CULTURAL RESOURCES REMOTE-SENSING SURVEY OF HALFMOON REEF, MATAGORDA BAY, MATAGORDA COUNTY, TEXAS

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FINAL REPORT

By

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Performed under contract with the:

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ABSTRACT

A Phase 1 marine, cultural resources, remote-sensing survey was conducted of a 1190-acre area located on Halfmoon Reef in Matagorda Bay, Matagorda County, Texas. The study was undertaken by Coastal Environments, Inc., of Corpus Christi, Texas. The area surveyed consists of the majority of Halfmoon Reef, a large sand bank extending into Matagorda Bay. Some portion of Halfmoon Reef is to be selected for a project intended to reestablish oyster beds. The cultural resources survey encompassed several Texas State Tracts identified by the Texas Historical Commission as high probability areas relative to submerged cultural resources. In addition, the area surveyed included the former location of the Halfmoon Reef Lighthouse, which stood from 1858 to 1943. Remote-sensing instruments used consisted of a marine magnetometer, side-scan sonar, and a fathometer. A differential GPS system was used for positioning and navigation. A review of pertinent geological, archeological, and historical records was undertaken prior to the survey to determine the cultural resources potential of the project area. The only cultural features of interest identified in the survey were magnetic anomalies and features identified on side-scan sonar records that appear to represent elements associated with the iron frame foundation of the former Halfmoon Reef Lighthouse. Insufficient data were collected to make a determination of eligibility to the National Register of Historic Places or as a Texas State Archeological Landmark; however, the lighthouse has been assigned archaeological site number 41MG135. This survey was conducted under Texas Antiquities Committee Archeology Permit Number 5429.

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CHAPTER 1

INTRODUCTION

This report presents the results of a hydrographic and a Phase I, cultural resources remote-sensing survey undertaken by Coastal Environments, Inc., (CEI) in response to plans by the Nature Conservancy (TNC) of Texas to restore vital shellfish habitat to Halfmoon Reef, located in Matagorda Bay in Matagorda County, Texas. This restoration plan will involve the placement of base material to build structure for the reef, and then placement of a capping material that is conducive to oyster spat attachment and oyster growth. Portions of Halfmoon Reef include State tracts identified as high-probability areas for cultural resources (i.e., historic shipwrecks and other underwater historic properties) as identified by the Texas Historical Commission (THC). The remote-sensing survey was conducted across the entirety of Halfmoon Reef to identify and evaluate the extent of submerged oyster reef habitat and the presence of potentially significant cultural remains. Of particularly interest was the potential for historic shipwrecks because of the hazard to shipping that Halfmoon Reef has represented. Of additional interest were remains that might be associated with the Halfmoon Reef Lighthouse, a structure built at the southwestern end of the reef in 1857-1858 and that operated until 1942. The lighthouse structure was damaged by a hurricane in 1942, after which it was sold. In 1943, the wooden structure was removed and later donated to Calhoun County where it has been restored as a visitor's center in the town of Port Lavaca. There is no indication that the iron screw pilings on which the lighthouse building rested were ever removed and they may still be there, in addition to debris and trash lost from the lighthouse over its long period of use.

This document presents the results of the cultural resources remote-sensing survey. Detailed results relating specifically to the oyster reef assessment and the viability of the shellfish revitalization plan have been presented to the Nature Conservancy as a separate document.

The Halfmoon Reef Project Area

Figure 1-1 depicts the project area, which constitutes that area within which the remote-sensing survey was conducted. Halfmoon Reef (or "Half Moon Reef," as it was commonly spelled in the nineteenth century and occasionally today) is a large, elongated sand and shell bank extending in a southwest direction from Palacios Point into Matagorda Bay (Figure 1-1). Historically, Halfmoon Reef was covered with a thick deposit of living and dead oyster shell and was one of the important oyster producing habitats in Matagorda

Bay. However, today the reef contains almost no living oyster shell and what little dead shell remains consists principally of small fragments best described as "shell hash." Halfmoon Reef lies at the juncture of two segments of Matagorda Bay. To the west, the bay is wide and expansive, while east of Halfmoon Reef and Palacios Point, the bay is extremely narrow.

The project area encompasses all of Halfmoon Reef and measures 5.47 km long (3.39 miles) and 0.90 km (0.56 miles) wide. The northeastern portion of Halfmoon Reef falls within Texas state tracts that are considered "sensitive" relative to the presence of submerged cultural resources, such as shipwrecks. The Texas Historical Commission (THC) typically requires cultural resources surveys in these high probability blocks when ground disturbing impacts are anticipated, as in this project.

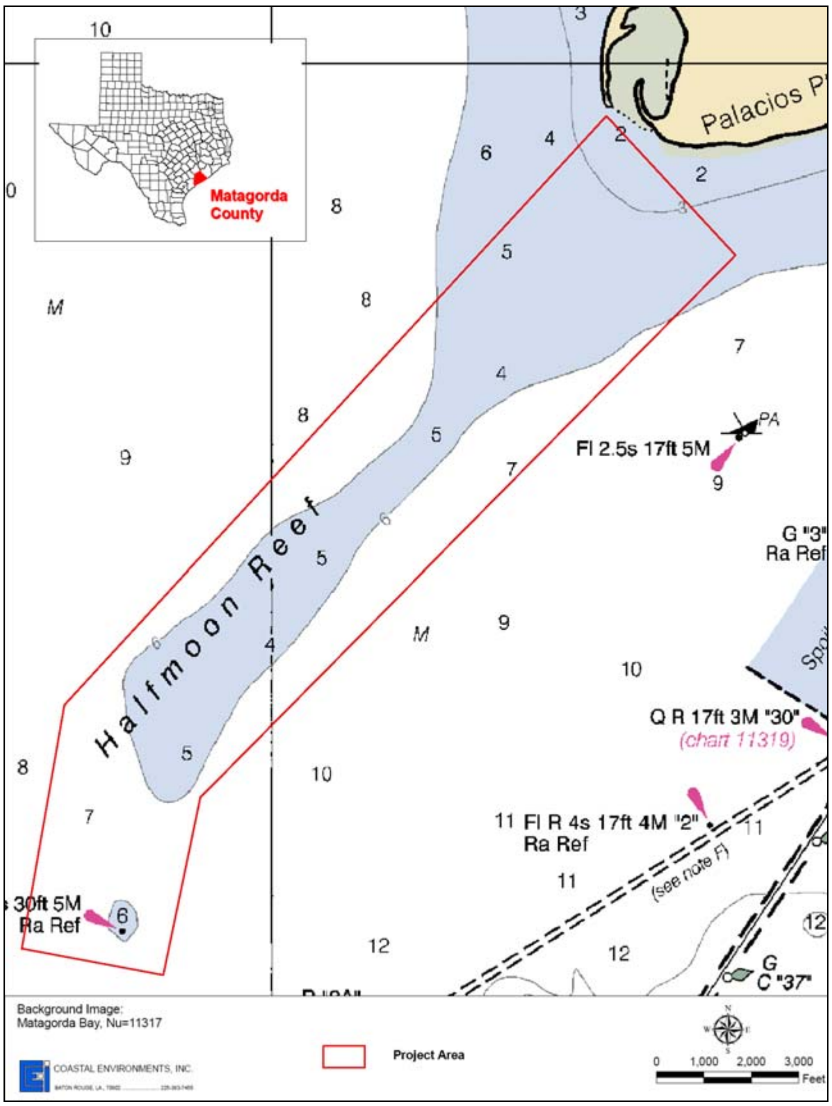

Figure 1-1. The Halfmoon Reef project area. Water depths are in feet. (Map base: National Oceanic and Atmospheric Administration [NOAA], 2009).

This study involved background historical research on the cultural, biological, and geological aspects of Halfmoon Reef, in addition to the systematic remote-sensing survey. The remote-sensing survey was designed to locate sunken vessels and other historic submerged properties, as well as to identify and delineate oyster reef and shell habitat. Following the requirements of the THC, survey transects were spaced 20 m apart to insure complete and intensive coverage. The remote-sensing instruments used consisted of a Geometrics Model 882SX cesium magnetometer, an Edgetech 4125P dual frequency side-scan sonar system, and a Syquest digital recording dual frequency fathometer. The side-scan sonar was operated at a range setting to insure a minimum of 100 percent overlap on adjacent lines. Accurate positioning was obtained with a Trimble Navigation DGPS based system utilized with Hypack Max computer software to control navigation and data acquisition. Texas South-Central State Plane coordinates, based on the 1927 North American Datum (NAD27) coordinate system were employed for the survey. Details of the design and conduct of the remote-sensing survey are discussed in Chapter 4 of this report.

In conjunction with the remote-sensing survey, data on the natural setting, previous surveys of Halfmoon Reef, and shipwreck potential of the project area were collected. In addition, detailed information on the Halfmoon Reef Lighthouse was gathered, including original plans and drawings from the National Archives in Washington D.C. This information provided a background against which the results of the remote-sensing data could be interpreted. The identification of possible shipwrecks relied on the information available on the history of vessel use in the project area, on reported vessel losses, and on past impacts that natural and man-induced activities may have had on wrecks in the project area. Interpretation of remote-sensing data also drew upon the available literature on similar shipwreck surveys. Each of these factors is discussed in the following chapters.

Previous Maritime Investigations in the Project Area

A considerable amount of marine archaeological research has been conducted in Matagorda Bay. Much of this previous work has consisted of remote-sensing surveys undertaken relative to oil and gas facilities or along navigation channels as elements of U.S. Army Corps of Engineers projects. In regards to the latter category, Enright et al. (2002) report on a remote-sensing survey along alternate routes of the Gulf Intracoastal Waterway Matagorda Bay; Pearson and Hudson (1990) report on a magnetometer survey of the Matagorda Ship channel, located on the west side of Matagorda Bay; and Saltus (1990) presents the results of a magnetometer survey of a navigation channel in Tres Palacios Bay. None of these surveys located historically significant submerged resources. Only a couple of the remote-sensing surveys conducted relative to oil and gas activities have been conducted in the near vicinity of the Halfmoon Reef project area. These consist of surveys conducted by PBS&J at well pads and along flow lines located in several State Tracts located a couple of miles west of Halfmoon Reef (Jones et al 2005, 2006). Neither of these surveys recorded historically significant cultural properties.

Few underwater projects in Matagorda Bay have involved the physical examination of historic vessel remains. Hoyt (2005) reports on research conducted at the old port town of Indianola on the west side of Matagorda Bay that included the examination of what is believed to be the steamer *Perseverance*, lost in 1856. Several archaeological projects have been conducted at Pass Cavallo, the entrance to Matagorda Bay, but the pass is located a considerable distance from the present project area. The most significant marine archaeological work conducted in Matagorda Bay was related to the discovery and excavation of the seventeenth century wreck of the French vessel *La Belle*. This research included a considerable amount of remote-sensing survey in the search for the vessel (Arnold 1996). In 1995, the wreck of *La Belle,* assigned site number 41MG86, was discovered in southern Matagorda Bay, about 7.1 km southwest of Halfmoon Reef. In 1996 and 1997, the Texas Historical Commission undertook excavation and recovery of the remains of *La Belle* and this work is reported in Bruseth and Turner (2005) and Weddle (2001). Many consider the *La Belle* project among the most important shipwreck studies undertaken in the United States. Relatively little marine survey work has been conducted in the eastern part of the bay and, apparently, none on or in the immediate vicinity of Halfmoon Reef.

CHAPTER 2

NATURAL SETTING

The project area encompasses the submerged natural feature known as Halfmoon Reef, located on the north shore of Matagorda Bay in Matagorda County, Texas. Although identified as a "reef," Halfmoon Reef is actually a large, submerged sand and shell bank extending in a southwest direction from Palacios Point into Matagorda Bay (see Figure 1-1). There are few living oysters on the reef at present.

Matagorda Bay, lying on the central Texas coast, is a portion of a network of bays composed of East Matagorda Bay, Lavaca Bay, Matagorda Bay proper, plus several smaller, connecting water bodies, specifically, Tres Palacios, Karankawa, and Keller bays (Figure 2-1). Matagorda Bay proper is about 26 km (16 mi) long (east-west) and, toward its western end, about 19 km (12 mi) wide (north-south). However, at Palacios Point the bay abruptly narrows to a width of about 7.2 km (4.5 mi). The narrow portion of the bay extends eastward to the Colorado River Delta. Halfmoon Reef lies at the juncture of these two segments of Matagorda Bay. The Matagorda Bay system represents the second largest embayment on the Texas coast; only the Galveston Bay system is larger (Ward et al. 1980:1). Matagorda Bay is a lagoonal estuary. Typical of Gulf Coast embayments, it is broad and shallow and nearly isolated from the Gulf of Mexico by a barrier island-peninsula, in this instance, Matagorda Island. Matagorda Bay is shallow, as are the other Texas bays, with a mean depth of only about 3 m (10 ft). Numerous shoals exist in the bay, most commonly associated with oyster (*Crassostrea virginica*) reefs (Ward et al. 1980:5). Halfmoon Reef is the largest of the shoals in the bay.

Several streams flow into the Matagorda Bay system. The Lavaca and Navidad rivers and smaller streams, such as Chocolate Bayou and Garcitas Creek, flow into Lavaca Bay. This freshwater inflow makes salinities in Lavaca Bay lower than those in the main body of Matagorda Bay. Flowing into the bay system from the north are streams such as Keller, Karankawa, Turtle, and Reed creeks, and the Tres Palacios River. East Matagorda Bay is separated from Matagorda Bay by the delta of the Colorado River. Rapid progradation of this delta from the mainland to Bolivar Peninsula occurred between about 1929 and 1941, isolating what is now East Matagorda Bay. This rapid period of delta development was triggered by the elimination of an extensive log raft on the lower Colorado

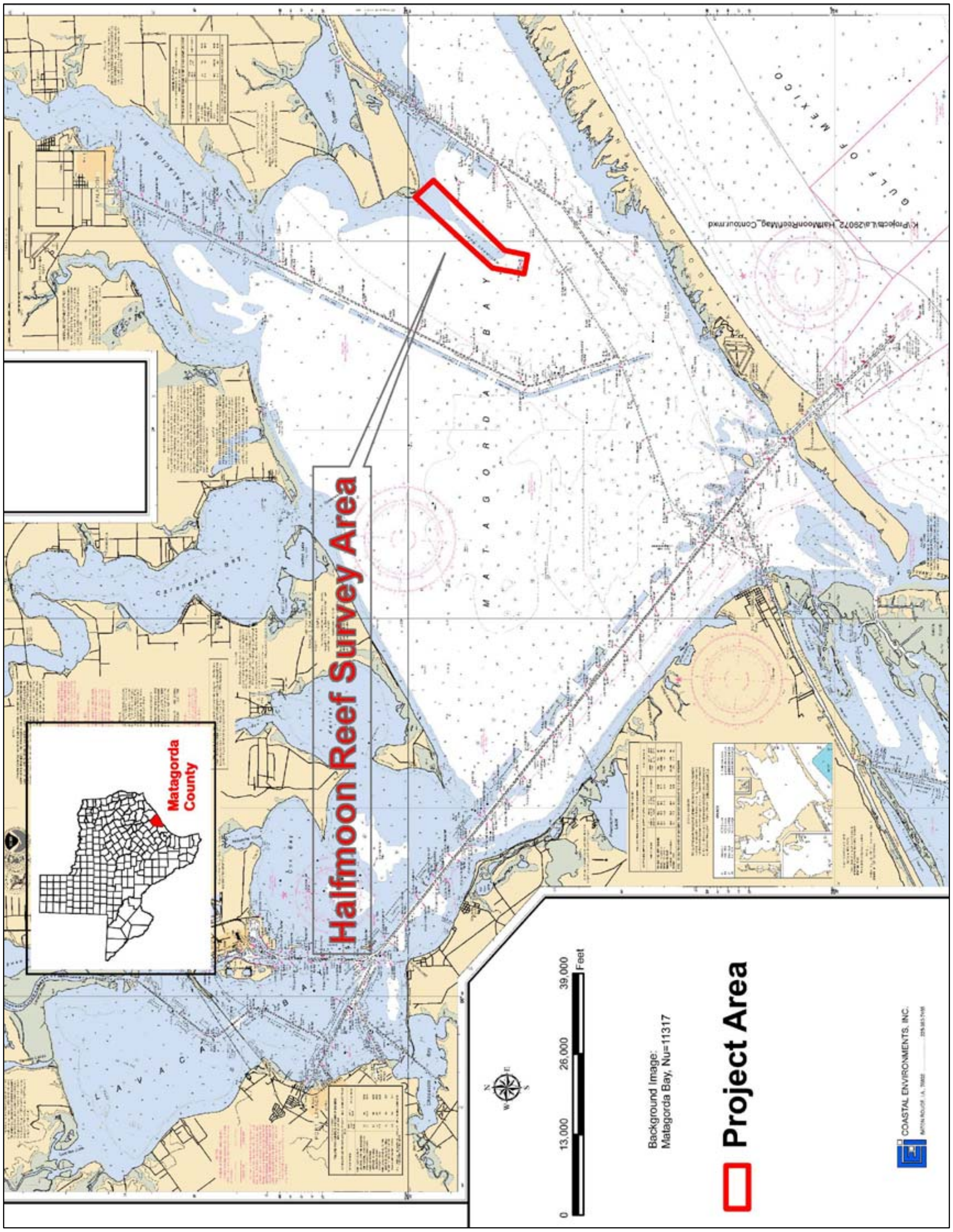

Figure 2-1. The Halfmoon Reef project area and vicinity (Map base: NOAA Chart 11317, *Matagorda Bay*, 32th edition, March 2009).

River. The river, which formerly discharged into Matagorda Bay, now empties into the Gulf of Mexico.

Geologic History

The Matagorda embayment system began to gradually evolve into its present condition and configuration between about 2,500 and 3,000 years B.P. The processes of erosion, deposition, compaction, and subsidence combined to mold landforms and bodies of water which were formed during the Pleistocene and Holocene episodes. Prior to 10,000 years ago, with sea level much lower than at present, the area of Matagorda Bay was dry land, a portion of the coastal plain situated some distance from the Gulf of Mexico. The now filled and buried late Pleistocene-age channels of the Lavaca-Navidad River system underlie the western portion of Matagorda Bay (McGowen et al. 1976:16). These deeply incised channels were created during a period of low sea level in the late Pleistocene which began about 50,000 to 60,000 years B.P. By about 25,000 years B.P. sea level had dropped as much as 120 m (400 ft) below its present level, causing extensive downcutting of streams into the older, underlying fluvial and deltaic deposits. At the time of lowest sea level, the shoreline was about 80 km (50 mi) south of the Modem Gulf shoreline. .

Beginning about 18,000 years B.P., sea level began to rise with the melting of the continental glaciers. The coastal valleys were slowly inundated and filled, first with estuarine and finally with marine sediments. By about 9,500 years ago, the sea had inundated the Lavaca-Navidad valley to the present area of Lavaca Bay and, presumably, the valley of the ancestral Tres Palacios River to the area of Tres Palacios Bay. In fact, Gulf waters extended inland along the incised valleys as far as 40 km (25 mi) or so from its present shoreline (McGowen et al. 1976:16).

The formation of Matagorda Bay proper began when it became separated from the open Gulf by the development of Matagorda Peninsula, and Matagorda and St. Joseph Islands. This development began with the slowing and stabilizing of sea level between about 2,500 and 3,000 years ago. As a result of wave action, sediments began to accumulate to form a series of shoals, probably on top of Pleistocene topographic highs. These shoals developed into barrier island nuclei, fed by sands derived from the underlying and adjacent Pleistocene strandplain features and from the erosion of offshore fluvial deltaic deposits. Prior to about 1,800 years B.P., Matagorda Peninsula consisted of a series of spits, islands, and shoals. After that date, fine-grained sediments from the Brazos and Colorado rivers began to discharge into the area. The accumulation of sediments resulted in the coalescence of the disconnected islands into the present-day Matagorda Peninsula, and the formation of Matagorda Bay (McGowen et al. 1976:16). Just down the coast, incipient islands coalesced through spit accretion and tidal pass filling to form Matagorda and St. Joseph islands, creating Aransas, San Antonio, Espiritu Santo, and associated bays and lagoons.

With the stabilization of sea level, Matagorda Bay began to take on its Modern aspect. Shoreline features were smoothed by wave erosion; shallow tributary bays, such as Karankawa and Keller bays, and Powderhorn Lake, were isolated as a result of spit accretion across their entrances. River borne sediments began to fill Matagorda Bay. The Lavaca and

Navidad rivers have filled their estuaries since stillstand, and a delta, measuring almost 5 km (3 mi) long, has prograded into Lavaca Bay. Additionally, marshes and swamps began to develop around the northern periphery of the bay, particularly, in association with the bayhead deltas.

Since its formation, Matagorda Peninsula has remained a low profile, transgressive feature, consisting of a relatively thin deposit of sand (generally less than 6 m thick) overlying estuarine muds (Morton and McGowen 1980:141-143). Storm surges in the 1.5- to 2-m range wash over the peninsula and washover fans are numerous. Larger storms may create passes through the peninsula, most of which fill quickly, while some may remain open for years. In general, the entire Matagorda Peninsula shoreline is eroding and the entire feature is transgressing landward. Rates of shoreline change vary, but, along portions of the peninsula, shoreline retreat is greater than 3 m per year (McGowen et al. 1976:83). The western end of the peninsula has demonstrated less retreat than the eastern end in recent years.

Currently, there are five principal inlets connecting the Matagorda Bay system with the Gulf of Mexico. These are Pass Cavallo, Matagorda Ship Channel land cut, Greens Bayou, the Colorado River Mouth complex, and Brown Cedar Cut (Ward et al. 1980:9). The first three open into Matagorda Bay proper. Pass Cavallo is a natural entrance into the bay and was the only permanent inlet for the Matagorda Bay system prior to the construction of the Matagorda Entrance Channel land cut in 1963. This pass has served as the historic shipping entrance to the bay, although it has always been relatively dangerous because of its instability. In fact, it was off this pass that the French explorer La Salle lost his ship *l'Aimable* in 1685. The primary tidal channel through Pass Cavallo is Pass Gorge, and it seems to be the most stable element of the pass, demonstrating little morphological change for at least the past 300 years. The eastern channel, known as Decrows Channel, is not nearly as stable. The element showing the greatest amount of change in the Pass Cavallo system is the Pelican Shoal complex, located at the Gulf-side entrance to the pass. This large sand flat has, over the years, varied considerably in size and configuration, affecting the depth and specific position of the entrances to the pass.

The most significant alteration to the morphology of Pass Cavallo in recent history has been the accretion of an elongated spit from the south beach of Matagorda Peninsula. During 1878-1887 an effort to stabilize Pass Cavallo was made with the construction of a jetty intended to focus current into Pass Gorge and keep the Gulf bar scoured out. Apparently, the jetty was unsuccessful (Ward et al. 1980:9).

The other major entrance into Matagorda Bay is the Matagorda Ship Channel land cut. This artificial channel was dug through Matagorda Peninsula in 1963. An extremely strong current through this cut has kept it open without dredging. Soon after construction, the current enlarged the cut's initial dimensions from 11 m (38 ft) deep to over 15 m (50 ft) deep, and from 90 m (300 ft) wide to over 300 m (1000 ft) wide. The banks have since been revetted and stabilized to prevent further widening.

Along the length of Matagorda Peninsula are numerous low areas that are breached periodically during storms, but which normally close relatively quickly. Some of these "storm passes" are sufficiently permanent to be named. Greens Bayou is the most important of these washover passes opening into western Matagorda Bay. The size of the bayou varies considerably, depending upon the timing, size, and duration of storms. After a major hurricane, Greens Bayou can grow to as much as 2 km wide, but, typically, it fills and closes relatively quickly as a result of littoral drift (Ward et al. 1980:14). Storm washovers such as Greens Bayou may have intermittently served as routes for small boats, but were never important navigation passes.

