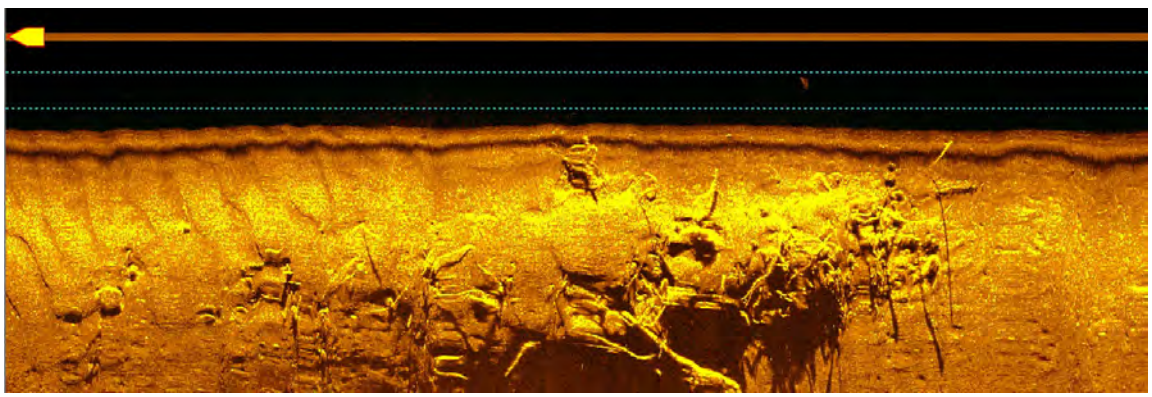
U.S. Army Corps of Engineers
Charleston District

CONTRACT NO. W912-HN-12-D-0016
WORK ORDER NO. DW03

DIVER IDENTIFICATION AND ASSESSMENT OF ANOMALIES IN THE LOWER HARBOR OF THE CHARLESTON HARBOR POST 45 STUDY AREA, CHARLESTON COUNTY, SOUTH CAROLINA



PREPARED FOR:

U.S. Army Corps of Engineers
Charleston District

UNDER CONTRACT TO:

DCA/GEC A Joint Venture, LLC
Jacksonville Beach, Florida

PREPARED BY:

Panamerican Consultants, Inc.
Memphis, Tennessee

PANAMERICAN CONSULTANTS, INC.
Experts in Cultural Resource Management

FINAL REPORT ♦ OCTOBER 2013

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PREPARED FOR:

U.S. Army Corps of Engineers
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UNDER CONTRACT TO:

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OCTOBER 2013

ABSTRACT

The U.S. Army Corps of Engineers, Charleston District is proposing channel deepening and modification of the existing Charleston Harbor Project as part of the Post 45 study. A Phase I survey of the Post 45 study area was conducted by Coastal Carolina University during the fall and winter of 2012 to 2013 in Charleston County, South Carolina. A total of 421 magnetic and acoustic anomalies were identified during the remote sensing survey. Of this total, three magnetic anomalies (LH1-001, LH1-009, and LH5-013) with sonar signatures could not be fully assessed for historical significance. In order to assist the U.S. Army Corps of Engineers, Charleston District with meeting compliance requirements associated with the laws and regulations cited above, Panamerican Consultants, Inc., under subcontract to DCA/GEC A Joint Venture, LLC, conducted a comprehensive submerged cultural resources investigation of each of the targets in response to the U.S. Army Corps of Engineers, Charleston District's Scope of Work entitled *Diver Identification and Assessment of Anomalies in the Lower Harbor of the Charleston Harbor Post 45 Study Area, Charleston County, South Carolina*, under Contract No. W912HN-12-D-0016, Work Order No. DW03.

Conducted September 3 through 6, 2013, and comprised of a magnetometer, sidescan sonar, and subbottom profiler refinement survey and diver investigation designed to locate, identify, and assess National Register of Historic Places significance, the results of the investigation indicates that two of the targets, LH1-009, and LH5-013, represented by surface debris fields with large magnetic signatures, are comprised of modern debris and do not represent significant cultural resources sites. The third anomaly, LH1-001, is represented by an extremely large buried anomaly with no acoustic signature. Extensive subsurface probing failed to locate the anomaly source indicating it is too small to contact with a probe (i.e., wire rope) or is too deeply buried to locate (i.e., more than 8 feet below sediment). A review of the subbottom record indicates a lack of detectable buried structure. While findings from the probing and the subbottom record indicate a non-detectable magnetic source like wire rope for the anomaly, it is a large complex anomaly and its identity remains unknown. Because the parameters for the proposed channel deepening and modification project are not known (i.e., depth of dredging), it is unclear if the target will be adversely impacted by project activities. It is therefore, recommended that the U.S. Army Corps of Engineers, Charleston District determine the exact parameters of the project activities and subsequently determine if any portion of Target LH1-001 will be adversely impacted. If dredging will be conducted at this target, it is recommended that an archaeologist monitor dredging at this target.

ACKNOWLEDGEMENTS

The successful completion of this project is the direct result of the input and hard work of numerous individuals. The authors would first like to thank the U.S. Army Corps of Engineers, Charleston District and Mr. Steve Dial with Dial Cordy, Inc. for allowing Panamerican Consultants, Inc. the opportunity to conduct this investigation.

The authors would also like to thank the archaeological crew who partook in this investigation. Mr. Stephen R. James, Jr., served as the Project Manager and Principal Investigator. Matt Gifford acted as Remote Sensing Specialist during the remote sensing survey along with Will Williams, Remote Sensing Technician. Mr. Michael Murray acted as Field Director for all diving operations. The dive team consisted of Mr. Murray along with divers Jim Duff, Matt Elliott, Jeffrey Coward, and Duke Hunsaker.

Mr. Mark Messersmith, Mr. Matthew Foss, and Mr. Matt Boles, all with the U.S. Army Corps of Engineers, Charleston District, are thanked for coming aboard, keeping us safe, and imparting their knowledge of the project and the local area.

Several individuals and facilities must be thanked for their local knowledge of the area and its archeology, and/or their help with archival information. Mr. Keith Derting, Director of the State Site Files at the South Carolina Institute of Archaeology and Anthropology, is thanked for access to the files. Mr. James Spirek, State Underwater Archaeologist for South Carolina, is thanked for taking the time with Mrs. Erica Gifford, project Historian, during her background research.

In-house Panamerican Consultants, Inc. personnel, who must be thanked for their assistance with this report production, include Ms. Kate Gilow, Office Manager, and Mrs. Anna Hinnenkamp-Faulk, Editor.

Finally, the good people of coastal South Carolina are thanked for the hospitality shown to the crew during our stay. We hope to return in the future to sample that hospitality once again.

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I. INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Charleston District, is proposing channel deepening and modification of the existing Charleston Harbor Project as part of the Post 45 study. A Phase I survey of the Post 45 study area was conducted by Coastal Carolina University during the fall and winter of 2012 to 2013 in Charleston County, South Carolina (Gayes et al. 2013). A total of 421 magnetic and acoustic anomalies were identified during the remote sensing survey. Of this total, three magnetic anomalies (LH1-001, LH1-009, and LH5-013) with sonar signatures could not be fully assessed for historical significance (Figure 1).

As an agency of the Federal Government, the USACE, Charleston District must consider the effects that their project activities will have on cultural resources. Based on the recommendations following the remote sensing survey and consultation between the USACE, Charleston District and the South Carolina State Preservation Office, it was determined the three anomalies required additional investigation to determine historical significance. The federal statutes regarding these responsibilities include: Section 106 of the National Historic Preservation Act of 1966, as amended (PL 89-665); the National Environmental Policy Act of 1969; the Archaeological Resources Protection Act of 1987 as amended; the Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800); and the Abandoned Shipwreck Act of 1987; and USACE Regulations as identified in 33 CFR 325 Appendix C.

In order to assist the USACE, Charleston District with meeting compliance requirements associated with the laws and regulations cited above, Panamerican Consultants, Inc. of Memphis, Tennessee (Panamerican), under subcontract to DCA/GEC A Joint Venture, LLC, of Jacksonville, Florida (DCA/GEC), conducted a comprehensive submerged cultural resources investigation of each of the targets in response to the USACE's Scope of Work (SOW) entitled *Diver Identification and Assessment of Anomalies in the Lower Harbor of the Charleston Harbor Post 45 Study Area, Charleston County, South Carolina*, under Contract No. W912-HN-12-D-0016, Work Order No. DW03.

Conducted September 3 through 6, 2013, and comprised of a magnetometer, sidescan sonar, and subbottom profiler refinement survey and diver investigation designed to locate, identify, and assess National Register of Historic Places significance, the results of the investigation indicates that two of the targets, LH1-009, and LH5-013, represented by surface debris fields with large magnetic signatures, are comprised of modern debris and do not represent significant cultural resources sites. The third anomaly, LH1-001, is represented by an extremely large buried anomaly with no acoustic signature. Extensive subsurface probing failed to locate the anomaly source indicating it is too small to contact with a probe (i.e., wire rope) or is too deeply buried to locate (i.e., more than 8 feet below sediment). A review of the subbottom record indicates a lack of detectable buried structure. While findings from the probing and the subbottom record indicate a non-detectable magnetic source like wire rope for the anomaly, it is a large complex anomaly and its identity remains unknown. Because the parameters for the proposed channel deepening and modification project are not known (i.e., depth of dredging), it is unclear if the target will be adversely impacted by project activities. It is therefore, recommended that the USACE, Charleston District determine the exact parameters of the project activities and subsequently determine if any portion of Target LH1-001 will be adversely impacted. If dredging will be conducted at this target, it is recommended that an archaeologist monitor dredging at this target.

Divided into chapters on Historical Background, Field Methods, Investigative Findings, and Conclusions and Recommendations, the following report presents the conduct and the results of the investigation.

Table 1. Locational Data for Three Targets.

Area and Target	Easting (X)	Northing (Y)	Reference
Lower Harbor 1-001	2339852	345011	Gayes et al. 2013
Lower Harbor 1-009	2344643	341704	Gayes et al. 2013
Lower Harbor 5-013	2333606	354975	Gayes et al. 2013

*Coordinates in State Plane NAD 1983 SC International Feet and NAVD 88 datum.

Figure 1. General location of targets within Charleston Harbor (as presented in the SOW).

II. HISTORICAL BACKGROUND

The initial European contact within the Carolinas took place in 1514, as Luis Vasquez de Ayllon sent an agent to find a source of labor for his plantations in the Caribbean. Supported by Ayllon, Francisco Gordillo sailed in 1521 along the American coastline north of Florida. Although the adventure was unprofitable for Ayllon, he still held hopes of profiting in the region. In 1523, he received a patent from the King of Spain to explore the coast and set up a colony. After an early reconnaissance, he fitted out four vessels with over 500 colonists and left Santo Domingo for the Carolinas in 1526 (Edgar 1998:21; Morison 1971:332). The landing near the Cape Fear River was unsuccessful and the colonists moved south to establish San Miguel de Gualdape. By 1527, Ayllon was dead and the colony broke up with roughly 150 survivors sailing back to Hispaniola (Coker 1987:2).

Three years after Gordillo's original Carolina reconnaissance, Giovanni da Verrazzano, an Italian from Florence sailing for the King of France, left Europe on a voyage to find a route to China in January 1524. His vessel, *La Dauphine*, weighed 100 tons and was manned by a crew of 50. Verrazzano coasted south along the eastern coast of present-day South Carolina for approximately 100 miles, but turned north to avoid the Spanish who had dominant control over Caribbean and Florida waters. After some brief reconnaissance along the coast, he continued north on his voyage and eventually returned to France in July. Verrazzano was able to conclude that he did not reach China, but a New World (Morison 1971:314). The French, however, did not follow up on Verrazzano's discovery of these new lands.

The Spanish expedition of Hernando de Soto trekked the Southeast from Florida to the Mississippi River. Part of de Soto's itinerary took him through the sand hills and piedmont region of South Carolina. His expedition aided in reinforcing the Spanish claim to the lands north of Florida. In 1559, King Philip II of Spain ordered a settlement at Punta Santa Elena in present-day Port Royal Sound. Considered by the Spanish to be the best natural harbor in the Southeast, this settlement was to act as a buffer to other encroaching European powers. The settlement failed, as a hurricane killed 26 colonists and destroyed three of the four vessels (Edgar 1998:22-26).

During 1562, the French sent two more vessels to explore the Carolina coast. Jean Ribaut took possession of the area in the name of the King of France Charles IX. The original settlement at Port Royal did not survive long as there was internal dissension and the post was abandoned. The French were not discouraged, and two years later a second attempt by Rene de Laudonniere established a settlement at Fort Caroline, on the St. Johns River in Florida (Coker 1987:3). The French settlement in Florida was a danger to the Spanish homeward fleets carrying New World wealth to Spain. King Philip II of Spain dispatched Menendez de Aviles to eradicate the problem in 1565. Fort Caroline was taken by a land assault, and after a promise of fair treatment, the defenders were all put to death. The French avenged the treachery three years later by retaking the fort and all killing all the Spanish prisoners (Morison 1971:470). In an attempt to maintain sovereignty over the region, the Spanish resettled Port Royal in 1566. When Francis Drake captured and burned St. Augustine in 1586, the post was abandoned.

Being on the edge of the empire, South Carolina took on a frontier characteristic. The English, late into the colonization lottery, established New World colonies concentrated north of Virginia. Attempts to settle the area between Virginia and Spanish Florida failed until the 1660s. On March 24, 1663, King Charles II of England granted a charter to eight men to be the "absolute lords and proprietors" of a colony between Virginia and Spanish Florida (Edgar 1998:39). With the aid of the local Indians, the English established their first permanent South Carolina settlement at Charles Towne in 1670, along Ashley River's western bank (Figure 2). A decade later, the population had exponentially grown to about 1,200 residents moving towards the convergence of the Cooper and Ashley rivers called Oyster Point (Coker 1987:8; Watts 1995c:4).

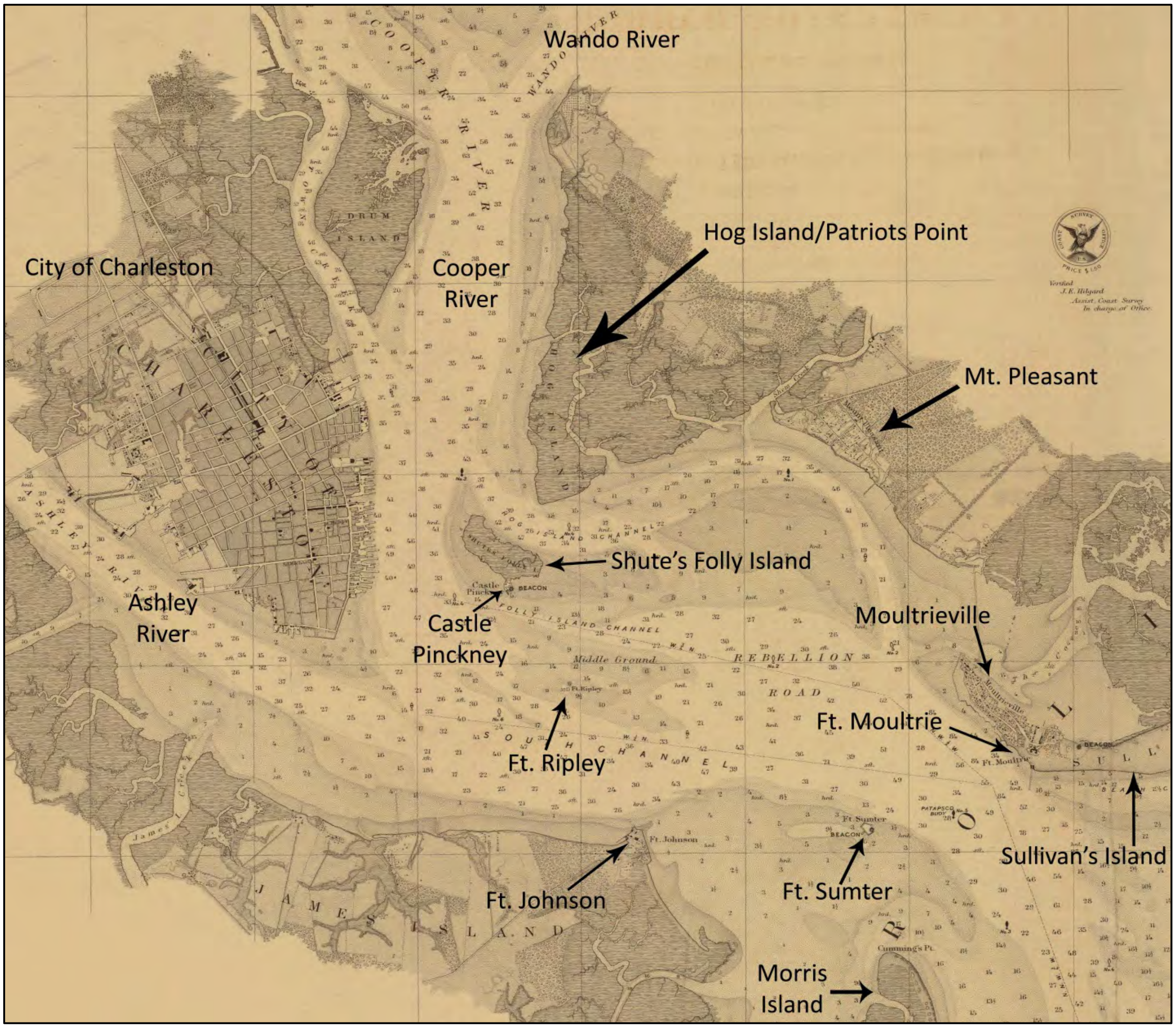

Figure 2. 1870 chart of the Charleston Harbor region showing general location of towns and late Civil War fortifications in relation to the Project Area (Chart 431 from the National Oceanic and Atmospheric Administration [NOAA] Office of Coast Survey's Historical Map and Chart Collection).

