A Cultural Resources Survey of the Proposed Herff Road Re-Alignment Project, Kendall County, Texa

David L. Nickels
Tierras Antiguas

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A Cultural Resources Survey of the Proposed Herff Road Re-Alignment Project, Kendall County, Texa

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A Cultural Resources Survey of the Proposed Herff Road Re-Alignment Project, Kendall County, Texas

Prepared for Klotz Associates
Houston, Texas
by
David L. Nickels, Principal Investigator
Tierras Antiguas Archaeological Investigations
Report #310
May 2014
Texas Antiquities Permit #6708
Abstract

Klotz Associates of Houston, Texas contracted with Tierras Antiguas Archaeological Investigations to conduct a cultural resources survey of 700 linear meters of road right-of-way on the outskirts of the city of Boerne, in Kendall County, Texas. The total Area of Potential Effect is 700 meters long x 45 meters wide, for a total of 7.78 acres. Texas Antiquities Permit #6708 was issued in order to proceed with the archaeological investigations.

Tierras Antiguas conducted a thorough pedestrian survey and dug 17 shovel tests on May 23 and 25, 2014, resulting in the discovery of no evidence of either prehistoric or historic cultural materials. In addition, no potentially historic structures were observed along the right-of-way.

As such, Tierras Antiguas recommends that construction of the Herff Road expansion project should be allowed to proceed as currently designed. The project should be considered as having “no effect” on any properties considered as eligible for nomination to the National Register of Historic Places or inclusion in the State Archeological Landmarks Program, and as such, the project should be allowed to proceed without further archaeological work. However, if any cultural resources are encountered during construction, work should immediately be halted in the vicinity until such finds are examined and evaluated by Tierras Antiguas, or by any qualified archaeological consultant, and by the Texas Historical Commission.

No artifacts were collected and curated during this project.
Acknowledgments

First and foremost, I express my sincere appreciation to Mr. Jeff Anderson, Project Manager at Klotz Associates. Jeff was most accommodating, informative, and instrumental in ensuring that the project was done on schedule, and in a professional manner.

Another individual who was extremely helpful in the completion of this report is Joel Butler who masterfully created the map overlays presented. In addition, I very much relied upon Emory Worrell, an archaeological Field Technician for Tierras Antiguas. He is a dedicated individual, and as always, Emory worked meticulously to ensure all aspects of this investigation were thoroughly documented in accordance with Texas Historical Commission and Council of Texas Archeologists standards.

Finally, I wish to extend my sincere appreciation to Ms. Tiffany Osburn and Mr. Mark Denton at the Texas Historical Commission for their project review and sage advice on selected issues involved with this project.

Cover Photo - Aerial photo showing shovel test locations along the Herff Road proposed right-of-way.
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Introduction

Klotz Associates of Houston, Texas is the lead agency for the 700-meter improvement and expansion of Herff Road on the edge of Boerne, but within the Kendall County jurisdiction. As such, Klotz is responsible for ensuring the requirements for cultural assessments would be conducted in a professional compliance manner. At the request of Klotz, Tierras Arqueológicas Investigations (TAAI) conducted a cultural resources survey of the Project Area (PA) on May 23 and 25, 2014.

The Kendall County project (Figures 1-3) was funded by a bond package approved by Kendall County citizens in May 2011. Based upon a Scope of Work and Antiquities Permit Application, the Texas Historical Commission issued Permit #6708, authorizing the cultural resources survey.

In addition to a surface survey, Tierras Antiguas excavated 17 shovel tests. The survey was conducted under the...
guidelines of the Texas Historical Commission (THC) and Council of Texas Archeologists (CTA).

Figure 3. Project Area on Boerne, TX 7.5' USGS Topographic Map.
Project Setting

Geology and Soils
The Project Area is located on Lower Cretaceous aged Edwards Limestone (Ked) (Figure 4). Medium gray to grayish brown, fine to coarse-grained chert can be found in abundance in the Edwards formation, formed over 66 million years ago, and ranging from 300 to 500 feet in thickness (Barnes 1982; Judson and Kauffman 1990; Spearing 1991). Along the creeks are Holocene-age fluvatile terrace deposits (Qt), commonly found along streams adjacent to the Edwards Plateau. These are made up of sand, silt, and clay, with being limestone, dolomite, and chert (Barnes 1982).

As shown in Figure 5, there are two different soil types within the Herff Road project area that offer varying depths, sedimentation and deposition rates, and Oakalla silty clay loam represents Menger Creek alluvium. As such, soil classifications and origins likewise imply the potential for the preservation of intact cultural resources to exist. Table 1 lists the soils that are mapped within the project area (Dittemore and Hensell1981; Websoil 2014).

Figure 4. Geologic map of the Project Area.
Figure 5. Soils to be dissected by the Herff Road project.
Table 1. Soils to be Dissected by the Herff Road Project.

<table>
<thead>
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<th>Soil Series</th>
<th>Typical Soils, Areas, and Depths</th>
<th>Buried and Intact Archaeological Potential</th>
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<td>Nuvalde silty clay (15)</td>
<td>Deep, clayey soils in ancient alluvium stream terraces</td>
<td>Moderate to high</td>
</tr>
<tr>
<td>Oakalla silty clay loam (16)</td>
<td>Deep, clay loam floodplain and lower terrace deposits found along streams</td>
<td>Minimal to moderate</td>
</tr>
</tbody>
</table>

**Hydrology**

The PA lies within the upper Cibolo Creek drainage basin. Cibolo Creek begins approximately 16 kilometers (km) west of Boerne from springs flowing out of Edwards Limestone hills. The waters then disappear from the channel as they drop into the Glen Rose formation (Gerstle et al. 1978:31). In the immediate area of Herff Road, Menger Creek is a first order tributary of Cibolo Creek. Menger Creek crosscuts through the western portion of the PA, and is subject to flash flooding during locally heavy thunderstorms. Following a recent rain, standing water was present over limestone bedrock during our investigations in May 2014 (Figure 6).

**Climate, Flora, Fauna, and Raw Materials**

The project area lies within the Edwards Plateau physiographic region of Texas, and in an area of southern Kendall County where the Native American groups who occupied it were advantageously able to exploit an ecotone encompassing riverine, upland, and semi-arid adapted plants and animals. The Edwards Plateau, with elevations reaching 2,250 ft above mean sea level (amsl) in northern Gillespie County (Allison et al. 1975:76), is a hilly region, gradually sloping...
to the southeast, and ending in the escarpment running across the middle of the sub-region (Figure 7). The most common flora observed on the plateau include juniper (*Juniperus ashei*),
plateau live oak (*Quercus fusiformis*), Texas persimmon (*Diospyros texana*), honey mesquite (*Prosopis glandulosa*), and agarita (*Berberis trifoliata*) (Blair 1950:112; Van Auken 1988:45; Simpson 1988). Due to overgrazing by livestock and restricted range fires, much of the plateau has been overtaken by juniper in modern times (Buechner 1944:703-704; Van Auken 1993:199-210).

