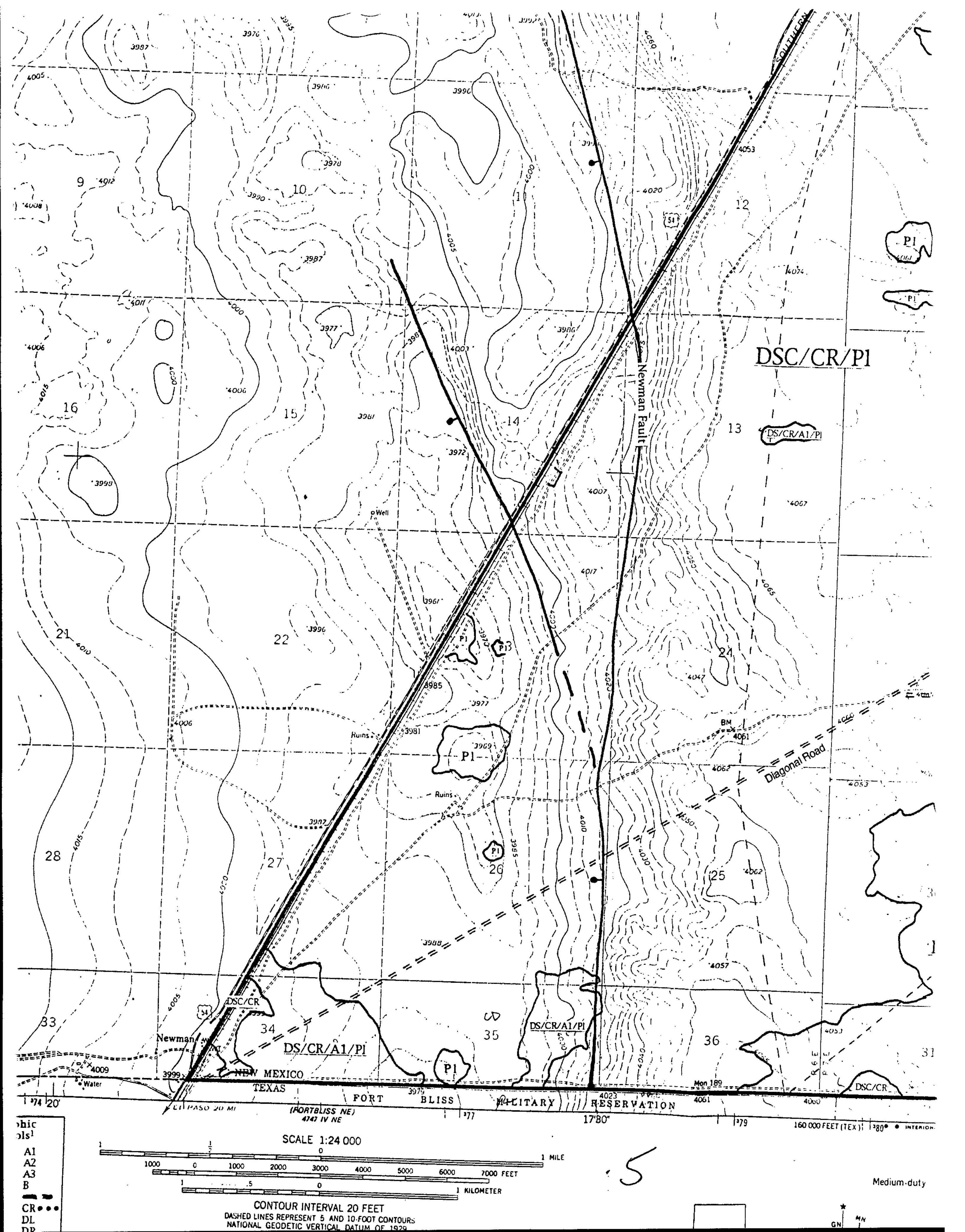
Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

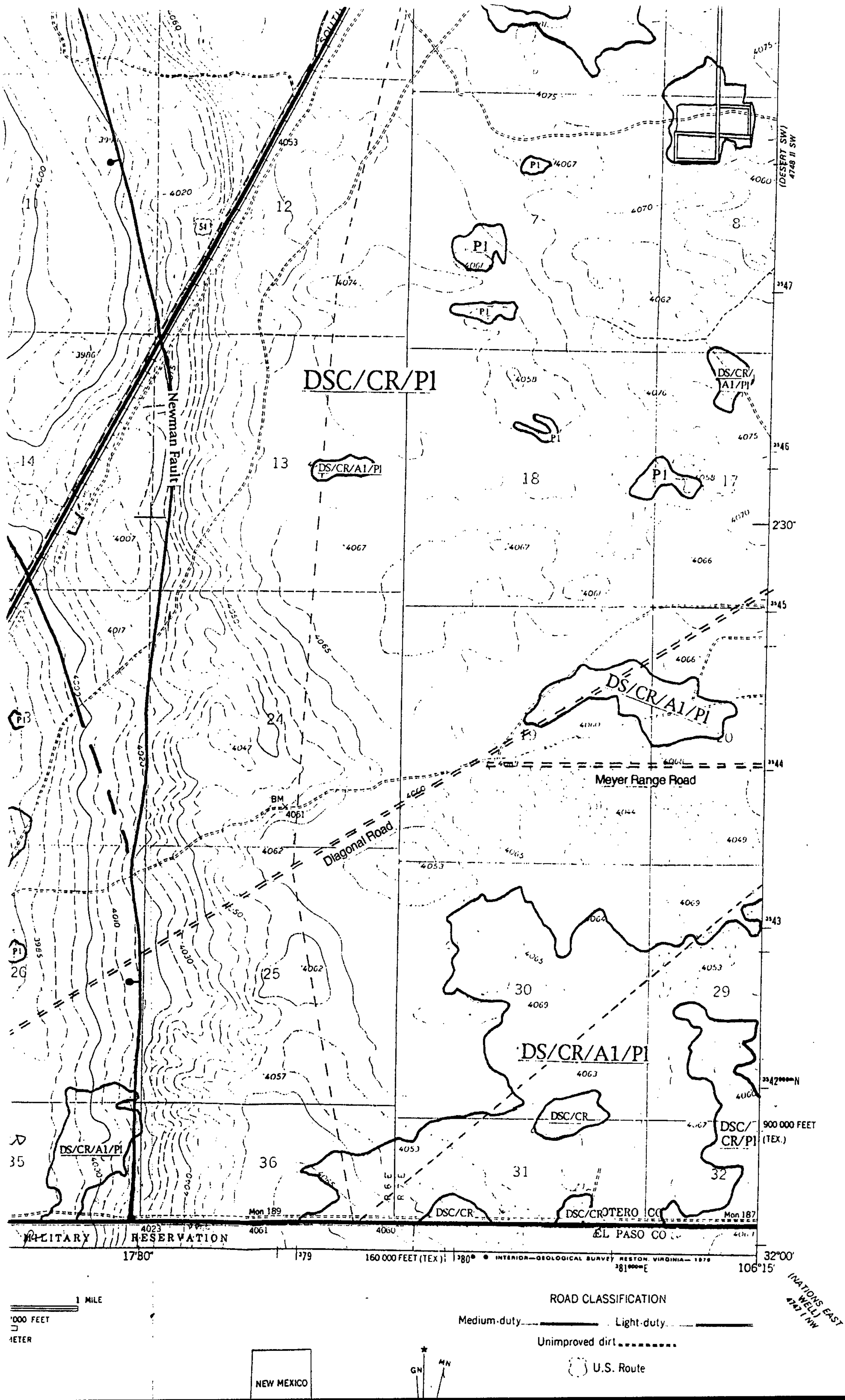
Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone and Texas coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP

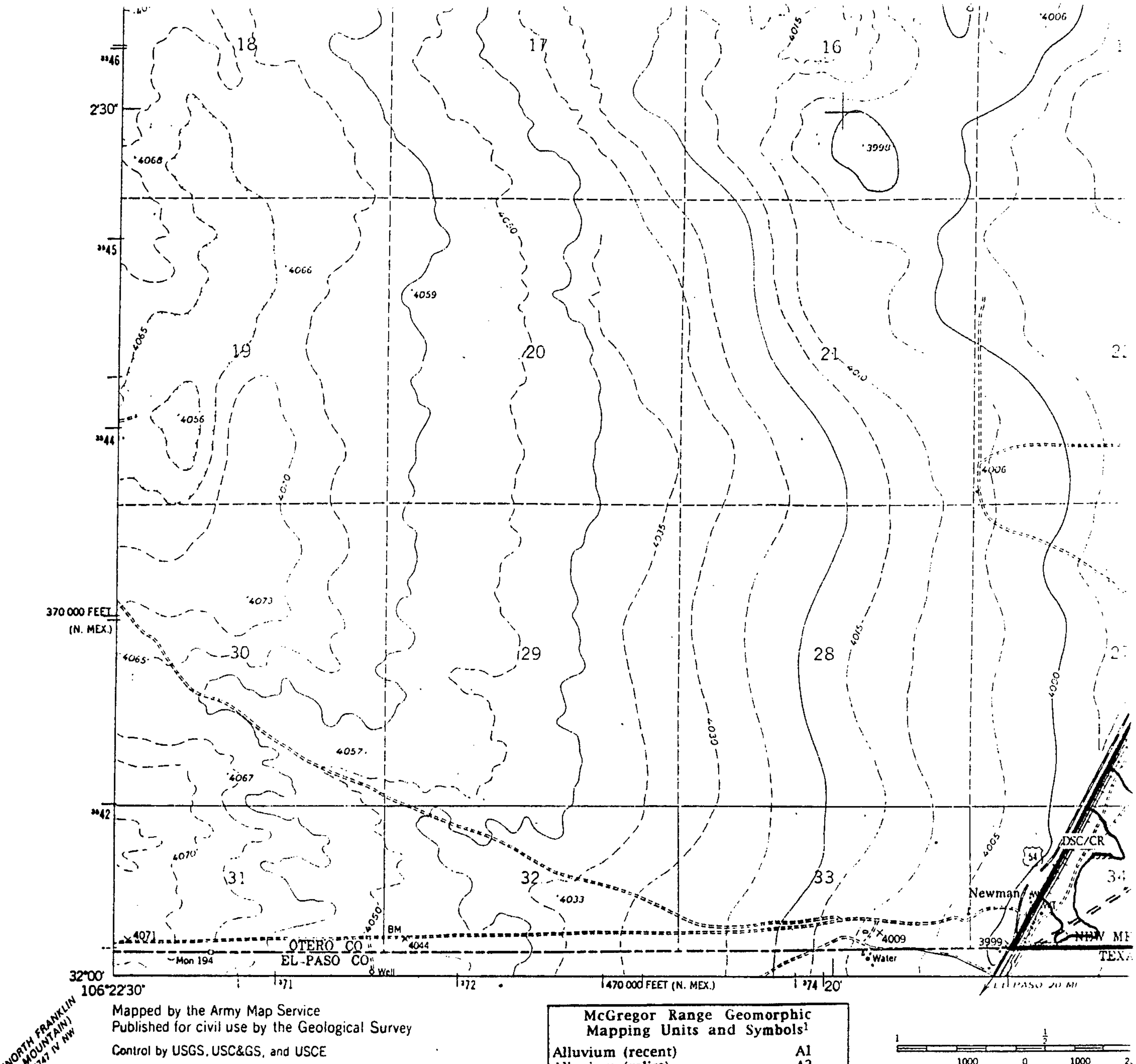


CONTOUR
DASHED LINES REPRE
NATIONAL GEODET


DSC/CR/Pl
DS/CR/A1/Pl
DSC/CR
Pl
Newman Fault
Diagonal Road
Newman
NEW MEXICO
TEXAS
FORT BLISS MILITARY RESERVATION
Ruins
Well
Water
Mon 189
BM
SOUTHERN
EL PASO 20 MI
(FORTBLISS NE)
4747 IV NE
160 000 FEET (TEX)
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
Medium-duty
A1
A2
A3
B
CR
DL
5


DSC/CR/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
DS/CR/A1/Pl
Pl
Pl
Pl
Pl
Pl
DSC/CR
DSC/CR
DSC/CR
DSC/CR/Pl
Newman Fault
Meyer Range Road
Diagonal Road
54
(DESERT SW)
4748 II SW
MILITARY RESERVATION
OTERO CO
EL PASO CO
Mon 189
Mon 187
BM
17'30"
32°00'
106°15'
2'30"
900 000 FEET (TEX.)
160 000 FEET (TEX.)
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1979
(NATIONS EAST WELL)
4747 I NW
1 MILE
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
U.S. Route
NEW MEXICO
GN
MN

6



Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone and Texas coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

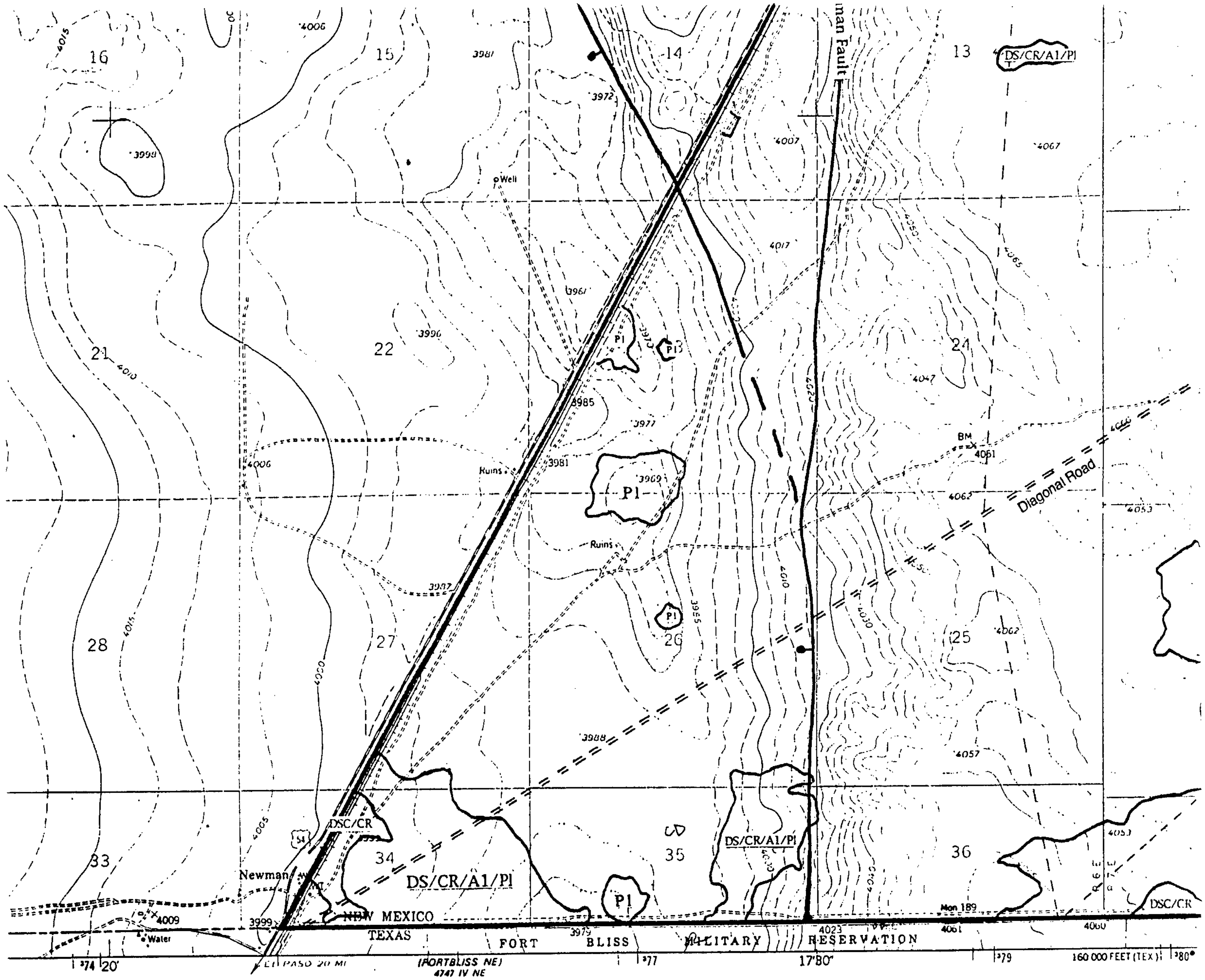
Alluvium (recent)	Al
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

1 ½
1000 0 1000 2
1 .5

CON
DASHED LINES
NATIONAL G

THIS MAP COMPLIES W
FOR SALE BY U. S. GEOLOGICAL SURVEY
A FOLDER DESCRIBING TOPOGRAP



Geomorphic
d Symbols[1]

A1
A2
A3
B
ediments CR
DL
DP
DS
DSC
us DSG
P
Pl
PlL

SCALE 1:24 000

1 MILE

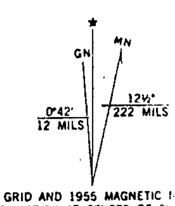
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

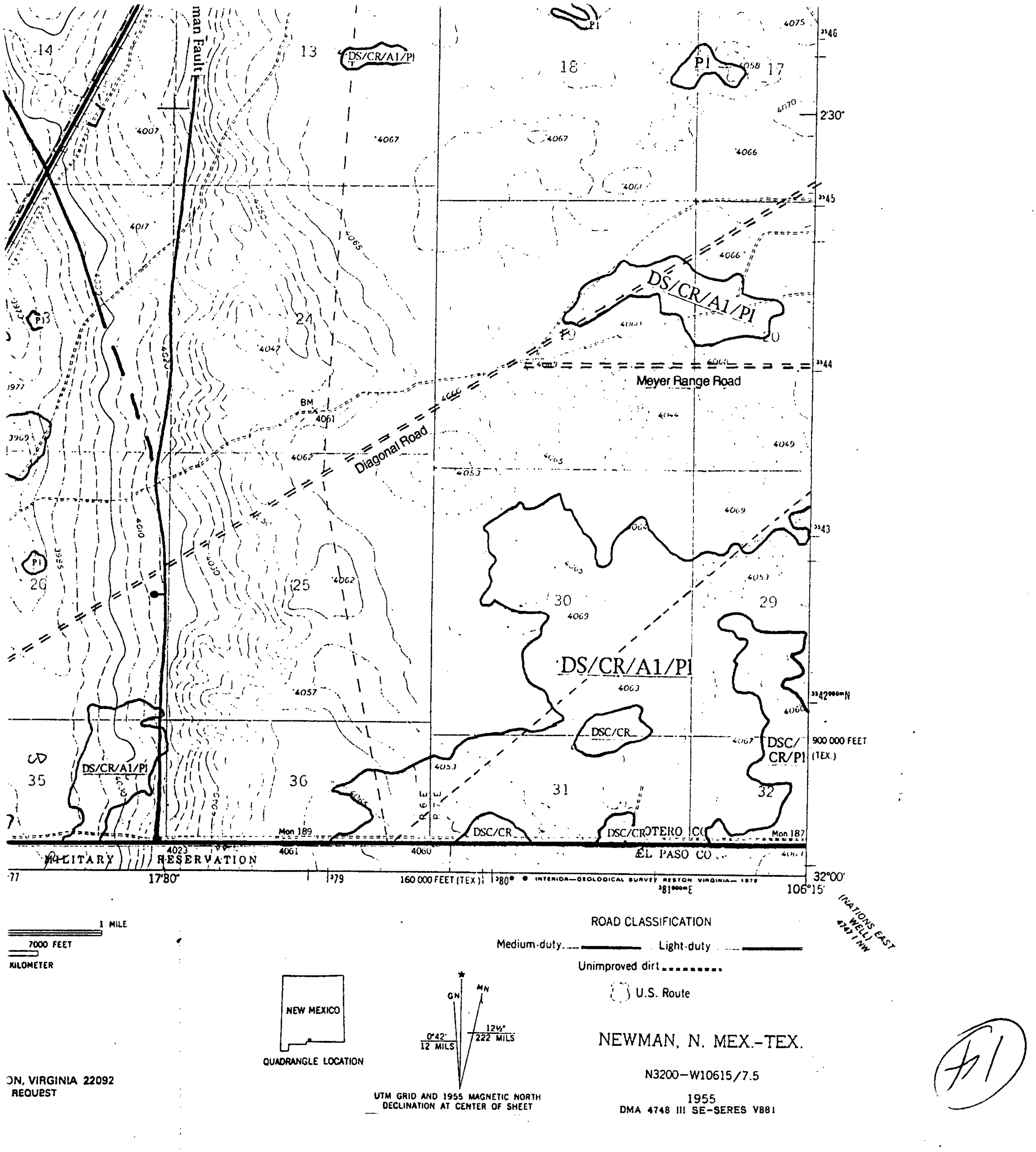
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION



UTM GRID AND 1955 MAGNETIC
DECLINATION AT CENTER OF SH

Med

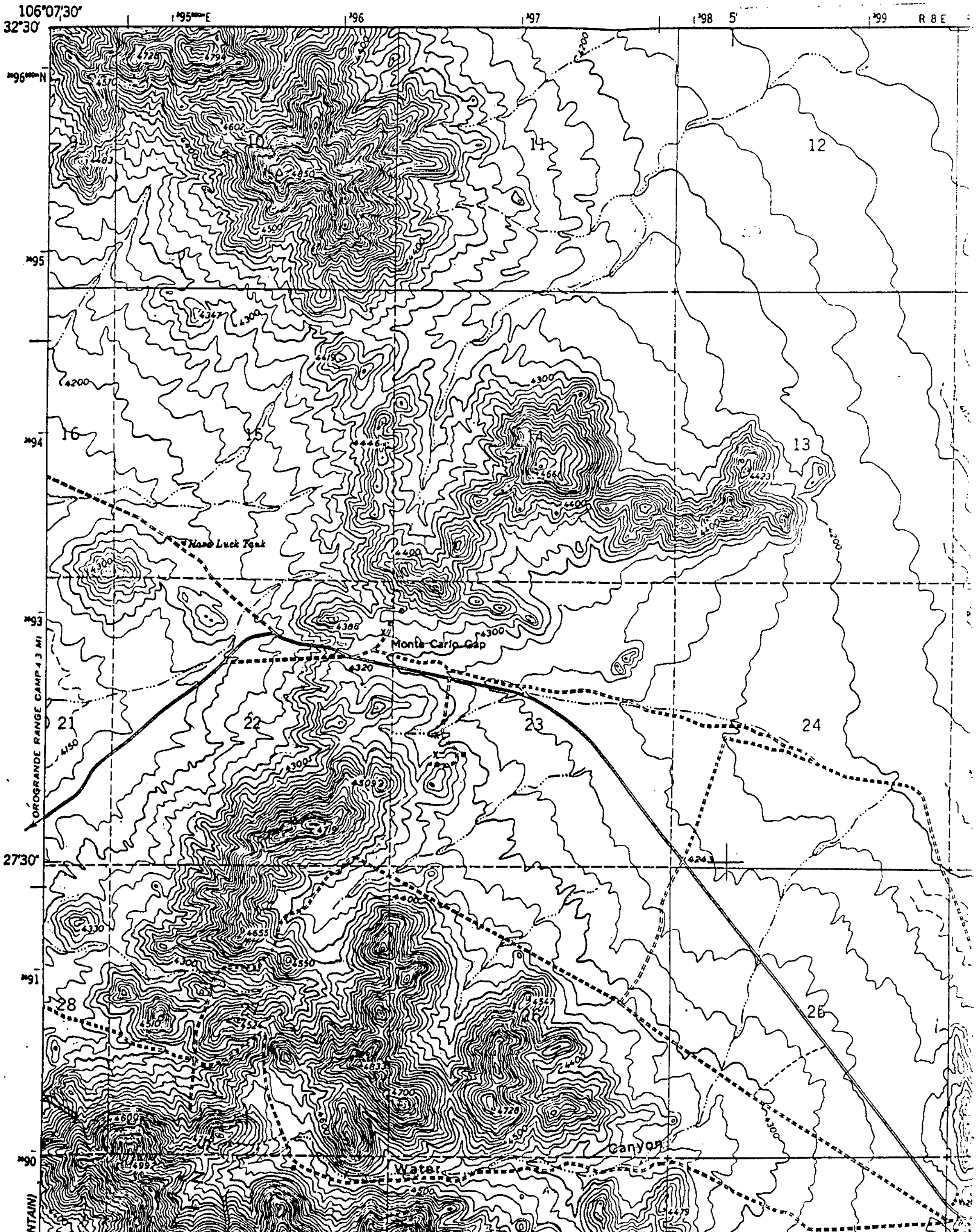


DS/CR/A1/PI
Meyer Range Road
Diagonal Road
DS/CR/A1/PI
DSC/CR
DSC/CR/PI
MILITARY RESERVATION
OTERO CO
EL PASO CO
Mon 189
Mon 187
900 000 FEET (TEX.)
160 000 FEET (TEX.)
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1979
32°00'
106°15'
(NATIONS EAST WELL) 4747 I NW
1 MILE
7000 FEET
KILOMETER
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
U.S. Route
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°42' 12 MILS
12½° 222 MILS
UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
NEWMAN, N. MEX.-TEX.
N3200—W10615/7.5
1955
DMA 4748 III SE—SERIES V881
ON, VIRGINIA 22092
REQUEST

9

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

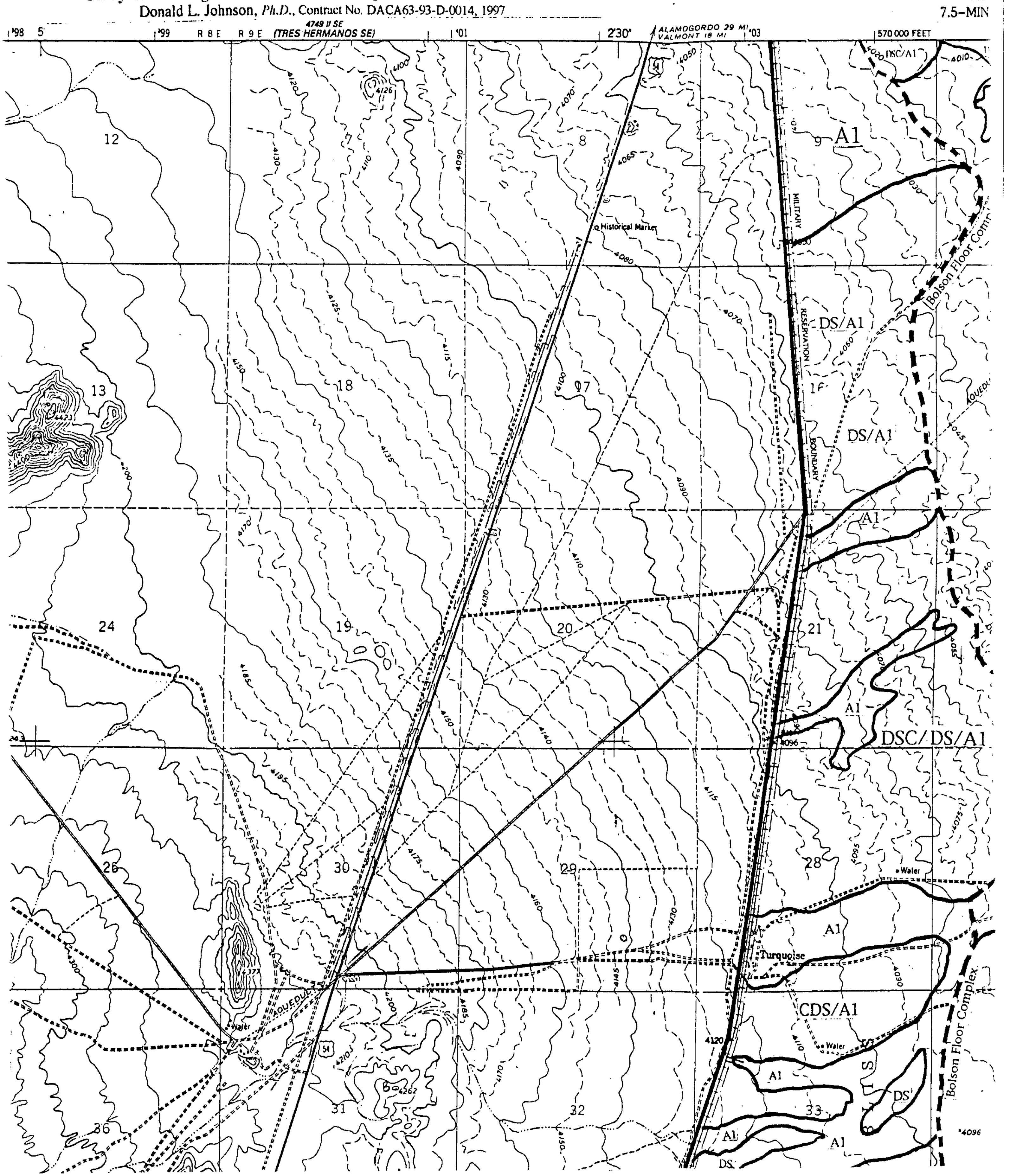
Geomorphological, Geoecol
Study of McGregor G
Donald L. Johns



1

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

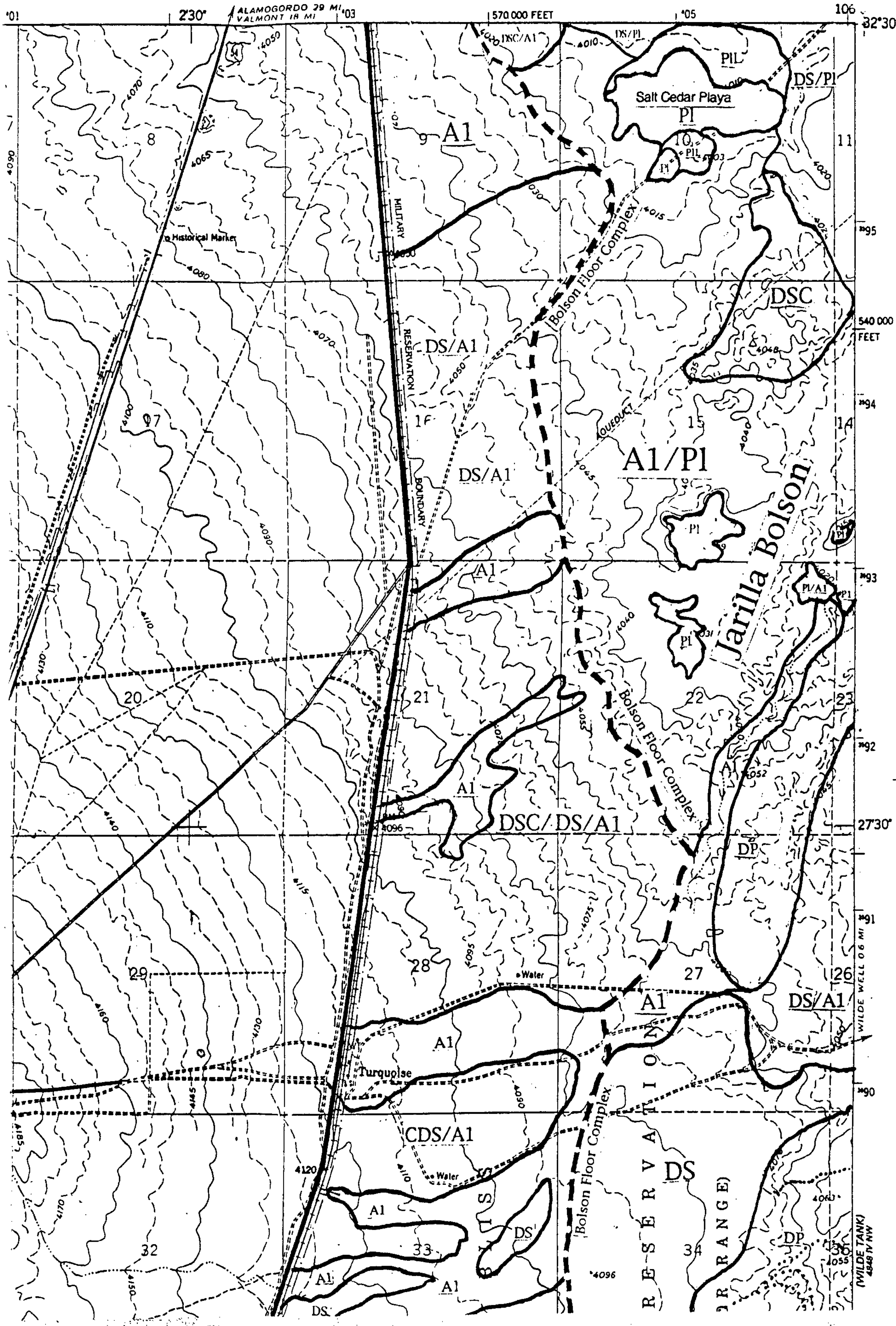
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



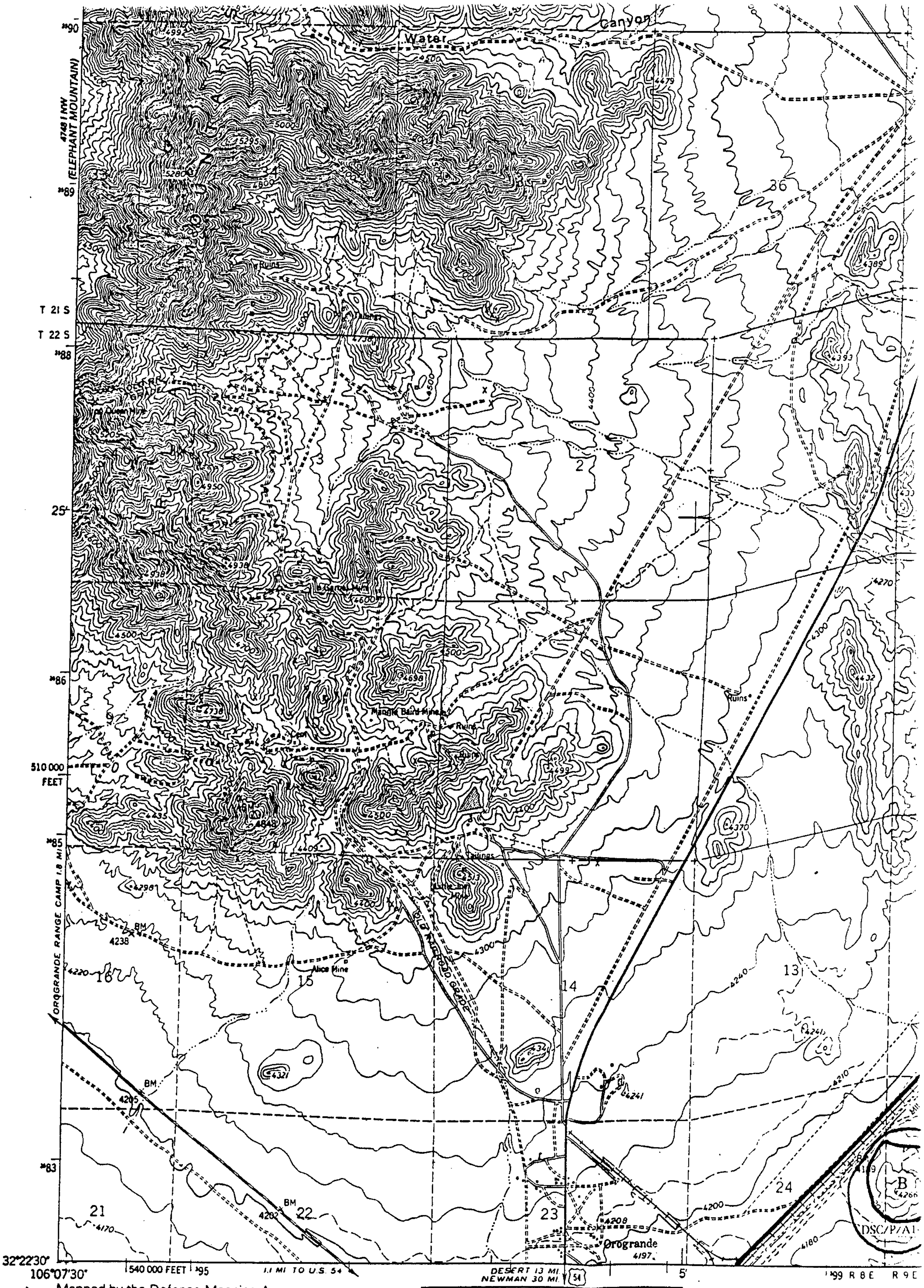
(2)

l Surficial Mapping
iss, New Mexico
'014, 1997

OROGRANDE NORTH QUADRANGLE
NEW MEXICO-OTERO CO.
7.5-MINUTE SERIES (TOPOGRAPHIC)



(3)



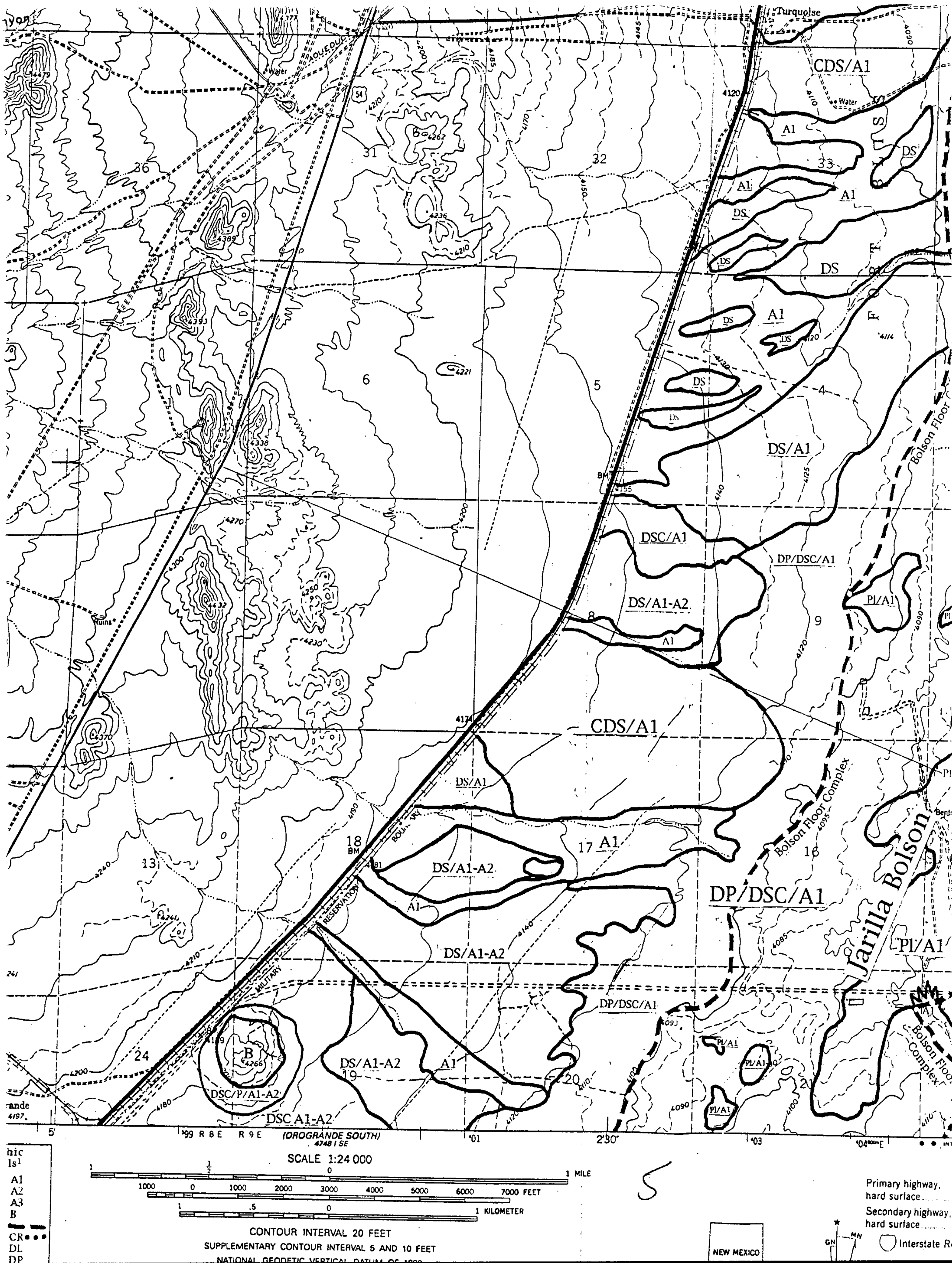
4

Mapped by the Defense Mapping Agency
Produced by the United States Geological Survey
Control by USGS, NOS/NOAA and USCE
Compiled from aerial photographs taken 1954. Field checked 1955
North American Datum of 1927 (NAD 27). Projection and 10 000-foot ticks: New Mexico Coordinate System, central zone (Transverse Mercator)
Blue 1000-meter Universal Transverse Mercator ticks, zone 13
North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83

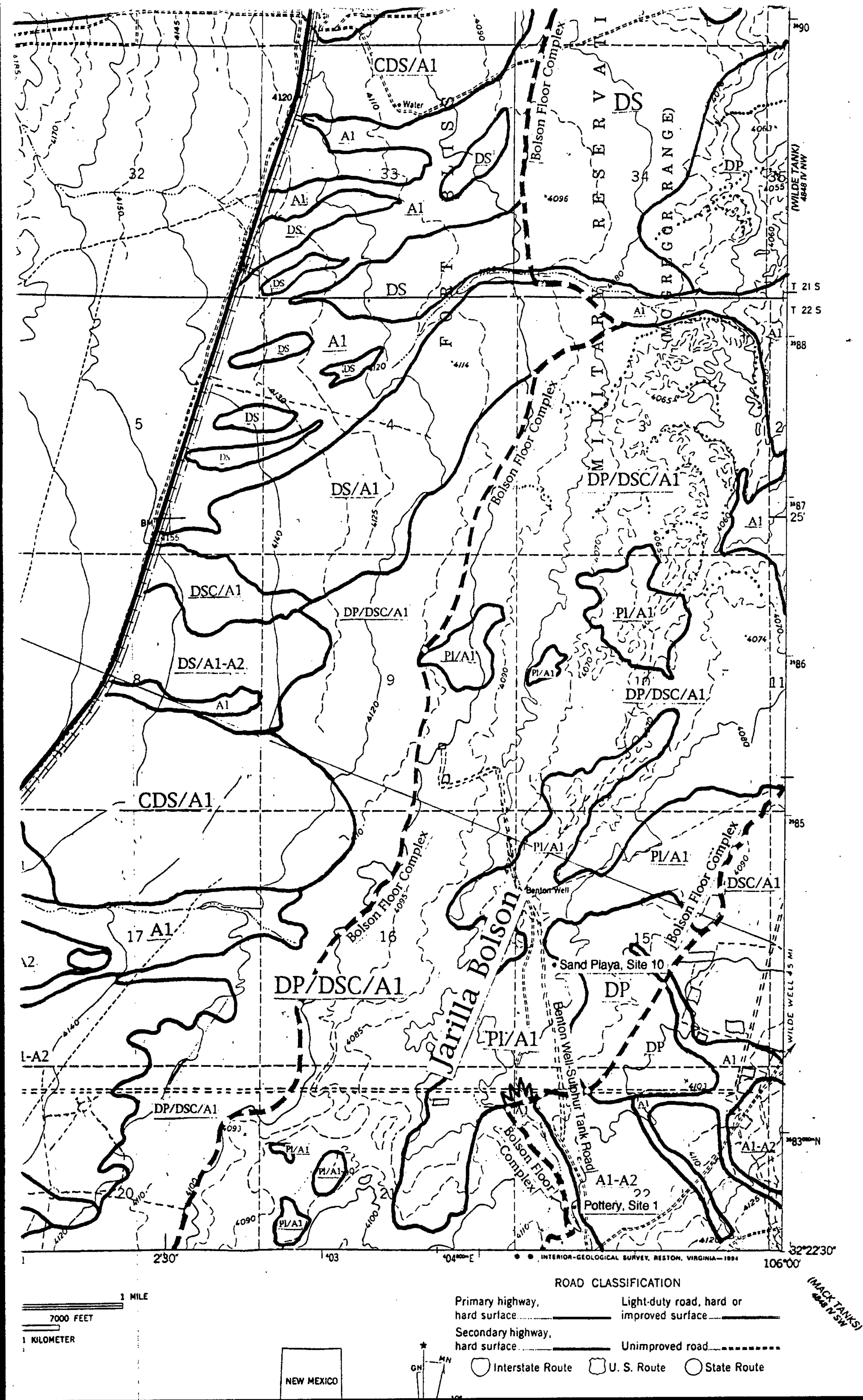
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP

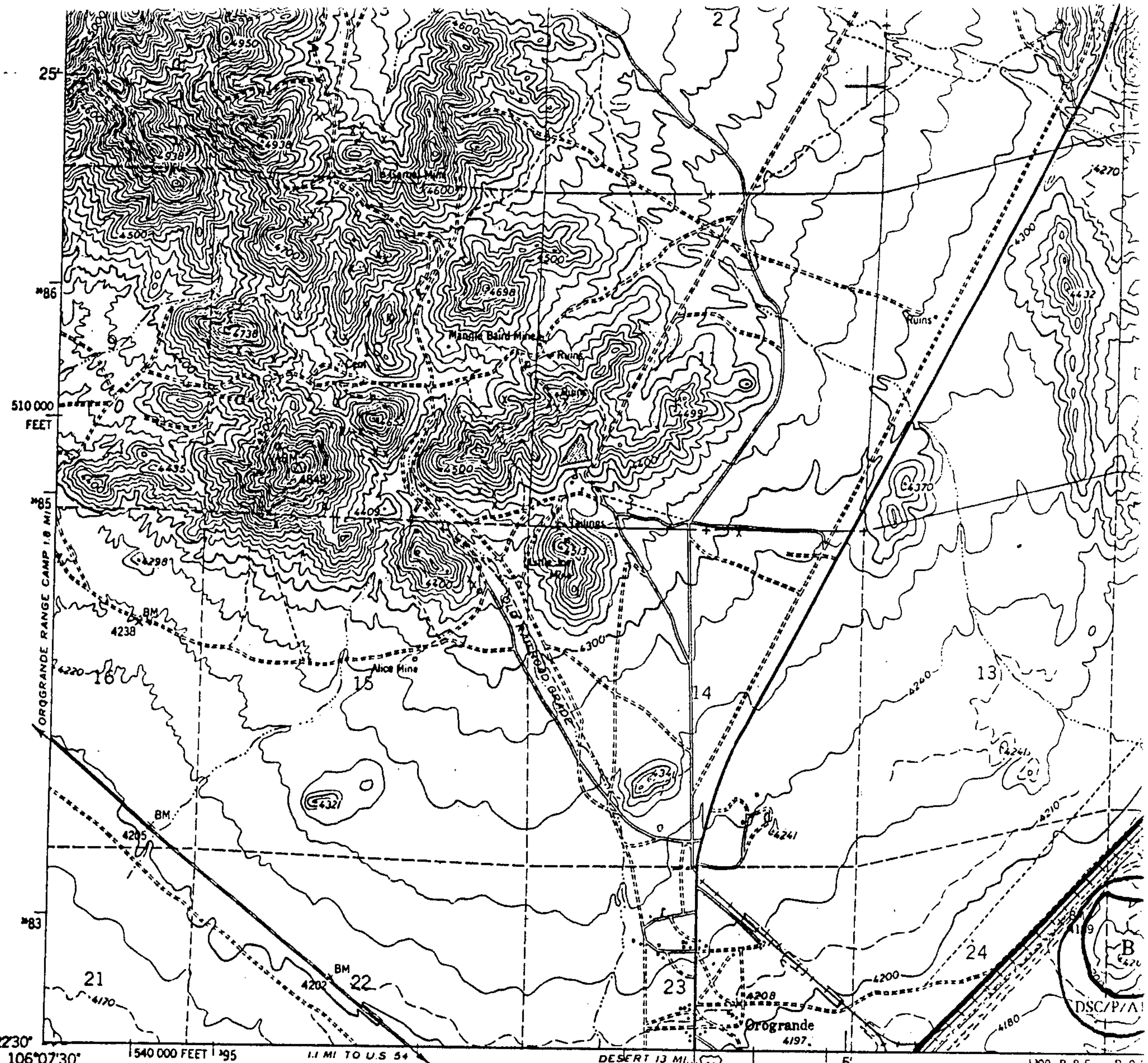
1 ½
1000 0 1000
1 .5
CO
SUPPLEMENTA
NATIONAL


Turquoise
CDS/A1
A1
DS
33
A1
DS
DS
DS
A1
DS
DS
DS
4
DS/A1
Bolson Floor
DSC/A1
DP/DSC/A1
DS/A1-A2
Pl/A1
A1
9
CDS/A1
DS/A1
17 A1
Bolson Floor Complex
16
Jarilla Bolson
DS/A1-A2
DP/DSC/A1
A1
DS/A1-A2
Pl/A1
DP/DSC/A1
Pl/A1
Pl/A1
Pl/A1
Bolson Floor Complex
DS/A1-A2
A1
19
20
21
B
DSC/P/A1-A2
DSC A1-A2
Water
Ruins
31
32
36
6
5
7
8
13
18
BM
24
MILITARY RESERVATION
R 8 E R 9 E
(OROGRANDE SOUTH)
4748 I SE
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 AND 10 FEET
NEW MEXICO
Primary highway, hard surface
Secondary highway, hard surface
Interstate R
A1
A2
A3
B
CR
DL
DP

5


CDS/A1
DS
Bolson Floor Complex
FORT BLISS
MILITARY RESERVATION
(MC GREGOR RANGE)
A1
DS
DP
DS/A1
DP/DSC/A1
DSC/A1
DS/A1-A2
PI/A1
CDS/A1
A1-A2
DSC/A1
Jarilla Bolson
Benton Well
Sand Playa, Site 10
Benton Well-Sulphur Tank Road
Pottery, Site 1
(WILDE TANK)
WILDE WELL 4.5 MI
T 21 S
T 22 S
25'
32°22'30"
106°00'
2'30"
INTERIOR-GEOLOGICAL SURVEY, RESTON, VIRGINIA—1994
(MACK TANKS)
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
1 MILE
7000 FEET
1 KILOMETER
NEW MEXICO

6



(ELWOOD) 4748 I SW

Mapped by the Defense Mapping Agency
Produced by the United States Geological Survey
Control by USGS, NOS/NOAA and USCE

Compiled from aerial photographs taken 1954. Field checked 1955

North American Datum of 1927 (NAD 27). Projection and 10 000-foot ticks: New Mexico Coordinate System, central zone (Transverse Mercator)
Blue 1000-meter Universal Transverse Mercator ticks, zone 13

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Photoinspected from 1990 source; no major culture or drainage changes observed. Boundaries and names revised 1994

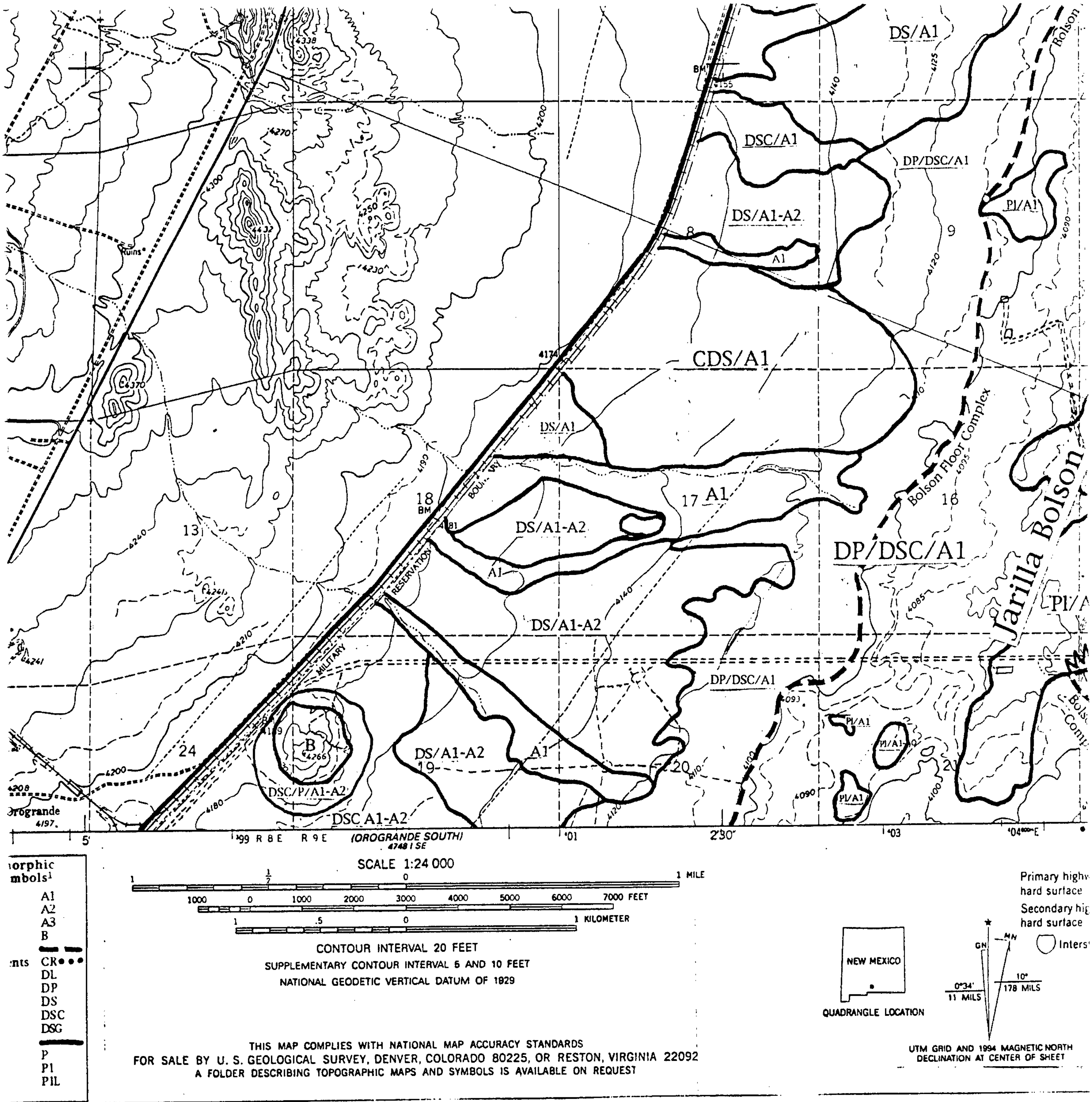
McGregor Range Geomorphic Mapping Units and Symbols[1]

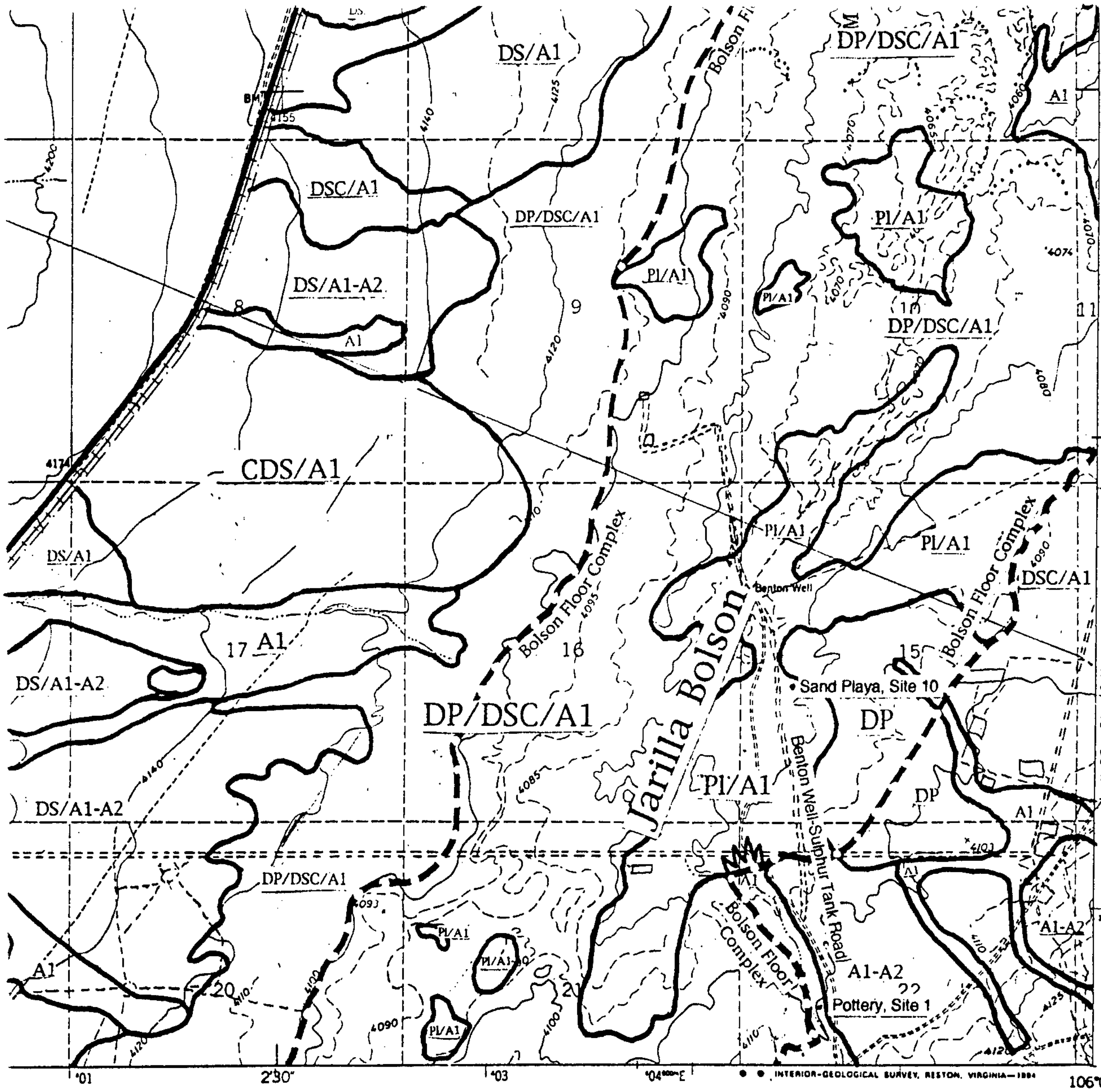
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

CC
SUPPLEMENT
NATIONAL

THIS MAP COMF
FOR SALE BY U. S. GEOLOGICAL S
A FOLDER DESCRIBING TO


DS/A1
DSC/A1
DP/DSC/A1
PI/A1
DS/A1-A2
A1
CDS/A1
Bolson Floor Complex
Jarilla Bolson
Bolson
DS/A1
17 A1
DS/A1-A2
A1
DP/DSC/A1
PI/A
DS/A1-A2
DP/DSC/A1
MILITARY
RESERVATION
B
DSC/P/A1-A2
DSC A1-A2
DS/A1-A2
A1
PI/A1
PI/A1-A2
PI/A1
Ruins
Orogrande
(OROGRANDE SOUTH)
4748 I SE
R 8 E
R 9 E
orphic
mbols[1]
A1
A2
A3
B
nts CR
DL
DP
DS
DSC
DSG
P
P1
P1L
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 AND 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°34'
11 MILS
10°
178 MILS
UTM GRID AND 1994 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET
Primary highw
hard surface
Secondary hig
hard surface
Inters



1 MILE

0 6000 7000 FEET

1 KILOMETER

EET

Y STANDARDS
25, OR RESTON, VIRGINIA 22092
AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°34' 11 MILS

10° 178 MILS

UTM GRID AND 1994 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION

Primary highway, hard surface ....

Light-duty road, hard or improved surface ....

Secondary highway, hard surface ....

Unimproved road ....

