Volume 2002 Article 24

2-2002

Archeological Impact Evaluations and Surveys in the Texas Department of Transportation's Bryan, Corpus Christi, San Antonio, and Yoakum Districts, 2000-2001

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Cite this Record

Fields, Ross C.; Kibler, Karl W.; Gadus, E. Frances; and Holmes, Amy M. (2002) "Archeological Impact Evaluations and Surveys in the Texas Department of Transportation's Bryan, Corpus Christi, San Antonio, and Yoakum Districts, 2000-2001," *Index of Texas Archaeology: Open Access Gray Literature from the Lone Star State*: Vol. 2002, Article 24. https://doi.org/10.21112/ita.2002.1.24
ISSN: 2475-9333
Available at: https://scholarworks.sfasu.edu/ita/vol2002/iss1/24

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by

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REPORTS OF INVESTIGATIONS, NUMBER 133

Prewitt and Associates, Inc.
Cultural Resources Services
Austin, Texas

ARCHEOLOGICAL STUDIES PROGRAM, REPORT NO. 35

Texas Department of Transportation
Environmental Affairs Division

February 2002

Texas Department of Transportation

TEXAS ANTIQUITIES COMMITTEE ARCHEOLOGY PERMIT NO. 2339

ARCHEOLOGICAL IMPACT EVALUATIONS AND SURVEYS IN THE TEXAS DEPARTMENT OF TRANSPORTATION'S BRYAN, CORPUS CHRISTI, SAN ANTONIO, AND YOAKUM DISTRICTS, 2001–2002

Printed by TxDOT, Austin, Texas
On acid-free, 60 lb. paper
January 2002

jointly published by the

Texas Department of Transportation
Environmental Affairs Division
Archeological Studies Program
Nancy A. Kenmotsu, Ph.D., Supervisor

Archeological Studies Program Report No. 35
A. McGraw, Series Editor

and

Prewitt and Associates, Inc.
Cultural Resources Services
Austin, Texas
Reports of Investigations, No. 133

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ABSTRACT

This document constitutes the final report of work done by Prewitt and Associates, Inc. (PAI), under a contract from the Texas Department of Transportation (TxDOT) to provide archeological services in four TxDOT districts—Bryan, Corpus Christi, San Antonio, and Yoakum—in east-central and south-central Texas. Under this contract, PAI completed Impact Evaluations and Surveys to assist TxDOT in meeting the requirements of their Memorandum of Understanding with the Texas Historical Commission and a Programmatic Agreement between the Advisory Council on Historic Preservation, the Federal Highway Administration, the Texas Historical Commission, and TxDOT. The contract began on 8 February 2000 and concluded on 8 February 2002. During these two years, 46 work orders were completed.

The 46 work orders consisted of 71 Impact Evaluations, 20 Surveys, 5 Surveys with Geoarcheological Evaluations, and 1 work order to produce this report. Combined, these work orders entailed efforts at 58 bridge replacements, 16 projects involving primarily road widening or realignment, and 1 project consisting of creation of a wetland mitigation area. During completion of these work orders, five newly discovered or previously recorded archeological sites were investigated.

Fifteen of the Impact Evaluations led to a recommendation that an archeological survey be completed before construction. The remaining 56 Impact Evaluations resulted in a recommendation that no survey be required based on the extent of disturbance and the limited potential for sites with good integrity. Three of the Surveys investigated sites that were recommended for testing to assess eligibility for listing in the National Register of Historic Places and designation as State Archeological Landmarks. The other 22 Surveys either did not find any archeological sites or investigated sites that could be assessed as ineligible for National Register listing and State Archeological Landmark designation using the survey data.

ACKNOWLEDGMENTS

A number of people contributed to the successful completion of this project. Al McGraw managed the contract for the Archeology Studies Program, Environmental Affairs Division, Texas Department of Transportation, with the oversight of Nancy Kenmotsu and the assistance of Steve Ahr, Tim Meade, and Cynthia Tennis. At Prewitt and Associates, Ross C. Fields served as Principal Investigator, and Douglas K. Boyd was the Quality Control Officer. Amy M. Holmes, E. Frances Gadus, and Christopher W. Ringstaff served as Project Archeologists, and Ms. Holmes also filled the position of Project Geoarcheologist. These people performed most of the fieldwork and were responsible for writing most of the reports on individual work orders included as Appendix B; the site descriptions included in the body of the report are extracted from the work order reports. Karl W. Kibler prepared the Environmental Setting section of the report and one of the culture history summaries (Southeast Margin of central Texas); Ms. Gadus wrote one of the other summaries (Central Coastal Plain); and Ms. Holmes compiled Tables 1 and 2. Mr. Fields wrote the remainder of the report. Support at Prewitt and Associates was provided by Karen M. Gardner (laboratory supervision, photograph cataloging, and curation); Brian J. Wootan and Sandra L. Hannum (production of graphics); and Audra L. Pineda and Jane Sevier (report editing and production).

INTRODUCTION

This document constitutes the final report of work done by Prewitt and Associates, Inc. (PAI), under a contract (P.O. No. C442000027194000) from the Texas Department of Transportation (TxDOT) to provide archeological services in four TxDOT districts—Bryan, Corpus Christi, San Antonio, and Yoakum—in east-central and south-central Texas. The contract began on 8 February 2000 and concluded on 8 February 2002. During those two years, 45 work orders for fieldwork were completed, with the final one issued in early September 2001 so that the draft version of this report could be submitted in November 2001, allowing time for review and revisions before the end of the contract.

Under this contract, PAI completed Impact Evaluations and Surveys to assist TxDOT in meeting the requirements of their Memorandum of Understanding with the Texas Historical Commission and a Programmatic Agreement between the Advisory Council on Historic Preservation, the Federal Highway Administration, the Texas Historical Commission, and TxDOT. TxDOT defines Impact Evaluations as "on-site inspection. . .documenting existing impacts or other conditions which may preclude the presence of intact archeological deposits within the project area for a proposed Transportation Activity." Impact Evaluations are thus an initial step to determine whether survey of a particular area is warranted, given the anticipated effects of the project, the existing level of disturbance, and the likelihood of archeological deposits in good context.

TxDOT defines surveys as "archeological field work. . .of a proposed Transportation Activity to locate archeological remains, if any, including on-foot examination of the surface, shovel testing, and subsurface trenching by mechanical means where appropriate." As described below, PAI completed 45 work orders involving 71 Impact Evaluations and 25 Surveys. Five of the surveys included geoarcheological evaluations, and 20 did not. Most of these projects focused on replacing bridges and on country and farm-to-market roads. Other kinds of Transportation Activities included widening roads, constructing new bypasses, and creating a wetland mitigation area.

The body of this report consists of three major sections. A brief characterization of the environmental setting of the four TxDOT districts follows this introduction. Three brief synopses of Native American culture histories are presented next. One deals with the central Texas coast and adjoining coastal plain and encompasses the Corpus Christi District and most of the Yoakum District, one covers the southeast margin of central Texas and applies to most of the San Antonio District, and one is for the southern part of east-central Texas and covers the Bryan District and the northern part of the Yoakum District. The third section summarizes the work done under this contract. It discusses the methods employed in the Impact Evaluations and Surveys and evaluates their effectiveness. It also presents tables listing the Impact Evaluations and Surveys and their topographic and geologic settings, soils, land use, vegetation, and presence or absence of archeological sites. The sites investigated are described, and the existing disturbances that affect the potential of project areas to contain sites with sufficient integrity to be eligible for National Register of Historic Places listing or State Archeological Landmark designation are listed and discussed. The third section also provides an evaluation of the need for survey based on the results of this project. A references cited section and two appendixes follow the body of the report. Appendix A is a glossary of technical terms, and Appendix B (on CD-ROM) contains the letters and reports submitted to TxDOT for all Impact Evaluations and Surveys done under the contract.

ENVIRONMENTAL SETTING

The Bryan, Corpus Christi, San Antonio, and Yoakum Districts cover a 43-county area in east-central and south-central Texas and along the central Texas coast. Most of the four-district area lies within the Gulf Coastal Plain physiographic province, its inland (western) edge hinging on the southern and eastern margins of the Edwards Plateau of the Great Plains province (Fenneman 1931, 1938). The intersection of these two physiographic provinces has been the scene of an interesting and dynamic geologic history (see Spearing 1991).

Geologically, the San Antonio District straddles a deep-seated fracture zone and site of past orogenic events that separates the stable continental interior to the west from the subsiding

Gulf basin to the east and southeast. During the Cretaceous period as the Gulf of Mexico formed, clastic sediments and carbonates were deposited along the broad marginal shelf of the Gulf basin. These Lower Cretaceous sandstones and limestones found throughout the dissected margins of the Edwards Plateau represent cycles of marine transgression and regression. By upper Cretaceous times, infilling of the Gulf basin and shoreline progradation predominated, as Upper Cretaceous sandstones and mudstones throughout the central portion of the San Antonio District show. Marine regression and shoreline progradation continued during the Tertiary and Quaternary and are represented by various sandstone and mudstone units present throughout all four districts.

The different rock units have a major influence on the topography, flora, and hydrology across the four-district area. Five different natural regions lie within the area, due in part to these lithological variations (Figure 1). Encompassed within these are 10 subregions: the Oak Woodlands of the Oak Woods and Prairies region; the Blackland Prairie of the Blackland Prairies region; the Dunes/Barrier, Estuarine Zone, and Upland Prairies and Woods of the Gulf Coast Prairies and Marshes region; the Coastal Sand Plains, the Brush Country, and the Bordas Escarpment of the South Texas Brush Country region; and the Live Oak-Mesquite Savanna and the Balcones Canyonlands of the Edwards Plateau region (LBJ School of Public Affairs 1978).

The Oak Woodlands subregion covers most of the Bryan District and smaller portions of the San Antonio and Yoakum Districts. The Blackland Prairie subregion covers parts of the Bryan, San Antonio, and Yoakum Districts. The Dunes/Barrier, Estuarine Zone, and Upland Prairies and Woods subregions are limited to the Corpus Christi and Yoakum Districts, and the Coastal Sand Plains are limited to the southern part of the Corpus Christi District. The Brush Country and Bordas Escarpment subregions cover the western Corpus Christi and southern San Antonio Districts, and the Live Oak-Mesquite Savanna and the Balcones Canyonlands are limited to the northern and western parts of the San Antonio District.

The modern plant communities vary from subregion to subregion across the four-district area (see Diamond et al. 1987). Diamond et al. (1987:205) classify these plant communities by their dominant growth form (e.g., trees, shrubs, grasses, graminoids, or forbs). They recognize forests (tree canopy cover ≥61 percent), woodlands (tree canopy cover 26–60 percent), shrublands (communities of 0.5–3.0-m-tall shrubs with a canopy cover ≥26 percent), herbaceous communities (<25 percent canopy cover of woody plants) consisting of grassland- and forb-dominated communities, swamps (arboreal-dominated wetlands), and marshes (herbaceous-dominated wetlands). The Oak Woodlands subregion consists of deciduous forests of overcup oak (*Quercus lyrata*), post oak (*Q. stellata*), and black hickory (*Carya texana*) and woodlands of bluejack oak (*Q. incana*), pine (*Pinus* sp.), blackjack oak (*Q. marilandica*), and post oak, as well as bogs of *Sphagnum* sp. and *Rhynchospora* sp. and marshes of gulf cordgrass (*Spartina spartinae*) and rushes and sedges (*Juncus* sp.).

The Blackland Prairie consists of tall grasslands (dominants ≥1 m tall) comprised of little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), gamagrass (*Tripsacum dactyloides*), switchgrass (*Panicum virgatum*), and silveanus dropseed (*Sporobolus silveanus*). Riparian deciduous forests are of hackberry (*Celtis laevigata*), elm (*Ulmus* sp.), overcup oak, post oak, and black hickory.

In the Dunes/Barrier subregion, tall grasslands of seacoast bluestem (*S. scoparium* var. *littoralis*), forb-dominated communities of cenicilla (*Sesuvium portulacastrum*) and beach morning glory (*Ipomoea stolonifera*), and marshes of marshhay cordgrass (*S. patens*), smooth cordgrass (*S. alterniflora*), gulf cordgrass, and rushes and sedges prevail. The Estuarine Zone also consists of marshes of the same cordgrass, rush, and sedge species. The Upland Prairies and Woods subregion consists of forests of water oak (*Q. nigra*) and live oak (*Q. virginiana*); woodlands of pecan (*C. illinoensis*), mesquite (*Prosopis glandulosa*), huisache (*Acacia farnesiana*), post oak, and live oak; tall grasslands of brownseed paspalum (*Paspalum plicatulum*), little bluestem, Indiangrass, gamagrass, and switchgrass; marshes of gulf cordgrass, marshhay cordgrass, rushes, and sedges; and swamps of buttonbush (*Cephalanthus occidentalis*). The Coastal Sand Plains are dominated by evergreen woodlands of live oak and seacoast bluestem, tall grasslands of seacoast bluestem, and marshes of

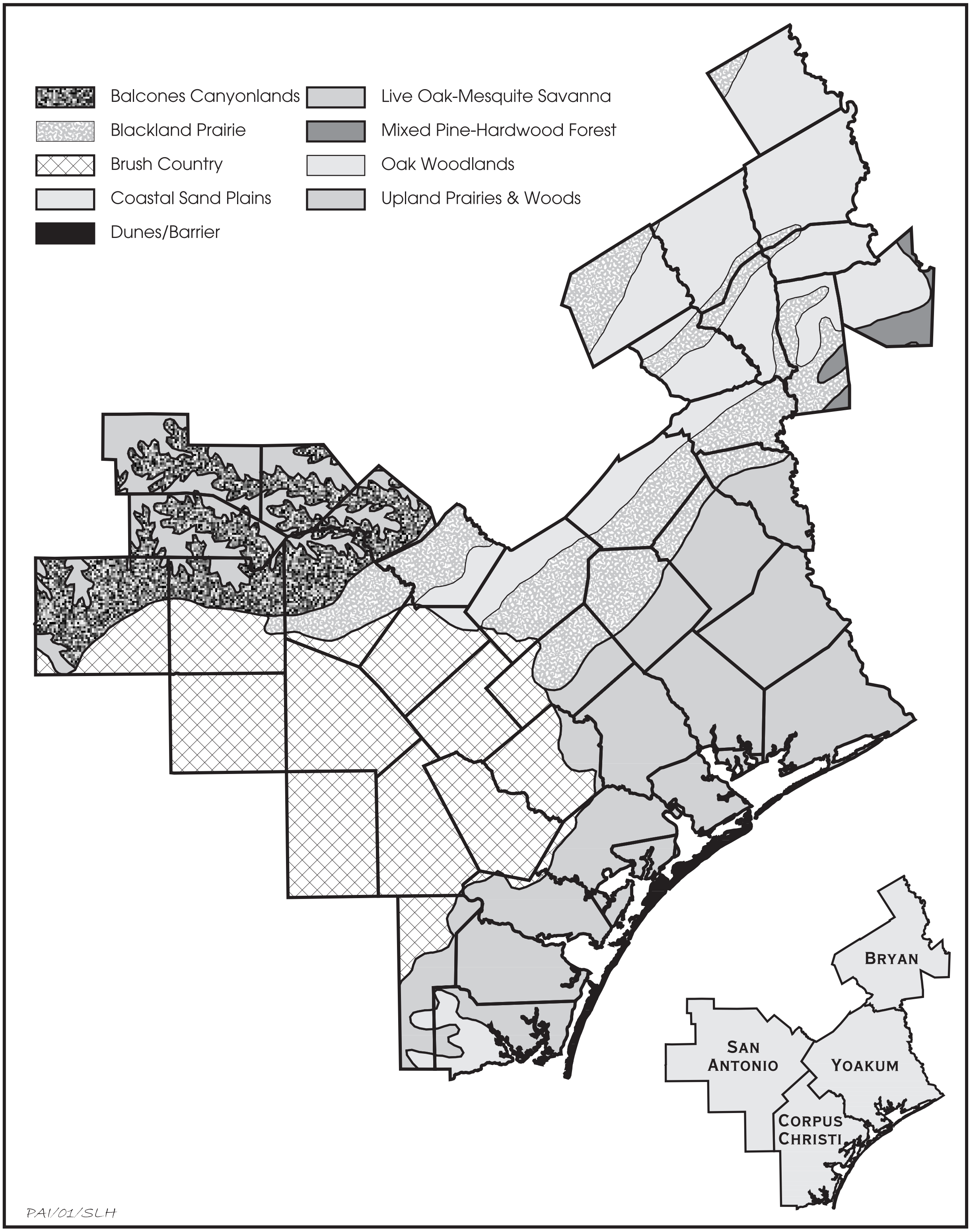

Figure 1. Locations of the Bryan, Corpus Christi, San Antonio, and Yoakum Districts in relation to natural regions.

saltgrass (*Distichlis spicata*), gulf cordgrass, rushes, and sedges.

The Brush Country subregion consists of deciduous forests of hackberry and elm, woodlands of mesquite and huisache, and deciduous shrublands of blackbrush (*Acacia rigidula*) and fern acacia (*A. berlandieri*). Evergreen shrublands of ceniza (*Leucophyllum frutescens*) and medium grasslands (dominants 0.5–1.0 m tall) of cane bluestem (*Bothriochloa barbinodis*) and mesquite are also part of the Brush Country floral community. Deciduous shrublands of fern acacia dominate the plant community of the Bordas Escarpment subregion.

The Live Oak-Mesquite Savanna subregion of the Edwards Plateau consists of deciduous forests of hackberry and elm and deciduous and evergreen woodlands of Lacey oak (*Q. glaucoides*), ashe juniper (*Juniperus ashei*), and live oak. Grasslands are also part of the floral community and consist of medium-tall grasslands of curly mesquite (*Hilaria belangeri*) and sideoats grama (*Bouteloua curtipendula*) and short grasslands (dominants <0.5 m) of blue grama (*B. gracilis*), buffalo grass (*Buchloe dactyloides*), and tobosa grass (*H. mutica*). The plant community of the Balcones Canyonlands consists of deciduous forests of bald cypress (*Taxodium distichum*), sycamore (*Platanus occidentalis*), hackberry, and elm and evergreen and deciduous woodlands of Texas oak (*Q. texana*), ashe juniper, live oak, and Lacey oak.

The major drainages within the four-district area are the Trinity, Brazos, Colorado, Guadalupe, San Antonio, and Nueces Rivers (Figure 2). Along the Texas coast, several smaller rivers and their basins separate these larger drainage basins. They include the San Bernard, Navidad, Mission, and Aransas Rivers. The Trinity River enters the Bryan District at Freestone County and flows southeast along the eastern edge of the Bryan District. It leaves the district as it enters Lake Livingston and exits Walker County. The Trinity River floodplain averages 5–6 km in width along this stretch and is flanked by large segments of Pleistocene-age terraces (Proctor et al. 1970; Shelby et al. 1968a, 1968b). Holocene alluvium is also mapped along several of the larger tributaries of the Trinity River, including Richland Creek, Tehuacana Creek, Upper Keechi Creek, Lower Keechi Creek, Boggy Creek, and Bedias Creek.

The Brazos River enters the four-district area at Milam and Robertson Counties, flowing southeast across the Bryan District and along the eastern edge of the Yoakum District (at Austin County), at which point it exits the study area. The floodplain along this stretch of the Brazos varies from 2 to 12 km in width (Proctor et al. 1970, 1979, 1981). Large, segmented, late Pleistocene terraces border the Holocene floodplain along its course. Dissected remnants of even higher gravelly Pleistocene terraces also are found sporadically along the upper slopes of the Brazos River valley. Three large tributaries enter the Brazos along this stretch of river. The Little River has a floodplain near its confluence with the Brazos of 5–6 km in width and is bordered by higher Pleistocene terraces. The Navasota River Holocene floodplain is 1–3 km wide and is also flanked by Pleistocene terraces. Yegua Creek has a Holocene floodplain that is ca. 3 km wide and is bordered intermittently by Pleistocene terraces. Holocene alluvium also is mapped for the tributary networks of these three drainages (Proctor et al. 1970, 1981). Other smaller tributaries of the Brazos River that display mapped Holocene alluvium include Pond, Walnut, Cedar, New Year, Caney, Jackson, and Mill Creeks.

The Colorado River enters the Yoakum District in Fayette County and flows southeast to Matagorda Bay and the Gulf of Mexico. The Holocene floodplain of the Colorado is up to 7.5 km wide, but at points near La Grange, upstream from Columbus, and downstream from Wharton, the floodplain becomes very narrow as the channel wedges between Pleistocene terraces and bedrock valley walls (Brown et al. 1987; Proctor et al. 1979). Tributaries of the Colorado that display mapped Holocene alluvium include Buckners, Cummins, and Skull Creeks.

The Guadalupe River is one of two larger river systems that are almost fully contained in the four-district area. The Guadalupe River heads in the northwestern portion of the San Antonio District and flows east and then southeast across the Yoakum District before it empties into San Antonio Bay. Near its headwaters, the Holocene floodplain of the Guadalupe is very narrow, and floodplain and terrace alluvium are not mapped separately (Barnes and Rose 1981; Brown et al. 1974). As the Guadalupe River enters the Balcones Canyonlands, its valley narrows, and the river becomes canyon confined.

