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November 2020

PAPE-DAWSON ENGINEERS

Transportation | Water Resources | Land Development | Surveying | Environmental

FINAL REPORT

ARCHAEOLOGICAL DATA RECOVERY OF A BURNED ROCK MIDDEN AT SITE 41CM412, COMAL COUNTY, TEXAS

Lead Agency:
Texas Historical Commission

Texas Antiquities Permit No. 8361
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FOR PUBLIC DISCLOSURE

Abstract

The Comal Independent School District (CISD) retained Pape-Dawson Engineers, Inc. (Pape-Dawson) to conduct cultural resource investigations for the proposed construction of a new high school (High School #4) near the city of Garden Ridge in southern Comal County, Texas. The CISD High School #4 Project (Project) includes construction of buildings, parking lots, roadways, and associated utility installation for the new school campus. After the identification of a State Antiquities Landmark (SAL)-eligible burned rock midden at site 41CM412 during the preliminary archaeological survey, a data recovery investigation was undertaken within this portion of the site.

Pape-Dawson archaeologists initially identified site 41CM412 during an intensive archaeological survey for the Project between December 11, 2017, and January 10, 2018, under Texas Antiquities Permit No. 8244. Comprising the entire 40.4-hectare (ha; 99.8-acre [ac]) survey area, site 41CM412 is a multi-component site containing early to mid-twentieth century structures, a light scatter of historic artifacts, an extensive scatter of prehistoric lithic material (both tools and non-tools), and a large burned rock midden. While the historic component of the site, as well as the extensive lithic artifact scatter, were determined to be not eligible for designation as a SAL, Pape-Dawson's survey effort concluded that the burned rock midden demonstrated research value. Following completion of the initial survey, Pape-Dawson archaeologists coordinated with the Texas Historical Commission (THC), who concurred that the burned rock midden feature at site 41CM412 met the requirements for SAL designation.

As impacts to the burned rock midden at site 41CM412 could not be avoided during the proposed Project construction, Pape-Dawson archaeologists conducted a data recovery investigation of the midden deposits. Since CISD is a political subdivision of the State of Texas, compliance with the Antiquities Code of Texas (ACT) was required for the investigation. Pape-Dawson completed the data recovery field effort under Texas Antiquities Permit No. 8361 between March 19 and April 3, 2018.

The data recovery Project Area included a buffer of 0.66 ha (1.63 ac) surrounding the 0.21-ha (0.51-ac) midden area within the overall 40.4-ha (99.8-ac) site boundary. The primary goals of the investigation were to (1) assess the age or age range of the midden accumulation; (2) identify if the type of burned rock formation was sheet, domed, or annular; (3) identify the fuel sources and types of food processed at the midden; (4) determine if a heating element was present within the midden or if the rocks were heated elsewhere; and (5) determine if the accumulation of burned rock was gradual over a period of time or rapid during a phase of intense usage.

To address these research questions, the investigation consisted of a program of systematic shovel testing, mechanical excavation of two archaeological trenches, and the hand-excavation of two 1-x-1-meter (3.3-x-3.3-foot) units, as well as five 50-x-50-centimeter (19.7-x-19.7-inch) columns. Melanie Nichols served as the initial Principal Investigator (PI), and Dr. Karissa Basse assumed responsibility as PI during report production. Field efforts were led by Melanie Nichols, with assistance from Jacob Sullivan, Virginia Moore, Megan Veltri, and Dr. Nesta Anderson. Light Detection and Ranging imaging and drone footage were collected on site by David Leyendecker and Angela Livingston. Geographic Information Systems and laboratory assistance was provided by Jacob Sullivan, Sheldon Smith, Ann Marie Blackmon, and Mikayla Mathews. Curation for the Project was completed by Ann Marie Blackmon and Mason Miller. Special

studies, including macrobotanical analysis, faunal analysis, projectile point analysis, magnetic susceptibility testing, and radiocarbon dating, were conducted by Dr. Leslie Bush, Melanie Nichols, Chris Ringstaff, Dr. Charles Frederick, and Direct AMS, respectively. Brooke Bonorden served as editor, and Zachary Overfield oversaw quality control and quality assurance.

The data recovery investigations resulted in the horizontal and vertical refinement of the boundaries of the burned rock midden (Feature 1) within 41CM412, which dates to the Archaic period. In addition, two internally embedded features—a possible heating element (Feature 1.1) and an earth oven pit (Feature 1.2)—were identified. A historic-age midden (Feature 2) was also identified during investigation. In total, the prehistoric assemblage collected from site 41CM412 consists of 3,224 prehistoric artifacts, including 3,156 lithics (17 projectile points, 2 dart point preforms, 29 bifaces, 3 unifacial scrapers, 1 perforator, 5 edge-modified flakes, 2 cores, 1 blank, and 3,096 pieces of unmodified debitage), 47 faunal bone fragments, 10 pieces of ocher (21.16 grams [g]), 1,395.4 g burned clay, 2.46 g charcoal, and 2,910 pieces of burned rock (214.29 kilograms). The historic- and modern-age material recovered from the site largely consists of metal, glass, cut faunal bone, and mortar. All cultural material was collected and brought back to the Pape-Dawson Laboratory in Austin for processing and analysis aside from FCR, which was analyzed and discarded in the field.

Based on the results of the fieldwork and subsequent analyses, the burned rock midden at site 41CM412 appears to have largely resulted from a series of long-term, or perhaps seasonal occupations occurring from the Early to Transitional Archaic periods, with a concentrated occupation evident during the Middle Archaic. The vertical distribution of artifacts at the site points to multiple occupations occurring on a landform with a slow sedimentation rate. Integral heating elements and earth oven pits (Features 1.1 and 1.2, respectively) within the Feature 1 midden suggest the site contained a center-focused cooking facility. This facility is represented by the annular formation of the overall midden and on-site heating of the rocks. Task specific activities at the site include earth oven baking (as evidenced by burned rock midden deposits) and tool manufacturing and maintenance (as evidenced by a high percentage of small, tertiary flakes within the artifact assemblage). Processing of predominantly meat products also occurred at the site, given the presence of faunal bone within the overall Feature 1 matrix and general lack of packing material in the earth oven. Ancient fuel sources appear to be hardwoods of oak and potentially juniper. In addition, trace evidence of hickory/walnut/pecan family nuts indicate these plants may have also been processed as a food source. Although not all cultural components of the site were stratigraphically discrete, the burned rock midden deposits illustrate evidence of use and reuse over several millennia. This sequence significantly contributes to our understanding of Archaic cooking models and burned rock formation processes.

In accordance with the criteria in 13 ACT 26.10, Pape-Dawson's data recovery of the SAL eligible portion of site 41CM412 has mitigated any impact associated with the construction of the Comal ISD High School #4. As a result, Pape-Dawson recommends no further work for the site. The THC concurred with the Pape-Dawson's recommendation on April 13, 2018 and allowed construction for the Project to proceed. Furthermore, Pape-Dawson received concurrence from the THC for the draft report of investigation on October 23, 2020.

Following completion of the final report, artifact discard decisions will be coordinated with the THC. Project records, photographs, and select collected artifacts will be curated at the University of Texas at San Antonio Center for Archaeological Research.

Table of Contents

List of Figures

List of Tables

CHAPTER 1: INTRODUCTION

The Comal Independent School District (CISD) retained Pape-Dawson Engineers, Inc. (Pape-Dawson) to conduct cultural resource investigations for the proposed construction of a new high school (High School #4) near the city of Garden Ridge in southern Comal County, Texas (**Figure 1**). The CISD High School #4 Project (Project) includes construction of buildings, parking lots, roadways, and associated utility installation for the new school campus. Subsequent to the identification of a State Antiquities Landmark (SAL)-eligible burned rock midden at site 41CM412 during an archaeological survey, Pape-Dawson conducted a data recovery investigation within this portion of the site.

Pape-Dawson archaeologists initially identified site 41CM412 during an intensive archaeological survey for the Project between December 11, 2017, and January 10, 2018. The preliminary survey was completed under Texas Antiquities Permit No. 8244. Comprising the entire 40.4-hectare (ha; 99.8-acre [ac]) survey area, site 41CM412 is a multi-component site containing early to mid-twentieth century structures, a light scatter of historic artifacts, an extensive scatter of prehistoric lithic material (both tools and non-tools), and a large burned rock midden (**Figure 2**). While the historic component of the site, as well as the extensive scatter of lithic artifacts, were determined to be ineligible for designation as a SAL, Pape-Dawson's survey effort concluded that the burned rock midden demonstrated research value. The midden is situated within a buried context with good stratigraphic integrity and contains both diagnostic artifacts and organic material (Moore and Galindo 2018). Following completion of the initial survey, Pape-Dawson archaeologists coordinated with the Texas Historical Commission (THC), who agreed that the burned rock midden feature at site 41CM412 met the requirements for SAL designation.

As impacts to the burned rock midden at site 41CM412 could not be avoided during Project construction, Pape-Dawson archaeologists conducted a data recovery investigation of the midden deposits. As CISD is a political subdivision of the State of Texas, compliance with the Antiquities Code of Texas (ACT) was required for the investigation. Pape-Dawson conducted the data recovery investigation under Texas Antiquities Permit No. 8361. No federal permitting or funding was anticipated for the Project, therefore, compliance with Section 106 of the National Historic Preservation Act was not required.

The data recovery investigation targeted the SAL-eligible portion of site 41CM412 between March 19 and April 3, 2018. The data recovery Project Area included a buffer of 0.66 ha (1.63 ac) surrounding the 0.21-ha (0.51-ac) midden area within the overall 40.4-ha (99.8-ac) site boundary (**Figure 3** and **Figure 4**). The primary goals of the investigation were to (1) assess the age or age range of the midden accumulation; (2) identify if the type of burned rock formation was sheet, domed, or annular; (3) identify the fuel sources and types of food processed at the midden; (4) determine if a heating element was present within the midden or if the rocks were heated elsewhere; and (5) determine if the accumulation of burned rock was gradual over a period of time or rapid during an intense usage.

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In order to address these research questions, the investigation consisted of a program of systematic shovel testing followed by mechanical excavation of two archaeological trenches and the hand-excavation of two 1-x-1-meter (m; 3.3-x-3.3-foot [ft]) units and five 50-x-50-centimeter (cm; 19.7-x-19.7-inch [in]) columns. Melanie Nichols served as the initial Principal Investigator (PI) for the fieldwork, and Dr. Karissa Basse assumed responsibility as PI on the permit for the final reporting stages of the Project. The field efforts were led by Melanie Nichols, with assistance from Jacob Sullivan, Virginia Moore, Megan Veltri, and Dr. Nesta Anderson. Light Detection and Ranging imaging (LiDAR) and drone footage were collected on site by David Leyendecker and Angela Livingston. Geographic Information Systems (GIS) and laboratory assistance was provided by Jacob Sullivan, Sheldon Smith, Ann Marie Blackmon, and Mikayla Mathews. Curation was completed by Ann Marie Blackmon and Mason Miller. Special studies, including macrobotanical analysis, projectile point analysis, faunal analysis, magnetic susceptibility testing, and radiocarbon dating, were conducted by Dr. Leslie Bush, Chris Ringstaff, Melanie Nichols, Dr. Charles Frederick, and Direct AMS, respectively.

The following report presents the results of Pape-Dawson's data recovery investigation of the burned rock midden at site 41CM412. Following this Introduction, Chapters 2 and 3 discuss the physical setting of the Project Area and situate the site within the region's larger cultural context. The research design and methods employed to perform the investigations are detailed in Chapter 4. Chapter 5 presents the results of the investigations at site 41CM412, and Chapter 6 provides a summary of the work, address the research questions, and provides management recommendations. Appendix A includes the site shovel test data, while Appendix B presents the artifact specimen inventory, and Appendices C and D provide the lithic and faunal analyses, respectively. Appendices E, F, and G contain the results of special studies conducted for the Project, including the macrobotanical analysis, radiocarbon dating, and magnetic susceptibility testing. Finally, Appendix H contains Project-related agency correspondence.

Following completion of the final report, artifact discard decisions will be coordinated with the THC. Project records, photographs, and select artifacts will be curated at the University of Texas at San Antonio Center for Archaeological Research (UTSA-CAR).

CHAPTER 2: ENVIRONMENTAL SETTING

Located in southern Comal County, site 41CM412 is situated along the west side of Farm-to-Market Road (FM) 3009, north of the intersection with Schoenthal Road. The site is mapped within the Bat Cave (2998-424) United States Geological Survey (USGS) 7.5-minute quadrangle topographic map. Site 41CM412 is largely surrounded by undeveloped, wooded rangeland; however, suburban residential developments are present to the south and a large gravel pit is located to the southeast. Site 41CM412 occupies mixed wooded and grassy rangeland containing a historic farmstead, with evidence of modern ranching activities and disturbances. The Project Area landscape is characterized by the nearly level to gently sloping summit of an upland ridge. The site is located approximately 350 m (1,148 ft) northwest of an unnamed tributary to Dry Comal Creek. This tributary flows into a second tributary roughly 1.0 kilometer (km; 0.6 mile [mi]) to the northeast, which eventually leads to the Guadalupe River in New Braunfels, Texas.

Site 41CM412 is located within the Guadalupe River drainage basin. The site straddles the boundary between the Balcones Canyonlands subregion of the greater Edwards Plateau ecoregion to the northwest and the Northern Blackland Prairie subregion of the Texas Blackland Prairie ecoregion to the southeast (Griffith et al. 2007). This ecotone experiences hot summers and fairly warm winters. Snowfall is rare, and rainfall is heaviest from late spring to early fall, correlating with the dissipation of tropical storms (United States Department of Agriculture [USDA] Soil Conservation Service [SCS] 1984). Winter temperatures average 11.1˚Celsius (C; 52˚Fahrenheit [F]), while summer temperatures warm to 28.9˚C (84˚F) on average. The annual precipitation in the region totals approximately 83.8 cm (33 in) (USDA-SCS 1984). The Pleistocene was generally wetter and cooler in Central Texas than present conditions; however, speleothem reconstruction of the Holocene climate in Texas indicates the region became progressively warmer and drier during the transition from the early to mid-Holocene (Wong et al. 2015). Seasonal variation in temperature and precipitation consequently increased, with overall conditions becoming wetter during the Altithermal approximately 5,000 years ago (Meltzer 1999). Climatic shifts from mesic to xeric conditions throughout the early and middle Holocene correlate with the intensification of bison hunting on open grasslands.

The Edwards Plateau is considered a dissected limestone plateau containing a sparse network of perennial streams (Griffith et al. 2007). Vegetation in less disturbed areas of the eastern Edwards Plateau range from grasslands and savannas to woodlands and forests (van Auken 1988). Many upland forests present in the ecoregion today are dominated by Ashe juniper (*Juniperus ashei*) or honey mesquite (*Prosopis glandulosa*). This oak-mesquite savanna is often used for grazing beef cattle (*Bos* spp.), sheep (*Ovis* spp.), goats (*Capra* spp.), and exotic game (Griffith et al. 2007).

In prehistoric times, frequent fires and less dense livestock populations limited the spread of mesquite and restricted juniper to rocky ridges, canyons, and slopes near streams (Bezanson 2000; van Auken 1988). Upland landscapes, where fire or cutting restricted juniper and mesquite colonization, typically contained mixed grasslands punctuated by mottes of trees and brush (Gould 1962; Riskind and Diamond 1988). Common native grass species included little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), silver bluestem (*Bothriochloa laguroides*), and curly mesquite (*Hilaria belangeri*) (Bezanson 2000). Daisies (e.g., *Melampodium cinereum*, *Rudbeckia hirta*, and *Symphyotrichum oblongifolium*), sages (*Salvia* spp.), foxgloves (*Penstemon* spp.), zexmenia (*Wedelia* *acapulcensis*), and other wildflowers were also present. Plateau live oak (*Quercus fusiformis*), cedar elm (*Ulmus crassifolia*), Texas oak (*Q. texana*), Lacey oak (*Q. laceyi*), post oak (*Q. stellata*), Ashe juniper, Texas persimmon (*Diospyros texana*), agarita (*Mahonia trifoliolata*), dewberry (*Rubus trivialis* and *R. riograndis*), and several species of grapes (*Vitis* spp.) were common woody plants in the mottes (Bezanson 2000; Gould 1962).

The Balcones Canyonlands form the eroded southern border of the Edwards Plateau, exhibiting a stairstep topography of canyons, sinkholes, and caverns (Griffith et al. 2007). The broken topography of the Balcones Canyonlands is considerably less attractive for human settlement than the rest of the Edwards Plateau, and therefore supports a highly diverse habitat for endemic and endangered species. Such species include the widemouth blindcat (*Satan eurystomus*), Comal blind salamander (*Eurycea tridentifera*), Blanco blind salamander (*Typhlomolge robusta*), and Mexican free-tailed bat (*Tadarida brasiliensis*), as well as maidenhair fern (*Adiantium capillus-veneris*), tuber anemone (*Anemone edwardsiana*), southern shield fern (*Thelypteris kunthii*) slippery elm (*Ulmus rubra*), Ohio buckeye (*Aesculus glabra*), boxelder (*Acer negundo*), bigtooth maple (*Acer grandidentatum*), Carolina basswood (*Tilia caroliniana*), and escarpment black cherry (*Prunus serotina* var. *exima*) (Griffith et al. 2007). Portions of the Balcones Canyonlands are also used for wildlife management areas, specifically for game species like white-tailed deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), and exotic axis (*Axis axis*), fallow (*Dama dama*), and sika deer (*Cervus nippon*); blackbuck antelope (*Antelope cervicapra*), and wild boar (*Sus scrofa*).

The Texas Blackland Prairie ecoregion begins roughly 5.0 km (3.1 mi) east of 41CM412. This ecoregion is characterized by the fine-textured, clayey soils and prairie vegetation that historically dominated the region. Prairies grasses included little bluestem, big bluestem (*Andropogon gerardii*), yellow Indiangrass, and switchgrass (*Panicum virgatum*). The ecoregion historically contained habitat for bison (*Bison bison*), pronghorn antelope (*Antilocapra americana*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), ocelot (*Leopardus pardalis*), black bear (*Ursus americanus*), collared peccary (*Pecari tajacu*), deer (*Odocoileus virginianus*), coyote (*Canis latrans*), fox (*Vulpes vulpes*), badger (*Meles meles*), and river otter (*Lontra canadensis*) (Griffith et al. 2007).

In addition to the plant communities found throughout the Texas Blackland Prairie, the Northern Blackland Prairie subregion historically contained tall dropseed (*Sporobolus asper*), eastern gamagrass (*Tripsacum dactyloides*), Silveanus dropseed (*Sporobolus silveanus*), Mead's sedge (*Carex meadii*), longspike tridens (*Tridens strictus*), asters (*Aster* spp.), prairie bluet (*Hedyotis nigricans*), prairie clovers (*Dalea* spp.), and coneflowers (*Rudbeckia* spp.) (Griffith et al. 2007). Stream bottoms present within the Northern Blackland Prairie exhibited bur oak (*Quercus macrocarpa*), Shumard oak (*Q. shumardii*), sugar hackberry (*Celtis laevigata*), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), eastern cottonwood (*Populus deltoides*), and pecan (*Carya illinoinensis*) trees as well. However, since the late 1800s, nearly all native tallgrass prairie in the ecoregion has been converted to cropland, pasture, or for urban use in major metropolitan areas. Non-native Johnson grass (*Sorghum halepense*), Bermuda grass (*Cynodon dactylon*), and King Ranch bluestem (*Bothriochloa ischaemum*) currently dominate the landscape (Griffith et al. 2007).

GEOLOGY AND SOILS

Geologically, the Project Area is underlain by two formations: Buda Limestone and Del Rio Clay, undivided, of Late Cretaceous age (Kbd), and Edwards Limestone of Early Cretaceous age (Ked) (USGS-Mineral Resources Program [USGS-MRP] 2020). The upper portion of the Buda Limestone formation contains some chert cobbles that outcrop, along with the limestone beds, where soil was lost to erosion (USGS-MRP 2020). In Central Texas, Edwards Limestone contains beds of nodular dolostone and chert (USGS-MRP 2020). This formation contains one of the most productive aquifers in Texas (Edwards Aquifer).

Soil survey data for the Project was derived from the U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Web Soil Survey. According to NRCS data, 41CM412 contains four mapped soil series: Krum clay, the Rumple-Comfort association, Real gravelly loam, and the Medlin-Eckrant association (USDA-NRCS 2020). The Krum series is mapped with 1 to 5 percent slopes within the site boundary. Krum clay consists of very deep, well drained soils that formed in calcareous clayey alluvium derived from interbedded chalk and marl (USDA-NRCS 2020). The Krum series is commonly found on risers and treads of stream terraces on river valleys and dissected plains. The Rumple-Comfort association consists of moderately deep, well drained, moderately slowly permeable soils that formed in residuum and colluvium derived from limestone, as well as soils that are shallow to indurated limestone bedrock. This soil series is mapped on backslopes of low hills on dissected plateaus (USDA-NRCS 2020). Slopes within 41CM412 range from 1 to 8 percent. The Real series, meanwhile, consists of very shallow soils or paralithic limestone bedrock interbedded with marl and chalk. The Real series, also exhibiting 1 to 8 percent slopes, occurs on summits, shoulders, and backslopes of ridges on dissected plateaus. The Medlin-Eckrant association, with 1 to 8 percent slopes, consists of deep, well drained, very slowly permeable soils that formed in clayey marine sediments, as well as soils that are shallow over indurated limestone bedrock (USDA-NRCS 2020). The Medlin-Eckrant association is found on summits, shoulders, and backslopes of ridges on dissected plateaus, as well as narrow stream divides and slopes along drainageways.

CHAPTER 3: CULTURAL BACKGROUND

Comal County falls within the Central Texas archaeological region as delineated by the THC (Mercado-Allinger et al. 1996). Cultural developments in this region are typically divided into four primary time periods: Paleoindian, Archaic, Late Prehistoric, and Historic. These classifications are defined by changes in material culture and subsistence strategies over time, as evidenced through data recovered from archaeological sites. This cultural chronology provides a brief summary of each major cultural period with reference to significant archaeological work that has occurred within the region, in addition to a brief discussion of burned rock middens in Central Texas relevant to the data recovery investigations at site 41CM412.

PREHISTORIC PERIOD

PALEOINDIAN PERIOD (11,500 B.P. TO 8800 B.P.)

Although there is some debate about whether pre-Clovis Paleoindian peoples lived in Texas, there is definitive evidence of a Paleoindian occupation within Texas by 11,500 years before present (B.P.). Collins (1995) divides this period into early and late phases, with Dalton, San Patrice, and Plainview points possibly providing the transition between the subdivisions. Paleoindians gathered wild plants and hunted both large mammals (mammoth, bison, etc.) and smaller terrestrial and aquatic species (Bousman et al. 2004; Collins 1995). Projectile points characteristic of the Paleoindian period in Central Texas are lanceolate-shaped. Forms common to the region include Clovis, Plainview, and Folsom (Turner and Hester 1999). In Texas, most Paleoindian sites are classified as procurement or consumption sites (Bousman et al. 2004), but a few, such as the Wilson-Leonard site in Williamson County (Collins 1995) and the Pavo Real site in Bexar County (Collins et al. 2003; Figueroa and Frederick 2008; Henderson 1980), have produced burials (Collins 1995). Other Paleoindian sites discovered in Central Texas include 41BX47 on Leon Creek (Tennis 1996), the Richard Beene site (41BX831) (Thoms et al. 2005; Thoms and Mandel 2007), and the St. Mary's Hall site (41BX229), the latter of which indicates Paleoindian groups enjoyed a more diverse diet than previously thought (Hester 1978).

As the climate warmed and led to the extinction of megafauna, Paleoindian peoples shifted away from hunting large animals and subsisted on small game, including deer and rabbit, as well as gathering edible roots, nuts, and fruits (Black 1989). This change in food supply, as well as the manufacture of a different set of stone tools, marks the transition to the Archaic Period.

ARCHAIC PERIOD (8800 B.P. TO 1200 B.P.)

Usually divided into early, middle, late (and sometimes transitional) subperiods, the Archaic marks a gradual shift from Paleoindian subsistence strategies to a focus on hunting medium and small animals and gathering wild plants. The period also includes an eventual transition to agriculture. Beginning with Clear Fork gouges and Guadalupe bifaces in the Early Archaic (8800 to 6000 B.P.), Archaic peoples produced a variety of point types (Collins 1995; Turner and Hester 1999). The variation in points and their scattered distribution in the Early Archaic may indicate smaller groups of people moved over larger territories (Prewitt 1981). Point types transitioned to Bell-Andice-Calf Creek, Taylor, and Nolan-Travis in the Middle Archaic (6000 to 4000 B.P.) and burned rock middens became commonplace (Collins 1995; Turner and Hester 1999). The

Middle Archaic focus on constructing burned rock ovens to cook a diverse array of plant foods suggests a slightly more sedentary lifestyle emerged during the Middle Archaic (Black 1989). Bulverde, Pedernales, Ensor, Frio, and Marcos points in the Late Archaic (4000 to 1200 B.P.) mirror the diversity of point types found in the Early Archaic (Collins 1995; Turner and Hester 1999). During the Late Archaic, cemeteries, especially associated with rock shelters, became common in Central Texas (Dockall et al. 2006). The last 1,000 years of the Late Archaic subperiod is often termed the Transitional Archaic. The Transitional Archaic does not differ significantly from the Late Archaic but does mark the emergence of numerous small dart point styles, such as Ensor, Frio, Fairland, and Darl (Black and McGraw 1985).

In Comal County, sites with Archaic components include the Wunderlich site (41CM3) (Johnson et al. 1962) and the Royal Coachman site (41CM111) (Mahoney et al. 2003). Within Central Texas, sites represented by an Early Archaic component include the Richard Beene site (41BX831) (Thoms and Mandel 2007), the Higgins site (41BX184) (Black et al. 1998), and the Panther Springs site (41BX228) (Black and McGraw 1985). While the Gatlin site (41KR621) is representative of a multi-component site with occupations from both the Early and Middle Archaic subperiods (Houk et al. 2008), the Granberg site (41BX17/41BX271) in San Antonio is a multi-component site with occupations from both the Middle and Late Archaic subperiods.

Late Prehistoric Period (1200 B.P. to 250 B.P.)

Several technological changes are apparent in the transition from the Archaic period to the Late Prehistoric period. Most notably, the bow and arrow replaced the spear and atlatl, as evidenced by the production of smaller dart points and eventually arrow points. Another significant innovation was the creation and use of ceramic vessels. Some groups began to practice consistent agriculture during the Late Prehistoric as well. There is some evidence that peoples in Central Texas may have incorporated agriculture into their lives, but most remained hunter gatherers (Collins 1995). There are also indications that major population movements occurred during this period, along with changes in settlement patterns and perhaps decreased population densities (Black 1989). Archaeologists divide the Late Prehistoric into two phases: the Austin phase, followed by the Toyah phase. Sites with significant Late Prehistoric components in Comal County include the Comal Power Plant site (41CM25) and 41CM231.

Central Texas Burned Rock Middens During the Prehistoric Period

While the use of hot rock cooking technology in North America dates back 10,000 years, the utilization of hot rocks to process and cook plant and animal food intensified during the Archaic period (Black and Thoms 2014). As a result, burned rocks and burned rock features are commonly found in Archaic components at archaeological sites. These features are varyingly described as clusters, scatters, hearths, pavements, and middens (Mahoney et al. 2003).

Burned rock features attributed to the Archaic have been documented across the Edwards Plateau, but changes in frequency and form relative to time within this period are noted. Though hot rock cooking features were widespread across the Edwards Plateau in the Early Archaic, they were more frequently constructed and utilized in the Middle and Late Archaic subperiods. Burned rock features from the Early Archaic are typically described as scatters or small-to-medium-sized clusters or hearths, while most burned rock features from the Middle and Late Archaic are classified as more massive burned rock middens (Houk et al. 2008). It should be noted that even though burned rock middens are predominately associated with the Archaic period, radiocarbon data indicates the use of burned rock middens continued and potentially even peaked during the Late Prehistoric period (Black et al. 1997; Black and Thoms 2014).

Over the years, archaeologists have proposed various theories to explain burned rock midden formation. In the early part of the twentieth century, James Pearce referred to middens as “kitchen middens,” and hypothesized that some middens resulted from the use of numerous stone-lined hearths meant for cooking and warmth, while others resulted from stone boiling (a method of cooking where heated stones are placed into a vessel of water, causing the water to rapidly heat and boil). In 1942, J. Charles Kelley and Thomas Campbell presented an alternative scenario, known as the “intersecting hearth” model. In this model, a midden is the unintended consequence of building stone-lined hearths in a favored spot on a stable landform over a long-time span. Then, in the late 1960s, William Sorrow offered yet another explanation for midden accumulation. Commonly referred to as the “communal dump” model, Sorrow postulated that middens are secondary deposits of spent stones. In this scenario, the hearths from which the stones came were constructed within another portion of the site. The midden was formed by the discard or dumping of spent rocks from the hearths in a separate but centralized location over an extended period. However, the current prevailing theory, the “central-focused” or “earth oven model” presented by Steve Black in the mid-1990s, asserts that a midden forms around a central focal point, a localized area utilized as an earth oven (Black et al. 1997; Black 2004).

An earth oven is a pit in the ground that contains a layered arrangement of hot rocks and food capped by a thick layer of earth. Earth ovens are used to bake, smoke, or stream a variety of foods, but are most often used to cook carbohydrate-rich plants that require prolonged heating before they are edible and/or reach their maximum nutritional value. When an earth oven is cleaned out for reuse, the spent cooking stones are tossed out and replaced with new, unfractured stones. Over time, the discarded (now thermally-altered) rocks accumulate, forming a burned rock midden. According to this formation process, burned rock middens typically contain deposits that are culturally and temporally mixed (Black et al. 1997). Archaeologically, earth ovens are identified through their signature components, namely a central heating element and/or oven pit, thermally-oxidized sediments, and burned or fire-cracked rocks within a blackened, carbon stained matrix (Black and Thoms 2014).

Burned rock middens were historically categorized as either sheet, domed, or annular formations. Sheet middens are thin accumulations of burned rock thought to represent incipient, or early-stage, middens. Domed middens, the dominant type documented along the eastern portion of the Edwards Plateau, are large mounds of burned rock with no internal structure or central cooking facility. In contrast, annular middens, which are more frequently found in the western portions of the Edwards Plateau, are represented by a ring shape that radiates outward from a centrally located earth oven. However, Black et al. (1997) argue that all middens are likely the consequence of central-focused cooking facilities (i.e., earth ovens), and therefore, most are actually annular middens that were not recognized as such because they were disturbed, buried, or covered by vegetation.

Historic Period (1600s to 1950)

Comal County was the site of many occupations by prehistoric peoples, but Europeans did not explore the area until the seventeenth century. Alonso de León's (1689 and 1690) and Domingo Terán de los Ríos' (1691) expeditions were likely some of the first interactions between Europeans and Native groups in the region (de la Teja 1995). These explorations helped the Spanish choose locations to establish five missions in and around what would later become San Antonio. After Terán de los Ríos' 1691 expedition, a portion of El Camino Real de los Tejas was established crossing the Guadalupe River near the future site of New Braunfels. Subsequent French and Spanish expeditions—such as those by Marqués de Aguayo and Louis Juchereau de St. Denis—traversed present-day Comal County (Greene 2016). Nuestra Señora de Guadalupe Mission was later founded in 1756 at Comal Springs but closed two years later. In 1825, Juan M. Veramendi was granted the land around the springs by the Mexican government. Prior to European settlement, the Waco were known to camp at Comal Springs and a Tonkawa village of 500 was present upriver from New Braunfels; Lipan Apaches and Karankawas also included the area in their hunting and gathering territory (Greene 2016).

During the 1820s and early 1830s, American settlers moved to Central Texas in increasing numbers, though the population remained predominately Mexican. In 1824, Texas and Coahuila were united into a single state with its capital at Saltillo. The Siege of Bexar and the Battle of the Alamo, in 1835 and 1836, were both located in nearby San Antonio. After Texas gained its independence from Mexico in 1836, Bexar County was created, and San Antonio was chartered as its seat (Long 2010). However, this was not the end of conflict in the area; a dispute with Comanche Indians resulted in the Council House Fight in 1840, and Woll's invasion in 1842 precipitated Texas' entrance into the United States as the 28th state.

About 200 German immigrants led by Prince Carl of Solms-Braunfels, commissioner-general of the Society for the Protection of German Immigrants in Texas (also called Mainzer Adelsverein or Adelsverein), arrived in present-day Comal County in 1845 (Biesele 1946). The Adelsverein founded the towns of New Braunfels and Fredericksburg. As early as 1850, German immigrants constituted more than 5 percent of the total Texas population, a proportion that remained constant throughout the nineteenth century (Jordan 2010). Comal County was formed in 1846 from the Eighth Precinct of Bexar County, with New Braunfels as its county seat.

On March 2, 1861, Texas seceded from the Union about a month before the Civil War (1861 to 1865) began. San Antonio became a Confederate storage area, as well as a location where military units could be organized; however, the city kept its distance from most of the actual fighting (Fehrenbach 2010). Three all-German volunteer companies—two cavalry and one infantry—were formed in Comal County (Greene 2010). During the war, John F. Torrey imported looms and machinery to manufacture cotton textiles, laying the foundation for the twentieth-century cotton industry in Comal County (Greene 2010). The diversified farms and ranches of the original Comal County agriculturalists ceded to a more livestock-oriented economy of the twentieth century. Local industries also increased in scope and scale, aided by improvement in transportation and power generation (Greene 2010).

After the Civil War, the flow of German immigrants to Comal County dwindled, but their influence on the social and cultural life of the area endured. Social clubs and an annual celebration of the county's German heritage—Wurstfest—serve to maintain the ethnic identity and cultural legacy of the original settlers (Greene 2010)

CHAPTER 4: METHODOLOGY

Pape-Dawson archaeologists conducted data recovery investigations at the burned rock midden within site 41CM412. The investigation consisted of the mechanical excavation of trenches and hand excavation of units and column samples to investigate the midden deposits. The primary goals of the investigations were to address the following research questions:

1. What is the age or age range of the midden accumulation?
2. Is the burned rock midden annular in form, thereby conforming to the “central-focused” cooking facility model proposed by Black and colleagues (1997)?
3. What types of fuel sources were used in the feature, and what was being processed in the cooking feature that formed the burned rock midden?
4. Did the heating that altered the rocks making up the burned rock midden occur at the location of the midden or were the rocks heated elsewhere and then dumped?
5. Does the burned rock midden represent repeated use of the same locality over a long period of time with gradual accumulation, or an intensive use over a short period of time with rapid accumulation?

Subsequent to the field effort, recovered materials were analyzed according to material category within provenience, including prehistoric lithic material, burned clay, ocher, faunal remains, charcoal, and historic materials. Special studies included macrobotanical analysis, radiocarbon dating, and geoarchaeological analysis. The methods employed during the field effort, laboratory analysis, and special studies are presented below.

FIELD METHODS

Pape-Dawson archaeologists excavated shovel tests at 10-m (32.8-ft) intervals to refine the horizontal extent of the midden. Based on the results of the shovel test program, archaeologists monitored the mechanical excavation of two trenches placed through the middle of the midden to expose a cross-section of the midden’s internal structure. Archaeologists photographed and prepared measured profile maps of each trench to provide a detailed record of the burned rock feature and note areas where the midden deposits were clast- and matrix-supported. Diagnostic artifacts from midden deposits observed within backdirt piles were collected and assigned a number used to indicate the artifact’s general location along each trench. Shovel test and trench locations, as well as general artifact locations, were mapped with a handheld Trimble Global Positioning System (GPS) unit. Following trench excavation, Pape-Dawson used a DJI Matrice 600 Pro Drone to take high resolution photographs of the site and create an orthomosaic of the overall area. LiDAR data was also collected to create a digital map of the midden profile within the trench walls.