The Balcones Escarpment separates the Edwards Plateau from the lower blackland prairies to the east. It is a fault zone, consisting of blocky limestone, chalk, shale, and marl. The escarpment slopes to the southeast from about 700-1,000 feet above mean sea level (Taylor et al. 1991:119). The most economically important floral species are riparian nut trees, including oak, walnut, and pecan that thrive along the rivers and creeks (Van Auken 1988:55). The intertwined diversity in biotic resources existing along the escarpment provides an ecotone in which humans could exploit a wide variety of plants and animals from season to season (Collins 1995:366; 2004). The presence of prehistoric cemeteries found in areas along the escarpment where seasonally rich food resources such as nut-bearing species, particularly acorn and pecan trees, and prickly pear tunas may not be just a coincidence (Hall 1995:633-647).

More specifically, the Herff Road project lies in the southern portion of the Edwards Plateau, in central Texas’s “Hill Country,” so named for its rugged, stream-eroded topography. The environmental zone can be classified as upland. The annual average rainfall is about 28 inches (77 centimeters), with 194 growing-season days per year (Dittemore and Hensell 1981:64-65).

Lithic resources in the form of Edwards formation chert can be observed in abundance within the Cibolo Creek bed, and are available in the many cutbanks and second and third order tributaries that dissect the Edwards formation. These resources suggest that raw materials for making stone tools were readily available.

Three different micro-environmental zones encompass this relatively short, 700-meter Project...
Area: creek, terrace, and uplands (Simpson 1988:180, 301). The predominant vegetation on the upper sideslope is live oak and Texas cedar, with native grasses, prickly pear, and yucca in the open areas. (Figure 8).

Gently undulating and historically plowed alluvial terraces are present within roughly 100 meters on both sides of Menger Creek (Figure 9). Along the immediate edges of Menger Creek are both large oak trees and thin to moderately dense cedar understory (see Figures 6 and 10).

Figure 9. Shovel testing on alluvial terrace north of Menger Creek; facing northeast.

Figure 10. North bank of Menger Creek; facing north.
Cultural Context and Chronology

Introduction
The Project Area is located within the Central Texas archaeological region (Figure 11), and as such, prehistoric cultural affinities most common to the Central Texas hill country cultures are often manifested in archaeological sites along the upper Cibolo Creek basin. The most basic chronology of the Central Texas regions can be divided into either: (1) prehistoric cultural groups with no specific tribal affiliation, or; (2) historically documented groups with a designated tribal or band name. Before Spanish soldiers and Catholic missionaries arrived in Texas, the cultural activities of the groups of prehistoric Native Americans who inhabited the region can only be surmised from what we can glean from the archaeological records at undisturbed, and well-documented sites. Historic cultural groups are those observed firsthand by the Spanish soldiers and priests beginning in the late 1500s. The Spanish then began recording their encounters by writing the names, numbers, and living conditions of the many groups of Native Americans who lived in the region. However, there is a significant transition era between the least archaeologically known prehistoric cultural groups, and the historic Native Americans that the Spanish documented; the transition era occurs in the 1500s when Spanish explorers and treasure seekers ventured through Texas.

The Prehistoric Chronology
Based on research in Texas over the past 70+ years, beginning with professionals from the University of Texas at Austin, archaeologists have been able to segregate the prehistoric period in Central Texas into the Paleoindian, Archaic, and Late Prehistoric periods (Figure 12).
<table>
<thead>
<tr>
<th>Geologic Epoch</th>
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<td>Historic</td>
<td></td>
<td>Perdiz</td>
<td>A.D. 1690 - A.D. 1950</td>
<td>0-260</td>
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<tr>
<td>Late</td>
<td></td>
<td></td>
<td>A.D. 750 - A.D. 1490</td>
<td>260-1,200</td>
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<tr>
<td>Prehistoric</td>
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<td>Ensor, Frio,</td>
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<td>Fairland</td>
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<td>Marcos, Montell,</td>
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<tr>
<td>Late</td>
<td></td>
<td>Castrovilles</td>
<td>A.D. 750 - 2050 B.C.</td>
<td>1,200 - 4,000</td>
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<tr>
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<td></td>
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<td></td>
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<td></td>
<td>Middle</td>
<td>Taylor</td>
<td>2050 B.C. - 4050 B.C.</td>
<td>4,000 - 6,000</td>
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<tr>
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<td>Uvalde</td>
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<tr>
<td>Holocene</td>
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<td>4050 B.C. - 6850 B.C.</td>
<td>6,000 - 8,800</td>
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<td>Angostura</td>
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Figure 12. Central Texas cultural chronology (primarily from Collins 1995; 2004).
Although other archaeologists have made significant foundational contributions to our current understanding of how past cultures changed through time (e.g., Story 1985; Prewitt 1981), the most current and widely recognized chronology for Central Texas are those offered by Michael Collins (1995; 2004).

Paleoindian Period (11,500-8,800 years ago)
With minor differences observed in the archaeological record across the wide expanse of Central Texas, this period spans the past years estimated at between ca. 11,500 and 8,800 years ago (Collins 1995:381–383; 2004). Diagnostic artifacts include a unique, fluted, finely flaked, and blade-shaped spear or dart point called “Clovis”, other stone tools chipped on both sides, and unique prismatic blade-like flakes systematically knocked off from river cobbles. Archaeologists have documented Clovis-age sites in Central and South Texas such as killsites, quarries, stone tool caches, open campsites, ritual sites, and burials (Collins 1995:381–383; 2004). A Folsom interval follows the Clovis. Folsom artifacts are fairly common in Central and South Texas; however, no campsites or killsites have been found south of Bexar County (Hester 1995:434–435).

During this 2,700-year Paleoindian period around the project area, the Native Americans we term as the Paleoindian culture were likely one of small bands of nomadic, big-game hunters following herds of Late Pleistocene fauna, including mammoth, mastodons, bison, camel, and horse that are now extinct in North America (Black 1989). Nevertheless, when big game was not available, we have archaeological evidence that the Paleoindian peoples supplemented their diet by eating turtles, tortoises, alligators, mice, badgers, and raccoons (Collins 1995:381; 2004).

Archaic Period (8,000-1,200 years ago)
Primarily, by studying the differences in the stone tools, the diversities in campsites or other types of sites, the locations of the sites, as well as many other measurable and analytical observations such as ethnobotanical and faunal remains found at Central Texas archaeological sites, archaeologists have been able to dissect about 6,000 years of our past into what we commonly term the “Archaic”. Based on these same aforementioned affinities, the Archaic has further been defined in terms of the Early Archaic, the Middle Archaic, and the Late Archaic.