Advantageously situated just off the Gulf Stream, Charleston became an English commercial center attracting a number of entrepreneurs. Close proximity to the Spanish and French colonies in the Caribbean encouraged both legal and illegal trade. During the early colonial periods, piracy was an activity that was tolerated, and sometimes encouraged, if the intended targets were colonial adversaries and an advantage was to be gained (Ritchie 1986:11-26). New York, Boston, Newport, and Charleston were havens for many pirates in America (Cordingly 1995:15). In Charleston, no authorities confronted local pirates and "in fact, they may have encouraged these outlaws of the sea, since their booty was scattered around generously" (Coker 1987:10). At first, these coastal ports took advantage of the "wealth" created by these individuals; however, as the region's frontier moved inland and coastal ports expanded becoming economic and cultural centers, residential attitudes on piracy began to change by the end of the seventeenth century.

British initiative to stop piracy took an active role at the beginning of the eighteenth century as a new form of national policy. The penalty for piracy was death, usually by hanging. Charleston saw one of the largest executions of pirates in 1717, with the demise of Captain Stede Bonnet, when he and 29 of his men were hanged (Cordingly 1995:245). Royal Navy vessels patrolled the coast of South Carolina to keep both marauders and Spanish away from the colony. In 1724, George Anson was stationed at Charleston as a permanent feature of English protection. When he left his station in 1730, the colony was in a much more tranquil state (Coker 1987:29-34). Ironically, Anson made his fortune by sacking the *Cobadonga*, a Spanish Manila galleon (in the Philippines), during the 1740s, which many considered an act of piracy.

The English soon established Savannah, Georgia on the banks of the Savannah River in 1733, between South Carolina and Spanish Florida. This colony acted as a buffer to Charleston and aided in the growth and relative security of South Carolina. The final Spanish land advance north was stopped in 1742, at the Battle of Bloody Marsh on St. Simons Island, Georgia (Ginn 1987). The Treaty of Paris (1763) settled the matter, as the Spanish relinquished all claim to lands north of the St. Mary's River. With the population expanding into the interior, the production of agricultural goods for exporting trade began to flourish. Timber, naval stores, rice, indigo, and eventually cotton were the main agricultural products exported from the coast and the interior of South Carolina.

Additional settlements inland added to the safety and prosperity of Charleston. Charleston was geographically set to flourish as a natural port as products from inland increased, with the surrounding rivers acting as natural highways into the interior. Numerous areas of the upcountry were marked off to be settled under the guidance of Governor Robert Johnson in 1730 (Meriwether 1974:19). Regardless of the political and religious considerations, the new interior population completed two essential tasks. Most essential in the early eighteenth century, these townships acted as buffers and a first line of defense from native populations. Secondly, as the frontier became settled these areas became major producers of agricultural goods and stores, eventually increasing trade in Charleston.

Charleston was the main *entrepôt* for the colony of South Carolina. Produce coming down from the numerous rivers that surrounded Charleston was funneled to the wharves of Charleston for export. During the Colonial period, the major export products were naval stores, timber, rice, and indigo. Each had been supported at one time or another with a bounty from Great Britain. Trade was to be the economic driving force of the colony. Vessels sailing from the Caribbean to points north and Europe could easily stop over to fill their vessels with local products. Charleston, one of only two major ports in the southeast (the second being Savannah) extended its trade influence into Georgia and North Carolina. Just prior to the American Revolution, the port cleared approximately 450 vessels and had total annual imports and exports to Great Britain of some 800,000 pounds (Labaree 1999:101-103).

For the southern colonies, Charleston controlled the importation of slaves. Slave trade into the port was so large that "between 1700 and 1775, 40% of the Africans imported into North America came through Charleston" (Edgar 1998:67). The Carolina low country produced rice and indigo, and soon cotton would be the major cash crop. Such large tracts of land required a large work force, generally made up of African slaves. By the 1720s, blacks outnumbered whites 2 to 1, a ratio which would continue to the Revolution (Edgar 1998:69). The reason for this was the slave trade and economic dependence on labor-intensive agriculture.

When Lord Campbell left Charleston in 1775, effective British rule in the colony ended. In the spring of 1776, South Carolina became the second rebellious colony to draft a constitution. The British were not slow to react. They quickly sent a force of 11 ships and 2,900 army regulars to take Charleston. What came to be known as the Battle of Sullivan's Island was a victory for the locals (Edgar 1998:226-7). The early victory was not to last as the British, after taking Savannah in 1778, returned for the capture of Charleston. By mid-May 1780, the British succeeded in taking the city (Labaree 1999:146). From Charleston, the British fought the colonials and established control over the city, which became a haven for South Carolina Tories (supporters of the King). The last of the British and exiting Tories evacuated the city on December 14, 1782, essentially ending the Revolutionary War in South Carolina (Edgar 1998:237-240).

Eli Whitney and his invention of the cotton gin in 1793 are considered by historians to be both a boon and bane to the American South (Wallace 1951). With the invention, the entire southern region became locked into an agricultural economy based on cotton. In 1791, South Carolina raised about 1,500,000 pounds of cotton and by 1834 approximately 65,500,000 pounds were produced, an increase of almost 4,400% (Wallace 1951:364). Cotton was the primary commodity grown for export. Rivers offered the best form of transportation, as hauling bales of the relatively bulky commodity overland was expensive. Vessels powered by steam did ascend from Charleston as far as Columbia and Camden through mid-nineteenth century. However, steam was generally confined along coastal routes or to the port of Charleston as inland traffic and commerce was eventually taken over by railroads.

Steam in another form was to influence the internal improvements of the state. By 1835, a 136-mile long stretch of railroad track was laid between Charleston and Hamburg, making Charleston one of the early rail centers. By 1860, every district in the state with one exception was connected to Charleston or Columbia by railroad. Rivers were no longer the single means of transporting cotton and "once tracks could run to Charleston's docks, more cotton was shipped to the port by rail" (Edgar 1998:283). The railroad and state turnpikes inhibited river and canal traffic after the mid-nineteenth century. Railroads were more dependable than river traffic, not relying on water levels or hindered by obstructions (Wallace 1951:375).

Eventually road construction challenged traffic along all of South Carolina's rivers. Wallace notes when discussing transportation improvements in South Carolina, that "the State Road ran from Charleston by the later Holly Hill and Cameron and two miles west of St. Matthews on by Columbia, and thence up the western side of the Broad very near the river, and, crossing the Enoree, very near that stream on its eastern side, on over Saluda Gap in Greenville County into North Carolina" (Wallace 1951:375). The development of these suitable roadways, similar to railroads, had a drastic effect upon river transportation in the southeast.

Prior to the Civil War, South Carolina was one of the wealthiest states per capita, surpassed only by the other slave-holding states of Mississippi and Louisiana. Economic indicators such as personal property, real estate value, bank deposits and exports were all on the increase. On the eve of the Civil War, per capita wealth was $846, excluding slaves. Including slaves, the figure jumped to $2,017. Charleston, headquarters of the state bank, also held nearly 75% of all private banking capital in the state (Edgar 1998:284-5). By the 1860s, over 40,000 inhabitants in the city of Charleston made the port town the largest concentration of people in South Carolina. With approximately 5% of the total population of the state, Charleston became a political, economic trade center for the southern states.

With the election of Lincoln during the presidential campaign of 1860, South Carolinians began to take action that would affect the future of the nation. In Washington, the congressional delegation for South Carolina resigned and the state legislature called for a state convention to be held to decide the issue of secession. On December 20, 1860, at Charleston, the 169 delegates of the Secession Convention made a unanimous decision. South Carolina became the first state to claim its right and need to secede from the United States (Edgar 1998:350-2). The Civil War devastated the state of South Carolina and the city of Charleston. After the initial repulse of the *Star of the West* by cadets from the Citadel from re-supplying Fort Sumter in 1861, to the beginning of the Civil War with the fort's bombardment, an initial state of euphoria swept the South.

Prior to the outbreak of the conflict, floating batteries were established and placed to oppose the Federal troops at Fort Sumter. Initiated by Captain John Hamilton, and based on British and French designs used during the Crimean War of 1854, the batteries were basically barges with an iron-covered casemate on one face. Just two days before the bombardment of Sumter the floating battery was grounded on the west end of Sullivan's Island (Coker 1987:207-8).

The initial naval blockades of southern ports proved unsuccessful as vessels entered and exited the ports almost at will. Due to its ineffectiveness, there was an international protest of the policy. Over time as ports fell, and the Union became more efficient at the techniques of blockade and the south was slowly strangled from receiving foreign aid. In order to close off Charleston, as an active trade center that could support the Confederate cause, the Union decidedly blockaded the port with what became known as the "Stone Fleet." Various vessels filled with stone were deposited in the channels of Charleston in 1861. The Stone Fleet's efficacy was almost immediately diminished by the force of the natural scouring of tides as the redirected tidal waters of the harbor made new channels.

With the failure of the Stone Fleet at closing the harbor at Charleston, a fleet of Union naval vessels was detached to enforce the blockade. Sitting in the harbor were some of the newest and most advanced designs in naval warfare such as the *New Ironsides* (Figure 3). The *New Ironsides* were an attempt by the Union to produce a steam driven vessel with the cannon of a traditional sail man-of-war in order to make a "broadside ironclad." The steam-powered vessel was rigged as a bark and for most of her active career the masts were removed. Her presence at Charleston caused great consternation to the Confederates. On one occasion, she took 70 hits off Fort Moultrie and in another operation supported the grounded Union vessel *Weehawken*, taking 50 hits without major damage (Canney 1993:15-20).

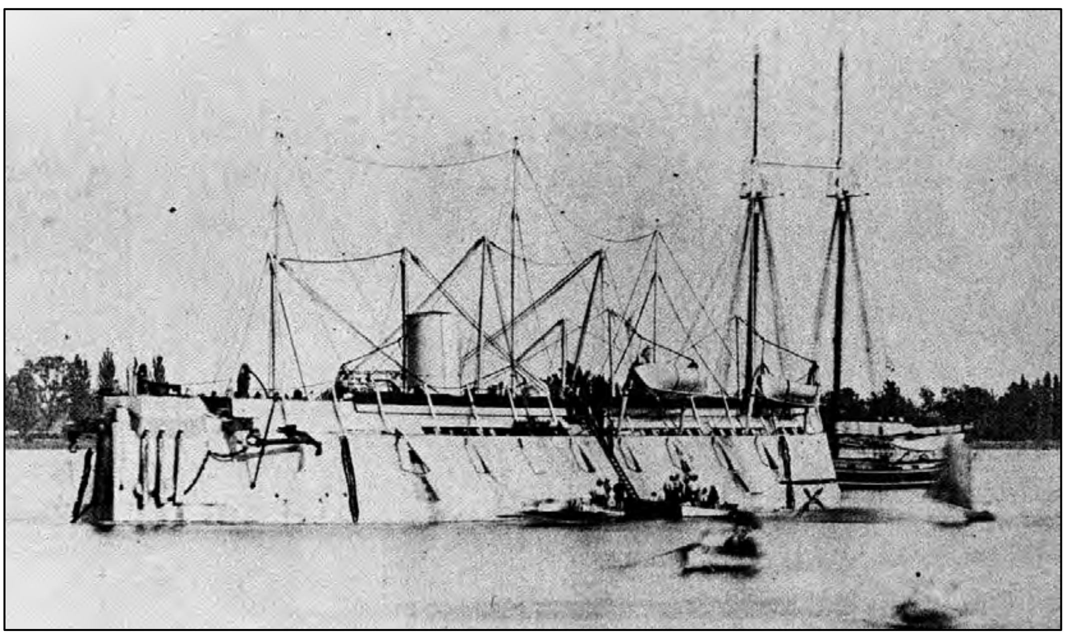

Figure 3. ***New Ironsides*** **at the Cramp Shipyard in Philadelphia, 1862 (as presented in Coker 1987:257).**

Port after port fell to relentless Union attacks. By mid-November 1861, Port Royal was in Federal hands. Federal forces infested the mouth of the Savannah River in 1861 and effectively cut the Confederate Port of Savannah off from commerce. The fall of Fort Pulaski on April 11, 1862 sealed the fate of the city and river. During the spring of 1862, Union forces looking south took numerous port towns of Florida including St. Augustine and Jacksonville. In spite of two forts guarding the Mississippi and a line of obstructions, New Orleans fell to Farragut in the spring of 1862. For the Confederates only a few Texan ports, Mobile in Alabama, Charleston, and Fort Fisher on the Cape Fear River in North Carolina held out through 1864.

Charleston, the first to fight, was one of the last port cities of the Confederacy to be taken by Union forces. The defenses and ingenuity of the natives created some unique accomplishments with floating batteries, torpedo boats, semi-submersibles, and a submarine. Charleston utilized her resources to make the Union pay for her stranglehold, effectively holding out until February 1865.

To take war to the Union forces another method was undertaken with varying degrees of success. The United States was not a signatory to the Declaration of Paris (1856), which outlawed privateers as a means of war (Kemp 1993:237). Not being constrained by the international statute, the South issued letters of mark, commissions for privateers. The first privateer to make a prize for the south was a Charleston-built pilot boat. The *Number 7* captured the Yankee brig *Joseph*, a prize worth $30,000. Other Charleston privateers were to follow with mixed results (Coker 1987:211).

Defending the harbor from the blockading Union fleet, South Carolina built several ironclad vessels. The first constructed was the *Palmetto State* at the Marsh and Sons yard, followed by the *Chicora*, constructed at the Eason Shipyard. Both vessels were ready for combat by October of 1862 (Coker 1987: 224; Scharf 1996:670). Although slow (due to a lack of powerful steam engines), the ironclads made a strong impression. On the last day of January, the two Charleston-built ironclads surprised the Union blockaders. The *Mercedita*, *Keystone State*, *Memphis*, *Housatonic*, *Quaker City*, and *Augusta* were attacked and driven off. The *Mercedita* and the *Keystone State* struck their colors and surrendered, but the *Keystone State* managed to steam out of range and be towed by the *Memphis* to Port Royal. The blockade was broken, and under international law had to be lifted for 30 days. The Lincoln administration did not acknowledge that the blockade had been broken and refused to honor the international statute (Coker 1987:227-9). Soon after the attack, the Union sent a fortified squadron posted off Charleston, which included monitor vessel types and the Union's most powerful vessel, the *New Ironsides*.