Pape-Dawson archaeologists identified all potential internal features (e.g., heating elements, oven pits, and heat-induced oxidized sediments) located within the midden profile and assigned them a unique number. A 1-x-1-m (3.3-x-3.3-ft) hand excavated unit was placed over each identified internal midden feature. Soil overlying the potential internal features within the units was excavated in 10-cm (3.9-in) levels, while all internal feature content was collected as a bulk sample. In addition to the units, a series of 50-x-50-cm (19.7-x-19.7-in) columns were excavated along the trenches. Columns were excavated in 10-cm (3.9-in) levels from the surface to pre-Holocene-age clay and marl. A temporary datum was placed at the southwest corner of each unit/column to aid in unit excavation. A 2-liter (0.5 gallon) soil sample was collected from one corner of each level of a unit or column that extended through the midden deposits. These samples, along with the bulk samples, were screened in the field through ¼-in and ⅛-in mesh hardware cloth to sperate the coarse and fine matrices. The fine matrix was then collected for flotation, while the coarse matrix, including macro-artifacts (≥ ¼ in diameter) and micro-artifacts (¼ < x > ⅛ in diameter), was sorted by artifact class in the field. The remaining soil from the units and columns was screened in the field through a ¼-in mesh hardware cloth. All recovered cultural material was assigned provenience by unit/column and level. Burned rock was counted and weighed by material type, size grade (<7.5 cm [3 in], 7.5 to 11 cm [3 to 4.3 in], 11 to 15 cm [4.3 to 5.9 in], and >15 cm [5.9 in]) and edge angularity (angular or rounded). Burned rocks from all hand excavated units were then discarded in the field. All other artifacts within the coarse matrix were collected and brought back to the Pape-Dawson laboratory in Austin for analysis.

Unit and column level information was recorded on a standard form detailing artifact content, soil characteristics, and feature association. One wall of each unit and/or column was photographed and profiled upon termination of unit/column excavation. Collected artifacts from these investigations were brought back to Pape-Dawson's Austin laboratory for cleaning and analysis. A site revisit form for 41CM412 was submitted to TexSite following the field effort.

LABORATORY ANALYSIS

The data recovery effort resulted in the recovery of five types of prehistoric archaeological material: lithics, burned clay, ocher, faunal remains, and charcoal. In addition, some modern and historic-age artifacts observed in mixed context were recovered from the upper portions of the excavated units/columns. Nonorganic artifacts were washed in distilled water and air-dried. Organic artifacts were dry-brushed only. All collected artifacts were analyzed according to class and material type. Artifacts were also catalogued by provenience.

Prehistoric Lithic Material

All prehistoric lithic artifacts collected from site 41CM412 were initially classified as either tools or non-tools, then sorted by raw material type. Tools were divided into six subcategories: biface, projectile point, preform, perforator, uniface, and edge-modified flake (EMF). Non-tools were categorized as debitage, core, or fire-cracked rock (FCR). The assemblage of lithic debitage, as well as the collection of flake tools, was further subdivided according to flake reduction stage (e.g., primary, secondary, and tertiary) followed by flake completeness (i.e., complete or broken). FCR was analyzed in the field (see Field Methods).

Additional lithic analysis was then conducted to determine the stage or stages of lithic reduction that contributed to the midden formation at site 41CM412. An expedient method developed by Turnbow and Staley (1995) was utilized for this analysis. This method arose to streamline the analysis of large collections from lithic procurement areas, following a more detailed analysis of nearby sites of this type (Benson and Garcia 1994), as well as a knapping experiment conducted by Collins (1975). The Turnbow and Staley (1995) method is based on grading debitage by size. Complete lithic debitage and flake tools were categorized as Grade A (< 2 cm [0.8 in]), Grade B (2 to 5 cm [0.8 to 2 in]), Grade C (5 to 8 cm [2 to 3.1 in]), or Grade D (> 8 cm [3.1 in]), where grade size was determined from the length of the longest flake measurement. The size grade histogram typology used in this study and detailed by Turnbow and Staley (1995) is illustrated in **Figure 5**.

Tools

Bifaces exhibit negative flake scars extending over both faces of the tool, with both sides converging on a single edge that circumnavigates the entire artifact. There are several possible functions for bifaces, including sources for usable flakes, chopping and cutting apparatuses, or as projectile points. Bifaces recovered from the site without recognizable haft elements were assigned to one of three bifacial reduction stages: early, middle, or late. The early-stage bifaces are largely characterized as edged bifaces with minimal to no thinning and with areas of cortex present near the midline or along one or more lateral edge. The middle-stage bifaces have no cortex and exhibit large flake scars that extend to the center of the biface with minimal to moderate thinning. The late-stage bifaces represent finished bifaces.

Projectile points are bifaces with identifiable hafting elements that were used, as the name implies, as projectiles. Based on size and manufacturing techniques, projectile points were further subdivided into arrow points and dart points. Arrow points are small projectile points with refined flaking and stems or hafting elements that permit the points to be attached to arrows. A dart point is a moderately large projectile point featuring a wide base, moderate thinning, and a stem that permitted the point to be fixed to a spear. Often a dart point exhibits evidence of re-working, which can be indicative of reuse occurring across multiple occupation periods. Projectile points were preliminarily identified by Pape-Dawson archaeologists. They were then examined by lithic specialist Chris Ringstaff, who assisted with final type determinations.

Preforms are bifaces that are in the process of being shaped into projectile points but have not yet achieved their final forms.

Perforators are unifacially or bifacially worked tools characterized by long, narrow, tapering bodies that are often diamond-shaped in cross-section. Perforators from Archaic sites are commonly made from reworked dart points. There are several possible functions for perforators, including punching holes through hides, weaving, or drilling holes into shells, soft stones, or wood.

Unifaces are unifacially-worked tools, meaning that they demonstrate flake reduction limited to one facial surface. The most common type of prehistoric uniface is a scraper. Scrapers often exhibit hafting elements, but unlike projectile points, were not used for arms. Rather, use-wear analysis has shown that scrapers were utilized for hideworking and woodworking.

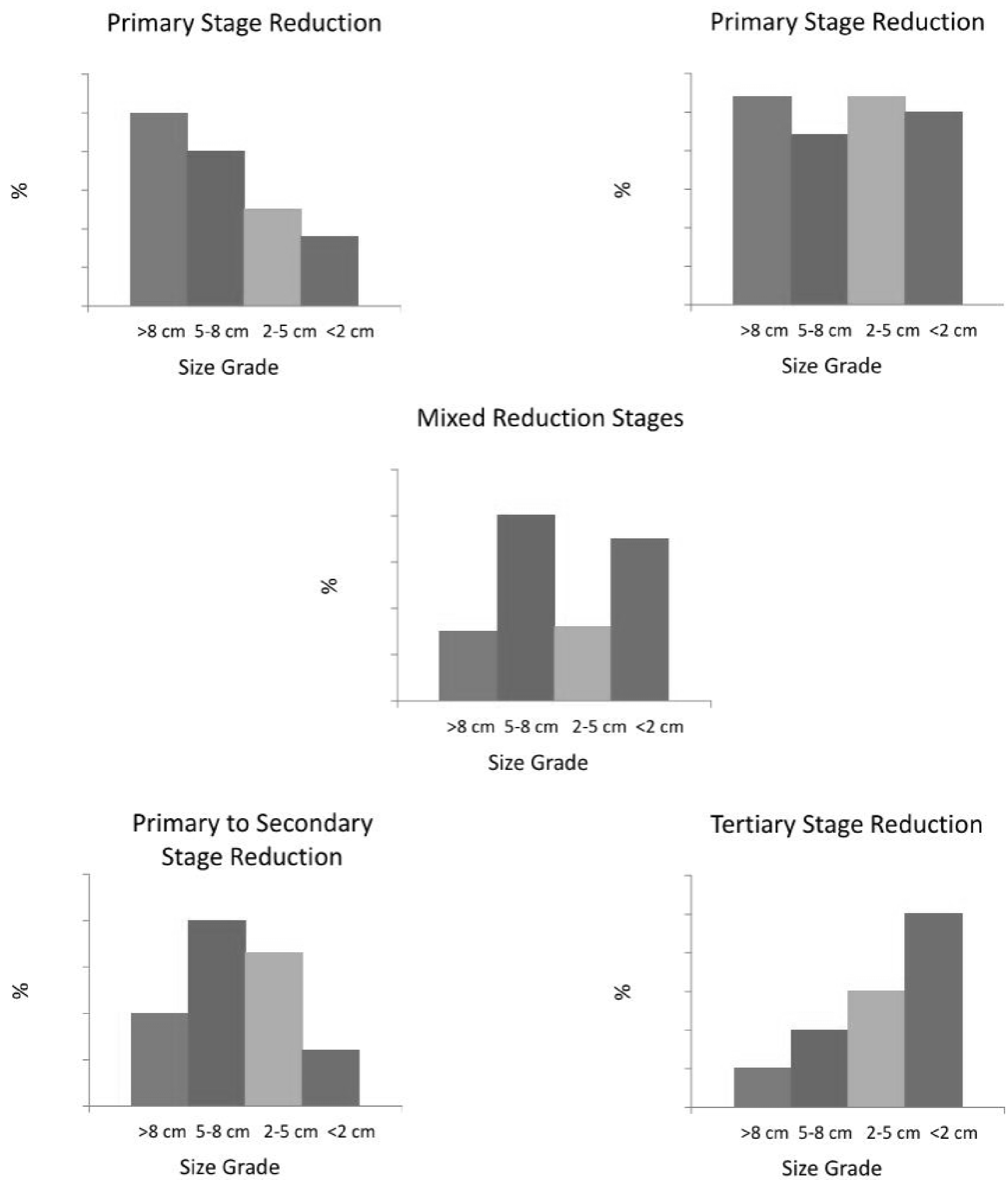

Figure 5. Size-grade histogram typology. Adapted from Turnbow and Staley (1995:69).

Edge-modified flakes (EMFs) are identified as pieces of lithic debitage that exhibit intentional retouching along one or more edge to shape it for use as a tool. Flake tools are commonly referred to as expedient tools, as they require less labor to create than formal, specialized tools. Flake tools were subdivided into the following three categories based on the amount of cortex present on the dorsal surface: primary (100 percent of cortex remaining), secondary (between 1 and 99 percent of cortex remaining), and tertiary (no cortex remaining). The EMFs were then further subdivided into complete and broken categories.

Non-tools

Analysis of the non-tool categories mainly focused on unmodified lithic debitage. However, FCR and two cores were also collected during the investigation. Characteristics of each non-tool category observed during analysis are summarized below.

Lithic Debitage includes all unmodified materials detached from an objective piece during core reduction or the production of chipped stone tools. Lithic debitage was classified under the following categories: primary flakes, secondary flakes, tertiary flakes, and shatter. As above, the criteria used to categorize these materials define primary flakes as initial reduction stage flakes retaining 100 percent of dorsal cortex. Secondary flakes denoted any flake exhibiting dorsal cortex ranging between 1 and 99 percent. Tertiary flakes were defined as non-cortical interior flakes. Lithic debitage lacking an observable striking platform or other morphologically discernable flake characteristics were categorized as shatter. Primary, secondary, and tertiary flakes were further subdivided into complete and broken subcategories.

Fire-cracked rocks (FCR) are lithics that have been thermally altered from intentional heat exposure during use for cooking and heating. Characteristics associated with thermal alteration of lithic material include color change, increased luster, and heat fracturing. FCR is identified as a lithic specimen that exhibits all three forms of thermal alteration.

A *core* represents any relatively large, homogenous lithic material exhibiting negative flake scarring on its surface owing to flake reduction activities. Andrefsky (1998) additionally categorizes cores as either unidirectional or multidirectional with respect to the directional mode of reduction. Unidirectional cores demonstrate flake reduction in one direction from a single striking platform, whereas multidirectional cores display flake reduction in variable directions from multiple platforms.

Burned Clay

Burned clay is soil that has been hardened and oxidized by exposure to heat. At prehistoric sites, burned clay may be found directly beneath fire-related features, such as hearths or heating elements for earth ovens. At historic sites, burned clay may provide evidence that a former structure was destroyed by fire. However, burned clay can also result from natural causes, including wildfires and lightning strikes that set fire to trees and roots. Burned clay collected at 41CM412 was weighed by provenience. No additional analysis was attempted.

Ocher

Ocher is a form of iron oxide that occurs naturally within the earth and is commonly used as pigment. Ocher varies in color from yellow to orange to brown. Prehistoric people used ocher for a variety of decorative purposes, including to paint their bodies or cave walls, dye animal skins, and decorate ceramics. Ocher also appears to have held a spiritual or symbolic meaning for many prehistoric peoples, as red ocher is often found in association with burials.

Faunal Remains

The faunal assemblage was analyzed using various publications of zoological reference material (Boessneck 1969; Hillson 1992; Schmidt 1972). The faunal remains were categorized to the lowest taxonomic level that could be determined based on specimen completeness. All remains that could not be identified to the taxon were separated into categories based on animal type and size. These indeterminate categories include large mammal (cow/bison size), medium mammal (deer/javelina/dog size), small mammal (rabbit/squirrel/rat/mouse size), and mammal (indeterminate mammal size). No bird, fish, or reptile specimens were identified in the 41CM412 assemblage.

For each bone, a series of information was catalogued including context, taxon, element, and completeness. In addition, side, weathering, and butchery were recorded for specimens that could be identified by skeletal element, and fusion and fragmentation was considered for long bones. Weathering was simply graded on a 4-point scale ranging from 0 (none) to 3 (heavy). Butchery marks for skinning, filleting, and dismembering were identified based on features identified by Binford (1981) and were recorded. Additionally, chopped marks and breaks associated with marrow extraction were noted. Bone modifications, including carnivore gnawed, rodent gnawed, burned, or worked bone, were also noted.

Charcoal

Charcoal was weighed and recorded by provenience from excavation units and flotation samples.

Historic Material

The recovered historic-age artifacts are associated with the site's historic component. Only basic analysis was conducted for these artifacts, as they are intrusive within the prehistoric midden and were highly fragmentary. Furthermore, the historic component of 41CM412 was not considered a central focus of the approved data recovery research design for the Project.

CURATION

All lithic tools, faunal remains, special items (e.g., ocher), and ⅓ of the lithic debitage will be prepared for curation along with documentation. Pape-Dawson proposes that the remaining lithic debitage, as well as any historic artifacts, modern materials, and non-cultural materials, should be discarded following analysis. Artifact discard procedures will be coordinated with the THC upon acceptance of this draft report. Artifacts and original paperwork (e.g., photographs, trench logs, and unit/feature forms) will be curated at UTSA-CAR in accordance with their specified standards of preparation.

SPECIAL STUDIES

Special studies performed for the data recovery effort include macrobotanical analysis, radiocarbon dating, and magnetic susceptibility testing. The methods employed for each type of analysis are detailed below.

Macrobotanical Analysis

Flotation Processing

Soil samples, ranging in volume from 1.25 to 11.6 cubic decimeter (dm^3), were submitted to Leslie L. Bush, Ph.D., R.P.A., of Macrobotanical Analysis for examination. Flotation samples were processed on October 3 and 4, 2018 according to the TAS Field School method (Bush 2012, 2014). Samples were deflocculated by soaking in water with at least 200 cubic cm (ccs) of baking soda. An additional 200 ccs of baking soda was added for each additional 4 dm^3 of sample volume or portion thereof. Samples were soaked for up to an hour outdoors in temperatures ranging from 23.9 to 32.8 ºC (75 to 91 ºF). Flotation light fractions were decanted into mesh with triangular openings of 0.3-x-0.4-x-0.5-millimeters (mm; 0.01-x-0.02-x-0.02-in). Heavy fractions were poured through mesh with square openings of 1 mm (0.04 in). After drying, flotation heavy fractions were examined under a stereoscopic light microscope at 6-55 X magnification for carbonized botanical materials that failed to float during processing. Any carbonized botanical remains were moved to the light fraction prior to examination.

Radiocarbon Samples

Immediately after drying, light fractions were quickly scanned for material suitable for radiocarbon dating, which was then removed and returned to Pape-Dawson. For selection of potential radiocarbon material, light fractions were examined on freshly cleaned glassware and handled with vinyl gloves and metal forceps. Contact with paper and other plant products was avoided. Data were recorded using plastic mechanical pencils, and the scale pan was cleaned between samples.

Flotation Samples

Flotation samples were sorted according to standard procedures (Pearsall 2015). Each flotation light fraction was weighed on an Ohaus Scout II 200 x 0.01 gram (g) electronic balance before being size-sorted through a stack of graduated geologic mesh. All carbonized botanical materials that did not pass through the No. 10 mesh (2 mm^2 [0.003 in^2] openings) were sorted under a Leica S9i stereozoom microscope at 6-55 X, then counted, weighed, recorded, and labeled. Gastropods, other non-botanical material, and uncarbonized botanical material larger than 2 mm (0.08 in) were weighed, recorded, and labeled as "contamination." Materials that fell through the 2-mm (0.08-in) mesh ("residue") were examined under a stereoscopic microscope at 6-55 X magnification for carbonized botanical remains that had not been previously identified in the 2-mm (0.08-in) size fraction. Identifiable carbonized and semi-carbonized botanical materials were removed from residue, counted, weighed, recorded, and labeled. Uncarbonized plant remains, other than rootlets (at this site, seeds, leaves, wood, and an acorn cap), were recorded on a presence/absence basis on laboratory forms.

Wood charcoal identification was attempted for up to 20 specimens from each flotation sample. When fewer than 20 wood charcoal fragments were present in the 2-mm (0.08-in) size fraction, all such fragments were identified, and identification was attempted for progressively smaller fragments until either 20 fragments were identified or the fragments became too small to snap and/or to identify as anything more specific than "hardwood." Wood charcoal fragments were snapped to reveal a transverse section and examined under a stereoscopic microscope at 6-55 X magnification. When necessary, tangential or radial sections were examined for ray seriation, presence of spiral thickenings, types and sizes of intervessel pitting, and other characteristics.

Botanical materials were identified to the lowest possible taxonomic level by comparison to materials in the Macrobotanical Analysis comparative collection and with standard reference works (e.g., Core et al. 1979; Davis 1993; Hoadley 1990; InsideWood 2004; Martin and Barkley 1961; Musil 1963; Panshin and de Zeeuw 1980; Wheeler 2011). Plant nomenclature follows that of the PLANTS Database (USDA-NCRS 2019).

Radiocarbon Dating

Radiocarbon dating is a technique for determining the age of organic remains based on the rate of decay of radioactive carbon (C-14). The radiocarbon dating method relies on radioactive carbon that is constantly created in the atmosphere. Radioactive carbon is taken in by plants during the process of photosynthesis and is transferred to animals upon their consumption of plant material. When a plant or animal dies, it stops acquiring carbon from its environment and begins to lose C-14 at a constant rate through radioactive decay. Thus, by measuring the C-14 level in the remains of an organism, scientists can estimate the time of its death.

Carbonized materials identified during the excavation or flotation process were submitted to DirectAMS, a radiocarbon dating service in Washington, for analysis. DirectAMS presented results in units of percent modern carbon (pMC) and the uncalibrated radiocarbon age before present (B.P.). All results were corrected for isotopic fractionation with an unreported $\delta^{13}C$ value measured on the prepared carbon by the accelerator. The pMC reported requires no further correction for fractionation.

Magnetic Susceptibility Analysis

Magnetic susceptibility is a general measure of the degree to which a sample may be magnetized. This measure provides basic information on the magnetic mineralogy of a sample, which may vary owing to a variety of factors, such as depositional processes, soil development, and human occupation. The application of magnetic susceptibility in archeological studies has been discussed in detail by Dalan (2008) and Dalan and Bannerjee (1998). In this situation, it is the kindling of fires and the use of rock for cooking that likely resulted in magnetic susceptibility enhancement of the soil. A geoarchaeological assessment of the site, consisting of magnetic susceptibility sampling and analysis, was conducted by Charles Frederick, Ph.D., P.G. The methods employed by Dr. Frederick are presented below.

In the field, trench profiles were inspected, cleaned with a trowel, and designated profiles were described and sampled. Description of these profiles generally followed the procedures outlined in Schoeneberger et al. (2012). A suite of small samples was collected from each profile in a plastic 2.5-cm (1-in) paleomagnetic sample box at approximately 5-cm (2-in) intervals. These samples were intended for measuring the magnetic susceptibility of the deposits, but a variety of analyses can be performed on samples of this type.

In addition to these profiles, the soils exposed by two trenches were logged, sketched, and then a bulk sample of about 500 g (17.6 ounces [oz]) was collected from a depth of 20 cm (8.9 in) every 2 m (6.6 ft). These samples were also intended for magnetic susceptibility analysis, to provide an independent assessment of where anthropogenic enrichment of the soils may have occurred during the prehistoric occupation of the site.

In the lab, the plastic cube samples were first weighed, and then the low frequency (470 hertz) magnetic susceptibility (kappa) was measured for on the 0.1 setting on a Bartington MS2 meter and an MS2b sensor (Gale and Hoare 1991). The mass corrected magnetic susceptibility (χ_{lf}) was then calculated, and the results are reported in SI units ($10^{-8}m^3kg^{-1}$).

CHAPTER 5: RESULTS

PREVIOUS INVESTIGATION

Originally recorded by Pape-Dawson during an archaeological survey for the Comal ISD High School #4 Project, site 41CM412 is a multicomponent site. The historic component dates from the early to mid-twentieth century and includes several historic-age structures, structural remains, and historic-age artifacts. The site's prehistoric component consists of a sprawling lithic scatter and a burned rock midden. Despite the site's extent and various components, the only aspect of the site determined to contain significant archaeological deposits eligible for SAL designation is the burned rock midden (Moore and Galindo 2018), which was the focus of the current data recovery effort.

The burned rock midden at site 41CM412 was originally encountered through shovel test excavations during Phase I investigation (Moore and Galindo 2018). Thirteen (13) shovel tests were placed in and around the buried midden feature, five of which revealed deposits associated with the feature. The distribution of these positive shovel tests suggested that the burned rock midden was roughly 40 m (262 ft) in diameter. The vertical distribution of burned rock observed within the shovel tests indicated that the midden largely fell between 10 and 40 cm below surface (cmbs; 3.9 and 15.7 in below surface [inbs]), although prehistoric artifacts were recovered from 0 to 60 cmbs (0 to 23.6 inbs). Artifacts discovered within the midden matrix included the proximal fragment of a Late to Transitional Archaic Marcos dart point, an edge-modified flake, lithic debitage, a piece of ocher, and charcoal (Moore and Galindo 2018).

Disturbances to the burned rock midden resulted from both artificial and natural impacts. Observed artificial disturbances included the construction of a historic–age chicken coop, the construction and demolition of a historic-age residence, and the construction and partial removal of a historic-age pier and beam outbuilding. The rubble from the residential structure appeared to cover part of the southern portion of the midden, while six piers associated with the former outbuilding extended into the feature. Natural impacts to the burned rock midden included bioturbation, which was primarily caused by root activity. Despite these disturbances, roughly 75 percent of the midden was estimated intact (Moore and Galindo 2018).

Based on these results, Pape-Dawson recommended that the burned rock midden at site 41CM412 be avoided and not impacted by development. However, as avoidance of the site was not possible, the burned rock midden was recommended for data recovery (Moore and Galindo 2018).

SETTING

The landscape across 41CM412 consists of gently to moderately sloping uplands, with three main upland landforms dominating the site. Two larger ridges are divided by a small ephemeral stream that runs through the Project Area along its western half (**Figure 13**). This ephemeral stream feeds into an unnamed tributary of Bear Creek, roughly 82 m (269 ft) south of the overall site boundary. The burned rock midden is located on top of the eastern ridge. Vegetation primarily consists of short to tall grasses, various cacti, agarita, and groves of dense oak and mesquite trees. Ground surface visibility within the site boundary varies depending on leaf litter and grasses, averaging 10 percent.

FIELDWORK RESULTS

Pape-Dawson archaeologists conducted archaeological data recovery investigations of the burned rock midden at site 41CM412 in compliance with the ACT between March 19 and April 3, 2018. Melanie Nichols as PI for the field investigation, and Dr. Karissa Basse served as PI during the reporting stages of the Project. The PIs were assisted by archaeologists Jacob Sullivan, Virginia Moore, Megan Veltri, Sheldon Smith, Ann Marie Blackmon, Mikayla Mathews, and Dr. Nesta Anderson. Special studies were conducted by Dr. Leslie Bush, Chris Ringstaff, DirectAMS, and Dr. Charles Frederick.

Investigations consisted of a program of systematic shovel testing (supplemental to the original Phase I survey) followed by the mechanical excavation of two trenches and hand excavation of two 1-x-1-m (3.3-x-3.3-ft) units and five 50-x-50-cm (19.7-x-19.7-in) columns. This field effort resulted in the hand excavation of 12.25 m^3 (423.6 ft^3) of matrix and the recovery of 3,224 prehistoric artifacts, 79 historic artifacts, and 4 modern materials. In addition, 1,395.4 g (49.2 oz) of burned clay and 2.46 g (0.09 oz) of charcoal were collected. The location of excavations conducted for the data recovery at site 41CM412 can be seen on **Figure 6** and **Figure 7**. Results of individual efforts are detailed below.

SHOVEL TESTING

Pape-Dawson archaeologists excavated shovel tests as part of the data recovery Project to verify the horizontal extent of the burned rock midden within 41CM412. A total of 24 shovel tests were excavated within and near the midden in a 10-x-10-m (32.8-x-32.8-ft) grid (see **Figure 6** and **Figure 7**). Due to the presence of bedrock at the surface across portions of the site boundary, surface inspections were performed at two proposed shovel test locations. Additionally, one proposed shovel test was not excavated, given that a shovel test (NJA01) was previously excavated at that location during the initial survey effort (Moore and Galindo 2018).

While shovel tests lacking evidence of midden deposits were excavated to bedrock or pre-Holocene strata, shovel tests which encountered evidence of the midden were terminated prematurely (typically 10 to 20 cmbs [3.9 to 7.9 inbs]) to limit disturbances to the feature prior to hand excavations. The typical shovel test contained very dark grayish brown (10YR 3/2) to grayish brown (10YR 5/2) silty clay to silty clay loam to a depth of 20 to 30 cmbs (7.9 to 11.8 inbs) (**Appendix A**). **Figure 8** illustrates a typical shovel test profile (JS01).

Of the 24 shovel tests excavated to delineate the midden, 19 were positive for cultural materials, yielding 698 prehistoric artifacts and 18 historic artifacts (**Table 1**). The prehistoric artifact assemblage includes 340 pieces of lithic debitage, 352 pieces of FCR, two bifaces (one mid-stage and one late-stage), one core, and three faunal bone fragments. Prehistoric artifacts were recovered from the shovel tests at depths ranging from 0 to 40 cmbs (0 to 15.7 inbs), with the greatest concentration encountered between 0 and 20 cmbs (0 and 7.9 inbs). Significantly fewer prehistoric artifacts were encountered at depths greater than 30 cm (11.8 in).

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Figure 8. Representative shovel test profile (JS01).

Table 1. Cultural Material from Shovel Tests by Level							
Level (cmbs)	**Biface**	**Core**	**Debitage**	**FCR**	**Bone**	**Historic**	**Grand Total**
1 (0-10)	-	-	108	152	-	6	266
2 (10-20)	1	1	112	139	1	12	266
3 (20-30)	-	-	90	48	2	-	140
4 (30-40)	1	-	30	13	-	-	44
Grand Total	**2**	**1**	**340**	**352**	**3**	**18**	**716**

Historic artifacts recovered from the shovel tests include two machine cut nails, one wire nail, two amber bottle glass shards, one refined white earthenware sherd with a magenta floral transfer print, and 12 pieces of faunal bone. The faunal bone fragments are considered historic-age based on their association with the other historic cultural material recovered. Additionally, one fragment exhibited evidence of saw marks. All historic cultural material was recovered from 0 to 20 cmbs (0 to 7.9 inbs), but the historic artifact assemblage is sparse in comparison to the density of prehistoric material observed in shovel tests.

Although scattered FCR was encountered in most positive shovel tests, only 11 of the 19 positive shovel tests contained concentrated burned rock midden deposits. The distribution of these shovel tests revealed that the burned rock midden extended eastward beyond its originally recorded boundary. The current distribution of shovel tests across the Project Area suggests the midden is ovoid in shape, with a major axis extending approximately 50 m (164 ft) east-west and a minor axis extending roughly 40 m (131.3 ft) north-south.

TRENCHING

Based on the results of the shovel testing effort, which refined the extent of the burned rock midden within 41CM412, Pape-Dawson excavated two perpendicular trenches within the feature to cross-section and expose the internal structure (see **Figure 6** and **Figure 7**). Trench 1 was oriented east-west along the major axis of the midden, while Trench 2 was oriented north-south along the feature's minor axis. Both trenches were excavated to a depth of approximately 39.4 in (100 cm) below surface, well below the midden deposit visible in the trench profiles (**Figure 9**).

Figure 9. Drone image of Trench 1 and 2 locations within site 41CM412.

Profile Summary

The stratigraphy exposed in the walls of the trenches resembles the Medlin series (**Table 2**) (USDA-NRCS 2020). The profiles exhibited an A-Horizon (Zone 1) of dark gray (10YR 4/1) silty clay loam with few to common limestone gravels and cobbles and a clear lower boundary to a depth of 20 to 35 cmbs (7.9 to 13.8 inbs). Root disturbance was moderate throughout this horizon. The underlying B-Horizon (Zone 2) was discontinuous and did not appear uniformly across the length of either trench. When encountered, Zone 2 consisted of a brown (10YR 4/3) silty clay loam with few angular limestone gravels and a clear lower boundary to a depth of 50 cmbs (19.7 inbs). Root disturbance ranged from moderate to slight, decreasing with depth.

The basal substrate within each trench primarily consisted of light yellowish brown (10YR 6/4) marly silty clay loam to a depth of 100 cmbs (39.4 inbs). This stratum was characterized as the C1-Horizon (Zone 3). However, within the northernmost portion of Trench 2, a C2-Horizon (Zone 4) was also observed, consisting of a very pale brown (10YR 8/2) marl with discrete pockets of grayish brown (10YR 5/2) loam, also to a depth of 100 cmbs (39.4 inbs). **Figure 10** and **Figure 11** demonstrate typical trench profiles.

Feature Identification

Two macro-features (Features 1 and 2) were exposed within the trench profiles (**Figure 12** and **Figure 13**). Feature 1 represents the burned rock midden initially encountered through shovel testing and further exposed within Trenches 1 and 2. The feature was visible in the trench profiles as a concentration of very dark grayish brown (10YR 3/2) carbon-stained clay sediment containing a dense cluster of burned rock, FCR, chert tools, and debitage. The burned rock and FCR largely consisted of limestone, though some sandstone and chert pieces were also observed. Feature 1 was designated as (Zone 5) in each trench, visible from the ground surface to approximately 45 cmbs (17.7 inbs) in profile (see Table 2 and Table 3).

Table 2. Trench Profile Summary

Trench	Zone	Depth (cmbs)	Horizon	Feature
1	1	0-35	A	-
	2	35-50	B	-
	3	50-100	C1	-
	5	0-45	-	1
	6	0-45	-	1.1
2	1	0-20	A	-
	2	30-50	B	-
	3	50-100	C1	-
	4	50-100	C2	-
	5	0-35	-	1
	7	24-40	-	1.2
	8	0-60	-	2

Figure 10. East wall of Trench 2 near southern terminus.

Figure 11. East wall of Trench 2 near northern terminus.

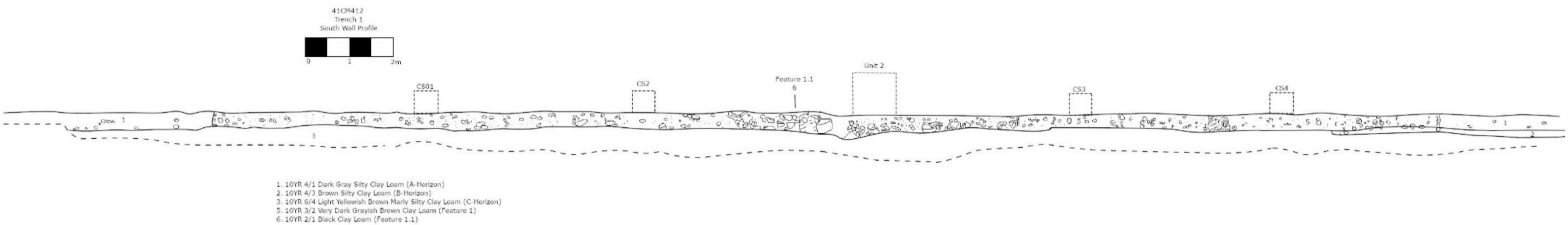

Figure 12. Trench 1 south wall profile illustrating Feature 1 and Feature 1.1 with locations of Unit 2 and Column Samples 1-4.

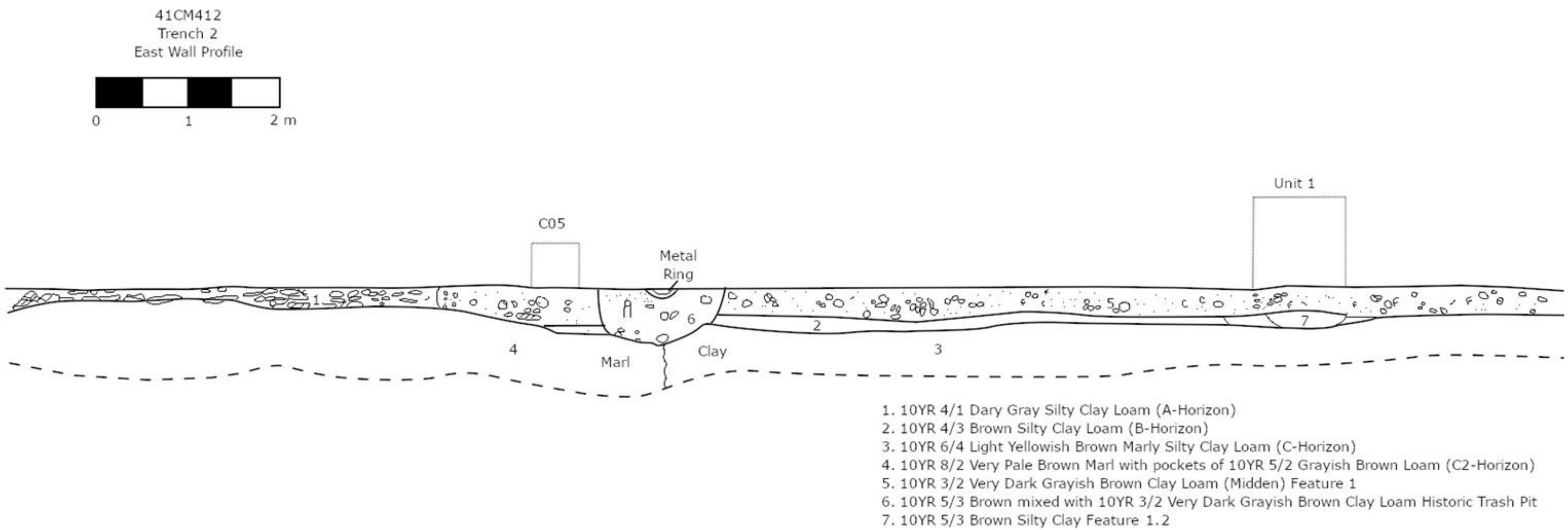

Figure 13. Trench 2 east wall profile illustrating Feature 1 and Feature 1.2 with locations of Unit 1 and Column Sample 5.

Table 3. Features Identified During Trenching at 41CM412				
Feature	**Trench**	**Feature Type**	**Length (m)**	**Depth (cmbs)**
1	1 and 2	Burned Rock Midden	28.2	0 to 45
1.1	1	Possible Heating Element	6.3	0 to 45
1.2	2	Earth Oven Pit	0.9	24 to 40
2	2	Historic-Age Midden	1.35	0 to 60

Within Trench 1, Feature 1 extended roughly 28.2 m (92.5 ft) across the horizontal extent of the trench profile and was bracketed on each end by a transitional zone from the layered midden deposit to a light scatter with diminishing thickness. Within Trench 2, Feature 1 extended north from the juncture with Trench 1 approximately 12.2 m (40 ft). The remainder of the Trench 2 profile excavated north of the feature contained unburned limestone cobbles. Based on these data, the horizontal extents of the burned rock midden were refined to the north, west, and east; however, the southern extent was not delineated by trenching.

