Cultural Resources Investigations for the Port O'Connor Improvement District Water Line, Water Well, and Water Plant Improvements Project, Calhoun County, Texas

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Cultural Resources Investigations for the Port O'Connor Improvement District
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Port O’Connor Improvement District Water Line, Water Well, and Water Plant Improvements

Cultural Resources Investigations for the Port O’Connor Improvement District Water Line, Water Well, and Water Plant Improvements Project, Calhoun County, Texas

Principal Investigator: Katherine Turner-Pearson, MA, RPA

Authors: Katherine Turner-Pearson, R. Benjamin Lee, and Krista McClanahan

Permit: Texas Antiquities Permit # 9538

October 2020
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Report Authors: Katherine Turner-Pearson, R. Benjamin Lee, and Krista McClanahan

Prepared for:
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Prepared by:
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Atkins Job No. 100068304

October 2020
Management Summary

**Project Name:** Cultural Resources Investigations for the Port O'Connor Improvement District Water Line, Water Well, and Water Plant Improvements Project, Calhoun County, Texas

**Atkins Project No.:** 100068304

**Agency Permit:** Texas Antiquities Permit # 9538

**Sponsor:** Port O'Connor Improvement District

**Project Location:** Port O'Connor, Calhoun County, Texas

**Type of Investigation:** Intensive Archaeological Survey

**Regulatory Trigger:** Antiquities Code of Texas and Section 106 of the National Historic Preservation Act

**Principal Investigator:** Katherine Turner-Pearson, MA, RPA

**Crew Members:** Katherine Turner-Pearson, MA, RPA, and R. Benjamin Lee, B.S.

**Date(s) of Work:** August 31, 2020-September 2, 2020

**Person-Days:** 6

**Area Surveyed (acres):** 0.036 hectares (0.089 acres)

**Newly Recorded Sites:** 0

**Revisited Sites:** 0

**Curation:** Texas Archeological Research Laboratory, University of Texas at Austin

**Recommendations:** No further work
Abstract

John D. Mercer and Associates on behalf of the Port O'Connor Improvement District (POCID) requested assistance from Atkins North America, Inc. for environmental and permitting services in support of the Texas Water Development Board’s (TWDB) National Environmental Protection Act (NEPA) guidelines for the completion of an Environmental Data Form. The proposed project also required pre-construction notification under Nationwide Permit (NWP) 12 Utility Line Activities, NWP 7 Outfall Structures, NWP 13 Bank Stabilization, and a possible Navigation 408 application to the U.S. Army Corps of Engineers (USACE), Galveston District. Additionally, portions of the proposed project would be constructed on property owned by the POCID or Calhoun County and once completed, was anticipated to be operated by the POCID. The POCID, utilizing funds from the TWDB, proposed the installation of five new water wells and connecting water lines, along with a new ground storage tank and a new reverse osmosis treatment facility. An outfall line for the reverse osmosis rejected water would be constructed from the reverse osmosis facility to a discharge point in the Gulf Intracoastal Water Way (GIWW).

Atkins archaeologists conducted Cultural Resources Investigations for the Port O’Connor Improvement District Water Line, Water Well and Water Plant Improvements Project, located in Calhoun County, Texas between August 31, 2020 and September 2, 2020 under Texas Antiquities Permit (TAP) Number 9538. During the archaeological survey, a total of 34 shovel tests were placed along the 3,389 linear meters (11,119 linear feet) survey area as well as the 0.036 hectares (0.089 acres) of well pad sites. Archaeological survey work was completed by a two-person crew, including the Principal Investigator, over three days. Due to the sandy coastal soils, almost all of the shovel tests went to the research designed planned depth of 80 centimeters below surface (cmbs). While none of the shovel tests encountered archaeological sites, artifacts, or any other sign of cultural occupancy, two shovel tests showed soil horizons that could represent buried A Horizons (paleosols). However, the possible buried paleosols did not show any signs of archaeological remains nor cultural features, so one can only speculate as to any possible occupancy in the past. A large portion of the area of potential effects (APE) proved to be previously disturbed by utility lines, highways, driveways, or building construction, and any archaeological sites located in those areas would already be highly disturbed or destroyed. Additionally, no historic structures were observed within 150 ft of the APE. Because much of the APE proved to be disturbed, and since no known archaeological sites and no historic properties were located within or adjacent to the project APE, and no new archaeological sites or cultural remains were discovered during the survey, Atkins archaeologists recommended that the project be allowed to proceed as proposed.
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Introduction

John D. Mercer and Associates on behalf of the Port O'Connor Improvement District (POCID - the applicant) requested environmental and permitting services in support of the Texas Water Development Board’s (TWDB) National Environmental Protection Act (NEPA) guidelines for completion of an Environmental Data Form (form). In addition to the form, the proposed project required pre-construction notification under Nationwide Permit (NWP) 12 Utility Line Activities, NWP 7 Outfall Structures, NWP 13 Bank Stabilization, and a possible Navigation 408 application to the U.S. Army Corps of Engineers (USACE), Galveston District. Additionally, portions of the proposed project will be constructed on property owned by the POCID or Calhoun County and once completed, is anticipated to be operated by the POCID.

Project Description

The Port O’Connor (POC) community, in Calhoun County, Texas, is approaching the limit of permissible connections relative to water supply. A secondary source of water is required if development continues with construction of residential and commercial structures. Construction of the proposed project will increase the water supply and increase the allowable connections. The purpose of the proposed project is to increase the capacity of the POC potable water system for the residents in POC, to meet the demand and to convert POC to a primarily ground water supply, and reduce the dependency on and provide an alternative to purchased surface water from Guadalupe Blanco River Authority (GBRA) as the communities’ primary water supply source. The project anticipated start date is November 2020 with completion of construction in January 2022.

The applicant, utilizing funds from the TWDB, proposed to install five new water wells and connecting water lines to offset large quantities of potable surface water that is currently purchased from the GBRA. The well water will be discharged into a new ground storage tank and then treated by a new reverse osmosis treatment facility to blend the permeate water within acceptable Texas Commission of Environmental Quality (TCEQ) limits. The reverse osmosis treated water will be discharged into the existing ground storage tank where it will be blended with water from GBRA before being pumped into the distribution system. An outfall line for the reverse osmosis rejected water will be constructed from the reverse osmosis facility to a discharge point in the Gulf Intracoastal Water Way (GIWW) and will comply with the National Pollutant Discharge Elimination System program.

The applicant proposed to drill five new water wells in upland areas. The applicant also proposed the installation of the new connecting water lines via a temporary 24-inch open trench in an existing utility easement along approximately 6,754 linear feet (LF) of State Highway (SH) 185 (also known as Adams Street), Trevor Street and various private drives. The approximate 6,754 LF of new waterline installation will not impact wetlands or other waters of the US on the project site. The material from the 24-inch trenching activities will be placed on adjacent pavement or uplands. The trench area will be backfilled, and the affected areas returned to their preconstruction contours and will be re-vegetated as appropriate. The new water line terminates at the existing reverse osmosis facility, where the applicant will construct a new larger capacity reverse osmosis facility as well as a new potable water ground storage tank within upland areas.
The proposed access roads from HWY 185 associated with new water wells #3 and #5, will permanently impact 0.010-acres and 0.008-acres of wetlands respectively, a total of 0.018-acres. The applicant will install approximately 41 cubic yards (CY) of pervious material for the access road construction. The applicant will construct the access roads to minimize adverse impact to waters of the U.S. The installation of well #7 and the access road will permanently impact 0.026-acres of wetlands and will include fill.

The applicant also proposes to install approximately 3,484 LF of outfall line in a temporary 30-inch open trench from the reverse osmosis facility to an outfall constructed along the shoreline of the GIWW (see project plan sheets). For the outfall line to cross Highway 185 from the reverse osmosis facilities, the applicant proposes a 90-foot horizontal bore under the highway. The outfall line open trench will temporarily impact 0.051-acres of wetlands. The applicant proposes an access road for the outfall line off SH 185 to the south, and as a result will permanently impact 0.020-acres of wetlands with 25 CY of pervious fill material. As the outfall line approaches the GIWW and the discharge point, it will be situated above ground and mounted on four 8-inch x 8-inch pilings. To stabilize the immediate shoreline in the area of this portion of the outfall line, the applicant proposes to install approximately 6 CY of crushed rock in 0.002-acres of wetlands and 9 CY of the same crushed rock along 12 LF of the shoreline below the mean high water (MHW) to provide erosion control on the shoreline of the GIWW.

The area of potential effects (APE) for direct effects are any areas of ground disturbing activities including the well locations and connecting water lines. The area of indirect effects is the area within 150 feet of the area of direct effects (Figure 1).
Figure 1. Project Area Map.
Environmental Setting

Geology and Soils

The geologic formation at the project area is the Beaumont Formation, which is Quaternary in age and consists of barrier island deposits. According to the Bureau of Economic Geology, the soils in the area are mapped as Pleistocene-age Beaumont Formation soils (United States Geologic Society 2020). These soils are mainly clay, silt and gravel, deposited by stream channels, point bars, natural levees, and back-swamp deposits, with some recent development by modern man-made lakes. Many of the soils within the area have developed high levels of calcium carbonates. Soils within the proposed project APE are Portalto-Roemer (0-3 percent slope, occasionally ponded), Galveston-Mustang complex (0-3 percent slope, occasionally flooded, frequently ponded), and Dianola (frequently flooded Portalto complex) (USDA, NRCS 2020), and are generally thought to have a medium to high probability of containing previously unrecorded cultural resources.

Portalto-Roemer (0-3 percent slope, occasionally ponded) are eolian sands of Holocene age that overlay Quaternary age alluvium deposits. These well drained sandy loam soils are usually located on the rise in strand plains and reach depths of more than 2.032 meters (m) (80 inches) (USDA, NRCS 2020).

Galveston-Mustang complex (0-3 percent slope, occasionally flooded) soils were formed by sandy eolian deposits derived from igneous, metamorphic and sedimentary rocks. These moderately well drained soils are usually found on the rise of foredunes and extend to below 2.032 m (80 inches) in depth (USDA, NRCS 2020).

Dianola (frequently flooded Portalto complex) soils, are basically Portalto soils that are currently flooded most of the time, either by natural causes or by man-made geomorphological changes. They are usually found on the downslope or dips in strand plains. Like Portalto soils, these soils reach over 2.032 m (80 inches) in depth (USDA, NRCS 2020).