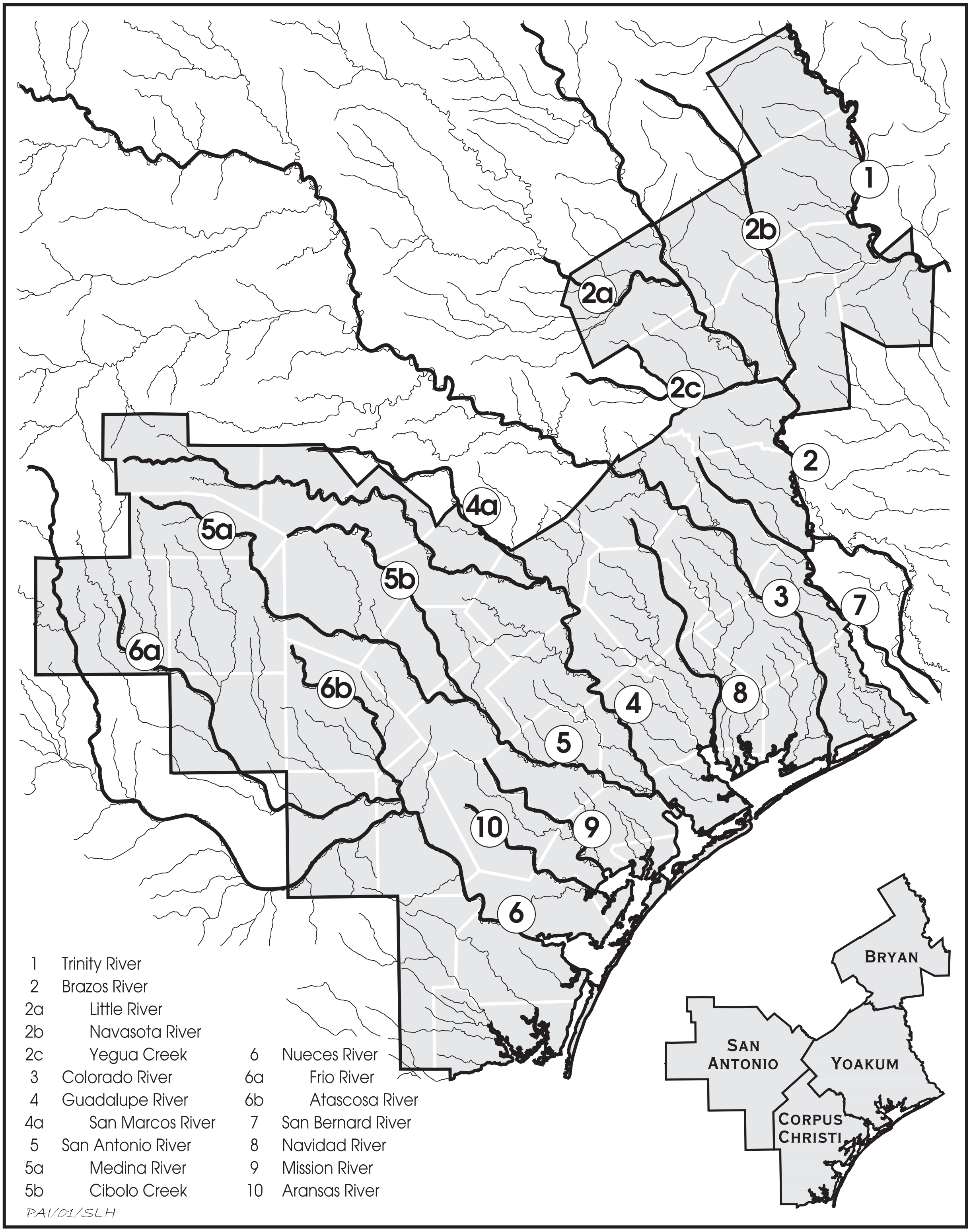

Figure 2. Major drainages in the Bryan, Corpus Christi, San Antonio, and Yoakum Districts.

Floodplain and terraces are not individually mapped, or they are so small that they are not mapped at all (Brown et al. 1974). Crossing the Balcones Fault zone, the Guadalupe turns and flows southeast. As it exits the fault zone and enters the Gulf Coastal Plain, its valley and floodplain widen. On the Coastal Plain the upper reaches of the Guadalupe River floodplain are less than 0.5 km to 4.5 km wide and flanked sporadically by large Pleistocene terraces. Along its lower course, the floodplain is 1.0 to 7.5 km wide and bordered intermittently by Pleistocene terraces and terraces of the Deweyville formation (Brown et al. 1987). Throughout its headwaters and the Balcones Canyonlands, tributaries of the Guadalupe River are small. Tributaries Johnson Creek, Turtle Creek, and Verde Creek all have mapped Holocene and Pleistocene alluvium. On the Gulf Coastal Plain, the tributaries are much larger. The San Marcos River, Peach Creek, Sandies Creek, and Coleto Creek, as well as many of their tributaries, have wide Holocene floodplains that are flanked intermittently by Pleistocene terraces.

The San Antonio River is the second river system fully contained within the four-district area. Tributaries of the San Antonio River head in the northwestern portion of the San Antonio District and merge in and south of the city of San Antonio. Southeast of the city, the San Antonio River turns and flows southeast across the Corpus Christi District before it joins the Guadalupe River just northwest of San Antonio Bay.

Headwater tributaries of the San Antonio with mapped late Quaternary floodplains and terraces include the Medina River, Medio Creek, Leon Creek, Olmos Creek, Cibolo Creek, and Salado Creek. As these drainages come together (Brown et al. 1974), the valley and floodplain widen as the river flows across the Gulf Coastal Plain. Bordered by large Pleistocene terraces, the floodplain of the San Antonio River is up to 4 km wide. Larger tributaries of the San Antonio River on the Gulf Coastal Plain with mapped alluvium include Manahuilla Creek, Cabeza Creek, Hord Creek, Escondido Creek, and Ecleto Creek (Brown et al. 1987).

The Nueces River enters the San Antonio District in Uvalde County, flowing south and leaving the study area once it exits the county. Along its course through Uvalde County, the Nueces River valley is narrow, though the Holocene floodplain and late Quaternary terraces are mapped separately (Brown et al. 1974; Waechter et al. 1977). Tributaries along this portion of the Nueces course are small, though a few such as the West Nueces River and Indian Creek display mapped Holocene floodplains and Pleistocene terraces (Brown et al. 1974; Waechter et al. 1977). The Nueces River reenters the San Antonio District at McMullen County, flowing northeast and entering the Corpus Christi District at Live Oak County. Here, the river turns and flows southeast to Nueces and Corpus Christi Bays. Along this portion of its course, the Nueces floodplain is up to 4 km wide and is up to 6 km wide near its mouth. Pleistocene terraces flank the Holocene floodplain. Tributaries along this stretch of the Nueces River include two large rivers, the Frio and Atascosa, and many smaller creeks. The Frio and Atascosa Rivers and their network of tributaries display extensive Holocene floodplains up to 2.5 km wide and large Pleistocene terraces (Brown et al. 1976). The many smaller tributaries with mapped Holocene floodplains include Green Branch Creek, Piscachar Creek, Guadalupe Creek, Elm Creek, Spring Creek, Mule Creek, Cow Creek, Dragon Creek, Salt Branch, and Sulphur Creek.

The smaller coastal river systems—which include the San Bernard, Navidad, Mission, and Aransas Rivers—also display drainage networks with mapped alluvial surfaces. The San Bernard basin lies between the Brazos and Colorado Rivers. The San Bernard River heads in Austin and Colorado Counties in the Yoakum District and flows southeast along the northeast boundary of the district (Wharton-Fort Bend County line). It exits the district at the intersection of Wharton, Fort Bend, and Brazoria Counties. The Holocene floodplain of the San Bernard is very narrow, less than 0.5 km (Aronow et al. 1982; Proctor et al. 1979). Before it exits the district, the San Bernard enters the old Colorado River valley, which is now occupied by Caney Creek. The Holocene floodplain alluvium merges with that of Caney Creek and the Colorado River to form an extensive floodplain 11–14 km wide (Aronow et al. 1982).

The Navidad River lies between the Colorado and Guadalupe drainage basins. It heads in Fayette County in the Yoakum District and flows south-southeast to Lavaca Bay. Along its upper reaches, the Holocene floodplain of the Navidad is very narrow and not even mapped along some stretches, though large Pleistocene terraces flank the channel (Proctor et al. 1979). Along its lower course, the floodplain is ca. 1–3 km wide (Brown et al. 1987; Proctor et al. 1979). The Lavaca River, a larger tributary of the Navidad River, heads in Lavaca County in the Yoakum District and joins the Navidad River downstream in Jackson County. The Holocene floodplain is ca. 1.5 km wide and is bordered by Pleistocene terraces along its course (Brown et al. 1987; Proctor et al. 1979). Other tributaries of the Navidad River displaying mapped Holocene alluvium include East Navidad River, West Navidad River, Sandy Creek, West Sandy Creek, Mulberry Creek, and Big Rocky Creek.

The Mission and Aransas Rivers lie between the San Antonio and Nueces River basins. The Mission River heads in Bee and Goliad Counties in the Corpus Christi District and flows southeast to empty in Mission Bay. The Mission River and its network of tributaries (Blanco Creek, Mucorrera Creek, Indian Creek, and Medio Creek) display narrow Holocene floodplains along sections of their courses, as well as Pleistocene terraces (Brown et al. 1987). The Aransas River and its tributaries head in Bee County and flow southeast, emptying into the southern end of Copano Bay. Like the Mission River and its tributaries, the Aransas River and its tributaries (Aransas Creek, Poesta Creek, and Chiltipin Creek) have narrow Holocene floodplains along sections of their courses, as well as Pleistocene terraces (Brown et al. 1987).

SYNOPSIS OF NATIVE AMERICAN CULTURE HISTORY

Central Coastal Plain

Many people, institutions, and governmental agencies have undertaken archeological investigations on the central coastal plain of Texas. Among the more prominent of these are excavations by The University of Texas at Austin and the Works Progress Administration at the Johnson and Kent-Crane sites in the Copano Bay and Aransas Bay areas (Campbell 1947, 1952); Story's (1968) excavations at the Ingleside Cove and Anaqua sites in San Patricio and Jackson Counties; excavations at 41AU37 and 41AU38 along Allen's Creek in southern Austin County by The University of Texas at Austin (Hall 1981); excavations by the University of Texas at San Antonio (UTSA) at the Hinojosa site situated approximately 60 km inland from Corpus Christi Bay (Black 1986); explorations by the Texas Historical Commission (Mallouf et al. 1973) in the projected area of Palmetto Bend Reservoir along the Lavaca and Navidad Rivers of Jackson County; UTSA survey and site testing in the area of Coleto Creek Reservoir in Victoria and Goliad Counties (Fox and Hester 1976; Fox et al. 1979); extensive survey and excavation efforts, primarily by UTSA, at Choke Canyon Reservoir in Live Oak and McMullen Counties (Hall et al. 1982, 1986); excavations by the Texas Department of Transportation (TxDOT) at the Loma Sandia site in Live Oak County and subsequent analysis by The University of Texas at Austin (Taylor and Highley 1995); Robert A. Ricklis's (1990, 1996) work at the Holmes and McKinzie sites, among others, in the Corpus Christi and Copano Bay area; testing and data recovery excavations at sites along the Victoria Barge Canal in Victoria and Calhoun Counties (Gadus et al. 1999; Weinstein 1992); and recent work by the Texas Historical Commission at La Salle's Fort St. Louis (Davis and Bruseth 2000), as well as work at other Spanish Colonial Mission-period sites (Calhoun 1999; Hindes et al. 1999; Ricklis 1999; Walter 1999). Summaries of the prehistory of the region based on these investigations, and more complete bibliographies concerning previous work, have been compiled by Black (1989a), Weinstein (1992), Hester (1995), Ricklis (1995), and Tomka et al. (1997).

The earliest occupation of the coastal plain occurred in the Paleoindian period ca. 11,000 to 8,000 years ago. The first half of this period is marked by the occurrence of Clovis and Folsom dart points, almost always in isolated contexts. For instance, a Clovis point was recovered from San Patricio County near the mouth of the Nueces River (Hester 1976), and a Folsom point was recovered on Oso Creek (Hester 1980:6). Excavated Paleoindian components on the coastal plain include the deep terrace sites of Buckner Ranch located in Bee County, the Berger Bluff site in Goliad County, and the Johnston-Heller and J-2 Ranch sites in Victoria County. The Buckner Ranch site produced late Pleistocene fauna and hearth-like clusters of burned rocks, as well as Folsom, Plainview, Scottsbluff, and Angostura points (Sellards 1940). Hester (1978:8–9), in a reevaluation of Sellards's data, concluded that the site "served as a campsite for a succession of Paleo-Indian groups" possibly spanning 3,000 years. Though this site is the only one of the excavated components to produce a Folsom point, in a more recent discussion Hester (1995:434) states "no Folsom camps or kill sites have been located."

Late Paleoindian points such as Plainview and Golondrina have been recovered from the Johnston-Heller site and the J-2 Ranch site (Birmingham and Hester 1976; Fox et al. 1979). Clear Fork tools also were recovered at the Johnston-Heller site. The Berger Bluff site, now inundated by Coleto Creek Reservoir, produced a deeply buried hearth dated to ca. 8,000 to 6,000 years ago. This site is of interest because its faunal assemblage includes small animals not thought to be characteristic of a Paleoindian big-game subsistence pattern (Brown 1996: 497–498; Weinstein 1992:60). Investigation of these components indicates the earliest Americans' long-lived, slowly changing adaptation to the near-coast.

Evidence of Paleoindian use of the coastal zone also comes from isolated finds in eroded or disturbed contexts. The erosion is in part the result of a dramatic sea level change associated with the end of the last glaciation. At that time, sea level was much lower than today, and the Gulf shoreline was appreciably farther south of its present position (Aten 1983:117, 146). As sea level began to rise, it likely inundated many Paleoindian sites. Both artifacts and fossil bones have been recovered from Texas beaches and are believed to be eroding from submerged, relict deltaic landforms that contain these ancient sites. One such area that has produced artifacts and fossil bones is 41MG4, the Sargent Beach site. The site produced one late Paleoindian Angostura point, as well as Archaic Pedernales and Kent points and fossil bones, including horse, bison, and mammoth teeth. Fossil bones and teeth of mastodon, mammoth, bison, horse, camel, deer, and turtle without associated artifacts have been recovered from several nearby disposal areas for dredged materials along the Gulf Intracoastal Waterway west of the San Bernard River (Black and Cox 1983) and to the south in alluvium of the ancestral Palo Blanco River of northern Kenedy County (Shum 1980).

Toward the end of the Paleoindian period, a disruption in large game populations may have precipitated a greater reliance on a broad-based subsistence strategy (Aten 1983:152–157). This presumed but probably overstated change in subsistence strategy has been used to mark the beginning of the Archaic period. There also is evidence of climatic fluctuations and additional episodes of sea level rise within this period. These fluctuations have been used to divide the Archaic into early, middle, and late subperiods.

The Early Archaic spans the period from 8000 to 5000 B.P. when sea level was still well south of its present location (Aten 1983:117). As with Paleoindian sites, few Early Archaic sites are known, and it has been suggested that populations and site densities continued to be low on the entire coastal plain (Story 1985:37). Projectile points diagnostic of the period include Gower, Wells, Bell, Andice, Martindale, Uvalde, and related forms (Black 1989a:49; Weinstein 1992:57). Inland along the edge of the coastal plain, sites are associated with upland landforms and high terraces, though several components within deep alluvium are known from the Choke Canyon area of Live Oak County (Scott and Fox 1982). Examples of sites from the coastal bend include 41VT17 (Fox and Hester 1976), the McKenzie site (Ricklis 1988), and the Swan Lake site (Prewitt et al. 1987). Though the Early Archaic components at these sites are ephemeral, they demonstrate early use of the estuarine bay shore environment. During the late part of the Early Archaic, the number of coastal components increased, as did the intensity of the occupations. It appears that both shellfish and fish were exploited to the extent that these early components likely functioned as fishing camps (Ricklis 1988:101–102, 1995: 272–278).

The coastline reached its present position in the Middle Archaic, which lasted from 5000 to 3000 B.P., with the climate approaching modern conditions at the end of the period (Aten 1983:137, 316; Story 1990:244). It has been suggested that these changes may have enhanced coastal resources enough that populations and site densities increased (Story 1985:39, 1990:244). Toward the end of this period, extensive shell middens appeared, signaling that the bays and estuaries had developed to the extent that shellfish had become a ubiquitous resource. On the coast in Aransas and Nueces Counties, this intensive exploitation of estuarine resources was first given the appellation Aransas Focus (Campbell 1947, 1952). Distinctive shell tools such as *Busycon* whorl scrapers and columella gouges mark Aransas sites. Similar tools have been recovered from shell midden sites as far north along the coast as Lavaca Bay and the lower reach of Caney Creek in Matagorda County (Fritz 1975:129).

To tighten the chronological and spatial parameters for this archeological manifestation, the Aransas Complex was defined for the Late Archaic period based on work at the Kent-Crane site (Campbell 1958; Corbin 1974). The Middle Archaic manifestation has been labeled the Kent Phase (Weinstein 1992:61). Projectile points including Matamoros, Bulverde, and Palmillas mark the Kent Phase. Other Middle Archaic period projectile points with inland ties include Morhiss, Nolan, Travis, and Refugio (Black 1989a:49; Weinstein1992:61).

Inland, data from the Choke Canyon Reservoir sites suggest that open camps along stream courses on natural levees and low terraces marked the Middle Archaic period. Features such as formal hearths, earth ovens, and concentrations of burned rocks point to an emphasis on use of plant resources (Hall et al. 1986). Possible baking pit features with associated concentrations of burned rocks also have been identified at coastal shell midden sites. One such Middle Archaic shell midden, 41CL9 situated in Calhoun County along the upper Guadalupe River estuary, also produced faunal data indicating that terrestrial resources contributed significantly to the coastal resource base (Gadus et al. 1999:35–73). These data suggest that, in general, subsistence practices may not have differed greatly between coastal and inland sites.

The Late Archaic period, which dates from ca. 3000 to 1250 B.P., is marked by a continuation and intensification of Aransas adaptations on the coast. Some sites, such as Mustang Lake on San Antonio Bay and Ingleside Cove on Corpus Christi Bay, produce faunal data that suggest intensive fishing (Ricklis 1995:281–280). Inland, the presence of grinding implements and large deposits of burned rocks at the Choke Canyon sites suggest continued, intensive exploitation of plant resources (Hester 1995:441). Point types found on the coast include Ensor, Darl, and Fairland. Inland point types for this period include Frio, Marcos, Montell, Morhiss, Castroville, and Ellis (Black 1989a:51; Weinstein 1992:57). Overall, this period saw a continued increase in populations and trend toward defined territories (Story 1985:44–45, 48).

One indication of population increase is the expansion of formal cemeteries. Cemeteries appeared in the Middle Archaic period and grew in size and number though the Late Archaic and into the Late Prehistoric period (Hall 1995a:56–57). An extensive Middle Archaic through Late Prehistoric period cemetery has been excavated at Allen's Creek (Hall 1981). The site, 41AU36, is located on the Brazos River approximately 115 km north of the coast in Austin County. Burials showed an increase in traumatic deaths, specifically during the Late Archaic period, that might be considered evidence of a boost in hostilities suggesting greater territorial competition (Hall 1981:284–285). Closer to the coast, the Blue Bayou cemetery (41VT94) and the Morhiss cemetery (41VT1) are situated on the lower reach of the Guadalupe River in Victoria County (Campbell 1976:81–85; Huebner 1988). The Morhiss cemetery has been dated to the Archaic period by diagnostic projectile points recovered from the associated habitation site. Because shell ornaments and many lithic materials were recovered from the habitation site, investigators have suggested that the inhabitants had both inland and coastal interactions (Hall 1995a:49–50). Similar interactions can be suggested from the inland formal cemetery at the Loma Sandia site in Live Oak County (Taylor and Highley 1995). But Hall (1995b:645–646) points out that though the grave furnishings from Loma Sandia suggest interaction with nearby coastal cultures, the overriding connection appears to be with cultures of the Rio Grande Plain. These suggested differences in interaction provide data needed for understanding territorial affiliations across the coastal plain.

The Late Prehistoric period began variously along the Texas coastal plain at ca. 1700 to 1250 B.P. It was marked by the addition of pottery and the bow and arrow to an otherwise Archaic technological repertoire (Aten 1983:297–304; Corbin 1976:91; Weinstein 1992:57). Scallorn arrow points, one of the earliest forms found on the coast, have been recovered from burials at the Blue Bayou site dating to the early Late Prehistoric, ca. A.D. 430–990

(Huebner 1988). Scallorn points and expanding-stem arrow point forms also were recovered from more-inland sites such as the Berger Bluff site located in Goliad County (Brown 1983) and sites in the Choke Canyon area of Live Oak County (Hall et al. 1986). In many cases, no ceramics were associated with these components, suggesting separate arrival or development of the two technologies. Similarities of these components to the early Late Prehistoric Austin phase components of central Texas have been acknowledged (Brown 1983: 80–81;Weinstein 1992:63).

Slightly later but before A.D. 1000, bone-tempered ceramics and expanding-stem arrow points are known from the Choke Canyon sites (Black 1989a:52), and Scallorn points and sandy paste ceramics like ceramics from the upper Texas coast appeared on the central coast. Scallorn points and sandy paste ceramics were recovered from the Anaqua site and other sites located along the lower Lavaca and Navidad Rivers in Jackson County (Mallouf et al. 1973:136; Story 1968), as well as the Kent-Crane site in Aransas County (Cox and Smith 1988). Weinstein (1992:64) suggests that these components are recognizable cultural manifestations that preceded introduction of Rockport ceramics along the south and central coasts.

Rockport ceramics, a sandy paste ware decorated with asphalt designs and incising, occur most often with Perdiz and Fresno points. Other arrow point types occasionally found include Starr, Padre, Scallorn, Young, Cliffton, and McGloin (Corbin 1974:43). The occurrence of these artifact types along the coast–generally in Kleberg, Nueces, San Patricio, Aransas, and Refugio Counties–has been used to define the Rockport phase of the Late Prehistoric-Historic period (Campbell 1952, 1958; Story 1968; Suhm et al. 1954). The Rockport phase has been linked to the historically known Karankawa Indians because that group continued to produce the distinctive asphalt-decorated and asphalt-coated ceramics well into historic times.

Archeological studies of prehistoric and historic Karankawa adaptive strategies suggest that these people took advantage of both the coastal estuarine and adjoining prairie-riverine resources. Based on sites in the Corpus Christi Bay and Copano Bay area, Ricklis (1996:100–124) discerned a seasonal pattern in the occupation of coastal and nearby inland sites that may reflect this strategy. Two Late Prehistoric site types have been identified. One is a shoreline fishing camp that has extensive deposits of estuarine resource remains, and the other is an inland hunting camp with large quantities of terrestrial game such as deer and bison (Ricklis 1996:33). Seasonal data based on fish otoliths and *Rangia cuneata* samples indicate that the fishing camps were occupied in the fall through winter or early spring and that hunting camps were occupied in the spring and summer (Ricklis 1996:70–71, 89–95). In this model, fishing camps were occupied at a time of year when a reliable resource—that is, fish—was concentrated along the coast and allowed people to mass. Concomitantly, hunting camps represent population dispersal geared toward more-scattered resources—bison and deer. How far inland the Karankawa may have journeyed on their seasonal round and what interactions they may have had with inland-based groups are questions that require additional research.

Though the Karankawa may have moved inland seasonally to hunt bison and deer, faunal evidence from Hinojosa site in Jim Wells County and the Choke Canyon sites suggests that resident inland groups may have focused both on large game and on a wide range of smaller animals (Steele 1986; Steele and Hunter 1986). Recognition of a related lithic tool kit emphasized the importance of large game such as bison to the subsistence base (Black 1989a:53–54). Consisting of Perdiz arrow points, small end scrapers, and beveled knives, this tool kit has been linked to the Toyah phase cultures that appear to have originated on the Southern Plains and moved south to central Texas, probably in response to southward-expanding bison herds (Black 1989a:57). The Toyah phase tool kit has been identified at the Hinojosa site and is often found within Rockport phase sites on the central coast (Black 1986:254–255; Ricklis 1995:285, 287). But the mechanisms behind adoption of this Toyah technology and its meaning for the coastal and near-coastal peoples have yet to be clearly defined (see Johnson [1994] for a wide-ranging discussion of the Toyah culture).