The third ironclad constructed at Charleston took the name of its homeport. Built by James Eason, an iron shortage in the south delayed her construction and she entered service in early 1864 armed with four Brooke Rifles on the broadside and two IX smoothbores on fore and aft pivots, and reported to have a propeller wheel of 8.5 feet (Coker 1987:232; Scharf 1996:671). The last ironclad built at Charleston was larger than the preceding three and in fact, the largest constructed in the Confederacy. The *Columbia* was built by F.M. Jones and launched in early March 1864. Pierced with eight ports for cannon, she would have been a formidable foe for the Union blockaders. However, with a relatively deep draft the vessel collided with an obstruction and was stranded. Stripped of arms and the *Columbia* was finally taken by the Union (Coker 1987: 232-3; Scharf 1996:706).

The effectiveness of the Union blockade of Charleston Harbor prompted the Confederates to devise numerous inventions and modifications to traditional naval tactics. One of these inventions included torpedo boats. In August 1863, the *Torch,* with an underpowered steam engine, was the next to attempt a torpedo boat attack. The intended target was the *New Ironsides*, the nearly invincible Union broadside ironclad. The initial attack failed and the *Torch* retreated in the face of one of the strongest of the Union's naval vessels (Coker 1987:256-7).

A type of vessel that could offer protection to an attacking crew was a semi-submersible vessel called, the *David*. A vessel powered by a steam engine with a cigar-shaped hull that was mostly awash appeared to be the answer to the torpedo boat question. Thin strips of iron on the top of the hull were the only armor protection for the craft. While underway, the vessel could submerge to a point where only the cockpit coaming and smoke stack were above the water. A spar with an explosive charge was the only offensive weapon the vessel carried (Coker 1987:257-261; Scharf 1996:758).

With the *New Ironsides* still on station off Charleston, the vessel again became a target of the improved torpedo boat. During the evening of October 5, 1863, the *David* set off in search of the Union blockader, under the command of a Lieutenant Glassell. A sentinel sighted the attacker and called out but was shot dead by Glassell moments before the torpedo struck. The violent explosion rocked the *New Ironsides* and the wash was such that it entered the *David's* smoke stack and doused the boilers. Two of the *David*'s four-man crew were captured, while the other two relit the boiler and made their escape with at least 13 bullet holes from small arms fire. The explosive had hit the frigate's armor plate and did not penetrate through the hull (Coker 1987:261-2; Scharf 1996:759). Although not sunk by the assault, the *New Ironsides* was damaged enough to be removed from service and repaired later. This hostile attack caused the Union to take extra precautions against torpedo boat attacks. Other modified *David*s were constructed and employed around Charleston, but none were as successful as the first attempt.

The first true and successful submarine, the *H.L. Hunley,* was moved to Charleston in August of 1863 from Mobile. The first unsuccessful trial resulted in the death of five of the crewmen. There was no lack of volunteers to fill the place of the deceased. Other trials were more successful and on February 17, 1864, the *Hunley* espied the steam sloop-of-war *Housatonic* and placed the spar torpedo in the starboard quarter. The *Housatonic* sank in four minutes with five men killed (Coker 1987: 264-5; Scharf 1996:760-1). The intact remains of the *Hunley* rested approximately 600 meters away from the *Housatonic* (National Park Service 1998:60).

Confederate forces evacuated the city of Charleston on February 17, 1865. Upon abandoning the "birth place" of rebellion, the southern forces burned and scuttled all military equipment that could be used by the Federal forces. The ironclads were burnt at the Charleston waterfront. Numerous other vessels were lost, destroyed or scuttled in the harbor during the war. The Civil War destroyed Charleston, buildings lay in rubble, and the transportation infrastructure was in ruins.

After the Civil War, it would take years before Charleston would regain its position as a center for the southern economy. Once Colonel Quincy A. Gillmore was appointed the supervising engineer for river and harbor improvements (from Cape Fear to St. Augustine), Charleston's trade and economy improved. In 1871, an engineering office was established in Charleston and by 1877 an alliance of Southern and Midwestern members of Congress obtained "federal funds for river and harbor improvements" (Watts 1986:46; Moore 1981:32-33). Once cleared of major hazards, local ferries, such as the Sullivan's Island Ferry Company, transported people from Charleston to Mt. Pleasant and Sullivan's Island (Figure 4). Tourism to the Isle of Palms became a new source of needed income for the region (Watson 2004).

During the late nineteenth-century, a number of events would affect Charleston Harbor and the larger area of Charleston. Wharf fires raged during the years 1875, 1879, 1880, and 1885 and hurricanes struck violently in 1871, 1873, 1885, and 1893 (South Carolina State Ports Authority 1991:9). However, one of the most damaging and powerful events to take place in Charleston was the earthquake of 1886. The earthquake struck at night on August 31. Reportedly, the quake lasted less than a minute but damaged 2,000 buildings with its 7.3 magnitude; some of which can be seen today (Coffman and Hake 1970; U.S. Geological Survey 2010).

The population of Charleston reached 50,000 inhabitants by 1880 and its ocean-borne trade continued to increase. The principal exports of Charleston continued to be cotton, rice, and during the 1870s, phosphate from up the Ashley River began to dominate the exporting market

(Annan and Gabriel 2002; Watts 1986:49). By the 1890s phosphates value declined as the popular material had fully saturated the market successfully ending the industry. Charleston's industrial base had faltered with the continued expansion of the inland railroad systems. With more goods being exported by rail, Charleston experienced a severe decline in trade. Charleston's exports "for the 1900–1909 period was less than a fourth of the value of the 1885–1894 trade" (Watts 1986:49; Moore 1981:169).

Figure 4. A portion of a 1890s flyer showing excursions to Sullivan's Island and the ferry schedules for the Mt. Pleasant and Sullivan's Island Ferry Company (courtesy of The South Caroliniana Library, University of South Carolina).

Charleston's industry base began to improve with the establishment of the Charleston Naval Shipyard in 1901 and with the relocation of a naval base to the area (Watson 2004; Watts 1986). New installations at the Navy base also brought expansion to Charleston's Naval Yard in preparation for World War I. However, after the war the local community no longer saw the need for the large military presence. The Great Depression did nothing to support the area of Charleston. The naval base developed slowly until 1941 with the outbreak of World War II. By 1941, the naval base became the area's largest industry (Watts 1986:49-50). The bases large water transportation facilities, developed during World War I, were turned over to the city in 1947, which then relinquished them to the State Ports Authority. Post-World War II, the port of Charleston once again thrived, becoming one of the South Atlantic's most important ports (Watts 1986:50).

Three bridges would eventually be created crossing the Cooper River, just north of Charleston Harbor (Annan and Gabriel 2002). The first bridge opened in 1929 called the John P. Grace Memorial Bridge and spanned 2.7 miles and connecting Charleston to Mt. Pleasant. Built by the Cooper River Bridge Company, the design was a cantilever truss with a suspended center span. The immovable bridge reached the height of 250 feet and charged drivers $0.50 to cross. In 1946, the 10,000-ton freighter *Nicaragua Victory* drifted and smashed into the Grace Memorial Bridge (Annan and Gabriel 2002; Watson 2004). The impact ripped out a 240-foot section of the span and caused a vehicle to fall into the river below. The vehicle was recovered from the Cooper River but it is unknown what happened to the impacted bridge span.

Damage to the bridge encouraged another bridge to be built leading to the 1966 Silas N. Pearman Bridge (Annan and Gabriel 2002). The Pearman Bridge paralleled the preceding bridge and helped to alleviate traffic. The newly built cable-stayed Arthur Ravenel, Jr. Bridge replaced both bridges in 2005. It is worth noting that anomaly LH5-013 is located in an area of bridge rubble from the removal of the previous bridges and constitutes the source of the target (Figures 5 and 6).

Figure 5. The 1929 John P. Grace Memorial Bridge (right), the 1966 Pearman Bridge (center), and the 2005 Arthur Ravenel, Jr. Bridge (left) replaced both bridges in 2005. Anomaly LH5-013 is located in an area of bridge rubble from the removal of the previous bridges and constitutes the source of the target. Specifically it is located in the bent location for the Pearman Bridge (photo by Michael McLaughlin courtesy of http://www.city-data.com/picfilesc/picc9281.php).

Figure 6. After construction of the 2005 Arthur Ravenel, Jr. Bridge, the 1929 Silas N. Pearman Bridge and the 1966 Pearman Bridge were removed. In the approximate location under the arrow, Anomaly LH5-013 is located in an area of bridge rubble from the removal of the previous bridges and constitutes the source of the target (photo by Mike D. courtesy of http://www.city-data.com/picfilesc/picc16657.php).

NAVIGATIONAL IMPROVEMENTS

During Reconstruction, it became apparent that the harbor at Charleston needed to be cleared of wartime obstructions and hazards. The USACE were responsible for the task of clearing the dangers to navigation at Charleston (Figure 7). The 1873 Annual Report of the Chief of Engineers specified that:

> "On the 31st day of October, 1871, a contract was entered into with Mr. Benjamin Maillefert for the removal of the five following named and described wrecks for the sum of $10,800, and the proceeds of the wrecks, viz:
>
> The *Palmetto State*, an iron-clad gun-boat, sunk in the mouth of Town Creek, just above the city, in 1865.
>
> The *Charleston* and *Chicora*, two wrecks near each other, in the Cooper River, below Drum Island, off Marshall's wharf.
>
> The *Beatrice* and her companion, two wrecks near the inner mouth of Beach Channel of the north side of Drunken Dick Shoal" [U.S. Army Corps of Engineers 1873:652-3].

The USACE documented that all the wrecks had been removed as per the stipulations in the contract. Later they reported that contracts had been signed for the removal of the wreck of the monitor *Patapsco* near Fort Sumter. Future work considered the removal of an unnamed wreck near Fort Sumter, the *Weehaken*, the *Housatonic*, an unnamed wreck near the end of Bowman Jetty, and some dredging (U.S. Army Corps of Engineers 1873:652).

The following year it was reported that the wrecks of the *Patapsco*, the unnamed wreck near Fort Sumter, the *Weehawken*, and the *Housatonic* were removed to the required depth. In the same area as the *Housatonic*, "the torpedo-boat, sunk at the same time and place, could not be found" (U.S. Army Corps of Engineers 1874:728). Other improvements, such as dredging and jetty construction, are also stated for the year.

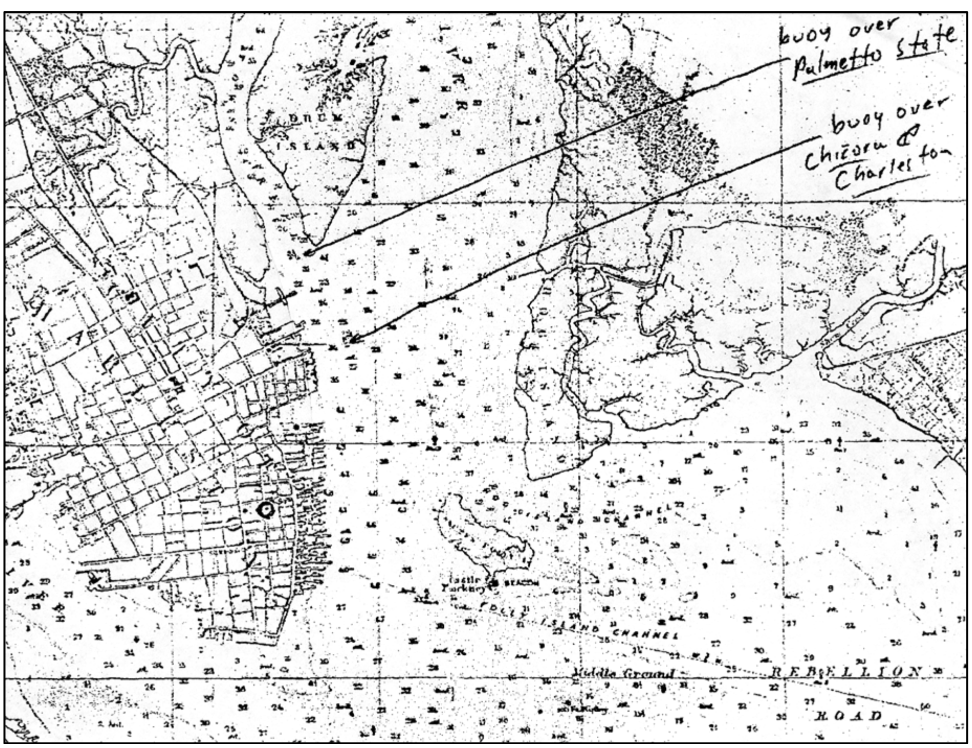

Figure 7. 1870s map showing the buoyed wreck location of the CSS *Palmetto State*, *Chicora*, and *Charleston* (courtesy of the Naval Historical Center).

During 1875, a recap of the previous work was reported for the improvement of Charleston Harbor, "The original project for this improvement comprised the removal of sundry wrecks sunk during the Civil War, the removal of 125 feet from the outer end of Bowman Jetty, projecting from Fort Moultrie into Beach Channel, and dredging in that channel to 15 feet at mean low water" (U.S. Army Corps of Engineers 1875:76). Wreck sites removed and reported on included the *Stono*, *Prince of Wales* and *Juno* near the jetty, and the monitor *Keokuk* was removed from the shipping channel. For the first time in the federal reports, there is the indication of local interest relative to the harbor, as it notes that the "municipal authorities" have taken steps to do some harbor improvements (U.S. Army Corps of Engineers 1875:5). It appears the engineers considered the wreck removal of Charleston Harbor complete.

By the 1876 edition report, there are no mentions of wreck removal. The five paragraphs expended on improvements of the ship-channel in Charleston Harbor exclusively focus on dredging and jetty work, or appropriations (U.S. Army Corps of Engineers 1876:82). The lack of comments on Civil War wreckage removal may indicate that there were no other unnatural obstructions or hazards to navigation in Charleston Harbor.

PREVIOUS INVESTIGATIONS

Previous research by scholars and American History enthusiasts has incredibly advanced our understandings of maritime and military history at Charleston Harbor. These resources include works by historians E. Lee Spence (1980, 1984) and Clive Cussler, the Naval Historical Center, and archaeologists Gordon Watts for USACE (1986, 1989, 1995a, 1995b, 1995c), James Spirek (2012), and Christopher Amer. The production of several Civil War vessels and the conflicts between Federal and Confederate forces within Charleston Harbor have been a central focus for research and interpretation (Gaines 2008:141-157; Spirek and Amer 2004; Spirek 2012). A review of this literature and the following cultural resource surveys provide historical context and aid in the possible identification of the anomalies in Charleston Harbor.

One of the best tools for accurately assessing the potential for unknown submerged cultural resources is to compare the Project Area with findings and results of previous investigations, including both remote sensing and cultural resources surveys, which have been completed in or near the current Project Area. Varying in the degree of applicability to Panamerican's research, these studies allow for the identification of potentially significant resources and aid in the recognition of specific problems or aspects that are inherent in the assessment of survey data and in identifying potential resources. In order to ascertain the presence of submerged archaeological sites and investigations in or adjacent to the Project Area, several resources were researched. In all: the South Carolina Institute of Archaeology and Anthropology (SCIAA) archaeological site files; Panamerican's report archives; and the local watershed management survey studies were reviewed.

Generally, 23 submerged cultural resource surveys were found to have been conducted from 1976 to 2013, either near or in the immediate Project Area (Table 2). An examination of these previous investigations did not identify any potential significant archaeological shipwrecks or resources immediate to the current Project's three anomalies.

Conducted in 1976, Alan Albright, and other personnel from the SCIAA's Underwater Research Division, performed a remote-sensing survey off the Cooper River for an expanding Amoco facility. The survey did not reveal any archaeological sites and only modern debris within the river bottom was identified (Albright 1976). Later in 1979, Albright surveyed the east bank of the Wando River north of Hobcaw Creek and the current Project Area (Albright 1980). The initial remote sensing survey looked at the river channel for a proposed dock for the SC State Ports Authority. Modern remains were noted along with two significant anchors, which were recovered for display. No underwater specific archaeological sites were determined in the area but the entire survey area received the site number 38CH425.

Table 2. Previous Submerged Cultural Resources Investigations.