Early Archaic (ca. 8,800-6,000 years ago)
The region was most probably occupied by small groups who moved almost constantly during the Early Archaic period. Archaeologists have observed a distinctive change in projectile point styles that are unique to this period; they include Early Corner Notched and Early Basal Notched dart points. Although they were still very much hunters and gatherers, the large animals such as mammoths that their Paleoindian ancestors had hunted were by this time extinct. To survive, they capitalized on exploiting the other abundant food resources that Central Texas had to offer Texas—such as deer, fish, rodents, prickly pear tunas, and various plant bulbs and tubers. Archaeologists point to the increased numbers of ground stone, firecracked limestone used in cooking ovens larger in size than normal campfires, and specialized stone processing tools as evidence that Native Americans refocused their pursuit of foodstuffs (Weir 1976; McKinney 1981; Story 1985; Collins 1995; Hester 1995).
Middle Archaic (ca. 6,000-4,000 years ago?)
When this period actually began and ended is always debatable among archaeologists. Some (e.g., Collins 1995; 2004) see a significant pattern in the archaeological record between 6,000 and 4,000 years ago, but others (e.g., Hester 1995) don’t think the same changes were prevalent until much later in South Texas - about between 4,500 and 2,400 years ago. Nevertheless, the climate began changing in Central Texas beginning around 6,000 years ago, and a continuum of dry climate known as the Altithermal, is believed by some archaeologists to have caused the Native Americans to gather in larger groups. They gathered in large groups to exploit plant foods that were more dependable than larger game animals such as bison (Sollberger and Hester 1972:338; Weir 1976:125, 128; Story 1985:40). Archaeologists have found more sites that date to this period, and in Summer seasons the groups apparently took advantage of the numerous prickly pear tunas and pads that thrived in the environs of South-Central Texas, as well as deer and rabbit (Campbell and Campbell 1981:13–15; Collins 1995:38; 20043).

Later, they apparently congregated along the many creeks and rivers in the area to gather the abundant and nutritional nuts ripening in the Fall (Black 1989). On the Edwards Plateau, they may have come together to gather acorns, and then built large cooking ovens to steam the tannic acid out of them to make them edible (Weir 1976). The large cooking ovens were apparently used over and over again. Whether they were repeatedly used within just a few years or over several hundred years is still being debated, but the consensus seems to be that they were used to cook not only deer, but also a great deal of tubers and other plants (Black et al. 1997; Mauldin et al. 2003). These large cooking ovens which contain mounds of accumulated firecracked rocks are called “burned rock middens” in the archaeological community, but are sometimes referred to as “Indian mounds” by artifact collectors.

Late Archaic (4,000-1,200 years ago?)
As with the Middle Archaic period, differences in the traits of Native Americans inhabiting Central Texas during the Late Archaic period may have occurred over several hundred years. Whether it was a matter of cultural adaptation or an adaption to the environment is questionable. In either case, the uniqueness seen in archaeological sites of the two regions imply that change may have been slower in South Texas than in Central Texas.

Collins (1995; 2004) dates the final interval of the Archaic in Central Texas to approximately 4,000–1,200 years ago. The large cooking ovens which after repeated uses coalesced into burned rock middens, intensified during the Late Archaic (Black et al. 1997; Mauldin et al. 2003). Some researchers believe populations increased throughout the Late Archaic (Prewitt 1985), while others feel populations remained the same or fell during this period (Black 1989:30). Although the Native Americans of Central Texas still sought the abundant acorns, prickly pear, and riverine plant foods such as nuts, the slightly cooler and moister climate allowed them to pursue other food goods. Even though by about 1,500 years ago the gregarious, large herds of bison no longer predominated the now-dwindling grasslands of Central Texas (Dillehay 1974), the Native Americans still hunted and/or gathered deer and smaller animals such as rabbits, rodents, fish, and turtles (Black 1989:30).
Although farther south, near Brownsville and Rockport, the Native Americans inhabiting those areas began making pottery about 1,800 years ago, those groups farther to the north, around the upper Cibolo Creek area, either elected not to make pottery vessels, lacked the skills, or because of their generally highly nomadic lifestyle, simply elected not to use the easily breakable vessels until 1,000± years later (Story 1985:45–47). In addition to the uniqueness of Central Texas’ hunter-gatherers not adapting to the use of pottery, archaeologists have also observed a noticeable change in the styles/types of killing dart points used during the Late Archaic. Dart points were manufactured to be used with the atlatyl, a spear-like shaft with a dart point attached to it, and thrown or launched from over the shoulder. It would not be until perhaps 1,200 years ago that the bow-and-arrow was adapted for use for hunting in the region. Late Archaic dart points tend to be much smaller than Middle Archaic points, and the most common dart points that are found within the area are what archaeologists call Ensor and Frio types (Turner and Hester 1999:114,122).

As with most spectrums of scientific research, there is ongoing speculation amongst professional archaeologists as to when, and what traits mark a transition between the Late Archaic, hunter-gatherer practices of Central Texans and the Late Prehistoric peoples who presumably began to settle down into territorial groups claiming a part of the landscape as their own.

Transitional Archaic (2,300 - 1,300 years ago?)
A clear and abrupt transition of Native Americans adapting or developing the traits that archaeologists define as being inclusive to the Late Archaic period, separate from the Late Prehistoric period, around the project area is simply not distinct in the many sites that archaeologists have been able to excavate and analyze. In effect, some of the same characteristics that archaeologists see in Late Archaic artifacts and earlier Late Prehistoric assemblages left behind are nearly identical - or at least transitional in technology and style. Therefore, some archaeologists prefer to deem this transitional period as the “Terminal, or Transitional Archaic”, spanning from approximately 1,200 to perhaps as long ago as 2,300 years ago - depending on where in Central Texas the groups who left behind the now-present archaeological sites were living (Weir 1976; Hester 1995). Nevertheless, the increased number of burned rock midden sites that archaeologists have documented in Central Texas, and that date to this time period, suggest that people returned time and again to the same sites to once again take advantage of cooking and eating the abundant plants available during this time (e.g., Mauldin et al. 2003).

Late Prehistoric Period (ca. 1,250-300 Years Ago)
Although artifacts commonly associated with earlier Late Archaic occupations are also found on some Late Prehistoric-in-age archaeological sites, archaeologists have documented a distinct change in projectile point styles that Native Americans began manufacturing about 1,250 years ago. These stone points suggest that Native Americans in the Central Texas region surrounding the Herff Road project area adapted the bow-and-arrow as a weapon rather than the shoulder-thrown atlatyl with a dart point attached. As such, the stone points devised for killing became much smaller and streamlined. In layman terminology, the smaller, sleeker shafts arrow shafts carried an “arrowhead”, instead of a dart point.
Archaeologists have found Edwards and Scallorn arrow points dating to the earliest 600+ years of the period (e.g., Goode 1991:71). Concurrently, excavations by professional archaeologists have provided evidence that Native Americans began using crude clay pottery vessels made from local clays, as well as perhaps trading vessels from the South, Southeast Coastal, and Northeast Texas regions. As with any successful venture, the making of pottery was refined so that vessels were used more, and the technique of firing became perhaps an art (e.g., Story 1985:45-47; Black 1989:32; Hester 1995; Nickels 2000).

