Archeological and Geoarcheological Investigations, M&G Resins USA, LLC/ChemTex International, Inc., Proposed Jumbo Project, Corpus Christi, Nueces County, Texas

By:

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Prepared for:

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Austin, Texas

Prepared by:

Horizon Environmental Services, Inc.
Austin, Texas

March 2014

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MANAGEMENT SUMMARY

Horizon Environmental Services, Inc. (Horizon), was selected by Zephyr Environmental Corporation (Zephyr), on behalf of M&G Resins USA, LLC (M&G), and ChemTex International, Inc., to conduct an archeological and geoarcheological survey and assessment of the proposed location of the Jumbo Project, a new plastics-manufacturing plant in Corpus Christi, Nueces County, Texas. M&G's tract is situated on a narrow splinter of land between the Viola portion of the Corpus Christi Ship Channel to the southwest and the mouth of the Nueces River and Nueces Bay to the northeast, and the overall property covers a total area of approximately 176.4 hectares (ha) (431.0 acres [ac]). Within this overall property, the proposed undertaking would include construction of the following facilities:

- The industrial plant within an approximately 43.7-ha (108.0-ac) rectangular area in the southeastern portion of the parcel off the southwest side of the J.R. Fulton International Trade Corridor (JRFITC) (also known as Carbon Plant Road and County Road [CR] 55B), which passes northwest to southeast through the center of the M&G property.
- A desalinization area within an approximately 23.2-ha (57.3-ac) area located northwest of the main plant site consisting of a desalinization plant, a storm water detention area, a water intake channel, and a rail yard.
- An approximately 12.0-ha (29.6-ac) equipment laydown area located northeast of the main plant site between the JRFITC and the Nueces River mouth.
- An approximately 2.6-kilometer- (km) (1.6-mile- [mi]) long paraxylene pipeline right-of-way (ROW) extending northwest from the proposed desalinization area.

No permanent or temporary facilities other than those described above would be constructed in connection with the proposed undertaking, and the remainder of the overall M&G property would not be disturbed.

As construction of the proposed Jumbo Project would require a Prevention of Significant Deterioration (PSD) permit for Greenhouse Gases (GHG) issued by the US Environmental Protection Agency (EPA), the undertaking falls under the regulations of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC §470, et seq.); the

Historic Sites Act (16 USC §471, et seq.); the Archeological and Historic Preservation Act (16 USC §469, et seq.); and Executive Order 11593, "Protection and Enhancement of the Cultural Environment," among others. These statutes are invoked when federal funds are utilized or when federal permitting is required for a proposed project. The NHPA states that the Advisory Council for Historic Preservation (ACHP) and the Texas Historical Commission (THC), which serves as the State Historic Preservation Office (SHPO) for the state of Texas, must be afforded the opportunity to comment when any cultural resources potentially eligible for inclusion in the National Register of Historic Places (NRHP) are present in a project area affected by federal agency actions or covered under federal permits or funding.

As the specific locations of some proposed project facilities had not yet been identified at the time of the cultural resources survey, the Area of Potential Effect (APE) of the proposed Jumbo Project was considered to consist of the entire 176.4-ha (431.0-ac) M&G property. Preliminary geological research indicated that the entire landform on which the M&G property is situated is composed of a thick sequence of dredge spoil deposited during and subsequent to the construction of the Viola Channel immediately southwest of the APE, though it was considered to be possible that natural deltaic sediments may underlie the deep dredge deposits. As the anticipated depths of ground disturbances associated with the proposed undertaking vary widely across different portions of the overall APE, survey methods were structured accordingly in coordination with the THC.

From June 10 to 12, 2013, Horizon archeologists Briana Nicole Smith and Jared Wiersema, assisted by Dr. Charles D. Frederick, an independent professional geomorphologist, under the overall direction of Jeffrey D. Owens, Horizon Principal Investigator, performed archeological and geoarcheological survey investigations on the overall 176.4-ha (431.0-ac) M&G property to locate any cultural resources properties that potentially would be impacted by the proposed undertaking. The cultural resources investigations consisted of an archival review, a pedestrian walkover with judgmental shovel testing of the overall 176.4-ha (431.0-ac) APE, geoarcheological trackhoe trenching within the proposed 43.7-ha (108.0-ac) location of the main industrial plant facility, and the production of a report suitable for review by the SHPO in accordance with the THC's Rules of Practice and Procedure, Chapter 26, Section 27, and the Council of Texas Archeologists' (CTA) Guidelines for Cultural Resources Management Reports.

Horizon's archeologists traversed the overall 176.4-ha (431.0-ac) M&G property and inspected the modern ground surface and cutbanks of the Nueces River, Nueces Bay, and the Viola Channel for aboriginal and historic-age cultural resources. The APE consists of a thick sequence of artificial dredge spoil piled atop natural deltaic sediments. Large portions of the overall APE, including most areas located beyond the proposed location of the main plant, would be the sites of relatively minor construction, used for temporary equipment laydown during construction, or remain unutilized. Anticipated ground disturbances in these areas would extend no more than approximately 0.3 to 0.6 m (1.0 to 2.0 ft) below surface; as such, these portions of the overall APE were surveyed via pedestrian walkover with judgmental shovel testing to assess the potential of the project to impact any surficial or shallowly buried cultural resources. Within the proposed 43.7-ha (108.0-ac) location of the main industrial facility in the southeastern portion of the overall M&G property, subsurface construction impacts are

anticipated to extend at least 1.2 to 3.0 m (4 to 10 ft) below surface across portions of this area and in excess of 6.1 m (20 ft) below surface in limited areas in which structural support pilings would be drilled. In the proposed locations of support pilings in which deeper ground disturbances are anticipated, Horizon excavated a series of trackhoe trenches to determine the thickness of the artificial dredge spoil, to evaluate whether or not (and at what depths) natural deltaic sediments may exist underneath the dredge deposits, and to assess whether or not any intact aboriginal or historic-age cultural resources are present in undisturbed deltaic sediments underneath the thick dredge spoil deposits.

The proposed paraxylene pipeline ROW was not surveyed for cultural resources. Horizon consulted with the THC before initiating the fieldwork for the Jumbo Project. Based on the anticipated presence of deep deposits of artificial dredge spoil deposits across the landform on which the proposed paraxylene pipeline ROW would be constructed, it was expected that the pipeline trench would not be excavated deep enough to penetrate below the dredge spoil deposits into any natural deltaic sediments that may be present underneath the artificial fill. As such, the THC recommended that Horizon's field archeologists inspect the proposed pipeline ROW. If any portions of the proposed pipeline ROW would traverse undisturbed areas, those areas should be surveyed for cultural resources; however, areas that were clearly composed of deep dredge spoil deposits would not need to be surveyed as construction of the proposed pipeline would have effectively no potential to disturb any natural sediments that may lie below the thick artificial fill section. Based on Horizon's field inspection, the entire proposed pipeline ROW traversed a landform characterized by deep dredge spoil deposits; thus, in accordance with the THC's recommendations, the proposed pipeline ROW did not warrant a cultural resources survey.

The Texas State Minimum Archeological Survey Standards (TSMASS) require a minimum of 1 subsurface probe (e.g., shovel tests, backhoe/trackhoe trenches, auger tests) per 3 acres for project areas measuring more than 100 acres in size; as such, a minimum of 144 subsurface probes would be required within the current project's 176.4-ha (431.0-ac) APE. Horizon excavated a total of 36 shovel tests and 15 trackhoe trenches within the APE, for a total of 51 subsurface probes. Shovel tests were excavated across the broader M&G parcel beyond the proposed 43.7-ha (108.0-ac) location of the main industrial plant facility, while trackhoe trenches were excavated within the proposed construction footprints of building locations associated with the deeper impacts where support pilings would be drilled. While the TSMASS requirements were not met for an APE of this size, the entire landform on which the APE is sited is composed of a thick sequence of artificial dredge spoil deposits. The only potential impacts to intact archeological deposits would be associated with the few locations within the main plant site in which support pilings would be drilled below the thick dredge deposits into possibly natural underlying deltaic sediments. Given the limited potential of the proposed undertaking to disturb intact archeological deposits, the archeological and geoarcheological survey program implemented by Horizon, which was developed in consultation with and approved by the THC, is considered to constitute an adequate methodology to detect cultural resources that would be potentially impacted by the project.

Modern construction debris, including chunks of concrete, tile, and other construction materials, were observed in several trench exposures, but these materials were believed to be modern and, in any case, were contained within the artificial dredge spoil deposits in disturbed contexts. Shovel testing across the broader property did not produce any evidence of subsurface cultural resources, and all sediments observed in shovel tests were consistent with the dredge spoils observed in backhoe trenches. Underlying natural deltaic sediments were observable along the shorelines of the Nueces River, Nueces Bay, and the Viola Channel in some areas underlying the dredge spoil overburden, but no cultural resources were observed eroding out of the cutbanks based on a visual inspection of shoreline areas.

Trenching exposed up to 5 m of unconsolidated dredge spoil that could be divided into 3 broad forms—sands, dark-colored muds, and green mud. These deposits share some attributes of naturally deposited sediments, with the sands exhibiting the clearest evidence of their origin, primarily in the form of matrix-supported gravelly deposits with highly heterogeneous composition, but none of the trenches were definitively able to reach the buried deltaic deposits. The water-saturated, poorly consolidated, sandy dredge spoil deposits slumped with alarming frequency during excavation, and this precluded excavating in excess of approximately 5.0 m (16.4 ft) in depth. More specifically, trenches were excavated deeper than 5.0 m (16.4 ft), but the deposits slumped before the depth could be measured, often before the excavator bucket could be removed from the hole. None of the trenches revealed the presence of prehistoric cultural materials. No intact cultural resources, historic or prehistoric, were identified on the modern ground surface, along cutbanks, or within any of the shovel tests or trackhoe trenches excavated within the APE during the survey.

Based on the results of the survey-level investigations documented in this report, no potentially significant cultural resources would be affected by the proposed undertaking. In accordance with 36 CFR 800.4, Horizon has made a reasonable and good faith effort to identify archeological historic properties within the APE. No archeological resources were identified that meet the criteria for inclusion in the NRHP according to 36 CFR 60.4, and no further archeological work is recommended in connection with the proposed undertaking. However, in the unlikely event that any human remains or burial accoutrements are inadvertently discovered at any point during construction, use, or ongoing maintenance in the APE, even in previously surveyed areas, all work should cease in the immediate vicinity of any inadvertent discovery of human remains and the THC should be notified of the discovery.

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1.0 INTRODUCTION

Horizon Environmental Services, Inc. (Horizon), was selected by Zephyr Environmental Corporation (Zephyr), on behalf of M&G Resins USA, LLC (M&G), and ChemTex International, Inc., to conduct an archeological and geoarcheological survey and assessment of the proposed location of the Jumbo Project, a new plastics-manufacturing plant in Corpus Christi, Nueces County, Texas. M&G's tract is situated on a narrow splinter of land between the Viola portion of the Corpus Christi Ship Channel to the southwest and the mouth of the Nueces River and Nueces Bay to the northeast, and the overall property covers a total area of approximately 176.4 hectares (ha) (431.0 acres [ac]) (Figures 1 and 2). Within this overall property, the proposed undertaking would include construction of the following facilities:

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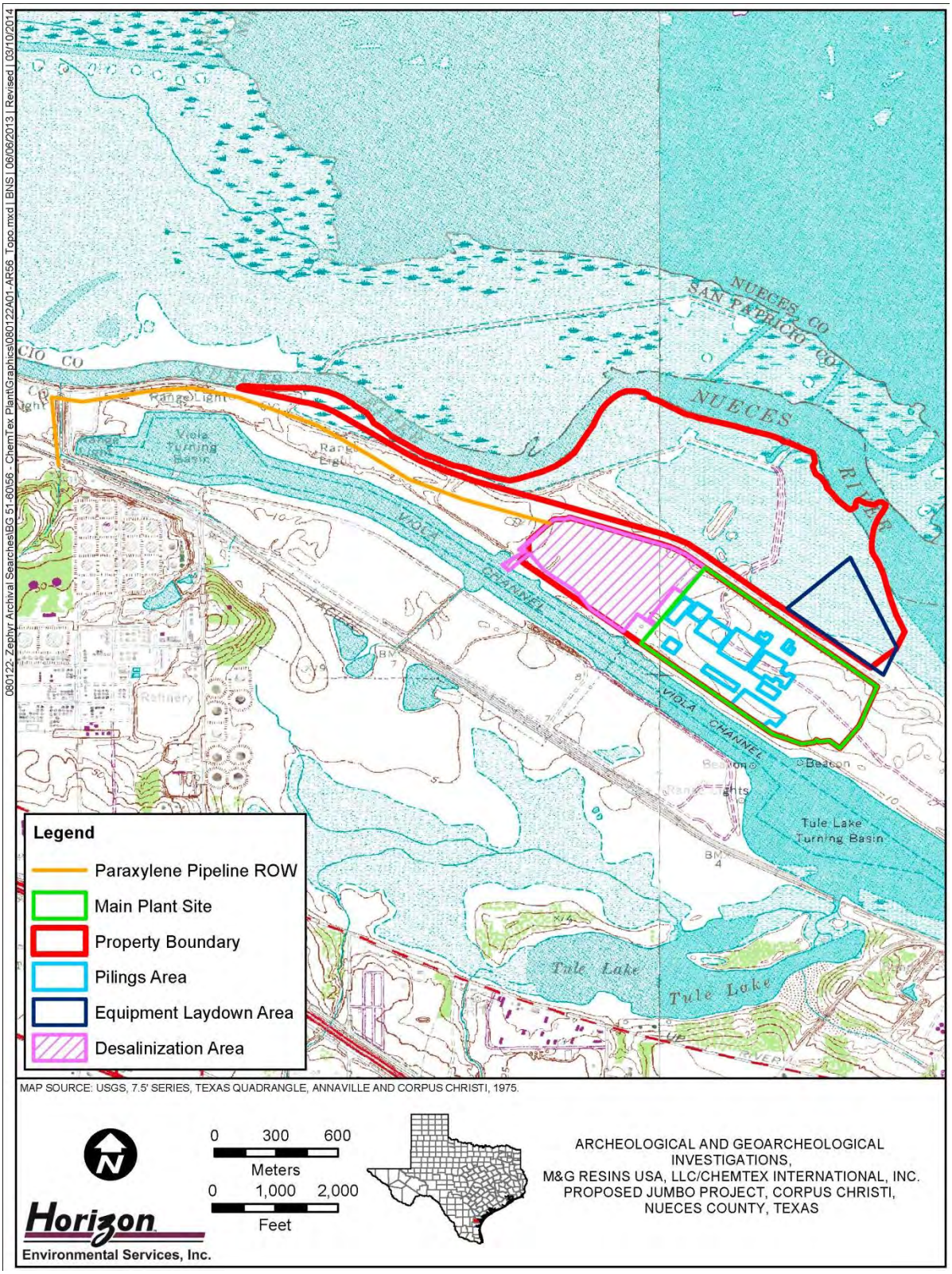

Figure 1. Location of APE on USGS Topographic Quadrangle

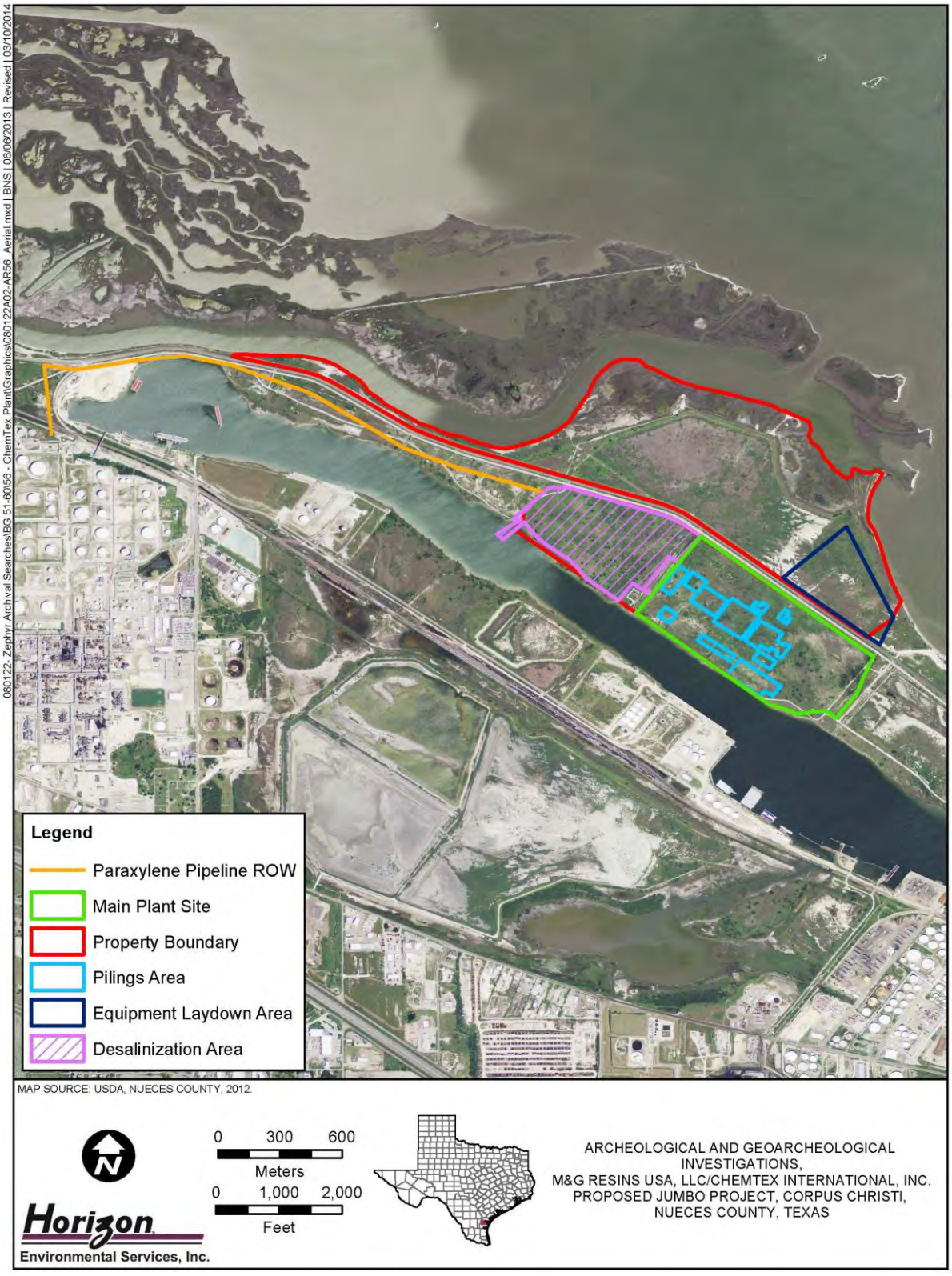

Figure 2. Location of APE on Aerial Photograph

Historic Sites Act (16 USC §471, et seq.); the Archeological and Historic Preservation Act (16 USC §469, et seq.); and Executive Order 11593, "Protection and Enhancement of the Cultural Environment," among others. These statutes are invoked when federal funds are utilized or when federal permitting is required for a proposed project. The NHPA states that the Advisory Council for Historic Preservation (ACHP) and the Texas Historical Commission (THC), which serves as the State Historic Preservation Office (SHPO) for the state of Texas, must be afforded the opportunity to comment when any cultural resources potentially eligible for inclusion in the National Register of Historic Places (NRHP) are present in a project area affected by federal agency actions or covered under federal permits or funding.

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This report presents the results of this cultural resource survey. Following this introductory chapter, Chapters 2.0 and 3.0 present the environmental and cultural background, respectively, of the APE. Chapter 4.0 describes the research objectives, results of archival research, and archeological and geoarcheological survey methods implemented during the survey. Chapter 5.0 presents the results of the geoarcheological investigations, and Chapter 6.0 presents cultural resource management recommendations for the project. Chapter 7.0 lists the references cited in the report. Appendix A summarizes shovel test data, Appendix B presents trackhoe trenching data, and Appendix C contains the curriculum vitae of the Principal Investigator.