Topography and Watershed

The Gulf Coast Prairies and Marshes ecoregion is an almost level and slowly draining plain, with less than 45.72 m (150 ft) in elevation. It is dissected by streams and rivers that flow to the Gulf of Mexico. The average annual rainfall varies from 76.2 to 127 centimetres (cm) (30 to 50 inches) per year. The growing season is usually more than 300 days, with extremely high humidity and very warm temperatures (Texas Parks and Wildlife 2020). The project APE drains to Espirú Santo Bay, then into the Gulf of Mexico.

Flora and Fauna

The project APE is part of Texas Parks and Wildlife's Gulf Coast Prairies and Marshes Ecoregion (Ecoregion 2) which consists of a narrow band of land about 96.6 kilometers (km) (60 miles) wide along the Texas coast from the Louisiana border to Brownsville. The region is exemplified by continual confrontations with the sea, wind, and rain that shaped the region into a mosaic of shallow bays, estuaries, salt marshes, dunes and tidal flats. Because of its proximity to the Gulf of Mexico, the plants of this region must be highly salt tolerant or halophytic. These coastal marshes shelter thousands of wintering geese and ducks and provide necessary landfall every spring for neotropical
migratory birds. Several important wildlife sanctuaries and refuges are in this region, including refuges for the endangered Attwater’s prairie-chicken (Tymanuchus cupido attwateri) and the whooping crane (Grus Americana). The nearby 22,500-acre Aransas National Wildlife Refuge supports the majority of the nation’s wintering whooping cranes. Additionally, coastal dunes may serve as sentry roosts for north bound peregrine falcons (Falco peregrinus) in the fall. Coastal waters are often graced by willets (Tringa semipalmata), sanderlings (Calidris alba), gulls (Chordata), terns (Sternidae) and black skimmers (Rynchops niger) (Texas Parks and Wildlife 2020).

Trees in the Coastal Plains region include sugarberry/hackberry ( Celtis laevigata), water oak ( Quercus nigra), willow oak ( Quercus phellos), Shumard red oak ( Quercus shumardii), southern live oak ( Quercus virginiana), American elm ( Ulmus Americana), yaupon ( Ilex vomitoria), red mulberry ( Morus rubra), wax myrtle ( Myrica), flame leaf sumac ( Rhus copallinum), red buckeye ( Aesculus pavia), eastern red cedar ( Juniperus virginiana), short-leaf pine ( Pinus echinate), and loblolly pine ( Pinus taeda). Shrubs in the project area include American beautyberry ( Callicarpa Americana), buttonbush ( Cephalanthus occidentalis), lantana ( Lantana camara) and dwarf palmetto ( Sabal minor), while succulents include prickly-pear cactus ( Opuntia) and Spanish dagger ( Yucca gloriosa). Vines in the area included pipevine ( Aristolochia), cross-vine ( Bignonia capreolata), trumpet creeper ( Campsis radicans), Carolina jessamine ( Gelsemium sempervirens), coral honeysuckle ( Lonicera sempervirens), May-pop/passion flower vine ( Passiflora incarnata), and muscadine grape ( Vitis rotundifolia) (Texas Parks and Wildlife 2020).

Grasses in the project area include big blue stem ( Andropogon gerardii), bushy bluestem ( Schizachyrium scoparium), inland sea-oats ( Chasmanthium latifolium), sugarcane plume grass ( Saccharum giganteum), Gulf cordgrass ( Spartina spartinae), and eastern gamagrass ( Tripsacum dactyloides), while wildflowers include lance-leaf coreopsis ( Coreopsis lanceolata), coral bean ( Erythrina herbacea), spider lily ( Lycoris radiata), cardinal flower ( Lobelia cardinalis), Turk’s cap ( Malaviscus arboresus), Gulf Coast pensemon ( Brazos Beardtongue), scarlet sage ( Salvia splendens), Indian paintbrush ( Castilleja), beach evening primrose ( Camissoniopsis cheiranthifolia), showy evening primrose ( Oenothera speciose), and meadow pink ( Sabatia campestris).

Rare and endangered species include brown pelican ( Pelecanus occidentalis), reddish egret ( Egretta rufescens), white-faced Ibis ( Plegadis chihi), wood stork ( Mycteria Americana), bald eagle ( Haliaeetus leucocephalus), white-tailed hawk ( Geranoaetus albicaudatus), peregrine Falcon ( Falco peregrinus), and whooping crane ( Grus Americana), Texas diamondback terrapin ( Malaclemys terrapin litoralis), Texas prairie sawn ( Hymenoxys texana), South Texas ambrosia ( Ragweed) ( Ambrosia cheiranthifolia), black lace cactus ( Echinocereus reichenbachii), slender rush pea ( Hoffmannseggia tenella), Attwater’s prairie chicken ( Tymp anuchus cupido), piping plover ( Charadrius melodus), whooping crane ( Grus Americana), Eskimo curlew ( Numenius borealis), white-tailed hawk ( Geranoaetus albicaudatus), white-faced ibis ( Plegadis chihi), Texas scarlet snake ( Cemophora coccinea lineri), and smooth green snake ( Opheodrys vernalis) (Texas Parks and Wildlife 2020).

The animals that live in the Coastal Plains include white-tailed deer ( Odocoileus virginianus), mule deer ( Odocoileus hemionus), pronghorn antelope ( Antilocapra Americana), desert bighorn sheep ( Ovis canadensis nelson), collared peccary ( Javalena) ( Pecari tajacu), Eastern astern fox squirrel ( Ardilla zorra), badger ( Meles meles), beaver ( Castor), nutria ( Myocastor coypus), muskrat ( Ondatra zibethicus), mink ( Neovison vison), otter ( Lutrinae), long-tailed weasel ( Mustela frenata), ringtail ( Bassariscus astutus), and spotted skunk ( Spilogale putorius). Other wildlife found in this
Cultural Context

The project location is in the Southern Coastal Corridor (SCC) Archaeological Region of the Central and Southern Planning Region of Texas as delineated by the Texas Historical Commission (THC) (Mercado-Allinger et al. 1996). This Archaeological Region encompasses the Coastal Bend from the Colorado River in Matagorda County south to the Rio Grande Valley (Bailey 1987; Ricklis 1990). The SCC Archaeological Region contains five subareas, each of which possesses unique geographic and cultural features. This project is in the Aransas/Guadalupe subarea with a primary resource zone that includes the coastal estuaries and terrestrial floodplains with adjacent prairies (Mercado-Allinger et al. 1996).

Archaeological evidence supports the continued presence of indigenous groups in the SCC Archaeological Region from at least 12,000 BP through the time of European contact and colonization (Mercado-Allinger et al. 1996). The generally accepted cultural history of the area is divided into four major periods: the Paleoamerican, Archaic, Late Prehistoric, and Historic.

Prehistoric Context

Paleoamerican Period (ca. 12,000-8,000 BP)

The Paleoamerican period in the SCC Archaeological Region is the earliest recognized cultural period dating from at least 12,000 years before present (BP) to circa 8,000 BP. The Paleoamerican period is poorly defined for the coastal portions of this archaeological region, largely because global sea level was lower, and the shoreline was situated as much as 50 km (31 miles) seaward from the contemporary shoreline. Geomorphic evidence suggests that as sea level rapidly rose, rivers and streams along the coastal margins may have down cut up to 40 m (131 ft) into the underlying Beaumont Formation. Thus, any archaeological evidence of early people not submerged on the continental shelf would be deeply buried within the Pleistocene alluvium of the present-day coastal zone (Corbin 1974; Hester 1980; Morton and Price 1987; Ricklis 2004). To date, no intact deposits containing evidence of Paleoamerican occupations have been found along the present-day coastal margins; however, the isolated occurrences of diagnostic artifacts, such as Clovis and Folsom dart points, attest to the presence of Paleo people in the area.

Little is known about the initial Paleoamerican adaptation of the region, but researchers have suggested that this period was marked by very low population density, small band sizes, and extremely large territorial ranges (Black 1989). Material indications of the Paleoamerican presence in the region include primarily surface finds of projectile point types. For example, a Clovis point was recovered from the mouth of the Nueces River in San Patricio county (Hester 1976), and a Folsom point was found on the banks of Oso Creek in Nueces County (Hester 1980). Given the lack of stratified deposits, no cultural chronology for the Paleoamerican period has been defined for the coastal zone.

Coastal sites with possible Paleoamerican components include the Petronila Creek site (41NU246) and the La Paloma site in Kenedy County (Mercado-Allinger et al. 1996). The River Spur site (41VT112) has also yielded
Paleoindian artifacts from the surface and subsurface deposits (Cloud et al. 1994). In Nueces County, the presence of early materials along Oso and Petronila creeks demonstrates that assemblages dating to Paleoamerican times occur in this region (Shafer and Bond 1985).

Further inland on the Gulf Coastal Plains, stratified sites with Paleoamerican components have been found; however, as Ricklis (2004) points out, these early sites represent inland terrestrial/riverine adaptations rather than coastal adaptations. Examples of deep terrace sites located along inland tributaries are Berger Bluff in Goliad County (Brown 1986, 2006) and the Buckner Ranch sites (Sellards 1940; Hester 1976; Nash 2001) in Bee County. At Berger Bluff (41GD30), now inundated by Coleto Creek Reservoir, radiocarbon assays from the middle portions of the bench deposits fall mostly within the Folsom and Late Paleoamerican time span. Although no dates exist from above or below this zone, the presence of faunal and cultural remains throughout the deposits suggests a time span of 8,000 to 6,000 BP. The site is interesting in that the faunal assemblage from the bench deposits include primarily small mammals, a variety of small rodents, and the remains of a wide variety of microvertebrates (i.e., salamanders, eastern mole, fish, snakes, frogs or toads, birds, pocket mice, wood rats, lizards, and voles), suggesting a slow adaptation to near-coast resources and little evidence of a dependence on big game hunting (Brown 2006).

Buckner Ranch (41BE2) is in a stream valley between two parallel creeks, Blanco and Medio. Diagnostic artifacts recovered from the site’s deep terrace deposits include the base of a Clovis point, a bifacial Clear Fork tool, the tip of a Midland point, an Angostura point, and two side-notched points, all of which indicate a time range from about 13,000 to 9,000 years ago. Many of these artifacts were found in situ and in close association with Late Pleistocene fauna (Sellards 1940; Nash 2001).