Coastal aboriginal groups were affected not only by inland aboriginal groups, but they also bore the brunt of early contact with European explorers and colonists. The first encounter was that of the Spanish shipwreck survivor and eventual trader Alvar Nuñez Cabeza de Vaca, who lived and traveled with various aboriginal groups across coastal Texas ca. 1528 (Hester 1999:17–19). Reestablishing Cabeza de Vaca's movements places him on the Texas coast in the vicinity of San Antonio, Copano, and Corpus Christi Bays (Campbell and Campbell 1981:2–9). The Karankawa also met Robert Sieur de La Salle on his fateful expedition that ended along Matagorda Bay in the winter of 1685 (Ricklis 1996:1,112). Recent work at the site of La Salle's Fort St. Louis (41VT4) and the excavation of La Salle's ship, the *Belle*, in Matagorda Bay will provide new information on this contact and the lives of the Frenchmen who participated in that expedition (Davis and Bruseth 2000). The French presence on the Texas coast was short, but the Spanish, with their emphasis on establishing missions and presidios, had a lasting effect.

Spanish attempts to establish missions and presidios along the coastal plain continued through the 1700s. These included Mission Espiritu Santo, established in 1722 in the present vicinity of Jackson County and then moved to Victoria County in 1726, Presidio La Bahia and Mission Rosario established in 1749 and 1754 in Goliad County, and Mission Nuestra Señora de Refugio, first located in Calhoun County and then moved to Refugio County in 1795 (Ricklis 1996:145). Recent investigations of some of these sites, including the major ongoing studies of TxDOT at the Mission Refugio site, have provided information on the mobility patterns, economic activities, and interactions of both Spanish and Native American occupants (Calhoun 1999; Ricklis 1999; Walter 1999). These investigations, as well as work on Late Prehistoric and historic aboriginal sites, appear to indicate that coastal aboriginal groups kept their ethnic identities despite attempts by the Spanish to missionize them, and to some extent they fit the mission system into their aboriginal subsistence pattern (Ricklis 1996:159–168). Consequently, local coastal Native American groups, such as the Karankawa, survived as much-reduced but viable groups into the nineteenth century. Native groups did not, however, survive the aggressive Anglo-American settlement of the Texas coast that took place during the nineteenth and twentieth centuries.

Southeast Margin of Central Texas

The archeological record of the central Texas region is known from decades of investigations of stratified open air sites and rockshelters throughout the Edwards Plateau, its highly dissected eastern and southern margins, and the adjoining margins of physiographic regions to the east and south (see Collins [1995] for review). Traditionally, the central Texas archeological area has included the Balcones Canyonlands and Blackland Prairie—that is, the northern part of the San Antonio District (e.g., Prewitt 1981; Suhm 1960). These two areas are on the periphery of the central Texas archeological area, and their archeological records and projectile point style sequences contain elements that suggest influences from and varying degrees of contact over time with other areas such as the Lower Pecos and Gulf Coastal Plain (Collins 1995; Johnson and Goode 1994). Archeological sites in these two areas of the San Antonio District that have contributed important information include the Richard Beene site at Applewhite Reservoir (McGraw and Hindes 1987; Thoms et al. 1996; Thoms and Mandel 1992), the Cibolo Crossing site at Camp Bullis (Kibler and Scott 2000), the Panther Springs Creek site in Bexar County (Black and McGraw 1985), the Jonas Terrace site in Medina County (Johnson 1995), the Camp Pearl Wheat site in Kerr County (Collins et al. 1990), 41BX1 in Bexar County (Lukowski 1988), 41BX300 in Bexar County (Katz 1987), and several sites at Canyon Reservoir (Johnson et al. 1962). For more-complete bibliographies concerning archeological work done in the region, see Black (1989b), Collins (1995), and Johnson and Goode (1994).

Surficial and deeply buried sites, rockshelter sites, and isolated artifacts represent Paleoindian (11,500–8800 B.P.) occupations of the Central Texas region. The period is often described as having been characterized by small but highly mobile bands of foragers who were specialized hunters of Pleistocene megafauna. But Paleoindians probably used a much wider array of resources (Meltzer and Bever 1995:59), including small fauna and plant foods. Faunal remains from Kincaid Rockshelter and the Wilson-Leonard site (41WM235) support this view (Bousman 1998; Collins 1998; Collins et al. 1989). Longstanding ideas about Paleoindian technologies also are being challenged.

Collins (1995) divides the Paleoindian period into early and late subperiods. Two projectile point styles, Clovis and Folsom, are included in the early subperiod. Clovis chipped stone artifact assemblages, including the diagnostic fluted lanceolate Clovis point, were produced by bifacial, flake, and prismatic-blade techniques on high-quality and oftentimes exotic lithic materials (Collins 1990). Along with chipped stone artifacts, Clovis assemblages include engraved stones, bone and ivory points, stone bolas, and ochre (Collins 1995:381; Collins et al. 1992). Clovis points are found evenly distributed along the eastern edge of the Edwards Plateau, where the presence of springs and outcrops of chert-bearing limestone are common (Meltzer and Bever 1995:58). Sites within the area yielding Clovis points and Clovis-age materials include Kincaid Rockshelter (Collins et al. 1989), Pavo Real (Henderson and Goode 1991), and San Macros Springs (Takac 1991). A probable Clovis polyhedral blade core and blade fragment were found at the Greenbelt site in San Antonio (Houk et al. 1997). Analyses of Clovis artifacts and site types suggest that Clovis peoples were well-adapted, generalized hunter-gatherers with the technology to hunt larger game but not solely rely on it. In contrast, Folsom tool kits—consisting of fluted Folsom points, thin unfluted (Midland) points, large thin bifaces, and end scrapers—are more indicative of specialized hunting, particularly of bison (Collins 1995:382). Folsom points have been recovered from Kincaid Rockshelter (Collins et al. 1989) and Pavo Real (Henderson and Goode 1991).

Postdating Clovis and Folsom points in the archeological record are a series of dart point styles (primarily unfluted lanceolate darts) for which the temporal, technological, or cultural significance is unclear. Often, the Plainview type name is assigned these dart points, but Collins (1995:382) has noted that many of these points typed as Plainview do not parallel Plainview type-site points in thinness and flaking technology. Recent investigations at the Wilson-Leonard site (see Bousman 1998) and a statistical analysis of a large sample of unfluted lanceolate points by Kerr and Dial (1998) have shed some light on this issue. At Wilson-Leonard, the Paleoindian projectile point sequence includes an expanding-stem dart point termed Wilson, which dates to ca. 10,000–9500 B.P. Postdating the Wilson component is a series of unfluted lanceolate points referred to as Golondrina-Barber, St. Mary's Hall, and Angostura, but their chronological sequence is poorly understood. Nonetheless, it has become clear that the artifact and feature assemblages of the later Paleoindian subperiod appear to be Archaic-like in nature and in many ways may represent a transition between the early Paleoindian and succeeding Archaic periods (Collins 1995:382).

The Archaic period for central Texas dates from ca. 8800 to 1300–1200 B.P. (Collins 1995) and generally is believed to represent a shift toward hunting and gathering of a wider array of animal and plant resources and a decrease in group mobility (Willey and Phillips 1958:107–108). In the eastern and southwestern United States and on the Great Plains, development of horticultural-based, semisedentary to sedentary societies succeeds the Archaic period. In these areas, the Archaic truly represents a developmental stage of adaptation as Willey and Phillips (1958) define it. For central Texas, this notion of the Archaic is somewhat problematic. An increasing amount of evidence suggests that Archaic-like adaptations were in place before the Archaic (see Collins 1995:381–382, 1998; Collins et al. 1989) and that these practices continued into the succeeding Late Prehistoric period (Collins 1995:385; Prewitt 1981:74). In a real sense, the Archaic period of Central Texas is not a developmental stage, but an arbitrary chronological construct and projectile point style sequence. Establishment of this sequence is based on several decades of archeological investigations at stratified Archaic sites along the eastern and southern margins of the Edwards Plateau. Collins (1995) and Johnson and Goode (1994) have divided this sequence into three parts—early, middle, and late—based on perceived (though not fully agreed upon by all scholars) technological, environmental, and adaptive changes.

Early Archaic (8800–6000 B.P.) sites are small, and their tool assemblages are diverse (Weir 1976:115–122), suggesting that populations were highly mobile and densities low (Prewitt 1985:217). It has been noted that Early Archaic sites are concentrated along the eastern and southern margins of the Edwards Plateau (Johnson and Goode 1994; McKinney

1981). This distribution may indicate climatic conditions at the time, given that these environments have more reliable water sources and a more diverse resource base than other parts of the region. Early Archaic projectile point styles include Hoxie, Gower, Wells, Martindale, and Uvalde. Clear Fork and Guadalupe bifaces and a variety of other bifacial and unifacial tools are common to Early Archaic assemblages. Construction and use of rock hearths and ovens, which had been limited during late Paleoindian times, became commonplace. The use of rock features suggests that retaining heat and releasing it slowly over an extended period were important in food processing and cooking and reflects a specialized subsistence strategy. Such a practice probably was related to cooking plant foods, particularly roots and bulbs, many of which must be subjected to prolonged periods of cooking to render them consumable and digestible (Black et al. 1997:257; Wandsnider 1997; Wilson 1930). Botanical remains, as well as other organic materials, are often poorly preserved in Early Archaic sites, so the range of plant foods exploited and their level of importance in the overall subsistence strategy are poorly understood. But recovery of charred wild hyacinth (*Camassia scilloides*) bulbs from an Early Archaic feature at the Wilson-Leonard site provides some insights into the types of plant foods used and their importance in the Early Archaic diet (Collins et al. 1998). Significant Early Archaic sites include the Richard Beene site in Bexar County (Thoms and Mandel 1992), the Camp Pearl Wheat site in Kerr County (Collins et al. 1990), and the Jetta Court site in Travis County (Wesolowsky et al. 1976).

During the Middle Archaic period (6000–4000 B.P.), the number and distribution of sites, as well as their size, probably increased as population densities grew (Prewitt 1981:73; Weir 1976:124, 135). Macrobands may have formed at least seasonally, or more small groups may have used the same sites for longer periods (Weir 1976:130–131). Development of burned rock middens toward the end of the Middle Archaic suggest a greater reliance on plant foods, although tool kits still imply a considerable dependence on hunting (Prewitt 1985:222–226). Middle Archaic projectile point styles include Bell, Andice, Taylor, Baird, Nolan, and Travis. Bell and Andice points reflect a shift in lithic technology from the preceding Early Archaic Martindale and Uvalde point styles (Collins 1995:384). Johnson and Goode (1994:25) suggest that the Bell and Andice darts are parts of a specialized bison-hunting tool kit. They also believe that an influx of bison and bison-hunting groups from the Eastern Woodland margins during a slightly more mesic period marked the beginning of the Middle Archaic. Though no bison remains were recovered or present, Bell and Andice points and associated radiocarbon ages were recovered from the Cibolo Crossing (Kibler and Scott 2000), Panther Springs Creek, and Granberg II (Black and McGraw 1985) sites in Bexar County. Bison disappeared as more-xeric conditions returned during the late part of the Middle Archaic. Later Middle Archaic projectile point styles represent another shift in lithic technology (Collins 1995:384; Johnson and Goode 1994:27). Prewitt (personal communication 2000) postulates that the production and morphology of Travis and Nolan points are similar to projectile points from the Lower Pecos region. Because they appeared earlier in the Lower Pecos than in central Texas, such characteristics as beveled stems and overall morphology may have originated in the Lower Pecos. At the same time, a shift to more-xeric conditions saw the burned rock middens develop, probably because intensified use of a specific resource (geophytic or xerophytic plants) or resource patches meant the debris of multiple rock ovens and hearths accumulated as middens on stable to slowly aggrading surfaces, as Kelley and Campbell (1942) suggested many years ago. Johnson and Goode (1994:26) believe that the dry conditions promoted the spread of yuccas and sotols, and that it was these plants that Middle Archaic peoples collected and cooked in large rock ovens.

During the succeeding Late Archaic period (4000 to 1300-1200 B.P.), populations continued to increase (Prewitt 1985:217). Within stratified Archaic sites such as Loeve-Fox, Cibolo Crossing, and Panther Springs Creek, the Late Archaic components contain the densest concentrations of cultural materials. Establishment of large cemeteries along drainages suggests certain groups had strong territorial ties (Story 1985:40). A variety of projectile point styles appeared throughout the Late Archaic period. Johnson and Goode (1994:29–35) divide the Late Archaic into two parts, Late Archaic I and II, based on increased population densities and perceived evidence of Eastern Woodland ceremonial rituals and religious ideological influences. Middle Archaic subsistence technology, including the use of rock and earth ovens, continued into the Late Archaic period. Collins (1995:384) states that, at the beginning of the Late Archaic period, the use of rock ovens and the resultant formation of burned rock middens reached its zenith and that the use of rock and earth ovens declined during the latter half of the Late Archaic. There is, however, mounting chronological data that midden formation culminated much later and that this high level of rock and earth oven use continued into the early Late Prehistoric period (Black et al. 1997:270–284; Kleinbach et al. 1995:795). A picture of prevalent burned rock midden development in the eastern part of the central Texas region after 2000 B.P. is gradually becoming clear. This scenario parallels the widely recognized occurrence of post-2000 B.P. middens in the western reaches of the Edwards Plateau (see Goode 1991).

The use of rock and earth ovens (and the formation of burned rock middens) for processing and cooking plant foods suggests that this technology was part of a generalized foraging strategy. The amount of energy involved in collecting plants, constructing hot rock cooking appliances, and gathering fuel ranks most plant foods relatively low based on the resulting caloric return (Dering 1999). This suggests that plant foods were part of a broad-based diet (Kibler and Scott 2000:134) or part of a generalized foraging strategy, an idea Prewitt (1981) put forth earlier. At times during the Late Archaic, this generalized foraging strategy appears to have been marked by shifts to a specialized economy focused on bison hunting (Kibler and Scott 2000:125–137). Castroville, Montell, and Marcos dart points are elements of tool kits often associated with bison hunting (Collins 1968). Archeological evidence of this association is seen at Bonfire Shelter in Val Verde County (Dibble and Lorrain 1968), Jonas Terrace (Johnson 1995), Oblate Rockshelter (Johnson et al 1962:116), John Ischy (Sorrow 1969), and Panther Springs Creek (Black and McGraw 1985).

The Archaic period represents a hunting and gathering way of life that was successful and that remained virtually unchanged for more than 7,500 years. This notion is based in part on fairly consistent artifact and tool assemblages through time and place and on resource patches that were used continually for several millennia, as the formation of burned rock middens shows. This pattern of generalized foraging, though marked by brief shifts to a heavy reliance on bison, continued almost unchanged into the succeeding Late Prehistoric period.

Introduction of the bow and arrow and, later, ceramics into Central Texas marked the Late Prehistoric period. Population densities dropped considerably from their Late Archaic peak (Prewitt 1985:217). Subsistence strategies did not differ greatly from the preceding period, although bison again became an important economic resource during the late part of the Late Prehistoric period (Prewitt 1981:74). Use of rock and earth ovens for plant food processing and the subsequent development of burned rock middens continued throughout the Late Prehistoric period (Black et al. 1997; Kleinbach et al. 1995:795). Horticulture came into play very late in the region but was of minor importance to overall subsistence strategies (Collins 1995:385).

In central Texas, the Late Prehistoric period generally is associated with the Austin and Toyah phases (Jelks 1962; Prewitt 1981:82–84). Austin and Toyah phase horizon markers, Scallorn-Edwards and Perdiz arrow points, respectively, are distributed across most of the state. Violence and conflict often marked introduction of Scallorn and Edwards arrow points into central Texas—many excavated burials contain these point tips in contexts indicating they were the cause of death (Prewitt 1981:83). Subsistence strategies and technologies (other than arrow points) did not change much from the preceding Late Archaic period. Prewitt's (1981) use of the term "Neoarchaic" recognizes this continuity. In fact, Johnson and Goode (1994:39–40) and Collins (1995:385) state that the break between the Austin and Toyah phases could easily and appropriately represent the break between the Late Archaic and the Late Prehistoric.

Around 1000–750 B.P., slightly more-xeric or drought-prone climatic conditions returned to the region, and bison came back in large numbers (Huebner 1991; Toomey et al. 1993). Using this vast resource, Toyah peoples were equipped with Perdiz point-tipped arrows, end scrapers, four-beveled-edge knives, and plain bone-tempered ceramics. Toyah technology and subsistence strategies represent a completely different tradition from the preceding Austin phase. Collins (1995:388) states that formation of burned rock middens ceased as bison hunting and group mobility obtained a level of importance not witnessed since Folsom times. Although the importance of bison hunting and high group mobility hardly can be disputed, the argument that burned rock midden development ceased during the Toyah phase is tenuous. A recent examination of Toyah-age radiocarbon assays and assemblages by Black et al. (1997) suggests that their association with burned rock middens represents more than a "thin veneer" capping Archaic-age features. Black et al. (1997) claim that burned rock midden formation, although not as prevalent as in earlier periods, was part of the adaptive strategies of Toyah peoples.

Hester (1989) and Newcomb (1961) provide historical accounts of Native Americans and their interactions with the Spanish, the Republic of Mexico, the Texas Republic, and the United States throughout the region. The beginning of the late seventeenth and early eighteenth centuries was an era of more-permanent contact between Europeans and Native Americans as the Spanish moved northward out of Mexico to establish settlements and missions on their northern frontier (see Castañeda [1936–1958] and Bolton [1970] for extended discussions of the mission system and Indian relations in Texas and the San Antonio area). There is little available information on aboriginal groups and their ways of life except for the fragmentary data Spanish missionaries gathered. In the San Antonio area and areas to the south, these groups have been referred to collectively as Coahuiltecans because of an assumed similarity in way of life, but many individual groups may have existed (Campbell 1988). Particular Coahuiltecan groups, such as the Payaya and Juanca, have been identified as occupying the San Antonio area (Campbell 1988). This area also served as a point of contact between the southward-advancing Apaches and the Spanish, with native groups often caught in between. Disease and hostile encounters with Europeans and intruding groups such as the Apache were already wreaking their inevitable and disastrous havoc on native social structures and economic systems by this time.

Establishment of the mission system in the first half of the eighteenth century to its ultimate demise around 1800 brought the peaceful movement of some indigenous groups into mission life, but others were forced in or moved in to escape the increasing hostilities of southward-moving Apaches and Comanches. Many of the Payaya and Juanca lived at Mission San Antonio de Valero (the Alamo), but so many died there that their numbers declined rapidly (Campbell 1988:106, 121–123). By the end of the mission period, European expansion and disease and intrusions by other Native American peoples had decimated many Native American groups. The small numbers of surviving Payaya and Juanca were acculturated into mission life. The last references to the Juanca and Payaya were recorded in 1754 and 1789, respectively, in the waning days of the mission (Campbell 1988:98, 123). By that time, intrusive groups such as the Tonkawa, Apache, and Comanche had moved into the region to fill the void. Outside of the missions, few sites attributable to these groups have been investigated. To complicate matters, many aboriginal ways of life endured even after contact with the Spanish. For example, manufacture of stone tools continued even for many groups settling in the missions (Fox 1979). The nineteenth century brought the final decimation of the Native American groups and the U.S. defeat of the Apaches and Comanches and their removal to reservations.

Southern East-Central Texas

This synopsis focuses on the southern part of east-central Texas—the Bryan District and the northern part of the Yoakum District. Most of this area is within the Oak Woods and Prairies region, although Blackland Prairie occurs along the western and southern edges and in a narrow band through the middle. The archeology of parts of this area is reasonably well understood because several large-scale projects involving excavations have been undertaken. Among those projects that have contributed important information are Richland-Chambers Reservoir in Freestone and Navarro Counties (Bruseth and Martin 1987; McGregor and Bruseth 1987); Lake Limestone in Leon, Limestone, and Robertson Counties (Mallouf 1979); Jewett Mine in Freestone and Leon Counties

(Espey, Huston and Associates, Inc. 1984; Fields 1987, 1990; Fields and Klement 1995; Fields et al. 1991; Gadus et al. 2001); Calvert Mine in Robertson County (Davis et al. 1987; Robinson and Turpin 1993); Sandow Mine in Lee and Milam Counties (Rogers 1997; Rogers and Kotter 1995; Rogers 1999); Gibbons Creek Mine in Grimes County (Rogers 1993, 1994, 1995); Somerville Lake in Burleson, Lee, and Washington Counties (Peterson 1965; Thoms and Ahr 1996); Cummins Creek Mine in Fayette County (Kotter et al. 1991); Fayette Power Plant in Fayette County (Skelton 1977); 41BU16 in Burleson County, the Kennedy Bluffs and Bull Pen sites in Bastrop County, and the Black Hopper site in Fayette County excavated because of Texas Department of Transportation projects (Bement 1989; Ensor and Mueller-Wille 1988; Fullem 1977; Roemer and Carlson 1987); and miscellaneous excavations such as those at the Winnie's Mound and Frisch Auf! sites (Bowman 1985; Hester and Collins 1969). Not surprisingly given its location, the archeology of this region often has been seen as reflecting influences from adjoining regions with better-defined cultural histories, with the strength of these influences varying across the area. For example, Caddoan influences predominate in the northern part of the study area, coastal influences are especially strong on the southeastern edge, and similarities to central Texas are most pronounced on the southern and western margins.

As elsewhere in Texas, excavated and reported Paleoindian materials from southern east-central Texas are scarce, but a variety of early points have been found, largely in mixed or surface contexts, and it is clear that this part of Texas was used throughout the period from ca. 10,000 to 6500 B.C. Presumably, this use was by hunter-gatherer groups with low population densities and high residential mobility. One significant early find, estimated to date between 12,000 and 10,000 B.P., was at the Duewell-Newberry site in Brazos County (Carlson et al. 1984). The find consisted of mammoth remains deeply buried in Brazos River alluvium. Although no artifacts were found in association, some of the bones contained cut marks indicating human modification. Other early materials from the region include a few San Patrice points from Richland-Chambers Reservoir (McGregor and Bruseth 1987:176–179); one Folsom point from Lake Limestone (Mallouf 1979:44); a Golondrina point, several untyped lanceolate points, and a radiocarbon assay of 8940 B.P. from the Lambs Creek knoll site at the Jewett Mine (Fields 1995:304), as well as a Clovis point, a Meserve-Dalton point, and two San Patrice points from two other sites (Day 1984:83; Fields et al. 1991:317); a San Patrice point and a Plainview-like point from the lowermost stratum at the Winnie's Mound site (Bowman 1985:44); a Plainview point and a Golondrina point from the Chesser site at the Sandow Mine (Rogers and Kotter 1995:134); occasional Dalton and San Patrice points from sites at the Gibbons Creek Mine (Rogers 1995:166); a Dalton point from Somerville Lake (Thoms and Ahr 1996:13); and a few Plainview and Meserve points from sites in the Fayette Power Plant Project area (Skelton 1977:124).