2.0 ENVIRONMENTAL SETTING

2.1 PHYSIOGRAPHY AND HYDROLOGY

The APE is located in Nueces County on the Gulf Coastal Plain in southeastern Texas. The Gulf of Mexico represents a structural basin formed by lithosphere deformation. The Texas Coastal Plain, which extends as far north as the Ouachita uplift in southern Oklahoma and westward to the Balcones Escarpment in central Texas, consists of seaward-dipping bodies of sedimentary rock, most of which are of terrigenous clastic origin, that reflect the gradual infilling of the basin from its margins (Abbott 2001). The Corpus Christi area is underlain by rocks and unconsolidated sediments that are quite young in a geological sense, ranging from modern to Miocene in age. These consist predominantly of a series of fluviodeltaic bodies arranged in an offlapped sequence, with interdigitated and capping eolian, littoral, and estuarine facies making up a relatively minor component of the lithology. Major bounding disconformities between these formations are usually interpreted to represent depositional hiatuses that occurred during periods of sea level low stand. The oldest rocks in this fill are of Late Cretaceous age. As a result of the geometry of basin filling, successively younger rock units crop out in subparallel bands from the basin margin toward the modern coastline.

The APE is situated on a modified deltaic landform on a narrow splinter of land between the Nueces River mouth and Nueces Bay to the northeast and the Viola portion of the Corpus Christi Ship Channel to the southwest. The landform on which the APE is located is composed of a thick sequence of dredge spoil deposited during and subsequent to the construction of the Viola Channel. Elevations across the APE range from 0.0 to 6.1 m (0.0 to 20.0 ft) above mean sea level (amsl). The topography within the APE is artificial and dependent on the uneven spread of dredge spoil.

2.2 GEOLOGY AND GEOMORPHOLOGY

The APE is situated on a thick bed of artificial fill composed of dredge spoil excavated during the construction and subsequent maintenance of the Viola Channel to the southwest. The dredge spoil deposits are presumed to overlie deeply buried late Holocene-age deltaic sediments deposited around the mouth of the Nueces River based on historic geological maps consulted during the study (see Chapter 5.0). The Beaumont, or Prairie, terrace fronts this deltaic landform across the current Viola Channel to the southwest. The Beaumont Formation

consists of clay, silt, and fine sand arranged in spatial patterns that reflect the distribution of fluvial (e.g., channel, point bar, levee, and backswamp) and mudflat/coastal marsh facies (Abbott 2001; Van Siclen 1985). Sandy deposits associated with littoral facies are also frequently considered part of the Beaumont. Many investigators (cf. DuBar et al. 1991; Fisk 1938, 1940) have correlated the Beaumont terrace with the Sangamon Interglacial (ca. 130 to 75 thousand years ago [kya]), although age estimates range from Middle Wisconsinan (Alford and Holmes 1985) to 100 to 600 kya (Blum and Price 1994). While debate about the temporal affiliations of and correlations among the deposits that underlie the major coastline terraces remains active, they are of little direct geoarcheological relevance because virtually all investigators agree that these deposits considerably predate the earliest demonstrated dates of human occupation in North America.

The APE is situated on 4 mapped soil units (NRCS 2013) (Table 1; Figure 3). The majority (approximately 90%) of the overall APE is mapped as Tidal flats (Ta), composed of loamy fluviomarine deposits of Holocene age. A small area near the westernmost end of the APE between the JRFITC and the Nueces River channel is mapped as Aransas clay, saline (Lo), which consists of clayey alluvium of Holocene age. A small segment of shoreline along the Viola Channel on the southwestern boundary of the APE is mapped as Galveston and Mustang fine sands (Gm), which consists of deep, sandy eolian sediments of Holocene age found on dune fields and foredunes. Finally, a small portion of the APE, located at the southeastern end of the proposed plant construction site off the southwest side of the JRFITC, is mapped as Ijam clay loam (Ma), which consists of sandy and/or loamy dredge spoils on flats. While all 4 mapped soil units are of Holocene-age, the natural soil units within the APE are buried under deep deposits of artificial dredge spoils excavated during and subsequent to construction of the nearby Viola Channel to the southwest and deposited on this landform to artificially increase its elevation above sea level.

2.3 CLIMATE

Evidence for climatic change from the Pleistocene to the present is most often obtained through studies of pollen and faunal sequences (Bryant and Holloway 1985; Collins 1995).

Table 1. Mapped Soils Located within APE

Soil Name	Soil Description	Typical Profile
Galveston and Mustang fine sands (Gm)	Deep, sandy eolian sediments of Holocene age on dune fields and foredunes	0-12 in: Fine sand 12-60 in: Fine sand
Aransas clay, saline (Lo)	Clayey alluvium of Holocene age on flood plains	0-60 in: Clay
Ijam clay loam (Ma)	Sandy and/or loamy dredge spoils on flats	0-8 in: Clay loam 8-62 in: Clay
Tidal flats (Ta)	Loamy fluviomarine deposits	0-5 in: Fine sand 5-60 in: Loamy fine sand

Source: NRCS 2013 in: Inches

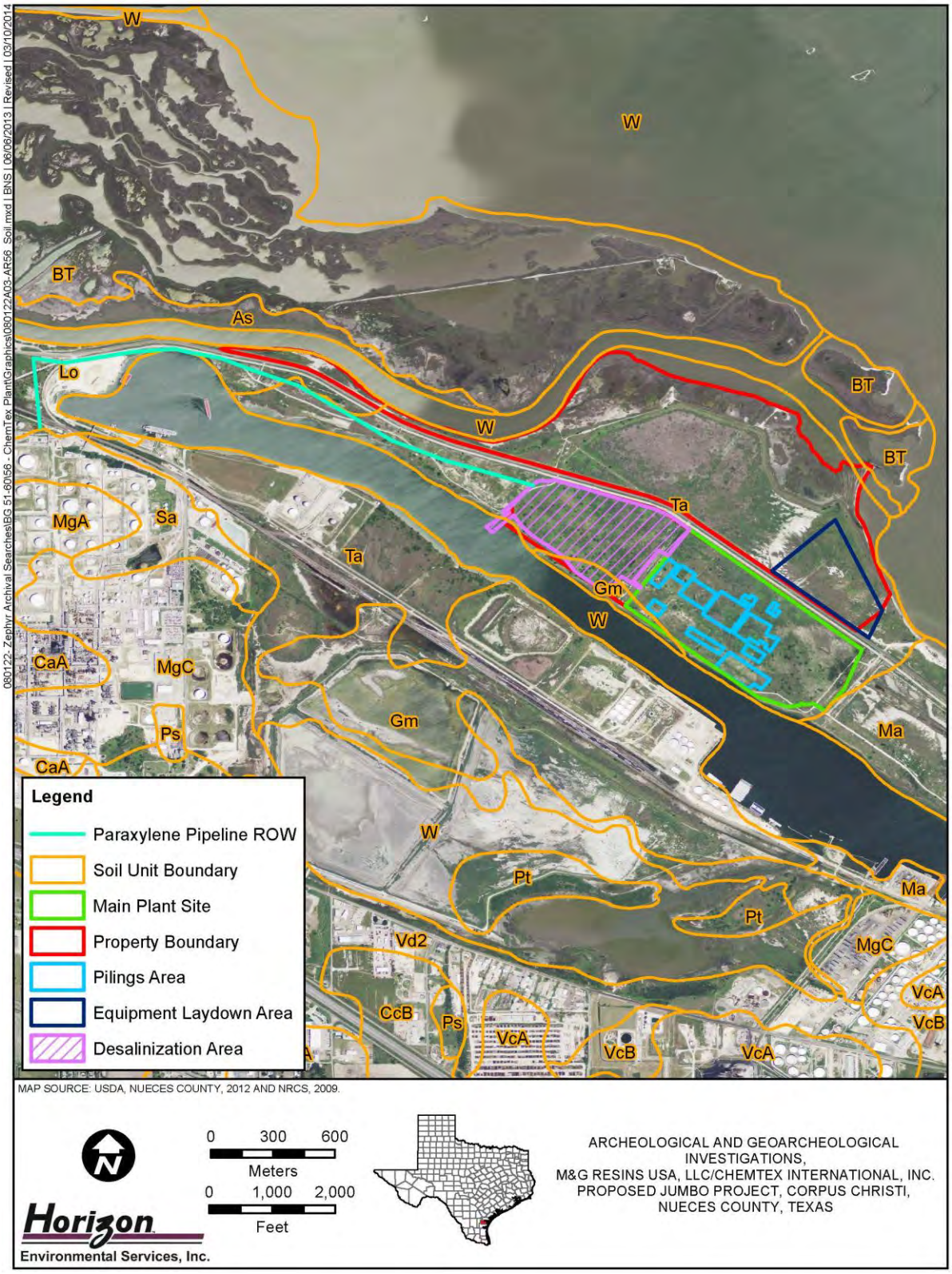

Figure 3. Distribution of Mapped Soil in APE

Bryant and Holloway (1985) present a sequence of climatic change for nearby east-central Texas from the Wisconsin Full Glacial period (22,500 to 14,000 B.P.) through the Late Glacial period (14,000 to 10,000 B.P.) to the Post-Glacial period (10,000 B.P. to present). Evidence from the Wisconsin Full Glacial period suggests that the climate in east-central Texas was considerably cooler and more humid than at present. Pollen data indicate that the region was more heavily forested in deciduous woodlands than during later periods (Bryant and Holloway 1985). The Late Glacial period was characterized by slow climatic deterioration and a slow warming and/or drying trend (Collins 1995). In east-central Texas, the deciduous woodlands were gradually replaced by grasslands and post oak savannas (Bryant and Holloway 1985). During the Post-Glacial period, the east-central Texas environment appears to have been more stable. The deciduous forests had long since been replaced by prairies and post oak savannas. The drying and/or warming trend that began in the Late Glacial period continued into the mid-Holocene, at which point there appears to have been a brief amelioration to more mesic conditions lasting from roughly 6000 to 5000 B.P. Recent studies by Bryant and Holloway (1985) indicate that modern environmental conditions in east-central Texas were probably achieved by 1,500 years ago.

The modern climate is typically dry to subhumid with long, hot summers and short, mild winters. The climate is influenced primarily by tropical maritime air masses from the Gulf of Mexico, but it is modified by polar air masses. Tropical maritime air masses predominate throughout spring, summer, and fall. Modified polar air masses are dominant in winter and provide a continental climate characterized by considerable variations in temperature.

In winter, the average temperature is 52 degrees Fahrenheit (°F); however, during winter the temperature tends to fluctuate greatly as air masses move in and out of the area. These air masses can produce light rain and drizzle, and conditions can become cloudy. Spring is relatively dry, with some thunderstorms and cool spells. Summer temperatures are high, with the daily maximum temperature often reaching or exceeding 90°F. Fall is warm, dry, and pleasant, with increasing cold spells.

The average precipitation within the region is 33 inches. The majority of this precipitation occurs as rain that falls between April and September. The growing season is approximately 265 days long.

2.4 FLORA AND FAUNA

The project site is located in the Tamaulipan Biotic Province (Blair 1950) and the South Texas Plains vegetational region (Gould 1975). The upland areas support a rich tapestry of south Texas chaparral. The vegetation of the undeveloped and uncleared areas can be characterized as brush country, with variably dense scrub ranging in height from 1 to 3 m (4 to 10 ft). Mesquite and associated thorny shrubs, such as catclaw acacia, huisache, blackbrush, granjeno, whitebrush, prickly pear, and Spanish dagger are common locally. Understory vegetation is characteristically sparse. Along major drainages, live oak, Texas ebony, Texas sugarberry, cedar elm, and retama occur. Little bluestem, bristlegrass, paspalums, windmill grass, and buffelgrass are dominant grasses.

The Tamaulipan/Mezquital ecoregion of southern Texas and northeastern Mexico has unique plant and animal communities containing tree- and brush-covered dunes, wind tidal flats, and dense native brushland. Although there are large acreages of cultivated land on the South Texas Plains, most of the area is still rangeland. Land holdings predominantly are large cattle ranches. Deer and other wildlife species are common. This area originally supported a grassland- or savannah-type climax vegetation. Long continued grazing and other factors have altered the plant communities to such a degree that ranchmen of the region now face a severe brush problem (Gould 1975).

3.0 CULTURAL BACKGROUND

The prehistory of South Texas can essentially be divided into 3 major periods—(1) PaleoIndian (9200 to 6000 BC); (2) Archaic, which has been subdivided into the Early Archaic (ca. 6000 to 2500 BC), Middle Archaic (ca. 2500 to 400 BC), and Late Archaic (ca. 400 BC to AD 800); and (3) Late Prehistoric (AD 800 to 1600). These prehistoric periods are principally defined by the presence of particular diagnostic projectile points, but they are intended to designate general cultural patterns based on ecology, technology, and subsistence strategies (Black 1989:48-57; Suhm et al. 1954).

3.1 PALEOINDIAN PERIOD (CA. 9200–6000 BC)

Evidence of PaleoIndian occupations in South Texas (9200 to 6000 BC) usually consists of surface finds found most frequently in the Nueces-Guadalupe and Rio Grande plains. Only 2 stratified PaleoIndian sites have been excavated in the region: Buckner Ranch (Sellards 1940) and Berger Bluff (Brown 1987). Both sites were deeply buried in alluvial terraces. Diagnostic projectile point styles of the PaleoIndian period include Clovis (Meltzer 1986), Folsom (Largent et al. 1991), Golondrina, Scottsbluff, and Angostura (Black 1989:48-49). Finely flaked end scrapers fashioned on blades and bifacially worked Clear Fork tools are also diagnostic of the PaleoIndian period. PaleoIndian peoples have traditionally been characterized as terminal Pleistocene big-game hunters, but these highly mobile hunter-gatherers probably exploited a rich diversity of wild plant and animal foods. Investigations at Baker Cave, for instance, indicate that a diverse array of fish, snakes, and rodents was exploited by the PaleoIndian occupants (Hester 1983). PaleoIndian populations were probably organized into small groups that ranged over great distances across periglacial plains and marginally forested areas to acquire different food sources throughout the year (Black 1989:48).

3.2 ARCHAIC PERIOD (CA. 6000 BC–AD 800)

The major distinction of the Early Archaic period (6000 to 2500 BC) is the replacement of earlier lanceolate-shaped projectile points by stemmed and corner-notched types. These styles include Bell, Andice, Early Triangular, and Early Expanding Stemmed points such as Bandy, Martindale, Uvalde, and related forms (Turner and Hester 1999). Other diagnostic artifacts include Clear Fork tools and large, thin, triangular bifaces with concave bases. The beginning of the Early Archaic period marks the onset of the modern Holocene era, during which the periglacial climate of the late Pleistocene began to grow warmer. Available evidence from the

Gulf Coastal Plain suggests that population densities remained low through the beginning of the Archaic period in South Texas, reflecting a continuation of the highly mobile adaptations of the PaleoIndian period.

The Middle Archaic period (2500 to 400 BC) in South Texas is defined by the presence of Pedernales, Langtry, Kinney, Bulverde, and Tortugas projectile point styles (Bell 1958; Turner and Hester 1999). Distally beveled tools are also common during this period, and ground stone tools, such as tubular grinding stones and manos, appear for the first time (Black 1989:49). Site densities in South Texas increase markedly during the Middle Archaic, possibly reflecting a decrease in group mobility and/or an increase in territoriality among groups (Black 1989:51). A heavier reliance on vegetal foods may be indicated by the introduction of ground stone technology and the appearance of large burned rock middens throughout Central Texas.

Late Archaic (400 BC to AD 800) occupations in South Texas are defined by small corner- and side-notched dart points, including Ensor, Frio, Marcos, Fairland, and Ellis types (Bell 1958, 1960; Turner and Hester 1999). Site densities continue to increase throughout the Late Archaic period, possibly indicating that population densities continued to rise. Cultural deposits on Late Archaic sites also tend to be deeper than during preceding periods, suggesting that occupations were either more extended in duration or that reoccupation of the same locations was more frequent (Black 1989:51). Cemeteries appear during this period, possibly indicating higher levels of social organization and increasing territoriality (Black 1989:51). During the Late Archaic, the exploitation of different ecological niches continued to intensify, becoming increasingly oriented toward the exploitation of seasonal food sources. This kind of adaptation is best illustrated by the frequent occurrence of shell middens along the coast and burned rock middens farther inland. Data collected from inland sites indicate that the economy was based primarily on vegetal resources supplemented with the hunting of small game such as rodents and rabbits (Black 1989:51).

3.3 LATE PREHISTORIC PERIOD (CA. AD 800–1600)

The onset of the Late Prehistoric period (AD 800 to 1600) is defined by the appearance of pottery and the bow and arrow. The small dart points of the Late Archaic period were largely replaced by arrow points (Black 1989:52). The Late Prehistoric period in South Texas has been divided into 2 distinct time horizons, the Austin (AD 800 to 1350) and Toyah (AD 1350 to 1600) phases (Black 1986). The Austin phase is characterized by the presence of Scallorn arrow points, while the Toyah phase is defined by the presence of Perdiz arrow points. Faunal resources became increasingly important during this period, especially large mammals such as bison and deer. Lithic tool kits seem to have been manufactured for the processing of large mammals (Black 1989:51-57). Late Prehistoric sites are relatively common throughout South Texas, which might be interpreted as the result of population increases. The movement of bison from Central to South Texas may coincide with a movement of peoples and/or technology from both the Austin and Toyah phases of Central Texas (Black 1989:51-57).

3.4 HISTORIC PERIOD (CA. AD 1600–PRESENT)

The first European incursion into what is now known as Texas was in 1519, when Álvarez de Pineda explored the northern shores of the Gulf of Mexico. In 1528, Cabeza de Vaca crossed South Texas after being shipwrecked along the Texas Coast near Galveston Bay. However, European settlement did not seriously disrupt native ways of life until after 1700. The first half of the 18th century was the period in which the fur trade and mission system, as well as the first effects of epidemic diseases, began to seriously disrupt the native culture and social systems. This process is clearly discernable at the Mitchell Ridge site, where burial data suggest population declines and group mergers (Ricklis 1994) as well as increased participation on the part of the Native American population in the fur trade. By the time that heavy settlement of Texas began in the early 1800s by Anglo-Americans, the indigenous Indian population was greatly diminished.

The earliest Europeans to reach the area of the future Nueces County may have been the party of Alonzo Álvarez de Pineda, who reputedly reached Corpus Christi Bay on the feast of Corpus Christi, 1519.[1] Conclusive evidence is lacking, however, because the records of his expedition are lost. Nine years later, Álvar Núñez Cabeza de Vaca and his crew were shipwrecked on the Texas coast. Although Cabeza de Vaca's exact route is unknown, historians believe that some members of his party skirted Corpus Christi Bay. The Spanish, however, largely ignored Texas until the French, under René Robert Cavelier, Sieur de La Salle, established a colony in the region in 1685. Spanish authorities dispatched an expedition to the region in 1689 under Alonso De León, the governor of Coahuila. Corpus Christi Bay, however, remained unknown and unexplored until 1747, when Joaquín Prudencio de Orobio y Basterra, captain of the presidio at La Bahía, led an expedition down the Nueces River to its mouth, where he arrived on February 26. After his return, José de Escandón, governor and captain general of Nuevo Santander, proposed to found a settlement called Villa de Vedoya at the mouth of the Nueces. Indians living in the area were to be served by a mission named Nuestra Señora del Soto. In the summer of 1749, 50 families accompanied by a squadron of soldiers and 2 priests set out, but because of drought and poor provisions they never reached their goal. Several other attempts were made to found a colony at the mouth of the Nueces, but not until the 1760s, when ranchers from Camargo, Nuevo Santander (now Tamaulipas), pushed northward in search of new grazing lands, did the first Spanish settlers reach the area. The first settlement was founded by Blas María de la Garza Falcón, captain of Camargo, who in 1766 established a ranch called Santa Petronila on Petronila Creek. In 1787, Manuel de Escandón, the son of José de Escandón, proposed another settlement at the mouth of the Nueces, but the project never advanced beyond the planning stages. In the late 1780s and early 1790s, Spanish authorities also considered moving Nuestra Señora del Refugio Mission to the mouth of the Nueces, but abandoned the idea because of continuing friction with the Lipan Apaches. At the end of the 18th century, ranchers from the Rio Grande valley began applying for and receiving land grants in the lower Nueces valley. By 1794, a large ranch belonging to Juan Barrera and known as Rancho de Santa Gertrudis was in operation on the north side of Corpus

[1] The following historical summary is adapted from TSHA (2013).

Christi Bay. Between 1800 and the end of Spanish dominion, much of what is now Nueces County was granted to ranching families, most of whom were related by marriage. In 1812, after an Indian uprising, the colonists abandoned the area and sought refuge in the Rio Grande valley. The colonists returned, but repeated skirmishes with the Indians continued until about 1824, when peace was made with the Comanches and Lipans. After Mexican independence, the region became part of Tamaulipas. During the period from 1829 to 1836, most of the land in the lower Nueces valley that had not been granted under Spanish rule was deeded to individuals by the Tamaulipan government.