Author	Year	Title
Albright	1976	Underwater Archeological Survey of Proposed Cooper River Dredge Area adjacent to the Amoco Facilities
Watts	1979	Submerged Cultural Resource Survey and Assessment of the Mark Clark Expressway, Wando River Corridor, Charleston and Berkeley Counties, South Carolina
Albright	1980	Underwater Archaeological Survey of the Wando River
Watts	1980	Submerged Cultural Resource Survey and Assessment of the Mark Clark Expressway, Wando River Corridor, Charleston and Berkeley Counties, South Carolina, Addendum Report
Watts	1986	A Cultural Resource Reconnaissance of Charleston Harbor at Charleston South Carolina
Watts	1987a	An Underwater Archaeological Survey of the Grace Memorial Bridge Replacement Study Area, Charleston, South Carolina
Watts	1987b	An Underwater Archaeological Survey of the Highway 700 Bridge Replacement Alignments on the Stono River and Penny's Creek near Charleston, South Carolina
Simmons	1988	Reconnaissance Survey Report: Underwater Archaeological Investigations of Selected Targets Sites in Charleston Harbor, SC
Beard	1989	1989 Reconnaissance Survey Report: Underwater Archaeological Investigations of Selected Target Sites in Charleston Harbor, South Carolina
Watts	1989	Historical and Cartographical Research and a Cultural Resource Identification and Assessment Survey for Homeporting of SSN Submarine's Charleston Naval Complex, Charleston, South Carolina
Watts	1992	A Submerged Cultural Resource Survey for Proposed Bridge Construction, North Rhett Avenue, Berkeley County, South Carolina

Author	Year	Title
Harris et al.	1993	The Cooper River Survey: An Underwater Reconnaissance of the West Branch. South Carolina
Hall	1995	1995 Underwater Archaeological Testing of Two Submerged Wharf Structures at Historic Moreland Landing on the Cooper River, Berkeley County, South Carolina
Watts	1995a	Historical Documentation and Archaeological Remote Sensing Survey at Charleston Harbor, Charleston County, SC
Watts	1995b	A Submerged Cultural Resource Management Document and GIS Database for the Charleston Harbor Project Study Area, Charleston South Carolina
Watts	1995c	Underwater Archaeological Site Survey at Charleston Harbor, Charleston SC. Modification 2
Krivor and Tuttle	2000	Underwater Archaeological Survey at the Charleston Deepening Project, Charleston, South Carolina
Wilbanks and Pecorelli	2006	An Underwater Cultural Resources Survey of Selected Portions of the Proposed South Carolina State Ports Authority, Charleston Naval Center, Marine Container Terminal
Wilbanks	2008a	An Underwater Cultural Resources Survey of Proposed Marina on the Wando River, Daniels Island, S. C. Appendix A in Eric Poplin and Emily Jateff, Investigation and Evaluation of Unexamined Portions of 38BK815 Proposed Daniel Island Marina, Daniel Island, South Carolina
Wilbanks	2008b	Target Identification Survey in the Area of a Proposed Marina on the Wando River, Daniels Island, S. C. Appendix A in Eric Poplin and Emily Jateff, Investigation and Evaluation of Unexamined Portions of 38BK815 Proposed Daniel Island Marina, Daniel Island, South Carolina

Author	Year	Title
Wilbanks	2009	Cultural Resources Survey of the Area Between Proposed Wando Marina and USCOE Spoil Area, Charleston, South Carolina
Poplin and Jateff	2009	Investigation and Evaluation of Unexamined Portions of 38BK815 Proposed Daniel Island Marina, Daniel Island, South Carolina
Gayes et al.	2013	Hardbottom and Cultural Resource Surveys of the Post 45 Charleston Harbor Project Study Area, Charleston, South Carolina

Gordon Watts for Tidewater Atlantic Research (TAR) of Washington, North Carolina would conduct the majority of the remote-sensing and underwater investigations for Charleston Harbor and in the connecting Cooper and Wando Rivers. In 1979, TAR surveyed a portion of the Wando River for SCDOT's proposed Mark Clark corridor (Watts 1979). The survey identified three potential sites (38BK426, 38BK427, and 38BK428) containing the remains of hull structure with artifacts. The sites were positioned within the corridor, north of the current Project Area's anomalies. Further inspection of the sites, prompted SCIAA archaeologist Lynn Harris to say that 38BK426 and 38BK427 were the same vessel, still containing a lead-sheathed wooden hull. Both shipwrecks (38BK426/427 and 38BK428) were considered to be turn of the nineteenth-century vessels. Watts suggested the three sites were significant enough for NRHP status (Watts 1980).

In 1985, the USACE, Charleston District contracted with TAR for "anticipation of deepening and widening sections of the navigation channel, enlarging an anchorage basin, modifying and enlarging turning basins and modifying and widening selected channel segments in the Charleston Harbor" (Watts 1986:i). TAR completed a literature and archival investigation as well as a reconnaissance level remote-sensing survey to locate and assess any potentially significant submerged cultural resources within the project area.

The remote sensing survey located eighty-four magnetic and sidescan sonar anomalies (Watts 1986). Of these targets, thirty-four were subsequently examined using the magnetometer and sidescan sonar for purposes of identification and location; the remaining 50 targets were identified as modern debris (pipes, cables, sunken buoys). Nineteen of the 34 targets had signatures that were deemed necessary for on-site examination. Of the 19 targets, 13 were rated as high priority for Phase II investigation while the remaining six were rated as moderate priority for limited on-site reconnaissance (Watts 1986:i). TAR concluded that while many of these anomalies are likely modern debris "they cannot be reliably eliminated from additional consideration on the basis of remote-sensing data alone" (Watts 1986:107). In order to assess historic and archaeological significance, TAR recommended physical examination of each site "where proposed channel improvements will significantly extend the traditionally maintained channel" (Watts 1986:107).

SCIAA archaeologists using remote sensing equipment and diver inspection would investigate targets detected by TAR's 1986 survey. In a 1988 investigation, three anomalies were identified as modern debris with the exception of a nineteenth-century iron shank, determined not culturally significant (Simmons 1988). The anomalies were nearby the Custom House Reach, the Lower Reach of Town Creek, and near Hog Island. David Beard (1989) would later return to examine a further eight sites from the 1986 survey. Diver inspections of the seven targets yielded no significant finds. The eighth target could not be located at the time. Later the eighth target would be struck by dredging activities in 2000 at the crossing of Hog Island Reach and Town Creek Lower Reach. Panamerican (Krivor and Tuttle 2000) would perform investigation on this target (which follows below).

TAR returned working with Garrow & Associates, Inc. for an underwater archaeological survey of selected portions of the Grace Memorial Bridge replacement between Charleston and Mt. Pleasant (Watts 1987a). The full study provided an architectural, archaeological, and historical survey of the surrounding area of the Grace Memorial Bridge (Reed et al. 1989). Remote sensing detected 17 anomalies, with all being determined as modern debris. No archaeological sites were determined by TAR's underwater survey. During the same year, TAR surveyed for another area for bridge replacement on Highway 700 over the Stono River (Watts 1987b). Again, no significant sites or resources were noted.

In 1989, TAR conducted a remote sensing survey nearby Shipyard Creek (Watts 1989). A total of 24 anomalies were detected with magnetometer and sidescan sonar equipment. Review of the magnetic and acoustic data identified all but nine as debris. Diver investigation of the final targets further concluded all were modern. Survey by TAR on Goose Creek, northeast of the Project Area in Berkeley County, for another bridge replacement also did not detect any significant finds (Watts 1992).

Well north of the Project Area, SCIAA archaeologists conducted an underwater archaeological survey of the Cooper River in 1993 (Harris et al. 1993). Historical maritime cultural resources and prehistoric resources were noted along the northern reaches of the Cooper River. A variety of artifacts and watercrafts were reported and revisits to a few archaeological sites were discussed, including four canoes (38BK52), a barge (38BK62), and the Mepkin Abbey shipwreck (38BK48).

In 1994, Mid-Atlantic Technology performed underwater archaeological testing for identification of submerged resources along the Cooper River in the area known as Moreland Landing (Hall 1995). North of the current Project Area, archaeologists identified three historic wharves and the remains of a buried eighteenth-century wreck. Excavations revealed the presence of two different wharves types at Moreland Landing.

In 1994, TAR would return to conduct significant historical research in the area of Charleston Harbor for proposed dredging of deepening channels (Watts 1995a, 1995b). Using a sidescan sonar and magnetometer, 32 anomalies were detected within the project's survey area. Review of the recorded data identified 26 as modern materials. No new sites were located, however the USS *Patapsco* (38CH270) was revisited by TAR that year. The last eight targets were to be investigated by divers but only two were inspected and found not culturally significant (Watts 1995c).

In 2000, the USACE, Wilmington/Charleston District was informed that a wreck site might have been damaged during channel maintenance operations within Charleston Harbor. A large bucket dredge inadvertently recovered a large, encrusted cannon as well as a propeller/shaft and associated hull section. After being recorded by archaeologists from SCIAA, the artifacts were redeposited in a disposal site in Charleston Harbor to prevent further degradation. As a result, archaeologists from Panamerican conducted an intensive remote-sensing refinement survey and diver investigations of five targets within Charleston Harbor and the Cooper River of South Carolina as part of the Charleston Harbor Deepening Project (Krivor and Tuttle 2000). A remote sensing refinement survey and diver investigation of the first target confirmed that no potentially significant submerged cultural resources remained at this location. The material placed at the disposal site did not meet eligibility requirements under the National Register of Historic Places (NRHP), but they should be considered historically significant and protected as such. The four other sites examined did not contain any cultural materials or consist of modern debris and are not eligible for listing on the NRHP. No further archaeological research was recommended for the four target areas.

A survey near the former Charleston Navy Base in Cooper River was performed by Diversified Wilbanks, Inc. for Brockington and Associates, Inc. and the South Carolina State Ports Authority in 2006 (Wilbanks and Pecorelli 2006). Four anomalies were detected in two survey project areas. One target was found to be outside the Area of Potential Effect (APE) and the other three were modern debris.

Wilbanks returned to work with Brockington and Associates, Inc. again for a proposed marina at Daniel Island in the Wando River (Wilbanks 2008a, 2008b, 2009; Poplin and Jateff 2009). The underwater portion of the survey examined the bottom of the river, the intertidal shore, and the former "Daniell's pier". Archaeologists did not identify archaeological sites (terrestrial or underwater) within the APE. One anomaly was detected inside the APE by remote sensing and requires further diver investigation to determine eligibility.

Most relevant to the current study is the early 2013 survey that Coastal Carolina University's Center for Marine and Wetland Studies conducted, findings and recommendations from which form the basis of our present investigation. Employing a magnetometer, sidescan sonar, subbottom profiler, and single beam bathymetry equipment, researchers were able to delineate hardbottom areas of the channel and harbor areas. A total of 421 magnetic anomalies were examined with no additional investigation warranted with the exception of three anomalies. Two anomalies with sidescan images, LH1-009 and LH5-013, and LH1-001, an anomaly without an associated acoustic signature were suggested for diver investigation (Gayes et al. 2013). Currently under investigation by Panamerican as detailed by this report, remote sensing images for the three targets are presented in Figures 8, 9, and 10.

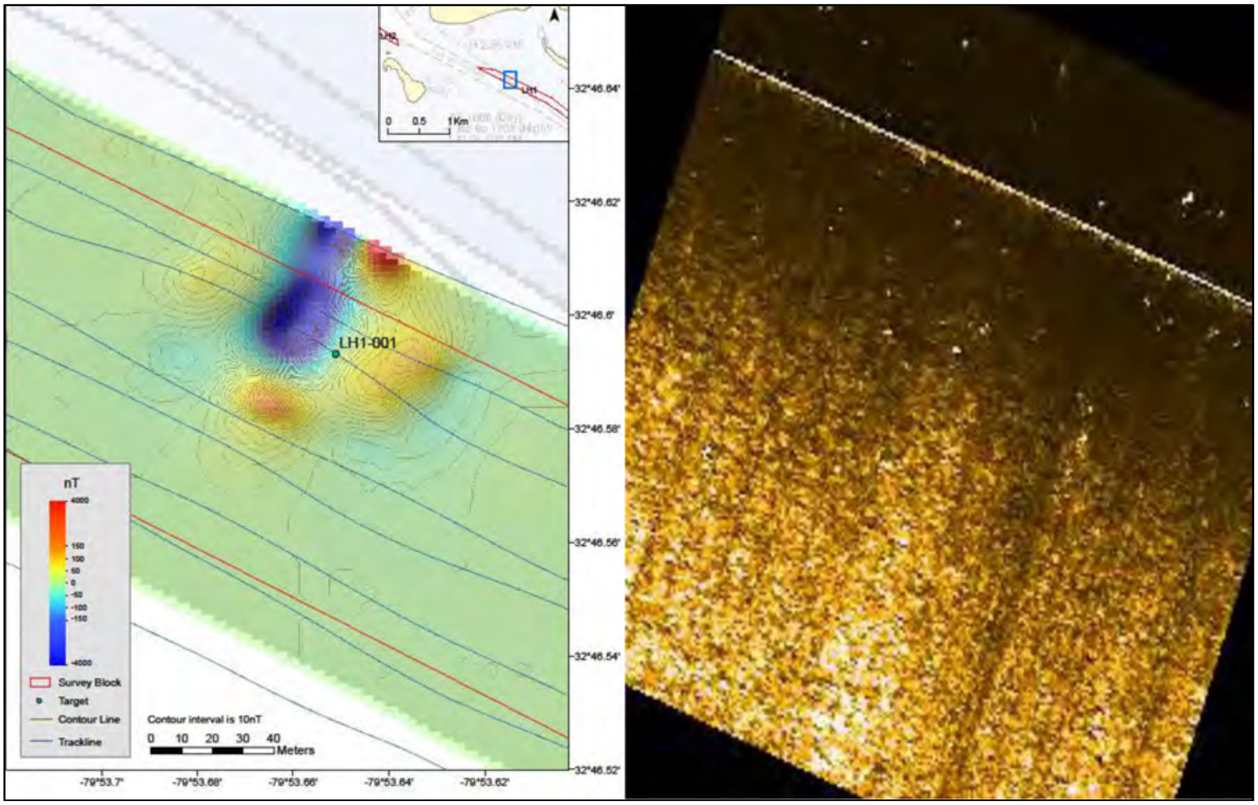

Figure 8. Magnetic and sonar remote sensing data for Anomaly LH1-001 (as presented in Gayes et al. 2013).

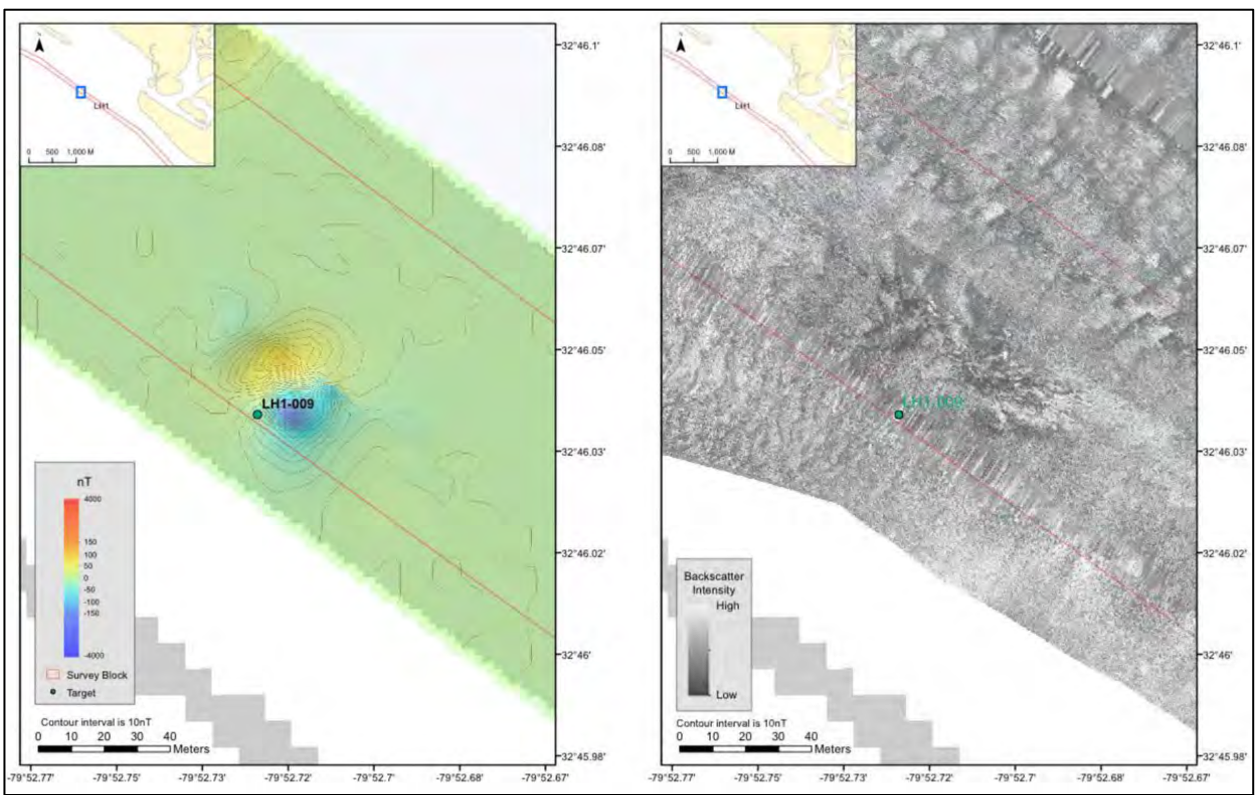

Figure 9. Magnetic and sonar remote sensing data for Anomaly LH1-009 (as presented in Gayes et al. 2013).