Many of the excavated sites in the region have components dating to the Archaic period (ca. 8500–1250 B.P.), and it is clear that the area supported sizeable populations by the last third of the period. Materials dating to the early and middle parts of the period are widespread but not very abundant. For example, the relatively intensive work at Richland-Chambers Reservoir and Lake Limestone and Jewett Mine at the north end of the study area suggests limited use of the western edge of the Oak Woodlands before the Late Archaic, although for both areas it has been noted that data pertaining to the early to middle parts of the Archaic may be scarce in part because sites dating to this interval lie deeply buried or were removed by extensive erosion during the mid-Holocene (Fields 1995:302; McGregor and Bruseth 1987:229). Only a few radiocarbon assays predating 4000 B.P. were obtained from these project areas, and only one excavated site, Charles Cox at the Jewett Mine, contains a substantial component that might be Early or Middle Archaic in age (Fields 1995:303–305). A variety of untyped dart points with expanding and parallel stems appear to represent this component, but later materials are mixed in as well, and the deposits were not dated by radiocarbon. Points dated to this interval in central Texas—for example, Bell, Andice, Calf Creek, and Hoxie—occur at both Richland-Chambers Reservoir and the Jewett Mine, but only in very small numbers.

Similar conclusions can be reached for the other project areas listed above. The work at the Calvert Mine has not revealed evidence of significant Early to Middle Archaic occupations, and the evidence from the Sandow Mine is limited as well—an early split-stem point, an Angostura-Hoxie point, and two Travis points from the Chesser site and a Martindale point from 41LE120 (Rogers 1997:52; Rogers and Kotter 1995:134). Early to Middle Archaic materials elsewhere in the region, all from sites that date predominantly later, include a Hoxie point from 41GM166 at the Gibbons Creek Mine (Rogers 1995:166–167); an Angostura-like point from Somerville Lake (Thoms and Ahr 1996:13); a few Travis, Nolan, Hoxie, and Uvalde points from the Cummins Creek Mine (Kotter et al. 1991:111, 124, 136); single Gower and Angostura points from the Fayette Power Plant (Skelton 1977:124, 125); and a Travis point from the Black Hopper site (Fullem 1977:11).

Two excavated sites with substantial Early to Middle Archaic components are Winnie's Mound and Kennedy Bluffs, although the primary components at both of these sites are Late Archaic. At the former, a Bell point, a Hoxie point, five Gower-Uvalde-like points, two Gower-like points, and five Hoxie-Gower-Uvalde-like points were found in the lower strata, along with at least one hearth (Bowman 1985:43–47, 70). At Kennedy Bluffs, only a few Early to Middle Archaic points (one Travis, one Tortugas-Taylor, two Angostura, one Gower-like, and one Nolan) were found in the area TxDOT excavated, but many items dating to this interval were documented among the materials collectors recovered from another part of the site (Bement et al. 1989:35–36, 71–154). Given the limited information available for this part of the period, it is difficult to say much about adaptations and life. It does appear, however, that the region was used in a limited fashion, presumably reflecting low population densities among mobile hunter-gatherers.

The late part of the Archaic period—after about 4000 B.P.—presents a very different picture. All parts of the area that have been studied archeologically contain sites dating to this period, and the Late Archaic represents the earliest time for which much is known about Native American life. One of the more-complete pictures of the archeology of the Late Archaic for this region comes from the Oak Woodlands at the eastern margin of the Blackland Prairie on the north edge of the study area. Along Richland and Chambers Creeks, Late Archaic groups appear to have been hunter-gatherers whose subsistence pursuits focused on wild plant foods such as hickory nuts and prairie turnip and faunal taxa such as deer, turtles, small mammals, birds, and fish (McGregor and Bruseth 1987:236–240). Although presumably not sedentary, these groups clearly used the area intensively for residential purposes, and populations appear to have increased while territory sizes decreased. A conspicuous component of the record is the so-called Wylie pit, examples of which were excavated at the Bird Point Island and Adams Ranch sites. These were large features that appear to have been used for communal processing of vegetal resources (and later as cemeteries), perhaps in the context of band aggregation in tension zones as territories decreased in size (McGregor and Bruseth 1987:237).

The Navasota River valley and the area eastward to and across the Trinity River divide also were occupied with increased intensity during the Late Archaic period (Fields 1995:307–309), although there is no evidence for the kind of population aggregations indicated at Richland-Chambers Reservoir. Faunal and macrobotanical remains were not preserved in the Late Archaic components at Lake Limestone and the Jewett Mine, except for the ubiquitous hickory nut shells, and thus data on subsistence are limited. Nonetheless, it is surmised that these hunter-gatherers subsisted on a variety of wild plant foods and game, especially deer. Of the 20 excavated components assigned to this period, 15 are interpreted as residential bases and 5 as procurement or processing locations. Five of the residential-base components are situated along the Navasota River and appear to represent general-purpose campsites, and the others are in the uplands to the east and consist of 2 general-purpose residential bases and 8 residential bases at which activities focused heavily on plant processing and secondarily on hunting. This distinction suggests that Late Archaic settlement systems were based on the occurrence of plant foods. The analysis units interpreted as procurement-processing locations appear to have focused primarily on plant processing and then on hunting-related activities. Four of these are along streams in the uplands, and the fifth is along a Navasota River tributary to the west. The data from these 20 components are consistent with the idea that Late Archaic groups were chiefly foragers because procurement-processing locations suggesting logistical use are not frequent. Settlement systems appear to have been highly scheduled, probably by season, with residential sites in riverine settings differing from those in the uplands. Comparisons with earlier components at Lake Limestone and the Jewett Mine are difficult, but the much greater frequency of Late Archaic components and the overall greater intensity of use suggest increased population densities, decreased territories, or both. The occurrence of the Late Archaic cemetery at the Cottonwood Springs site along Lambs Creek on the east side of the Navasota River valley also points to this shift (Fields and Klement 1995).

Not only do constellations of projectile point styles (e.g., Dawson, Gary, Godley, Kent, Neches River oletha, and Yarbrough) from the Richland-Chambers, Lake Limestone, and Jewett Mine areas indicate ties to the north and east rather than to the south and west, but each of these areas also has yielded information suggesting that ceramics may have been introduced into the material culture of local groups during the latest part of the Late Archaic, as they were across most of Texas to the east (where this interval usually is called the Early Ceramic period and sometimes the Woodland period).

At Richland-Chambers Reservoir, distinctive shell-tempered sherds were recovered from contexts dated between A.D. 200 and 700 at the Adams Ranch site (McGregor and Bruseth 1987:180–181), apparently representing the earliest ceramic industry in this part of the Trinity River basin. At Lake Limestone and the Jewett Mine, a few shell-tempered sherds, a few sherds with a fine kaolin paste but no obvious temper, and larger numbers of sandy paste ceramics and grog- or bone-tempered ceramics were found in contexts that appeared to predate arrow points (i.e., the latter part of the Late Archaic). Although some of these could be genuinely early, especially the sandy paste wares that are so reminiscent of the early ceramics that predominate in east Texas south of the Sabine River, it is possible that the other sherds intruded from later deposits (Fields 1995:308). In either case, sherds were sufficiently infrequent to suggest that, although ceramic containers may have been a notable addition to the material culture, they were not abundant.

The Late Archaic archeology of the other project areas in southern east-central Texas has not been deciphered to the same extent as that at Richland-Chambers Reservoir and the Jewett Mine, but it is clear that similar, though not identical, cultural developments occurred within hunter-gatherer groups across the region. The single excavated site at the Calvert Mine, 41RT267, apparently contains a Late Archaic component, but small sample sizes and the lack of features hamper interpretation (Robinson and Turpin 1993). Both of the excavated sites at the Sandow Mine—the Chesser site and the Walleye Creek site—have strong Late Archaic components. At these sites, many burned rock features were found in association with dart point types such as Bulverde, Pedernales, Lange, Marshall, Marcos, Ensor, Darl, and Fairland (Rogers 1999:96; Rogers and Kotter 1995:134). Although these types show distinct ties to Central Texas in general, Rogers (1999:96–97) argues that the last three represent more-local types especially common to the eastern margin of the Edwards Plateau. A single sandy paste sherd was recovered from the Chesser site, but it is unclear if it relates to terminal Archaic or Late Prehistoric use of the site. In either case, ceramics were a less-prominent part of the material culture here than they were farther to the east and north. The limited faunal and macrobotanical remains recovered suggest reliance on *Carya* nuts and deer (Rogers 1999:28, 31–32; Rogers and Kotter 1995:42–45, C-1–10).

To the east, two sites along the Brazos River, Winnie's Mound and 41BU16, have significant Late Archaic components (Bowman 1985; Roemer and Carlson 1987). Perhaps most important, both apparently contained cemeteries probably Late Archaic in age. Cemeteries here and elsewhere across the region perhaps represent increased population densities and definition of territories. The projectile point styles recovered—Bulverde, Darl, Dawson, Edgewood, Ensor, Fairland, Frio, Gary, Kent, Lange, Marcos, Pedernales, and Yarbrough—are a mix of types characteristic of central and eastern Texas. Winnie's Mound yielded a few sandy paste sherds, and 41BU16, a larger ceramic collection that is hard to relate typologically to ceramics in surrounding regions.

At the Gibbons Creek Mine on the east edge of the study area, most of the excavated sites have Late Archaic components, and Rogers (1995:167) suggests that this reflects "a less mobile population relying more heavily on the area's plant resources, particularly hickory nuts." Rock hearths are common at these sites, but other kinds of features are not. Not surprisingly, the most common dart point types—Gary, Kent, and Palmillas—show strong connections to the eastern part of the state rather than to central Texas (Rogers 1995:167). As at the Jewett Mine and Richland-Chambers Reservoir to the north, ceramics may have been added to the material culture during the latest Archaic. These early ceramics were sandy paste wares comparable to early ceramics elsewhere in southeastern Texas (Rogers 1995:167).

At Somerville Lake on Yegua Creek, the single site excavated, Erwin's Bridge, contained a strong Late Archaic component, although it was difficult to isolate it from the Late Prehistoric component (Peterson 1965). Most of the kinds of projectile points recovered—Bulverde, Castroville, Darl-like, Elam, Fairland, Palmillas, and Pedernales—resemble those from the Sandow Mine not far to the northwest, with both collections indicating ties to central Texas to the west. Erwin's Bridge yielded a small collection of ceramics, primarily sandy paste, but it is impossible to tell if these relate to the late Archaic or Late Prehistoric occupations.

Moving farther south into the Colorado River basin, the Kennedy Bluffs and Bull Pen sites in Bastrop County and most of the tested sites at the Fayette Power Plant and the Cummins Creek Mine have Late Archaic components. Both the Kennedy Bluffs site and the Bull Pen site contained evidence of extensive use of burned rock features associated with point styles typical of central Texas to the west, especially Pedernales, with Bulverde, Marcos, Montell, and Marshall-like points also at Kennedy Bluffs and Ensor, Fairland, and Darl at Bull Pen (Bement et al. 1989:21–30, 37–44; Ensor and Mueller-Wille 1988:181–183). These sites have been interpreted as seasonal base camps used repeatedly by hunter-gatherers for a variety of maintenance, extractive, and processing tasks (Ensor and Mueller-Wille 1988:183–200). At the Fayette Power Plant, a number of sites yielded similar styles of points—Pedernales, Marshall, Ensor, Darl, and Fairland. The last three types were especially common and indicated "a marked increase in site utilization and exploitation of the local resources" during terminal Archaic times (Skelton 1977:125–126). Several of the tested sites at the Cummins Creek Mine contained Darl, Ensor, Pedernales, and Mahomet points and were interpreted as having been used as short-term campsites during the Late Archaic period (Kotter et al. 1991:118–119, 159–160, 177).

Sites dating to the Late Prehistoric, after ca. A.D. 700, also are common across most of the region. As for the preceding period, good data on how Native Americans used the region comes from Richland-Chambers Reservoir and Lake Limestone and nearby Jewett Mine. Sites dating to this interval are frequent at Richland-Chambers Reservoir, especially for the early half of the period, and it appears that there was a significant decline in population densities after about A.D. 1300 (McGregor and Bruseth 1987:245). The data suggest that most of the excavated sites with Late Prehistoric components were used for residential purposes (McGregor and Bruseth 1987:241, 244, 246), although there are some sites, for example the streamside concentrations of mussel shells and artifacts at 41FT193 and 41NV139, that probably had more-limited use. The house patterns at the Bird Point Island site point to intensive use by sedentary hunter-gatherers during the first half of the period, and other components that are contemporaneous, slightly earlier, or later (for example, at Bird Point Island, Adams Ranch, Irvine, and Little Cedar Creek) have middens and many features suggesting intensive use but no houses. These components may represent occupations that were seasonal in length. Macrobotanical remains point to use primarily of wild plant foods—hardwood nuts, a variety of seeds, tubers, and rhizomes (McGregor and Bruseth 1987:243). The only tropical cultigen is maize, and it occurs in very small quantities only in contexts dating to the last half of the period, so groups who lived in this area were predominantly hunters and gatherers. Alba, Scallorn, and Steiner arrow points were used during the early part of the period, and Perdiz and Cliffton points are more characteristic of the late part. Gary dart points may have been used through the early Late Prehistoric (McGregor and Bruseth 1987:183). Ceramics are moderately common and clearly relate to Caddoan wares, with most of the identified types (for example, Maydelle Incised, Poyner

Engraved, and Weches Fingernail Impressed) indicating contact with groups in the Neches River drainage, east of the Trinity.

Work at Lake Limestone along the Navasota River and the Jewett Mine in the uplands to the east identified 12 components dating predominantly to the Late Prehistoric period, although not all are well dated (Fields 1995:313–317; Gadus et al. 2001). Six are interpreted as residential bases, and the other 6 are procurement-processing locations. These sites suggest that the Late Prehistoric period saw a change in settlement strategies from the Late Archaic and that there were changes within the Late Prehistoric period as well. During the early part of the period, residential activities were increasingly restricted to lowland sites, while the uplands were used mostly for hunting-related procurement and processing tasks. This pattern indicates that logistical strategies became more important, but there is no evidence that groups also became more sedentary within the upper Navasota River basin itself. Only one site, McGuire's Garden, contained the kinds of features and other remains that suggest permanent (or nearly so) occupation, with this unusually sedentary use dating to a short interval around A.D. 1300. During the late part of the period, the area apparently saw a return to forager-oriented hunter-gatherer strategies entailing more equable use of upland and lowland settings. Faunal remains indicate that deer, turtles, and rabbits were hunted commonly, and other small mammals, bison, fish, birds, lizards, and snakes were represented as well. Hickory nut shells are by far the most common plant remains. The only evidence for horticulture came from the McGuire's Garden site. Scallorn and Steiner are the most common early arrow point styles, and use of dart points appears to have persisted through the early part of the period (Fields 1995:314). Perdiz is the dominant later arrow point style. Ceramics occur widely but infrequently, being common at only a handful of sites that date mostly to the middle and late parts of the period. Nonetheless, they all relate strongly to Caddoan wares from east of the Trinity River, with the more-distinctive sherds showing typological affinities to early types such as Holly Fine Engraved and Weches Fingernail Impressed and later types such as Maydelle Incised, Killough Pinched, Poyner Engraved, and Patton Engraved. Because Caddoan ceramics abound in these components but evidence for permanent occupations (i.e., structures) is scarce, Fields et al. (1991) suggested that Caddo Indians used most of these sites as base camps to support forays by hunting parties or other procurement and processing task groups, or perhaps groups in transit between the eastern and central parts of the state used them. It is equally plausible, however, that local hunter-gatherer groups created them and that the ceramics resulted from trade or borrowing of ideas about ceramic manufacture and decoration.

At the Calvert Mine in the uplands between the Brazos and Navasota Rivers, the primary component at the single excavated site, 41RT267, appears to date to the early Late Prehistoric period (Robinson and Turpin 1993:23–69). It contained Scallorn, Alba, and Granbury points, as well as a single potsherd and several burned rock features, and was interpreted as having been used mostly as a hunting camp with occasional use as a domestic campsite (Robinson and Turpin 1993:71–72). Farther south at the Sandow Mine, both of the excavated sites have Late Prehistoric components, but they do not appear to represent intensive use. Materials diagnostic of this period include small numbers of Scallorn, Perdiz, Alba, and Cuney points; ceramics are scarce to absent (Rogers 1999:96; Rogers and Kotter 1995:136). At Somerville Lake not far to the southeast, arrow points typed as Alba, Cliffton, Granbury, Perdiz, Scallorn, and Young were recovered from the Erwin's Bridge site, along with a handful of undecorated potsherds (Peterson 1965:22–27, 36–43); small numbers of Alba, Scallorn, Perdiz and Bonham points and sandy paste sherds were found at other sites Thoms and Ahr (1996) recorded.

Eastward along the Brazos, an early Late Prehistoric component represented by a few Scallorn points, a small number of sandy paste sherds, and perhaps a few burials was documented at Winnie's Mound (Bowman 1985:43, 50, 61–63). Alba, Perdiz, and Scallorn points were found at 41BU16 nearby, along with both sandy paste and bone- or grog-tempered ceramics (Roemer and Carlson 1987:80–93); some of the burials at 41BU16 could relate to the Late Prehistoric component as well.

At the Gibbons Creek Mine at the southeast edge of the study area, Late Prehistoric remains are well represented, with substantial occupations at 41GM281 and 41GM282 and more-limited occupations at several other sites (Rogers 1993:77, 102, 174, 214, 1994:154, 1995:138–143, 164–165). The predominant early and late arrow point styles are Scallorn and Perdiz, respectively. The ceramics from most of the excavated sites (Rogers 1993:102, 160–173, 210–212, 1994, 1995:108–123, 168–171) are the sandy paste ware that occurs throughout southeast Texas, first in late Archaic (or Woodland or Early Ceramic) contexts and then in some Late Prehistoric contexts (e.g., on the upper coast). Two sites (41GM281 and 41GM282) also have sizable samples of pottery tempered with grog or bone. Some of these probably are related to the Late Prehistoric San Jacinto ware that occurs on the upper coast to the east and southeast, and small numbers of sherds bear designs similar to those seen on Caddoan pottery to the northeast. Subsistence data from the Gibbons Creek Mine are especially sparse, but hardwood nutshells occur in most sites and liliaceous bulb fragments were recovered from a single site (Rogers 1993:74, 124, 214, 1994:120, 149, 1995:56, 153). Consistent with the lack of cultigens at Gibbons Creek is the low stable carbon isotope value on human remains from a Late Prehistoric burial at 41GM205 (Rogers 1993:D–1 through D–3). The combined evidence indicates that, for the most part, the Gibbons Creek sites represent short-term residential occupations by hunter-gatherers.

In the Colorado River basin at the south end of the study area, Late Prehistoric components do not seem to be well represented. At the Cummins Creek Mine, only one minor Late Prehistoric occupation is represented by a single untyped arrow point from one of the four sites tested (Kotter et al. 1991:154). The Black Hopper, Kennedy Bluffs, and Bull Pen sites all contained sparse Late Prehistoric materials indicating limited occupations; arrow point types consisted of Scallorn, Perdiz, and Granbury, with none of the sites yielding ceramics (Bement et al. 1989:47; Ensor and Mueller-Wille 1988:116–118; Fullem 1977:12–13). One of the most substantial excavated Late Prehistoric components in this area was at the Cedar Bridge site at the Fayette Power Plant (Skelton 1977:127–128), where a Toyah occupation represented by Perdiz and Cliffton arrow points, bone-tempered ceramics, and bison bones was sampled. Another important Late Prehistoric component in the area was at the Frisch Auf! site, where Scallorn points and bone-tempered ceramics were found in association with a cemetery (Hester and Collins 1969).

Native American archeological materials dating to the protohistoric and early historic periods are scarce in southern east-central Texas. In fact, materials of this age are so rare as to be almost invisible archeologically in the project areas discussed above. But ethnohistoric accounts make it clear that historic Native Americans, both resident groups and immigrants, occupied the area (Bolton 1970; Campbell 1988; Newcomb 1993). Further, two historic routes from south Texas to east Texas, Camino de los Tejas and Camino Arriba, passed through present-day Milam, Robertson, Leon, Burleson, Madison, and Brazos Counties by the seventeenth and eighteenth centuries (McGraw et al. 1991:9). In the late 1740s and early 1750s, the Spanish located three missions—San Francisco Xavier de Horcasitas, San Ildefonso, and Nuestra Señora de la Candelaria—and a presidio (San Francisco Xavier de Gigedo) near one of these routes, not far from where Brushy Creek joins the Little River in Milam County (Gilmore 1996a, 1996b). The impetus for this action came when members of the Yojuane, Deadose, Mayeye, and Ervipiame asked that a mission be established in their territory. Other Native American groups reportedly associated with the missions were the Asinia, Top, Nabedache, Akokisa, Bidai, and Coco. For a variety of reasons, the Spanish had abandoned their efforts along lower Brushy Creek by the mid-1750s (Newcomb 1993:16–17).