In 1830, new attempts were made to establish colonies in the area. Gen. Manuel de Mier y Terán proposed founding 2 towns near the mouth of the Nueces. One settlement was to be located at the site of present-day Corpus Christi, but it was never realized. The other settlement, however, a military post known as Fort Lipantitlán, was established in 1831 in the northwestern part of the future county at the point where the road from Matamoros to Goliad crossed the river. During the remaining years of Mexican rule, no other towns were established on the west bank of the Nueces; however, in the 1820s, 2 Irish colonies were founded on the east side of the river under contracts issued to James Power and James Hewetson by the state of Coahuila and Texas. In 1828, John McMullen and James McGloin obtained a grant to settle a tract of land along the east side of the Nueces 10 leagues west of the coast. Later, some of these colonists and their descendents moved west of the river.

During the 1830s, 2 further unsuccessful attempts were made to establish colonies at the mouth of the Nueces. German nobleman Baron Johan von Raiknitz attempted to found a German settlement on the west bank of the Nueces, but the ship carrying the colonists was prevented from landing by the French during the so-called ~~P~~astry War" between France and Mexico. A second ship transporting colonists from Germany was shipwrecked. Around the same time, abolitionist Benjamin Lundy proposed to established a colony for freed slaves, but the plans were abandoned after the outbreak of the Texas Revolution. During the revolution, Texans under Ira Westover captured the Indian village of Lipantitlán, which was later occupied by Francis W. Johnson and the New Orleans Greys. After the revolution, the area south and west of the Nueces River was a no-man's-land. Texas claimed the territory, but Mexico said it was part of Tamaulipas. Neither exercised effective control. Both Texan and Mexican raiding parties made periodic forays into the region between 1838 and 1841. Mexican Federalist forces twice sought sanctuary at Fort Lipantitlán in the late 1830s, and, in 1838, Gen. Antonio Canales organized his army for the Republic of the Rio Grande nearby.

During this period, both Mexican and Texan merchants engaged in illegal trading in the Nueces valley. Among the most prominent of these was Henry Lawrence Kinney, who established a trading post and fort on Corpus Christi Bay in 1839. The land belonged to Capt. Enrique Villareal, a rancher from Matamoros, who had obtained it in 1832. Villareal led a force of 300 men to confront Kinney in 1841. Kinney, however, managed to negotiate an agreement and purchase the land from him. The small settlement soon became the focus of trade in the area. Repeated attacks by Mexican bands forced Kinney to abandon the post in 1842, but he returned a short time later and reestablished his trading business. A post office opened in 1842 with William P. Aubrey as its postmaster. The population of the small settlement, now known as

Corpus Christi, boomed briefly when Gen. Zachary Taylor's army arrived there in September 1845, but it quickly shrank again after the Mexican War.

Nueces County, including the entire area south of Bexar County west to the Rio Grande and east to the Gulf of Mexico, was formed from San Patricio County in 1846 and organized the same year. Corpus Christi, which was incorporated in 1846, became the county seat. The population of the county, however, remained small. Although large numbers of fortune seekers passed through Corpus Christi to join wagon trains heading west during the California gold rush of 1849, few settlers put down roots. Continuous Indian attacks and the relative isolation of the region kept away most would-be settlers. The first census of the county in 1850 showed a population of 689. Between 1850 and 1861, the Nueces County area was further divided to form several new counties.

Kinney, who continued to promote Corpus Christi, organized a major fair in the town in 1852, reportedly the first state fair in Texas. Despite extensive preparations, however, it proved to be a failure. Two years later, yellow fever decimated the population. Nonetheless, the early 1850s saw the construction of a county courthouse and jail and the beginnings of regular county government.

The mainstay of the local economy in late antebellum Texas remained ranching. Between the Texas Revolution and the late 1840s, the area's ranches had been virtually abandoned. After the Mexican War, the land grants of Mexican ranchers in the region were gradually acquired by Anglos who reestablished the cattle and horse industries. Tax rolls in 1848 reported only 647 cattle and 19 horses. By 1860, however, records showed 56,454 cattle and 8,554 horses and mules worth an estimated $489,520. Farming was not extensive and was only for subsistence.

During the early years of the Civil War, Corpus Christi was an important center for Confederate commerce. In 1859, no fewer than 45 small vessels carried trade between Corpus Christi and Indianola. Small boats sailing inside the barrier islands transported goods from the Brazos River to the Rio Grande, while inland cotton was moved along the Cotton Road through Banquete to Matamoros and the mills of England. In an effort to halt the trade, Union forces seized control of Mustang Island in the fall of 1863. Corpus Christi was twice bombarded by federal gunboats, but the overland trade continued without interruption until the end of the war.

Although Nueces County escaped the destruction that devastated other parts of the South, the war years were difficult for the county's citizens, who were thwarted by the lack of markets and the wild fluctuations in Confederate currency, as well as by concern for combatants. After the war, Nueces County residents experienced a protracted period of lawlessness and violence. Although the black population before the war had been very small and no Ku Klux Klan chapter was organized in the county during Reconstruction, political violence was commonplace, as Republicans and former Confederates struggled for control. Turmoil continued along the Mexican border, and cattle rustling and raids by bandits were frequent problems. In the end, however, because of its relatively small population, Nueces County was spared much of the fighting that other Texas counties experienced, and order was generally restored by the early 1870s.

The war and its aftermath also had a less serious effect on the county's economy than was the case in much of Texas. Land prices fell significantly, from 50 cents per acre in 1860 to 28 cents per acre in 1869. The boom in the cattle industry in the early 1870s helped Nueces County to overcome the postwar economic depression. In 1871, local tax rolls showed 218,969 cattle worth more than $942,000, more than 4 times the number from 1860. The cattle were shipped to market by 2 main routes—by water to New Orleans and Havana, or overland to Kansas, where they were shipped by rail to the East. During the early 1870s, some 10 meat-packing plants operated in Nueces County, but most were closed by the middle of the decade because the cattle drives proved to be more profitable.

Mustangs and other horses also contributed to the county's new prosperity; in 1871, there were 34,077 horses and mules in the county. The greatest competition to the cattle industry came from sheep ranching. Before the ranges were fenced, Nueces County was an important center for wool production. During the late antebellum period, the number of sheep had been relatively small, with some 35,000 reported in 1860. By 1871, 363,835 sheep were counted, and by 1876 the number of sheep topped 650,000. In 1875 and 1876, the assessed value of sheep in the county actually exceeded that of cattle. Falling wool prices in the 1880s, however, and the advent of fencing eventually caused the sheep industry to decline. For a number of years between the mid-1870s and early 1880s, Nueces County led all Texas counties in the number of sheep and cattle.

During the latter half of the 19th and the early 20th centuries, the population of Nueces County grew markedly, particularly in the decade after the turn of the century. In 1860, the county had only 2,906 residents, but the number increased rapidly in the post-Civil War years, to 3,975 in 1870, 7,673 in 1880, 8,093 in 1890, 10,439 in 1900, and 21,955 in 1910. Much of the population was centered in and around Corpus Christi, which gradually emerged as the commercial hub of the region. As the city grew in importance as a shipping center, efforts were made to improve access to the ocean. In 1874, the main sea channel was dredged to a depth of 8 feet to allow large steamers to navigate. During the mid-1870s, construction also began on the county's first railroad, a narrow-gauge line from Corpus Christi to Laredo. After its completion in 1881, a second line was begun, the San Antonio and Aransas Pass, which was completed in 1886 and extended from Corpus Christi to San Antonio.

The mid-1880s also witnessed the beginnings of cash-crop agriculture in Nueces County. During the late 1870s and early 1880s, livestock raising in some areas of the county began to be supplanted by more traditional farming, particularly of cotton and vegetables. The growth of such farms began the breakup of the huge expanses of pastureland in the county and spelled the beginning of the end of the old cattle-ranching life. In 1889, 1,010 bales of cotton were produced; by 1910, the figure had grown to 8,566, and by 1930 Nueces County was among the leading cotton-producing counties in the state, with 148,442 bales.

Although cotton was the dominant crop during the early decades of the 20th century, Nueces County farmers also produced large quantities of vegetables, including cabbage, onions, spinach, carrots, cucumbers, and turnips. The transition to cash-crop farming brought dramatic changes in land tenure. While large ranchers had predominated during the antebellum and early postwar period, by the turn of the century the land was increasingly worked by tenant

farmers. In 1910, when agriculture was still developing in the county, only 35.3% of farmers were tenants, below the statewide average of 52.6%. By 1925, however, 76.4% of all Nueces County farmers were tenants. The majority of the leaseholders were Anglos, but much of the labor was performed by Mexican Americans who were poorly paid and frequently lived in poverty.

During the 1920s, agricultural mechanization began in the county. Tractors and other machines appeared in increasing numbers, and by the eve of World War II Nueces County farms were among the most mechanized in the state. The onset of the Great Depression, falling cotton prices, and the arrival of the boll weevil brought new hardships for county farmers. Many were forced to move to the cities. The total number of farms in the county fell from a high of 1,969 in 1930 to 1,306 in 1950. Cotton production, which had peaked during the mid-1920s at more than 100,000 bales per year, fell markedly during the 1930s and early 1940s. In 1945, only 46,000 bales were ginned. Cotton farming rebounded in the late 1940s, and in 1949 production once again topped the 100,000-bale mark. Since that time cotton production has declined, though it remains a significant part of the county's agricultural receipts. Truck farming flourished in the 1950s, but was afterward increasingly replaced by sorghum, which in the 1980s and 1990s was the county's largest crop. The decline in cotton and truck farming in the post-World War II era also forced many tenant farmers to leave the land or to hire out as agricultural workers. In the 1980s, the economic base of the county outside of the Corpus Christi area was still overwhelmingly agricultural. In 1982, 85% of the county was in farms and ranches, with 77% of the land under cultivation and 1% irrigated. Nueces County ranked 29th in the state in agricultural receipts, with some 87% coming from crops.

Another important sector of the Nueces County economy in the 20th century has been oil and natural gas. In 1922, natural gas was discovered in Nueces County, and a few years later several major oilfields were developed. Gas-recycling plants and carbon black plants, as well as oil refineries, are located in the county. Total oil production in the county from 1930 to January 1, 1989, was 533,831,701 barrels. Soda and salts of several varieties are produced from raw materials chiefly from Duval County. Other industries include a Celanese chemical plant and copper and lead refineries.

In 1926, the port of Corpus Christi was opened. The legislature made the port a state project by allocating the taxes from 7 adjacent counties for the construction of breakwaters, jetties, and other ancillary improvements. The channel from the Gulf of Mexico to the turning basin is a part of the Gulf Intracoastal Waterway, which connects the port with cities of the Mississippi valley as well as with foreign markets and makes it potentially one of the chief ports in America. In 1935, the depth of the channel was increased to 35 feet so that large ships could be accommodated. The 1930s and 1940s also brought improvements in the transportation network of the county. By 1940, most of the major roads in the county were paved, and US Highway (US) 77 and State Highways (SH) 44 and 286 had given farmers better access to markets.

The military importance of the area has been recognized since the time of the Mexican War, when Fort Marcy, the first federal post activated on Texas soil, was established. At one time, Nueces County had 5 federal forts; Corpus Christi was a supply depot until 1857. On

March 12, 1941, with the establishment of the Naval Air Station in Corpus Christi, the town became the home of the so-called "University of the Air."

Since World War I, Nueces County has shown a remarkable growth in population, increasing from 22,807 residents in 1920 to 165,471 in 1950 and to 237,544 in 1970. In 1991, the reported population of the county was 296,527. Hispanics were about 50.5% of the population, non-Hispanic whites 44.1%, and African Americans 4.4%. The largest towns were Corpus Christi, Robstown, Port Aransas, and North San Pedro. During the early 1980s, the county had 13 school districts with 60 elementary, 20 middle, and 15 high schools, as well as 6 special-education schools.

4.0 RESEARCH OBJECTIVES AND METHODOLOGY

The cultural resources survey described in this report was undertaken with 3 primary research goals in mind:

1. To locate and record cultural resources occurring within the designated APE
2. To provide a preliminary assessment of the significance of these resources regarding their potential for inclusion in the NRHP
3. To make recommendations for the treatment of these resources based on their NRHP assessments

The first of these goals was accomplished by means of a review of documentation on file at the Texas Historical Commission's (THC) online *Texas Archeological Sites Atlas* (Atlas), the National Park Service's (NPS) online *National Register Information System* (NRIS), the Texas State Historical Association's (TSHA) *Handbook of Texas Online*, as well as a program of archeological and geoarcheological survey. No cultural resources were documented within the APE as a result of the survey; as a result, the second and third goals were not brought into play. The rest of this chapter presents the results of archival research, the methodological background for the current investigations, and the specific survey methods used in the field.

4.1 ARCHIVAL RESEARCH

Prior to initiating fieldwork, Horizon personnel reviewed existing information on the THC's online Atlas (THC 2013) and the NPS's NRIS database (NPS 2013) for information on previously recorded archeological sites, cemeteries, and historic properties as well as previous cultural resources investigations conducted within a 1.6-km (1.0-mi) radius of the APE. This archival research indicated the presence of 8 previously recorded archeological sites within a 1.6-km (1.0-mi) radius of the APE (THC 2013), and a review of the NPS's NRIS database indicated the presence of no historic properties listed on the NRHP within the review area (NPS 2013) (Figure 4; Table 2).

Sites 41NU60 and 41NU276 are described as containing at least 1 human burial and associated aboriginal cultural materials, including fire pits, mussel shell middens, and/or lithic artifacts). The remaining sites consist primarily of accumulations of mussel shells, called mussel shell ~~-m~~middens," with associated scatters of aboriginal artifacts dating to the Late

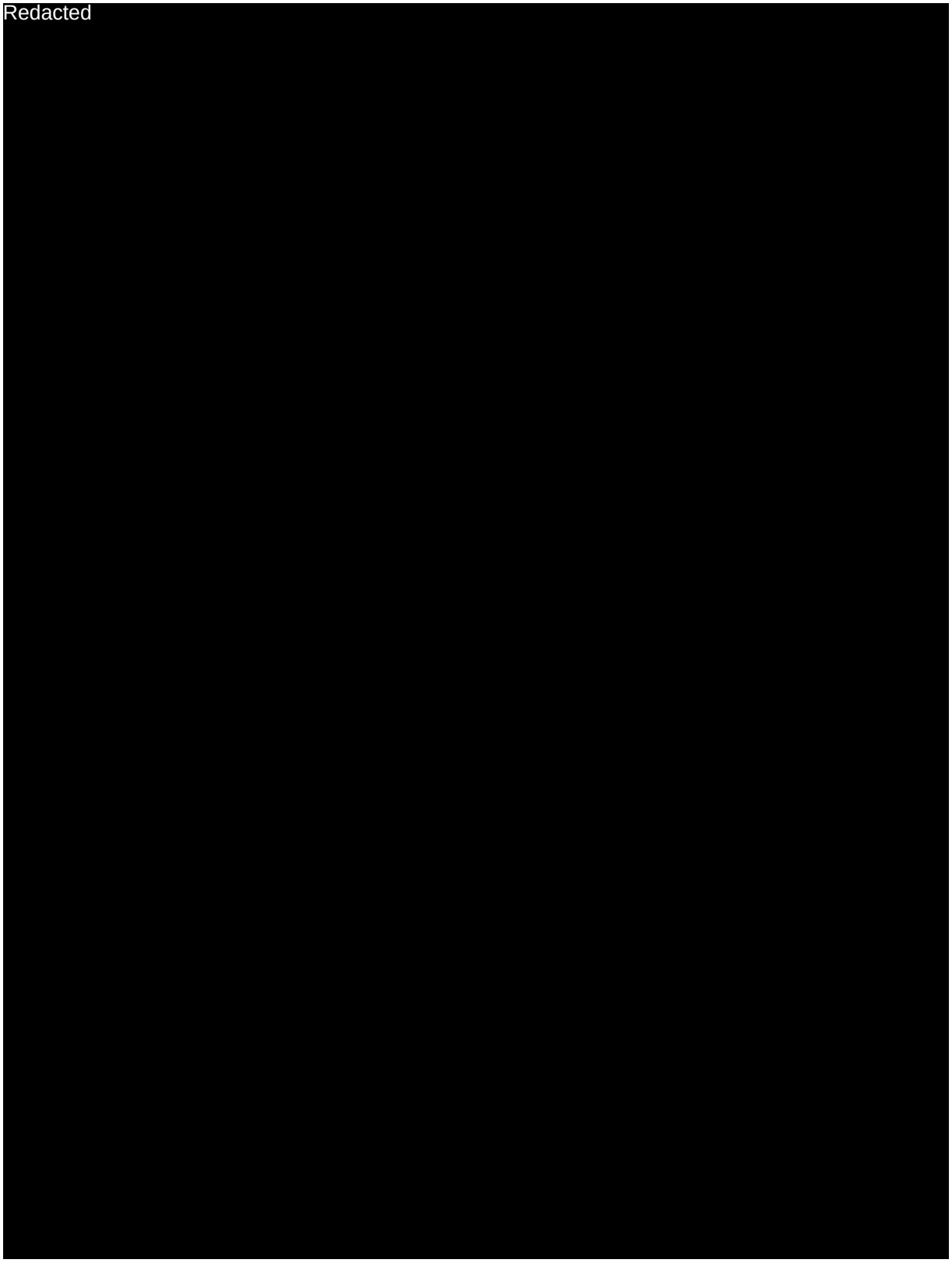

Figure 4. Locations of Previously Recorded Cultural Sites

Table 2. Previously Recorded Cultural Sites within 1 Mile of APE

Site No./Name	Site Type	NRHP Eligibility	Distance/Direction from APE	Potential to be Impacted by Project
41NU60	Aboriginal cemetery (human burials, fire pits, mussel shell) (Undetermined prehistoric)	Undetermined	1.0 mile S/SW	None
41NU157	*Rangia* mussel shell midden (Late Prehistoric)	Undetermined	0.5 mile S/SW	None
41NU158	Low-density aboriginal artifact scatter (Undetermined prehistoric)	Undetermined	0.8 mile S	None
41NU177	Aboriginal artifact scatter (Late Prehistoric)	Undetermined	0.9 mile S/SE	None
41NU266	*Rangia* mussel shell midden (Late Prehistoric)	Undetermined	1.0 mile SW	None
41NU267	*Rangia* mussel shell midden (Late Prehistoric)	Undetermined	0.9 mile SW	None
41NU268	*Rangia* mussel shell midden (Late Prehistoric)	Undetermined	0.8 mile SW	None
41NU276	Aboriginal cemetery (human burials, aboriginal artifact scatter) (Late Prehistoric)	Undetermined	0.7 mile SW	None

NRHP National Register of Historic Places

Prehistoric period. Based on their mapped locations, all 8 of these previously recorded sites are located along the distal edge of the Late Pleistocene Beaumont Terrace across the Viola Channel from the current APE to the south. The entire area fronting the southwestern shoreline of the Viola Channel is currently covered in refineries and other industrial facilities, and the eligibility of the 8 previously recorded sites for inclusion in the NRHP and the current condition of these sites are unknown at the present time. None of the previously recorded sites are located within or immediately adjacent to the boundaries of the current project's APE, and none of these sites would be impacted as a result of the proposed undertaking.

The THC's Atlas depicts 2 previous cultural resources surveys within 1.6 km (1.0 mi) of the current project's APE (Table 3). The Tule Lake Tract Survey was conducted in 1977 by UTSA and resulted in the recording of sites 41NU157 and 41NU158, described above (Highley et al. 1977). A second, smaller survey was conducted in 1984 on an industrial facility east of the previously surveyed Tule Lake Tract for an unspecified project with negative results (THC 2013). No prior cultural resources surveys have been conducted within the current APE or in the immediately surrounding area.