Halfmoon Reef

Halfmoon Reef probably initially formed as a large, submerged sand shoal extending into Matagorda Bay from Palacios Point. Today this shoal is an elongated feature measuring approximately 5.5 km (3.4 mi) long and about 1 km (0.6 mi) wide. Halfmoon Reef makes a slight curve to the south near its western end, possibly giving rise to its name. The spelling of the reef's name has changed over time. In the past 70 years or so, the name has been typically spelled as one word, "Halfmoon." However, in earlier years it was most often spelled as two words "Half Moon." The modern form of the name is used in this document.

The processes that formed Halfmoon Reef are not fully understood; however, the feature appears to have formed on the same elevated Pleistocene land surface that forms Palacios Point. Apparently, this ridge feature, now submerged, extends to the southwest from present-day Palacios Point. Cores and borings made during the present study indicate that the ridge consisted of tenacious clays of the Pleistocene Beaumont formation that extended out as exposures on the shallow bay floor. Currents and waves within Matagorda Bay combined to deposit sandy sediments on this submerged ridge and, subsequently, conditions led to the development of oyster reefs on this sandy feature, leading to its stabilization and vertical accretion. Over time, the accumulated dead and living oysters extended above the water surface, at least during periods of low water. Halfmoon Reef proper is separated from Palacios Point by a narrow stretch of slightly deeper water, historically known as Palacios Channel or Palacios Point Channel. This channel served as a navigation route for small vessels traveling between the eastern portion of Matagorda Bay and the vicinity of Tres Palacios Bay and the town of Palacios (Moore 1907:20).

Today, water depths over the highest portions of Halfmoon Reef are about 1.5 m (5 ft) at low water, approximately one-half the depth of the surrounding bay bottom (see Figure 1-1). However, in the recent past, the reef was higher, in part related to extensive oyster beds that once covered much of the feature. One of the early accurate maps of Matagorda Bay, produced by Topographical Engineers in 1846-1847, depicts the reef as a long, thin feature, rising above the surface of the water (Figure 2-2). It is presumed that the exposed portion of the reef consisted of living oyster beds. This map shows that the water depths of Matagorda Bay in the vicinity of the reef were about 11 to 13 ft, approximately the same as today. In 1907, Halfmoon Reef was described as an "economically important" oyster reef that measured about 2.95 miles long and 0.28 miles wide, encompassing close to 500 acres (Moore 1907:20). At that time, water depths over the spine of the reef were less than one

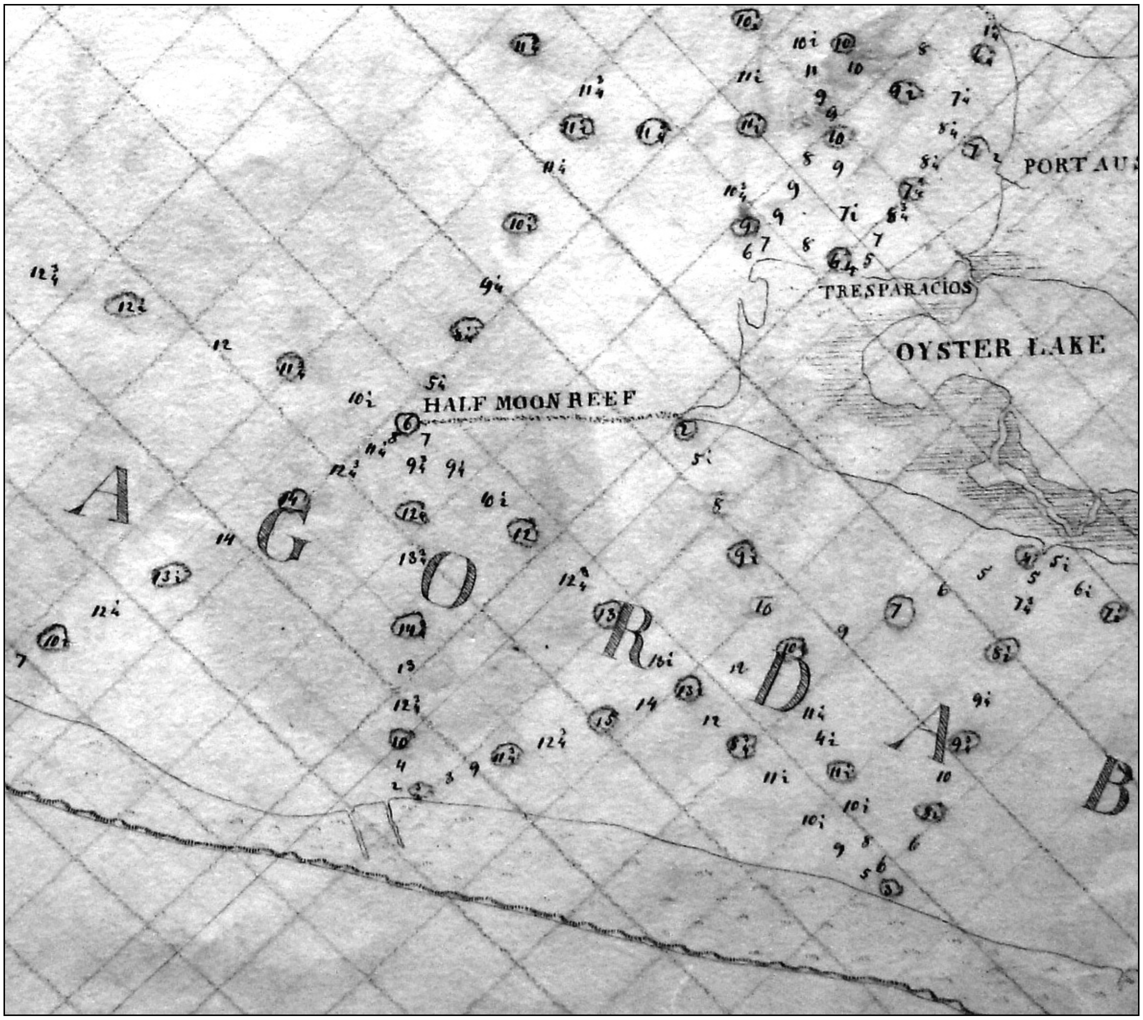

Figure 2-2. Detail of an 1846-1847 map showing Halfmoon Reef as a long, narrow and exposed feature (Mackay and Smith 1846-1847).

foot during low water and oyster beds and oyster shell were described as stretching almost the entire length of the reef and the shell and shell fragments were up to four feet thick. As late as 1934, navigation charts showed that water depths over Halfmoon Reef were as little as one foot (Figure 2-3).

The large oyster reefs that once blanketed Halfmoon Reef are now gone and oystermen report that only a few oysters grow on the reef, particularly at its northeastern end near Palacios Point (Blackie Longaria, personal communication 2009). The disappearance of oysters from Halfmoon Reef since the early years of the twentieth century is not totally understood; some of it may be related to over fishing of the reef during the early years of the twentieth century. However, even as early as 1907, it was noted that few young oysters were growing on the reef (Moore 1907). It is likely that environmental changes in Matagorda Bay, particularly changing water salinities and currents, have been most responsible for the disappearance of oysters over the past

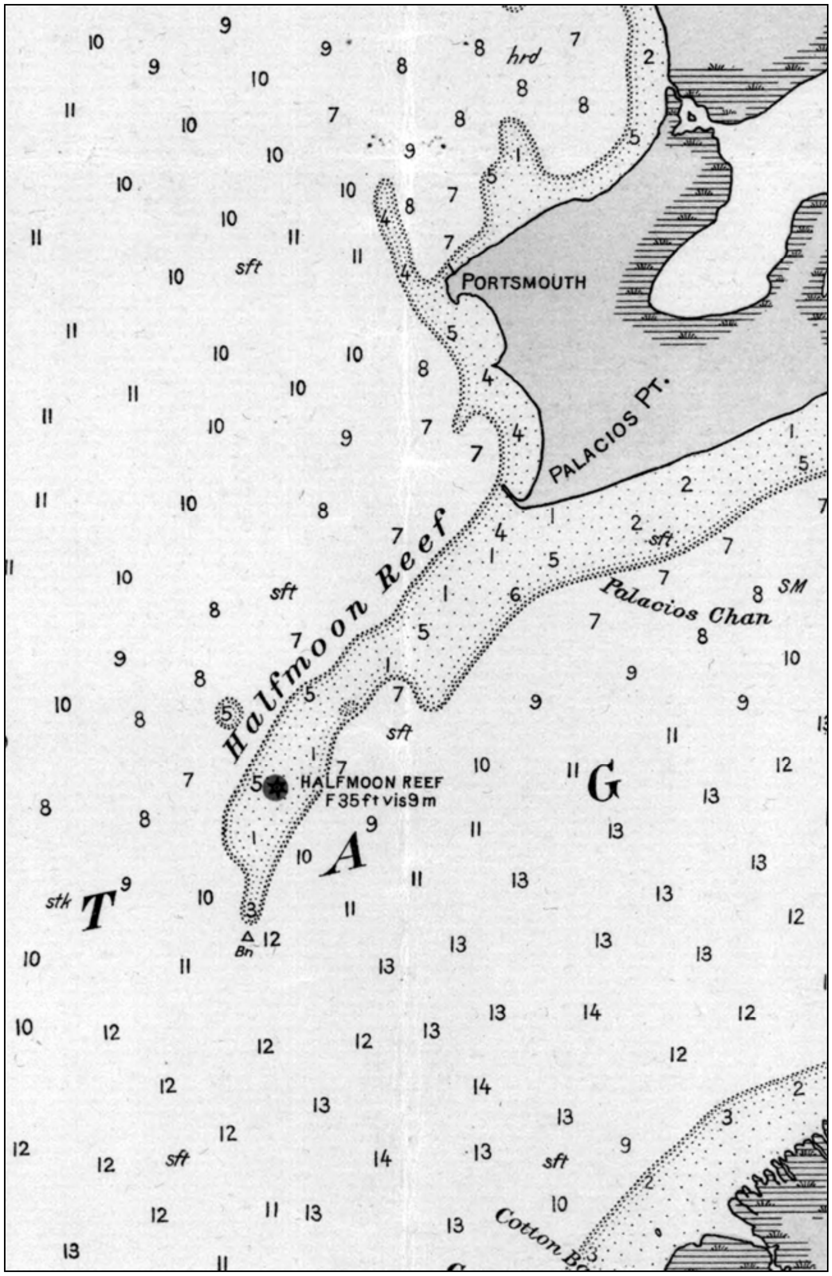

Figure 2-3. Detail of a 1934 navigation chart showing water depths over Halfmoon Reef and the location of the Halfmoon Reef Lighthouse. The position of Palacios Channel, a navigation route running close to Palacios Point, is also shown (United States Coast and Geodetic Survey [USCGS] 1934).

century. Possibly the most dramatic changes have resulted from the development of the Colorado River Delta in the 1920s and 1930s, forcing the Colorado River to discharge into the Gulf of Mexico, rather than into the eastern end of Matagorda Bay, as it had done in the past. This change significantly reduced the amount of freshwater flowing into this portion of the bay, dramatically altering the current flows in the bay and resulting in increased salinities. In addition, agricultural and residential development around the bay has resulted in numerous changes to the flow patterns of streams discharging into the bay. All of these factors have significantly altered the bay's ecology over the past 100 years or so and impacted oyster habitats.

Of some interest is that the recent disappearance of oysters from Halfmoon Reef does not seem to be a unique event. In his study on the conditions of oysters in Matagorda Bay made in 1905, H. F. Moore (1907:20) reported that witnesses stated no marketable oysters grew on Halfmoon Reef in 1895. This was only a decade prior to Moore's discovery of about 500 acres of commercially viable oyster beds covering the reef. By 1902, oysters large enough to harvest were again growing on the reef. However, Moore's discovery that the reef consisted of shell measuring 3 to 4 ft thick led him to conclude that it was a "very old reef" (Moore 1907:20). This suggests that the report of no oysters on the reef in 1895 referred to live oysters, not dead shell, in contrast to the present situation, where even dead shell has largely disappeared.

The shallow waters over Halfmoon Reef represented a significant hazard to vessels traveling in Matagorda Bay, especially those traveling eastward to the town of Matagorda at the mouth of the Colorado River, once an important Texas port. Because of this, a lighthouse was erected near the southwestern end of the reef in 1857-1858 (see Figure 2-3). This screw pile lighthouse stood until it was removed in 1943, by which time it had outlived its usefulness. A detailed discussion of this lighthouse is presented in Chapter 3. Commercial boat traffic is still fairly heavy in Matagorda Bay, particularly along the Gulf Intracoastal Waterway, a portion of which passes just a few miles southeast of Halfmoon Reef. Because Halfmoon Reef still represents a hazard to boat traffic, after the removal of the Halfmoon Reef Lighthouse, a warning light was placed at the extreme southwestern tip of the reef.

CHAPTER 3

SETTLEMENT AND NAVIGATION HISTORY OF THE PROJECT AREA

Exploration and Settlement

The navigation history of the project area, and particularly the record of vessel losses, is the most critical aspect of regional history for the present study. Settlement history is closely tied to navigation history, so this chapter deals with both topics for the Matagorda Bay area and, where data are available, for the Halfmoon Reef vicinity specifically.

The Matagorda Bay area has been the locus of vessel activity since prehistoric times. Early historic accounts reveal that the aboriginal populations utilized dugout canoes in their travels around Matagorda Bay. However, little is known about prehistoric waterborne activity in the area and it is not until the arrival of Europeans that information on navigation of the bay becomes available. The coastal area around Matagorda Bay is characterized by barren and sandy beaches and islands and was considered inhospitable by the earliest European explorers. As a result, Europeans sporadically visited the area for almost two centuries before any attempts at settlement were made. In 1519, possibly the first of these European explorers, Alonso Alvarez de Pineda, explored and mapped the Gulf coast from Apalachicola to Yucatan (Weddle 1985). The map produced by de Pineda seems to show Matagorda Bay and gives it the name "*Bahia de Espiritu Santo*." In 1558, Guido de Lavazares sailed northward from San Juan de Ulua on the eastern coast of Mexico to "explore the ports and bays on the coast of Florida" (Weddle 1985:257). At 28^{o} 30" north latitude, Lavazares discovered a large bay that he named "*San Francisco,*" where he went ashore and claimed the land for the Spanish crown. Weddle (1985:258) suggests that this was Matagorda Bay.

The first attempt at settlement in the Matagorda Bay area was made by the French under Rene-Robert Cavalier, Sieur de La Salle. La Salle had reached the Gulf of Mexico from the north in 1682, by way of the Mississippi River. Returning to France, he successfully campaigned for permission to establish a French colony at the mouth of the Mississippi, hoping to control both the northern Gulf of Mexico and to establish a base from which to attack the Spanish. Of particular interest to the French were the Spanish silver mines of northern Mexico. In July 1684, La Salle, left France with four ships and about three hundred people, bound for the mouth of the Mississippi River. Whether as a result of less than reliable navigation or of secret alternative plans, in February 1685 La Salle and his company arrived instead at Pass Cavallo, the entrance to Matagorda Bay (Bruseth and Turner 2005:25; Stephens and Holmes 1989:Map 11).

One of the party's ships, the ketch *Saint-François*, loaded with tools and provisions, was lost to Spanish buccaneers on the journey and never reached Texas (Bruseth and Turner 2005:21). A second ship, the *l'Aimable*, was lost at Pass Cavallo on February 20, 1685. The *l'Aimable* was a vessel described as a "flute" of 250 to 300 tons carrying four cannons, 1,620 cannon balls, 400 grenades, 4,000 pounds of iron, 5,000 pounds of lead, most of the settler's remaining tools, a forge, a mill, cordage, boxes of arms, medicines, and baggage (Scurlock 1971:3). Accounts of the La Salle expedition record that the *l'Aimable* ran aground while trying to enter Matagorda Bay through Pass Cavallo. There are suggestions that the commander of the *l'Aimable*, Captain Aigron, intentionally ran his ship aground because of his belief that La Salle had missed the Mississippi River and taken the expedition too far to the west (Bruseth and Turner 2005:26). The *l'Aimable* reportedly grounded a "cannonshot" from shore and was exposed for several days before it finally broke up. The *l'Aimable* carried a large portion of the expedition's supplies and the French were able to recover only a portion of the cargo from the vessel (Weddle et al. 1987:108-111,226).

In March 1685, the *Le Joly*, the flagship of the expedition, returned to France; after a disagreement with La Salle, her captain refused to surrender the cannon and ammunition aboard, claiming to need the ballast (Stephens and Holmes 1989:Map 12). La Salle, left with only 180 of the original 300 or so colonist, sought a safe place for a permanent settlement farther inland. He eventually established a permanent camp, named Fort Saint Louis, on Garcitas Creek at the head of Lavaca Bay. Without the supplies from the *l'Aimable*, colonization was a struggle, which only became more difficult over time. In February 1686, while La Salle and an exploration party were away, the last remaining ship in his fleet, *La Belle*, described as a "*barque longue*," or light frigate, approximately 55 ft long, was lost along the inside of the Matagorda Peninsula during a squall. *La Belle*, laden with a considerable portion of the remaining supplies for the colony, had been anchored on the north shore of Matagorda Bay when the squall hit and she was driven to the southern side of the bay where she ran aground just off Matagorda Peninsula, not too far from present-day Greens Bayou. Only six of the 26 people aboard *La Belle* survived the storm and sinking and eventually made it back to the main settlement at Fort St. Louis (Bruseth and Turner 2005:5-6). In 1995, the wreck of *La Belle* was discovered in the shallow waters of southern Matagorda Bay, only a few miles southwest of Halfmoon Reef. In 1996 and 1997, the Texas Historical Commission, with funding from the state of Texas, undertook excavation of the wreck of *La Belle*. A large, sheet pile cofferdam was constructed around the wreck, the water was pumped from inside of the cofferdam and the ship was fully excavated and, ultimately, entirely removed. Thousands of seventeenth century French artifacts, including approximately 40 percent of the hull of *La Belle* were recovered. The wreck of *La Belle* represents possibly the most important historic shipwreck ever discovered in the United States and several publications on the history and archaeology of the ship have been produced, although many of the artifacts recovered are still being conserved and analyzed (Bruseth and Turner 2005; Weddle 2001).

In March 1687, La Salle was murdered by disaffected members of the expedition while attempting to find his way to the French settlements on the Great Lakes. The colonists he left behind on Lavaca Bay did not fare well, most succumbing to the depredations of Indians or disease. Receiving reports that French were within their territory, the Spanish sent out expeditions to locate the colony. Alonso de León, a Spaniard of Mexican birth serving as Governor of Coahuila, made several attempts to search for the French, as well as to colonize Texas, reaching only as far as the Rio Grande on his first expedition in 1686. On a second attempt the following year, de León crossed the Rio Grande and reached the area of Baffin Bay.

In 1688, de León heard rumors of a Frenchman living as a chieftain among the Indians. Mounting another expedition, he succeeded in finding and taking prisoner Jean Henri, an apparent deserter from La Salle's settlement. Henri served as a guide for the Spanish, who eventually discovered the abandoned and decrepit site of Fort St. Louis in April 1689. De León intended to establish a settlement at or near Fort St. Louis, but bad weather forced an end to his colonization effort and the expedition returned to Mexico. However, the following year, de Leon returned and burned what little remained of Fort St. Louis (Webb 1952:1:483-484, 798; 2:552). The Spanish, also, found the eight iron cannons that La Salle had removed from *l'Aimable* and placed at the fort. De León buried the cannons, intending to recover them at a later date (Bruseth and Turner 2005:28). De León and his party continued north and established the mission of San Francisco de los Tejas on the Neches River and also retrieved five remaining survivors of la Salle's colony who were being held by the Indians (Weddle et al. 1987:214-215).

The Spanish returned to the area in 1722 to establish a presidio and mission on the site of Fort Saint Louis; however this settlement was moved inland to the Guadalupe River in 1749 (Stephens and Holmes 1989:Map 12). By this time, the location of the buried cannons was forgotten and they were never recovered. However, in 1996 the cannons were discovered and subsequently excavated by the Texas Historical Commission. The discovery of the cannons ended a long-standing controversy about the location of Fort St. Louis (Bruseth and Turner 2005).

Another Spanish effort to find the French in 1686-1687 was undertaken by water. The Spanish pilot Juan Enríquez Barroto left an account of this venture. The expedition, under the command of Captain Martín de Rivas, departed from Veracruz traveling along the coast in two, large, shallow-draft sailing "*piragues*" (Weddle et al. 1987:129-203). On reaching Matagorda Bay in the spring of 1687, the Spaniards found the wrecks of *l'Aimable* and *La Belle*, but did not find the French colonists (Weddle et al. 1987:129-130). De Rivas' expedition did explore the area of present-day Matagorda Bay, which they named "*Lago de San Bernardo*."

In 1690, another expedition set out to find the French at Matagorda Bay. This expedition sailed from Vera Cruz in October aboard the frigate *Nuestra Señora de la Encarnación* under the command of Francisco de Llanos. Llanos and his party were to map San Bernardo Bay, or "*Espiritu Santo Bay*" as it was also known, and to determine the suitability of Fort St. Louis as the location for a future Spanish presidio. Manuel José de Cárdenas y Magaña, an engineer, was along to map the bay and surrounding area. The expedition traveled all around Matagorda Bay, explored up the Navidad and Lavaca rivers, and visited the site of Fort St. Louis collecting information for de Cárdenas' map (Weddle 2009).

Figure 3-1 presents a seventeenth-century Spanish map of the Matagorda Bay area, apparently the result of the Llanos-Cárdenas expedition and the various other expeditions sent out to find La Salle's settlement. This map indicates the extent of regional knowledge the Spanish had obtained of the area by the late 1600s. Principal features, such as Matagorda Bay ("K" called "*Lago de San Bernardo*"), Lavaca Bay ("J" called "*Lago Todos Santos*"), and Matagorda Peninsula are accurately depicted. Tres Palacios Bay, in the northeastern corner of Matagorda Bay, and the Colorado River ("M" called "*Rio de la Trinidad*"), are also accurately shown. The site of La Salle's settlement, Fort St. Louis, is identified as "Pueblo de los Franceses." This map even seems to show shallow water extending out from the area of Palacios Point, possibly a depiction of the large and obvious shoal produced by Halfmoon Reef.