SUMMARY OF IMPACT EVALUATIONS AND SURVEYS

Forty-six work orders distributed across all four TxDOT Districts were completed (Figure 3). These consisted of 71 Impact Evaluations, 20 Surveys, 5 Surveys with Geoarcheological Evaluation, and 1 work order to produce this report. Combined, these work orders entailed efforts at 59 bridge or relief structure replacements, 16 projects involving primarily road widening or realignment, and 1 wetland mitigation area. During completion of these work orders, five newly discovered or

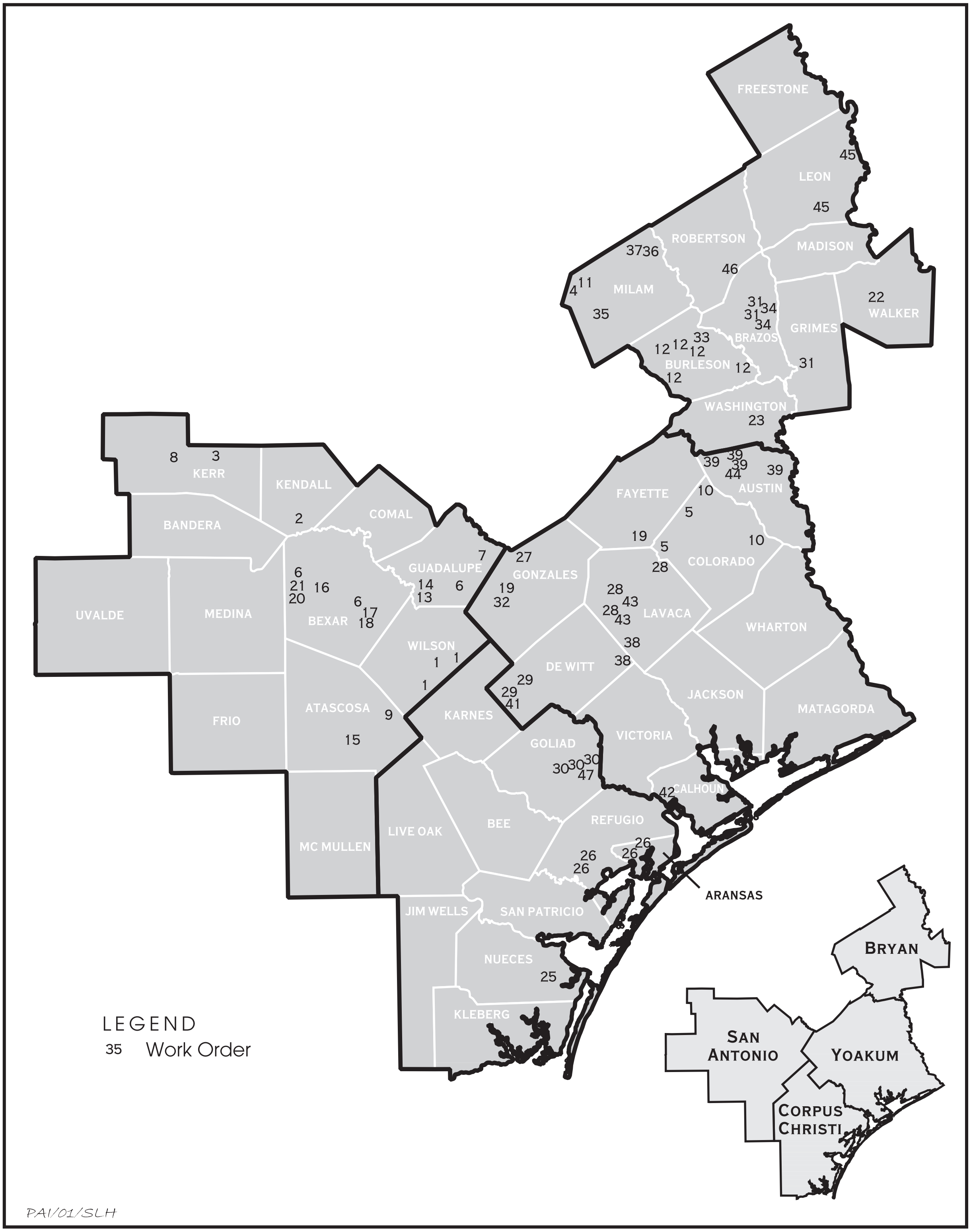

Figure 3. Map of the study area showing the locations of all Impact Evaluations and Surveys.

previously recorded archeological sites were investigated. This section begins with an outline of the methods used in accomplishing the work orders. Next, the work efforts are summarized in terms of distribution, setting, presence or absence of sites, and recommendations, followed by a discussion of the existing disturbances observed as they relate to the potential for archeological remains in good context at these locations and descriptions of the sites investigated. The section closes with a discussion of the utility of the fieldwork done under these work orders and recommendations for future projects of this kind.

Methods

Each work order done under this contract began with acquisition of the appropriate USGS map(s), a file search at the Texas Archeological Research Laboratory and the online Texas Archeological Sites Atlas for known sites in and near the project area, and review of project plans to identify impact areas. The field methods employed varied depending on the type of project.

For Impact Evaluations, fieldwork typically consisted of on-the-ground examination of the existing right of way on both sides of the road along the full length of the project area. Where right-of-entry had not been obtained for known or potential impact areas beyond the existing right of way, these areas were inspected visually across fence lines. The ground surface and any disturbed areas (e.g., road cuts, the backdirt of recently placed fiber optic or telephone lines, plowed fields, and so on) within and adjoining the existing right of way were examined for evidence of archeological remains. The primary thrust, however, was to record the kinds and extent of disturbance and determine the likelihood of archeological remains in undisturbed contexts. In most cases, this entailed examining visible stream cutbanks and overall valley geometry to form an opinion about the thickness and extent of Holocene alluvium that could host buried archeological deposits. Typically, shovel tests were not dug since cutbanks provided adequate information on sediment thickness.

For each bridge replacement or other Transportation Activity, a standardized Impact Evaluation form was completed recording anticipated impacts, location and extent of disturbances (e.g., ditches, fill sections, underground utilities, gullying and erosion, and other), location and extent of undisturbed right of way; geologic-geomorphic setting; nature, thickness, and origin of sediments; archeological remains observed; recommendations; personnel; and time spent. Each project area also was documented with color photographs. One or two people did Impact Evaluations, with the typical bridge replacement requiring 1–2 hours. Each of the Impact Evaluations that involved long stretches of highway was carried out as a series of on-the-ground inspections (i.e., at each stream crossing) following the methods outlined above, with the intervening upland areas subjected to windshield inspection.

For Surveys and Surveys with Geoarcheological Evaluations, fieldwork included excavating enough backhoe or Gradall trenches, sometimes accompanied by shovel tests, to constitute a good-faith effort toward determining whether archeological sites are present. As listed in Table 1, 97 trenches were excavated in 23 of the 25 survey areas, ranging from as few as 1 trench to as many as 10. On 5 surveys, a total of 24 shovel tests were dug in addition to trenches (range = 1–11 tests). On 2 other surveys, only shovel tests were dug because there are no deep Holocene deposits requiring trenching. Nine tests were excavated in one survey area, and 71 were dug in the other. Only 6 of the surveys were restricted to existing rights of way; substantial parts of these survey areas (usually one-third to two-thirds) were disturbed by existing roads and bridges. These 6 surveys involved excavating 21 trenches and 2 shovel tests. The other 19 surveys were in relatively undisturbed proposed new rights of way or construction easements varying from 0.2 to 25 acres in size (median = 0.9 acres; total = 88.03 acres). Seventy-six trenches and 102 shovel tests were excavated in surveying these areas. Trenches and shovel tests usually were placed according to the size and shape of each survey area, distributions of landforms, accessibility, and the locations of known sites rather than at specific intervals.

The trenches were at least 5 m long and 0.75 m wide and were usually at least 1.5 m deep (i.e., the anticipated maximum depth of substantial disturbance). After excavation, their walls were cleaned and examined for cultural materials. Stratigraphic descriptions were prepared for selected trenches to characterize the sediments. Shovel tests averaged 30 cm in diameter and were dug to varying depths depending on depth to bedrock, clay content, and water content. The sediments removed from shovel tests were screened through ¼-inch-mesh hardware cloth. A standardized Survey Summary Form was completed noting whether the survey included a geoarcheological evaluation; describing the areas subjected to surface survey and visibility, indicating the number, depth, and placement of shovel tests and trenches; listing the cultural materials observed and sites recorded; providing assessments and recommendations; and noting the personnel and time needed for the survey. Other documentation consisted of color photographs, Temporary Site Forms (for eventual submittal to the Texas Archeological Research Laboratory in TexSite format), stratigraphic profile descriptions, and project plans showing the locations of all trenches, shovel tests, and sites. Surveys usually were done by two-person crews; on Surveys with Geoarcheological Evaluations, one member of the crew was a geoarcheologist. The time required to complete the surveys varied depending on their size, the number of trenches and shovel tests excavated, and what was found. The range was 3–52 person-hours, with the median being 6.5 person-hours (excludes time spent by TxDOT personnel, including backhoe and Gradall operators).

Synopsis of Work Orders

As listed in Table 1, 13 of the 45 work orders involving fieldwork were in the Bryan District (Brazos, Burleson, Grimes, Leon, Milam, Robertson, Walker, and Washington Counties), 4 were in the Corpus Christi District (Aransas, Goliad, Nueces, and Refugio Counties), 15 were in the San Antonio District (Atascosa, Bexar, Guadalupe, Kendall, Kerr, and Wilson Counties), and 13 were in the Yoakum District (Austin, Colorado, DeWitt, Fayette, Gonzales, and Lavaca Counties). The projects in the Bryan District consisted of 12 Impact Evaluations, 10 Surveys, and 2 Surveys with Geoarcheological Evaluations for replacing 21 bridges and widening 1 road. In the Corpus Christi District, the work orders were for 12 Impact Evaluations and 1 Survey on 7 bridge replacements and 2 projects involving road widening (1 with construction of bypasses). The San Antonio District work orders consisted of 26 Impact Evaluations, 1 Survey, and 3 Surveys with Geoarcheological Evaluations entailing 9 bridge replacements and 12 road-widening projects. In the Yoakum District, 21 Impact Evaluations and 8 Surveys focused on replacement of 21 bridges, 1 road-widening project, and 1 wetland mitigation project.

Not surprising given the focus on bridge replacements, many of the projects (n = 68) were restricted to Holocene alluvial settings (see Table 1). Another 18 Impact Evaluations and Surveys encompassed upland margins as well as Holocene alluvium, with the uplands mapped as a variety of Tertiary and Quaternary formations (Beaumont, Fleming, Goliad, and Willis), Pleistocene fluviatile terrace deposits, and the Upper Cretaceous Austin Chalk and Pecan Gap Chalk Formations. The 10 projects that were mostly in upland areas crossed the Pleistocene Lissie Formation, Pleistocene fluviatile terrace deposits, and the Eocene Wilcox, Carrizo Sand, Reklaw, Yegua, Manning, Wellborn, and Caddell Formations. A variety of soils are mapped for the project areas, ranging from loamy to clayey, sometimes stony, often shallow soils in the western part of the study area to dark, calcareous, clayey soils of the Blackland Prairie to loamy to sandy soils with clayey substrates in the Oak Woodlands to clayey to sandy soils, some with indurated caliche, in the south Texas Brush Country. Among the mapped Holocene alluvial soils in the areas examined during these work orders are Aransas clay, Boerne silt loam, Bosque clay loam, Brazos fine sand, Christine clay loam, Frio silty clay loam, Gowen clay loam, Meguin silty clay, Navaca clay, Oakalla silty clay loam, Odem fine sandy loam, Orif silt loam, Pursley loam, Trinity clay, and Uhland loam (see Table 1). Upland and old terrace soils in these areas include Axtell fine sandy loam, Burleson clay, Clodine loam, Crockett fine sandy loam, Hockley fine sandy loam, Houston Black clay, Jedd gravelly sandy loam, Katy fine sandy loam, Lewisville silty clay, Lufkin loam, Miguel fine sandy loam, Patrick clay loam, Queeny gravelly loam, Tabor fine sandy loam, Tarrant clay loam, Webb fine sandy loam, and Wilson silt loam.

Most of the Impact Evaluations and Surveys (n = 79) were in rural areas where adjoining lands were undeveloped and in pastures or

Table 1. Summary of work orders

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
1	Wilson	Impact Evaluation; bridge replacement on CR 202 at Marcelinas Creek (0.1 acres of new ROW)	Holocene alluvium (1.0–1.5 m) and Quaternary terrace deposits along Marcelinas Creek; Miguel fine sandy loam and Clareville Clay soils; adjacent uplands are Eocene Yegua Formation	Rural; adjacent lands mostly in fields and pastures with woods along the creek	None	No survey needed
	Wilson	Impact Evaluation; bridge replacement on CR 252 at Dry Creek (0.4 acres of new ROW)	Holocene alluvium (2 m+) along Dry Creek and Quaternary terrace deposits; Willamar fine sandy loam and Gowen clay loam soils; adjacent uplands are Eocene Yegua and Cook Mountain Formations	Rural; adjacent lands mostly in fields and pastures with woods along the creek	None	No survey needed
	Wilson	Impact Evaluation; bridge replacement on CR 225 at Marcelinas Creek (0.2 acres of new ROW)	Holocene alluvium (4–5 m) along Marcelinas Creek and Quaternary terrace deposits; Miguel fine sandy loam and Clareville clay soils; adjacent uplands are Eocene Yegua and Cook Mountain Formations and Quaternary terrace deposits	Rural; adjacent lands mostly in fields and pastures with woods along the creek	None	Survey with cutbank inspection
2	Kendall	Survey with Geoarcheological Evaluation (1 trench); bridge replacement on U.S. Hwy. 87 at Cibolo Creek (no new ROW)	Holocene alluvium (1.0–1.5 m) along Cibolo Creek; Oakalla silty clay loam soils; adjacent uplands are Lower Cretaceous Glen Rose Formation	Urban; undeveloped adjacent lands are wooded	None	No further work
3	Kerr	Survey with Geoarcheological Evaluation (7 trenches); bridge replacement on G Street at Guadalupe River (ca. 2 acres of new ROW)	Holocene alluvium (1.0–1.5 m) along Guadalupe River; Orif sandy loam and Boerne sandy loam soils; adjacent uplands are Low Terrace deposits	Urban; adjacent lands are wooded along the river	None	No further work

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
4	Milam	Survey with Geoarcheological Evaluation (5 trenches); bridge replacement on CR 278 at Donahoe Creek (1.28 acres of new ROW)	Holocene alluvium (6–7 m) along Donahoe Creek; Trinity clay soils; adjacent uplands are Pleistocene terrace and high gravel deposits, Cretaceous Navarro and Taylor Group	Rural; adjacent lands used mostly for agricultural fields with trees along the creek.	None	No further work
5	Colorado	Impact Evaluation; bridge replacement on CR 397 at Cottonwood Creek (no new ROW)	Holocene alluvium (2.5–3.0 m) along Cottonwood Creek; Pursley loam soils; adjacent uplands are Upper Tertiary Fleming Formation	Rural; adjacent lands are pastures with trees along the creek.	None	No survey needed
	Colorado	Impact Evaluation; bridge replacement on CR 113 at Crier Creek (no new ROW)	Holocene alluvium (2.5 m) along Crier Creek; Pursley loam soils; adjacent uplands are Upper Tertiary Fleming Formation	Rural; adjacent lands are pastures with trees along the creek.	None	No survey needed
6	Bexar	Impact Evaluation; road widening and culvert replacement on FM 471 (3.1 acres of new ROW)	Holocene alluvium (1.0–1.5 m) along tributary to Culebra Creek; Lewisville silty clay and Patrick clay loam; adjacent uplands are Upper Cretaceous Austin Chalk	Semirural; mixed farmland and residences	None	No survey needed
	Bexar	Impact Evaluation; road reconstruction and culvert replacement on Pecan Valley Road (0.86 acres of new ROW)	Holocene alluvium (< 1 m) along tributary of Salado Creek; Houston Black clay soils; adjacent uplands are Pliocene Uvalde gravels	Urban; adjacent unpaved areas are wooded	None	No survey needed
	Guadalupe	Impact Evaluation; road reconstruction and culvert replacement on FM 1117 (no new ROW)	Holocene alluvium (1.0–1.5 m) along tributaries; Crockett and Windthorst fine sandy loam, Demona loamy fine sand, Patilo loose fine sand soils; adjacent uplands are Eocene Wilcox, Carrizo Sand, and Reklaw Formations	Semirural; mixed farmland and residential developments	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
7	Guadalupe	Impact Evaluation; road widening and culvert replacement on Dietz Road (0.68 acres of new ROW).	Holocene alluvium (2.0 m) along East Dietz Creek; Austin silty clay, Barbarosa silty clay loam, Trinity clay, and Queeny gravelly loam soils; Upper Cretaceous Pecan Gap chalk and chalky marl	Urban; undeveloped areas are wooded and grassy	None	No survey needed
	Guadalupe	Impact Evaluation; road widening and culvert replacement on FM 1150 (no new ROW)	Holocene alluvium (ca. 1.5 m) along Nash Creek; Crockett gravelly sandy loam and Vernia very gravelly loamy sandy soils; adjacent uplands are Eocene Wilcox Group and Carrizo Sand	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
8	Kerr	Impact Evaluation; bridge replacement on FM 1340 at Waldemar Crossing of the Guadalupe River (no new ROW)	Holocene alluvium (1.5 m) along Guadalupe River; Oakalla silty clay loam, Orif-Boerne, and Boerne fine sandy loamy soils; adjacent uplands are Cretaceous Edwards Limestone, Glen Rose Limestone, and Pleistocene Low Terrace deposits	Semirural; mixed pastures and residences with woods along the river	None	No survey needed
	Kerr	Impact Evaluation; bridge replacement on FM 1340 at Quinns Crossing of the Guadalupe River (no new ROW)	Holocene alluvium (1.0–1.5 m) along Guadalupe River; Oakalla silty clay loam, Orif-Boerne, and Boerne fine sandy loamy soils; adjacent uplands are Cretaceous Edwards Limestone, Glen Rose Limestone, and Pleistocene Low Terrace deposits	Semirural; mixed pastures and residences with woods along the river	None	No survey needed
9	Atascosa	Impact Evaluation; bridge replacement on CR 414 at Borrego Creek, eastern bridge (no new ROW)	Holocene alluvium (3 m) along Borrego Creek; Christine series and Odem fine sandy loam soils; adjacent uplands are Eocene Caddell and Wellborn Sandstone Formations	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
	Atascosa	Impact Evaluation; bridge replacement on CR 414 at Borrego Creek,	Holocene alluvium (1.0–1.5 m) along Borrego Creek relief; Christine series and Odem fine sandy loam soils; adjacent uplands	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		western bridge (no new ROW)	are Eocene Caddell and Wellborn Sandstone Formations			
10	Colorado	Impact Evaluation; bridge replacement on CR 142 at Boggy Creek (no new ROW)	Holocene alluvium (1.5–2.0 m) along Boggy Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands used mostly for pastures with woods along the creek	None	No survey needed
	Colorado	Impact Evaluation; bridge replacement on CR 121 at Cummins Creek (0.22 acres of new ROW)	Holocene alluvium (2–6 m) along Cummins Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Quaternary terrace and recent alluvium and Pliocene Willis Formation	Rural; adjacent lands are pastures with woods along the creek	None	Survey with trenching
	Colorado	Impact Evaluation; bridge replacement on CR 119 at Cummins Creek (0.44 acres of new ROW)	Holocene alluvium (1.5–5.5 m) along Cummins Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Quaternary terrace and recent alluvium and Pliocene Willis Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	Survey with trenching
	Colorado	Impact Evaluation; bridge replacement on CR 171 at Coushatta Creek (no new ROW)	Holocene alluvium (1.5–3.0 m) along Coushatta Creek; Katy-Hockley-Clodine association soils; adjacent uplands are Quaternary alluvium and Pleistocene Lissie Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
11	Milam	Survey with Geoarcheological Evaluation (7 trenches); bridge replacement on CR 275 at Little River (0.97 acres of new ROW)	Holocene alluvium (ca. 8 m) along Little River; Frio silty clay loam soils; adjacent uplands are Quaternary alluvium and Cretaceous Taylor Marl and Navarro Group.	Rural; adjacent lands are pastures with woods along the creek	None	No further work
12	Burleson	Impact Evaluation; bridge replacement on CR 225 at Dry Creek (0.06 acres of new ROW)	Holocene alluvium (1 m) along Dry Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Quaternary alluvium and Eocene Cook Mountain Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
	Burleson	Impact Evaluation; bridge replacement on CR 190 at Davidson Creek (0.02 acres of new ROW)	Holocene alluvium (1.5–2.0 m) along Davidson Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Quaternary alluvium and Eocene Cook Mountain Formation	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
	Burleson	Impact Evaluation; bridge replacement on CR 252 at Porter Branch (0.3 acres of new ROW)	Holocene alluvium (2.0 m) along Porter Branch; Wilson-Crockett-Burleson association soils; adjacent uplands are Eocene Queen City Sand	Semirural; adjacent lands are pastures with residences	None	No survey needed
	Burleson	Impact Evaluation; bridge replacement on CR 291 at Old River (0.08 acres of new ROW)	Holocene alluvium (ca. 1.5 m) along Old River; Miller-Norwood-Pledger association soils; adjacent uplands are Quaternary alluvium	Rural; adjacent lands used mostly as pastures with woods along the creek	None	Survey with trenching
	Burleson	Impact Evaluation; bridge replacement on CR 188 at Second Davidson Creek (no new ROW)	Holocene alluvium (1.5–2.0 m) along Second Davidson Creek; Wilson-Crockett-Burleson association soils; adjacent uplands are Eocene Cook Mountain Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Burleson	Impact Evaluation; bridge replacement on CR 247 at Porter Branch (0.26 acres of new ROW)	Holocene alluvium (2.5 m) along Porter Branch; Wilson-Crockett-Burleson association soils; adjacent uplands are Eocene Queen City Sand	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Burleson	Impact Evaluation; bridge replacement on CR 200 at Old River (0.45 acres of new ROW)	Holocene alluvium (ca. 1.5 m) along Old River; Miller-Norwood-Pledger association soils; adjacent uplands are Quaternary alluvium	Rural; adjacent lands used mostly as agricultural fields and pastures with woods along the creek	None	Survey with trenching
	Burleson	Impact Evaluation; bridge replacement on CR 276 at Davidson Creek (no new ROW)	Holocene alluvium (1 m) along Davidson Creek; Lufkin-Axtell-Tabor association soils; adjacent uplands are Quaternary alluvium and Eocene Cook Mountain Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
13	Guadalupe	Impact Evaluation; road widening on FM 539 at Sandy Elm Creek (no new ROW)	Holocene alluvium (< 0.5 m) along Sandy Elm Creek; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands used as agricultural fields and pastures with woods along the creek	None	No survey needed
	Guadalupe	Impact Evaluation; road widening on FM 539 at Blue Creek (no new ROW)	Holocene alluvium (1 m) along Blue Creek; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Guadalupe	Impact Evaluation; road widening on FM 539 at unnamed tributary of Elm Creek (no new ROW)	Holocene alluvium (< 0.5 m) along unnamed tributary; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands are agricultural fields and pastures with woods along the creek	None	No survey needed
14	Guadalupe	Impact Evaluation; road widening on FM 467 at Blue Creek (no new ROW)	Holocene alluvium (1.5 m) along Blue Creek; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Guadalupe	Impact Evaluation; road widening on FM 467 at historic grave (no new ROW)	Holocene alluvium (<0.5 m); Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed (historic grave is outside existing ROW)
	Guadalupe	Impact Evaluation; road widening on FM 467 at minor tributaries of Elm Creek (no new ROW)	Holocene alluvium (0.5–1.0 m) along tributaries; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Guadalupe	Impact Evaluation; road widening on FM 467 at Elm Creek and tributary (no new ROW)	Holocene alluvium (1.0–1.5 m) along Elm Creek; Uhland loam and Crockett loam soils; adjacent uplands are Eocene Wilcox Group	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
15	Atascosa	Impact Evaluation;	Holocene alluvium (4–7 m) along	Rural; adjacent lands	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		road widening on FM 140 at La Parita Creek (no new ROW)	La Parita Creek; Christine clay loam and Webb fine sandy loam soils; adjacent uplands are EoceneYegua Formation	used mostly as pastures with woods along the creek		
	Atascosa	Impact Evaluation; road widening on FM 140 at Christine Creek (no new ROW)	Holocene alluvium (< 0.5 m) along Christine Creek; Christine clay loam and Webb fine sandy loam soils; adjacent uplands are Eocene Manning, Wellborn, and Caddell Formations	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
	Atascosa	Impact Evaluation; road widening on FM 140 at Metate Creek (no new ROW)	Holocene alluvium (1.0 m) along Metate Creek; Christine clay loam and Webb fine sandy loam soils; adjacent uplands are Eocene Manning, Wellborn, and Caddell Formations	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
	Atascosa	Impact Evaluation; road widening on FM 140 at upland localities A–G (no new ROW)	Uplands are Eocene Yegua, Manning, Wellborn, and Caddell Formations	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed
16	Bexar	Impact Evaluation; road widening on SW 24th Street between Lake Elmendorf and El Paso Street (no new ROW)	No Holocene deposits; Houston Black clay soils; adjacent uplands are Pleistocene fluvial terrace deposits	Urban; residential and commercial development	None	No survey needed
17	Bexar	Impact Evaluation; road widening on Southcross Boulevard (5.2 acres of new ROW)	No Holocene deposits; soils are Lewisville silty clay, Patrick clay loam, and Tarrant clay loam; project area is upland Pleistocene fluvial terrace deposit	Urban; abandoned pastures adjacent to industrial and commercial lots	None	Survey with shovel testing
18	Bexar	Survey (9 shovel tests); road widening on Southcross Boulevard (5.2	No Holocene deposits; soils are Patrick clay loam and Tarrant clay loam; project area is upland Pleistocene fluvial terrace deposit	Urban; abandoned pastures adjoining industrial and commercial lots	None	No further work