Archaeologists probably know more about the Native Americans who lived in Texas during this time than any other time in prehistory (Hester 1995). They continued to build large cooking ovens, or burned rock middens in which they roasted tubers, nuts, and some game animals (see for example, Mauldin et al. 2003). During this same period, the inhabitants may have increased their dependence upon bison (Steele and Assad-Hunter 1986:468). Huebner (1991) suggests that the sudden return of bison to Central Texas resulted from a more xeric climate in the plains north of Texas, and increased grassiness in the Cross-Timbers and Post Oak Savannah in north Central Texas, forming a “bison corridor” into the South Texas Plain along the eastern edge of the Edwards Plateau (Huebner 1991:354–355).

One theory is that perhaps there were not as many people occupying Central Texas and the area around the Herff Road project area during the Late Prehistoric period (Black 1989:32). We do know that they began occupying the limestone overhangs and rockshelters created by the many creeks and rivers cutting into the Balcones Escarpment limestone cliffs. Examples of rockshelters occupied by Native Americans along the escarpment include Scorpion Cave beside the Medina River in Medina County (Highley et al. 1978), Classen Rockshelter along Cibolo Creek in northern Bexar County (Fox and Fox 1967), and Timmeron Rockshelter in Hays County (Harris 1985).

Historic Period
Primarily beginning slightly over 350 years ago, European explorers, entrepreneurs, Catholic missionaries, and government officials encroached into what is today Central Texas in ever-increasing numbers. This transitional end of the Late Prehistoric and beginning of the Historic period in both Central Texas is characterized by a continuum of written accounts of European contact with the numerous indigenous, Native American groups encountered in the region. In Central Texas, we can be ever grateful to the meticulous writings of the Spanish priests and government officials for their recording of the names, numbers, and lifeways of the indigenous groups. Dr. Thomas Hester (1995) is most often credited with recognizing this transitional period between the Late Prehistoric and the Historic, and labels this largely unknown period as the “Protohistoric.”

Traveling northward from present-day central Mexico in the 1500s and 1600s, the Spanish encountered numerous small groups of Coahuiltecans (Campbell 1983; Campbell and Campbell 1985; Hester 1989; John 1975; Newcomb 1961; Swanton 1952). In later years, intrusive groups such as the Tonkawa, Lipan Apache, and Comanche took over the lands roamed by the Coahuiltecans (Ewers 1969; Hester 1989; Jones 1969; Kelley 1971; Newcomb 1961, 1993; Sjoberg 1953a, 1953b).
For example, around A.D. 1700, many south Texas Indian groups were being pushed northward by continual Spanish expansion. But by about 1750, the Apache, adapting to a more Southern Plains-lifeway style of bison hunting, entered what is today’s Texas from the northwest. Their incursion was especially rapid because they had acquired horses from the Spaniards (Campbell and Campbell 1985:27). As if the indigenous groups were not effectively dispersed and disrupted by the Apaches, the remnants of native American cohesion that previously existed in Central Texas were even further disrupted by the nomadic, bison-hunting Comanche from the High Plains of Texas (Campbell 1991:111).

Thus ensued over a century of turmoil for those numerous, but splintered Native American groups who had established a semi-permanent foothold in Central Texas before the arrival of the Apache and Comanche. They must have been heavily traumatized and significantly demoralized over the constant conflicts resulting in death, and the mysterious diseases caused by the forced continual mixing and remixing among ethnicities from around the regions and the world (Bolton 1915; Campbell 1991:345; León et al. 1961). Supposedly, there were dozens if not hundreds of language dialects that were spoken by the earlier inhabitants, but nearly all have been lost (e.g. Johnson 1994; Johnson and Campbell 1992).

Amidst the turmoil, the Spanish Catholic missions became a refuge for many of the otherwise dispersed bands and tribes within Texas. By the early 1700s, several missions had been established, and reestablished within the Nacogdoches and San Antonio areas (Campbell and Campbell 1985; Chipman 1992; de la Teja 1995; Habig 1968a, 1968b; Hard et al. 1995). Those that entered the missions did so usually voluntarily, seeking refuge from more powerful, warring bands or tribes. Others did so because they were starved for food that the protective missions could offer in seasons of natural destitution. Regardless, the Spanish government saw the Catholic religious zeal as a means of peaceful conquest in an otherwise untenable, unsettled, and hostile environment. At the same time, each and every Native American who relied upon support from the Spanish missions became less of a threat to eventual Spanish domination of the region, and infiltration by France or other countries (Campbell 1975:2; 1991:346–347).

Although a treaty with the Apaches in 1749 brought peace for a while, Apaches continued to range over the area between San Antonio and Laredo until the early 1800s, pushed southward by the invading Comanche who had moved into the Hill Country of Central Texas (Campbell and Campbell 1985:27; de la Teja 1995:100). In 1785, a peace treaty was agreed to in Santa Fe, New Mexico between the Spanish Crown and the Comanches. Although the ceremony of this treaty took place hundreds of miles to the west, its signing signaled the opening of a period of peaceful coexistence in what is today Bexar County, in which Comanches brought hides, meat, and tallow to San Antonio to trade for goods and services not available elsewhere, such as blacksmithing and gun repair (Fehrenbach 1983:221-224; Poyo and Hinojosa 1991:125-126).

In 1821, after a hard-fought rebellion, Mexico gained its national sovereignty from Spain; including the vast expanse that was to become the Republic of Texas. After only 15 years, the combined Tejano and Euro-American compatriots rebelled against Mexican rule, and defeated
the Mexican army to declare an independent Republic of Texas in 1836. By the 1840s, the city of San Antonio was well-established as the most progressive and most populated city in the newly formed Republic.

Apaches continued to range over the area between San Antonio and Laredo until the early 1800s, pushed southward by the invading Comanche who had moved into the Hill Country of central Texas (Campbell and Campbell 1985:27). Weary of warfare with the Comanche, a few Apache were beginning to seek asylum in the missions (McGraw and Hindes 1987:367; West 1904:50). The newly formed government of Texas gave land grants that were large, consisting of around 5,000 acres for each property, and Spanish cattle ranching became prevalent south and southeast of San Antonio (Jackson 1986), however the vast expanse west of San Antonio was not settled until the late 1800s.