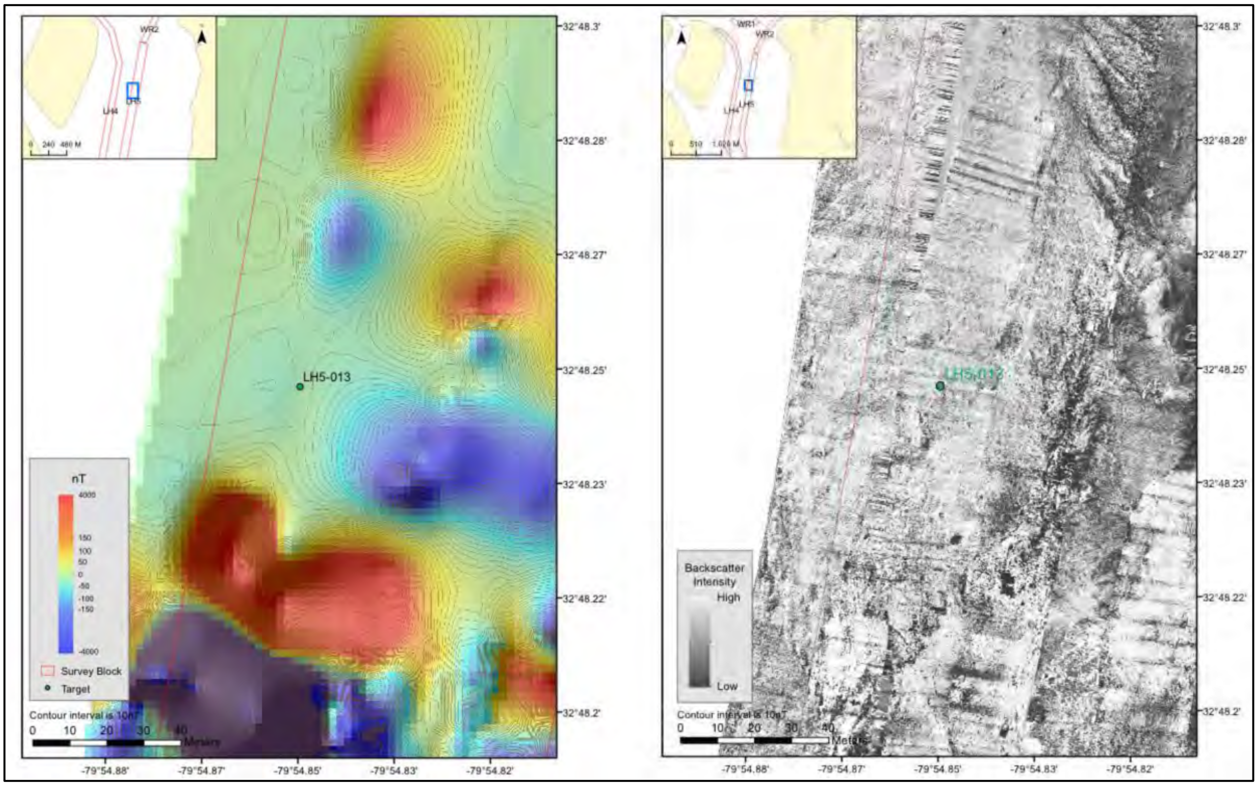

Figure 10. Magnetic and sonar remote sensing data for Anomaly LH5-013 (as presented in Gayes et al. 2013).

SHIPWRECKS, AUTOMATED WRECK AND OBSTRUCTION INFORMATION SYSTEM, AND HISTORIC SITES INVENTORY

The most up-to-date documented listing of known vessels lost in the Charleston Harbor area comes from Coastal Carolina University's recent remote sensing survey (Gayes et al. 2013:69-73). The list includes intensive historical and archaeological research of the Charleston Harbor through discussion with authoritative individuals (Spirek and Amer 2004; Watts 1986; Gaines 2008; Spirek 2012). This listing has been included in this report as *Appendix A: Documentation of Vessels Losses as Presented in Gayes et al. 2013*.

Visitation to the SCIAA facility was completed to review state archaeological site files and an examination of South Carolina's online Geographical Information System (GIS) archaeological cultural resource management system, called ArchSite, was also performed. ArchSite was queried for archaeological sites and surveys within 0.5 miles of the Project Area's anomalies (anomalies LH1-001, LH1-009, and LH5-013). No archaeological shipwreck site files were found within 0.5 miles of the three anomalies using ArchSite.

Buffer zones of 0.5 miles around anomalies LH1-001 and LH-009 did not identify any resources; however, a buffer zone of 1 mile identified cultural resources for both anomalies (Figures 11 and Figure 12, respectively). In addition, SCIAA site files were searched for historic sites as well for Charleston and Berkeley counties within the immediate Project Area. Both of the southernmost anomalies (LH1-001 and LH1-009) are within 1 mile of the Mount Pleasant Historic District (38CH0268). Additionally, anomaly LH1-001's 1-mile buffer zone similarly connects with Castle Pinckney (38CH0076) on Shute's Folly Island. Likewise, anomaly LH1-009's 1-mile buffer zone touches the Fort Sumter National Monument (38CH0075). All three sites

(38CH0075, 38CH007, and 38CH0268) are listed on the NRHP and are considered historic military fortifications and districts. Examining the 0.5-mile buffer zone around anomaly LH5-013 (Figure 13) also did not identify shipwrecks, but did note two previous surveys in the area of the contemporary Arthur Ravenel, Jr. Bridge (Reed et al. 1989; Harvey and Bailey 2001).

Analysis of archaeological state site files at SCIAA relative to the current archaeological investigation identified two nautical archaeological sites adjacent to this project's anomalies. Just north of anomaly LH5-013 is the Wando Terminal underwater survey conducted by Albright (1980). The entire survey tract is listed as the archaeological site, 38CH425. The site is comprised of a series of prehistoric and historic isolated finds and determined ineligible for the NRHP. Nearby anomaly LH1-009 are the remains of the USS *Patapsco* (38CH270). The wreck's current position has been confirmed with remote sensing equipment (Watts 1995a, 1995b; Spirek and Amer 2004:144-148) and was additionally investigated by Jim Spirek (2012). According to Coastal Carolina University's recent study, the USS *Patapsco* is "approximately 650 m[eters] south of the Lower Harbor 1 boundary area" (Gayes et al. 2013:98). Many other maritime archaeological resources have been described in the areas of the Wando River and on and offshore of Sullivan's Island; however, these sites are not immediate to the current project's anomalies.

The current online edition of NOAA's Automated Wreck and Obstruction Information System (AWOIS) was also queried for historic shipwreck sites in or adjacent to the Project Area. It listed only those obstructions noted on maps discussed below.

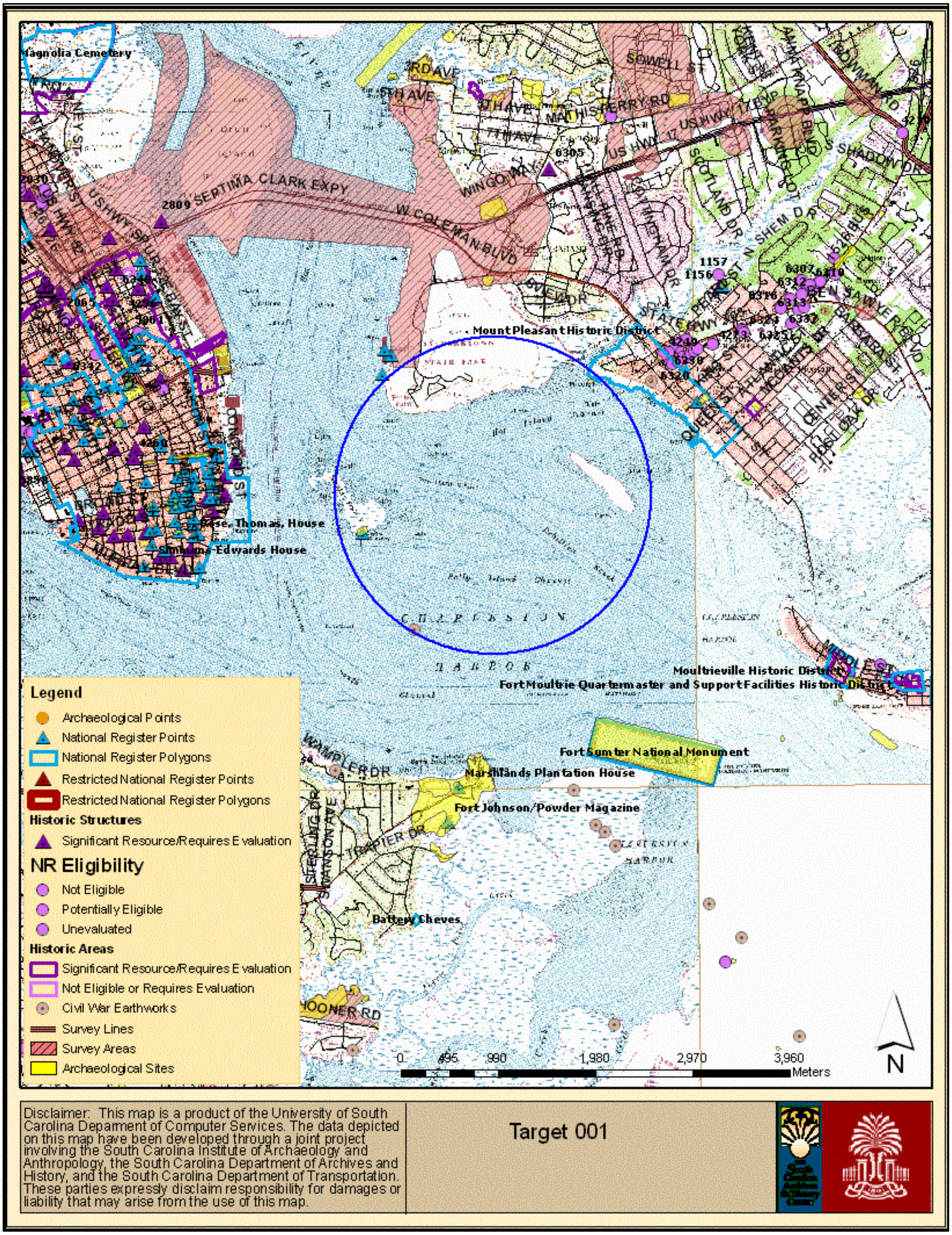

Figure 11. ArchSite map showing a 1-mile buffer zone around anomaly LH1-001 in Charleston Harbor (courtesy of The South Carolina Institute of Archaeology and Anthropology).

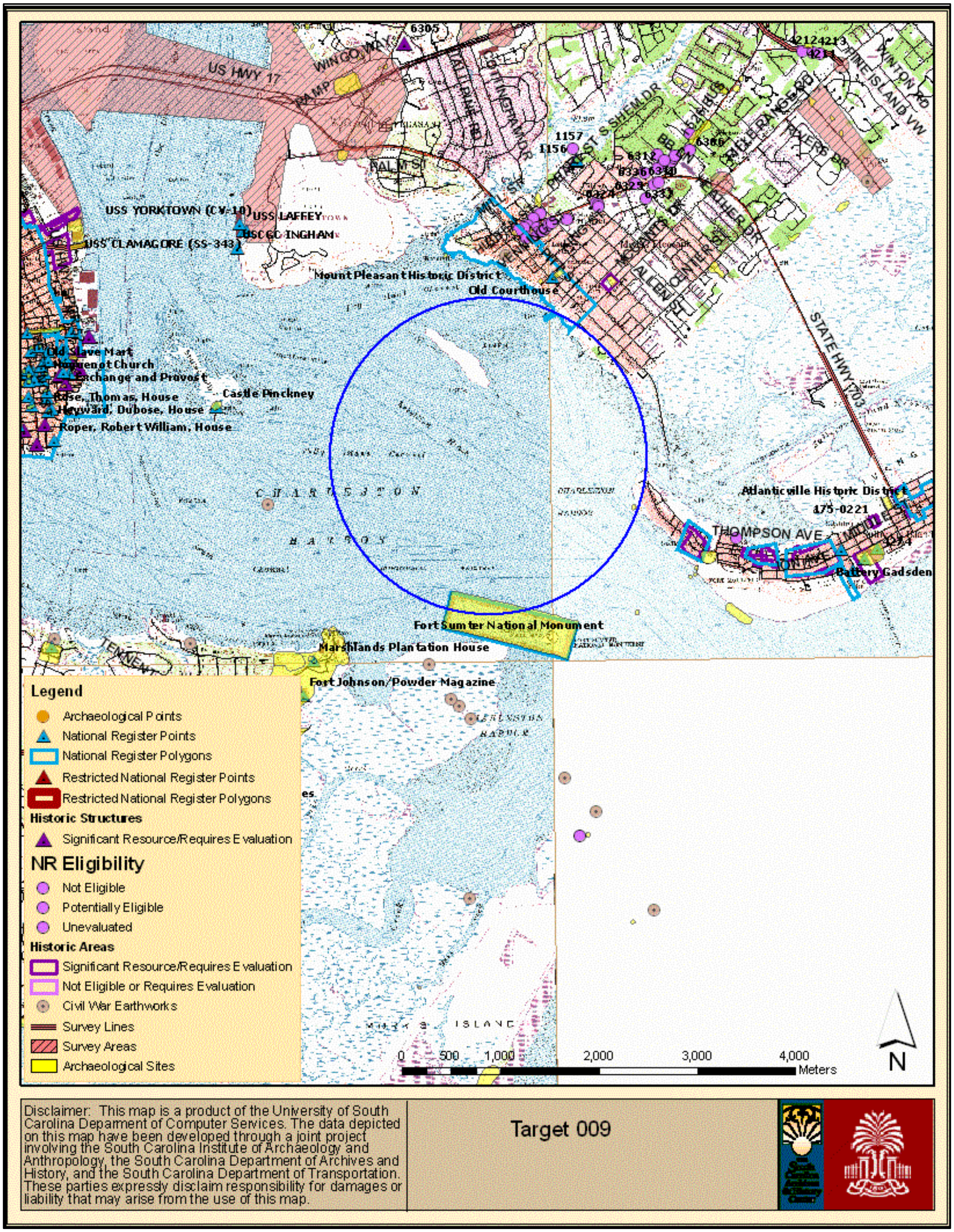

Figure 12. ArchSite map showing a 1-mile buffer zone around anomaly LH1-009 in Charleston Harbor (courtesy of The South Carolina Institute of Archaeology and Anthropology).