Interstate Route U. S. Route State Route

(MACK TANKS) 4848 IV SW

OROGRANDE NORTH, NM

32106-D1-TF-024

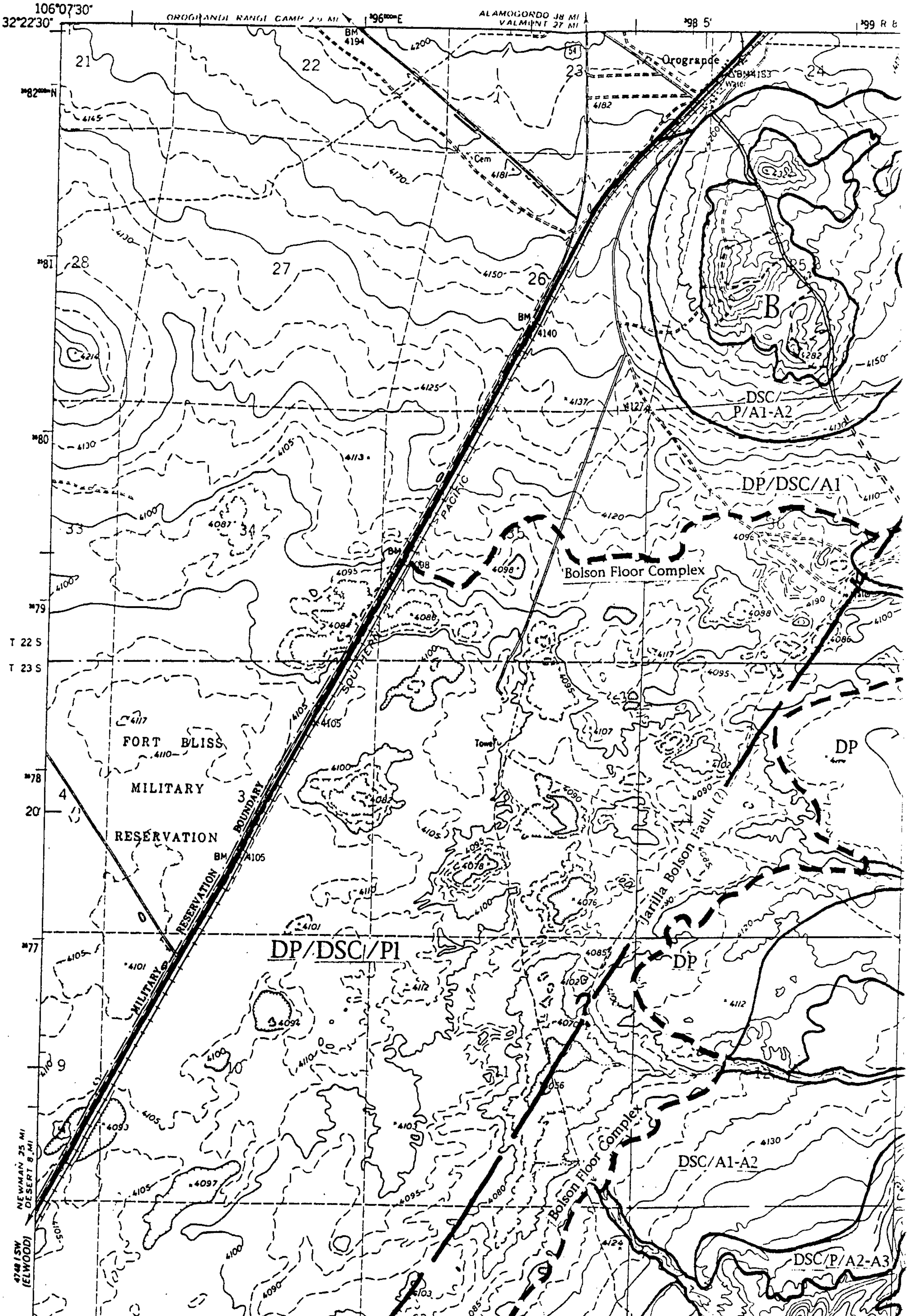
1955
MINOR REVISION 1994
DMA 4748 I NE-SERIES V881

51

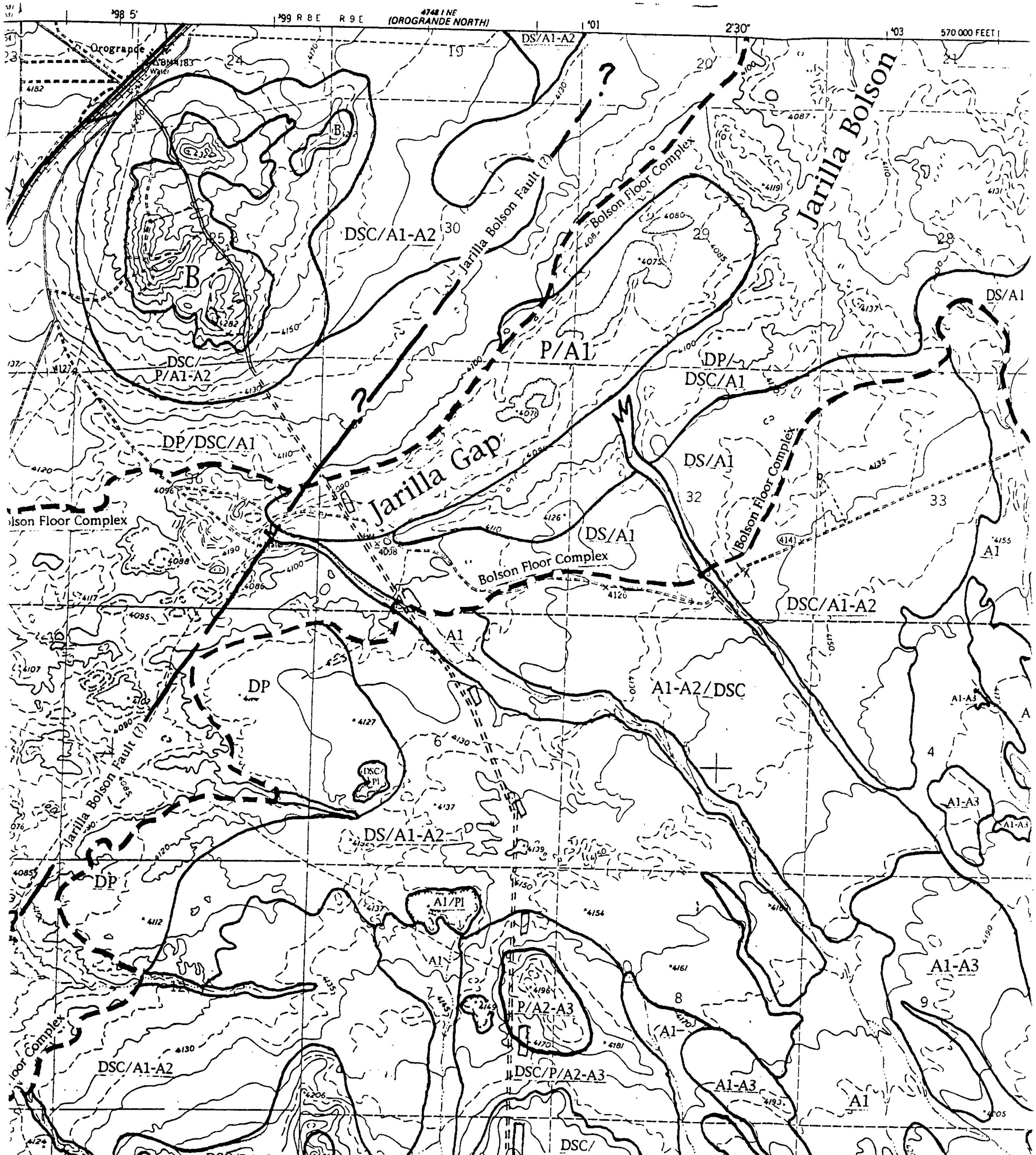
9

GEOLOGICAL SURVEY

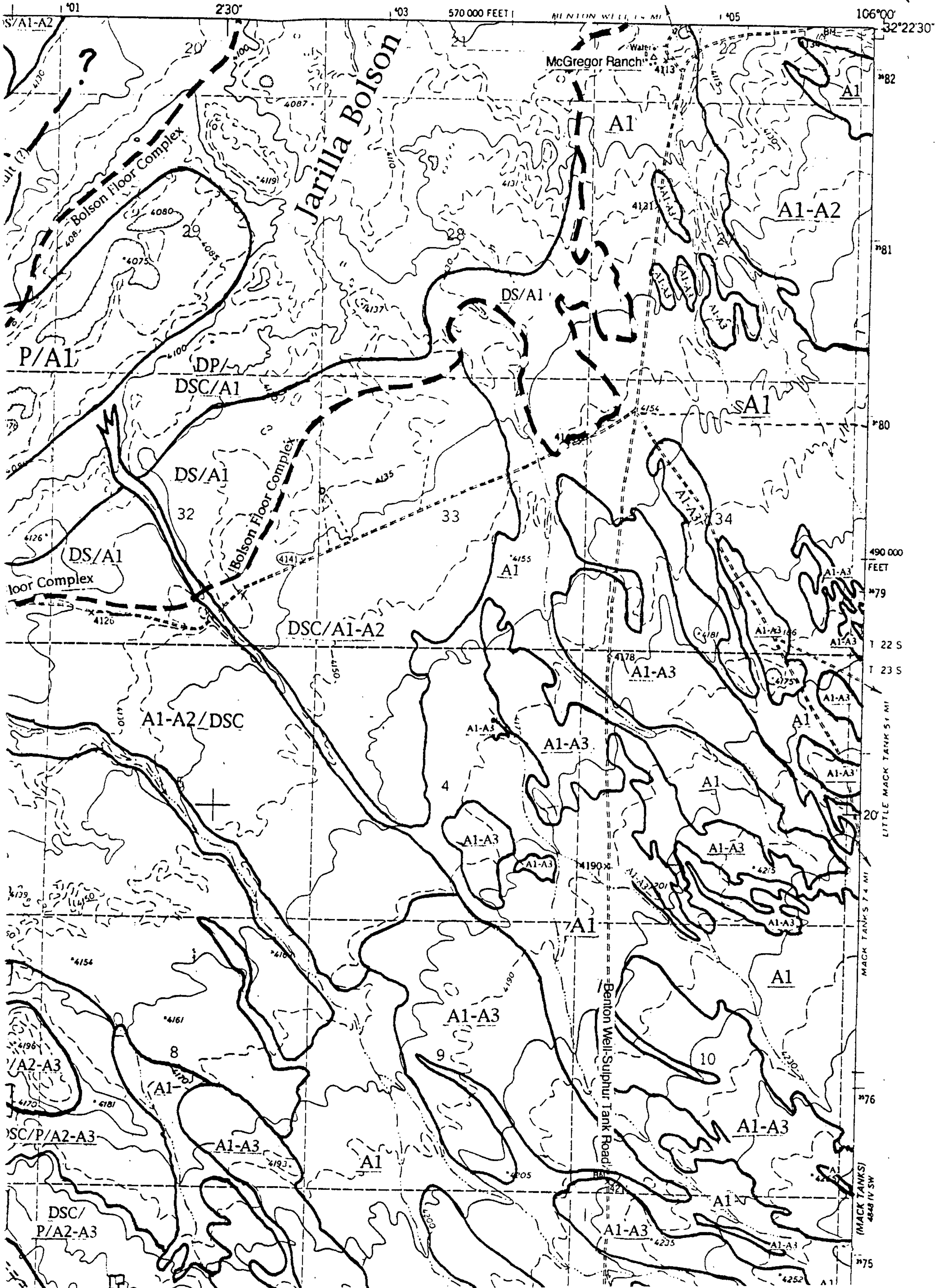
Donald L. J

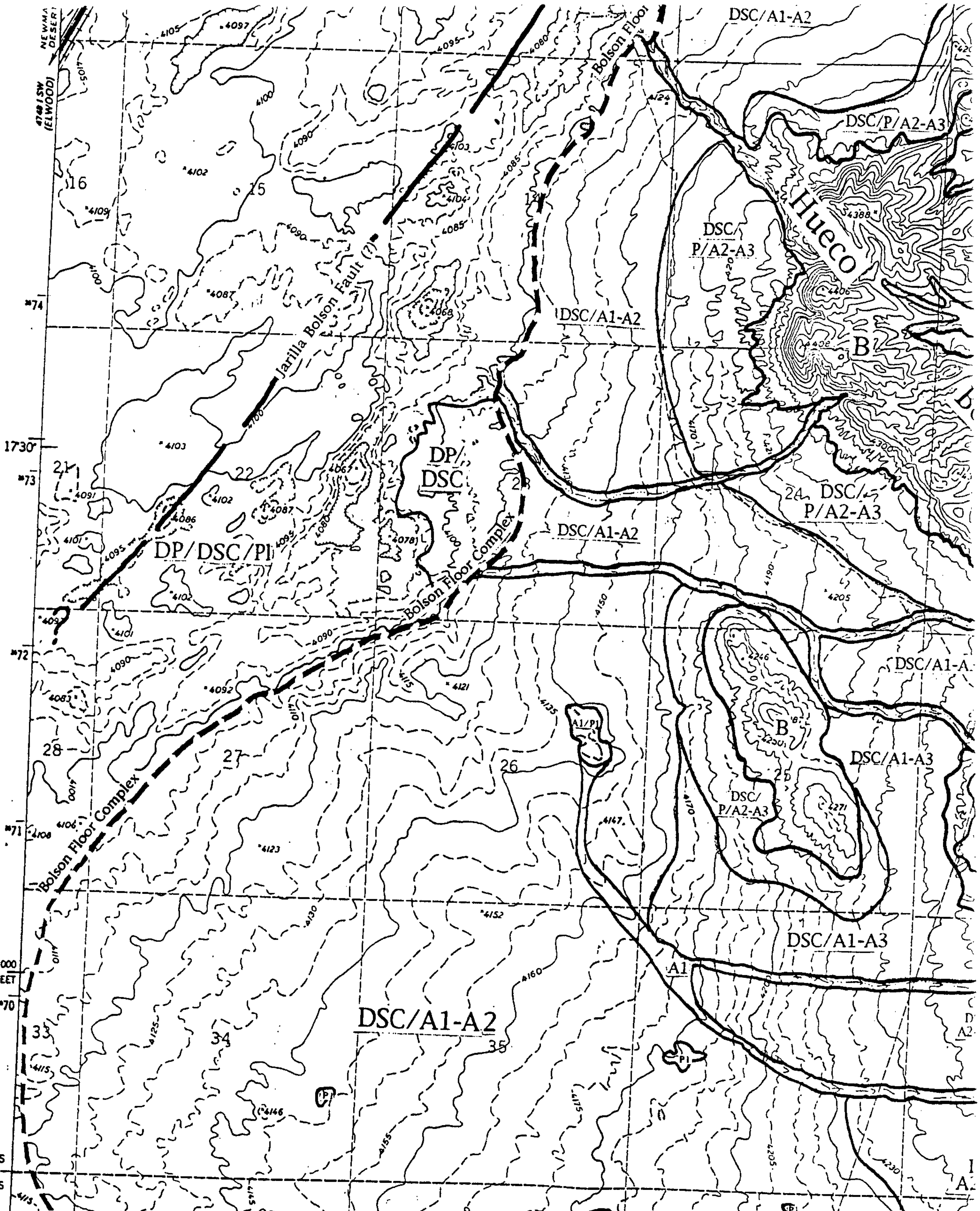


16


(OROGRANDE NORTH)
570 000 FEET
Orogrande
Jarilla Bolson
Jarilla Bolson Fault (?)
Bolson Floor Complex
Jarilla Gap
DSC/A1-A2
DS/A1-A2
B
DSC/P/A1-A2
P/A1
DP/DSC/A1
DS/A1
DS/A1
DSC/A1-A2
A1
DP
DSC/Pl
DS/A1-A2
A1-A2/DSC
A1-A3
DP
A1/Pl
A1
P/A2-A3
DSC/A1-A2
DSC/P/A2-A3
DSC/P/A2-A3
A1-A3
A1
A1

4848 IV NW
(WILDE TANK)





(DESERT) 4748 II NW

Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations
Land lines omitted in T.24S.-R.9E. because of insufficient data

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs
This information is unchecked

4

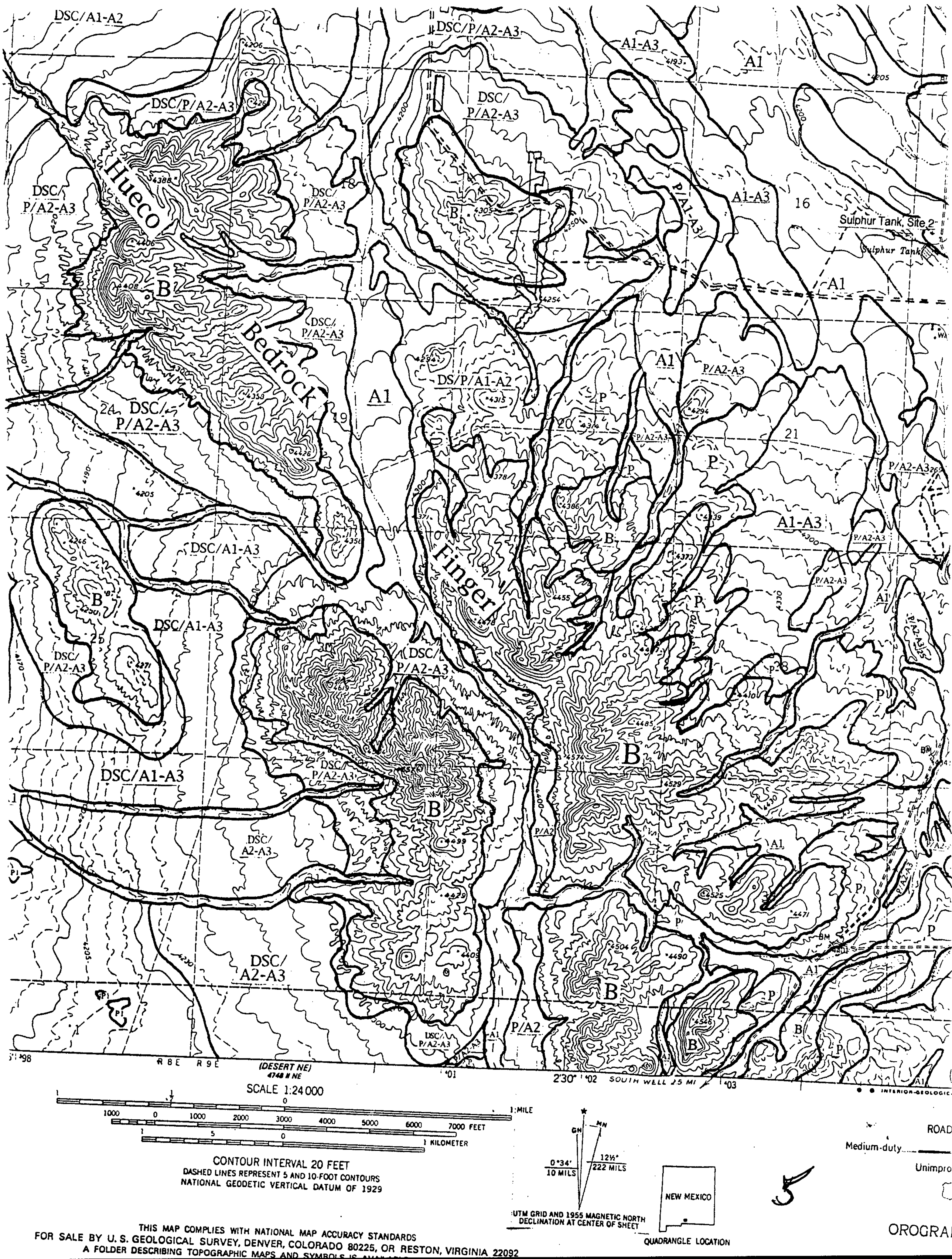
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl

1000 0 1000 2000

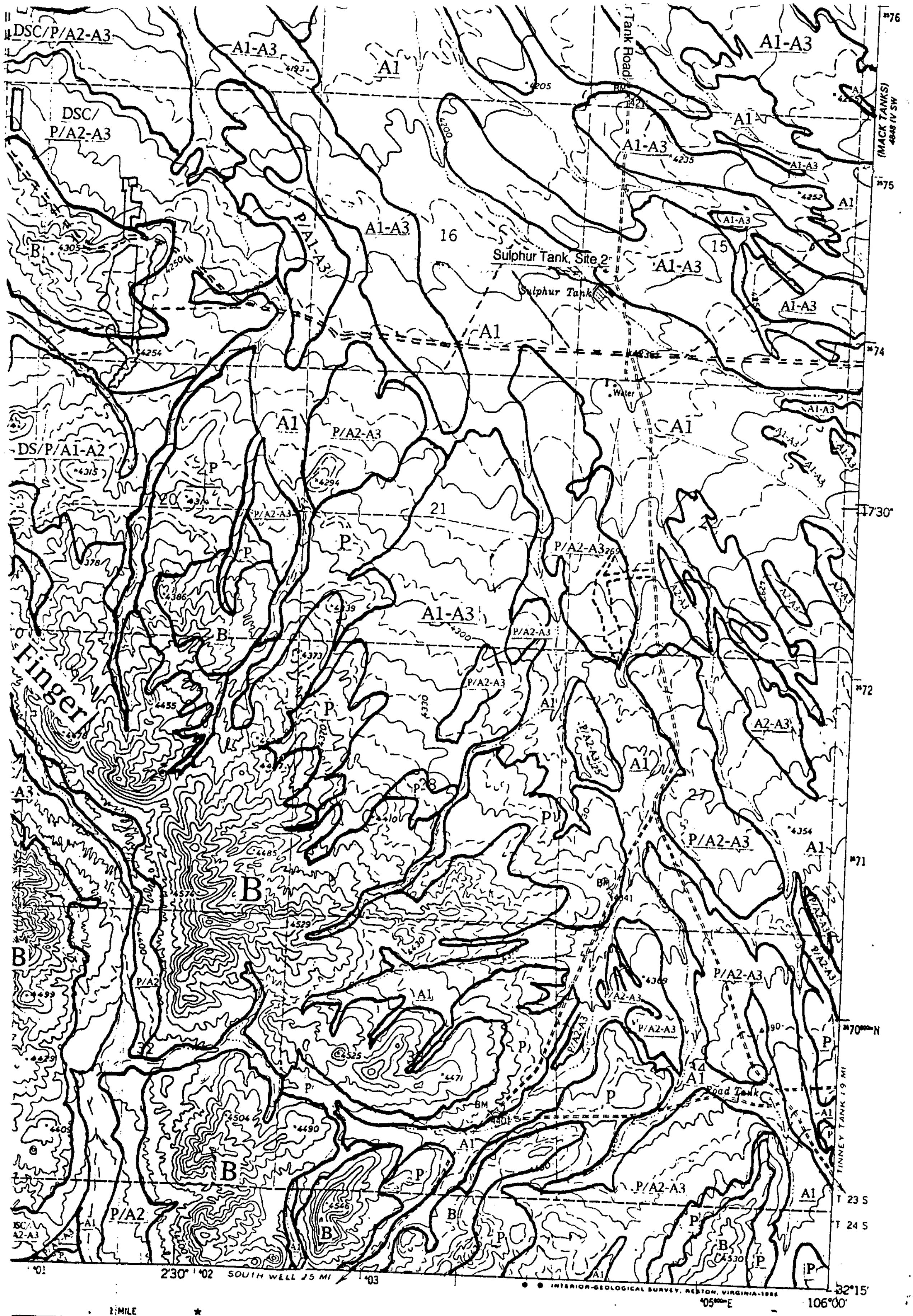
CONTOU
DASHED LINES REP
NATIONAL GEODE

THIS MAP COMPLIES WITH
FOR SALE BY U. S. GEOLOGICAL SURVEY, DE
A FOLDER DESCRIBING TOPOGRAPHIC



DSC/A1-A2
DSC/P/A2-A3
A1-A3
A1
DSC/P/A2-A3
DSC/P/A2-A3
Hueco
Bedrock
B
DSC/P/A2-A3
DSC/P/A2-A3
P/A1-A3
A1-A3
16
Sulphur Tank, Site 2
Sulphur Tank
A1
DSC/P/A2-A3
DS/P/A1-A2
A1
A1
P/A2-A3
24
DSC/P/A2-A3
19
20
21
P
P/A2-A3
Finger
B
A1-A3
P/A2-A3
DSC/A1-A3
B
DSC/A1-A3
DSC/P/A2-A3
DSC/P/A2-A3
P
B
DSC/A1-A3
DSC/P/A2-A3
B
P/A2
DSC/A2-A3
A1
P
DSC/A2-A3
B
P/A2
DSC/P/A2-A3
B
B
P1
R 8 E
R 9 E
(DESERT NE)
4748 II NE
SOUTH WELL 2.5 MI
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
NEW MEXICO
QUADRANGLE LOCATION
ROAD
Medium-duty
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

5



1 MILE

7000 FEET

KILOMETER

GN MN

0°34' 10 MILS

12½° 222 MILS

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Medium-duty ____ Light-duty ____

Unimproved dirt ------

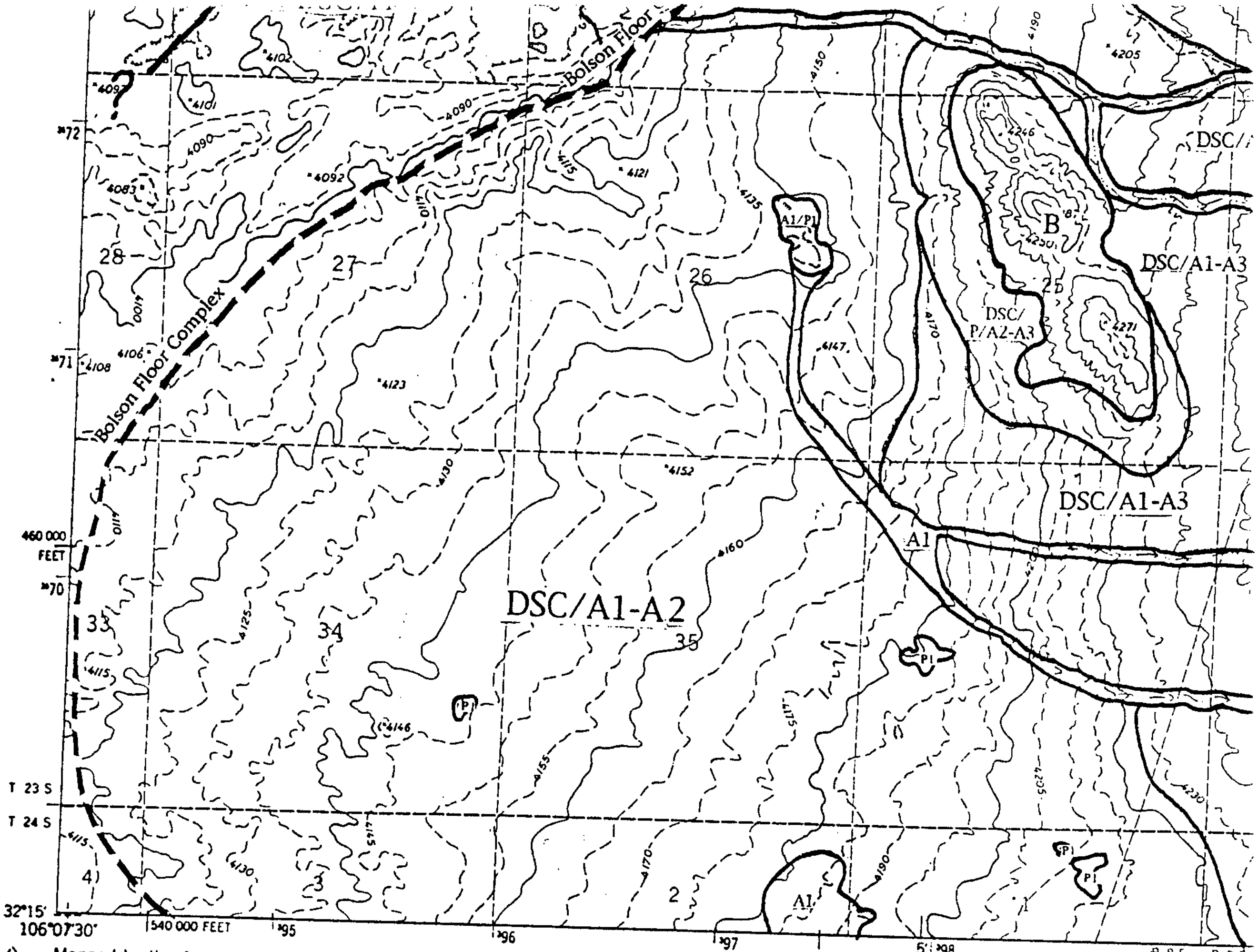
U.S. Route

OROGRANDE SOUTH. N. MEX.

ON, VIRGINIA 22092

6

91



(DESERT) 4748 II NW

Mapped by the Army Map Service
Published for civil use by the Geological Survey

Control by USGS, USC&GS, and USCE

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Photography field annotated 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on New Mexico coordinate system
central zone
1000-meter Universal Transverse Mercator grid ticks,
zone 13, shown in blue

Dashed land lines indicate approximate locations
Land lines omitted in T.24S.-R.9E. because of insufficient data

Fine red dashed lines indicate selected fence and field lines
where generally visible on aerial photographs
This information is unchecked

McGregor Range Geomorphic Mapping Units and Symbols[1]

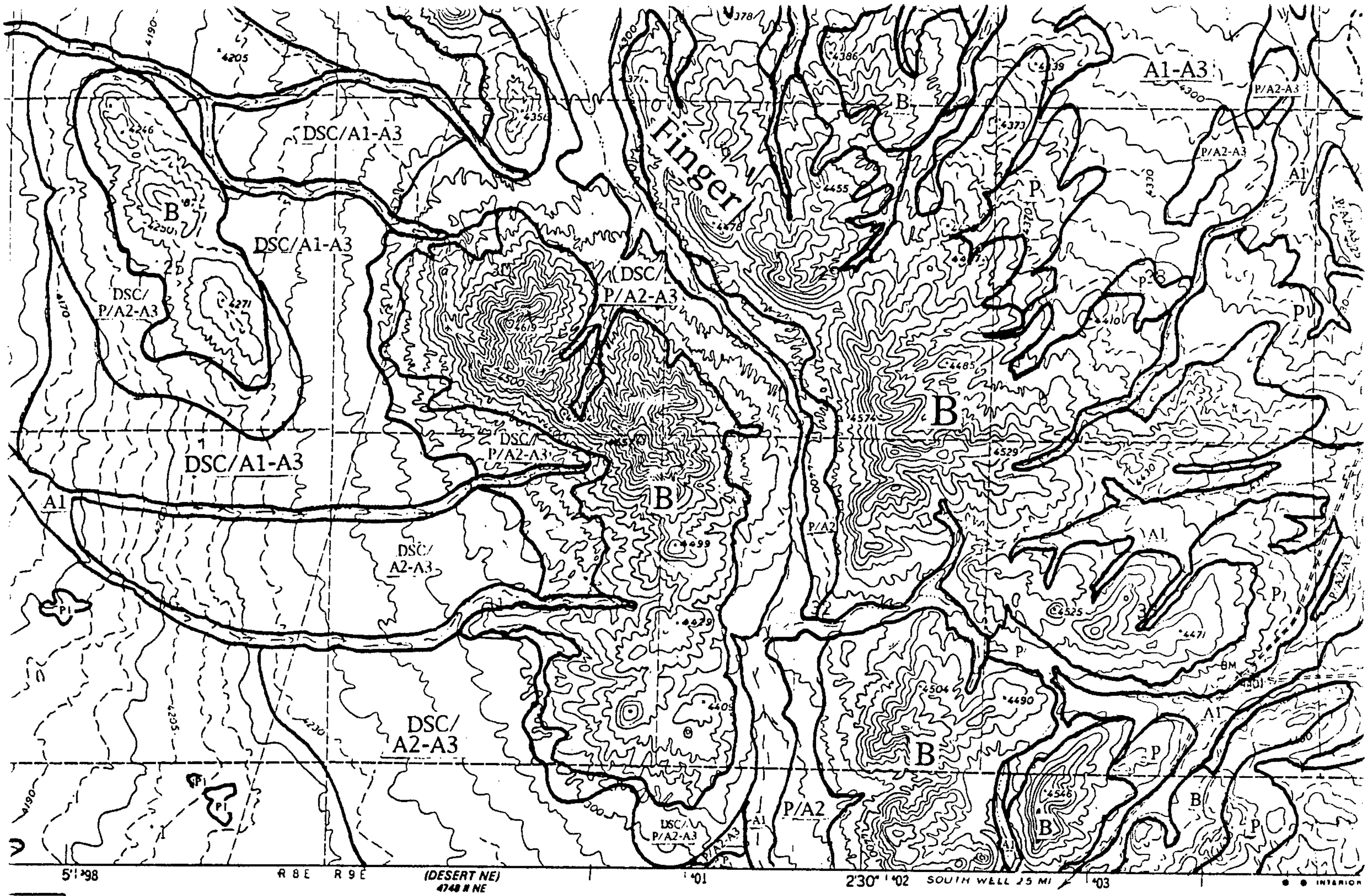
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR • • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬ •
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

1000 0 1000

C(
DASHED LI
NATIONAL

THIS MAP COMPLIES
FOR SALE BY U. S. GEOLOGICAL SUR\
A FOLDER DESCRIBING TOPOGR.



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5 AND 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GN MN
0°34' 10 MILS
12½° 222 MILS

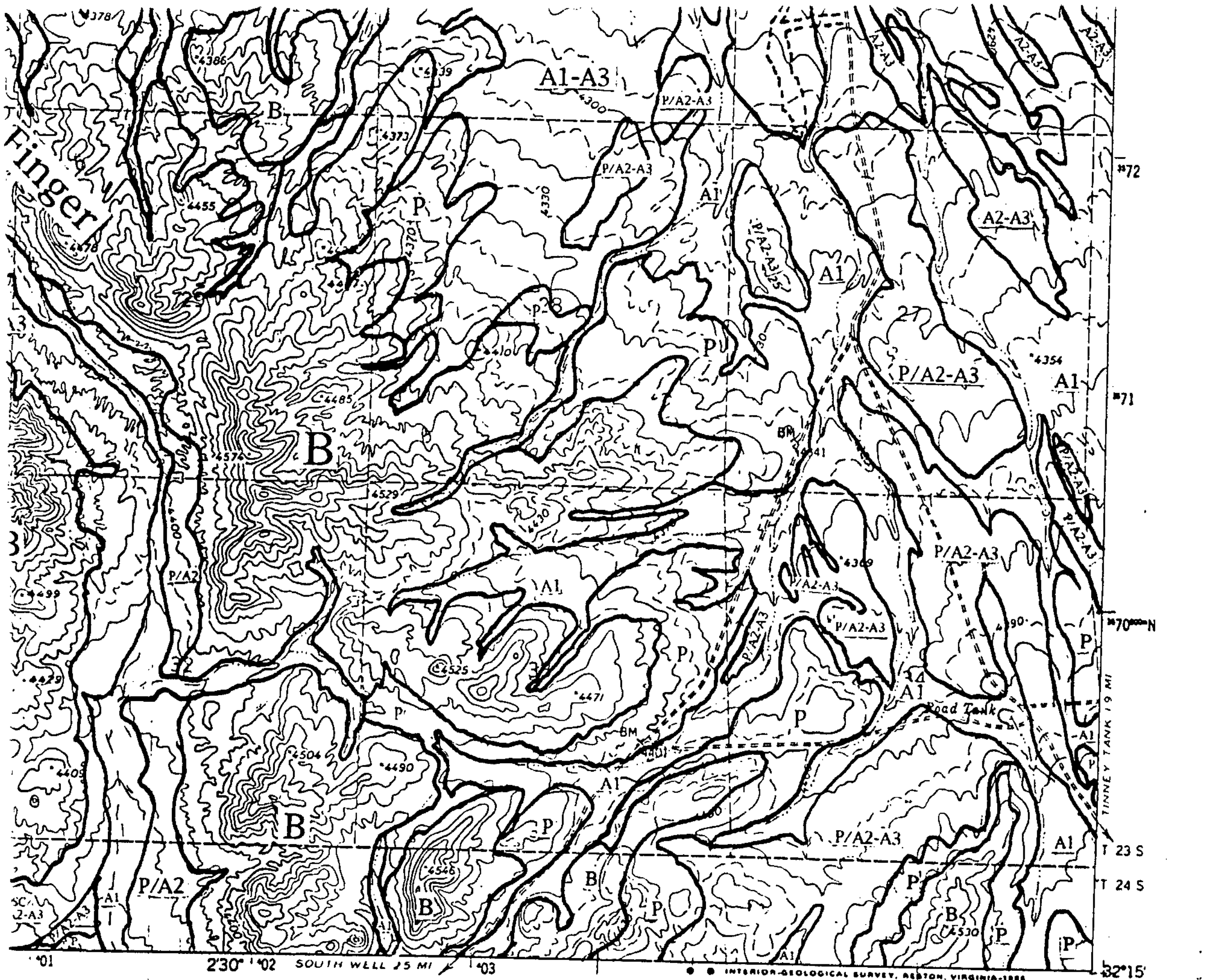
UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

Medium-duty

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



1 MILE

7000 FEET

KILOMETER

GN MN

0°34' / 10 MILS

12½° / 222 MILS

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW MEXICO

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Medium-duty .... Light-duty ....

Unimproved dirt ....

U.S. Route

ON, VIRGINIA 22092
REQUEST

OROGRANDE SOUTH, N. MEX.

32106–C1–TF–024

1955

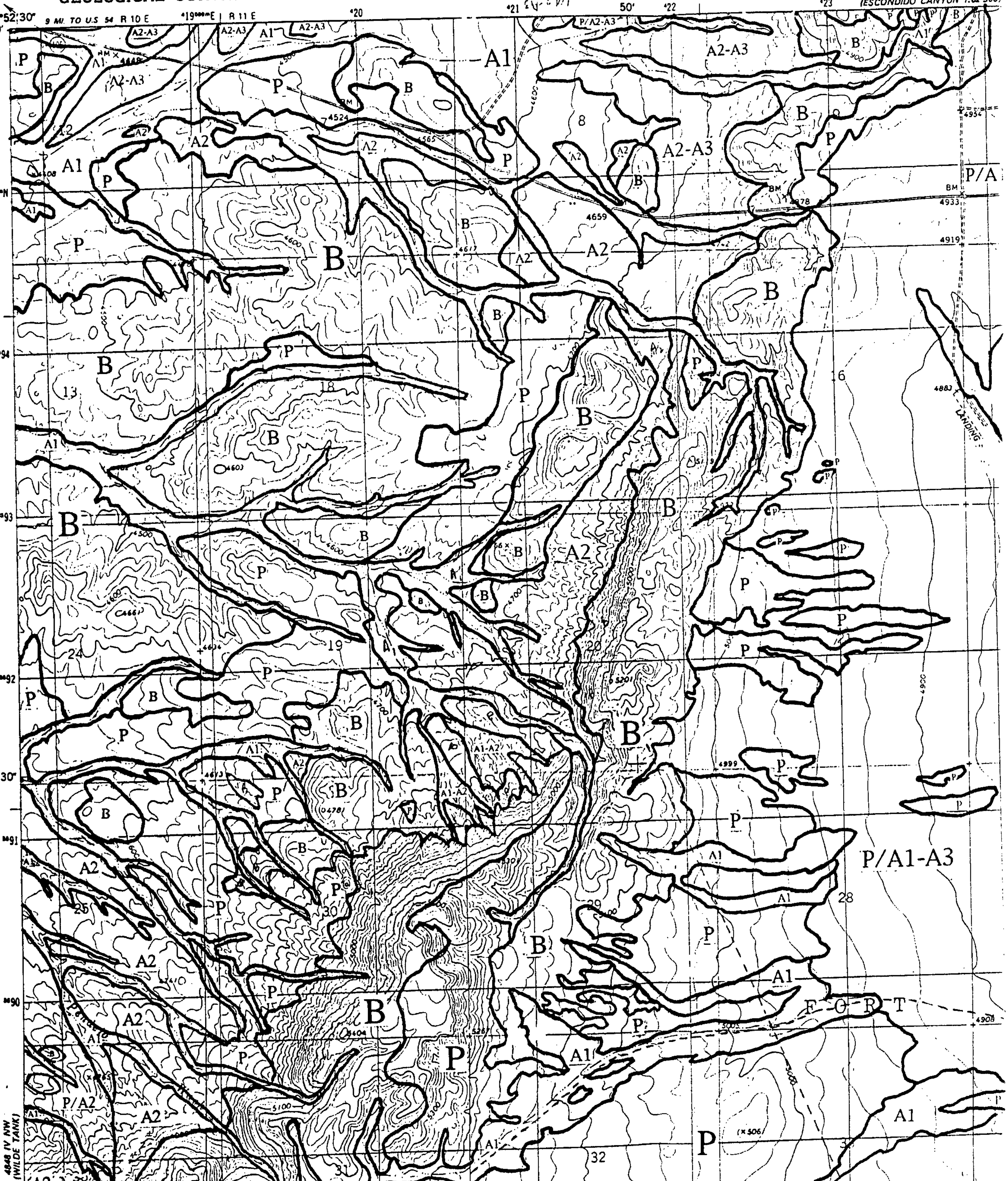
DMA 4748 I SE–SERIES V881

91

9

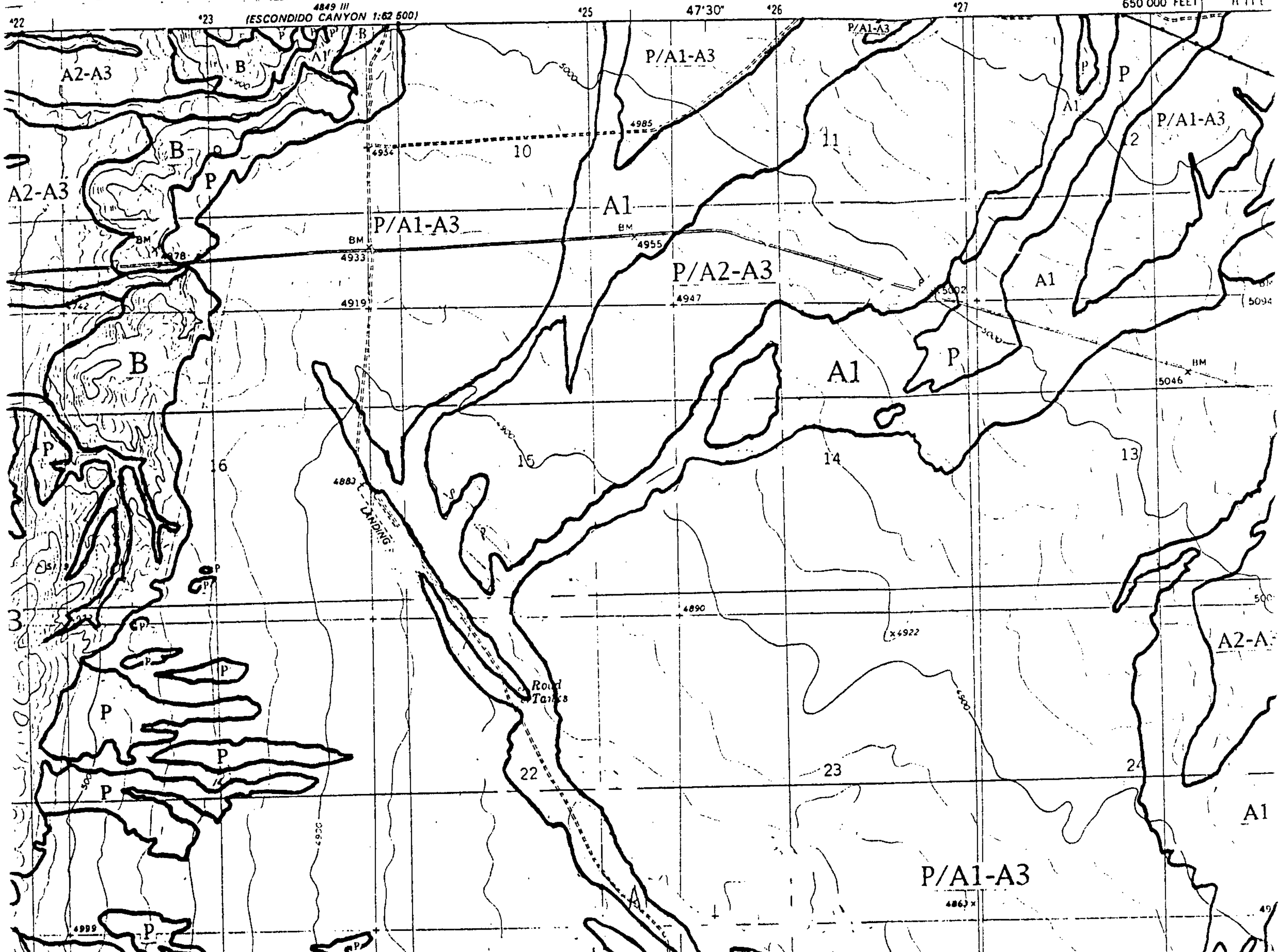
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Donald L. Johnson, *Ph.D.*, Contract No. DA(

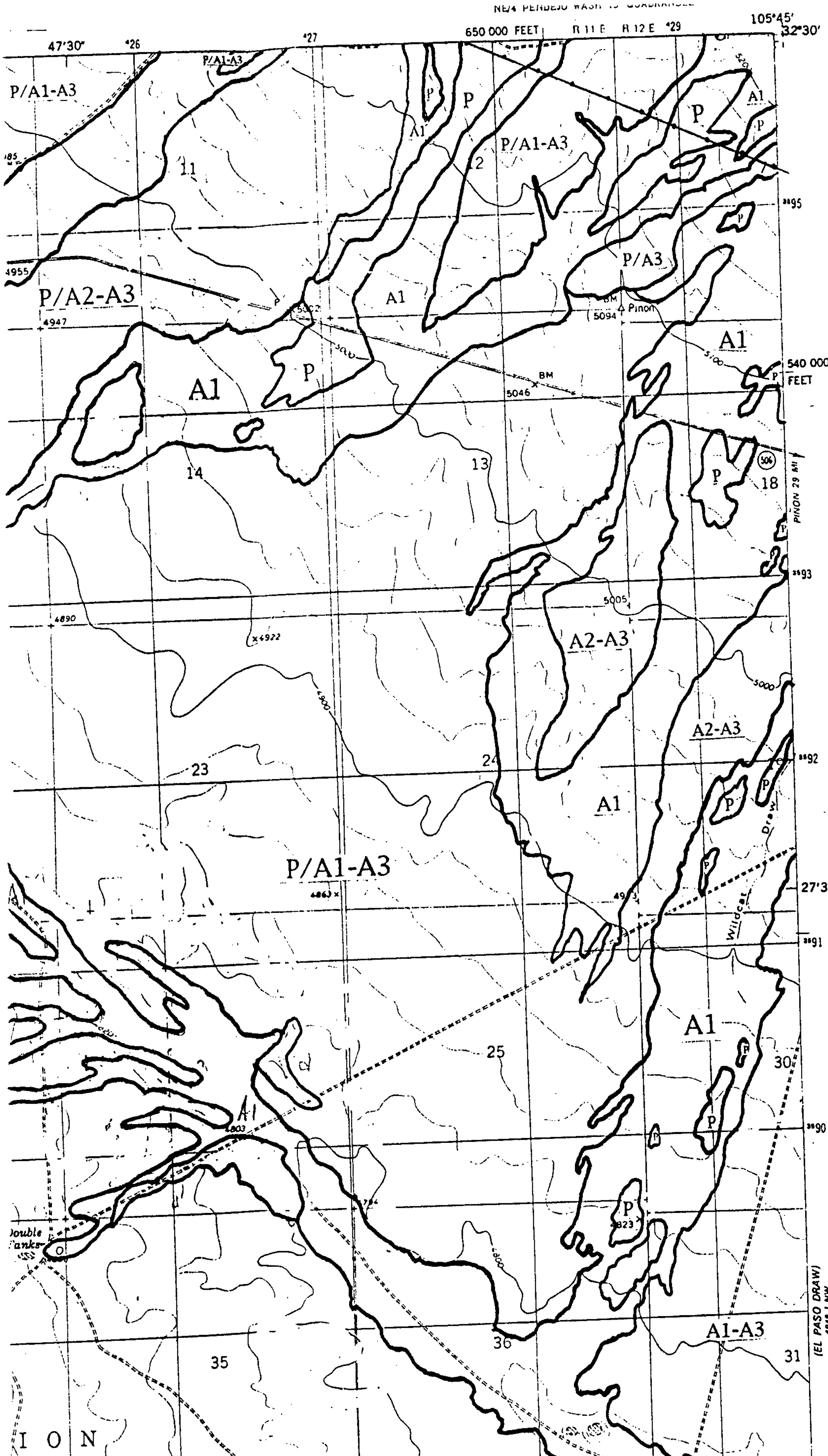


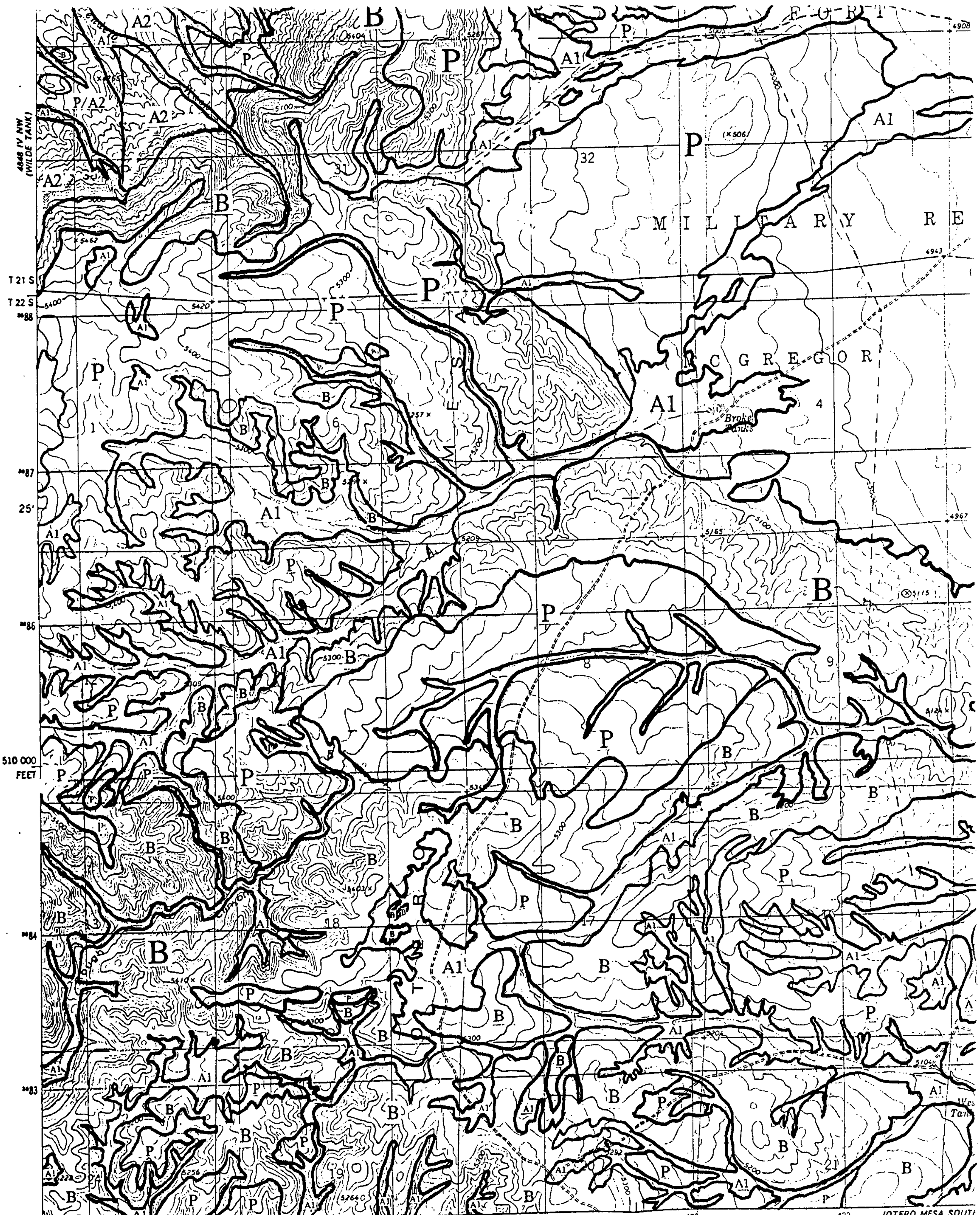
1

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



2


NE/4 PERDEJO WASH 15' QUADRANGLE
650 000 FEET
R 11 E
R 12 E
105°45'
32°30'
47'30"
P/A1-A3
P/A1-A3
P
P
A1
P/A1-A3
P
A1
P
11
12
P/A3
4955
P/A2-A3
4947
5094
Pinon
A1
P
A1
A1
5046
540 000 FEET
13
14
P
18
PIÑON 29 MI
4890
x4922
5005
A2-A3
A2-A3
23
24
A1
P
P
Wildcat Draw
P/A1-A3
27'30"
25
A1
P
30
P
P
P
4823
Double Tanks
A1-A3
35
36
31
(EL PASO DRAW)
I O N



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1976. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

McGregor Range Geomorphic Mapping Units and Symbols[1]

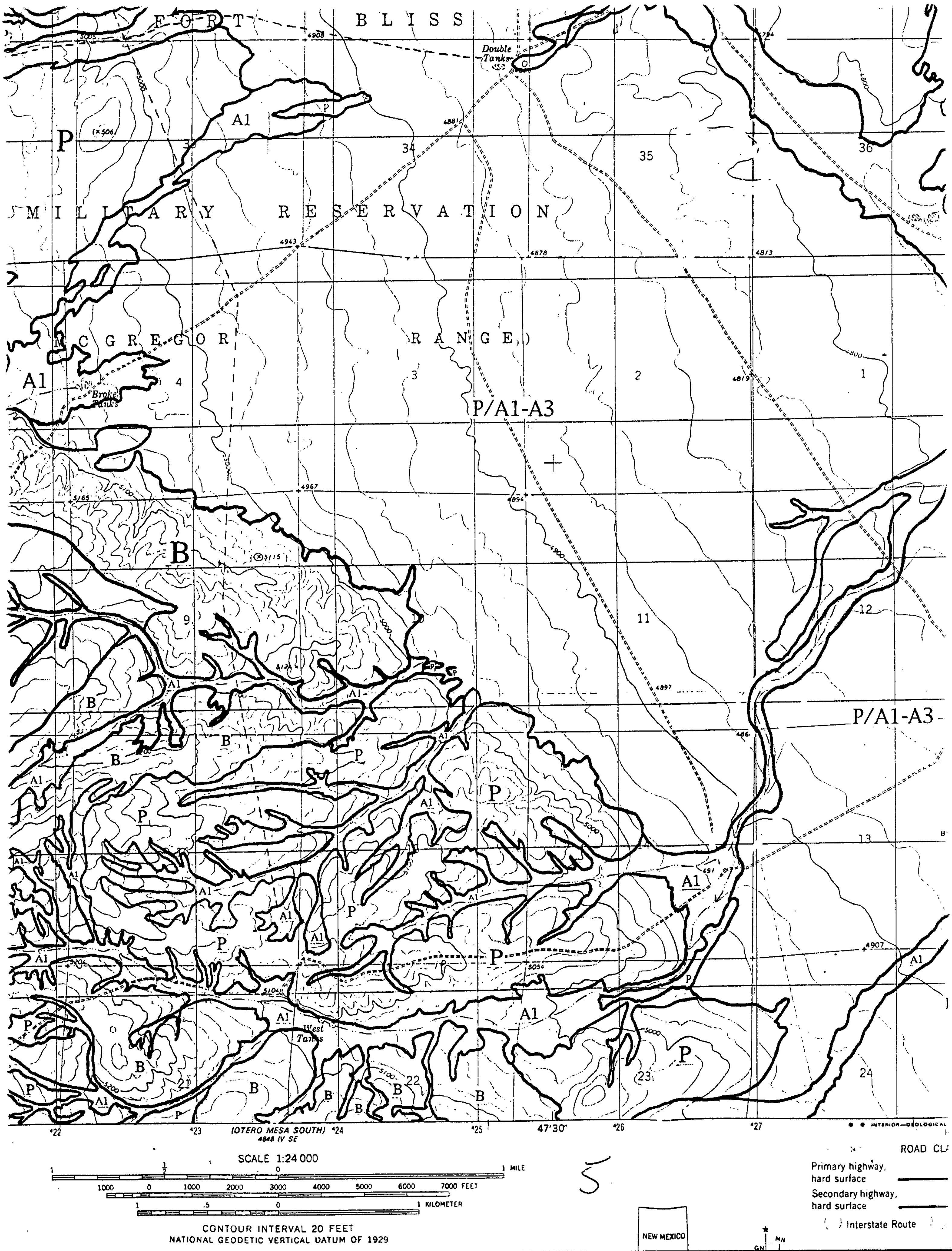
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL

4

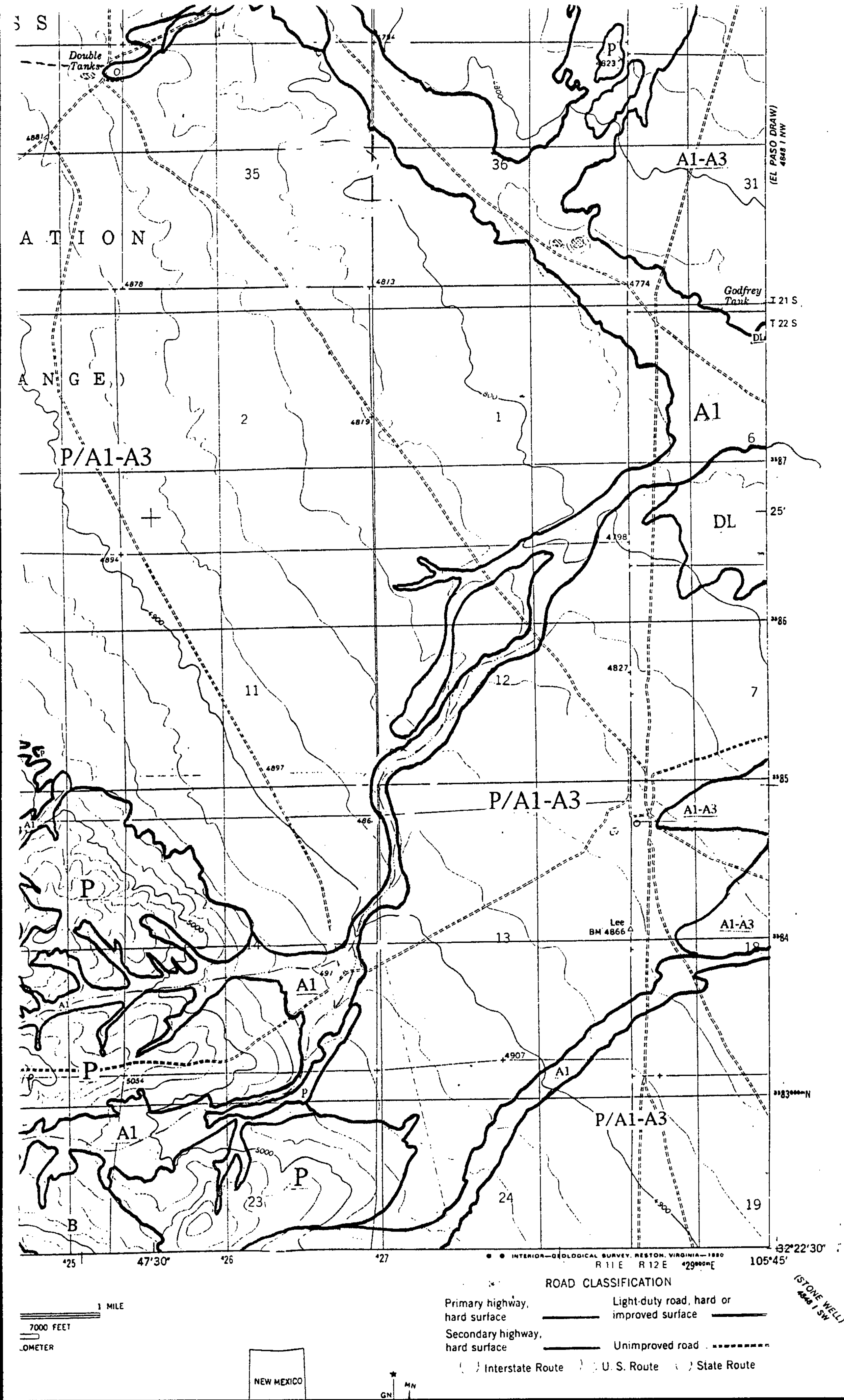
SCALE 1:24 000

CONTOUR INTERVAL 2(

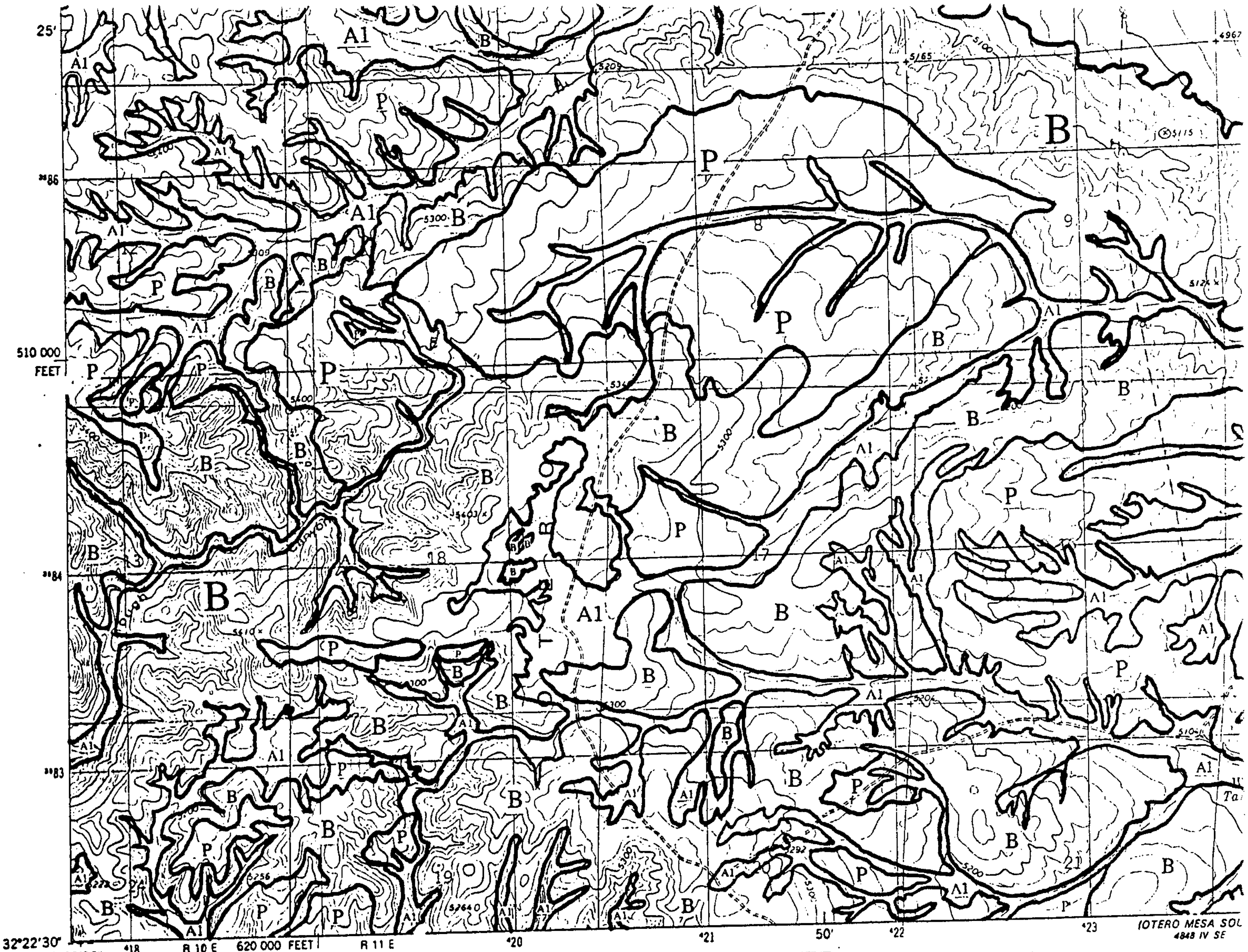
NATIONAL GEODETIC VERTICAL


FORT BLISS
MILITARY RESERVATION
McGREGOR RANGE
Double Tanks
Broke Tanks
West Tanks
P/A1-A3
P/A1-A3
A1
P
B
(OTERO MESA SOUTH)
4848 IV SE
47'30"
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
GN
MN
ROAD CL
Primary highway, hard surface
Secondary highway, hard surface
Interstate Route

5


Double Tanks
35
36
31
A1-A3
(EL PASO DRAW) 4848 I NW
A T I O N
A N G E,)
Godfrey Tank
T 21 S
T 22 S
DL
2
1
A1
6
P/A1-A3
DL
25'
12
11
7
P/A1-A3
A1-A3
P
Lee BM 4866
A1-A3
13
A1
P
A1
P/A1-A3
A1
P
23
24
19
B
32°22'30"
47'30"
105°45'
R 11 E R 12 E
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
1 MILE
7000 FEET
KILOMETER
NEW MEXICO
(STONE WELL) 4848 I SW

6



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1976. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	P1
Playa Lunette	P1L

[1]See text for explanation

SCALE 1:24 0(

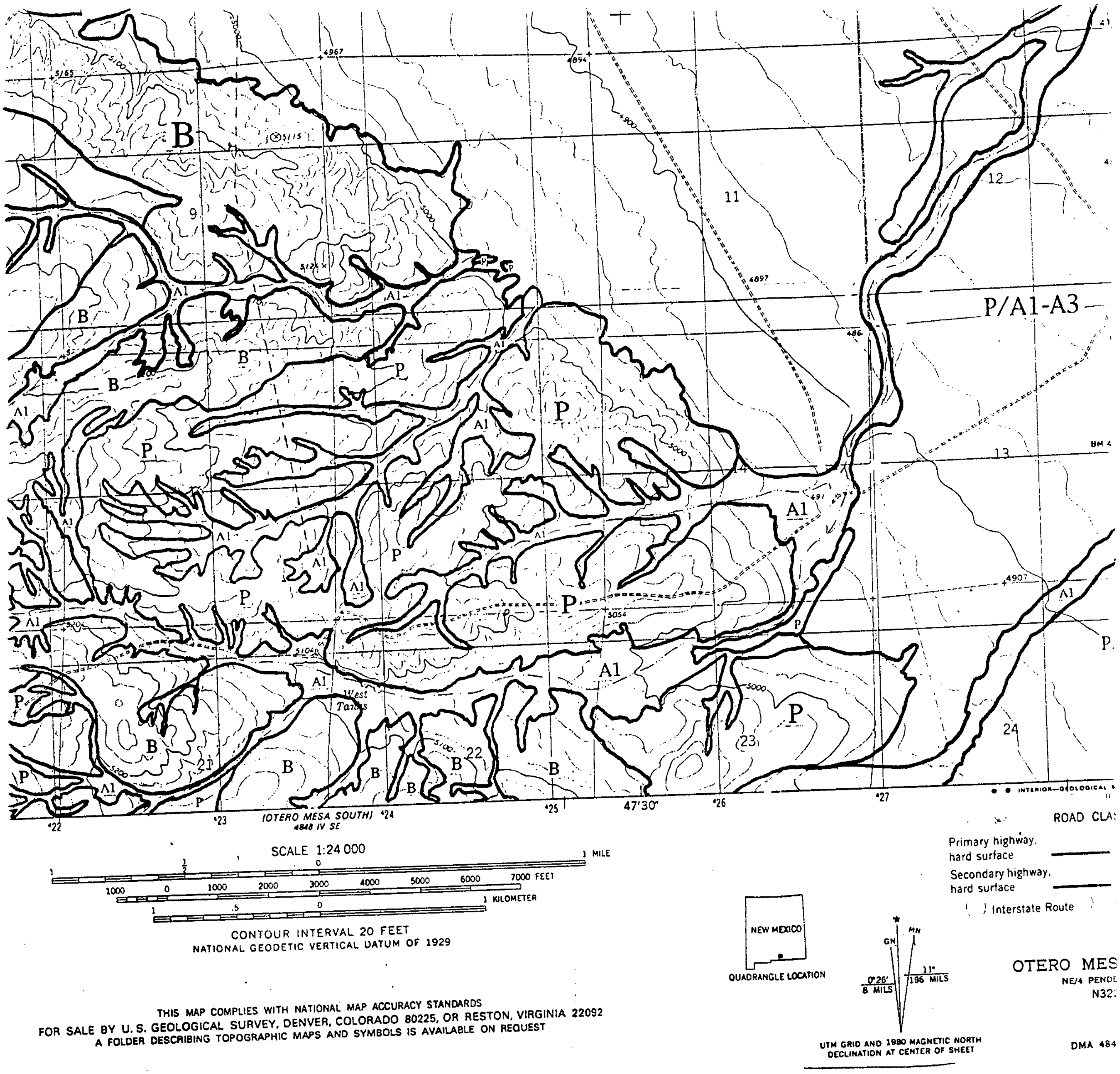
1 ½ 0

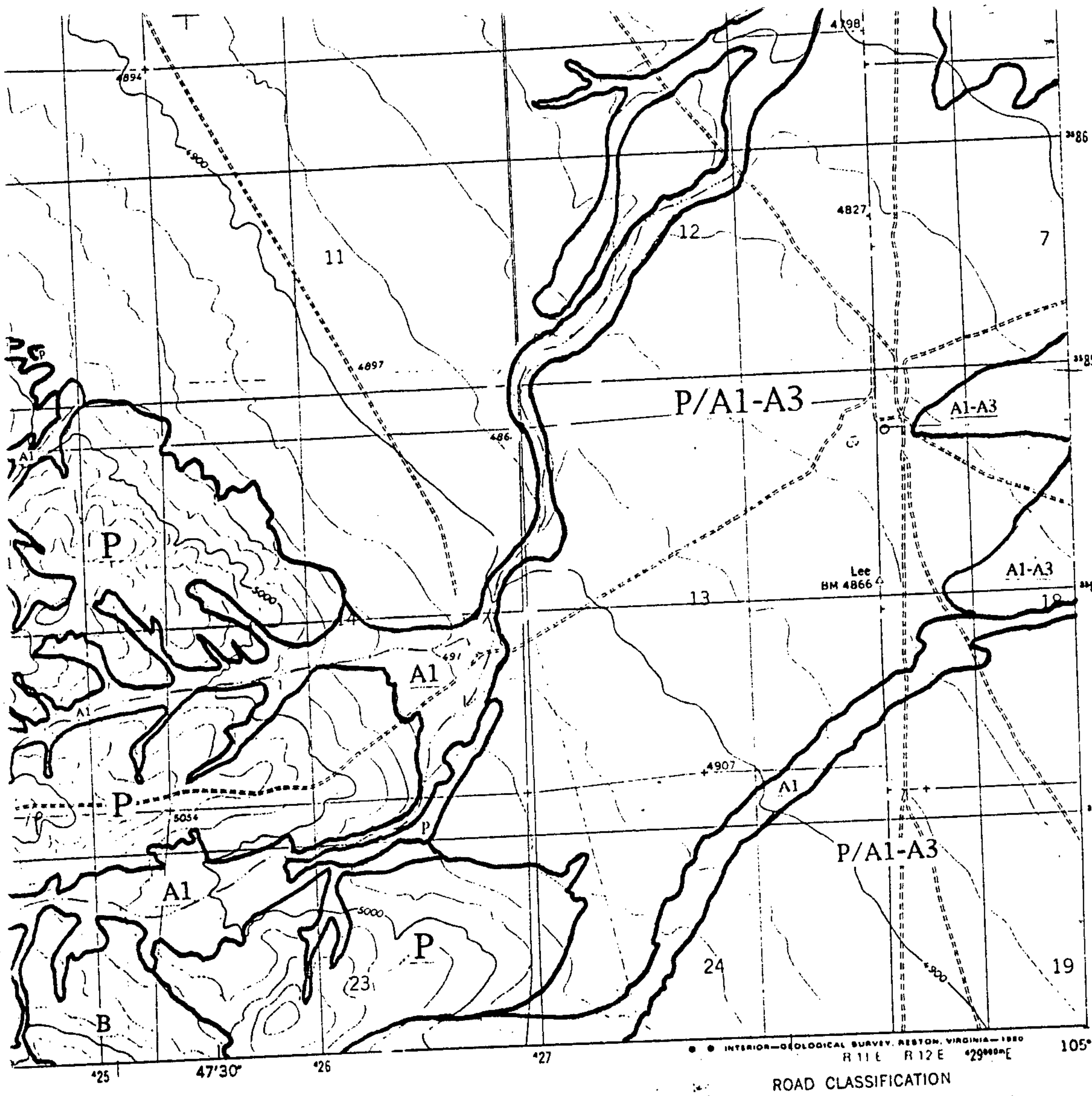
1000 0 1000 2000 3000

1 .5 0

CONTOUR INTERVAL
NATIONAL GEODETIC VERTICA

THIS MAP COMPLIES WITH NATIONAL M
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COL
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND S