Table 3. Previous Cultural Resource Surveys Conducted within 1 Mile of APE

Survey Name	Acres Surveyed	Survey Date	No. Sites Recorded within 1 Mile of APE	Site Nos. Recorded within 1 Mile of APE	Reference
Tule Lake Tract Survey	Approx. 860	1977	2	41NU157, 41NU158	Highley et al. (1977)
Unnamed Survey	Approx. 12	1984	0	N/A	THC 2013

APE Area of Potential Effect (of current project)
NRHP National Register of Historic Places
USGS United States Geological Survey

4.2 SURVEY METHODS

From June 10 to 12, 2013, Horizon archeologists Briana Nicole Smith and Jared Wiersema; assisted by Dr. Charles D. Frederick, an independent professional geomorphologist; under the overall direction of Jeffrey D. Owens, Horizon Principal Investigator, performed archeological and geoarcheological survey investigations on the overall 176.4-ha (431.0-ac) M&G property to locate any cultural resource properties that potentially would be impacted by the proposed undertaking. The cultural resources investigations consisted of an archival review, a pedestrian walkover with judgmental shovel testing of the overall 176.4-ha (431.0-ac) APE, geoarcheological trackhoe trenching within the proposed 43.7-ha (108.0-ac) location of the main industrial plant facility, and the production of a report suitable for review by the SHPO in accordance with the THC's Rules of Practice and Procedure, Chapter 26, Section 27, and the CTA's Guidelines for Cultural Resources Management Reports.

Horizon's archeologists traversed the overall 176.4-ha (431.0-ac) M&G property and inspected the modern ground surface and cutbanks of the Nueces River, Nueces Bay, and the Viola Channel for aboriginal and historic-age cultural resources. The APE consists of a thick sequence of artificial dredge spoil piled atop natural deltaic sediments. Large portions of the overall APE, including most areas located beyond the proposed location of the main plant, would be the sites of relatively minor construction, used for temporary equipment laydown during construction, or remain unutilized. Anticipated ground disturbances in these areas would extend no more than approximately 0.3 to 0.6 m (1.0 to 2.0 ft) below surface; as such, these portions of the overall APE were surveyed via pedestrian walkover with judgmental shovel testing to assess the potential of the project to impact any surficial or shallowly buried cultural resources. Within the proposed 43.7-ha (108.0-ac) location of the main industrial facility in the southeastern portion of the overall M&G property, subsurface construction impacts are anticipated to extend at least 1.2 to 3.0 m (4 to 10 ft) below surface across portions of this area and in excess of 6.1 m (20 ft) below surface in limited areas in which structural support pilings would be drilled. In the proposed locations of support pilings in which deeper ground disturbances are anticipated, Horizon excavated a series of trackhoe trenches to determine the thickness of the artificial dredge spoil, to evaluate whether or not (and at what depths) natural deltaic sediments may exist underneath the dredge deposits, and to assess whether or not any intact aboriginal or historic-age cultural resources are present in undisturbed deltaic sediments

underneath the thick dredge spoil deposits. Representative photographs of the APE are presented in Figures 5 to 14.

The proposed paraxylene pipeline ROW was not surveyed for cultural resources. Horizon consulted with the THC before initiating the fieldwork for the Jumbo Project. Based on the anticipated presence of deep deposits of artificial dredge spoil deposits across the landform on which the proposed paraxylene pipeline ROW would be constructed, it was expected that the pipeline trench would not be excavated deep enough to penetrate below the dredge spoil deposits into any natural deltaic sediments that may be present underneath the artificial fill. As such, the THC recommended that Horizon's field archeologists inspect the proposed pipeline ROW. If any portions of the proposed pipeline ROW would traverse undisturbed areas, those areas should be surveyed for cultural resources; however, areas that were clearly composed of deep dredge spoil deposits would not need to be surveyed as construction of the proposed pipeline would have effectively no potential to disturb any natural sediments that may lie below the thick artificial fill section. Based on Horizon's field inspection, the entire proposed pipeline ROW traversed a landform characterized by deep dredge spoil deposits; thus, in accordance with the THC's recommendations, the proposed pipeline ROW did not warrant a cultural resources survey.

The Texas State Minimum Archeological Survey Standards (TSMASS) require a minimum of 1 subsurface probe (e.g., shovel tests, backhoe/trackhoe trenches, auger tests) per 3 acres for project areas measuring more than 100 acres in size; as such, a minimum of 144 subsurface probes would be required within the current project's 176.4-ha (431.0-ac) APE. Horizon excavated a total of 36 shovel tests and 15 trackhoe trenches within the APE, for a total of 51 subsurface probes (Figures 15 to 18). Shovel tests were excavated across the broader M&G parcel beyond the proposed 43.7-ha (108.0-ac) location of the main industrial plant facility, while trackhoe trenches were excavated within the proposed construction footprints of building locations associated with the deeper impacts associated with drilling of support pilings. While the TSMASS requirements were not met for a project area of this size, the entire landform on which the APE is sited is composed of a thick sequence of artificial dredge spoil deposits. The only potential impacts to intact archeological deposits would be associated with the few locations within the main plant site in which support pilings would be drilled below the thick dredge deposits into possibly natural underlying deltaic sediments. Given the limited potential of the proposed undertaking to disturb intact archeological deposits, the archeological and geoarcheological survey program implemented by Horizon, which was developed in consultation with and approved by the THC, is considered to constitute an adequate methodology to detect cultural resources that would be potentially impacted by the project.

In general, shovel tests measured approximately 30 cm (12 in) in diameter and were excavated to a target depth of 1.0 m (3.3 ft) below ground surface, to the top of pre-Holocene deposits, or to the maximum depth practicable, and all sediments were screened through 6.35-millimeter (mm) (0.25-in) hardware cloth. In practice, most shovel tests were terminated at depths of 30 to 60 cmbs when it was determined that sediments consisted of artificial fill and that no intact archeological deposits were present in surface or near-surface contexts that would be disturbed by use of the broader APE as equipment-laydown areas during the proposed

Figure 5. View of Main Construction Site (Facing N)

Figure 6. View of Main Construction Site Showing Large Dredge Piles (Facing N)

Figure 7. View of Areas along Viola Channel (Facing SE)

Figure 8. Close-up of Actively Eroding Bank along Viola Channel (Facing NW)

Figure 9. View of Areas along Tule Lake Turning Basin (Facing NW)

Figure 10. View of Dredge Piles in APE (Facing SE)

Figure 11. View of NE Portion of APE near Nueces River Mouth (Facing NE)

Figure 12. View along Northern Edge of APE (Facing SW)

Figure 13. View along Nueces River Levee on Northern Side of APE (Facing NW)

Figure 14. View of Northwest End of APE along Nueces River (Facing SE)

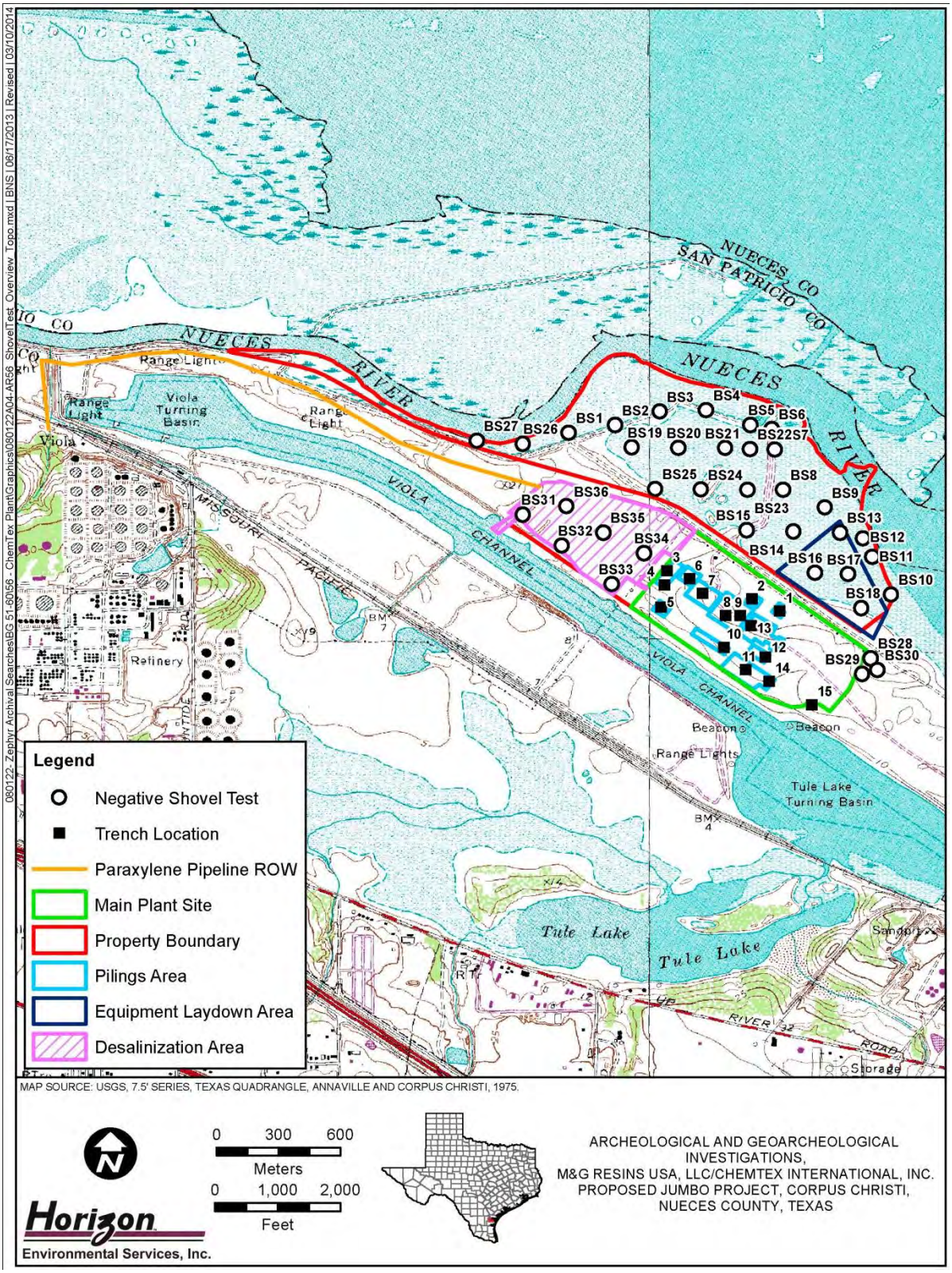

Figure 15. Locations of Shovel Tests and Backhoe Trenches on USGS Topographic Map

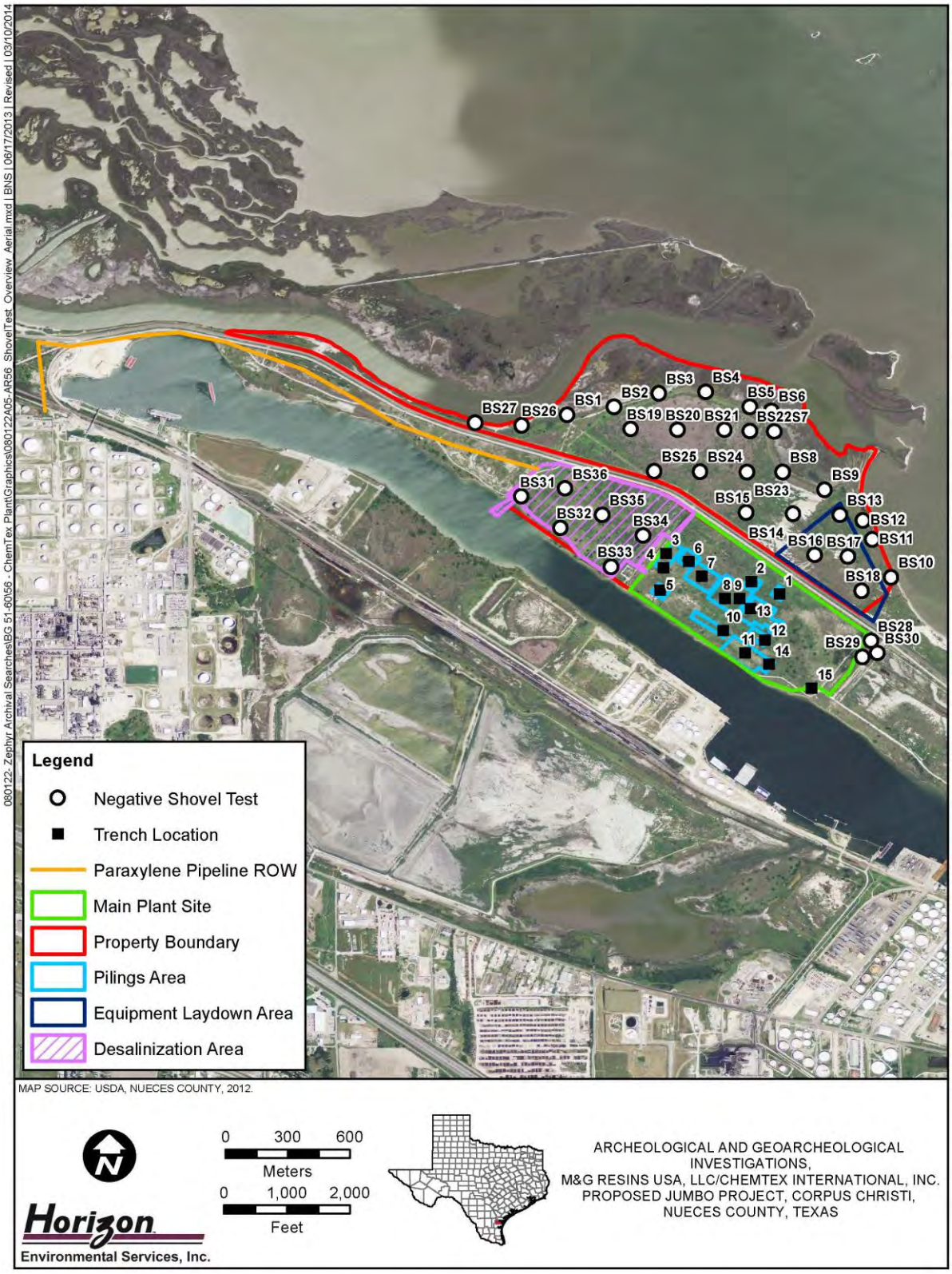

Figure 16. Locations of Shovel Tests and Backhoe Trenches on Aerial Photograph

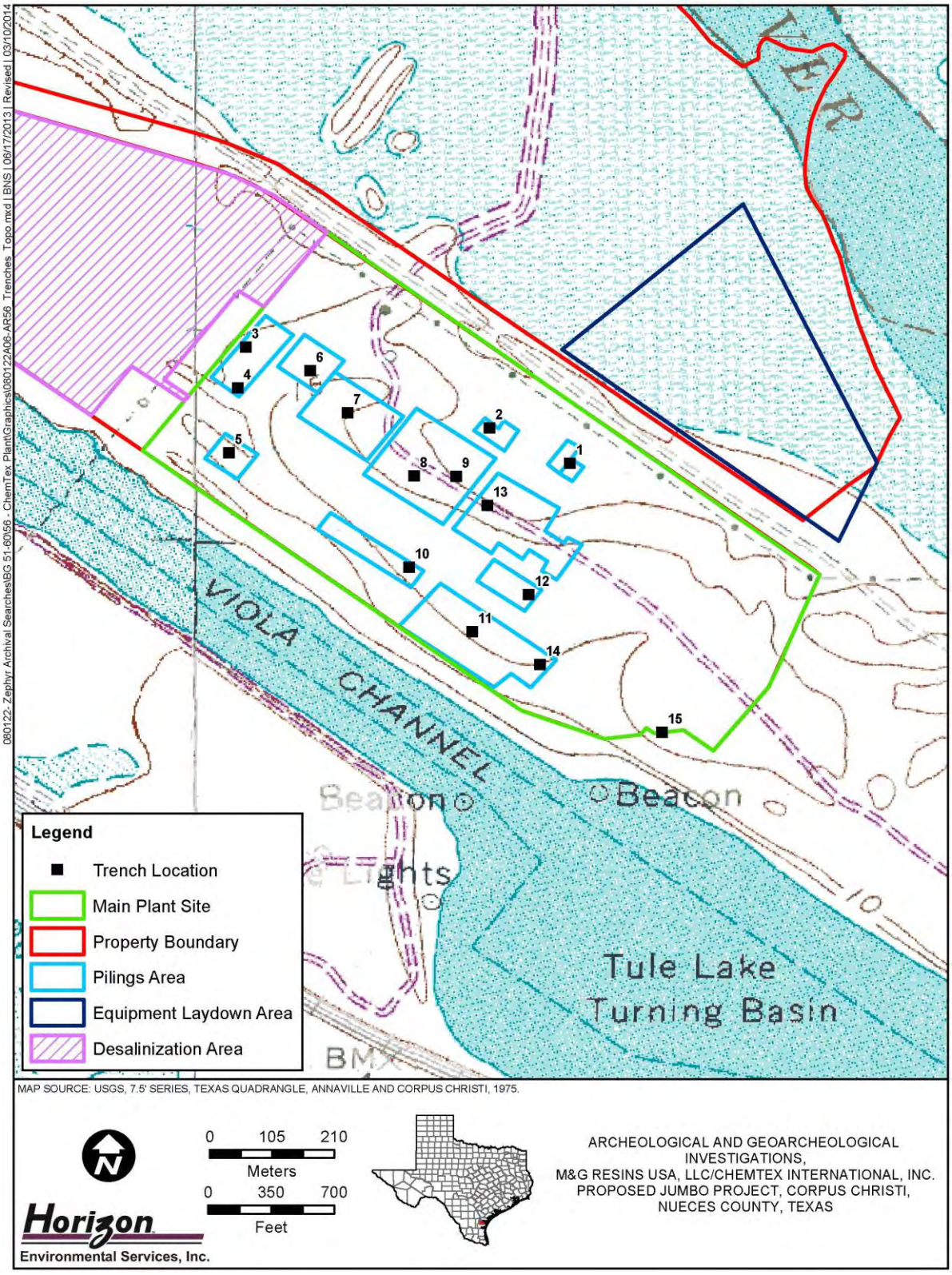

Figure 17. Detail of Trackhoe Trench Locations within Main Construction Site (Topo)

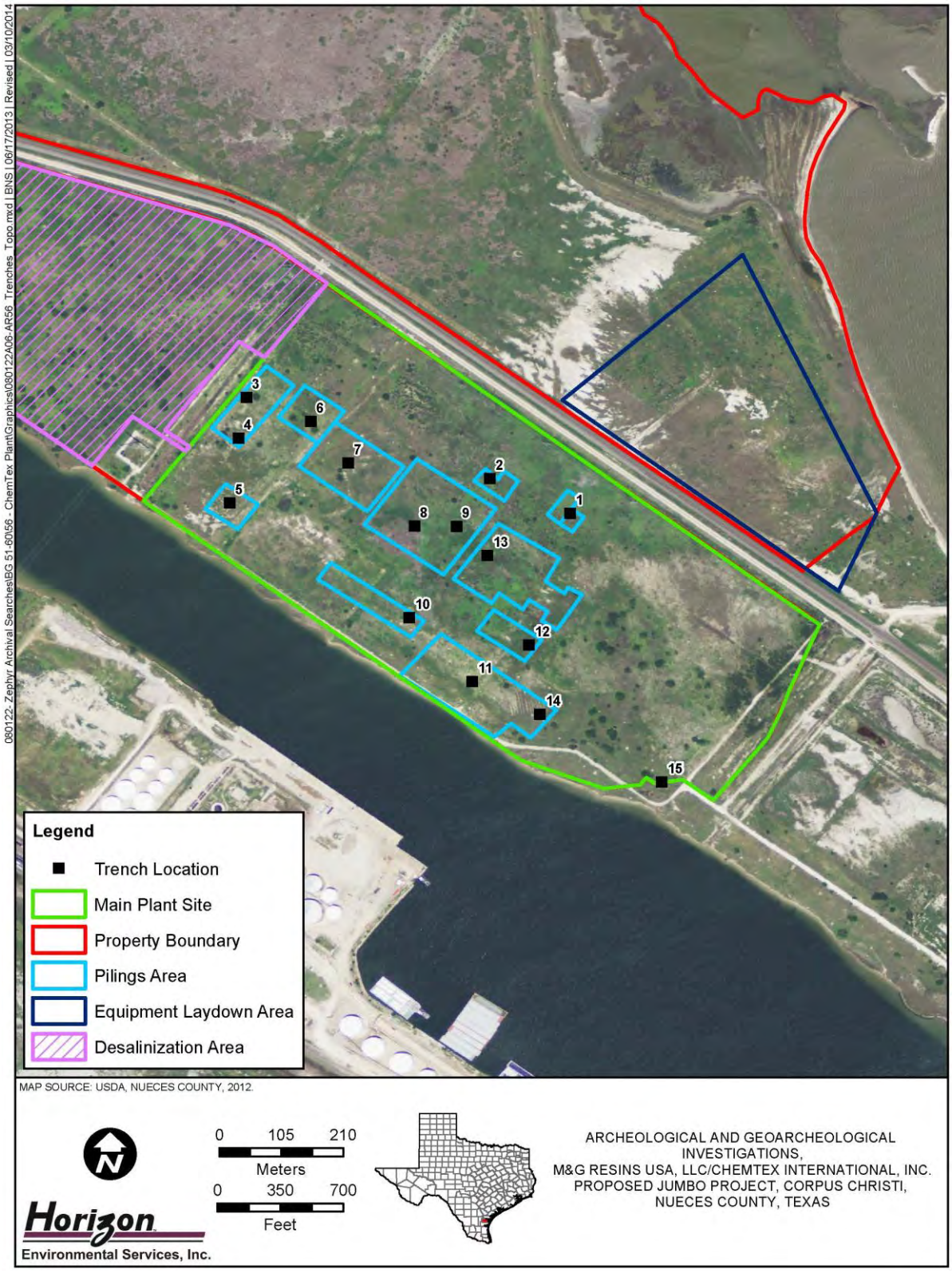

Figure 18. Detail of Trackhoe Trench Locations within Main Construction Site (Aerial)

undertaking. The Universal Transverse Mercator (UTM) coordinates of all shovel tests were determined using hand-held Garmin ForeTrex Global Positioning System (GPS) devices based on the North American Datum of 1983 (NAD 83). Specific shovel test data are summarized in Appendix A.