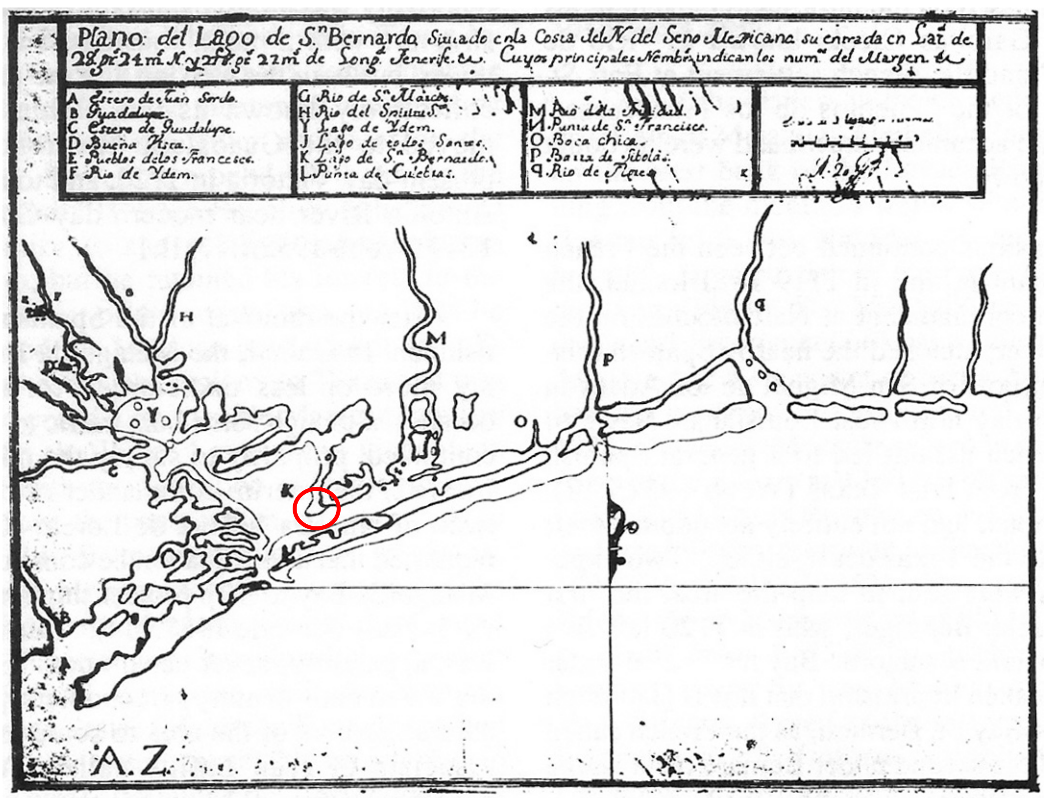

Figure 3-1. Late seventeenth century Spanish map of the Matagorda Bay area. The red circle denotes shallow water extending out from present-day Palacios Point, possibly a depiction of Halfmoon Reef (Weddle et al. 1987:Plate 10).

Despite the failure of the La Salle effort, the French did not entirely abandon their interest in the Texas coastal area. Two expeditions were sent to map the area, the first under Jean Béranger, who in 1720 left five men to hold Matagorda Bay for France under the mistaken impression that it was Galveston Bay, and a second under Bernard de la Harpe

(Gutherie 1988:114; Webb 1952:1:148). The Spanish responded in earnest to these and other French incursions with an expeditionary force of about 500 men led by the newly-appointed governor of Coahuila and Texas, the Marqués of San Miguel de Aguayo. Aguayo drove the French out of east Texas and established a presidio and mission near the French post of Natchitoches on the Red River in present-day northern Louisiana. He sent a secondary force to reoccupy the region of Matagorda Bay, now known to the Spanish as "*La Bahía del Espíritu Santo*." Aguayo established the presidio of Nuestra Señora de Loreta on the site of the old French Fort St. Louis (Garcitas Creek) and erected a nearby mission, Nuestra Señora del Espíritu Santo de Zúñiga. The mission and presidio, known collectively as "La Bahía," were moved in 1726 to the Guadalupe River and, in 1749, to the San Antonio River near modern-day Goliad (Webb 1952:1:17, 2:1).

The next Spaniard to visit the region seems to have been Ortíz Parrilla who, in September 1766, left the Rio Grande for La Bahía. He explored down the Guadalupe River and then across land to Matagorda Bay, perhaps reaching the bay in the area of present-day Indianola (Huson 1935:73). Between 1766 and 1785, the Spanish evidently explored and charted the much of this coastal area, because maps become more detailed during this period. However, these expeditions are not well known. During this time there seems to have been a small amount of boat traffic on Matagorda Bay, principally to supply the missions established in the area. In 1782, the interim commander of the presidio of Nuestra Senora de Loreto (Goliad) requested that a fortification be constructed at Matagorda Bay to help protect shipping from depredations by the Indians (Guthrie 1988:114). This request was apparently never acted upon, but it does indicate vessel activity on Matagorda Bay.

Between 1783 and 1786, the pilot José de Evía, at the request of Governor Bernardo de Gálvez, made a careful study of the Gulf coast. This resulted in the 1799 *Carta Esférica que Comprehende las Costas del Seno Mexicano Construida de Orden del Rey*, by Juan de Lángara of the Spanish Hydrographic Service. Evía examined and mapped Matagorda Bay (Hackett 1931:440-442).

Early Nineteenth Century Mexican and Anglo-Texan Period

The Matagorda Bay area remained quiet during the final decades of the eighteenth century, but in the early nineteenth century the bay was at least visited by the pirate community that made its headquarters on Galveston Island. In 1817, an associate of Jean Lafitte called d'Autrey entered the bay with a fleet of 13 ships, some of them prizes, possibly anchoring in the Saluria Bayou area at the eastern end of Matagorda Island. The pirates reportedly burned the ships they could not man and departed in the remaining vessels (Arnold 1982:24).

The Mexican War of Independence (1811-1821) had little direct impact on the Matagorda Bay area. In 1824, the Mexican Congress incorporated all of Texas into a new state, Coahuila y Texas, with the capital at Saltillo. States were granted the power to set immigration laws, and the state legislature of Coahuila y Texas, wishing to encourage settlement, established the *empresario* system, a decision that would have great and lasting impact on the settlement of the region. Empresarios were men given permits and land grants by the government to bring settlers into the region. The Americans, Moses Austin and his son, Stephen F. Austin, were the most important of the empresarios. In 1821, Stephen Austin was granted permission to explore Texas in a search for lands for colonists. Austin traveled along much of the Texas coast during this examination, and, ultimately, selected for his colony an area on the central Texas coast lying between the Lavaca and Brazos rivers, the western portion of which bordered on Matagorda Bay. Eventually, the state legislature of Coahuila y Texas granted no less than two dozen empresario contracts similar to Austin's and the settlement of Texas turned into a virtual land rush (Haley 1985:19).

The eastern portion of Matagorda Bay, roughly that area which is now in present-day Matagorda County, fell within the large and well-known Stephen F. Austin colony, while the western portion, now in Calhoun and Jackson counties, was part of a grant awarded to Martin de Leon (Stephens and Holmes 1989:Map 22). De Leon's colony, which included Irish and American, as well as Mexican, settlers, grew into the town Victoria on the Guadalupe River (Webb 1952:1:484).

The majority of American settlers in Texas in the 1820s were not actively interested in separation from Mexico, but they did want a greater say in their own government. A Mexican law enacted on April 6, 1830, supported military occupation of Texas, increased colonization by Mexicans and Europeans, particularly immigrants from Germany and Switzerland, while forbidding further settlers from the United States, and urged the establishment of more coastwise trade between Texas and Mexico. The American settlers, upset with the restriction on immigration from the United States, responded with the Convention of 1832, which met in San Felipe de Austin and aired various complaints against the Mexican government, and with the Second Convention in April 1833 that met to write a constitution for the (still Mexican) state of Texas. That spring, Stephen Austin traveled to Mexico City with hopes of negotiating the differences between the settlers and the government, but he was jailed by the authorities there, and did not return to Texas until September 1835 (Haley 1985:28-29).

Worried about the increasing Anglo-Texan colonist situation, in 1834 the Mexican government sent General Juan N. Almonte to Texas on a tour of inspection. As a result of Almonte’s trip, the Mexican government took several actions in an effort to control the spread of Anglo influence in Texas. None of these interventions by the Mexican government helped and in 1835 armed rebellion broke out. Ultimately, the Mexican army was defeated by Texans at the Battle of San Jacinto on April 21, 1836, and the Republic of Texas was founded.

Post Independence History, 1836-Present

With the end of hostilities, settlement and economic growth of the region again resumed. After independence in 1836, Matagorda County was organized as one of the first twenty-three counties in the Republic of Texas. The town of Matagorda, located at the mouth of the Colorado River in eastern Matagorda Bay, was designated as the county seat and a port of entry (Figure 3-2). In 1845, Texas was annexed as a state by the United States. Subsequently, Matagorda County developed into an agricultural and livestock raising region. Cotton became the principal crop, although a considerable amount of sugarcane was grown. Between 1850 and 1855, large numbers of black slaves were brought into the county, principally by slaveholders from Georgia, South Carolina, and Virginia, to work on plantations in the bottomlands of the Colorado River and Caney Creek. The area between the towns of Matagorda and Brazoria, situated forty miles to the east, came to be known as "Old Caney" and was noted for its production of cotton and sugar. By 1850, there were 2,124 people living in Matagorda County, including 913 whites, 1,208 slaves, and 3 free blacks (Kleiner 2009a).

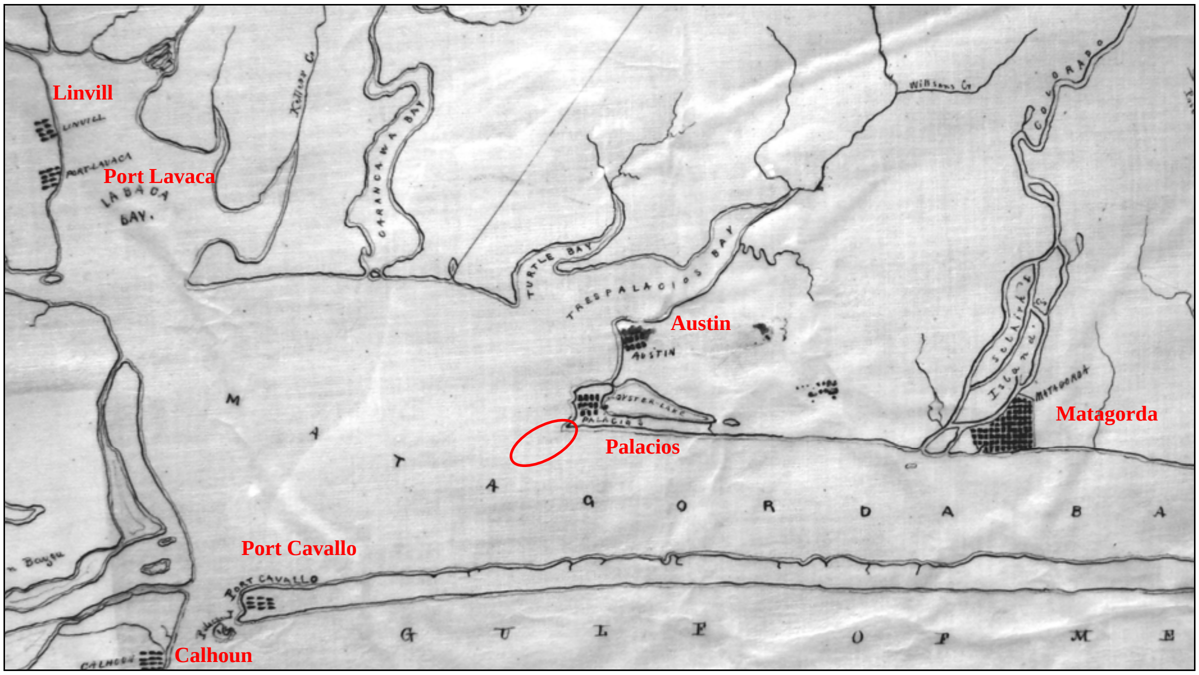

Figure 3-2. **Detail of an 1846 map showing towns established or planned around Matagorda Bay. The town of Matagorda, at the mouth of the Colorado River in the lower right of the figure, was the earliest town established on the bay. The location of Halfmoon Reef is circled in red (Board of Engineers 1846).**

In a special election held in early 1861, the county overwhelming supported secession from the Union. Several Confederate camps and garrisons were established in the area. These included DeCrow's Battery on the southwestern tip of Matagorda Peninsula to guard the east channel to Matagorda Bay and Fort Caney, at the mouth of Caney Creek. In 1861 and 1862, the Federal Navy established a blockade off the Gulf coast, in an effort to stop vessel traffic into and out of the Confederacy. The Confederate gunboat *John H. Carr* was anchored at Matagorda, along with the *Lizzie Lake*, a stern wheeler, and a transport called the *Lucy Guinn*.

Few Federal land forces entered Matagorda County during the war, but Matagorda Bay saw a considerable amount of military activity. At the start of the war, Pass Cavallo was defended by Fort Esperanza and its associated earthworks and batteries located at the eastern end of Matagorda Island near Saluria (Arnold 1982:29). Action in the area began fairly early in the war, when Confederate forces seized the steamer *Star of the West* at Indianola on April 19, 1861. On April 25, the Federal troops stationed at Saluria surrendered (Naval History Division 1971:1:2-9; Long 1971:65).

On October 25, 1862, Union ships forced the entrance at Pass Cavallo, and the Confederate forces abandoned Fort Esperanza rather than be cut off from Indianola (Arnold 1982:29). The following day, Indianola was captured by Union gunboats. This force, led by the *U.S.S. Westfield* and *Clifton,* continued into Lavaca Bay where it spent October 31 and November 1 unsuccessfully bombarding Port Lavaca. The *Westfield* and *Clifton* had previously captured the schooner *Lecompte*, a Confederate vessel operating in Matagorda Bay (Naval History Division 1971:6:261; Long 1971:282-283). On November 20, Confederates captured a boat crew from the U.S. mortar schooner *Henry James* when the men went ashore near Matagorda to secure fresh beef (Naval History Division 1971:2:110).

The Federal incursion of 1862 was not permanent; Union forces left the bay and Fort Esperanza was reoccupied and held by Confederate forces for most of 1863. During this time, one Confederate officer, a Captain Bradbury whose family operated a foundry in Port Lavaca, anchored eighteen mines (which he had probably built himself) across the channel through Pass Cavallo. These did seem to serve as a deterrent to Union vessels (Arnold 1982:29; Perry 1965:46).

The Union established a naval blockade along the Texas coast early in the war, but the Matagorda Bay area was a center for blockade-running activities and several blockaders were captured in the vicinity. On April 21, 1863, the *U.S.S. Rachel Seaman* captured the schooner *Nymph* attempting to run the blockade into Pass Cavallo with a cargo of coffee, rice, shoes, and medicine. The sloop *Blazer,* captured at Pass Cavallo by the *U.S.S. Brooklyn* on May 27, was outward-bound with a cargo of cotton. On June 23, the British blockade-runner *Sea Drift,* with a cargo of gunpowder, lead, and drugs, was taken near Matagorda Island by the *U.S.S. Itasca.* Another British blockade-runner, the schooner *Florrie,* was seized with a cargo of medicine, wine, and saddles, on October 1 near Matagorda by the *U.S.S. Bermuda.* The schooner *Reserve* was captured off Pass Cavallo on October 25 by the *U.S.S. Kittatinny* (Naval History Division 1971:3:70, 87, 97, 143, 149).

In November 1863, Union forces under General Nathaniel Banks, moving up the coast from the Corpus Christi area, arrived at Matagorda Island and attacked Fort Esperanza (Long 1971:436). The Confederate forces once again abandoned the fort, this time blowing up the magazines and burning Saluria, which was never rebuilt (Arnold 1982:29; Naval History Division 1971:3:159; Webb 1952:2:537). In April 1864, the *U.S.S. Estrella* and two U.S. Army steamers, the *Zephyr* and the *Warrior,* made a reconnaissance expedition up Matagorda Bay, sighting and firing upon two Confederate vessels near Matagorda Reef; however, the quarry escaped. The Union ships landed troops on the upper bay, captured two small schooners, and returned to Pass Cavallo (Naval History Division 1971:4:42).

On November 30, 1864, a British blockade-runner, the schooner *Carrie Mair,* was captured off Pass Cavallo by the U.S.S. *Itasca*. A few days later, on December 8, the *Itasca* made another capture, the sloop *Mary Ann*. Union personnel removed the cargo of cotton from the sloop and destroyed her (Naval History Division 1971:4:116). On February 18, 1865, a boat crew from the U.S.S. *Pinola* boarded the schooner *Anna Dale,* which had been armed and fitted out at Pass Cavallo as a cruiser by the Confederates. The prize crew accidentally grounded her and set her afire to prevent recapture (Naval History Division 1971:5:45).

The Union's blockade of the Texas coast restricted foreign cotton trade, crippled the commerce of the port at Matagorda, and severely damaged the local economy. It took many years for the region to recover from the effects of the Civil War. Many planters left the region; however, cattle ranching grew in prominence. Beef packing plants and a hide and tallow factory were established near the coast prior to 1870. Cotton production did revive after 1870, but the port of Matagorda was no longer a commercially viable port, losing its trade to the towns of Port Lavaca and Indianola on the western side of Matagorda Bay. The 1890s saw some revival in the county's agricultural economy. The inland community of Bay City was founded in 1894 and it replaced Matagorda as the county seat. In 1902, the town of Palacios on Tres Palacios Bay was founded and became a shrimping and oystering center. After 1899, rice became an important agricultural product and rice plantations sprang up along the railroad line running north of Bay City. By 1920, 38,000 acres in the county were planted in rice, and more than 46,000 acres were planted in cotton. Additionally, tenants became increasingly numerous, and by 1930 about 60 percent of the farms in the county were operated by tenant farmers (Kleiner 2009a).
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Massive log jams had blocked the lower Colorado River since the early years of Anglo settlement and impeded travel on the river. However, in the late 1920s, efforts to remove the log jams on the lower Colorado were finally successful. But, by this time railroads had extended throughout the county, and the importance of the Colorado River and nearby Caney Creek as routes of transportation had been negated. In 1901, oil and gas were discovered at Big Hill, and within a few years several oil fields were in production. Shortly afterwards, sulphur began to be mined. Cotton cultivation continued to decline through the first several decades of the twentieth century, as the oil, gas, and sulphur industries expanded and these have continued to be important to the present day. The fishing industry, which began in the final decade of the nineteenth century, became important by the 1930s, particularly with improvements in gear used for catching shrimp. Matagorda Bay developed into an important shrimping and oystering local and it remains so today (Kleiner 2009a).

The Town of Matagorda

The first Anglo settlers to the Austin Colony arrived aboard the schooner *Only Son* in 1822. In 1827, Stephen Austin received permission to build a town at the mouth of the Colorado River to protect incoming settlers. The result was the town of Matagorda, the earliest settlement on Matagorda Bay (see Figure 3-2). Elias R. Wightman, Hosea H. League, James E. B. Austin, and partners Thomas M. Duke and William Selkirk each took a one-quarter interest in the townsite. Elias Wightman, after laying out the town in 1827, gathered approximately 50 to 60 colonists, mostly from New York, for the community (Kleiner 2009b). From the beginning, cotton was an important crop for the settlers and a gin was in operation in the area as early as 1825. Matagorda was incorporated in 1830 and became an official Mexican Port of Entry in 1831. By 1832, the town had some 1,400 residents (Hansen 1969:571; Webb 1952:2:157).

Matagorda was an important and commercially active town during the Mexican period and under the Republic of Texas. Beginning in the 1830s, the town, then the closest Texas port city to New Orleans, served as an entry point for immigrants arriving both overland and by sea. Ships sailed to the town from New Orleans with supplies for the Texas colony. Citizens from Matagorda were involved in meetings leading to the Texas Revolution

(1835-1836), and several were among those who signed the Goliad Declaration of Independence in 1835. The town was deserted during the "Runaway Scrape," when many Texans fled their homes as Mexican General Antonio López de Santa Anna began his attempted conquest of Texas in February 1836 (Kleiner 2009b). Subsequent to the defeat of Santa Anna's army at the Battle of San Jacinto on April 21, 1836, the Republic of Texas was founded.

After the Revolution and during the period of the Republic of Texas (1836-1845), Matagorda grew in importance as a shipping point. In 1836, Matagorda was established as a port of entry by the new Republic of Texas. George W. Collinsworth was appointed the first Collector of customs for the District of Matagorda (Matagorda County Historical Commission 1986:122). The Collector was responsible for collecting tariffs on imported and exported goods, and on warehouse and dock rentals, harbor entrance fees and clearance fees. In 1840, a customhouse was finally built in Matagorda (Matagorda County Historical Commission 1986:121, 124). The importance of Matagorda is expressed in President Martin Van Buren's nomination of Senator John Monges of Delaware to serve as United States consul in Matagorda in 1838. In December 1845, the U. S. Congress established the entirety of the new state of Texas as a single custom collection district with Galveston as the port of entry. Matagorda and several other small ports were named "ports of delivery." In January 1846, President James K. Polk nominated Galen Hodges as the first United States "Surveyor and Inspector" of customs at Matagorda. In June 1846, citizens of Matagorda petitioned Congress to establish a new collection district with Matagorda as the port of entry. In 1847, Congress did divide Texas into two collection districts, but the town of Saluria was named the port of entry for the Southern District, into which the town of Matagorda fell. James H. Selkirk constructed one of the first dock and warehouse businesses in the town, and by 1840, wagon freight service was available on a more or less regularly scheduled basis between Matagorda and Austin (Hogan 1946:67). Matagorda was the site of a district court under the Republic of Texas and served as county seat from 1837 to 1894 (Hogan 1946:258). A large sugar mill, a grist mill, and a beef packing plant were located there before the Civil War, and a hide and tallow factory by 1870.

Although Matagorda was the earliest of the towns founded on Matagorda Bay and a critical port during the earliest period of settlement, it was somewhat inaccessible for ships. Vessels sailing to the port had to enter Matagorda Bay through Pass Cavallo, located over 20 miles to the west, and then they had to travel across the shallow bay along the north side of Matagorda Peninsula to reach the town at the mouth of the Colorado River (see Figure 3-2). This route passed by several shoals and reefs, including Halfmoon Reef, Shell Island Reef, and, most particularly, Dog Island Reef, all of which represented hazards to navigation. Reports and maps from the nineteenth century indicate that water depths leading to the town were only 3 to 4 ft (Figure 3-3). This meant that only very shallow draft vessels could reach the town, or goods had to be lightered from vessels anchored in the bay in deeper water. William Bollaert, writing in 1842, described the difficulties in reaching the customhouse in Matagorda:

> Got under way and in making for the custom house to present the ship's papers, got aground. What the reason can be I do not know why a custom house should be placed where it is, so much out of the way and moreover dangerous to get at. The proper position would be at Decrows Point where

there is deep water for anchorage and every facility of getting to it, and in a direct course to the town of Matagorda [in Matagorda County Historical Commission 1986:122].

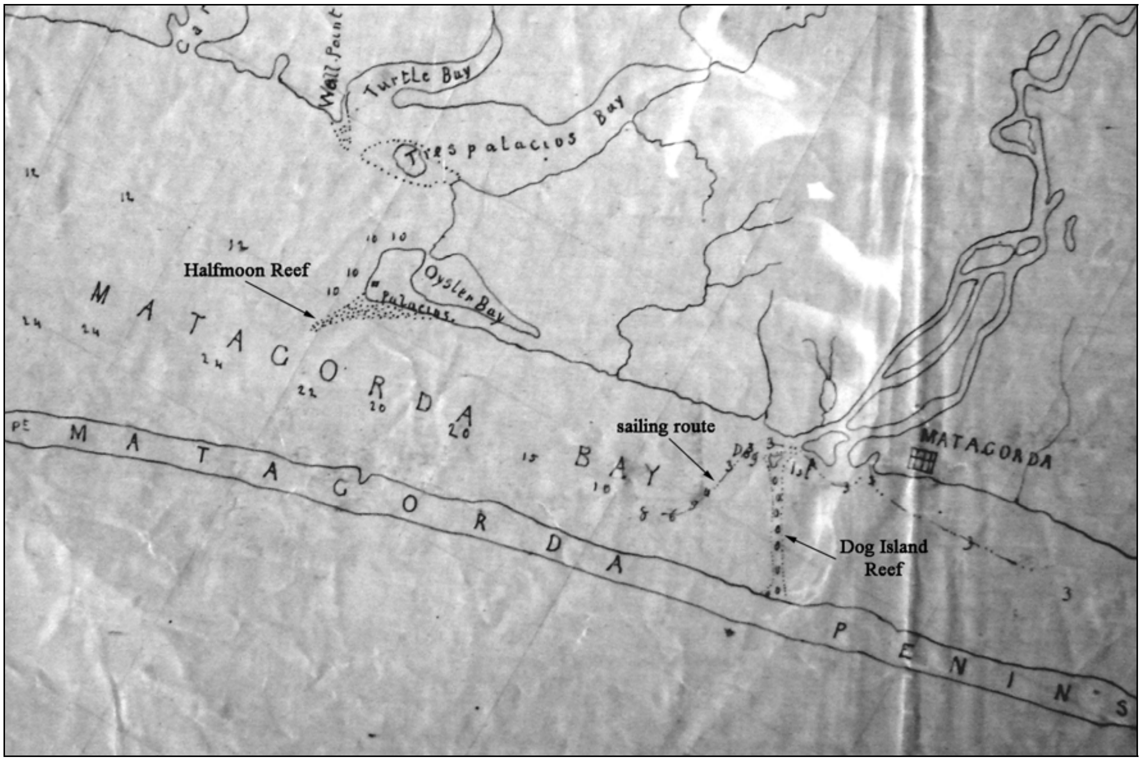

Figure 3-3. Detail of an 1846 map of Matagorda Bay showing the water depths along the sailing route to the town of Matagorda (Scarritt and Meade 1846).