Upon winning its independence from Mexico in 1836, a struggling young Republic of Texas continued the empresario (colonization) system as a means of bringing new families to settle and develop the land. Earlier grants of huge tracts of land to empresarios such as Stephen F. Austin Texas, Green DeWitt, Haden Edwards, Sterling Robertson, John McMullen, and others proved successful in establishing communities in south and east Texas. Around 1840 settlers from Germany and Alsace-Lorraine, and from other regions of the United States began to flood into San Antonio and New Braunfels. Many of the Germans moved into the Hill Country to the north, settling into communities such as Boerne, and raised sheep or cattle (Freeman 1994:5-9).

Under President Sam Houston’s second term in 1842, Henry Fisher, Burchard Miller, and Joseph Baker petitioned the Republic of Texas for authorization to establish 1,000 families in an area consisting of over 3 million acres of land between the Colorado and Llano Rivers. Permission was granted to Fisher and Miller to begin recruiting 600 immigrant families who would be given 640 acres per family, provided they build a cabin and farm 15 acres of fenced land. However, settlement in the area did not come easy. The objective of luring 600 families (later increased to 6,000 by the Republic of Texas) could not be accomplished for two principal reasons: (1) portions of the tract encompassed the hunting grounds of the Comanches who were not about to relinquish their domain without a fight, and (2) the area was well west of the main San Antonio – Mexico trade routes (Biesele 1987:76-110).

Following a chain of events that led to the Fisher-Miller Grant being acquired by the Adelsverein (the Society for the Protection of German Immigrants in Texas), John O. Muesebach as Commissioner-General of the organization sent a survey party to the San Saba River area near Menard to investigate the possibilities of mineral wealth and tillable farmland available within the western portion of the Grant. Well aware that he would be encroaching upon Comanche territory, he met with a group of Comanche chiefs for three days in March 1847 and negotiated a treaty of peaceful coexistence with them (King 1967:111-118). Speaking through an interpreter, Muesebach’s treaty proposal to the Comanche chiefs (from Tiling 1913:100) was as follows:
The following May the chiefs finalized the agreement by coming into Fredericksburg to sign the treaty and collect the money promised them (King 1967:118). Thus, German immigration into the lands west of San Antonio and Austin began in the 1830s and is fairly well documented. By the 1840s new routes and trails were being established through the largely unsettled area, due in part to the desire to reach the gold fields of California. “German immigrants established Sisterdale in 1847, Tusculum (Boerne) in 1849. Currey’s Creek in 1850, and Comfort in 1854” (Smryl 1996:1062). Leiding (1992) provides an account of 218 Germans attempting to settle in all of Texas by 1836, but increasing to 30,000 by 1860.

The 670 square miles (428,800 acres) that comprise modern-day Kendall County (Dittemore and Hensell:1) was cut out of Kerr and Blanco counties in 1862, and named in honor of George Wilkins Kendall, a pioneer journalist and sheepman. In 1852 he began raising sheep along the Nueces River, later moved his flock to near New Braunfels, and then to Post Oak Springs near Boerne (Cutrer 1996).

**Site Types That Could be Expected Along the Herff Road Right-of-Way**

**Prehistoric Open Campsites**

Most numerous among the sites recorded in Kendall County are prehistoric open campsites ranging in age from the Paleoindian period through the Historic period (see Figure 12). Some of these represent a single campfire where a very small group of Native Americans may have camped for one night. Others are very large, covering very extensive areas representing large groups of people that stayed for long periods, perhaps seasonally, with ancestral groups returning to these same campsites over a period of several thousands of years. Cultural remains to be found at these large campsites include among other items, an abundance of fire-cracked rocks representing multiple hearths, a wide variety of chipped stone tools and the lithic debris.

---

1. “My countrymen have the permission to go and travel where they please, and no harm must be done to them, but you must protect them everywhere. On the other hand, your people can come to our wigwams and cities without fear and can go wherever they please and shall be protected.”

2. “You the chiefs, and your people will assist us and report to us, when bad men and redfaces of other tribes steal our horses or intend other felonies, and we shall do the same, when you are attacked.”

3. I am going to send men with the thing that steals the land (compasses), as the red men call it, and will survey the whole country of the San Saba as far as the Concho and other waters, so that we may know the boundaries where we can go and till the soil. And if you are willing after consultation with your warriors, to make this treaty,
that results from making them, ground and smoothed stones used to grind nuts and seeds, faunal remains from terrestrial and aquatic animals consumed, bone tools, pottery sherds, and mussel and snail shells. Open campsites occur in all types of environments, whether that be in a plush riverine environment that offered a wide variety banquet of plant and animal foodstuffs, or in the uplands away from flowing water sources. Seasonally, the upland grasses, shrubs, and cacti offered a different food source that could be exploited such as various grass seeds, mesquite beans, prickly pear pads and tunas, and agave hearts. In addition, at various times, bison were known to graze on the northern South Texas Plains, and were highly sought after for use as food, hides, and bone tools (Dillehay 1974).

Depending upon the integrity of these open campsites, archaeologists and the Texas Historical Commission consider these as perhaps the most significant types of sites in regard to their ability to contribute to our understanding of Central Texas prehistory. A few of the desired ingredients that can indicate significance include cultural material that is buried beneath the surface in a well-preserved, stratified, and relatively undisturbed context. Although these situations most frequently occur within stratified terrace deposits adjacent to streams, they can also occur in upland settings where the landscape has been generally stable through time. Other ingredients that archaeologists look for in potentially significant campsites include good organic preservation in the form of charcoal and/or charred plant remains, faunal preservation, temporally diagnostic stone tools or ceramics, and intact features such as hearths.

**Prehistoric Lithic Scatters or Procurement Sites**

Lithic scatters are the next most common type of archaeological site that could be expected along the Herff Road right-of-way. These sites simply represent the chipped stone debris and broken tools that were left behind when Native Americans made new tools or re-sharpened their old ones. The general absence of fire-cracked rocks and other cultural material normally found at open campsites suggest that they did not camp there, or remain there for any extended period of time ( However, small camp fires may have been used to heat-treat chert or quartzite cobbles to make them more knappable). Yet, they were drawn to these isolated locales because of the natural outcroppings or surface exposures of good quality raw material such as chert or quartzite cobbles. Examples of chipped stone most commonly found at these sites include cobbles with one or two flakes removed, called ‘tested cobbles’. That is, the Native Americans knew from experience the quality of stone that could most easily be flaked and reduced for stone tool production, so they ‘tested’ the cobble to judge whether it was usable or not. If the quality was judged to be inferior, then the cobble was tossed aside. That is why the majority of tested cobbles found on these sites are of poor quality, coarse-grained material. While the finished stone tool products are carried away from these sites, what remains are those tools broken during the manufacturing process, and the thousands of pieces of debitage in the form of flakes and angular debris. Also unique to lithic scatters where large cobbles are present are snapped ‘quarry blanks’. These are simply cobbles flakes on both sides, reducing the cobble into a transportable ‘blank’ that can be used to further reduce it and make finished stone tools from the flakes taken off of it. The unbroken quarry blanks are usually not found on these sites because they have been carried off, presumably to areas of south Texas where raw material is not readily available. The snapped or broken quarry blanks are of little or no use, so they are discarded and left behind.
Lithic scatters range in age from the Paleoindian through the Historic periods and can be found on any landscape setting where gravels or cobbles have been exposed. Notably, gravel outcrops that were exposed to the surface a few hundred or thousand years ago could be deeply buried today, and the opposite could also be true; it all depends on the terrain setting and the dynamics of landscape evolution through time. Most lithic scatters in Kendall County have been documented along upper stream terraces abutting the eroded upland slopes.