Trackhoe trenches were excavated using a 0.6-m- (2.0-ft-) wide bucket. Most trenches were approximately 0.6 m (2.0 ft) wide, 3.0 to 4.0 m (9.8 to 13.1 ft) long, and from 3.6 to 5.0 m (11.8 to 16.4 ft) deep. The trenches were excavated by removing thin layers measuring approximately 0.1 m (0.3 ft) in thickness from across the entire trench before proceeding downward. Dr. Frederick, assisted by Horizon personnel, monitored all trench excavations. Trench walls and floors were carefully monitored during excavation; backfill piles were thoroughly examined for archeological resources during excavation; and trench walls were inspected following excavation for artifacts, distinctive stratigraphic anomalies, and/or soil discolorations that might be indicative of past cultural activities. Fourteen of the 15 trenches were excavated within the main plant construction site within areas in which support pilings would be constructed, and 1 of the 15 trenches was excavated near the southeastern corner of the proposed plant construction site. The geoarcheological trenching investigations are discussed in more detail in the following chapter. Specific backhoe trench data are summarized in Appendix B.

During the survey, field notes were maintained on terrain, vegetation, soils, landforms, survey methods, and shovel test results. Digital photographs were taken, and a photographic log was maintained. Horizon employed a non-collection policy for cultural resources. Diagnostic artifacts (e.g., projectile points, ceramics, historic materials with maker's marks) and non-diagnostic artifacts (e.g., lithic debitage, burned rock, historic glass, and metal scrap) were to be described, sketched, and/or photo-documented in the field and replaced in the same location in which they were found. As no cultural resources were observed during the survey, the collections policy was not brought into play.

The survey methods employed during the survey represented a ~~"r~~easonable and good-faith effort" to locate significant archeological sites within the APE as defined in 36 Code of Federal Regulations (CFR) 800.3.

5.0 RESULTS OF GEOARCHEOLOGICAL INVESTIGATIONS

This chapter presents the results of mechanically assisted archeological survey investigations of M&G's proposed Jumbo Project site in Corpus Christi, Texas. The survey was performed on June 10 to 12, 2013.

5.1 METHODS

Prior to fieldwork, a geologic literature review was performed, and it was determined that the surficial deposits that occupy the APE today are dredge spoil deposited during and subsequent to the creation of the Corpus Christi Ship Channel, but that the spoil in this particular place was deposited upon the late Holocene delta of the Nueces River. As a result, trenching was recommended by the THC to examine the natural delta deposits beneath the spoil for the presence of cultural resources. A trackhoe capable of excavating to a depth of about 6.0 m (19.7 ft) below surface was used to excavate 15 trenches within the proposed 43.7-ha (108-ac) main construction site area, which represents the only portion of the overall APE in which construction activities would potentially penetrate below the spoil underlying deltaic deposits (see Figure 19). Owing to the very unconsolidated nature of the spoil deposits, none of the trench excavations were entered, and the deposits were logged without entering the excavations. The deepest trench was excavated to about 5.0 m (16.4 ft) below surface, but most were shallower than this owing to the unconsolidated nature of the fill and a perched water table that led to extensive slumping of the trench walls. Descriptions of the deposits exposed in each trench are provided in Appendix B. In general terms, these descriptions were made following the methods advocated by Schoeneberger et al. (2012), although the inability to closely examine the deposits in situ precludes full recording of the details of certain aspects of the deposits.

5.2 SETTING

The APE is situated between Nueces Bay and the Viola section of the Corpus Christi Ship Channel immediately adjacent to the current mouth of the Nueces River (Figure 20). The land immediately to the north and west is the distal end of the late Holocene Nueces River delta and today comprises a broad expanse of periodically flooded tidal marshes that lie only a few feet above sea level. Across the ship channel to the south lies the Pleistocene Beaumont Formation upland, which is separated from the delta by a prominent scarp that in this area rises

Figure 19. Main Construction Site and Backhoe Trenches on USGS LIDAR Imagery

Shaded relief digital elevation model of the APE derived from LIDAR data, showing the location of the trenches (red squares) and areas where deep subsurface impacts are anticipated (black polygons). The dark blue water body on the southern side of the figure is the Corpus Christi Ship Channel, and the water body on the north side is Nueces Bay. Green depicts areas of elevated land and light blue shows the locations of lower-elevation areas.

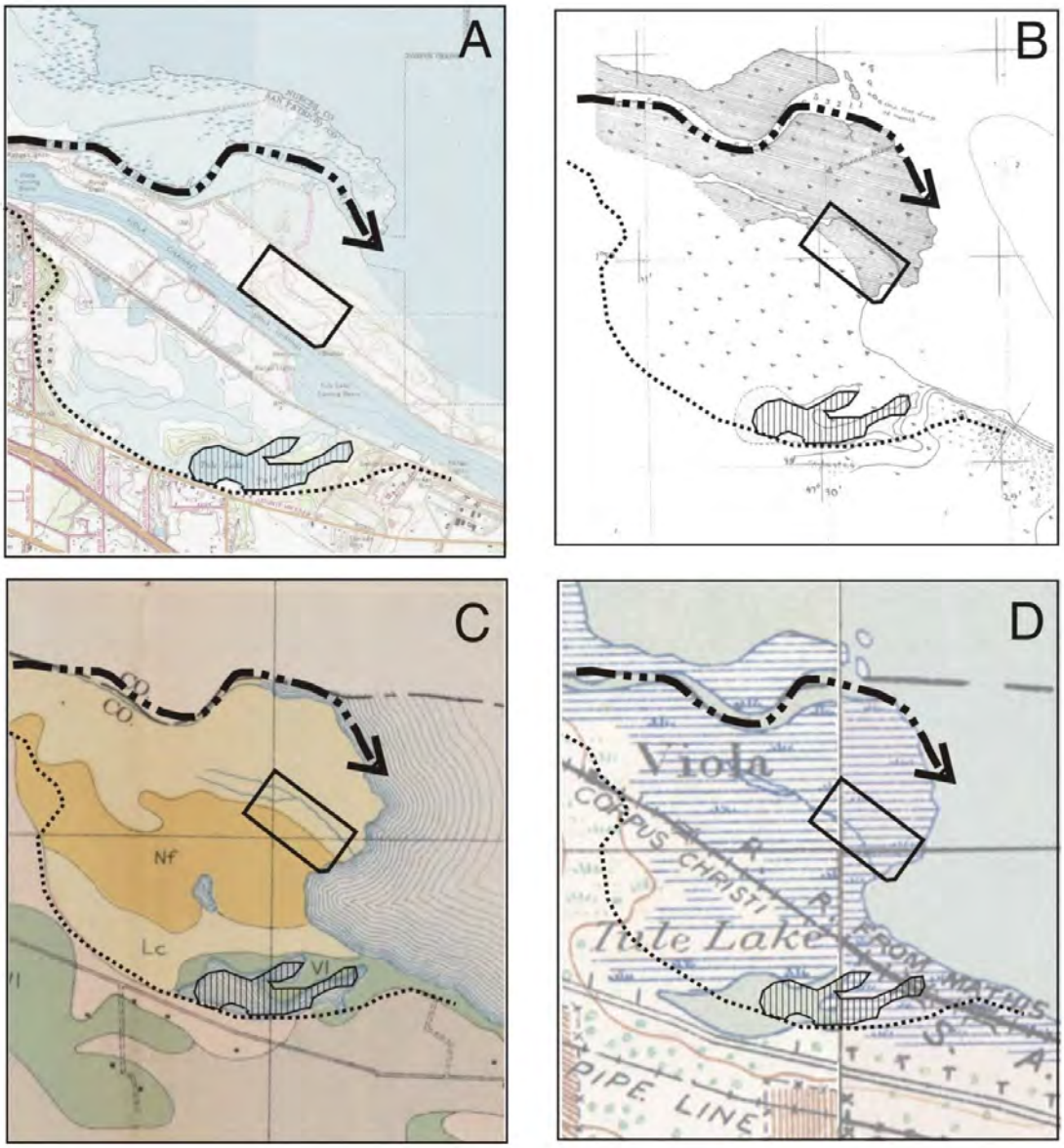

Figure 20. Pre-Ship Channel Landscape as Inferred from Historic Maps

A: Modern topographic map with several features highlighted that were used to compare the modern and historic maps, specifically the Nueces River channel, the APE (box), Tule Lake (vertical hatch), and scarp at the edge of the Pleistocene upland (dotted line). B: Section of the 1882 U.S. Coast and Geodetic Survey map of the shores of Nueces Bay showing the projected location of the APE and the features derived from the modern topography used in map comparison. C: Portion of the 1922 Nueces County soil map (Magnum and Westover 1911) showing the location of the APE with respect to mapped soils (Lc=Lomalta Clay, Nf=Nueces Fine Sand, and Vl=Victoria Loam). D: US Army Corps of Engineers 1937 (left side) and 1920 (right side) maps based on topographic survey performed in 1908-1909, with the APE superimposed.

about 15.0 m (49.2 ft) above the delta. At its closest approach, this scarp lies about 1.0 km (0.6 mi) south of the APE, along the southern shore of Tule Lake.

The APE lies at the juncture of 2 parts of the Corpus Christi Ship Channel—the Viola Channel and the Tule Lake Channel. Extension of the Corpus Christi Ship Channel up to Tule Lake was approved by the US Army Corps of Engineers in 1938, and dredging of this channel was completed in 1958 (Weil 1986). The Viola Channel borders the southwest side of the project, and the excavation of this channel was completed by 1971 (Morton and Paine 1986).

The deposits underlying the APE are mapped on several geologic maps as fill, spoil, or made land (cf. Bureau of Economic Geology 1975; Brown et al. 1976; Morton and Paine 1986), and this earthen material was clearly derived from the dredging that created the Viola and Tule Lake portions of the Corpus Christi Ship Channel. However, the most relevant point to archeological examination of this parcel is whether this property was land prior to the construction of the Corpus Christi Ship Channel, or whether the entire parcel was formerly part of Nueces Bay and therefore not inhabitable prior to construction of the ship channel.

5.3 PALEOGEOGRAPHY

Close examination of historic maps (see Figure 20) indicates that the majority of the APE examined during this fieldwork was originally an emergent part of the late Holocene Nueces River delta. The oldest cartographic source examined is the 1882 US Coast and Geodetic Survey (USCGS) map of Nueces Bay that shows the Nueces River mouth (see Figure 20b). Projecting the study area onto this map using the Nueces River channel and Tule Lake as reference points suggests that this area was the distal end of the Nueces River delta and that it encompassed an unnamed Nueces River distributary channel.

This interpretation is further supported by projecting the study area onto the 1909 soil map of the Corpus Christi area (Magnum and Westover 1911), which yields a similar result to the 1882 USCGS map of Nueces Bay (see Figure 20c). Again, the APE is shown to occupy the southeastern end of the Nueces River delta and contains a drainage channel that is in the same approximate position but is less clearly a former distributary channel of the Nueces River. In 1922, Magnum and Westover (1911) mapped 2 soils in the APE —Lomalta Clay and Nueces Fine Sand. The land immediately south of the Nueces River mouth and immediately north and west of Tule Lake is identified as Lomalta Clay, which is described by Magnum and Westover (1911:912) as a soil associated with the lower valley of the Nueces River that occupies almost level land that lies only slightly above sea level and with a water table at 0.6 to 0.9 m (2.0 to 3.0 ft) below the ground surface. The land bordering the southern side of the southern distributary channel is mapped as Nueces Fine Sand, which consists of 30.5 to 38.1 cm (12.0 to 15.0 in) of loose gray, fine-textured sand that has been deposited by sand dunes and river deltas, and in this specific place it is clearly deltaic in origin.

The last example, and perhaps least satisfactory in terms of fit between the modern physiographic features and the old map, is a military map compiled by the US Army Corps of Engineers in 1908 to 1909 (USACE 1920, 1937). The area depicted in Figure 20d lies on the seam between 2 different map sheets (the Corpus Christi and Robstown quadrangles) and

when the 2 were stitched together, the resulting map fits poorly with the modern registration features, specifically the Nueces River channel and Tule Lake. Unlike the previous 2 maps, an acceptable fit could not be achieved with these 2 features, such that when 1 feature (like the Nueces River channel) fit well the other was clearly mismatched. Regardless of the goodness of fit, however, this overlay still places the APE at the end of the delta, and the main difference concerns the location of the abandoned distributary channel that, depending upon which physiographic feature is used for registration, lies on either the northeast side or the southeast side of the APE.

Field support for the cartographic interpretation that the APE is underlain by the Late Holocene emergent Nueces River delta was found adjacent to the Viola Channel of the Corpus Christi Ship Channel that abuts the southwest side of the APE. Here, several cutbanks exposed the boundary between the natural delta deposits and the overlying dredge spoil (Figure 21). An incipient soil (an A-C profile) was observed within the delta deposits. One of these exposures exhibited several widely dispersed clam shells of *Rangia* sp., but no cultural material was observed, and none of the shells were clearly altered by human action and are interpreted as natural occurrences. These exposures are not within the APE, but rather lie on a narrow band of Port of Corpus Christi land adjacent to the ship channel, but are thought to be representative of the deposits within the APE.

If historically measured sedimentation rates for the Nueces River delta are accurate for the late Holocene growth of the delta, then this portion of the delta is likely to have been deposited within the last 500 years or so. Morton and Paine (1986:48) report accretion rates for the Nueces River delta immediately northwest of the APE between 1882 and 1930 as between 3.0 and 27.4 m (10.0 and 90.0 ft) per year, which for the roughly 1,274-m- (4,180-ft-) long area examined suggests deposition occurred within approximately the last 300 years. Examination of the historic map from 1888 clearly indicates that deposition has not been as rapid as 27.4 m (90 ft) per year over most of the delta, as this rate suggests the entire APE could have been deposited within 34 years. However, the depositional rates that Morton and Paine (1986) observed clearly suggest that this portion of the delta has a potential for Late Prehistoric or younger occupations.

5.4 DREDGE SPOIL DEPOSITS

As noted, modern geologic maps identify the ground surface within the APE as dredge spoil. For instance, Morton and Paine (1986:10, Figure 3) show the entire APE as spoil and made land, and they note that:

> Vast areas of newly created land lie next to the deep-draft channels in Corpus Christi and southern Nueces Bays. Excavation, subsequent deepening, and maintenance dredging of the channels supplied the sand and mud that were hydraulically emplaced to form the fill. Broad-low lying sand flats and higher spoil mounds formed by dredged material are located along the south side of Nueces Bay (Tule Lake Channel and Turning Basin)… (Morton and Paine 1986:18)

Figure 21. View of Cutbank Exposures Adjacent to the Viola Channel

Photograph of cutbank exposure adjacent to the Viola Channel of the Corpus Christi Ship Channel showing the location of the boundary between dredge spoil (light-colored sandy sediment) and in situ deltaic deposits within which a weakly developed marsh soil has formed (dark-colored bed just above the water line).

Dredging and spoil deposition associated with the construction of the Corpus Christi Ship Channel occurred principally between 1930 and 1958, but continued up until 1971 near the mouth of the Nueces River.

Many of the deposits within the APE appear to be part of a confined disposal facility that isolates dredged material from the environment by means of a dike. US Geological Survey (USGS) LIDAR imagery shows a shaded relief digital elevation model (DEM) of the APE and the locations of the trenches excavated for this project with respect to the areas in which deep impacts are anticipated during construction (see Figure 19). The DEM clearly depicts several broad, elevated areas of spoil (e.g., the northwestern and southeastern ends of the APE) as well as discrete linear banks or dikes that define and border lower areas that appear to be basins. The largest of these basins is in the central portion of the study area and was examined by Trenches 1, 2, 7, 8, 9, 10, 12, and 13. It appears that this area periodically ponds water judging by the presence of the shells of many aquatic freshwater snails on the modern ground surface in this part of the APE. The broad elevated areas were examined by Trenches 3, 4, 5, and 6 in the northwestern part of the APE, and by Trenches 14 and 15 in the southeastern part of the APE.

Although the deposits exposed by trenching varied somewhat from place to place, the basins and elevated areas appear to have somewhat different types of deposits in the near surface. The elevated areas are dominated by weakly stratified sand to slightly gravelly sand, whereas the depressions contain alternating thick beds of dark, variably colored mud and sand (Figure 22). In broad terms, the dredge spoil is composed of 3 types of deposit—sand, dark-colored mud, and green mud.

5.5 SANDY DREDGE SPOIL

All of the trenches placed in the elevated spoil mounds on the northwestern and southeastern ends of the APE exposed extensive accumulations of sand, and most of the trenches in the lower basin areas also exposed a thick body of sandy dredge spoil immediately beneath the uppermost dark-colored mud. These sandy deposits, when freely drained, were generally white (10YR 8/1), although most appeared to be in the zone of the fluctuating water table below a depth of 2 m, where they more often appeared gray (5Y 5/1), light brownish-gray (2.5Y 6/2), or light gray (10YR 7/1). Some of the sands were fine to very fine sand and contained few or no coarse fragments, whereas others were coarser (medium to coarse sand) and contained highly variable amounts of coarse material, including marine shells and shell fragments (primarily clams and oysters), small siliceous pebbles, pedogenic calcium carbonate nodules (and fragments thereof), light green to greenish-gray clay balls, and fragments of calcium carbonate cemented sandstone. A few exposures also contained building debris (chunks of concrete, tile, and other construction material). Most of the coarse fragments were matrix supported, although a few trenches exhibited alternating gravel-poor and gravel-rich beds, the latter of which often exhibited clast-supported gravels (Figure 23). The sandy dredge spoil often exhibited subtle horizontal bedding that was either flat-lying or very low angle sub-horizontal (see Figures 22 and 23). Clear laminations were uncommon, but they might have been present and visible if the deposits could have been inspected closely in situ.

5.6 DARK-COLORED MUDS

The dark-colored muds were observed most often within the basin areas within the APE and were found in 2 distinct stratigraphic positions: (1) an Upper Mud, which started at the modern ground surface and extended to depths between 40 and 100 cmbs, and (2) a Lower Mud that was found at depths generally below 3 m.

5.6.1 The Upper Dark-Colored Mud

This deposit was typically recorded as a clay and occasionally as a silty clay, and ranged in color from gray (2.5Y 5/1), dark gray (10YR 4/1 to 2.5Y 4/1), very dark gray (2.5Y 3/1), to black (2.5Y 4/1). This deposit typically exhibited weakly developed subangular blocky structure, but in a few exposures it exhibited a surprisingly advanced degree of structural development, characterized by strongly developed, very coarse prismatic form (Figure 24). This deposit had a sharp to abrupt lower boundary separating it from the underlying sand that was often wavy (see Figure 22), and in many exposures the upper 20 cm contained more sand than the lower part of the deposit. In 2 exposures, this deposit also exhibited calcium carbonate filaments on ped faces.