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		acres of new ROW)				
19	Gonzales	Survey (3 trenches and 2 shovel tests); bridge replacement on CR 143 at the Guadalupe River (0.9 acres new ROW)	Holocene alluvium (ca. 4–8 m) along the Guadalupe River; Bosque and Seguin clay loam soils; adjacent uplands are Eocene Weches Formation.	Rural; adjacent lands used mostly as pastures with woods along the river	None	No further work in area examined; survey with shovel testing for new ROW southwest of bridge
	Fayette	Impact Evaluation; bridge replacement on CR 291 at Mulberry Creek (no new ROW)	Holocene alluvium (2–3 m) along Mullberry Creek; Wilson-Crockett-Burleson soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
20	Bexar	Survey with Geoarcheological Evaluation (3 trenches, 11 shovel tests); road widening on Loop 1604 at Medio Creek (ca. 8 acres of new ROW)	Holocene alluvium (2.5 m +) along Medio Creek; Trinity and Frio clay soils; adjacent uplands are Upper Cretaceous Pecan Gap Chalk	Semirural; adjacent lands are being developed	41BX1421	Testing
21	Bexar	Impact Evaluation; road widening on Loop 1604 at Culebra Creek (2.5 acres of new ROW)	Holocene alluvium (< 0.25 m) along Culebra Creek; Trinity and Patrick clay soils; adjacent uplands are Quaternary alluvium and Upper Cretaceous Austin Chalk	Semirural; adjacent lands are being developed	None	No survey needed
22	Walker	Survey (6 trenches and 2 shovel tests); road widening on SH 30 (11.4 acres of new ROW)	Holocene alluvium (1.1–1.3 m) along tributaries of McGary Creek; Gowker and Annona soils; adjacent uplands are Miocene Fleming and Pliocene Willis Formations	Semirural; adjacent to developed area	None	No further work
23	Washington	Survey (2 trenches); bridge replacement on CR 309 at a tributary of Rocky	Holocene alluvium (ca. 2 m) along tributary of Rocky Creek; Bosque clay loam and Silawa loamy fine sand soils; adjacent uplands are	Rural; adjacent lands used mostly as pastures with woods along creek	None	No further work

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		Creek (0.32 acres of new ROW)	Miocene Fleming Formation			
25	Nueces	Impact Evaluation; road widening on FM 2444 between SH 286 and Oso Creek (no new ROW)	Holocene alluvium (<0.5 m) along Oso Creek; Victoria clay soils; adjacent lands are Pleistocene Beaumont Formation	Semirural; adjacent lands are agricultural fields, city botanical gardens, and residential developments	None	No survey needed
26	Aransas	Impact Evaluation; bridge replacement on SH 35 at Cavasso Creek (no new ROW)	Holocene alluvium (< 0.5 m) along Cavasso Creek; Barrada-Tatton soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands are salt marshes	None	No survey needed
	Aransas	Impact Evaluation; bridge replacement on SH 35 at Salt Creek (no new ROW)	Holocene alluvium (< 0.5 m) along Salt Creek; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands are salt marshes	None	No survey needed
	Refugio	Impact Evaluation; bridge replacement on FM 136 at Chocolate Swale (no new ROW)	Holocene alluvium (ca. 1–2 m) along Chocolate Swale; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands are salt marshes and pastures with wooded areas along the creek	None	No survey needed
	Refugio	Impact Evaluation; bridge replacement on FM 136 at Sous Creek, north bridge (no new ROW)	Holocene alluvium (1.0 m) along Sous Creek; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Refugio	Impact Evaluation; bridge replacement on FM 136 at Sous Creek, south bridge (no new ROW)	Holocene alluvium (1.0 m) along Sous Creek; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
	Refugio	Impact Evaluation; bridge replacement on FM 629 at Chocolate Swale, north bridge (no	Holocene alluvium (1.5 m) along Chocolate Swale; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands are pastures with woods along the creek	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		new ROW)				
	Refugio	Impact Evaluation; bridge replacement on FM 629 at Chocolate Swale, south bridge (no new ROW)	Holocene alluvium (1.5 m) along Chocolate Swale; Aransas clay soils; adjacent lands are Pleistocene Beaumont Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No survey needed
27	Gonzales	Impact Evaluation; bridge replacement at CR 230 at Mule Creek, north bridge (0.1 acres of new ROW)	Holocene alluvium (ca. 2.5 m) along Mule Creek; Brazos fine sand and Jedd stony soils; adjacent uplands are Eocene Reklaw Formation	Rural; adjacent land used mostly as pastures with woods along the creek	None	No survey needed
	Gonzales	Impact Evaluation (2 shovel tests); bridge replacement at CR 230 at Mule Creek, central bridge (0.3 acres of new ROW)	Holocene alluvium (< 1 m) along Mule Creek; Brazos fine sand and Jedd stony soils; adjacent uplands are Eocene Reklaw Formation	Rural; adjacent land is used for grazing	None	No survey needed
	Gonzales	Impact Evaluation (3 shovel tests); bridge replacement at CR 230 at Mule Creek, south bridge (0.1 acres of new ROW)	Holocene alluvium (< 1 m) along Mule Creek; Brazos fine sand and Jedd stony soils; adjacent uplands are Eocene Reklaw Formation	Rural; adjacent land used for pastures or woods	None	No survey needed
28	Lavaca	Impact Evaluation; bridge replacement on CR 306 at Rocky Creek (0.9 acres of new ROW)	Holocene alluvium (ca. 5 m) along Rocky Creek; Navaca clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land used mostly as pastures	None	Survey with trenching
	Lavaca	Impact Evaluation; bridge replacement on CR 298 at South Fork Mustang Creek (0.3 acres of new ROW)	Holocene alluvium (ca. 3 m) along South Fork Mustang Creek; Navaca clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land is used for grazing	None	Survey with trenching

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
	Lavaca	Impact Evaluation; bridge replacement on CR 139 at Miller Branch (0.3 acres of new ROW)	Holocene alluvium (ca. 3–4 m) along Miller Branch; Pursley soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land used mostly as pastures	None	Survey with trenching
29	DeWitt	Impact Evaluation; bridge replacement on CR 362 at Thomas Creek (0.35 acres of new ROW)	Holocene alluvium (3+ m) along Thomas Creek; Meguin silty clay loam soils; adjacent uplands are Pleistocene fluviatile terrace deposits and Miocene Fleming Formation	Rural; adjacent lands are agricultural fields, pastures, and woods	None	Survey with trenching
	DeWitt	Impact Evaluation; bridge replacement on CR 340 at unnamed tributary to Yorktown Creek, eastern bridge (no new ROW)	Holocene alluvium (< 0.5 m) along tributary; Meguin silty clay loam soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land used mostly for pastures, with woods south of the road	None	No survey needed
	DeWitt	Impact Evaluation; bridge replacement on CR 340 at unnamed tributary to Yorktown Creek, western bridge (no new ROW)	Holocene alluvium (< 0.5 m) along tributary; Denhawken-Elmendorf complex soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land is agricultural fields and pastures	None	No survey needed
30	Goliad	Impact Evaluation; road widening on U.S. Hwy. 59: Section B, Minnehulla Church to 2.5 km east of Manahuilla Creek (3 acres of new ROW)	Holocene alluvium (< 2 m) along Manahuilla Creek; Lufkin-Axtell-Tabor soil association; adjacent uplands are Miocene Goliad Formation	Rural; adjacent lands mostly are wooded pastures	None	No survey needed
	Goliad	Impact Evaluation; road widening and relocation of U.S. Hwy. 59: Section D,	No Holocene deposits; Katy-Hockley-Clodine soils; Pleistocene Lissie Formation	Rural; adjacent lands are pastures	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		Fannin relief route (38 acres of new ROW)				
	Goliad	Impact Evaluation; road widening and relocation of U.S. Hwy. 59: Section E, Noble Cemetery relief route (47 acres of new ROW)	Holocene alluvium (< 0.5 m) along Payton Branch and tributary to Perdido Creek; Katy-Hockley-Clodine soils; adjacent uplands are Pleistocene Lissie Formation	Rural; adjacent lands are pastures and woods	2 sites reported by landowner (see Work Order 47)	Survey with shovel testing
	Goliad	Impact Evaluation; road widening on U.S. Hwy. 59: Section F, east end of Noble Cemetery relief route to Lott Road (15 acres of new ROW)	No Holocene alluvium; Katy-Hockley-Clodine soils; Pleistocene Lissie Formation	Semirural; adjacent lands are pastures and woods	None	No survey needed
31	Grimes	Impact Evaluation; bridge replacement on CR 131 at Holland Creek (0.29 acres of new ROW)	Holocene alluvium (5+ m) along Holland Creek; Tinn clay soils; adjacent uplands are Miocene Catahoula and Fleming Formations	Rural; adjacent land used mostly as pastures and agricultural fields	None	Survey with trenching
	Brazos	Impact Evaluation; bridge replacement on CR 164 at Wickson Creek and Relief (no new ROW)	Holocene alluvium (3+ m) along Wickson Creek; Gowen-Ochlockonee soils; adjacent uplands are Eocene Yegua Formation and Pleistocene fluviatile terrace deposits	Rural; adjacent land used mostly for grazing	None	Survey with trenching
	Brazos	Impact Evaluation; bridge replacement on CR 165 at Wickson Creek (0.27 acres of new ROW)	Holocene alluvium (4+ m) along Wickson Creek; Gowen-Ochlockonee soils; adjacent uplands are Eocene Yegua Formation and Pleistocene fluviatile terrace deposits	Rural; adjacent land used mostly for grazing	None	Survey with trenching
32	Gonzales	Impact Evaluation; bridge replacement on CR 143 at the	Holocene alluvium (4–8 m) along the Guadalupe River; Queeny gravelly loam soils; Pleistocene	Rural; adjacent land used mostly as pastures with woods	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		Guadalupe River (0.3 acres of new ROW, southwest quad only)	fluviatile terrace deposits (southwest of the bridge)	along the river		
33	Burleson	Survey (5 trenches); bridge replacement on FM 1362 at Reed Creek (no new ROW)	Holocene alluvium (4 m) along Reed Creek; Lufkin-Axtell-Tabor soils; adjacent uplands are Eocene Cook Mountain Formation	Rural; adjacent land is used mostly as pastures with woods along the creek	None	No further work
34	Brazos	Survey (4 trenches); bridge replacement on CR 164 at Wickson Creek and relief (no new ROW)	Holocene alluvium (3+ m) along Wickson Creek; Gowen-Ochlockonee soils; adjacent lands are Eocene Yegua Formation and Pleistocene fluviatile terrace deposits	Rural; adjacent land used mostly as pastures	None	No further work
	Brazos	Survey (3 trenches); bridge replacement on CR 165 at Wickson Creek (0.27 acres of new ROW)	Holocene alluvium (4+ m) along Wickson Creek; Gowen-Ochlockonee soils; adjacent lands are Eocene Yegua Formation and Pleistocene fluviatile terrace deposits	Rural; adjacent land used mostly for pastures with woods along the creek.	None	No further work
35	Milam	Survey (8 trenches); bridge replacement on CR 353 at the San Gabriel River (1.04 acres of new ROW)	Holocene alluvium (ca. 8 m) along the San Gabriel River; Wilson-Crockett-Burleson soils; adjacent lands are Quaternary alluvium and fluviatile terrace deposits	Rural; adjacent lands used mostly as pastures with woods along the river	41MM373	Testing
36	Milam	Survey (3 trenches); bridge replacement on CR 151 at Hog Creek (0.34 acres of new ROW)	Holocene alluvium (4 m) along Hog Creek; Gowen clay loam soils; adjacent lands are Eocene Midway Group	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No further work
37	Milam	Survey (1 trench); bridge replacement on CR 156 at Big Briary Creek (0.26 acres of new ROW)	Holocene alluvium (4 m) along Big Briary Creek; Gowen clay loam soils; adjacent uplands are Cretaceous Kemp Clay and Eocene Midway Group	Rural; adjacent lands used mostly as pastures with wooded areas along the creek	None	No further work

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
38	DeWitt and Lavaca	Survey (10 trenches and 8 shovel tests); road widening on U.S. Hwy. 77 (23 acres of new ROW)	Holocene alluvium (0.5–2.0 m) along Scarboroughs Branch, Big Brushy Creek, Little Brushy Creek, Dry Hollow Branch, Peck Branch, and tributaries; Pursley soils on floodplains; adjacent uplands are Pliocene Goliad and Willis Formations	Rural; adjacent lands used mostly as pastures with woods along the creeks	41LC13	No further work
39	Austin	Impact Evaluation; bridge replacement on CR 344 at Clear Creek (1.9 acres of new ROW)	Holocene alluvium (1.0–1.5 m) along Clear Creek; Sealy loamy fine sand soils; adjacent uplands are Pliocene Willis Formation	Rural; adjacent lands are pastures	None	No survey needed
	Austin	Impact Evaluation; bridge replacement on CR 235 at Skull Creek (no new ROW)	Holocene alluvium (2+ m) along Skull Creek; Trinity clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands are pastures and woods	None	No survey needed
	Austin	Impact Evaluation; bridge replacement on CR 249 at Williams Creek (0.06 acres of new ROW)	Holocene alluvium (2–3 m) along Williams Creek; Bosque clay loam soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands are pastures and woods	None	No survey needed
	Austin	Impact Evaluation; bridge replacement on CR 272 at East Mill Creek (no new ROW)	Holocene alluvium (2+ m) along East Mill Creek; Trinity clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	Survey with trenching and shovel testing
41	DeWitt	Survey (3 trenches); bridge replacement on CR 362 at Thomas Creek (0.35 acres of new ROW)	Holocene alluvium (3+ m) along Thomas Creek; Meguin silty clay loam soils; Pleistocene fluviatile terrace deposits and Miocene Fleming Formation	Rural; adjacent lands are agricultural fields, pastures, and woods	None	No further work
42	Calhoun	Survey (8 trenches); wetland mitigation area in the Guadalupe Delta	Holocene alluvium (2+ m) in the Guadalupe River valley; Austwell clay soils	Rural; salt marshes and wildlife management areas	None	No further work

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		Wildlife Management Area (8 acres)				
43	Lavaca	Survey (3 trenches); bridge replacement on CR 306 at Rocky Creek (0.9 acres of new ROW)	Holocene alluvium (ca. 5 m) along Rocky Creek; Navaca clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land used mostly as pastures	None	No further work
	Lavaca	Survey (3 trenches); bridge replacement on CR 298 at South Fork Mustang Creek (0.3 acres of new ROW)	Holocene alluvium (ca. 3 m) along South Fork Mustang Creek; Navaca clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land is used for grazing	None	No further work
	Lavaca	Survey (1 trench and 1 shovel test); bridge replacement on CR 139 at Miller Branch (0.3 acres of new ROW)	Holocene alluvium (ca. 3–4 m) along Miller Branch; Pursley soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent land used mostly as pastures	None	No further work
44	Austin	Survey (3 trenches and 2 shovel tests); bridge replacement on CR 272 at East Mill Creek (no new ROW)	Holocene alluvium (2+ m) along East Mill Creek; Trinity clay soils; adjacent uplands are Miocene Fleming Formation	Rural; adjacent lands used mostly as pastures with woods along the creek	None	No further work
45	Leon	Survey (2 trenches); bridge replacement on CR 275 at Boggy Creek (no new ROW)	Holocene alluvium (1.5+ m) along Boggy Creek; Nahatche clay loam soils; adjacent uplands are Eocene Stone City and Sparta Formations	Rural; adjacent lands are mostly pastures with some woods	None	No further work
	Leon	Survey (6 trenches); bridge replacement on FM 542 at Upper Keechi Creek (no new ROW)	Holocene alluvium (1.7+ m) along Upper Keechi Creek; Hatliff loam soils; adjacent uplands are Pleistocene fluviatile terrace deposits and Eocene Queen City Sand	Rural; adjacent lands are pastures	None	No further work
46	Robertson	Impact Evaluation;	Holocene alluvium (2 m) along	Rural; adjacent lands	None	No survey needed

Table 1, continued

Work Order	County	Project Type	Topographic/Geologic Setting	Land Use/Vegetation	Sites	Recommendations
		bridge replacement on CR 407 at Cedar Creek (0.4 acres of new ROW)	Cedar Creek; Patilo-Stidham soils; adjacent uplands are Eocene Queen City Sand	are pastures and woods		
47	Goliad	Survey (71 shovel tests); road widening and relocation of U.S. Hwy. 59: Section E, Noble Cemetery relief route (25 acres of new ROW)	Holocene alluvium (< 0.5 m) along Payton Branch and tributary to Perdido Creek; Katy-Hockley-Clodine soils; adjacent uplands are Pleistocene Lissie Formation	Rural; adjacent lands are pastures and woods	41GD113 and 41GD114	Testing; survey with shovel testing of east and west ends of relief route (no right-of-entry)

Note: Work Orders 24, 40, 48, and 49 were not assigned. Work Order 50 was for preparation of this report. New right of way (ROW) indicated under Project Type may include construction and drainage easements as well as actual new right of way.

woods (see Table 1). Ten projects were in settings that can be classified as semirural (i.e., largely undeveloped but near low-density residential or commercial areas). Seven project areas were in urban settings (i.e., the cities of Boerne, Kerrville, San Antonio, and Shertz).

Fifteen of the Impact Evaluations resulted in recommendations that an archeological survey be completed before construction (see Table 1). This was the case most often when construction plans called for new right of way or an easement across areas with substantial (i.e., at least 1 m thick), undisturbed Holocene deposits that could host buried, prehistoric archeological remains in good context. The remaining 56 Impact Evaluations resulted in a recommendation that no survey be required based on the extent of disturbance and the limited potential for sites with good integrity. In most cases (n = 36), these Transportation Activities will require no new rights of way or easements, with all construction-related disturbances restricted to the existing rights of way.

Three of the Surveys investigated sites that were recommended for testing to assess eligibility for listing in the National Register of Historic Places and designation as State Archeological Landmarks (see Table 1). The other 22 Surveys either did not find any archeological sites or investigated sites that could be assessed as ineligible for National Register listing and State Archeological Landmark designation using the survey data.

Impacts and Site Potential

A primary thrust of the Surveys and especially of the Impact Evaluations performed under this contract was documentation of existing disturbances that would affect the potential of each project area to contain archeological sites with sufficient integrity to be eligible for listing in the National Register of Historic Places or designation as a State Archeological Landmark. In general, four kinds of disturbances were observed consistently within existing rights of way: fill sections, ditches, gullies, and underground utilities (Figure 4).

Fill sections to elevate the approaches to bridges above the adjoining floodplains were present at most of the bridge replacement project areas (Table 2). These fill sections ranged from less than 0.5 m in thickness to as much as 10 m, but most extended 0.5–2.0 m above the natural surface. Horizontally, they extended as little as 5 m from each end of a bridge to as much as several hundred meters, depending on the size of the valley and the kind of road. The higher and longer fill sections tended to be associated with the larger roads and larger streams. Typically, fill sections extended at least several meters beyond the edges of the pavement, in some cases occupying almost all of the existing right of way. It is difficult to quantify how much disturbance is associated with the placement of fill sections, but it is assumed that at least the upper 0.5 m of sediment beneath and beside fill sections is disturbed by heavy machinery during construction and later by compaction. Presumably, the larger the fill section, the deeper the disturbance.

In many cases, fill sections were bordered on both sides by shallow drainage ditches (see Table 2). These usually were less than 1 m deep, and often less than 0.5 m, and they were up to several meters wide. Vegetation covered most, and thus they did not offer any subsurface visibility, but a few that recently had been maintained exposed subsurface deposits. Better exposures typically were provided by gully erosion, which occurred often in the bottoms of ditches running along the edges of fill sections and breaching the creek banks. In many cases, such gullies were present at one or more corners of a bridge, often extending to depths of 1 m or more (see Table 2).

The fourth kind of disturbance observed consistently was underground utilities. These were present in many project areas, with the most common kind being buried telephone or fiber optic lines (see Table 2). These almost always were at one or both edges of the existing right of way and were marked by signs or areas of recent disturbance from placement of the lines. Based on the extent of the recent disturbance, it appears that trenching for these lines usually had disrupted an area 0.5 m or less in width. Presumably, they vary in depth, with most probably being no deeper than 1 m. More-extensive disturbance probably is associated with other kinds of underground utilities, including water lines, sewer lines, and gas pipelines. These were not as ubiquitous as telephone and fiber optic lines, although some (especially water lines) may not be marked with signs as consistently as telephone and fiber optic lines.