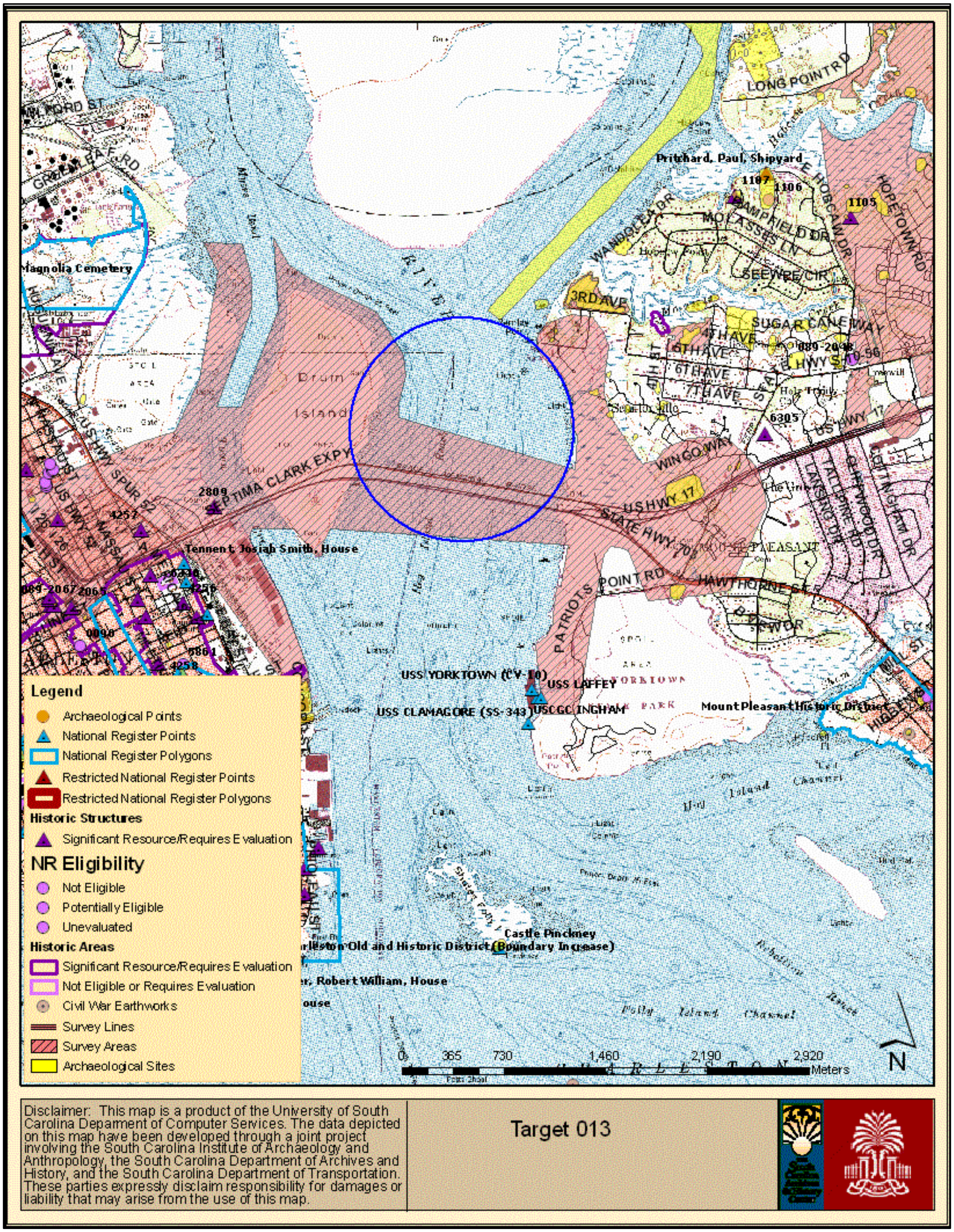

Figure 13. ArchSite map showing a 0.5-mile buffer zone around anomaly LH5-013 in Charleston Harbor (courtesy of The South Carolina Institute of Archaeology and Anthropology).

CARTOGRAPHIC REVIEW

Another excellent tool for identifying shipwrecks within or adjacent to the Project Area is a review of historic navigation maps and charts for the area. Often noting shipwrecks, obstructions, and other various hazards for the mariner, many of these maps can be accessed from NOAA's Office of Coast Survey's Historical Map and Chart Collection at www.historicalcharts.noaa.gov/historicals/search, while others are found in various repositories, publications, or websites. The NOAA website allows the researcher to specify the area or region of interest and then review all available maps for that area. Another valuable utility provided by this site is the virtual magnification feature, which allows the researcher to zoom in and out of specific areas.

Illustrated in Figure 14, the earliest navigation chart available relative to the current Project Area dates to 1858. Close examination of the map includes hydrographic data for Charleston Harbor and identifies the channels, buoys, beacons, and quarantine areas. South of Hog Island Castle Pickney can be seen on Shutes Folly. Two wrecks are found south of the Project Area, offshore and outside the inlet into Charleston Harbor. No cultural features (i.e., shipwrecks) are represented at or near the Project Area on the map.

Figure 14. 1858 chart excerpt showing the Charleston Harbor (Chart 15 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

The next navigation chart from the NOAA website dates to 1870 (Figure 15). The chart closely resembles the previous 1858 chart. The only wreck of note in the Charleston Harbor is the wreck of the USS *Patapsco*. The wreck lies south of the Project Area and east of Fort Sumter. No shipwrecks or structures are represented near and of the Project Area's targets on the map.

Figure 15. 1870 chart excerpt showing the Charleston Harbor. The wreck of the USS *Patapsco* is highlighted east of Fort Sumter (Chart 431 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

Illustrated in Figure 16, the next available map from NOAA dates to 1894. The chart closely resembles the previous maps, but no longer identifies the wreck of the USS *Patapsco* as on the 1870's chart. A quarantine anchorage can now be seen below the South Channel. No cultural features (i.e., shipwrecks) are represented at or near the Project Area on the map.

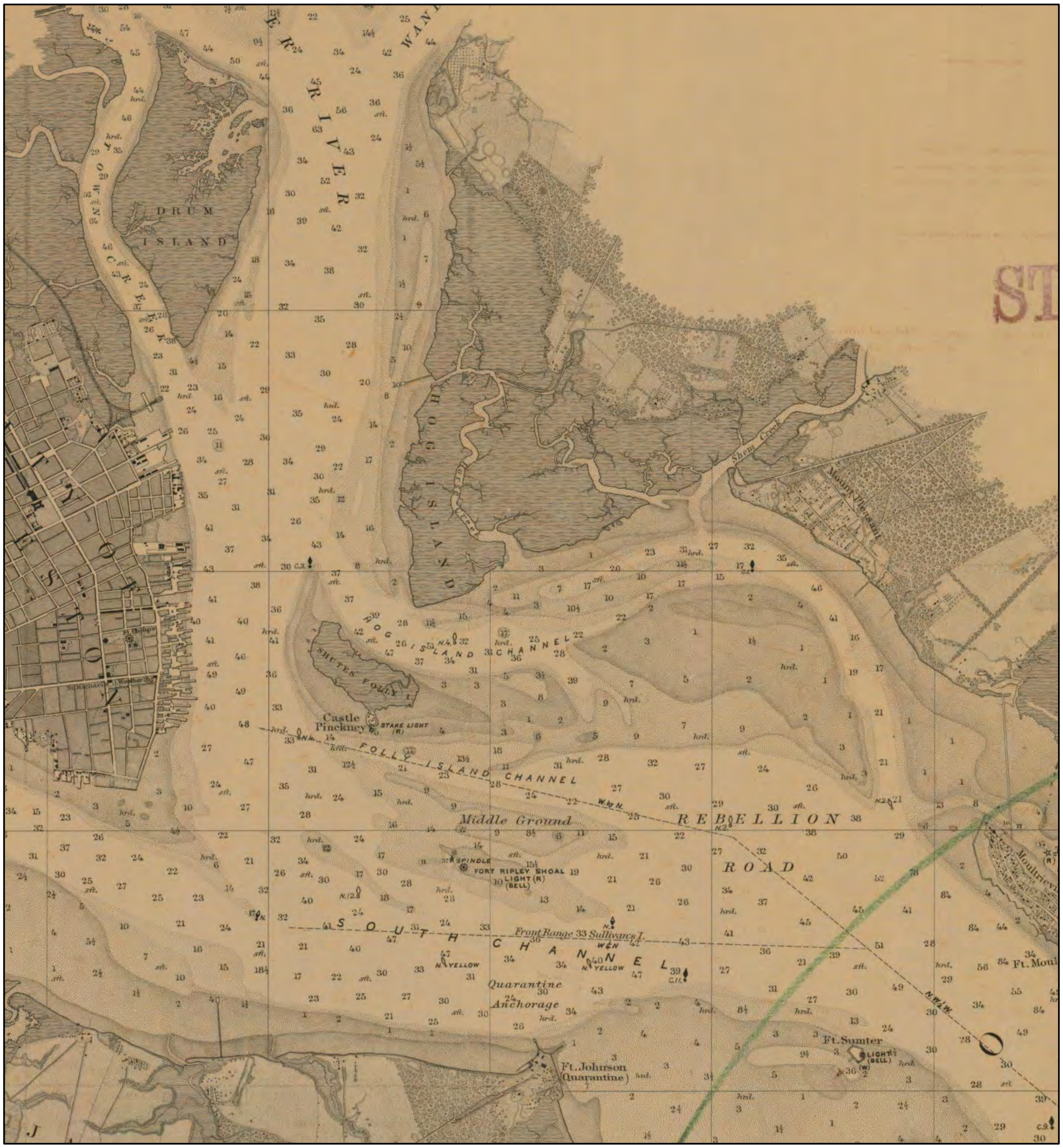

Figure 16. 1894 chart excerpt showing the channels in Charleston Harbor (Chart 431 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

Illustrated in Figure 17, the next available navigation chart from the NOAA website dates to 1900. Mirroring the previous charts with the hydrographical data, the only additional features are on land. No cultural features (i.e., shipwrecks) are represented at or near the Project Area on the map.

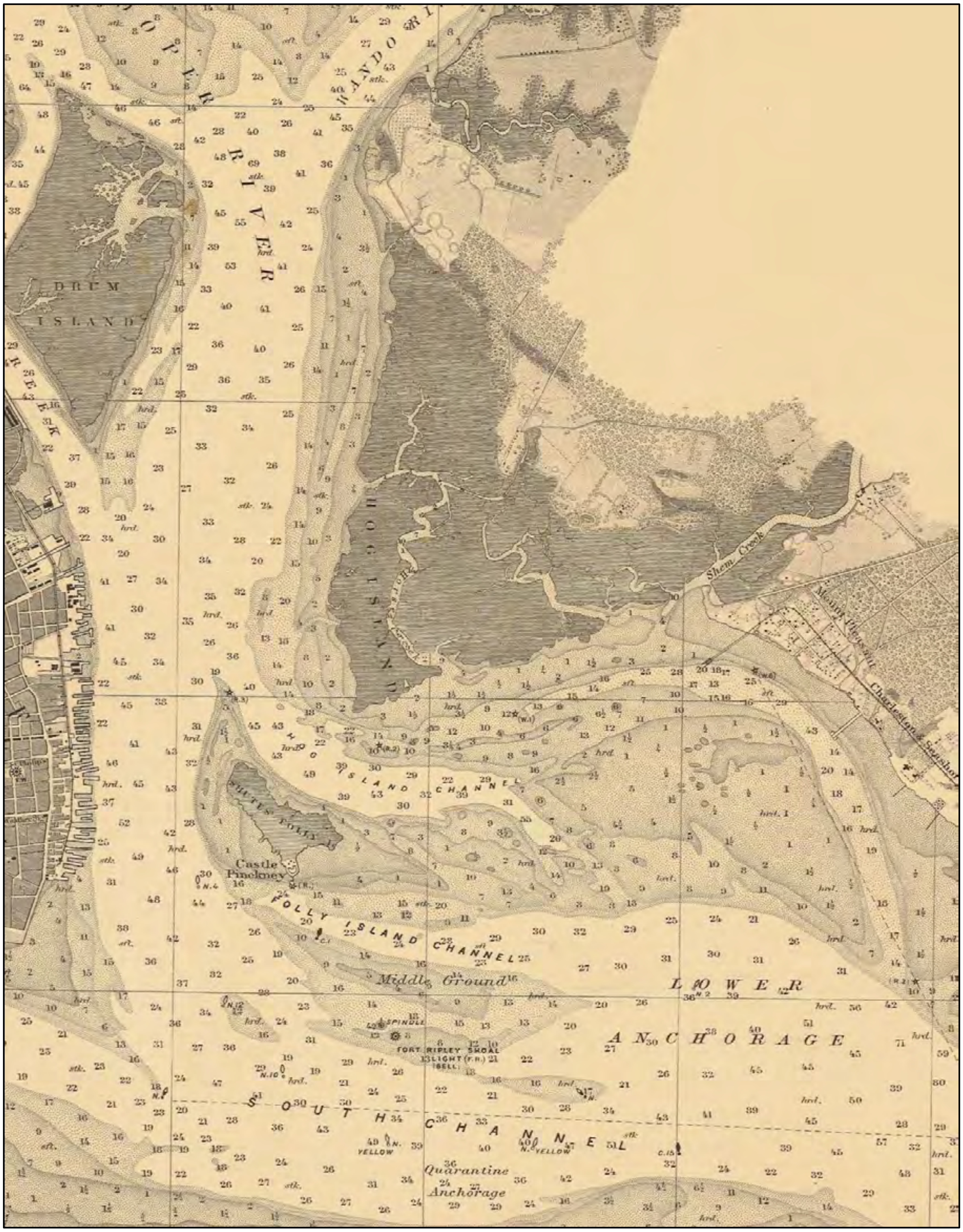

Figure 17. 1900 chart excerpt showing the channels in Charleston Harbor and the Cooper and Wando rivers (Chart 431 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

Figure 18, the 1920 chart, shows more structures visible at Mount Pleasant and a railway running from the town to Moultrieville and further east to the Isle of Palms. The portion previously identified as Rebellion Road is noted as the Lower Anchorage on this 1920 chart. No cultural features (i.e., shipwrecks) are represented at or near the Project Area on the map.

Figure 18. 1920 chart excerpt showing Charleston Harbor with Rebellion Road now identified as the Lower Anchorage (Chart 431 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

Figure 19, the 1959 chart, shows the channels well marked with navigation aids through Charleston Harbor. Five wrecks are noted on the eastern side of the Cooper River, nearby the Project Area. All five are noted as showing hull or superstructure above the waterline. Further south, one shipwreck is noted just outside Rebellion Reach. This wreck is immediately in the Project Area for Target LH1-009.