Feature 1 contained two distinguishable internal midden components. These micro-features were designated Features 1.1 and 1.2. Feature 1.1 is the possible remains of a central heating element for an earth oven situated within Feature 1. Feature 1.1 was identified by a slight change in soil color and structure from the remainder of the midden and designated as Zone 6. Specifically, Feature 1.1 exhibited a black (10YR 2/1) clay loam matrix that was slightly darker than the surrounding midden sediments, and the midden fill within this portion of Feature 1 was more clast-supported (as opposed to matrix-supported) due to an increase in both the size and density of burned rock/FCR. Feature 1.1 was characterized as a basin-shaped pit, with several super-imposed slab linings extending roughly 6.3 m (20.7 ft) horizontally within the south wall of Trench 1. Feature 1.1 was visible from the ground surface to approximately 45 cmbs (17.7 inbs).

Feature 1.2 is likely the location of a former earth oven pit within Feature 1. Feature 1.2 was identified by a basin-shaped area of heat-induced oxidized sediments visible near the base of Feature 1 and characterized as Zone 7. Feature 1.2 exhibited brown (10YR 5/3) silty clay soil heavily mottled with light reddish brown (5 YR 6/4) burned clay sediment. Feature 1.2 was observed within the eastern wall of Trench 2 extending approximately 0.9 m (3 ft) in length at a depth of 24 to 40 cmbs (9.4 to 15.7 inbs). The central heating element from Feature 1.2 appears to have been dismantled after use and the oven abandoned. The feature was later buried as subsequent ovens were built and cleaned out at the site.

Feature 2 is a historic-age trash pit that intruded into Feature 1 near the northern terminus of Trench 2. Feature 2 contained brown (10YR 5/3) silty clay mixed with very dark grayish brown (10 YR 3/2) and very dark gray (10YR 3/1) clay loam. Feature 2 artifacts included burned/cut faunal bone, metal, and FCR. No artifacts were collected from this feature, as the prehistoric component of 41CM412 was the central focus of the investigation.

Artifact Areas

Backdirt piles for each trench were examined for diagnostic artifacts. When encountered, diagnostic artifacts were collected and assigned field specimen numbers used to indicate their general location within each trench, resulting in the identification of seven general artifact concentrations. Five concentrations were documented within Trench 1 and two concentrations were documented within Trench 2 (see **Figure 6** and **Figure 7**). Cultural material encountered within each artifact concentration is summarized in **Table 4**. Altogether, 38 artifacts were collected from the trenches and backdirt, including Early, Middle, and Late to Transitional Archaic dart points, as well as a preform, bifaces, a scraper, a perforator, two EMFs, one biface blank, and one large tertiary flake. In total, ten Pedernales and Pedernales-like points were recovered from the Artifact Areas. Artifacts recovered from the trenches are discussed in greater detail in the Artifact Assemblage section of this chapter.

Table 4. Cultural Material by Artifact Area

Trench 1					Trench 2	
1	**2**	**3**	**4**	**5**	**6**	**7***
1-Pedernales 1-Biface (M.S.)	1-Marcos 1-cf Pedernales 2-Biface (L.S.)	1-cf Pedernales 1-Perforator 1-EMF 1-Biface (E.S.)	1-Pedernales 1-Taylor Thinned Base	1-Pedernales 1-cf Pedernales 2-Biface (L.S.) 1-Scraper	3-Pedernales 1-Nolan 1-Langtry 1-Preform 1-Biface (E.S.) 6-Biface (M.S.) 4-Biface (L.S.) 1-EMF 1-Trade Blank 1-Flake	1-Pedernales
***13 cmbs (Zone 2)** **E.S.=Early-Stage; M.S.=Mid-Stage; L.S.=Late-Stage**						

HAND-EXCAVATED UNITS

Following trench excavations, Pape-Dawson archaeologists hand excavated two 1-x-1-m (3.3-x-3.3-ft) units and five 50-x-50-cm (19.7-x-19.7-in) columns within the burned rock midden designated as Feature 1. Unit 1 and Column Sample (CS)-5 were placed along Trench 2, while Unit 2 and CS-1 to CS-4 were evenly distributed along Trench 1. Units 1 and 2 were positioned to investigate the two potential internal midden features (Features 1.1 and 1.2) identified during mechanical trenching. CS-1 through CS-4 were excavated to examine the midden deposits at intervals from the perceived midden center, and CS-5 was situated over a small portion of the midden that appeared to have been capped by surface regolith through the geomorphological processes of sheetwash and erosion. While all unit and column level elevations were recorded in the field based on datums that were established 10 cm (3.9 in) above the ground surface, elevations are presented below as cmbs rather than cm below datum (cmbd) for ease of comparison with shovel test excavations and trench observations.

Unit 1

Unit 1 measured 1-x-1-m (3.3-x-3.3-ft) and was situated along the eastern edge of Trench 2 (see **Figure 6, Figure 7,** and **Figure 13**). Unit 1 was excavated to further investigate Feature 1, the burned rock midden, and Feature 1.2 (a basin-shaped area of thermally oxidized clay). Unit 1 was excavated through a total of 4 levels, including several layers of very dark grayish brown (10YR 3/2) clay loam (Feature 1) and brown (10YR 5/3) silty clay mottled with light reddish-brown (5YR 6/3) burned clay (Feature 1.2) terminating at light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon) (**Figure 14** to **Figure 17**). **Figure 18** and **Figure 19** illustrate the east wall profile and plan view of Unit 1 Level 3 depicting portions of Feature 1 and Feature 1.2.

All recovered artifacts from Unit 1 including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 cm < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil and bulk samples are presented in **Table 5**. Excavation of this unit resulted in the recovery of 1 projectile point, 9 non-diagnostic lithic tools, 1,823 pieces of lithic debitage (1,790 macro-artifacts and 33 micro-artifacts), 6 pieces of faunal remains (3 macro-artifacts and 3 micro-artifacts), 1,575 pieces of FCR (1,557 macro-artifacts and 18 micro-artifacts), 9 pieces of ochre, 0.42 g (0.01 oz) of charcoal, and 1,400.69 g (49.4 oz) of burned clay. In addition, 14 historic-age artifacts were encountered, including colorless glass shards, cut nails, wire nails, a fence staple, a plastic button, and unidentified ferrous metal fragments.

Most artifacts recovered from Levels 1 through 4 (0 to 35 cmbs [0 to 13.8 inbs]) of Unit 1 are associated with the burned rock midden identified as Feature 1. These artifacts include 1 diagnostic projectile point (1 Archaic cf. Lerma), 8 non-diagnostic tools (1 dart point preform, 6 bifaces, and 1 EMF), 1,715 pieces of debitage, 6 pieces of faunal remains, 1,125 pieces of FCR, 6 pieces of ochre, 0.42 g (0.01 oz) of charcoal, and 5.94 g (0.2 oz) of burned clay. Thirteen (13) historic-age artifacts were also encountered within Levels 1 and 2 (0 to 20 cmbs [0 to 7.9 inbs]), indicating there are some areas with slight mixing of site components within the upper portions of the burned rock midden. Lithic debitage, followed by FCR, was the most common class of cultural material recovered from Unit 1.

Near the base of the midden (Feature 1), Feature 1.2 was encountered within Levels 3 and 4 (24 to 40 cmbs [9.4 to 15.7 inbs]) of Unit 1. Artifacts and soil from Feature 1.2 were collected separately from the overlying and partially surrounding midden matrix of Feature 1. Artifacts recovered from within Feature 1.2 include 1 non-diagnostic lithic tool (a uniface scraper), 108 pieces of lithic debitage, 450 pieces of FCR, 3 pieces of ochre, 1,394.75 g (49.2 oz) of burned clay, and 1 historic-age artifact (a very small unidentified metal fragment). Burned clay is the most common class of cultural material recovered within Feature 1.2. Surprisingly, given the amount of burned clay, charcoal was only recovered from Feature 1.2 in a small amount from floatation of the bulk soil sample. In addition, the small historic-age artifact discovered within Level 4 is considered the result of bioturbation, given its size and lack of similar material at this level within the unit.

Figure 14. Unit 1 plan view of top of Feature 1 at 20 cmbs (7.9 inbs).

Figure 15. Unit 1 plan view of Feature 1 and Feature 1.2 at 30 cmbs (11.8 inbs).

Figure 16. Unit 1 plan view of Feature 1.2 at 40 cmbs (15.7 inbs).

Figure 17. Unit 1 plan view of Feature 1.2 at 50 cmbs (19.7 inbs).

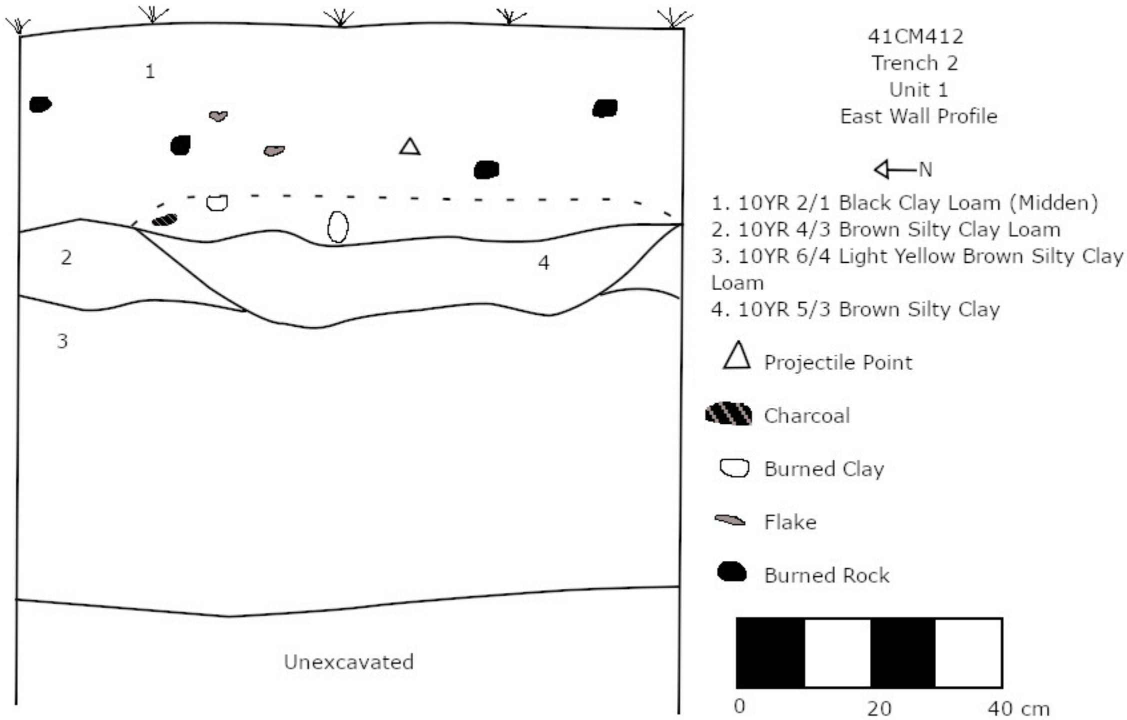

Figure 18. Unit 1 east wall profile within Trench 2 depicting Feature 1 (burned rock midden) and Feature 1.2 (basin-shaped area of thermally oxidized clay).

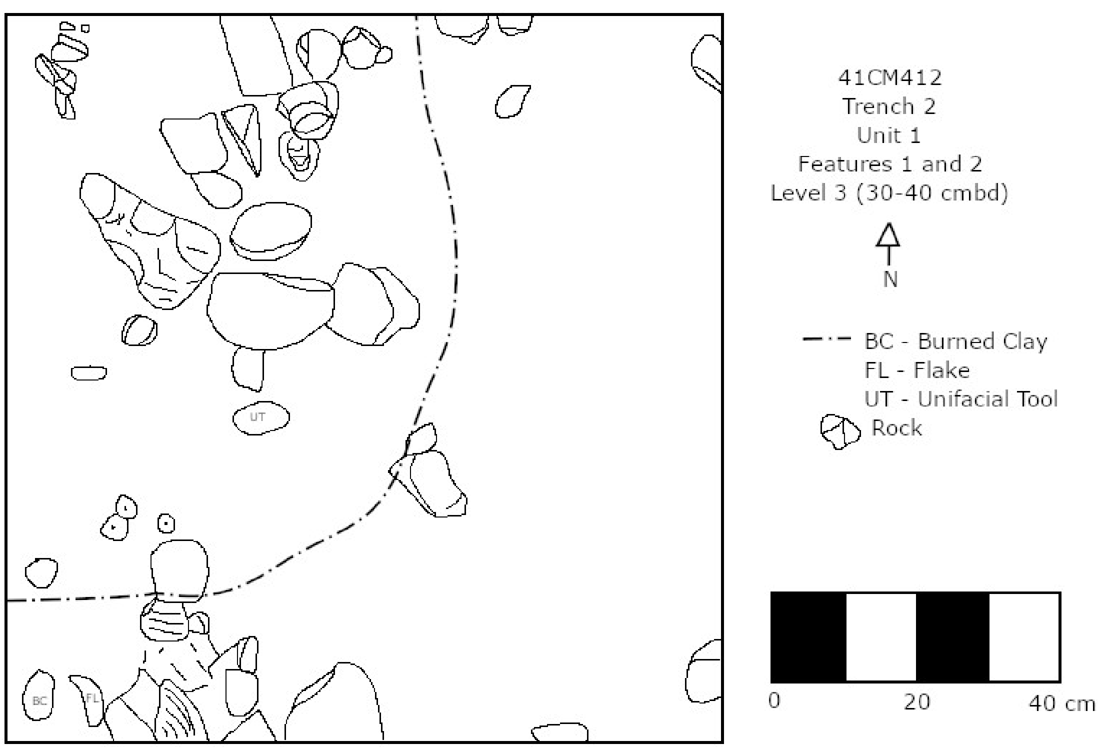

Figure 19. Unit 1 Level 3 plan view at 35 to 40 cmbs (13.8 to 15.7 inbs) depicting Feature 1.2 (basin-shaped area of thermally oxidized clay).

Table 5. Cultural Material from Unit 1 by Level														
Level (cmbs)		¼-in screen (macro-artifacts)									⅛-in screen (micro-artifacts)			
		Diagnostic Projectile Point	Non-Diagnostic Tool	Debitage	Faunal Remains	FCR	Ochre	Burned Clay (g)	Charcoal (g)	Historic	Debitage	FCR	Faunal Remains	Grand Total
Feature 1	1 (0-10)	-	1	94	-	112	-	-	0.05	6	6		-	219
	2 (10-20)	1	3	805	2	630	-	4.54	0.24	7	8	11	-	1,467
	3 (20-30)	-	4	736	1	287	4	0.72	0.13	-	18	7	3	1,060
	4 (30-35)	-	-	48	-	78	2	0.68	-	-	-	-	-	128
Feature 1.2	3 (24-30)	-	1	70	-	409	-	482.54	-	-	1	-	-	481
	4 (30-40)	-	-	37	-	41	3	912.21	-	1	-	-	-	82
Grand Total		**1**	**9**	**1,790**	**3**	**1,557**	**9**	**1,400.69**	**0.42**	**14**	**33**	**18**	**3**	**3,437**

Unit 2

Unit 2 measured 1-x-1-m (3.3-x-3.3-ft) and was placed near the center of Trench 1 to investigate Feature 1.1 (see **Figure 6, Figure 7,** and **Figure 12**). Unit 2 was excavated through a total of 3 levels containing black (10YR 2/1) clay loam (Feature 1.1) and was terminated at light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon). **Figure 20** and **Figure 21** depict the portion of Feature 1.1 exposed within Unit 2 at varying depths, and

Figure 22 illustrates the south wall profile of Unit 2, exhibiting a portion of Feature 1.

All recovered artifacts from Unit 2, including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil and bulk samples, are presented in **Table 6**. Excavation of this unit resulted in the recovery of 1 non-diagnostic lithic tool (a flake tool), 133 pieces of lithic debitage (125 macro-artifacts and 8 micro-artifacts), 858 pieces of FCR, and 1 historic-age artifact (a colorless glass shard). FCR, followed by lithic debitage, was the most common class of cultural material recovered from Feature 1.1 within Unit 2.

Figure 20. Unit 2 plan view of Feature 1.1 at 10 cmbs (3.9 inbs), facing south.

Figure 21. Unit 2 plan view of Feature 1.1 at 40 cmbs (15.7 inbs), facing south.

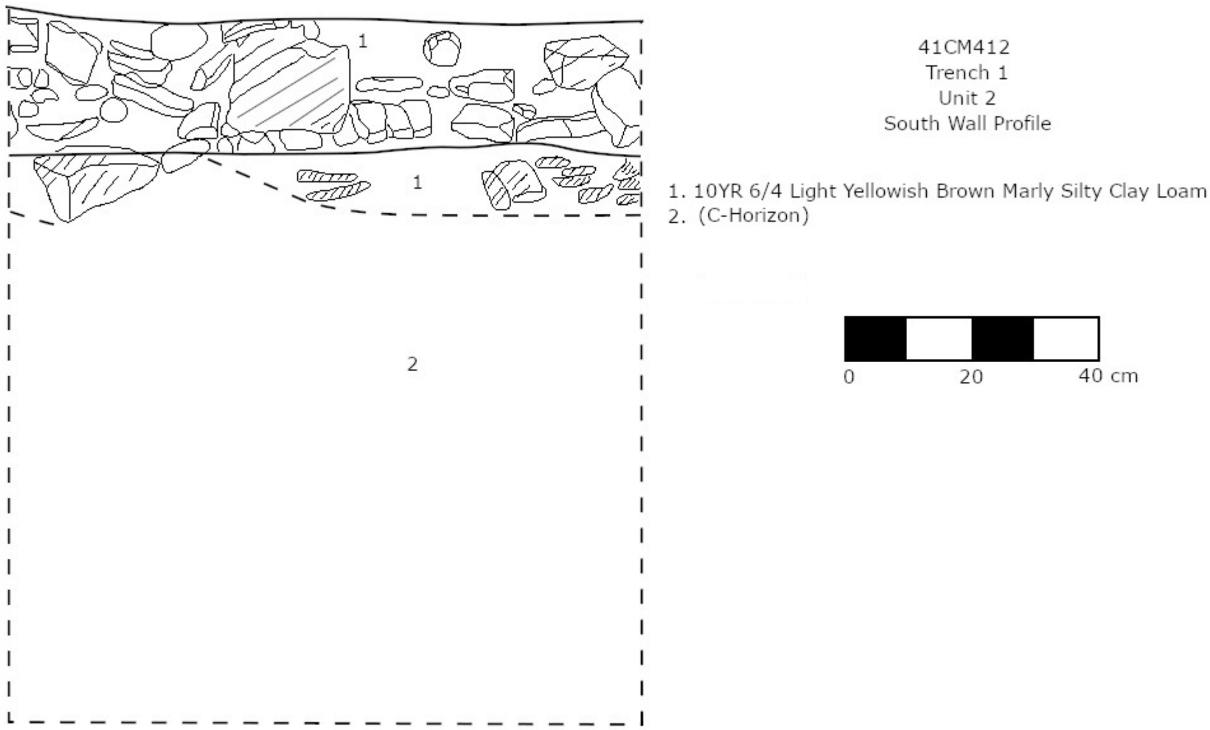

Figure 22. Unit 2 south wall profile depicting Feature 1.1.

Table 6. Cultural Material from Unit 2 by Level							
Level (cmbs)		¼-in screen (macro-artifacts)				⅛-in screen (micro-artifacts)	
		Non-Diagnostic Tool	Debitage	FCR	Historic	Debitage	Grand Total
Feature 1.1	1 (0-10)	1	87	315	1	4	408
	2 (10-20)	-	38	515	-	4	557
	3 (20-30)	-	-	28	-	-	28
Grand Total		1	125	858	1	8	993

CS-1

CS-1 was a 50-x-50-cm (19.7-x-19.7-in) unit situated along the southern wall of Trench 1 to investigate the outer edge of Feature 1 (see **Figure 6, Figure 7,** and **Figure 12**). CS-1 was excavated through a total of 4 levels, including several layers of very dark grayish brown (10YR 3/2) clay loam associated with Feature 1 and one level of light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon). **Figure 23** illustrates the south wall profile and plan view of CS-1 Level 3, depicting a liminal portion of Feature 1.

All recovered artifacts from CS-1, including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil samples, are presented in **Table 7**. Excavation of this unit resulted in the recovery of 152 pieces of lithic debitage (141 macro-artifacts and 11 micro-artifacts), 273 pieces of FCR (271 macro-artifacts and 2 micro-artifacts), 1 piece of ochre, and 4 historic-age artifacts (1 colorless glass shard, 1 brick fragment, and 2 metal fragments). FCR, followed by lithic debitage, was the most common class of cultural material recovered from Feature 1 within CS-1. All recovered artifacts from CS-1 are associated with the burned rock midden matrix. No artifacts were discovered within Level 4 of the unit, which extended beneath the midden and into the C1-Horizon.

Figure 23. CS-1 plan view at 30 cmbs (11.8 inbs) depicting Feature 1, facing south.

Table 7. Cultural Material from CS-1 by Level								
Level (cmbs)		¼-in screen (macro-artifacts)				⅛-in screen (micro-artifacts)		
		Debitage	FCR	Ochre	Historic	Debitage	FCR	Grand Total
Feature 1	1 (0-10)	42	34	1	2	5	1	85
	2 (10-20	67	170	-	2	5	1	245
	3 (20-30)	32	67	-	-	1	-	100
-	4 (30-40)	-	-	-	-	-	-	-
Grand Total		**141**	**271**	**1**	**4**	**11**	**2**	**430**

CS-2

CS-2 was a 50-x-50-cm (19.7-x-19.7-in) unit situated along the southern wall of Trench 1 to investigate a portion of the burned rock midden (Feature 1) between the potential central heating element (Feature 1.1) and the outer edge of Feature 1 (see **Figure 6, Figure 7,** and **Figure 12**). CS-2 was excavated through a total of four levels, including several layers of very dark grayish brown (10YR 3/2) clay loam (Feature 1) and into the underlying light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon). **Figure 24** illustrates the south wall profile and plan view of CS-2 Level 4, depicting a portion of Feature 1.

All recovered artifacts from CS-2 including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil samples, are presented in **Table 8**. Excavation of this unit resulted in the recovery of 1 non-diagnostic lithic tool (a flake tool), 78 pieces of lithic debitage (69 macro-artifacts and 11 micro-artifacts), and 339 pieces of FCR. In addition, a total of 16 historic-age artifacts (13 pieces of mortar, 1 square nail, 1 brick fragment, and 1 piece of metal) were discovered within Level 1 (0-10 cmbs [0 to 3.9 inbs]). FCR, followed by lithic debitage, was the most common class of cultural material recovered from Feature 1 within CS-2. All recovered artifacts from CS-2 are associated with the burned rock midden matrix. No artifacts were discovered within the lower portion of Level 4, which coincides with the C1-Horizon situated beneath the midden deposits. The increase in number of historic-age artifacts found in Level 1 of CS-2, including several pieces of mortar, suggest that a former historic-age structure once stood either over or near the location of this unit.

Figure 24. CS-2 depicting Feature 1 at 30 cmbs (11.8 inbs), facing south.

Table 8. Cultural Material from CS-2 by Level							
Level (cmbs)		¼-inch screen (macro-artifacts)				⅛-inch screen (micro-artifacts)	
		Non-Diagnostic Tool	Debitage	FCR	Historic	Debitage	Grand Total
Feature 1	**1 (0-10)**	-	6	33	16	2	57
Feature 1	**2 (10-20)**	1	27	128	-	5	161
Feature 1	**3 (20-30)**	-	30	175	-	4	209
Feature 1	**4 (30-34)**	-	6	3	-	-	9
-	**4 (34-40)**	-	-	-	-	-	-
Grand Total		**1**	**69**	**339**	**16**	**11**	**436**

CS-3

CS-3 was a 50-x-50-cm (19.7-x-19.7-in) unit situated along the southern wall of Trench 1 to investigate the portion of the burned rock midden (Feature 1) between the potential central heating element (Feature 1.1) and the outer edge of Feature 1 (see **Figure 6**, **Figure 7**, and **Figure 12**). CS-3 was excavated through a total of four levels, including several layers of very dark grayish brown (10YR 3/2) clay loam (Feature 1) and one level of light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon). **Figure 25** illustrates the south wall profile and plan view of CS-3 Level 1, depicting a portion of Feature 1.

All recovered artifacts from CS-3, including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil samples, are presented in **Table 9**. Excavation of this unit resulted in the recovery of 1 non-diagnostic lithic tool (a biface), 1 core, 301 pieces of lithic debitage (266 macro-artifacts and 35 micro-artifacts), 206 pieces of FCR (199 macro-artifacts and 7 micro-artifacts), 1 piece of faunal bone, and 7 historic-age artifacts (1 square nail, 1 wire nail, 1 slate fragment, 1 asphalt fragment, and 3 metal fragments). Lithic debitage, followed by FCR, was the most common class of cultural material recovered from Feature 1 within CS-3. All recovered artifacts from CS-3 are associated with the burned rock midden matrix. No artifacts were discovered within Level 4 of this unit, which extended beneath the midden and into the C1-Horizon.

Figure 25. CS-3 depicting Feature 1 at 10 cmbs (3.9 inbs), facing south.

Table 9. Cultural Material from CS-3 by Level									
Level (cmbs)		¼-inch screen (macro-artifacts)					⅛-inch screen (micro-artifacts)		
		Non-Diagnostic Tool	Core	Debitage	Faunal Remains	Historic	Debitage	FCR	Grand Total
Feature 1	1 (0-10)	-	-	96	-	6	-	2	140
	2 (10-20)	-	1	160	1	1	34	4	351
	3 (20-30)	1	-	13	-	-	1	1	26
-	4 (30-40)	-	-	-	-	-	-	-	-
Grand Total		**1**	**1**	**266**	**1**	**7**	**35**	**7**	**517**

CS-4

CS-4 was a 50-x-50-cm (19.7-x-19.7-in) unit situated along the southern wall of Trench 1 to investigate the outer edge of Feature 1 (see **Figure 6, Figure 7,** and **Figure 12**). CS-4 was excavated through a total of 4 levels, including several layers of very dark grayish brown (10YR 3/2) clay loam (Feature 1) and one level of light yellowish brown (10YR 6/4) marly silty clay loam (C1-Horizon). **Figure 26** illustrates the south wall profile and plan view of CS-4 Level 3, depicting a liminal portion of Feature 1. **Figure 27** depicts the west wall profile of CS-4.

All recovered artifacts from CS-4, including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil samples, are presented in **Table 10**. Excavation of this unit resulted in the recovery of 4 non-diagnostic lithic tools (3 bifaces and 1 uniface scraper), 106 pieces of lithic debitage (105 macro-artifacts and 1 micro-artifact), 200 pieces of FCR, and 2.46 g (0.09 oz) of charcoal. In addition, 14 historic-age artifacts, including 4 square nails, 4 wire nails, 2 ceramic Prosser buttons, 1 tack, 1 metal chain fragment, and 2 unidentified metal fragments, were encountered within Levels 1 and 2. FCR, followed by lithic debitage, was the most common class of cultural material recovered from Feature 1 within CS-4. All recovered artifacts from CS-4 are assumed to be associated with the burned rock midden matrix. The few artifacts recovered from the C1-Horizon (Level 4), which lies beneath the midden matrix, were recovered from the upper portion of this level, suggesting they were likely displaced from the midden as a result of bioturbation.

Figure 26. CS-4 depicting Feature 1 at 40 cmbs (15.7 inbs), facing south.

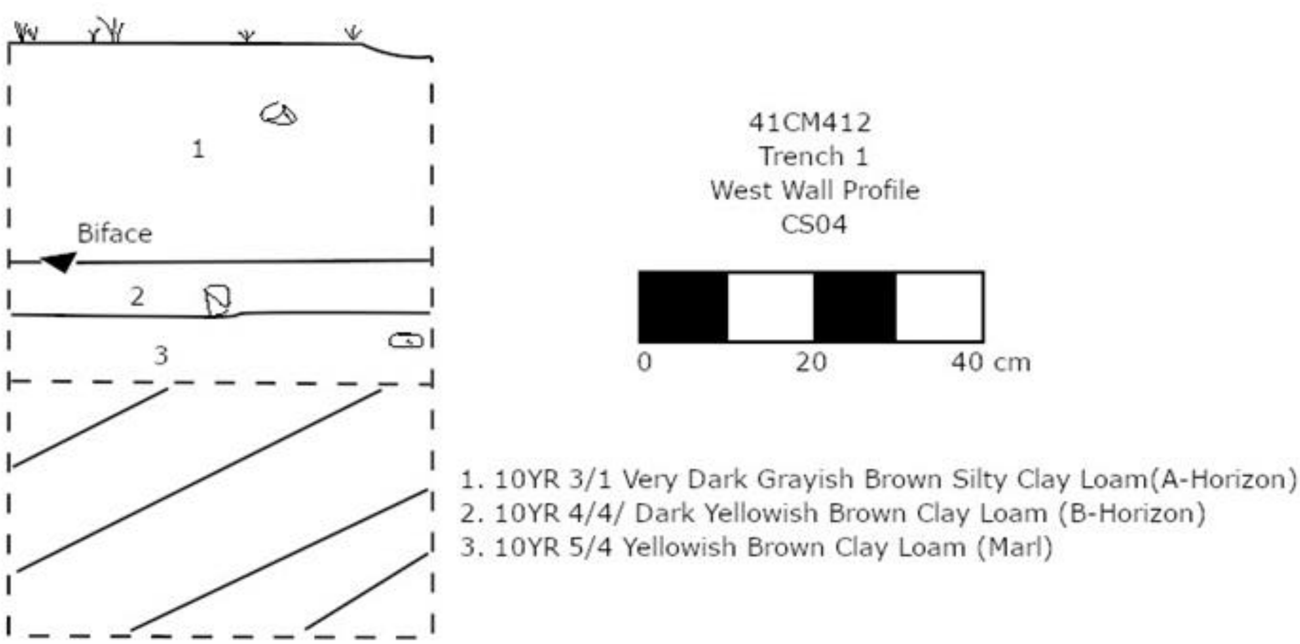

Figure 27. CS-4 west wall profile.

Table 10. Cultural Material from CS-4 by Level								
Level (cmbs)		¼-in screen (macro-artifacts)					⅛-in screen (micro-artifacts)	
		Non-Diagnostic Tool	Debitage	FCR	Charcoal	Historic	Debitage	Grand Total
Feature 1	1 (0-10)	3	3	62	0.37	12		80
	2 (10-20)	-	56	57	2.09	2		115
	3 (20-30)	1	44	68		-	1	114
-	4 (30-40)	-	2	13	-	-	-	15
Grand Total		4	105	200	2.46	14	1	324

CS-5

CS-5 was a 50-x-50-cm (19.7-x-19.7-in) unit situated along the western wall of Trench 2 to investigate a small pocket of the midden (Feature 1) that appeared to have been capped by surface regolith through sheetwash and erosion (see **Figure 6**, **Figure 7**, and **Figure 13**). CS-5 was excavated through a total of 5 levels, including several layers of very dark gray (10YR 3/1) clay loam (washed in soil and midden debris), very dark grayish brown (10YR 3/2) clay loam (Feature 1), and brown (10YR 5/3) silty clay loam (B-Horizon), terminating at very pale brown (10YR 7/3) marl (C2-Horizon). **Figure 28** and **Figure 29** illustrate the plan view and west wall profile of CS-5, depicting a portion of Feature 1.

All recovered artifacts from CS-5, including all macro-artifacts (> 0.63 cm [¼ in]), as well as all micro-artifacts (0.63 < x > 0.31 cm [¼ in < x > ⅛ in]) recovered from soil samples, are presented in **Table 11**. Excavation of this unit resulted in the recovery of 2 projectile points, 160 pieces of lithic debitage (156 macro-artifacts and 4 micro-artifacts), 180 pieces of FCR (179 macro-artifacts and 1 micro-artifact), and 37 pieces of faunal remains. In addition, 9 historic-age artifacts, including 1 wire nail, 2 colorless glass shards, 1 piece of foil, 1 graphite pencil lead, and 4 unidentified ferrous metal fragments were encountered within Level 1.

Figure 28. CS- 5 west wall profile and plan view at 20 cmbs (7.9 inbs) depicting a portion of Feature 1, facing west.

Figure 29. CS-5 west wall profile and plan view at 60 cmbs (23.6 inbs) depicting a portion of Feature 1, facing west.

Table 11. Cultural Material from CS-5 by Level									
Level (cmbs)		¼-in screen (macro-artifacts)					⅛-in screen (micro-artifacts)		
		Diagnostic Projectile Point	Debitage	FCR	Faunal Remains	Historic	Debitage	FCR	Grand Total
-	1 (0-10)	-	39	30	37	9	-	-	115
-	2 (10-20)	-	37	28	-	-	-	-	65
Feature 1	3 (20-30)	2	35	54	-	-	1	-	92
	4 (30-40)	-	28	55	-	-	-	-	83
-	5 (40-50)	-	17	12	-	-	3	1	33
Grand Total		**2**	**156**	**179**	**37**	**9**	**4**	**1**	**388**

All artifacts recovered from Levels 3 and 4 (0 to 35 cmbs [0 to 13.8 inbs]) of CS-5 are associated with the intact burned rock midden identified as Feature 1. These artifacts include 2 diagnostic projectile points (1 late Middle Archaic Marshall and 1 Archaic cf. Lerma), 64 pieces of debitage, and 109 pieces of FCR. FCR was the most common class of cultural material recovered from Feature 1 within CS-5. Above the intact midden, a total of 180 artifacts were recovered, including 76 pieces of lithic debitage, 37 faunal fragments, 95 pieces of FCR, and 9 historic-age artifacts. Aside from the historic-age artifacts, these artifacts and the soil matrix from these upper two levels appear to be constituents of the burned rock midden that have been transported and redeposited at this location because of sheet erosion. Beneath the midden, a total of 33 artifacts were recovered, including 20 pieces of lithic debitage and 13 pieces of FCR. These artifacts were likely displaced from the midden into the underlying B-Horizon due to bioturbation from root growth, animal burrowing, and argilliturbation.

Artifact Assemblage

A total of 3,307 artifacts, 1,395.4 g (49.2 oz) of burned clay, and 2.46 g (0.09 oz) of charcoal were recovered during data recovery investigations of the burned rock midden at site 41CM412. The entire assemblage was recovered from subsurface deposits through shovel testing (n=364), trenching (n=38), and unit/column excavations (n=2,905). The artifact assemblage is composed of 3,224 prehistoric artifacts, 79 historic-age artifacts, and 4 modern materials.

Prehistoric material recovered from the site consists of lithics, comprising 97.9 percent (n=3,156) of the total prehistoric artifact assemblage, followed by faunal bone (1.5 percent; n=47), ocher (0.3 percent; n=10), and samples of burned clay (0.2 percent; n=6), as well as charcoal (0.2 percent; n=5). The historic- and modern-age material recovered from the site largely consists of metal, glass, cut faunal bone, and mortar. All cultural material was collected and brought back to the Pape-Dawson laboratory in Austin for processing and analysis aside from FCR, which was analyzed and discarded in the field. The results of the prehistoric artifact analysis are presented below. **Appendix B** presents the Specimen Inventory, while **Appendix C** presents the lithic analysis and **Appendix D** presents the faunal analysis.

Lithic Analysis

Tools

The assemblage of lithic tools includes 17 projectile points, 2 dart point preforms, 29 bifaces, 3 unifaces, 1 perforator, and 5 EMFs representing 1.8 percent of the lithic assemblage. Of the 57 total tools, 2 were recovered from shovel tests, 17 from Trench 1, 19 from Trench 2, 10 from Unit 1, 1 from Unit 2, 1 from CS-2, 1 from CS-3, 4 from CS-4, and 2 from CS-5. All the lithic tools recovered from the burned rock midden at site 41CM412 are made from fine-grained chert.

Projectile Points

Archaeologists recovered a total of 17 projectile points from the burned rock midden at site 41CM412 during the data recovery investigation. The projectile point assemblage consists of 1 Late to Transitional Archaic point, 13 Middle Archaic points, 1 Early Archaic point, and 2 points that are associated with the Archaic Period in general (Turner et al. 2011). All but one (Specimen 38.01) of the points appear to exhibit signs of thermal alteration. Six of the 17 projectile points are complete. The 11 incomplete specimens are mostly broken due to impact fractures. However, some exhibit flaws that would have prevented further lithic reduction and were likely rejected by the knapper during manufacture.