B
9
B
A1
B
B
P
P
A1
P
11
12
P/A1-A3
13
A1
A1
A1
P
A1
A1
P
P
P
A1
P
A1
A1
P
West Tanks
P
B
21
B
B
B
22
B
23
24
P
A1
P
4967
4894
4897
4907
5054
5000
5100
5200
(OTERO MESA SOUTH)
4848 IV SE
47'30"
INTERIOR—GEOLOGICAL
ROAD CLA
Primary highway, hard surface
Secondary highway, hard surface
Interstate Route
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
QUADRANGLE LOCATION
GN
MN
0°26'
8 MILS
11°
196 MILS
UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
OTERO MES
NE/4 PENDE
N32
DMA 484
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

1 MILE

7000 FEET

KILOMETER

NEW MEXICO

QUADRANGLE LOCATION

GN MN 0°26' 8 MILS 11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

OTERO MESA NORTH, N. MEX.
NE/4 PENDEJO WASH 15' QUADRANGLE
N3222.5—W10545/7.5

1980

DMA 4848 IV NE—SERIES V881

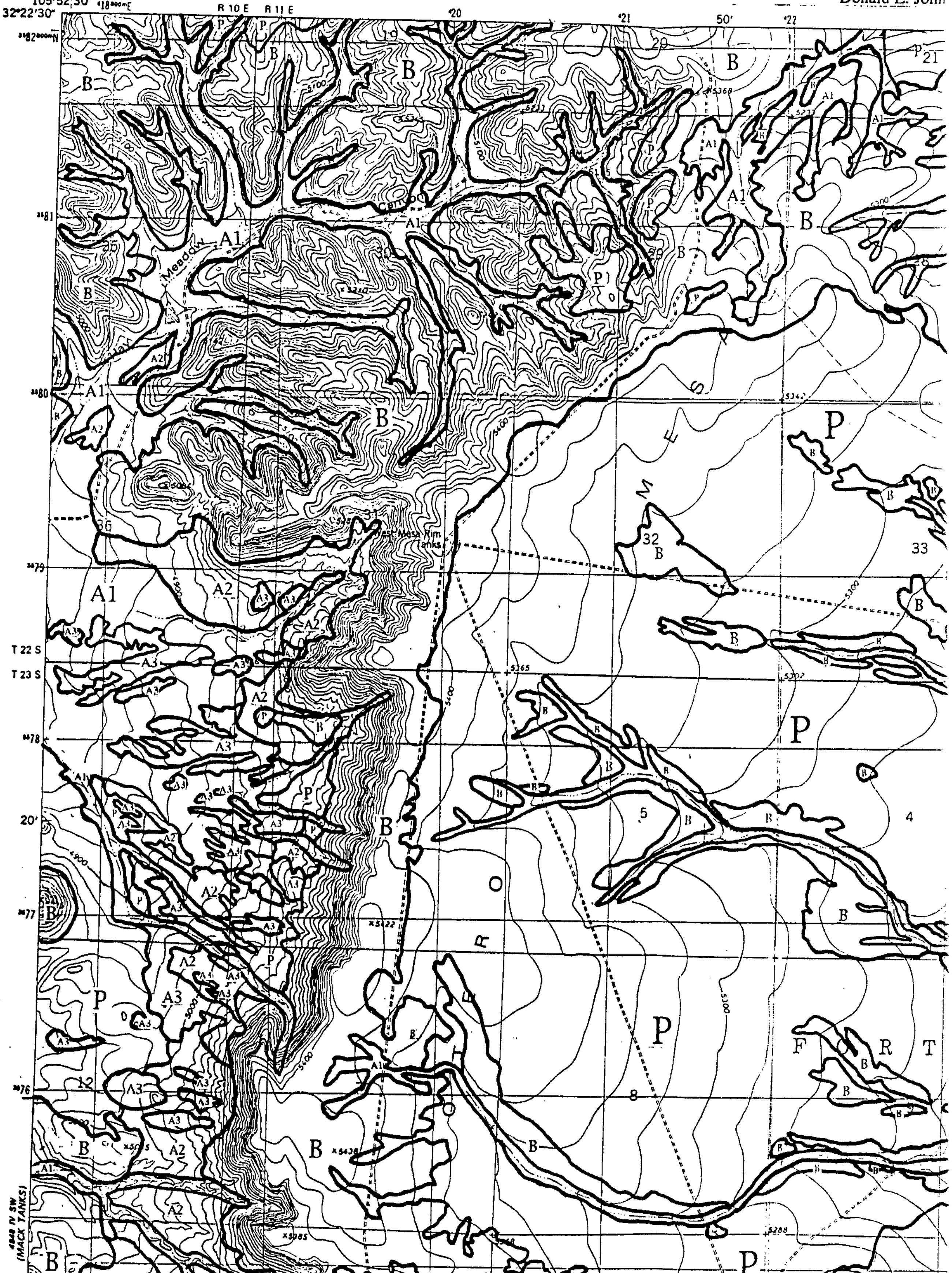
TON, VIRGINIA 22092
ON REQUEST

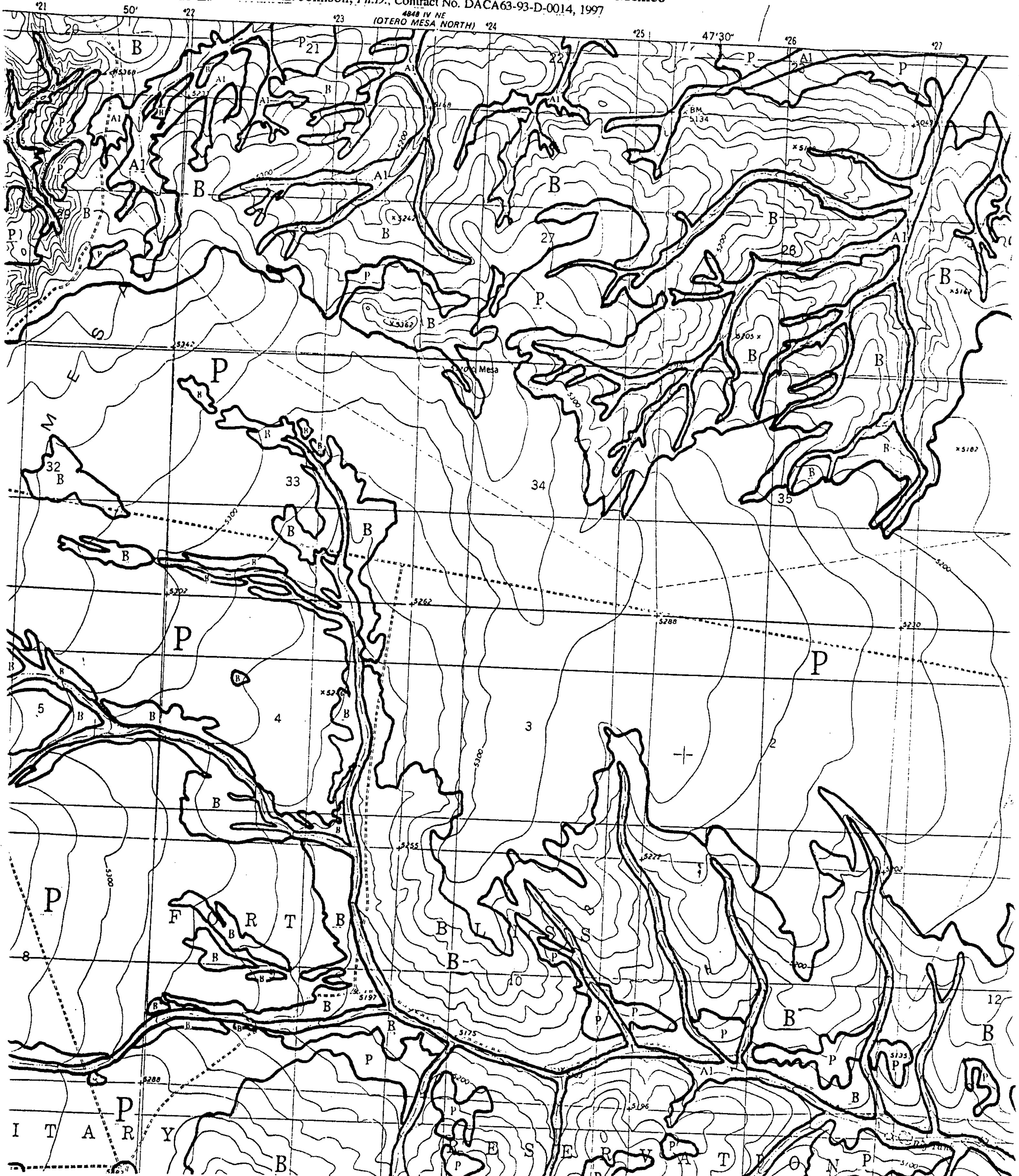
41

9

DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoec
Study of McGregor
Donald L. John

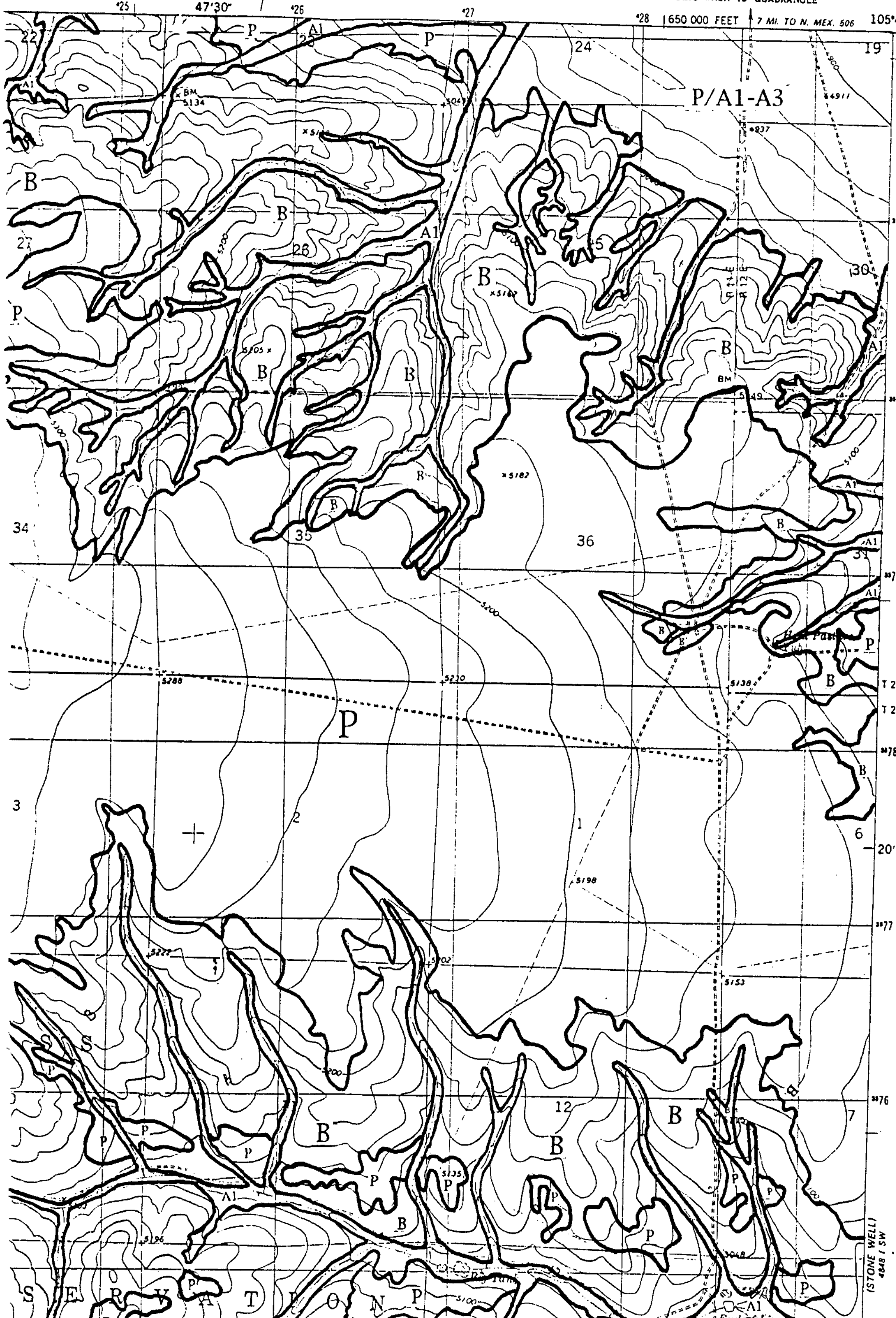



4848 IV NE
(OTERO MESA NORTH)
50'
47'30"
Otero Mesa
M E S A
F O R T B L I S S
I T A R Y
R E S E R V A T I O N
5242
5362
5288
5262
5230
5255
5222
5197
5175
5196
5135
BM 5134

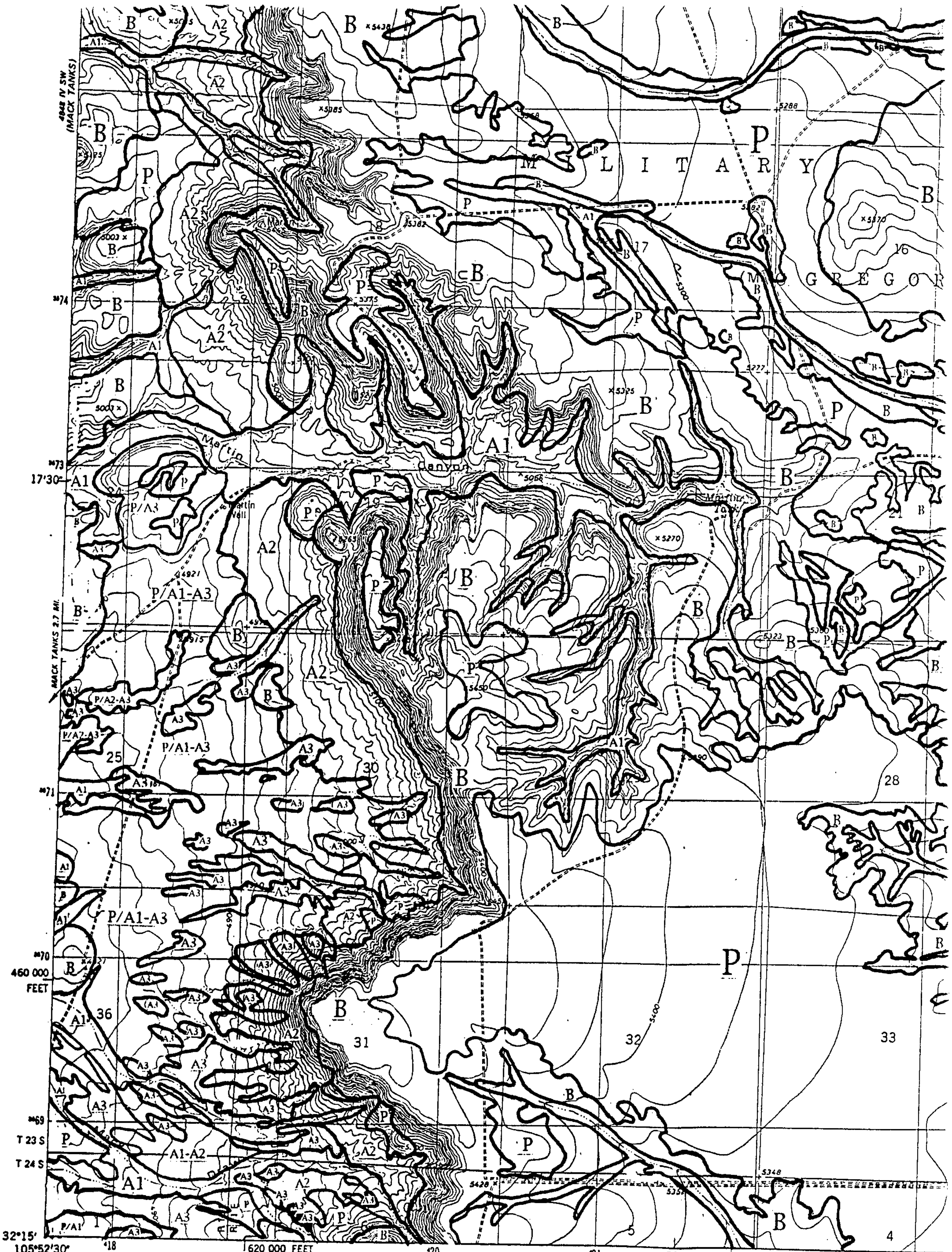
ınd Surficial Mapping
Bliss, New Mexico
D-0014, 1997

OTERO MESA SOUTH QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 PENDEJO WASH 15' QUADRANGLE

4848 I NW
(EL PASO DRAW)



3



(OWL TANK CANYON WEST)
4848 III NW

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1979

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American Datum

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

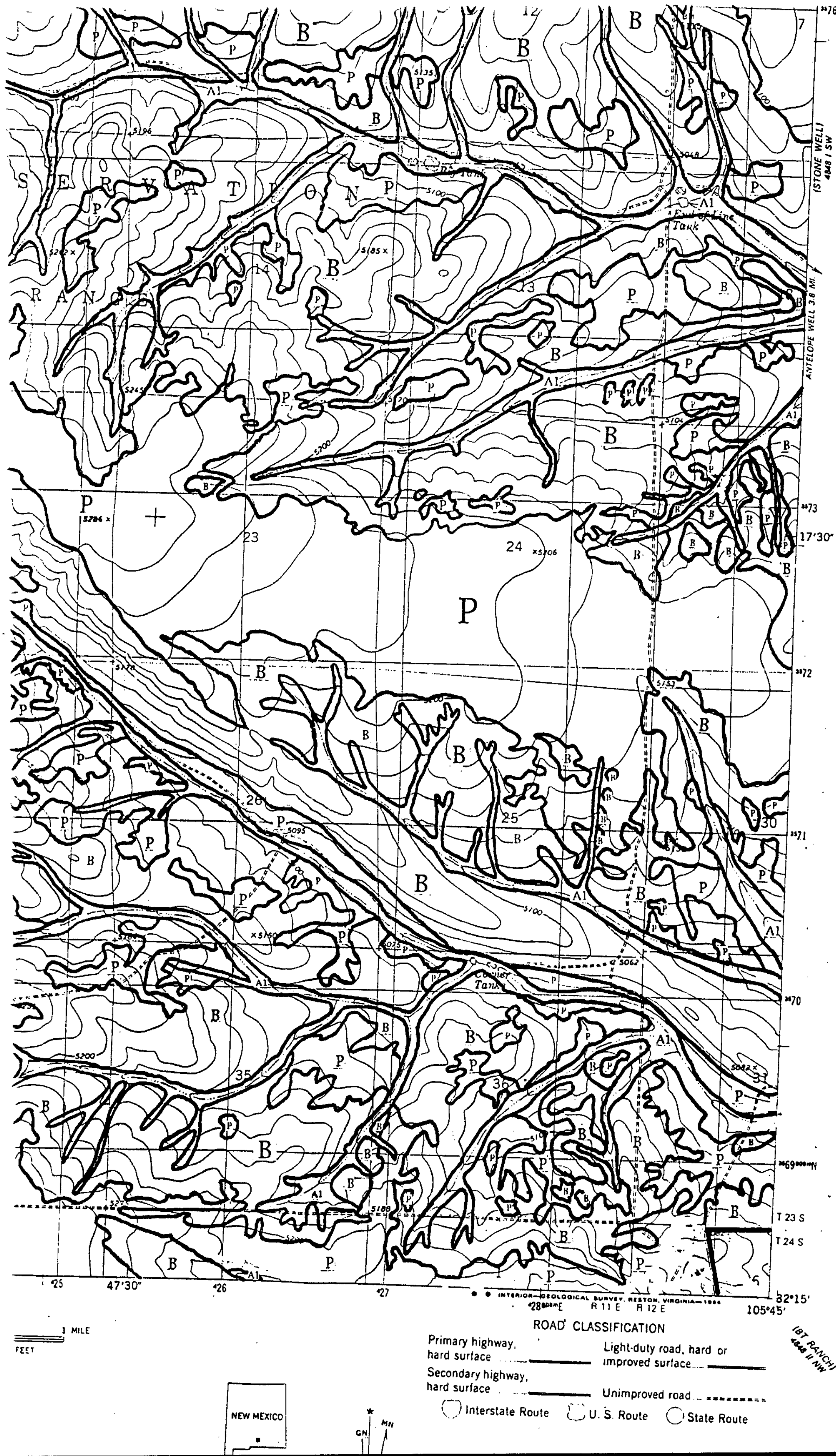
McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC

4

1 ½ S
1000 0 1000 2000
1 .5

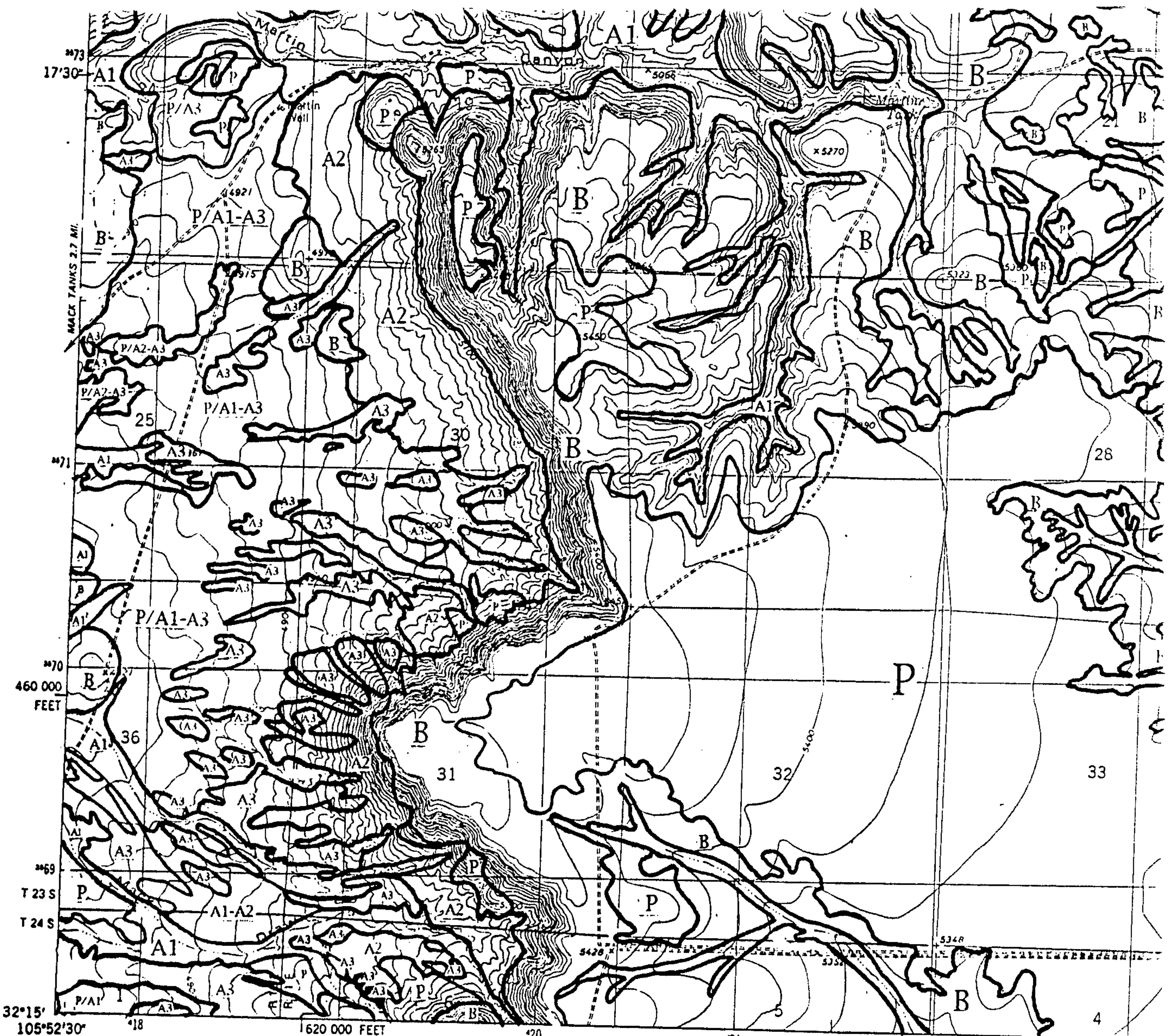
CONTOU
NATIONAL GEODE

M^cGREGOR RANGE
MILITARY RESERVATION
Owl Tank
Coyote Tank
23 (OWL TANK CANYON EAST)
4848 III NE
47'30"
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
GN
MN
ROA
Primary highway, hard surface
Secondary highway, hard surface
Interstate Route
5.



SERVATION
RANGE
(STONE WELL) 4848 I SW
ANTELOPE WELL 3.8 MI.
End of Line Tank
Dry Tank
Tank
17'30"
T 23 S
T 24 S
32°15'
105°45'
47'30"
R 11 E
R 12 E
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1984
(BT RANCH) 4848 II NW
1 MILE
FEET
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
NEW MEXICO
GN
MN

6.



(OWL TANK CANYON WEST)
4848 III NW

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1979

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American Datum

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

McGregor Range Geomorphic Mapping Units and Symbols[1]

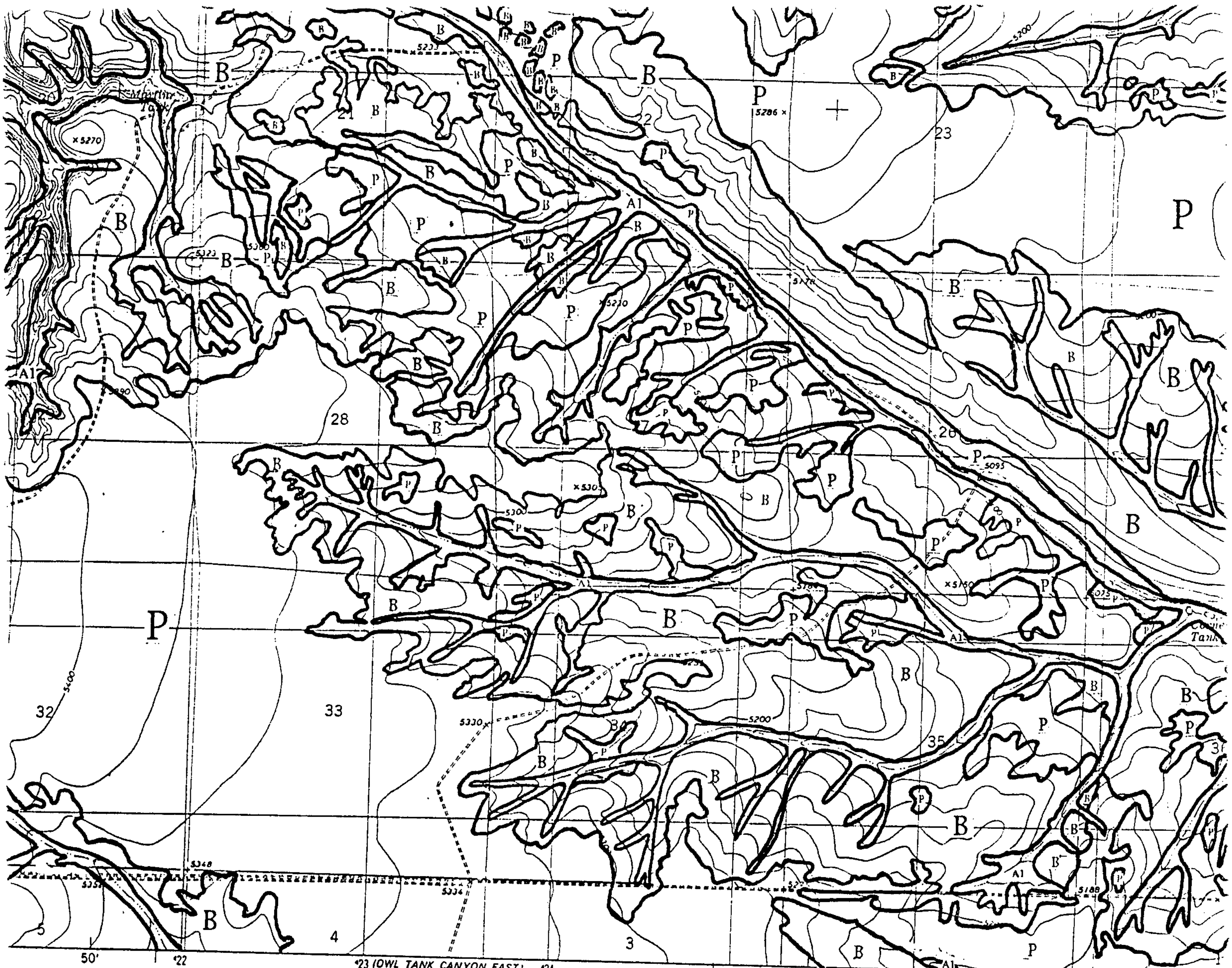
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

1 ½
1000 0 1000 2000
1 .5

CONTOU
NATIONAL GEOD

THIS MAP COMPLIES WI
FOR SALE BY U. S. GEOLOGICAL SURVEY,
A FOLDER DESCRIBING TOPOGRAPH



rphic
ıbols[1]

A1
A2
A3
B

ts CR
DL
DP
DS
DSC
DSG

P
P1
P1L

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°26' 8 MILS

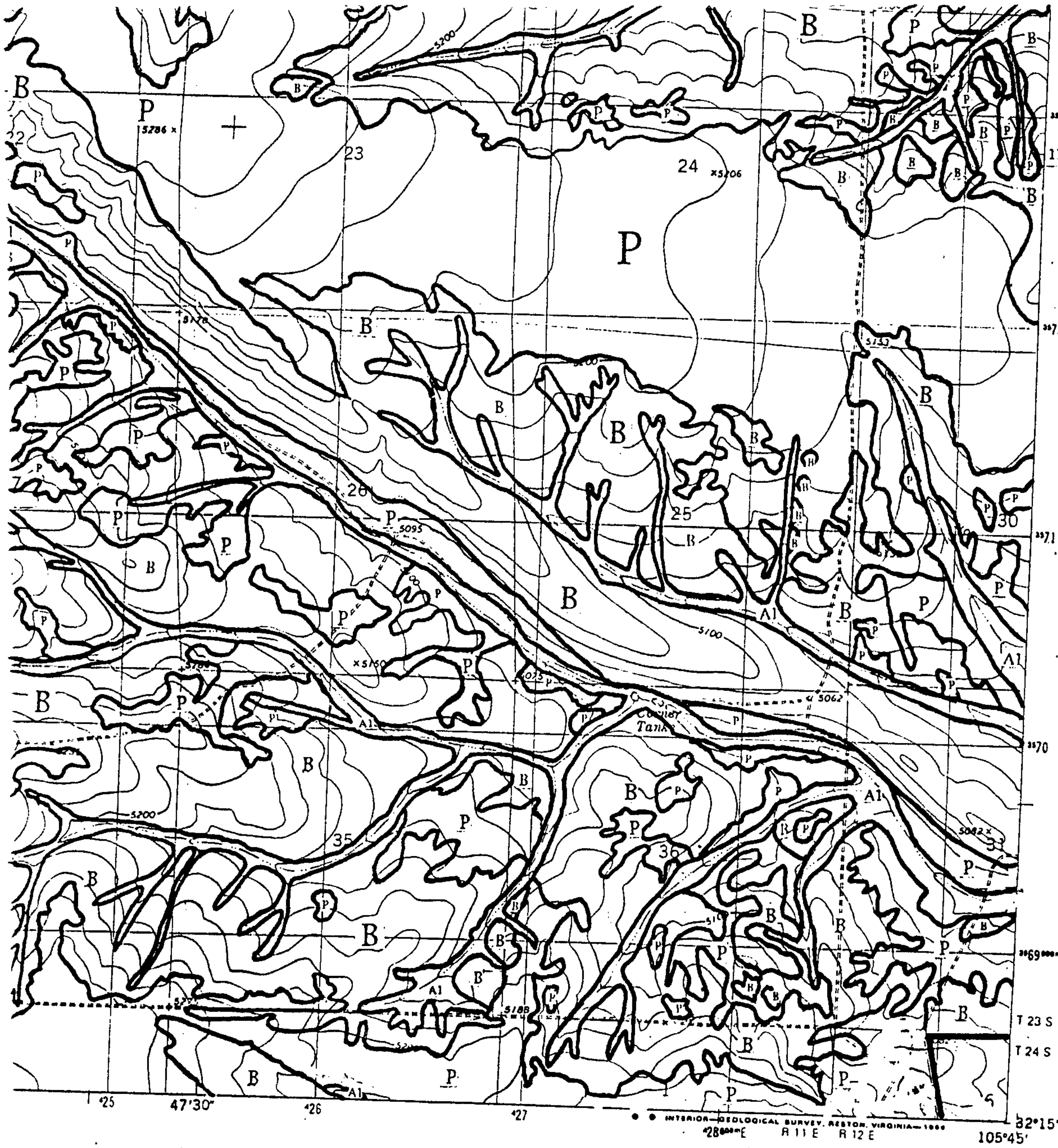
11° 196 MILS

UTM GRID AND 1979 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Primary highw
hard surface

Secondary high
hard surface

Intersta



INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980

1 MILE

7000 FEET

OMETER

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route

U. S. Route

State Route

(BT RANCH) 4848 II NW

NEW MEXICO

QUADRANGLE LOCATION

N, VIRGINIA 22092

REQUEST

GN

MN

0°26'
8 MILS

11°
196 MILS

UTM GRID AND 1979 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

OTERO MESA SOUTH, N. MEX.

SE/4 PENDEJO WASH 15' QUADRANGLE

32105–C7–TF–024

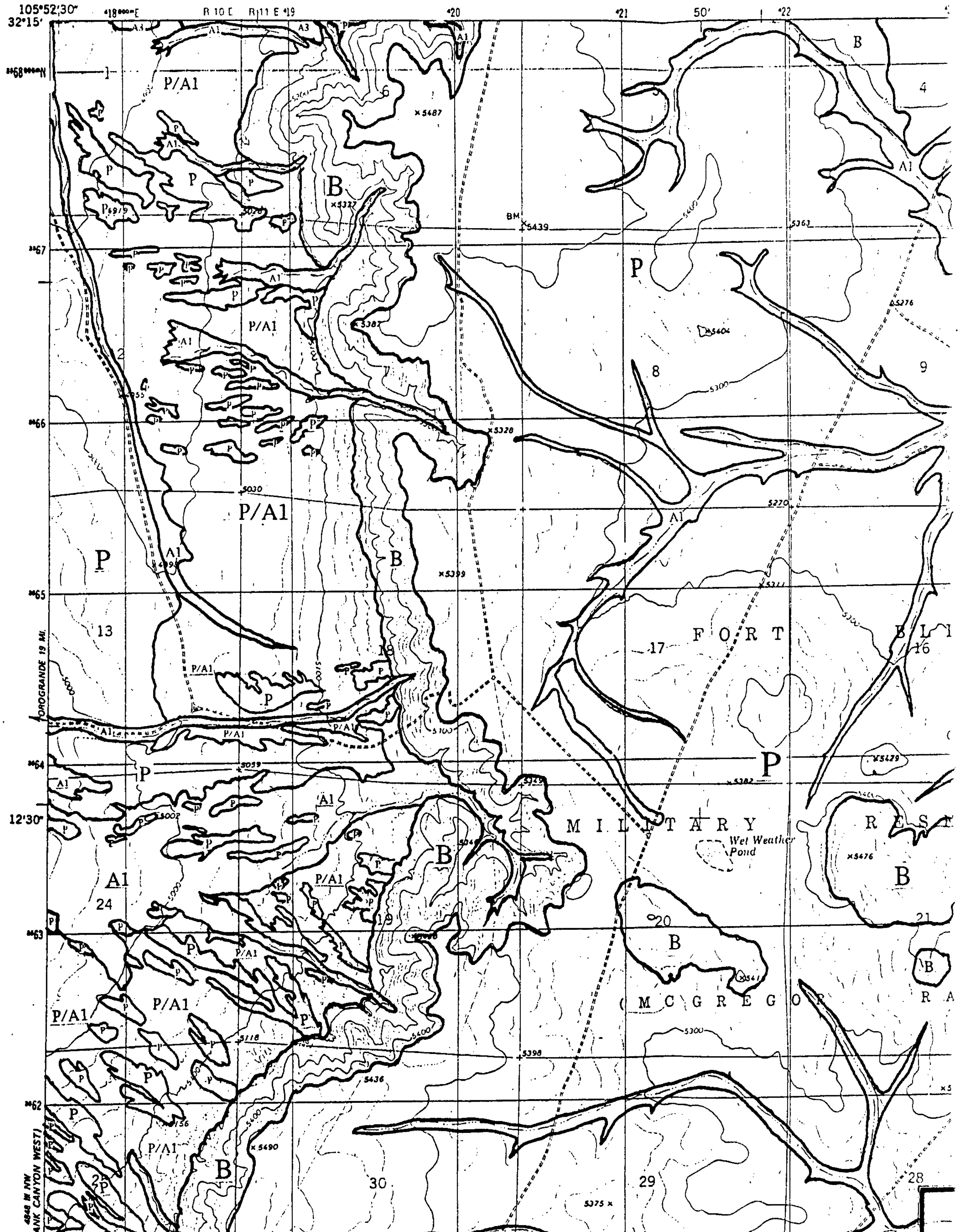
1979

DMA 4848 IV SE—SERIES V881

(81)

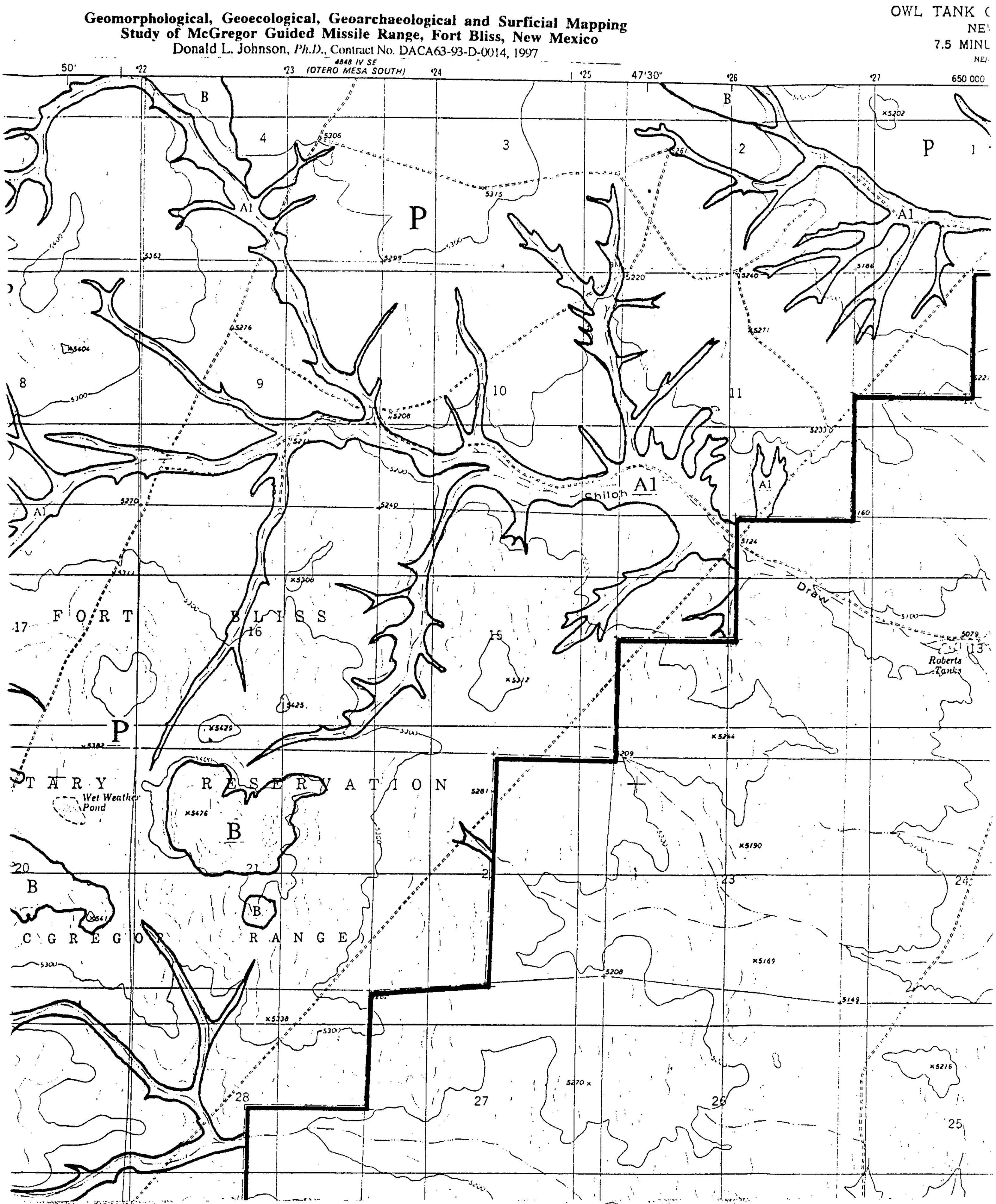
9,

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



12

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

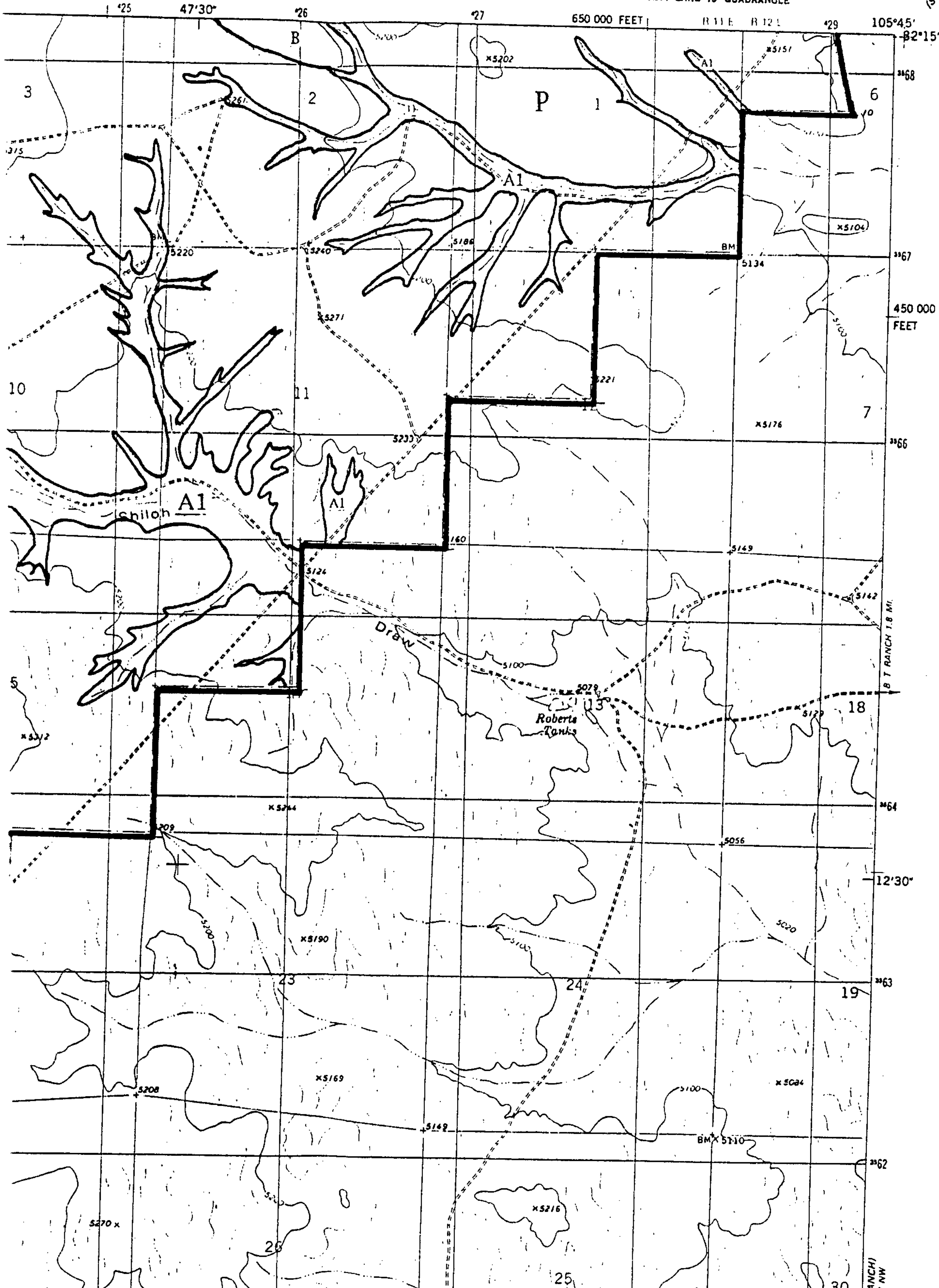


2

d Surficial Mapping
iss, New Mexico
)014, 1997

OWL TANK CANYON EAST QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 BASSETT LAKE 15' QUADRANGLE

4848 I SW
(STONE WELL)



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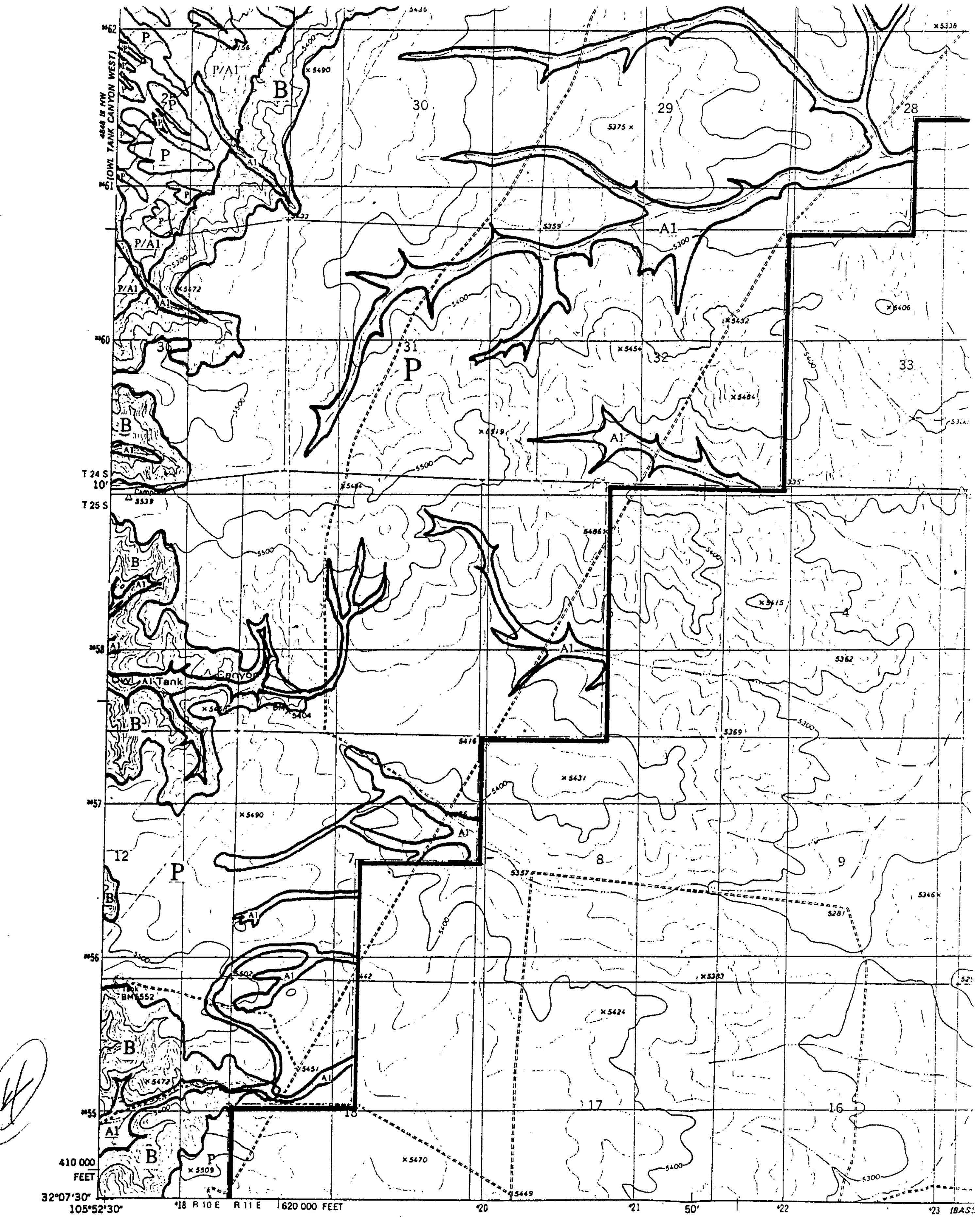

Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975 Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

To place on the predicted North American Datum 1983

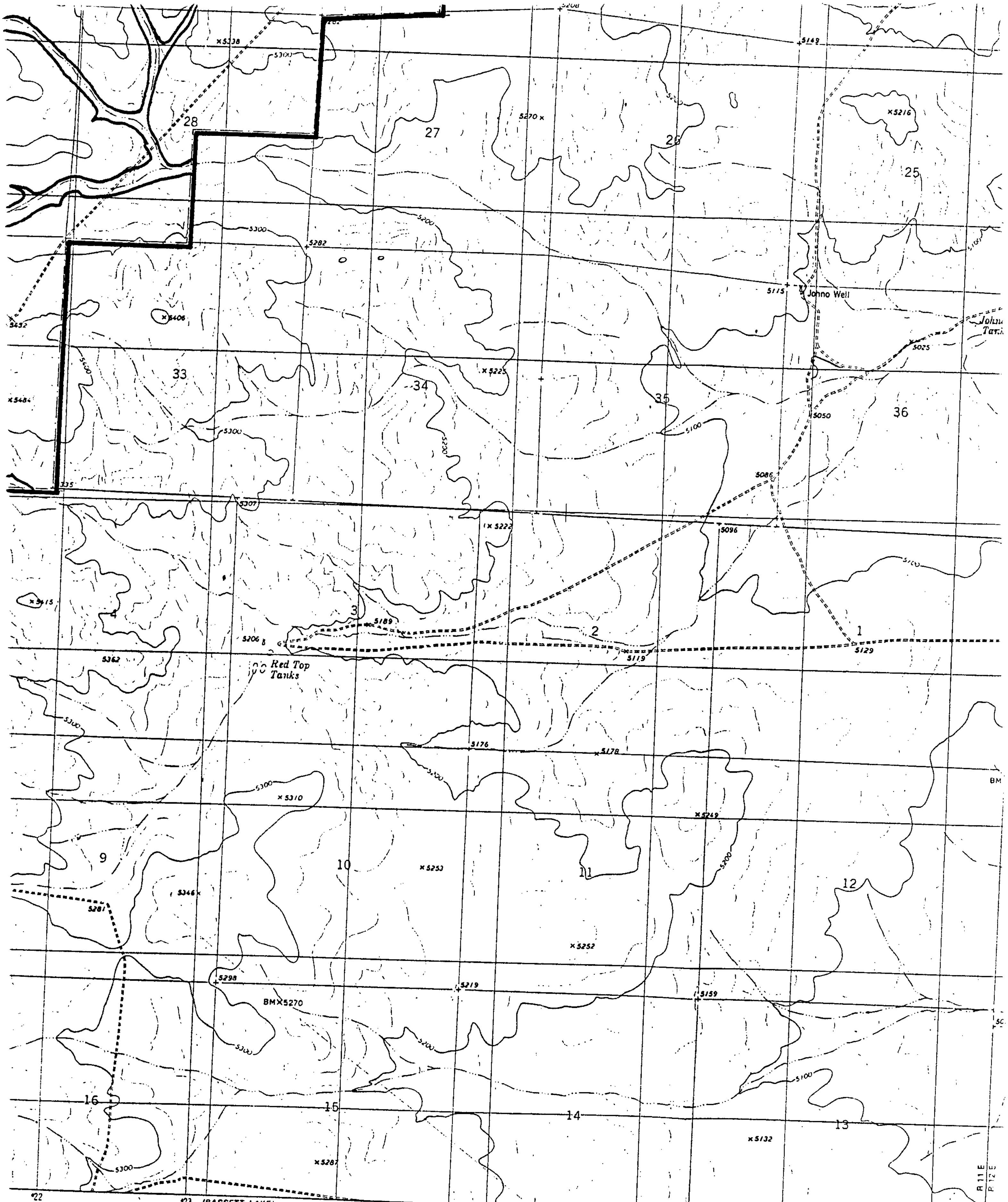
McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP

SCAL

CONTOUR IN

DOTTED LINES REPRE

NATIONAL GEODETIC



INTERIOR—GEOLOGICAL SURVEY, REST...

428000m E

SCALE 1:24 000

1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

5.

CONTOUR INTERVAL 20 FEET

DOTTED LINES REPRESENT 10-FOOT CONTOURS

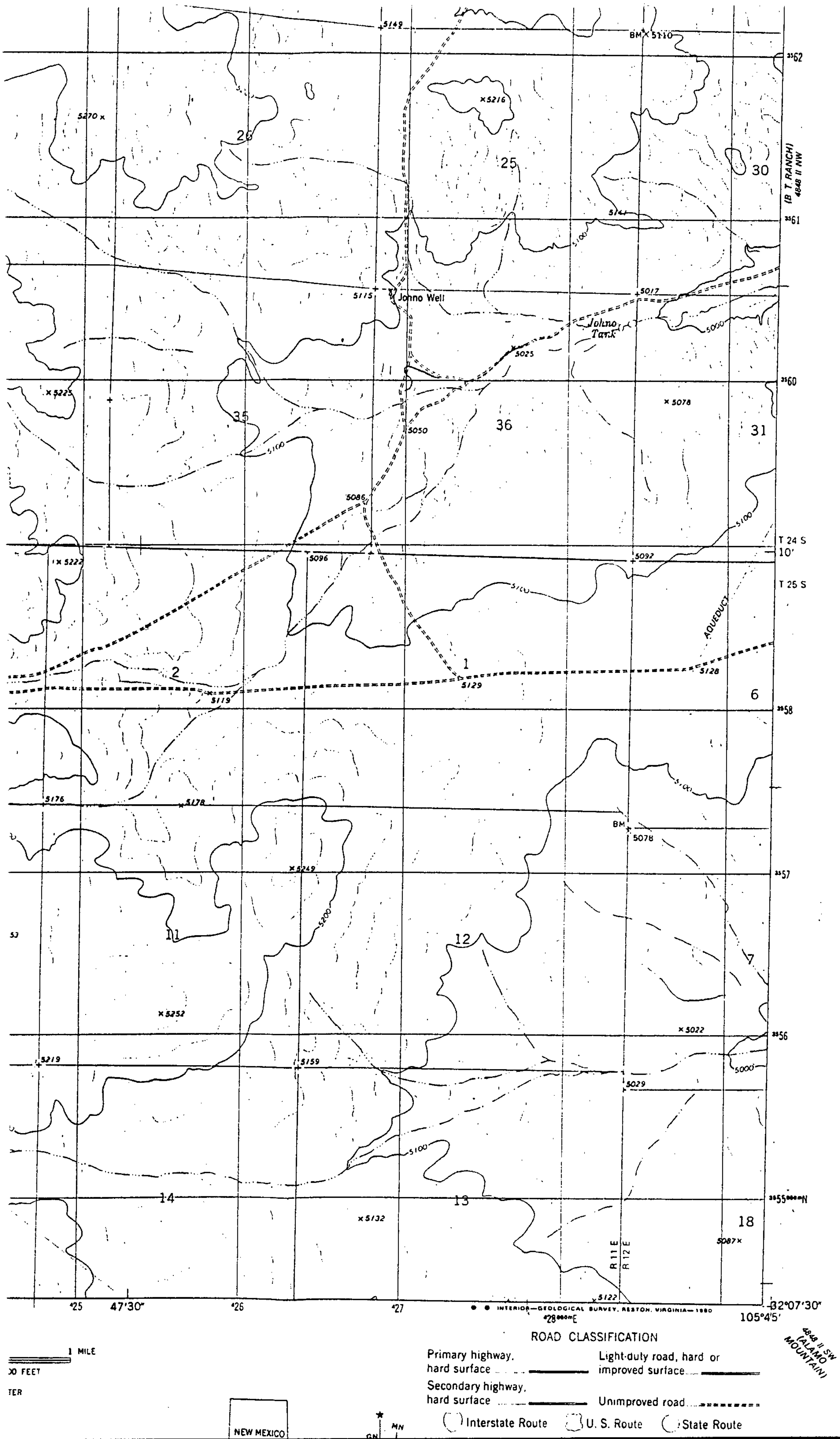
ROAD CLASSIFICATI...

Primary highway, hard surface

Light-du... improved

Secondary highway, hard surface

Unimpro...



BM × 5110
5149
5216
5270
25
26
30
(B T. RANCH)
4848 II NW
5141
5100
Johno Well
5115
5017
Johno Tank
5000
5025
5225
5078
35
36
31
5050
5100
5086
T 24 S
10'
T 25 S
5222
5096
5092
AQUEDUCT
1
2
5129
5128
5119
6
5176
5178
BM
5078
5249
5200
11
12
7
5252
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5219
5159
5029
5000
5100
14
13
18
5132
5087
R 11 E
R 12 E
5122
425
47'30"
426
427
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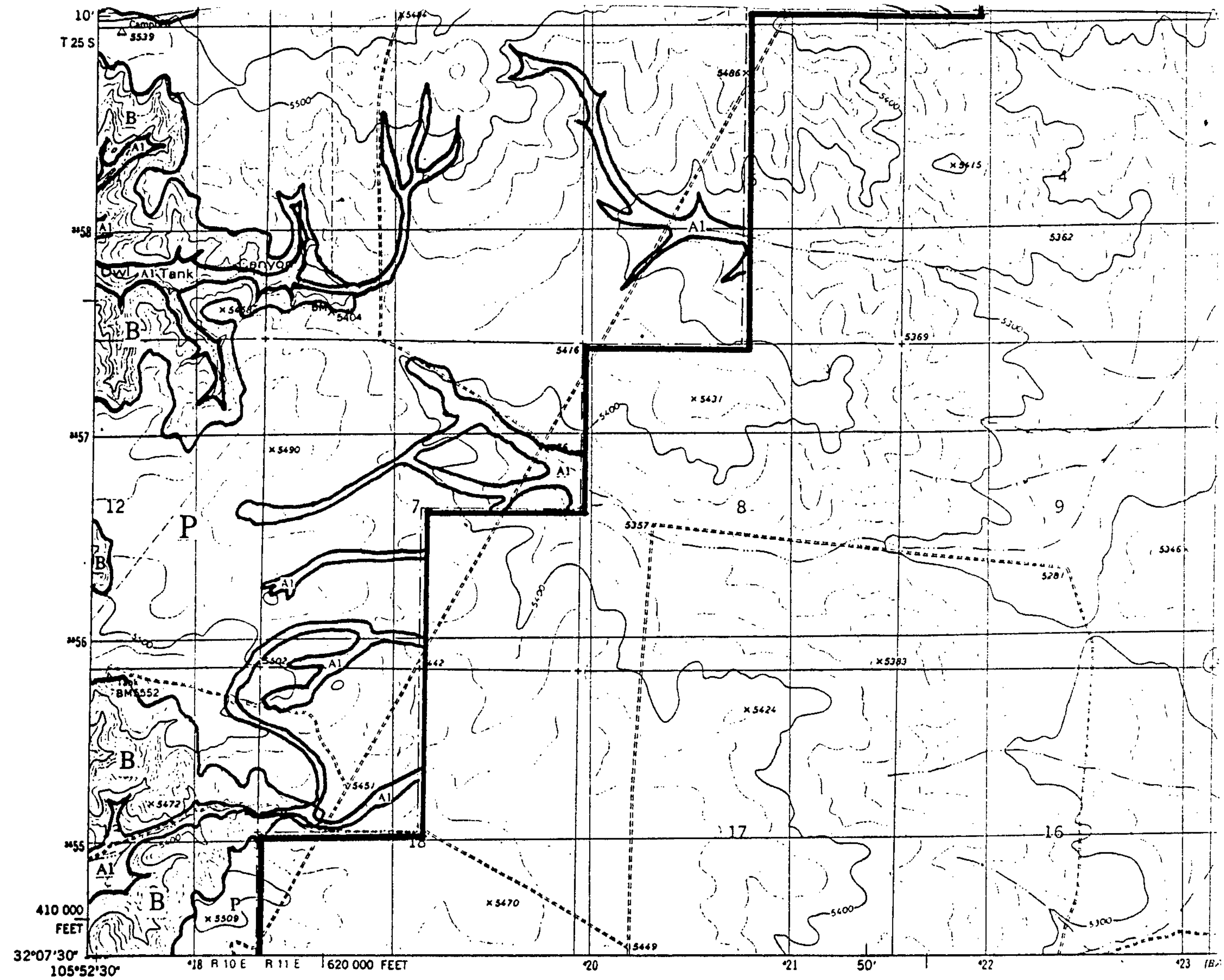
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980
32°07'30"
105°4'5'
3562
3561
3560
3558
3557
3556
3555000mN
4848 II SW (ALAMO MOUNTAIN)
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route
1 MILE
FEET
TER
NEW MEXICO
GN
MN

6.