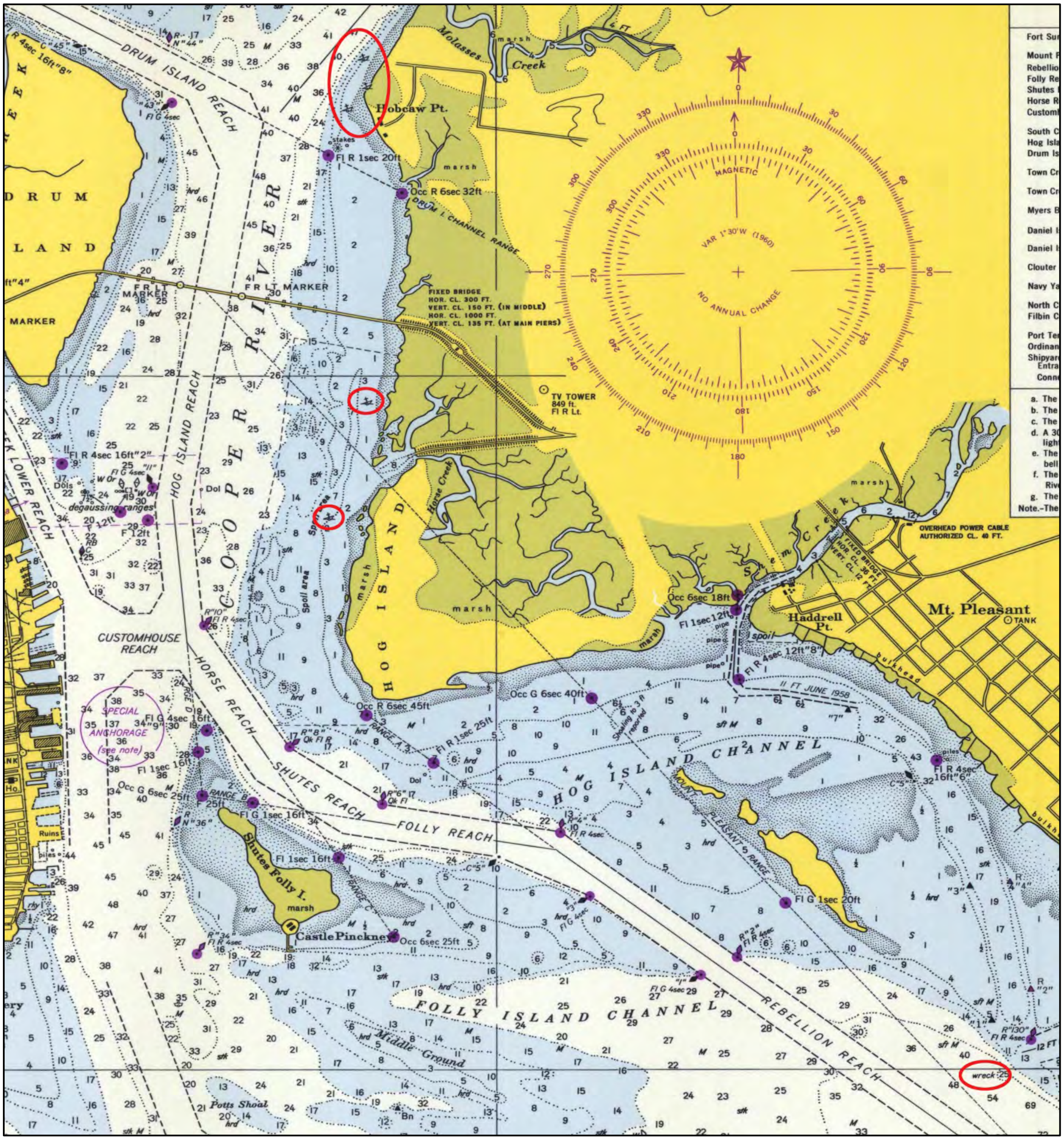

Figure 19. 1959 chart excerpt showing six wrecks in the Charleston Harbor area. One shipwreck is noted on the eastern side of Rebellion Reach, well to the northeast of Anomaly LH1-009. The other five are on the eastern side of the Cooper River (Chart 470 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

The 1980 chart illustrated in Figure 20 has exceptional detail for the Project Area. The John P. Grace Memorial Bridge and the Silas N. Pearman Bridge can be seen crossing the Cooper River to Mount Pleasant. Four shipwrecks are noted in or nearby to the Project Area. All of the wrecks are proximate to the wrecks on the previous 1959 chart.

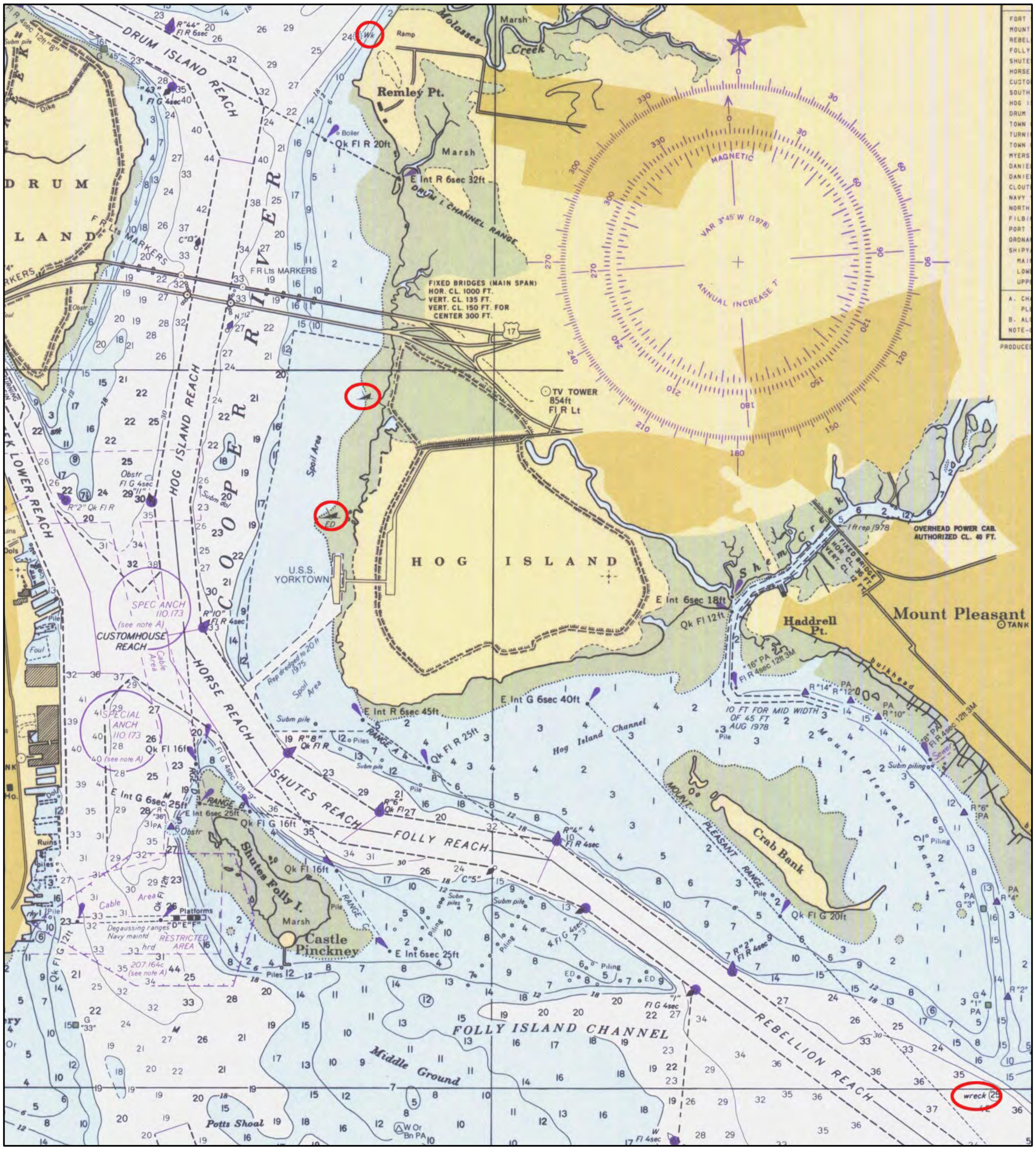

Figure 20. 1980 chart excerpt of the Charleston Harbor showing the two former bridges, John P. Grace Memorial Bridge and Silas N. Pearman Bridge, and four wrecks in the area (Chart 11524 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

The 2011 chart shown in Figure 21 is a very detailed and contemporary map of the Project Area. It shows a channel well marked by navigation aids. The John P. Grace Memorial Bridge and the Silas N. Pearman Bridge are no longer present, but instead noted as submerged bridge ruins. These bridge ruins run immediately along the Project Area and Target LH5-013. Two shipwrecks are again noted in the vicinity and in the same places as the previous 1980 chart.

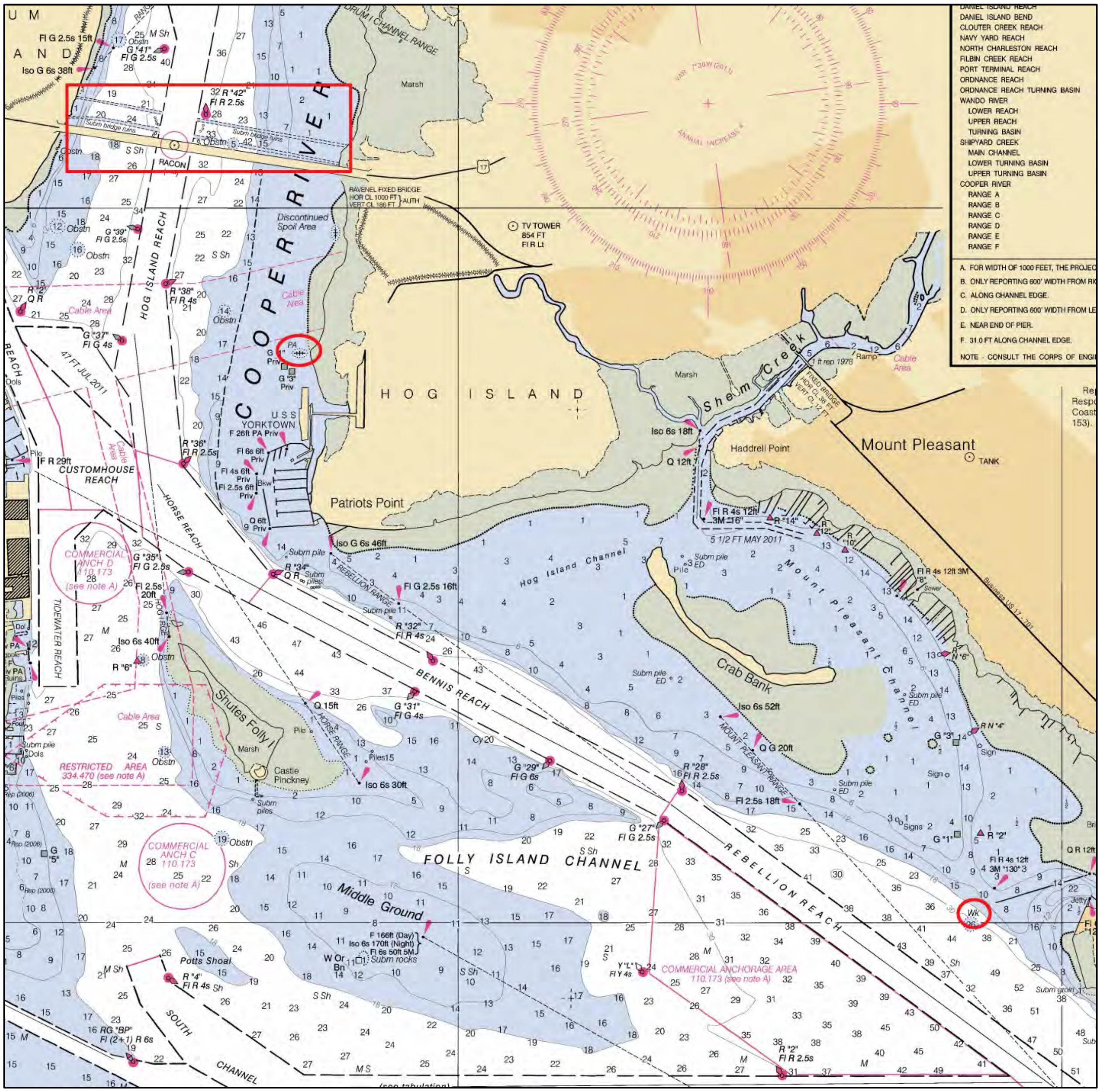

Figure 21. 2011 chart excerpt of the Charleston Harbor with two shipwrecks and the former Pearson and Grace bridges highlighted as submerged bridge ruins (note that the lower shipwreck symbol is well to the northeast of Anomaly LH1-009; Chart 11524 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

PROJECT AREA ENVIRONMENT

The working environment of the Project Area is in and along the Charleston Harbor navigation channel system. Targets LH1-001 and LH1-009 were just outside the eastern side of the channel in the lower part of the harbor. However, Target LH5-013 was on the edge of the channel just upriver from the eastern bridge bent of the Ravenel Bridge in the upper harbor. All targets were in the mid-40-foot range, with swift tidal currents the main impediment to diving. Diving windows centered on the slack tide window, either high or low slack tide (Figure 22). Because the project was located in and along the edge navigation channel, both large and small commercial and recreational vessel traffic was a concern, especially at Target LH5-013, which was essentially adjacent to the eastern bent of the Ravenel Bridge (Figure 23). Furthermore, bridge removal debris at this latter target was problematic for both anchoring and diver safety.

Figure 22. Targets LH1-001 and LH1-009 were located just outside the eastern side of the channel in the lower part of the harbor. However, Target LH5-013 was on the edge of the channel just upriver from the eastern bridge bent of the Ravenel Bridge in the upper harbor. Debris at this latter target was problematic for both anchoring and diver safety (base map courtesy of Google Earth).

Figure 23. Photograph of the LH05-013 anomaly area at the Ravenel Bridge during survey (magnetometer cable visible). The anomaly location is just to the right of the channel buoy (in channel) and between buoy and bridge; view is to the south.

Conducted September 3 through 6, 2013, the weather during the investigation was typical for Charleston during the late summer—low to mid-90s, little to no wind until afternoon, and generally calm seas. Water depths were in the mid-40-foot range, with zero visibility. Water temperatures were in the comfortable mid- to upper 80-degree range. Strong tidal currents in Charleston Harbor dictated the time and duration of the dives.

Personnel

All of the personnel involved with this remote-sensing survey had the requisite experience to effectively and safely complete the project as proposed. Stephen James served as Principal Investigator; and Matt Gifford served as Remote-Sensing Specialist along with Will Williams, Remote Sensing Technician. Michael Murray served as the Diving Supervisor along with archaeological divers Jim Duff, Matt Elliott, Jeff Coward, and Duke Hunsaker.

Remote-Sensing Refinement Survey Equipment

Each of the three targets were surveyed with remote sensing equipment relative to respective target type in an effort to refine the target positions for subsequent diver assessment. All three targets were magnetic anomalies with two having associated sidescan images. All targets were refined with a magnetometer, sidescan sonar, and subbottom profiler.

DIFFERENTIAL GLOBAL POSITIONING SYSTEM

A primary consideration in any remote sensing survey is positioning. Accurate positioning is essential during the running of survey tracklines, and it is essential in returning to exactly recorded locations for supplemental remote-sensing operations or ground-truthing activities. These positioning functions were accomplished on this project through the use of a Trimble Navigation DSM12/212 global-based positioning system (GPS; Figure 24).

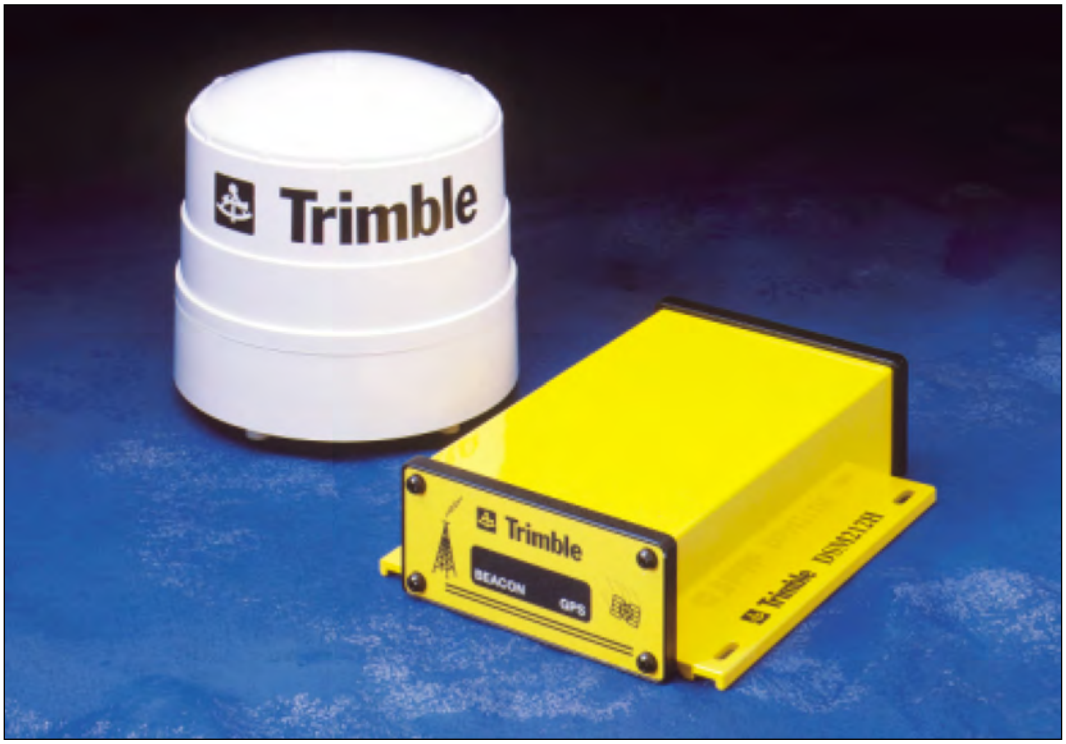

Figure 24. Trimble Navigation DSM 12/212 global-based positioning system used during the investigation.

