Summary Report for the 2004-2005 STATEMAP Project:
Geologic Mapping to Support Improved Database Development and Understanding of Urban Corridors, Critical Aquifers and Special Areas of Environmental Concern in Texas

Final Report

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Edward W. Collins and Jay A. Raney

Prepared for
U.S. Geological Survey
Under Cooperative Agreement No. 04HQAG0080

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ABSTRACT

A geologic map of the Del Rio, Texas, area, scale 1:100,000, has been constructed through digital compilation of nine 1:24,000-scale open-file geologic maps. The map is intended to be used by professionals and laypersons as a source of general geologic information that relates to land and resource use and management. Geology of the study area consists of Cretaceous Salmon Peak limestone, Del Rio clay and minor calcareous siltstone, Buda limestone, Eagle Ford shale, siltstone and flaggy limestone, and Austin Group chalk, limestone, and lesser marl. These rocks were folded during Laramide deformation (Late Cretaceous to early Eocene), and they were faulted during development of the Miocene Balcones Fault Zone. Fractures and karst within the Edwards Group Salmon Peak limestone contribute to the porosity of the prolific Edwards aquifer, a source of groundwater for the study area. Cretaceous rocks are overlain by broad Tertiary to Quaternary alluvial deposits and younger Quaternary alluvium associated with the Rio Grande and its tributaries. Tertiary to Quaternary alluvial deposits, which contain older alluvium classified as part of the Uvalde aquifer, provide another source of shallow groundwater locally. Cretaceous limestone is an aggregate resource. The older alluvial deposits are a local resource for sand, gravel, and caliche.

PROJECT 1: DEL RIO CORRIDOR DIGITAL COMPILATION

This Texas STATEMAP project involved digital compilation of nine open-file geologic maps for construction of a 1:100,000-scale geologic map of the Del Rio, Texas, area. The study area, a Rio Grande border area in south-central Texas, includes Del Rio (an international border town on the Rio Grande), Amistad National Recreation Area, and major transportation routes from Mexico (fig. 1). This area is within the southern Edwards Plateau part of the important Edwards limestone aquifer, and the area also contains a smaller aquifer, the alluvial Uvalde aquifer (fig. 2). Project 1 addresses land-use and groundwater resource issues within the growth corridor bordering Mexico. The digital geologic map constructed for this project will meet the needs of the public and a variety of professionals, including geologists, hydrologists, engineers, planners, and biologists who must respond to demands placed on the environment and resources of this region and to provide a basis for developing information that will improve public awareness of geologic processes and the geologic framework of Texas. A digital geologic map of this area is critical because many of the economic, environmental, and political issues are multidisciplinary, and digital geologic data that can be readily integrated with other data sets are needed. The map will provide data for those interested in sources of construction materials, engineering properties of near-surface materials, groundwater resources, areas of recharge, and geologic hazards, such as flooding, erosion, and expansive soils.

Figure 1. Location of Project 1, Del Rio Corridor Digital Compilation, study area.