(MOUNTAIN TANK)
4848 III SW

Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975 Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 49 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

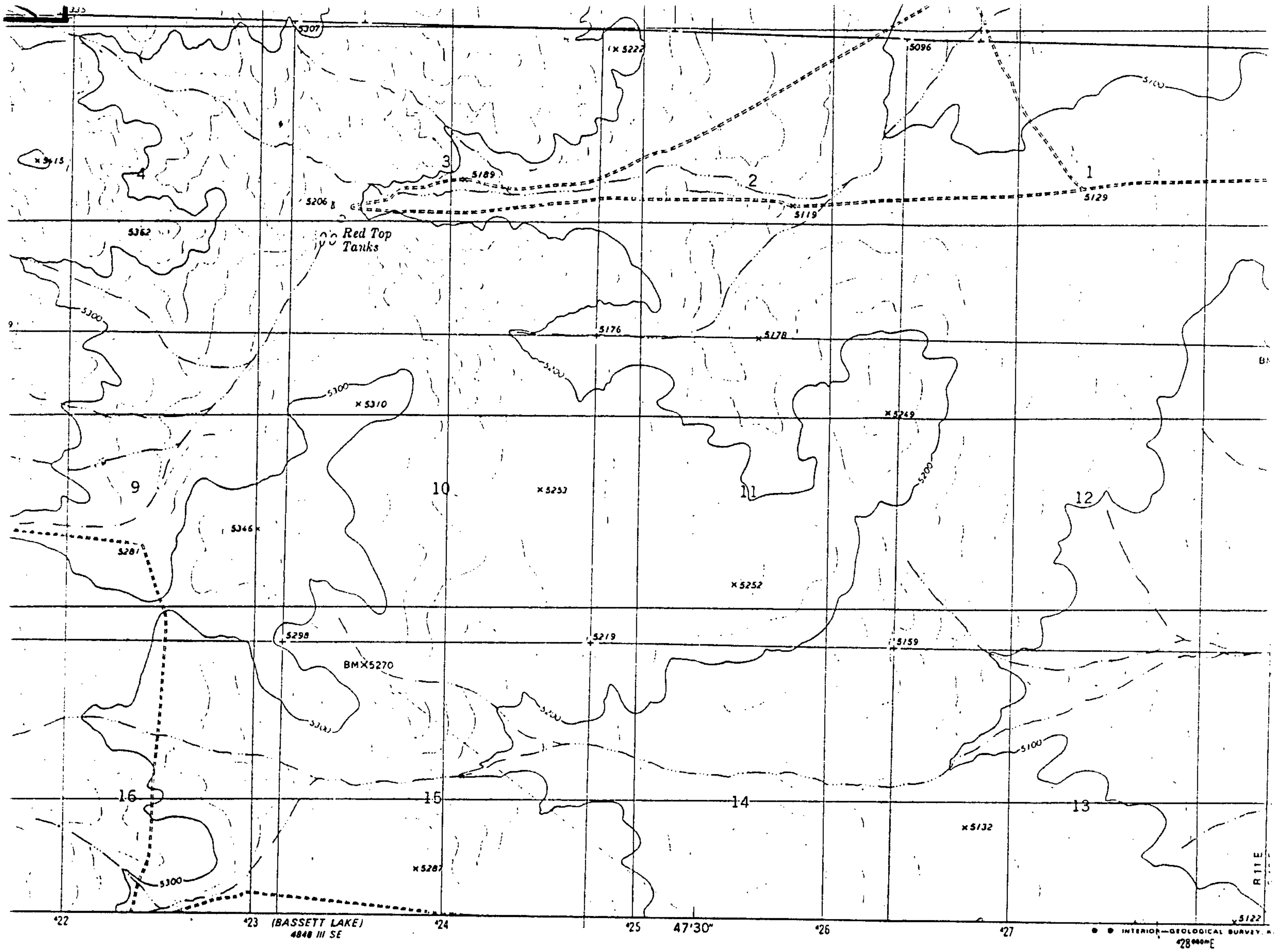
[1]See text for explanation

SC

1 ½
1000 0 1000 2000
1 .5

CONTOUR
DOTTED LINES RE
NATIONAL GEODET

THIS MAP COMPLIES WITH N
FOR SALE BY U.S. GEOLOGICAL SURVEY, DE
A FOLDER DESCRIBING TOPOGRAPHIC M



SCALE 1:24 000

1 ½ 0 1 MILE

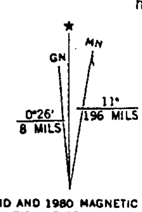
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
R SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFIC

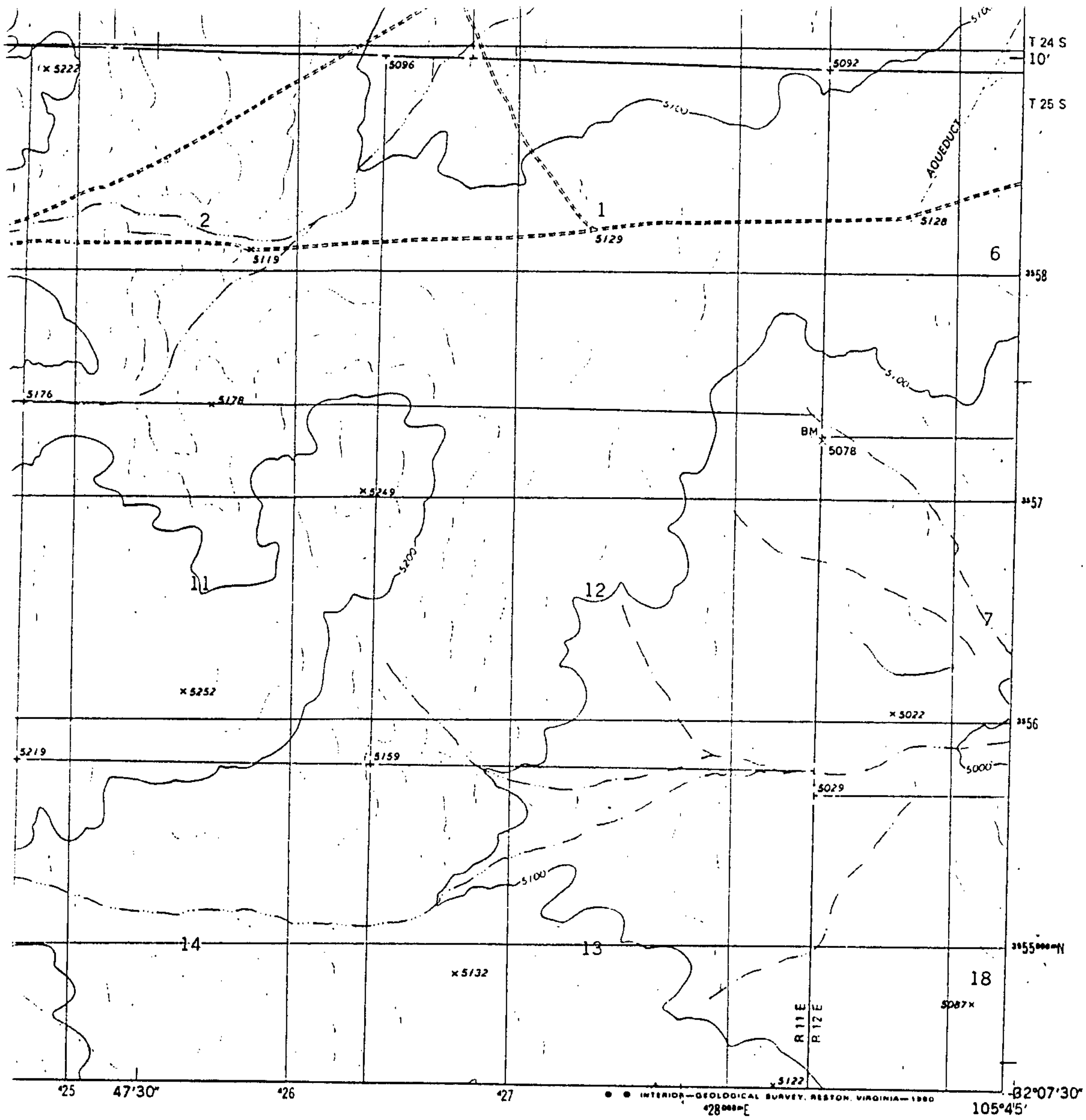
Primary highway, hard surface — Light impr

Secondary highway, hard surface — Unim

Interstate Route U. S. Ro

OWL TANK CANYON
NE/4 BASSETT LAKE 15'
N3207.5—W105
1980
DMA 4848 III NE—SE

8.



4848 II SW (ALAMO MOUNTAIN)

1 MILE

ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty road, hard or improved surface
Secondary highway, hard surface	Unimproved road

Interstate Route U. S. Route State Route

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°26' 8 MILS

11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

A 22092

OWL TANK CANYON EAST, N. MEX.

NE/4 BASSETT LAKE 15' QUADRANGLE
N3207.5—W10545/7.5

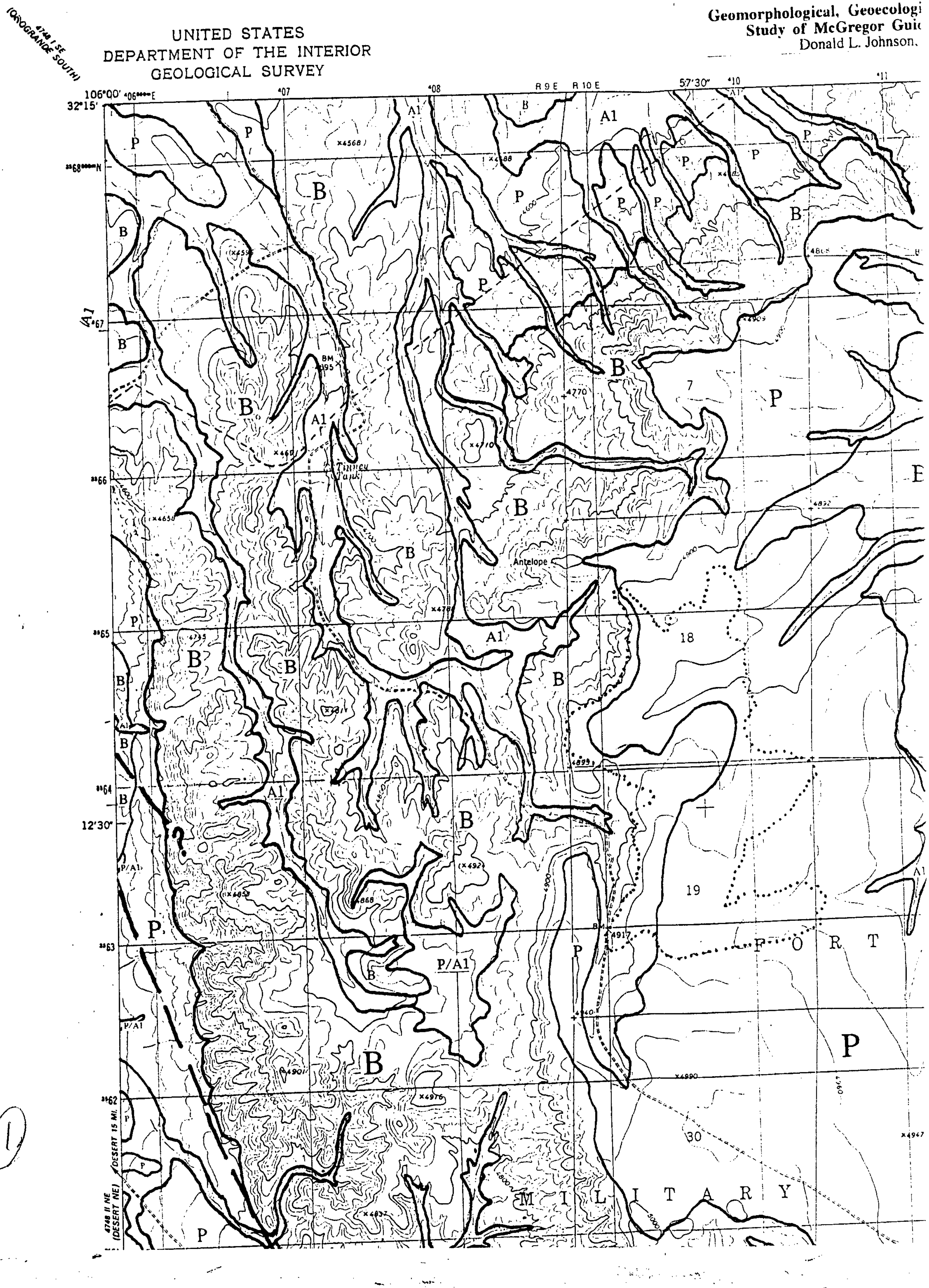
1980

DMA 4848 III NE—SERIES V881

61

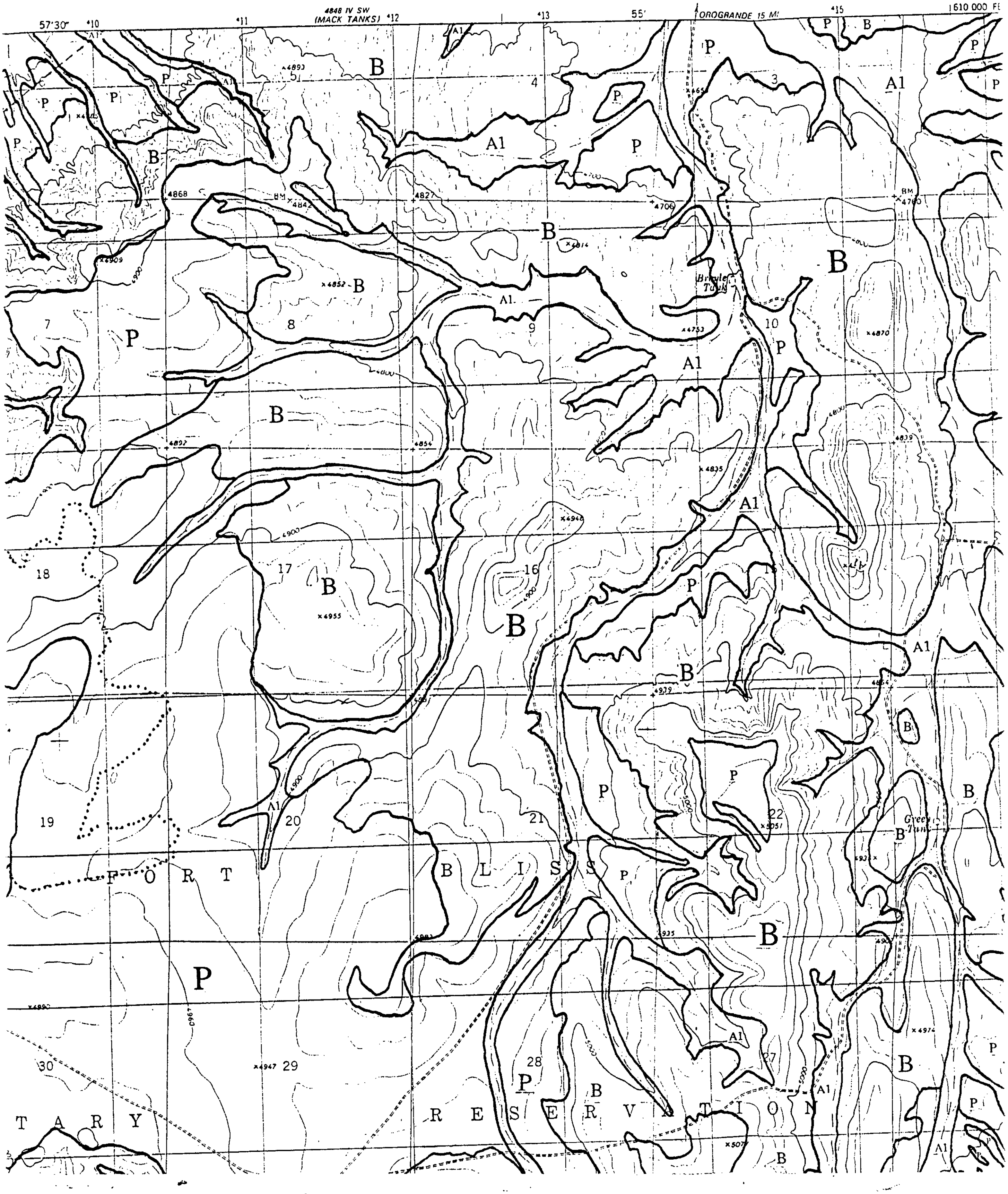
9.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



(1)

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



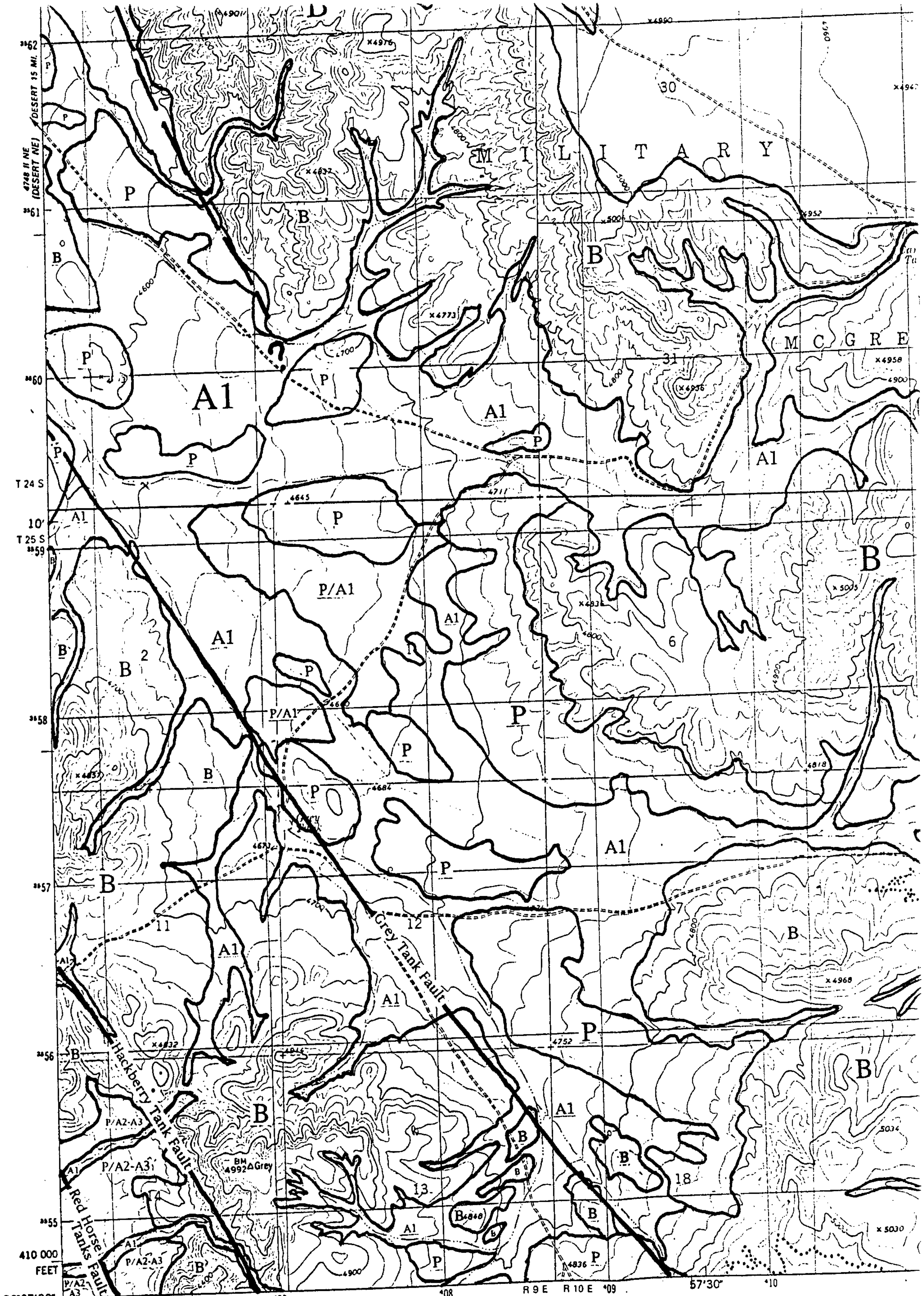
2.

urficial Mapping
New Mexico
, 1997

OWL TANK CANYON WEST QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 BASSETT LAKE 15' QUADRANGLE

4848 IV SE
(OTERO MESA SOUTH)

3.



4

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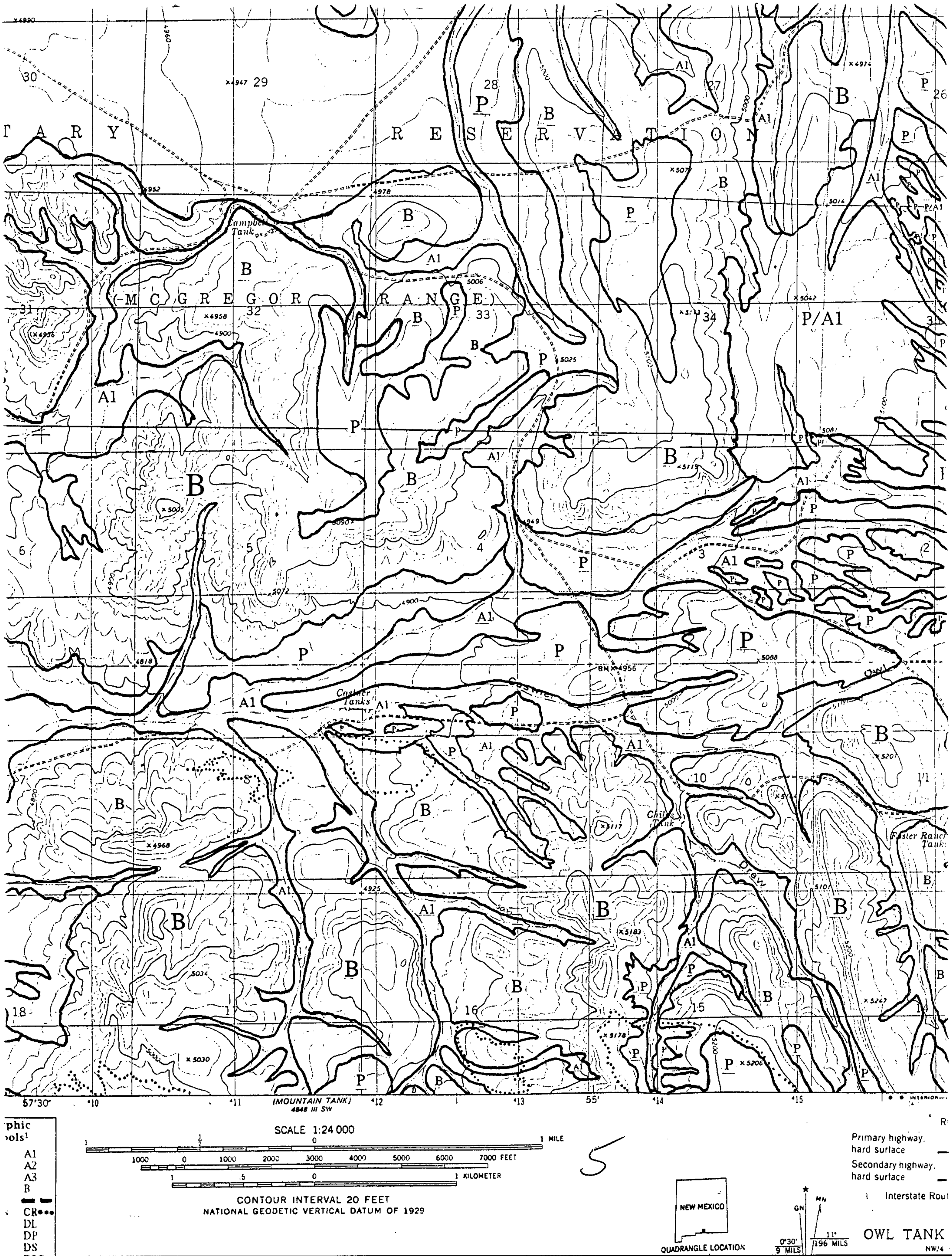
Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and

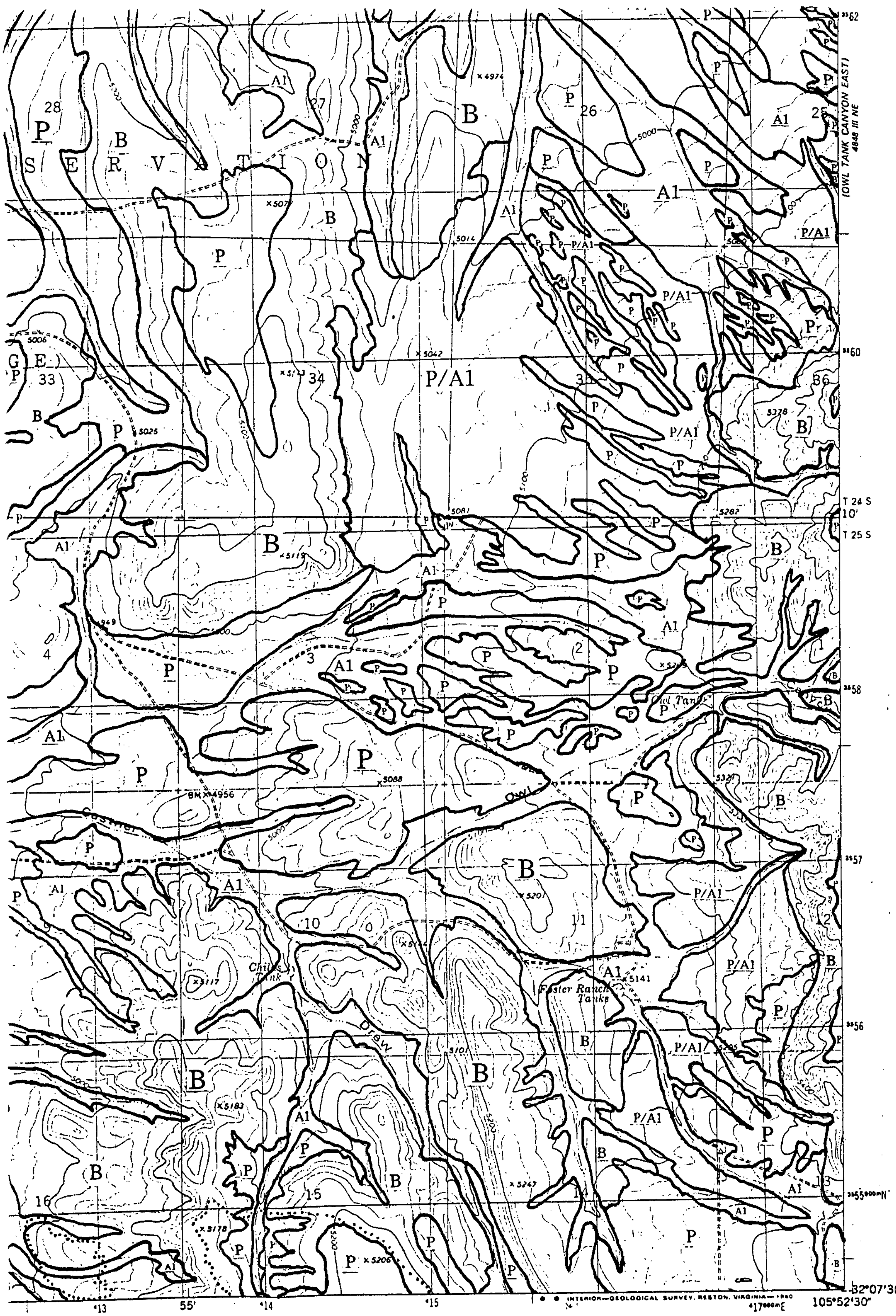
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
	DSC



MILITARY RESERVATION
McGREGOR RANGE
Campbell Tank
Castner Tanks
Childs Tank
Owl
Castner
Draw
Foster Ranch Tank
A1
B
P
P/A1
57'30"
55'
(MOUNTAIN TANK)
4848 III SW
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NEW MEXICO
QUADRANGLE LOCATION
0°30'
9 MILS
11°
196 MILS
GN
MN
Primary highway, hard surface
Secondary highway, hard surface
Interstate Rout
OWL TANK
NW/4
phic
ols[1]
A1
A2
A3
B
CR
DL
DP
DS

5



6

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

(BASSETT LAKE) 4848 III SE

1 MILE

7000 FEET

1 KILOMETER

NEW MEXICO

QUADRANGLE LOCATION

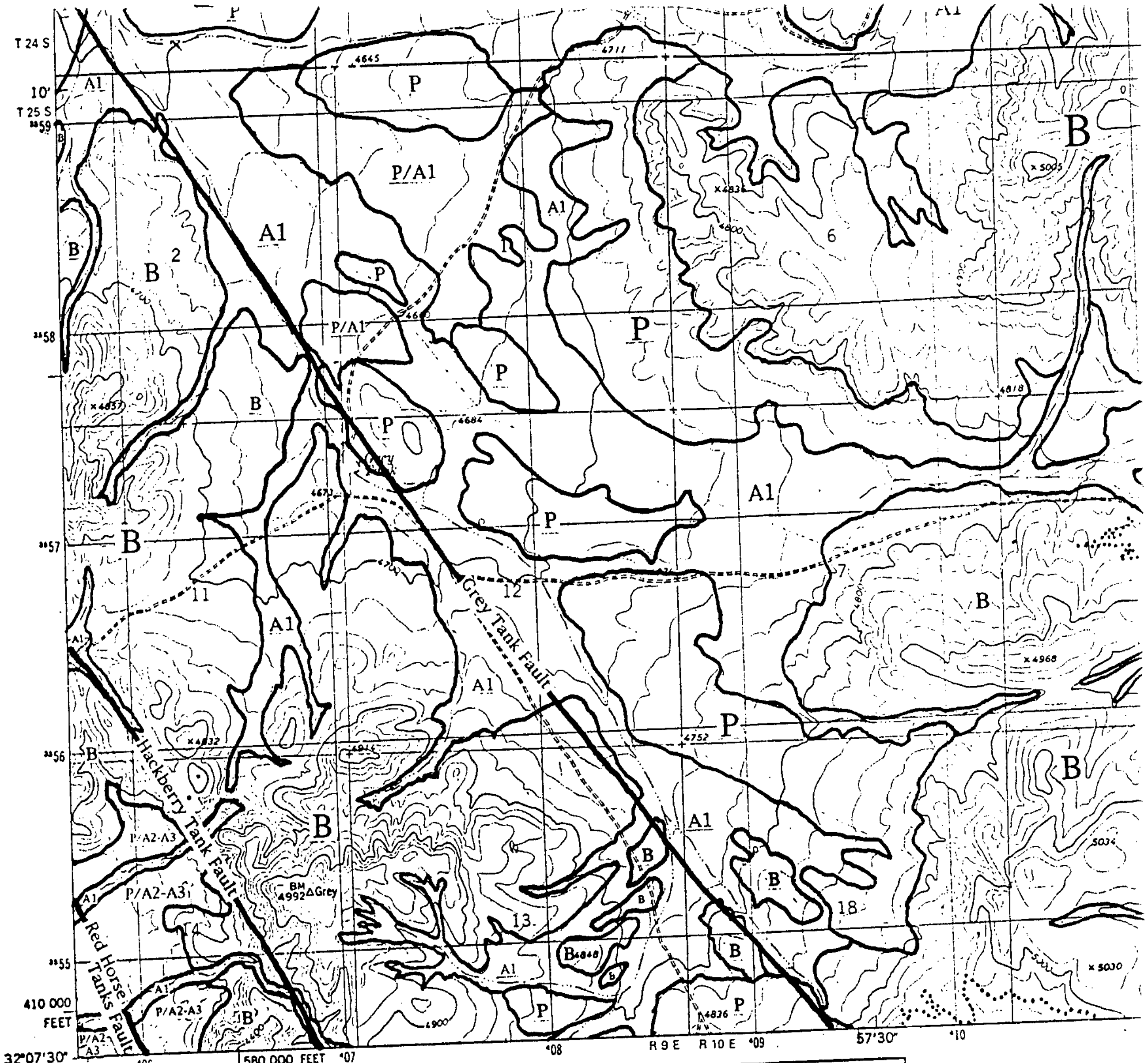
GN MN

0°30' 9 MILS

11° 196 MILS

OWL TANK CANYON WEST, N. MEX.

NW/4 BASSETT LAKE 15' QUADRANGLE



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Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

Certain landlines are omitted because of insufficient data

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

(DESERT SE)
4748 II SE

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL
Wind Erosion (fire induced)	

[1]See text for explanation

1 ½
1000 0
1

NAT

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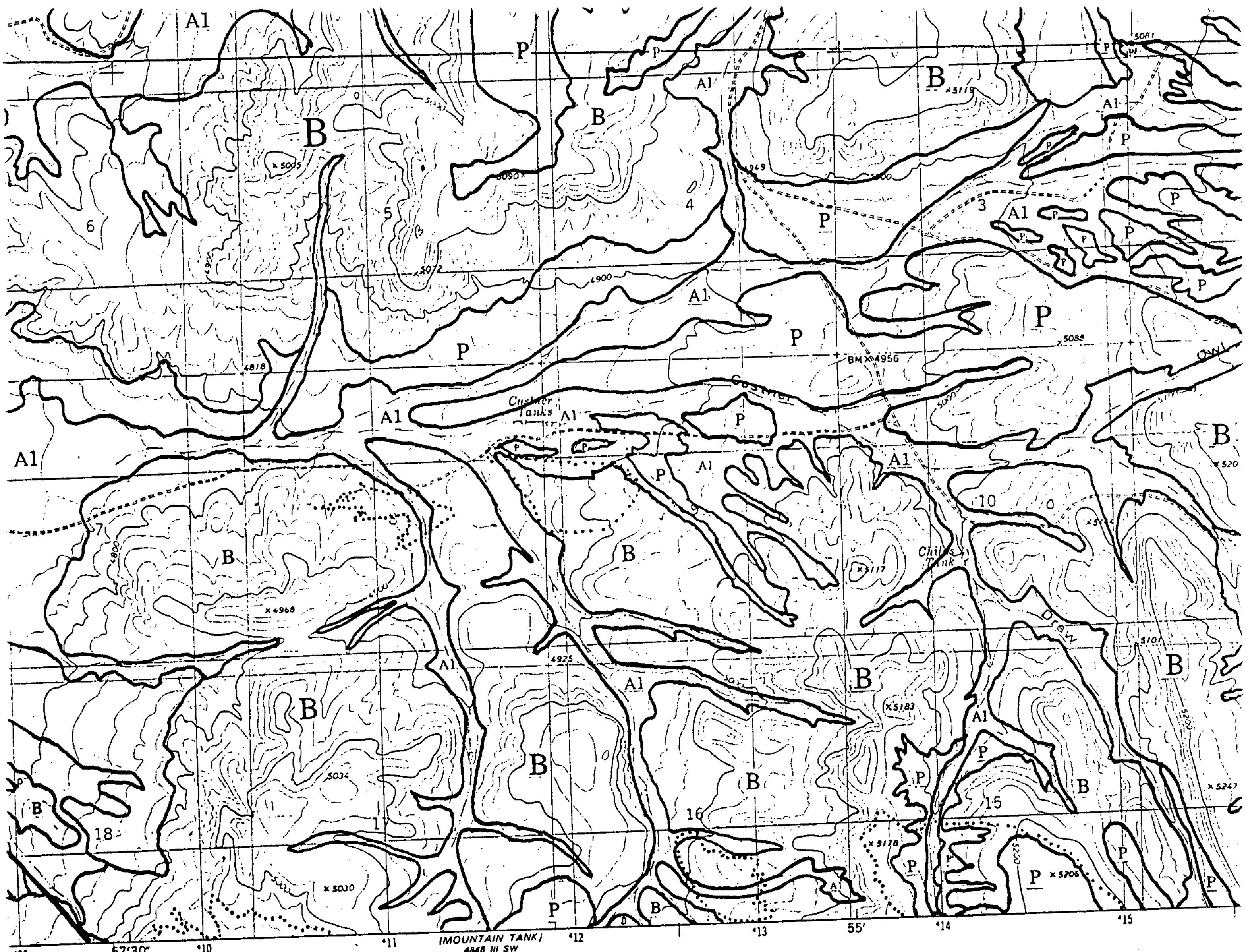
A FOLDER DESCRIBING



SCALE 1:24 000

1 MILE

7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN

MN

0°30'
9 MILS

11°
196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

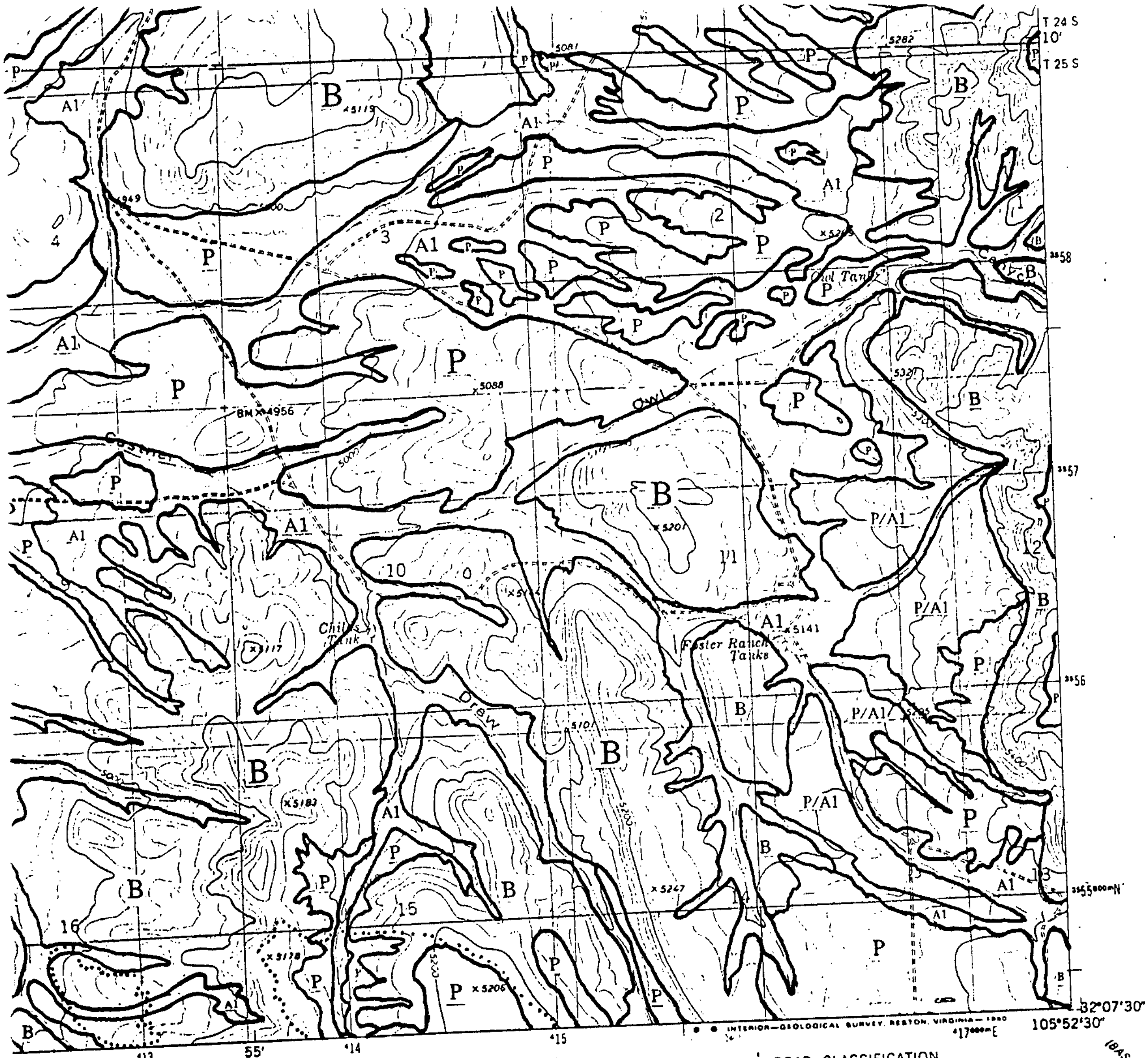
Primary hard su

Second. hard su

OW

...ge Geomorphic
... and Symbols[1]

	A1
	A2
...t)	A3
	B
...le) Sediments	CR
	DL
	DP
	DS
	DSC
...ous	DSG
	P
	Pl
	PlL
...e induced)	
...n	



1 MILE

6000 7000 FEET

1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

(BASSETT LAKE) 4848 III SE

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°30' 9 MILS

11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

OWL TANK CANYON WEST, N. MEX.

NW/4 BASSETT LAKE 15' QUADRANGLE

N3207.5—W10552.5/7.5

1980

DMA 4848 III NW—SERIES V881

NDARDS

)R RESTON, VIRGINIA 22092

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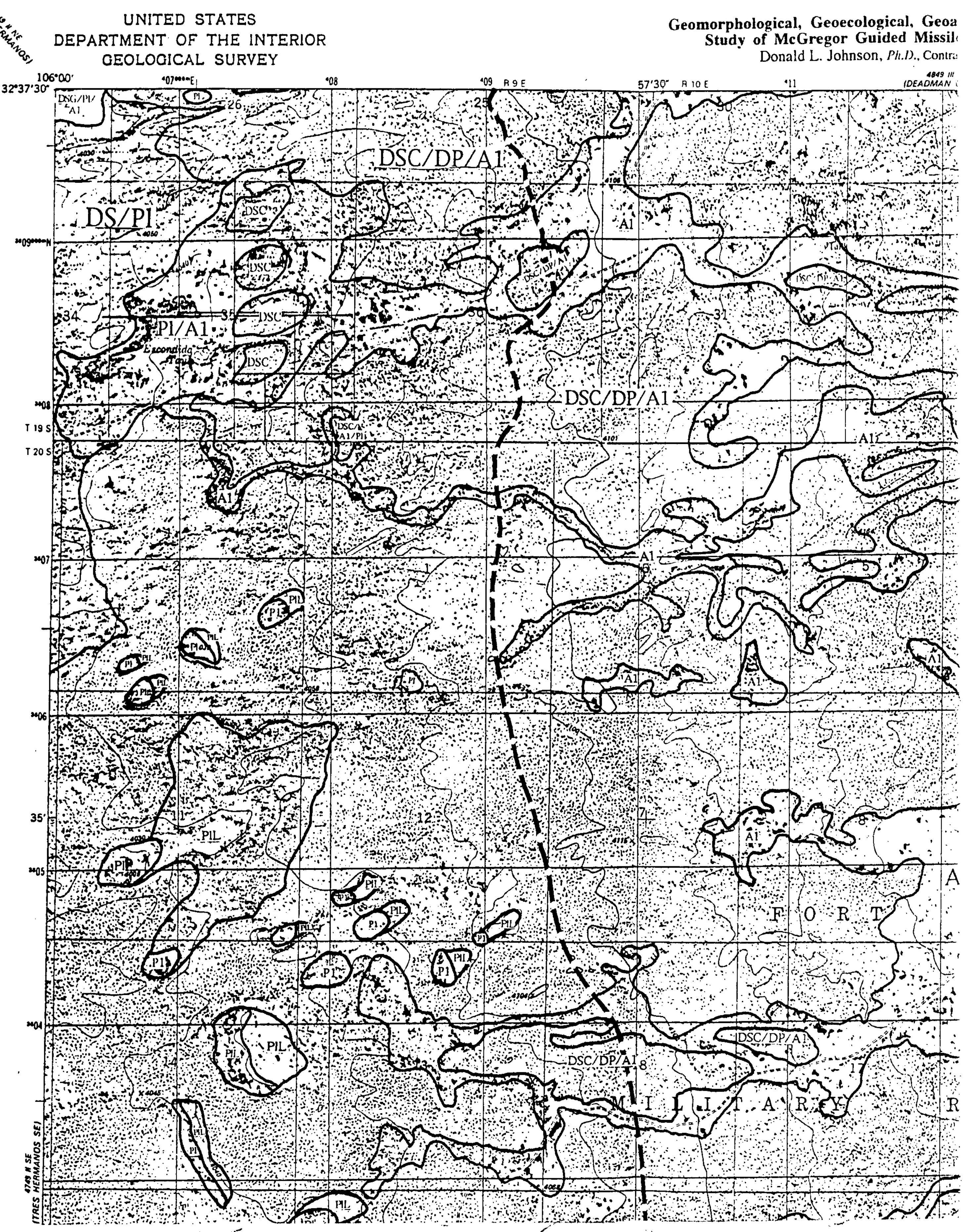
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoecological, Geoa
Study of McGregor Guided Missil
Donald L. Johnson, *Ph.D.*, Contra



(1)

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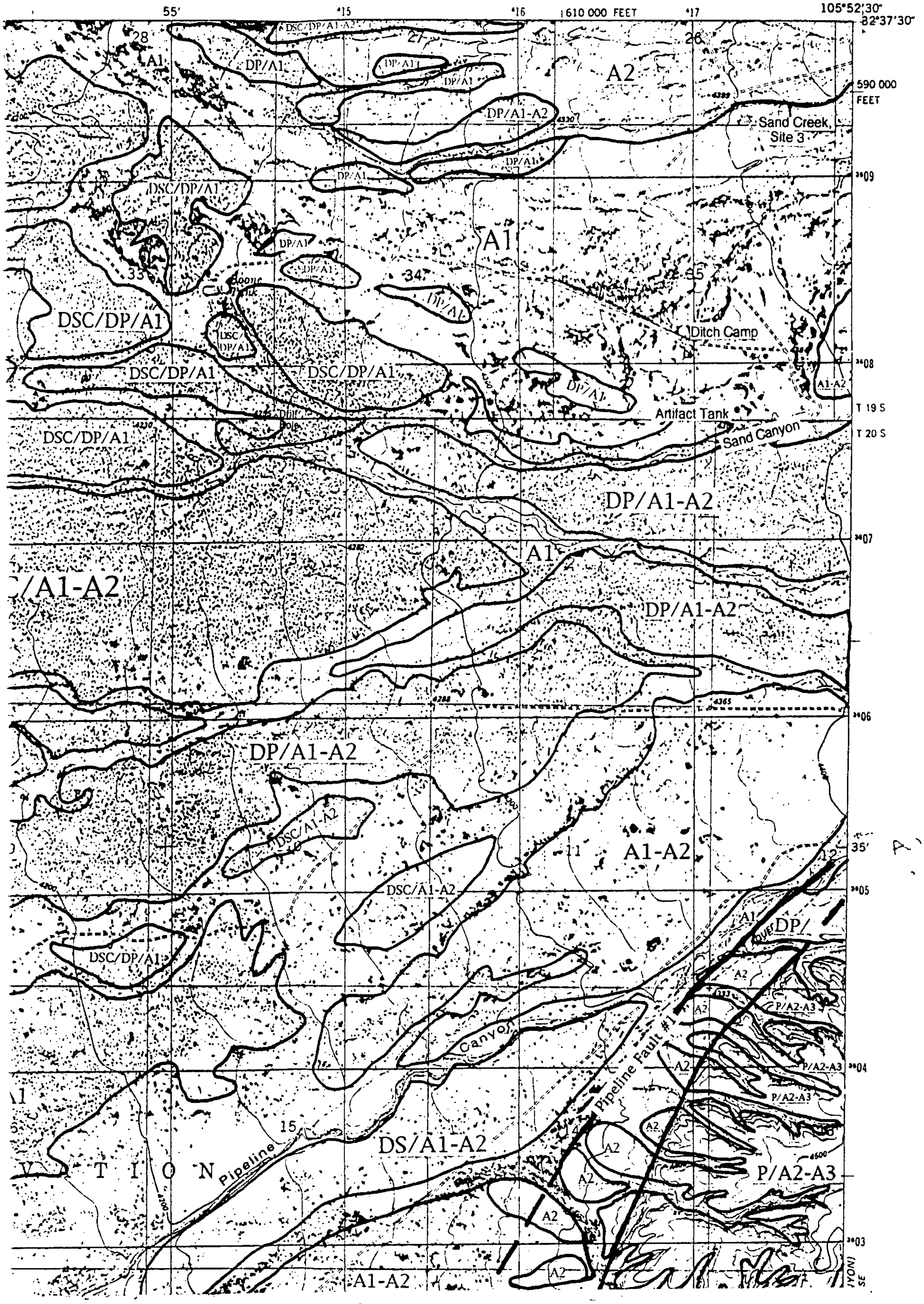
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

Surficial Mapping
. New Mexico
1, 1997

PIPELINE CANYON QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SW/4 ESCONDIDO CANYON 15' QUADRANGLE

4849 III NE (BUG SCUFFLE CANYON)



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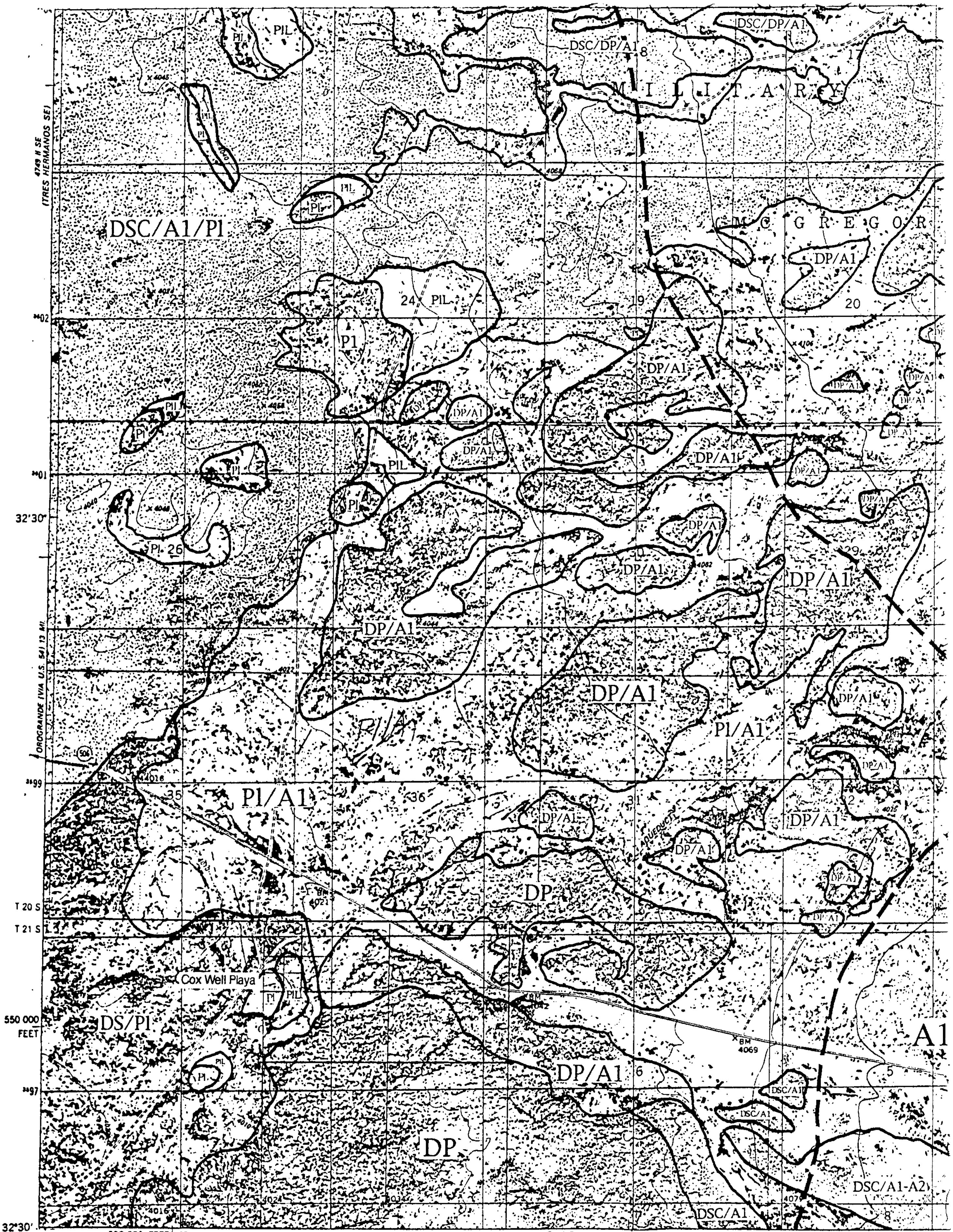

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Topography by photogrammetric methods from aerial photographs taken 1972. Orthophotomosaic from aerial photographs taken 1971 Field checked 1975. Map edited 1982

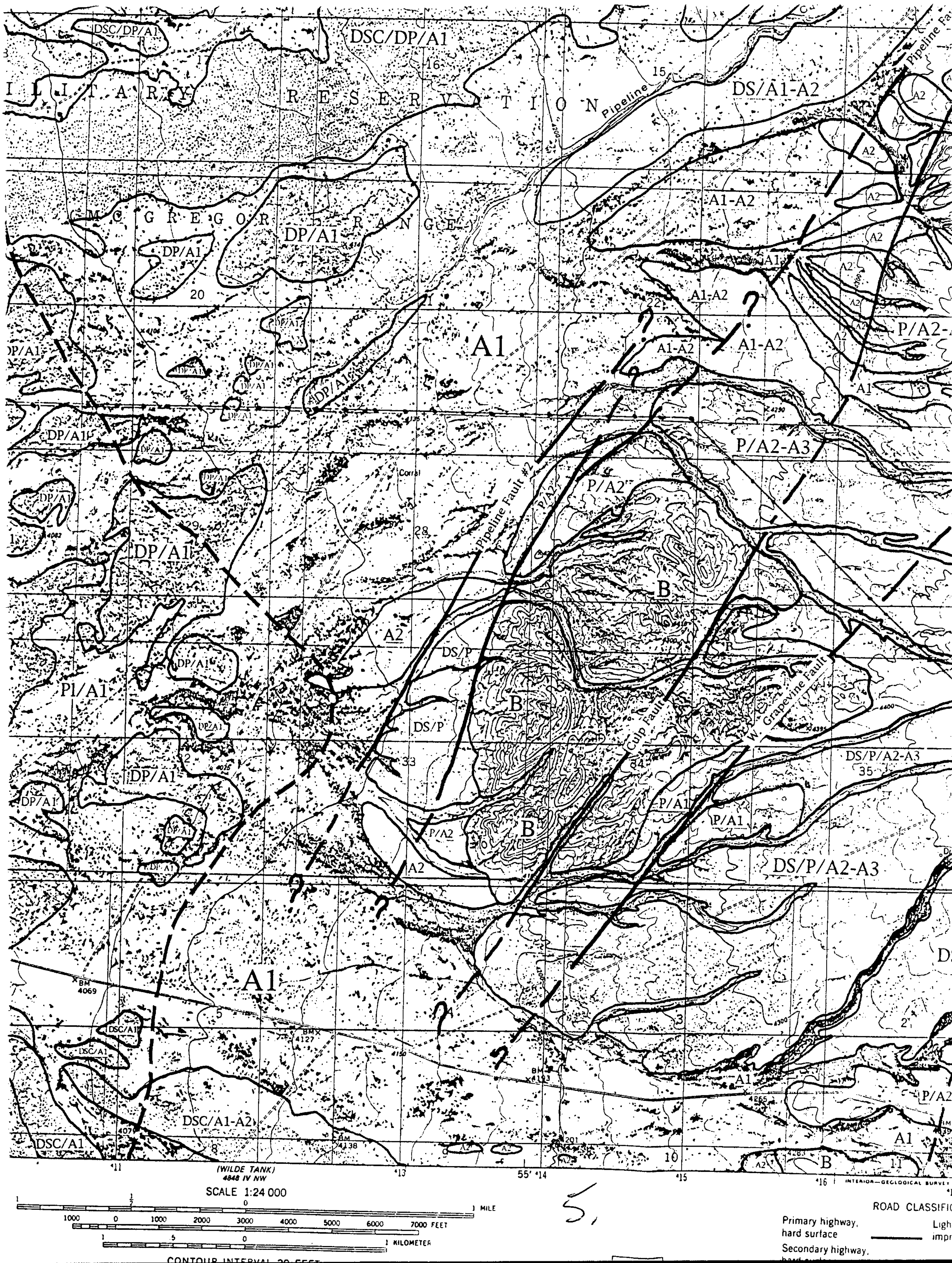
Projection and 10,000-foot grid ticks: New Mexico

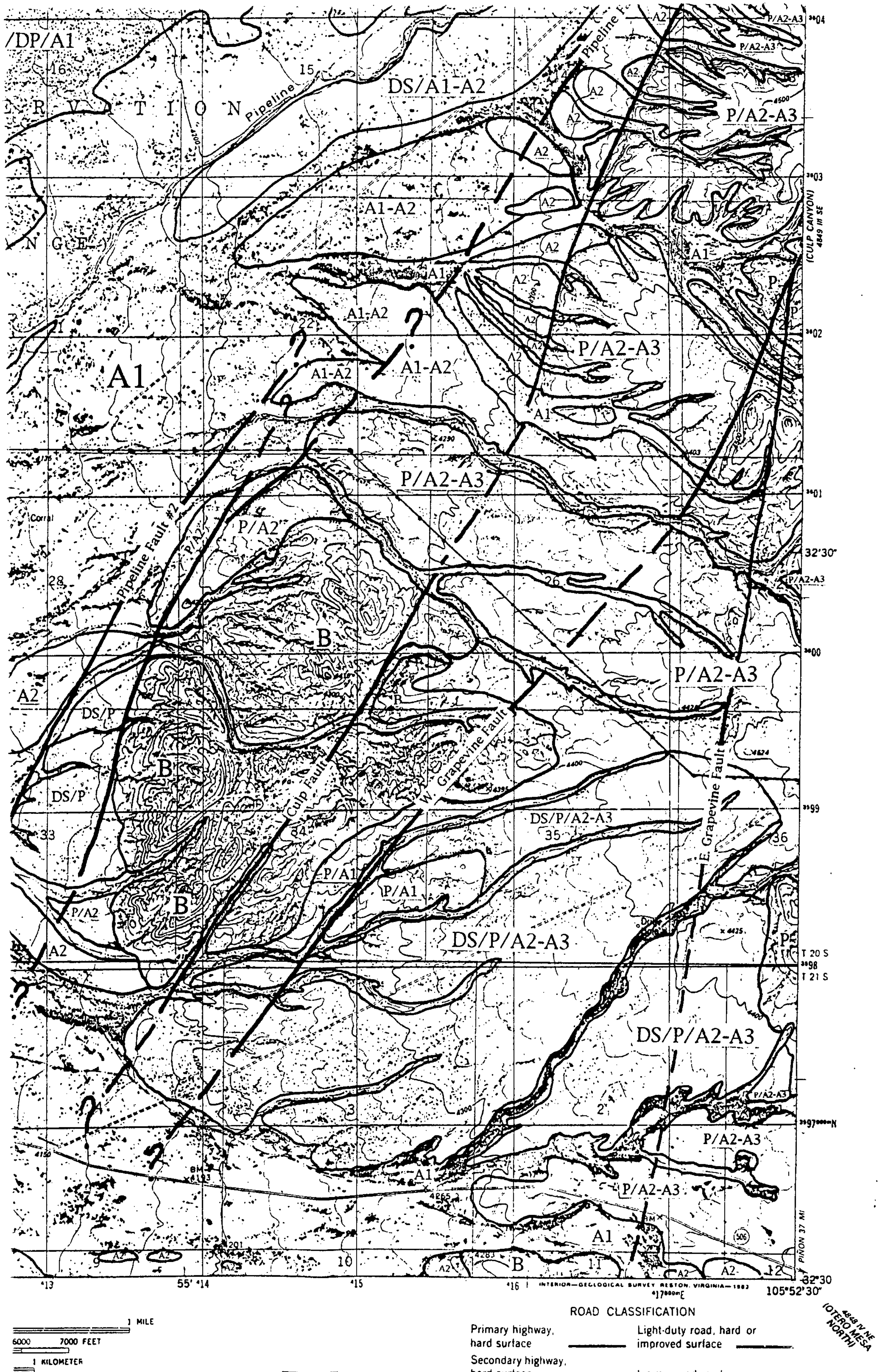
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬

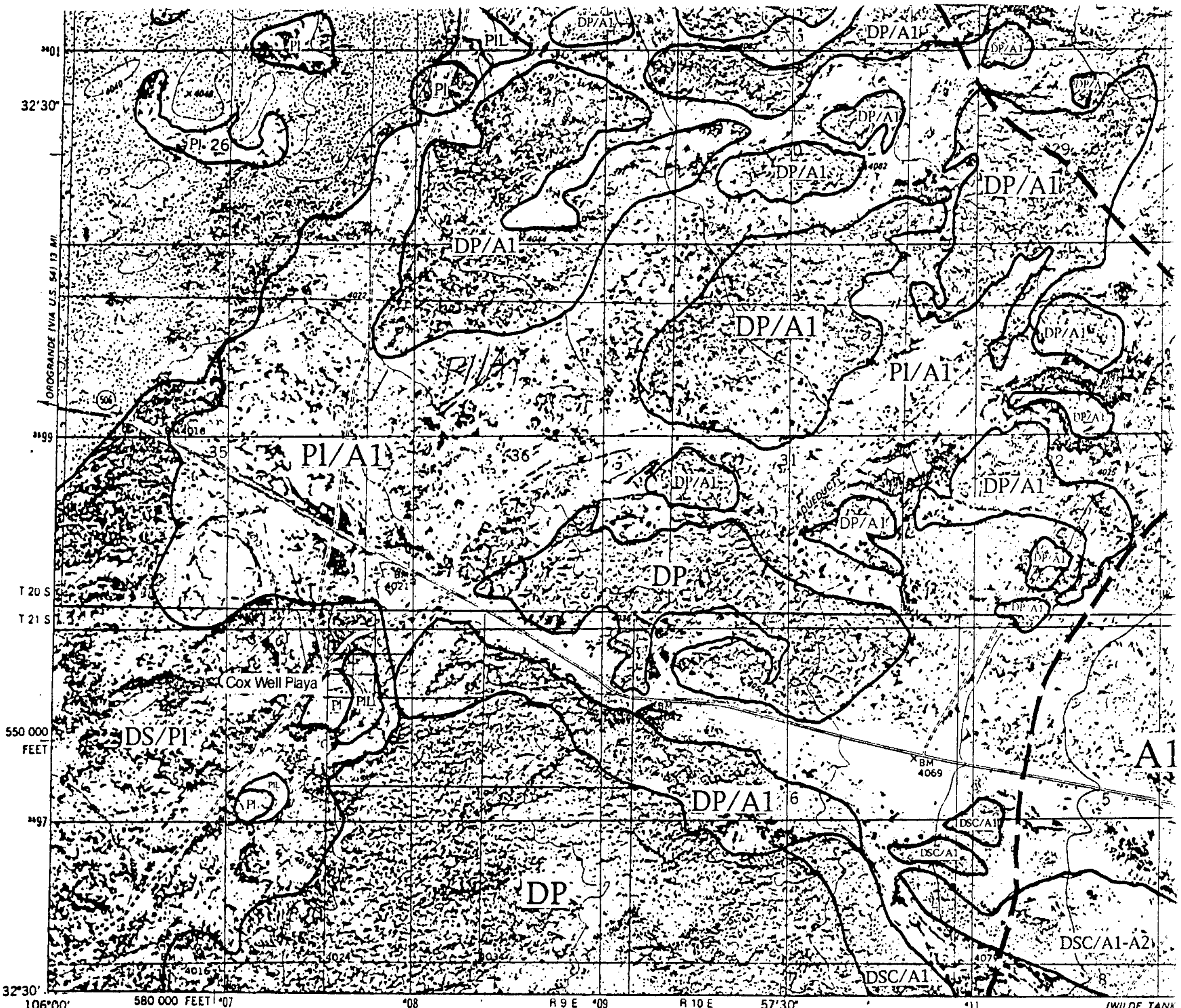
SCALE 1:24 0

CONTOUR INTERVAL


DSC/DP/A1
DSC/DP/A1
MILITARY RESERVATION
Pipeline
DS/A1-A2
Pipeline Fault
McGREGOR RANGE
DP/A1
DP/A1
A1-A2
A2
A1
A1-A2
A1-A2
A1-A2
P/A2-
DP/A1
A1
P/A2-A3
Corral
Pipeline Fault #2
P/A2
P/A2
DP/A1
B
A2
DS/P
B
PI/A1
DS/P
Culp Fault
W. Grapevine Fault
DP/A1
DS/P/A2-A3
P/A1
P/A1
P/A2
B
A2
DS/P/A2-A3
A1
DSC/A1
DSC/A1
DSC/A1-A2
DSC/A1
A1
A1
P/A2-
B
(WILDE TANK)
4848 IV NW
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
INTERIOR—GEOLOGICAL SURVEY
ROAD CLASSIFIC
Primary highway, hard surface
Secondary highway,
Light
impro


/DP/A1
DS/A1-A2
Pipeline
Pipeline F
P/A2-A3
A1-A2
A1
A2
P/A2
P/A2-A3
Pipeline Fault #2
Corral
B
DS/P
Culp Fault
W. Grapevine Fault
E. Grapevine Fault
DS/P/A2-A3
P/A1
T 20 S
T 21 S
(CULP CANYON) 4849 III SE
PIÑON 37 MI
32°30'
105°52'30"
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1983
1 MILE
6000
7000 FEET
1 KILOMETER
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
4848 IV NE (OTERO MESA NORTH)

6.