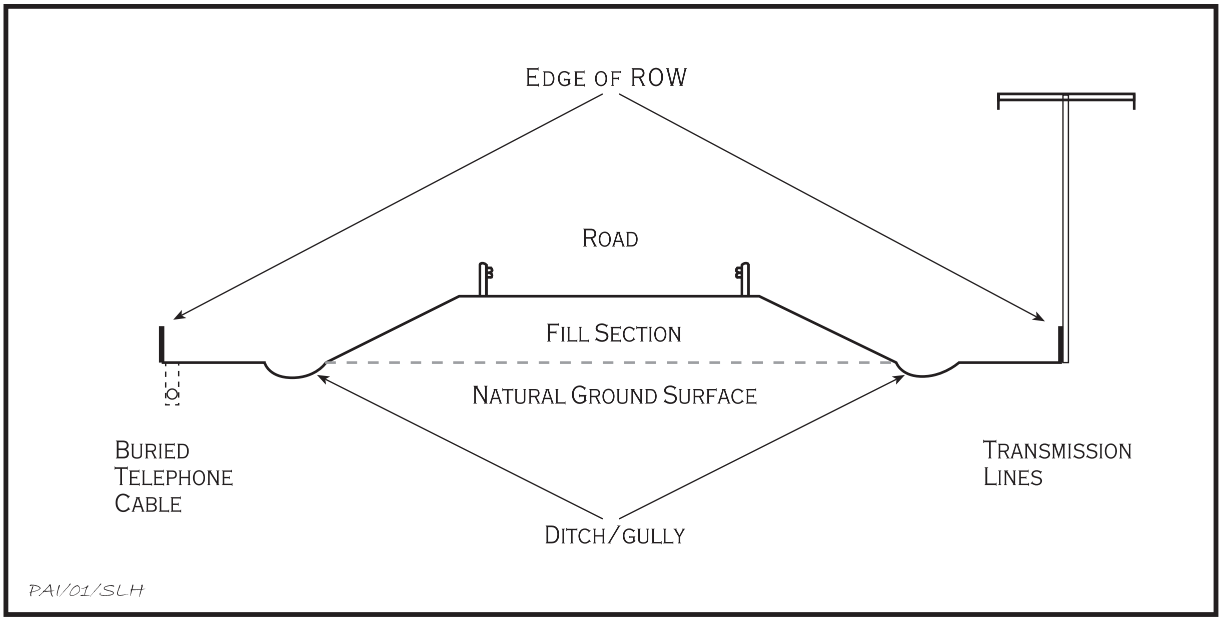

Figure 4. Schematic cross section of a bridge approach showing common disturbance factors.

A variety of other disturbances were noted less frequently (see Table 2). These included the following: constructed earthen berms to control runoff or creek flooding; severe erosion of creek banks; slope erosion; flood scouring; deposition of flood debris piles; uprooted trees; push piles from minor earth moving; road cutting; erosion associated with use of low-water crossings; creek channelization; placement of fill piles; the construction of dirt, gravel, or paved driveways, often with associated culverts, to access fields, businesses, and residences beyond existing rights of way; construction of boat ramps; plowing of fields by existing rights of way; use of two-track roads; tire ruts; cattle trampling; construction and maintenance of railroad beds near existing rights of way; excavation of stock tanks on adjoining lands; excavation of borrow pits; and nearby commercial or residential development. Overhead transmission and telephone lines, which were observed along the edges of the rights of way at many locations, occurred more frequently but caused little disturbance.

By combining information on the observed or presumed depth of these disturbance factors, their horizontal extent, the size of the existing right of way, and planned new right of way or construction easements, it was possible to identify areas where disturbance has been so severe that archeological remains (if present) would be unlikely to survive with good integrity—that is, areas where survey was not warranted. Areas lacking such disturbance typically were recommended for survey, especially if the potential for sites was considered high (i.e., on terraces or upland margins overlooking medium-sized and larger water courses) or if there were thick alluvial deposits that could host archeological remains in stratified contexts present.

Sites Investigated

Five archeological sites were investigated during four work orders. Descriptions of these sites, drawn from the original reports included on CD-ROM in Appendix B, are presented below. Table 3 summarizes the materials observed and recommendations made.

Work Order 20, 41BX1421

Site 41BX1421 was discovered on the T_2 terrace within the channel easement and new right of way west of Loop 1604 at Medio Creek in Bexar County. It is 37x38 m in size and is limited to the area between Medio Creek and its southern tributary. Lithic debitage, a biface, modified flakes, cores, and tested cobbles were

Table 2. Summary of existing impacts by work order

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
1	Wilson	Impact Evaluation; CR 202 at Marcelinas Creek	2 fill sections 2 m thick		2 gullies 1–2 m deep	possible water line	swale 1.0–1.5 m deep
	Wilson	Impact Evaluation; CR 252 at Dry Creek			3 filled gullies 2 m deep; 1 gully 2 m deep	fiber optic line	road cut 0.5–2.0 m deep
	Wilson	Impact Evaluation; CR 225 at Marcelinas Creek			extensive gullying 1–2 m deep	fiber optic line; telephone line	low-water crossing; bank erosion
2	Kendall	Survey with Geoarcheological Evaluation; U.S. Hwy. 87 at Cibolo Creek	3 fill sections 2.0–2.5 m thick		1 gully 0.5 m deep	sewer line; water line	
3	Kerr	Survey with Geoarcheological Evaluation; G Street at the Guadalupe River	1 fill section 0.5 m thick	2 ditches 0.5 m deep	2 gullies 1–2 m deep	water line; gas line	paved turn-around area
4	Milam	Survey with Geoarcheological Evaluation; CR 278 at Donahoe Creek			1 gully 0.5 m deep		trash pile; two-track road; flooding disturbance
5	Colorado	Impact Evaluation; CR 397 at Cottonwood Creek	1 fill section 0.5 m thick	2 ditches 0.2–0.3 m deep	1 gully 1.5 m deep	telephone line	
	Colorado	Impact Evaluation; CR 113 at Crier Creek	1 fill section 0.5 m thick		1 gully 0.2 m deep	telephone line	two-track road; brush piles; flood debris piles; surface erosion
6	Bexar	Impact Evaluation; FM 471	2 fill sections 1.0–1.5 m thick	2 ditches 0.5 m deep	2 gullies 0.5–0.7 m deep; gullying around culverts	water line; gas line; fiber optic line	road cut 1.5 m deep
	Bexar	Impact Evaluation; Pecan Valley Road				water line; sewer line; telephone line	2 road cuts 0.2–0.4 m deep
	Guadalupe	Impact Evaluation; FM 1117	4 fill sections 0.5–1.5 m thick	4 ditches 0.5–1.0 m deep	1 gully 0.7 m deep	2 telephone lines; water line; gas	2 road cuts 1.0–2.5 m deep

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
						line	
7	Guadalupe	Impact Evaluation; Dietz Road	2 fill sections 0.5–1.0 m thick	2 ditches 0.5 m deep	1 gully 0.3 m deep	2 sewer lines	creek channelization
	Guadalupe	Impact Evaluation; FM 1150	2 fill sections 0.5–1.0 m thick	2 ditches 0.5 m deep		telephone line	
8	Kerr	Impact Evaluation; FM 1340 at the Guadalupe River	2 fill sections 0.5–1.0 m thick	2 ditches 0.2 m deep	1 gully 0.5 m deep		concrete spillways
	Kerr	Impact Evaluation; FM 1340 at the Guadalupe River	1 fill section 0.5 m thick	2 ditches 0.3–0.6 m deep	2 gullies 0.5–1.0 m deep		flooding; debris piles
9	Atascosa	Impact Evaluation; CR 414 at Borrego Creek, eastern bridge		3 ditches 0.3–0.5 m deep	3 gullies 0.3 m deep		flooding; debris piles; tree throws
	Atascosa	Impact Evaluation; CR 414 at Borrego Creek, western bridge		3 ditches 0.3–0.5 m deep	1 gully 0.3 m deep		flooding; debris piles; tree throws
10	Colorado	Impact Evaluation; CR 142 at Boggy Creek	1 fill section 0.75 m thick			telephone line	
	Colorado	Impact Evaluation; CR 121 at Cummins Creek	2 fill sections 4 m thick	2 ditches 0.3 m deep	1 gully 0.5 m deep	telephone line	
	Colorado	Impact Evaluation; CR 119 at Cummins Creek	2 fill sections 6 m thick	1 ditch 0.5 m deep	2 gullies 0.5 m deep	telephone line	
	Colorado	Impact Evaluation; CR 171 at Coushatta Creek	1 fill section 1.5 m thick	2 ditches 1 m deep	4 gullies 0.5–1.0 m deep		
11	Milam	Survey with Geoarcheological Evaluation; CR 275 at Little River	1 fill section 4 m thick			telephone line; water line	modern cabin; road cut 1.5 m deep
12	Burleson	Impact Evaluation; CR 225 at Dry Creek	2 fill sections 1.5 m thick	1 ditch 0.5 m deep	2 gullies 1 m deep		
	Burleson	Impact Evaluation;	2 fill sections 1 m	3 ditches	2 gullies 1.5–2.0 m	telephone line	

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
		CR 190 at Davidson Creek	thick	0.25–0.5 m deep	deep		
	Burleson	Impact Evaluation; CR 252 at Porter Branch		2 ditches 0.2–0.5 m deep	3 gullies 0.2–0.3 m deep	2 telephone lines	flooding; riprap around culvert
	Burleson	Impact Evaluation; CR 291 at Old River	1 fill section 1 m thick				riprap; berm
	Burleson	Impact Evaluation; CR 188 at Second Davidson Creek	1 fill section 1 m thick	3 ditches 0.2–0.5 m deep	2 gullies 1 m deep		
	Burleson	Impact Evaluation; CR 247 at Porter Branch		4 ditches 0.2–0.3 m deep	3 gullies 0.5–1.0 m deep	2 telephone lines	
	Burleson	Impact Evaluation; CR 200 at Old River				telephone line	dirt and gravel piles; truck turn-around; tire ruts
	Burleson	Impact Evaluation; CR 276 at Davidson Creek	1 fill section 1 m thick	2 ditches 0.3–0.5 m deep	3 gullies 0.5 m deep	telephone line	
13	Guadalupe	Impact Evaluation; FM 539 at Sandy Elm Creek	2 fill sections 1.5 m thick	2 ditches 0.5 m deep	2 gullies 0.5 m deep	telephone line	tire ruts
	Guadalupe	Impact Evaluation; FM 539 at Blue Creek	2 fill sections 1 m thick	2 ditches 0.3–0.5 m deep	1 gully 0.5 m deep		
	Guadalupe	Impact Evaluation; FM 539 at unnamed tributary of Elm Creek	2 fill sections 1 m thick	1 ditch 0.3 m deep			tire ruts
14	Guadalupe	Impact Evaluation; FM 467 at Blue Creek	1 fill section 0.5 m thick	2 ditches 0.3 m deep		telephone line	tire ruts
	Guadalupe	Impact Evaluation; FM 467 at historic grave	1 fill section 0.5 m thick	2 ditches 0.75 m deep		telephone line	
	Guadalupe	Impact Evaluation; FM 467 at minor tributaries of Elm	3 fill sections 1–2 m thick	2 ditches 0.5 m deep	1 gully 0.5 m deep	water line; telephone line	

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
		Creek					
	Guadalupe	Impact Evaluation; FM 467 at Elm Creek and tributary	2 fill sections 1 m thick	1 ditch 0.3 m deep	1 gully 0.5 m deep		
15	Atascosa	Impact Evaluation; FM 140 at La Parita Creek	2 fill sections 0.5 m thick	4 ditches 0.2–0.5 m deep		telephone line	flooding
	Atascosa	Impact Evaluation; FM 140 at Christine Creek	1 fill section 0.75 m deep	2 ditches 0.2 m deep			road cut 1 m deep; paved shoulder
	Atascosa	Impact Evaluation; FM 140 at Metate Creek	2 fill sections 0.5–1.0 m thick		1 gully 0.75 m deep		two-track road
	Atascosa	Impact Evaluation; FM 140 at upland localities A-G					road cuts
16	Bexar	Impact Evaluation; SW 24th Street between Lake Elmendorf and El Paso Street	1 fill section 1 m thick			2 water lines; gas line; sewer line; gas line; telephone line	above-ground waterworks controls; traffic signal control box; sidewalks
17	Bexar	Impact Evaluation; Southcross Boulevard	1 fill section 0.5 m thick	4 ditches 0.3–1.0 m deep	1 gully 1 m deep	2 water lines; telephone line	road cut 3 m deep; gravel fill; push piles
18	Bexar	Survey; Southcross Boulevard					large patches of gravel fill
19	Gonzales	Survey; CR 143 at the Guadalupe River	2 fill sections 1.5 m thick	2 ditches 0.3–0.75 m deep	1 gully 1 m deep	2 telephone lines	borrow pits; berm 0.3 m high; brush pile; road cut 1.5 m deep; bank erosion
	Fayette	Impact Evaluation; CR 291 at Mulberry Creek	1 fill section 0.5–1.0 m thick	2 ditches 0.3 m deep	2 gullies 0.5 m deep		
20	Bexar	Survey; Loop 1604 at Medio Creek	2 fill sections 8–10 m thick		5 gullies 0.3–0.5 m deep; gullied	sewer line; telephone line	bank erosion concrete spillway;

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
					floodplain (0.5 m deep)		two-track roads; trackhoe trench; tree clearing; brush piles
21	Bexar	Impact Evaluation; road widening on Loop 1604 at Culebra Creek					bank erosion
22	Walker	Survey; SH 30	4 fill sections 1.0–2.0 m thick	5 ditches 0.3–2.0 m deep	5 gullies 0.3–0.75 m deep	2 telephone lines; gas line	ongoing utility construction; road cut 1.5–2.0 m deep
23	Washington	Survey; CR 309 at a tributary of Rocky Creek	2 fill sections 0.5 m thick	2 ditches 0.2–0.3 m deep	1 gully 0.5 m deep	telephone line	
25	Nueces	Impact Evaluation; FM 2444 between SH 286 and Oso Creek	3 fill sections 1.0–2.0 m thick	2 ditches 1.0–1.5 m deep	2 gullies 0.3–2.0 m deep	telephone lines; gas line	road cuts 0.5–1.0 m deep; two-track gravel road
26	Aransas	Impact Evaluation; SH 35 at Cavasso Creek	2 fill sections 1.5 m thick	1 ditch 0.2 m deep	gullied area 0.2 m deep		2 boat ramps; two-track roads; tire ruts
	Aransas	Impact Evaluation; SH 35 at Salt Creek	2 fill sections 2 m thick		1 gully 1 m deep		road cuts 1 m deep; two-track road; earthmoving; tire ruts
	Refugio	Impact Evaluation; FM 136 at Chocolate Swale	2 fill sections 2 m thick		2 gullies 0.5 m deep		
	Refugio	Impact Evaluation; FM 136 at Sous Creek, north bridge	2 fill sections 1.0–1.5 m thick	2 ditches 0.3 m deep	4 gullies 0.5–1.0 m deep	gas line	
	Refugio	Impact Evaluation; FM 136 at Sous Creek, south bridge	2 fill sections 1.0–1.5 m thick	2 ditches 0.3 m deep	1 gully 0.3 m deep	gas line	
	Refugio	Impact Evaluation; FM 629 at Chocolate Swale, north bridge	2 fill sections 1.5 m thick	2 ditches 0.5–1.5 m deep	2 gullies 0.5–1.0 m deep		road cuts 0.5–1.5 m deep

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
	Refugio	Impact Evaluation; FM 629 at Chocolate Swale, south bridge	2 fill sections 1.0–1.5 m thick	3 ditches 0.3–1.5 m deep	1 gully 1.5 m deep	gas line	flood debris
27	Gonzales	Impact Evaluation; CR 230 at Mule Creek, north bridge	1 fill section 0.5 m thick		2 gullies 0.5–1.0 m deep	telephone line	cattle trampling
	Gonzales	Impact Evaluation; CR 230 at Mule Creek, central bridge	2 fill sections < 0.5 m thick				cattle trampling; tree clearing
	Gonzales	Impact Evaluation; CR 230 at Mule Creek, south bridge				gas line	road cut 1.5 m deep; cattle trampling; bank erosion
28	Lavaca	Impact Evaluation; CR 306 at Rocky Creek			2 gullies 1–2 m deep		animal burrowing; cattle trampling; erosion
	Lavaca	Impact Evaluation; CR 298 at South Fork Mustang Creek				telephone line	bank and slope erosion
	Lavaca	Impact Evaluation; CR 139 at Miller Branch	1 fill section 1.0–1.5 m thick		1 gully 0.5–1.0 m deep	2 telephone lines	concrete rubble fill
29	DeWitt	Impact Evaluation; CR 362 at Thomas Creek					road cut 1 m deep
	DeWitt	Impact Evaluation; CR 340 at a tributary of Yorktown Creek, eastern bridge	2 fill sections 1.5–2.0 m thick	3 ditches 0.5 m deep		telephone line	
	DeWitt	Impact Evaluation; CR 340 at a tributary of Yorktown Creek, western bridge	2 fill sections 1 m thick	3 ditches 0.3–0.5 m deep		telephone line	
30	Goliad	Impact Evaluation; U.S. Hwy. 59:		1 ditch 0.5–1.0 m deep			flood scouring; sheet and gully

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
		Section B, Minnehulla Church to 2.5 km east of Manahuilla Creek					erosion; cattle trampling; railroad grade; introduced fill; road cut 1.0–1.5 m deep
	Goliad	Impact Evaluation; U.S. Hwy. 59: Section D, Fannin relief route	large fill section and railroad overpass				
	Goliad	Impact Evaluation; U.S. Hwy. 59: Section E, Noble Cemetery relief route	large fill section and railroad overpass				recently constructed road
	Goliad	Impact Evaluation; U.S. Hwy. 59: Section F, east end of Noble Cemetery relief route to Lott Road					commercial and residential structures
31	Grimes	Impact Evaluation; CR 131 at Holland Creek		1 ditch 0.5 m deep	1 gully 2–3 m deep		concrete rubble fill
	Brazos	Impact Evaluation; CR 164 at Wickson Creek	3 fill sections 0.5–2.0 m thick	2 ditches 0.3–1.0 m deep			flood erosion
	Brazos	Impact Evaluation; CR 165 at Wickson Creek	2 fill sections 0.5–1.0 m thick	3 ditches 0.3 m deep		telephone line; gas line	road cut 1 m deep; earthmoving
32	Gonzales	Impact Evaluation; CR 143 at the Guadalupe River (southwest quad)			1 gully 2–3 m deep		animal burrowing; gravel pavement; slope erosion; cattle trails; tree throws; push piles
33	Burleson	Survey; FM 1362 at	2 fill sections 0.5–1.5 m	2 ditches 0.3 m	1 gully 1–2 m deep	2 telephone lines	

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
		Reed Creek	thick	deep			
34	Brazos	Survey; CR 164 at Wickson Creek	3 fill sections 0.5–2.0 m thick	3 ditches 0.3–1.0 m deep			paved fill section/low water crossing; flooding
	Brazos	Survey; CR 165 at Wickson Creek	2 fill sections 0.5–1.0 m thick	3 ditches 0.3 m deep		telephone line; gas line	earthmoving; flooding and channel cutting
35	Milam	Survey; CR 353 at the San Gabriel River	2 fill sections 0.5–1.0 m thick		gullying 0.5–1.0 m deep		plowing
36	Milam	Survey; CR 151 at Hog Creek			1 gully 0.5–1.0 m deep		plowing
37	Milam	Survey; CR 156 at Big Briary Creek	2 fill sections 0.5–1.0 m thick	4 ditches 1–2 m deep			
38	DeWitt and Lavaca	Survey; U.S. Hwy. 77			gullying 0.5–1.0 m deep	telephone line	bank and slope erosion; tree clearing
39	Austin	Impact Evaluation; CR 344 at Clear Creek		2 ditches 0.3 m deep	1 gully 1.0–1.5 m deep		push piles; road cuts <0.5 m deep; cattle trampling
	Austin	Impact Evaluation; CR 235 at Skull Creek					fill placement
	Austin	Impact Evaluation; CR 249 at Williams Creek	2 fill sections 0.3 m thick	1 ditch 0.3 m deep	3 gullies 1–2 m deep		adjacent oil field with pipelines; excavation of stock tanks
	Austin	Impact Evaluation; CR 272 at East Mill Creek	1 fill section 0.3 m thick	ditches 0.3 m deep			road cut 1 m deep
41	DeWitt	Survey; CR 362 at Thomas Creek					road cut 1 m deep; flooding
42	Calhoun	Survey; Guadalupe Delta Wildlife Management Area	1 fill section 1 m thick	2 ditches 0.5 m deep			cattle trampling
43	Lavaca	Survey; CR 306 at Rocky Creek			2 gullies 1–2 m deep		cattle trampling; animal burrowing

Table 2, continued

Work Order	County	Project	Fill Sections	Ditches	Gullies	Underground Utilities	Other
	Lavaca	Survey; CR 298 at South Fork Mustang Creek				telephone line	bank and slope erosion
	Lavaca	Survey; CR 139 at Miller Branch	2 fill sections 1.0–1.5 m thick		1 gully 0.5–1.0 m deep	telephone line	fill placement
44	Austin	Survey; CR 272 at East Mill Creek	1 fill section 0.3 m thick	ditches 0.3 m deep			road cut 1 m deep
45	Leon	Survey; CR 275 at Boggy Creek	2 fill sections 1.0–1.5 m thick	4 ditches 0.2–0.5 m deep	1 gully 0.3 m deep		2 berms 1.5–2.0 m high
	Leon	Survey; FM 542 at Upper Keechi Creek	2 fill sections 2 m thick	4 ditches 0.3 m deep			old road bed; two-track road
46	Robertson	Impact Evaluation; CR 407 at Cedar Creek	2 fill sections 1.0–1.5 m thick	3 ditches 0.5–1.0 m deep	1 gully 1 m deep	2 telephone lines	2 berms 0.5–1.0 m high
47	Goliad	Survey; U.S. Hwy. 59: Section E, Noble Cemetery relief route					animal burrowing; recently constructed road

Table 3. Summary of archeological sites investigated

Work Order	Site	Materials Observed	Recommendation
20	41BX1421	biface, debitage, modified flakes, cores, tested cobbles, burned rocks, animal bones, mussel shell	test excavations
35	41MM373	biface, debitage, core, burned rock feature, burned rocks, mussel shells, *Rabdotus* shells	test excavations
38	41LC13	none	apparently destroyed; no further work
47	41GD113	biface, debitage, animal bones, mussel shells, *Rabdotus* shells	test excavations
	41GD114	biface, debitage, animal bones	test excavations

observed on the surface; no temporally diagnostic artifacts were noted. All of the worked lithics appeared to be Edwards chert. Burned rocks also were observed on the surface, as well as buried up to 97 cm in the T_2 alluvium exposed in a trackhoe trench associated with sewer line construction. Burned rocks, burned bones, and lithics also were observed eroding out of the beveled T_2 terrace edge along the tributary cutbank 30 m south of Medio Creek.