Late to Transitional Archaic

Marcos

Specimen 32.01 is a Marcos dart point recovered from Artifact Area 2 along Trench 1 (**Figure 30**). Thin and well-made, this specimen has a broad, triangular-shaped body with straight lateral edges and barbed shoulders. The base is convex, and the stem is expanding due to deep notches that cut inward from the corners. The distal tip was lost to a cleanly snapped bend-break through impact with a hard object during use. The point was discarded rather than being reworked or repurposed. Though incomplete, this specimen measures 59.89 mm (2.36 in) in length by 43.44 mm (1.71 in) in width, with a maximum thickness of 7.67 mm (0.3 in).

Middle Archaic

Pedernales

Seven Pedernales dart points (Specimens 31.01, 34.01, 35.01, 36.01, 36.03, 36.05, and 37.01) and three possible Perdernales dart points (Specimens 32.02, 33.01, and 35.02) were identified within the projectile point assemblage (**Figure 31** and **Figure 32**). These points are recognized based on their triangular-shaped bodies with barbed shoulders, lateral edges that are straight unless reworked, and rectangular stems with V-shaped central basal notches. Characteristics that are unique to each recovered Pedernales specimen are presented below.

Figure 30. Late to Transitional Archaic Marcos point from site 41CM412.

Figure 31. Middle Archaic Pedernales points from site 41CM412.

Figure 32. Possible Pedernales points from site 41CM412.

Specimen 31.01 is a Pedernales dart point recovered from Artifact Area 1 along Trench 1. The stem was thinned through the removal of a flute-like flake on one surface. The distal tip is broken as a result of a bend-break impact fracture. Though incomplete, this specimen measures 53.59 mm (2.1 in) in length by 30.61 mm (1.2 in) in width, with a maximum thickness of 6.73 mm (0.3 in).

Specimen 34.01 is a Pedernales dart point recovered from Artifact Area 4 along Trench 1. The stem of this point does not exhibit any signs of basal thinning. A chip in one lateral edge was retouched, indicating the point experienced minor damage and repair during its use life. The point appears to have been discarded when the tip broke. Though incomplete, this specimen measures 74.61 mm (2.9 in) in length by 33.35 mm (1.3 in) in width, with a maximum thickness of 10.2 mm (0.4 in).

Specimen 35.01 is a Pedernales dart point recovered from Artifact Area 5 along Trench 1. This point is heavily patinated on one side. A small flute-like flake was removed to thin the stem on the same surface as the patination. The distal end exhibits evidence of two types of usewear-related impacts. The distal tip was lost to crushing, and a portion of one lateral edge was removed by a large shearing fracture that resulted in a burin type break. Though incomplete, this specimen measures 66.54 mm (2.6 in) in length by 42.66 mm (1.7 in) in width, with a maximum thickness of 6.51 mm (0.3 in).

Specimen 36.01 is a Pedernales dart point recovered from Artifact Area 6 along Trench 2. The point is complete, showing no signs of damage or repair. The stem appears to have been thinned through the removal of large U-shaped flakes from both surfaces. This specimen measures 82.16

mm (3.4 in) in length by 32.54 mm (1.3 in) in width, with a maximum thickness of 8.14 mm (0.3 in).

Specimen 36.03 is a Pedernales dart point recovered from Artifact Area 6 along Trench 2. Cortex is present across roughly 40 percent of one face, indicating that the point was likely either manufactured from a small cobble or a cortical flake. Portions of the distal end and stem were lost as a result of bend-break fractures that occurred upon impact with a hard object. Following the break, the distal end was reworked along one lateral edge, giving it a convex/slightly recurved appearance. The morphology and pronounced asymmetry of the body following the rework indicates that the broken point was likely reworked to be repurposed, probably as a knife, to extend its use life before discard. Though incomplete, this specimen measures 67.48 mm (2.7 in) in length by 33.88 mm (1.3 in) in width, with a maximum thickness of 6.75 mm (0.3 in).

Specimen 36.05 is a Pedernales dart point recovered from Artifact Area 6 along Trench 2. The distal end was lost due to a snap fracture. The proximal end shows slight patination across one face. A hinge and a step-type fracture are present on that same face along opposite edges that are severe enough to impede further thinning at those points. A mass or knot of chert remains along the midline of the body between the two fractures. Unlike most projectile points within this assemblage, which appear to have been discarded after use, this point appears to have been discarded following a failure in the production process. Though incomplete, this specimen measures 39.59 mm (1.6 in) in length by 49.86 mm in width with a maximum thickness of 11.78 mm.

Specimen 37.01 is a Pedernales dart point recovered from Artifact Area 7 along Trench 2. The stem has been thinned through the removal of a small flake on one surface. The distal end is broken and has been lost as a result of a bend-break impact fracture. Though incomplete, this specimen measures 55.86 mm in length by 41.13 mm (2 in) in width, with a maximum thickness of 6.48 mm (0.3 in).

Specimen 32.02 is a possible Pedernales dart point recovered from Artifact Area 2 along Trench 1. One lateral edge appears straight, while the other is convex. Two step fractures are present on one face along opposite edges that are severe enough to prevent further thinning of the specimen at those points. A mass of chert remains along the midline of the body between the two fractures. The distal half is missing due to a snap fracture, probably caused by the presence of one or both step fractures. Given the type of fractures observed, this specimen appears to have been broken and discarded during manufacture. Though incomplete, this specimen measures 46.24 mm (1.8 in) in length by 46.06 mm (1.8 in) in width, with a maximum thickness of 8.7 mm (0.3 in).

Specimen 33.01 is a possible Pedernales dart point recovered from Artifact Area 3 along Trench 1. This specimen is complete, with moderate patination on one face. There are small step fractures visible on both facial surfaces, which might account for its abandonment at the site. This specimen measures 82.96 mm (3.3 in) in length by 28.9 mm (1.1 in) in width, with a maximum thickness of 7.23 mm (0.3 in).

Specimen 35.02 is a possible Pedernales dart point recovered from Artifact Area 5 along Trench 1. A step and a hinge fracture are present on one face along opposite edges that are severe enough to impede further thinning of the specimen at those points. A mass of chert remains along the midline of the body between the two fractures. The specimen appears to have been rejected by the knapper after the distal half was removed due to a snap fracture, probably caused by the location of the step and hinge fractures. Though incomplete, this specimen measures 34.95 mm (1.4 in) in length by 39.61 mm (1.6 in) in width, with a maximum thickness of 10.41 mm (0.4 in).

Nolan

Specimen 36.02 is a complete Nolan dart point recovered from Artifact Area 6 along Trench 2 (**Figure 33**). This specimen is crudely made and has both a convex and a concave lateral edge, which meet in such a way that the tip of the point is slightly offset from the midline. The point was identified based on several key features, including the presence of shoulders that are tapered and a stem that is rectangular and alternately beveled. The specimen measures 58.63 mm (2.3 in) in length by 28.57 mm (1.1 in) in width, with a maximum thickness of 9.27 mm (0.4 in).

Langtry

Specimen 36.04 is a Langtry dart point recovered from Artifact Area 6 along Trench 2. This point is thin and well made with a tampering stem and straight base (see **Figure 33**). The shoulders are broken, and the distal tip was lost due to a snap fracture that appears to have occurred upon impact with a hard object. Though incomplete, this specimen measures 52.8 mm (2.1 in) in length by 33.55 mm (1.3 in) in width, with a maximum thickness of 5.48 mm (0.2 in). The presence of a Langtry in the burned rock midden deposit at site 41CW412 within Central Texas is noteworthy, as these points are not typical of the region and are most commonly discovered in the Lower Pecos, South Texas, and the southwestern portion of the Edwards Plateau (Turner et al. 2011).

Marshall

Specimen 86.01 is a possible Marshall dart point recovered from Level 3 (20 to 30 cmbs [7.9 to 11.8 inbs]) of CS-5 (see **Figure 33**). This specimen is complete, aside from both barb tips, which were lost to snap fractures. The body is thin and triangular with slightly convex lateral edges. The stem, which is thinned on both sides, is slightly expanding with a concave base. The specimen measures 56.56 mm (2.2 in) in length by 35.65 mm (1.4 in) in width, with a maximum thickness of 5.9 mm (0.2 in).

Archaic

Lerma

Two possible Lerma dart points (**Specimens 38.01 and 86.02**) were recovered from the burned rock midden at site 41CM412 (**Figure 34**). These points are slender, lanceolate-shaped, and bi-pointed. Lerma points are often attributed to the Paleoindian Period, but points resembling Lerma types have been discovered at Archaic sites within South Texas and the Coastal Plain (Turner et al. 2011). Like the Langtry, these possible Lerma points are not commonly found within Central Texas.

Figure 33. Middle Archaic Nolan, Langtry, and cf. Marshall points from site 41CM412.

Figure 34. Archaic cf. Lerma points from site 41CM412.

Specimen 38.01 is a complete possible Lerma dart point recovered from Level 2 (10 to 20 cmbs [3.9 to 7.9 inbs]) of Unit 1. This specimen appears to represent a finished tool. It measures 60.33 mm (2.4 in) in length by 22.64 mm (0.9 in) in width, with a maximum thickness of 10.89 mm (0.4 in).

Specimen 86.02 is a complete possible Lerma dart point recovered from Level 3 (20 to 30 cmbs [7.9 to 11.8 inbs]) of CS-5. The presence of many small step fractures along the lateral edges, in conjunction with weak shoulders and a poorly contracting stem, indicates that this specimen may represent a preform, rather than a finished tool. It measures 70.38 mm (2.8 in) in length by 24.15 mm (1 in) in width, with a maximum thickness of 11.81 mm (0.5 in).

Early Archaic

Specimen 34.02 is an Early Triangular dart point (Turner et al. 2011), which Prewitt (1981) refers to as either a Baird or Taylor Thinned Base. The point was recovered from Artifact Area 4 along Trench 4 (**Figure 35**). This triangular point has straight and alternately beveled lateral edges. Parallel-oblique flaking is evident along each beveled edge. The stem is slightly concave and exhibits signs of basal thinning. The distal end was lost to a crushing type impact fracture, and the shoulders were lost to snap fractures. Though incomplete, this specimen measures 53.5 mm (2.1 in) in length by 33.68 mm (1.3 in) in width, with a maximum thickness of 7.84 mm (0.3 in).

Bifaces

A total of 29 bifaces were recovered from subsurface deposits, ranging in depth from 0 to 30 cmbs (0 to 11.8 inbs) during the current field effort (**Table 12** and **Figure 36**). Most bifaces were recovered during trenching excavations from Artifact Areas 1, 2, 3, 5 and 6, with a noted concentration in Artifact Area 6. Bifaces were also recovered from two levels of shovel test JS05, in addition to 3 levels of Unit 1 with a noted concentration in Level 3 (20 to 30 cmbs [7.9 to 11.8 inbs]). Two bifaces were also recovered from CS-3 and CS-4. Most bifaces were recovered from Artifact Area 6 during the excavation of Trench 2.

Of the 29 bifaces recovered, 4 are early-stage bifaces (Specimens 33.04, 36.18, 48.03 and 69.02), 12 are middle-stage bifaces (Specimens 12.01, 31.02, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 48.04 and 55.01), and 13 are late-stage bifaces (Specimens 10.01, 32.03, 32.04, 35.03, 35.04, 36.07, 36.08, 36.09, 36.10, 40.01, 42.02, 48.01 and 48.02).

All the bifaces recovered from 41CM412 are broken. Most of the bifaces have flaws that would have prevented further reduction. Flaws include material defects, breaks, and step and hinge fractures. In addition, all the bifaces exhibit some signs of thermal alteration, and at least one of the specimens (Specimen 36.08) has been extensively burned as evidenced by surface crenulations and numerous pot lids.

Figure 35. Early Archaic Early Triangular point from site 41CM412.

Unifaces

Three unifaces/scrapers were recovered during data recovery at site 41CM412 (**Table 13**). All three of the unifaces were recovered during subsurface investigations, including trenching and unit excavation. One uniface was recovered from Trench 1 within Artifact Area 5, while the remaining two unifaces were recovered from CS-4 and the fill of Feature 1.2 in Unit 1. All the unifaces, except for one, are complete, and all the unifaces show signs of thermal alteration (**Figure 37**).

Perforator

One perforator was recovered from site 41CM412 (**Figure 38**). The single perforator was recovered during mechanical excavation of Trench 1 within Artifact Area 3. The perforator is characterized by a long, cylindrical bit that appears diamond-shaped in cross section. Although broken, Specimen 33.02 is roughly 58.93 mm (2.3 in) in length by 13.08 mm (0.5 in) wide by 6.66 mm (0.3 in) thick.

Preforms

Two dart point preforms were identified within the artifact assemblage from site 41CM412 (**Figure 39**). One specimen was recovered during mechanical excavation of Trench 2 within Artifact Area 6 (Specimen 36.06), and the other specimen was recovered from Unit 1 Level 2 (10 to 20 cmbs [3.9 to 7.9 inbs]) (Specimen 42.01). Both specimens exhibit evidence of thermal alteration; however, only Specimen 42.01 is complete.

Table 12. Bifaces recovered from 41CM412								
Lot-Spec	**Feature**	**Provenience**	**Artifact Area**	**Level (10 cm)**	**Depth (cmbs)**	**Count**	**Reduction Stage**	**Completeness**
10-01	-	ST JS05	-	2	10-20	1	Late-stage	Broken
12-01	-	ST JS05	-	4	30-40	1	Mid-stage	Broken
31-02	-	Trench 1	1	-	n/a	1	Mid-stage	Broken
32-03	-	Trench 1	2	-	n/a	1	Late-stage	Broken
32-04	-	Trench 1	2	-	n/a	1	Late-stage	Broken
33-04	-	Trench 1	3	-	n/a	1	Early-stage	Broken
35-03	-	Trench 1	5	-	n/a	1	Late-stage	Broken
35-04	-	Trench 1	5	-	n/a	1	Late-stage	Broken
36-07	-	Trench 2	6	-	n/a	1	Late-stage	Broken
36-08	-	Trench 2	6	-	n/a	1	Late-stage	Broken
36-09	-	Trench 2	6	-	n/a	1	Late-stage	Broken
36-10	-	Trench 2	6	-	n/a	1	Late-stage	Broken
36-11	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-12	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-13	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-14	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-15	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-16	-	Trench 2	6	-	n/a	1	Mid-stage	Broken
36-18	-	Trench 2	6	-	n/a	1	Early-stage	Broken
40-01	1	Unit 1	-	1	0-10	1	Late-stage	Broken
42-02	1	Unit 1	-	2	10-20	1	Late-stage	Broken
48-01	1	Unit 1	-	3	20-30	1	Late-stage	Broken
48-02	1	Unit 1	-	3	20-30	1	Late-stage	Broken
48-03	1	Unit 1	-	3	20-30	1	Early-stage	Broken
48-04	1	Unit 1	-	3	20-30	1	Mid-stage	Broken
55-01	1	CS-4	-	1	0-10	3	Mid-stage	Broken
69-02	1	CS-3	-	3	20-30	1	Early-stage	Broken

Edge-Modified Flakes

Five pieces of lithic debitage recovered from the site were identified as EMF tools. These specimens exhibit signs of intentional retouching along one or more lateral edges. The EMFs were recovered from a variety of locations across the site, including Artifact Areas 3 and 6 within Trenches 1 and 2, respectively, and Units 1, 2, and CS-2 at depths ranging from 10 to 20 cmbs (3.9 to 7.9 inbs).

This assemblage includes two secondary flake tools and three tertiary flake tools. All but one of the flake tools are incomplete, and all exhibit signs of thermal alternation. Of the five EMFs, three exhibit unifacial retouching along one lateral edge, one along two lateral edges, and one with bifacial retouching along two lateral edges.

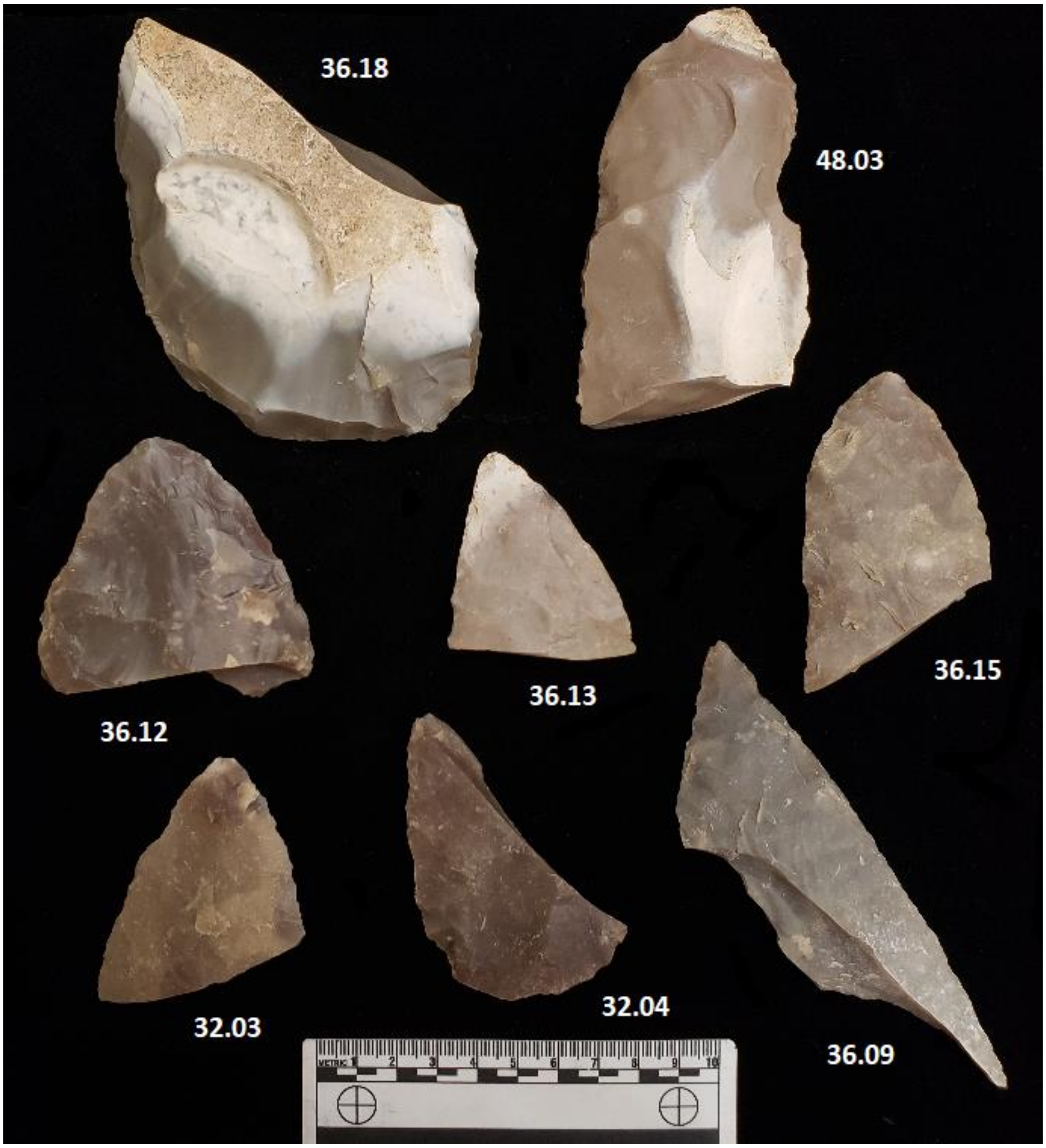

Figure 36. Representative sample of bifaces from Site 41CM412. Top Row: Early-Stages Bifaces, Middle Row: Mid-Stage Bifaces, Bottom Row: Late-Stage Bifaces.

Non-Tools

The assemblage of non-tool lithic artifacts includes 2 cores, 1 blank, and 3,096 pieces of unmodified debitage, representing 99 percent of the lithic assemblage. The unmodified debitage assemblage consists solely of chert. The unmodified debitage includes 17 primary flakes, 482 secondary flakes, 2,480 tertiary flakes, and 117 pieces of shatter. All the unmodified debitage was recovered subsurface from within shovel tests (n=340), units and column samples (n=2,755) and mechanical trenching (n=1). In addition to unmodified debitage, two multidirectional cores and one chert blank were recovered at the site.

Table 13. Unifaces Recovered from 41CM412											
Lot-Spec	**Feature**	**Provenience**	**Artifact Area**	**Level (10 cm)**	**Depth (cmbs)**	**Count**	**Type**	**Completeness**	**Length (mm)**	**Width (mm)**	**Thickness (mm)**
35.05	-	Trench 1	5	n/a	n/a	1	End and Side Scraper	Complete	74.39	55.05	21.49
50.02	1.2	Unit 1	-	3	24-30	1	End and Side Scraper	Broken	64.82	48.98	14.85
74.02	1	CS 04	-	3	26	1	End and Side Scraper	Complete	96.42	38.78	11.51

Figure 37. Unifaces recovered from site 41CM412.

Figure 38. Perforator recovered from site 41CM412.

Figure 39. Preforms recovered from site 41CM412.

FCR

Of the 3,424 total pieces of FCR identified during shovel testing and unit excavation at site 41CM412, 2,910 pieces were recovered from Units 1 and 2 and CS-1 to CS-5. A total of 1,193 pieces of FCR were recovered from Unit 1 (**Table 14**) and 819 pieces were recovered from Unit 2 (**Table 15**). Although FCR was distributed throughout most of the vertical column of Unit 1, the highest rates of recovery were obtained in Levels 2 and 3, which correspond with the vertical extent of Feature 1 (burned rock midden) underlain by Feature 1.2 (earth oven pit). Likewise, the highest rates of recovery for FCR within Unit 2 were encountered within unit Levels 1 and 2 excavated through Feature 1.1 (a possible heating element). Similarly, a total of 216 pieces of FCR were recovered from CS-1 (**Table 16**), 223 from CS-2 (**Table 17**), 157 from CS-3 (**Table 18**), 169 from CS-4 (**Table 19**), and 99 from CS-5 (**Table 20**). In general, highest rates of recovery for column samples corresponded to Levels 2 and 3, but FCR was observed throughout the vertical column associated with Feature 1. Overall, the FCR assemblage consists primarily of limestone (n=2,856), but chert (n=28) and sandstone (n=26) are also represented.

FCR from each hand-excavated unit was grouped into four separate size grades (**Table 21** to **Table 27**). Specimens were categorized as < 7.5 cm (3 in), 7.5 to 11 cm (3 to 4.3 in), 11 to 15 cm (4.3 to 5.9 in), or > 15 cm (5.9 in), where size was determined from the length of the longest measurement. Within all units, small fragments (< 7.5 cm [3 in]) make up the majority of the FCR assemblage by count and weight. They also make up the majority of the FCR assemblage associated with Feature 1 and Feature 1.2, indicating that both features largely comprise spent cooking stones.

Table 14. FCR for Unit 1 by Level

Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	11	0.01	59	0.34	8	0.08	78	0.43
	2	1	0.1	420	24.84	-	-	421	24.94
Feature 1.2	3	3	0.08	570	45.03	16	0.5	589	45.61
	4	3	0.12	102	4.41	-	-	105	4.53
Total		**18**	**0.31**	**1151**	**74.62**	**24**	**0.58**	**1193**	**75.51**

Table 15. FCR for Unit 2 by Level

Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1.1	1	3	0.2	280	27.61	-	-	283	27.81
	2	-	-	508	49.8	-	-	508	49.8
	3	-	-	28	14.27	-	-	28	14.27
Total		**3**	**0.2**	**816**	**91.68**	**-**	**-**	**819**	**91.88**

Table 16. FCR for CS-1 by Level									
Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	-	-	29	0.5	-	-	29	0.5
	2	-	-	124	6.56	-	-	124	6.56
	3	1	0.01	62	4.63	-	-	63	4.64
Total		**1**	**0.01**	**215**	**11.69**	**-**	**-**	**216**	**11.7**

Table 17. FCR for CS-2 by Level									
Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	-	-	21	0.48	-	-	21	0.48
	2	1	0.01	77	2.18	-	-	78	2.19
	3	4	0.03	118	5.05	-	-	122	5.08
	4	-	-	2	0.08	-	-	2	0.08
Total		**5**	**0.04**	**218**	**7.79**	**-**	**-**	**223**	**7.83**

Table 18. FCR for CS-3 by Level										
Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	-	-	23	1.47	2	0.02	25	1.49
	2	-	-	124	7.93	-	-	124	7.93
	3	1	0.01	7	1.28	-	-	8	1.29
Total		**1**	**0.01**	**154**	**10.68**	**2**	**0.02**	**157**	**10.71**

Table 19. FCR for CS-4 by Level									
Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	-	-	62	3.67	-	-	62	3.67
	2	-	-	40	2.04	-	-	40	2.04
	3	-	-	54	5.01	-	-	54	5.01
-	4	-	-	13	0.55	-	-	13	0.55
Total		**-**	**-**	**169**	**11.27**	**-**	**-**	**169**	**11.27**

Table 20. FCR for CS-5 by Level										
Level		Chert		Limestone		Sandstone		Total Count	Total Weight (kg)
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
-	1	-	-	15	0.46	-	-	15	0.46
-	2	-	-	19	1.08	-	-	19	1.08
Feature 1	3	-	-	47	2.44	-	-	47	2.44
	4	-	-	48	1.16	-	-	48	1.16
-	**5**	-	-	4	0.25	-	-	4	0.25
Total		**-**	**-**	**133**	**5.39**	**-**	**-**	**133**	**5.39**

Table 21. FCR for Unit 1 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	78	0.43	-	-	-	-	-	-	78	0.43
	2	395	14.99	26	9.95	-	-	-	-	421	24.94
Feature 1.2	3	529	20.78	53	20.5	6	3.22	1	1.11	589	45.61
	4	100	3.31	5	1.22	-	-	-	-	105	4.53
Total		**1102**	**39.51**	**84**	**31.67**	**6**	**3.22**	**1**	**1.11**	**1193**	**75.51**

Table 22. FCR for Unit 2 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1.1	1	236	10.51	40	9.65	5	3.56	2	4.09	283	27.81
	2	427	14.42	57	12.09	14	8.91	10	14.38	508	49.8
	3	15	1.66	11	5.48	-	-	2	7.13	28	14.27
Total		**678**	**26.59**	**108**	**27.22**	**19**	**12.47**	**14**	**25.6**	**819**	**91.88**

Table 23. FCR for CS-1 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	29	0.5	-	-	-	-	-	-	29	0.5
	2	116	4.73	8	1.83	-	-	-	-	124	6.56
	3	56	2.24	5	1.6	2	0.8	-	-	63	4.64
Total		**201**	**7.47**	**13**	**3.43**	**2**	**0.8**	**-**	**-**	**216**	**11.7**

Table 24. FCR for CS-2 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	21	0.48	-	-	-	-	-	-	21	0.48
	2	76	1.69	2	0.5	-	-	-	-	78	2.19
	3	119	4.27	3	0.81	-	-	-	-	122	5.08
	4	2	0.08	-	-	-	-	-	-	2	0.08
Total		**218**	**6.52**	**5**	**1.31**	**-**	**-**	**-**	**-**	**223**	**7.83**

Table 25. FCR for CS-3 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	24	0.77	-	-	1	0.72	-	-	25	1.49
	2	115	5.44	8	2.01	1	0.48	-	-	124	7.93
	3	8	1.29		-	-	-	-	-	8	1.29
Total		**147**	**7.5**	**8**	**2.01**	**2**	**1.2**	**-**	**-**	**157**	**10.71**

Table 26. FCR for CS-4 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
Feature 1	1	55	1.23	7	2.44	-	-	-	-	62	3.67
	2	36	1.26	4	0.78	-	-	-	-	40	2.04
	3	42	1.47	12	3.54	-	-	-	-	54	5.01
	4	12	0.35	1	0.2	-	-	-	-	13	0.55
Total		**145**	**4.31**	**24**	**6.96**	**-**	**-**	**-**	**-**	**169**	**11.27**

Table 27. FCR for CS-5 by Size Grade and Level											
		Maximum Diameter (cm)									
Level		<7.5		7.5-11		11-15		>15		Total Count	Total Weight
		Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)	Count	Weight (kg)		
-	1	15	0.46	-	-	-	-	-	-	15	0.46
-	2	19	1.08	-	-	-	-	-	-	19	1.08
Feature 1	3	45	1.64	2	0.8	-	-	-	-	47	2.44
	4	48	1.16	-	-	-	-	-	-	48	1.16
-	5	4	0.25	-	-	-	-	-	-	4	0.25
Total		**131**	**4.59**	**2**	**0.8**	-	-	-	-	**133**	**5.39**

Conversely, while Feature 1.1 exhibits a dramatic decrease in the count of FCR > 7.5 cm (3 in) in size, the total weight for size categories < 11 cm (4.3 in) in size are relatively the same. This suggests Feature 1.1 comprises both unspent and spent cooking stones. Interestingly, there appears to be a correlation between the number of large (>15 cm [5.9 in]) pieces of FCR present and the total number of FCR recovered by level. This may point to an increase in occupational intensity at the site during the time periods associated with Level 3 of Feature 1 and Level 2 of Feature 1.1.

Flake Tools and Debitage Analysis

The complete assemblage of EMF tools and unmodified flakes recovered at site 41CM412 during the current archaeological investigation were further analyzed to identify which stage of lithic reduction appears to have most commonly occurred at the site. Unmodified debitage classified as shatter was not included in the study. An expedient method developed by Turnbow and Staley (1995), based on grading flakes by size, was employed for this analysis. **Table 28** shows that different manufacturing stages are characterized by variations in size-grade proportions. In general, flake size decreases as the lithic reduction process progresses.

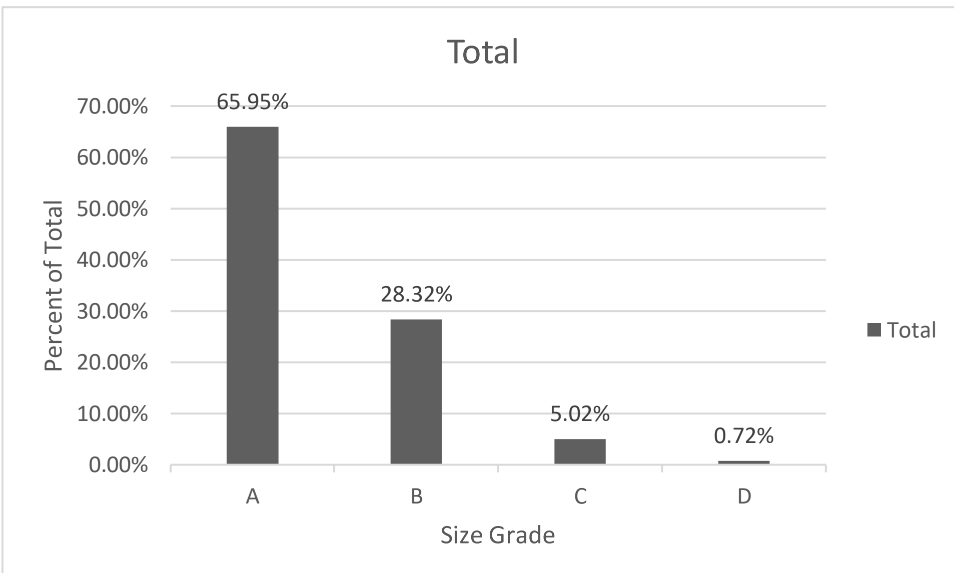

Table 28. Size-grade histogram for 41CM412 complete flake tools and debitage.

The analyzed assemblage included one flake tool and 278 complete, unmodified flakes. Of these, the majority (70 percent) are tertiary flakes. Primary and secondary flakes constitute 1 and 29 percent of the assemblage, respectively. In general, flake sizes are small, with 66 percent of the sample falling within size grade A (less than 2 cm [0.9 in] in size) and 29 percent within size grade B (2 to 5 cm [0.9 to 2 in]). This size-grade histogram for site 41CM412 is consistent with the expected histogram shown in representing Tertiary Stage Reduction, as defined by Turnbow and Staley (1995).

As a cautionary note, the results of this study may be somewhat skewed. For example, the larger size-grade D and C flakes might be slightly underrepresented, as these larger primary and secondary flakes are sometimes further reduced or shaped into tools, such as bifaces (Turnbow and Staley 1995). However, the overall lack of tested cobbles, cores, and raw material observed at the site, in conjunction with the lack of recovered primary and secondary flakes, suggests that site 41CM412 was not utilized primarily for lithic procurement or core reduction. Rather, the lithic artifact assemblage appears to have largely resulted from bifacial thinning and the trimming/retouching of existing tools. This assertion is evidenced by the presence of bifaces, projectile points (including several that showed signs of re-work), and an abundance of small tertiary flakes.

Faunal Analysis

Bone material recovered at site 41CM412 from a prehistoric context consists solely of faunal remains (n=47). Of the total faunal remains assemblage, 3 pieces were recovered during shovel testing of Feature 1 (JS03 and MN01) and 44 pieces were recovered from hand excavated units (Unit 1, CS-3, and CS-5). All the faunal remains were encountered within Levels 1 through 3 (0 to 30 cmbs [0 to 11.8 inbs]) in association with Feature 1 (**Table 29**).

Much of the faunal bone was highly fragmented. As a result, 92 percent of the faunal remains were classified as indeterminate medium mammal (n=43), 2 percent as small mammal (n=1), and 3 percent remain undetermined (n=3). Faunal remains could not be further identified by taxa; however, 41 long bone shaft fragments and 6 small bone fragments were recovered. In total, 41 specimens also exhibited evidence of burning, mostly in association with Feature 1. The general condition of the faunal assemblage from site 41CM412 is poor. The high level of fragmentation may be attributed to butchery or post-depositional processes, such as trampling, weathering, and bioturbation. None of the faunal specimens exhibited carnivore or rodent gnawing or cut marks.

Table 29. Faunal Remains from site 41CM412, NISP by Taxon

Taxa	Common Name	NISP	% of NISP	% of Total
Unidentifiable	-	-	-	-
Medium Mammal, Indeterminate	-	43	-	92
Small Mammal, Indeterminate	-	1	-	2
Indeterminate	-	3	-	6
Total Unidentifiable	**-**	**47**	**-**	**100**
Total Faunal Remains	**-**	**47**	**-**	**100**

Ocher

Ten (10) small pieces of red ocher were recovered from the site during unit excavations (**Figure 40**). The majority of ocher was collected from Levels 3 and 4 (20 to 40 cmbs [7.9 to 15.7 inbs]) of Unit 1 in association with Feature 1 (Specimens 48.20 and 58.09) and Feature 1.2 (Specimen 52.06), but also CS-1 Level 1 (0 to 10 cmbs [0 to 3.9 inbs]) in association with Feature 1 (Specimen 66.04). The total weight collected was 21.16 g (07 oz).

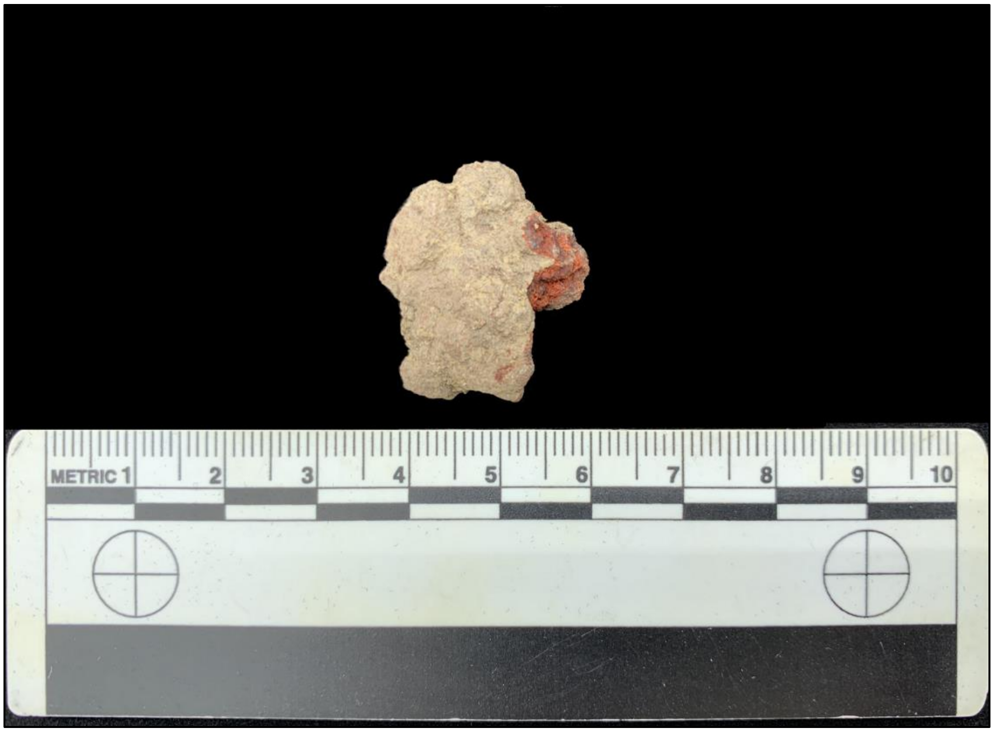

Figure 40. Representative sample of red ocher from site 41CM412 (Specimen 48.02).