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1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
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McGregor Range Geomorphic Mapping Units and Symbols[1]

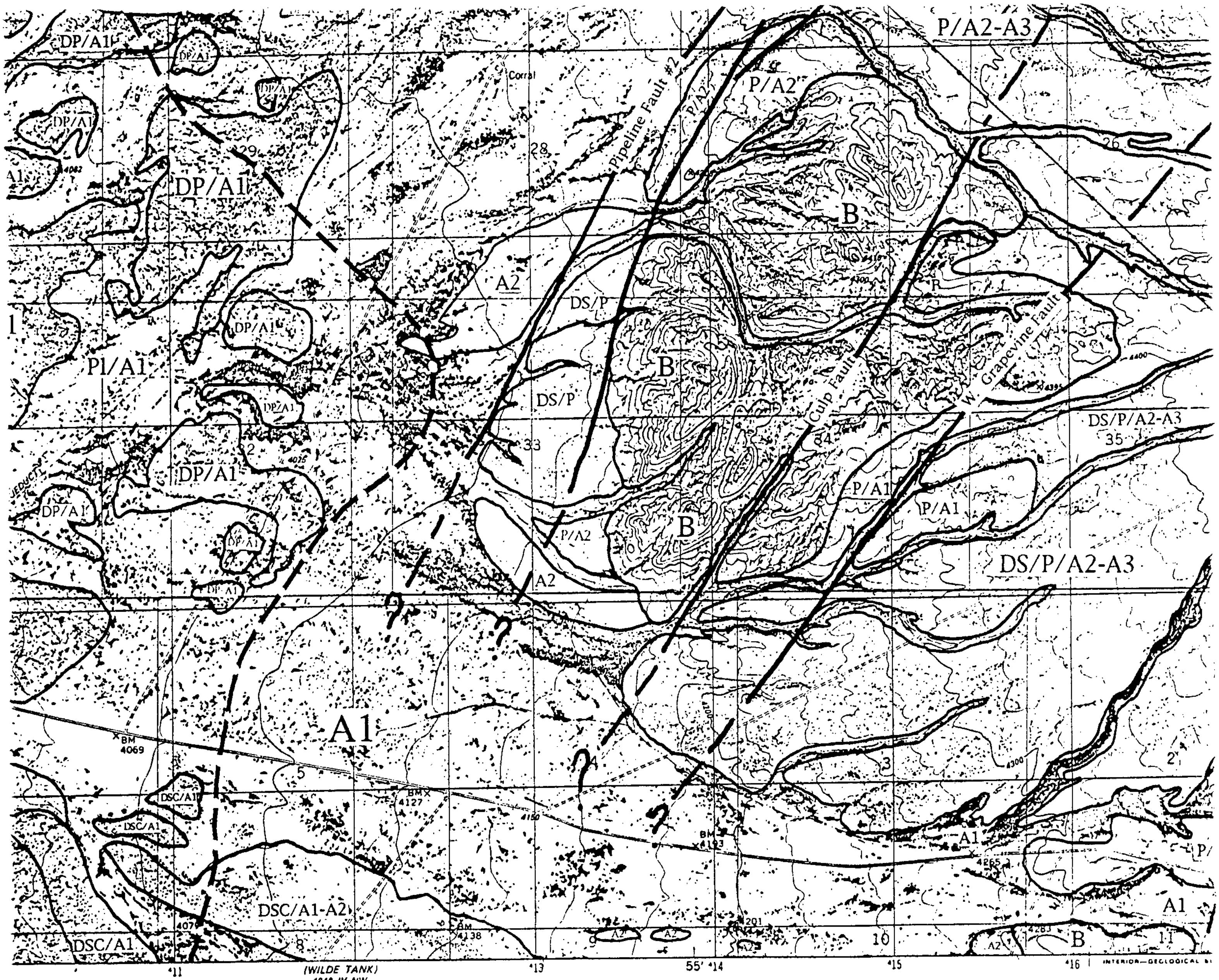
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR• • •
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

SCALE 1:24 (

CONTOUR INTERVAL
DOTTED LINES REPRESENT 1
NATIONAL GEODETIC VERTICA

THIS MAP COMPLIES WITH NATIONAL M
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, CO
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND



'11 (WILDE TANK) 4848 IV NW '13 55' '14 '15 '16 INTERIOR—GEOLOGICAL S

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN 0°30' 9 MILS 11° 196 MILS

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLAS

Primary highway, hard surface

Secondary highway, hard surface

Interstate Route U

PIPELINE

SW/4 ESCON

N3

DMA 48

1 MILE
7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

NEW MEXICO
QUADRANGLE LOCATION

GN
MN
0°30'
9 MILS
11°
196 MILS

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

PIPELINE CANYON, N. MEX.

SW/4 ESCONDIDO CANYON 15' QUADRANGLE
N3230–W10552.5/7.5

1982

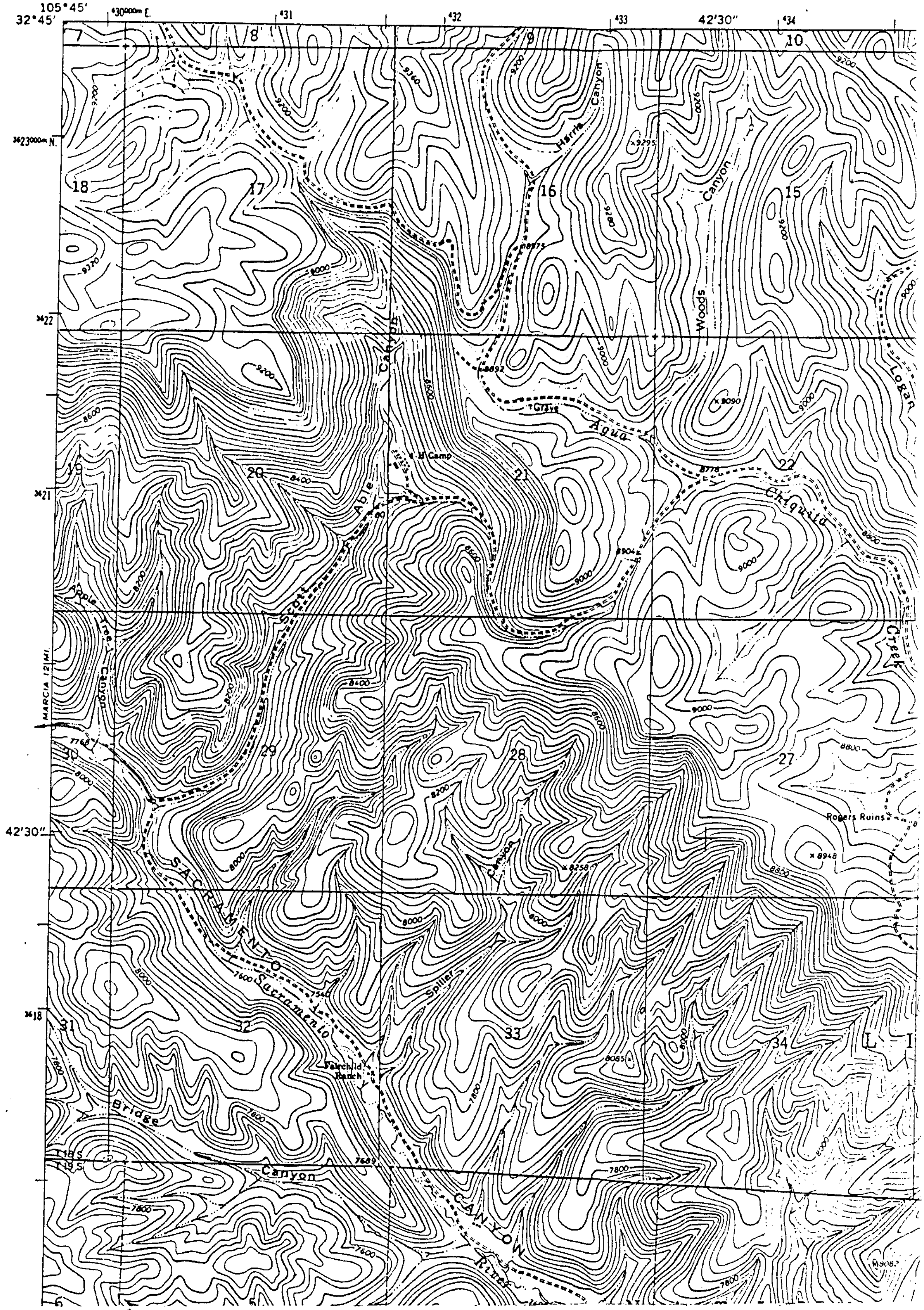
DMA 4849 III SW–SERIES V881

STON, VIRGINIA 22092
ON REQUEST

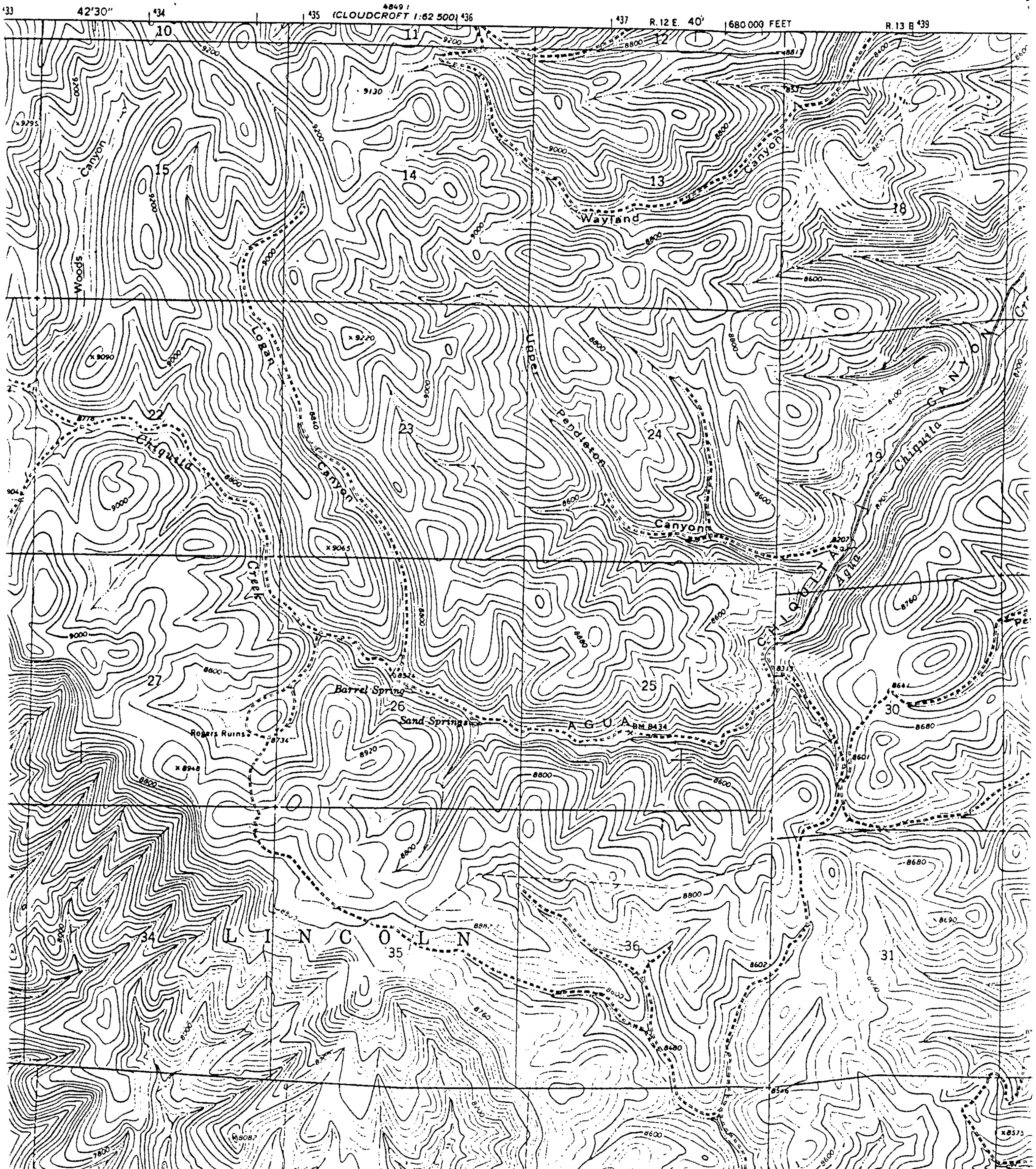
5e

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Ge
Study of McGreg
Donald L. J



1


42'30"
(CLOUDCROFT 1:62 500)
R. 12 E.
40'
680 000 FEET
R. 13 E.
Woods
Canyon
Logan
Creek
Upper
Pendleton
Canyon
Wayland
Canyon
Chiquita
Chiquita
Agua
CHIQUITA
CANYON
Barrel Spring
Sand Springs
Rogers Ruins
AGUA
BM 8434
LINCOLN
10
11
12
13
14
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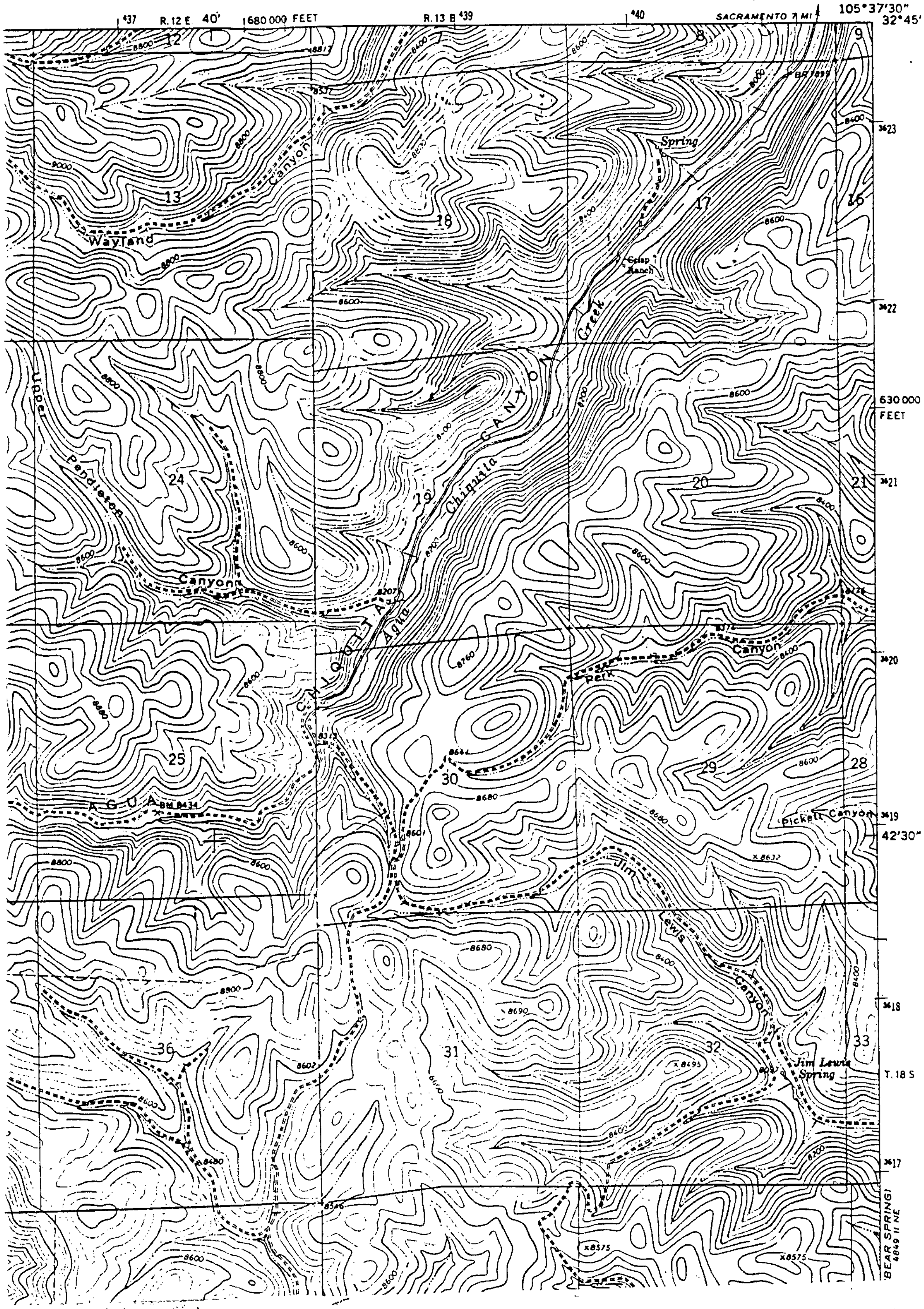
ınd Surficial Mapping
Bliss, New Mexico
D-0014, 1997

ROGERS RUINS QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



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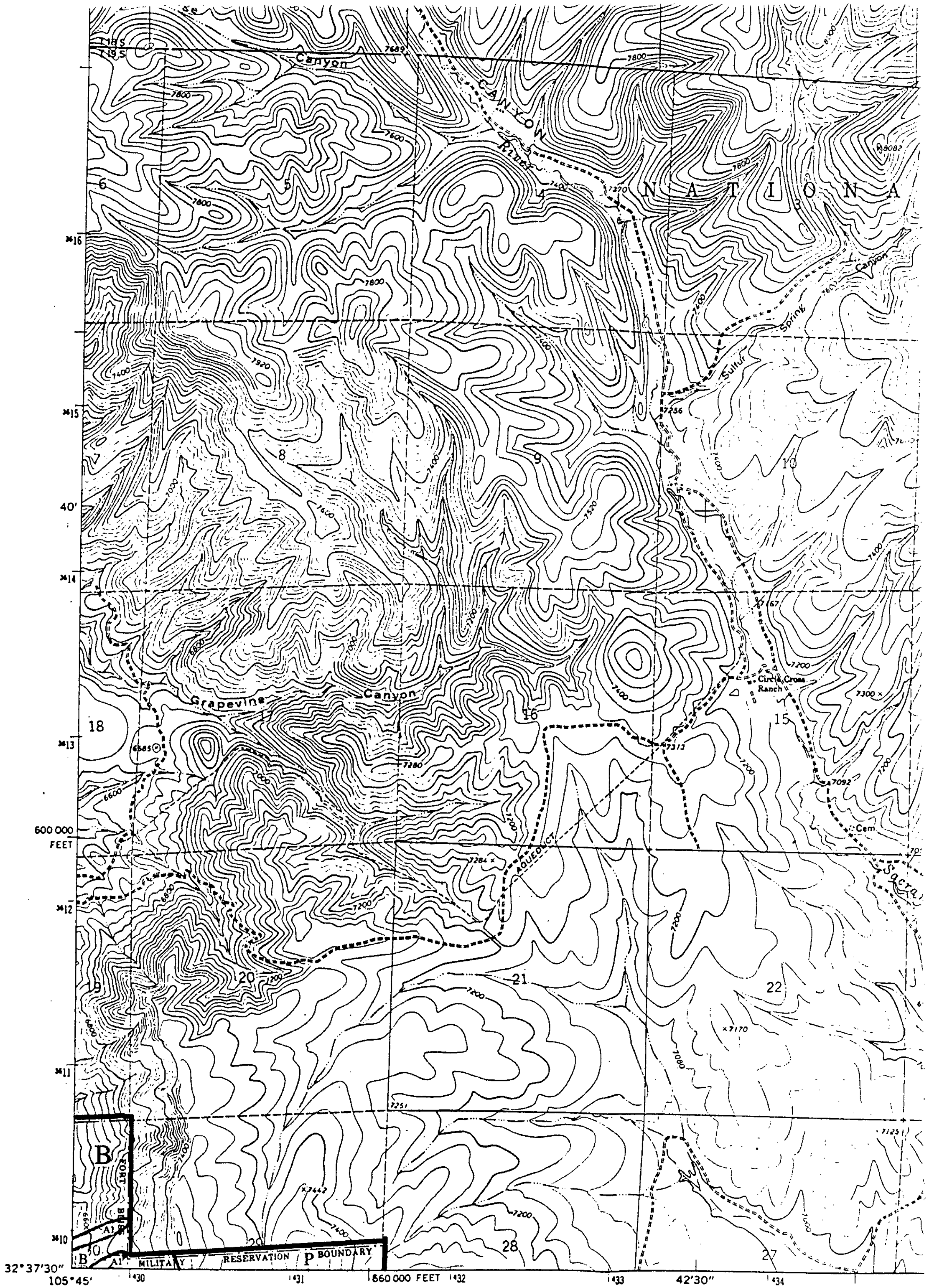


H

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

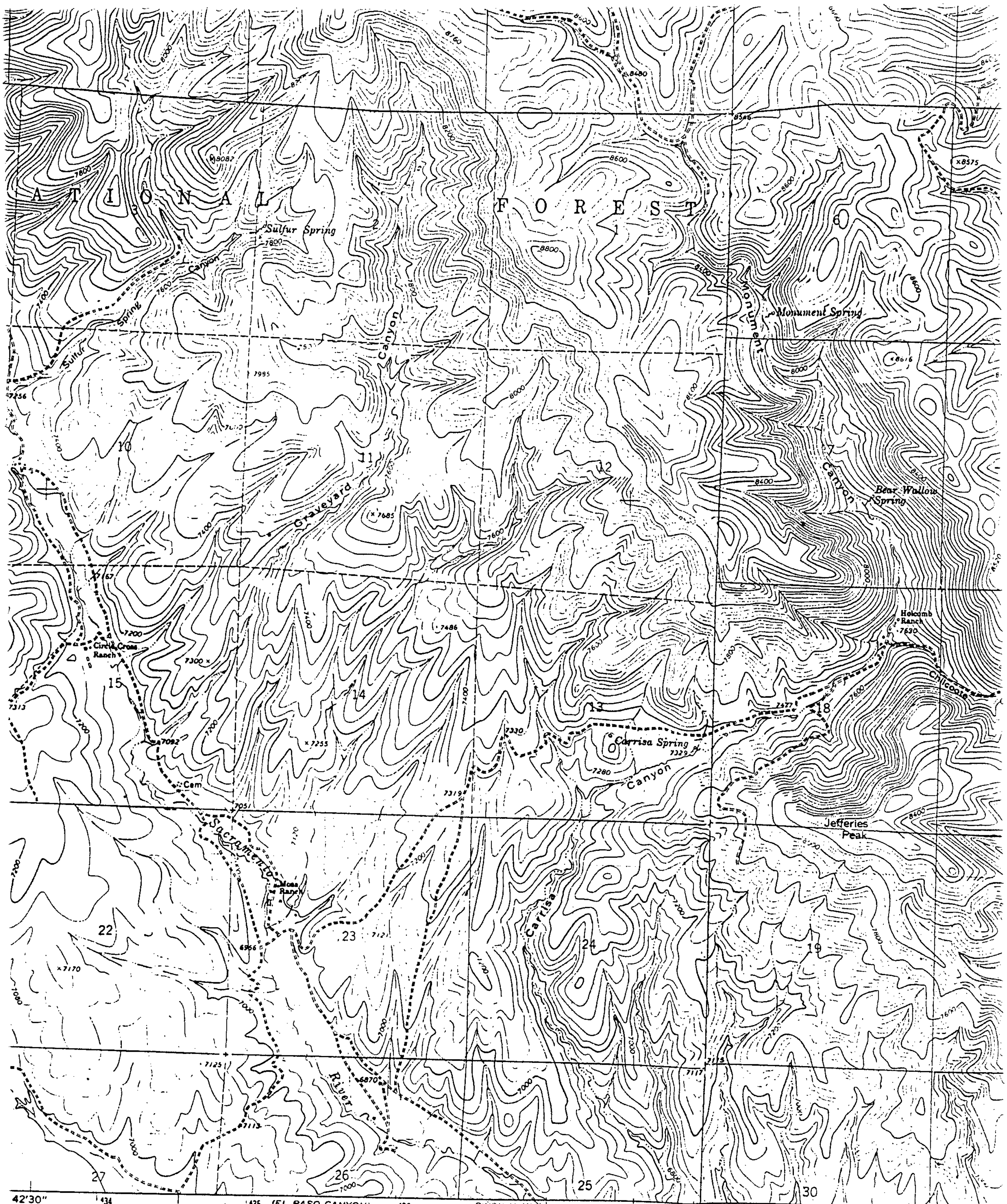
Topography by photogrammetric methods from aerial photographs taken 1964 and 1965. Field checked 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	---
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP

1000 0 1000



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

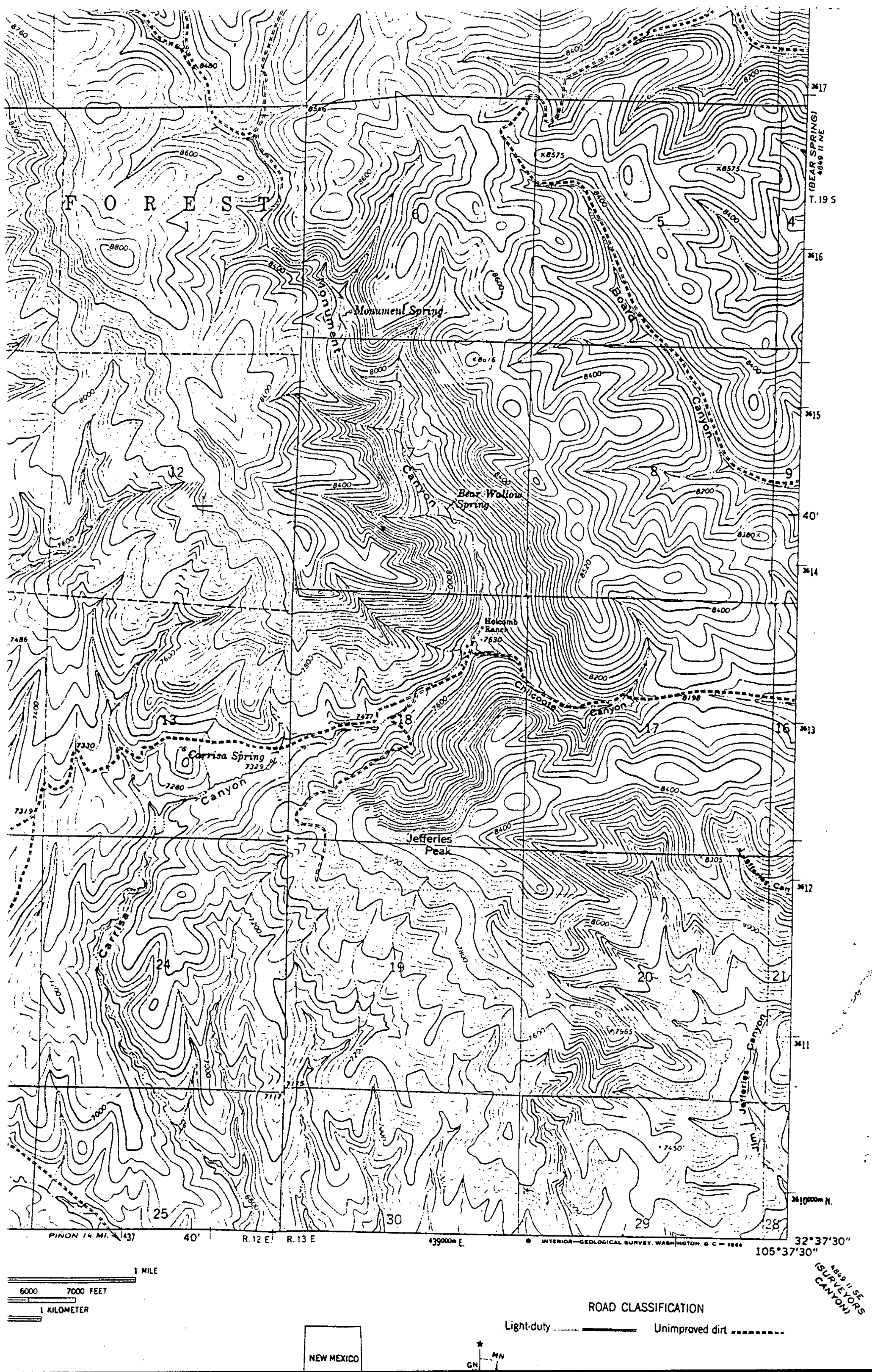
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

DATUM IS MEAN SEA LEVEL

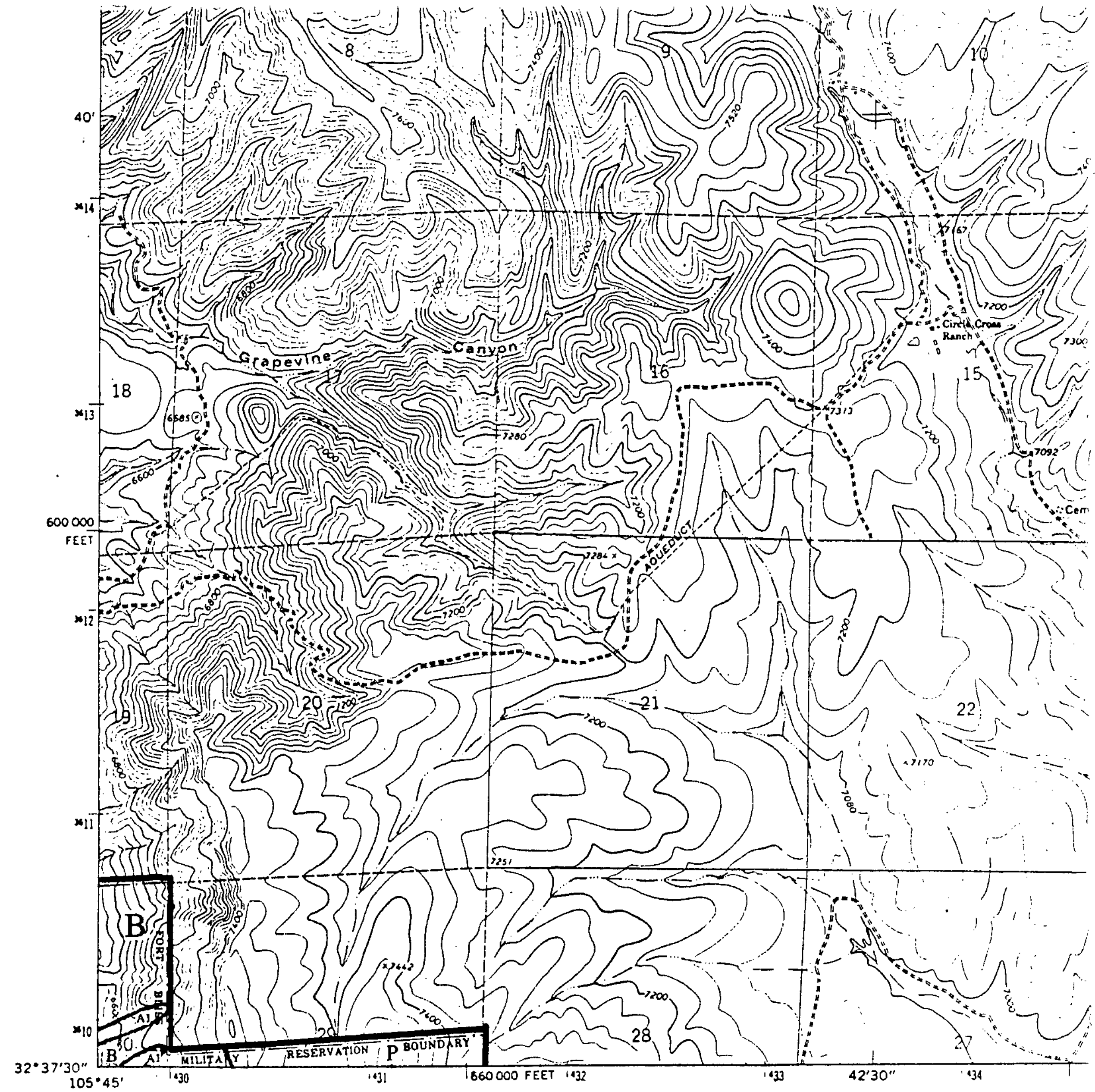
5,

Light-duty



F O R E S T
Monument Spring
Monument
Board
Canyon
Bear Wallow Spring
Canyon
Holcomb Ranch
7630
Chilcoote
Canyon
Carrisa Spring
Canyon
Carrisa
Jefferies Peak
Jefferies Can
Jefferies Canyon
(BEAR SPRING) 4849 II NE
T. 19 S
40'
PIÑON 14 MI.
R. 12 E.
R. 13 E
439000m E.
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
3610000m N.
32°37'30"
105°37'30"
4849 II SE (SURVEYORS CANYON)
1 MILE
6000
7000 FEET
1 KILOMETER
ROAD CLASSIFICATION
Light-duty
Unimproved dirt
NEW MEXICO
GN
MN

6.



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1964 and 1965. Field checked 1965

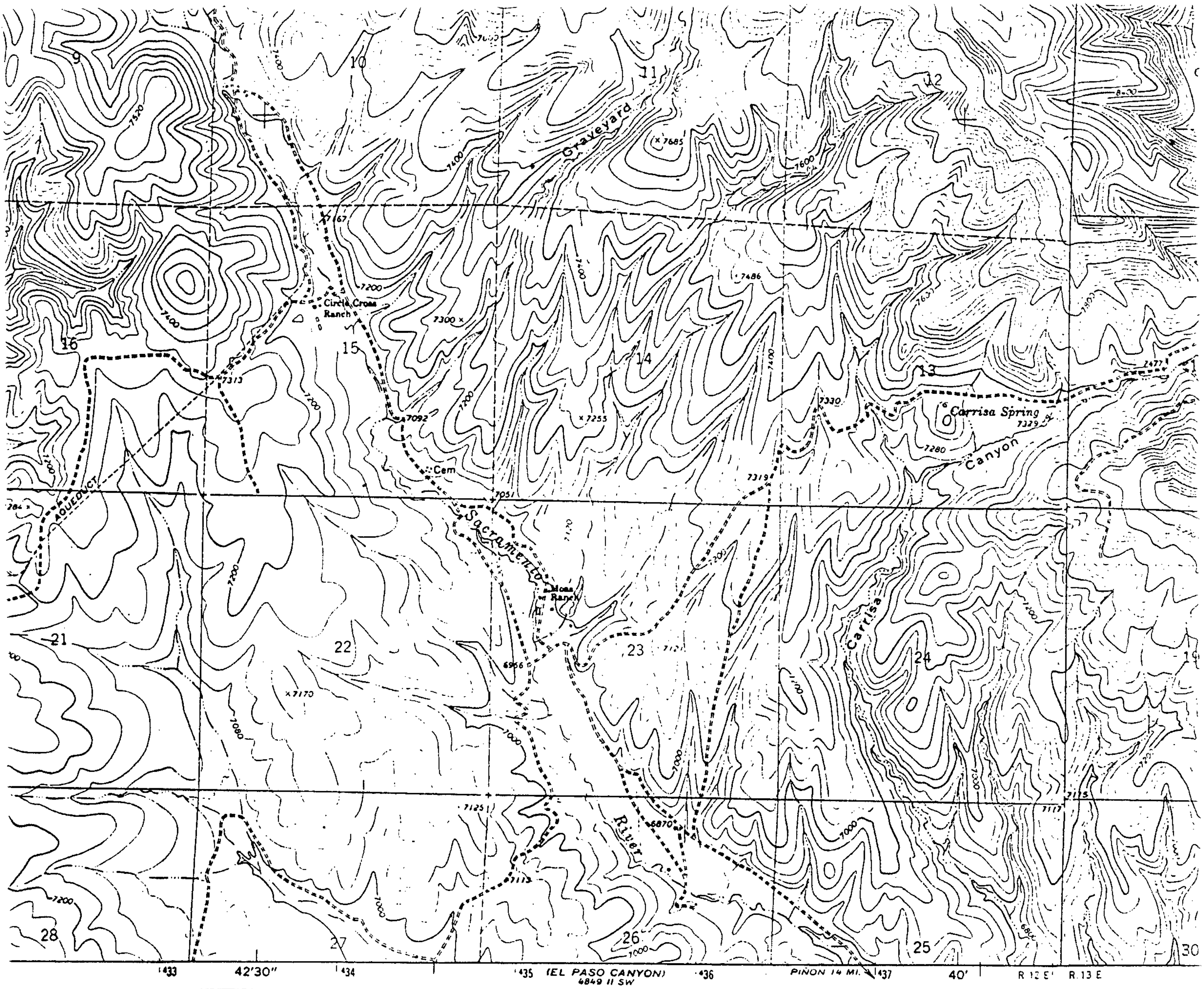
Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	---
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	---
Pediment	P
Playa	P1
Playa Lunette	P1L

[1]See text for explanation

THIS M
FOR SALE BY U. S. GEOLO
A FOLDER DESCR



lcGregor Range Geomorphic Mapping Units and Symbols[1]	
um (recent)	A1
um (relict)	A2
um (older relict)	A3
ck	B
Floor Complex	---
Rice (Rio Grande) Sediments	CR
Local	DL
Pile	DP
Sheet	DS
Sheet, Coppiced	DSC
Sheet, Gypsiferous	DSG
	---
ent	P
	PI
Lunette	PIL
xt for explanation	

SCALE 1:24 000

1 ½ 0 1 MILE

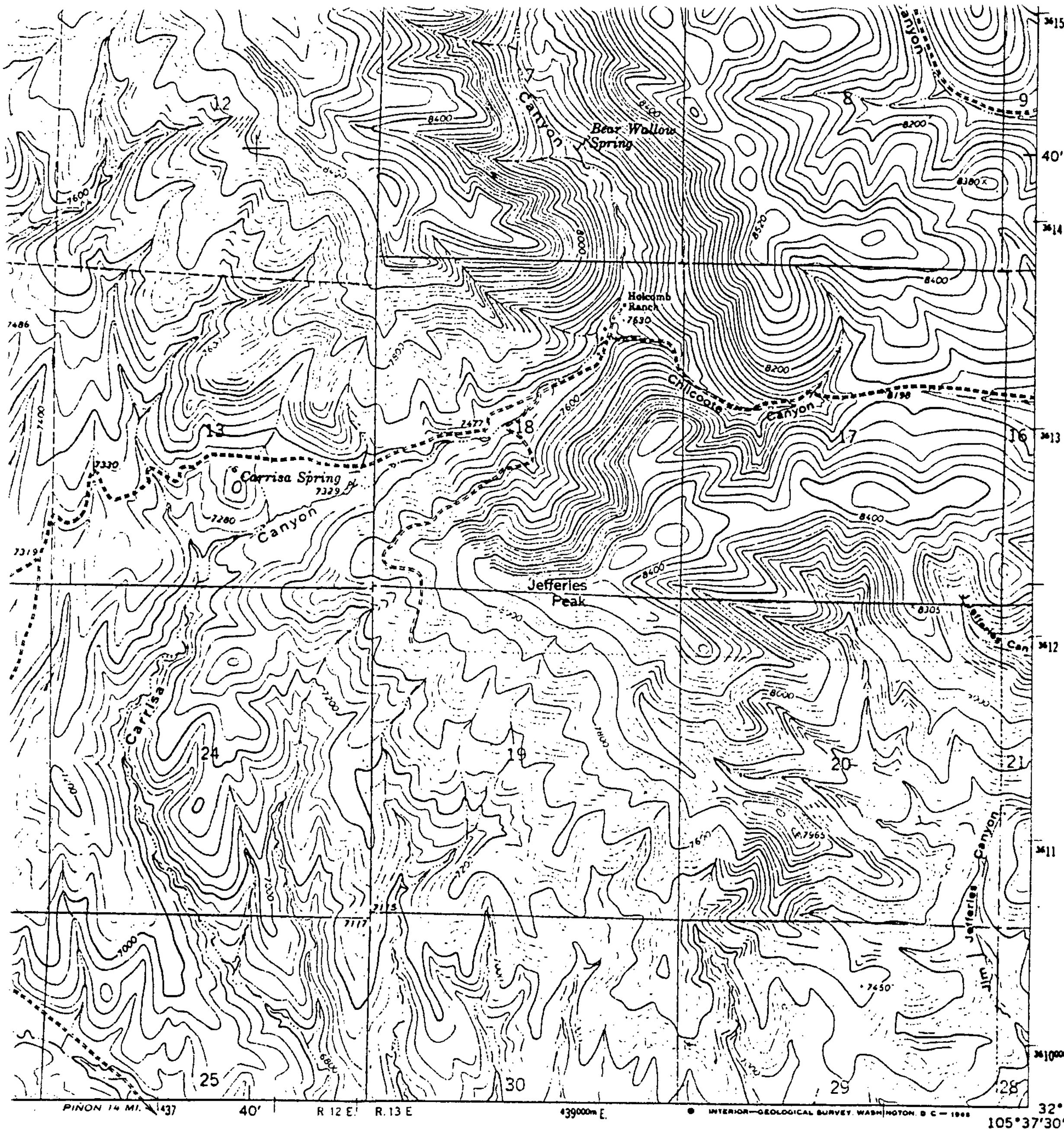
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

NEW MEXICO
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



4849 II SE (SURVEYORS CANYON)

1 MILE

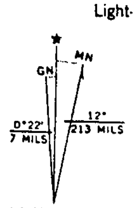
6000 7000 FEET

1 KILOMETER

ROAD CLASSIFICATION

Light-duty ——— Unimproved dirt - - - - -

QUADRANGLE LOCATION



UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NDARDS
R WASHINGTON, D. C. 20242
ABLE ON REQUEST

ROGERS RUINS, N. MEX.

N3237.5—W10537.5/7.5

1965

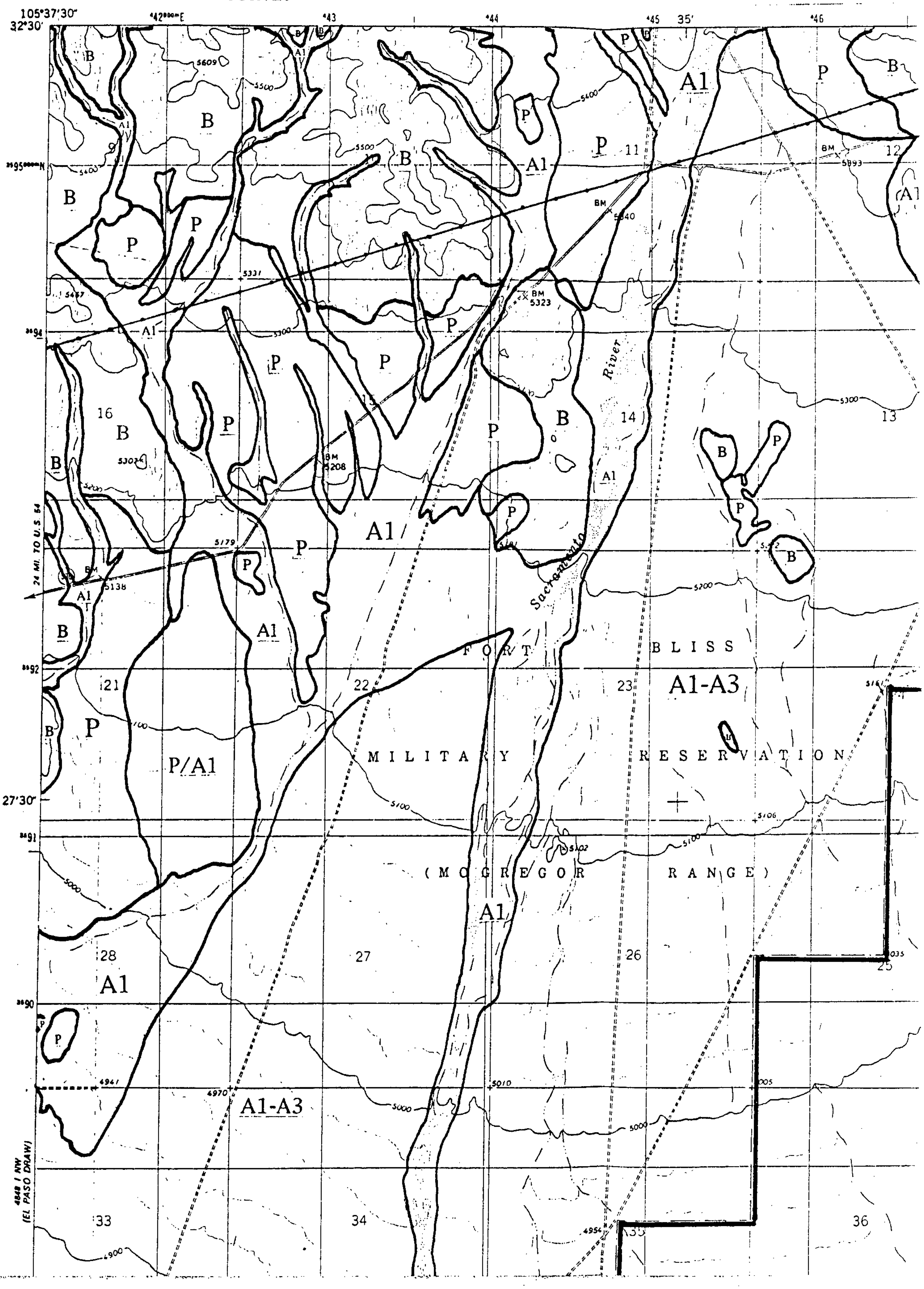
AMS 4849 II NW—SERIES V881

26

9

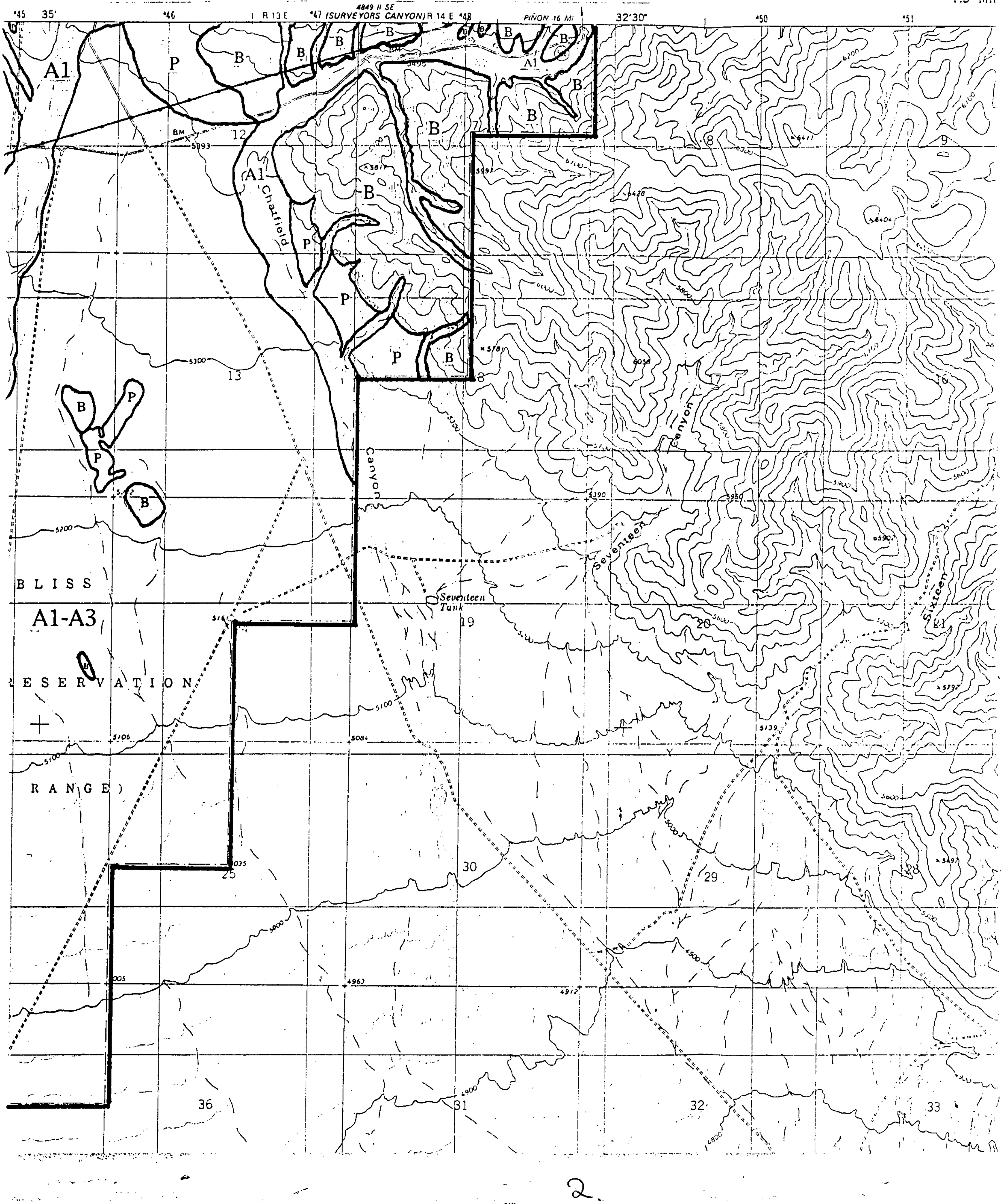
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Ge
Study of McGreg
Donald L. J



Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



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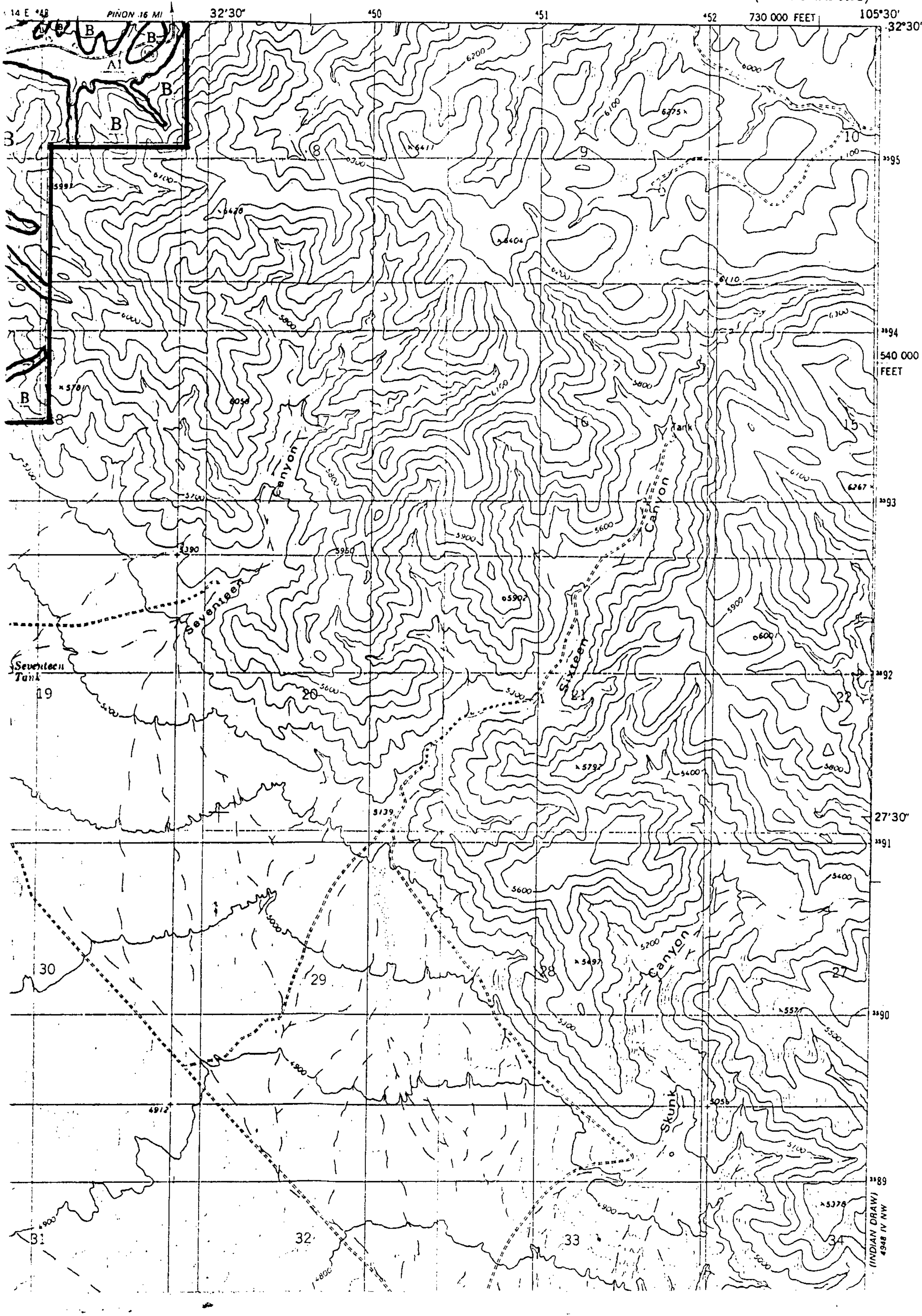
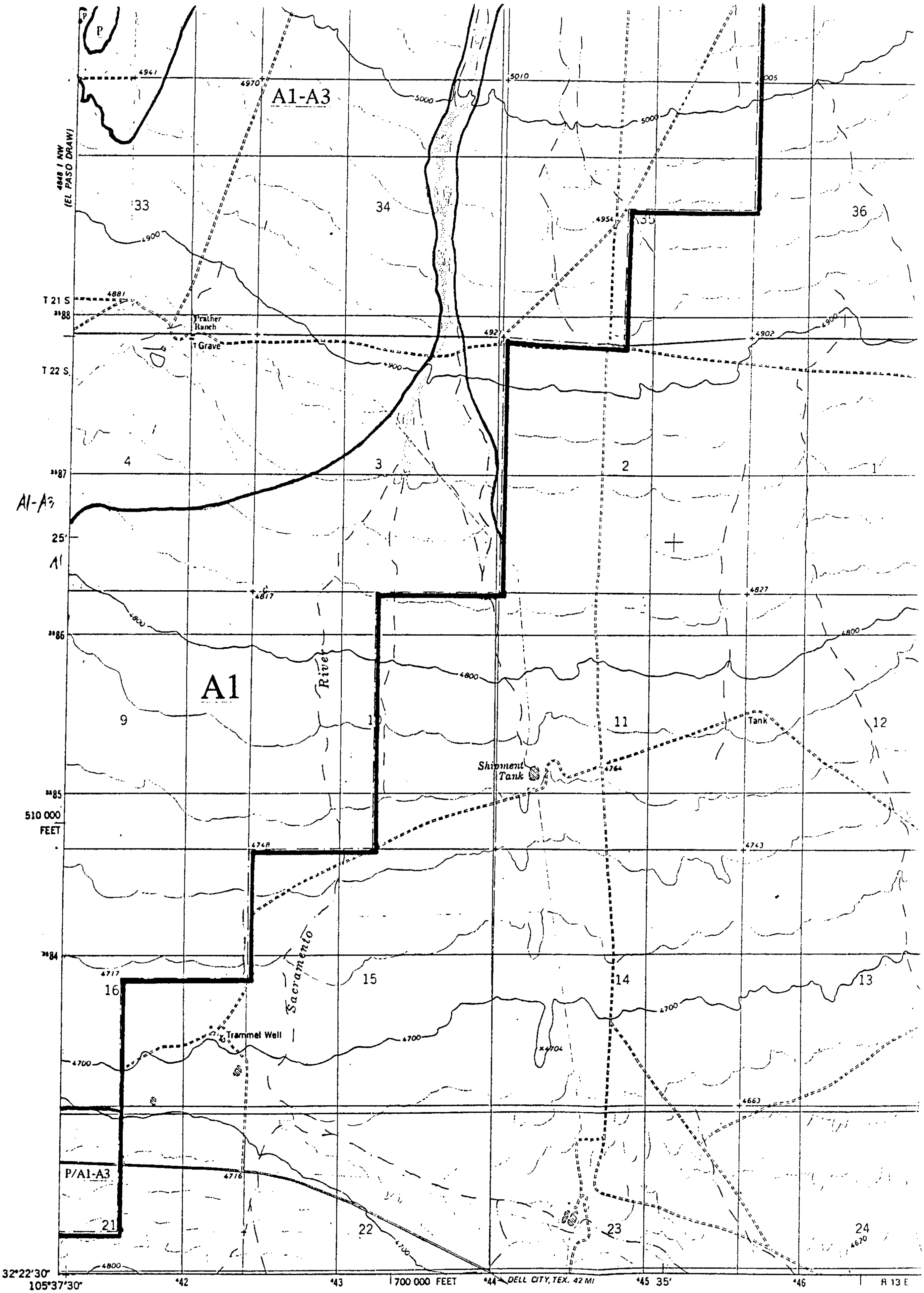
logical and Surficial Mapping
:e, Fort Bliss, New Mexico
\CA63-93-D-0014, 1997

SIXTEEN CANYON QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)





(STONE WELL) 4848 I SW

Mapped, edited, and published by the Geological Survey

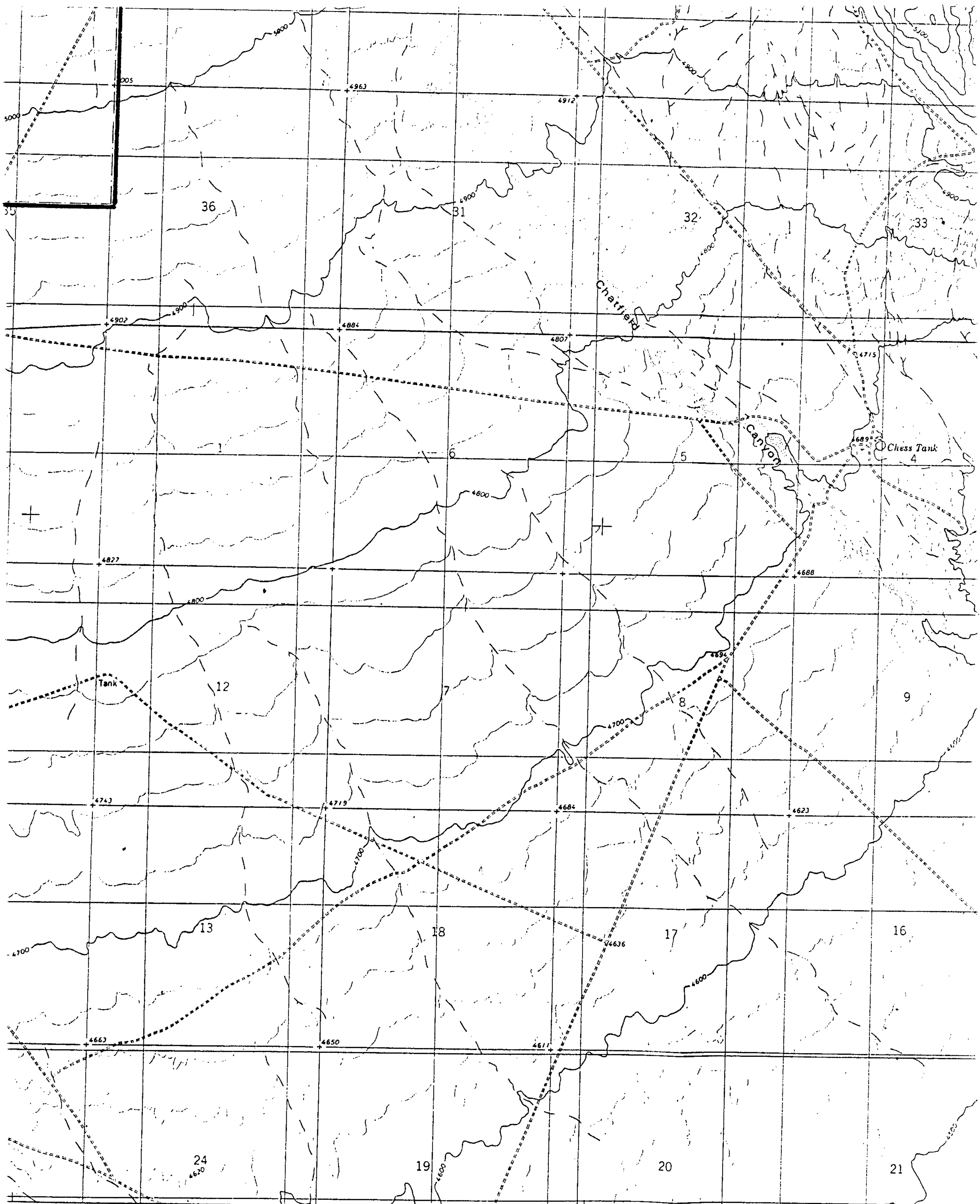
Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)

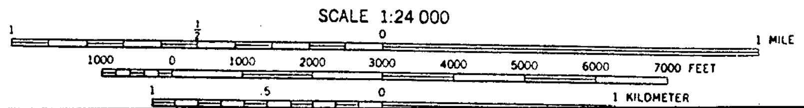
McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B

4



5.