**Archaic Period (ca. 8,000 – 950 BP)**

The archaeological evidence for the Archaic period (circa 8,000–950 BP) is more robust. Throughout the Archaic, continued climatic fluctuations brought additional vacillations in sea level, with a rapid rise beginning around 6,400 BP. By 5,000 BP, the modern coastline emerged and by 4,520 to 2,000 BP, the barrier islands had formed. These changes in sea level brought several changes, including a decline in the large game populations and a shift toward the exploitation of a wider range of plant and animal species. Based on climatic, archaeological, and chronological data recovered from numerous sites (Prewitt et al. 1987; Ricklis 1988, 1993; Ricklis and Cox 1991), the Archaic period in the SSC Archaeological Region has been divided into three subperiods: Early (8,000–4,500 BP), Middle (4,500–3,000 BP), and Late (3,000 BP–950 BP).

The Early Archaic (8,000–4,500 BP) represents a period of transition beyond the Paleoamerican period. Population density remains low, and large territorial ranges are still utilized (Black 1989). During this time period, sea level was still south of the modern coastline. Although populations and site densities remained relatively low, evidence from sites, such as the McKinzie site (41NU221) in Nueces County (Ricklis 1988, 1993), point to marine adaptations geared toward the exploitation of marine/estuarine shellfish populations. The earliest sites are relatively ephemeral, consisting of thin, but often dense, lenses of oyster shell situated on upland margins of eroded Beaumont surfaces. Based on calibrated oyster and scallop shell dates, sites 41SP136 and 41SP153, located on the uplands north shore of Nueces Bay, both yielded age ranges that fall within this period (Ricklis 2004). Site 41NU281, an oyster shell midden located on upland overlooking the Nueces River delta, also dated to this early time period (Ricklis 2004).
During the latter part of the Early Archaic, occupation intensity increased and despite preservation issues, sites such as 41NU267 have yielded evidence of hunting (Ricklis 1995). Artifacts from early archaic sites include shell tools, triangular dart points, and stemmed point varieties such as Gower, Bell, and the Early Stemmed (Ricklis and Cox 1991; Ricklis 1988, 2004). Other sites in the SCC Archaeological Region with identified Early Archaic deposits include the Means site (41NU184) at White's Point on Nueces Bay (Ricklis 1993), 41SP120 on Ingleside Cove (Ricklis 1993), and the Swan Lake site (41AS16) (Prewitt et al. 1987). The final phase of this subperiod roughly coincides with island formation, and it is during this time period that the earliest occupation of the barrier islands may have occurred.

During the Middle Archaic (4,500–3,000 BP) a dramatic shift in the subsistence regimes appears to have occurred that is reflected in the low density of recorded sites along the coastal margins. Occupational strata from at least 23 well-dated sites show a virtual lack of dense shell deposits during this time period (Ricklis 2004). The Middle Archaic also represents an era of rapidly rising sea levels that, when coupled with the archaeological evidence, lead Ricklis (2004) to infer that the interval of “reduced shoreline occupation reflects a corresponding reduction in the exploitable biomass in central coast estuaries.”

Although occupation of sites along the coastal margins decline, no corresponding decline appears to have occurred in the occupation of sites on the inland coastal plains. Sites such as the Morhiss Mound site (Campbell 1976; Dockall 1997) and the Choke Canyon Reservoir sites (Hall et al. 1986; Highley 1986) are open campsites located along low stream terraces and natural levees, and their assemblages suggest a reliance on seasonal terrestrial resources. Artifacts commonly found in Middle Archaic deposits include Bulverde, Catan, Kent, Morhiss, and Palmillas dart points, as well as tubular stone pipes, incised bone, conch columella gouges, and adzes (Corbin 1974, 1976; Black 1989; Headrick 1993). Sometime toward the end of the Middle Archaic, shoreline occupations resume, as does the dependence on marine resources.

The beginning of the Late Archaic (3,000 BP–950 BP) generally corresponds to the same time that sea level stabilized at its modern level (Ricklis 2004). Population increases and expanded exploitative areas are reflected in the increase in site size and intensity of use, the presence of thick shell midden accumulations, and a greater range and variety of artifacts. Campbell (1952) recognized this increased exploitation of marine resources and the accompanying diverse cultural assemblages, naming it the Aransas focus. Assemblages are typified by dart points such as Bulverde, Catan, Kent, Matamoros, and Palmillas, as well as tubular stone pipes, incised bone, conch columella gouges, and adzes (Corbin 1974, 1976; Black 1989; Headrick 1993). Sometime toward the end of the Middle Archaic, shoreline occupations resume, as does the dependence on marine resources.

The most productive Late Archaic sites, such as the Kent-Crane site (Campbell 1952) on Copano Bay and the Ingleside Cove sites in San Patricio County (Story 1968; Ricklis and Cox 1991) as well as the Mustang Lake Site in Calhoun County (Mercado-Allinger et al. 1996), are located near the seaward end of bays. In addition to dense shell middens containing a variety of moderate-to-high-salinity mollusks, the relative abundance of fish otoliths in the midden deposits suggests that a significant increase in fishing occurred during the Late Archaic (Ricklis, 2004). The Late Archaic tool assemblage includes evidence of a diverse bone and shell tool industry, as well as Ensor and Kent dart points and small, thick, unstemmed dart points of the Catan and Matamoros types. Also, evidence exists for the
use of baskets in that basketry-impressed clay and asphaltum nodules have been recovered from several sites near Corpus Christi (Campbell 1947, 1952; Cox and Smith 1988; Ricklis 1990, 2004). Sometime during the Middle to Late Archaic, coastal cemeteries began to appear, suggesting the emergence of well-defined group territories (Story 1985, 1990; Ricklis 2004).

**Late Prehistoric (ca. 950 – 450 BP)**

Several significant changes mark the beginning of the Late Prehistoric period (950 – 450 BP). During the initial Late Prehistoric, lithic assemblages located on both the coastal margins (Huebner 1988; Headrick 1993; Ricklis 1993) and the inland Coastal Plains (Brown 1986; Hall et al. 1986) indicate a shift from the use of heavy, thick dart points to light, thin arrow points (i.e., Scallorn, Fresno, Clifton and Perdiz). Ceramics appear in the archaeological record and ceramic technology evolves rapidly, with noticeable interregional distinctions (Ricklis 2004). Evidence exists of increased ethnicity among the coastal groups as settlement patterns shifted in response to the integration of new subsistence regimes, and the archaeological evidence points to shifting seasonal emphases, with groups moving from the occupation of shoreline fishing camps during the fall through winter-early spring to late spring-summer residences at hunting camps commonly located along the upland margins of stream valleys (Ricklis 1995, 2004). Excavations at stratified lithic and shell midden sites point to the exploitation of seasonally specific food resources (Thomas and Weed 1980a).

Somewhere around 729 BP, a relatively distinct artifact assemblage emerged on the Central Coast between Matagorda Bay and Baffin Bay. It was defined as the Rockport complex due to the presence of distinctive pottery and a range of diagnostic lithic artifacts (Campbell, 1958; Corbin, 1976; Shafer and Bond, 1985; Weinstein, 1992; Ricklis, 2004, 2006). Common to this phase are Perdiz arrow points, small unifacial end scrapers, thin alternately bevelled bifacial knives, small elongated drills, and a prismatic blade core technology. Ceramic technology grew to include a variety of vessel forms and distinctive decorative motifs often coated and/or decorated with asphaltum. Based on the distribution of the various Rockport pottery types, the geographic extent of the Rockport phase can be fairly well defined (Ricklis 2004). Major Rockport phase components have been identified at the Kirchmeyer site (41NU11) on Oso Bay (Headrick 1993) and the Packery Channel site (41NU219) at the north end of Padre Island (Warren 1984).

Resource exploitation and cultural assemblages occurring during this time period tentatively establish a link between Rockport complex sites and the two historically documented coastal groups known as the Karankawa and Coahuiltecan (Thomas and Weed 1980a). Most of the late prehistoric Rockport sites thus far investigated are interpreted as reflecting a littoral adaptation, with a secondary dependence on inland prairie resources (Prewitt 1984). Archival resources describe the Karankawa as residing in large shoreline camps during the fall and winter months but dispersing into smaller bands to camp along freshwater streams during the spring and summer months (Ricklis 1990, 2004). Artifacts associated with Rockport sites include shell containers, jewelry, shell working-tools, asphaltum, burned clay nodules, sandstone shaft straighteners, and decorated ceramics, including polychrome (Calhoun 1964), asphaltum painted black-on-gray wares (Fitzpatrick et al. 1964) and scallop-shell scored (Calhoun 1964).

Late Prehistoric cemeteries and burials are relatively common along the Texas coast and are often found in clay dunes (Headrick 1993). At least four late prehistoric cemeteries are documented within Nueces County. According
to Hester (1980) the Texas coast encompasses the largest number of prehistoric cemeteries in the region. One of these cemetery sites, 41NU2 (Calle del Oso), is one of the largest known cemeteries. At one time it may have contained as many as 600 burials. Unfortunately, this site has been largely destroyed by development and adequate studies were never conducted at the site. It is believed that site 41NU2 may have also been in use during the Late Archaic period. Another cemetery located in Nueces County is the Berryman site (41NU173) (Hall 1987).

**Historic Context (450 BP-present)**

The European post-contact historic period for the Texas coast and south Texas effectively begins with the explorations of the Gulf of Mexico by Spanish explorers seeking to locate new land and economic resources for the Spanish royal crown in Madrid. Piñeda explored and mapped the Gulf coast from Apalachicola to the Yucatan and became the first European to sail through Aransas Pass into a shallow body of water he named Corpus Christi Bay.

The earliest and best account of the indigenous groups living along the Texas Coast comes from the chronicles of Álvar Núñez Cabeza de Vaca, a survivor of a Spanish shipwreck in 1528 (Pupo-Walker 1993). For seven years Cabeza de Vaca lived and travelled along the Texas coast from Galveston Bay to Corpus Christi Bay and onto the Coastal Plains, interacting with many of the distinct cultural groups living in the region. In his chronicles, he describes the people living on the barrier islands and inland Gulf Prairies and Marshes area as the “Fish and Blackberry People.” These early coastal people were part of numerous politically, culturally, and/or linguistically distinct groups that shared a certain resource-based territory. Sometime during the seventeenth century, these groups came to be collectively known as the Karankawa (Newcomb 1983).