SPECIAL STUDIES

Macrobotanical Analysis

Ten (10) soil samples from Site 41CM412 were submitted for flotation processing, sorting, identification, and analysis. Results of this analysis are presented by material selected for possible radiocarbon dating from flotation samples, followed by a general discussion of other carbonized and semi-carbonized remains recovered from flotation samples (**Appendix E**).

Radiocarbon Materials at site 41CM412

Plant material removed from flotation samples for radiocarbon dating consisted of wood charcoal, nutshell, and a gall fragment that was presumably burned incidental to use of associated wood for fuel. The thin pieces of shell from nut interiors could only be identified to family (Juglandaceae). Members of this family in Central Texas are hickories (*Carya* spp., including pecan) and walnuts (*Juglans* spp.). Three taxa of wood were identified: Plateau live oak (*Quercus fusiformis*), white group oak (*Quercus* sect. *Quercus*), juniper (*Juniperus* spp.), and mesquite or acacia (*Senegalia*/*Prosopis* spp.). The discovery of semi-carbonized and uncarbonized juniper wood three months later during full sorting of the flotation samples raises the possibility that some or all of the fully carbonized juniper wood is not ancient. The two juniper specimens originally pulled for radiocarbon dating from CS-5 (Levels 2 and 4) were consequently not recommended for radiocarbon dating. An example of plateau live oak wood charcoal is shown in **Figure 41**. Carbonized materials recommended for radiocarbon dating are presented in Table 30.

Figure 41. Live oak (*Quercus fusiformis*) wood charcoal from Feature 1, CS-4, Level 2, 10 to 20 cmbs (3.9 to 7.9 inbs; Specimen 56) identified during macrobotanical analysis.

General Macrobotanical Materials at site 41CM412

Uncarbonized (Modern) Plant Remains

Most uncarbonized plant parts in the samples appear in the form of rootlets that are clearly related to the modern vegetation at the site. Uncarbonized seeds are a common occurrence on most archaeological sites, and they usually represent seeds of modern plants that have made their way into the soil either through their own dispersal mechanisms or by faunalturbation, floralturbation, or argilliturbation (Bryant 1985; Keepax 1977; Miksicek 1987). In all except the driest areas of North America, uncarbonized plant material on open-air sites can be assumed to be of modern origin, unless compelling evidence suggests otherwise (Lopinot and Brussell 1982; Miksicek 1987). The seeds, leaves, and fruits at 41CM412 consist of weedy annuals (e.g., sandmat [*Chamaesyce* spp.], chenopodium [*Chenopodium* spp.], and flatsedge [*Cyperus* spp.]), and parts of woody plants (oak [*Quercus* spp.], sugarberry [*Celtis laevigata*], greenbriar [*Smilax* spp.], and juniper [*Juniperus* spp.]) that relate to the current vegetation. All uncarbonized plant parts are interpreted here as modern.

Table 30. Carbonized Materials Recovered from Flotation Samples Recommended for Radiocarbon Dating										
Lot	**FS**	**Unit**	**Feature**	**Level**	**Plant**	**Botanical name**	**Common name**	**Count**	**Weight (g)**	**Comments**
47	48	1	1	3	Wood	*Quercus* sect. *Quercus*	White group oak	1	0.01	1 ring
52	53.1	1	1.2	4	Wood	*Quercus* sp.	Oak	1	0.01	2 rings
52	53.2	1	1.2	4	Wood	*Quercus fusiformis*	Plateau live oak	1	0.03	-
56	58	CS-4	1	2	Wood	*Quercus fusiformis*	Plateau live oak	1	0.22	6 rings, including outermost (see **Figure 41**)
56	58	CS-4	1	2	Gall	-	-	1	0.01	-
61	63	CS-4	1	3	Wood	*Quercus fusiformis*	Plateau live oak	1	0.01	1 ring
70	73	CS-1	1	2	Wood	*Senegalia/Prosopis* spp.	Acacia/Mesquite	1	0.01	-
78	82	CS-1	1	3	Wood	Hardwood	Hardwood	4	0.01	-
84	88	CS-5	1	2	Wood	*Juniperus* sp.*	Juniper	6	0.01	Latewood fragments
84	88	CS-5	1	2	Nutshell	Juglandaceae	Hickory/walnut family	1	0.01	-
85	90	CS-5	1	3	Nutshell	Juglandaceae	Hickory/walnut family	2	0.01	-
87	92	CS-5	1	4	Wood	*Juniperus* sp.*	Juniper	1	0.01	-

* Sample not recommended for radiocarbon dating due to later discovery of semi-carbonized and uncarbonized juniper wood onsite.

Semi-Carbonized Plant Remains

Semi-carbonized plant remains were recovered in CS-4 and CS-5, indicating burning in the site area is recent enough for incompletely burned remains to survive. Mulberry (*Morus* spp.), juniper, and pecan (*Carya illinoinensis*) wood were recovered in semi-carbonized form. Of these, only juniper was recovered in fully-carbonized (potentially ancient) form. Juniper was also recovered in uncarbonized form. In the interest of caution, all juniper wood from the site is interpreted as potentially modern. Fragments of live oak leaves were also recovered in all three states of carbonization. Carbonized leaf fragments are generally too delicate to survive long in the soil, and their mere presence at the site suggests the oak leaves were recently burned.

Carbonized (Ancient) Plant Remains

Density of wood charcoal and other plant remains was generally sparse (site mean=0.09 g/dm^3), with only one flotation sample producing more than 20 wood charcoal fragments large enough to be snapped for identification (Specimen 56). Identification was attempted for 127 fragments, of which 104 could be identified to family, genus, or species. Six wood taxa were present: Plateau live oak, white group oak, juniper (potentially not ancient), acacia or mesquite, condalia (*Condalia* spp.), and a member of the legume family (Fabaceae). Oaks made up nearly three-quarters of the identified wood (n=75), with plateau live oak the most common type of oak identified (n=38). Oak wood charcoal was present in every sample. Juniper was the next most common type of wood identified (n=26), although all or some of the juniper may not be ancient. One fragment was recovered in Unit 1, but juniper was more common in Trenches 1 and 2, where it was present in six of seven samples.

Non-wood plant remains at Site 41CM412 include several plant parts that were mostly likely carbonized incidental to the burning of wood for fuel: gall, bud, bark, and leaves. None of the four seeds and seed fragments recovered were identifiable. Three nutshell fragments from Trench 2 Feature 1 could not be identified to genus, but they are Juglandaceae family, which includes hickory, walnut, and pecan. These nuts fall from the trees at maturity, meaning they do not remain attached to the woody branches that provide useful fuelwood. They are thus the most likely examples of plant food debris recovered on the site. Nutshell fragments were recovered only in Trench 2.

Discussion

In Central Texas, burned rock middens like the one at 41CM412 are debris fields from earth ovens that were frequently—but not always—used to cook plant foods (Thoms et al. 2018). Many bulbs, roots, and tubers are more palatable and nutritious after the long slow cooking that earth ovens provide (Wandsnider 1997). In Central Texas, these plants include wild onions and garlic (*Allium* spp.), eastern camas (*Camassia scilloides*), and scurfpea (*Pediomelum* spp.). Other plant materials frequently associated with earth oven cooking include grass stems, grape leaves (*Vitis* spp.), and prickly pear pads (*Opuntia* spp.) that were used to provide moisture and insulate the food plants from ash and charcoal in the fire. The absence of plants typically cooked or used as packing material in earth ovens at site 41CM412 suggests either extremely successful cooking events in which no material was accidentally burned, or the use of earth ovens for purposes other than plant processing (e.g., cooking animal foods).

The abundance of oak wood charcoal (*Quercus* spp.) is not surprising, as oaks are abundant in the area and excellent fuel woods. The two common oaks of the area, live oak (*Quercus fusiformis*) and post oak (*Q. stellata*), have excellent coaling qualities and specific gravities of 0.88 and 0.67 respectively (Alden 1995). In general, the heat value of a wood is directly related to its specific gravity (Marcouiller and Anderson n.d.). Coaling properties, which are especially important in earth oven cooking, relate to the third stage of the burning process. After evaporation of within-cell moisture (first stage), wood is converted to charcoal (second stage, signified by flames). In the third stage, the glowing coals burn slowly, without flame, and can be left for hours without attention (Collier and Turner 1981; Marcouiller and Anderson n.d.). If the juniper wood recovered is indeed ancient, it could also have been useful in earth oven cooking. Softwoods, such as juniper, tend to ignite more easily than hardwoods (Collier and Turner 1981).

Archaeological plant remains at Site 41CM412 consisted mostly of wood charcoal. The wood charcoal is interpreted as fuel wood, possibly associated with earth oven cooking. Other ancient plant remains (i.e., bark, bud, and gall) are more likely to be carbonized and preserved incidental to the burning of wood for fuel. Three nutshell fragments in Trench 2 may represent exploitation of local nut resources for food. The absence of plants typically cooked or used as packing material in earth ovens suggests either extremely successful cooking events in which no material was accidentally burned, or the use of earth ovens for purposes other than plant processing (e.g., cooking animal foods).

Radiocarbon Analysis

A total of 10 charcoal samples, including 7 wood carbon samples, 2 carbonized nutshells, and 1 carbonized gall recovered during flotation, were submitted to DirectAMS for radiocarbon analysis. A total of eight of the charcoal samples were recovered from Feature 1 and two were recovered from Feature 1.2. Samples recovered from Feature 1 were collected from Unit 1 (Level 3), CS-1 (Levels 2 and 3), CS-4 (Levels 2 and 3), and CS-5 (Levels 2 and 3); while two specimens recovered from Feature 1.1 were collected from Unit 1 (Level 4) below the documented extent of the macro-feature. These samples were selected for radiocarbon analysis because they were from levels with intact cultural deposits, allowing for a comparison between the general accumulation of the midden feature and usage of the earth oven pit. Results of the radiocarbon analysis (**Appendix F**) have been rounded to the nearest 10-year interval and are presented by level in **Table 31**.

Of the ten samples submitted for radiocarbon dating from site 41CM412, two samples from Feature 1 contained insufficient material for analysis. The remaining eight samples span the Middle Archaic to Late Archaic periods, while three samples were identified as modern. Specifically, samples from Feature 1 fall within the Middle Archaic and Late Archaic (Lots 61, 70, and 78). Two specimens from different geographic locations within Feature 1 (Lots 61 and 78) exhibited overlap between calibrated 2-sigma dates ranging from the Late Archaic (1390 BCE and 1270 BCE). However, a third sample at a stratigraphically higher position within one of the same column samples came back with a significantly earlier date from the Middle to Late Archaic (Lot 70).

The remaining samples collected from Feature 1.2 below a portion of the burned rock midden (Feature 1) returned dates that fall within the Late Archaic period. The calibrated 2-sigma ranges for specimens collected from Feature 1.2 do not overlap but suggest an overall date range within the Late Archaic (2470 to 1900 BCE).

Table 31. Radiocarbon Samples from Feature 1 and Feature 1.2 at 41CM412

	Sample ID	Lot No.	Unit	Level	Depth (cmbs)	Sample Type	Species ID	Median Probability (B.P.)	2-Sigma, cal (BCE)	Era	Other Temporal Diagnostics
Feature 1	D-AMS 034496	47	1	3	20-30	Wood Charcoal	*Quercus* sect. *Quercus*	Insufficient material for analysis		n/a	n/a
	D-AMS 034502	70	CS-1	2	10-20	Wood Charcoal	*Senegalia/ Prosopis* spp.	5270 ±33	4230-3990	MA to LA	n/a
	D-AMS 034503	78	CS-1	3	20-30	Wood Charcoal	Hardwood	3080 ±28	1420-1270	LA	n/a
	D-AMS 034499	56	CS-4	2	10-20	Carbonized Gall	Not examined	Modern		n/a	n/a
	D-AMS 034500	56	CS-4	2	10-20	Wood Charcoal	*Quercus fusiformis*	Modern		n/a	n/a
	D-AMS 034501	61	CS-4	3	20-30	Wood Charcoal	*Quercus fusiformis*	3020 ±32	1390-1130	LA	n/a
	D-AMS 034504	84	CS-5	2	10-20	Carbonized Nutshell	Juglandaceae	Insufficient material for analysis		n/a	n/a
	D-AMS 034505	85	CS-5	3	20-30	Carbonized Nutshell	Juglandaceae	Modern		n/a	cf. Lerma/ Marshall (Archaic/MA)
Feature 1.2	D-AMS 034497	52	1	4	30-40	Wood Charcoal	*Quercus* sp.	4030 ±33	2470-2620	MA/LA	n/a
	D-AMS 034498	52	1	4	30-40	Wood Charcoal	*Quercus fusiformis*	3620 ±30	2120-1900	LA	n/a

Early Archaic = EA; Middle Archaic = MA; Late Archaic = LA; Late Prehistoric = LPH.

Discussion

The results of the radiometric assays suggest a relatively simple chronological sequence of formation for the burned rock midden. The overall burned rock midden (Feature 1) appears to have resulted from the continuous use or the repeated seasonal use of the site for hot rock cooking from the Middle Archaic through the Late Archaic, with a concentrated accumulation during the Late Archaic. A general date within the Archaic Period is further supported by which by the presence of three points similar to a Lerma and Marshall recovered from Unit 1 and CS-5. However, radiometric dating for Unit 1 was not available and the sample from CS-5 returned a modern date, suggesting more recent disturbance of the deposits. The earth oven pit (Feature 1.2) located beneath a portion of the burned rock midden suggests the mixed nature of the matrix of a burned rock midden that develops on a relatively stable landform. One possible explanation of the midden formation process is that the site was continuously occupied or was repeatedly revisited by predominantly Late Archaic peoples. These peoples continued the tradition of processing and baking food at site 41CM412 by constructing and dismantling earth ovens, which contributed to the development of the burned rock midden. As a result of the earth oven construction process, the initial construction of an earth oven within the vicinity of CS-1 would have impacted and likely been constructed from sediment borrowed from the underlying earlier component; thereby, causing artifacts of this earlier occupation to become part of the midden assemblage. However, as none of the radiometric assays for Feature 1 returned a date that falls after 3020 B.P., it is unclear whether the use of the midden continued well into the Late Prehistoric period.

Magnetic Susceptibility Analysis

Magnetic susceptibility analysis was conducted to provide a second line of evidence to compare against unit and column excavation to determine if cultural living surfaces might exist within Feature 1. Magnetic susceptibility is the measure of magnetization of a material when it is placed in an applied magnetic field. Magnetic susceptibility reflects the existence of magnetic iron-oxide minerals within the soil. The presence of magnetic iron-oxide minerals, and therefore, the magnetization of the soil, can be enhanced as a result of pedogenesis (soil development) and burning. Through pedogenesis, the topsoil undergoes the greatest magnetic enhancement so that the magnetic susceptibility of topsoil is typically greater than the subsoil. Burning may have natural (e.g., a wildfire) or anthropogenic causes (e.g., cultural introduction of thermal refuse, such as ash or burned material, into the soil). The relationship between magnetization, pedogenesis, and burning means that magnetic susceptibility can be used to detect buried A-Horizons, as well as archaeological sites and features. The technique can also be used to answer questions about landform and/or site formation processes.

At site 41CM412, magnetic susceptibility sampling employed synchronic and diachronic strategies. Vertical sampling consisted of soil samples from two columns analyzed for depth variation along Profiles 1 and 2 along the west wall of Trench 2. Profile 1 was located about 10 m (32.8 ft) north of the intersection of the two trenches, whereas Profile 2 was located about a meter (3.28 ft) north of the trench junction (**Figure 42**). Spatial sampling consisted of collection of one sample every 2 m (6.6 ft) at depth of 20 cm (7.9 in) along the south wall of Trench 1 and west wall of Trench 2. The results of the magnetic susceptibility analysis are reported in SI units ($10^{-8}m^3kg^{-1}$) in **Table 32** and **Table 33**, respectively (**Appendix G**).

Vertical Sampling

Table 34 presents the results of the profile sample columns. Both profiles exhibit small peaks at the same depth as the burned rock concentrations visible in the photos of Trench 2 Profile 1 (**Figure 43**) and Trench 2 Profile 2 (**Figure 44**). It is possible that these peaks are attributable to concentrations of thermal refuse at depths associated with Feature 1. Profile 1 exhibits very high values of magnetic susceptibility in the top 10 cm (3.9 in), more than twice what is typically observed in prehistoric deposits and/or natural topsoil in this landscape, and this anomaly is most likely attributable to ferrous metal associated with the historic occupation on the site.

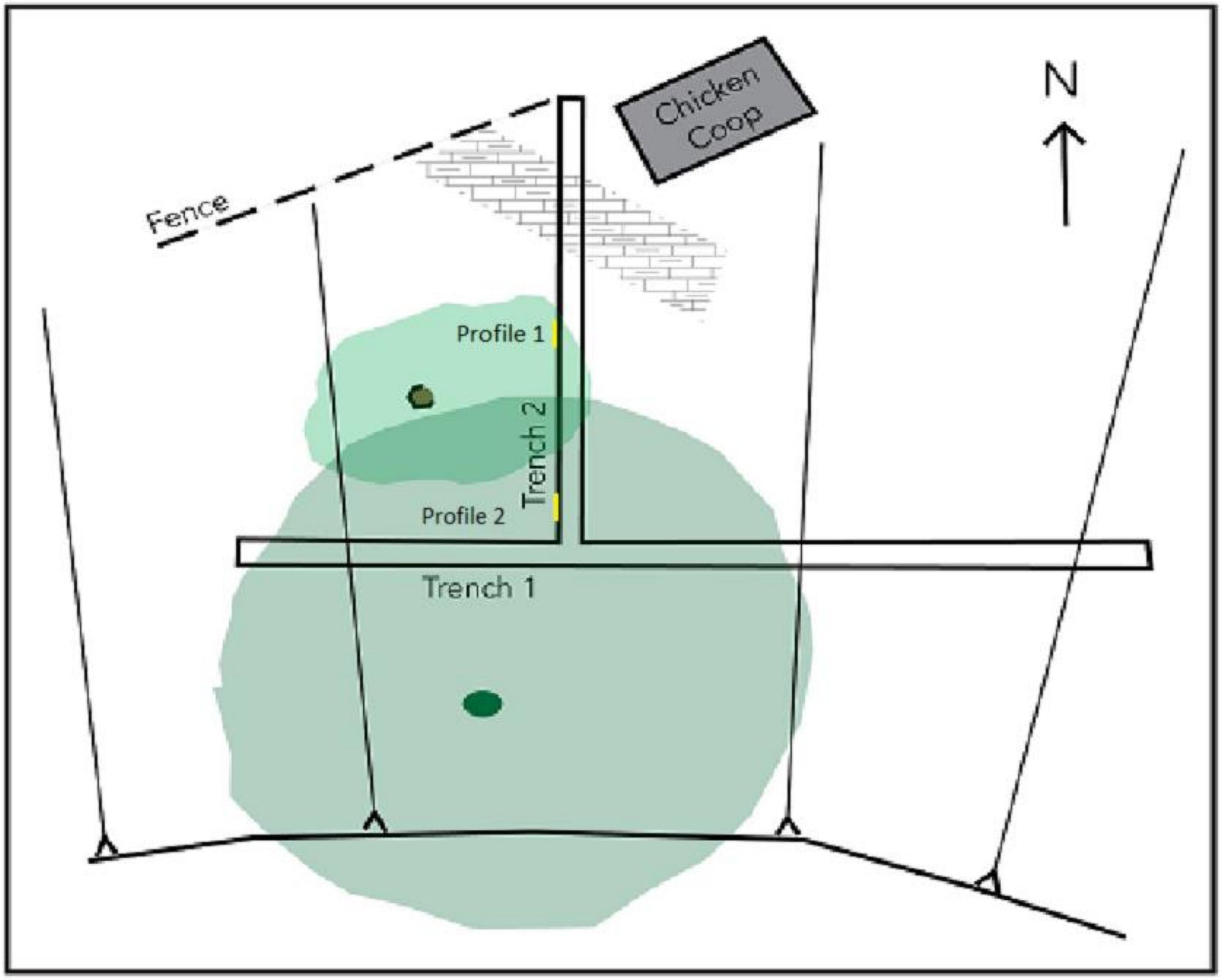

Figure 42. Relative locations of magnetic susceptibility samples.

Table 32. Magnetic Susceptibility Results from Profiles 1 and 2 Along West Wall of Trench 2			
Sample Number	Profile	Plot Depth	χLF (10^{-8} m^3 kg^{-1})
1	1	5	608.0
2	1	10	225.6
3	1	15	194.1
4	1	20	172.6
5	1	25	148.7
6	1	30	154.8
7	1	35	120.4
8	1	40	105.8
9	1	45	96.8
10	1	50	77.5
11	1	55	83.5
12	1	60	68.9
13	1	62	32.9
14	1	70	4.4
1	2	5	157.0
2	2	10	123.5
3	2	15	130.2
4	2	20	86.3
5	2	25	75.4
6	2	30	45.4
7	2	35	31.8
8	2	40	22.9
9	2	45	14.5
10	2	50	9.6
11	2	55	7.5
12	2	60	7.9

Table 33. Magnetic Susceptibility Results from Spatial Samples Along Trenches 1 and 2			
Sample Number	Profile	Plot Depth	χLF (10^{-8} m^3 kg^{-1})
1	1	20	97.5
2	1	20	119.5
3	1	20	154.9
4	1	20	113.6
5	1	20	102.2
6	1	20	93.6
7	1	20	60.8
8	1	20	82.1
9	1	20	131.8
10	1	20	82.2
11	1	20	94.1
12	1	20	81.8
13	1	20	102.4
14	1	20	99.2
15	1	20	130.7
16	1	20	128.9
17	1	20	145.4
18	1	20	104.5
19	1	20	103.5
20	2	20	87.2
21	2	20	110.6
22	2	20	135.8
23	2	20	123.7
24	2	20	175.3
25	2	20	270.0
26	2	20	213.9
27	2	20	184.3
28	2	20	172.9
29	2	20	194.7
30	2	20	186.8

Table 34. Plot of Low Frequency Magnetic Susceptibility for Samples Collected from Two Profiles along West Wall of Trench 2

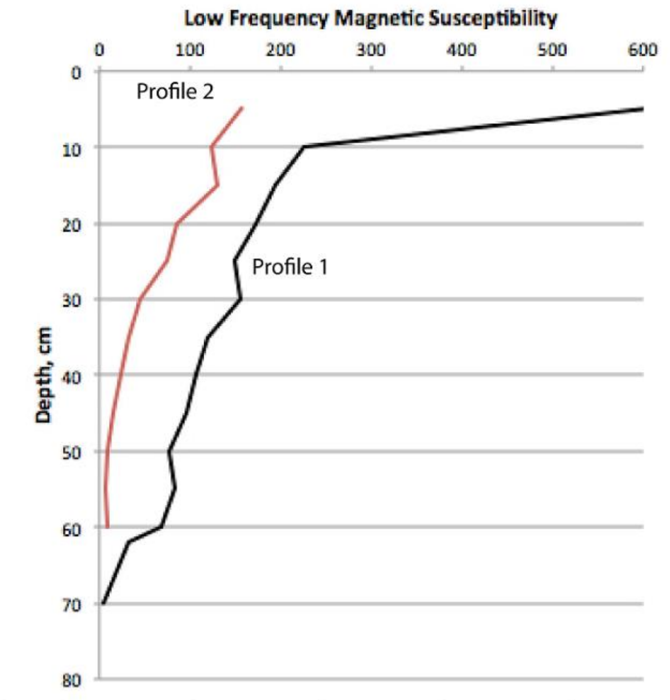

Figure 43. Profile 1 of Trench 2 west wall, facing west.

Figure 44. Profile 2 of Trench 2 west wall, facing west.

Spatial Sampling

Spatial variation in magnetic susceptibility was present along the two trenches. The south wall of Trench 1 shows three relatively discrete areas of possible enhancement, one of which correlates to the location of Feature 1.1 (**Figure 45**). Conversely, almost all of Trench 2 exhibits elevated values (**Figure 46**). Given the exceptionally high values in Profile 1 of Trench 2 (see Vertical Sampling above), it is possible that the values in this trench are in part due to historic activities.

Discussion

In general, a comparison between the magnetic susceptibility profile for vertical sampling of Trench 2 within Feature 1 to the density of prehistoric cultural material recovered from contexts associated with Feature 1 within hand-excavated units across the site presents a correlation between Levels 2 and 3. While both profiles exhibited an overall gradual increase at shallower depths, Profile 1 and Profile 2 exhibited marked peaks at 15, 25, and 30 cmbs (5.9, 9.8, and 1..8 inbs). This correlates to a dramatic relative increase in the density of prehistoric materials from Levels 2 and 3 (**Table 35**). Interestingly, these peaks correspond to levels from which three formal tools were also recovered (Specimens 38.01, 86.01, 86.02). Temporally diagnostic tools recovered from Levels 2 and 3 are associated with the Middle Archaic and in general with the Archaic Period.

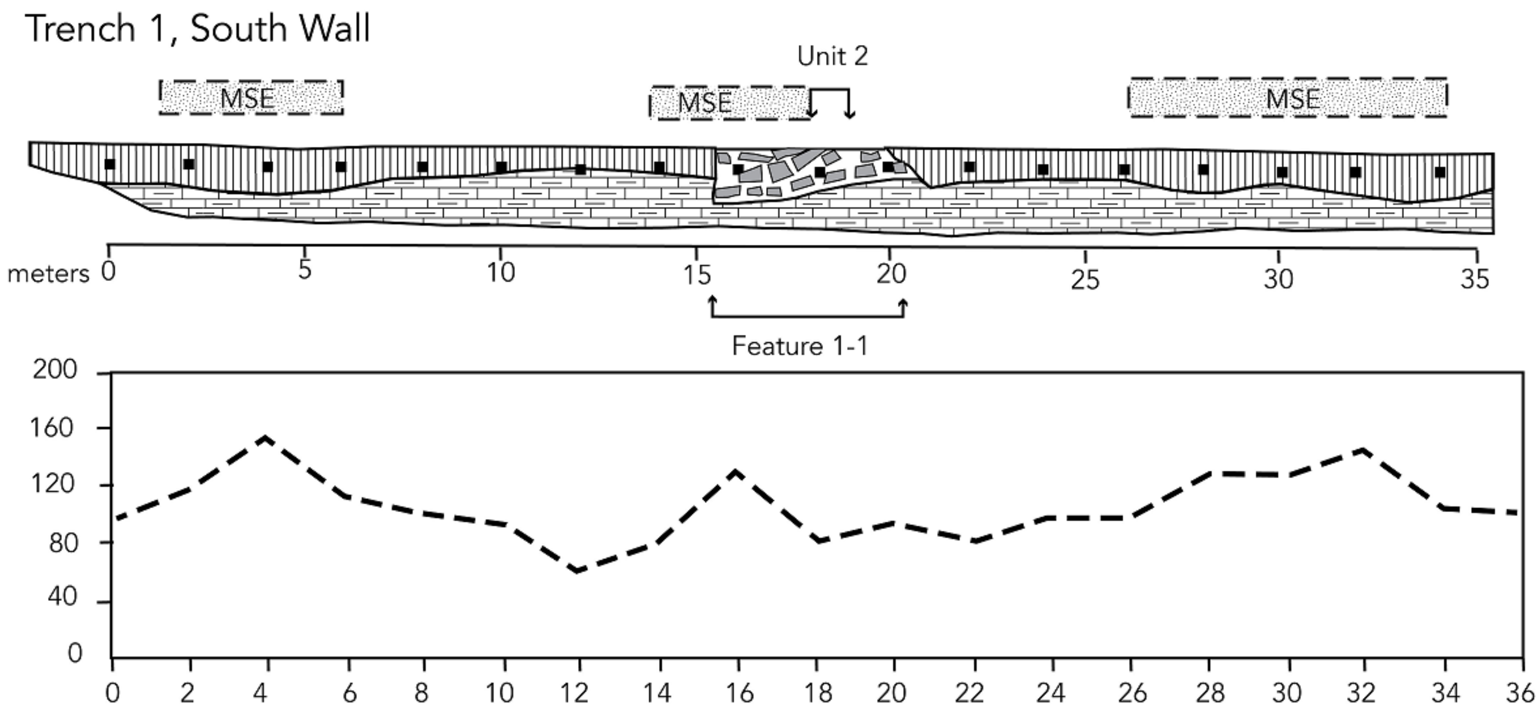

Figure 45. Sketch profile of the south wall of Trench 1 delineating the areas of probable magnetic susceptibility enhancement.

Topsoil (vertical hatch), Feature 1.1 (irregular rectangles), the ridge of hard limestone (brick pattern), samples collected for magnetic susceptibility (black squares). Immediately below is a plot of the variation in magnetic susceptibility along the trench. The stippled dashed line-bordered bar above the stratigraphic sketch denotes the portion of the profile that exhibits magnetic susceptibility enhancement.

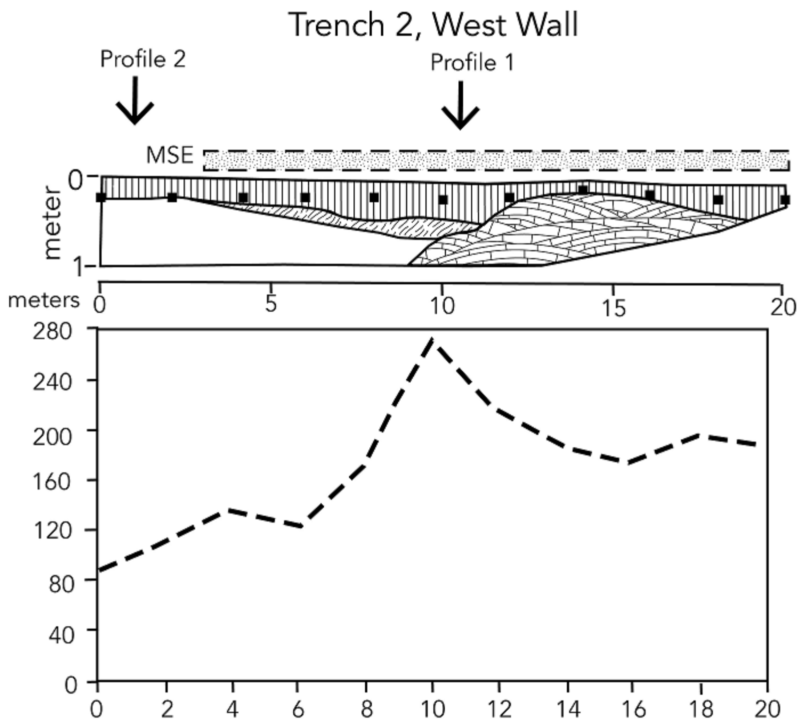

Figure 46. Sketch profile of the west wall of Trench 2 showing the topsoil (vertical hatch) the B-Horizon (diagonal hatch) and the ridge of hard limestone (between 10 and 20 m [32.8 and 65.6 ft], base of profile).

The black squares represent samples collected for magnetic susceptibility. Immediately below this is a plot of the variation in magnetic susceptibility along the trench. The stippled dashed line-bordered bar above the stratigraphic sketch denotes the portion of the profile that exhibits magnetic susceptibility enhancement.

Table 35. Artifact Densities Associated with Feature 1								
Level	Historic/ Modern	Tools	Debitage	FCR		Prehistoric Total	Temporal Diagnostics	Era
				Count	Weight			
0-10	51	4	290	215	6.57	**509**	n/a	-
10-20	12	5	1205	747	43.66	**1957**	cf. Lerma (38.01)	Archaic
20-30	-	8	916	396	35.36	**1320**	cf. Lerma (86.01)/Marshall (86.02)	Archaic/ Middle Archaic
30-40	-	-	84	69	4.92	**153**	n/a	-
40-50	-	-	20	4	0.25	**24**	n/a	-

CHAPTER 6: SUMMARY AND RECOMMENDATIONS

Between March 19 and April 3, 2018, Pape-Dawson conducted archaeological data recovery within a SAL-eligible component (a burned rock midden) associated with site 41CM412 to mitigate the impacts of the proposed Coma ISD High School #4 construction. The primary goals of the investigation were to: (1) assess the age or age range of the midden accumulation; (2) identify if the type of burned rock formation was sheet, domed, or annular; (3) identify the fuel sources and types of food processed in the midden; (4) determine if a heating element was present within the midden or if the rocks were heated elsewhere; and (5) determine if the accumulation of burned rock was gradual over a period of time or rapid during an intense usage.

A total of 24 shovel tests, two trenches, two 1-x-1-m (3.3-x-3.3-ft) units, and five 50-x-50-cm (19.7-x-19.7-in) column samples were excavated during the data recovery investigation at site 41CM412. A total of 3,307 artifacts, 1,395.4 g (49.2 oz) of burned clay, and 2.46 g (0.09 oz) of charcoal were recovered during the investigation, composed of 3,224 prehistoric artifacts, 79 historic-age artifacts, and four modern materials. The entire assemblage was recovered from subsurface deposits through shovel testing (n=364), trenching (n=38), and unit/column excavations (n=2,905). Data derived from each of these investigative methods is discussed below with regard to the research questions posed above.

WHAT IS THE AGE OR AGE RANGE OF THE MIDDEN ACCUMULATION?

Radiocarbon analysis of three wood charcoal samples with recovered diagnostic projectile points suggest the burned rock midden dates from the Middle Archaic through the Late Archaic, with a concentrated accumulation during the Late Archaic. This assertion is further supported by the presence of three points associated with the Archaic and Middle Archaic, respectively (two Lerma-like points and one possible Marshall point recovered from hand-excavated units 10 to 30 cmbs [3.9 to 11.8 inbs]). Similar to other burned rock middens, the midden at site 41CM412 is largely the product of earth oven baking that occurred and reoccurred at the site for thousands of years. However, the presence of lithic tools, debitage, and faunal remains within Feature 1 are evidence that other activities, such as tool maintenance and food processing, contributed to the formation process of the midden.

IS THE BURNED ROCK MIDDEN ANNULAR IN FORM, THEREBY CONFORMING TO THE "CENTRAL-FOCUSED" COOKING FACILITY MODEL PROPOSED BY BLACK AND COLLEAGUES (1997)?

Intruding within the burned rock midden, Feature 1.1, the possible remains of a central heating element for an earth oven, was identified from the ground surface to approximately 45 cmbs (17.7 inbs). Feature 1.1 was characterized as a basin-shaped pit, with several super-imposed slab linings extending roughly 6.3 m (20.7 ft) horizontally within the south wall of Trench 1. Hand-excavation of Unit 2 over Feature 1.1 identified an artifact concentration between 0 and 20 cmbs (0 and 7.9 inbs) consisting of 133 pieces of lithic debitage, 1 uniface, 858 pieces of FCR (91.88 kg [202.6 lbs]), and 1 historic-age artifact (a colorless glass shard). While no charcoal or temporally diagnostic artifacts were recovered from Feature 1.1, spatial magnetic susceptibility testing at 20 cmbs (7.9 inbs) detected an area of interest consistent with the horizontal profile of Feature 1.1, further indicating the concentration of thermal refuse in this area characteristic of annular midden formation.