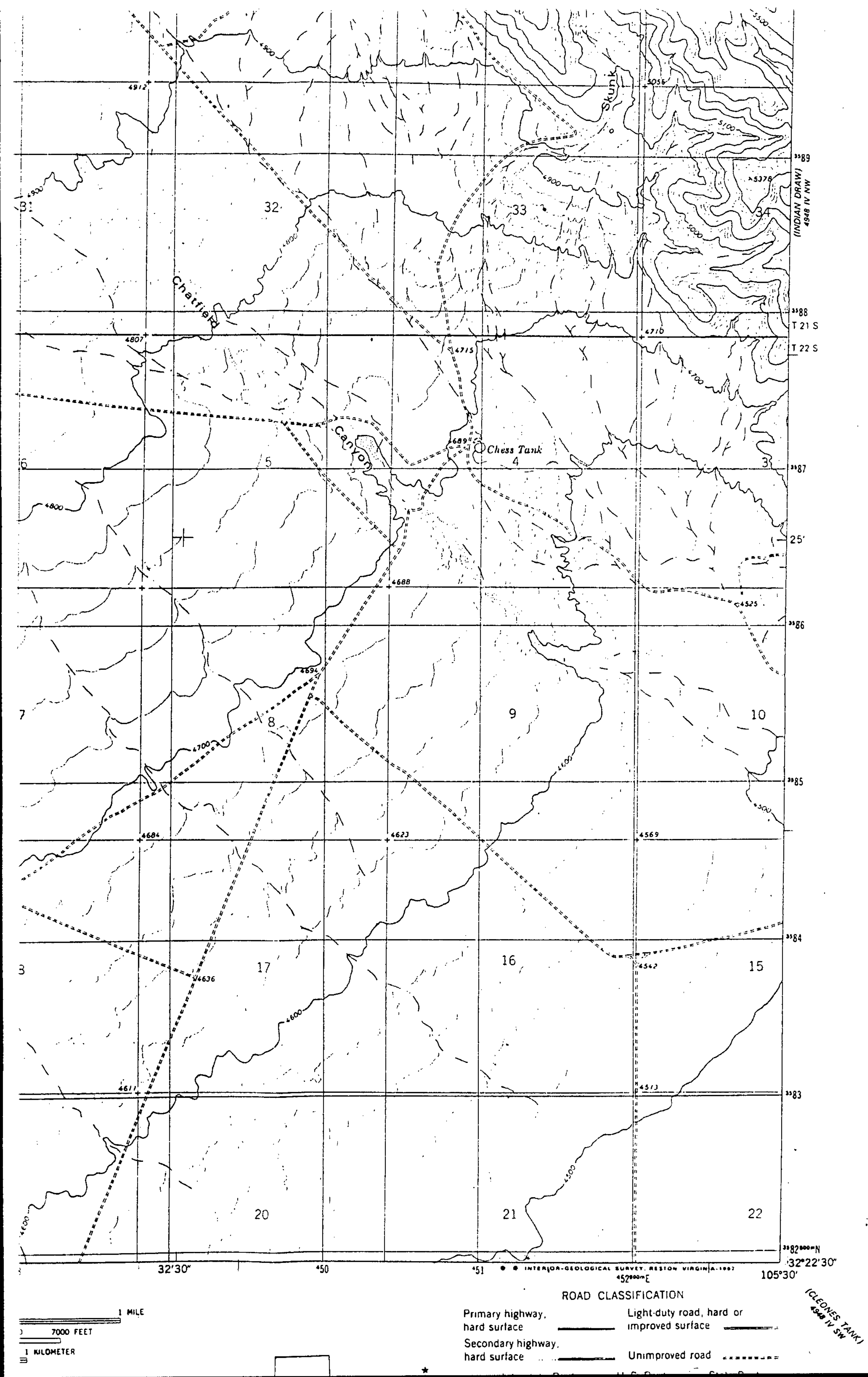
SCALE 1:24 000



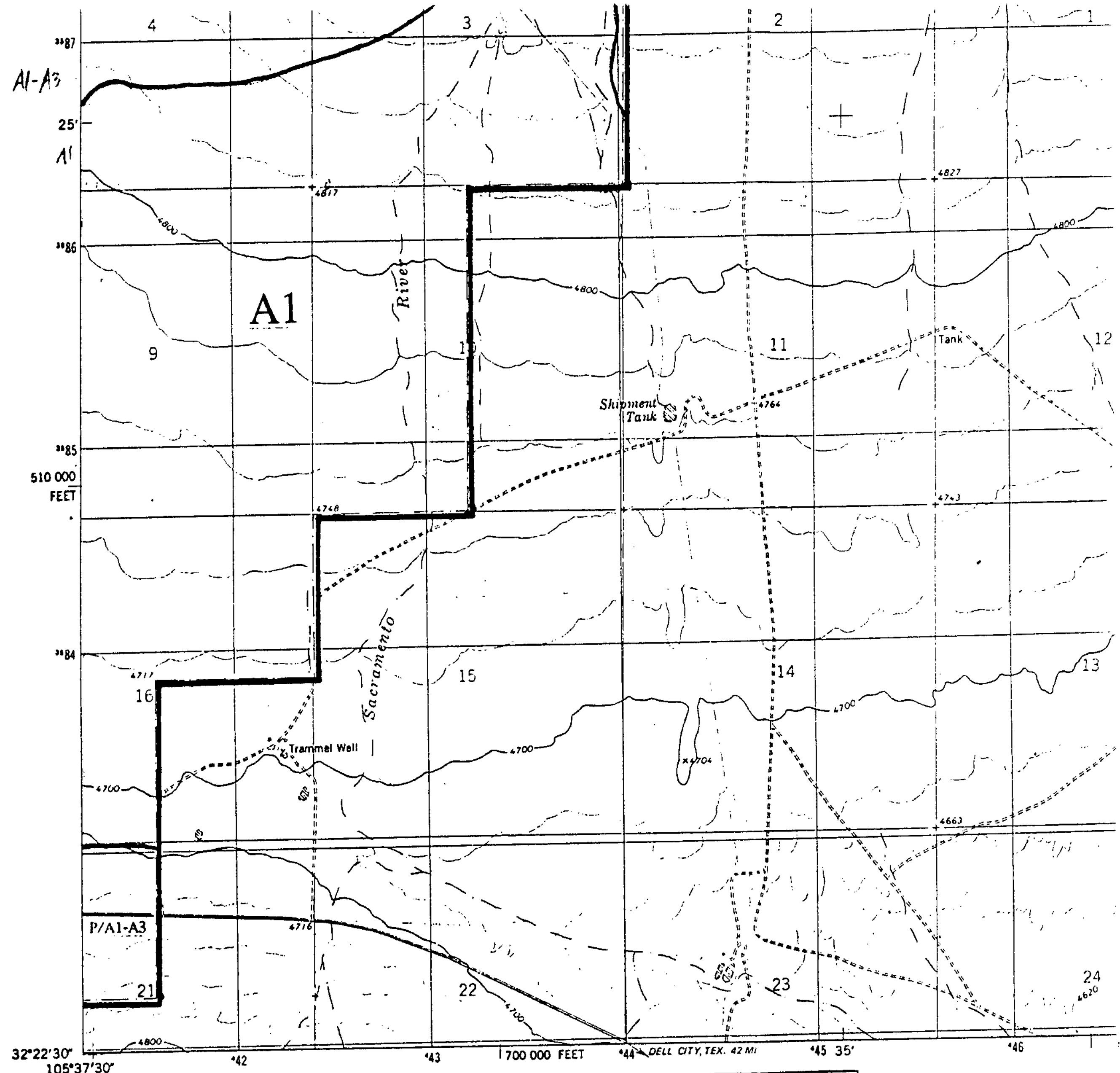
ROAD (

Primary highway, hard surface

Secondary highway,


Skunk
Chatfield
Canyon
Chess Tank
(INDIAN DRAW) 4948 IV NW
(CLEONES TANK) 4948 IV SW
T 21 S
T 22 S
25'
32'30"
32°22'30"
105°30'
450
451
452000mE
3582000mN
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1967
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
1 MILE
7000 FEET
1 KILOMETER

6.



(STONE WELL) 4846 I SW

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American Datum
The difference between 1927 North American Datum and North American Datum of 1983 (NAD 83) for 7.5 minute intersections is given in USGS Bulletin 1875. The NAD 83 is shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

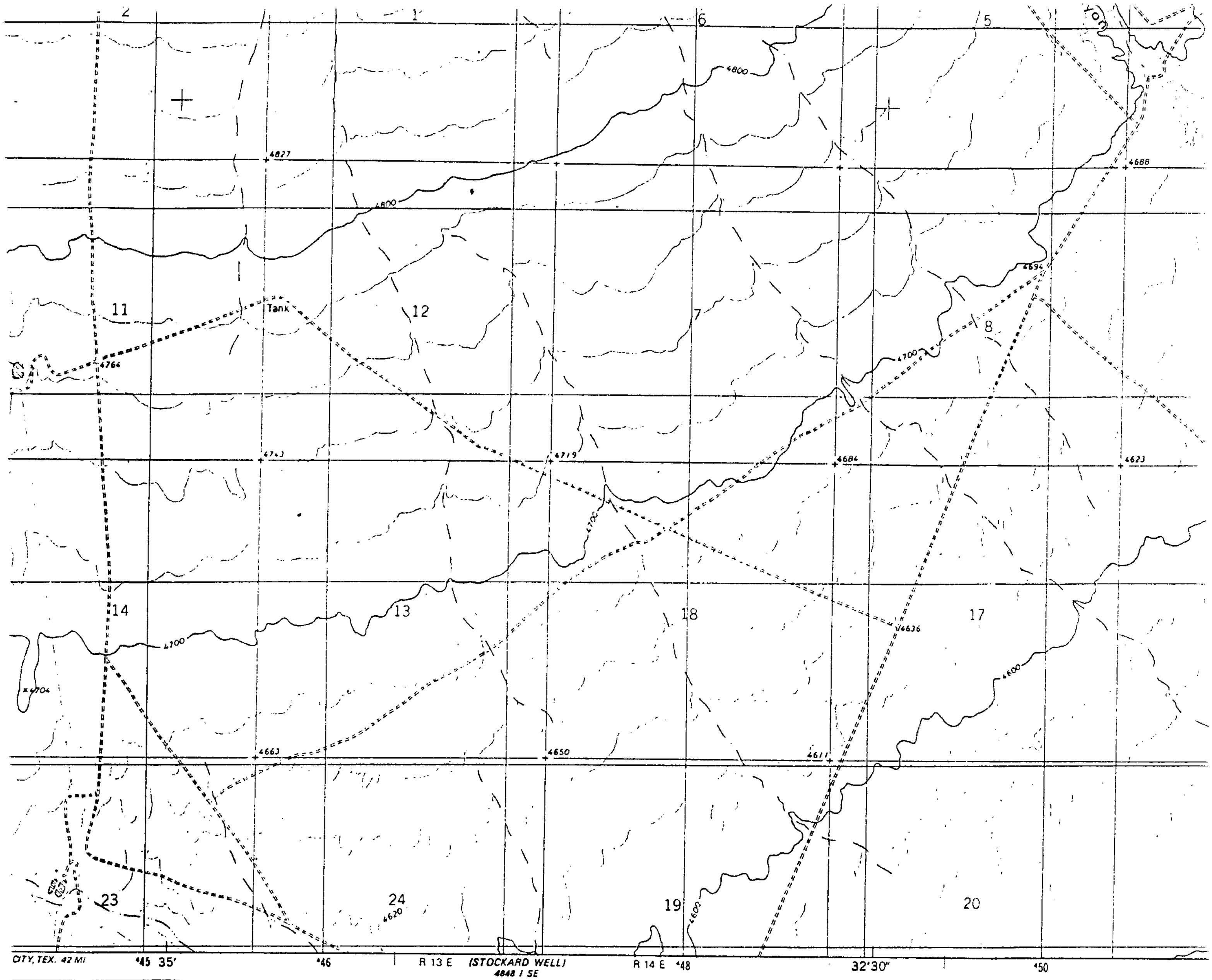
[1]See text for explanation

NATION

THIS MAP COM

FOR SALE BY U. S. GEOLOGICAL

A FOLDER DESCRIBING TO



ange Geomorphic
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	A1
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	B
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ınde) Sediments	CR
	DL
	DP
heet)	DS
ed	DSC
siferous	DSG
	P
	P1
	P1L
ition	

SCALE 1:24 000

1 ½ 0 1 MILE

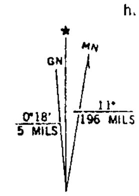
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC
DECLINATION AT CENTER OF S

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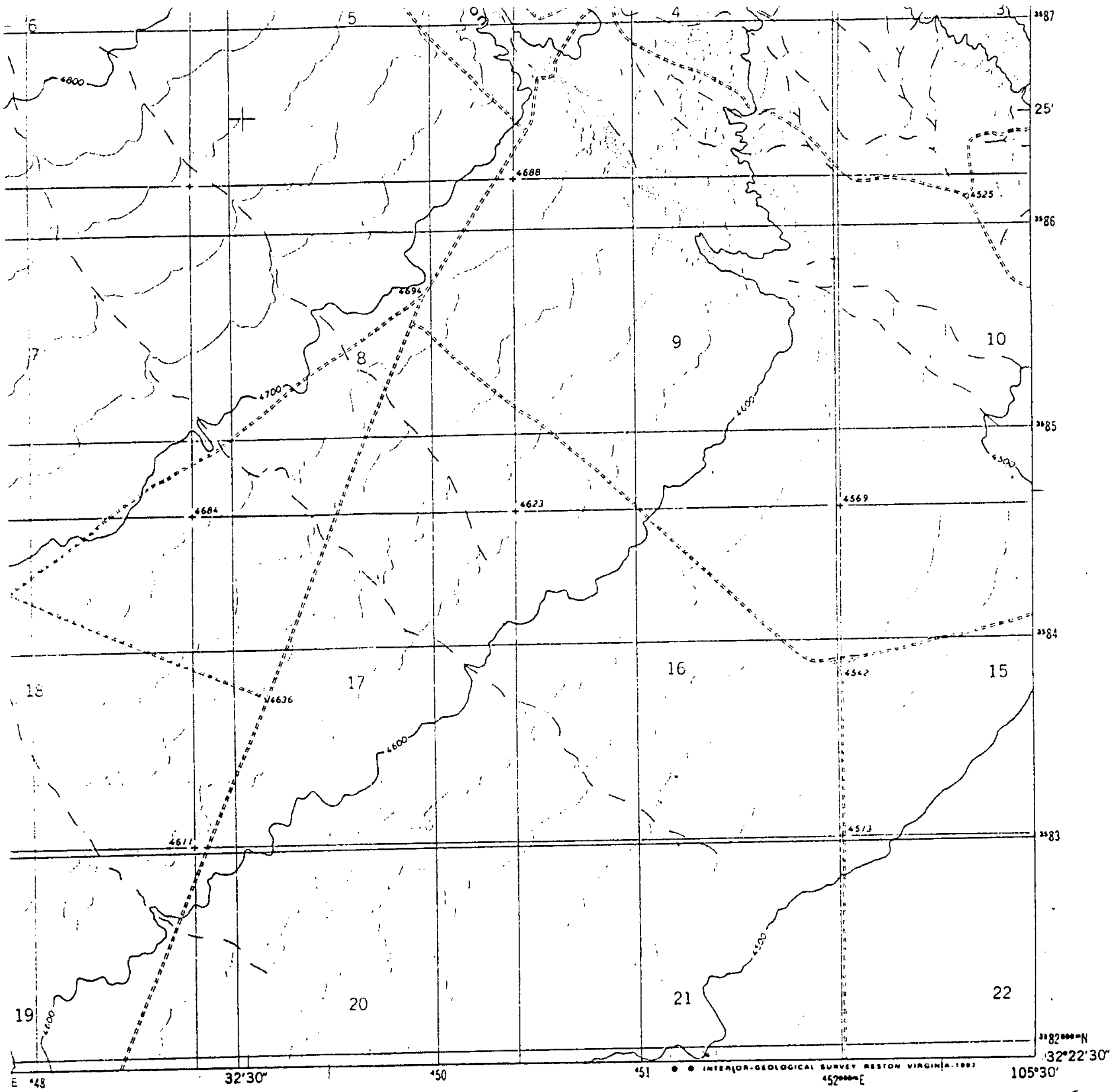
8



(CLEONES TANK)
4948 IV SW

ROAD CLASSIFICATION

Primary highway, hard surface — Light-duty road, hard or improved surface

Secondary highway, hard surface — Unimproved road

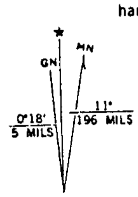
Interstate Route — U. S. Route — State Route

1 MILE

6000 7000 FEET

1 KILOMETER

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SIXTEEN CANYON, N. MEX.

32105-D5-TF-024

1980

DMA 4848 I NE-SERIES V881

-IDARDS
-JR RESTON, VIRGINIA 22092
-ABLE ON REQUEST

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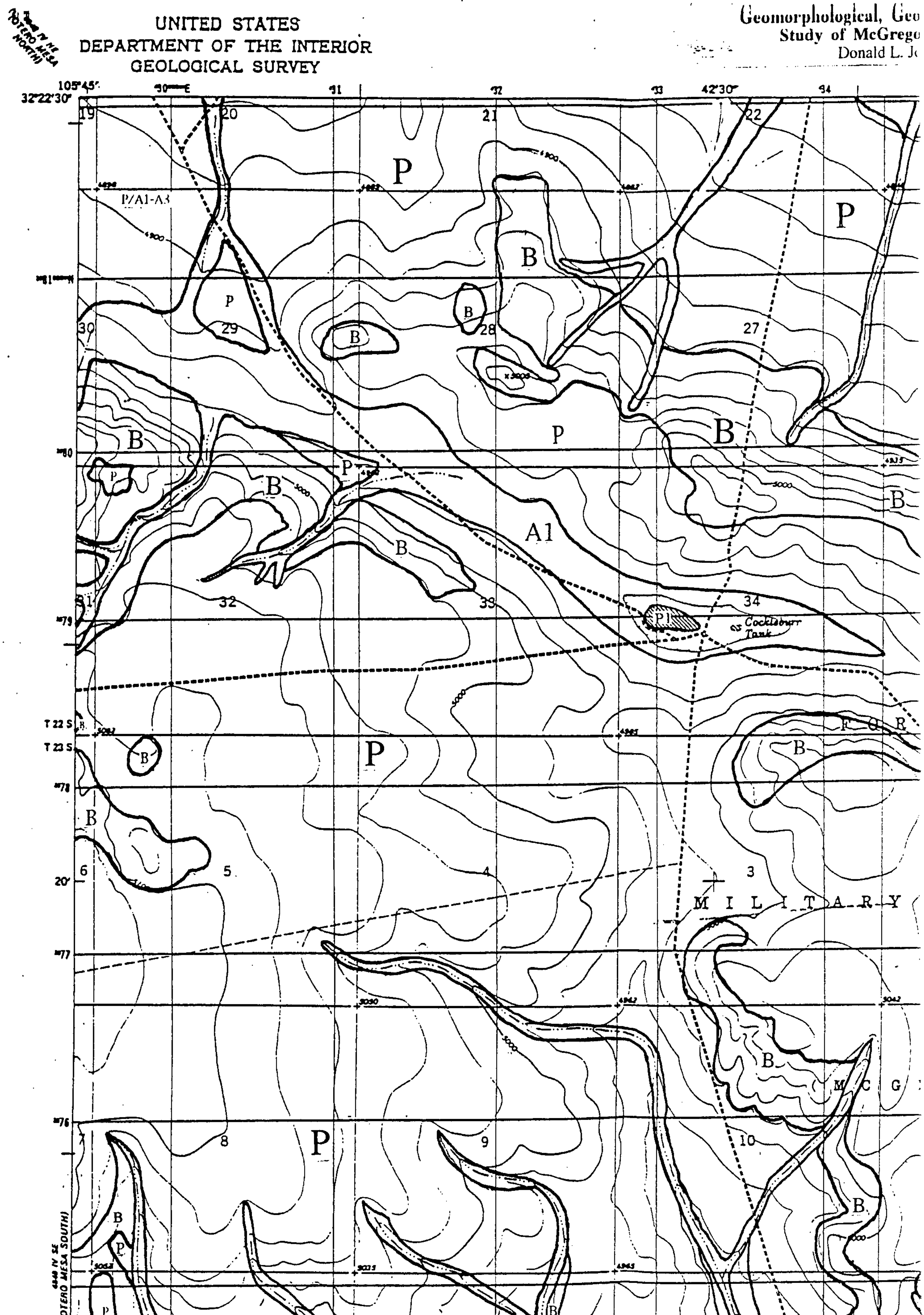
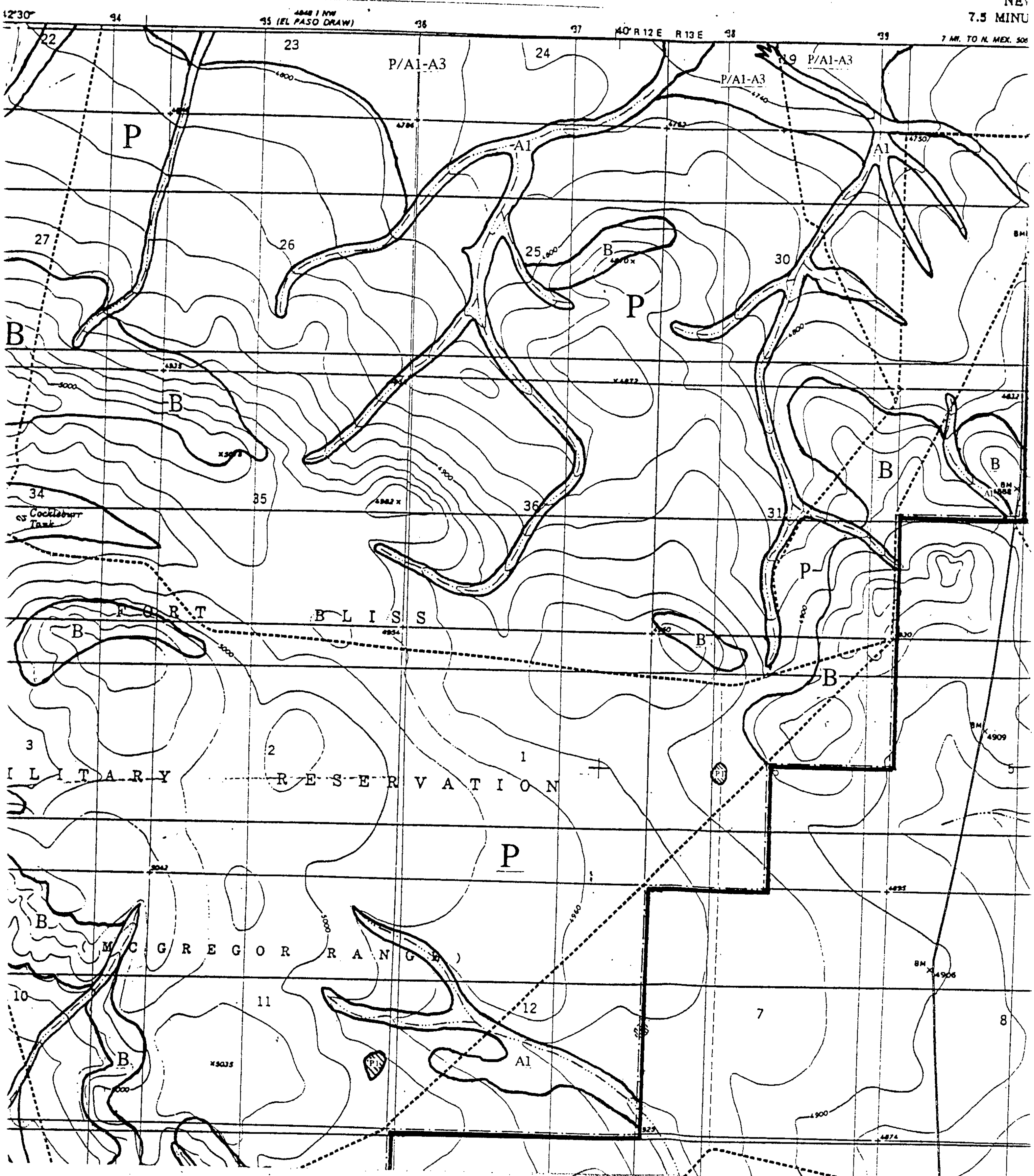

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
105°45'
32°22'30"
42'30"
P/A1-A3
P
B
A1
P1
Cocklebur Tank
T 22 S
T 23 S
20'
M I L I T A R Y
F O R
M C G
(OTERO MESA SOUTH)

1

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



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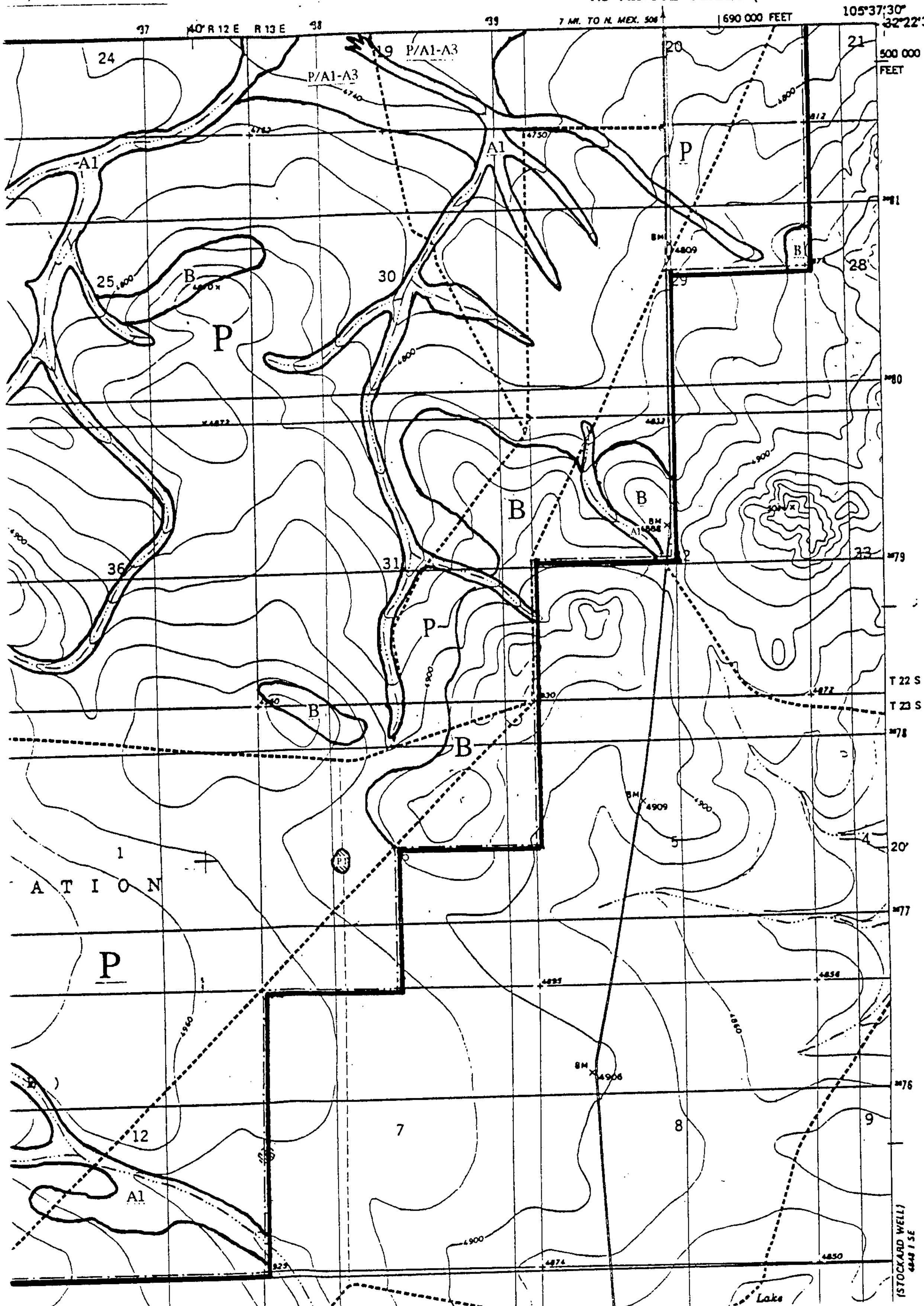
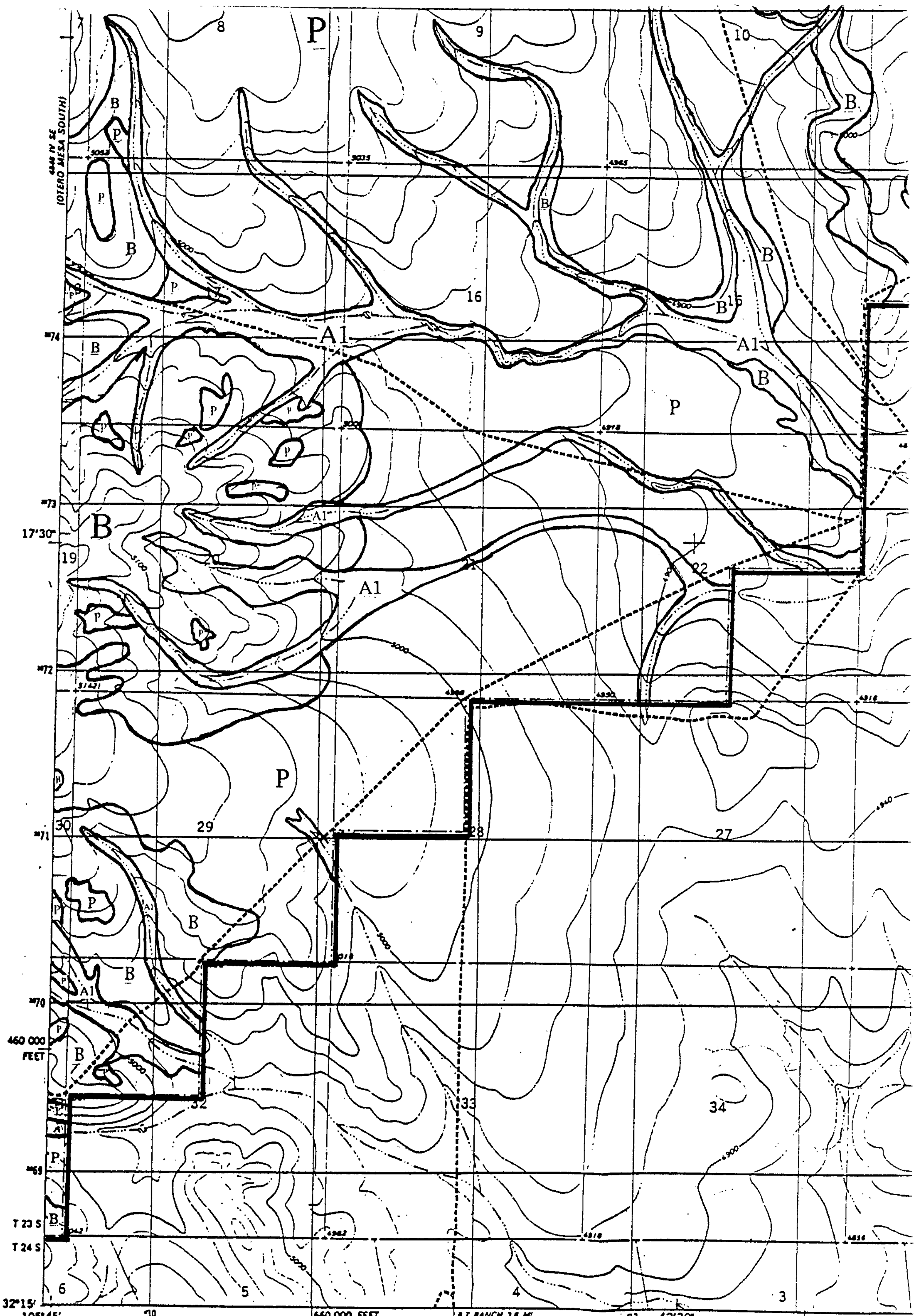
l Surficial Mapping
iss, New Mexico
014, 1997

STONE WELL QUADRANGLE
NEW MEXICO—OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



3,



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Mapped, edited, and published by the Geological Survey

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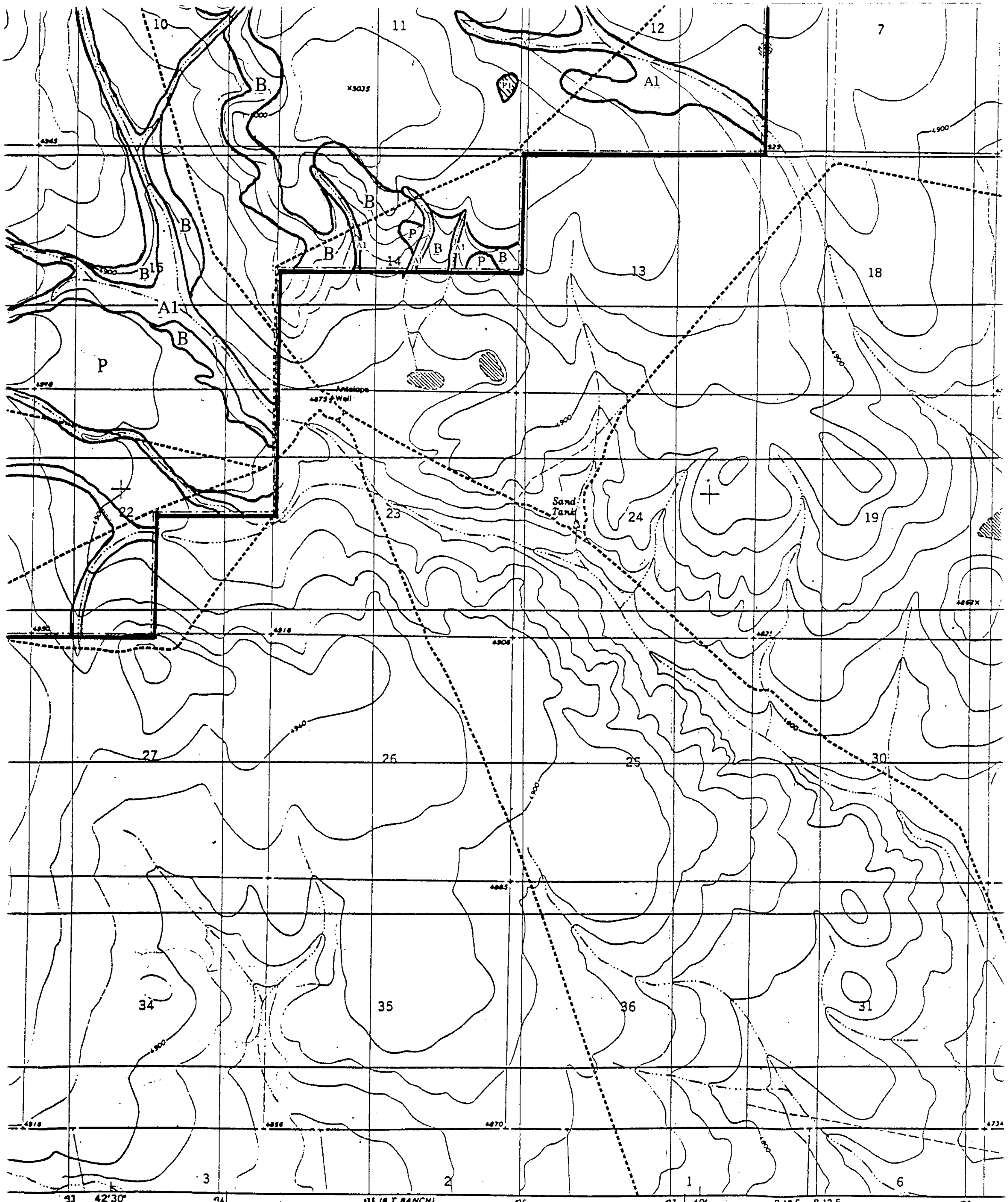
Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••



ge Geomorphic
; and Symbols[1]

AI
A2
A3
B

.)

ie) Sediments CR

SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

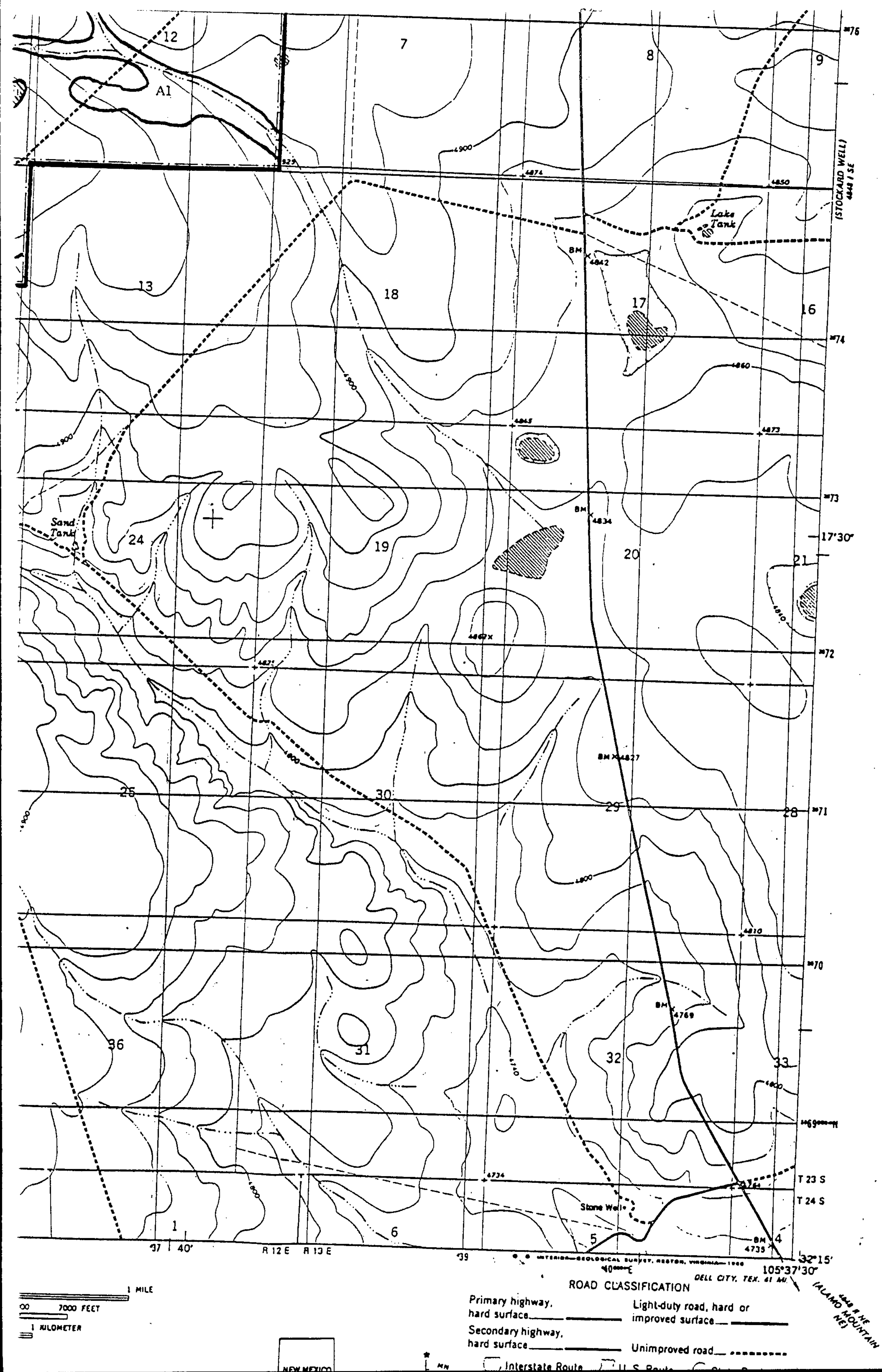
1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

5,

NEW MEXICO

Primar
hard su
Second
hard su


12
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A1
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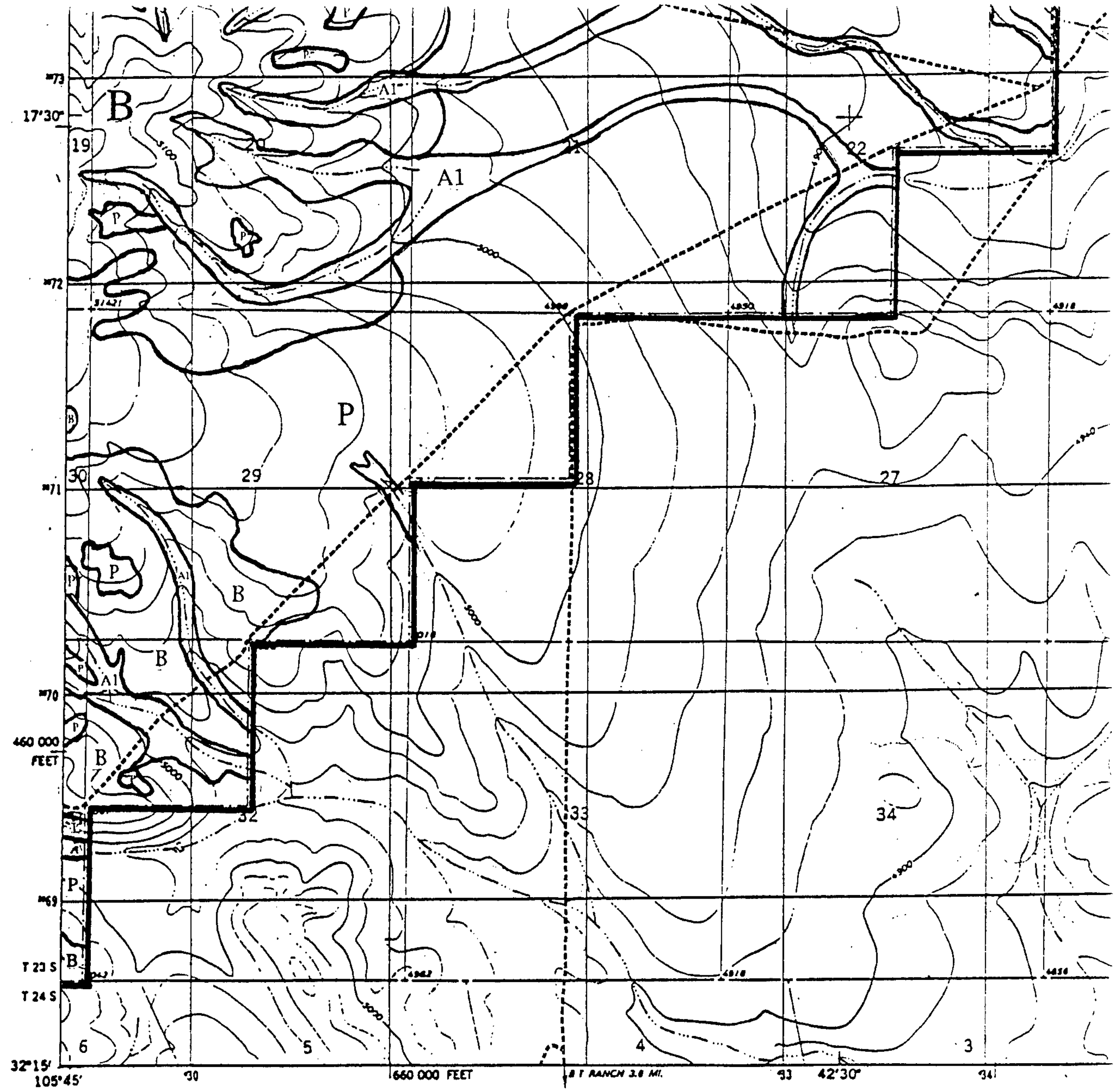
32
33
1
6
5
4
Lake Tank
Sand Tank
Stone Well
BM 4842
BM 4834
BM 4827
BM 4769
BM 4735
4900
4874
4850
4860
4845
4873
4867
4810
4734
4800
76
74
73
72
71
70
69
17'30"
32°15'
105°37'30"
T 23 S
T 24 S
R 12 E
R 13 E
40'
(STOCKARD WELL)
DELL CITY, TEX. 41 MI.
(ALAMO MOUNTAIN NE)
ROAD CLASSIFICATION
Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
1 MILE
7000 FEET
1 KILOMETER
NEW MEXICO

6.



(OWL TANK CANYON EAST)

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 7 meters north and 49 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

NATIO

THIS MAP CO

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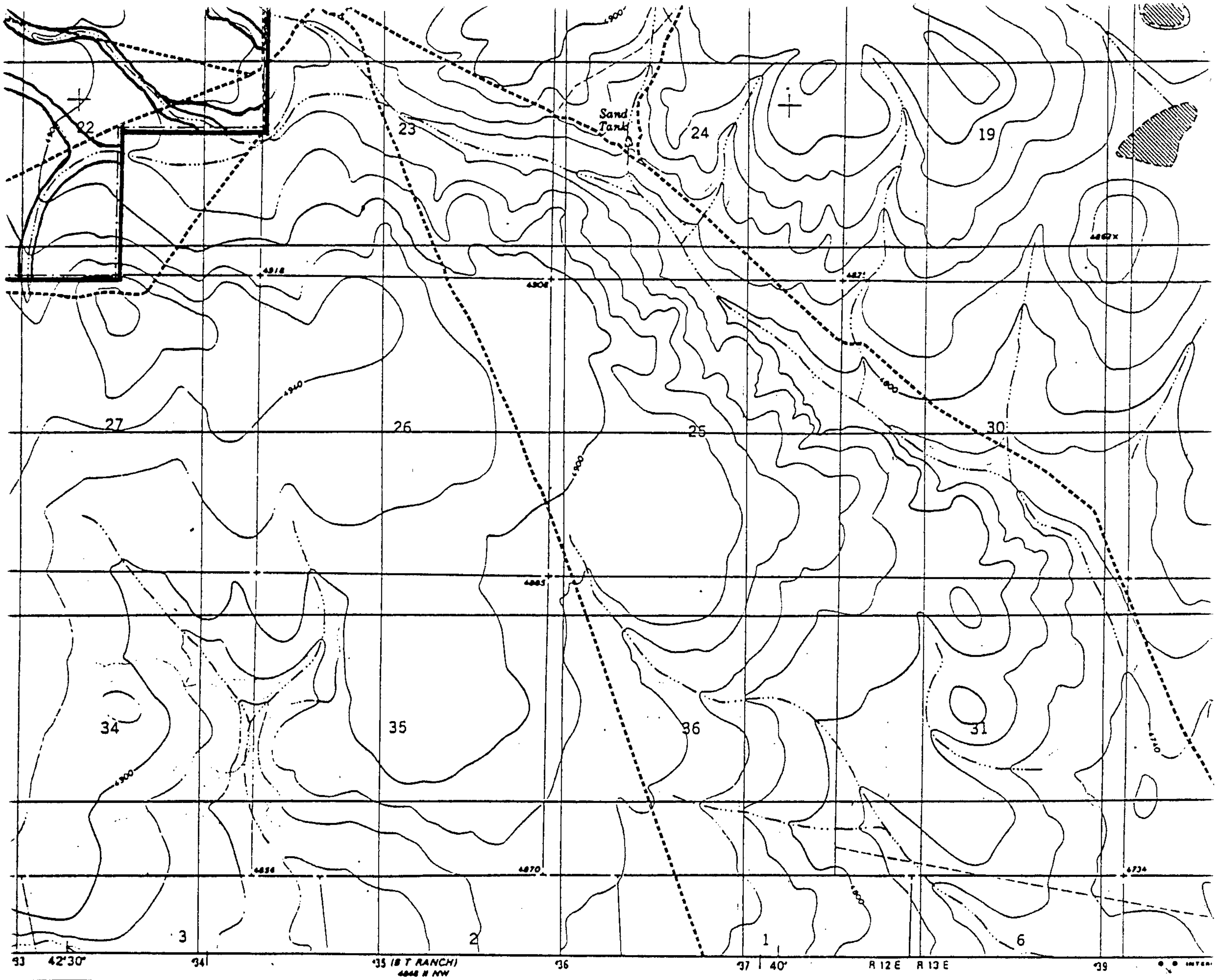
A FOLDER DESCRIBING TO

7



orphic
nbols[1]
A1
A2
A3
B
its CR•••
DL
DP
DS
DSC
DSG
P
PI
PIL

SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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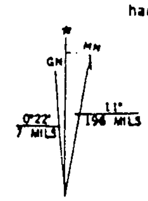
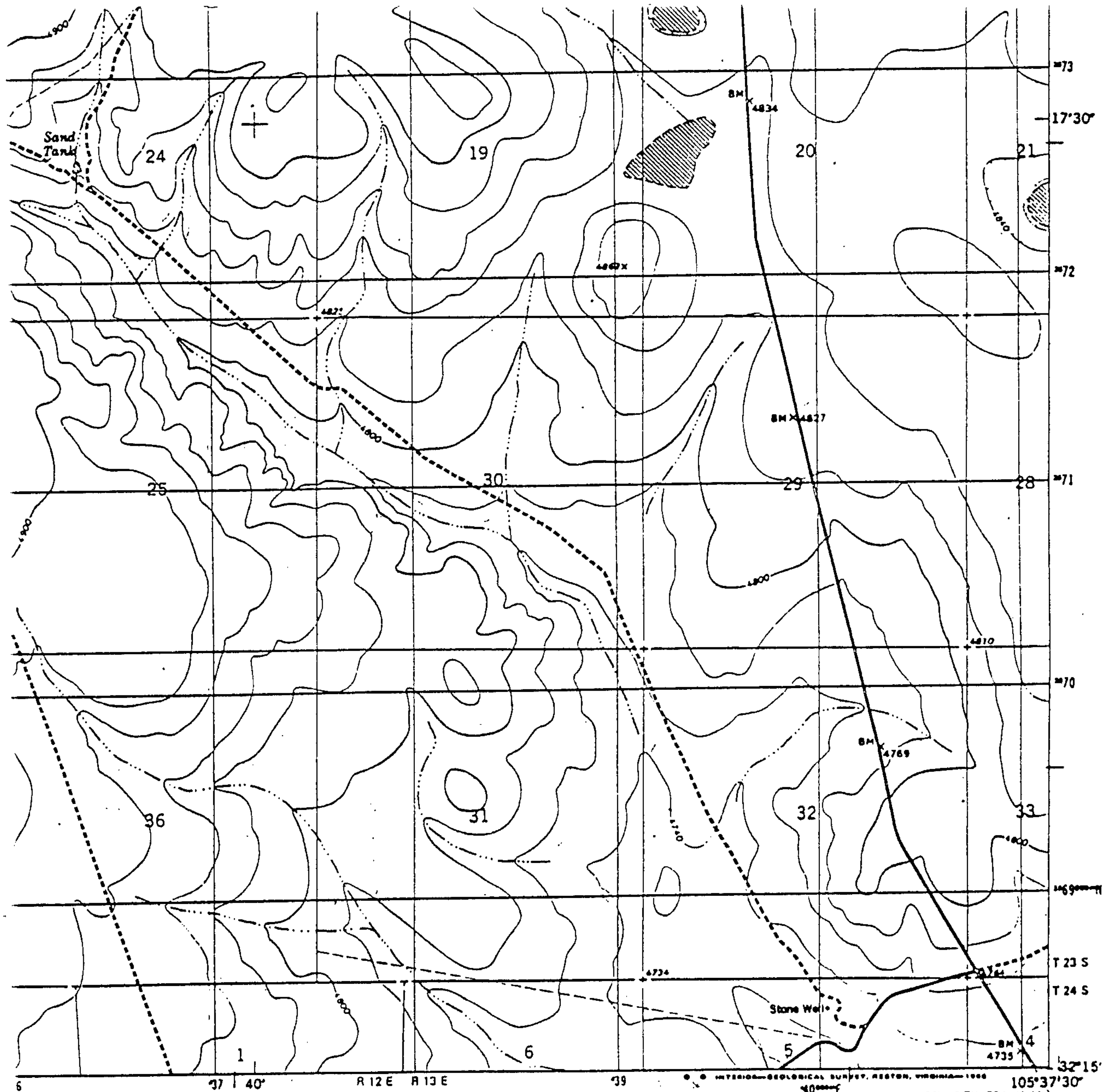
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

Primary highway, hard surface
Secondary highway hard surface
Interstate



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

1 MILE

6000 7000 FEET

1 KILOMETER

NEW MEXICO

QUADRANGLE LOCATION

GN MN 0°22′ 7 MILS 11° 196 MILS

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

STONE WELL, N. MEX.
N3215—W10537.5/7.5

1980

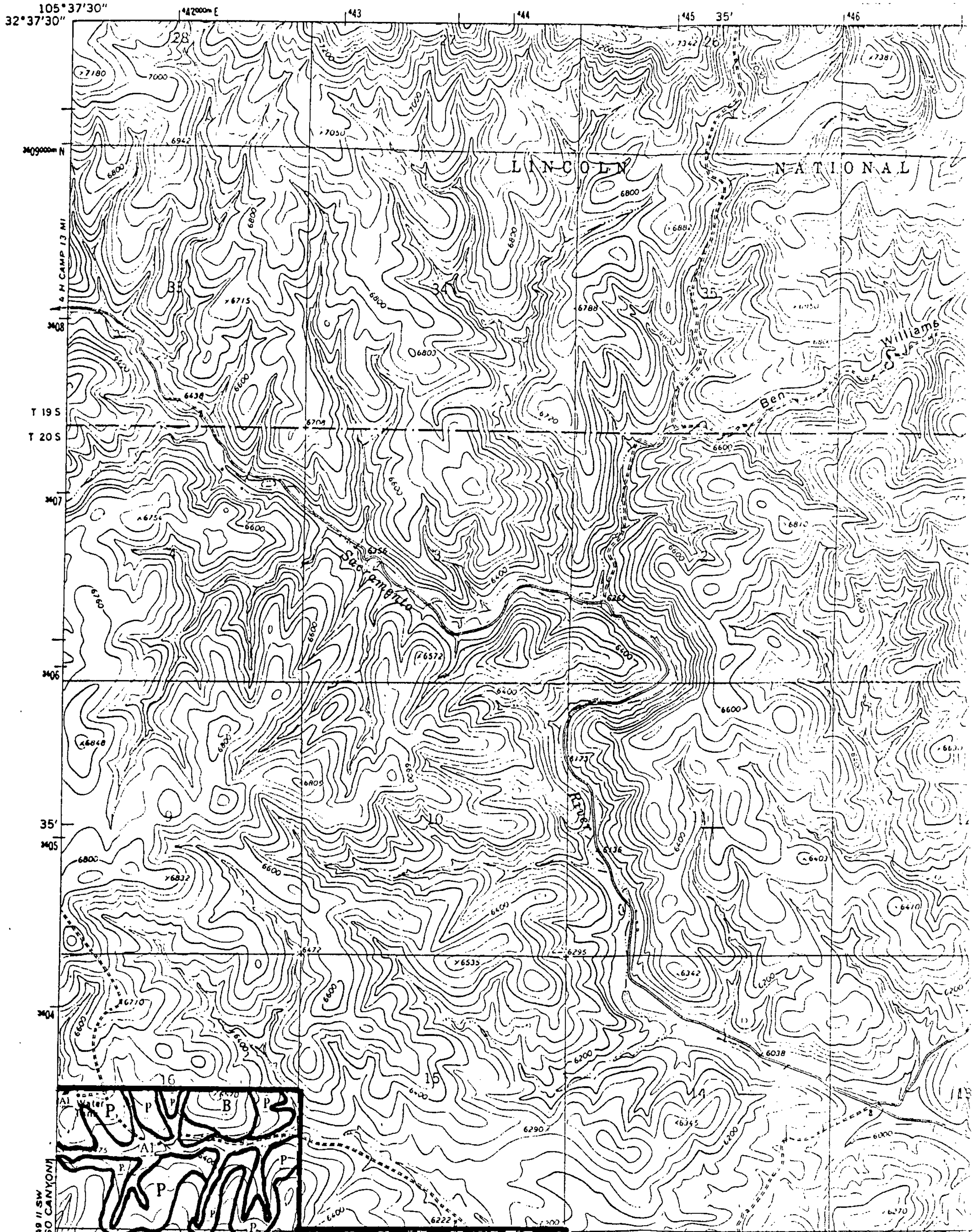
DMA 4848 I SW—SERIES V881

OARDS
R RESTON, VIRGINIA 22092
ABLE ON REQUEST

w

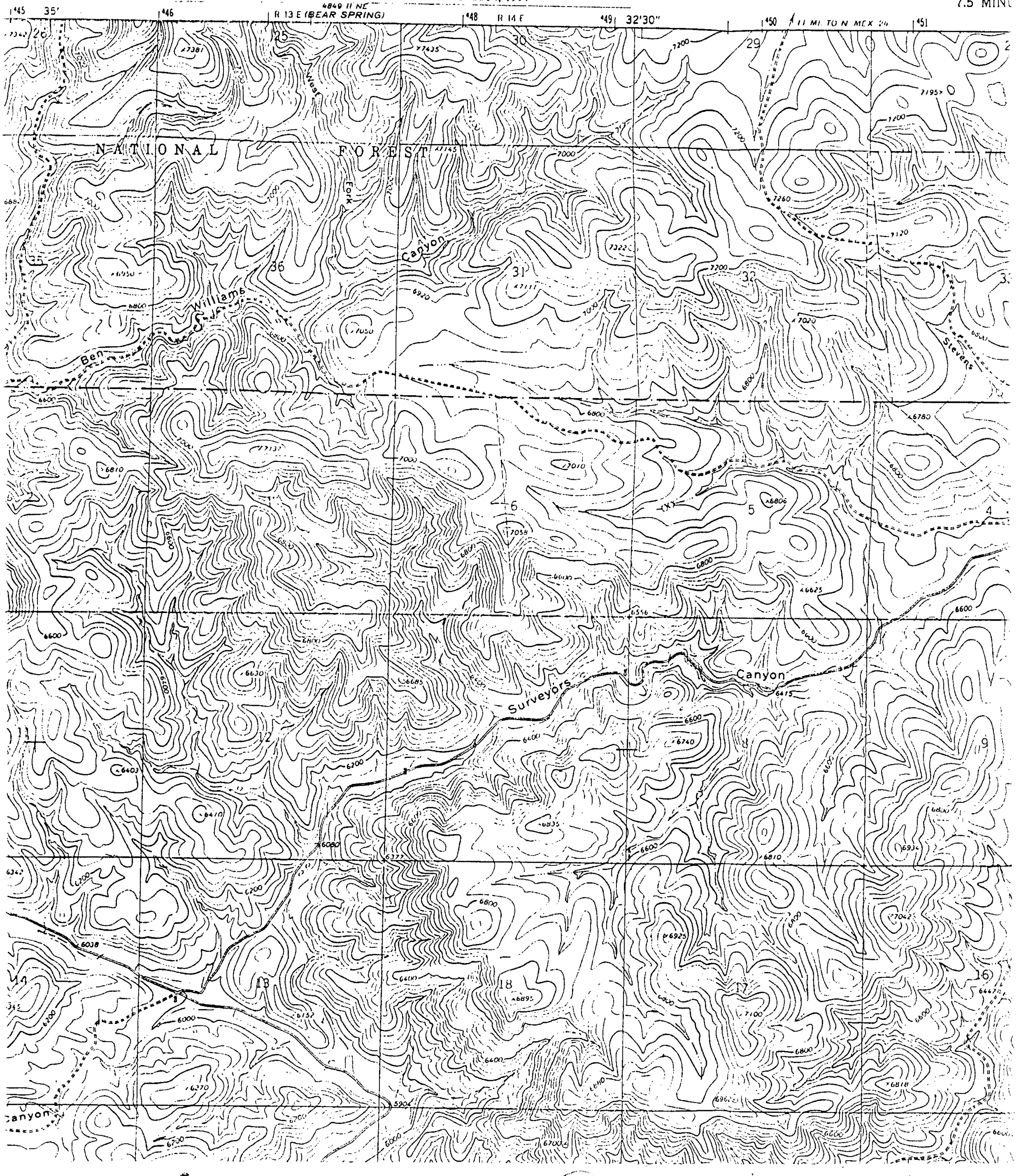
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoecolo
Study of McGregor Gu
Donald L. Johnson



Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

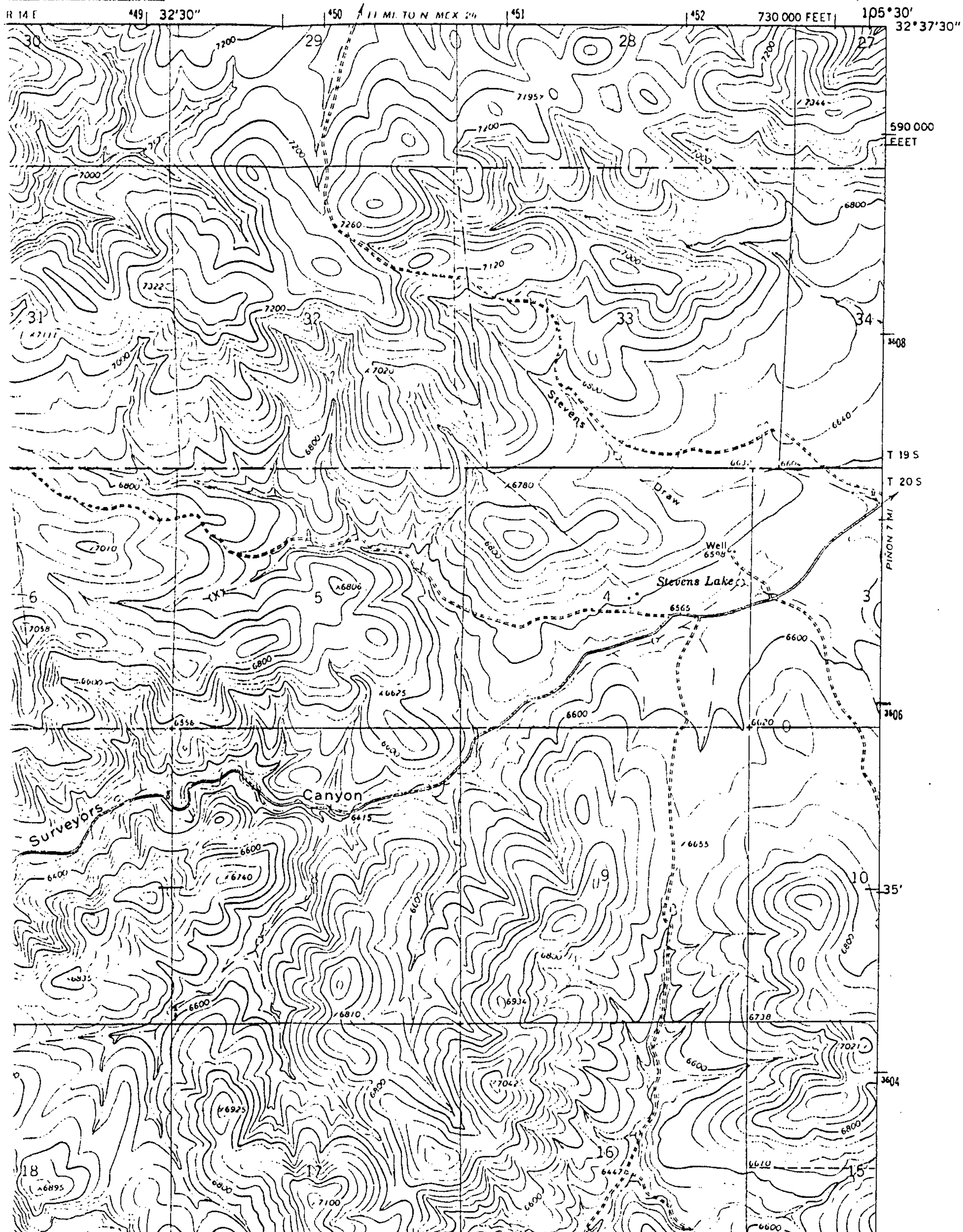
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997



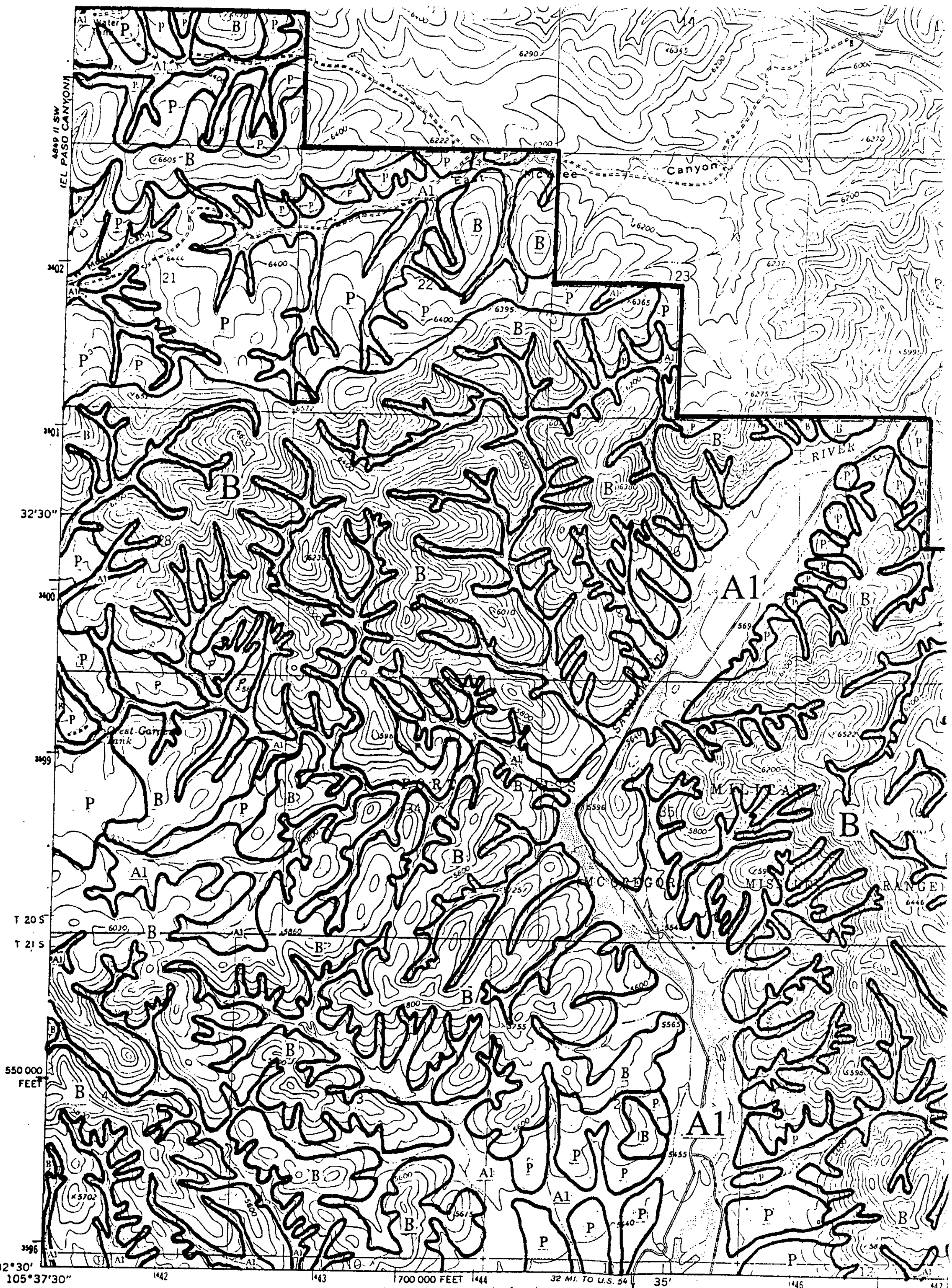
urficial Mapping
New Mexico
, 1997

SURVEYORS CANYON QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

4949 III NW (AVIS)



3,



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

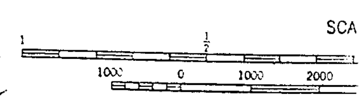
Topography by photogrammetric methods from aerial photographs taken 1964. Field checked 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