Living and interacting with the Karankawa were a few small hunting and gathering groups living on the inland Coastal Plains and along the southern Coastal Margins. Based on their linguistically related languages, these groups eventually became collectively known as the Coahuiltecans (Campbell 1988). The Coahuiltecans settled primarily on the mainland and only after contact with the Spaniards did, they venture out onto Padre Island (Thomas and Weed 1980a, 1980b). Some of the Coahuiltecan bands consisted of the Orejon, west of Corpus Christi Bay; the Malaquite, along the coast from Corpus Christi Bay to Baffin Bay; and the Borrado, in the area from Baffin Bay to the Rio Grande (Scurlock et al. 1974). The Karankawa, conversely, occupied the coastline and barrier islands from Trinity to Aransas bays (Thomas and Weed 1980a, 1980b). Five major Karankawan groups historically documented include the Capoques and Hans to the north; the Kohanis around the mouth of the Colorado; the Karenkake, Clamcoets, and Carancaquacas on Matagorda Bay and Matagorda Island; and the Kopanos along Copano Bay and St. Joseph Island (Scurlock et al. 1974).

Over the next three centuries, French, Spanish, and Anglo explorers, missionaries, soldiers, and settlers encountered these Native American groups with devastating effects. These nomadic hunters and gatherers were decimated by European diseases, the encroachment of the Spaniards from the south, the Apache and Comanche from the north, as well as the Anglo-Americans from the east. By the 1850s, a combination of European-introduced diseases and tribal wars had driven most of the indigenous population to near extinction. The Spanish, however, largely ignored the region until the late 1600s, when Spanish authorities dispatched an expedition to the area in 1689 under Alonso De León (“El Mozo”). However, the Corpus Christi Bay area remained unknown and unexplored until 1747, when Joaquín de Orobio y Basterra led an expedition down the Nueces River. After Orobio’s return, the governor and
captain of Nuevo Santander, José de Escandón, proposed founding a settlement at the mouth of the Nueces, but the settlement was never realized (Long 2013a).

European settlement of the central coast began after the establishment of Spanish missions such as Mission Nuestra Señora del Espíritu Santo de Zúñiga in 1721, Mission Nuestra Señora del Rosario in 1755, and Mission Nuestra Señora del Refugio in 1795 (Mounger 1959; Headrick 1993). A few ranches in the Corpus Christi area date to the period between 1757 and 1766, but the area remained virtually uninhabited until the early 1800s when Enrique Villarreal received a Mexican grant of 42,840 acres (10 leagues) of land encompassing what is now the present city of Corpus Christi and Oso Bay (Taylor 1976; Headrick 1993). Villarreal had been in possession of the tract as early as 1810 but had abandoned operations due to hostile Indian attacks. He named his holdings el Rincón Del Oso and established his headquarters at Rancho del Oso. By about 1830, cattle operations on the ranch had resumed, although Villarreal himself lived in Matamoros (Ricklis 1987; Headrick 1993).
Methods of Investigation

Background Review

As part of the proposed project, Atkins conducted a cultural resources background review of the area within one kilometer (km) of the proposed project components (i.e. new water wells, etc.). Research of available records was conducted using the Texas Historical Commission’s (THC) on-line Restricted Archaeological Sites Atlas (2020) files with the purpose of determining the location of previously recorded archaeological sites (sites issued a trinomial/recorded at the Texas Archeological Research Laboratory [TARL]), as well as identify National Register of Historic Places (NRHP) listed and eligible properties and sites, NRHP-listed districts, cemeteries (including Historic Texas Cemeteries [HTC]), Official Texas Historical Markers (OTHM) (including Recorded Texas Historic Landmarks), State Archaeological Landmarks (SALs), and any other potential cultural resources such as National Historic Landmarks (NHLs), National Monuments, National Memorials, National Historic Sites, and National Historical Parks to ensure the completeness of the study. As a secondary source of NRHP properties and NHLs, the National Park Service’s (NPS) NRHP database and GIS Spatial Data as well as the NHL Program were consulted. The NPS Geographic Resources Program National Historic Trails Map Viewer was used to identify National Historic Trails (NHT). Additionally, Texas Department of Transportation’s (TxDOT) NRHP Listed and Eligible Bridges of Texas map and Historic Districts & Properties of Texas map were reviewed. Finally, the Office of Coast Survey’s Automated Wreck and Obstruction Information System (AWOIS) was consulted.

Reports of previous archaeological investigations and previously recorded cultural resources in the project area or vicinity were also reviewed along with sources like the Bureau of Economic Geology’s Geologic Atlas of Texas, the United States Department of Agriculture’s Natural Resources Conservation Service’s Soil Surveys and Texas Department of Transportation’s (TxDOT) Yoakum District Hybrid Potential Archaeological Liability Map (HPALM) to assess the project area’s potential for containing previously unrecorded archaeological sites.

Archaeological Resources

The results of the cultural resources background review identified one previously recorded cemetery and associated OTHM within 1 km of the proposed project (Table 1).

<table>
<thead>
<tr>
<th>Resource</th>
<th>Resource Type</th>
<th>Designation</th>
<th>Determination of Eligibility per THC Atlas</th>
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<tr>
<td>Port O’Connor Cemetery (CL-C007)</td>
<td>Cemetery</td>
<td>HTC</td>
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<tr>
<td>Port O’Connor Cemetery (#17476)</td>
<td>OTHM</td>
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While other cultural resource investigations occurred within one km of the proposed project, the entirety of the proposed project does not appear previously surveyed. In 1975, Frank Weir undertook a survey of State Highway (SH) 185 from Seadrift to Port O’Connor for the State Department of Highways and Public Transportation (SDHPT). The survey did not result in the identification of cultural resources (SDHPT 1975). Much later in 2001, Prewitt and Associates conducted historic archival research and a cultural resources survey of the GIWW from Port O’Connor to
Corpus Christi Bay for the USACE, Galveston District. For the portion of the project along Blackberry Island, the entire area was surveyed by helicopter and 8 km (4.97 miles) of bank were inspected by boat. No previously recorded prehistoric sites and no unrecorded sites were identified (Gadus and Freeman 2005). Most recently, Archaeology Consultants, Inc. conducted a survey of an approximately 18-hectare (43-acre) parcel adjacent to the Port O’Connor airport for Belaire Environmental, Inc. The survey does not appear to have resulted in the identification of any cultural resources. An associate abstract or report of findings was not available in the THC on-line Restricted Archaeological Sites Atlas files.

The TxDOT Yoakum District HPALM (2020) generally recommends that for the portion of the project along SH 185, there is low shallow potential, moderate deep potential at depth >1 meter (integrity value 2) for the project area to contain preserved previously unrecorded archaeological resources. For portions of the project north of SH 185, there is a moderate potential (integrity value 5) to contain preserved previously unrecorded archaeological resources. For portions of the project south of SH 185, the project area mostly has high potential (integrity value 9) or a high shallow potential, moderate potential at depth (integrity value 8) with a small portion containing moderate shallow potential, high potential at depth (integrity value 6) or moderate potential (reasonable integrity value 5) for containing preserved previously unrecorded archaeological sites.

**Historic Resources**

There are no previously recorded historic resources within 1 km of the project components and a review of current and historic aerial imagery indicates there are no historic-age resources adjacent to the APE (Figure 5; Attachment 1). A review of historic topographic maps dating from 1954, 1973 and 1976 depict historic-age buildings within the APE (National Environmental Title Research Online [NETRO] 2020). Recent topographic maps dating to 2013 and 2016 as well as aerial imagery from 1995, 2004, 2008, 2010, 2014, and 2016 indicate that the buildings are no longer extant (NETRO 2020). However, archaeological evidence of the former buildings may be present within the project area pending level of existing impacts and disturbances.

**Field Investigations**

**Archaeological Intensive Survey**

Prior to conducting fieldwork, Atkins obtained a Texas Antiquities Permit (TAP 9538) from the THC. All field work was supervised by a Registered Professional Archaeologist that meets or exceeds the U.S. Secretary of the Interior’s Professional Qualifications and Standards for Historic Preservation for Archaeology (48FR22716 or 36CFR Part 61) (SOI) and the THC’s standards for Principal Investigators as defined in Title 13, Part II of the Texas Administrative Code, Chapter 26. The survey met or exceeded the archaeological and historic-age resources survey standards as set forth by the THC and/or the Council of Texas Archaeologists (CTA) guidelines and complied with applicable standards as defined or referenced in 13 TAC 26.20 and THC policy.

Atkins archaeologists employed shovel testing to probe for subsurface cultural materials and visually inspected the ground surface and any available cut bank exposures within the APE. Shovel tests were at least 30-centimeters (cm) in diameter and excavated in 10-cm maximum levels to an 80 cm depth or restrictive features, whichever came first.
The soil matrix was screened through ¼-inch mesh, unless it was dominated by clay. Clay soils were hand trowelled and visually inspected for the presence of cultural materials. Atkins archaeologists plotted each shovel test location using a sub-meter GPS receiver and recorded each test on appropriate project field forms. Texas minimum survey standards required 16 shovel tests per mile, or approximately 37 shovel tests for the linear part of the project (water line, outflow line and driveways), and two shovel tests per acre for the areal part of the project (water well and water plant), or approximately five shovel tests. However, shovel testing frequency varied depending on the nature of the disturbances, soils, topography, or proximity of previously recorded cultural resources. Any areas determined in the field to be sufficiently deflated, disturbed, and/or contaminated as to not require shovel testing were well documented, and the reason for not conducting shovel tests in that area explained in the results section of the report.

During the survey, no archaeological sites or cultural remains were located within the APE, so no additional delineation shovel tests were necessary. Additionally, since no archaeological sites or cultural remains were encountered, no artifacts were collected

**Historic-Age Standing Structures Survey**

No historic age structures were encountered (those built in or prior to 1977), within 150 ft of the proposed project components using the SOI Standards and Guidelines for Identification and Evaluating Historic Properties.

**Curation**

Atkins conducted a non-collection survey for all of the work performed for the project. Records generated as a part of the survey work performed will be curated at the Texas Archeological Research Laboratory (TARL) at the University of Texas at Austin.
Results

Field Investigations

Atkins archaeologists surveyed a linear area approximately 3,389 m (11,119 ft) in length with the width ranging from 24 inches (60.9 cm) to 30 inches (76.2 cm), as well as the proposed location of five well pads with a combined acreage cover of 0.036 hectares (0.089 acres). The field investigation was conducted from August 31 through September 2, 2020 by archaeologists R. Benjamin Lee, B.S. - Project Archaeologist and Katherine Turner-Pearson, MA, RPA - Principal Investigator.