The most common types of vessels serving Matagorda during the first half of the nineteenth century were shallow-draft sloops, schooners, and steamboats. In most instances, we know very little about these vessels other than their names. Among the ships sailing to Matagorda during the early years of the Austin Colony were the schooners *Only Son*, *Lively*, and *John Motley*. In 1822, while sailing from New Orleans to the mouth of the Colorado River, the *Lively* was lost off the west end of Galveston Island (Matagorda County Historical Commission 1986:28). Later, in the 1830s, schooners such as the *Marmion* and *Martha* are mentioned. In March 1838, the schooner *Pocomoke* arrived at Matagorda from New Orleans with families intending to settle in Texas. In 1841, the schooner *Black Jack* was issued a license at Matagorda. In 1837, two steamers operated regularly on Matagorda Bay. These were the *Amite* and the *Convoy* (Matagorda County Historical Commission 1986:121-124).

Many of the vessels traveling to Texas in the first half of the nineteenth century were issued register or enrollment documents in New Orleans and, fortunately, these records are extant and provide some descriptive information on these early Texas vessels. The *John Motley*, which was sailing to Texas in the 1820s, was a small 52-ft-long, two-masted schooner built at Blakely, Alabama, in 1821. In June 1822, the *John Motley* was issued a register at New Orleans, a document required for vessels sailing to foreign ports, which Texas was at the time. The *John Motley* had a depth of hull of only 3 ft, 9 inches, probably shallow enough to travel the route across Matagorda Bay to the mouth of the Colorado River (Work Projects Administration [WPA] 1942:2:86). The *Martha* was a 69-ft, two-masted schooner built at Waterville, Maine, in 1829. The *Martha* obviously traded with Texas because a register issued to the schooner at New Orleans in August 1834 contains a notation that the vessel "wrecked at Port of Matagorda, Feb. 11, 1837, and sold." Exactly where this loss occurred is unknown, but it appears to have been at or near the town in eastern Matagorda Bay. The *Martha* was apparently raised and repaired after the wreck, because the schooner was issued another register document in New Orleans in April 1837 (WPA 1942:3:136). The *Pocomoke* was a two-masted, 77 ft, 6 inch-long schooner built in Worcester County, Maryland, in 1837. This schooner was issued a temporary register in New Orleans on March 12, 1838, apparently specifically to permit the ship to sail to Texas, still a foreign country, with its group of settlers. With a depth of hull of 6 ft, 6 in, the *Pocomoke* would have had a difficult time reaching Matagorda and may have had to unload in deeper water out in Matagorda Bay (WPA 1942:3:176). The schooner *Black Jack*, which was issued a license at Matagorda in 1841, is believed to be the small, 32 ft, 7 inch-long schooner built in Louisville, Kentucky, in 1837. This tiny schooner was sailing on the Gulf coast, probably to Texas, in 1838, the year she was issued a register in New Orleans. Sometime after this, the *Black Jack* seems to have shifted her homeport to Matagorda. With a depth of hull of only 3 ft, the *Black Jack* was ideally suited to sail the shallow waters of Matagorda Bay and surrounding waters (WPA 1942:3:25).

In 1837, the steamboat *Amite* was owned by Daniel G. Conner of Texas who obtained a register for the vessel at Matagorda from George Collinsworth, the Collector of Customs at the port. The *Amite* measured 68 ft long and 4 ft deep and was built in Pittsburg, Pennsylvania, in 1836 (Matagorda County Historical Commission 1986:123). The *Amite's* shallow draft was ideally suited for the Texas coastal bays. The steamer *Convoy*, built in Cincinnati, Ohio, in 1837, was a much larger vessel, measuring almost 161 ft long and 8 ft, 6 inches deep (WPA 1942:3:49). With such a deep hull, it is unlikely that the *Convoy* could actually reach the town of Matagorda or the mouth of the Colorado River. Another early steamboat associated with Matagorda was the *Delta*. The *Delta* was a small 78 ft-long, 3 ft, 6 inch-deep steamboat built in Batesville, Arkansas. In 1847, the *Delta* was enrolled at Matagorda and her owner and master was Thomas Decrau, a resident of the town (WPA 1942:4:71).

In addition to the problems involved in reaching the town of Matagorda, vessels traveling on the Colorado River itself were also hampered. Transport on the river was impeded by log rafts and jams produced by the river's slow moving current. By 1836, the log rafts and jams that had blocked the river mouth had been cleared to permit access to the town. But, log jams gradually grew upstream so that in 1839 river was navigable only ten miles or so above its mouth. By 1858, the blockage had become so bad that state funds were appropriated for the construction of a new channel around the raft. Despite these and other efforts to clear the raft, it was never entirely removed during the nineteenth century, even though shallow-draught vessels were at times able to ascend the Colorado to Austin. More commonly, to get around the raft, teamsters unloaded vessels above the raft and carried the cargo down to other teams that loaded it on other boats for shipment to Galveston and other Gulf ports (Comer and Kleiner 2009). The Colorado River ceased to be an important factor in transportation shortly after the Civil War, as other towns established around the bay were more accessible by sea-going vessels. As a result, the commercial importance of Matagorda declined as others rose (Webb 1952:2:157-158).

During the Civil War, Matagorda was one of several Texas ports used by blockade runners to transport cotton out of the state, and bring needed materiel and supplies in. The Union navy blockaded this portion of the Gulf by 1862, interrupting this surreptitious trade. The town was fired upon by Union forces, but never occupied. After the war, agriculture in the region declined, bringing an end to the plantation economy and Matagorda continued to decline. However, ranching grew and the expanding beef industry led to the establishment of the Stabler Patent Beef Packing Plant in 1866 and a hide and tallow factory in 1870. Matagorda was periodically damaged by hurricanes, including those in 1875, 1886, and 1894. These storms, in conjunction with the decreased importance of Matagorda as a commercial center, were partly responsible for shifting the county seat to Bay City in 1894 (Kleiner 2009b).

The removal of the logjam on the Colorado River in the 1920s, led to the development of a delta that reached across Matagorda Bay as far as Matagorda Peninsula by 1936. That year a channel was dredged through the new delta from the Gulf of Mexico to the town of Matagorda, thus forcing the river to deposit its sediment directly into the Gulf. With removal of the raft, the community of Matagorda, formerly a major Texas port, gradually became landlocked (Comer and Kleiner 2009).

The Cane Belt Railroad reached the town around 1901 and the community was on the Gulf Intracoastal Waterway by 1914. In the late nineteenth century, oystering in Matagorda Bay began to develop into an important enterprise. The first oyster "claim" in Matagorda Bay was made in the late nineteenth century by Billie Sterling and Charlie Baker and the first fish and oyster house in Matagorda was established in the 1880s by a Mr. Lorina. Oystering as an important commercial enterprise in Matagorda began with the arrival of the railroad and by 1911 the firm of Lorina and Thornhill marketed 25,000 barrels of oysters, and 242,300 pounds of fish (Marr 1928:228-230). Beginning in the 1920s, oil wells and the local operations of the Texas Gulf Sulphur Company provided employment and drew new residents to the area. In 1942, a hurricane caused major damage and prompted the construction of a protective levee around the town; lessening the effects of later hurricanes. After World War II Matagorda became a tourist and resort community and these have remained important to the present (Kleiner 2009b).

Other Towns Around Matagorda Bay

A series of other communities sprang up around Matagorda Bay during the nineteenth century. These included Linnville and Lavaca (present Port Lavaca), located on Lavaca Bay, and Indianola, located on the western shore of Matagorda Bay. By the 1850s, Port Lavaca and, especially, Indianola, were becoming the important ports on Matagorda Bay, ultimately replacing the town of Matagorda in terms of commercial activity. These towns are some distance from the Halfmoon Reef project area and are not discussed here. Discussions on their histories can be found in Pearson et al. 1993 and Malsh 1988.

Figure 3-2, presented above, is a detail of an 1846 map of Matagorda Bay showing the principal towns on the bay at the time, in addition to several communities that were planned, but never fully developed, including two on Palacios Point in the vicinity of Halfmoon Reef. The towns of Linnville ("Linvill" on the map shown as Figure 3-2) and Port Lavaca, both established before 1840, are located on the western shore of Lavaca Bay, and Matagorda, the oldest community on the bay is shown at the mouth of the Colorado River. Two communities are shown on Palacios Point, near Halfmoon Reef. These are Austin and Palacios, both of which were planned, but neither of which ever amounted to much. Austin appears to have never been truly established, although in later years a hotel was constructed at the location, leading to the present name for this location, Hotel Point. Palacios or Palacios Point, as it was commonly called, was founded in 1838 by John Duncan and R. R. Royall. That year, the two men placed an advertisement in the *Matagorda Bulletin,* stating:

> This town is situated upon "Half Moon Point," formed by the junctions of the Bays of Matagorda and Trespalacios—the latter of which forms a harbour of superior excellence, affording a sufficient depth of water contiguous to the shore for the largest vessels which can enter the Matagorda Bay to lay in security alongside of a wharf and discharge and receive cargoes at pleasure. . . . The proprietors with a thorough knowledge of the whole sea coast, unhesitatingly state it as their firm conviction that this place will become the great commercial emporium of Texas [in Griffin 1986:390].

Palacios Point did not live up to the promises of the developers, although a townsite was laid out, a few lots sold, and a few houses built. Apparently, a wharf was constructed, because cattle were occasionally shipped from the town aboard Morgan Line steamers. Ultimately, a conflict arose over the title to the land, and it failed to develop. The hurricane of 1875 forced abandonment of the townsite and shortly after the remaining houses were torn down (Griffin 1986:390).

The Town of Palacios

The town of Palacios was established on Tres Palacios Bay in 1902 by the Palacios City Townsite Company, a subsidiary of the Texas Rice Development Company, the owners of the land. Lots for the town were surveyed that year by J. F. Hervey. By 1903, the Southern Pacific Railroad extended its line to Palacios and a hotel was built. This was shortly followed by construction of a large T-head pier and pavilion extending into the bay (Matagorda County Historical Commission 1986:367).

The town developed into a tourist community and, also, a fishing and oystering center. In 1903, the first packing company was opened. By 1915, the town had 2,000 residents and numerous businesses, including two banks, newspaper, mercantile and groceries, a telephone company, machine shops, a livery and transfer, dairy, tailor drug stores, restaurants, feed store, broom factory, and planning mill.

The oyster business became the most important in the town. By 1915, there was a fleet of about 30 oyster boats operating out of Palacios, collecting oysters from the numerous reefs in Matagorda Bay, of which Halfmoon Reef was one of the most important (Figure 3-4). Several docks and oyster processing facilities were built on the bay on the south side of town. The town was damaged by several hurricanes over the years. In 1915, a hurricane washed away fish and oyster wharves and the dock and pavilion.

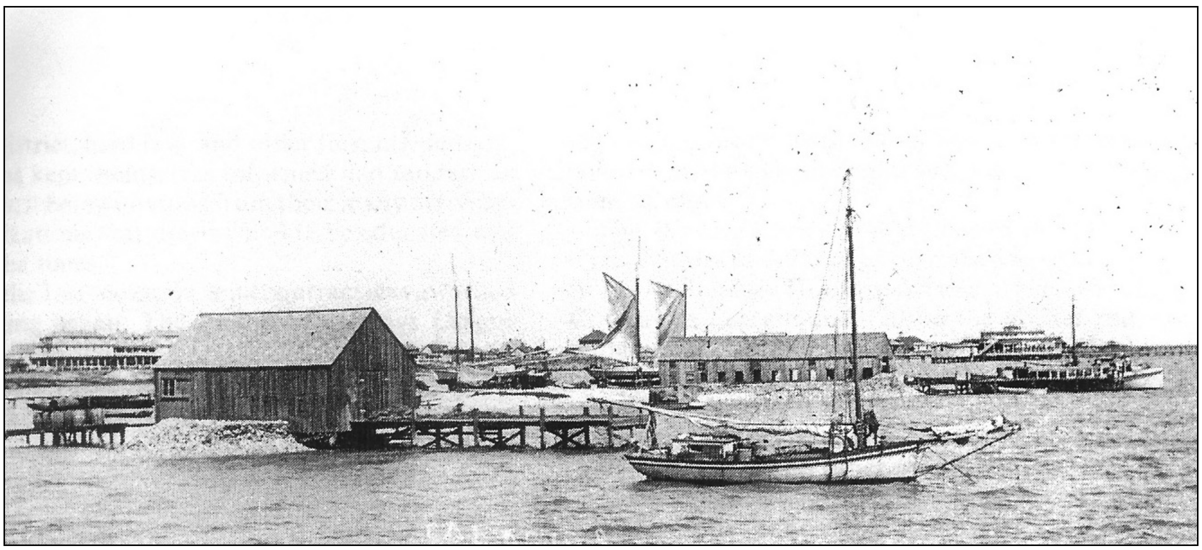

Figure 3-4. Oyster houses and boats at Palacios circa 1913. The small, single-masted sailing vessels were the type involved in oystering and fishing on and around Halfmoon Reef in the late nineteenth and early twentieth centuries (Matagorda County Historical Commission 1986:371).

The early vessels involved in oystering were sailing sloops and luggers, with oysters collected by tonging. Fish were caught with seines. Marr (1928:232) presents a list of 21 fishing boats operating out of Palacios in 1912, with names like *Fannie*, *Zargosa*, *Motor Go* and *Eagle*. These included sailing, as well as motorized vessels. Most of these boats were involved in oystering; only a few worked in fishing. By the late 1920s, Palacios was the principal oyster port in Texas, shipping around 25,000 barrels of oysters annually, as well as 100,000 pounds of fish (Marr 1928:233). The shrimping industry in Matagorda Bay did not begin until about 1920, with the arrival of Fred Bates, Sr. from Mississippi, who seems to have initiated the business (Ted Bates, Jr., personal communication 2009). As oystering declined, shrimping became the most important fishing activity in Palacios. In the 1920s, most of the sailboats working in the bay were converted to motor power and by 1935 all of the fishing boats working out of Palacios were motor boats. By 1938, the Crawford Cannery in Palacios was processing from 40,000 to 60,000 pounds of shrimp a day, and on some days up to 100,000 pounds. Shrimp were initially sold fresh or salted for shipment, but by the 1940s they were being frozen for market. Crabbing as an industry did not begin until after World War II.

In the 1950s, larger shrimp boats began to be built to catch brown shrimp in the open waters of the Gulf of Mexico. Ultimately two types of shrimp trawlers were developed in the region; small "Bay boats" that worked in the shallow-water bays and larger "Gulf boats" that worked offshore and often remained at sea for several days at a time. In the mid-1970s, several Vietnamese families settled in Palacios and became involved in the shrimping business. By the 1990s, Vietnamese families operated five fish houses in Palacios and owned or operated 60 Gulf boats and 45 Bay boats working out of the town (Palacios Museum 2009). In 1990, the marine and seafood-processing industry was the largest industry in the Palacios area. Several seafood-processing plants shipped fresh and frozen shrimp and crabmeat nationwide. Among these facilities is the largest blue-crab-processing plant in the United States. Agriculture, livestock raising, and petroleum and natural gas are also a vital part of the Palacios area economy, and in 1990 aquaculture was the newest developing industry there (Cox 1986:430-432; Griffin 2009).

Shipwrecks Recorded in the Vicinity of the Project Area

The historical record indicates a modest level of shipping activity in the vicinity of Halfmoon Reef since the nineteenth century, specifically in relation to the towns of Matagorda and, later, Palacios. However, specific accounts of shipwrecks in the area are rare. Although a number of shipwrecks have been reported in Matagorda Bay as a whole, very few have been physically located and identified as such. Pearson and Hudson (1990:17), for example, provide a list of 27 named and ten unknown vessels lost in the vicinity of the Matagorda Ship Channel, several miles west of Halfmoon Reef. Many of these named losses occurred at or near Indianola and the remains of several historic vessels have been reported at the old port town. In addition, various historical accounts report a large number of sinkings in Matagorda Bay, but losses of most of these vessels is imprecisely reported such that their exact location is unknown. For example, an early incident in Matagorda Bay that is not well documented is the 1817 loss of a small fleet of possibly Spanish vessels at the hands of Galveston pirates (Arnold 1982:24; Scurlock 1971:4). Also, many boats were destroyed in the great hurricane that struck Matagorda Bay on September 16, 1875, although where most of the vessels actually sank is unknown. Losses also occurred in the storm of 1886, including the fishing boat *Buffalo Bill* and the schooner *Flower of France* (Scurlock 1971:4), but not on the same scale as the 1875 hurricane.

Texas archaeological site data provided online on the Texas Archeological Sites Atlas (Texas Historical Commission 2009) lists several shipwrecks in the vicinity of Halfmoon Reef, but only one of these is identified. This is the seventeenth century wreck of the French vessel *La Belle*. In 1995, the wreck of *La Belle*, assigned site number 41MG86, was discovered in the shallow waters of southern Matagorda Bay, about 7.1 km southwest of Halfmoon Reef. In 1996 and 1997, the Texas Historical Commission undertook excavation of the wreck site. As noted previously, the wreck of *La Belle* represents possibly the most important shipwreck ever discovered in the United States (Bruseth and Turner 2005; Weddle 2001).

The other shipwrecks identified on the Texas Archeological Sites Atlas near Halfmoon Reef all appear to be derived from United States Coast and Geodetic Survey (USCGS) and National Oceanic and Atmospheric Administration (NOAA) navigation charts. None of these wrecks lie on or immediately adjacent to Halfmoon Reef, or within the project area, but they are in the vicinity. These include the following:

1. THC Shipwreck No. 1236: an unidentified wreck located about 4.5 km (2.89 miles) north of Halfmoon Reef.

2. THC Shipwreck No. 935: an unidentified wreck located about 5 km west of the southwestern tip of Halfmoon Reef

3. THC Shipwreck No. 936: an unidentified wreck located adjacent to Shipwreck No. 935.

4. THC Shipwreck Nos. 879 and 934: two unidentified wrecks located about 4.3 km south of Halfmoon Reef and south of the Gulf Intracoastal Waterway.

5. THC Shipwreck No. 1486: an unidentified wreck located about 10.5 km south of Halfmoon Reef on the north side of Matagorda Peninsula.

The reported shipwreck closest to Halfmoon Reef is depicted on recent editions of NOAA navigation chart No. 11317 entitled *Matagorda Bay*. This wreck is not listed in the THC files and the evidence examined in this study suggests it is a recent wreck. An examination of editions of the *Matagorda Bay* chart dating back to the 1930s reveals that this wreck is first shown on the 1998 edition of Chart No. 11317, and it appears on editions up through 2009. The wreck is situated due south of Palacios Point and only about 1 km east of Halfmoon Reef, at the following geographic coordinates: Latitude = 28 degrees 33’ 47” North; Longitude= 96 degrees 13’, 12” West. This location falls well outside of the present project area. These NOAA charts, also, show that a warning light was placed at the wreck site, suggesting it was considered a hazard to navigation. NOAA’s Automated Wreck and Obstruction Information System (AWOIS) was queried to see if that system included a record for this wreck. It turns out that this wreck is listed as AWOIS Record No. 8727 and is identified as an unknown vessel with an unknown date of loss. The “History” section of the AWOIS record notes that the wreck was first reported in 1991-1992, suggesting it was lost about that time. In June 1993, the United States Coast Guard contacted the Corps of Engineers about removal of the wreck and reported that a temporary buoy would be retained on the site until the removal of the wreck was confirmed. All of the available information indicates that this wreck is recent and not historically significant. Further, as noted, the wreck falls outside of the present project area.

The Halfmoon Reef Lighthouse

Although no historic shipwrecks are reported to exist on Halfmoon Reef, one structure of historical importance did stand on the reef from 1858 to 1943. This was the Halfmoon Reef Lighthouse (or the "Half Moon Reef Light House" or "Half Moon Reef Light Station," as it was often referred to in the nineteenth century) that was situated near the southwestern end of the reef (Figure 3-5). T. L. Baker (1991) provides a fairly detailed history of the Halfmoon Reef Lighthouse and his information has been supplemented with additional primary documents examined in the National Archives and other secondary sources in the following discussions.

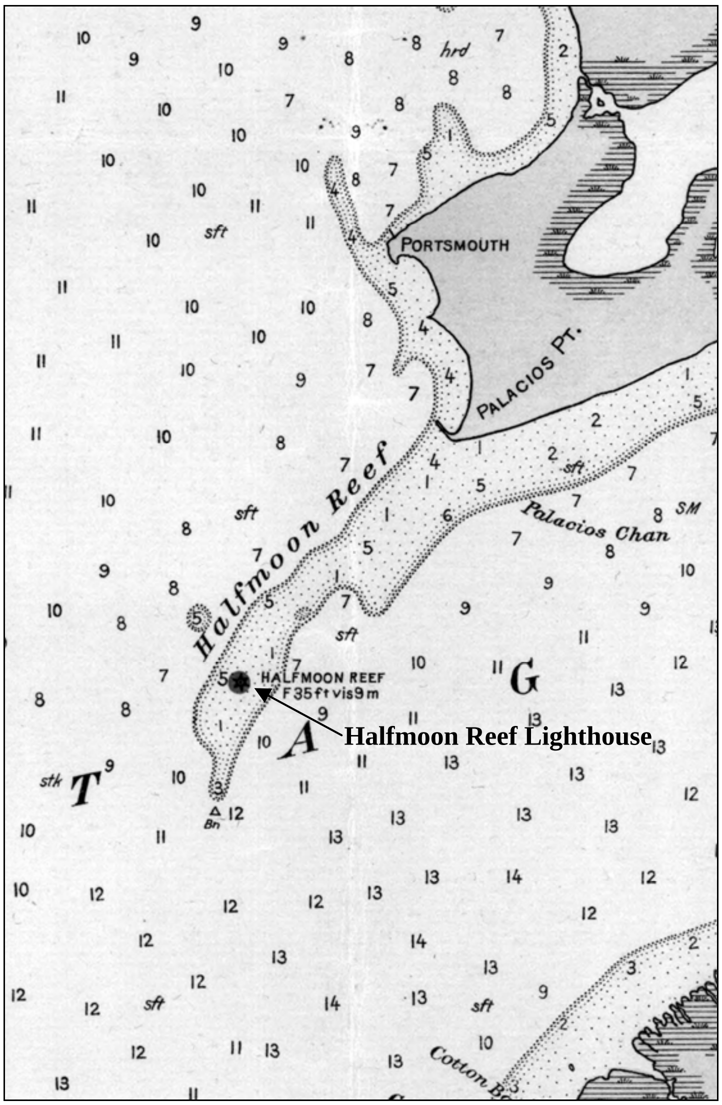

Figure 3-5. The Halfmoon Reef Lighthouse shown on a detail of the 1934 United States Coast and Geodetic Survey navigation chart entitled *Matagorda Bay and Approaches* (USCGS 1934).