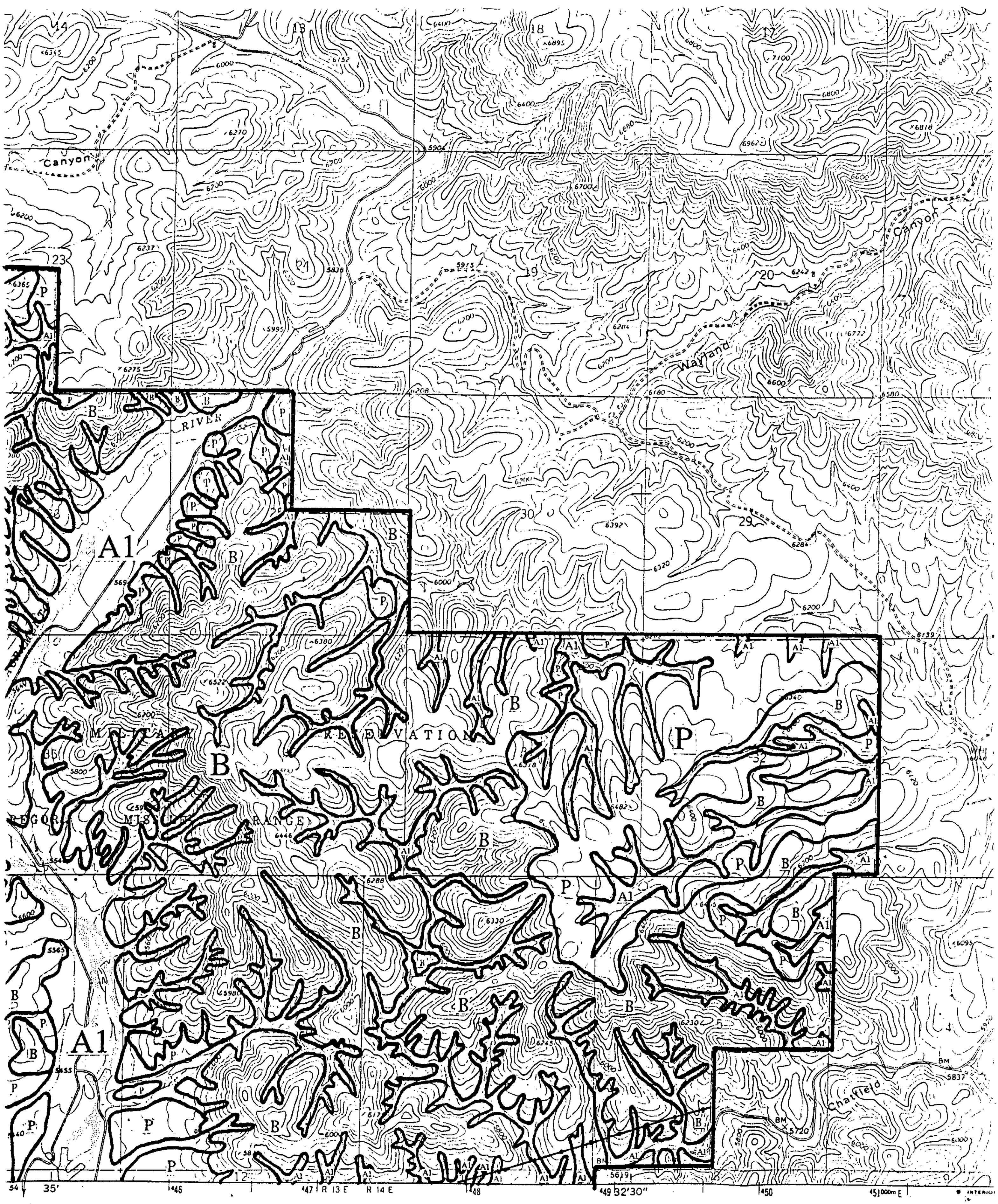
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL

4



CONTOUR I
NATIONAL GEODETIC



SCALE 1:24 000

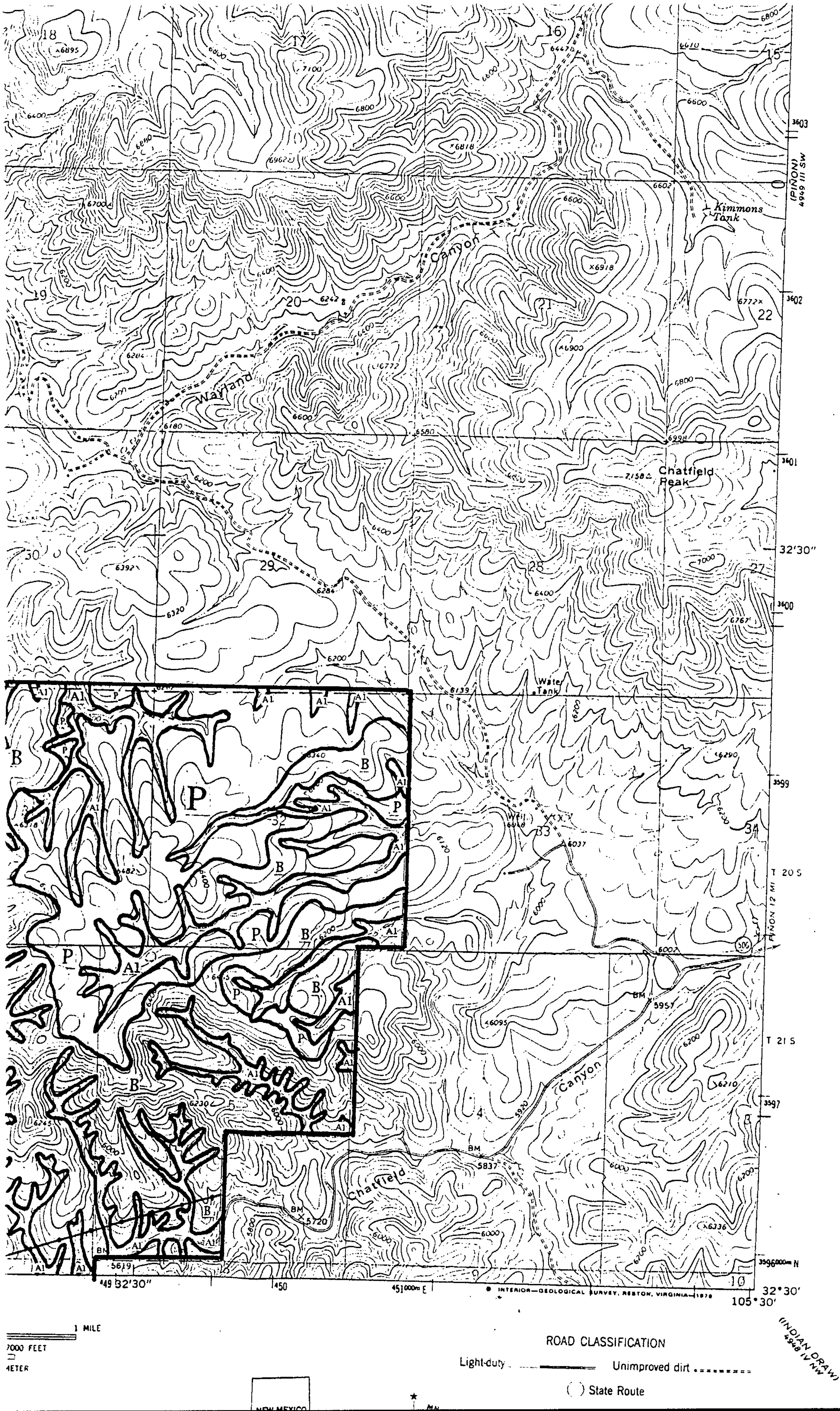
1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

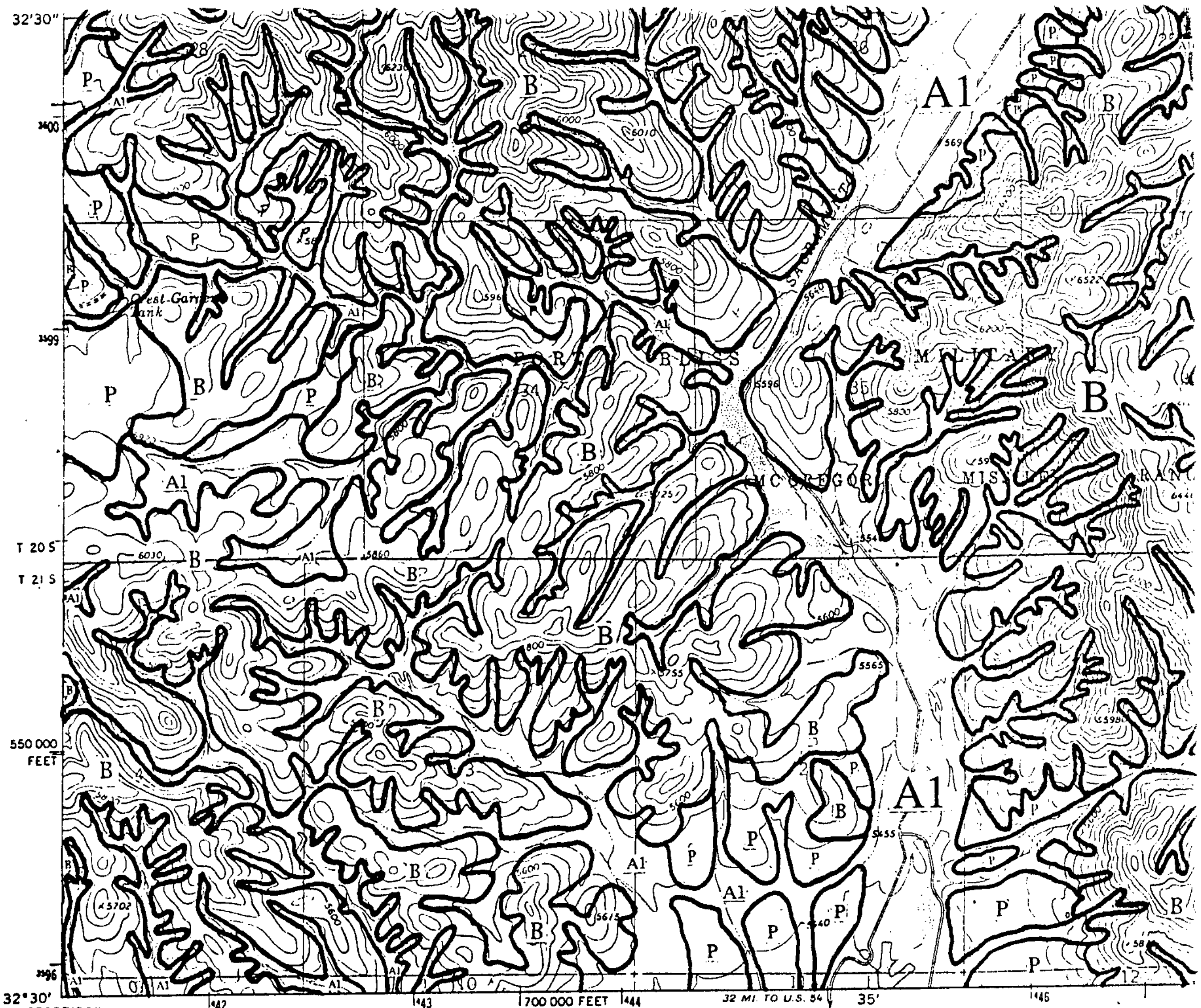
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

5,


Kimmons Tank
Wayland
Canyon
Chatfield Peak
Wate Tank
Well
Chatfield
Canyon
(PIÑON) 4949 III SW
PIÑON 12 MI
T 20 S
T 21 S
32'30"
32°30'
105°30'
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1978
(INDIAN DRAW) 4948 IV NW
1 MILE
7000 FEET
METER
ROAD CLASSIFICATION
Light-duty
Unimproved dirt
State Route

6



Mapped, edited, and published by the Geological Survey

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Topography by photogrammetric methods from aerial photographs taken 1964. Field checked 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Fine red dashed lines indicate selected fence lines

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	▬ ▬
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	▬
Pediment	P
Playa	Pl
Playa Lunette	PlL

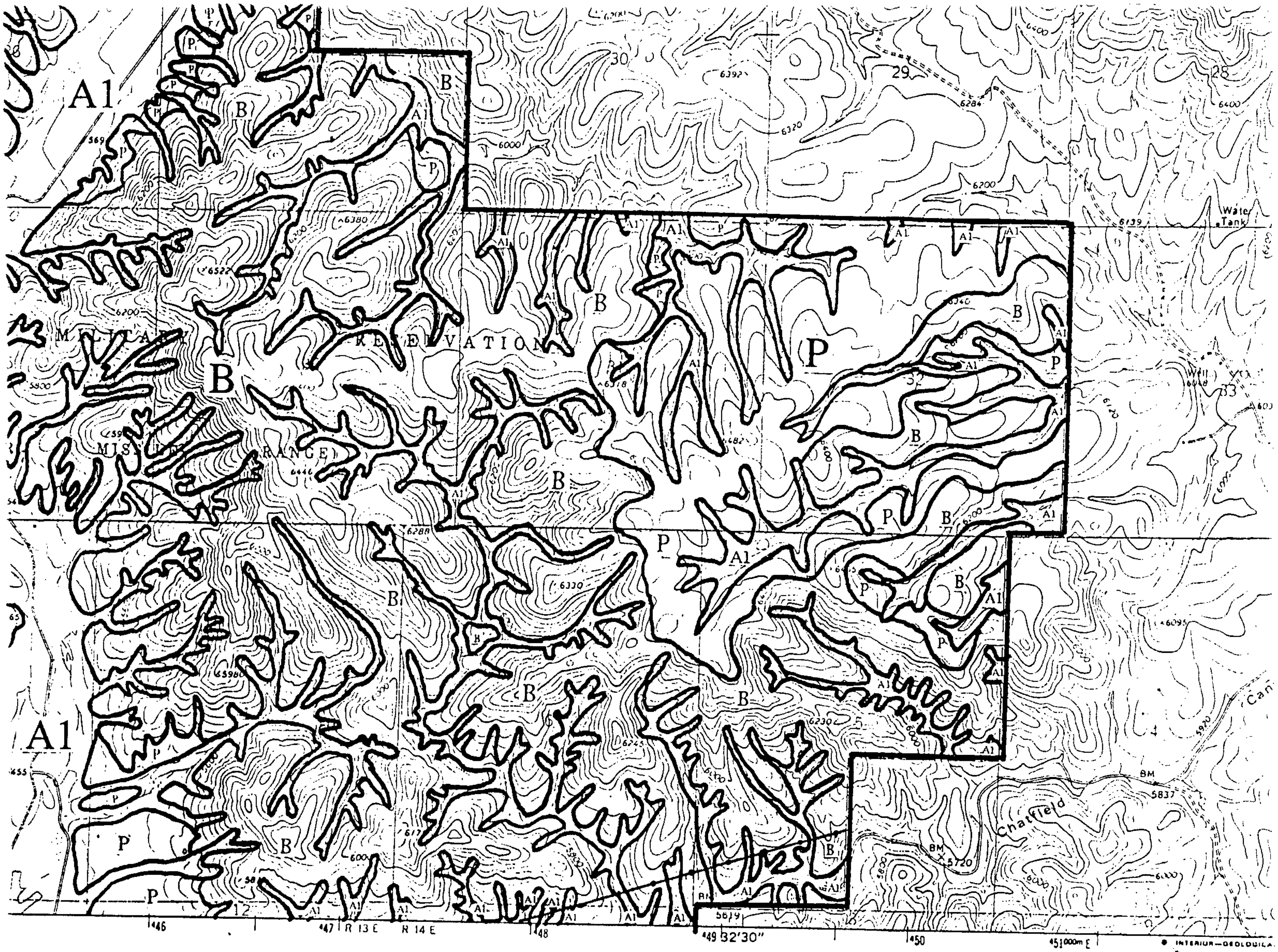
[1]See text for explanation

1000 0 1000

CONT
NATIONAL GE

THIS MAP COMPLIES
FOR SALE BY U. S. GEOLOGICAL SURV
A FOLDER DESCRIBING TOPOGRA

7.



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD

Light-duty

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°18'
5 MILS

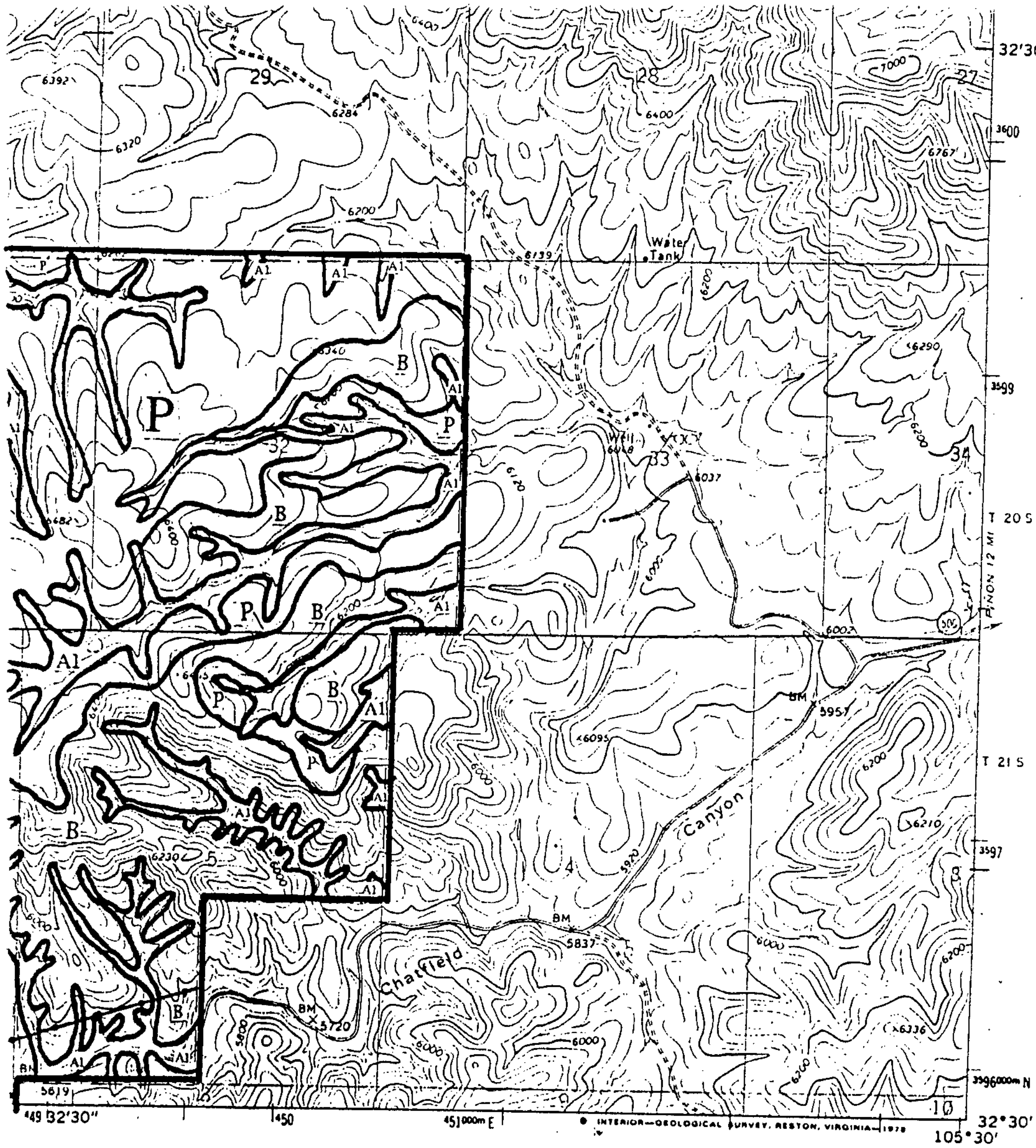
12°
213 MILS

UTM GRID AND 1965 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SURVEYOR

N32

AMS 48



LE

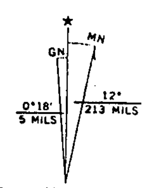
(INDIAN DRAW 4948 IV NW)

ROAD CLASSIFICATION

Light-duty .... Unimproved dirt ....

( ) State Route

QUADRANGLE LOCATION



UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SURVEYORS CANYON, N. MEX.

N3230—W10530/7.5

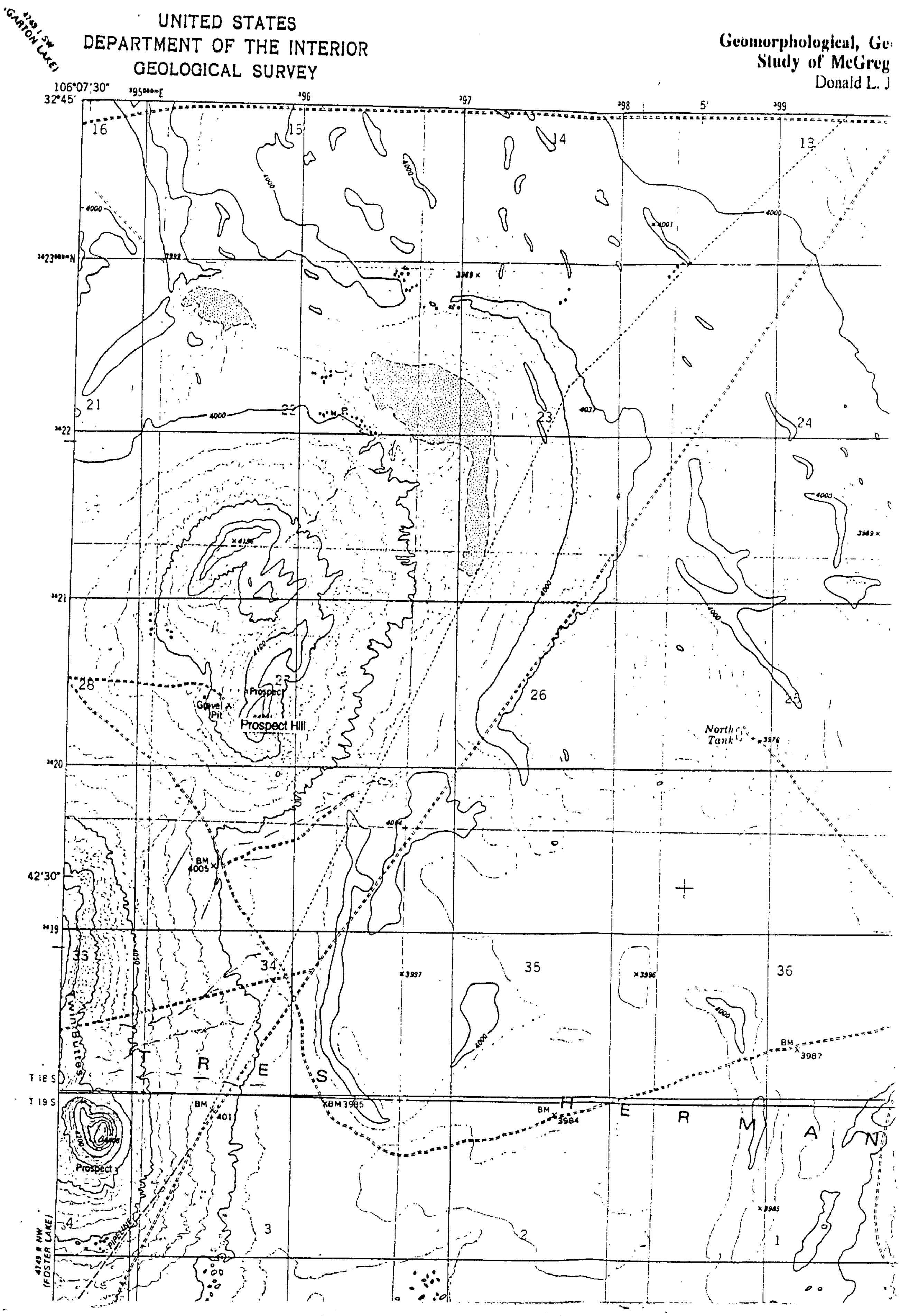
1965

AMS 4849 II SE—SERIES V881

59

9

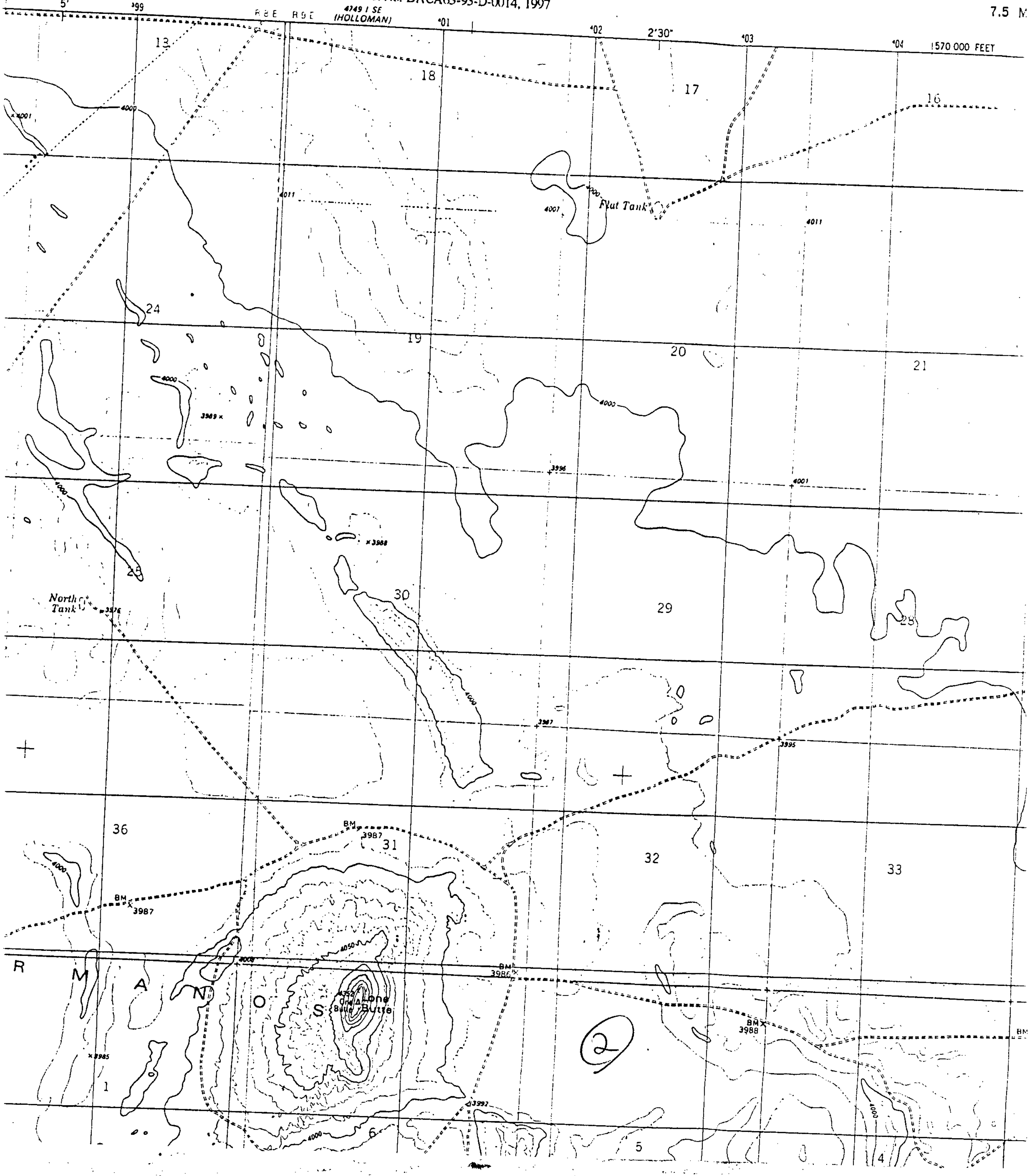
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



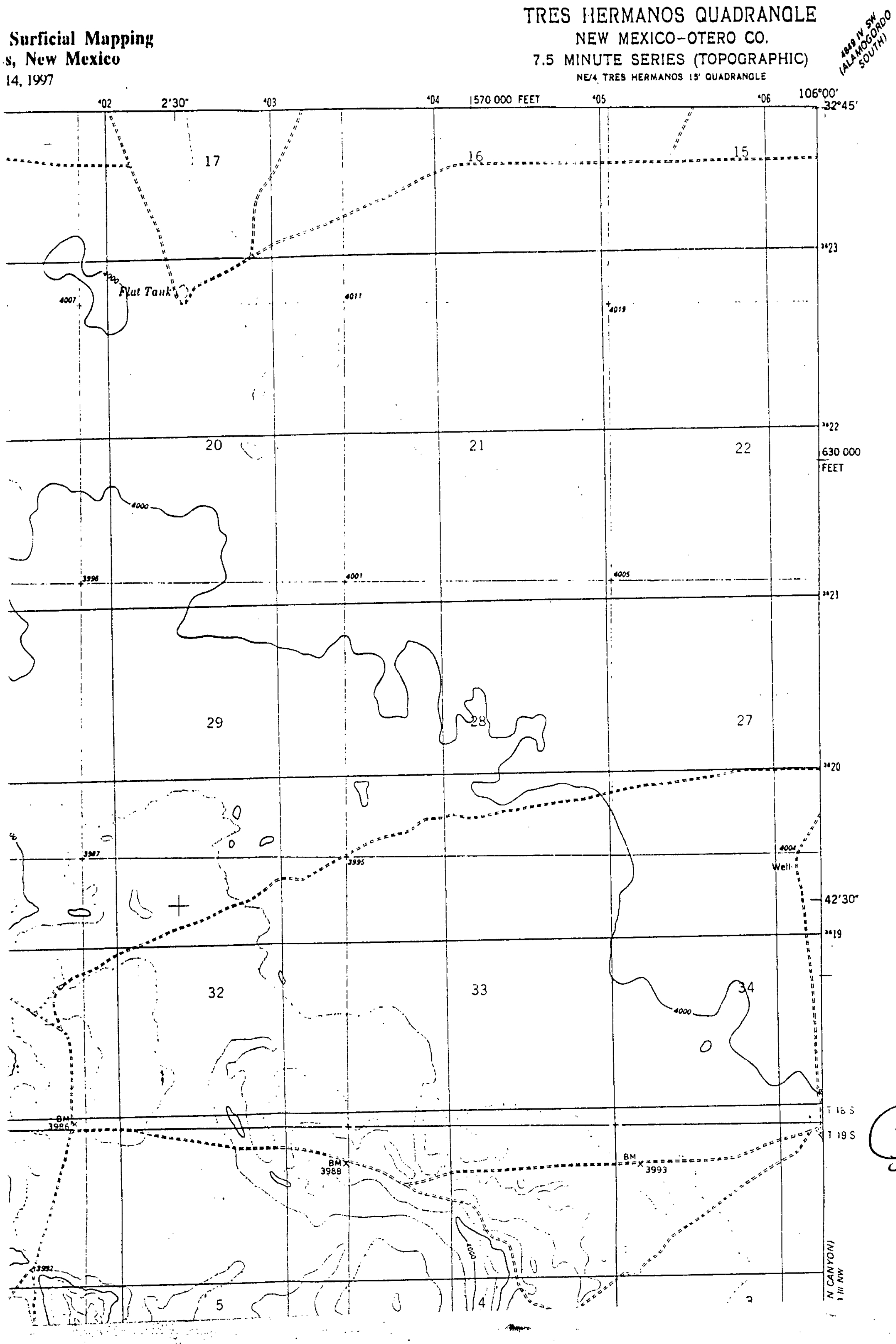
Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

TRES

7.5 M



Surficial Mapping
s, New Mexico
14, 1997



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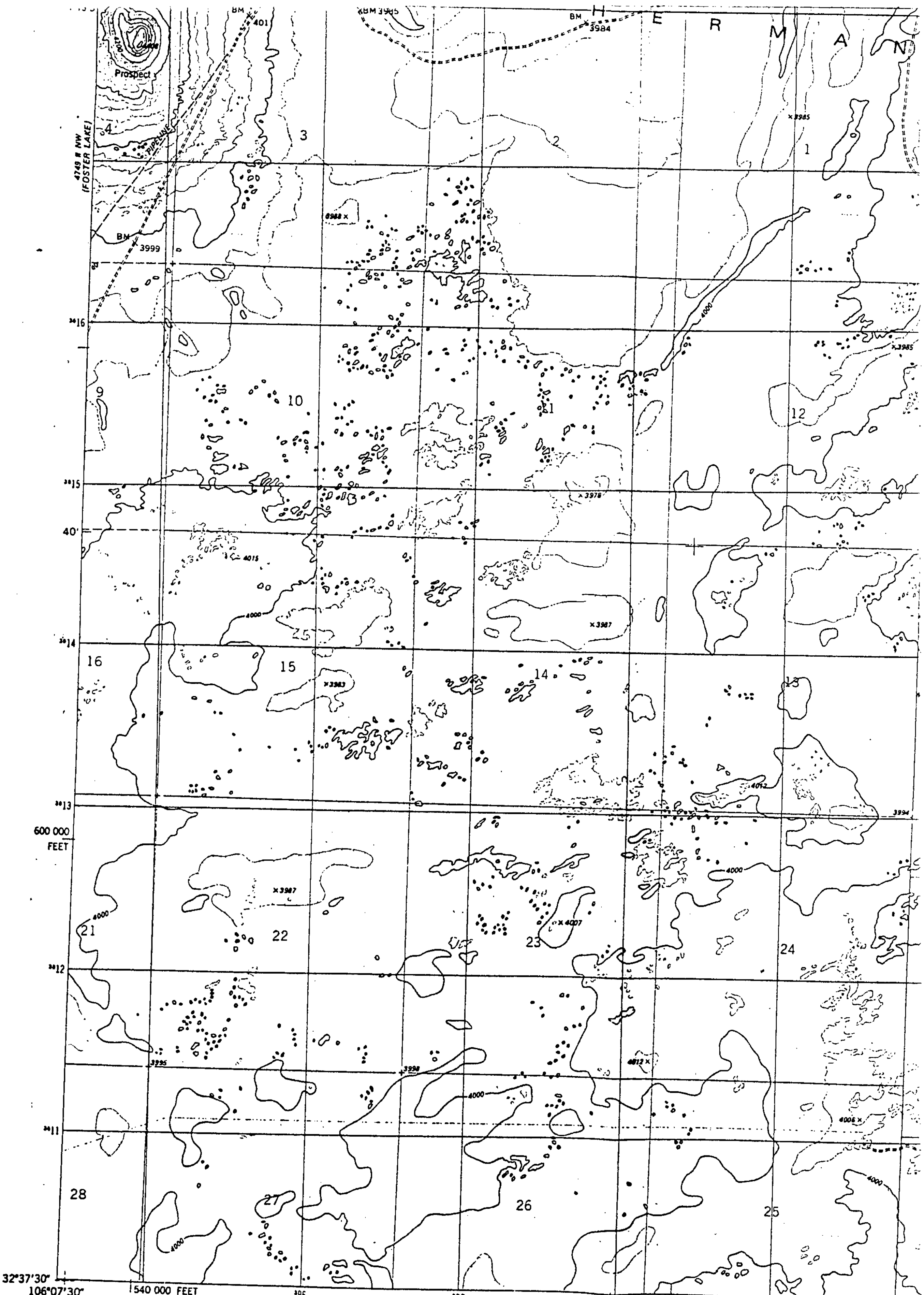


Mapped, edited, and published by the Geological Survey

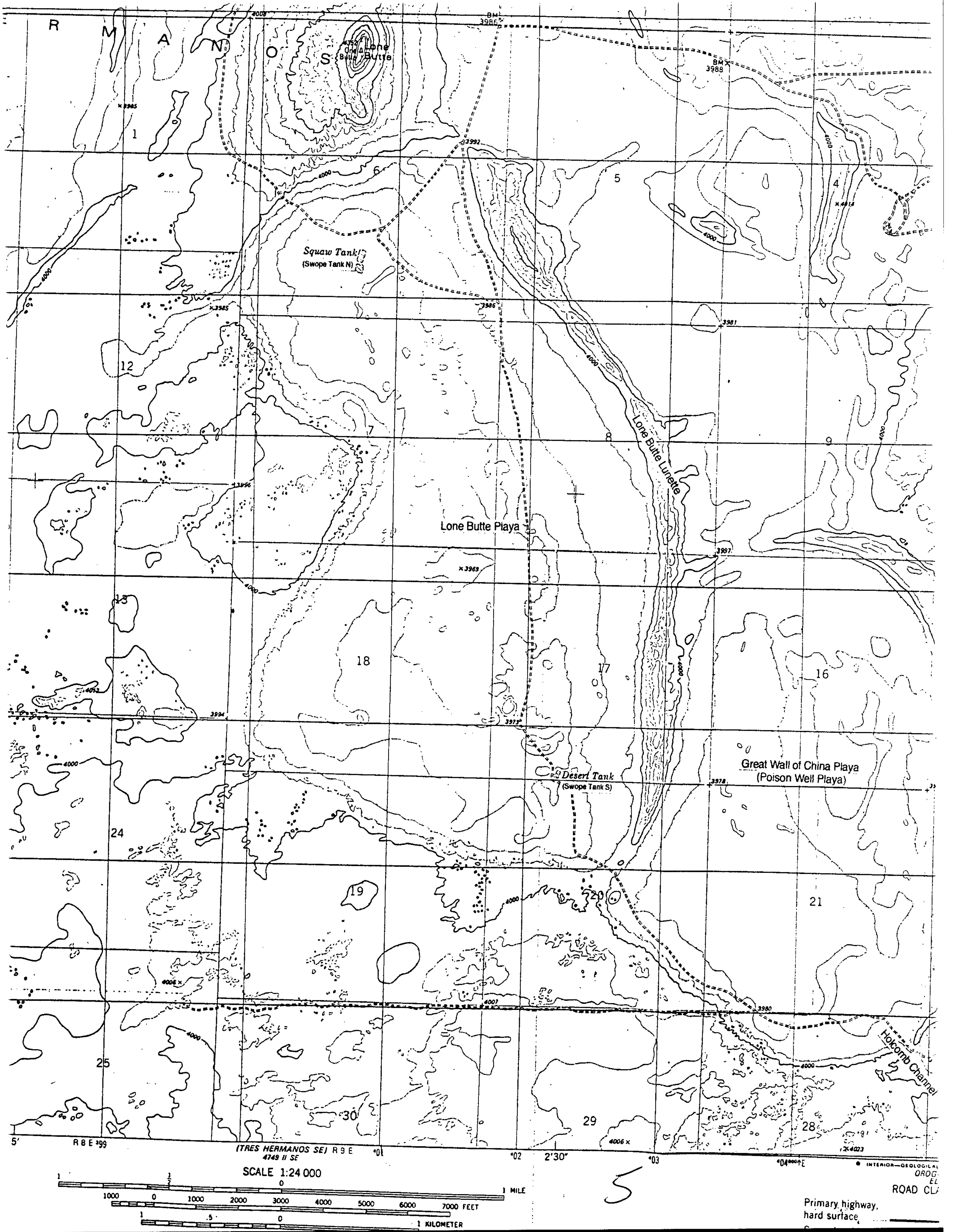
Control by USGS AND NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1972. Field checked 1975. Map edited 1982

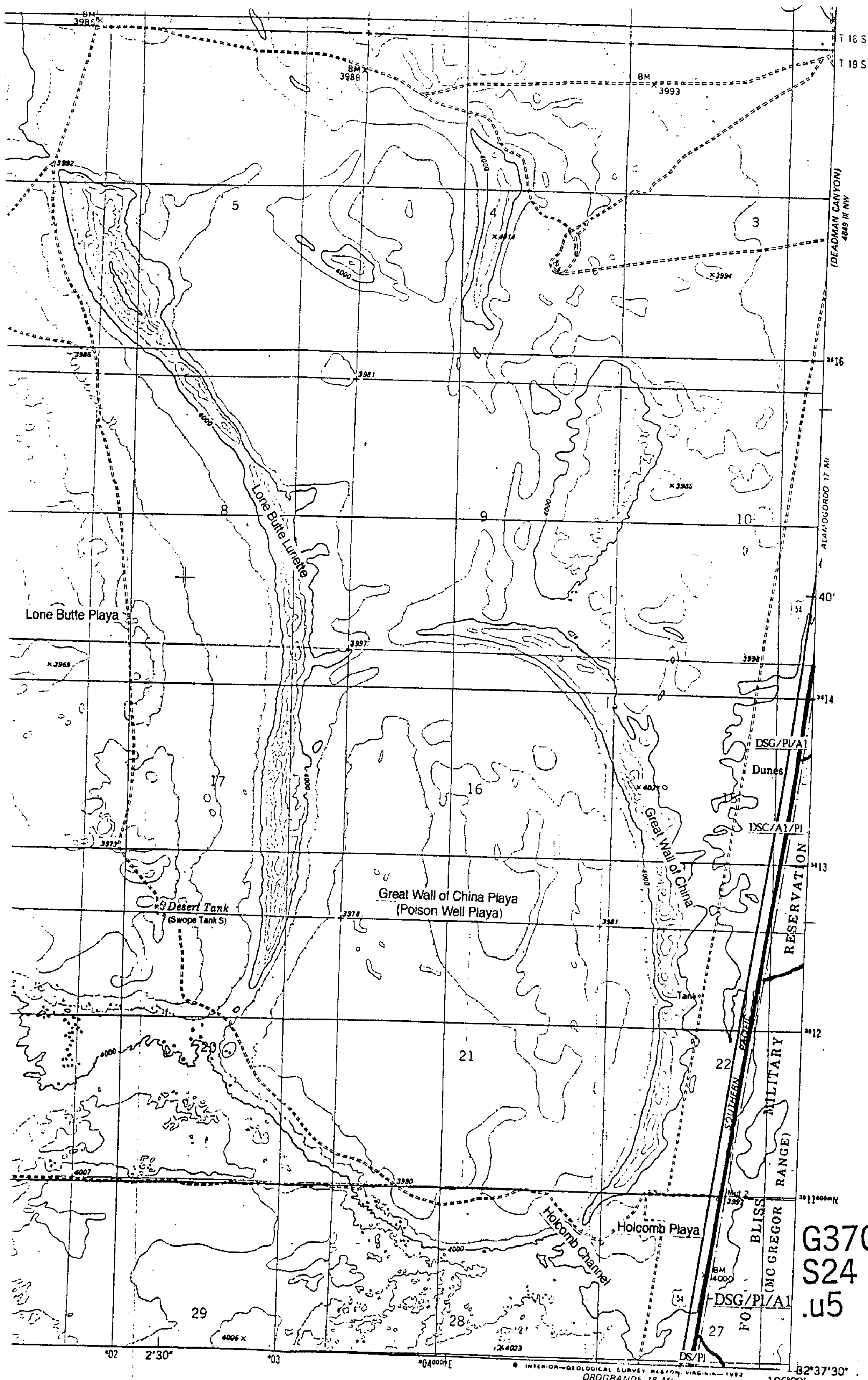
Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid...

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sedimen...	


R M A N O S
Lone Butte
BM 3986
BM 3988
Squaw Tank
(Swope Tank N)
Lone Butte Playa
Lone Butte Lunette
Great Wall of China Playa
(Poison Well Playa)
Desert Tank
(Swope Tank S)
Holcomb Channel
(TRES HERMANOS SE) R 9 E
4749 II SE
2'30"
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
ROAD CL
Primary highway, hard surface

5



6

1 MILE
7000 FEET
LOMETER

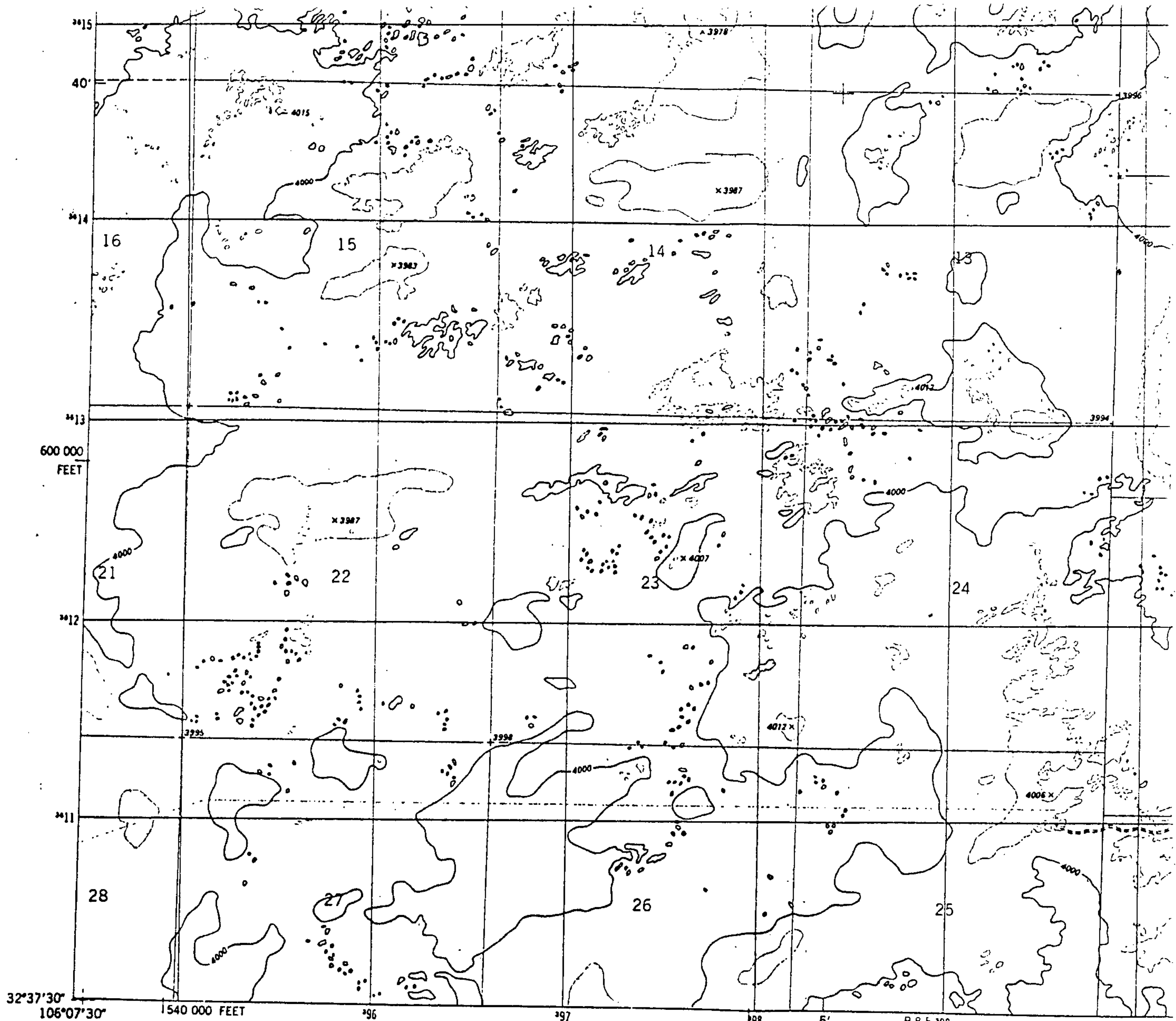
ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway

(PIPELINE CA... 4849 III



4748 II SW (TRES HERMANOS SW)

Mapped, edited, and published by the Geological Survey

Control by USGS AND NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1972. Field checked 1975. Map edited 1982

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 6 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

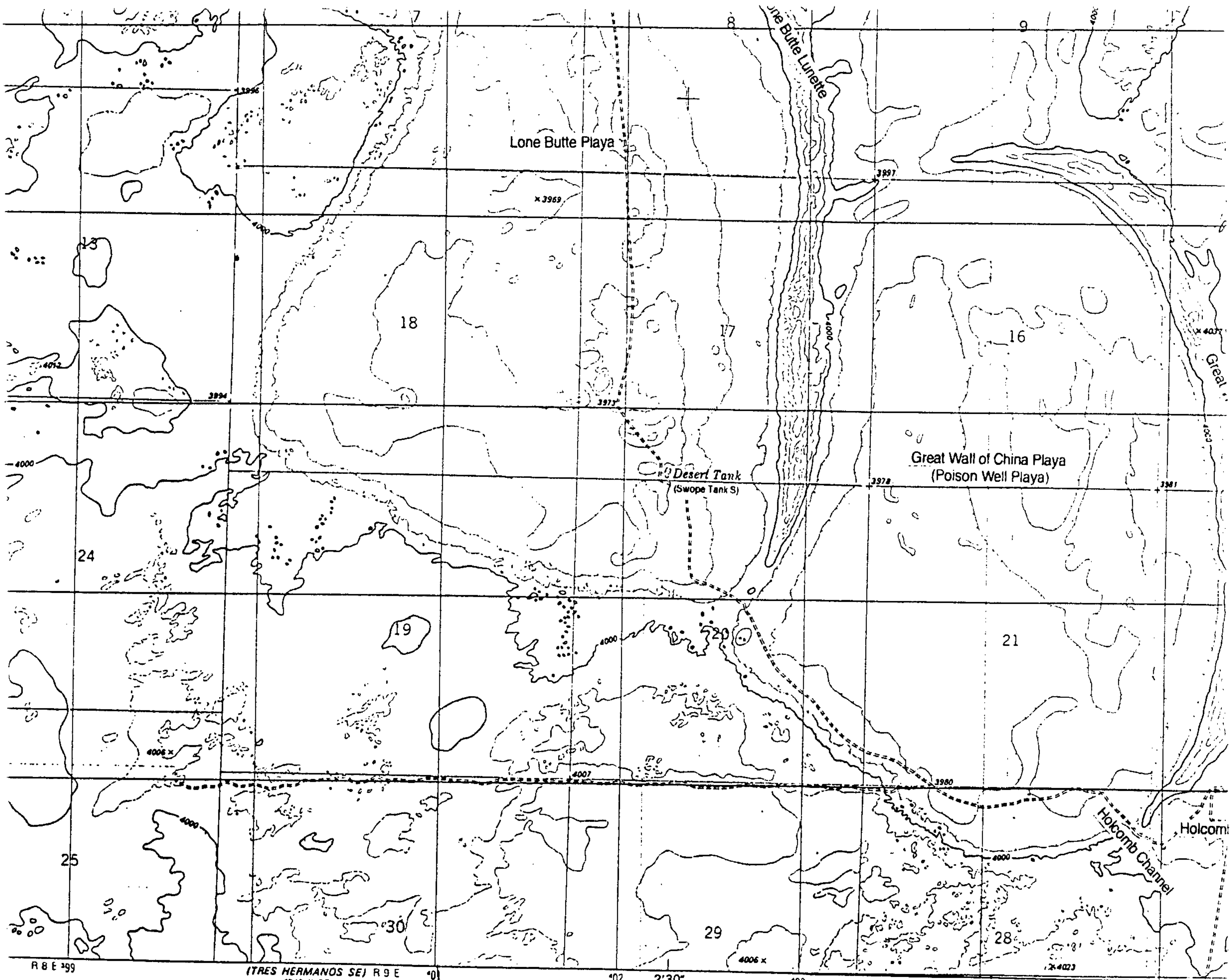
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

SCAL

CONTOUR IN
NATIONAL GEODETIC

THIS MAP COMPLIES WITH NA
FOR SALE BY U. S. GEOLOGICAL SURVEY, DEN
A FOLDER DESCRIBING TOPOGRAPHIC MA



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

OROGRANDE 15
EL PASO 69

ROAD CLASSIFICA

Primary highway, hard surface — Light-d improv

Secondary highway, hard surface — Unimp

Interstate Route U. S. Rou

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°34' 10 MILS

11 196 MILS

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

TRES HERM

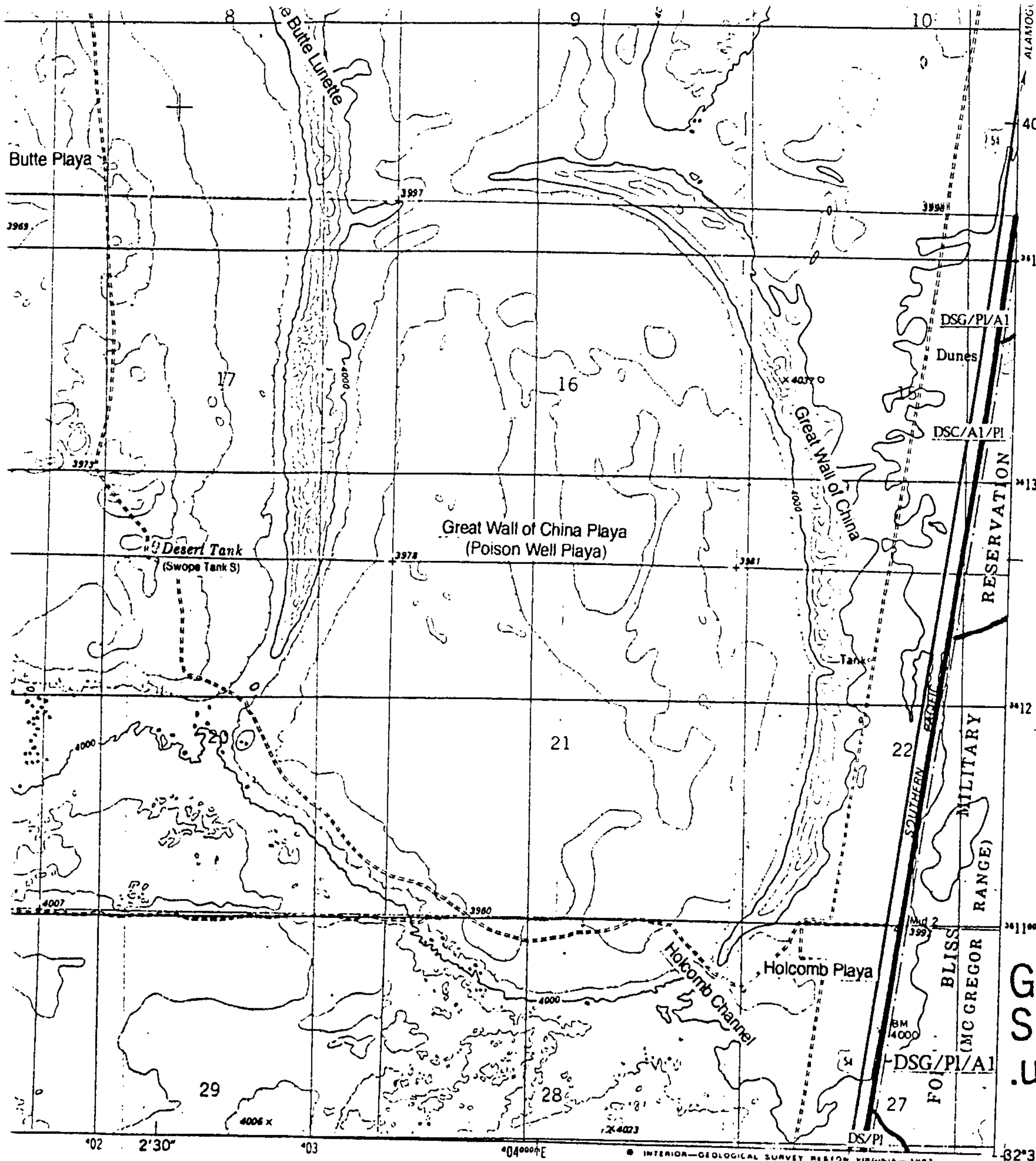
NE/4 TRES HERMA

N3237.5-

DMA 4749 II N

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
R SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

8



INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1982

OROGRANDE 18 MI
EL PASO 69 MI

(PIPELINE CANYON)
4843 II SW

1 MILE

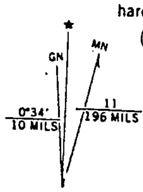
FEET

ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty road, hard or improved surface
Secondary highway, hard surface	Unimproved road

Interstate Route U. S. Route State Route

QUADRANGLE LOCATION



UTM GRID AND 1982 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

INIA 22092

TRES HERMANOS, N. MEX.