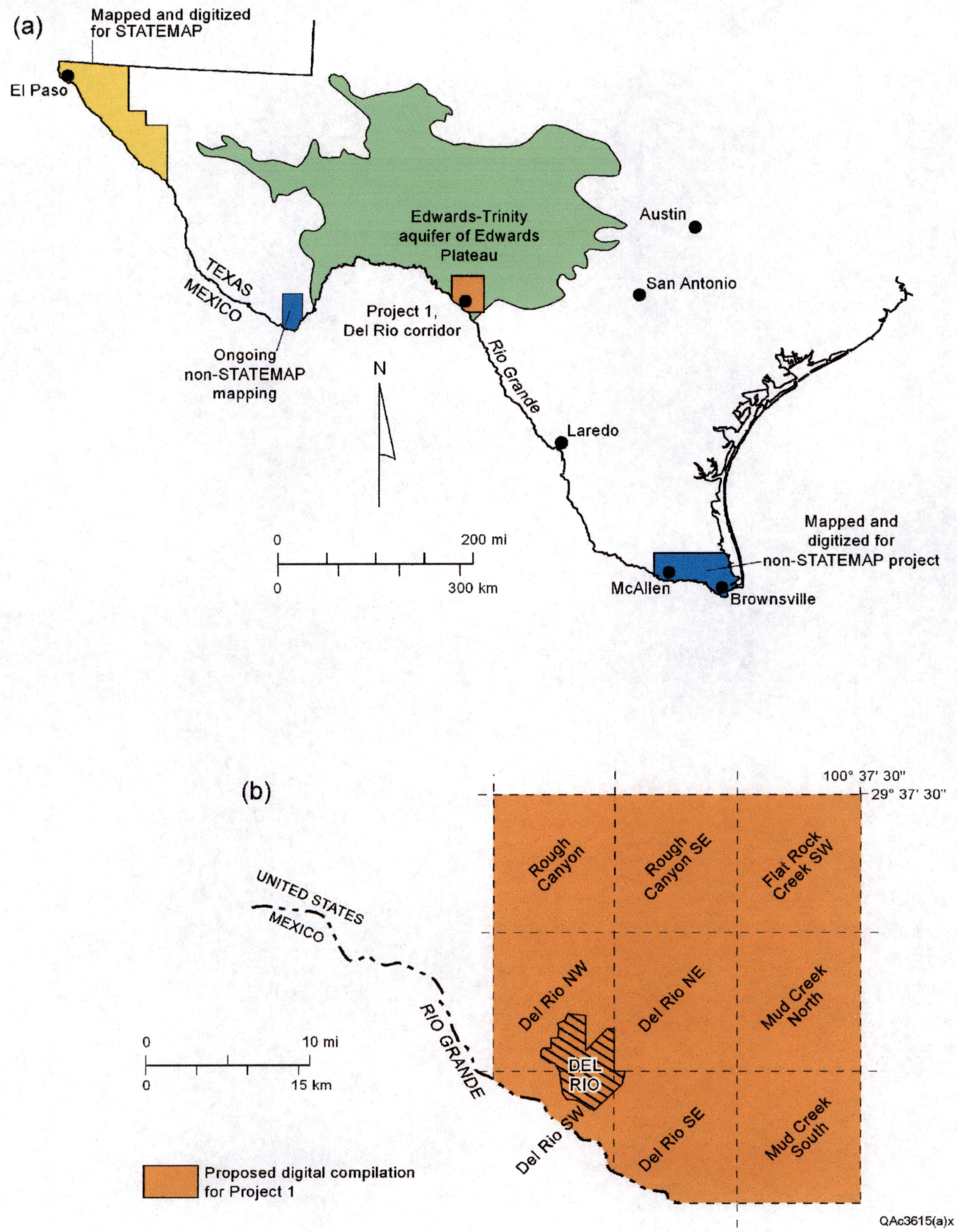

Figure 2. (a) Location of study area along Rio Grande border between Texas and Mexico. (b) Geologic quadrangle maps that were digitized and compiled for Del Rio corridor digital compilation project.

Nine 1:24,000-scale open-file geologic maps that were mapped during previous STATEMAP projects (fig. 2b), were digitized to construct the deliverable for this project, the 1:100,000-scale Geologic Map of the Del Rio, Texas, Area (in pocket). The nine 1:24,000-scale quadrangle maps include Rough Canyon, Rough Canyon SE, Flat Rock Creek SW, Del Rio NW, Del Rio NE, Mud Creek North, Del Rio SW, Del Rio SE, and Mud Creek South quadrangles. The geology illustrated on the Geologic Map of the Del Rio, Texas, Area is based on field and aerial-photograph interpretations by the author. Previous works reviewed for this study include Lozo and Smith (1964), Freeman (1968), Rose (1972), Waechter and others (1977), San Antonio Geological Society (1984), McFarlan and Menes (1991), Sohl and others (1991), Smith and others (2000), and Smith (2004). Selected water wells and data related to depths to water for the Edwards and Uvalde aquifers have been added to the map. These data were provided by the Texas Water Development Board.

The study area contains three areas distinguished by contrasting physiography and geology. The north part is within the well-dissected southern edge of the Edwards Plateau and has hilly and locally rugged terrain within Lower and Upper Cretaceous rocks. South of, and incised into, the edge of the dissected Edwards Plateau is an area having topographic relief relatively lower than that of the remnant plateau margin. This lower topographic relief area has been shaped by stream erosion and deposition, and it contains aerially broad Tertiary to Quaternary alluvial deposits that overlie Cretaceous rocks, as well as some exposed Cretaceous deposits. The south part of the study area contains the Rio Grande valley and Quaternary deposits associated with river and valley margins.