In 1852, a lighthouse was erected at Pass Cavallo to help guide ships into Matagorda Bay and, specifically, to the then growing port town of Indianola. Subsequently, requests were made by the citizens of Indianola for additional lights to mark channels and obstacles in the bay itself. Complying with these demands, the Lighthouse Board successfully petitioned Congress in 1854 for funds to construct a light on the southern tip of Halfmoon Reef. On August 3, 1854, the United States Congress authorized $10,000 for the construction of this lighthouse (T. L. Baker 1991:34). The lighthouse was considered important for navigation in Matagorda Bay, particularly for ships sailing to and from the port town of Matagorda at the mouth of the Colorado River. However, the need for the lighthouse may have been exaggerated because by this time Matagorda was declining in importance as a commercial port, being replaced by other towns around Matagorda Bay, particularly Indianola and Lavaca. Both of these towns are located on the western side of Matagorda Bay, where Halfmoon Reef was of little threat to navigation.

The Halfmoon Reef Lighthouse was one of the early lighthouses in Texas. The first two lighthouses erected by the United States government in the state were at Bolivar Point, marking the entrance to Galveston Bay; and at Pass Cavallo, lighting the entrance to Matagorda Bay. Both of these structures were built in 1852. Several more Texas lighthouses were added between 1852 and 1858, when the Halfmoon Reef Lighthouse was completed (T. L. Baker 1991). Those lighthouses built after 1852 were erected under the authority of the United States Lighthouse Board, the federal agency responsible for the construction and operation of lighthouses in the United States. The Lighthouse Board was created in 1852 to oversee the Lighthouse Service because of numerous complaints against the Fifth Auditor of the Treasury Department that had formerly been in charge of lighthouses. The Lighthouse Board membership was composed of experienced and knowledgeable naval officers. The country was organized into 12 lighthouse districts, each having an Inspector (a naval officer) who was charged with building lighthouses and seeing that they remained in good condition and that the lens was in operation. The Gulf coast from Barataria Bay, Louisiana, to the Mexican border comprised the Ninth District, which included all of Texas. Galveston was the headquarters of the Ninth District. After a few years, the inspectors became overburdened with work and an engineer (an army officer) was appointed to each district to tend to the construction and maintenance of lighthouses. After its formation in 1852, the Lighthouse Board moved quickly in applying new technology, particularly in purchasing and installing new Fresnel lenses and constructing screw-pile lighthouses, such as the Halfmoon Reef Lighthouse.

Plans for the Halfmoon Reef Lighthouse were not completed until several years after Congress authorized the $10,000 for its construction. Records at the National Archives in Washington, D.C. include the original 1856-1857 engineering drawings produced for the lighthouse, as well as later drawings made in 1911 when major repairs were made to the station. These various drawings provide detailed information on its construction. Unfortunately, relatively few textual documents relating to the original planning and construction of the lighthouse have been found in the National Archives. Some may simply be filed in obscure and difficult to find locations, but others are known to have been destroyed in a fire in the 1920s. Among these destroyed documents were the letter books containing correspondence related to the construction of the lighthouse, although an index file (Index Slips) to this correspondence does exist in Record Group 26 at the National

Archives. The entries in this index typically provide the name of the writer, the date of the correspondence, and a very brief description of the contents. Although meager, these records provide some clues on the events related to the erection of the Halfmoon Reef Lighthouse.

On November 25, 1854, Lieutenant Walter H. Stevens wrote a letter or report that discussed the siting of a lighthouse on Halfmoon Reef in Matagorda Bay (Stevens 1854). This was just a few months after Congress authorized the funds for building a lighthouse at Halfmoon Reef. Lieutenant Stevens' letter was destroyed in the 1920s fire, but record of it exists in the surviving index of correspondence and it appears to be one of the earliest documents relating to the planning of the Halfmoon Reef Lighthouse. Walter Husted Stevens was an officer in the Corps of Engineers and he was assigned as the "Inspector" for the Ninth Lighthouse District in charge of the construction and maintenance of lighthouses (Figure 3-6). Lieutenant Stevens, a native of New York, graduated from West Point in 1848 and was commissioned a Lieutenant of Engineers and assigned to New Orleans. While there, he was involved in the construction of the fort on the island of Grand Terre and fortifications at Lake Borgne. He also designed the defenses for the Mississippi River and the city of New Orleans. In 1853, Stevens became a member of the Board of Engineers assigned to survey rivers and harbors along the western Gulf and to select sites for fortifications in Texas. In

Figure 3-6. Walter H. Stevens, the person responsible for constructing the Halfmoon Reef Lighthouse. Photograph taken while serving as a Brigadier General in the Confederate Army (Hunt 1912:257).

1854, he was appointed as the “Light House Inspector” for the Ninth Lighthouse District (N. B. Stevens 1896:39-41). In this capacity, Walter Stevens built several lighthouses along the coast, including the Ship Shoal Lighthouse off the central Louisiana coast, as well as the Halfmoon Reef Lighthouse in Texas. At the start of the Civil War, Walter Stevens resigned his commission and offered his services to the Confederacy. Stevens’ wife, Valerie Hebert, was a member of a distinguished Louisiana family and this appears to be a principal reason for his throwing his lot with the Confederacy. Walter Stevens had a distinguished career as a Confederate officer, rising to the rank of Brigadier General and serving as Chief Engineer of the Army of Northern Virginia under General Robert E. Lee (Figure 3-6). In this position he was responsible for designing and constructing the defenses of Richmond. Following the war, Walter Stevens took a position as an engineer for a railroad company in Vera Cruz, Mexico. While in Vera Cruz, he contracted yellow fever and died there on November 12, 1867. His body was returned to Richmond, Virginia, where he was buried with great ceremony (N. B. Stevens 1896:40-42).

In 1856 and 1857, Lieutenant Stevens and others wrote several letters and reports concerning the Halfmoon Reef Lighthouse. On February 16, 1856, Stevens wrote that operations were commencing at “Half Moon Shoal, Matagorda Bay, Tex” (W. H. Stevens 1856). This letter seems to relate to preliminary selection of the location of the lighthouse, because later correspondence in August and October 1856 discuss the specific examination of the location of the lighthouse and aspects of foundation conditions. In August 1856, Lieutenant Stevens recommended that the Halfmoon Reef Lighthouse, as well as another lighthouse in Matagorda Bay abreast of Alligator Head, be built as screw-pile structures, a design then beginning to appear in Chesapeake Bay (T. L. Baker 1991:35). In January 1857, Stevens wrote specifically about the placement of these two “Screwpile Lt. Houses.” Apparently, by this time, the design of the lighthouse had been decided upon, and by March 1857, Lieutenant Stevens was writing about engineering aspects of the lighthouse (W. H. Stevens 1857).

It is unknown how Walter Stevens participated in the development of drawings and plans for the Halfmoon Reef Lighthouse. He certainly recommended the design of the lighthouse, but it is possible that the plans were produced by engineers of the Lighthouse Board or by the firm constructing the ironwork for the lighthouse. Ultimately, these plans were examined and approved by Lieutenant Stevens. On May 26, 1857, the I. P. Morris & Company of Philadelphia transmitted drawings for the “Half Moon Shoal, Texas” lighthouse to the Ninth District. Two weeks earlier, this same firm had submitted a “Proposal for iron work” for the Halfmoon Reef Lighthouse. Several months later, on September 14, 1857, Hayward, Bartlett & Company of Baltimore also submitted a proposal for providing the “iron work” for the Halfmoon Reef Lighthouse. Hayward, Bartlett & Company, ultimately, was selected to provide the ironwork for the lighthouse (T. L. Baker 1991:35-36; Hayward, Bartlett & Company 1857; I. P. Morris & Company 1857). This firm was a major manufacturer of iron machinery and foundry pieces that had been founded by Jonas H. Hayward, with his elder brother George, in about 1837. In 1839, George Hayward left the firm and another brother, Nehemiah Hayward, joined Jonas in the company. Through the 1840s, the name of the company was listed variously as Hayward & Company; Hayward, Fox & Company; and Bartlett, Robbins & Company. David L. Bartlett became associated with the firm as a partner in 1844, after which the name was changed to Hayward, Bartlett & Company. The firm erected a large foundry on Leadenhall Street in Baltimore, and in 1851 a new and larger facility consisting of foundry and machine shops, was erected at Pratt and Scott streets. The company was principally involved in the manufacture of ornamental and architectural iron work, galvanized iron work, boilers, various forms of heating apparatus, and later, with building locomotives. The company, apparently, produced iron work for several lighthouses; in 1856, they manufactured the lantern for the Aransas Pass Lighthouse at Aransas Pass, Texas. Jonas Hayward was particularly identified with improved methods for heating large buildings (T. L. Baker 1991:24; Lewis Historical Publishing Company 1912:48-49).

In September 1857, Captain William B. Franklin, of the Topographic Engineers, dispersed $3,686.00 to Lieutenant Walter Stevens for “Lt. House on or near Half Moon Reef Texas” (Franklin 1857). It is suspected that this money was to be used by Walter Stevens for the construction of the lighthouse and, possibly, for the purchase of the iron work from Hayward, Bartlett & Company and other material. Captain Franklin was the Supervisor of the Lighthouse Board, having been appointed to that position in March 1857. He was responsible for lighthouse construction across the nation.

Material for the lighthouse was shipped to the site in Matagorda Bay during the winter of 1857-1858. The iron screw piles for the lighthouse were shipped from Baltimore in December 1857. These went, first, to Galveston and then were carried to Matagorda Bay in March 1858 aboard the schooner *Harriet*. It is suspected that other ironwork in addition to the screw piles was aboard the *Harriet*. “Glass” for the lighthouse was shipped in January 1858, and the Fresnel lens was ordered from the Staten Island lighthouse depot in March 1858 and shipped aboard the bark *Golden Age*. In February 1858, Captain William Franklin sent Lieutenant Stevens the plans for the wooden superstructure of the lighthouse that would rest on top of the iron screw piles. These plans copied the design of the lighthouse then in service at Wades Point, North Carolina (T. L. Baker 1991:35-36).

With the arrival of the ironwork in March 1858, Walter Stevens proceeded with construction of the Halfmoon Reef Lighthouse. As noted previously, the original plans of the Halfmoon Reef Lighthouse are extant at the National Archives. These drawings, in addition to the existing wooden superstructure now standing in the town of Port Lavaca, and several historic photographs provide comprehensive information on the construction and appearance of the lighthouse. None of the extant drawings in the National Archives contain the name of the agency that produced them; however several of the sheets do include the name “J. K. Whilldin.” This was Joseph K. Whilldin, a civil and mechanical engineer who was attached to the Lighthouse Board in Washington D.C. in the 1850s and 1860s (Journal of the Franklin Institute 1866). It is unknown if Whilldin was involved in the design of the lighthouse, or if he was simply responsible for drafting the final plans.

The Halfmoon Reef Lighthouse was an iron screw-pile (sometimes “screwpile”) lighthouse, a type of structure that came into common use throughout the United States in the nineteenth century. These types of structures were designed specifically for sandy areas, where soft or shifting soil conditions prevented the construction of masonry lighthouses. Many screw-pile lighthouses were erected in shallow-water locations with sandy or mud bottoms, the conditions existing at Halfmoon Reef. These lighthouses employed iron pilings, known as “screw piles,” for their foundations. The screw pile usually consisted of a rolled-iron shaft, 3 to 10 inches in diameter, having at its foot one or two turns of a cast-iron screw, the blades of which varied from 1 to 5 ft in diameter. The piles ordinarily employed for lighthouses exposed to moderate seas had a shaft 3 to 5 inches in diameter and screw blades 3 to 4 ft in diameter. The cast iron screw weighed 600 to 700 pounds (I. O. Baker 1905:733).

Typically, for small lighthouse built in shallow water, such as the Halfmoon Reef Lighthouse, these iron pilings were screwed 10 to 15 ft into the ground and extended several feet above the water level, where they were connected and topped with iron framing. The lighthouse structures were typically wooden buildings that sat on top of the iron pilings and framing. The screw piles, with their wide-bladed screw at the bottom, had an advantage over ordinary straight pilings in that they could not be drawn upward by the force of any wave action against the superstructure. The supporting power of screw piles, also, was considerable, owing to the increased bearing surface of the flaring screw blade (I. O. Baker 1905:733).

The original plans of the Halfmoon Reef Lighthouse reveal that the foundation consisted of six iron screw pilings arranged in a hexagonal pattern around a seventh, central piling (Figures 3-7 and 3-8). The hexagon measured approximately 15 ft on a side. Each of these round pilings was 24 ft long and six inches in diameter. A cast iron screw tip measuring 2 ft in diameter was fitted at the bottom of each screw pile (Figure 3-9). The pilings were screwed into the reef a distance of 9 ft and they extended above the bottom a distance of 15 ft (Figure 3-7). Iron braces and framing connected the pilings at the bay bottom and at their tops. In addition, a framework of 2-in-diameter cast iron rods fitted with turnbuckles connected the pilings, as shown in Figure 3-7. Cast iron hubs were fitted on the central screw pile and iron and wooden braces and framing extended from the hubs to the pilings on the outside edge of the hexagon. This framing formed the foundation for the wooden lighthouse building.

The initial task in erecting the lighthouse was screwing the pilings nine feet into the reef. No specific description on how this was done at the Halfmoon Reef Lighthouse has survived, but Ira Baker (1905:734) reports that:

> These piles are usually screwed into the soil by men working with capstan bars. Sometimes a rope is wound around the shaft and the two ends pulled in opposite directions by two capstans, and sometimes the screw is turned by attaching a large cog-wheel to the shaft by a friction-clutch, which is rotated by a worm-screw operated by a hand crank. Horse-power, steam, and hydraulic power have been used for this purpose.

Although screwing these pilings into the bottom might seem to be a very difficult task, Ira Baker (1905:734) states that it typically could be done very quickly. He noted that:

> The screw will penetrate most soils. It will pass through loose pebbles and stones without much difficulty, and push aside boulders of moderate size. Ordinary clay does not present much obstruction; but clean, dry sand gives the

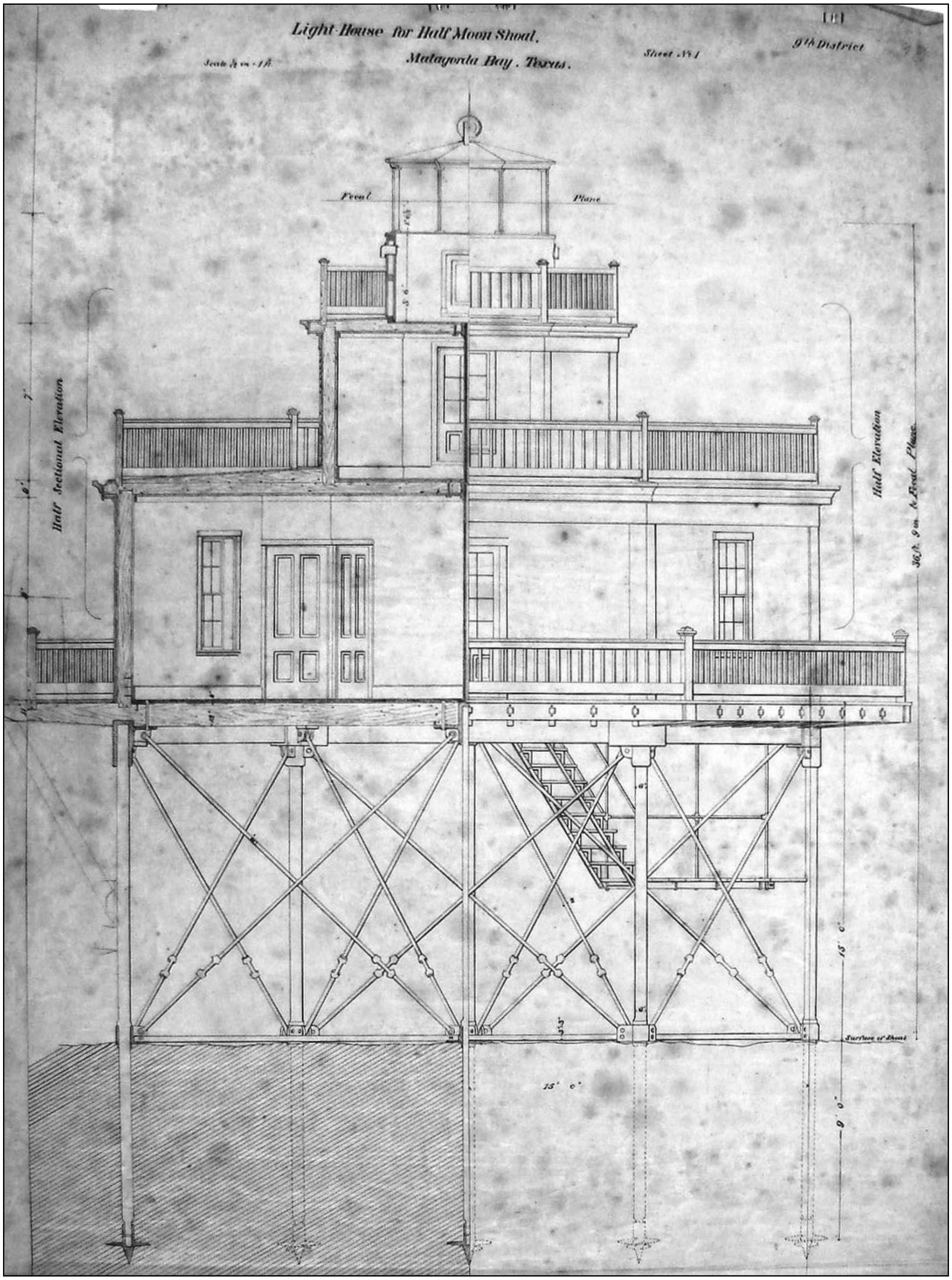

Figure 3-7. Original plans for the Halfmoon Reef Lighthouse showing an elevation view. Note the iron screw pilings extending nine feet into the bottom (National Archives 1857).

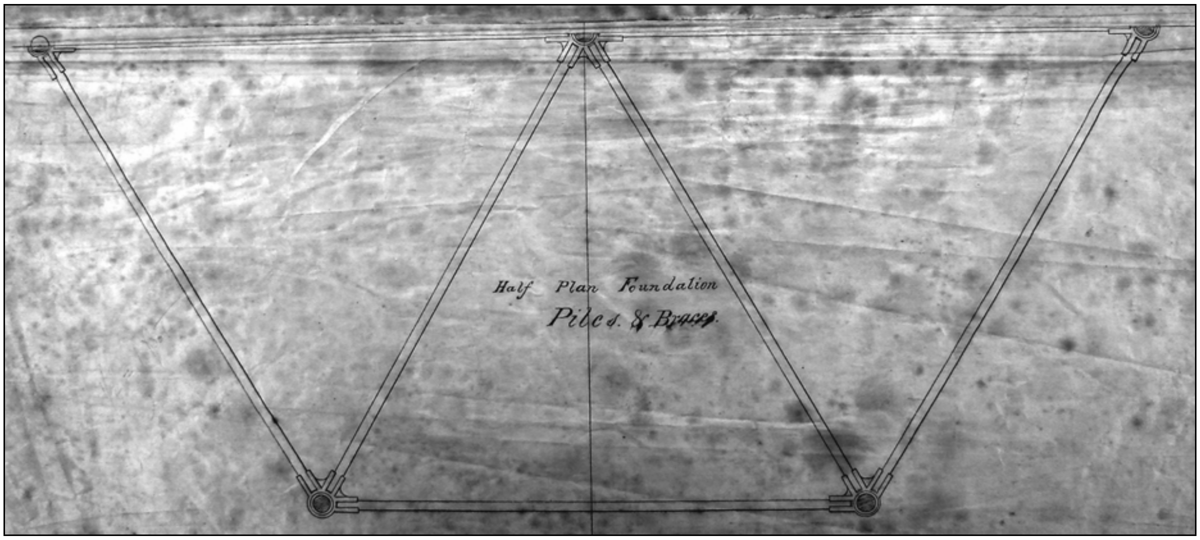

Figure 3-8. A one-half plan view of the placement of the iron screw piles for the Halfmoon Reef Lighthouse. Note the iron framing extending from the central piling to those forming the perimeter of the hexagonal-shaped structure (National Archives 1857).

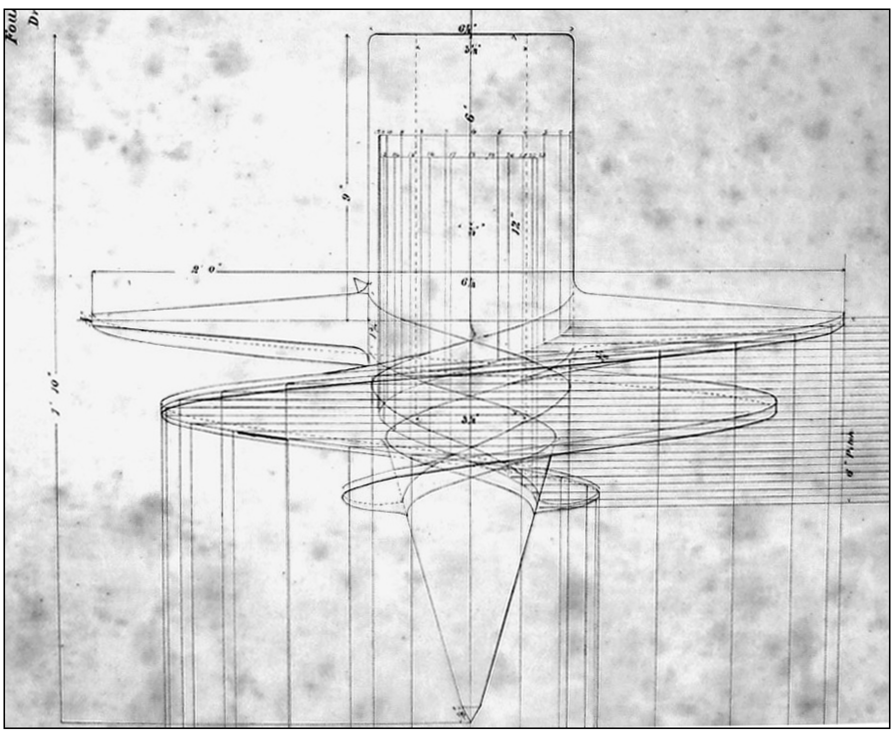

Figure 3-9. Drawing of one of the cast iron screws attached to the bottom of the iron pilings of the Halfmoon Reef Lighthouse (National Archives 1857).

> most difficulty . . . . under favorable circumstances an ordinary screw pile can be sunk very quickly. Screws 4 feet in diameter have, in less than two hours, been sunk by hand labor 20 feet in sand and clay, the surface of which was 20 most difficulty. . . . under favorable circumstances an ordinary screw pile can feet below the water. For depths of 15 to 20 feet, an average of 4 to 8 feet per day is good work for wholly hand labor.

The soils into which the pilings were screwed at Halfmoon Reef consisted of a layer of oyster reef underlain by sandy, clay sediment. Given Ira Baker's statements, it would seem that the screw piles for the light could have been screwed in place easily by hand-powered machinery. It is unknown how Lieutenant Stevens inserted the pilings, but Figure 3-10 depicts the machinery used in the 1870s to place the screw pilings for the Trinity Shoal and Timbalier Island lighthouses in coastal Louisiana. This machinery consists of a large, horizontal toothed gearwheel driven by two smaller gear wheels, each of which was turned by a hand crank. The piling was inserted through the center of the large central wheel and then screwed down into the ground. Presumably, this apparatus would have been mounted aboard a barge that was carefully anchored over the required location.