NE/4 TRES HERMANOS 15' QUADRANGLE
N3237.5–W10600/7.5

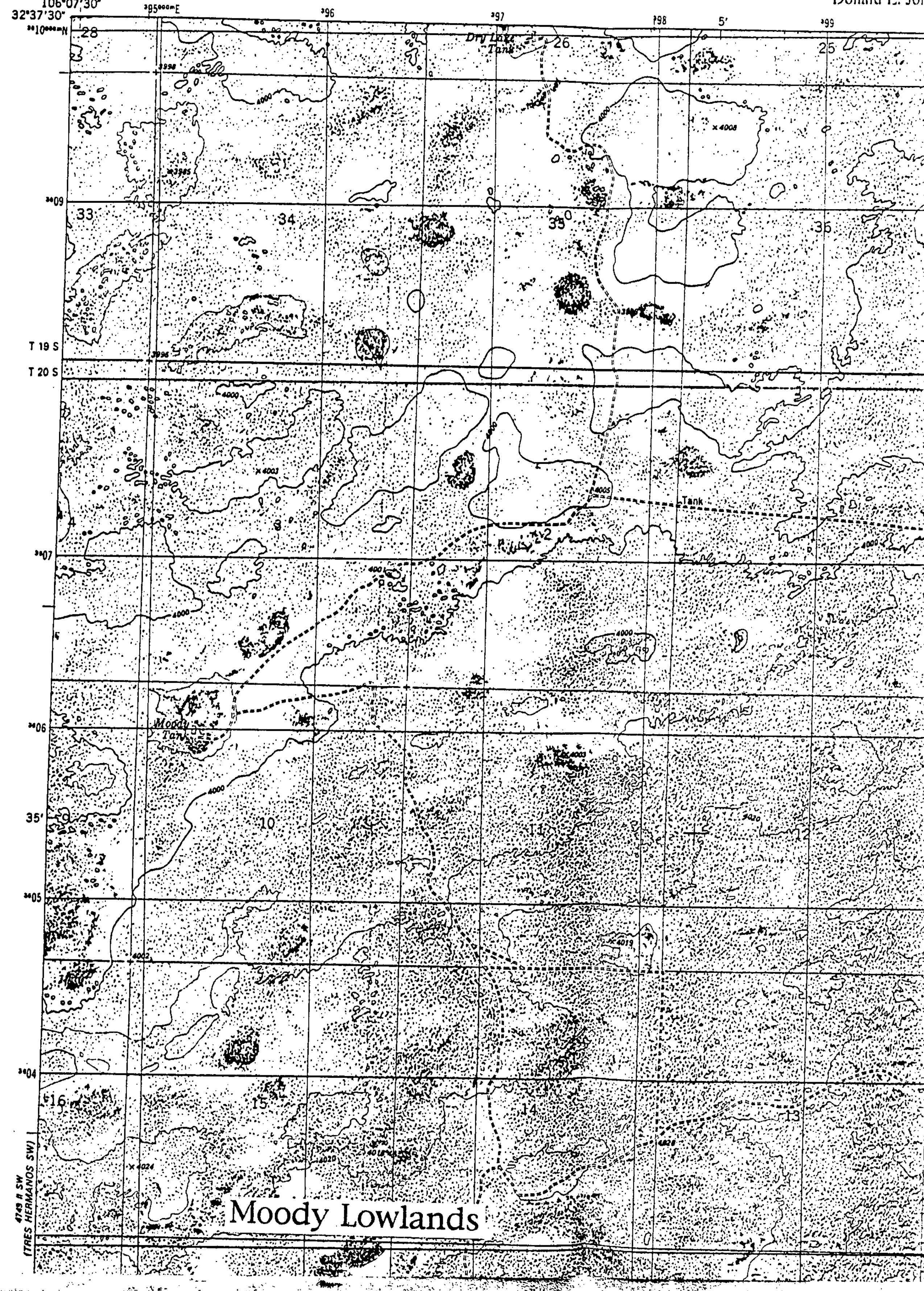
1982

DMA 4749 II NE–SERIES V881

9

4749 II NW (FOSTER LAKE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



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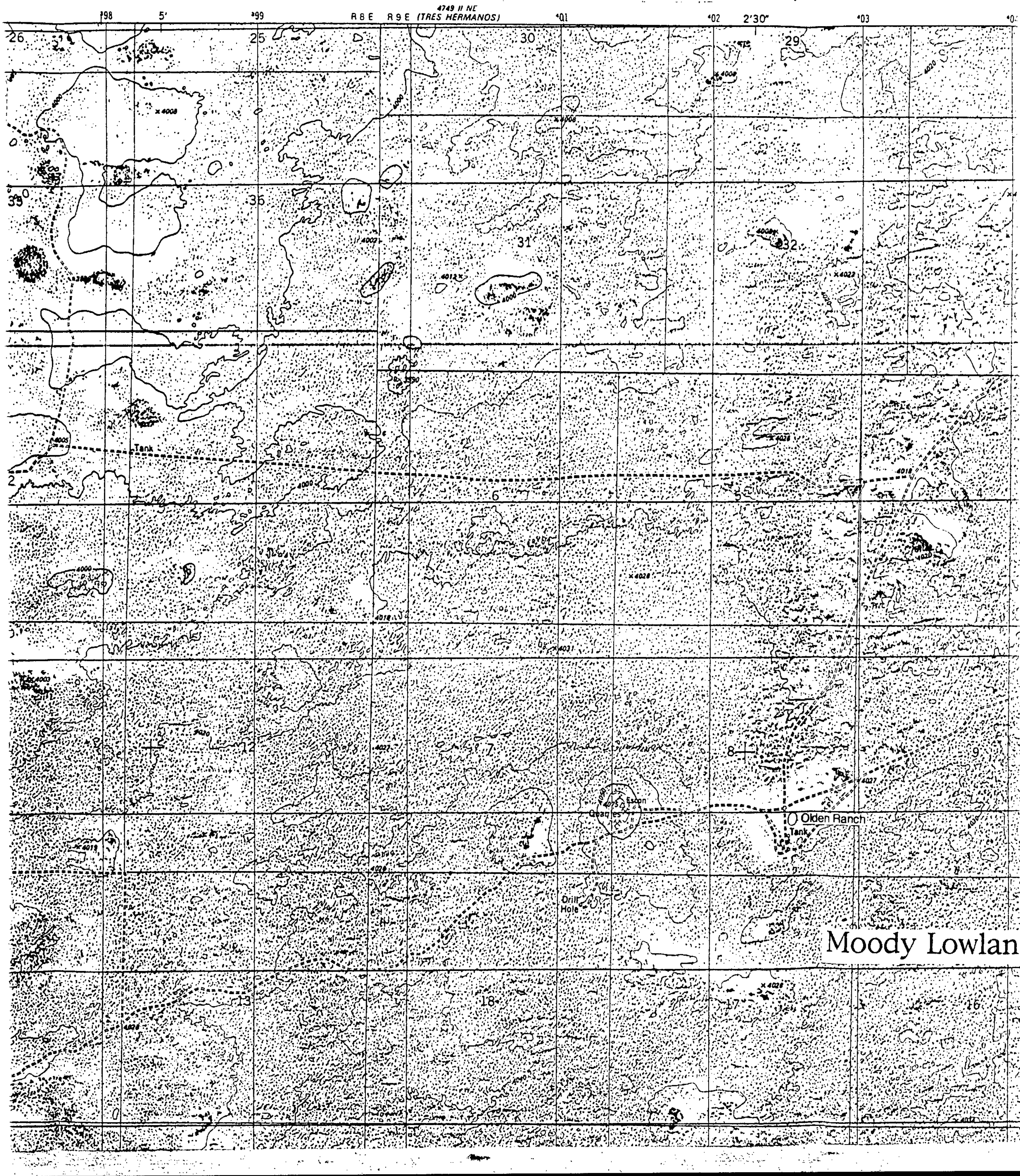
T

7.5 MIN

Geomorphological, Geoecological, Geoarchaeological and Surficial Mapping Study of McGregor Guided Missile Range, Fort Bliss, New Mexico

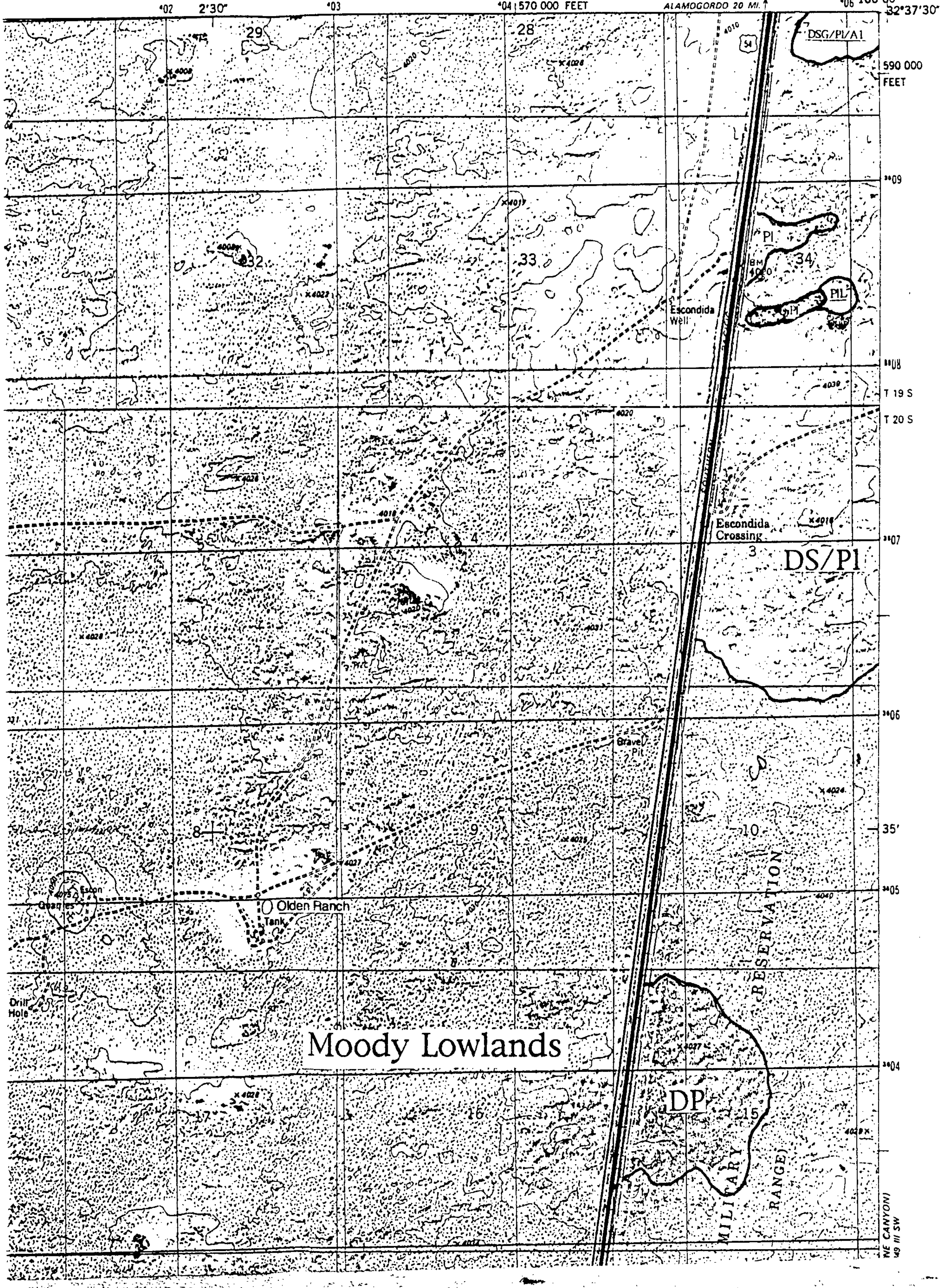
Donald L. Johnson, Ph.D., Contract No. DACA63-93-D-0014, 1997



nd Surficial Mapping
Bliss, New Mexico
)-0014, 1997

TRES HERMANOS SE QUADRANGLE
NEW MEXICO–OTERO CO.
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SE/4 TRES HERMANOS 15' QUADRANGLE

4849 III NW (DEADMAN CANYON)



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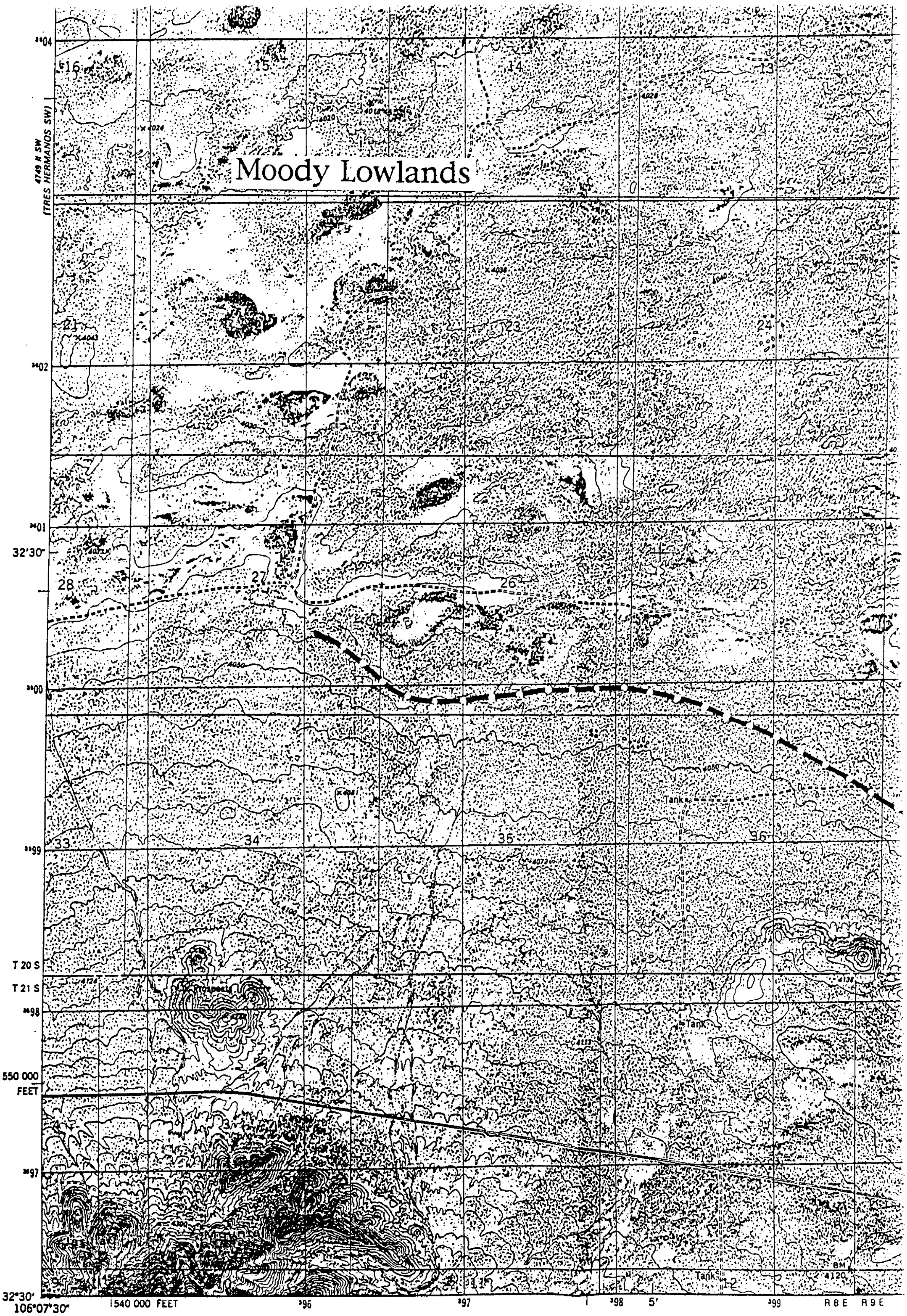


Mapped, edited, and published by the Geological Survey

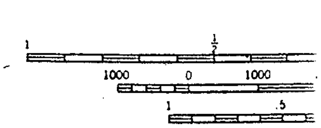
Control by USGS and NOS/NOAA

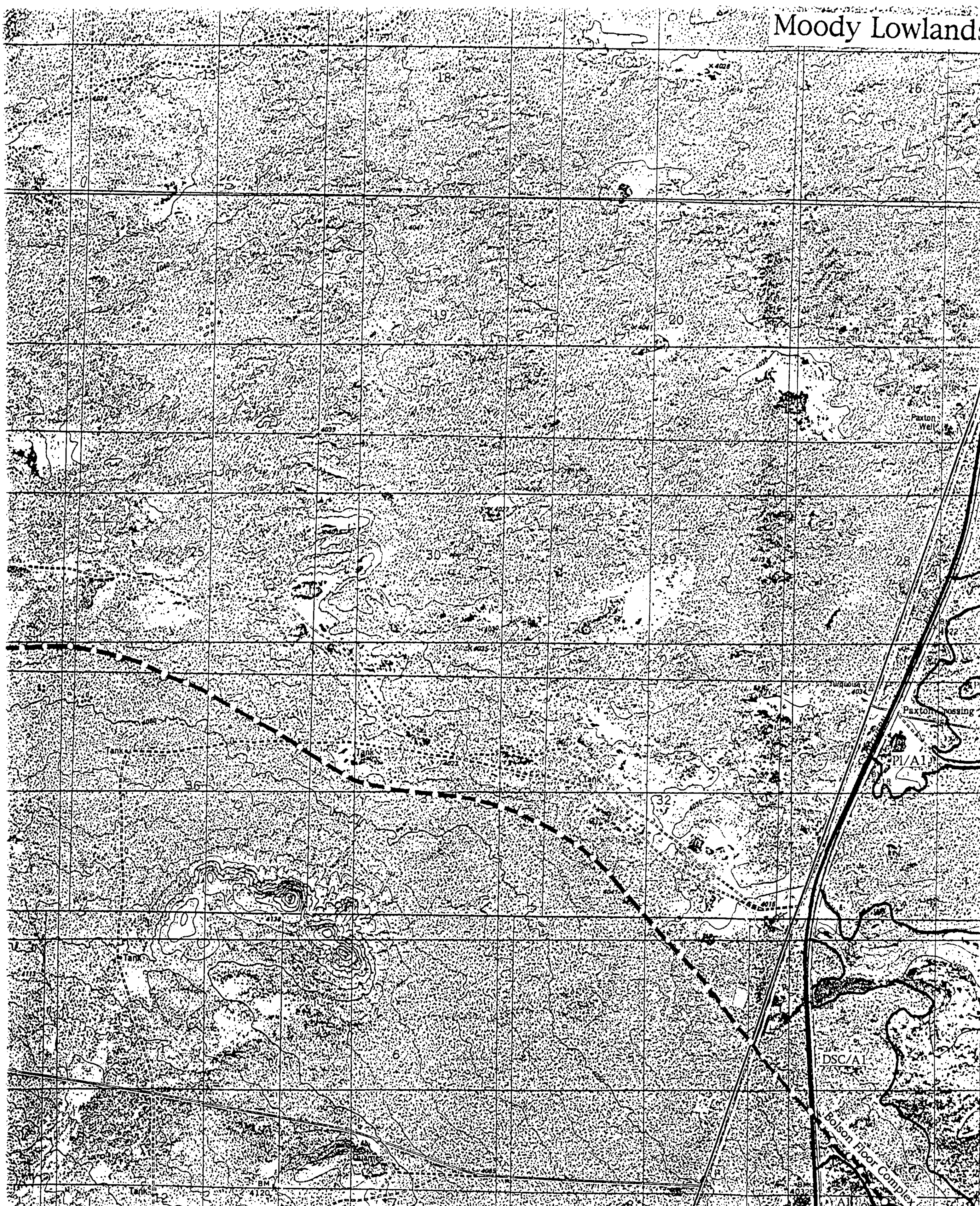
Topography by photogrammetric methods from aerial photographs taken 1972. Orthophotomosaic from aerial photographs taken 1971

Field checked 1975. Map edited 1982

Projection and 10 000 foot grid ticks New Mexico

McGregor Range Geomorphic Mapping Units and Symbols[1]	
Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B





SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

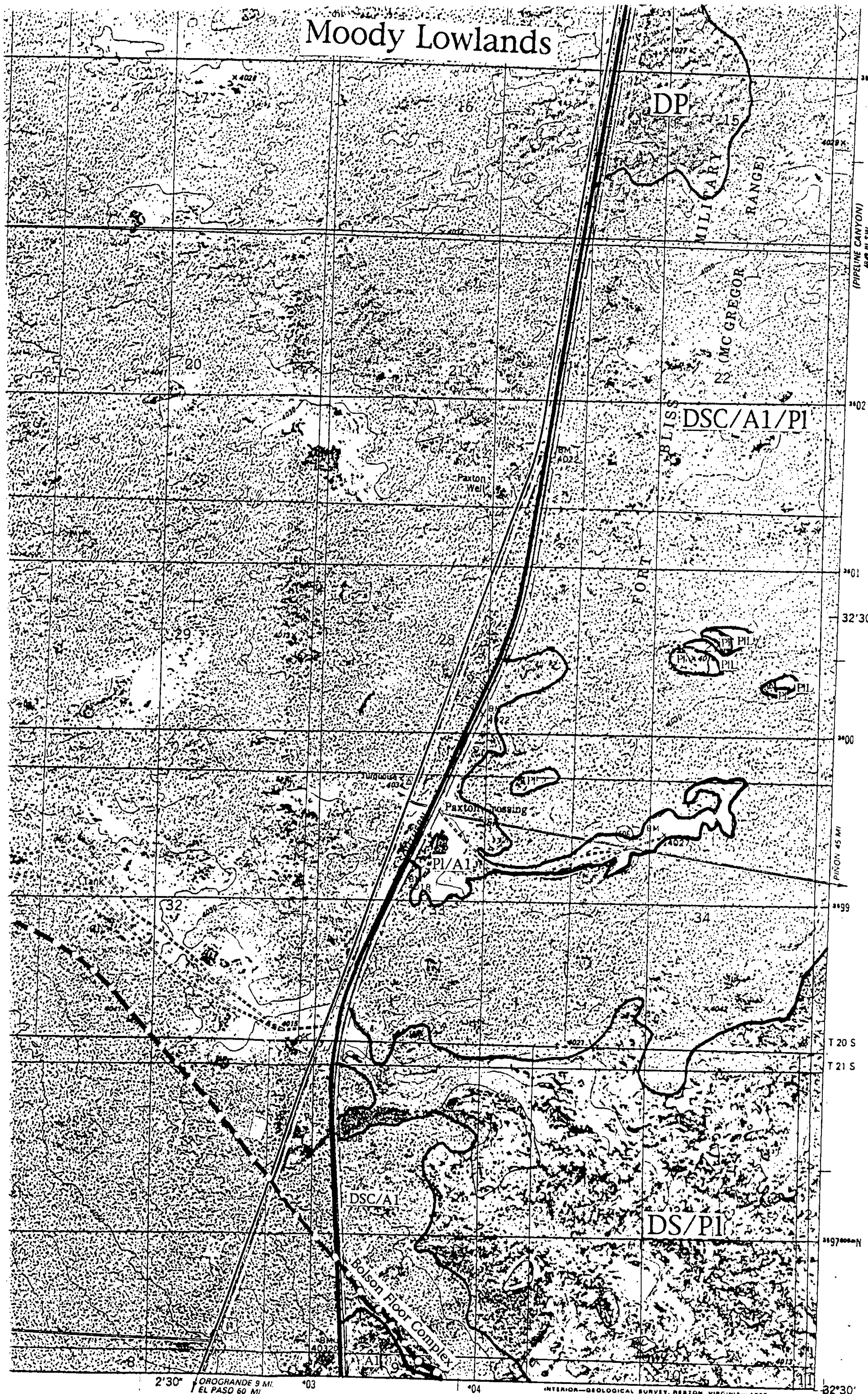
1 .5 0 1 KILOMETER

5

›morphic
Symbols[1]

A1
A2
A3
B

Primary high
hard surface
Secondary h

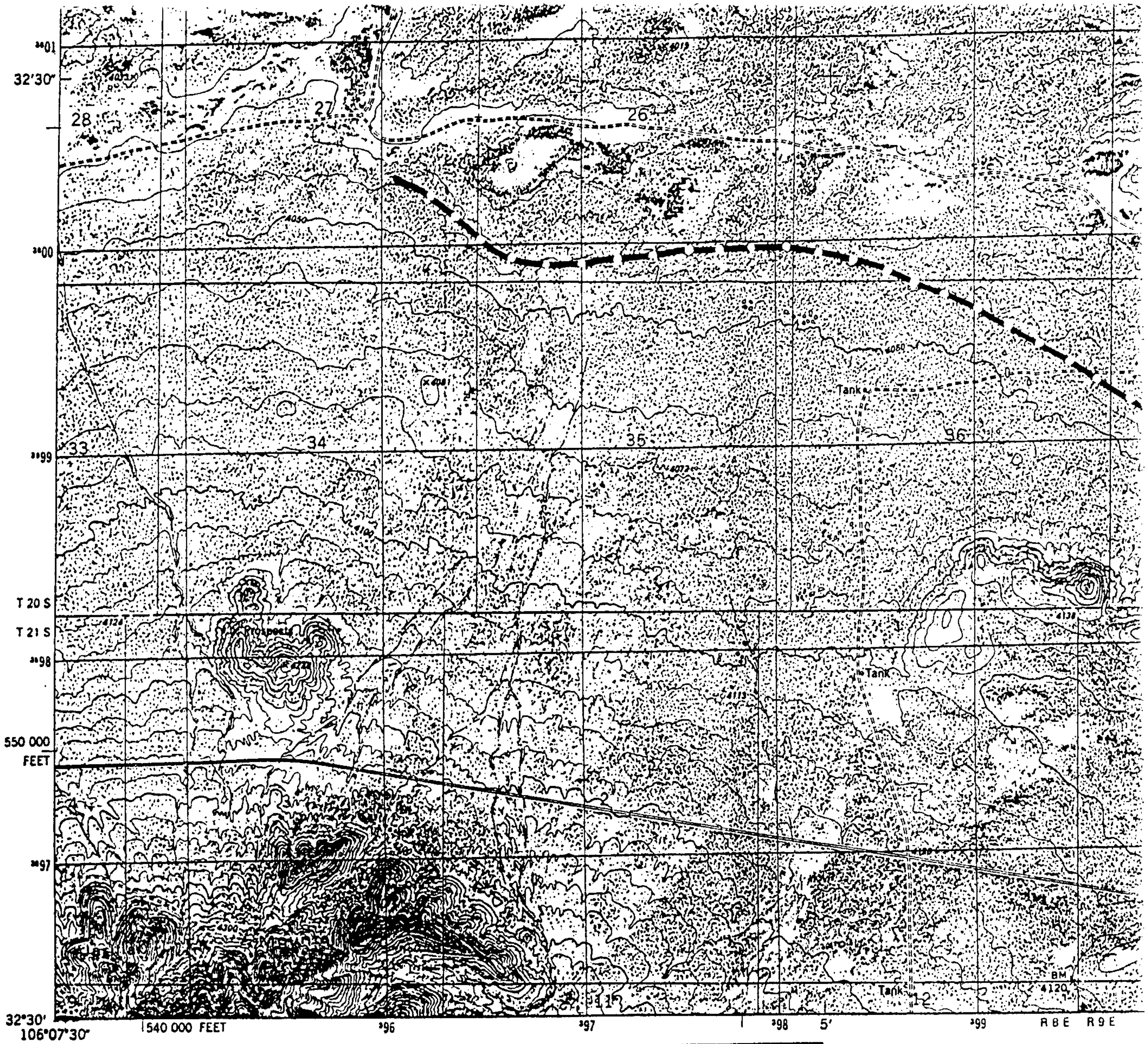


1 MILE
7000 FEET
1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway

6



4748 I NW (ELEPHANT MOUNTAIN)

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Topography by photogrammetric methods from aerial photographs taken 1972. Orthophotomosaic from aerial photographs taken 1971 Field checked 1975. Map edited 1982

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum
To place on the predicted North American Datum 1983 move the projection lines 6 meters south and 50 meters east as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	Al
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

CONT
NATIONAL GE

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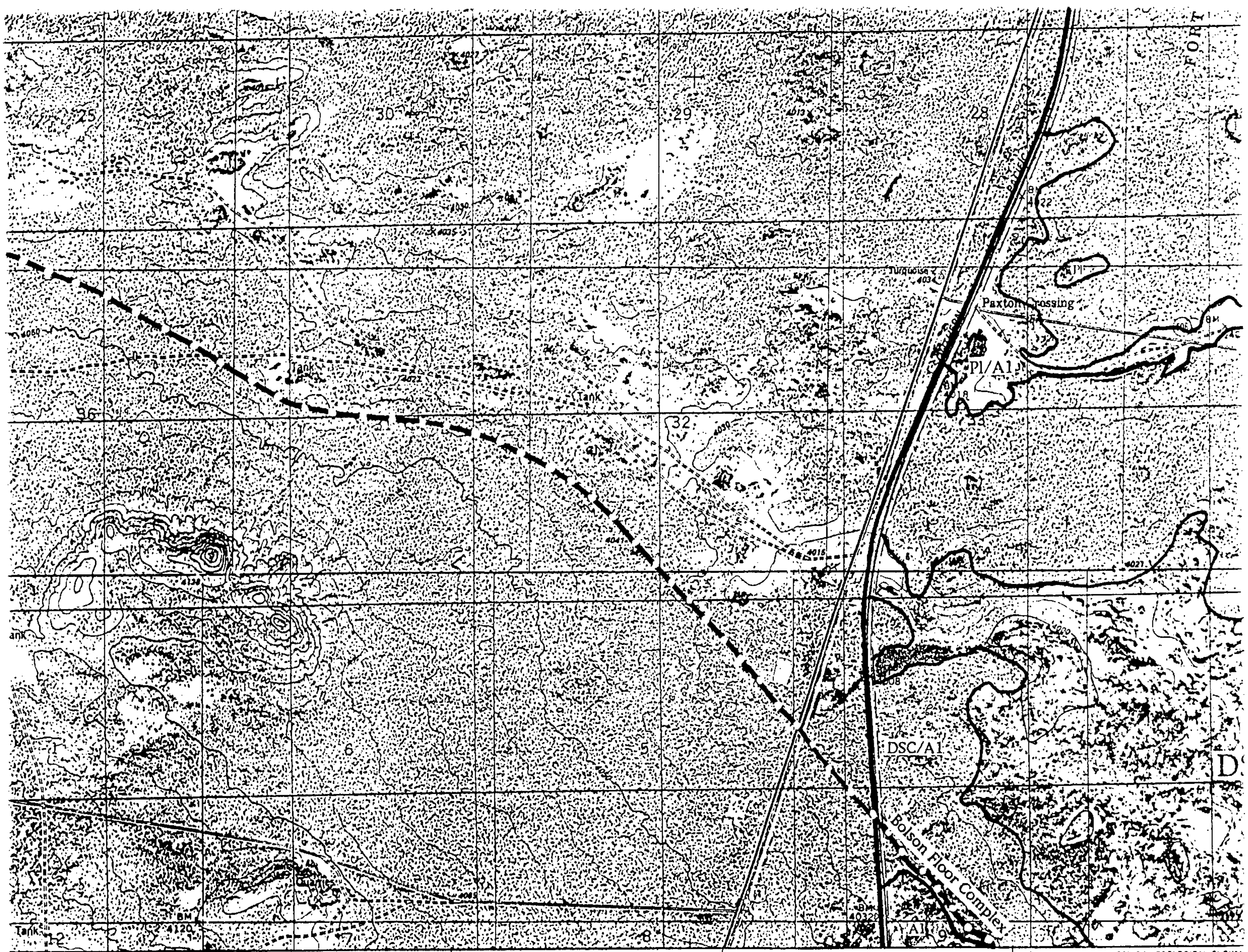
A FOLDER DESCRIBING TOPOGRA



R8E R9E (OROGRANDE NORTH) 4748 I NE

2'30" OROGRANDE 9 MI. EL PASO 60 MI.

INTERIOR—GEOLOGICAL SURVEY

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°34' 10 MILS

11° 196 MILS

UTM GRID AND 1982 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

ROAD CLASSIF

Primary highway, hard surface

Secondary highway, hard surface

Interstate Route

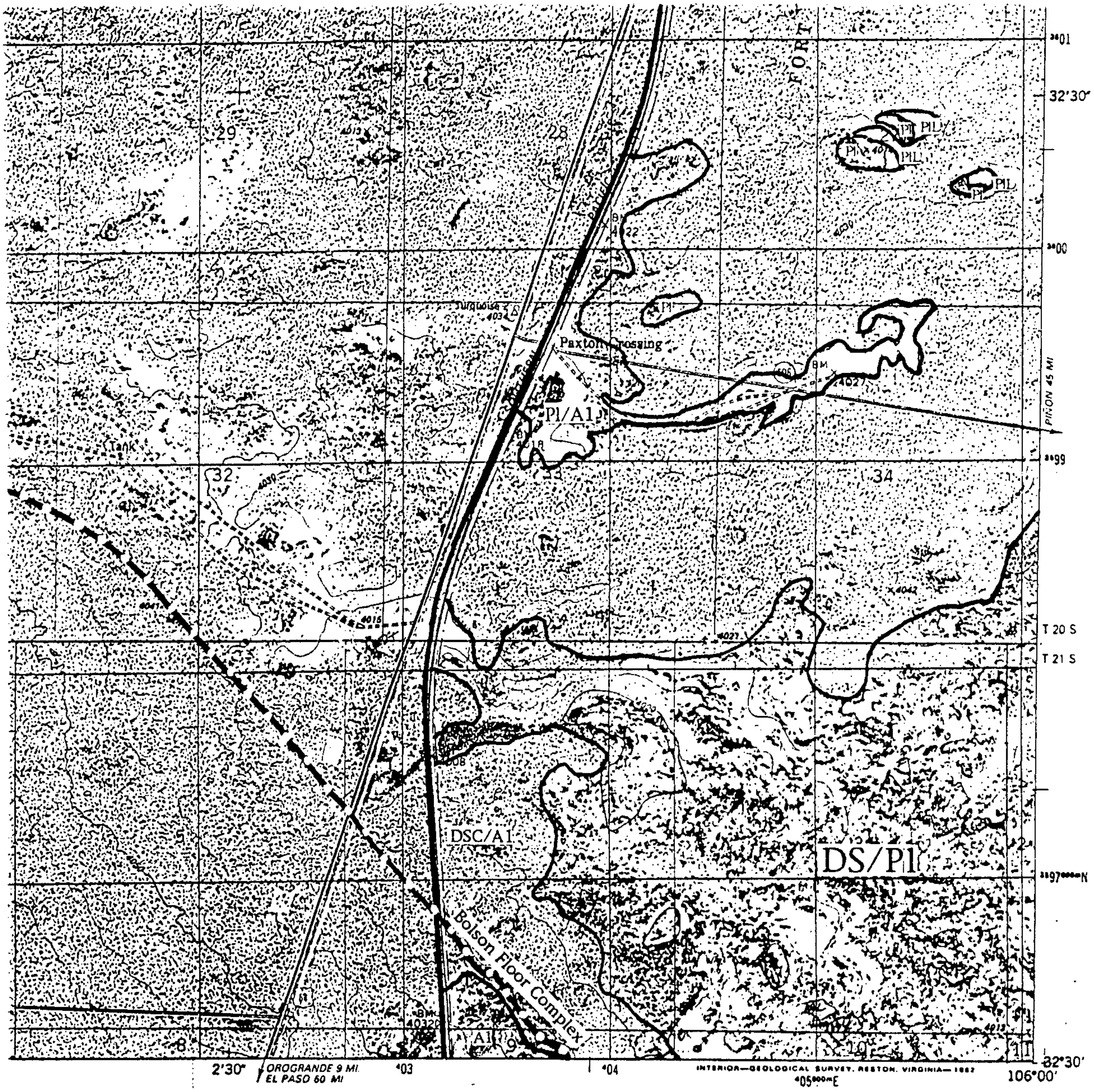
U. S.

TRES HERMA

SE/4 TRES HERM

N3230—

DMA 4749 II



1 MILE

000 7000 FEET

1 KILOMETER

ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty road, hard or improved surface
Secondary highway, hard surface	Unimproved road

Interstate Route U. S. Route State Route

(WILDE TANK) 4849 IV NW

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°34' 10 MILS

11° 196 MILS

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

TRES HERMANOS SE, N. MEX.

SE/4 TRES HERMANOS 15' QUADRANGLE

N3230—W10600/7.5

1982

DMA 4749 II SE—SERIES V881

DS

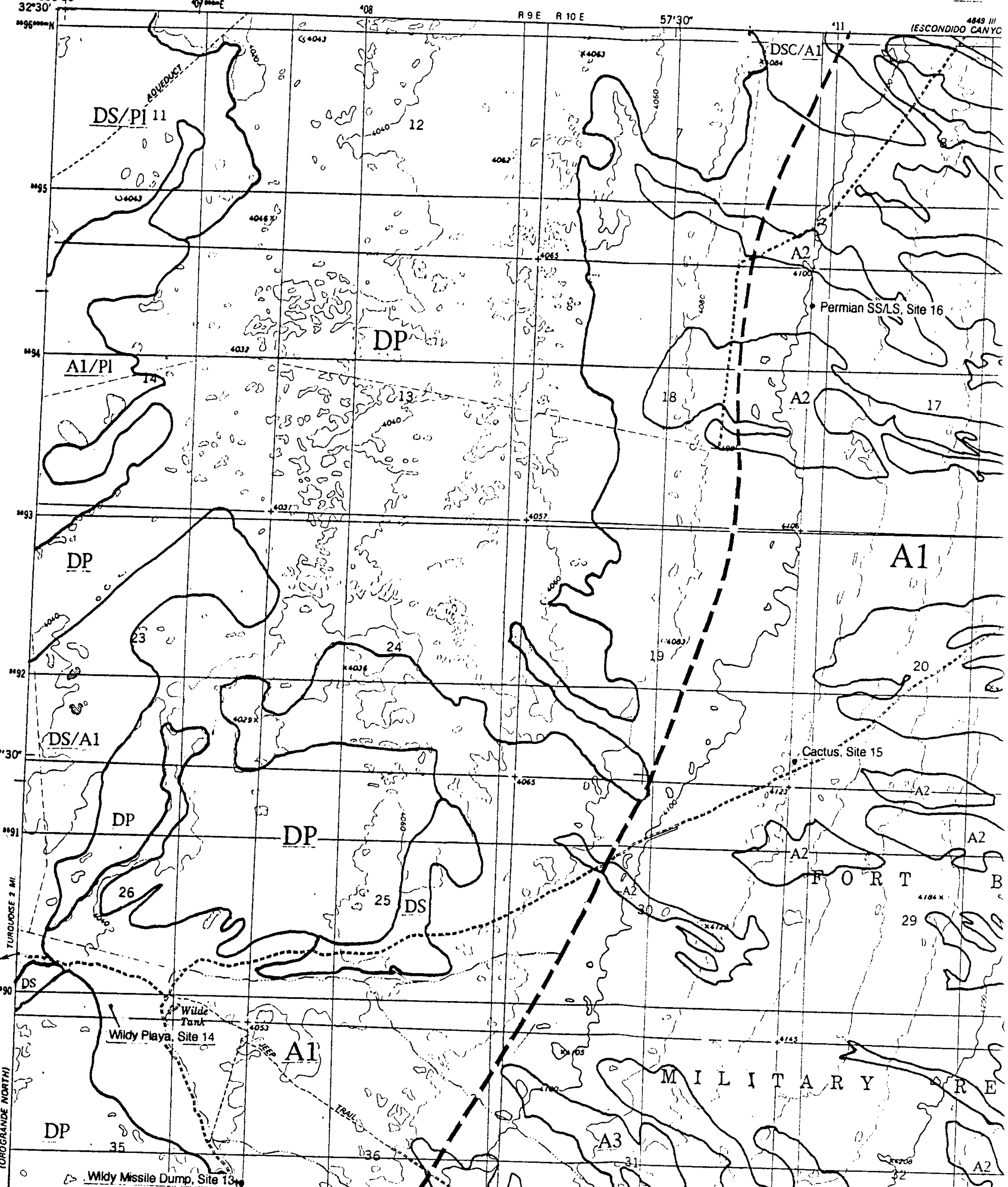
RESTON, VIRGINIA 22092

E ON REQUEST

9

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geomorphological, Geoecological, Geoarc
Study of McGregor Guided Missile
Donald L. Johnson, *Ph.D.*, Contract



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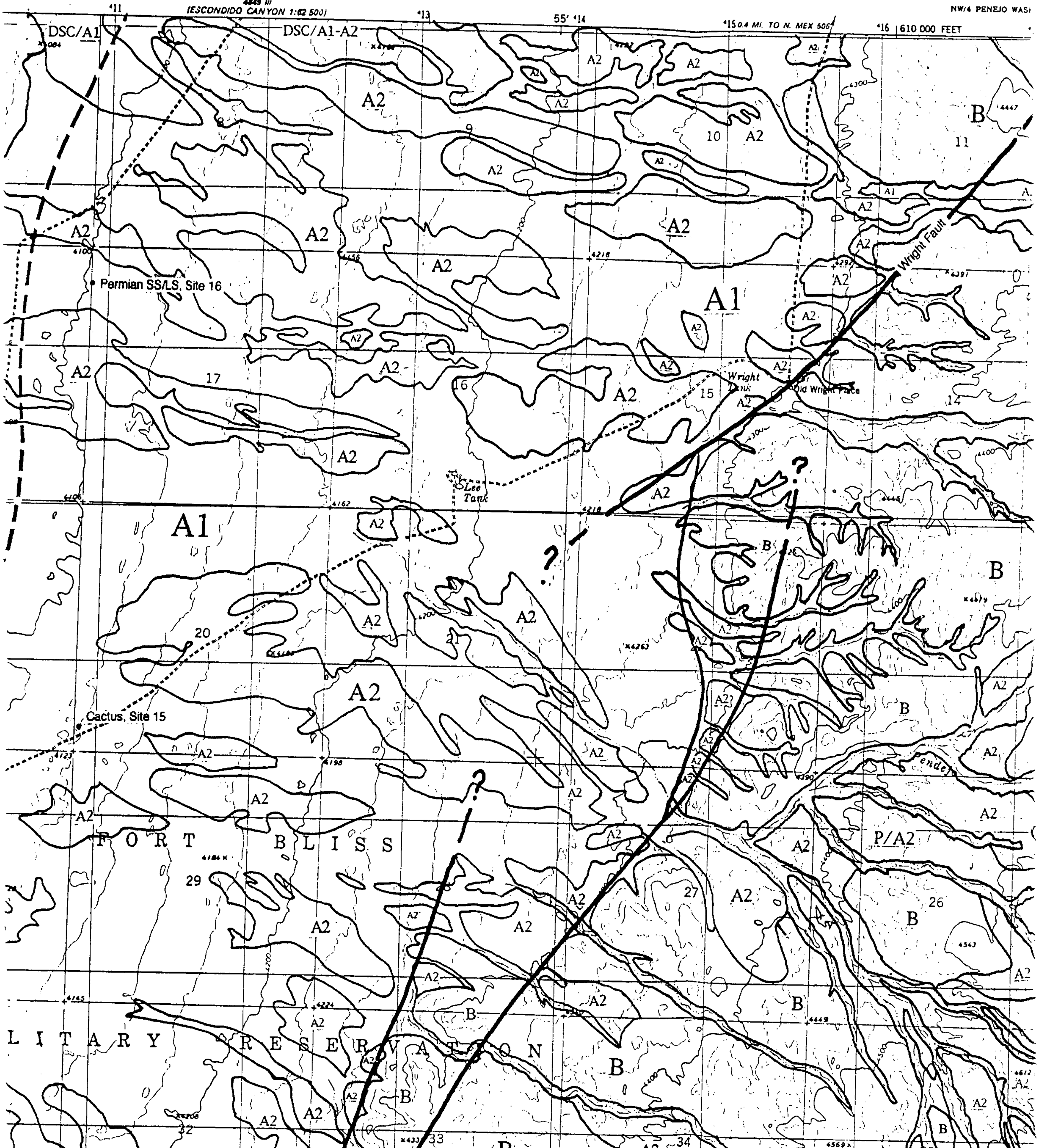
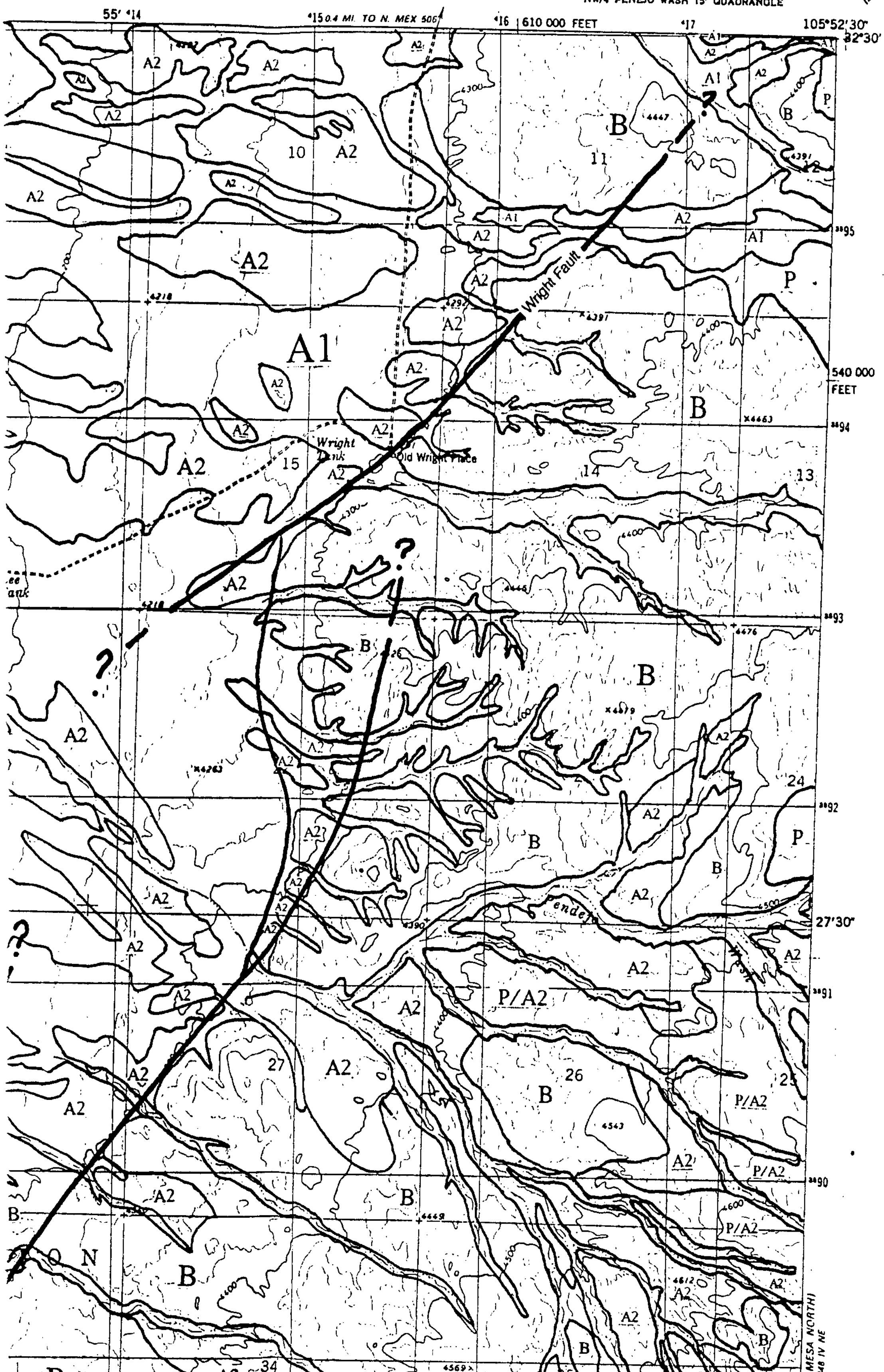
'norphological, Geoecological, Geoarchaeological and Surficial Mapping
Study of McGregor Guided Missile Range, Fort Bliss, New Mexico
Donald L. Johnson, *Ph.D.*, Contract No. DACA63-93-D-0014, 1997

WILDE TANK
NEW MEXICC
7.5 MINUTE SERIE
NW/4 PENEJO WAS

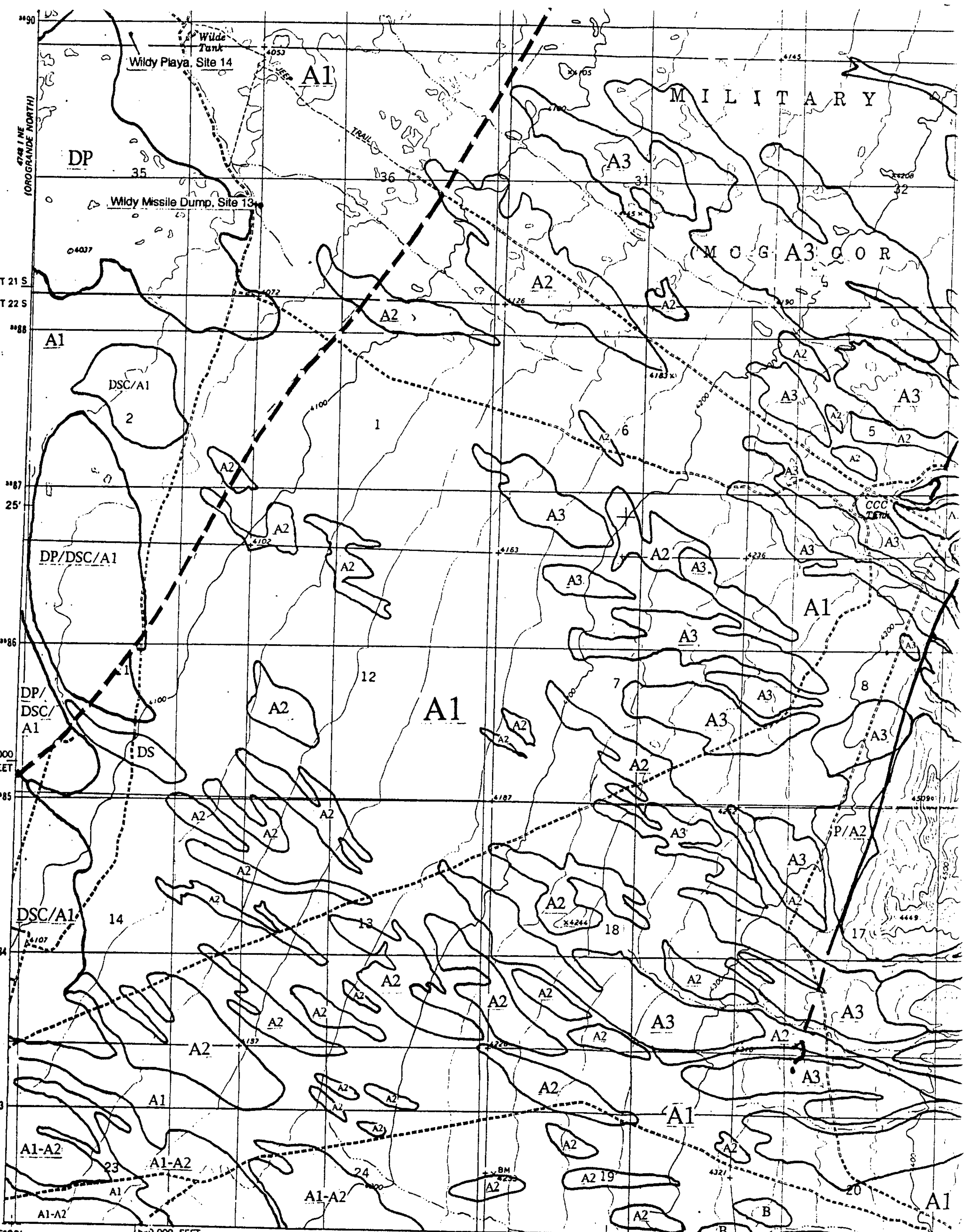


Mapping
exico

WILDE TANK QUADRANGLE
NEW MEXICO-OTERO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 PENEJO WASH 15' QUADRANGLE



3



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Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 13
1927 North American datum

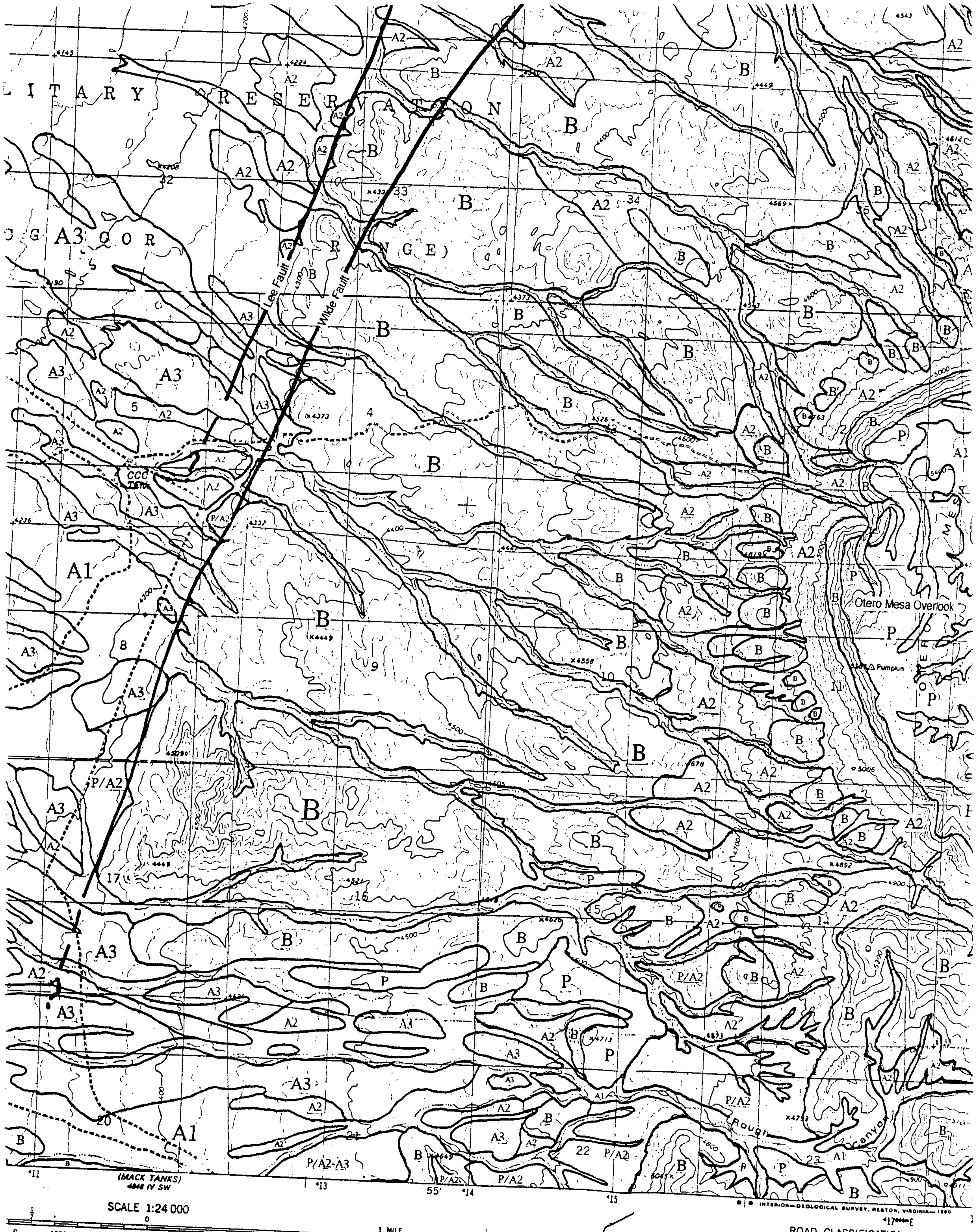
McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••

4

SCALE 1:24 000

CONTOUR INTERVAL 20 FE



SCALE 1:24 000

1 MILE

0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET

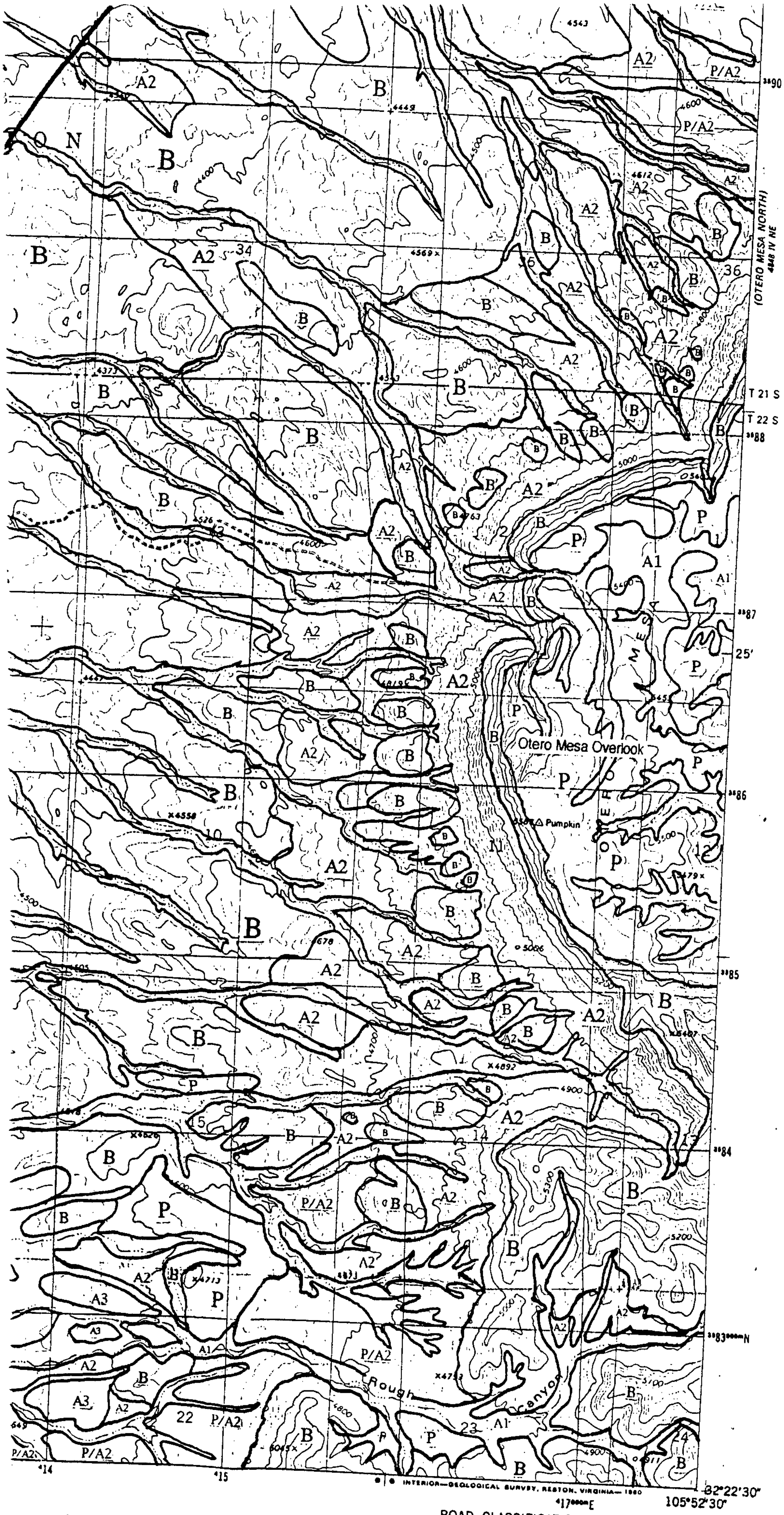
5

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface



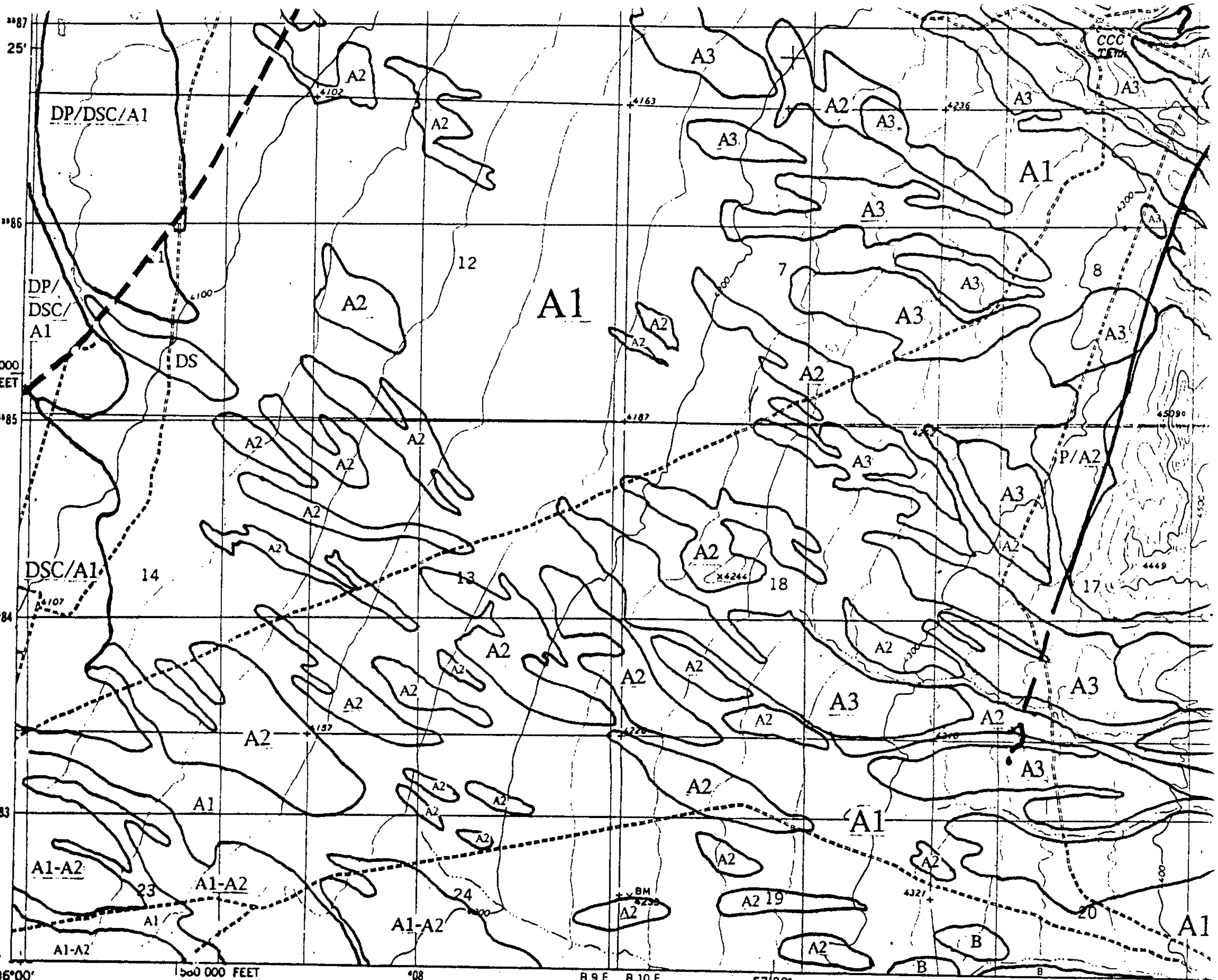
6

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway,



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1974. Field checked 1975. Map edited 1980

Projection and 10,000-foot grid ticks: New Mexico coordinate system, central zone (transverse Mercator) 1000-meter Universal Transverse Mercator grid, zone 13 1927 North American datum

To place on the predicted North American Datum 1983 move the projection lines 7 meters south and 50 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence lines

There may be private inholdings within the boundaries of the National or State reservations shown on this map

McGregor Range Geomorphic Mapping Units and Symbols[1]

Alluvium (recent)	A1
Alluvium (relict)	A2
Alluvium (older relict)	A3
Bedrock	B
Bolson Floor Complex	
Camp Rice (Rio Grande) Sediments	CR•••
Dune, Local	DL
Dune Pile	DP
Dune Sheet (Sand Sheet)	DS
Dune Sheet, Coppiced	DSC
Dune Sheet, Gypsiferous	DSG
Fault	
Pediment	P
Playa	Pl
Playa Lunette	PlL

[1]See text for explanation

SCALE 1:24 000

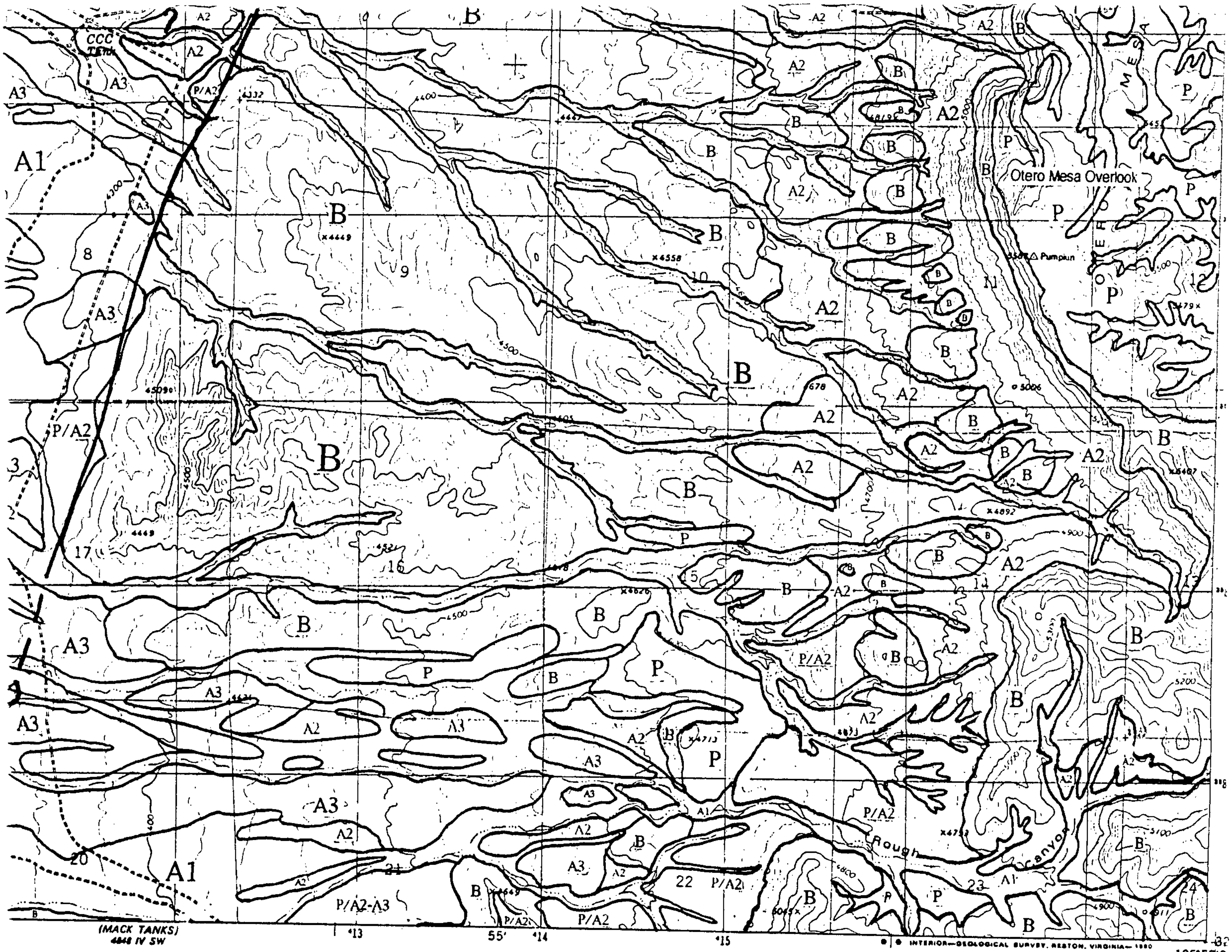
CONTOUR INTERVAL 20

NATIONAL GEODETIC VERTICAL DA

THIS MAP COMPLIES WITH NATIONAL MAP AC

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORA

A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMB



SCALE 1:24 000

1 MILE

1000 2000 3000 4000 5000 6000 7000 FEET

.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
TIONAL GEODETIC VERTICAL DATUM OF 1929

COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
AL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

NEW MEXICO

QUADRANGLE LOCATION

GN MN

0°30' 9 MILS

11½° 204 MILS

UTM GRID AND 1980 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

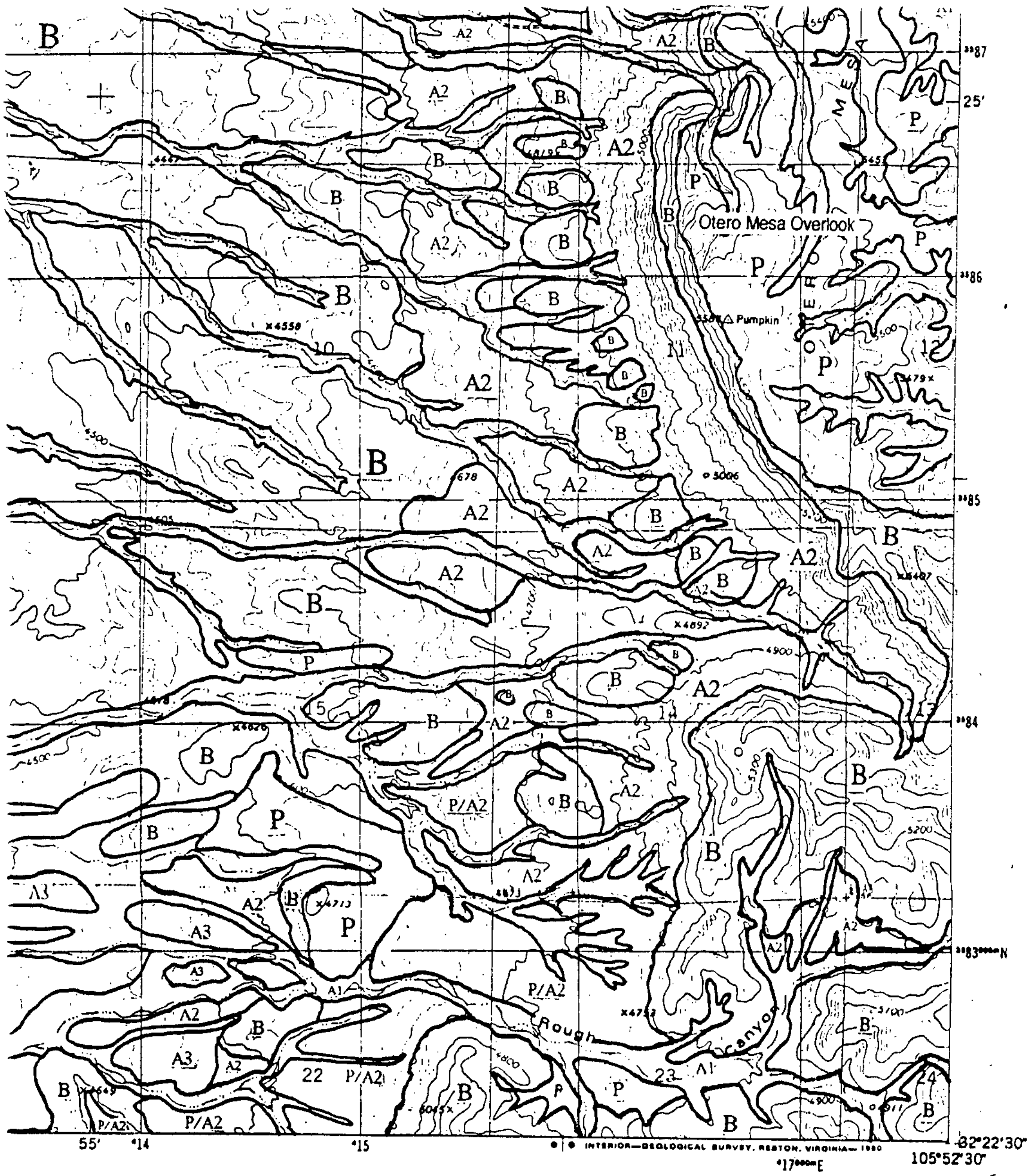
Unimproved road

Interstate Route U. S. Route State Route

WILDE TANK, N. MEX.
NW/4 PENDEJO WASH 15' QUADRANGLE
N3222.5—W10552.5/7.5

1980

DMA 4848 IV NW—SERIES V881



ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

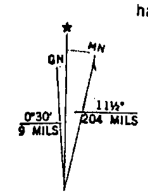
Unimproved road

Interstate Route U. S. Route State Route

4848 IV SE (OTERO MESA SOUTH)

1 MILE

QUADRANGLE LOCATION



UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

WILDE TANK, N. MEX.

NW/4 PENDEJO WASH 15' QUADRANGLE

N3222.5—W10552.5/7.5

1980

DMA 4848 IV NW—SERIES V881

992

80

9