Feature 1.2 is also an internally embedded feature beneath the overall burned rock midden. Feature 1.2 is likely the location of a former earth oven pit within Feature 1. Feature 1.2 was identified by a basin-shaped area of heat-induced oxidized sediments visible near the base of Feature 1. Feature 1.2 was observed within the eastern wall of Trench 2, extending approximately 0.9 m (3 ft) in length at a depth of 24 to 40 cmbs (9.4 to 15.7 inbs). The central heating element from Feature 1.2 appears to have been dismantled after use and the oven abandoned. The feature was later buried as subsequent ovens were built and cleaned out at the site. Hand-excavation of Unit 1 within Feature 1.2 identified 108 pieces of lithic debitage, 1 uniface, 3 pieces of burned clay (1,394.75 g [49.2 oz]), 3 pieces of ochre (12.49 g [0.4 oz]), and 424 pieces of burned rock (30.11 kg [66.4 lbs]). Macrobotanical remains from Feature 1.2 were interpreted as ancient fuel sources, such as oak (*Quercus* spp. and *Quercus fusiformis)* consistent with use of Feature 1.2 as an earth oven. While no temporally diagnostic artifacts were recovered in association with Feature 1.2, radiometric assays of carbonized wood samples returned two overlapping dates within the Middle to Late Archaic, which may represent a single cooking episode from an intact cooking feature.

What types of fuel sources were used in the feature, and what was being processed in the cooking feature that formed the burned rock midden?

Macrobotanical remains recovered from the burned rock midden contained carbonized remains of ancient fuel sources, such as oak, acacia/mesquite, and unidentified hardwood (*Quercus* sect. *Quercus*, *Quercus fusiformis*, and *Senegalia/Prosopis* spp.). In addition, carbonized and partially carbonized juniper was also identified, but was potentially related to modern burning activity on site. Plant parts that were most likely carbonized incidental to the burning of wood for fuel included gall, bud, bark, leaves, and three nutshell fragments from the hickory/walnut/pecan family (Juglandaceae). Nutshells are likely examples of plant food debris recovered from the site and associated with Feature 1.

Did the heating that altered the rocks making up the burned rock midden occur at the location of the midden or were the rocks heated elsewhere and then dumped?

As noted above, the identification of Features 1.1 and 1.2 within the overall midden support the notion of a center-focused cooking facility, rather than a communal dump site. Therefore, it is likely that the rocks forming the midden were heated onsite and represent a primary deposit.

Does the burned rock midden represent repeated use of the same locality over a long period of time with gradual accumulation, or an intensive use over a short period of time with rapid accumulation?

Magnetic susceptibility data suggest that palimpsest occupations with spatially variable discrete cooking areas used at different times are present at the site. These cooking areas were not used repeatedly enough to develop into classic burned rock middens. The site setting, a dominantly erosional upland, is typical of one where the occupational debris from multiple occupations become comingled (Waters 1996). Based on the vertical distribution of artifacts within hand-excavated units within Feature 1, it appears that the burned rock midden, and the site in general, resulted from recurring occupations over a span of time upon a stable landform with a slow sedimentation rate.

Hand-excavated units were placed to not only examine the midden deposits associated with Feature 1, but also investigate the internal midden features (Features 1.1 and 1.2) identified during mechanical trenching. The vertical distribution of artifacts within hand-excavated units revealed the greatest concentration of cultural materials were recovered in association with Feature 1. Evidence of Feature 1 was encountered from Levels 1 to 5 (0 to 50 cmbs [0 to 19.7 inbs]); however, the greatest concentration of artifacts was identified from Levels 2 and 3 (10 to 30 cmbs [3.9 to 11.8 inbs]). The trench profiles did not reveal exposures typical of a burned rock midden, in that they did not consist of clast (or rock)-supported deposits dominated by burned rock with minor amounts of black (10YR 2/1) clayey fine-grained matrix between the rocks. Instead, the soils were dominated by fine-earth and exhibited somewhat dispersed, usually matrix-supported concentrations of cultural material. Small, somewhat discrete concentrations of burned rock, as well as isolated fragments of burned rock and debitage are present. This presentation is more consistent with discrete features, which may have been repeatedly used.

Conclusion

In total, the prehistoric assemblage from site 41CM412 consists of 3,224 prehistoric artifacts including lithics 3,156 (17 projectile points, 2 dart point preforms, 29 bifaces, 3 unifaces, 1 perforator, 5 EMFs, and 3,099 pieces of lithic debitage), 47 faunal bone fragments, 10 pieces of ocher, 6 samples of burned clay, 5 charcoal samples, and 2,910 pieces of burned rock (214.29 kg [472.4 lbs]). While the FCR was analyzed and discarded in the field, the remaining cultural material was collected and brought back to the Pape-Dawson laboratory in Austin for processing and analysis. Project records, photographs, and collected artifacts will be curated at UTSA-CAR.

Based on the results of the fieldwork and subsequent analyses, the burned rock midden at site 41CM412 appears to have largely resulted from a series of long-term, or perhaps seasonal occupations occurring from the Early to Transitional Archaic periods, with a concentrated occupation during the Middle Archaic. The vertical distribution of artifacts at the site points to multiple occupations occurring on a landform with a slow sedimentation rate. Internal heating elements and earth oven pits (Features 1.1 and 1.2, respectively) within the overall Feature 1 midden suggest a center-focused cooking facility represented by an annular formation of the overall midden and onsite heating of the rocks. Task specific activities at the site include earth oven baking, as evidenced by burned rock midden deposits, and tool manufacturing/maintenance as evidenced by a high percentage of small, tertiary flakes within the artifact assemblage. Processing of predominantly meat products also occurred at the site, given the presence of faunal bone within the Feature 1 matrix and overall lack of packing material in earth ovens. Ancient fuel sources appear to be hardwoods of oak and potentially juniper as well. In addition, trace evidence suggests hickory/walnut/pecan family nuts may have also been processed as a food source. Although not all cultural components of the site were stratigraphically discrete, the burned rock midden deposits illustrated evidence of use and reuse over several millennia. This sequence significantly contributed to our understanding of Archaic cooking models and burned rock formation processes.

In accordance with the criteria in 13 ACT 26.10, Pape-Dawson's data recovery of the SAL-eligible portion of site 41CM412 has mitigated any impact associated with the construction of the Comal ISD High School #4. As a result, Pape-Dawson recommends no further work for the site. The THC concurred with the Pape-Dawson's recommendation on April 13, 2018 and allowed construction to proceed. Following completion of the final report, artifact discard decisions will be coordinated with the THC. Project records, photographs, and select collected artifacts will be curated at UTSA-CAR. Furthermore, Pape-Dawson received concurrence from the THC for the draft report of investigation on October 23, 2020.

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APPENDIX A: SITE SHOVEL TEST DATA

Appendix X:
Site Shovel Test Data

SST #	FST #	Level	Depth (cmbs)	Results	Munsell	Soil Color	Soil Texture	Cultural Material	Comments/Reason for Termination
	MN1	1	0-10	P	10YR3/2	Very dark grayish brown	Silty clay loam w/ 40% LMST gravels	2 flakes	Disturbed
		2	10-20	P	10YR3/2	Very dark grayish brown	Silty clay loam	15 flakes, 2 FCR	Top of midden reached at 20 cmbs
		3	20-30	P	10YR3/2	Very dark grayish brown	Silty clay loam	53 flakes, 1 bone, 10 FCR	Reached midden matrix
	MN2	1	0-10	P	10YR3/2	Very dark grayish brown	Silty clay loam	1 flake, 13 FCR	Top of midden reached at 10 cmbs
		2	10-20	P	10YR3/2	Very dark grayish brown	Silty clay loam	21 flakes, 34 FCR	-
	MN3	1	0-10	P	10YR3/2	Very dark grayish brown	Silty clay loam		No evidence of midden
		2	10-15	P	10YR3/2	Very dark grayish brown	Silty clay loam	3 FCR (Scattered)	Not burnt- many large degraded IMST frags/Limestone bedrock at 15 cmbs
	MN4	1	0-10	N	10YR3/2	Very dark grayish brown	Silty loam	-	Large non-burnt fragments of limestone bedrock
	MN5	1	0-10	P	10YR5/2	Grayish brown	Silty loam	FCR	-
		2	10-20	P	10YR5/2	Grayish brown	Silty loam	3 Flakes, 8 FCR	Possible edge of midden
		3	20-30	P	10YR5/2	Grayish brown	Silty loam	11FCR	-

Appendix X: Site Shovel Test Data

SST #	FST #	Level	Depth (cmbs)	Results	Munsell	Soil Color	Soil Texture	Cultural Material	Comments/Reason for Termination
	MN6	1	0-10	N	10YR3/2	Very dark grayish brown	Silty clay loam	-	LMST bedrock reached at 10 cmbs
	MN7	1	0-10	P	10YR5/2	Grayish brown	Silty clay loam	4 flakes, 16 FCR	Top of midden reached at surface
		2	10-20	P	10YR5/2	Grayish brown	Silty clay loam	5 flakes, 15 FCR	-
	MN8	1	0-10	P	10YR4/2	Dark grayish brown	Silty clay loam	1 flake, 1 FCR	
		2	10-20	P	10YR4/2	Dark grayish brown	Silty clay loam	8 flakes, 3 FCR	
		3	20-30	P	10YR4/2	Dark grayish brown	Silty clay loam	8 flakes, 12 FCR	Top of midden at 25-30 cmbs, cluster of larger FCR at 30 cmbs
	MN9	1	0-10	N	10YR4/2	Dark grayish brown	Silty clay loam	-	Degraded bedrock reached at 10 cmbs
	MN10	1	0-10	P	10YR3/2	Very dark grayish brown	Silty clay loam	20 FCR	No evidence of midden
		2	10-20	P	10YR3/2	Very dark grayish brown	Silty clay loam	28 FCR	
	MN11	1	0-10	P	-	Yellowish brown	Silty clay loam	FCR	No evidence of midden, disturbed
		2	10-20	P	10YR3/2	Dark grayish brown	Silty clay loam	2 FCR	
		3	20-30	P	10YR3/2	Dark grayish brown	Silty clay loam	FCR	
	MN12	1	0-10	P	10YR4/2	Dark grayish brown	Silty clay loam	3 flakes, 14 FCR	Top of midden reached at 5 cmbs

Appendix X:
Site Shovel Test Data

PAPE-DAWSON ENGINEERS

SST #	FST #	Level	Depth (cmbs)	Results	Munsell	Soil Color	Soil Texture	Cultural Material	Comments/Reason for Termination
	MN13	1	0-10	P	10YR4/2	Dark grayish brown	Silty clay loam	4 FCR	No evidence of midden/Solid LMST bedrock at 10 cmbs
	MN14	1-4	0-40	N	10YR3/2	Very dark grayish brown	Silty clay loam	-	No evidence of midden/Sandstone bedrok at 40 cmbs
	MN15	1-3	0-30	N	10YR3/2	Very dark grayish brown	Compact clay loam	-	No evidence of midden
	MN16	1	0-10	P	10YR3/2	Very dark grayish brown	Compact clay loam	4 flakes, 2 FCR	No evidence of midden
		2	10-20	P	10YR3/2	Very dark grayish brown	Compact clay loam	1 flake, 1 FCR	
		3	20-30	P	10YR3/2	Very dark grayish brown	Compact clay loam	1 flake	
	JS01	1	0-10	P	10YR3/2	Very dark grayish brown	Clay loam	52 FCR, 29 lithics	
	JS02	1	0-10	P	10YR3/2	Very dark grayish brown	Clay loam	12 FCR, 18 lithics	
		2	10-20	P	10YR3/2	Very dark grayish brown	Clay loam	21 FCR, 22 lithics	
	JS03	1	0-10	P	10YR3/2	Very dark grayish brown	Clay loam	5 FCR, 18 lithics	
		2	10-20	P	10YR3/2	Very dark grayish brown	Clay loam	3 FCR, 9 lithics, 1 bone	
		3	20-30	P	10YR3/2	Very dark grayish brown	Clay loam	5 FCR, 10 lithics, 1 bone	
		4-5	30-50	P	10YR7/6	Yellow	Silt	-	Subsoil
		1	0-10	P	10YR3/2	Very dark grayish brown	Clay	1 FCR, 2 lithics, 1 square nail	

Appendix X: Site Shovel Test Data

SST #	FST #	Level	Depth (cmbs)	Results	Munsell	Soil Color	Soil Texture	Cultural Material	Comments/Reason for Termination
	JS04	2	10-20	P	10YR3/2	Very dark grayish brown	Clay	1 FCR, 2 lithics	
		3	20-30	P	10YR7/6	Yellow	Silty loam	-	Subsoil
		1	0-10	P	10YR3/2	Very dark grayish brown	Clay loam	1 wire nail, 1 amber glass, 1 square nail, 1 whiteware, 1 FCR, 18 lithics	
	JS05	2	10-20	P	10YR3/2	Very dark grayish brown	Clay loam	10 FCR, 32 lithics	
		3	20-30	P	10YR4/2	Dark grayish brown	Silty loam	8 FCR, 32 lithic	
		4	30-40	P	10YR4/2	Dark grayish brown	Silty loam	13 FCR, 33 lithics	Depth
		1	0-10	P	10YR4/2	Dark grayish brown	Silty loam	5 FCR, 10 lithics	
	JF06	2	10-20	P	10YR4/2	Dark grayish brown	Silty loam	3 FCR	
		3	20-30	P	10YR4/2	Dark grayish brown	Silty loam	2 FCR	Subsoil
		1	0-10	P	-	-	Caliche fill	-	
	JF07	2	10-20	P	10YR4/2	Dark grayish brown	Silty loam	-	Encountered feature
	JF08	1	0-10	P	10YR3/2	Very dark grayish brown	Clay loam	1 FCR, 8 lithics	
		2	10-20	P	10YR3/2	Very dark grayish brown	Clay loam	3 FCR, 7 lithics, 2 bone	
		3	20-30	P	10YR4/2	Dark grayish brown	Silty loam		Subsoil

APPENDIX B: SPECIMEN INVENTORY

Project Name: Comal ISD Data Recovery
Project # 08100-13
Client: Comal ISD

Specimen Inventory

PAPE-DAWSON ENGINEERS

FS No.	Trench No.	Unit, CS, or ST No	Feature No	Level (10 cm)	Depth		Prehistoric						Historic/Modern										Soil Sample	Comments
					(cmbs)	(cmbd)	Lithic	Burned Clay	Ocher	Bone	Charcoal	Shell	Glass	Ceramic	Plastic	Slate	Graphite	Brick	Asphalt	Mortar	Metal			
1		JS01		1	0-10		28																	
2		JS02		1	0-10		18																	
3		JS02		2	10-20		21																	
4		JS03		1	0-10		17																	
5		JS03		2	10-20		9			1														
6		JS03		3	20-30		10			1														
7		JS04		1	0-10		2														1			
8		JS04		2	10-20		1																	
9		JS05		1	0-10		10						2	1							2			
10		JS05		2	10-20		26																	1 Biface
11		JS05		3	20-30		23																	
12		JS05		4	30-40		31																	1 Biface
13		JS06		1	0-10		10																	
14		JS08		1	0-10		8																	
15		JS08		2	10-20		7			12														
16		MN01		1	0-10		2																	
17		MN01		2	10-20		14																	
18		MN01		3	20-30		49			1														
19		MN02		1	0-10		1																	
20		MN02		2	10-20		20																	
21		MN05		2	10-20		3																	
22		MN07		1	0-10		4																	
23		MN07		2	10-20		4																	
24		MN08		1	0-10		1																	
25		MN08		2	10-20		8																	
26		MN08		3	20-30		7																	
27		MN12		1	0-10		3																	
28		MN16		1	0-10		4																	
29		MN16		2	10-20		1																	
30		MN16		3	20-30		1																	
31	1				Backdirt		2																	1 Projectile Point, 1 Biface
32	1				Backdirt		4																	2 Projectile Points, 2 Bifaces
33	1				Backdirt		4																	1 Projectile Point, 1 Perforator, 1 Flake tool, 1 Biface
34	1				Backdirt		2																	2 Projectile Points
35	1				Backdirt		5																	2 Projectile Points, 2 Bifaces, 1 Uniface
36	2				Backdirt		20																	5 Projectile Points, 1 Preform, 11 Biface, 1 Flake Tool
37	2				13		1																	1 Projectile Point
38	2	Unit 1	1	2		25	1																	1 Projectile Point
39	2	Unit 1	1	1		10-20	10																4	
40	2	Unit 1	1	1		10-20	91				1		1		1						4			1 Biface
41	2	Unit 1	1	2		20-30	17				1										3		9	
42	2	Unit 1	1	2		20-30	799	1			1		1								3			1 Preform, 1 Biface, 1 Flake Tool
43	1	Unit 2	1-1	1		10-20	80						1											1 Flake Tool
44	1	Unit 2	1-1	1		10-20	12																5	
45																								
46	1	Unit 2	1-1	2		20-30	6																4	
47	1	Unit 2	1-1	2		20-30	36																	
48	2	Unit 1	1	3		30-40	47			3													7	
49	2	Unit 1	1	3		30-40	711	1	4	1	1													4 Bifaces
50	2	Unit 1	1-2	3		34-40	7																4	1 Uniface
51	2	Unit 1	1-2	3		34-40	65	1																
52	2	Unit 1	1-2	4		40-50	4	1															2	
53	2	Unit 1	1-2	4		40-50	33	1	3															
54	1	CS 3	1	1		10-20	2																1	
55	1	CS 3	1	1		10-20	91									1			1		4			
56																								
57	1	CS 4	1	1		10-20	6				1			2							10			1 Biface
58	1	CS 4	1	2		20-30	3																1	
59	1	CS 4	1	2		20-30	53				1										2			
60	2	Unit 1	1	4		40-50	48	1	2															
61	1	CS 3	1	2		20-30	45			1											1		9	
62	1	CS 3	1	2		20-30	150																	
63	1	CS 4	1	3		30-40	3																3	
64	1	CS 4	1	3		30-40	42																	
65	1	CS 2	1	1		10-20	5													11	2		7	
66	1	CS 2	1	1		10-20	3											1		2				
67	1	CS 1	1	1		10-20	7																	
68	1	CS 1	1	1		10-20	40		1				1					1						
69																								
70	1	CS 4	1	4		40-50	2																	
71	1	CS 3	1	3		30-40	1																1	
72	1	CS 3	1	3		30-40	14																	1 Biface

Project Name: Comal ISD Data Recovery
Project # 08100-13
Client: Comal ISD

Specimen Inventory

PAPE-DAWSON ENGINEERS

	Trench	Unit, CS, or ST	Feature	Level	Depth		Prehistoric						Historic/Modern									Soil	
FS No.	No.	No	No	(10 cm)	(cmbs)	(cmbd)	Lithic	Burned Clay	Ocher	Bone	Charcoal	Shell	Glass	Ceramic	Plastic	Slate	Graphite	Brick	Asphalt	Mortar	Metal	Sample	Comments
73	1	CS 1	1	2		20-30	10															3	
74	1	CS 1	1	2		20-30	80														2		
75																							
76	1	CS 2	1	2		20-30	8																
77	1	CS 2	1	2		20-30	25																1 Flake Tool
78	1	CS 4	1			36	1																1 Uniface
79	2	CS 5	1	1		10-20															1		
80	1	CS 2	1	3		30-40	6																
81	1	CS 2	1	3		30-40	28																
82	1	CS 1	1	3		30-40	3															3	
83	1	CS 1	1	3		30-40	30																
84	1	CS 2	1	4		40-50	1															1	
85	1	CS 2	1	4		40-50	5																
86	2	CS 5	1	1		10-20	39						2				1				5		
87																							
88	2	CS 5	1	2		20-30																1	
89	2	CS 5	1	2		20-30	27																
90	2	CS 5	1	3		30-40	2															2	
91	2	CS 5	1	3		30-40	36																2 Projectile Points
92	2	CS 5	1	4		40-50	1															1	
93	2	CS 5	1	4		40-50	27																
94	2	CS 5	1	5		50-60	7																
95	2	CS 5	1	5		50-60	13																

APPENDIX C: LITHIC ANALYSIS

41CM412
Lithic Analysis

PAPE-DAWSON ENGINEERS

Curated (Y/N)	Box #	Lot-Spec	Lot #	Spec	FS No.	Feature No.	Trench No.	Add'l Info	Artifact Area	Unit, CS, or ST No.	Level (10 cm)	Depth (cmbd/cmbs)	Screen Size (in.)	Count	Material	Artifact Description	Artifact Sub-description	Flake Reduction Stage	Size Grade	Form	Decoration	Color	Taxa	Completeness	Fragmentation	Butchery	Length (mm)	Width (mm)	Thickness (mm)	Thermal Alteration	(g)	Time Period	Comments	References
Y		01-01	01	01	1					JS01	1	0-10 cmbs	1/4	3	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric	2 are fitters	
Y		02-02	02	02	2					JS01	1	0-10 cmbs	1/4	9	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		03-03	03	03	3					JS02	2	10-20 cmbs	1/4	14	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		03-04	03	04	3					JS02	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Core	Multi-directional						Broken						Yes		Prehistoric		
Y		04-01	04	01	4					JS03	1	0-10 cmbs	1/4	3	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		04-02	04	02	4					JS03	1	0-10 cmbs	1/4	8	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		05-03	05	03	5					JS03	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		06-01	06	01	6					JS03	3	20-30 cmbs	1/4	2	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		07-02	07	02	7					JS04	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		08-01	08	01	8					JS04	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		09-01	09	01	9					JS05	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		09-02	09	02	9					JS05	1	0-10 cmbs	1/4	8	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		10-01	10	01	10					JS05	2	10-20 cmbs	1/4	1	Chert	Tool	Biface	Late-stage						Broken			18.69	14.27	3.37	Yes		Prehistoric		
Y		10-03	10	03	10					JS05	2	10-20 cmbs	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		10-04	10	04	10					JS05	2	10-20 cmbs	1/4	5	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		11-01	11	01	11					JS05	3	20-30 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Primary						Broken						No		Prehistoric		
Y		11-05	11	05	11					JS05	3	20-30 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		12-01	12	01	12					JS05	4	30-40 cmbs	1/4	1	Chert	Tool	Biface	Mid-stage						Broken			86.61	36.77	15.31	Yes		Prehistoric		
Y		12-03	12	03	12					JS05	4	30-40 cmbs	1/4	25	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		13-01	13	01	13					JS06	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		13-02	13	02	13					JS06	1	0-10 cmbs	1/4	7	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		14-03	14	03	14					JS08	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		15-01	15	01	15					JS08	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		15-02	15	02	15					JS08	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		15-03	15	03	15					JS08	2	10-20 cmbs	1/4	4	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		16-01	16	01	16					MN01	1	0-10 cmbs	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		17-03	17	03	17					MN01	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		18-03	18	03	18					MN01	3	20-30 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	C					Complete						Yes		Prehistoric		
Y		18-04	18	04	18					MN01	3	20-30 cmbs	1/4	35	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		18-05	18	05	18					MN01	3	20-30 cmbs	1/4	4	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		19-01	19	01	19					MN02	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		20-03	20	03	20					MN02	2	10-20 cmbs	1/4	2	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		21-01	21	01	21					MN05	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	B					Complete						Yes		Prehistoric		
Y		21-02	21	02	21					MN05	2	10-20 cmbs	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		22-01	22	01	22					MN07	1	0-10 cmbs	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		23-01	23	01	23					MN07	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		23-03	23	03	23					MN07	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		26-01	26	01	26					MN08	3	20-30 cmbs	1/4	6	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		26-02	26	02	26					MN08	3	20-30 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		27-01	27	01	27					MN12	1	0-10 cmbs	1/4	2	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		28-02	28	02	28					MN16	1	0-10 cmbs	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		29-01	29	01	29					MN16	2	10-20 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		30-01	30	01	30					MN16	3	20-30 cmbs	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		31-01	31	01	31		1		1			Backdirt		1	Chert	Tool	Projectile Point							Broken			53.59	30.61	6.73	Yes		Prehistoric	Pedernales	
Y		31-02	31	02	31		1		1			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			83.72	64.16	19.29	Yes		Prehistoric		
Y		32-01	32	01	32		1		2			Backdirt		1	Chert	Tool	Projectile Point							Broken			59.89	43.44	7.67	Yes		Prehistoric	Marcos	
Y		32-02	32	02	32		1		2			Backdirt		1	Chert	Tool	Projectile Point							Broken			46.24	46.06	8.70	Yes		Prehistoric	cf Pedernales	
Y		32-03	32	03	32		1		2			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			63.68	46.19	8.94	Yes		Prehistoric		
Y		32-04	32	04	32		1		2			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			74.98	50.51	9.45	Yes		Prehistoric		
Y		33-01	33	01	33		1		3			Backdirt		1	Chert	Tool	Projectile Point							Complete			82.96	28.90	7.23	Yes		Prehistoric	cf Pedernales	
Y		33-02	33	02	33		1		3			Backdirt		1	Chert	Tool	Perforator							Broken			58.93	13.18	6.66	Yes		Prehistoric		
Y		33-03	33	03	33		1		3			Backdirt		1	Chert	Tool	Flake Tool	Secondary						Broken			65.41	84.71	11.98	Yes		Prehistoric	Bimarginal flake tool; 2 worked edges	
Y		33-04	33	04	33		1		3			Backdirt		1	Chert	Tool	Biface	Early-stage						Broken			75.64	65.68	15.73	Yes		Prehistoric		
Y		34-01	34	01	34		1		4			Backdirt		1	Chert	Tool	Projectile Point							Broken			74.61	33.35	10.20	Yes		Prehistoric	Pedernales	
Y		34-02	34	02	34		1		4			Backdirt		1	Chert	Tool	Projectile Point							Broken			53.50	33.68	7.84	Yes		Prehistoric	Early Triangular	
Y		35-01	35	01	35		1		5			Backdirt		1	Chert	Tool	Projectile Point							Broken			66.54	42.66	6.51	Yes		Prehistoric	Pedernales	
Y		35-02	35	02	35		1		5			Backdirt		1	Chert	Tool	Projectile Point							Broken			34.95	39.61	10.41	Yes		Prehistoric	cf Pedernales	
Y		35-03	35	03	35		1		5			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			47.10	43.99	12.53	Yes		Prehistoric		
Y		35-04	35	04	35		1		5			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			52.69	32.00	7.71	Yes		Prehistoric		
Y		35-05	35	05	35		1		5			Backdirt		1	Chert	Tool	Uniface	Scraper						Complete			74.39	55.05	21.49	Yes		Prehistoric	Uniface end and side scraper	
Y		36-01	36	01	36		2		6			Backdirt		1	Chert	Tool	Projectile Point							Complete			82.16	32.54	8.14	Yes		Prehistoric	Pedernales	
Y		36-02	36	02	36		2		6			Backdirt		1	Chert	Tool	Projectile Point							Complete			58.63	28.57	9.27	Yes		Prehistoric	Nolan	
Y		36-03	36	03	36		2		6			Backdirt		1	Chert	Tool	Projectile Point							Broken			67.48	33.88	6.75	Yes		Prehistoric	Pedernales	
Y		36-04	36	04	36		2		6			Backdirt		1	Chert	Tool	Projectile Point							Broken			52.80	33.55	5.48	Yes		Prehistoric	Langtry	
Y		36-05	36	05	36		2		6			Backdirt		1	Chert	Tool	Projectile Point							Broken			39.59	49.86	11.78	Yes		Prehistoric	Pedernales	
Y		36-06	36	06	36		2		6			Backdirt		1	Chert	Tool	Preform							Broken			68.13	58.61	12.57	Yes		Prehistoric	Dart point preform	
Y		36-07	36	07	36		2		6			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			37.62	23.34	6.79	Yes		Prehistoric	Possible projectile point tip	
Y		36-08	36	08	36		2		6			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			23.36	20.91	5.00	Yes		Prehistoric	Possible projectile point tip; Heavily burned	
Y		36-09	36	09	36		2		6			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			125.37	43.62	10.63	Yes		Prehistoric		
Y		36-10	36	10	36		2		6			Backdirt		1	Chert	Tool	Biface	Late-stage						Broken			23.95	34.05	6.36	Yes		Prehistoric		
Y		36-11	36	11	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			63.01	70.17	15.09	Yes		Prehistoric		
Y		36-12	36	12	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			68.64	65.72	12.51	Yes		Prehistoric		
Y		36-13	36	13	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			58.21	45.37	11.24	Yes		Prehistoric		
Y		36-14	36	14	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			46.50	49.58	13.06	Yes		Prehistoric		
Y		36-15	36	15	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			78.38	46.21	12.09	Yes		Prehistoric		
Y		36-16	36	16	36		2		6			Backdirt		1	Chert	Tool	Biface	Mid-stage						Broken			62.79	56.69	21.49	Yes		Prehistoric		
Y		36-17	36	17	36		2		6			Backdirt		1	Chert	Tool	Flake Tool	Tertiary	D					Complete						Yes		Prehistoric	Unimarginal flake tool; 2 worked edges	
Y		36-18	36	18	36		2		6			Backdirt		1	Chert	Tool	Biface	Early-stage						Broken			99.40	83.41	22.80	Yes		Prehistoric		
Y		36-19	36	19	36		2		6			Backdirt		1	Chert	Non-Tool	Blank							Broken						No		Prehistoric		
Y		36-20	36	20	36		2		6			Backdirt		1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		37-01	37	01	37		2	East wall; 1.2 m north of south terminus	7			13 cmbs		1	Chert	Tool	Projectile Point							Broken			55.86	41.13	6.48	Yes		Prehistoric	Pedernales	
Y		38-01	38	01	38	1	2			Unit 1	2	25 cmbd	1/4	1	Chert	Tool	Projectile Point							Complete			60.33	22.64	10.89	No		Prehistoric	cf Lerma	
Y		39-03	39	03	39	1	2	Soil Sample		Unit 1	1	10-20 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary														Prehistoric		
Y		39-04	39	04	39	1	2	Soil Sample		Unit 1	1	10-20 cmbd	1/8	5	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		40-01	40	01	40	1	2			Unit 1	1	10-20 cmbd	1/4	1	Chert	Tool	Biface	Late-stage						Broken			27.47	13.38	5.93	Yes		Prehistoric		
Y		40-02	40	02	40	1	2			Unit 1	1	10-20 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Primary	A					Complete						Yes		Prehistoric		
Y		40-04	40	04	40	1	2			Unit 1	1	10-20 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		40-07	40	07	40	1	2			Unit 1	1	10-20 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						No		Prehistoric		
Y		40-08	40	08	40	1	2			Unit 1	1	10-20 cmbd	1/4	49	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		41-01	41	01	41	1	2	Soil Sample		Unit 1	2	20-30 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		41-02	41	02	41	1	2	Soil Sample		Unit 1	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		41-03	41	03	41	1	2	Soil Sample		Unit 1	2	20-30 cmbd	1/4	5	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		42-01	42	01	42	1	2			Unit 1	2	20-30 cmbd	1/4	1	Chert	Tool	Preform							Complete			56.99	34.88	8.99	Yes		Prehistoric	Dart Point Preform	
Y		42-02	42	02	42	1	2			Unit 1	2	20-30 cmbd	1/4	1	Chert	Tool	Biface	Late-stage						Broken			16.50	15.72	3.38	Yes		Prehistoric	Possible projectile point tip	
Y		42-03	42	03	42	1	2			Unit 1	2	20-30 cmbd	1/4	1	Chert	Tool	Flake Tool	Tertiary						Broken						Yes		Prehistoric	Unimarginal flake tool; 1 worked edge	
Y		42-04	42	04	42	1	2			Unit 1	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Primary	A					Complete						Yes		Prehistoric		
Y		42-05	42	05	42	1	2			Unit 1	2	20-30 cmbd	1/4	6	Chert	Non-Tool	Debitage (Flake)	Primary						Broken						Yes		Prehistoric		
Y		42-06	42	06	42	1	2			Unit 1	2	20-30 cmbd	1/4	14	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		42-09	42	09	42	1	2			Unit 1	2	20-30 cmbd	1/4	38	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		42-11	42	11	42	1	2			Unit 1	2	20-30 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary	C					Complete						Yes		Prehistoric		
Y		42-13	42	13	42	1	2			Unit 1	2	20-30 cmbd	1/4	24	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		43-01	43	01	43	1.1	1			Unit 2	1	10-20 cmbd	1/4	1	Chert	Tool	Flake Tool	Tertiary						Broken						Yes		Prehistoric	Unimarginal flake tool; 1 worked edge	
Y		43-03	43	03	43	1.1	1			Unit 2	1	10-20 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Secondary	B					Complete						Yes		Prehistoric		
Y		43-06	43	06	43	1.1	1			Unit 2	1	10-20 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		43-07	43	07	43	1.1	1			Unit 2	1	10-20 cmbd	1/4	54	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		44-02	44	02	44	1.1	1	Soil Sample		Unit 2	1	10-20 cmbd	1/4	6	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		45-01	45	01	46	1.1	1	Soil Sample		Unit 2	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		46-01	46	01	47	1.1	1			Unit 2	2	20-30 cmbd	1/4	8	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		46-02	46	02	47	1.1	1			Unit 2	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		46-03	46	03	47	1.1	1			Unit 2	2	20-30 cmbd	1/4	25	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		46-04	46	04	47	1.1	1			Unit 2	2	20-30 cmbd	1/4	2	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		47-01	47	01	48	1	2	Soil Sample		Unit 1	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	C					Complete						Yes		Prehistoric		
Y		47-04	47	04	48	1	2	Soil Sample		Unit 1	3	30-40 cmbd	1/4	23	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		47-05	47	05	48	1	2	Soil Sample		Unit 1	3	30-40 cmbd	1/8	2	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		47-06	47	06	48	1	2	Soil Sample		Unit 1	3	30-40 cmbd	1/8	16	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		48-01	48	01	49	1	2			Unit 1	3	30-40 cmbd	1/4	1	Chert	Tool	Biface	Late-stage						Broken			35.39	24.04	6.68	Yes		Prehistoric	Possible projectile point tip	
Y		48-02	48	02	49	1	2			Unit 1	3	30-40 cmbd	1/4	1	Chert	Tool	Biface	Late-stage						Broken			17.62	26.48	7.47	Yes		Prehistoric		
Y		48-03	48	03	49	1	2			Unit 1	3	30-40 cmbd	1/4	1	Chert	Tool	Biface	Early-stage						Broken			102.01	53.84	17.70	Yes		Prehistoric		
Y		48-04	48	04	49	1	2			Unit 1	3	30-40 cmbd	1/4	1	Chert	Tool	Biface	Mid-stage						Broken			28.69	27.72	8.18	Yes		Prehistoric		
Y		48-08	48	08	49	1	2			Unit 1	3	30-40 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary	C					Complete						Yes		Prehistoric		
Y		48-10	48	10	49	1	2			Unit 1	3	30-40 cmbd	1/4	81	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		48-11	48	11	49	1	2			Unit 1	3	30-40 cmbd	1/4	46	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		48-13	48	13	49	1	2			Unit 1	3	30-40 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary	C					Complete						Yes		Prehistoric		
Y		49-01	49	01	50	1.2	2	Soil Sample		Unit 1	3	34-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Primary						Broken						Yes		Prehistoric		
Y		49-02	49	02	50	1.2	2	Soil Sample		Unit 1	3	34-40 cmbd	1/4	5	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken								Prehistoric		
Y		50-01	50	01	51	1.2	2	Feature Fill		Unit 1	3	34-40 cmbd	1/4	1	Chert	Tool	Uniface	Scraper						Broken			64.82	48.98	14.85	Yes		Prehistoric	Uniface end and side scraper	
Y		50-03	50	03	51	1.2	2	Feature Fill		Unit 1	3	34-40 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Secondary	B					Complete						Yes		Prehistoric		
Y		50-05	50	05	51	1.2	2	Feature Fill		Unit 1	3	34-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		50-07	50	07	51	1.2	2	Feature Fill		Unit 1	3	34-40 cmbd	1/4	4	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		51-01	51	01	52	1.2	2	Soil Sample		Unit 1	4	40-50 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		52-01	52	01	53	1.2	2	Feature Fill		Unit 1	4	40-50 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		52-02	52	02	53	1.2	2	Feature Fill		Unit 1	4	40-50 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		53-01	53	01	54	1	1	Soil Sample		CS 3	1	10-20 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		54-01	54	01	55	1	1			CS 3	1	10-20 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		54-03	54	03	55	1	1			CS 3	1	10-20 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		54-06	54	06	55	1	1			CS 3	1	10-20 cmbd	1/4	24	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		55-01	55	01	57	1	1			CS 4	1	10-20 cmbd	1/4	3	Chert	Tool	Biface	Mid-stage						Broken			34.20	37.03	11.73	Yes		Prehistoric	All are fitters	
Y		55-03	55	03	57	1	1			CS 4	1	10-20 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		56-01	56	01	58	1	1	Soil Sample		CS 4	2	20-30 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric	2 are fitters	
Y		57-02	57	02	59	1	1			CS 4	2	20-30 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		57-03	57	03	59	1	1			CS 4	2	20-30 cmbd	1/4	48	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		