**Prehistoric Quarries**

Prehistoric quarries can also can range in age from the Paleoindian through Historic periods, but differ from lithic scatters in that at those sites Native Americans exploited loose gravels, but at times they specifically sought quarry sites where raw material such as cherts or quartzites were not yet freed from their parent geologic formation, and they had to be ‘quarried’. These types of sites are rare in south Texas for two reasons: 1) the geological exposures generally do not present themselves, and 2) throughout Texas, even in central Texas, it is much easier to pick up gravels from the surface than to try to mine them from hard rock. Quarried and chipped stone remains likely to be found at these sites include large chunks of angular cherts or quartzites, as well as parent material detritus, and flaking debris. Snapped quarry blanks can also be expected. Because of the many limestone formations with chert inclusive gravels prehistoric quarries or procurement sites in Central Texas are not infrequent.

**Prehistoric Burned Rock Middens**

Burned rock middens result from a series of multiple-use earth ovens that were constructed much like modern-day roasting pits are dug into the earth for roasting a pig. With repetitive uses, as the larger rocks that serve as heating elements in the earthen pit fracture and thus become less effective as a thermal source, they are ‘pitched out’ around the edge of the pit. As the pit becomes unusable, another is dug near by, and the procedure repeated. Over time, these multiple pits and the ‘pitched out’ fire-cracked rocks coalesce together, obscuring each pit as indiscernible. (For a full discussion of the formation of burned rock middens and their documented presence in Texas, see Leach and Bousman 2001; Leach et al. 2001; Mauldin et al. 2003).

**Prehistoric Burial and Cemetery Sites**

Although not common, isolated prehistoric burials and cemeteries have been documented in Central Texas. Individual and isolated burials have been found in association with open campsites in both upland settings as well as in alluvial terraces along streams, within rock shelter overhangs, and within limestone sinkholes.

**Historic Sites**

As discussed above in the Cultural Chronology section above, Spanish entradas with government officials and Catholic priests began recording their encounters with local Native American groups as early as the late 1500s. However, as yet there are no documents discovered that would suggest a permanent historic presence within the Herff Road and Kendall County areas until the mid-1800s (Smyrl 1996:1062). The most common historic site types to be encountered are related to ranching and farming endeavors, or small communities from the 19th
and 20th centuries. Site types most commonly include farmsteads or ranches with corrals, cisterns, chimney and foundation remains from both main houses and outbuildings, related trash dumps, an occasional family burial or cemetery, school houses, churches, community buildings, and industry-related structures or construction projects. In general, the area has been historically used predominantly as ranchland pasture, with no development other than associated ranching activities such as windmills, stock tanks, corrals, and sparsely scattered outbuildings.

**Previous Archaeological Work in the Area**

As early as the 1930s, A.T. Jackson from The University of Texas at Austin began visiting Kendall County archaeological sites, making maps, and compiling notes about the sites. It wasn’t until many years later that a handful of sites were recorded in the 1960s. Site recordings increased significantly beginning in the 1970s, due mostly to the establishment of the Center for Archaeological Research (CAR) at the University of Texas at San Antonio in 1973. As the Center’s first director, Dr. Tom Hester sought to foster a hand-in-hand relationship among amateur collectors, landowners, and professional archaeologists. As such, he was instrumental in establishing the Southern Texas Archaeological Association (STAA) in 1973, a dedicated bunch of individuals who were (and still are) committed to documenting and preserving archaeological sites throughout Central and South Texas. In more recent years, the Hill Country Archaeological Association based in Kerrville has been active in the area.

While we will never know for sure how many archaeological sites have been destroyed, or how many still remain in Kendall County, we do know that as of May 2014, professional and avocational archaeologists have managed to document 219 sites. Of those, 100 are prehistoric open campsites, and 68 are prehistoric lithic scatters or procurement sites. Burned rock middens have been documented on 32 sites, and there are six rockshelters with intensive human occupation remains. One of those shelters has nine steps carved into a rock face leading to it, and another has carved petroglyphs. Notably, two prehistoric burial sites have been recorded in the county. The first features burials in a limestone sinkhole, with a burned rock midden on the surface above. The second has a series of above-ground rock cairn burials. The 16 historic sites and components recorded thus far include mostly mid- to late 19th century stone farm and ranch structures, but also a stone dam for a mill operation, trash scatters, a local cemetery, and a 20th century railroad bed. There are also two State Archaeological landmarks documented within the county. The first is the historic Kendall Courthouse and Jail in Boerne, and the second is the Treue der Union Monument now located in the Corpus Christi Museum of Science and History (Atlas 2014).

**Archaeological Atlas Site Results**

A review of the Texas Historical Commission’s Atlas of Texas Archaeological sites (Atlas 2014) indicated that although the proposed right-of-way had not been subjected to a formal cultural resources survey, there are six archaeological sites in close proximity to the Herff Road project. Their locations are shown in Figure 13, and they are briefly described in Table 2.
Of particular note, is the survey conducted by Tierras Antiguas of the initial alignment of Herff Road as it was to cross Menger Creek some 300 meters to the southeast. During that 2011 survey, three backhoe trenches were excavated on the approaches to Menger Creek, resulting in the discovery of no cultural materials (Nickels 2011).

Figure 13. Previously documented archaeological surveys within close proximity to the Herff Road project (archaeological sites intentionally not shown).
Table 2. Archaeological Sites Documented Near the Project Area.