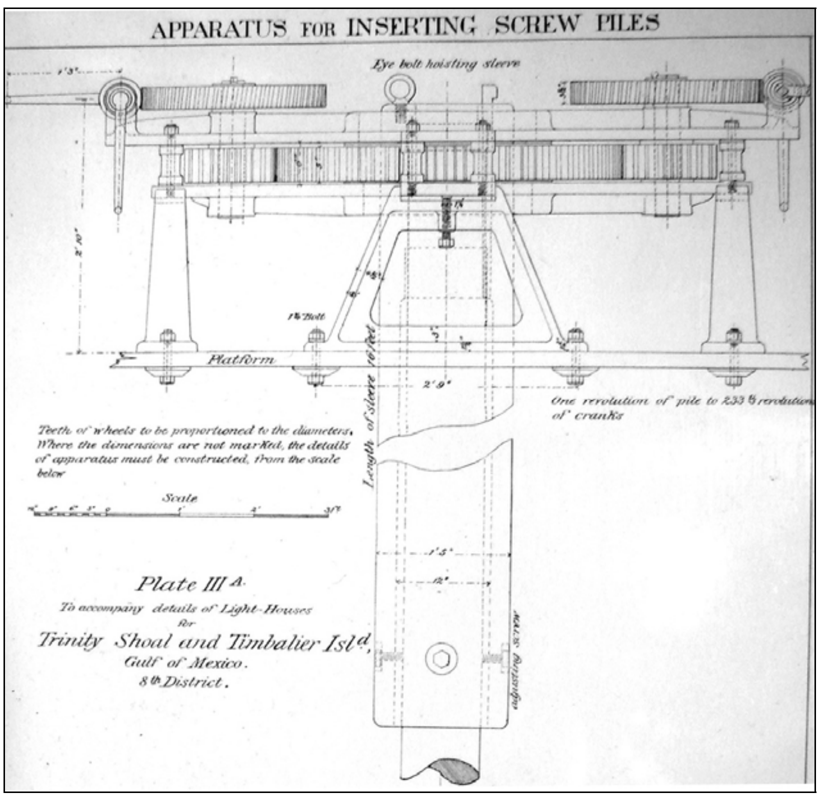

Figure 3-10. Machinery used for inserting iron screw piles (National Archives 1871).

The wooden lighthouse structure on the Halfmoon Reef light, which stood about ten feet above the water level, was three stories tall, with each story progressively smaller. The bottom two stories were hexagonal in shape, with the lower story measuring about 16 ft on a side and the second story about 7 ft on a side. The top story, which housed the light, was circular and about 7 ft in diameter. The first floor served as the principal living quarters for the lighthouse keeper, while the second floor contained storage and, possibly, sleeping areas (Figure 3-11). Additionally, the original plans depict two oil drums on the second floor, which held fuel for the lamp. The first floor was surrounded by a narrow deck and the roof of the second story also served as a deck (see Figure 3-7). The original plans show several interior water tanks on the main floor, however, in later years water cisterns, storerooms and outhouses stood on the deck surrounding the main structure. A set of landing stairs to provide access to boats extended below the first floor of the structure.

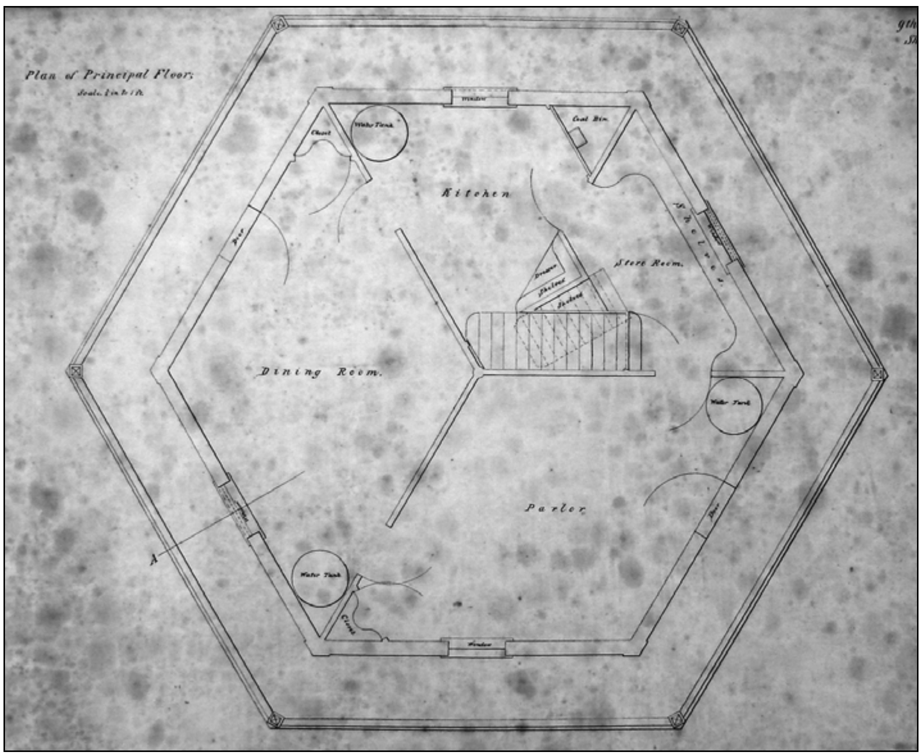

Figure 3-11. Plan of the first floor of the Halfmoon Reef Lighthouse (National Archives 1857).

Construction of the lighthouse seems to have progressed quickly and with no problems, and by June 1858 keepers were being nominated for the lighthouse. The Halfmoon Reef Lighthouse was completed by July 1, 1858, the date the light was put into operation. The lighthouse was fitted with a 360 degree, fixed white light of the sixth order that stood about 37 feet above the reef. The light utilized a Fresnel lens that could be seen a distance of approximately six miles. Three months after the lighthouse was completed, the Inspector in Boston shipped a foghorn to Texas for the lighthouse. This horn sounded every five minutes in foggy weather. Shortly after the light was put into operation, mariners claimed that as they sailed in the Gulf along the Matagorda Peninsula, dunes would periodically obscure the Halfmoon Reef light, creating a flashing signature that closely resembled the light of the nearby Matagorda Island Lighthouse at the entrance to Pass Cavallo. To eliminate the confusion, in October 1859 a ruby red glass chimney replaced the clear one used on the oil lamp that illuminated the lens, changing the characteristic of the Halfmoon Reef light to red. This involved no alterations to the Fresnel lens. The light remained red for most of the Halfmoon Reef Lighthouse's history of service (T. L. Baker 1991:34-35; Claybourn 1986:125).

The Fresnel lens used in the lighthouse was developed by French physicist Augustin-Jean Fresnel in 1822. The lens consists of a series of thin glass prisms arranged in concentric rings around a light source (Figure 3-12). These prisms bend the light source and send it out from the lens in a horizontal plane of concentrated light. At the center, the lens is shaped like a magnifying glass, so the concentrated beam was even more powerful. This design enables the construction of lenses of large aperture and short focal length without the weight and volume of material that would be required if the lens was constructed from solid pieces of glass. The Fresnel lens was much more efficient than other types of lenses in use in the early nineteenth century, with an ability to capture and transmit all but about 17 percent of the light produced. Because of this efficiency, Fresnel lenses could easily throw its light 20 or more miles to the horizon (Lighthousegetaway.com 2009).

The Fresnel lens quickly became popular in the United States and seven types of the lens, called "orders," were developed. The first three largest orders were for seacoast lights, while orders four through six were smaller, for harbor or bay lights. There was also a 3.5 order lens which was used mostly in the Great Lakes. The largest, first-order lenses were huge, measuring 7 ft, 10 in tall and 6 ft, 1 inch in diameter. The smallest, sixth-order lens, the type mounted in the lantern room of the Halfmoon Reef Lighthouse, was only 1 ft, 5 in high and 1 ft in diameter (Lighthousegetaway.com 2009).

Figure 3-12. Fresnel lens of about the fourth or fifth order (Lighthousegetaway.com 2009).

The Halfmoon Reef Lighthouse seems to have operated uneventfully until the Civil War. Table 3-1 provides the names of the Keepers and Assistant Keepers assigned to the light from its construction until its first deactivation in 1886. The first Keeper was W. B. Bridges and his Assistant Keeper was Abner Reeves. Both men were assigned to their position on February 8, 1859, eight months after the light had been put into operation. Presumably, Walter Stevens had arranged for someone to man the light in the interim. W. B. Bridges died in late 1859 or early 1860 and he was replaced as Keeper on February 28, 1860, by Richard O'Hanlin, a native of Ireland. Abner Reeves resigned his position shortly before O'Hanlin arrived.

Table 3-1. List of Keepers and Assistant Keepers for the Halfmoon Reef Lighthouse, 1859-1886 (National Archives 1859-1886).

NAME	POSITION*	SALARY	DATE ASSIGNED	DATE LEFT	REASON LEFT	NATIVITY
W. B. Bridges	K	$400	2/8/1859	-	Deceased	-
Abner Reeves	AK	$300	2/8/1859	2/16/1860	Resigned	
Richard O'Hanlin	K	$400/$640	2/1/1860	-	-	Ireland
W. A. Simmons	AK	$300	4/2/1860	9/17/1860	Resigned	New York
R. Rhodes	AK	$300	10/17/1860	2/12/1861	Resigned	-
John Williams	AK	$400	2/12/1861	-	-	-
Joseph R. Sheldon	K	$640	1/28/1868	6/25/1868	Resigned	Miss.
W.J. Phillips	AK	$400	3/6/1868	6/5/1868	Resigned	Texas
Robert Robson	AK	$400	6/5/1868	7/2/1869	Removed	England
Benj. C. Parker	K	$640	6/25/1868	6/3/1869	Removed	Missouri
John M. Lawless	K	$640	6/3/1869	12/24/1869	Resigned	RI
Mrs. Harriet Lawless	AK	$400	7/2/1869	12/24/1869	Resigned	RI
Horace W. Crockett	K	$640	12/24/1869	-	-	Maine
Mrs. Jane Crockett	AK	$400	12/24/1869	-	-	-
John Hicks	AK	$400	9/19/1871	10/1872	Resigned	
Elias Seamans	AK	$400	10/21/1872	-	Resigned	
W.J. Williams	AK	$400	7/14/1873	-	-	-
Jane Crockett	AK	$400	12/26/1873	-	-	
Frank Ray	AK	$400	9/20/1875	-	Resigned	
Frank Ray	AK	$400	3/16/1876	-	-	-
James Hutchins	K	$640	1/14/1884	10/22/1886	Lt. discontinued	England

* K=Keeper; AK=Assistant Keeper

Richard O'Hanlin, Abner Reeves, and Evelin Bridges, believed to be the widow of the first Keeper, all appear in the 1860 Federal census for Matagorda County. Evelin Bridges, identified as a seamstress, and Abner Reeves, employed as a sailor, both resided in the town of Matagorda. Richard O'Hanlin appears in the 1860 Matagorda County census as a 40-year-old native of Ireland employed as a "Light House Keeper." O'Hanlin is listed in the household of William Simmons, identified as a 23 year old native of England employed as "Keeper Light-House," although National Archives records show that Simmons was the Assistant Keeper. Also living in the Simmons household were his wife, Catherine, and Jesse Dyson, a 25-year-old "Laborer," and his wife Elizabeth Dyson (U. S. Census Bureau 1860). The fact that all of these individuals were living in the same household suggests they all lived in the lighthouse, although that would seem to have made for rather crowded living conditions.

The first two Keepers, W. B. Bridges and Richard O'Hanlin, were paid an annual salary of $400, although this was increased to $640 in 1860, during O'Hanlin's tenure. The salary of Assistant Keeper was initially $300, but this was raised to $400 in 1860.

Richard O'Hanlin served as Keeper until the Civil War, when the lighthouse was abandoned. In 1861, Confederate forces took over the Halfmoon Reef Lighthouse, as they did other lighthouses along the southern coast, and the lens and lamp were removed in an effort to thwart blockading Federal ships. Although the light was extinguished, the tower seems to have received little damage during the war, possibly because of its isolated location. In June 1865, as Federal troops began the occupation of Texas, the lighthouse engineer in New Orleans, M. F. Bonzano, ordered a new sixth-order, fixed red light apparatus for the Halfmoon Reef Lighthouse, intending to put it back into operation. However, it was not until two years later that the inspection steam launch *Susan* arrived to inspect the lighthouse and estimate the cost of restoration. Restoration was finally finished in the winter of 1867-1868 and the new light was exhibited on February 20, 1868. The Lighthouse Board report for 1868 noted that repairs to the station had cost $1,946.21 (T. L. Baker 1991:36; Claybourn 1986:126). In 1867, the Eighth and Ninth Lighthouse Districts were consolidated into one district with New Orleans as the headquarters. The Halfmoon Reef Lighthouse fell into the newly created Ninth District.

In the summer of 1869, both the Keeper and Assistant Keeper were "Removed" from their position, although the reasons for this are unknown (see Table 3-1). In 1869, John M. Lawless was assigned as Keeper and his wife, Harriet, was named Assistant Keeper. This couple only served for about six months before resigning. In 1869, Horace W. Crockett was named Keeper, replacing John Lawless. When Crockett became Keeper, his wife, Jane Crockett, was named Assistant Keeper. Horace Crockett is listed in the 1870 Federal census for Matagorda County as "Harry Crockett," a 28-year-old native of New York, although other records indicate that he was actually a native of Maine. His wife Jane is identified as a 24-year-old native of "Hanover," likely a member of one of the many German families to immigrate into Texas through the port of Indianola (U. S. Census Bureau 1870). Horace Crockett seems to have remained as keeper through 1883. although his wife was replaced as Assistant Keeper for part of this time. Crockett appears in the 1880 Federal census for Matagorda County with the occupation of "Keeping Light House." This census identifies his wife as 26-year-old Amelia Crockett, obviously not the same person he was married to in 1870. In addition to Amelia, Horace Crockett's household included a daughter Clara (8 years old), a son Henry (7 years old) and his father, 71-year-old David Crockett, identified as a carpenter. It is unknown if all of these individuals resided in the lighthouse (U. S. Census Bureau 1880).

The Halfmoon Reef Lighthouse apparently suffered little damage in the powerful hurricane of 1875 that devastated the nearby town of Indianola. This hurricane also destroyed the East Shoal and West Shoal screw-pile lighthouses that stood at the entrance to Pass Cavallo, killing all four of the keepers (Lighthousefriends.com. 2009).

The Halfmoon Reef Lighthouse was an isolated station, many miles from the nearest community. Typically, a couple of boats were moored at the station for the use of the residents, plus a boat periodically visited the station to deliver mail and check on the water supply. Claybourn (1986:126) notes that the Lighthouse Board provided food supplies to isolated lighthouses, usually delivered twice a year. In 1871, the food allowance for the Halfmoon Reef Keeper consisted of two half barrels (200 lbs) of pork, 1 half barrel of salt beef, 2 barrels (50 lbs) of flour, 24 pounds of green coffee, 50 pounds of rice, 4 gallons of vinegar, 10 gallons of peas and beans, 2 barrels of Irish potatoes and brown sugar. Keepers supplemented these provided supplies with food purchased out of their own pocket, plus fish, oysters, crabs, a variety of waterfowl and a few vegetables grown in tubs on the outside deck.

In 1882, a new lens and a kerosene lamp were installed at the lighthouse, and some minor repairs were made. That same year, the position of Assistant Keeper was discontinued (Lighthouse Board 1882:491). Horace Crockett left the position of Keeper sometime before January 1884, having served for about 14 years. His replacement was James Hutchins, who took the position as Keeper on January 14, 1884. In 1885, extensive repairs were made to the lighthouse; however, the following year the Halfmoon Reef Lighthouse received moderate damage from the hurricane of 1886. That year, the Lighthouse Board decided to discontinue the light, rather than make the needed repairs. The Board noted that "since the railroad has been completed, no steamers enter Matagorda Bay. Very few vessels now pass up the bay, and these few are small fishing boats. . . . this light is of no practical use to commerce" (T. L. Baker 1991:36-37). On November 15, 1886, the light was extinguished and the lens and lamp were removed. The structure, however, was left in place as a day marker.

On September 15, 1902, the Halfmoon Reef Lighthouse was reactivated. The reactivation of the Halfmoon Reef Lighthouse corresponded to the establishment of the nearby port town of Palacios in 1902 and the anticipation of increased vessel activity in the vicinity of the reef, particularly small fishing and oystering boats. The structure had become dilapidated since its abandonment 15 years earlier and extensive repairs were required to put it back in condition. The Annual Report of the Lighthouse Board for 1902 noted that:

> All the metal work was scaled and painted, all the woodwork was renewed, a new galvanized iron roof was put on. An oil room was built with brick floor. A storeroom and coal rooms, etc., were built. A landing ladder was put up. A hoist for handing up coal and provisions was rigged. A fourth-order red 270 degree light is to be installed [Lighthouse Board 1902:1183].

Figure 3-13 is an early twentieth century photograph of the Halfmoon Reef Lighthouse showing a cistern and storerooms/coalroom/outhouses on the deck of the main floor; possibly some of the alterations made during or after the 1902 reactivation. As noted in the 1902 Lighthouse Board report, when the lighthouse was reactivated, a five-day light, with a fourth-order fixed red light visible for 15 miles was installed.

Extensive repairs were made to the lighthouse in 1911. These repairs included modifying the roof to incorporate an increased pitch, an effort to address persistent leaks reported at the station. The results of these modifications are seen in the photograph shown as Figure 3-14. In 1912, the light was converted to an incandescent oil vapor lantern that used less fuel and gave off a fixed white light, rather than a red light (Claybourn 1986:126).

Figure 3-13. A photograph of the Halfmoon Reef Lighthouse made between 1902, when the lighthouse was reactivated, and 1911, when the second story deck was eliminated. A water cistern and two storage sheds or outhouses are built on the deck surrounding the main floor (Lighthousefriends.com 2009).

Figure 3-14. Post-1911 photograph of the Halfmoon Reef Lighthouse. Note the steep roof and the absence of the second story deck, the results of the extensive alterations made in 1911. Two water cisterns and two storage sheds or outhouses are built on the deck surrounding the main floor (United States Coast Guard 2009).

A series of lighthouse keepers and their families were stationed at the Halfmoon Reef Lighthouse after it was reactivated in 1902. Claybourn (1986:126) provides the names of some of the keepers who served after the 1902 reactivation. These included Albert Broussard, H. J. Graland, E. P. Spratley, J. M. O'Neil, George Anderson, A. E. Fox, E. H. Rinks, Tom Parsuitt, B. W. Gomez, Adam Gomez, George Holman, and Charles M. Teller. George W. Anderson began working at the Halfmoon Reef Lighthouse in August 1917 and remained there until he transferred to the lighthouse at Aransas Pass in 1923 (Claybourn 1968:126). Many of the Keepers at Halfmoon Reef lived at the lighthouse with their families. This provided for rather cramped quarters and some families preferred to live on the mainland (T. L. Baker 1991:37).

Lighthouse keepers were required to keep a journal that provided daily descriptions on the work done, observations on weather and any unusual occurrence. These journals show that life on a light station was often monotonous, but occasionally unusual and even dangerous events occurred. On September 14, 1917, A. E. Fox reported on a hurricane that hit the Halfmoon Reef station, noting:

> . . . wind gradually increasing and working toward east. blowing hardest about noon. Hurricane blowing a tide up within 2 feet of galley and spray flying clear over steps. East Galley and cistern went about 4 p.m. East side went about 4:30 p.m. Then partition and floors in kitchen, east room and west room. Blowing hard nearly all of Sunday night but wind gradually abating. Heavy rain squalls. Mud all inside of building that was left and in light tower bedding, clothes, anything inside. . . [in Claybourn 1986:126].

In November 1920, the lighthouse log reported that numerous birds were killed flying into the plate glass at night during a strong norther, and in December 1929 the log reported that an 85-ft whale floundered at the lighthouse (Claybourn 1986:126).

During the depression of the 1930s, the lighthouse service had to cut back on maintenance and personnel at minor stations like Halfmoon Reef. As a result, in 1935 the Assistant Keeper position was discontinued and the Keeper was allowed to live ashore. In March 1935, D. M. Nelson became the keeper. During his service the five-day lantern in the lighthouse was replaced by an eight-day light that had to be checked only once every six days. During his tenure, Keeper Nelson was given the additional task of maintaining other lights in the bay and along the newly completed Intracoastal Waterway. This included as many as twenty-one lighted beacons (Claybourn 1986:127).

D. M. Nelson was the last Keeper for the Halfmoon Reef light. After the Japanese attacked Pearl Harbor, the light was extinguished, as were other lights all along the coast. In 1942, a hurricane struck the lighthouse and tore the walkway off the lighthouse and left the wooden structure sagging on its pilings. The United States Coast Guard, the agency then responsible for the nation's lighthouses, decided to sell the structure rather than repair it. The following year, local businessmen William H. Bauer and Henry Smith purchased the lighthouse, planning to use the wooden superstructure as quarters for the night watchman at their Point Comfort dredging business. Using a barge with a lifting crane, they were able to remove the wooden structure from the pilings and carry it back to Port Comfort. At the time, part of Matagorda Bay was being used as a gunnery and bombing range by the United States

Army and the crew removing the lighthouse structure were told to stop their work and leave the site because a bombing session was about to begin. Fortunately, Henry Smith decided not to abandon his work, and the bombing was delayed and the lighthouse structure was successfully removed (Claybourn 1986:127; Rhodes 1985). In 1978, William Bauer and his wife, Louise, donated the lighthouse building to the Calhoun County Historical Commission. The structure was moved to Port Lavaca and it has been extensively renovated and repaired and is now used as a tourist information center. The Halfmoon Reef Lighthouse building is the oldest wooden lighthouse structure remaining in Texas.

When Henry Smith and William Bauer removed the wooden structure of the lighthouse, it is presumed that they left portions of the iron foundation structure in place, particularly the iron screw pilings that extended nine feet into the reef. As discussed in the following chapter, the remote-sensing survey of Halfmoon Reef identified scattered material on the bay floor and recorded a cluster of intense magnetic anomalies at the former location of the Halfmoon Reef Lighthouse. These are believed to represent the still in-place iron screw pilings as well as other metallic debris from the lighthouse structure.

Chapter 4

Field Investigations

Introduction

This chapter presents the conduct and results of the Phase I, cultural resources remote-sensing, survey undertaken of the Halfmoon Reef project area. As discussed previously, the remote-sensing survey was designed to identify and evaluate possible significant cultural resources, as well as the extent of submerged oyster reef habitat at Halfmoon Reef. In addition, field investigations included the collection of bottom samples, borings and cores to examine the composition and stratification of the reef and underlying deposits, and the collection of samples to assess water quality and flow at the time of the survey. The results of the geological and water sampling are discussed in detail in a separate report submitted to the Nature Conservancy, and are only briefly mentioned here.

As noted previously, Matagorda Bay has been traveled by watercraft throughout the historic period and it was anticipated that some might have been lost on the reef over this period. In addition, it was anticipated that some structural remains of the historic Halfmoon Reef Lighthouse might remain on the reef. The cultural resources survey discussed in this document followed all of the requirements for such survey established by the THC and it was conducted under Texas Antiquities Committee Archeology Permit Number 5429.

The cultural resources survey of the project area was conducted in two sessions in September 2009. The first session was begun on September 14 and continued through September 20, when strong winds and high waves in the project area forced a stop to the survey. The survey was completed on September 24 and 25. Overall, the survey experienced a considerable amount of bad weather, often forcing a halt to the work for a part of the day and, as noted, prevented any work at all for several days. The geological assessment of the reef was conducted in a later field session.