41CM412
Lithic Analysis

Curated (Y/N)	Box #	Lot-Spec	Lot #	Spec	FS No.	Feature No.	Trench No.	Add'l Info	Artifact Area	Unit, CS, or ST No.	Level (10 cm)	Depth (cmbd/cmbs)	Screen Size (in.)	Count	Material	Artifact Description	Artifact Sub-description	Flake Reduction Stage	Size Grade	Form	Decoration	Color	Taxa	Completeness	Fragmentation	Butchery	Length (mm)	Width (mm)	Thickness (mm)	Thermal Alteration	(g)	Time Period	Comments	References
Y		58-01	58	01	60	1	2			Unit 1	4	40-50 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		58-03	58	03	60	1	2			Unit 1	4	40-50 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		58-05	58	05	60	1	2			Unit 1	4	40-50 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		59-01	59	01	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		59-06	59	06	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/8	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		59-07	59	07	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/8	3	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		59-08	59	08	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/8	26	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		59-09	59	09	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/8	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		60-01	60	01	62	1	1			CS 3	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Primary						Broken						Yes		Prehistoric		
Y		60-04	60	04	62	1	1			CS 3	2	20-30 cmbd	1/4	19	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		60-05	60	05	62	1	1			CS 3	2	20-30 cmbd	1/4	11	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		60-06	60	06	62	1	1			CS 3	2	20-30 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		60-07	60	07	62	1	1			CS 3	2	20-30 cmbd	1/4	110	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		60-09	60	09	62	1	1			CS 3	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Core	Multi-directional						Complete						Yes		Prehistoric		
Y		61-03	61	03	63	1	1	Soil Sample		CS 4	3	30-40 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		62-01	62	01	64	1	1			CS 4	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		62-05	62	05	64	1	1			CS 4	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		63-07	63	07	65	1	1	Soil Sample		CS 2	1	10-20 cmbd	1/8	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		64-01	64	01	66	1	1			CS 2	1	10-20 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		65-01	65	01	67	1	1	Soil Sample		CS 1	1	10-20 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		65-03	65	03	67	1	1	Soil Sample		CS 1	1	10-20 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		66-01	66	01	68	1	1			CS 1	1	10-20 cmbd	1/4	8	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		67-01	67	01	70	1	1			CS 4	4	40-50 cmbd	1/4	2	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		68-01	68	01	71	1	1	Soil Sample		CS 3	3	30-40 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		69-02	69	02	72	1	1			CS 3	3	30-40 cmbd	1/4	1	Chert	Tool	Biface	Early-stage						Broken			28.11	40.89	21.09	Yes		Prehistoric		
Y		70-01	70	01	73	1	1	Soil Sample		CS 1	2	20-30 cmbd	1/4	5	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		70-03	70	03	73	1	1	Soil Sample		CS 1	2	20-30 cmbd	1/8	5	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		71-01	71	01	74	1	1			CS 1	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	B					Complete						Yes		Prehistoric		
Y		71-02	71	02	74	1	1			CS 1	2	20-30 cmbd	1/4	7	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		72-01	72	01	76	1	1	Soil Sample		CS 2	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		72-05	72	05	76	1	1	Soil Sample		CS 2	2	20-30 cmbd	1/8	4	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		73-01	73	01	77	1	1			CS 2	2	20-30 cmbd	1/4	1	Chert	Tool	Flake Tool	Secondary						Broken						Yes		Prehistoric	Unimarginal flake tool; 1 worked edge	
Y		73-02	73	02	77	1	1			CS 2	2	20-30 cmbd	1/4	3	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		73-03	73	03	77	1	1			CS 2	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		74-01	74	01	78	1	1	West Wall		CS 4	3	36 cmbd		1	Chert	Tool	Uniface	Scraper						Complete			96.42	38.78	11.51	Yes		Prehistoric	Uniface end and side scraper	
Y		76-03	76	03	80	1	1	Soil Sample		CS 2	3	30-40 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		76-04	76	04	80	1	1	Soil Sample		CS 2	3	30-40 cmbd	1/8	3	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		77-01	77	01	81	1	1			CS 2	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	C					Complete						Yes		Prehistoric		
Y		77-03	77	03	81	1	1			CS 2	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		78-03	78	03	82	1	1	Soil Sample		CS 1	3	30-40 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		79-02	79	02	83	1	1			CS 1	3	30-40 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		79-03	79	03	83	1	1			CS 1	3	30-40 cmbd	1/4	25	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		80-01	80	01	84	1	1	Soil Sample		CS 2	4	40-50 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		82-01	82	01	86	1	2			CS 5	1	10-20 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		82-04	82	04	86	1	2			CS 5	1	10-20 cmbd	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	
Y		84-01	84	01	89	1	2			CS 5	2	20-30 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	A					Complete						Yes		Prehistoric		
Y		84-03	84	03	89	1	2			CS 5	2	20-30 cmbd	1/4	6	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		84-04	84	04	89	1	2			CS 5	2	20-30 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Tertiary	A					Complete						Yes		Prehistoric		
Y		85-02	85	02	90	1	2	Soil Sample		CS 5	3	30-40 cmbd	1/8	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		86-01	86	01	91	1	2			CS 5	3	30-40 cmbd	1/4	1	Chert	Tool	Projectile Point							Complete			56.56	35.65	5.90	Yes		Prehistoric	Possible Marshall	
Y		86-02	86	02	91	1	2			CS 5	3	30-40 cmbd	1/4	1	Chert	Tool	Projectile Point							Complete			70.38	24.15	11.81	Yes		Prehistoric	cf Lerma	
Y		86-04	86	04	91	1	2			CS 5	3	30-40 cmbd	1/4	5	Chert	Non-Tool	Debitage (Flake)	Secondary						Broken						Yes		Prehistoric		
Y		86-05	86	05	91	1	2			CS 5	3	30-40 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary	B					Complete						Yes		Prehistoric		
Y		87-01	87	01	92	1	2	Soil Sample		CS 5	4	40-50 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		88-01	88	01	93	1	2			CS 5	4	40-50 cmbd	1/4	1	Chert	Non-Tool	Debitage (Flake)	Secondary	B					Complete						Yes		Prehistoric		
Y		88-04	88	04	93	1	2			CS 5	4	40-50 cmbd	1/4	21	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		89-01	89	01	94	1	2	Soil Sample		CS 5	5	50-60 cmbd	1/4	4	Chert	Non-Tool	Debitage (Flake)	Tertiary						Broken						Yes		Prehistoric		
Y		90-03	90	03	95	1	2			CS 5	5	50-60 cmbd	1/4	1	Chert	Non-Tool	Debitage (NonFlake)															Prehistoric	Angular shatter	

APPENDIX D: FAUNAL ANALYSIS

Project Name: Data Recovery at Site 41CM412, Comal ISD
Project #: 08100-13
Client: Comal Independent School District

41CM412
Faunal Analysis

PAPE-DAWSON ENGINEERS

Curated (Y/N)	Box #	Lot-Spec	Lot #	Spec	FS No.	Feature No.	Trench No.	Add'l Info	Artifact Area	Unit, CS, or ST No.	Level (10 cm)	Depth (cmbd/cmbs)	Screen Size (in.)	Count	Material	Artifact Description	Artifact Sub-description	Flake Reduction Stage	Size Grade	Form	Decoration	Color
Y		05-04	05	04	5					JS03	2	10-20 cmbs	1/4	1	Bone	Non-Tool	Small Bone Fragment					
Y		06-04	06	04	6					JS03	3	20-30 cmbs	1/4	1	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		15-05	15	05	15					JS08	2	10-20 cmbs	1/4	2	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		15-06	15	06	15					JS08	2	10-20 cmbs	1/4	7	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		15-07	15	07	15					JS08	2	10-20 cmbs	1/4	3	Bone	Non-Tool	Small Bone Fragment					
Y		18-06	18	06	18					MN01	3	20-30 cmbs	1/4	1	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		41-08	41	08	41	1	2	Soil Sample		Unit 1	2	20-30 cmbd	1/4	1	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		42-18	42	18	42	1	2			Unit 1	2	20-30 cmbd	1/4	1	Bone	Non-Tool	Small Bone Fragment					
Y		47-07	47	07	48	1	2	Soil Sample		Unit 1	3	30-40 cmbd	1/8	3	Bone	Non-Tool	Small Bone Fragment					
Y		48-17	48	17	49	1	2			Unit 1	3	30-40 cmbd	1/4	1	Bone	Non-Tool	Small Bone Fragment					
Y		59-04	59	04	61	1	1	Soil Sample		CS 3	2	20-30 cmbd	1/4	1	Bone	Non-Tool	Long Bone Shaft Fragment					
Y		82-05	82	05	86	1	2			CS 5	1	10-20 cmbd	1/4	37	Bone	Non-Tool	Long Bone Shaft Fragment					

Lot-Spec	Taxa	Completeness	Fragmentation	Butchery	Length (mm)	Width (mm)	Thickness (mm)	Thermal Alteration	(g)	Time Period	Comments	References
05-04	Indeterminate	Broken						No	0.16	Potentially prehistoric		
06-04	Medium Mammal	Broken						Yes	1.26	Prehistoric	Broke into 4 pcs. in transit/lab	
15-05	Medium Mammal	Broken	Cylinder	Yes				No	2.46	Historic	Saw cut bone	
15-06	Medium Mammal	Broken						No	7.85	Probably Historic		
15-07	Indeterminate	Broken						No	1.05	Probably Historic		
18-06	Medium Mammal	Broken						Yes	1.28	Prehistoric	Bone has potentially been digested	
41-08	Medium Mammal	Broken	Cylinder	No				No	0.410	Unknown		
42-18	Indeterminate	Broken						Yes	1.30	Unknown		
47-07	Medium Mammal	Broken						No	0.61	Unknown	Bone has potentially been digested	
48-17	Indeterminate	Broken						No	0.16	Unknown	Bone has potentially been disgested	
59-04	Small Mammal	Broken	Cylinder	No				Yes	0.05	Unknown		
82-05	Medium Mammal	Broken						Yes	16.66	Unknown		

APPENDIX E: MACROBOTANICAL ANALYSIS

FLOTATION SAMPLES AND RADIOCARBON MATERIAL FROM SITE 41CM412, COMAL COUNTY, TEXAS

January 23, 2019

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Ten soil samples from Site 41CM412 were submitted for flotation processing, sorting, identification, and analysis. Site 41CM412 is situated on an upland ridge in southeastern Comal County in modern Garden Ridge, Texas, near the borders of Guadalupe County to the east and Bexar County to the south. The site itself is in the Guadalupe River drainage basin, but a tributary of Cibolo Creek, which flows into the San Antonio River in Karnes county, is located little more than a kilometer to the southwest. A recent survey documented a burned rock midden dating to the Late to Transitional Archaic and standing structures and foundations dating to the early to middle 20th century (THC Site Form 5/18/2017).

Ecologically, the site is located at the eastern edge of the Edwards Plateau. Vegetation in less disturbed areas of the eastern Edwards Plateau today ranges from grasslands and savannas to woodlands and forests (van Auken 1988). Many upland forests today are dominated by Ashe juniper (*Juniperus ashei*) or honey mesquite (*Prosopis glandulosa*). In prehistoric times, frequent fires and lower livestock loads would have limited the mesquite population and restricted juniper to rocky ridges, canyons, and slopes near streams (Bezanson 2000:100; van Auken 1988:53). Upland landscapes where fire or cutting restricts colonization by juniper and mesquite are typically mixed grasslands punctuated by mottes of trees and brush (Gould 1962; Riskind and Diamond 1988). Common native grass species include little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), silver bluestem (*Bothriochloa laguroides*), and curly mesquite (*Hilaria belangeri*) (Bezanson 2000:102-105). Daisies (e.g., *Melampodium cinereum*, *Rudbeckia hirta*, *Symphyotrichum oblongifolium*), sages (*Salvia* spp.), foxgloves (*Penstemon* spp.), zexmenia (*Wedelia acapulcensis*), and other wildflowers are also present. Plateau live oaks (*Quercus fusiformis*), cedar elm (*Ulmus crassifolia*), Texas oak (*Quercus texana*), Lacey oak (*Q. laceyi*), post oak (*Q. stellata*), Ashe juniper, Texas persimmon (*Diospyros texana*), agarita (*Mahonia trifoliolata*), dewberry (*Rubus trivialis*, *R. riograndis*), and several species of grapes (*Vitis* spp.) are common woody plants in the mottes (Bezanson 2000:100-102; Gould 1962).

The Blackland Prairie vegetation region begins roughly five kilometers to the east of Site 41CM412. Although little of the original prairie ecosystems remain today, vegetation in pre-settlement times would have been trallgrass prairie with the most common grasses being little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and big bluestem (*Andropogon gerardii*). Prairie forbs include important food plants such as species of sunflower (*Helianthus* spp.) and breadroot (*Pediomelum* spp.) and medicinal plants such as basil beebalm (*Monarda clinopodioides*) and milkwort (*Polygala alba and P. incarnata*) (Moerman 1998). Community types vary in localized areas primarily due to differences in soil (Diggs et al. 1999:40). Wooded areas would have been present in the prairies in scattered upland areas and near larger rivers and streams. Wildfires tended to make smaller tributaries treeless in pre-settlement times.

METHODS

Flotation processing. Flotation samples were processed on October 3 and 4, 2018 according to the TAS Field School method (Bush 2012, 2014). Samples were deflocculated by soaking in water with at least 200 cubic centimeters of baking soda. An additional 200 ccs of baking soda was added for each additional 4 cubic decimeters of sample volume or portion thereof. Samples were soaked for up to an hour outdoors in temperatures ranging from 75 to 91 degrees F. Flotation light fractions were decanted into mesh with triangular openings of 0.3 x 0.4 x 0.5 mm. Heavy fractions were poured through mesh with square openings of 1.0 mm. Heavy fractions consisted mostly of caliche with some gastrods and small lithics. Examples of chert flakes and shatter from Feature 1-2 (Unit 1) are shown in Figure B.1. After drying, flotation heavy fractions were examined under a stereoscopic light microscope at 6-55 X magnification for carbonized botanical materials that failed to float during processing. Any carbonized botanical remains were moved to the light fraction prior to examination.

Radiocarbon samples. Immediately after drying, light fractions were quickly scanned for material suitable for radiocarbon dating that was then removed and returned to Pape-Dawson. For selection of potential radiocarbon material, light fractions were examined on freshly cleaned glassware and handled with vinyl gloves and metal forceps. Contact with paper and other plant products was avoided. Data were recorded using plastic mechanical pencils, and the scale pan was cleaned between samples.

Flotation samples were sorted according to standard procedures (Pearsall 2015). Each flotation light fraction was weighed on an Ohaus Scout II 200 x 0.01 g electronic balance before being size-sorted through a stack of graduated geologic mesh. All carbonized botanical materials that did not pass through the No. 10 mesh (2 mm square openings) were sorted under a Leica S9i stereozoom microscope at 6-55 X, then counted, weighed, recorded, and labeled. Gastropods, other non-botanical material, and uncarbonized botanical material larger than 2 mm were weighed, recorded, and labeled as “contamination”. Materials that fell through the 2 mm mesh (“residue”) were examined under a stereoscopic microscope at 6-55 X magnification for carbonized botanical remains that had not been previously identified in the 2 mm size fraction. Identifiable carbonized and semi-carbonized botanical materials were removed from residue, counted, weighed, recorded, and labeled. Uncarbonized plant remains other than rootlets (at this site, seeds, leaves, wood, and an acorn cap) were recorded on a presence/absence basis on laboratory forms.

Wood charcoal identification was attempted for up to twenty specimens from each flotation sample. When fewer than twenty wood charcoal fragments were present in the 2 mm size fraction, as was the case for all flotation samples at Site 41CM412 except one (FS 58), all such fragments were identified, and identification was attempted for progressively smaller fragments until either twenty fragments were identified or the fragments became too small to snap and/or to identify as anything more specific than "hardwood". Wood charcoal fragments were snapped to reveal a transverse section and examined under a stereoscopic microscope at 6-55 X magnification. When necessary, tangential or radial sections were examined for ray seriation, presence of spiral thickenings, types and sizes of intervessel pitting, and other characteristics.

Botanical materials were identified to the lowest possible taxonomic level by comparison to materials in the Macrobotanical Analysis comparative collection and through the use of standard reference works (e.g., Core et al. 1979; Davis 1993; Hoadley 1990; InsideWood 2004; Martin and Barkley 1961; Musil 1963; Panshin and de Zeeuw 1980; Wheeler 2011). Plant nomenclature follows that of the PLANTS Database (USDA, NCRS 2019).

RESULTS

Radiocarbon material

Material selected for possible radiocarbon dating is given in Table B.1. Note that this material is included in the flotation tables (Tables B.2 and B.3) as well as the radiocarbon table so that the flotation tables reflect the actual density of charcoal per volume.

Plant material removed from flotation samples for radiocarbon dating consisted of wood charcoal, nutshell, and a gall fragment that was presumably burned incidental to use of associated wood for fuel. The thin pieces of shell from nut interiors could only be identified to family (Juglandaceae). Members of this family in central Texas are hickories (*Carya* spp., including pecan) and walnuts (*Juglans* spp.). Three taxa of wood were identified: Plateau live oak (*Quercus fusiformis*), white group oak (*Quercus* sect. *Quercus*), juniper (*Juniperus* sp.), and mesquite or acacia (*Senegalia*/*Prosopis* spp.). The discover of semi-carbonized and uncarbonized juniper wood, three months later during full sorting of the flotation samples, raises the possibility that some or all of the fully carbonized juniper wood is not ancient. The two juniper specimens originally pulled for radiocarbon dating from CS-5 (Levels 2 and 4) are no longer recommended for radiocarbon dating. An example of plateau live oak wood charcoal is shown in Figure 1.

Flotation samples

Carbonized and semi-carbonized plant materials recovered are given in Tables B.2 and B.3 by count and weight respectively. As noted above, the tables include charcoal designated for possible radiocarbon dating that is also reported in Table B.1. Uncarbonized plant materials other than rootlets are shown on a presence/absence basis in Table B.4.

Uncarbonized (modern) plant remains. Most uncarbonized plant parts in the samples appear in the form of rootlets that are clearly related to the modern vegetation at the site. Uncarbonized seeds are a common occurrence on most archaeological sites, and they usually represent seeds of modern plants that have made their way into the soil either through their own dispersal mechanisms or by faunalturbation, floralturbation, or argilliturbation (Bryant 1985:51-52; Keepax 1977; Miksicek 1987:231-232). In all except the driest areas of North America, uncarbonized plant material on open-air sites can be assumed to be of modern origin unless compelling evidence suggests otherwise (Lopinot and Brussell 1982; Miksicek 1987:231). The seeds, leaves, and fruits at 41CM412 consist of weedy annuals (e.g., sandmat [*Chamaesyce* spp.], chenopodium [*Chenopodium* spp.], and flatsedge [*Cyperus* spp.]), and parts of woody plants (oak [Quercus spp.], sugarberry [*Celtis laevigata*], greenbriar [*Smilax* spp.], and juniper [*Juniperus* spp.]) that relate to the current vegetation. All uncarbonized plant parts are interpreted here as modern.

Semi-carbonized plant remains were recovered in CS-4 and CS-5, indicating burning in the site area that is recent enough for incompletely burned remains to have survived. Mulberry (*Morus* spp.), juniper, and pecan (*Carya illinoinensis*) wood were recovered in semi-carbonized form. Of these, only juniper was recovered in fully-carbonized (potentially ancient) form. Juniper was also recovered in uncarbonized form. In the interest of caution, all juniper wood on the site is interpreted as potentially modern. Fragments of live oak leaves were also recovered in all three states of carbonization. Carbonized leaf fragments are generally too delicate to survive long in the soil, and their mere presence on the site suggests the oak leaves were recently burned.

Carbonized (ancient) plant remains. Density of wood charcoal and other plant remains was generally sparse (site mean = 0.09 g/cu.dm.), with only one flotation sample producing more than 20 wood charcoal fragments large enough to be snapped for identification (FS 58). Identification was attempted for 127 fragments, of which 104 could be identified to family, genus, or species. Six wood taxa were present: Plateau live oak, white group oak, juniper (potentially not ancient), acacia or mesquite, condalia (*Condalia* spp.), and a member of the legume family (Fabaceae). Oaks made up nearly three-quarters of the identified wood (n=75), with plateau live oak the most common type of oak identified (n=38). Oak wood charcoal was present in every sample. Juniper was the next most common type of wood identified (n=26), although all or some of the juniper may not be ancient. One fragment was recovered in Unit 1, but juniper was more common in Trenches 1 and 2, where it was present in six of seven samples.

Non-wood plant remains at Site 41CM412 include several plant parts that were mostly likely carbonized incidental to the burning of wood for fuel: gall, bud, bark, and leaves. None of the four seeds and seed fragments recovered were identifiable. Three nutshell fragments from Trench 2 Feature 1 could not be identified to genus, but they are Juglandaceae family, which includes hickory, walnut, and pecan. These nuts fall from the trees at maturity, meaning they do not remain attached to the woody branches that provide useful fuelwood. They are thus the most likely examples of plant food debris recovered on the site. Nutshell fragments were recovered only in Trench 2.

DISCUSSION

In central Texas, burned rock middens like the one at 41CM412 are debris fields from earth ovens that were frequently – but not always – used to cook plant foods (Thoms et al. 2018). Many bulbs, roots, and tubers are more palatable and nutritious after the long slow cooking that earth ovens provide (Wandsnider 1997). In central Texas, these include wild onions and garlic (*Allium* spp.), eastern camas (*Camassia scilloides*), and scurfpea (*Pediomelum* spp.). Other plant materials frequently associated wiht earth oven cooking include grass stems, grape leaves (*Vitis* spp.), and pricklypear pads (*Opuntia* spp.) that were used to provide moisture and insulate the food plants from the ash and charcoal in the fire. The absence of plants typically cooked or used as packing material in earth ovens at Site 41CM412 suggests either extremely successful cooking events in which no material was accidentally burned or the use of earth ovens for purposes other than plant processing (e.g., cooking animal foods)

The abundance of oak wood charcoal (*Quercus* spp.) is not surprising as oaks are abundant in the area and excellent fuel woods. The two common oaks of the area, live oak (*Quercus fusiformis*) and post oak (*Q. stellata*), have excellent coaling qualities and specific gravities of 0.88 and 0.67 respectively (Alden 1995:101). In general, the heat value of a wood is directly related to its specific gravity (Marcouiller and Anderson n.d.). Coaling properties, which are especially important in earth oven cooking, relate to the third stage of the burning process. After evaporation of within-cell moisture (first stage), wood is converted to charcoal (second stage, signified by flames). In the third stage, the glowing coals burn slowly, without flame, and can be left for hours without attention (Collier and Turner 1981, Marcouiller and Anderson n.d.). If the juniper wood recovered is indeed ancient, it could also have been useful in earth oven cooking. Softwoods such as juniper tend to ignite more easily than hardwoods (Collier and Turner 1981).

SUMMARY

Archaeological plant remains at Site 41CM412 consisted mostly of wood charcoal. The wood charcoal is interpreted as fuel wood, possibly associated with earth oven cooking. Other ancient plant remains (bark, bud, gall) are more likely to have been carbonized and preserved incidental to the burning of wood for fuel. Three nutshell fragments in Trench 2 may represent exploitation of local nut resources for food. The absence of plants typically cooked or used as packing material in earth ovens suggests either extremely successful cooking events in which no material was accidentally burned or the use of earth ovens for purposes other than plant processing (e.g., cooking animal foods).

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Figure 1: Chert flakes and shatter from Feature 1-2, Unit 1, TU 2, Level 4, 40-50 cmbd (FS 53)

Figure 2: Live oak (*Quercus fusiformis*) wood charcoal from Feature 1, Tr. 1, CS 4, Level 2, 20-30 cmd (FS 58)

Table 1: Samples for Radiocarbon Dating, Site 41CM412
October 2018
All material carbonized

FS	Unit	Feature	Level	Plant part	Botanical name	Common name	Number	Weight (g)	Comments
48	1	1	3	Wood	*Quercus* sect. *Quercus*	White group oak	1	0.01	1 ring
53.1	1	1-2	4	Wood	*Quercus* sp.	Oak	1	0.01	2 rings
53.2	1	1-2	4	Wood	*Quercus fusiformis*	Plateau live oak	1	0.03	
58	CS-4	1	2	Wood	*Quercus fusiformis*	Plateau live oak	1	0.22	6 rings, including outermost. Figure B.2
58	CS-4	1	2	Gall			1	0.01	
63	CS-4	1	3	Wood	*Quercus fusiformis*	Plateau live oak	1	0.01	1 ring
73	CS-1	1	2	Wood	*Senegalia/Prosopis* spp.	Acacia/Mesquite	1	0.01	
82	CS-1	1	3	Wood	Hardwood	Hardwood	4	0.01	
88	CS-5	1	2	Wood	*Juniperus* sp.*	Juniper	6	0.01	latewood fragments
88	CS-5	1	2	Nutshell	Juglandaceae	Hickory/walnut family	1	0.01	
90	CS-5	1	3	Nutshell	Juglandaceae	Hickory/walnut family	2	0.01	
92	CS-5		4	Wood	*Juniperus* sp.*	Juniper	1	0.01	

*No longer recommended for radiocarbon dating due to later discovery of semi-carbonized and uncarbonized juniper wood on the site.

Table B.2: Carbonized and Semi-carbonized Plant Remains from Flotation Samples, Site 41CM412
Number of Individual Specimens

FS	48	53.1	53.2	58	63
Unit	U 1	U 1	U 1	CS 4	CS 4
Trench	2	TU 2	TU 2	1	1
Feature	1	1-2	1-2	1	1
Level	3	4	4	2	3
Depth (cmbs)	30-40	40-50	40-50	20-30	30-40
Volume (cu. dm.)	1.65	11.6	10.2	1.6	1.25
Bark			1		
Bud					1
Gall				1	
Indeterminable				6	
Live oak leaf (*Quercus fusiformis*)*	3			3	2
Hickory/walnut/pecan nutshell (Juglandaceae)					
Seeds and seed fragments, indeterminable	2				
Wood charcoal					7
Acacia/mesquite (*Senegalia/Prosopis* spp.)					
Condalia *(Condalia* spp.)			1		
Legume family (Fabaceae)	1				
Hardwood	3	2	5		1
Juniper *(Juniperus* spp.)*	1			4	
Not examined for species				143	
Plateau live oak *(Quercus fusiformis*)	3	8	3	16	3
White group oak *(Quercus* sect. *Quercus)*	1				
Oak, unspecifiable *(Quercus* spp.)	5	11	7	1	3
Softwood					
Semi-carbonized plant material					
Pecan wood (*Carya illinoinensis*)					
Mulberry wood *(Morus* spp.)					
Juniper wood *(Juniperus* spp.)				1	
Live oak leaf (*Quercus fusiformis*)					

*potentially modern

Table B.2, cont'd: Carbonized and Semi-carbonized Plant Remains from Flotation Samples, Site 41CM412

Number of Individual Specimens

FS	73	82	88	90	92	
Unit	CS 1	CS 1	CS 5	CS 5	CS 5	
Trench	1	1	2	2	2	
Feature	1	1	1	1		
Level	2	3	2	3	4	Site
Depth (cmbs)	20-30	30-40	20-30	30-40	40-50	Total
Volume (cu. dm.)	1.45	2	1.3	1.3	1.35	33.7
Bark						1
Bud						1
Gall						1
Indeterminable						6
Live oak leaf (*Quercus fusiformis*)*			1	2		11
Hickory/walnut/pecan nutshell (Juglandaceae)			1	2		3
Seeds and seed fragments, indeterminable					2	4
Wood charcoal						
Acacia/mesquite (*Senegalia/Prosopis* spp.)	1					1
Condalia (*Condalia* spp.)						1
Legume family (Fabaceae)						1
Hardwood	1	7			2	21
Juniper (*Juniperus* spp.)*	1	1	10	5	4	26
Not examined for species						143
Plateau live oak (*Quercus fusiformis*)			3	2		38
White group oak (*Quercus* sect. *Quercus*)						1
Oak, unspecifiable (*Quercus* spp.)	2	3		2	2	36
Softwood				2		2
Semi-carbonized plant material						
Pecan (*Carya illinoinensis*) wood				2		
Mulberry (*Morus* spp.) wood			1			
Juniper (*Juniperus* spp.) wood						
Live oak (*Quercus fusiformis*) leaf fragment				1		

*potentially modern

Table B.3: Carbonized and Semi-carbonized Plant Remains from Flotation Samples, Site 41CM412
Weight in grams

FS	48	53.1	53.2	58	63
Unit	U 1	U 1	U 1	CS 4	CS 4
Trench	2	TU 2	TU 2	1	1
Feature	1	1-2	1-2	1	1
Level	3	4	4	2	3
Depth (cmbs)	30-40	40-50	40-50	20-30	30-40
Volume (cu. dm.)	1.65	11.6	10.2	1.6	1.25
Bark			0.01		
Bud					0.01
Gall				0.01	
Indeterminable				0.02	
Live oak leaf (*Quercus fusiformis*)*	0.01			0.01	0.01
Hickory/walnut/pecan nutshell (Juglandaceae)					
Seeds and seed fragments, indeterminable	0.02				
Wood charcoal					
Acacia/mesquite (*Senegalia/Prosopis* spp.)					
Condalia (*Condalia* spp.)			0.01		
Legume family (Fabaceae)	0.01				
Hardwood	0.01	0.01	0.02		0.01
Juniper (*Juniperus* spp.)*	0.01			0.02	
Not examined for species				1.81	
Plateau live oak (*Quercus fusiformis*)	0.01	0.04	0.04	0.38	0.02
White group oak (*Quercus* sect. *Quercus*)	0.01				
Oak, unspecifiable (*Quercus* spp.)	0.01	0.05	0.04	0.01	0.01
Softwood					
Semi-carbonized plant material					
Pecan wood (*Carya illinoinensis*)					
Mulberry wood (*Morus* spp.)					
Juniper wood (*Juniperus* spp.)				0.01	
Live oak leaf (*Quercus fusiformis*)					
Contamination > 2 mm	1.43	2.13	5.04	0.10	0.02
Examined residue < 2 mm	1.49	5.85	5.14	3.99	0.24

*potentially modern

Table B.3, cont'd.: Carbonized and Semi-carbonized Plant Remains from Flotation Samples, Site 41CM412
Weight in grams

FS	73	82	88	90	92	
Unit	CS 1	CS 1	CS 5	CS 5	CS 5	
Trench	1	1	2	2	2	
Feature	1	1	1	1		
Level	2	3	2	3	4	Site
Depth (cmbs)	20-30	30-40	20-30	30-40	40-50	Total
Volume (cu. dm.)	1.45	2	1.3	1.3	1.35	33.7
Bark						0.01
Bud						0.01
Gall						0.01
Indeterminable						0.02
Live oak leaf (*Quercus fusiformis*)*			0.01	0.01		0.05
Hickory/walnut/pecan nutshell (Juglandaceae)			0.01	0.01		0.02
Seeds and seed fragments, indeterminable					0.02	0.04
Wood charcoal						
Acacia/mesquite (*Senegalia/Prosopis* spp.)	0.01					0.01
Condalia *(Condalia* spp.)						0.01
Legume family (Fabaceae)						0.01
Hardwood	0.01	0.02			0.01	0.09
Juniper *(Juniperus* spp.)*	0.01	0.01	0.02	0.01	0.02	0.1
Not examined for species						1.81
Plateau live oak *(Quercus fusiformis*)			0.02	0.01		0.52
White group oak *(Quercus* sect. *Quercus)*						0.01
Oak, unspecifiable *(Quercus* spp.)	0.01	0.01		0.01	0.01	0.16
Softwood				0.01		0.01
Semi-carbonized plant material						
Pecan wood (*Carya illinoinensis*)				0.01		0.01
Mulberry wood *(Morus* spp.)			0.01			0.01
Juniper wood *(Juniperus* spp.)						0.01
Live oak leaf (*Quercus fusiformis*)				0.01		0.01
Contamination > 2 mm	0.02	0.42	0.04	0.03	0.03	9.26
Examined residue < 2 mm	0.29	0.28	0.38	0.36	0.17	18.19

*potentially modern

Table B.4: Uncarbonized Plant Remains from Flotation Samples, Site 41CM412
Roots not noted. All plant parts seeds unless otherwise indicated.

FS	48	53.1	53.2	58	63
Unit	U 1	U 1	U 1	CS 4	CS 4
Trench	2	TU 2	TU 2	1	1
Feature	1	1-2	1-2	1	1
Level	3	4	4	2	3
Depth (cmbs)	30-40	40-50	40-50	20-30	30-40
Volume (cu. dm.)	1.65	11.6	10.2	1.6	1.25
Sandmat *(Chamaesyce* sp.)	X	X	X	X	X
Live oak leaf fragment *(Quercus fusiformis*)	X	X	X		
Chenopodium *(Chenopodium* sp.)		X	X		
Flatsedge *(Cyperus* sp.)				X	
Mallow *(Malva* sp.)				X	X
Purslane *(Portulaca oleracea)*	X			X	
Onion bulblet *(Allium* sp.)	X				
Acorn cap fragment *(Quercus* sp.)	X				
Daisy family (Asteraceae)			X		
Caric sedge *(Carex* sp.)	X				
Hackberry *(Celtis* sp.)					
Mint family (Lamiaceae)					
Woodsorrell *(Oxalis* sp.)		X			
Dewberry *(Rubus* sp.)					
Bulrush *(Scirpus* sp., lenticular)	X				
Catchfly *(Silene* sp.)		X			
Greenbriar *(Smilax* sp.)					
Clover *(Trifolium* sp.)		X			
Vervain *(Verbena* sp.)					
Juniper wood *(Juniperus* sp.)					
Total taxa	7	6	4	4	2

Table B.4, cont'd.: Uncarbonized Plant Remains from Flotation Samples, Site 41CM412
Roots not noted. All plant parts seeds unless otherwise indicated.