Exposed Lower Cretaceous rocks in the area compose the limestone of the Salmon Peak Formation, an upper unit of the Comanchean Edwards Group within the Maverick Basin (Lozo and Smith, 1964; San Antonio Geological Society, 1984; Smith and others, 2000). Humpreys (1984) and Smith and others (2000) determined that Salmon Peak lime mudstones, wackestones, and packstones to grainstones of the study area reflect deposition at the transition between the open to slightly restricted basin and the progradational shelf margin. At the surface in the study area, lime packstones and grainstones are relatively common in many outcrops, although regional studies of subsurface core and surface outcrops by Humpreys (1984) and Smith and others (2000) indicate that most of the Salmon Peak stratigraphic section of the map area and beyond is dominated by lime mudstones and wackestones. West Prong Formation limestone, which overlies the upper progradational rocks of the Salmon Peak at the north margin of the Maverick Basin, is indistinguishable from Salmon Peak rocks (Humpreys, 1984; Smith and others, 2000). It pinches out by onlap northward from the basin. Possible West Prong rocks were not subdivided from Salmon Peak strata for the Del Rio mapping study, although Smith and others (2000) interpreted about 50 feet of West Prong limestone near Del Rio from core studies.

Upper Cretaceous rocks overlying the Salmon Peak Formation include Del Rio clay and minor calcareous siltstone, Buda limestone, Eagle Ford shale, siltstone and flaggy limestone, and Austin Group chalk, limestone, and lesser marl. Sohl and others (1991) summarized the regional framework of this Upper Cretaceous stratigraphic section

that represents deposition from the Cenomanian through Santonian stages. They noted marine regression and transgression characteristics of the Del Rio and Buda rocks. Del Rio deposits, reflecting shallow marine shelf clay and minor silt deposition, are disconformable to the Buda shallow marine shelf limestones (Freeman, 1968). Eagle Ford deposits of the study area represent deposition in lagoonal to shallow shelf environments. Austin rocks indicate carbonate deposition within a shallow, open-marine shelf that was relatively distant to the shoreline.

Overlying and incised into the Cretaceous bedrock are (a) older, probably upper Tertiary to Quaternary, alluvial deposits of gravel, sand, and clay having well-developed calcic soil horizons and (b) Quaternary alluvial deposits associated with the Rio Grande and smaller tributaries. The older alluvial deposits, classified as part of the Uvalde alluvial aquifer, cover relatively broad areas and provide local sources of shallow groundwater. The more prolific aquifer of the area, the Edwards limestone aquifer, is part of the regional aquifer system that extends throughout the Edwards Plateau (Reeves and Small, 1973; Barker and Ardis, 1996). In the study area, depths to Edwards water are generally between 350 and 65 feet. San Felipe Spring discharges from the aquifer in Del Rio. Fractures in the Edwards aquifer strata, as well as karst features and strata collapse, contribute to the aquifer's porosity.

Limestone of the Buda and the Salmon Peak is a potential aggregate resource. One relatively large pit quarrying Buda limestone currently operates north of Del Rio. Some small pits, inactive to periodically active, occur within the Salmon Peak Formation. Eagle Ford flaggy limestone and calcareous siltstone are potential building or decorative stone resources. The older alluvial deposits provide a local resource for sand, gravel, and caliche, and they contain several small pits.

Structural elements within the Cretaceous rocks reflect at least two periods of tectonic deformation. A broad, easterly trending anticline probably developed during regional Laramide (Late Cretaceous to early Eocene) folding (Ewing, 1991). Normal faults striking northeastward and having tens of feet of throw have been interpreted to be the part of the regional Miocene Balcones Fault Zone that Murray (1961) reported extends across Central Texas from Del Rio to Dallas. Some northwest normal faults in the study area are assumed also to be associated with this zone. Joints within the Cretaceous rocks probably resulted from both periods of deformation.

ACKNOWLEDGMENTS

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