<table>
<thead>
<tr>
<th>Site #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>41KE127</td>
<td>Site of an unknown age recorded by TxDOT in 1990; no further information available</td>
</tr>
<tr>
<td>41KE187</td>
<td>1850s German style rock house and farmstead; privately owned</td>
</tr>
<tr>
<td>41KE188</td>
<td>Prehistoric open campsite with bifaces, flakes, and fire-cracked rocks on a terraces slope west of Cibolo Creek</td>
</tr>
<tr>
<td>41KE215</td>
<td>Ca. 1940s farmstead</td>
</tr>
<tr>
<td>41KE216</td>
<td>Prehistoric lithic scatter, Archaic in age; situated in a wooded upland area</td>
</tr>
<tr>
<td>41KE217</td>
<td>Prehistoric burned rock midden and open campsite; Early Archaic through Late Archaic in age; situated near the confluence of Menger and Cibolo Creek</td>
</tr>
</tbody>
</table>

**Project Goals and Methods**

**Goals**

The project goals focused on archaeological issues that could be addressed by the types of data obtained through pedestrian survey, along with limited shovel testing and backhoe trenching. The topics addressed were site type, distribution, density, size, depth, and stratigraphy. The prehistoric theoretical framework is structured around patterns of settlement, mobility, subsistence, and social systems for the Central Texas region. The historic framework is structured around the settlement along Cibolo Creek and the Central Texas Hill Country as documented in the earliest written accounts by Spanish priests and government representatives, through Mexican and Republic of Texas sovereignty, and into the Texas Statehood period.

The goals of the project were to:

1) locate and record cultural locations and sites in the project area using a systematic survey methodology;
2) quantify site size, as well as depth, and stratigraphy; and,
3) place any diagnostic artifacts within the regional time frame.

**Methods and Levels of Effort**

In accordance with Texas Historical Commission (THC) and Council of Texas Archaeologists (CTA) Archaeology Survey Standards, a systematic and thorough pedestrian survey of the 700-meter linear right-of-way was conducted. Surface visibility ranged from 30 to 100 percent along the right-of-way. A total of 17 shovel tests were placed in a systematic pattern along the right-of-way (see Cover Photo and Figure 14). The results of shovel testing were fully documented on Shovel Test forms, and are described in Appendix A. The shovel tests were dug in 20-centimeter (cm) levels, and all sediments were screened through 1/4-inch wire mesh (Figure 15).

Particular attention was paid to both cutbank exposures of Menger Creek, as well as numerous
animal burrows and backdirt piles. Following our designed research plan, any artifacts recovered from shovel tests or the surface were not to be collected, but were to be placed either in the upper 10 cm of the backfilled shovel tests, or on the surface where they were observed and documented.

Figure 14. Locations of shovel tests along the right-of-way.
Figure 15. Shovel Test #3 on the south edge of Menger Creek; facing east-northeast.

Figure 16. Shovel Test #1 near the intersection of TxDOT tie-in at Highway 87; facing southwest.
Results of the Investigations

Surface Examination and Shovel Testing

Typically shallow, sandy clay and clay soils with fragmented limestone bedrock were encountered in the upland, eastern portion of the ROW, while expected deeper silty loams were present along the lower, southern portions of the ROW in closer proximity to Menger Creek. Surface visibility ranged from approximately 50-percent in the eastern, upland portion of the right-of-way (ROW) to about 30 percent on the cultivated terraces along Menger Creek. In the immediate area on the slopes of Menger Creek fragmented limestone bedrock was prevalent (see for example, Figure 18).

No evidence of prehistoric or historic cultural materials was observed either on the surface, or within the 17 shovel tests (see Appendix A), numerous animal burrows and backdirt, or within the cutbanks along Menger Creek.
Historic Archival Research

During our May 2014 investigations, we observed no evidence of historic cultural material neither within the pipeline right-of-way, nor were there any potentially historic structures within 100 meters of the right-of-way, to include the TxDOT tie-in at Highway 87.

A search for historic aerial photographs and topographic maps reveals that the 700-meter Project Area was apparently in an area that warranted little attention. However, a 1943 topographic map discovered in the Perry Castañeda Library at the University of Texas (Maps 1943) indicates that no historic structures were present along the proposed Herff Road right-of-way at that time (Figure 19). In 1952 and 1963, aerial photographs (USGS Earth Explorer 2014a, b) once again show no historic structures within or adjacent to the proposed right-of-way (Figures 20 and 21). Finally, a 1964 topographic map (Figure 22) reveals no indication of historic structures (Maps 1964).

In sum, our on-the ground survey and archival research provided no indication that historic structures existed within or adjacent either along the Herff Road right-of-way, or near the TxDOT tie-in at Highway 87.

Figure 18. Fragmented bedrock on north bank of Menger Creek; facing east-northeast.
Figure 19. Project Area overlaid on a 1943 topographic map.
Figure 20. Project Area on 1952 aerial photograph.
Figure 21. Project Area on 1963 aerial photograph.
Figure 22. Project Area on 1964 topographic map.
Summary, Conclusions, and Recommendations

A thorough pedestrian survey of the surface that offered up to >90% visibility within the 700-meter Project Area was conducted, along with the excavation of 17 shovel tests. No evidence of prehistoric or historic cultural materials was observed either on the surface, or within the 17 shovel tests, numerous animal burrows and backdirt, or within the cutbanks along Menger Creek.

Accordingly, we recommend that construction of the Herff Road Project should be allowed to proceed as currently designed. The project should be considered as having “no effect” on any properties considered as eligible for nomination to the National Register of Historic Places or inclusion in the State Archeological Landmarks Program, and as such, the project should be allowed to proceed without further archaeological work. However, if any cultural resources are encountered during construction, work should immediately be halted in the vicinity until such finds are examined and evaluated by Tierras Antiguas, or by any qualified archaeological consultant, and by the Texas Historical Commission.
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Appendix A. Results of Shovel Testing.

The following table presents the results of shovel testing (ST) in centimeters below the surface (cmbs). Notably, no cultural material was found in any of the 17 shovel tests excavated along the right-of-way.

Table A1. Results of shovel testing.