Figure 22. Stratigraphy Observed in Trench 2

Photograph of Trench 2 showing the alternating dark mud, sand, and laminated green mud that rests upon another dark-colored mud, which is typical of the spoil deposits observed in the depressions within the APE.

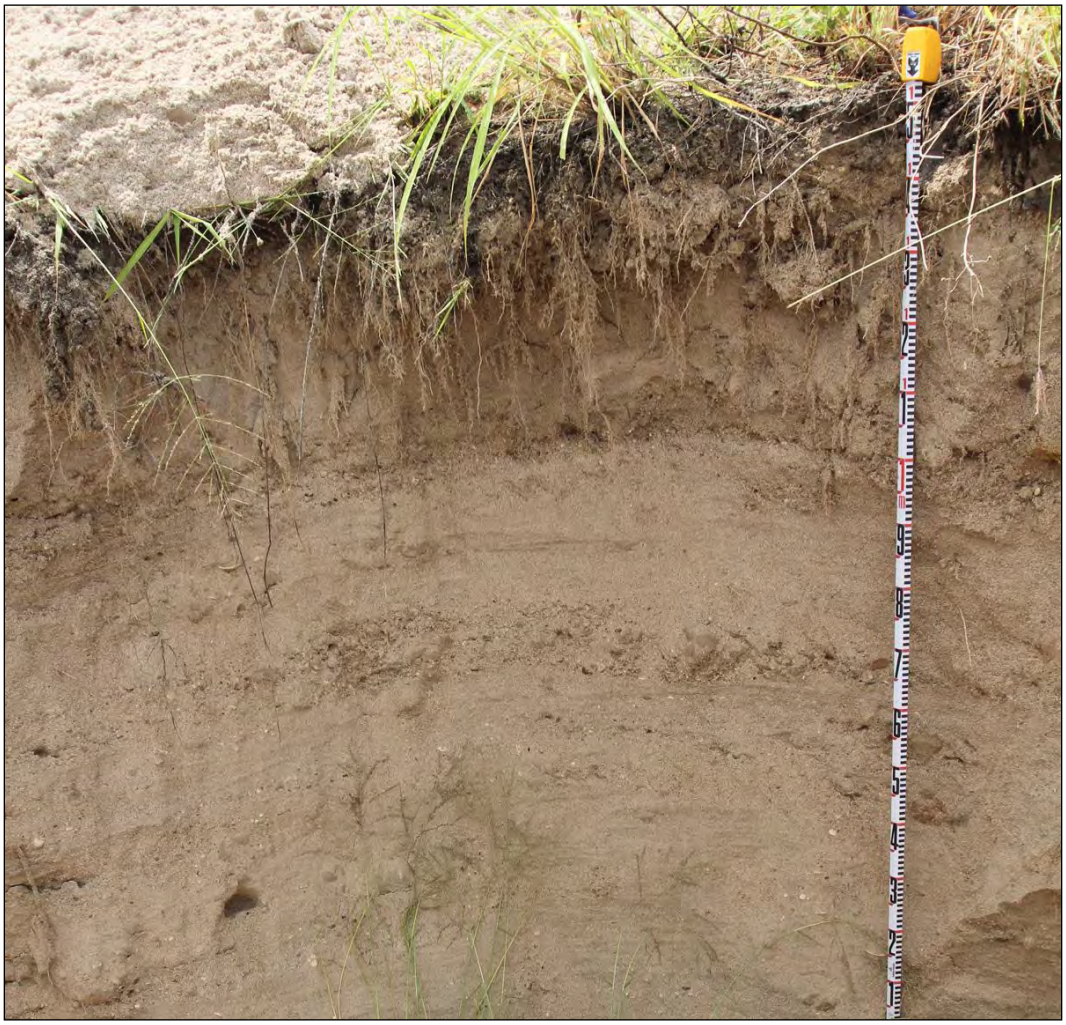

Figure 23. Stratigraphy Observed in Upper 1.5 Meters of Trench 11

Photograph of the upper 1.5 m of Trench 11 illustrating the weakly stratified nature of the sandy to slightly gravelly sandy fill deposits common in the APE.

5.6.2 The Lower Dark-Colored Mud

As noted above, this deposit was observed near the base of many trenches (see Figure 22) and ranged in texture from silty clay to clay. The top of this deposit was most commonly observed around 3.0 to 3.3 m below surface, but was observed as shallow as 2.7 m and as deep a 4.2 m. It appeared to serve as an aquiclude in most places, and the overlying deposits were typically saturated and gleyed immediately above it. The Lower Dark-Colored Mud ranged in color from gray (N 6/), to very dark gray (N 3/) to dark bluish-gray (5PB 4/1), and a few deposits contained woody materials suggestive of this deposit having supported plants for a period of time after deposition and before subsequent burial. It was unclear in the field if this deposit was the top of the Late Holocene delta or merely another dark-colored dredge spoil mud.

Figure 24. View of the Upper Dark-Colored Mud Observed in Trench 8

Photograph of the Upper Dark Colored Mud exposed in Trench 8. The very large prismatic peds seen here are 10 to 15 cm wide.

5.7 GREEN MUD

Several trenches, primarily those located in the central depression, exposed a bed of green mud immediately above the Lower Dark-Colored Mud. This mud ranged from massive to laminated (almost varved) and ranged in color from light greenish-gray to greenish-gray (5G 7/1 to 5GY 7/1), to greenish-gray (5GY 5/1 to 5GY 6/1) and dark greenish-gray (10GY 4/1). It was most often recoded as silty clay and was typically saturated and heavily deformed by the excavator (Figure 25).

Figure 25. View of Laminated Green Mud Observed in Trench 2

5.8 CONCLUSIONS

Background research indicates that the APE is situated on ground that was once the distal end of the Late Holocene-age Nueces River Delta and that the surface of the delta was subsequently buried by the addition of dredge spoil derived from the construction of the Corpus Christi Chip Channel sometime between 1930 and 1971. Fifteen trench excavations were placed within the portions of the property likely to experience deep impacts in order to inspect the deltaic deposits for buried cultural materials, but none of the trenches were definitively able to reach this surface. These trenches exposed up to 5 m of unconsolidated dredge spoil that could be divided into 3 broad forms—sands, dark-colored muds, and green mud. These deposits share some attributes of naturally deposited sediments, with the sands exhibiting the most clear evidence of their origin, primarily in the form of matrix-supported gravelly deposits with highly heterogeneous composition. These water-saturated, poorly consolidated, sandy dredge spoil deposits slumped with alarming frequency during excavation, and this precluded excavating in excess of 5 m deep. More specifically, trenches were excavated deeper than 5 m, but the deposits slumped before the depth could be measured, often before the excavator bucket could be removed from the hole. None of the trenches revealed the presence of prehistoric cultural materials.

6.0 SUMMARY AND RECOMMENDATIONS

6.1 CONCEPTUAL FRAMEWORK

The archeological investigations documented in this report were undertaken with 3 primary management goals in mind:

- Locate historic and prehistoric archeological resources that occur within the designated survey area.
- Evaluate the significance of these resources regarding their potential for inclusion in the NRHP.
- Formulate recommendations for the treatment of these resources based on their NRHP evaluations.

At the survey level of investigation, the principal research objective is to inventory the cultural resources within the APE and to make preliminary determinations of whether or not the resources meet one or more of the pre-defined eligibility criteria set forth in the state and/or federal codes, as appropriate. Usually, management decisions regarding archeological properties under applicable statutes by applicable federal and/or state agencies are a function of the potential importance of the sites in addressing defined research needs, though historic-age sites may also be evaluated in terms of their association with important historic events and/or personages. Under the NHPA, archeological resources are evaluated according to criteria established to determine the significance of archeological resources for inclusion in the NRHP.

Analyses of the limited data obtained at the survey level are rarely sufficient to contribute in a meaningful manner to defined research issues. The objective is rather to determine which archeological sites could be most effectively investigated further in pursuance of regional, methodological, or theoretical research questions. Therefore, adequate information on site function, context, and chronological placement from archeological and, if appropriate, historical perspectives is essential for archeological evaluations. Because research questions vary as a function of geography and temporal period, determination of the site context and chronological placement of cultural properties is a particularly important objective during the inventory process.

6.2 ELIGIBILITY CRITERIA FOR INCLUSION IN THE NATIONAL REGISTER OF HISTORIC PLACES

Determinations of eligibility for inclusion in the NRHP are based on the criteria presented in 36 CFR §60.4(a-d). The 4 criteria of eligibility are applied following the identification of relevant historical themes and related research questions:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> A. [T]hat are associated with events that have made a significant contribution to the broad patterns of our history; or,
>
> B. [T]hat are associated with the lives of persons significant in our past; or,
>
> C. [T]hat embody the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or,
>
> D. [T]hat have yielded, or may be likely to yield, information important in prehistory or history.

The first step in the evaluation process is to define the significance of the property by identifying the particular aspect of history or prehistory to be addressed and the reasons why information on that topic is important. The second step is to define the kinds of evidence or the data requirements that the property must exhibit to provide significant information. These data requirements in turn indicate the kind of integrity that the site must possess to be significant. This concept of integrity relates both to the contextual integrity of such entities as structures, districts, or archeological deposits and to the applicability of the potential database to pertinent research questions. Without such integrity, the significance of a resource is very limited.

For an archeological resource to be eligible for inclusion in the NRHP, it must meet legal standards of eligibility that are determined by 3 requirements: (1) properties must possess significance, (2) the significance must satisfy at least 1 of the 4 criteria for eligibility listed above, and (3) significance should be derived from an understanding of historic context. As discussed here, historic context refers to the organization of information concerning prehistory and history according to various periods of development in various times and at various places. Thus, the significance of a property can best be understood through knowledge of historic development and the relationship of the resource to other, similar properties within a particular period of development. Most prehistoric sites are usually only eligible for inclusion in the NRHP under Criterion D, which considers their potential to contribute data important to an understanding of prehistory. All 4 criteria employed for determining NRHP eligibility potentially can be brought to bear for historic sites.

Criterion A—Events

To be considered for listing under Criterion A, a property must be associated with 1 or more events important in the defined historic context. Criterion A recognizes resources

associated with single events, such as the founding of a town, or with a pattern of events, repeated activities, or historic trends, such as the gradual rise of a port city's prominence in trade and commerce. The event or trends, however, must clearly be important within the associated context of settlement, in the case of the town, or development of a maritime economy, in the case of the port city. Moreover, the property must have an important association with the event or historic trends, and it must retain historic integrity.

Criterion B—Persons

Criterion B applies to resources associated with individuals whose specific contributions to history can be identified and documented. Persons –significant in our past" refers to individuals whose activities are demonstrably important within a local, state, or national historic context. The criterion is generally restricted to those resources that illustrate (rather than commemorate) a person's important achievements.

Criterion C—Design or Construction

This criterion applies to resources significant for their physical design or construction, including such elements as architecture, landscape architecture, engineering, and artwork. To be eligible under this criterion, a property must meet *at least one* of the following requirements—embody distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction.

Criterion D—Information Potential

Certain important research questions about human history can only be answered by the actual physical material of cultural resources. Criterion D encompasses the resources that have the potential to answer, in whole or in part, those types of research questions. The most common type of property nominated under this Criterion is the archeological site (or a district composed of archeological sites). Buildings, objects, and structures (or districts composed of these property types), however, can also be eligible for their information potential. Criterion D has 2 requirements, which must *both* be met for a property to qualify—the property must have, or have had, information to contribute to our understanding of human history or prehistory, and the information must be considered important.

6.3 SUMMARY OF INVENTORY RESULTS

Horizon archeologists performed archeological and geoarcheological survey investigations of the proposed project's APE to locate any cultural resource properties that potentially would be impacted by the proposed undertaking. The APE was traversed by Horizon's archeologists; the modern ground surface and cutbanks of the Nueces River, Nueces Bay, and the Viola portion of the Corpus Christi Ship Channel, were inspected for cultural resources; and a total of 51 subsurface probes were excavated within the APE, including 36 shovel tests and 15 trackhoe trenches. While the TSMASS requirements were not met for an APE of this size, the entire landform on which the APE is sited is composed of a thick sequence of artificial dredge spoil deposits. The only potential impacts to intact archeological

deposits would be associated with the few locations within the main plant site in which support pilings would be drilled below the thick dredge deposits into possibly natural underlying deltaic sediments. Given the limited potential of the proposed undertaking to disturb intact archeological deposits, the archeological and geoarcheological survey program implemented by Horizon, which was developed in consultation with and approved by the THC, is considered to constitute an adequate methodology to detect cultural resources that would be potentially impacted by the project.

Modern construction debris, including chunks of concrete, tile, and other construction materials, was observed in several trench exposures, but these materials were believed to be modern and, in any case, were contained within the artificial dredge spoil deposits in disturbed contexts. Shovel testing across the broader property did not produce any evidence of subsurface cultural resources, and all sediments observed in shovel tests were consistent with the dredge spoils observed in backhoe trenches. Underlying natural deltaic sediments were observable along the shorelines of the Nueces River, Nueces Bay, and the Viola Channel in some areas underlying the dredge spoil overburden, but no cultural resources were observed eroding out of the cutbanks based on a visual inspection of shoreline areas. Trenching exposed up to 5 m of unconsolidated dredge spoil that could be divided into 3 broad forms—sands, dark-colored muds, and green mud. These deposits share some attributes of naturally deposited sediments, with the sands exhibiting the clearest evidence of their origin, primarily in the form of matrix-supported gravelly deposits with highly heterogeneous composition, but none of the trenches were definitively able to reach the buried deltaic deposits. The water-saturated, poorly consolidated, sandy dredge spoil deposits slumped with alarming frequency during excavation, and this precluded excavating in excess of approximately 5.0 m (16.4 ft) in depth. More specifically, trenches were excavated deeper than 5.0 m (16.4 ft), but the deposits slumped before the depth could be measured, often before the excavator bucket could be removed from the hole. None of the trenches revealed the presence of prehistoric cultural materials. No intact cultural resources, historic or prehistoric, were identified on the modern ground surface, along cutbanks, or within any of the shovel tests or trackhoe trenches excavated within the APE during the survey.

6.4 MANAGEMENT RECOMMENDATIONS

Based on the results of the cultural resources survey documented in this report, no potentially significant cultural resources would be affected by the proposed undertaking. In accordance with 36 CFR 800.4, Horizon has made a reasonable and good faith effort to identify archeological historic properties within the APE. No archeological resources were identified that meet the criteria for inclusion in the NRHP according to 36 CFR 60.4, and no further archeological work is recommended in connection with the proposed undertaking. However, in the unlikely event that any human remains or burial accoutrements are inadvertently discovered at any point during construction, use, or ongoing maintenance in the APE, even in previously surveyed areas, all work should cease in the immediate vicinity of any inadvertent discovery of human remains and the THC should be notified of the discovery.

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APPENDIX A:

Shovel Test Data

Table A-1. Shovel Test Summary Data (cont.)

ST No.	UTM Coordinates[1]		Depth (cmbs)	Soils	Artifacts
	Easting	Northing			
BS1	647339	3080660	0-60	Grayish-brown sand	None
			60-70+	Grayish-brown very wet sand with dark grayish-brown clay mottles	None
BS2	647538	3080700	0-30	Dark grayish-brown clay	None
			30-90	Light yellowish-brown sand with shells	None
			90+	Dark grayish-brown clay	None
BS3	647730	3080767	0-60	Pale brown sand with shells	None
			60-65+	Pale brown compact gravelly sandy clay	None
BS4	647929	3080777	0-65	Light yellowish-brown very wet sand with shells	None
			65+	Water	None
BS5	648119	3080708	0-90	Light yellowish-brown wet sand with shells	None
			90-95+	Black and very dark grayish-brown clay with shells	None
BS6	648212	3080689	0-30+	Dark grayish-brown, yellowish-brown, pale brown and black clay with shells	None
BS7	648226	3080590	0-25	Brown clay	None
			25-30+	Very dark grayish-brown, brown, and dark yellowish-brown clay	None
BS8	648264	3080397	0-55	Pale brown sand with shells	None
			55+	Light yellowish-brown compact sandy clay with shells	None
BS9	648445	3080313	0-100+	Light grayish-brown sand with shells	None
BS10	648735	3079896	0-100+	Light grayish-brown sand with shells	None
BS11	648651	3080077	0-55	Light yellowish-brown gravelly sand	None
			55+	Light yellowish-brown compact gravelly sandy clay	None
BS12	648610	3080166	0-60	Light yellowish-brown gravelly sand	None
			60+	Light yellowish-brown compact gravelly sandy clay	None
BS13	648511	3080193	0-25+	Grayish-brown gravelly sandy clay	None
BS14	648312	3080195	0-65	Light yellowish-brown very fine sand	None
			65+	Dark gray, dark yellowish-brown and light yellowish-brown wet clay	None

Table A-1. Shovel Test Summary Data (cont.)

ST No.	UTM Coordinates[1]		Depth (cmbs)	Soils	Artifacts
	Easting	Northing			
BS15	648110	3080200	0-30+	Very dark grayish-brown, yellowish brown and light grayish-brown clay	None
BS16	648406	3079998	0-35	Light yellowish-brown gravelly sand	None
			35+	Light yellowish-brown compact gravelly sandy clay	None
BS17	648548	3079992	0-30+	Brown and light grayish-brown clay with shells	None
BS18	648608	3079830	0-30	Yellowish-brown sandy clay loam with shells	None
			30+	Brown and light yellowish-brown clay	None
BS19	647612	3080594	0-30+	Yellowish-brown and very dark grayish-brown clay	None
BS20	647812	3080593	0-35+	Yellowish-brown and very dark grayish-brown clay	None
BS21	648012	3080595	0-30+	Yellowish-brown and very dark grayish-brown clay	None
BS22	648120	3080591	0-35+	Yellowish-brown and very dark grayish-brown clay	None
BS23	648111	3080394	0-40+	Yellowish-brown and very dark grayish-brown clay	None
BS24	647911	3080393	0-35+	Yellowish-brown and very dark grayish-brown clay	None
BS25	647715	3080393	0-30+	Yellowish-brown and very dark grayish-brown clay	None
BS26	647144	3080606	0-55	Pale brown sand	None
			55+	Very dark grayish-brown clay	None
BS27	646945	3080617	0-40	Grayish-brown very wet sand	None
			40-45+	Very dark grayish-brown clay	None
BS28	648651	3079588	0-30	Pale brown gravelly sandy clay	None
			30+	Pale brown compact gravelly sandy clay	None
BS29	648616	3079511	0-35	Pale brown gravelly sandy clay	None
			35+	Pale brown compact gravelly sandy clay	None
BS30	648680	3079531	0-30	Dark grayish-brown clay	None
			30+	Light grayish-brown clay	None
BS31	647148	3080264	0-45	Grayish-brown gravelly sand	None
			45+	Light grayish-brown clay with shells	None

Table A-1. Shovel Test Summary Data (cont.)