The remote-sensing survey was undertaken by a field crew of three persons. These were Charles Pearson (Principal Investigator/Remote-Sensing Specialist), Mark Gagliano (Project Manager/Oyster Biologist), and David Heckman (Boat Operator/Remote-Sensing Specialist). During the entire survey, systematic bottom polings were taken to collect information on bottom conditions and the presence of shell beds. The cultural resources remote-sensing survey encompassed approximately 1190 acres of water bottom and involved an estimated 152 linear miles of survey. Specifics on the equipment used and the conduct and results of the remote-sensing survey are discussed below.

Remote-Sensing Survey Procedures and Methodology

Survey coverage of the project area was achieved along a series of pre-established survey transects spaced 20 meters apart. The initial plan was to conduct the survey along survey lines oriented parallel to the long axis of the reef. However, field conditions dictated some changes in this plan. Figure 4-1 depicts the survey lines as they were ultimately run. As can be seen, lines at the northeastern end of the reef were run across the long axis of the reef, rather than parallel to it. This was, principally, because the water depths in this area were so shallow that it was impossible to run toward the shore (Palacios Point) and make the required turn onto the next survey line without running aground. By running across the reef in this area, it was possible to slowly edge into shallow water with less danger of grounding. Ultimately, it was possible to extend the survey into water depths of about 2.5 ft before the survey had to be suspended because of fear of damage to the remote-sensing survey equipment, as well as running aground. The remainder of the survey area was covered with parallel survey lines oriented along the length of the reef. This portion of the reef was covered in two segments, because of the slight turn the reef takes to the south near its western end (Figure 4-1).

Remote-Sensing Survey Equipment

The remote-sensing survey was conducted with equipment and procedures intended to facilitate the effective and efficient search for magnetic and/or side-scan sonar targets and to determine their exact location. The positioning system used was a Trimble Pro XRS Differential Global Positioning System (DGPS) system. The remote-sensing instruments used included a Geometrics Model 882 cesium magnetometer, an Edgetech 4125P dual frequency side-scan sonar system, and a Syquest digital recording dual frequency fathometer. The survey utilized the navigation software Hypack Max for survey design, navigation and data acquisition. Data were collected in Texas South-Central State Plane coordinates, based on the 1927 North American Datum (NAD27).

Differential Global Positioning System

Accurate positioning is essential during the running of survey lines, and for returning to recorded locations for supplemental remote-sensing operations or ground-truthing activities. These positioning functions were accomplished using a Trimble Pro XRS Differential Global Positioning System (DGPS) system that obtains sub-meter accuracy in positions. The Pro XRS attains differential capabilities by internal integration with a Dual-channel MSK Beacon receiver. This electronic device interprets transmissions both from satellites in Earth’s orbit and from a shore-based station to provide accurate coordinate positioning data for offshore or riverine surveys. Positioning was provided through continuous real-time tracking of the moving survey vessel by utilizing corrected position data

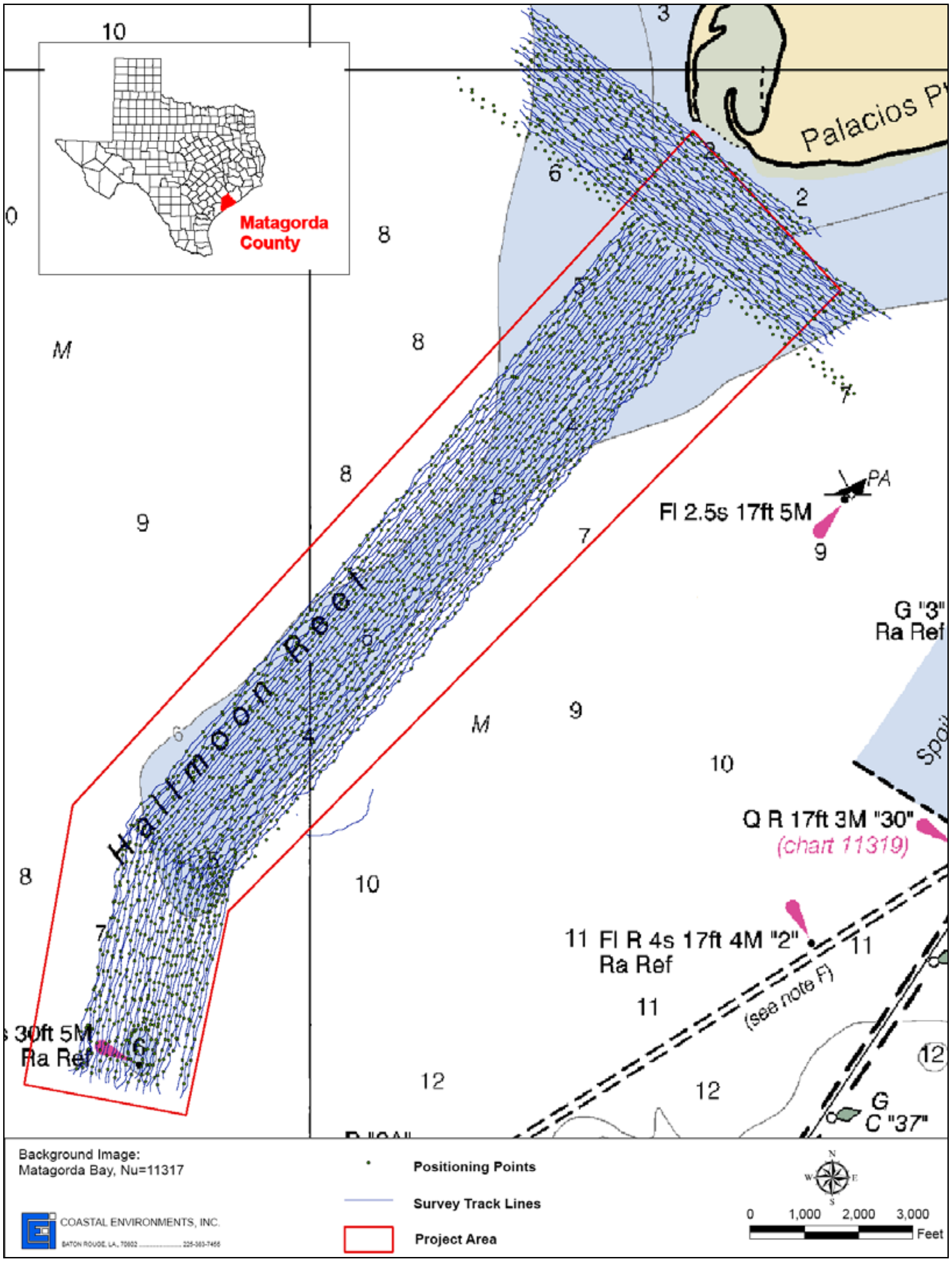

Figure 4-1. Survey lines run in the Halfmoon Reef project area. The outlined Project Area depicts a general area for the project. The survey lines encompass all areas that might be impacted by the proposed project.

provided by an on-board GPS, which processed both satellite data and differential data transmitted from a shore-based GPS station. The differential station monitored the difference between the position that the receiver derived from satellite transmissions and that station's known position. The DGPS aboard the survey vessel constantly monitored the navigation beacon radio transmissions in order to provide a real-time correction to any variation between the satellite-derived and actual positions of the survey vessel. Positioning data were recorded in Texas South Central State Plane coordinates, feet, based on the 1927 North American Datum (NAD27).

Magnetometer

The magnetometer used was a Geometrics Model 882 cesium magnetometer. The magnetometer was used to locate metallic objects that might represent submerged cultural resources as well as hazards, such as pipelines, well heads and the like. The magnetometer measures and records both the Earth's ambient magnetic field and the presence of magnetic anomalies (deviations from the ambient background) generated by ferrous masses and various other sources. These measurements are recorded in gammas, the standard unit of magnetic intensity (equal to 0.00001 gauss). Magnetic data were collected at one-second intervals providing a record of both the ambient field and the character and amplitude of anomalies encountered. These data were stored electronically in the navigation computer.

The magnetometer sensor was towed at distance of 18.2 m (60 ft) aft of the survey vessel, beyond its magnetic interference. Water depths in the much of project area were less than about 2 m (6 ft) deep and in places they were less than about 1 m (3 ft) deep. Because of this, the magnetometer sensor was floated at the water surface using several foam "noodles."

Side-Scan Sonar

The side-scan sonar used was an Edgetech 4125P dual frequency side-scan sonar system. . The side-scan sonar is an instrument that, through the transmission of dual fan-shaped pulses of sound and reception of reflected sound pulses, produces an acoustic image of the bottom. Under ideal circumstances, the side-scan sonar is capable of providing a near-photographic representation of the bottom on either side of the line of survey. The Edgetech 4125P utilized on this project was operated at the high frequency setting, 900 kHz. The Edgetech 4125P has internal capability for removal of the water column from the instrument's video printout, as well as correction for slant range distortion. Side-scan sonar data are useful in searching for the physical features indicative of submerged cultural resources. Specifically, the record is examined for features showing characteristics such as height above bottom, linearity, and structural form. Additionally, potential acoustic targets are checked for any location correlation with the data derived from the simultaneous magnetometer survey.

The side-scan sonar ran off of a second Panasonic computer as an independent system, but was connected to the Trimble DGPS navigation system for positioning. The towfish was towed on a pole attached to the center bow of the vessel and at a depth of 0.6 m (2 ft) below the water surface. In extremely shallow water, the towfish was raised to just beneath the water surface in an effort to gather some data. The instrument was operated at the 25-m-per-channel setting to collect acoustic data over a 50-m-wide (166-ft-wide) swath on each line. This setting provided resolution detail and complete overlapping coverage with the 20-m (66-ft) line spacing used in this portion of the project area.

Fathometer/Echosounder

A Syquest Hydrobox hydrographic dual frequency echosounder was used to obtain information on bathymetry in the surveyed areas, but it also served to identify objects that extend above the bottom. This system, also, provided subbotttom penetration permitting the collection of some information on subbottom sedimentary characteristics. The transducer was mounted to the side of the vessel and all water depths were adjusted to account for the depth of the transducer below the water surface and to mean low lower water (MLLW).

Navigation System

The survey utilized the navigation software Hypack Max for survey design, navigation and data acquisition. A Panasonic Toughbook computer was used to run the navigation, digital echosounder and magnetometer and to collect position data from the DGPS system.

Survey Vessel

The survey vessel was a 30-ft, flat-bottomed aluminum boat powered by dual outboard engines. This flat-bottomed vessel drew only about one foot of water, making it possible to conduct survey in waters to as shallow as 1.5 to 2 ft deep. The vessel has an enclosed cabin and ample deck area for the placement and operation of the necessary remote-sensing equipment (Figure 4-2). The vessel conformed to all U.S. Coast Guard specifications, according to class, and had a full compliment of safety equipment. Appropriate emergency supplies, including lifejackets, spare parts kit, tool kit, first-aid supplies, flare gun, air horns, and paddles were aboard. The vessel was rigged with a Honda 2000 electric generator to power the electronic devices. The survey vessel was docked in the town of Palacios and the running time from the dock to the project area was 30 to 45 minutes, depending on sea conditions.

Survey Procedures

The remote-sensing cultural resources survey was conducted along pre-plotted transects spaced 20 m apart. As noted, at the northeastern end of Halfmoon Reef, these survey lines ran across the long axis of the reef, in a roughly northwest-southeast direction. The major portion of the reef was surveyed in two segments, with survey lines oriented to the long axis of the reef. During the survey, the helmsman steered via a video monitor, linked to the DGPS and navigational computer, which displayed the real-time position of the path of the survey vessel along each survey track line. The speed of the survey vessel was maintained at about 4 knots for the uniform acquisition of data. The navigation system determined vessel position along the actual line of travel every second. One computer recorded positioning, magnetometer and bathymetry data every second while a separate

Figure 4-2. The survey vessel.

computer recorded all side-scan sonar returns during the survey. Magnetic readings were obtained every second which, given the vessel speed, represents a reading every three to four feet along a survey track line. The positioning points along the line traveled were recorded on the computer hard drive, and the magnetic and bathymetric data were also stored digitally.

As previously noted, the survey vessel was able to operate in water as shallow as about 1.5 ft, but it was impossible to safely use the side-scan sonar in water that was less than about 2.5 ft deep, limiting survey coverage to water of about this depth. As a result, because of shallow water, the remote-sensing survey did not extend all the way to the shore at the northeastern end of the project area.

Upon completion of the survey, the raw positioning and magnetometer data were edited within the Hypack computer program. The edited file was input into the system's contouring program to produce magnetic contour maps. The maps, field notes, and magnetometer digital data were then analyzed to create a list of magnetic anomalies that were indicative of potentially significant cultural resources relying on criteria discussed below. Additionally, the side-scan sonar data were reviewed for any evidence of submerged objects.

Analysis and Interpretation of Remote-Sensing Data

Overall, the data collected during the survey of the project area was of good quality. The side-scan sonar records provided a clear picture of the bottom in all of the areas examined. In terms of cultural resources, interpretation of side-scan sonar records is straight forward, in the sense that, generally, dense objects (such as metal or wood) are good reflectors and produce a darker image on the record that contrasts with the return from the bottom (Fish and Carr 1990). Garrison et al. (1989:223) note that side-scan sonar images of shipwrecks tend to be geometrically complex, exhibit scouring, and are associated with magnetic anomalies, while isolated pieces of modern debris tend to produce geometrically simple images. For example, targets such as isolated sections of pipe or lengths of cable can normally be easily identified and eliminated as possibly significant resources.

Although a considerable body of magnetic signature data for shipwrecks is now available, it is impossible to positively associate any specific signature with a shipwreck. The variations in the iron content, condition, and distribution of a wreck all influence the intensity and configuration of the magnetic signature produced. In addition, the manner in which the magnetic data are collected affect the characteristics of the signature. Despite these problems, watercraft remains do tend to exhibit characteristic magnetic signatures that often aid in differentiating them from other types of anomalies. When magnetic data are used in conjunction with other data (historic accounts, use patterns of the area, diver inspection), other remote-sensing technologies, and prior knowledge of similar targets, it can often lead to a reasonable estimation of identity.

Traditionally, archaeologists have argued that historic shipwrecks will most commonly produce a magnetic signature composed of a cluster of multiple anomalies (both dipoles [i.e., pairs of magnetic highs and lows] and monopoles [i.e., a single magnetic high or low]), normally with differing amplitudes (see Garrison et al. 1989; Irion et al. 1995; Pearson et al. 1991). Often referred to as a "complex" magnetic signature, this characteristic was recognized in the 1960s by Clausen (1966) and Clausen and Arnold (1975:129) who noted that the wrecks of sailing vessels in Florida and Texas produced magnetic signatures with "a central area of magnetic distortion characterized by a number of intense and generally localized anomalies surrounded. . . [or] interspersed by scattered, smaller magnetic disturbances." Others (e.g., Watts 1980, 1983), however, have demonstrated that a shipwreck can generate much less complex magnetic signatures, sometimes simply a broad-based anomaly of less than 25 gammas. This does occur, but the distance of the sensor from the source object is a major influence on the complexity of the signature. The farther away the sensor is, the less likely the anomaly will be "complex" because the sensor is reading the wreck as a single large object and does not discern individual and possibly dispersed elements of a wreck.

Recently, Gearhart (2004), relying on an assessment of 12 shipwreck magnetic anomalies, has argued that the typical magnetic signature produced by an historic shipwreck will be a simple dipole whose polar axis (declination) is aligned nearly parallel with the earth's magnetic axis. In northern magnetic latitudes, the negative portion of each shipwreck anomaly will be located toward magnetic north, and the positive pole will be located toward the magnetic South Pole. In addition, the declinations or orientation of the long axes of these dipoles will vary less than 31 degrees from magnetic north. Gearhart (2004) has argued that this observation on declination is useful for distinguishing between shipwrecks and modern debris, because the declinations of the magnetic signature of debris tend to follow the orientations of the debris; thus, debris anomalies might be aligned along any azimuth. However, other recent studies have recorded non-shipwreck objects that produce magnetic signatures displaying the characteristics Gearhart argues should be associated with historic shipwrecks (see Gearhart et al. 2006; Pearson and Guevin 2009). These finding suggest that Gearhart's model needs further examination.

The field surveys were designed with the presumption that wrecks in the project area could exist either as scattered remains or as relatively intact vessels with minimal dispersal. Data interpretation relied on the same presumption. The strength, size and configuration of the magnetic signature of any vessel or other submerged object depends principally upon the amount and spatial distribution and orientation of ferrous material it contains. Pearson et al. (1991:70) argued that the magnetic signatures of watercraft of even modest size would range from moderate to high intensity (greater than 50 gammas) when the magnetometer sensor is at a distance of 6 m (20 ft) or so. Additionally, wrecks of these moderate-sized vessels tend to produce signatures that are greater than 24 or 27 m (80 or 90 ft) across the smallest dimension. Smaller vessels, such as those that might exist within the project areas, will produce magnetic signatures that are less intense and that cover a smaller area. While recognizing that a considerable amount of variability does occur, Pearson et al. (1991) suggested that this information establishes a beginning point for the identification of the sources of the magnetic anomalies.

More recent assessments of objects and vessels (mostly steamboats) discovered in western rivers suggest that the magnetic signatures of sunken vessels tend to be more intense and larger than Pearson et al. (1991) had proposed. This recent work suggests that the magnetic signatures of historic steamboat wrecks typically have a magnetic deviation of at least 500 gammas and a duration (dimension) of no less than 33 m (110 ft), usually in the 60-plus meter (200 ft) range (James et al. 1999:7; James and Krivor 2000:16-17). It is recognized, or course, that a variety of post-wreck event factors (i.e., environmental impacts, salvage efforts, channel improvements, etc.) will effect the magnetic signature of any individual wreck. While recognizing that a considerable amount of variability can occur, magnetic anomaly signatures that were less than 50 gammas in strength and less than 20 m (65 ft) across were eliminated from consideration as possible wrecks unless other factors (e.g., side-scan sonar images) suggested otherwise. Thus, magnetic anomalies recorded on a single survey transect that were less than 50 gammas in strength were eliminated from additional consideration, unless side-scan sonar records showed a feature of interest. These relatively low thresholds are considered appropriate considering the very shallow water found throughout the survey area. Given the shallow water in the survey area, in combination with the close survey line spacing, it is anticipated that any shipwreck or submerged object containing even a small amount of ferrous material would be detected during the survey. It should be noted that these criteria do not allow a positive identification of a historic shipwreck or a piece of modern debris, but they do provide a starting point for eliminating some magnetic targets from consideration as possible historic shipwrecks while selecting others for additional examination or treatment.

Results of the Remote-Sensing Survey

Bathymetry

Bathymetric information collected during the survey is presented in Figure 4-3. Water depths along the central axis of Halfmoon Reef are on the order of 5 to 7 ft, although at the extreme northeastern end of the reef, closest to Palacios Point, the depths decrease to as little as 4 ft. Along the edges of the reef, the water deepens to 8 or 9 ft and at the extreme southwestern end of the survey area, in the vicinity of the hazard light, water depths measure up to 10 or 11 ft deep.

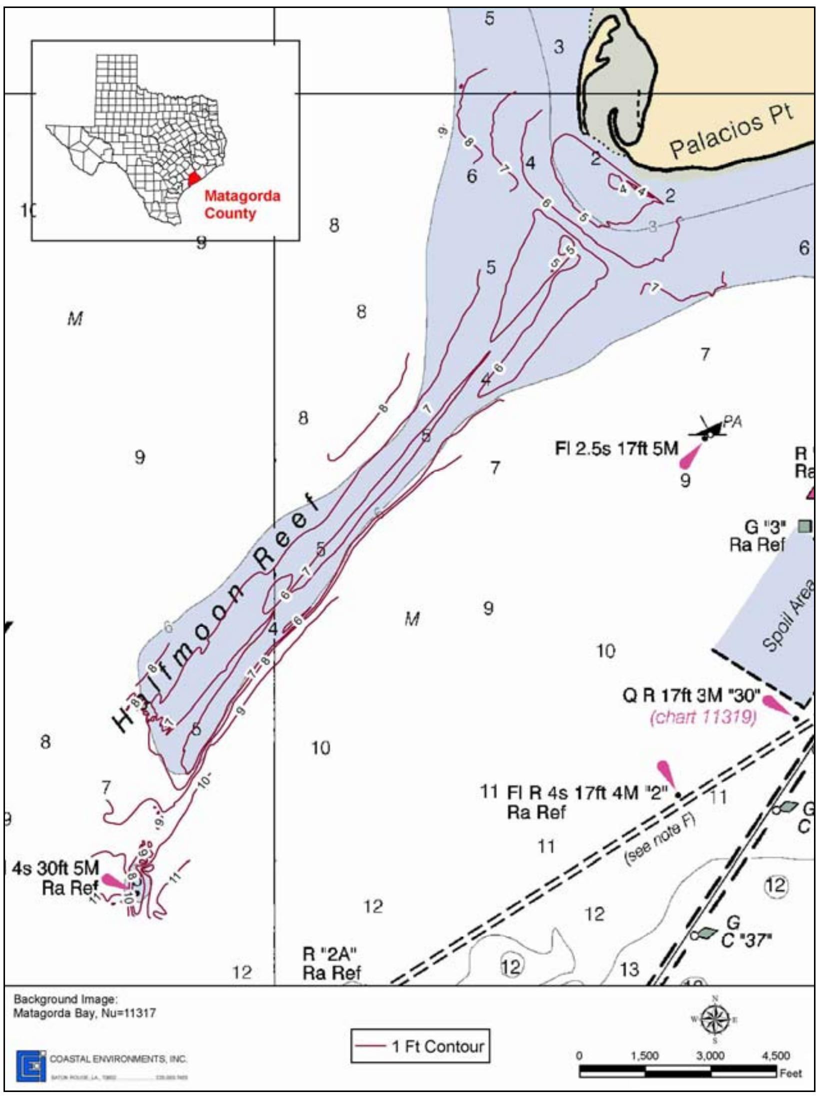

Figure 4-3. Bathymetry of the project area. Contour interval is 1 ft.

Magnetometer and Side-Scan Sonar Data

The results of the magnetometer survey are presented in Figure 4-4 as contoured data. The magnetic data in this figure are contoured at a 25-gamma interval. In order to clearly distinguish high magnetic readings from low readings, those contours falling below the approximate median magnetic reading of 47260 gammas are shown in blue, while those falling above this median are shown in red.

Some of the magnetic contours display considerable "linearity," in that they appear as long lines paralleling the survey transects (Figure 4-4). This results from the slow change in the earth's magnetic field, known as diurnal change, over the course of a day in combination with the very long running time along individual survey lines. This linearity does not effect the interpretation of the magnetic data, because anomalies meeting the criteria for selecting anomalies of interest as discussed above are easily distinguished within this linearity.

Several discrete magnetic anomalies were recorded in the area close to Palacios Point, at the northeastern end of Halfmoon Reef. As seen in Figure 4-4, these appear as tight contours in red (high readings) or blue (low readings). It is believed that these magnetic anomalies represent small, ferrous metal objects. The very shallow water in this portion of the survey area means that objects lying on the bottom, or that were buried only a short distance below the bottom were only a few feet from the magnetometer sensor, which was floated at the water's surface. These objects likely represent modern items lost or thrown from commercial or recreational vessels that travel these waters. No objects were identified on side-scan sonar imagery that could be correlated with these individual magnetic anomalies located near Palacios Point, suggesting the sources of the anomalies were very small or were buried. Burial seems likely given the very soft, muddy sediment identified in most of this portion of the survey area. None of these magnetic anomalies are considered to represent historically significant objects.