All locations within the linear APE were shovel tested at approximately 100 m (328 ft) along existing roadways, and across agricultural fields and cattle pastures. Where shovel tests could not be excavated because of disturbances, archaeologists photographed the areas and noted the disturbances on their shovel test logs. The average shovel test depth was 76 cm (29.9 inches).

In the field, the crew divided the project area into four smaller project areas in order to stay within a safe walking distance from Atkins vehicles (Figure 2, Figure 7, Figure 12, and Figure 16).

A total of six shovel tests were excavated within project area 1 (Figure 2). The area consisted of approximately 450 m (1,476.4 ft) of new waterline, 146 m of new roadway (479 ft), and water well pad #3. The terrain within the area was relatively flat with a slight upward slope to the north. Vegetation in the area consisted of a few copse of trees and high grasses (Figure 3). The portion of the APE that ran along Adams Street (Highway 185) had been heavily impacted by a maintained drainage ditch and buried utilities. No shovel tests were excavated in that area and photographs were taken for documentation (Figure 4 and Figure 5). Two other shovel tests were excavated in the area; one within the proposed roadway (KTP07), and one within the area of Well Pad #3 (BL09). During the excavation of BL09 a distinctive soil color change (10YR 7/2 to 10YR 4/2) was noted at 50 centimeters below surface (Figure 6). The Principle Investigator determined that the distinct soil color change may be evidence of a buried A Horizon.
Figure 2. Project Area 1.
Figure 3. Shovel test: BL09, Well Pad 3, facing west.
Figure 4. Shovel test: BL19, No dig, disturbed, facing southeast.
Figure 5. Shovel test: BL21, No dig, disturbed, facing northwest.
Project area 2 (Figure 7) was comprised of approximately 955 m (3,133.2 ft) of new waterline, 125 m (410.1 ft) of new roadway and well pads #4 and #5. In total, 12 shovel tests were excavated in the project area. The terrain within the project area was within a relatively flat coastal plain, with vegetation mostly being short grasses. The entire area showed signs of frequent mowing (Figure 8). Atkins archaeologists determined in the field that the proposed APE along the south side of Adams Street was heavily disturbed as it lay within a maintained drainage ditch (Figure 9), so no shovel tests were placed in that area. Moreover, the location for shovel test BL10 showed signs of mechanical disturbance and lay at the base of a man-made push pile (Figure 10). Lastly, the location of BL16 was within the landscaped and well-maintained front lawn of the municipal building and highly disturbed (Figure 11). All other shovel tests in the project area were unremarkable. No cultural resources or artifacts were observed.
Figure 7. Project Area 2.
Figure 8. Katherine Turner-Pearson starting a shovel test, facing northwest.
Figure 9. Shovel test: BL11, No dig, disturbed, facing west.
Figure 10. Shovel test: BL10, No dig, disturbed, facing southeast.
Figure 11. Disturbed, no dig area along Hwy 185. ST: BL16, facing east.
Ten shovel tests were placed within project area 3 (Figure 12). The project area comprised approximately 770.45 m (2,527.7 ft) of new waterline, 106.52 m (349.5 ft) of new roadway, and well pads #6 and #7. The project area was primarily land used for agriculture and cattle pastures. The terrain was flat and composed of both short and high grasses along with dense stands of trees (Figure 13). The portion of the proposed APE that ran northwest along Trevors Road area had been heavily impacted by the construction of a dirt road so no shovel testing was conducted in that area (Figure 14). To the northeast at the BL05 location, the APE crossed a property fence line and was impacted by the construction of a dirt road as well as utility lines (Figure 15). Therefore, no shovel tests were placed in that location. All completed shovel tests within the project area were negative and no cultural resources or artifacts were noted.

Figure 12. Project Area 3.
Figure 13. Shovel test: BL04, Well Pad 7, facing southwest.
Figure 14. No dig at Shovel test: BL01. Disturbed, facing south.
Figure 15. Shovel test: BL05, No dig. Disturbed, facing southwest.

Project area 4 (Figure 16) is the outflow line that runs southeast of Adams Road for 836.1 m (2,743.1 ft) before discharging into Espíritu Santo Bay. Atkins archaeologists excavated six shovel tests in project area 4, located in a cattle pasture that began to slope upwards 450 m southeast of Adams Road (Figure 17). The vegetation in the area consisted of short and high grasses, bushes, stands of trees, and in one area, a dense section of eight-foot tall sunflowers (Figure 18). Atkins staff encountered a very high and sturdy barbed wire fence 591.3 m (1,940.2 ft) southeast of Adams Street along the APE corridor. The crew was unable to find a safe place to cross over the fence, nor could the crew pass through or under the fence. The crew attempted to find another way to access the property but were unable to locate a gate, road or other access point. Therefore, Atkins archaeologists were unable to survey the 244.7 m (802.8 ft) of the proposed APE within that parcel of land. Of the sections that were surveyed, five of the shovel tests excavated in the APE were unremarkable. However, the sixth, KTP09, was unique in that dense clay was encountered immediately upon the beginning of excavation. This shovel test location was at the top of the rise within the APE. Archaeologists were only able to dig 42 cm, before terminating the shovel test due to the highly compacted clays. No cultural resources or artifacts were encountered in project area 4.
Figure 16. Project Area 4.
Figure 18. Sunflowers in path of APE. R. Benjamin Lee is in photo, facing southwest.
Summary and Recommendations

A total of 34 shovel tests were placed along the 3,389 linear meters (11,119 linear ft) survey area as well as the 0.036 hectares (0.089 acres) of well pad sites for the Port O'Connor Improvement District Project. Almost all of the shovel tests went to the research designed planned depth of 80 cmbs (31.5 inches). While none of the shovel tests encountered archaeological sites, artifacts, or any other sign of cultural occupancy, two shovel tests showed soil horizons that could represent buried A Horizons (paleosol). A large portion of the APE proved to be previously disturbed by utility lines, highways, driveways, or building construction, and any archaeological sites located in those areas would already be highly disturbed or destroyed. Additionally, no historic structures were observed within 150 ft of the APE. The soils encountered during the survey were consistent with ever-changing coastal environments where severe weather can move and deposit sands by water or wind, changing landforms quickly. Analyzing these types of coastal environments in order to determine possible occupational areas of ancient people is difficult, if not impossible. So archaeological surveys attempt to systematically test the sandy horizons for signs of ancient occupations. The archaeological survey crew acted with due diligence to survey the APE as completely as possible in an effort to find any unknown archaeological sites. However, there is always the possibility of an unknown site remaining within the APE between the systematic shovel tests. While two of the shovel tests showed possible evidence of buried A Horizons, they did not show any signs of archaeological remains nor cultural features. Suggesting prehistoric occupation horizons in those areas without further evidence would be purely conjecture.

Since no known archaeological sites and no historic properties are located within or adjacent to the project APE, and no new archaeological sites or cultural remains were discovered during the survey, it is recommended that the project be allowed to proceed as proposed. However, in the event that human or cultural remains be encountered during construction, all work must stop in the area, and the THC notified immediately.
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United States Geologic Society


Warren, J.E.


Weinstein, R.A.

Appendix A. Project Results Maps

NOT FOR PUBLIC DISCLOSURE.
Port O'Connor Water Line, Water Well and Water Plant Improvements Cultural Resources Investigations
October 2020 | Atkins
Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas

THC Tracking #202011887
POCID Water Line, Water Well and Water Plant Improvements
SH 185, Trevor Street and various private drives
Port O'Connor, TX

Dear Krista:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act and the Antiquities Code of Texas.

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

Archeology Comments

• An archeological survey is required. The work should meet the minimum archeological survey standards posted online at www.thc.texas.gov. A report of investigations should be produced in conformance with the Secretary of the Interior's Guidelines for Archaeology and Historic Preservation, and submitted to this office for review. In addition, any buildings 45 years old or older that are located on or adjacent to the tract should be documented with photographs and included in the report. If this work will occur on land owned by a state agency or political subdivision of the state, an Antiquities permit must be obtained from this office prior to initiation of fieldwork.

We have the following comments: The review staff, led by Jeff Durst and Caitlin Brashear, has examined our records. According to our maps, the proposed project is located in an area where archeological survey has not been previously conducted. This area has a moderate to high probability of containing significant cultural resources; and an archeological investigation is warranted. The work should meet the newly established minimum archeological survey standards posted on-line at www.counciloftexasarcheologists.org. A report of investigations should be produced in conformance with the Secretary of the Interior's Guidelines for Archaeology and Historic Preservation, and submitted to this office for review. As portions of this work will occur on land owned by the state of Texas, an Antiquities Permit must be secured from our office before fieldwork may begin. Thank you for your cooperation in this federal and state review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review or if we can be of further assistance, please contact Jeff Durst at 512/463-8884.

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

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

Sincerely,

[Signature]

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

Please do not respond to this email.
Memo

To: Jeff Durst, Texas Historical Commission

From: Krista McClanahan
Email: krista.mcclanahan@atkinsglobal.com

Date: 16 April 2020
Phone: 512-372-1287

Subject: Port O'Connor Improvement District Water Line, Water Well and Water Plant Improvements, Calhoun County, Texas

John D. Mercer and Associates on behalf of the Port O'Connor Improvement District (POCID - the applicant) has requested environmental and permitting services in support of Texas Water Development Board’s (TWDB) National Environmental Protection Act (NEPA) guidelines for completion of an Environmental Data Form (form). In addition to the form, the proposed project will require pre-construction notification under Nationwide Permit (NWP) 12 Utility Line Activities, NWP 7 Outfall Structures, NWP 13 Bank Stabilization, and a possible Navigation 408 application to the U.S. Army Corps of Engineers (USACE), Galveston District. Additionally, portions of the proposed project will be constructed on property owned by the POCID or Calhoun County and once completed, it is anticipated to be operated by the POCID.

The Port O'Connor (POC) community is approaching the limit of permissible connections relative to water supply. A secondary source of water is required if development is allowed to continue with construction of residential and commercial structures. Construction of the proposed project will increase the water supply and increase the allowable connections. The purpose of this proposed project is to increase the capacity of the POC potable water system for the residents in POC to meet demand and to convert POC to a primarily ground water supply and reduce the dependency on and provide an alternative to purchased surface water from Guadalupe Blanco River Authority (GBRA) as the communities’ primary water supply source. The project anticipated start date is November 2020 with completion of construction in January 2022.