ST No.	UTM Coordinates[1]		Depth (cmbs)	Soils	Artifacts
	Easting	Northing			
BS32	647317	3080116	0-100+	Pale brown sand with shells	None
BS33	647534	3079932	0-35+	Dark grayish-brown and dark yellowish-brown clay	None
BS34	647670	3080083	0-60	Pale brown very fine sand	None
			60+	Light grayish-brown, yellowish-brown and dark grayish-brown clay	None
BS35	647494	3080180	0-35+	Dark grayish-brown, grayish-brown and dark yellowish-brown clay	None
BS36	647335	3080305	0-35+	Dark grayish-brown, grayish-brown and dark yellowish-brown clay	None

[1] All UTM coordinates are located in Zone 15 and utilize the North American Datum of 1983 (NAD 83)

cmbs = Centimeters below surface

ST = Shovel test

UTM = Universal Transverse Mercator

APPENDIX B:

Trackhoe Trench Data

Trench No.: 1
UTM Coordinates[1]: 648256 E, 3079810 N
Comment: Trench placed in basin near center of APE. Ground surface exhibits numerous shrinkage cracks and the shells of many aquatic freshwater snails.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-70	Dark gray (10YR 4/1 to 2.5Y 4/1, m) clay to silty clay, firm, weak coarse subangular blocky structure parting to moderate very fine subangular blocky structure, abrupt wavy boundary, strongly effervescent, few matrix supported clods up to 5 cm in diameter; spoil.	None
2	C	70-170	White (10YR 8/1, m) medium to fine sand, loose to very friable, massive, abrupt smooth boundary, slightly effervescent, few medium distinct yellowish-brown (10YR 5/8) vertically oriented mottles, faint traces of sub-horizontal lamination; spoil.	None
3	Cg	170-300	Light gray (10YR 7/1, m) sand to loamy sand interbedded with 0.5-to1-mm-thick light greenish gray (10GY 7/1) silty clay laminations (overall texture is a loam), very friable, massive, strongly effervescent, abrupt smooth boundary; spoil.	None
4	Cg or Ab	300-350	Dark bluish-gray (5PB 4/1, m) silty clay, sticky, weak coarse subangular blocky structure parting to moderate fine subangular blocky structure, gradual smooth boundary, slightly effervescent; most likely spoil but could be an A-horizon.	None
5	C	350-420	Dark gray (N 4/, m) sand, loose, single grain, slightly effervescent, few small marine shell fragments.	None

Trench No.: 2
UTM Coordinates[1]: 648135 E, 3079868 N
Comment: Like Trench 1, this excavation is located in one of the basin areas near the center of the tract.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-25	Gray (2.5Y 5/1, m) clay to silty clay, friable, weak medium to fine subangular blocky structure, abrupt wavy boundary, strongly to violently effervescent, has a prominent minor component of medium sand mixed into the clay; spoil.	None
2	C	25-70	Very dark gray (2.5Y 3/1, m) clay, firm to hard, moderate to strong fine to medium angular blocky structure, abrupt wavy boundary, some peds exhibit conchoidal fractures; spoil.	None
2a	C	50-53	White (10YR 8/1, m) very fine sand, loose, single grain, abrupt smooth boundary, violently effervescent, laminated; spoil.	None
3	C	70-185	White (10YR 8/1, m) fine sand, loose, single grain, abrupt smooth boundary, slightly effervescent, few distinct fine to medium yellowish brown (10YR 6/8) cylindrical vertically oriented mottles, contains <3% 3- to 5-mm-diameter clay balls; spoil.	None

Zone	Horizon	Depth (cmbs)	Description	Artifacts
4	Cg	185-240	Gray (10YR 6/1, m) sand interbedded with greenish gray (5GY 6/1) 0.5- to 1-mm-thick clay laminations, massive, abrupt smooth boundary, strongly effervescent; spoil.	None
5	Cg	240-270	Light greenish-gray to greenish-gray (5G 7/1 to 5GY 6/1, m) silty clay to clay, sticky, massive, abrupt smooth boundary, slightly effervescent, prominently laminated alternating color fining upward deposit with a few sand partings; spoil.	None
6	C or Ab	270-380	Very dark gray (N 3/, m) silty clay, friable, moderate to strong medium angular blocky structure, slightly effervescent, few (3%) 1- to 3-mm-wide pieces of woody debris (roots?) that appear to be in growth position (vertically oriented); either in situ deltaic deposit or spoil that had time to grow plants after deposition.	None

Trench No.: 3
UTM Coordinates[1]: 647769 E, 3080000 N
Comment: Trench was placed on an elevated spoil mound near the northwest end of the APE. The ground surface near this trench exhibits an armor of marine shell concentrated by overland flow winnowing of fines. The exact depth of the excavation is difficult to determine due to slumping of trench walls.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-140	Predominantly white (10YR 8/1, m) medium to fine sand (although subtle color variation is apparent), loose, single grain, abrupt smooth boundary, strongly effervescent, 5% coarse fragments that include marine shell fragments, deposit exhibits faint traces of horizontal bedding; spoil.	None
2	Cg	140-155	Alternating thin beds of gray (2.5Y 6/1, m) and light brownish-gray (2.5Y 6/2, m) silty clay, firm, massive, violently effervescent, laminated in places; spoil.	None
3	C	155-160	Very dark gray (10YR 3/1, m) clay to silty clay, firm, weak medium subangular blocky structure, abrupt irregular boundary, strongly effervescent, few fine faint dark yellowish brown (10YR 4/4) thread-like mottles; spoil.	None
4	C	160-270	Light brownish-gray (2.5Y 6/2, m) silty clay and sand, mixed, firm, massive, abrupt wavy boundary, violently effervescent, contains 5 to 15% 0.2-to-1.5 cm-diameter calcium carbonate nodule fragments; spoil derived from a Pleistocene-age deposit.	None
5	Cg	270-360	Light gray (10YR 7/1, m) medium to fine sand, loose, massive, abrupt smooth boundary, strongly effervescent, similar to Zone 1 but with no obvious shell fragments, spoil.	None
6	Cg	360-420	Gray to light gray (2.5Y 6/1.5, m) medium sand, loose, single grain to massive, gradual smooth boundary, slightly effervescent, contained a wolmanized pressure treated wood stake at 380 cmbs; spoil.	None

Zone	Horizon	Depth (cmbs)	Description	Artifacts
7	Cg	420-500	Dark gray (N4/, m) medium sand, very friable, massive, slightly effervescent, contains about 5% <5-cm-diameter clay balls; spoil.	None

Trench No.: 4
UTM Coordinates[1]: 647758 E, 3079931 N
Comment: Trench was placed on an elevated spoil mound near the northwest end of the APE.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-110	Light gray (10YR 7/2, m) artifactual sand, loose, single grain, abrupt smooth boundary, violently effervescent, approximately 30% coarse fragments that include marine shell, fragments of calcium carbonate nodules, as well as tile, brick, and fragments of cemented sand (calcium carbonate cemented sandstone) up to 30 cm in diameter, crudely stratified; spoil.	None
2	C	110-230	Light gray (10YR 7/2, m) medium sand, loose, single grain, abrupt smooth boundary, violently effervescent, approximately 5% coarse fragments that consist of small siliceous pebbles and marine shell, vague sub-horizontal bedding; spoil.	None
3	Cg	230-260	Bluish-gray (10BG 6/1, m) silty clay, sticky, massive, abrupt wavy boundary, strongly effervescent, very wet and saturated sediment; spoil.	None
4	C	260-460	Light gray (10YR 7/1, m) gravelly sand, loose, single grain, strongly effervescent, approximately 30% coarse fragments that consist of small siliceous pebbles, pale brown (10YR 6/3) clay balls up to 5 cm in diameter, calcium carbonate nodules and marine shell fragments; spoil.	None

Trench No.: 5
UTM Coordinates[1]: 647746 E, 3079822 N
Comment: Trench was placed on an elevated spoil mound near the northwest end of the APE and the ground surface around it was armored with marine shells and shell fragments, as well as small siliceous pebbles.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-40	Light brownish-gray (2.5Y 6/2, m) sandy clay, firm, moderate medium subangular blocky structure, abrupt smooth boundary, violently effervescent, approximately 5% coarse fragments that are calcium carbonate nodules up to 1.5 cm in diameter; spoil.	None
2	C	40-320	Light brownish-gray (10YR 6/2, m) gravelly to very gravelly medium sand, loose, single grain, abrupt smooth boundary,	None

Zone	Horizon	Depth (cmbs)	Description	Artifacts
			strongly effervescent, contains between 40 and 60% matrix-supported coarse fragments that include large (10- to 30-cm-diameter) clay balls, calcium carbonate nodules, siliceous pebbles and marine shells (primarily oysters); spoil.	
3	Cg	320-350	Light brownish-gray (2.5Y 6/2, m) sand, loose, single grain, abrupt smooth boundary, strongly effervescent, thin bedded and laminated, spoil.	None
4	Cg	350-400	Light bluish-gray (10B 7/1, m) sandy clay, very friable, sticky, weak medium subangular blocky structure, abrupt smooth boundary, violently effervescent, common prominent medium yellowish-brown (10YR 5/8) mottles lining roots and pores, possibly laminated; spoil that was exposed long enough to be colonized by plants prior to burial.	None
5	C	400-500	Very pale brown (10YR 7/3, m) gravelly medium to coarse sand, loose, single grain, strongly effervescent, approximately 20 to 30% matrix-supported coarse fragments that consist of small siliceous pebbles, clay balls, and marine shell fragments; spoil.	None

Trench No.: 6
UTM Coordinates[1]: 647866 E, 3079961 N
Comment: Trench was situated on the northeastern side of the elevated spoil mound at the northwest end of the APE. The lower deposits in this trench were very unstable and the recorded depth of the trench is an estimate as it repeatedly failed before a measurement could be completed.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-120	White (10YR 8/1, m) medium to fine sand, loose, single grain, abrupt wavy boundary, slightly effervescent, subtle horizontal bedding most prominent within 20 cm of the base of the zone, approximately 5% coarse fragments that consist of <5-mm-diameter clay balls and marine shells; spoil.	None
2	C	120-145	Bluish-gray clay, abrupt smooth boundary (unable to retrieve a sample of this deposit for examination due to trench slumping).	None
3	Cg	145-380	White (10YR 8/1, m) gravelly medium to fine sand, loose, single grain, abrupt smooth boundary, strongly effervescent, approximately 30 to 40% coarse fragments that are fragments of calcium carbonate cemented sandstone up to10 cm in diameter, irregular-shaped calcium carbonate nodules, marine shells, and small siliceous pebbles; spoil.	None
4	Cg	380-420	Gray (5Y 5/1, m) sand, very friable, massive, abrupt smooth boundary, slightly effervescent, spoil.	None
5	Cg	420-500	Dark bluish gray (5B 4/1, m) silty clay, friable (sticky), massive, strongly effervescent, spoil.	None

Trench No.: 7
UTM Coordinates[1]: 647923 E, 3079891 N
Comment: Trench was placed inside the large central depression but immediately adjacent to a higher spoil mound.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-90	White (10YR 8/1, m) sand, loose, single grain, abrupt smooth boundary, slightly effervescent, approximately 5% coarse fragments that consisted of small clay balls and siliceous pebbles; spoil.	None
2	C	90-100	Gray (2.5Y 5/1, m) silty clay, sticky, massive, abrupt smooth boundary, strongly effervescent; spoil.	None
3	C	100-300	White (10YR 8/1, m) sand, loose, single grain, abrupt smooth boundary, slightly effervescent, approximately 5% coarse fragments that consist of small clay balls and siliceous pebbles; spoil.	None
4	C	300-330	Laminated and interbedded greenish gray (10Y 5/1, m) silty clay and greenish gray (10Y 6/1) sand, very friable, massive, abrupt smooth boundary, strongly effervescent; spoil.	None
5	Cg or Ab	330-380	Very dark gray (N 3/, m) clay, friable, weak fine subangular blocky structure, slightly effervescent, probably spoil but could be natural, it is difficult to be certain.	None

Trench No.: 8
UTM Coordinates[1]: 648023 E, 3079786 N
Comment: Trench was placed inside the large central depression. This deposit is clearly spoil but the uppermost mud exhibits a surprisingly advanced degree of structure development.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	Css	0-100	Black (2.5Y 4/1, m) clay, firm, strong very coarse prismatic structure parting to weak to moderate medium to coarse subangular blocky structure, abrupt wavy boundary, strongly effervescent, few incipient slickensides on ped faces, many fine faint dark brown (10YR 3/3) mottles on ped faces, few calcium carbonate filaments; spoil.	None
2	C	100-230	Light gray (10YR 7/1.5, m) fine sand, loose, single grain, gradual smooth boundary, slightly effervescent, gradually becomes more gray with depth, few fine faint yellowish-brown (10YR 5/8) mottles, faint horizontal bedding that is highlighted by mottles in places near top of the zone; spoil.	None
3	C	230-380	Gray (10YR 5/1, m) slightly gravelly sand, loose, single grain, abrupt smooth boundary, strongly effervescent, approximately 15% coarse fragments that consist of granule-sized calcium carbonate nodules, small (< 5 cm) siliceous pebbles, and light	None

Zone	Horizon	Depth (cmbs)	Description	Artifacts
			greenish-gray (5GY 7/1) clay balls <10 cm in diameter; spoil.	
4	C or Ab	380-440	Gray (N 6/, m) clay, sticky, massive, slightly effervescent, contains about 10% twig-size (1- to 2-mm-diameter) pieces of woody debris that look like roots in growth position (vertically oriented); spoil that was exposed long enough to be colonized by plants or natural delta deposit.	None

Trench No.: 9
UTM Coordinates[1]: 648086 E, 3079786 N
Comment: Trench was placed inside the large central depression.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	Ap	0-30	Closely mixed gray (10YR 5/1, m, 80% of deposit) clay and light gray (10YR 7/2, m; 20% of the deposit) sand, firm, strong very coarse subangular blocky structure parting to strong very fine subangular blocky structure, abrupt smooth to wavy boundary, violently effervescent, sand mostly occurs between peds in 1- to 2-cm-wide patches; spoil.	None
2	Akss	30-60	Very dark gray (2.5Y 3/1, m) clay, firm, strong coarse prismatic structure parting to moderate fine subangular blocky structure, abrupt smooth to wavy boundary, slightly effervescent, 1 to 3% calcium carbonate filaments on ped faces, few incipient slickensides; spoil.	None
3	C	60-170	White (10YR 8/1, m) fine sand, loose, single grain, gradual smooth boundary, violently effervescent, very weakly expressed horizontal bedding; spoil.	None
4	C	170-300	Gray (10Y 5/1, m) medium sand, very friable, single grain, abrupt smooth boundary, strongly effervescent, few 1-mm-thick greenish-gray (5GY 5/1) clay laminations, approximately 1 to 3% coarse fragments that are mostly siliceous pebbles; spoil.	None
5	Cg	300-330	Greenish gray (10Y 6/1, m) silt to silty clay, sticky, massive, abrupt smooth boundary, strongly effervescent, laminated; spoil.	None
6	C or Ab	330-400	Very dark gray to dark gray (N 3.5/, m) clay, friable, weak medium to very fine subangular blocky structure, spoil?	None

Trench No.: 10
UTM Coordinates[1]: 648017 E, 3079632 N
Comment: Trench is situated in a depression between a linear elevated bank or dike, and a small discrete spoil mound. It was excavated to more than 4 meters but repeated slumping of the lower deposits precluded measurement of the actual depth reached.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	Ap/C	0-40	Dark gray (2.5Y 4/1, m) clay, sticky, weak medium to fine subangular blocky structure, abrupt irregular boundary, strongly effervescent, spoil.	None
2	C	40-200	White (10YR 8/1, m) medium to coarse sand, loose, single grain, gradual smooth boundary, slightly effervescent, vague impression of horizontal bedding, approximately 10 to 15% coarse fragments which consist of < 2-cm-diameter siliceous pebbles, calcium carbonate nodules, green clay balls; spoil.	None
3	Cg	200-280	Grayish-brown (10Y 5/2, m) medium to coarse sand, very friable to loose, single grain, abrupt smooth boundary, slightly effervescent, approximately 5 to 10% coarse fragments similar to Zone 2 in composition; spoil.	None
4	Cg	280-360	Greenish-gray (10Y 6/1, m) clay to silty clay, sticky, massive, violently effervescent, very wet, possibly laminated but most material removed by excavator was very deformed; spoil.	None

Trench No.: 11
UTM Coordinates[1]: 648113 E, 3079525 N
Comment: This trench was placed in a drainage channel between two elevated dikes separating confined disposal basins. Like Trench 10, the actual depth of excavation could not be measured owing to repeated slumping of the lower trench walls.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-10	Light brownish-gray (10YR 6/2, m) loam to silt loam, very friable, weak very fine subangular blocky structure, abrupt-irregular boundary, violently effervescent; spoil.	None
2	C	10-210	White (10YR 8/1, m) medium sand, loose, single grain, abrupt smooth boundary, slightly effervescent, deposit consists of alternating gravelly and relatively gravel-free weakly expressed beds around 10 cm thick, the less gravelly ones have about 5% coarse fragments most of that are mostly clay balls whereas the more gravel-rich deposits have 10 to 15% coarse fragments and include small siliceous gravels as well as marine shell and calcium carbonate nodules; spoil.	None
3	Cg	210-310	Dark gray to gray (N 4.5/, m) loamy sand, very friable to loose, single grain, abrupt smooth boundary, slightly effervescent, less than 10% coarse fragments of similar types to those in Zone 2; spoil.	None
4	Ab or Cg	310-360	Very dark gray (N 3/, m) clay to silty clay, firm, weak medium subangular blocky structure, slightly effervescent, most likely spoil.	None

Trench No.: 12
UTM Coordinates[1]: 648197 E, 3079588 N
Comment: Trench was placed in the central basin immediately northwest of the elevated spoil mound that occupies the southeastern third of the APE.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	A	0-10	Light brownish-gray (10YR 6/2, m) loamy sand, clear wavy boundary, loose, single grain, slightly effervescent, a weak topsoil formed in top of dredge spoil.	None
2	C	10-120	White (10YR 8/1, m) fine to very fine sand, loose, single grain, abrupt wavy boundary, slightly effervescent, spoil.	None
3	Cg	120-190	Dark greenish-gray (10GY 4/1, m) clay, friable/sticky, weak to moderate medium prismatic structure, abrupt smooth boundary, violently effervescent, ped margins and pores exhibit gray (10YR 5/1) 2- to -4-mm-wide oxidized margins, many fine faint light olive brown (2.5Y 5/3) thread-like mottles lining pores; spoil.	None
4	Cg	190-320	Gray (N 6/, m) sand, loose, single grain, abrupt smooth boundary, slightly effervescent; spoil.	None
5	A	320-400	Dark greenish-gray (10GY 4/1, m) clay, sticky, massive, slightly effervescent; spoil.	None

Trench No.: 13
UTM Coordinates[1]: 648133 E, 3079738 N
Comment: Trench was placed in the central basin.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-30	Alternating thin beds of dark gray (2.5Y 4/1, m) clay and silty clay and pale brown (10YR 6/3, m) sand, very friable, moderate to strong coarse subangular blocky structure, abrupt smooth boundary, strongly effervescent; spoil.	None
2	AC	30-55	Very dark gray (2.5Y 3/1, m) clay, firm, strong coarse prismatic structure parting to strong medium to fine angular blocky structure, abrupt wavy boundary, strongly effervescent, subtle traces of horizontal lamination; spoil.	None
3	C	55-210	White (10YR 8/1, m) sand, loose, single grain, gradual smooth boundary, slightly effervescent; spoil.	None
4	Cg	210-290	Light brownish-gray (10YR 6/2, m) sand, loose, single grain, abrupt smooth boundary, slightly effervescent; spoil.	None
5	Cg	290-310	Gray (10YR 6/1, m) clay to silty clay, sticky, massive, abrupt smooth boundary, strongly effervescent; spoil.	None
6	A or C	310-360	Very dark gray (N 3/, m) clay to silty clay, friable, weak very coarse subangular blocky structure, strongly effervescent, many small pressure faces; most likely spoil.	None

Trench No.: 14
UTM Coordinates[1]: 648215 E, 3079471N
Comment: Trench was placed on the elevated spoil mound on the southeastern side of the APE.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	A	0-10	Dark gray (10YR 4/1, m) loamy sand, very friable, massive to weak medium subangular blocky structure, clear wavy boundary, strongly effervescent; thin topsoil formed in spoil.	None
2	C	10-260	White (10YR 8/1, m) sand, loose, single grain, abrupt-smooth boundary, slightly effervescent, about 10% coarse fragments consisting of small siliceous gravels, calcium carbonate nodules, and marine shell, weakly expressed horizontal bedding; spoil.	None
3	Cg	260-360	Light brownish-gray (10YR 6/2, m) medium to coarse sand, loose, single grain, abrupt smooth boundary, slightly effervescent; approximately 5 to 10% coarse fragments, like Zone 2; spoil.	None
4	A or Cg	360-400	Greenish-gray (5GY 5/1, m) silty clay to clay, very friable/sticky, massive, slightly effervescent, few (3 to 5%) small bits of dark brown organic debris (1- to 2-mm-diameter twig-like fragments); probably spoil that was subsequently colonized by plants before subsequent burial.	None

Trench No.: 15
UTM Coordinates[1]: 648399 E, 3079359 N
Comment: Trench was placed on the elevated spoil mound on the southeastern side of the APE.

Zone	Horizon	Depth (cmbs)	Description	Artifacts
1	C	0-10	Dark gray (2.5Y 4/1, m) silty clay, friable, weak coarse subangular blocky structure, abrupt smooth boundary, violently effervescent; spoil.	None
2	C	10-30	Very pale brown (10YR 7/3, m) fine sand, loose, single grain, abrupt smooth boundary, slightly effervescent, <1% coarse fragments; spoil.	None
3	C	30-350	Light gray (10YR 7/1, m) slightly gravelly sand, loose, single grain, abrupt smooth boundary, approximately 15 to 20% coarse fragments that consist of small siliceous pebbles, calcium carbonate nodules, marine shell fragments and small green clay balls, zone exhibits subtle traces of horizontal bedding; spoil.	None
4	Cg	350-420	Gray (N 6/, m) gravelly sandy clay, friable, massive, slightly effervescent, about 30% coarse fragments similar to Zone 3, deposit has a slight methanic odor; spoil.	None

[1] All UTM coordinates are located in Zone 15 and utilize the North American Datum of 1983 (NAD 83)

cm = centimeters cmbs = Centimeters below surface

mm = Millimeter UTM = Universal Transverse Mercator

APPENDIX C:

Curriculum Vitae of Principal Investigator

Horizon Environmental Services, Inc.