Remote-Sensing Targets in the Vicinity of the Halfmoon Reef Lighthouse

As shown in Figure 4-4, a cluster of several, intense magnetic anomalies was recorded near the southwestern end of Halfmoon Reef near the location of the former Halfmoon Reef Lighthouse. Figure 4-5 presents a detailed view of this cluster of anomalies. In this figure, these five anomalies are labeled A through E. Also shown is the location of the Halfmoon Reef Lighthouse scaled off of the 1934 navigation chart presented in the previous chapter as Figure 3-5. Table 4-1 provides information on these five magnetic anomalies in terms of their character, intensity and location. Coordinates given in the table are Texas South-Central State Plane, based on the 1927 North American Datum (NAD27).

The water depth in the area of this anomaly cluster was on the order of 7 or 8 ft, meaning objects resting on the bottom or buried beneath the bottom were at some distance from the magnetometer sensor. The intensity of the magnetics in this cluster suggests fairly substantial pieces of ferrous metal. Of particular interest in Figure 4-5 is Magnetic Anomaly A, which exhibits a "complex" signature in that it contains multiple highs and lows,

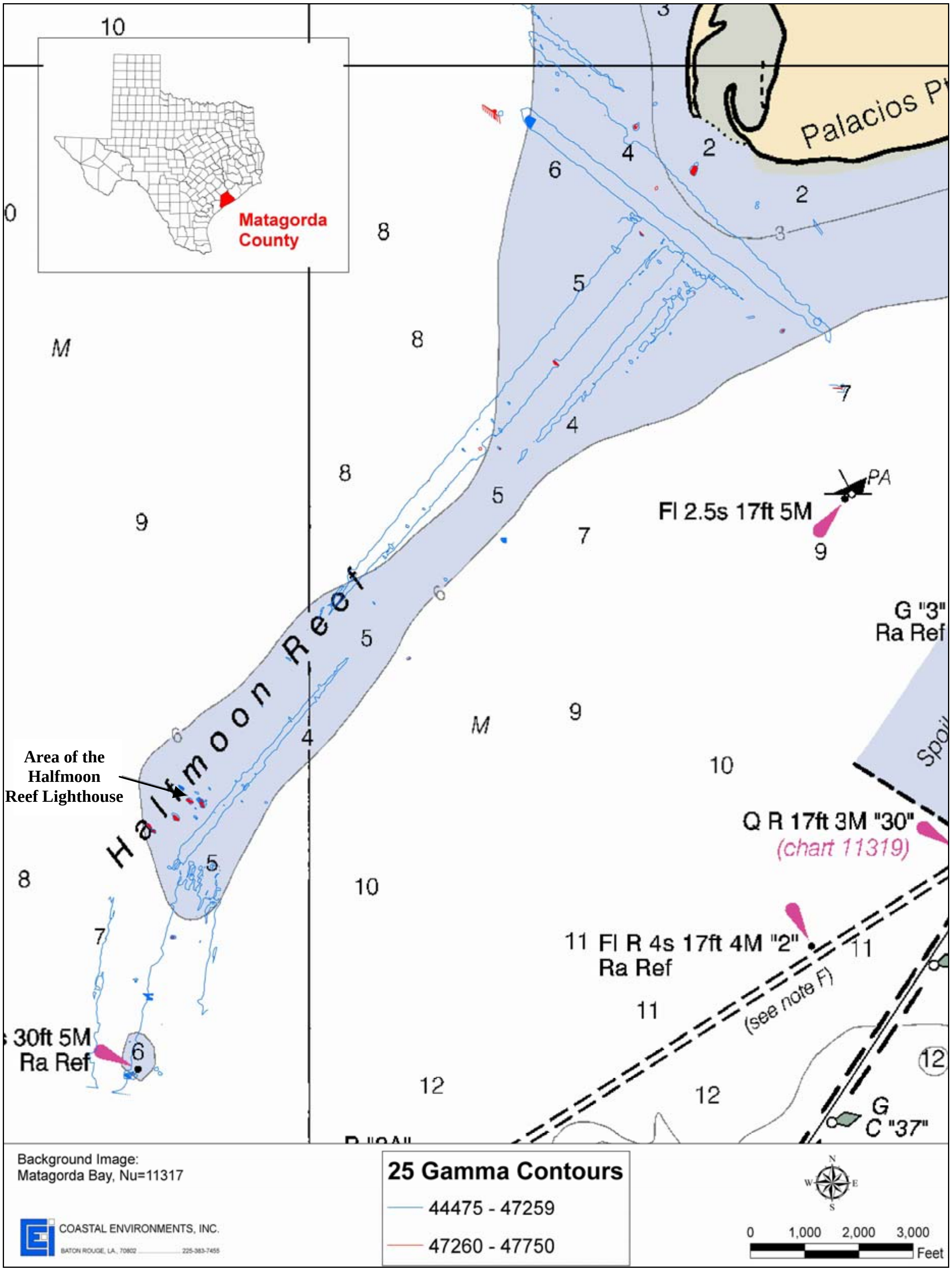

Figure 4-4. Contoured magnetic data from the Halfmoon Reef project area. The cluster of magnetic anomalies in the area of the Halfmoon Reef Lighthouse can be seen.

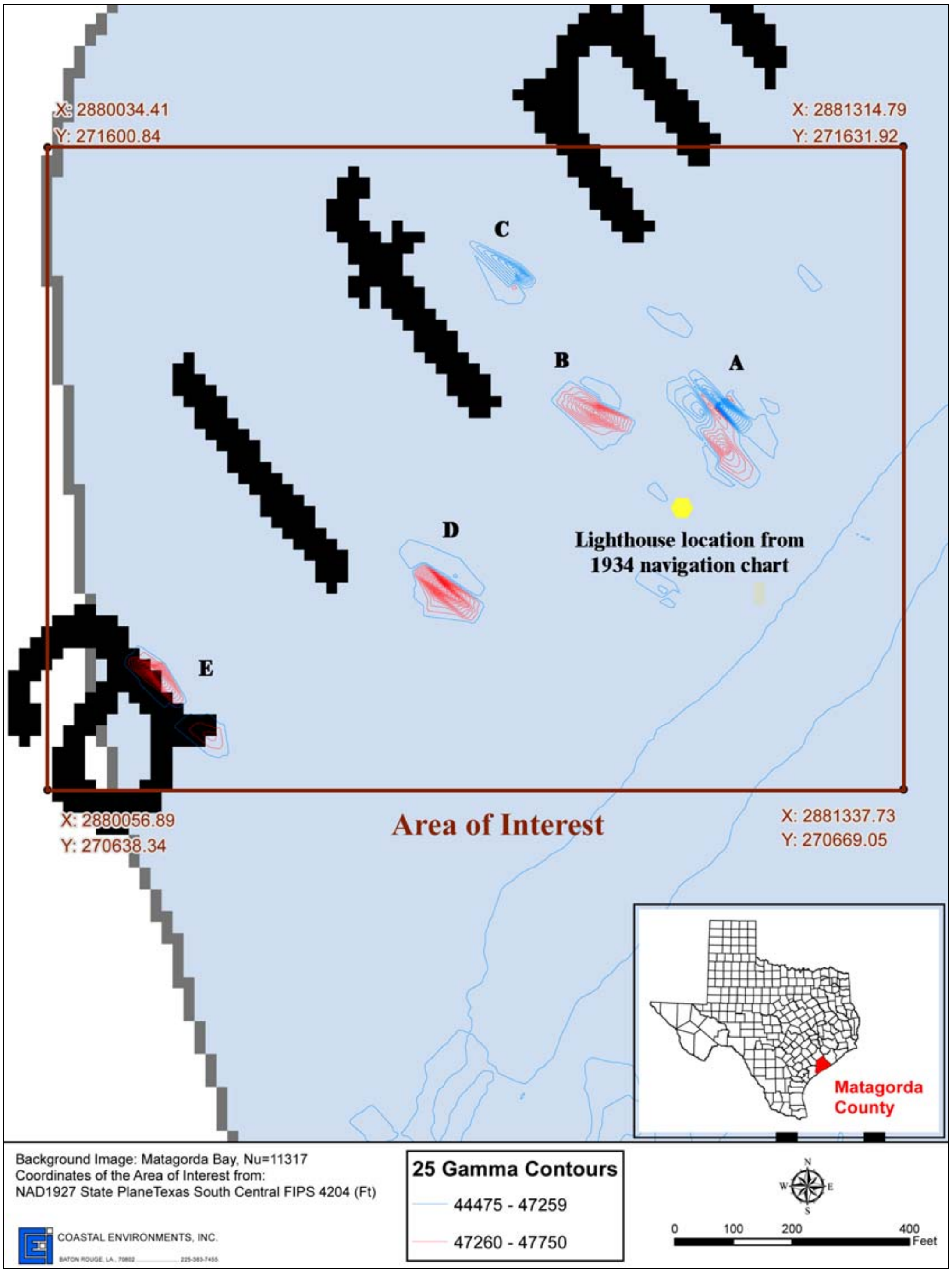

Figure 4-5. The cluster of magnetic anomalies recorded in the vicinity of the former Halfmoon Reef Lighthouse. The location of the lighthouse scaled from the 1934 United States Coast and Geodetic Survey navigation chart entitled *Matagorda Bay and Approaches* is shown. Corner coordinates are Texas South Central State Plane, feet, NAD1927.

Table 4-1. Magnetic Anomalies Recorded in the Vicinity of the Halfmoon Reef Lighthouse.

Anomaly	Easting	Northing	Deviation	Size (ft)	Type
A	2881044	271222	+175 / -300	220 x 135	C
B	2880871	271217	+300	130 x 76	M
C	2880738	271404	-200	123 x 65	M
D	2880653	270943	+475 / -25	160 x 104	D
E	2880256	270764	+ 200	130 x 57	M

C = complex, M = monopole, D = dipole

suggesting the presence of a grouping of multiple ferrous metal objects. This complex anomaly exhibited a maximum magnetic deflection of 475 gammas and measured about 220 ft by 135 ft in size. Anomaly A, also, is close to the position of the Halfmoon Reef Lighthouse as derived from the 1934 navigation chart. Given that some error is likely to result from transferring the lighthouse position from the 1934 paper chart, it seems probable that Magnetic Anomaly A represents structural elements and debris associated with the former Halfmoon Reef Lighthouse. It is suspected that some of the magnetics in this anomaly are produced by iron screw pilings and other framing elements that formed the foundation for the lighthouse structure. There is no record that any of the pilings were removed in the 1940s with the lighthouse structure and portions of some or all are believed to still be in place, screwed down into the reef.

The other four magnetic anomalies shown in Figure 4-5 (Magnetic Anomaly E actually consists of two signatures located close together) exhibit either monopole or dipole signatures, and some, are all, may be produced by individual pieces of ferrous metal. Given that these anomalies are in the near vicinity of the lighthouse location, it is suspected that they represent objects lost or discarded during the long period of lighthouse use or consist of items scattered when the lighthouse was dismantled and removed in 1943.

Side-scan sonar records exhibited a relatively featureless bottom throughout the project area. The only identified cultural features observed in the side-scan imagery consist of a clustering of objects at the exact location of Magnetic Anomaly A. The UTM coordinates (NAD1983, meters, Zone 14) for this location are: Easting (X) = 768498; Northing (Y) = 3161329. Figure 4-6 presents a side-scan sonar image of these bottom features. The evidence from the magnetometer and side-scan sonar records, in conjunction with the known position of the Halfmoon Reef Lighthouse, supports the contention that the objects shown in Figure 4-6 are pieces of the metal support framing of the lighthouse. It is impossibly to identify specific elements of the lighthouse structure in the side-scan sonar image, but this scatter of material measures approximately 13 m (42 ft) across, corresponding closely to the size of the lighthouse. It is suspected that these items consist of some of the iron framing that supported the wooden lighthouse building and, possibly, pieces of iron screw piles that projected above the bottom. Portions of some or all of the iron screw piles may still be in situ and buried. Given the findings of the survey, this location has been designated the Halfmoon Reef Lighthouse archaeological site and assigned archaeological site number 41MG135 by the Texas Archeological Research Laboratory. A completed site form is attached as Appendix A.

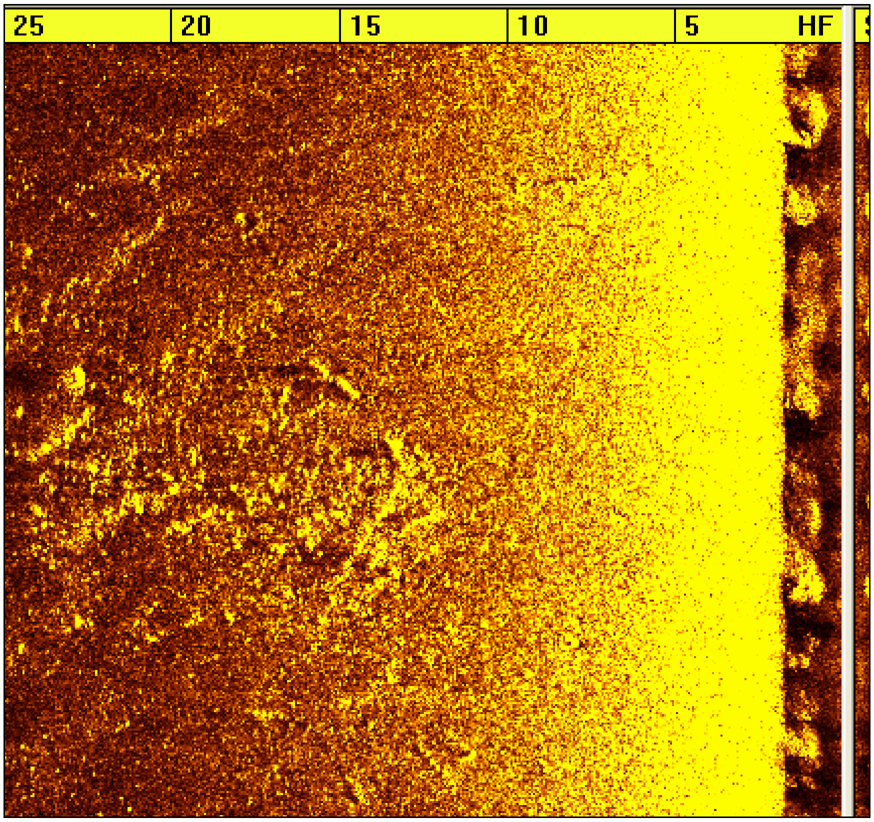

Figure 4-6. Side-scan sonar image of scattered material at the location of the Halfmoon Reef Lighthouse. Scale across the top is meters.

Although lighthouse structural features were exposed when the survey was conducted in September 2009, it appears that these objects may be buried at other times of the year. Interviews with shrimpers in Palacios revealed that nets could sometimes be dragged across the old lighthouse location without hanging, but at other times nets were damaged or hung when dragged across the location (Fred Bates, Jr. and Blackie Longoria, personal communication 2009). This suggests that elements associated with the lighthouse are periodically covered and uncovered with sediment.

Features associated with the Halfmoon Reef Lighthouse are considered to be historically significant cultural remains, given their association with one of the oldest lighthouses constructed in Texas. Recommendations for future treatment of these features are provided in the final chapter of this report.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

The remote-sensing survey reported in this volume obtained complete and systematic coverage of all of Halfmoon Reef where the water was deeper than about 3 ft. The survey was conducted along lines spaced 20 m apart, encompassed approximately 1190 acres of water bottom and involved an estimated 152 linear miles of survey. In terms of potentially significant cultural resources, the only features identified are those related to the historic Halfmoon Reef Lighthouse, located near the southwestern end of Halfmoon Reef. No other historic properties were identified on either magnetic or side-scan sonar records in the area surveyed.

Recommendations

The cluster of magnetic anomalies recorded near the southwestern end of Halfmoon Reef appears to be related to features associated with the Half Moon Reef Lighthouse. Specifically, Magnetic Anomaly A, shown in Figure 4-5, is believed to represent the former location of the lighthouse and has been assigned archaeological site number 41MG135. The location of this magnetic anomaly corresponds to a scatter of objects seen on the bay bottom in side-scan sonar records (see Figure 4-6). Although it is impossible to identify any specific structural element in the side-scan sonar imagery, it is believed that these objects represent pieces of iron framing and iron screw piles that comprised the supporting structure for the lighthouse. It is possible that portions of some, or all, of the iron screw piles are still in place, extending down into the bay bottom. Other objects, such as debris accumulated over the long period of lighthouse use, may also be present. It is possible that the other magnetic anomalies located in the vicinity of Magnetic Anomaly A, identified as Magnetic Anomalies B through E in Figure 4-5, represent pieces of debris associated with the long period of lighthouse use, or they represent objects scattered around the area when the lighthouse was dismantled and removed in 1943. No objects were identified in side-scan sonar records at the locations of these other magnetic anomalies, suggesting the items producing the magnetics are buried or are too small to be easily observed with side-scan sonar.

An intensive amount of historical research has brought to light the history of the Halfmoon Reef Lighthouse and revealed its importance in Texas maritime history. There is no doubt that it represents a historically important engineering structure. However, with the information in hand, it is impossible to accurately assess the condition of the lighthouse remains in terms of National Register eligibility. Despite this, the remains of the lighthouse should be avoided and it is recommended that any oyster reef development on Halfmoon Reef avoid the cluster of magnetic anomalies shown in Figure 4-5. Specifically, it is recommended that no ground disturbing activities be undertaken within the “Area of Interest” outlined in Figure 4-5.

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Personal Communications

Ted Bates, Jr., Palacios, Texas
Blackie Longaria, Palacios, Texas

APPENDIX A:

Archaeological Site Form for the Halfmoon Reef Light House, 41MG135

STATE OF TEXAS
Archeological Data Site Form
Trinomial 41MG135

GENERAL SITE INFORMATION

Site Name: Halfmoon Reef Lighthouse **Revisit:** False
Form Date: 08/13/2010 **Site ID:** HMRL **Local ID:** HMRL
Site Type: engineering structures; historic
Explanation of Type: Site consists of the remains of the Halfmoon Reef Lighthouse, an iron screw-pile lighthouse, 1857-1942

PROJECT AND PERMIT

Project Name: Halfmoon Reef Remote-Sensing/Hydrographic Survey
Project Number: 29072
Project Funding: The Nature Conservancy of Texas
Permitting Source: THC **Permit Number:** No. 5429

RECORDER INFORMATION

Recorder: Charles Pearson **Recorder Visited Site:** True
127 Babcock Farm Rd.
Appomattox ,VA 24522
Phone: 434-352-4168 **Fax:** 434-352-4168
Email: cpear2@hughes.net

Recorder Affiliation: Coastal Environments, Inc.

SOURCES OF INFORMATION

Owner: Site is located in Matagorda Bay and owned by the state of Texas (Texas General Land Office).
Informant: Information in report by Charles E. Pearson entitled "Cultural Resources Remote-Sensing Survey of Halfmoon Reef, Matagorda Bay, Matagorda County, Texas" submitted to the Texas Nature Conservancy.
Additional Source:

WORK PERFORMED

ACTION DATES AND METHODS

Observe/Record Date: Survey conducted September 14-September 25, 2009
Surface Inspect/Collect Dates:
Method:
Mapping Dates: September 14-September 25, 2009
Method: marine remote-sensing survey, using magnetometer and side-scan sonar
Testing Dates:
Method:
Excavation Dates:
Method:

RECORDS AND MATERIALS

Records: daily journal, computer disks
Materials Collected:
No materials were collected, however remote-sensing records were generated
Special Samples:
Temporary Housing: Coastal Environments, Inc., 1260 Main St., Baton Rouge, LA 70802
Permanent Housing: Coastal Environments, Inc., 1260 Main St., Baton Rouge, LA 70802

LOCATIONAL & ENVIRONMENTAL INFORMATION

STATE OF TEXAS
Archeological Data Site Form
Trinomial 41MG135

LOCATION

Primary County: Matagorda **Site Location in County:** SW
Other County:
USGS MAP Name & Quad #: Carancahua Pass (2896-421)

UTM Zone: 14 **Easting:** 768498 **Northing:** 3161329 **UTM Range:** NAD1983
Latitude: ° ' " **Longitude:** ° ' "

Elevation: -7 **Elevation Range:** -6 to -7

Description of Location:
Located in 7 feet of water near the southwestern end of Halfmoon Reef in Matagorda Bay, Matagorda County, Texas

ENVIRONMENT

Nearest Natural Water: In the waters of Matagorda Bay
Major Creek Drainage: Matagorda Bay
Name of Drainage Basin: Colorado-Lavaca River

SCS Soil Series, Mapping Unit:
Water, (W). Ref: "Soil Survey of Matagorda County, Texas," by Harold Hyde, United States Department of Agriculture, Natural Resources Conservation Service, 2001.

Soil Genetic Type:
Percentage Ground Surface Visible: 100
Surface Texture:
Soil Derivation: **In Situ:** False **Marine:** True **Eolian:** False **Colluvial:** False **Alluvial:** False
Other Soils:

Environmental/Topographical Setting:
Rests on a low sand/shell reef, submerged in a coastal bay.

CULTURAL MANIFESTATIONS

Time Period of Occupation:
Historic, 1858 to 1942
Basis for Time: Abundant historic documentation

Single Component: True **Multiple Component:** False **Component Unknown:** False
Basis for Component: Historical documentation

Cultural Features:
Site consists of the structural remains of the base of the Halfmoon Reef Lighthouse, consisting of iron frames, iron rods, and iron screw pilings. The remains are clustered in an area measuring about 13.5 meters across.

Approximate Site Size: 13.5 meters by 13.5 meters
Basis for Determination: Side-scan sonar record

Top of Deposit Below Surface: Surface
Basis for Determination: Side-scan sonar images

Thickness of Deposit: Unknown
Basis for Determination:

Artifactual Materials Present:
Metal (iron) structural remains of the base of the lighthouse

Discussion of Site:
The site consists of remains associated with the Halfmoon Reef Lighthouse an iron screw-pile lighthouse constructed in 1857-1858. The light was in service until 1941. In 1942 the wooden lighthouse living quarters was removed from the iron support framing. This wooden structure is now in Port Lavaca and serves as the Calhoun County Visitors Center and represents the oldest surviving wooden lighthouse building in Texas. The site appears to consist of a scatter of the metal framing and pilings that served as the foundation for the wooden structure. These, apparently, were left behind when the wooden superstructure was removed. Engineering drawings and abundant documentation related to the construction and use of the lighthouse exist in the National Archives, Washington DC, and other depositories.

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STATE OF TEXAS
Archeological Data Site Form
Trinomial 41MG135

SITE CONDITIONS

Circumstances Affecting Observations:
The site is submerged and was observed only with remote-sensing equipment.

Site Condition: The condition is unknown, but less than 20 percent of the original site remain.

Current Land Use:
Site is submerged and area is used for fishing, oystering and shrimping.

Natural Impacts:
Some impacts by currents and wave actions during major storms.

Artificial Impacts:
Possibly impacted by shrimping that might move smaller structural elements caught in nets.

Future Impacts:
Continued impact by shrimping activities.

DISCUSSION OF SITE

REGISTRATION STATUS

State Arch Landmark:	National Register:	Reg TX Landmark:	Conservation Easement:
	Has Potential		

Registration Comments: Important in Texas maritime history, but little information on condition.

Research Value:
Site could be important in terms of providing information on 1850s lighthouse engineering and construction technology. However, condition of remains is unknown.

Further Investigations:
The site is remote and infrequently visited. However, if bottom disturbing activities occur in the area, some effort to examine and verify the extent and condition of remains should be considered.

Attachments:
1. Contoured magnetic data at lighthouse location.
2. Side scan sonar record showing lighthouse remains.
3. Location of site plotted on portion of Carancahua Pass, 7.5 min Quad, 1980