<table>
<thead>
<tr>
<th>ST</th>
<th>Depth Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-20 cmbs</td>
<td>Brown (10YR 4/3) loamy clay; fine medium, fine; common grass rootlets, rare small and rounded limestone pebbles; abrupt lower boundary</td>
</tr>
<tr>
<td></td>
<td>20-55 cmbs</td>
<td>Dark brown (10YR3/3) clay loam; blocky, medium, moderate; few <em>Rabdotus</em> shell fragments, few rounded limestone gravels &lt; ½-inch in size; calcium carbonate fines increasing with depth; gradual, smooth lower boundary</td>
</tr>
<tr>
<td></td>
<td>55-60 cmbs</td>
<td>Pale brown (10YR6/3) sandy clay loam; blocky, medium, moderate; few <em>Rabdotus</em> shell fragments, few rounded limestone gravels to 1-inch in size; calcium carbonate fines increasing with depth</td>
</tr>
<tr>
<td>2</td>
<td>0-55 cmbs</td>
<td>Brown (10YR5/3) loam; fine medium, fine; common grass rootlets in upper 15 cm; common calcium carbonate fines to threads with depth; gradual, smooth lower boundary</td>
</tr>
<tr>
<td></td>
<td>55-60 cmbs</td>
<td>Brown (10YR4/3) clay loam; blocky, medium, moderate; few <em>Rabdotus</em> shell fragments; vertical cracking to ⅛-inch wide; common rounded limestone gravels to ½-inch in size, and increasing from 2% to 15% by volume with depth</td>
</tr>
<tr>
<td>3</td>
<td>0-5 cmbs</td>
<td>Dark brown (10YR3/3) clay loam; medium, medium, blocky; few grass rootlets; abrupt lower boundary (on lip of apparent T-1 terrace)</td>
</tr>
<tr>
<td></td>
<td>5-10 cmbs</td>
<td>Very dark grayish brown (10YR3/2) sandy clay loam; dense limestone gravels to baseball size 70% by volume over fragmented limestone bedrock</td>
</tr>
<tr>
<td>4</td>
<td>0-25 cmbs</td>
<td>Grayish brown (10YR5/2) clay loam; medium, medium, blocky; few grass rootlets; abrupt lower boundary (on modern floodplain)</td>
</tr>
<tr>
<td></td>
<td>25-40 cmbs</td>
<td>Brown (10YR4/3) clay loam; medium, moderate, blocky; common <em>Rabdotus</em> snail shell fragments; common tree roots to 1/2-inch in size; rounded and angular fragmented limestone gravels ½-inch to 3 inches in size 90% by volume</td>
</tr>
<tr>
<td>5</td>
<td>0-30 cmbs</td>
<td>Brown (10YR4/3) coarse sandy loam loam; medium, medium, blocky; common grass rootlets, common <em>Rabdotus</em> shell fragments; gradual smooth lower boundary</td>
</tr>
<tr>
<td></td>
<td>30-80 cmbs</td>
<td>Grayish brown (10YR5/2) clay; medium, moderate, blocky;</td>
</tr>
<tr>
<td>ST</td>
<td>Depth Range</td>
<td>Descriptions</td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>0-35 cmbs: Brown (10YR4/3) clay loam; medium, medium, blocky; common grass rootlets, few Rabdotus shell fragments; gradual smooth lower boundary (on apparent T-1 terrace)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35-70 cmbs: Grayish brown (10YR5/2) coarse sandy loam; few rounded and smoothed caliche and limestone colluvial gravels to 2 inches in size, 15% by volume, common Rabdotus snail shell fragments; calcium carbonate fines and threads</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0-25 cmbs: Brown (10YR4/3) clay loam; blocky, fine, moderate; common grass rootlets, few Rabdotus shell fragments; gradual smooth lower boundary (apparent plow zone)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25-60 cmbs: Grayish brown (10YR5/2) coarse sandy loam; few rounded and smoothed limestone colluvial gravels to 2 inches in size, 5% by volume, common Rabdotus snail shell fragments; calcium carbonate fines</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0-20 cmbs: Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few Rabdotus shell fragments; gradual smooth lower boundary (apparent plow zone)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-50 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common Rabdotus shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50-60 cmbs: Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0-20 cmbs: Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few Rabdotus shell fragments; gradual smooth lower boundary (apparent plow zone)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-45 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common Rabdotus shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-60 cmbs: Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0-18 cmbs: Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few Rabdotus shell fragments; gradual smooth lower boundary (apparent plow zone)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18-40 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common Rabdotus shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>40-60 cmbs</td>
<td>Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads</td>
<td></td>
</tr>
</tbody>
</table>
| **ST 11** | 0-22 cmbs: Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few *Rabdotus* shell fragments; gradual smooth lower boundary (apparent plow zone)  
22-45 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common *Rabdotus* shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary  
45-60 cmbs: Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads |
| 0-15 cmbs | Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few *Rabdotus* shell fragments; gradual smooth lower boundary (apparent plow zone)  
15-40 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common *Rabdotus* shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary  
40-60 cmbs: Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads; rounded and smoothed limestone gravels to golf ball in size 20% by volume |
| **ST 12** | 0-15 cmbs: Pale brown (10YR6/3) fine sandy loam loam; blocky, fine, moderate; common grass rootlets, few *Rabdotus* shell fragments; gradual smooth lower boundary (apparent plow zone)  
15-40 cmbs: Grayish brown (10YR5/2) clay; medium, moderate, blocky; common *Rabdotus* shell fragments; few rounded and smoothed limestone gravels 2% by volume; gradual, smooth lower boundary  
40-60 cmbs: Dark grayish brown (10YR4/2) clay loam; blocky, medium, moderate; common calcium carbonate fines and threads; rounded and smoothed limestone gravels to golf ball in size 20% by volume |
| **ST 13** | 0-20 cmbs: Dark grayish brown (10YR4/2) coarse sandy loam; fine, medium, fine; common tree roots, fragmented limestone and large cobbles 25% by volume; abrupt lower boundary  
20-30 cmbs: Light brownish gray (10YR6/2) coarse sandy loam; fine, medium, fine; fragmented limestone bedrock 80% by volume |
| **ST 14** | 0-15 cmbs: Dark grayish brown (10YR4/2) coarse sandy loam; fine, medium, fine; few tree roots, fragmented limestone and large cobbles 15% by volume; gradual, smooth lower boundary  
15-50 cmbs: Light brownish gray (10YR6/2) coarse sandy loam; fine, medium, fine; fragmented limestone bedrock 70% by volume |
| **ST 15** | 0-20 cmbs: Dark grayish brown (10YR4/2) coarse sandy loam; fine, medium, fine; few tree roots, fragmented limestone and large cobbles 40% by volume; gradual, smooth lower boundary  
20-30 cmbs: Light brownish gray (10YR6/2) coarse sandy loam; fine, medium, fine; fragmented limestone bedrock and rounded limestone gravels to baseball size 70% by volume |
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST 16</strong></td>
<td>0-25 cmbs: Grayish brown (10YR5/2) sandy clay loam; fine, medium, fine; few <em>Rabdotus</em> shell fragments, common grass rootlets; vertical cracking to 1/8-inch in width; gradual smooth lower boundary</td>
</tr>
<tr>
<td></td>
<td>25-60 cmbs: Dark brown (10YR3/3) loamy clay; blocky, medium, moderate; few <em>Rabdotus</em> shell fragments, faint calcium carbonate fines; few smoothed limestone pebbles 2% by volume</td>
</tr>
<tr>
<td><strong>ST 17</strong></td>
<td>0-30 cmbs: Grayish brown (10YR5/2) sandy clay loam; fine, medium, fine; few <em>Rabdotus</em> shell fragments, common grass rootlets; vertical cracking to 1/8-inch in width; gradual smooth lower boundary</td>
</tr>
<tr>
<td></td>
<td>30-60 cmbs: Dark brown (10YR3/3) loamy clay; blocky, medium, moderate; few <em>Rabdotus</em> shell fragments, faint calcium carbonate fines</td>
</tr>
</tbody>
</table>