FS	73	82	88	90	92	
Unit	CS 1	CS 1	CS 5	CS 5	CS 5	
Trench	1	1	2	2	2	
Feature	1	1	1	1	1	
Level	2	3	2	3	4	Site
Depth (cmbs)	20-30	30-40	20-30	30-40	40-50	Total
Volume (cu. dm.)	1.45	2	1.3	1.3	1.35	33.7
Sandmat (*Chamaesyce* sp.)	X	X	X		X	9
Live oak leaf fragment (*Quercus fusiformis*)						3
Chenopodium (*Chenopodium* sp.)					X	3
Flatsedge (*Cyperus* sp.)	X					2
Mallow (*Malva* sp.)						2
Purslane (*Portulaca oleracea*)						2
Onion bulblet (*Allium* sp.)						1
Acorn cap fragment (*Quercus* sp.)						1
Daisy family (Asteraceae)						1
Caric sedge (*Carex* sp.)						1
Hackberry (*Celtis* sp.)	X					1
Mint family (Lamiaceae)	X					1
Woodsorrell (*Oxalis* sp.)						1
Dewberry (*Rubus* sp.)	X					1
Bulrush (*Scirpus* sp., lenticular)						1
Catchfly (*Silene* sp.)						1
Greenbriar (*Smilax* sp.)	X					1
Clover (*Trifolium* sp.)						1
Vervain (*Verbena* sp.)	X					1
Juniper wood (*Juniperus* sp.)			X			1
Total taxa	7	1	2	0	2	35

APPENDIX F: RADIOCARBON DATING RESULTS

Report: **1530-034496-034505** 23 July 2019

Customer: 1530
Melanie Nichols
Pape-Dawson Engineers
10801 N MoPac Expy. Bldg. 3
Suite 200
Austin,TX 78759
USA

Samples submitted for radiocarbon dating have been processed and measured by AMS. The following results were obtained:

DirectAMS code	Submitter ID	Sample type	Fraction of modern		Radiocarbon age	
			pMC	1σ error	BP	1σ error
D-AMS 034496	FS# 48	wood charcoal	insufficient material for analysis			
D-AMS 034497	FS# 53a	wood charcoal	60.59	0.25	4025	33
D-AMS 034498	FS# 53b	wood charcoal	63.69	0.24	3624	30
D-AMS 034499	FS# 58a	carbonized gall	111.22	0.34	Modern	
D-AMS 034500	FS# 58b	wood charcoal	100.06	0.33	Modern	
D-AMS 034501	FS# 63	wood charcoal	68.69	0.27	3017	32
D-AMS 034502	FS# 73	wood charcoal	51.90	0.21	5268	33
D-AMS 034503	FS# 82	wood charcoal	68.13	0.24	3083	28
D-AMS 034504	FS# 88	carbonized nutshell	insufficient material for analysis			
D-AMS 034505	FS# 90	carbonized nutshell	105.09	0.33	Modern	

Results are presented in units of percent modern carbon (pMC) and the uncalibrated radiocarbon age before present (BP). All results have been corrected for isotopic fractionation with an unreported $\delta^{13}C$ value measured on the prepared carbon by the accelerator. The pMC reported requires no further correction for fractionation.

```
FS# 53a
D-AMS 034497
Radiocarbon Age 4025±33
Calibration data set: intcal13.14c
# Reimer et al. 2013
One Sigma Ranges: [start:end] relative area
                  [cal BC 2576: cal BC 2548] 0.347678
                  [cal BC 2539: cal BC 2489] 0.652322
Two Sigma Ranges: [start:end] relative area
                  [cal BC 2623: cal BC 2471] 1.
```

2-sig: E.A into beginning of M.A.

```
D-AMS 034498
FS# 53b
Radiocarbon Age 3624±30
Calibration data set: intcal13.14c
# Reimer et al. 2013
One Sigma Ranges: [start:end] relative area
                  [cal BC 2026: cal BC 1947] 1.
Two Sigma Ranges: [start:end] relative area
                  [cal BC 2120: cal BC 2095] 0.055996
                  [cal BC 2041: cal BC 1897] 0.944004
```

M.A.

```
D-AMS 034501
FS# 63
Radiocarbon Age 3017±32
Calibration data set: intcal13.14c
# Reimer et al. 2013
One Sigma Ranges: [start:end] relative area
                  [cal BC 1372: cal BC 1358] 0.095188
                  [cal BC 1299: cal BC 1214] 0.904812
Two Sigma Ranges: [start:end] relative area
                  [cal BC 1390: cal BC 1337] 0.181745
                  [cal BC 1321: cal BC 1189] 0.756818
                  [cal BC 1180: cal BC 1159] 0.030968
                  [cal BC 1145: cal BC 1130] 0.030469
```

M.A.

```
D-AMS 034502
FS# 73
Radiocarbon Age 5268±33
Calibration data set: intcal13.14c
# Reimer et al. 2013
One Sigma Ranges: [start:end] relative area
                  [cal BC 4225: cal BC 4205] 0.166257
                  [cal BC 4164: cal BC 4129] 0.293724
                  [cal BC 4113: cal BC 4100] 0.07963
                  [cal BC 4074: cal BC 4038] 0.304552
                  [cal BC 4018: cal BC 3998] 0.155837
Two Sigma Ranges: [start:end] relative area
                  [cal BC 4230: cal BC 4195] 0.158438
                  [cal BC 4175: cal BC 3988] 0.841562
```

E.A.

```
D-AMS 034503
FS# 82
Radiocarbon Age 3083±28
Calibration data set: intcal13.14c
# Reimer et al. 2013
One Sigma Ranges: [start:end] relative area
                  [cal BC 1404: cal BC 1373] 0.341865
                  [cal BC 1356: cal BC 1301] 0.658135
Two Sigma Ranges: [start:end] relative area
                  [cal BC 1417: cal BC 1271] 1.
```

M.A.

APPENDIX G: MAGNETIC SUSCEPTIBILITY ANALYSIS

Geoarchaeological Assessment of 41CM412

Charles D. Frederick

Introduction

Located high in the landscape on the eastern edge of the Edwards Plateau, the site is within the Balcones Fault Zone, a landscape riddled by numerous, relatively closely spaced echelon normal faults (Abbott and Woodruff 1986). The geological map of the terrain immediately around the site is reminiscent of a mosaic, with deposits of different age jumbled together and bounded by abrupt broken edges. Originally mapped by the Bureau of Economic Geology (1982) and more recently by Collins (2000), the area of investigation lies between two roughly parallel east-west oriented faults that are separated by about 200 m. The area between these two faults is today semi-forested and is underlain by wedge of the Buda Formation, whereas the cleared land immediately north and south of the faults are underlain by the Del Rio Formation. The Buda Formation is a hard, porcelaneous limestone that is generally resistant to weathering. The Del Rio Formation, on the other hand, is a relatively erodible fossiliferous, calcareous clay, claystone, and mudstone with minor amounts of pyrite and its weathering by-product, gypsum.

The Del Rio clay is considerably more erodible than the Buda limestone, and is also more suited to agriculture, and both attributes can be seen in aspects of the topography and land use in the immediate vicinity of the site. The site occupies an east-west oriented ridge, which is bounded by the two aforementioned faults, with the outcrop of the harder Buda Formation standing slightly higher (10 to 20 feet) than the outcrop of the Del Rio Formation bordering it. In a similar fashion, the thin, stony soils formed on the hard Buda Formation are less favorable to agriculture and more suited to ranching than the deeper clayey soils formed on the Del Rio Formation. In the immediate vicinity of the site the Buda Formation outcrops have been cleared and cultivated, whereas the Buda outcrop remains partially forested.

Although it does not occur on the site, the outcrop of the Edwards Group limestone, known for the high quality chert that it contains, lies a short distance (about 1 km) to the west of the site.

Soils

As noted elsewhere in the report, the soil mapped at the site by the Natural Resources Conservation Service is the Medlin-Eckrant Association. The Medlin series soils (NCSS 2020a) are classified as fine, smectitic, thermic Chromic Udic Haplusterts that typically exhibit A-Bkss-C profiles. The Eckrant soils (NCSS 2020b), on the other hand, exhibit A-R profiles where the A horizon is typically a 30 cm of black clay resting on indurated limestone. These clayey-skeletal, smectitic, thermic Lithic Haplstolls are commonly formed on hard indurated limestone.

Methods

In the field the profiles of Trenches 1 and 2 were inspected, cleaned with a trowel, and then two profiles, designated profiles 1 and 2, were described and sampled. Both profiles were situated on the west wall of Trench 2. Profile 1 was located about 10 m north of the intersection of the two trenches, whereas Profile 2 was located about a meter north of the trench junction. Description of these profiles (Tables 1 and 2) generally followed the procedures outlined in Schoeneberger et al, (2012). From each profile a suite of small samples was collected in plastic 2.5 cm (1 inch) paleomagnetic sample boxes at approximately 5 cm intervals. These samples were intended for measuring the magnetic susceptibility of the deposits, but a variety of analyses can be performed on samples of this type.

In addition to these two profiles, the soils exposed by the two trenches were logged and sketched and then and a bulk sample of about 500 grams was collected from a depth of 20 cm every 2 m. These samples were also intended for magnetic susceptibility analysis in order to provide an independent assessment of where anthropogenic enrichment of the soils may have occurred during prehistoric occupation of the site.

Magnetic susceptibility is a general measure of the degree to which a sample may be magnetized, and provides basic information on the magnetic mineralogy of the sample, which may vary owing to a variety of factors, such as depositional processes, soil development, and human occupation. The application of magnetic susceptibility in archeological studies has been discussed in detail by Dalan (2008) and Dalan and Bannerjee (1998). In this particular situation, it is the kindling of fires and the use of rock for cooking that is anticipated to have resulted in magnetic susceptibility enhancement of the soil. In the lab, the plastic cube samples were first weighed, and then the low frequency (470 Hz) magnetic susceptibility (kappa) was measured for on the 0.1 setting on a Bartington MS2 meter and an MS2b sensor (Gale and Hoare 1991). The mass corrected magnetic susceptibility (χ_{lf}) was then calculated, and the results are reported in SI units ($10^{-8}m^3kg^{-1}$) on Tables 3 and 4.

Observations

The generally non-fossiliferous nature of the rock exposed at the site and the presence of hard limestone are consistent with Collins (2000) map that identifies the bedrock here as the Buda Formation. The soils exposed by the two trenches have formed largely from the weathering of limestone and minor slope re-deposition of this material. Two basic profiles were noted which are in line with the soils mapped here by the NRCS. Where harder limestone beds are present the soil consist largely of an A horizon of black clay to silty clay resting directly on limestone (an A-R soil profile) which is consistent with descriptions of the Eckrant Series soils. Laterally, these relatively simple profiles gradually shift to slightly more complex soils that resemble the Medlin series soils in that they exhibit a B-horizon separating the topsoil and the bedrock. In most cases the B-horizon was a calcic horizon, but in some places it appeared more like a cambic horizon. In all cases it was slightly redder or rubified as compared to the topsoil.

In reality, these two soil types generally graded from one to the other, in what in what is typically referred to as a catena. The best example of this was observed in Trench 2 where a ridge of harder limestone crossed the north end of the trench at a near 90˚ angle (top left part of Figure 3, between 10 and 20 meters north of Trench 1). On the upslope side of this bedrock ridge (left side of Figure 1) the soil exhibits an A-Bk-R profile. But moving downslope (to the right on Figure 1) the B-horizon pinches out against the rising bedrock leaving a profile where the topsoil or A horizon rests directly upon the bedrock. The cause of this profile is difficult to discern with certainty. It is possible that overland flow moving downslope was partially blocked by the bedrock in the place resulting in deeper weathering and a more differentiated soil profile upslope. Alternatively, it is also possible that the B-horizon exhibited upslope once covered this bedrock rise but was subsequently truncated by soil erosion.

Figure 1. An example of the soil catena exposed by Trenches 1 and 2 at 41CM412. Here the B-horizon upslope of the bedrock high exposed along the west wall of Trench 2 can be seen pinching out against the bedrock.

The archeological work on the site was focused on what was thought to be one or more burned rock middens that had been discovered by shovel testing. The trench profiles did not reveal exposures typical of a burned rock midden, in that they did not consist of a clast (or rock) supported deposit dominated by burned rock with minor amounts of black clayey fine-grained matrix between the rocks. Instead the soils were dominated by fine-earth and exhibited somewhat dispersed, usually matrix-supported concentrations of cultural material. Figure 2 shows a photograph of Profiles 1 and 2, both of which exhibit typical expressions of the burned rocks observed in the trench walls. Small, somewhat discrete concentrations of burned rock as well as isolated fragments of burned rock and debitage are present in these profiles at depths ranging from 10 to 50 cm. Some of these were found in the A horizon, whereas others extended into the calcic soil horizon (Bk horizon). This presentation is more consistent with discrete features, which may have been repeatedly used, but were not used enough to create a classic burned rock midden.

The process responsible for burial of the cultural material is most likely a combination of internal re-organization by soil meso-fauna such as ants and worms that deposit (or exhume) soil on the surface that was excavated underground (a process also known as bioexhumation), and slope wash. Bioexhumation is a slow, continuous process, and it typically makes loose soil available to wash downslope during rain events when there is overland flow so it can accentuate the downslope transport of soil. The location of the site on the top of a ridge is an unlikely setting for depositional stratification, but to test this idea soil samples from the two columns were analyzed for their depth variation in magnetic susceptibility. Natural processes result in topsoils having elevated values of magnetic susceptibility, but prehistoric occupation surfaces, especially those where there was an abundance of thermal refuse, may also exhibit a similar enhancement. Buried occupations in aggrading environments may present as discrete zones of elevated magnetic susceptibility. Figure 3 presents the result of the profile sample columns. Both profiles exhibit small peaks at the same depth as the burned rock concentrations visible of the profile photos, and it is possible that these are attributable to concentrations of thermal refuse at these depths. Profile 1 exhibits very high values of magnetic susceptibility in the top 10 cm, more than twice what is typically observed in prehistoric deposits and/or natural topsoils in this landscape, and this is most likely attributable to ferrous metal associated with the historic occupation on the site. The general trend in both profiles suggests that pedogenesis, not human activity has had the greatest effect on the magnetic properties of these soils, with the top 10 cm of Profile1 an obvious exception.

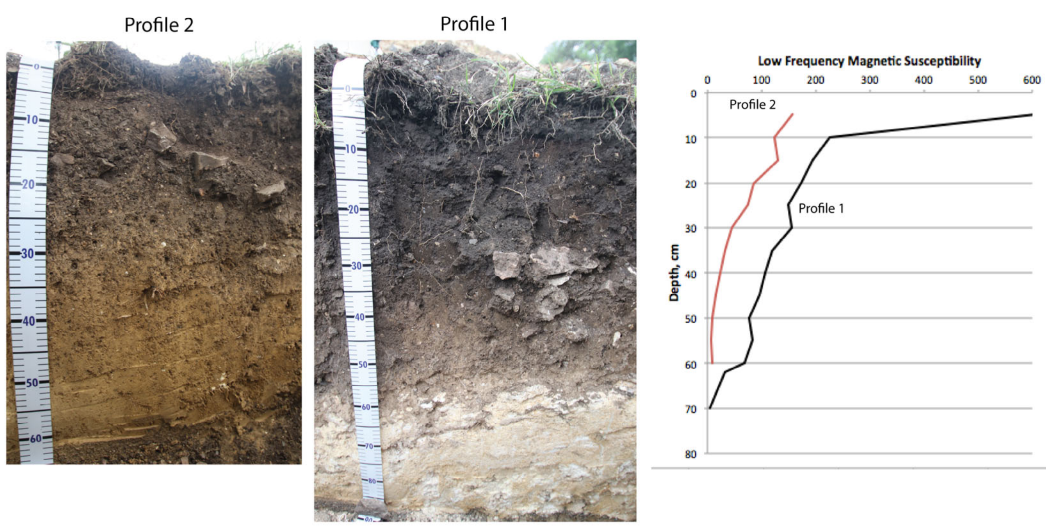

Figure 2. Left and Center: Photographs of Profiles 2 and 1. All of the angular rock visible in these photos above 50 cm is burned rock. Right: Plot of the low frequency magnetic susceptibility for samples collected from the two profiles shown at left. The extremely high values in the top 10 cm of Profile 1 are most likely due to Historic activity.

Working under the assumption that some locations saw greater amounts of prehistoric human activity than others a spatial sample of magnetic susceptibility samples was collected from the trench walls. One sample was collected every 2 m at depth of 20 cm, with the hope that this would avoid historic metal if it was present. Assessing what values of magnetic susceptibility represent enhancement is subjective, and in this case values in excess of 100 were considered high. Figure 3 plots the spatial variation in magnetic susceptibility along the two trenches. Trench 1 shows three relatively discrete areas of possible enhancement, where almost all of Trench 2 exhibits elevated values. Given the exceptionally high values in profile 1, it is possible that the values in this trench are in part due to historic activities. Ideally the magnetic susceptibility results would be compared with excavation data to see if the inferred correlation has explanatory value, but those data were not available when this report was written. Alternatively, the prehistoric cultural material in the bulk samples could be tallied and presented as a density to achieve the same goal.

Regardless, the magnetic susceptibility data, especially from Trench 1, and the general presentation of prehistoric cultural material in the trench walls, suggests that these are not typical burned rock middens, but palimpsest occupations with spatially variable discrete cooking areas used at different times, that were not used repeatedly enough to develop into classic burned rock middens. The site setting, a dominantly erosional upland, is typical of one where the occupational debris from multiple occupations become comingled. It is expected that the site may exhibit some semblance of stratigraphic integrity if the burial of the cultural material has been accomplished by small animals incapable of moving the artifacts. However, thin stony soils such as these a re highly susceptible to processes such as the wind throw, whereby wind topples trees that have shallow root systems. If this has occurred it would generally destroy or homogenize the affected deposits.

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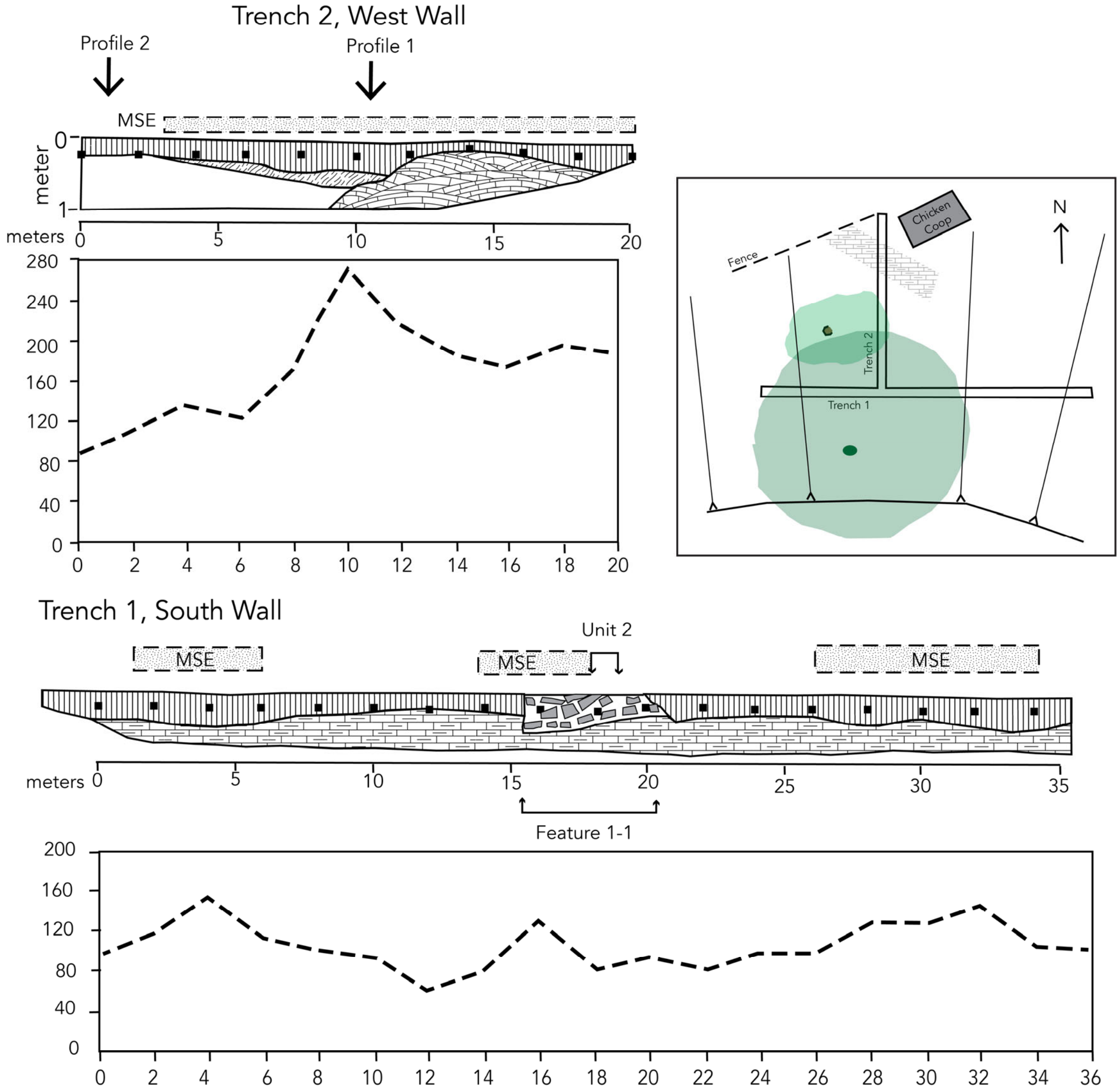

Figure 3. *Top right*: Sketch map showing the relative locations of the two trenches, the general slope at the site. *Top Left*: Sketch profile of the west wall of Trench 2 showing the top soil (the vertical hatch) the B horizon (the diagonal hatch) and the ridge of hard limestone (between 10-20 m, base of profile). The black squares represent the samples collected for magnetic susceptibility. Immediately below this is a plot of the variation in magnetic susceptibility along this trench. The stippled dashed line bordered bar above the stratigraphic sketch is denotes the portion of the profile that exhibits magnetic susceptibility enhancement. *Bottom Half*: Sketch profile of the south wall of Trench 1 and delineating the areas of probable magnetic susceptibility enhancement.

Table 1. Description of Profile 1

Zone	Depth	Horizon	Description
1	0-35	A	Black (10YR 2/1, m) silty clay to clay, firm, moderate medium to fine subangular blocky structure, gradual smooth boundary, 1% to 5% coarse fragments.
2	35-52	AB	Very dark grayish brown (10YR 3/2, m) silty clay, friable, weak to moderate medium subangular blocky structure parting to moderate fine crumb structure, clear smooth boundary, 5% coarse fragments.
3	52-67	Bk	Brown (7.5YR 5/3, m) silt loam, friable, moderate fine subangular blocky structure parting to moderate fine granular structure, many (15-20%) calcium carbonate filaments, 1% to 3% coarse fragments.
4	67-90	Bk/R	Yellowish brown (10YR 5/6, m) and white (10YR 8/1, m) limestone, friable, weak very coarse platy structure, rotted bedrock with traces of bedding.

Table 2. Description of Profile 2

Zone	Depth	Horizon	Description
1	0-20	A	Black (10YR 2/1, m), silty clay, friable, moderate fine subangular blocky structure parting to strong very fine granular structure, clear smooth boundary, ~5% coarse fragments, artifacts are present throughout the zone.
2	20-30	AB	Brown (10YR 4/3, m) silty clay, friable, moderate to weak coarse to medium subangular blocky structure, gradual smooth boundary, 5% coarse fragments, many worm passage features.
3	30-65	Bk	Yellowish brown (10YR 5/6, m) silty clay, friable, massive to weak coarse subangular blocky structure, few to common coarse prominent irregular calcium carbonate nodules.

Table 3. Magnetic Susceptibility Results from Profiles 1 and 2

Sample Number	**Profile**	**Plot Depth**	χ_{LF}
			(10^{-8} m^3 kg^{-1})
1	1	5	608.0
2	1	10	225.6
3	1	15	194.1
4	1	20	172.6
5	1	25	148.7
6	1	30	154.8
7	1	35	120.4
8	1	40	105.8
9	1	45	96.8
10	1	50	77.5
11	1	55	83.5
12	1	60	68.9
13	1	62	32.9
14	1	70	4.4
1	2	5	157.0
2	2	10	123.5
3	2	15	130.2
4	2	20	86.3
5	2	25	75.4
6	2	30	45.4
7	2	35	31.8
8	2	40	22.9
9	2	45	14.5
10	2	50	9.6
11	2	55	7.5
12	2	60	7.9

Table 4. Magnetic Susceptibility Results from Spatial Samples Along Trenches 1 & 2.

Sample No.	**Trench**	**Lateral Distance**	χ_{LF}
			(10^{-8} m^3 kg^{-1})
1	1	0	97.5
2	1	2	119.5
3	1	4	154.9
4	1	6	113.6
5	1	8	102.2
6	1	10	93.6
7	1	12	60.8
8	1	14	82.1
9	1	16	131.8
10	1	18	82.2
11	1	20	94.1
12	1	22	81.8
13	1	24	102.4
14	1	26	99.2
15	1	28	130.7
16	1	30	128.9
17	1	32	145.4
18	1	34	104.5
19	1	36	103.5
20	2	0	87.2
21	2	2	110.6
22	2	4	135.8
23	2	6	123.7
24	2	8	175.3
25	2	10	270.0
26	2	12	213.9
27	2	14	184.3
28	2	16	172.9
29	2	18	194.7
30	2	20	186.8

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APPENDIX H: AGENCY CORRESPONDENCE

TEXAS HISTORICAL COMMISSION
real places telling real stories

March 9, 2018

Melanie Nichols
Pape-Dawson Engineers
10801 North Mopac Expressway
Building 3, Suite 200
Austin, TX 78759

Re: Project review under the Antiquities Code of Texas
Data Recovery at Site 41CM412, Comal ISD, Comal County, Texas
Texas Antiquities Permit Application **#8361**

Dear Colleague:

Thank you for your Antiquities Permit Application for the above referenced project. This letter presents the final copy of the permit from the Executive Director of the Texas Historical Commission (THC), the state agency responsible for administering the Antiquities Code of Texas.

Please keep this copy for your records. The Antiquities Permit investigations requires the production and submittal of one printed copy of the final report, a completed abstract form submitted via our online system, two copies of the tagged PDF final report on CD (one with site location information & one without), and verification that any artifacts recovered and records produced during the investigations are curated at the repository listed in the permit. The abstract form maybe submitted via the THC website (www.thc.state.tx.us) or use url: http://xapps.thc.state.tx.us/Abstract/login.aspx Additionally, you must send the THC shapefiles showing the boundaries of the project area *and* the areas actually surveyed via email to archeological_projects@thc.texas.gov.

If you have any questions concerning this permit or if we can be of further assistance, please contact Lillie Thompson at 512/463-1858. The reviewer for this project is Jeff Durst, 512/463-6096.

Sincerely,

for
Mark Wolfe
Executive Director

MW/lft

Enclosures

Cc: Michael McCullar, Comal ISD

State of Texas

TEXAS ANTIQUITIES COMMITTEE

ARCHEOLOGY PERMIT # 8361

This permit is issued by the Texas Historical Commission, hereafter referred to as the Commission, represented herein by and through its duly authorized and empowered representatives. The Commission, under authority of the Texas Natural Resources Code, Title 9, Chapter 191, and subject to the conditions hereinafter set forth, grants this permit for:

Data Recovery

To be performed on a potential or designated landmark or other public land known as:

Title: ***Data Recovery at Site 41CM412, Comal ISD***

County: ***Comal***

Location: ***North of intersection of FM 3009 and Schoenthal Road in Comal County.***

Owned or Controlled by: (hereafter known as the Permittee):

Comal Independent School District
1404 IH 35 North
New Braunfels, TX 78130

Sponsored by (hereafter known as the Sponsor

Comal Independent School District
1404 IH 35 North
New Braunfels, TX 78130

The Principal Investigator/Investigation Firm representing the Owner or Sponsor is:

Melanie Nichols
Pape-Dawson Engineers
10801 North Mopac Expressway, Building 3, Ste. 200
Austin, TX 78759

This permit is to be in effect for a period of:

4 Years and 0 Months

and Will Expire on:

03/06/2022

During the preservation, analysis, and preparation of a final report or until further notice by the Commission, artifacts, field notes, and other data gathered during the investigation will be kept temporarily at:

Pape-Dawson, Austin

Upon completion of the final permit report, the same artifacts, field notes, and other data will be placed in a permanent curatorial repository at:

University of Texas at San Antonio, CAR

Scope of Work under this permit shall consist of:

Data recovery at 41CM412. For details, see research design submitted with permit application.

Karissa Basse @PD

From: Jeff Durst <Jeff.Durst@thc.texas.gov>
Sent: Friday, April 13, 2018 11:02 AM
To: Melanie Nichols @PD
Subject: RE: Data Recovery at Site 41CM412 (TAC Permit 8361)

Hi Melanie,
Thank you for inviting me out the site. The level of field work at the site was very satisfactory and the project may proceed. The requirements that you mention are the requirements necessary to satisfy the obligations of the permit.
Best,
Jeff

Jeff Durst
South Texas Regional Archeologist/
Project Reviewer
Archeology Division
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711-2276
P. 512-463-8884
F. 512-463-8927

From: Melanie Nichols @PD [mailto:MNichols@pape-dawson.com]
Sent: Friday, April 13, 2018 10:32 AM
To: Jeff Durst
Subject: Data Recovery at Site 41CM412 (TAC Permit 8361)

Hi Jeff,

I wanted to thank you for making the time to come out and visit our site last Tuesday. I also wanted to follow up with our conversation and make sure we are on the same page before moving forward. It is my understanding that you are satisfied with the level of field work for our data recovery effort at site 41CM412; and therefore, construction at the site may proceed. However, it is also my understanding that Pape-Dawson is still required to prepare a report of our findings, submit our records and artifacts for curation, and provide a public outreach component as outlined in the research disign in order to fulfill the obligations of our permit (#8361). Please let me know if I have misunderstood anything.

Thanks!
Mel

Melanie Nichols | **Principal Investigator II**
Pape-Dawson Engineers, Inc.
TBPE Firm Registration #470 | TBPLS Firm Registration #10028801

10801 North Mopac Expressway, Building 3 - Suite 200, Austin, TX 78759
P: 512.454.8711 | **E:** MNichols@pape-dawson.com

State of Texas

TEXAS ANTIQUITIES COMMITTEE

ARCHEOLOGY PERMIT # 8361 (TRANSFERRED)

This permit is issued by the Texas Historical Commission, hereafter referred to as the Commission, represented herein by and through its duly authorized and empowered representatives. The Commission, under authority of the Texas Natural Resources Code, Title 9, Chapter 191, and subject to the conditions hereinafter set forth, grants this permit for:

Data Recovery

To be performed on a potential or designated landmark or other public land known as:

Title: ***Data Recovery at Site 41CM412, Comal ISD***

County: ***Comal***

Location: ***North of intersection of FM 3009 and Schoenthal Road in Comal County.***

Owned or Controlled by: (hereafter known as the Permittee):

Comal Independent School District
1404 IH 35 North
New Braunfels, TX 78130

Sponsored by (hereafter known as the Sponsor

Comal Independent School District
1404 IH 35 North
New Braunfels, TX 78130

The Principal Investigator/Investigation Firm representing the Owner or Sponsor is:

Karissa Basse
Pape-Dawson Engineers
10801 N MoPac Expy Bldg 3 Suite 200
Austin, TX 78759

This permit is to be in effect for a period of:

4 Years and 0 Months

and Will Expire on:

03/06/2022

During the preservation, analysis, and preparation of a final report or until further notice by the Commission, artifacts, field notes, and other data gathered during the investigation will be kept temporarily at:

Pape-Dawson, Austin

Upon completion of the final permit report, the same artifacts, field notes, and other data will be placed in a permanent curatorial repository at:

University of Texas at San Antonio, CAR

Scope of Work under this permit shall consist of:

Data recovery at 41CM412. For details, see research design submitted with permit application.

ARCHEOLOGY PERMIT # 8361 (TRANSFERRED)

This permit is granted on the following terms and conditions:

1) This project must be carried out in such a manner that the maximum amount of historic, scientific, archeological, and educational information will be recovered and preserved and must include the scientific, techniques for recovery, recording, preservation and analysis commonly used in archeological investigations. All survey level investigations must follow the state survey standards and the THC survey requirements established with the projects sponsor(s).

2) The Principal Investigator/Investigation Firm, serving for the Owner/Permittee and/or the Project Sponsor, is responsible for insuring that specimens, samples, artifacts, materials and records that are collected as a result of this permit are appropriately cleaned, and cataloged for curation. These tasks will be accomplished at no charge to the Commission, and all specimens, artifacts, materials, samples, and original field notes, maps, drawings, and photographs resulting from the investigations remain the property of the State of Texas, or its political subdivision, and must be curated at a certified repository. Verification of curation by the repository is also required, and duplicate copies of any requested records shall be furnished to the Commission before any permit will be considered complete.

3) The Principal Investigator/Investigation Firm serving for the Owner/Permittee, and/or the Project Sponsor is responsible for the publication of results of the investigations in a thorough technical report containing relevant descriptions, maps, documents, drawings, and photographs. A draft copy of the report must be submitted to the Commission for review and approval. Any changes to the draft report requested by the Commission must be made or addressed in the report, or under separate written response to the Commission. Once a draft has been approved by the Commission, one (1) printed, unbound copy of the final report containing at least one map with the plotted location of any and all sites recorded and two copies of the report in tagged PDF format on an archival quality CD or DVD shall be furnished to the commission. One copy must include the plotted location of any and all sites recorded and the other should not include the site location data. A paper copy and an electronic copy of the completed Abstracts in Texas Contract Archeology Summary Form must also be submitted with the final report to the Commission. (Printed copies of forms are available from the Commission or also online at www.thc.state.tx.us.)

4) If the Owner/Permittee, Project Sponsor or Principal Investigator/Investigation Firm fails to comply with any of the Commission's Rules of Practice and Procedure or with any of the specific terms of this permit, or fails to properly conduct or complete this project within the allotted time, the permit will fall into default status. A notification of Default status shall be sent to the Principal Investigator/Investigation Firm, and the Principal Investigator will not be eligible to be issued any new permits until such time that the conditions of this permit are complete or, if applicable, extended.

5) The Owner/Permittee, Project Sponsor, and Principal Investigator/Investigation Firm, in the conduct of the activities hereby authorizes, must comply with all laws, ordinances and regulations of the State of Texas and of its political subdivisions including, but not limited to, the Antiquities Code of Texas; they must conduct the investigation in such a manner as to afford protection to the rights of any and all lessees or easement holders or other persons having an interest in the property and they must return the property to its original condition insofar as possible, to leave it in a state which will not create hazard to life nor contribute to the deterioration of the site or adjacent lands by natural forces.

6) Any duly authorized and empowered representative of the Commission may, at any time, visit the site to inspect the fieldwork as well as the field records, materials, and specimens being recovered.

7) For reasons of site security associated with historical resources, the Project Sponsor (if not the Owner/Permittee), Principal Investigator, Owner, and Investigation Firm shall not issue any press releases, or divulge to the news media, either directly or indirectly, information regarding the specific location of, or other information that might endanger those resources, or their associated artifacts without first consulting with the Commission, and the State agency or political subdivision of the State that owns or controls the land where the resource has been discovered.

8) This permit may not be assigned by the Principal Investigator/Investigation Firm, Owner/Permittee, or Project Sponsor in whole, or in part to any other individual, organization, or corporation not specifically mentioned in this permit without the written consent of the Commission.

9) Hold Harmless: The Owner/Permittee hereby expressly releases the State and agrees that Owner/Permittee will hold harmless, indemnify, and defend (including reasonable attorney's fees and cost of litigation) the State, its officers, agents, and employees in their official and/or individual capacities from every liability, loss, or claim for damages to persons or property, direct or indirect of whatsoever nature arising out of, or in any way connected with, any of the activities covered under this permit.The provisions of this paragraph are solely for the benefit of the State and the Texas Historical Commission and are not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

10) Addendum: The Owner/Permittee, Project Sponsor and Principal Investigator/Investigation Firm must abide by any addenda hereto attached.

Upon a finding that it is in the best interest of the State, this permit is issued on 03/06/2018.

Brad Jones,
Archeology Division Director

Mark Wolfe,
Executive Director

Begin forwarded message:

From: noreply@thc.state.tx.us
Date: October 23, 2020 at 12:07:58 PM CDT
To: zoverfield@pape-dawson.com, reviews@thc.state.tx.us
Subject: Project Review: 202100981

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
Permit 8361
THC Tracking #202100981
Data Recovery at Site 41CM412, Comal ISD
23255 FM 3009
San Antonio,TX 78266

Description: Pape-Dawson performed a data recovery at an SAL-eligible burned rock midden within site 41CM412 as impacts could not be avoided during construction of the Comal ISD HS #4. No further work recommended

Dear Zachary M. Overfield:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the Executive Director of the Texas Historical Commission (THC), pursuant to review under the Antiquities Code of Texas.

The review staff led by Jeff Durst has completed its review and has made the following determinations based on the information submitted for review:

Archeology Comments

- THC/SHPO concurs with information provided.
- This draft report is acceptable. Please submit a final report: one restricted version with any site location information (if applicable), and one public version with all site location information redacted. To complete the Texas Antiquities Permit, submit an abstract online at http://xapps.thc.state.tx.us/Abstract and ensure a curation form has been forwarded to the agency. Archeological project area shapefiles are due with the submittal of the draft report; if this has not occurred, email them to Archeological_projects@thc.texas.gov.

We have the following comments: THC concurs that mitigation of the site is complete and no further work is required.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: Jeff.Durst@thc.texas.gov

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

For Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.