The applicant, utilizing funds from the TWDB, proposes to install five new water wells and connecting water lines to offset large quantities of potable surface water that is currently purchased from the GBRA. The well water will be discharged into a new ground storage tank and then treated by a new reverse osmosis treatment facility to blend the permeate water within acceptable Texas Commission of Environmental Quality (TCEQ) limits. The reverse osmosis treated water will be discharged into the existing ground storage tank where it will be blended with water from GBRA before being pumped into the distribution system. An outfall line for the reverse osmosis reject water will be constructed from the reverse osmosis facility to a discharge point in the Gulf Intracoastal Water Way (GIWW) and will comply with the National Pollutant Discharge Elimination System program.

The applicant proposes to drill five new water wells in upland areas. The applicant also proposes the installation of the new connecting water lines via a temporary 24-inch open trench in an existing utility easement along approximately 7,000 linear feet (LF) of State Highway (SH) 185 (also known as Adams Street), Trevor Street and various private drives. The approximate 7,000 LF of new waterline installation will not impact wetlands or other waters of the US on the project site. The material from the 24-inch trenching activities will be placed on adjacent pavement or uplands. The trench area will be backfilled, and the affected areas will be returned to their preconstruction contours and will be re-vegetated as appropriate. The new water line terminates at the existing reverse osmosis facility, where the applicant will construct a new larger capacity reverse osmosis facility as well as a new potable water ground storage tank on within upland areas.

The proposed access roads from HWY 185 associated with new water wells #1 and #3, will permanently impact 0.010-acres and 0.008-acres of wetlands respectively, a total of 0.018-acres. The applicant will
install approximately 41 cubic yards (CY) of pervious material for the access road construction. The applicant will construct the access roads to minimize adverse impact to waters of the U.S.

The applicant also proposes to install approximately 3,484 LF of outfall line in a temporary 30-inch open trench from the reverse osmosis facility to an outfall constructed along the shoreline of the GIWW (see project plan sheets). For the outfall line to cross Highway 185 from the reverse osmosis facilities, the applicant proposes a 90-foot horizontal bore under the highway. The outfall line open trench will temporarily impact 0.051-acres of wetlands. The material from the 30-inch trenching activities will be placed on adjacent pavement or uplands. The trench area will be backfilled, and the affected areas will be returned to their preconstruction contours and will be re-vegetated as appropriate. The applicant proposes an access road for the outfall line off SH 185 to the south, and as a result will permanently impact 0.020-acres of wetlands with 25 CY of pervious fill material. As the outfall line approaches the GIWW and the discharge point, it will be situated above ground and mounted on four 8-inch x 8-inch pilings. To stabilize the immediate shoreline in the area of this portion of the outfall line, the applicant proposes to install approximately 6 CY of crushed rock in 0.002-acres of wetlands and 9 CY of the same crushed rock along 12 LF of the shoreline below the mean high water (MHW) to provide erosion control on the shoreline of the GIWW (Figures 1, 2 and 3).

The area of potential effects (APE) for direct effects is assumed to be any areas of ground disturbing activities including the well locations and connecting water lines. The area of indirect effects is assumed to be the areas immediately adjacent to the area of direct effects.

**Archeological Resources**

As part of the proposed project, Atkins conducted a cultural resources background review of the area within 1 kilometer (km) of the proposed project components (i.e. new water wells, etc.). Research of available records was conducted using the Texas Historical Commission’s (THC) on-line Restricted Archeological Sites Atlas files with the purpose of determining the location of previously recorded archeological sites (sites issued a trinomial/recorded at TARL), as well as identify National Register of Historic Places (NRHP) listed and eligible properties and sites, NRHP-listed districts, cemeteries (including Historic Texas Cemeteries), Official Texas Historical Markers (OTHM) (including Recorded Texas Historic Landmarks), State Archeological Landmarks (SALs), and any other potential cultural resources such as National Historic Landmarks (NHLs), National Monuments, National Memorials, National Historic Sites, and National Historical Parks to ensure the completeness of the study. As a secondary source of NRHP properties and NHLs, the National Park Service’s (NPS) NRHP database and GIS Spatial Data as well as the NHL Program were consulted. The NPS Geographic Resources Program National Historic Trails Map Viewer was used to identify National Historic Trails (NHT). Additionally, Texas Department of Transportation’s (TxDOT) NRHP Listed and Eligible Bridges of Texas map and Historic Districts & Properties of Texas map were reviewed. Finally, the Office of Coast Survey’s Automated Wreck and Obstruction Information System (AWOIS) was consulted.

Reports of previous archeological investigations and previously recorded cultural resources in the project area or vicinity were also reviewed along with sources like the Bureau of Economic Geology’s Geologic Atlas of Texas, the United States Department of Agriculture’s Natural Resources Conservation Service’s soil surveys and TxDOT’s Yoakum District Hybrid Potential Archeological Liability Map (HPALM) to assess the project area’s potential for containing previously unrecorded archeological sites.

The results of the cultural resources background review identified one previously recorded cemetery and associated OTHM within 1 km of the proposed project (Table 1 and Figure 4).

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<th>Designation</th>
<th>Determination of Eligibility per THC Atlas</th>
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<td>HTC</td>
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<tr>
<td>Port O’Connor Cemetery (#17476)</td>
<td>OTHM</td>
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While other cultural resource investigations have occurred within 1 km of the proposed project, the entirety of the proposed project does not appear to have been previously surveyed. In 1975, Frank Weir undertook a survey of SH 185 from Seadrift to Port O’Connor for the State Department of Highways and Public
Transportation. The survey did not result in the identification of cultural resources (SDHPT 1975). Much later in 2001, Prewitt and Associates conducted historic archival research and a cultural resources survey of the GIWW from Port O'Connor to Corpus Christi Bay for the USACE, Galveston District. For the portion of the project along Blackberry Island, the entire area was surveyed by helicopter and 8 km (4.97 miles) of bank were inspected by boat. No previously recorded prehistoric sites and no unrecorded sites were identified (Gadus and Freeman 2005). Most recently, Archaeology Consultants, Inc. conducted a survey of an approximately 43-acre (18 hectare) parcel adjacent to the Port O'Connor airport for Belaire Environmental, Inc. The survey does not appear to have resulted in the identification of cultural resources. An associate abstract or report of findings was not available in the THC on-line Restricted Archeological Sites Atlas files.

Geologically, according to the Bureau of Economic Geology, the area is mapped as Pleistocene-age Beaumont Formation soils. Soils within the proposed project area are predominately mapped as Portalto-Roemer (0-3 percent slope, occasionally ponded), Galveston-Mustang complex (0-3 percent slope, occasionally flooded, frequently ponded), and Dianola (frequently flooded Portalto complex) (USDA, NRCS 2020). These soils are generally thought to have a medium to high probability of containing previously unrecorded cultural resources. The TxDOT Yoakum District HPALM generally recommends that for the portion of the project along SH 185, there is low shallow potential, moderate deep potential at depth >1 meter (integrity value 2) for the project area to contain preserved previously unrecorded archeological resources. For portions of the project north of SH 185, there is mostly a moderate potential (integrity value 5) with a portion containing high shallow potential, moderate potential at depth (integrity value 8) to contain preserved previously unrecorded archeological resources. For portions of the project south of SH 185, the project area mostly has high potential (integrity value 9) or a high shallow potential, moderate potential at depth (integrity value 8) with a small portion containing moderate shallow potential, high potential at depth (integrity value 6) or moderate potential (reasonable integrity value 5) for containing preserved previously unrecorded archeological sites (Figure 5).

Historic Resources

There are no previously recorded historic resources within the study area and no historic-age residences adjacent to the proposed project (Attachment 1).

Conclusion

Based upon the information provided, Atkins respectfully requests the THC’s guidance on the required level of effort (if any) for the proposed project to achieve cultural resources clearance and compliance under the Antiquities Code of Texas of 1969, as amended; Section 106 of the National Historic Preservation Act of 1966, as amended; and the TWDB’s NEPA process. If the THC determines an archeological investigation is required, Atkins will obtain a Texas Antiquities Code permit which will include a research design for conducting investigations.

References Cited


State Department of Highways and Public Transportation (SDHPT) 1975 Letter Report : State Highway 185 From Seadrift East and Northeast to Port O’Connor, Cultural Resources Assessment, Calhoun County. SDHPT, Austin.

Figure 1
Vicinity Map

Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

Datum: NAD 1983
Projection: State Plane Texas South Central
Units: Feet
Basemap: ESRI Streets

Project Centroid

Project Area

28.431525
-96.455370

Project centroid is approximately 0.25 miles from intersection of Trevor St. and State Hwy 185

Figure 2
Port O'Connor Improvement District Water Line, Water Well, and Water Plant Improvements
Port O'Connor
Calhoun County, Texas

Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates

Datum: NAD 1983
Projection: State Plane Texas South Central
Units: Feet
Basemap: Bing Maps Aerial

Open Trench
Water Line
7,000
Outfall Line
3,484
Total Open Trench
10,484
Horizontal Bore
LF
Outfall Line
90

*ENLARGED FOR VISUAL PURPOSES
Port O'Connor Improvement District Water Line, Water Well, and Water Plant Improvements
Port O'Connor
Calhoun County, Texas

**Proposed Site Plan**

- **Proposed Water Well**
- **Proposed 6" Water Line**
- **Proposed 24'-wide Disturbance Zone***

*ENLARGED FOR VISUAL PURPOSES*

**Open Trench**

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Datum: NAD 1983
Projection: State Plane Texas South Central
Units: Feet
Basemap: Bing Maps Aerial

Microsoft Corporation, Earthstar Geographics, LLC, GeoEye, Harris Corporation, NASA, and DigitalGlobe.  © 2019. All rights reserved.

Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates

Prepared By: Atkins/WHIT 6392
Date: Apr 07, 2020
PROPOSED 30"-WIDE DISTURBANCE ZONE

PROPOSED 24"-WIDE DISTURBANCE ZONE

APPROX 275' TO GIWW CL

Existing Water Line
Proposed Water Line
Proposed Outfall Line
Proposed Disturbance Zone*

*ENLARGED FOR VISUAL PURPOSES

Datum: NAD 1983
Projection: State Plane Texas South Central
Units: Feet
Basemap: Bing Maps Aerial

Appr X 275' TO GIWW CL

Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates

Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

Job No.: 100668304
Date: Apr 07, 2020

Prepared By: ATKINS/WHIT6392

Scale: 1" = 370 feet


Figure 3

NOT FOR CONSTRUCTION

Open Trench | LF | 10,484
Water Line  | 7,000
Outfall Line| 3,484

Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates

ATKINS
Member of the SNC-Lavalin Group

Sheet 1 of 7
Water Line Plan View
Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements
Port O'Connor
Calhoun County, Texas

Job No.: 100068304  Scale: Not to Scale
Prepared By: Atkins/WHIT6392  Date: Apr 07, 2020

Page 9 of 23
Water Line Plan View and Section
Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

NOT FOR CONSTRUCTION

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NOT FOR CONSTRUCTION

Discharge Line Plan View and Section
Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

Open Trench
Water Line 7,000
Outfall Line 3,484
Total Open Trench 10,484
Horizontal Bore LF
Outfall Line 90
NOT FOR CONSTRUCTION

Open Trench  LF  10,484
Water Line  7,000
Outfall Line  3,484
Total Open Trench  10,484
Horizontal Bore  LF  90
Outfall Line  90

Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates

SHEET 4 OF 7
Water Plant Plan View
Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

Job No.: 100068304  Scale: Not to Scale
Prepared By: Atkins/WHIT6392  Date: Apr 07, 2020
**NOT FOR CONSTRUCTION**

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**Outfall Line Plan View and Section**

**Port O'Connor Improvement District**

**Water Line, Water Well, and Water Plant Improvements**

**Port O'Connor**

Calhoun County, Texas

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**Table: Water Levels**

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Water Levels per NOAA Station 8773763 (Port O'Connor, TX).

Directions shown on plans are in feet and referenced to NAVD88, unless noted otherwise.

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**Atkins**

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**Sheet 5 of 7**

Outfall Line Plan View and Section

**Prepared By:** Atkins/WHIT6392

**Job No.:** 100068304 **Date:** Apr 07, 2020

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Page 13 of 23
### WETLAND AND OPEN WATER IMPACTS

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<th>Lat</th>
<th>Long</th>
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### WATER LINE AND OUTFALL LINE LENGTHS

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**NOT FOR CONSTRUCTION**

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*Engineering Source: John D. Mercer, P.E., John D. Mercer and Associates*
### Coordinates Table

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<tr>
<td>27 REVERSE OSMOSIS BUILDING - CORNER</td>
<td>13350051.2431</td>
<td>2786326.8888</td>
<td>28.43226°NORTH</td>
<td>96.45531°WEST</td>
</tr>
<tr>
<td>28 REVERSE OSMOSIS BUILDING - CORNER</td>
<td>13350056.2631</td>
<td>2786326.8888</td>
<td>28.43226°NORTH</td>
<td>96.45531°WEST</td>
</tr>
<tr>
<td>29 REVERSE OSMOSIS BUILDING - CORNER</td>
<td>13350016.4644</td>
<td>2786286.4363</td>
<td>28.43226°NORTH</td>
<td>96.45531°WEST</td>
</tr>
</tbody>
</table>

---

**Open Trench**

<table>
<thead>
<tr>
<th>Description</th>
<th>LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Line</td>
<td>7,000</td>
</tr>
<tr>
<td>Outfall Line</td>
<td>3,484</td>
</tr>
<tr>
<td><strong>Total Open Trench</strong></td>
<td><strong>10,484</strong></td>
</tr>
<tr>
<td>Horizontal Bore</td>
<td>LF</td>
</tr>
<tr>
<td>Outfall Line</td>
<td>90</td>
</tr>
</tbody>
</table>
Figure 4
Previously Recorded Cultural Resources
Port O'Connor Improvement District
Water Line, Water Well, and Water Plant Improvements

Port O'Connor
Calhoun County, Texas

Datum: NAD 1983
Projection: State Plane Texas South Central
Units: Feet
Basemap: ESRI USA Topo Map
Scale: 1" = 1,900 feet
Datum: NAD 1983
Projection: State Plane Texas
Units: Feet
Basemap: ESRI USA Topo Map
Scale: 1" = 1,900 feet
Datum: NAD 1983
Projection: State Plane Texas
Units: Feet
Basemap: ESRI USA Topo Map
Scale: 1" = 1,900 feet
Datum: NAD 1983
Projection: State Plane Texas
Units: Feet
Basemap: ESRI USA Topo Map
Scale: 1" = 1,900 feet

Prepared By: ATKINS/WHIT6392
Job No.: 100068304
Date: Mar 18, 2020

NOT FOR PUBLIC DISCLOSURE

SDHPT 1975

Archaeology Consultants, Inc

Gadus & Freeman 2005

ESPIRITU SANTO BAY

BLACKBERRY ISLAND

Port O'Connor Cemetery

Existing Well
Existing Water Line
Proposed Well
Proposed Water Line Centerline
Proposed Outfall Line
Historical Marker
Previously Surveyed Area
Previously Recorded Cemetery
Previously Surveyed Area
Study Area 1 km
Disturbance Zone*

*ENLARGED FOR VISUAL PURPOSES

<http://services.arcgisonline.com/ArcGIS/rest/services/USA_Topo_Maps/MapServer> (18 March 2020)
USGS, National Geographic; i-cubed. USA Topo Maps. March 2019. 1:22,800; generated by Atkins; using ArcMap.
<http://services.arcgisonline.com/ArcGIS/rest/services/USA_Topo_Maps/MapServer>(18 March 2020)
Attachment 1 – Representative Photos of the Proposed Project Area

Proposed well location #1, facing south
Northside of SH 185 along proposed waterline, facing east
Proposed well location #2 along SH 185, facing southwest

Southside of SH 185 along proposed waterline, facing east
South of SH 185 along proposed waterline outfall to the GIWW, facing north

Proposed outfall area into GIWW, facing east
Proposed well location #3, facing northeast

Proposed well location #4, facing west
Vicinity of proposed well location #5, facing north

Proposed well location #5, facing northeast
## Appendix C. Project Shovel Test Data