Jeffrey D. Owens, M.A., R.P.A.

Archeological Principal Investigator/Project Manager

EXPERTISE

- Prehistoric Archeology
- Historic Archeology

RESEARCH AREAS

- Eastern North America (esp. Midwest, Southeast)
- Great Plains
- American Southwest

AREAS OF EXPERTISE

- Project Management
- Archival and Historical Research
- Archeological Survey, Testing, and Data Recovery
- National Register of Historic Places (NRHP) Evaluations
- Section 106 of the National Historic Preservation Act (NHPA)
- Antiquities Code of Texas (ACT)
- Native American Graves Protection and Repatriation Act (NAGPRA)
- Lithic and Ceramic Analysis
- Technical Writing and Editing
- Quality Assurance/ Quality Control

EDUCATION

- A.B.D., Anthropology, Southern Methodist University, 1997
- M.A., Anthropology, New York University, 1995
- B.A., Anthropology, New York University, 1991

Mr. Owens is an accomplished cultural resources professional with more than 23 years of experience in archeological fieldwork, research and analysis, and cultural resources management (CRM). He is an adept principal investigator and project manager, proficient at managing suites of turnkey, fast-turnaround projects as well as long-term, multidisciplinary research projects. He is fully versed in historic and environmental preservation laws, assessing the National Register of Historic Places (NRHP) eligibility of cultural resources, and developing management plans for historic properties that ensure compliance with applicable federal, state, and local laws while ensuring projects meet construction schedules and adhere to budgetary constraints.

Mr. Owens has planned, implemented, and successfully completed cultural resources survey, testing, and data recovery projects in Arizona, Arkansas, Illinois, Louisiana, Mississippi, Missouri, New Jersey, New Mexico, New York, Oklahoma, Pennsylvania, and Texas. He has completed hundreds of projects for a broad range of clients in the public and private sectors, including oil and gas exploration, development, and transportation; ethanol and petrochemical production; coastal and inland residential, commercial, and industrial land development; solid waste landfills; dredging activities; municipal planning; reservoir development; coastal port and channel improvements; transportation infrastructure; water and wastewater transportation and treatment; electricity generation and transportation; military reservations; and university research.

Mr. Owens also regularly contributes cultural resources oversight to the preparation of environmental regulatory documents, including Environmental Assessments (EA), Environmental Impact Statements (EIS), Biological Assessments (BA), and Categorical Exclusions (CE) for National Environmental Policy Act (NEPA) compliance projects.

Mr. Owens' project management style incorporates innovative leadership skills, resourcefulness, versatility, swift adaptability, and attention to the bottom line. His success is due in part to his thorough familiarity with federal, state, and local historic preservation laws and long-standing personal relationships with regulatory agency reviewers.

CERTIFICATIONS/QUALIFICATIONS

- Meets all Secretary of the Interior's standards for performing cultural resources investigations
- Permittable to perform cultural resource investigations on federal and state projects
- Listed on qualified cultural resource consultant lists in numerous states
- Pre-certified by TxDOT for Service 2.10.1 (Archeological Surveys, Documentation, Excavations, Testing, Reports, and Data Recovery Plans) and Service 2.11.1 (Historical and Archival Research)

PROFESSIONAL AFFILIATIONS

- Register of Professional Archaeologists (RPA)
- Council of Texas Archeologists (CTA)
- Texas Archeological Society (TAS)

PROFESSIONAL EXPERIENCE

Archaeological Principal Investigator/Project Manager Jan 2005 Present
Horizon Environmental Services, Inc.
1507 South IH-35
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(512) 328-2430

Project Archaeologist/Managing Editor Mar 2002 – Jan 2005
TRC Environmental Corporation
505 East Huntland Drive, Suite 250
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Senior Editor Oct 1999 – Aug 2001
Consulting Partners (now part of Beeline Learning Solutions)
14911 Quorum Drive, Suite 120
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Project Archaeologist Aug 1997 – Oct 1999
Geo-Marine, Inc.
2201 K Avenue, Suite A2
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Departmental/Teaching Assistant Sep 1995 – Jun 1997
Southern Methodist University
Department of Anthropology
3225 Daniel Avenue, Room 208
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Project Archaeologist Oct 1994 – Sep 1995
Soil Systems, Inc. (now part of PaleoWest)
1121 North 2nd Street
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Archeological Field Technician Jun 1994 – Oct 1994
John Milner Associates, Inc. Nov 1993 – Dec 1993
535 North Church Street
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Departmental Assistant Aug 1991 – Jun 1994
New York University
Department of Anthropology
25 Waverly Place, Rufus D. Smith Hall
New York, New York 10003
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Field Technician Dec 1993
Institute for Long Island Archaeology
State University of New York – Stonybrook
Department of Anthropology
Circle Road, Social & Behavioral Sciences Buildings, 5th Floor
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Crew Chief Sep 1993 – Nov 1993
Greenhouse Consultants, Inc.
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Research Associate May 1993 – Sep 1993
AquaTerra Environmental Services Corporation
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Crew Chief Jun 1992 – Jul 1992
New York University Jun 1990 – Jul 1990
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(212) 998-8550

Archaeological Consultant Nov 1991 – Dec 1991
TAMS Consultants, Inc.
300 Broadacres Drive
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(973) 338-6680

TECHNICAL PUBLICATIONS

n.d. *Intensive Cultural Resources Survey of the Proposed Eagle Mountain Stream Electric Station, Tarrant County, Texas*. HJN 080122.80 AR. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed Tradinghouse Power Plant Tract, McLennan County, Texas*. HJN 080122.79 AR. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed DeCordova II Power Plant Tract, Hood County, Texas*. HJN 080122.78 AR. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Cultural Resources Survey Report: Proposed Prue Road at French Creek (LC-6) Improvements, San Antonio, Bexar County, Texas*. HJN 130025. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Cultural Resources Survey and Construction Monitoring for the Proposed Kansas City Southern K478.0 Bridge Construction and Railroad Alignment Project, Bowie County, Texas*. HJN 130023. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Proposed Alpha Olefin Chemical Company, LLC, Alpha Olefins Plant, Freeport, Brazoria County, Texas—Cultural Resources Assessment*. HJN 110012.21. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed 0.67-acre Lindshire Lane Wastewater System Improvements Project, Austin, Travis County, Texas*. HJN 130138. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Archeological and Geoarcheological Investigations, M&G Resins USA, LLC/ChemTex International, Inc., Proposed Jumbo Project, Corpus Christi, Nueces County, Texas* (with Charles D. Frederick). HJN 080122.56. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed Enterprise Mont Belvieu Complex Fractionation Units 9 and 10 Project, Chambers County, Texas*. HJN 110012.17. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of 5.9 Miles of Proposed Subsurface Utility Relocations, FM 1637 Expansion Project, Waco, McLennan County, Texas*. HJN 130031. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Proposed Victoria Power Station Expansion Project, Victoria, Victoria County, Texas—Cultural Resources Review*. HJN 110012.11. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey for the Proposed INVENERGY Energy Center, Ector County, Texas*. HJN 080122.54. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey for the Proposed Kansas City Southern K478.0 Bridge Construction and Railroad Alignment Project, Little River County, Arkansas*. HJN 130023. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey for the Proposed Southern Company Natural Gas Plant, Trinidad, Henderson County, Texas*. HJN 080122.53. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of Proposed Yoakum Cryogenic Gas Processing Plant Expansion Areas, Lavaca County, Texas*. HJN 110012.15. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Assessment of Proposed INVISTA Victoria Plant Improvements, Victoria County, Texas*. HJN 130035. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Proposed Equistar Chemicals, L.P., Corpus Christi Complex Expansion Project, Corpus Christi, Nueces County, Texas—Cultural Resources Assessment*. HJN 110012.13. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed 78-Acre La Paloma Energy Center Tract, Harlingen, Cameron County, Texas*. HJN 080122.31. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Proposed Clinker Production Increase at the CEMEX Construction Materials South, LLC, Balcones Cement Plant, Comal County, Texas—Cultural Resources Review*. HJN 080122.39. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed 77-Acre Pinecrest Energy Center Tract, Lufkin, Angelina County, Texas*. HJN 080122.40. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Proposed Guadalupe Generating Station Expansion Project, Marion, Guadalupe County, Texas—Cultural Resources Review*. HJN 130016. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of the Proposed 181-Acre Enterprise Mont Belvieu Complex Propane Dehydrogenation Unit Project, Chambers County, Texas*. HJN 110012.12. Horizon Environmental Services, Inc., Austin, Texas.

n.d. *Intensive Cultural Resources Survey of a Proposed 20-Acre Expansion Tract Adjacent to an Existing PL Propylene, LLC, Facility, Houston, Harris County, Texas*. HJN 080122.30. Horizon Environmental Services, Inc., Austin, Texas.

2014 *Archeological and Historical Investigations for the Proposed Dell Medical School Phase 1 Project, Austin, Travis County, Texas*. HJN 130112. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources of a Proposed 12.6-acre Apartment Complex Development, Belton, Bell County, Texas*. HJN 130212. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of the Proposed University Boulevard and Parcel 150 Pipeline Rights-of-Way, Round Rock, Williamson County, Texas*. HJN 130118. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of a Proposed 171.0-Acre Residential Development, Conroe, Montgomery County, Texas*. HJN 130162. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of Segments of Browder Loop Road, Eldridge Lane, and North Butch Arthur Road, San Jacinto County, Texas*. HJN 130103. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of 4 USACE Jurisdictional Areas on Chesapeake Energy Corporation's Proposed JEA West Lateral Pipeline Right-of-Way, Dimmit County, Texas* (with R.K. Brownlow). HJN 130087.04. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of Chesapeake Energy Corporation's Proposed Sugarland DIM H Well Pad and Access Road, Dimmit County, Texas* (with R.K. Brownlow). HJN 130087.03. Horizon Environmental Services, Inc., Austin, Texas.

2013 *A Cultural Resources Assessment of the USACE Jurisdictional Areas along BridgeTex Pipeline Company, LLC's, Proposed BridgeTex North Pipeline ROW* (with R.K. Brownlow and J.L. Cochran). HJN 120166 AR. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of the Proposed 545-Acre Kansas City Southern Railroad Wylie Intermodal Facility, Wylie, Collin County, Texas*. HJN 130042. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of a USACE Jurisdictional Area on a Proposed 4.6-Acre HEB Grocery Store Expansion Tract, Georgetown, Williamson County, Texas*. HJN 120085. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Cultural Resources Investigations along the Proposed Lone Star Competitive Renewable Energy Zone (CREZ) 345-kV Transmission Line Right-of-Way in North-Central Texas*, Vols. I and II (with Jennifer L. Cochran, Russell K. Brownlow, and Raymundo Chapa). HJN 100137. Horizon Environmental Services, Inc., Austin, Texas.

2013 *Intensive Cultural Resources Survey of the San Antonio River Outfall Project, San Antonio, Bexar County, Texas*. HJN 120150. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Archeological Survey for the Proposed Brushy Creek Regional Trail Gap Project, Round Rock, Williamson County, Texas*. HJN 080151. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Archeological Survey for the Proposed San Gabriel River Trail Extension Project, Georgetown, Williamson County, Texas*. HJN 120057. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey of the 1,102-Acre Creekside Park West Tract, Harris County, Texas* (with Raymundo Chapa). HJN 100142. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey of Two 0.9-Acre HDD Locations on the Trinity River, Madison and Houston Counties, Texas*. HJN 120009.14. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey of a USACE Jurisdictional Area on the Proposed 18.5-Acre Esperanza Crossing Tract, Austin, Travis County, Texas*. HJN 120052. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey, One USACE Jurisdictional Area, Existing East Red Segment 1 Pipeline Maintenance Activities, Clay County, Missouri*. HJN 120075. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey, Two USACE Jurisdictional Area Dig Sites (#253 and #261) on the Existing Eskridge to Kearney Pipeline Maintenance Activities, Clay County, Missouri*. HJN 120075. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey for the Penn City Coal Expansion Project, Houston, Harris County, Texas*. HJN 110097. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey for the Lake Anahuac East Levee Project, Anahuac, Chambers County, Texas* (with Sally Victor). HJN 120004. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey, One USACE Jurisdictional Area on the Existing Eskridge to Kearney Pipeline Right-of-Way, Platte County, Missouri*. HJN 120075. Horizon Environmental Services, Inc., Austin, Texas.

2012 *Intensive Cultural Resources Survey of the Proposed 0.6-Mile-Long Rattler Road Extension Project, San Marcos, Hays County, Texas*. HJN 120036. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Cultural Resources Survey of 6 Jurisdictional Stream Crossings for the City of Hamshire Water System Improvements Project, Hamshire, Jefferson County, Texas*. HJN 110070. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Cultural Resources Investigations on the Proposed Waller Creekside Apartments Tract, Austin, Travis County, Texas*. HJN 110116. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Cultural Resources Survey of the Woodland Oaks Wastewater Treatment Plant Proposed 1.3-Acre Expansion Tract, Houston, Harris County, Texas*. HJN 100024. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Archeological Survey of the Farm-to-Market Road 1660 Realignment Project, Hutto, Williamson County, Texas*. HJN 090047. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Archeological Survey of a 3.7-Acre Tract in San Marcos, Hays County, Texas*. HJN 110124. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Cultural Resources Survey of USACE Jurisdictional Areas on the Proposed Whispering Pines Par 3 Golf Course Tract, Trinity County, Texas*. HJN 110031. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Archeological Avoidance Plan for the Proposed Washburn 3D Seismic Survey Project, Houston, Harris County, Texas*. HJN 110122. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Cultural Resources Survey of the Orange County Sewer and Natural Gas Infrastructure Improvements Project, Orange County, Texas*. HJN 110121. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive cultural Resources Survey for the McInnish Park Water System Improvements Project, Carrollton, Dallas County, Texas*. HJN 110135. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Intensive Cultural Resources Survey for the City of Liberty Wastewater System Improvement Project, Liberty County, Texas*. HJN 110005. Horizon Environmental Services, Inc., Austin, Texas.

2011 *Cultural Resource Investigations to Offset Mechanical Impacts to the Clear Creek Golf Course Site (41CV413), Fort Hood, Texas* (with J. Michael Quigg, Christopher Lintz, Grant D. Smith, and David DeMar). TRC Technical Report No. 02353. ARM Series, Research Report No. 60. TRC Environmental Corporation, Austin, Texas.

2011 *Archeological Avoidance Plan for the Proposed North Clinton Dome 3D Seismic Survey Project, Houston, Harris County, Texas*. HJN 110011. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Cultural Resources Assessment and Avoidance Plan for Shot Holes, Source Lines, and Access Routes, Shelby East 3D Seismic Survey Project, Sabine National Forest, San Augustine and Shelby Counties, Texas*. HJN 090017. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of the 10.6-Acre Helbig Road Tract, Beaumont, Jefferson County, Texas*. HJN 100099. Horizon Environmental Services, Inc., Austin, Texas

2010 *Intensive Cultural Resources Survey of the 44-Acre Creekside Park, Section 18, Tract, The Woodlands, Harris County, Texas*. HJN 100079. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of the 66-Acre Royal Shores Tract, Kingwood, Harris County, Texas*. HJN 100005. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of the Proposed 74 Ranch Pittman 1-H Well Pad, Campbellton, Atascosa County, Texas*. HJN 100093.01. Horizon Environmental Services, Inc., Austin, Texas

2010 *Intensive Cultural Resources Survey of the Proposed 74 Ranch Axis 1-H Well Pad, Campbellton, Atascosa County, Texas*. HJN 100093.02. Horizon Environmental Services, Inc., Austin, Texas

2010 *An Intensive Cultural Resources Survey of the USACE Jurisdictional Areas within Eagle Rock Energy Partners' Proposed "20" East Texas Mainline Extension Pipeline Right-of-Way in Nacogdoches County, Texas.* HJN 100019. Horizon Environmental Services, Inc., Austin, Texas.

2010 *An Intensive Cultural Resources Survey of a Proposed HDD Location Under an Abandoned Tram Road in Nacogdoches County, Texas*. HJN 100019. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey for the Green Valley Special Utility District's Water Supply Improvement Project, Guadalupe County, Texas*. HJN 090102. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive and Reconnaissance Survey of the Proposed Lake Halbert Water Treatment Plant Expansion Project, Corsicana, Navarro County, Texas*. HJN 100015. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of a Proposed 2.9-Mile-Long Force Main Right-of-Way, Houston, Harris County, Texas*. HJN 100051. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of a 13.9-Acre Tract for the Proposed Fort Bend County MUD No. 116 Wastewater Treatment Plant Project, Richmond, Fort Bend County, Texas*. HJN 100047. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of a Proposed 3,100-Foot-Long Erosion-Control Bulkhead on the T-BAR-O Ranch, Llano County, Texas*. HJN 100075. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of the 21.6-Acre Kalentari Tract, San Marcos, Hays County, Texas*. HJN 100055. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resource Survey of a 14.8-Acre Tract on Williams Gully in Houston, Harris County, Texas*. HJN 090127. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Cultural Resources Survey of the Proposed Crossroad Exhibit Hall Expansion, Fort Griffin State Historic Site, Shackelford County, Texas*. HJN 090019. Horizon Environmental Services, Inc., Austin, Texas.

2010 *Intensive Phase I Cultural Resources Survey of 3.5 Miles of M2 LGS, LLC's, Proposed Natural Gas Pipeline Right-of-Way on the Mansfield Battlefield, DeSoto Parish, Louisiana*. HJN 090055.025. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Intensive Archeological Survey of the US Highway 69 Expressway and Reliever Route, Jacksonville, Cherokee County, Texas*. HJN 080173. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Intensive Cultural Resource Survey of the Proposed 5.4-Acre Floral Gardens Senior Living Apartments Tract, Houston, Harris County, Texas*. HJN 090129. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resource Survey, PEC Marshall Ford to Buttercup Substations Transmission Line Rebuild Project, Travis and Williamson County, Texas*. HJN 090096. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resources Survey of the Possum Kingdom Lake Hike and Bike Trail, Phase III, Palo Pinto County, Texas*. HJN 090053. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Intensive Cultural Resource Survey of the Proposed 2.2-Acre Junker-Spencer Well No. 69, Fannett, Jefferson County, Texas*. HJN 090079. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Cultural Resource Survey of the Proposed 60-Acre Harrison Ranch Park, Dripping Springs, Hays County, Texas*. HJN 090080. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resource Survey of the Tyrrell Park Storm Water Detention Pond Project, Beaumont, Jefferson County, Texas*. HJN 090042. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resource Survey of 7 Miles of Proposed Dredge Disposal Areas along Green Pond Gully, Beaumont, Jefferson County, Texas*. HJN 090041. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resource Survey of for the Lumberton Lift Station Rehabilitation Project, Loeb, Hardin County, Texas*. HJN 080008. Horizon Environmental Services, Inc. Austin, Texas.

2009 *An Intensive Cultural Resources Survey of the Port of Houston Authority's 43-Acre Acryl Tract, Seabrook, Harris County, Texas*. HJN 080163. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resource Survey of 34 Acres of Dredge Disposal Areas along Bayou Din, Beaumont, Jefferson County, Texas*. HJN 090038. Horizon Environmental Services, Inc. Austin, Texas.

2009 *Intensive Cultural Resources Survey of the 2.8-Acre Harris County MUD No. 148 Wastewater Treatment Plant No. 2, Harris County, Texas*. HJN 090048. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Intensive Cultural Resources Survey of the Round Rock ISD 181-Acre Pearson/ England Tract, Round Rock, Williamson County, Texas*. HJN 090027. Horizon Environmental Services, Inc., Austin, Texas.

2009 *Intensive Cultural Resources Survey of the Round Rock ISD 12.8-Acre Stone Oak School Tract, Round Rock, Williamson County, Texas*. HJN 090006. Horizon Environmental Services, Inc., Austin, Texas.

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