A backhoe trench was placed within the site in the new right of way. A burned rock was observed in the wall at 66 cm, and burned rocks and lithics were noted on the backdirt pile. Two stratigraphic units were observed consisting of fluvial cobbles and pebbles overlain by fine-grained sediments. The T_2 sediments exhibit a relatively weak soil profile consisting of the following: a 44-cm-thick A horizon consisting of very friable very dark gray (10YR 3/1) silty clay loam with weak medium subangular blocky structure and an abrupt smooth boundary; a 44-cm-thick Bw horizon consisting of dark yellowish brown (10YR 4/4) clay loam with weak coarse subangular blocky structure, many (20 percent) fine irregular carbonate filaments, and an abrupt wavy boundary; and a 2C horizon consisting of subrounded fluvial pebbles and cobbles in a clay loam matrix at 88+ cm.

Two shovel tests were placed within the site in the channel easement. One test yielded 20 flakes and 1 bone fragment from 0–20 cm and 12 flakes and 1 mussel shell fragment from 20–40 cm. The second test yielded 1 flake from the upper 20 cm and 3 flakes from 20–40 cm.

Within the proposed channel easement and adjoining new right of way west of Loop 1604, 41BX1421 contains archeological materials in good context. Located on the T_2 terrace of Medio Creek, the site encompasses up to 1 m of fine-grained Holocene alluvium with documented subsurface archeological remains. Despite disturbance from recent construction activities, it is estimated that at least 50 percent of 41BX1421 remains intact. Based on the presence of intact subsurface deposits and the high probability of intact cultural features, the site is considered potentially eligible for listing in the National Register of Historic Places and designation as a State Archeological Landmark, pending testing to more fully determine the content, age, and integrity of the buried cultural components.

Work Order 35, 41MM373

In the northern portion of the CR 353 at the San Gabriel River project area in Milam County, five backhoe trenches were excavated with cultural materials noted in all but one trench. Trench 4 was located east of CR 353 and exposed a 50-cm-thick very dark brown (10YR 2/2) silty clay loam A horizon overlying 130 cm of mottled brown (10YR 5/3) and pale brown (10YR 6/3) silt loam. A possible burned rock and crushed *Rabdotus* snails were noted at and above the contact of the two soil horizons, but no diagnostic cultural materials were observed. Trench 5 was located on the west side of CR 353 and exhibited a similar profile to Trench 4, with cultural materials noted in the upper A horizon and a small burned rock feature and scattered burned rocks in the lower soil horizon at 135 cm. Trench 6 exhibited a similar profile to Trench 5, with a single piece of burned chert noted at 110 cm. Trenches 7 and 8, both close to the river, exhibited slightly thicker A horizons (70 cm). A few pieces of chert debitage and a mussel shell were noted at depths of 120 to 140 cm.

The archeological remains observed in Trenches 5–8 were recorded as 41MM373. The site apparently consists of at least two segregated cultural components. The first consists of several pieces of burned rock, lithic debitage, a chert core, a chert biface fragment, and mussel shells contained within the upper A horizon (0–50 cm) in Trench 5. These materials were noted in the wall of the trench during profiling and in the backdirt during monitoring. No diagnostic artifacts were encountered. The second component is contained within the weakly developed subsoil from 110 to 140 cm and is represented by a small burned rock feature, two flakes, mussel shells, and two pieces of burned chert. The burned rock feature was exposed in Trench 5 at 135 cm. Trenching was halted when the feature was exposed on the trench floor. The feature measured 45x25 cm and was between 15 and 20 cm thick. It consisted of many pieces of small, angular burned rocks with no apparent pattern other than being contained within the charcoal-stained area. A considerable amount of charcoal was noted within the feature but not collected. Scattered burned rocks also were noted on the trench floor ca. 1 m from the feature. Other cultural materials occurred at approximately the same elevation in other trenches, including a burned chert fragment in the wall of Trench 6 at 120 cm, a mussel shell and two flakes in Trench 7 at 120 to 130 cm, and a piece of burned chert in Trench 8 at 140 cm. No temporally diagnostic artifacts were encountered, hence the ages of these materials are unknown. The site appears to be within the entire northern right of way and likely extends beyond the western and possibly eastern boundary of the northern project area.

The site is buried within fine-grained alluvial sediments and appears to have at least two cultural components with at least one demonstrating good contextual integrity based on the buried burned rock feature. As a result, the site could yield important archeological information and is considered potentially eligible for listing in the National Register of Historic Places and designation as a State Archeological Landmark, pending test excavations to determine more fully the content, age, and integrity of the cultural components.

Work Order 38, 41LC13

One previously recorded site—41LC13—is reported in the existing right of way on the T_2 terrace and upland south of Little Brushy Creek in the U.S. Highway 77 widening project area in Lavaca County. Initially recorded by G. R. Dennis Price (TxDOT) in 1994, the site was observed eroding out of a 1.5-m-high and 20-m-long road cut east of the road. Price dug four negative shovel tests in the graded road by the cut and one in the road cut. According to records at the Texas Archeological Research Laboratory, the test in the road cut did not produce diagnostic artifacts but did contain "thermally fractured chert, one apparent pebble-gouge, a few good flakes, and a few small fragments of mussel shell." Price also noted what appeared to be noncultural *Rabdotus* shells associated with these materials. He also observed a "possible hearth or burn area" that included "black sandstone" (but no charcoal) resting on decomposing bedrock between 35 and 60 cm in the road cut. Based on the one positive shovel test and the possible feature, he considered the site potentially eligible for listing in the National Register of Historic Places and designation as a State Archeological Landmark.

Under Work Order 38, the area of 41LC13 was subjected to careful pedestrian examination. Because visibility in the road cut was good (50 percent) and no artifacts or archeological features were observed, no shovel tests were dug. The T_2 terrace and upland surface immediately east of the site also were examined (25–50 percent visibility), but no archeological materials were observed. A backhoe trench was excavated in this area ca. 15 m east of the reported site location, but no archeological materials were encountered. Excavated to a depth of 1.0 m, the trench revealed A-Bk1-Bk2-Cr horizons. The A horizon (0–20 cm) is very dark grayish brown (10YR 3/2) sandy clay loam. The Bk1 horizon (20–41 cm) is dark yellowish brown (10YR 4/4) silty clay with coarse irregular soft carbonate masses. The Bk2 horizon (41–95 cm) is very pale brown (10YR 8/2) silty clay, contains abundant caliche, and is entirely whitened in some areas. The Cr horizon (89–95+ cm) is brown (10YR 5/5) clay mottled yellowish red (5YR 5/6). Because no archeological remains were observed, 41LC13 could not be re-located. It appears that the site may have been limited to the existing right of way and has been destroyed by erosion. Thus, it is considered ineligible for listing in the National Register of Historic Places or designation as a State Archeological Landmark.

Work Order 47, 41GD113 and 41GD114

In February 2001, avocational archeologist Smitty Schmiedlin provided (through Texas Historical Commission archeologist Mike Davis) preliminary documentation (but not trinomial designations) on 41GD113 and 41GD114 recorded under Work Order 47 for survey of the Noble Cemetery relief route along U.S. Highway 59 in Goliad County. Both sites are low rises into which the landowner reportedly had made small bulldozer cuts. In these cuts, Schmiedlin observed bone fragments, mussel shells, lithics, and charcoal. These sites were examined but not recorded during the June 2001 Impact Evaluation done under Work Order 30.

Site 41GD113 is the western rise. It is located in a pasture ca. 125 m north of the upper reach of Payton Branch and 150 m north of the present location of U.S. Highway 59. The rise measures 30x30 m and stands about 75 cm high on the upland edge. A thicket of mesquite trees and thick forbs marks the site. This vegetation is distinctive because short-grass pasture surrounds the site. A private road through the pasture cuts the northern end of the site and has destroyed approximately 30 percent of 41GD113. Lithic flakes, one biface fragment, *Rabdotus* shells, and mussel shell fragments were noted in the drainage ditch along the south side of the road. Otherwise, the site appears intact.

Five shovel tests were dug to 100 cm, and the sixth reached a depth of 80 cm. The tests revealed relatively deep soils on the rise consisting of 60–90 cm of dark gray sandy clay loam above a grayish brown clay loam. Five of the six shovel tests on the site produced 27 pieces of lithic debitage, 2 burned chert fragments, 2 mussel shell umbo fragments, and 4 small pieces of animal bone. Two of the bone fragments appear to be bits of turtle carapace, and the other 2 are unidentifiable. *Rabdotus* shells and flecks of mussel shells were noted throughout the deposit, with the two umbo fragments coming from 40–60 cm below the surface in Shovel Tests 3 and 4. Lithic debitage and bone flecks also occur throughout the deposit, with almost half of the debitage (13 flakes) and all of the larger bones coming from Levels 4 and 5 (60–100 cm) in Shovel Tests 3–5. Levels 1 (0–20 cm), 2 (20–40 cm), and 3 (40–60 cm) in Shovel Tests 1–5 produced 4 flakes, 6 flakes, and 4 flakes.

Site 41GD114 is located approximately 100 m east of 41GD113 on the same landform. The site also is on a small rise, approximately 75 cm in height, that is 30 m north of Payton Branch and 160 m north of the present location of U.S. Highway 59. The rise is ca. 25x30 m and is marked by a mesquite thicket and tall forbs resembling those found at 41GD113. This site, however, does not appear to have been disturbed recently, and it is estimated that nearly 100 percent remains intact. No sign of the landowner's bulldozer cut Schmiedlin reported was observed.

As at 41GD113, the sediments at 41GD114 are deeper than they are on the surrounding upland surface. They are composed of 40–100 cm of dark gray sandy clay loam. In Shovel Tests 2, 4, and 5, dark gray clay loam with few to many siliceous gravels underlies the sandy clay loam at 40–60 cm. These three shovel tests were located on the western edge of the rise; none of them produced cultural materials. Only Shovel Tests 1 and 6 produced materials on this rise. These tests were located on the central, highest part of the rise. The materials recovered came from 60–100 cm below the surface in both tests, with Levels 4 (60–80 cm) and 5 (80–100 cm) each yielding four items. The materials recovered from 41GD114 consist of five lithic flakes, one distal end of a biface, and two small bone fragments, one of which appears to be a piece of a turtle carapace. Missing at this site are the *Rabdotus* and mussel shell fragments observed throughout the deposit at 41GD113. *Rabdotus* shells are present at 41GD114, but they appear to be concentrated at the surface in the vicinity of Shovel Test 1 and thus may not be cultural.

In terms of landform, soils, vegetation, and the kinds of artifacts present, 41GD113 and 41GD114 appear similar. Site 41GD114 produced fewer artifacts and may have not have seen the same intensity of occupation as 41GD113. Both sites, however, appear to have buried cultural deposits. Though sparse, faunal remains are present. These results suggest that both sites may represent small, possibly special-purpose camps located on the edge of an upland drainage.

The processes by which such upland rises form remain obscure (see Abbott [2001:91–97] for a discussion of the archeological significance of apparently similar landforms in the Houston area), but the possibility that they are depositional features indicates that they may contain archeological remains in good context. Based on this possibility and the remains found in the shovel tests, both 41GD113 and 41GD114 are considered potentially eligible for listing in the National Register of Historic Places and designation as State Archeological Landmarks, pending test excavations and geomorphic investigations to more fully determine the content, age, and integrity of the cultural deposits.

Patterns in Site Distributions

With a sample of just five prehistoric sites (one of which apparently has been destroyed), it is difficult to draw conclusions about patterns in site distributions and associations between site locations and elements of the environment. Nonetheless, it is useful to note that the investigated sites were in a variety of topographic settings near water courses, including a T_2 terrace and upland margin, low rises on Pleistocene uplands, a floodplain with relatively thin alluvium in the Balcones Canyonlands, and a floodplain with thicker alluvium on the Blackland Prairie. Two of the sites are in the Corpus Christi District, and one each is in the Bryan, San Antonio, and Yoakum Districts.

The two Corpus Christi District sites (41GD113 and 41GD114) occupy low circular rises on the Pleistocene Lissie Formation overlooking the Payton Branch arm of Coleto Creek Reservoir. These rises appear to be depositional settings and probably are comparable to pimple mounds documented elsewhere on the coastal plain. The cultural deposits at these sites extend to a depth of 100 cm. The single Bryan District site (41MM373) is buried within alluvium along the San Gabriel River, a short distance upstream from where it joins Brushy Creek. Cultural materials appear to be concentrated at 0–50 and 110–140 cm; deeper archeological remains could be present as well because the trenches did not extend below 140 cm. The single San Antonio District site (41BX1421) is buried in thinner fine-grained alluvium (90–100 cm) atop fluvial pebbles and cobbles along Medio Creek. The single Yoakum District site (41LC13), which apparently has been destroyed, occupied a T_2 terrace and upland overlooking Little Brushy Creek. The depth of the cultural deposits is not certain, but they appear to have been restricted to the upper 35–60 cm.

Utility of Existing Methods

In general, the methods employed for Impact Evaluations and Surveys appear to be consistent with a “reasonable and good faith effort” to comply with federal and state laws governing identification of archeological sites that are eligible for listing in the National Register of Historic Places or designation as State Archeological Landmarks. The level of effort typically required to complete an Impact Evaluation (1–2 hours for a single bridge replacement) seems appropriate given the intent of this type of work and the generally small project areas. When Impact Evaluations can quickly separate those project areas where survey is truly a good idea from those where sites are very unlikely or almost surely disturbed, they are an efficient and relatively inexpensive measure to guard against the loss of important archeological data.

The levels of effort spent on Surveys and the amounts of work done (i.e., numbers of trenches and shovel tests) also seem appropriate given the sizes of the project areas, although the amount of work can vary based on a variety of factors other than project size (e.g., backhoe accessibility, depth to ground water, landowner permission to trench, extent of disturbance, and number and location of buried utilities that must be avoided during trenching). The work done on these surveys easily meets or exceeds the Texas Historical Commission’s archeological survey standards, except in some cases where only trenches were dug. This was the case in some floodplain settings where shovel testing was considered ineffective and inefficient because of the thickness of the alluvium or because of dense clay soils. In these cases, the much greater subsurface visibility afforded by the backhoe trenches and the fact that the number of trenches well exceeds the minimum required compensates for the lack of shovel testing.

Evaluation of the Need for Survey

This final section deals with the related topics of identifying patterns of existing disturbances that affect the need for survey and predicting when field inspections are and are not needed. Based on the work done during this project, these issues can be addressed best by looking at how often survey was deemed warranted when an Impact Evaluation was completed and the factors that contributed to these evaluations.[1]

Of the 71 Impact Evaluations done, 15 led to recommendations that survey was needed before construction, and 56 resulted in recommendations for no survey. All but 2 of those where survey was recommended involved acquisition of new right of way and thus disturbance of areas that previous road construction had not affected. Of the 56 Impact Evaluations in which survey was not recommended, 20 involved new right of way and 36 did not. Breaking these figures down by the type of Transportation Activity and the kind of road shows some interesting patterns.

Two kinds of Transportation Activities—bridge replacements and road widening projects—and several kinds of roadways—county roads, farm-to-market roads, state highways, U.S. highways, and roads in urban areas—are represented in the sample. Of the 38 Impact Evaluations for bridge replacements on county roads, 24 involved new right of way and 14 did not. Of the 24 with new right of way, 11 were considered to warrant survey. On average, these areas of new right of way were no larger (range = 0.08–0.9 acres; mean = 0.35 acres) than those on the 13 bridge replacements where survey was not recommended (range = 0.06–1.9 acres; mean = 0.33 acres), and thus right of way size did not determine when survey was recommended (although this could have been a factor in some areas with very limited new right of way). Rather, the presence of significant amounts of disturbance, along with the presence of thin alluvium in some cases, made survey unnecessary.

Of the 14 bridge replacement projects without new right of way on county roads, only 2 were judged to need survey. One of these (Work Order 31, bridge replacement on CR 164 at Wickson Creek) had up to 6 m of undisturbed existing right of way with Holocene alluvium and the potential for buried archeological remains. The other (Work Order 39, bridge replacement on CR 272 at East Mill Creek) contained less undisturbed existing right of way, but the project area extended onto a terrace or upland knoll where archeological remains were considered likely.

These data show that the presence of new right of way is a partial indicator of where survey is needed in these kinds of projects (i.e., bridge replacements on county roads). The roadways are small, sometimes have relatively limited disturbance within the existing right of way, and generally are in rural areas where adjacent lands are undeveloped and often (but not always) little disturbed. As Work Orders 31 and 39 indicate, however, new right of way is not a perfect indicator of where survey is warranted. This, and the inability to predetermine where significant existing disturbances and thin alluvium might exist in project areas with new right of way, suggest that Impact Evaluations will continue to be the prudent choice on almost all such projects, whether new right of way is involved or not.

Fewer projects involving bridge replacements on larger roads (farm-to-market roads and state highways) were completed—all nine cases involved no new right of way. Larger roads usually have wider rights of way than county roads and thus may have a greater potential to contain archeological sites, but they also tend to be more highly disturbed, which explains why no survey was recommended in any of these

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[1] A more thorough evaluation of these issues looking at a larger number of projects over a broader geographic area might be instructive and probably could be done best by TxDOT using data from projects done by in-house personnel and contractors. It would be interesting to look at projects in which Impact Evaluations were followed by Surveys (and the rationales for requiring Surveys) and whether the additional work resulted in the discovery of potentially important sites.

nine projects. Two of these (Work Orders 8 and 9) were in the western part of the study area where relatively thin gravelly alluvium was documented within disturbed rights of way. The other seven (Work Order 26) were near the coast in Refugio County where extensive fill sections associated with ditches and gullies are common. This sample is too small and too slanted to particular settings to make general statements about the need for survey on such projects.

Impact Evaluations were done for road-widening projects in urban areas, on farm-to-market roads, and on a U.S. highway. Of the five projects in urban settings, four involved new right of way and one did not. Only one project, which involved 5.2 acres of new right of way, was considered to warrant survey. Survey was unnecessary in the other areas because of disturbance related to development of adjoining lands. This pattern is likely to pertain generally to projects in urban areas but is not a good basis for concluding that survey is not warranted in all such areas, at least where new right of way is involved.

Of the 15 Impact Evaluations on projects involving widening of farm-to-market roads (six roads total, with multiple Impact Evaluations on three roads), only 1 involved new right of way. Survey was not recommended in any of these 15 areas. In 7 cases, this was because of the lack of appreciable Holocene deposits that could host archeological remains in good context coupled with the presence of moderate to extensive disturbance. Seven other areas, including the one with new right of way, had thicker alluvium but sufficient disturbance to argue against survey. In one case, the Impact Evaluation was done because of a marked grave just outside the existing right of way; no evidence was found to indicate that that grave or any others extended into the project area. Because farm-to-market roads can have rights of way of variable width and exhibiting varying degrees of disturbance, the results of these 15 Impact Evaluations are not sufficient to conclude that surveys generally are not warranted on such projects.

Finally, four Impact Evaluations were done along sections of U.S. Highway 59 in Goliad County where the highway will be widened and, in two places, rerouted to avoid a town and a cemetery. New right of way will be acquired in all four cases, but survey was recommended in only one area. This area, although in a largely upland setting, flanked an arm of Coleto Creek Reservoir and was known to contain sites. Two of the other areas did not warrant survey because they consisted of flat expanses of Pleistocene coastal plain where sites are unlikely. Survey was not recommended for the fourth area because the new right of way extended only a few meters beyond a heavily disturbed railroad grade and contained limited Holocene alluvial deposits. As for most of the other categories of projects, this sample is too small and too skewed to allow general statements about the need for survey on comparable future projects, except that large projects such as this one obviously require careful, case-by-case consideration.

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APPENDIX A: GLOSSARY OF TECHNICAL TERMS

Adze: Tool whose cutting edge is at a right angle to the handle and that is used in working wood.

Arrow point: Point used to tip an arrow, which is propelled by a bow.

Biface: Piece of conchoidally fracturing stone that has had flakes removed from both faces to create a tool.

Burin: Chisel-like tool presumed to have been used in working bone, antler, and wood.

Dart point: Point used to tip a throwing spear or dart, which is propelled by an atlatl.

Debitage: Debris generated by the removal through percussion or pressure of flakes, chips, and chunks to make stone tools.

Fill section: Introduced fill used to elevate the approaches to a bridge above the surrounding terrain.

Flake: Generally thin piece of conchoidally fracturing stone with a positive bulb of percussion showing that it was removed from the parent piece by percussion or pressure.

Gouge: Generally thick, bifacially modified tool presumed to have been used like an adze.

Grog: Crushed fired clay added as temper to clay used in making ceramic vessels.

Impact Evaluation: Onsite inspection documenting existing damage or other conditions that may preclude the presence of intact archeological deposits within the project area for a proposed Transportation Activity.

Mano: Handheld stone used, usually with a metate, to grind plant parts such as seeds.

Megafauna: Very large animal.

Metate: Anvil of stone used, usually with a mano, to grind plant parts such as seeds.

Midden: Accumulation of occupational debris, particularly organic remains.

Projectile point: Inclusive term for arrow and dart points.

Scraper: Tool with generally thick, unifacially modified edges used to work hides, bone, and wood.

Sherd: A piece of broken pottery.

Survey: Fieldwork to locate archeological remains within the project area for a proposed Transportation Activity, including on-foot examination of the surface, shovel testing, and trenching by mechanical means where appropriate.

Survey with Geoarcheological Evaluation: Fieldwork to locate archeological remains within the project area for a proposed Transportation Activity, including examining and record trench walls or other exposures by a geomorphologist, quaternary geologist, physical geographer, soil scientist, or archeologist with the formal training and experience to apply the principles of geology to the evaluation of the pedological, stratigraphic, geomorphic, anthrogenic, and other conditions affecting the physical integrity of archeological deposits and the interpretation of archeological materials.

Temper: Nonplastic materials added to clay to decrease the risk of cracking when firing ceramic vessels.

Transportation Activity: any proposed project involving the development, design, construction, or maintenance of the state's intermodal transportation system.

APPENDIX B: LETTERS AND LETTER REPORTS FOR IMPACT EVALUATIONS AND SURVEYS

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The interim reports for the Impact Evaluations and Surveys are on the included CD-ROM. Authors of the reports include Amy M. Holmes, Ross C. Fields, E. Frances Gadus, and Christopher W. Ringstaff.

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