<table>
<thead>
<tr>
<th>Shovel Test No.</th>
<th>Level (10 cm)</th>
<th>Depth (cmbs)</th>
<th>P/N</th>
<th>Munsell Soil Color</th>
<th>Soil Texture</th>
<th>Description/Comments</th>
<th>Reason/Depth of Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL01</td>
<td>1</td>
<td>0-10</td>
<td>N</td>
<td>10YR 7/1</td>
<td>Sandy Loam</td>
<td>No dig, disturbed. On Trevors Rd. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL02</td>
<td>2-8</td>
<td>10-80</td>
<td>N</td>
<td>10YR 7/1</td>
<td>Sand</td>
<td>At Well Pad 5. Mowed field. Some grass rootlets</td>
<td>Rapid change to sand. Depth</td>
</tr>
<tr>
<td>BL03</td>
<td>1</td>
<td>0-10</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Loamy Sand</td>
<td>Along Adams Street (Highway 185) Area has been mowed. Some grass rootlets in first 10 centimeters.</td>
<td></td>
</tr>
<tr>
<td>BL03</td>
<td>2-5</td>
<td>10-50</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Loamy Sand</td>
<td>More loamy than previous level.</td>
<td></td>
</tr>
<tr>
<td>BL03</td>
<td>5-8</td>
<td>50-80</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Loamy Sand</td>
<td>Soil is damp. Soil darker.</td>
<td></td>
</tr>
<tr>
<td>BL04</td>
<td>0-1</td>
<td>0-10</td>
<td>N</td>
<td>0-5 10YR 5/2</td>
<td>Loamy Sand</td>
<td>At Well Pad 7. High grasses. Soil change at 5 centimeters below surface.</td>
<td></td>
</tr>
<tr>
<td>BL04</td>
<td>1-5</td>
<td>10-50</td>
<td>N</td>
<td>10YR 6/1</td>
<td>Loamy Sand</td>
<td>Soil has become moist. Small brownish yellow inclusions noted (10YR 6/6).</td>
<td></td>
</tr>
<tr>
<td>BL04</td>
<td>5-8</td>
<td>50-80</td>
<td>N</td>
<td>10YR 5/1</td>
<td>Sand</td>
<td>Soil is very damp. Increase in inclusions, same color.</td>
<td></td>
</tr>
<tr>
<td>BL05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed area at fence line. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL06</td>
<td>0-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 6/3</td>
<td>Sandy Loam</td>
<td>On edge of pasture. High grasses. About 5 meters southeast of fence line. Dense roots.</td>
<td></td>
</tr>
<tr>
<td>BL06</td>
<td>2-8</td>
<td>20-80</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sand</td>
<td>Transition to sand. Soil has darkened as moisture increases.</td>
<td></td>
</tr>
<tr>
<td>BL07</td>
<td>0-4</td>
<td>0-40</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Sand</td>
<td>Near fence line, opposite dirt road. New parcel, short grasses.</td>
<td></td>
</tr>
<tr>
<td>BL07</td>
<td>4-8</td>
<td>40-80</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Fine Sand</td>
<td>Sand has become more fine, powdery. Dampens at about 40 centimeters and on.</td>
<td></td>
</tr>
<tr>
<td>BL08</td>
<td>0-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sandy Loam</td>
<td>Shovel test is about 20 meters west of Well Pad 6 in the proposed new roadway. 0-20 centimeters, small gravels and modern trash.</td>
<td></td>
</tr>
<tr>
<td>BL08</td>
<td>2-4</td>
<td>20-40</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sandy Loam</td>
<td>20-40 centimeters, no trash, less gravels.</td>
<td></td>
</tr>
<tr>
<td>BL08</td>
<td>4-6</td>
<td>40-60</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Very Sandy Loam</td>
<td>At 40 centimeters large sandstone concretions observed. Past concretions are mid-sized gravels. Soil is more brown in color.</td>
<td></td>
</tr>
<tr>
<td>BL08</td>
<td>6</td>
<td>60-66</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Very Sandy Loam</td>
<td>Gravels end around 60 centimeters below surface. Soils have become cemented.</td>
<td></td>
</tr>
<tr>
<td>BL09</td>
<td>0-5</td>
<td>0-50</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Very Sandy Loam</td>
<td>At Well Pad 3. High grasses. 0-50 centimeters below surface grayish brown (10YR 5/2) inclusions noted.</td>
<td>Cemented Soils</td>
</tr>
<tr>
<td>BL09</td>
<td>5-8</td>
<td>50-80</td>
<td>N</td>
<td>10YR 4/2</td>
<td>Loamy Sand</td>
<td>Definite soil texture and color change at 50 centimeters below surface. Damp. Possible buried A Horizon. See photos.</td>
<td></td>
</tr>
<tr>
<td>BL10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Area appears to be plowed/turned up. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At the proposed driveway to the outfall line. No dig, disturbed. Shovel test location is in drainage ditch along Highway 185. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL12</td>
<td>0-3</td>
<td>0-30</td>
<td>N</td>
<td>10YR 8/1</td>
<td>Sand</td>
<td>At fence line. High grasses. Roots and rootlets in first 10 centimeters.</td>
<td></td>
</tr>
<tr>
<td>BL12</td>
<td>3-4</td>
<td>30-40</td>
<td>N</td>
<td>10YR 8/1</td>
<td>Sand</td>
<td>Yellowish brown mottling (10YR 5/4) observed in north wall. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL12</td>
<td>4-8</td>
<td>40-80</td>
<td>N</td>
<td>10YR 8/1</td>
<td>Sand</td>
<td>Mottling has ceased. Roots and rootlets still observed.</td>
<td></td>
</tr>
<tr>
<td>BL13</td>
<td>0-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 5/3</td>
<td>Sandy Loam</td>
<td>Soil is more brown than usual. Many roots. 2 meters from fence line.</td>
<td></td>
</tr>
<tr>
<td>BL13</td>
<td>2-7</td>
<td>20-70</td>
<td>N</td>
<td>10YR 5/6</td>
<td>Sand</td>
<td>Soil has become sandy. Soil is more pale and more yellow. As shovel test has continued, clay mottling observed.</td>
<td></td>
</tr>
<tr>
<td>BL13</td>
<td>7</td>
<td>75</td>
<td>N</td>
<td>10YR 5/8</td>
<td>Clay</td>
<td>Dense clay encountered. Stop at 75 centimeters.</td>
<td></td>
</tr>
<tr>
<td>BL14</td>
<td>0-3</td>
<td>0-38</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Very Sandy Loam</td>
<td>Shovel test near fence line, next to oak tree. Very dense roots. At 38 centimeters below surface, roots are too dense and thick to continue.</td>
<td>Dense Roots</td>
</tr>
<tr>
<td>BL15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Shovel test area is in a drainage ditch along Highway 185. Camera not working. Katherine Turner-Pearson took photographs.</td>
<td></td>
</tr>
<tr>
<td>BL16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Shovel test area is on the mowed lawn of the Port O'Connor Municipal Utility building. Shovel test is next to a sign. Camera not working. Katherine Turner-Pearson took photographs.</td>
<td></td>
</tr>
<tr>
<td>Shovel Test No.</td>
<td>Level (10 cm)</td>
<td>Depth (cmbs)</td>
<td>P/N</td>
<td>Munsell Soil Color</td>
<td>Soil Texture</td>
<td>Description/ Comments</td>
<td>Reason/Depth of Termination</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
<td>--------------</td>
<td>-----</td>
<td>--------------------</td>
<td>--------------</td>
<td>-----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>BL17</td>
<td>0-4</td>
<td>0-40</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sand</td>
<td>On proposed roadway to Well Pad 3. Area looks disturbed. Patches of sand can be seen around shovel test area.</td>
<td></td>
</tr>
<tr>
<td>BL17</td>
<td>4-8</td>
<td>40-80</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sand</td>
<td>At 40 centimeters soil becomes increasingly damp. Soil darkens a bit.</td>
<td>Depth</td>
</tr>
<tr>
<td>BL18</td>
<td>0-3</td>
<td>0-30</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sandy Loam</td>
<td>Shovel test area is similar to BL17. At Well Pad 4.</td>
<td></td>
</tr>
<tr>
<td>BL18</td>
<td>3-8</td>
<td>30-80</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sand</td>
<td>At 30 centimeters below surface, soil becomes increasingly damp, and darkens.</td>
<td>Depth</td>
</tr>
<tr>
<td>BL19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Water line runs along area flagged for underground utilities and utility lines. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Water line runs along area flagged for underground utilities and utility lines. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Water line runs along area flagged for underground utilities and also utility lines. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>BL22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No dig, disturbed. Water line runs along area flagged for underground utilities and also utility lines. Photos taken.</td>
<td></td>
</tr>
<tr>
<td>KTP01</td>
<td>1-4</td>
<td>0-40</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sand</td>
<td>Grass along highway</td>
<td></td>
</tr>
<tr>
<td>KTP01</td>
<td>4-8</td>
<td>40-80</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Sandy Loam</td>
<td>Grass along highway</td>
<td></td>
</tr>
<tr>
<td>KTP02</td>
<td>1-2</td>
<td>0-19</td>
<td>N</td>
<td>10YR 4/1</td>
<td>Sandy Loam</td>
<td>Grass along highway</td>
<td></td>
</tr>
<tr>
<td>KTP02</td>
<td>2-5</td>
<td>19-50</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sandy Loam</td>
<td>Grass along highway</td>
<td></td>
</tr>
<tr>
<td>KTP02</td>
<td>5-8</td>
<td>50-80</td>
<td>N</td>
<td>10YR 7/4</td>
<td>Sand</td>
<td>Grass along highway</td>
<td></td>
</tr>
<tr>
<td>KTP03</td>
<td>1-2</td>
<td>0-16</td>
<td>N</td>
<td>10YR 3/2</td>
<td>Sandy Loam</td>
<td>Tall grass, Camas and Catbriar</td>
<td></td>
</tr>
<tr>
<td>KTP03</td>
<td>2-3</td>
<td>16-33</td>
<td>N</td>
<td>10YR 4/2</td>
<td>Very Sandy Loam</td>
<td>Tall grass, Camas and Catbriar</td>
<td></td>
</tr>
<tr>
<td>KTP03</td>
<td>3-8</td>
<td>33-80</td>
<td>N</td>
<td>10YR 5/3</td>
<td>Very Sandy Loam</td>
<td>Tall grass, Camas and Catbriar</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP04</td>
<td>1-8</td>
<td>0-80</td>
<td>N</td>
<td>10YR 6/3</td>
<td>Sand</td>
<td>Grass and solid post oak Mowed</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP05</td>
<td>1-8</td>
<td>0-80</td>
<td>N</td>
<td>10YR 6/3</td>
<td>Sand</td>
<td>Grass and solid post oak Mowed</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP06</td>
<td>1-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 6/2</td>
<td>Very Sandy Loam</td>
<td>Grass and debris from old farm</td>
<td></td>
</tr>
<tr>
<td>KTP06</td>
<td>2-8</td>
<td>20-80</td>
<td>N</td>
<td>10YR 8/2</td>
<td>Sand</td>
<td>Grass and debris from old farm</td>
<td></td>
</tr>
<tr>
<td>KTP07</td>
<td>1-2</td>
<td>0-16</td>
<td>N</td>
<td>10YR 5/3</td>
<td>Very Sandy Loam</td>
<td>Tall grass (thick)</td>
<td></td>
</tr>
<tr>
<td>KTP07</td>
<td>2-3</td>
<td>16-30</td>
<td>N</td>
<td>10YR 4/3</td>
<td>With 10YR 5/8 10YR 6/1</td>
<td>Clay mottles</td>
<td></td>
</tr>
<tr>
<td>KTP07</td>
<td>3-8</td>
<td>30-80</td>
<td>N</td>
<td>10YR 4/3</td>
<td>Sandy Loam</td>
<td>Tall thick grass</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP08</td>
<td>1</td>
<td>0-7</td>
<td>N</td>
<td>10YR 4/2</td>
<td>Sandy Loam with gravels</td>
<td>Mowed grass</td>
<td></td>
</tr>
<tr>
<td>KTP08</td>
<td>1-3</td>
<td>7-34</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Very Sandy Loam</td>
<td>Mowed grass</td>
<td></td>
</tr>
<tr>
<td>KTP08</td>
<td>3-8</td>
<td>34-80</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Sand</td>
<td>Mowed grass</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP09</td>
<td>1-2</td>
<td>0-14</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sandy clay loam Hard</td>
<td>Seven foot sunflowers</td>
<td></td>
</tr>
<tr>
<td>KTP09</td>
<td>2-3</td>
<td>14-33</td>
<td>N</td>
<td>10YR 5/3</td>
<td>Extremely hard Clay Loam</td>
<td>Seven-foot sunflowers</td>
<td></td>
</tr>
<tr>
<td>KTP09</td>
<td>3-4</td>
<td>33-42</td>
<td>N</td>
<td>10YR 5/6</td>
<td>Very hard Clay With orange streaks</td>
<td>Seven-foot sunflowers Compact clay</td>
<td></td>
</tr>
<tr>
<td>KTP10</td>
<td>1-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 5/1</td>
<td>Sandy Loam</td>
<td>Sparse grass</td>
<td></td>
</tr>
<tr>
<td>KTP10</td>
<td>2-3</td>
<td>20-30</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sandy Loam</td>
<td>Sparse grass</td>
<td></td>
</tr>
<tr>
<td>KTP10</td>
<td>3-8</td>
<td>30-80</td>
<td>N</td>
<td>10YR 8/2</td>
<td>Sand</td>
<td>Sparse grass</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP11</td>
<td>1-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Very Sandy Loam</td>
<td>Sparse grass</td>
<td></td>
</tr>
<tr>
<td>KTP11</td>
<td>2-4</td>
<td>20-80</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Sand</td>
<td>Sparse grass</td>
<td>Depth</td>
</tr>
<tr>
<td>KTP12</td>
<td>1-2</td>
<td>0-20</td>
<td>N</td>
<td>10YR 5/2</td>
<td>Sandy Loam</td>
<td>Thick grass</td>
<td></td>
</tr>
<tr>
<td>KTP12</td>
<td>2-4</td>
<td>20-40</td>
<td>N</td>
<td>10YR 5/3</td>
<td>Sandy Loam</td>
<td>Thick grass</td>
<td></td>
</tr>
<tr>
<td>KTP12</td>
<td>4-8</td>
<td>40-80</td>
<td>N</td>
<td>10YR 7/2</td>
<td>Sand</td>
<td>Thick grass</td>
<td>Depth</td>
</tr>
</tbody>
</table>