The DSM12/212 is a GPS that attains differential capabilities by internal integration with a Dual-channel Minimum-Shift Keying (MSK) Beacon receiver. This electronic device interprets transmissions from satellites in Earth's orbit and a shore-based station in order to provide accurate coordinate positioning data for offshore surveys. This system has been specifically designed for survey positioning, which was provided through continuous real-time tracking of the moving vessel by using corrected position data from an on-board GPS. The GPS processed both the satellite data and the differential data transmitted from a shore-based GPS station using Radio Technical Commission for Maritime Services (RTCM) 104 corrections. The shore-based differential station monitored the difference between the position the shore-based receiver derived from satellite transmissions and that station's known position. Transmitting the differential that corrected the difference between received and known positions, the on-board differential global positioning system (DGPS) constantly monitored navigation beacon radio transmissions in order to provide a real-time correction to any variation between the satellite-derived and actual positions of the vessel.

Both the satellite transmissions and the differential transmissions received from the shore-based navigation beacon were entered directly into a Dell computer. The computer and associated hardware and software calculated and displayed the corrected positioning coordinates every second and stored the data. The level of precision for the system is considered by the manufacturer "…to achieve positions accurate to the sub-meter level" (Trimble Navigation

Limited 1998:1-2). Computer software (Hypack Max) used to control data acquisition was written and developed by Coastal Oceanographics, Inc. specifically for survey applications. Positioning information was stored on magnetic disk aboard the survey vessel.

The coordinate system employed for this project was State Plane NAD 1983 SC International Feet and NAVD 88 datum. All positioning coordinates are based on the position of the DGPS antenna. Each of the remote-sensing devices was oriented to the antenna, and their orientation relative to the antenna, (known as a layback) was noted (Figure 25). This information is critical in accurate positioning of targets in the data analysis phase and also in repositioning for any subsequent archaeological activities.

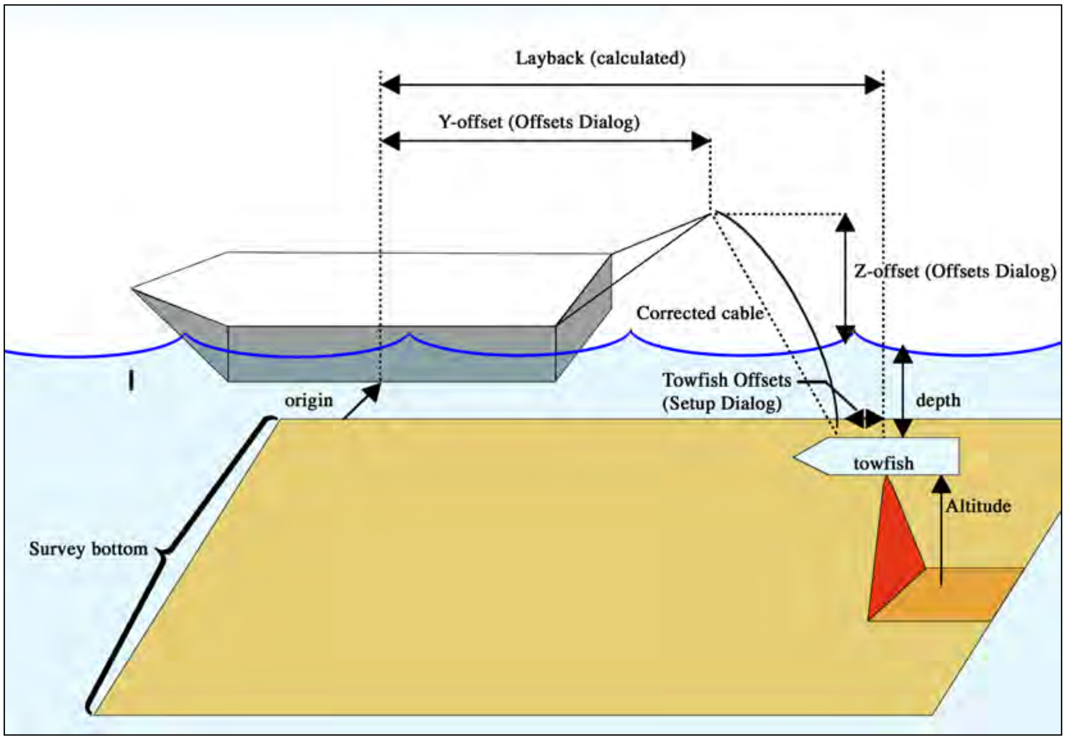

Figure 25. Equipment schematic illustrating layback (courtesy of Coastal Oceanographics, Inc.).

MAGNETOMETER

Magnetometers measure the intensity of magnetic forces with a sensor that measures and records the ambient (background) magnetic strength and deviations from the ambient background (anomalies) caused by ferrous and some other sources (Breiner 1973). These measurements are recorded in nanoteslas, the standard unit of magnetic intensity.

The success of the magnetometer to detect anomalies in local magnetic fields has resulted in the instrument being a principal remote sensing tool of maritime archaeologists because of anomalies that can be components of shipwrecks and other historic debris or objects hazardous to dredging or navigation. While it is not possible to identify specific ferrous objects from the magnetic field contours, it is occasionally possible to approximate shape, mass, and alignment characteristics of wrecks or other structures based on complex magnetic field patterns. In addition, other data (historic accounts, use patterns of the area, diver inspection), which overlap data from other remote sensing technologies, such as the sidescan sonar and prior knowledge of similar targets, can lead to an accurate identification of potential targets. Finally, it must be noted that other sources of magnetic field variation can overwhelm smaller objects. These include: electrical magnetic fields that surround power transmission lines; underground pipelines; navigation buoys; or bridges and dock structures, which can be quite extensive when the feature is massive.

There are three types of commercially available marine magnetometers available: proton precession; cesium; and Overhauser. Panamerican has determined that the Marine Magnetics SeaSPY Overhauser magnetometer is the most stable and precise magnetometer available and, therefore, it was the magnetometer used for this survey. The system was powered by a 110-volt gasoline powered generator (Figure 26). Data were stored in the navigation computer and archived. The SeaSPY is capable of sub-second recordation for precise locational control, but data were collected at 1-second intervals, providing a record of both the ambient field and the character and amplitude of the encountered anomalies. The magnetometer was towed no more than 20 feet above the harbor floor.

Figure 26. Survey instruments employed during the investigation included (from right to left) the magnetometer, the sidescan sonar, and the subbottom profiler. Honda generator employed to power the instruments is in the background adjacent to the transom.

SIDESCAN SONAR

Sidescan sonars produce images by "pinging" the water column with acoustic energy (sound), and then they determine distance and reflective strength of objects from the echoed returns. Under ideal circumstances (low energy wave and current conditions), they are capable of providing near-photographic images of submerged bottomland, on either side of a trackline of a survey vessel. A portion of the record from directly below the vessel is absent due to the physics of the system and depth of the water under the towfish. The EdgeTech kilohertz towfish was operated from the bow of the vessel to keep vessel and motor noises to a minimum.

Target characteristics, such as height above bottom, linearity, and structural form are recorded. Additionally, potential acoustic targets are checked for any locational match with the data derived from the simultaneous magnetometer survey.

The remote sensing instrument used to search for physical features on or above the ocean floor was a Marine Sonic Technology (MST) Sea Scan sidescan sonar system. The sidescan 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 sidescan sonar is capable of providing a near-photographic representation of the bottom on either side of the trackline of a survey vessel.

The Sea Scan PC has internal capability for removal of the water column from the instrument's video printout, as well as correction for slant range distortion. This sidescan sonar was utilized with the navigation system to provide manual positioning of fixed or target points on the digital printout. Sidescan 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 locational match with the data derived from the magnetometer and the subbottom profiler.

The MST Sea Scan PC sidescan sonar was linked to a towfish that employed a 900-kilohertz power setting and a variable side range of 20 meters-per-channel (131 feet) on each of the survey lines (Figure 26). The 20-meters-per-channel setting was chosen to provide 100% overlapping coverage with the 25-foot line spacing. The power setting was selected in order to provide maximum possible detail on the record generated; 900 kilohertz was the preferred frequency.

SUBBOTTOM PROFILER

Subbottom profilers generate low frequency acoustic waves capable of penetrating the seabed and then reflect off boundaries or objects within the subsurface. These returns are received by hydrophone or hydrophone array operated in close proximity to the source. The data are then processed and reproduced as a cross section scaled in two way travel time (the time taken for the pulse to travel from the source to the reflector and back to the receiver). This travel time can then be interpolated to depth in the sediment column by reference to the travel time of the sound (averaging 1,500 meters/second). These seismic cross sections can be studied visually and the shapes and extent of reflectors used to identify bottom and subbottom profile characteristics.

There are several types of subbottom profilers: sparkers; pingers; boomers; and chirp systems. Sparkers operate at the lowest frequencies and afford deep penetration but low resolution. Boomers operate from 0.5 to 5 kilohertz and they can penetrate to between 30 and 100 meters with resolution of 0.3 to 1.0 meters. Pingers operate from 3.5 and 7 kilohertz and penetrate seabeds from a few meters to more than 50m depending on sediment consolidation, with resolution to about 0.3 meters. CHIRP systems operate around a central frequency that is swept electronically across a range of frequencies between 3 and 40 kilohertz and resolution can be on the order of 0.1 meters in suitable near-seabed sediments.

The refinement survey employed an EdgeTech 424 XSE-500 Shallow Tow X-Star System of topside processor and towfish. This system included a Model 3100-G Topside Processor with DISCOVER Sub-Bottom Software and a 4-24 kilohertz SB-424 tow fish (Figure 26).

In general, high and low amplitude reflectors (light and dark returns) distinguish between stratigraphic beds; parabolic returns indicate point source objects of sufficient size to be sensed by the wavelength and frequency of the power source. There are five types of spurious signals that may cause confusion in the two dimensional records: direct arrivals from the sound source;

water surface reflection; side echoes; reflection multiples; and point source reflections. Judicious analysis is required to identify them.

PROJECT VESSEL

Remote sensing refinement and diving investigations were conducted from Panamerican's 25-foot *Parker*, a modified V-hulled motor vessel powered by a 200-horsepower Yamaha engine. The vessel has a covered cabin and an ample, covered-deck area for the placement and operation of the necessary remote sensing and diving equipment (Figure 27). The vessel conformed to all U.S. Coast Guard specifications, according to class, and had a full compliment of safety equipment. It carried all appropriate emergency supplies, including lifejackets, spare parts kit, tool kit, first-aid supplies, flare gun, and air horns.

Figure 27. Panamerican's 25-foot *Parker* employed for the refinement survey and diving investigations.

REFINEMENT SURVEY PROCEDURES

Prior to diving investigations, geophysical remote sensing refinement surveys were conducted at each of the three targets. Spaced at 25-foot intervals and centered on the target coordinates, survey lines were conducted to effectively cover the area surrounding each target (Figure 28). The magnetometer, sidescan sonar, subbottom, and DGPS were mobilized and tested, found operational, and the trackline running began. The helmsman viewed a video monitor, linked to the DGPS and navigational computer to aid in directing the course of the vessel along survey tracklines over and parallel to each target. The speed of the survey vessel was maintained at approximately 3 to 4 knots for the uniform acquisition of data. As the survey vessel maneuvered down each trackline, the navigation system monitored the position of the survey vessel relative to the tracklines every second, each of which was recorded by the computer. Event marks delineated the start and end of each trackline. The positioning points along the traveled line were recorded on the computer hard drive and the magnetic and subbottom data was also stored digitally.

Once the refinement survey was completed, refinement magnetic contour maps and sidescan images were produced of each of the targets. With respect to Anomaly LH1-001, based on proven principles of magnetism the source material for a dipole anomaly is located directly between the positive and negative fields (Figure 29). Buoys were placed at this refined source material location between the largest positive and negative contours for Anomaly LH1-001 as illustrated in Figure 30.

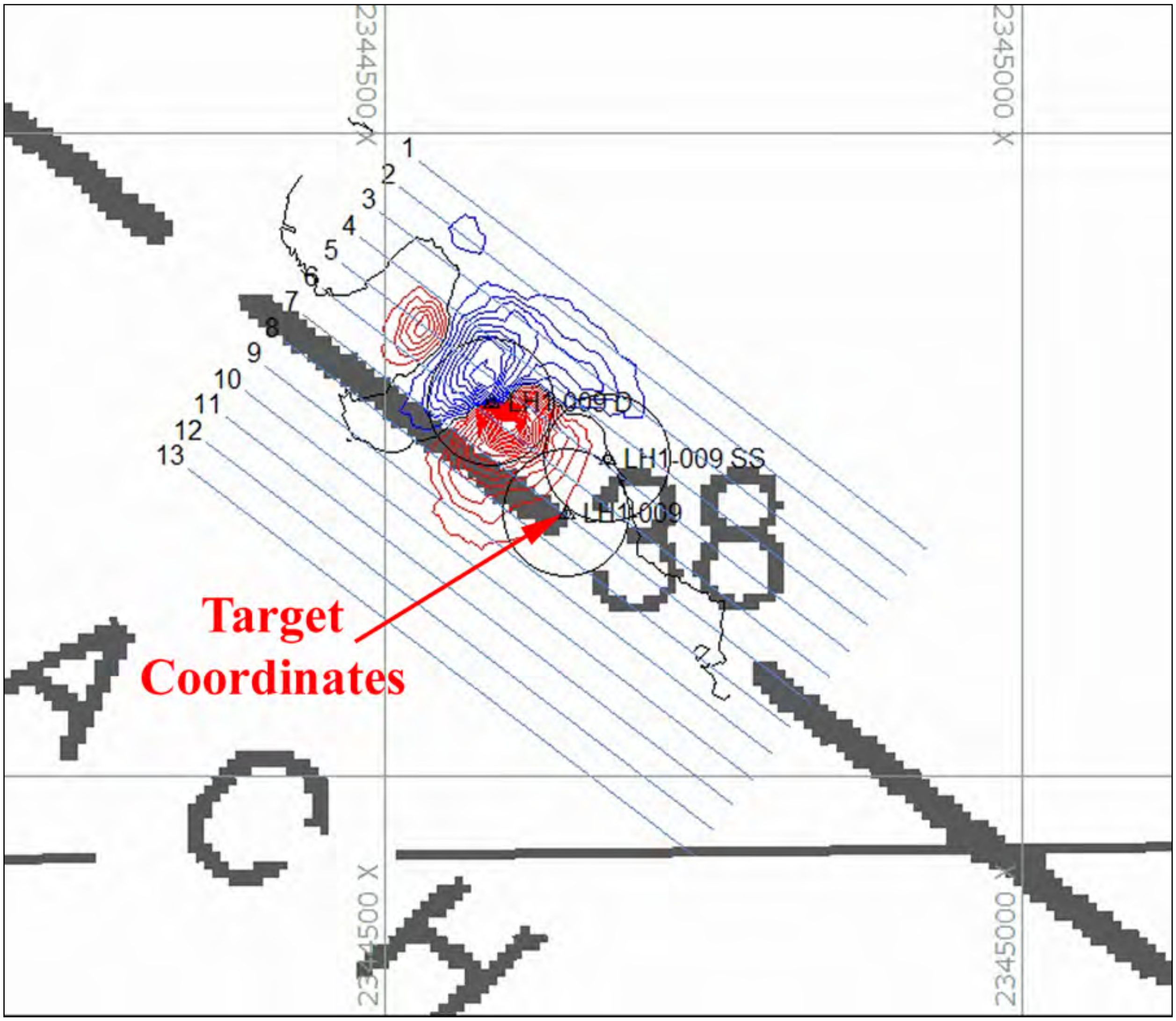

Figure 28. Refinement survey transects spaced at 25-foot intervals were conducted at each target to refine the source location. Shown are track lines, original target coordinate location and resultant magnetic contour for LH1-009.

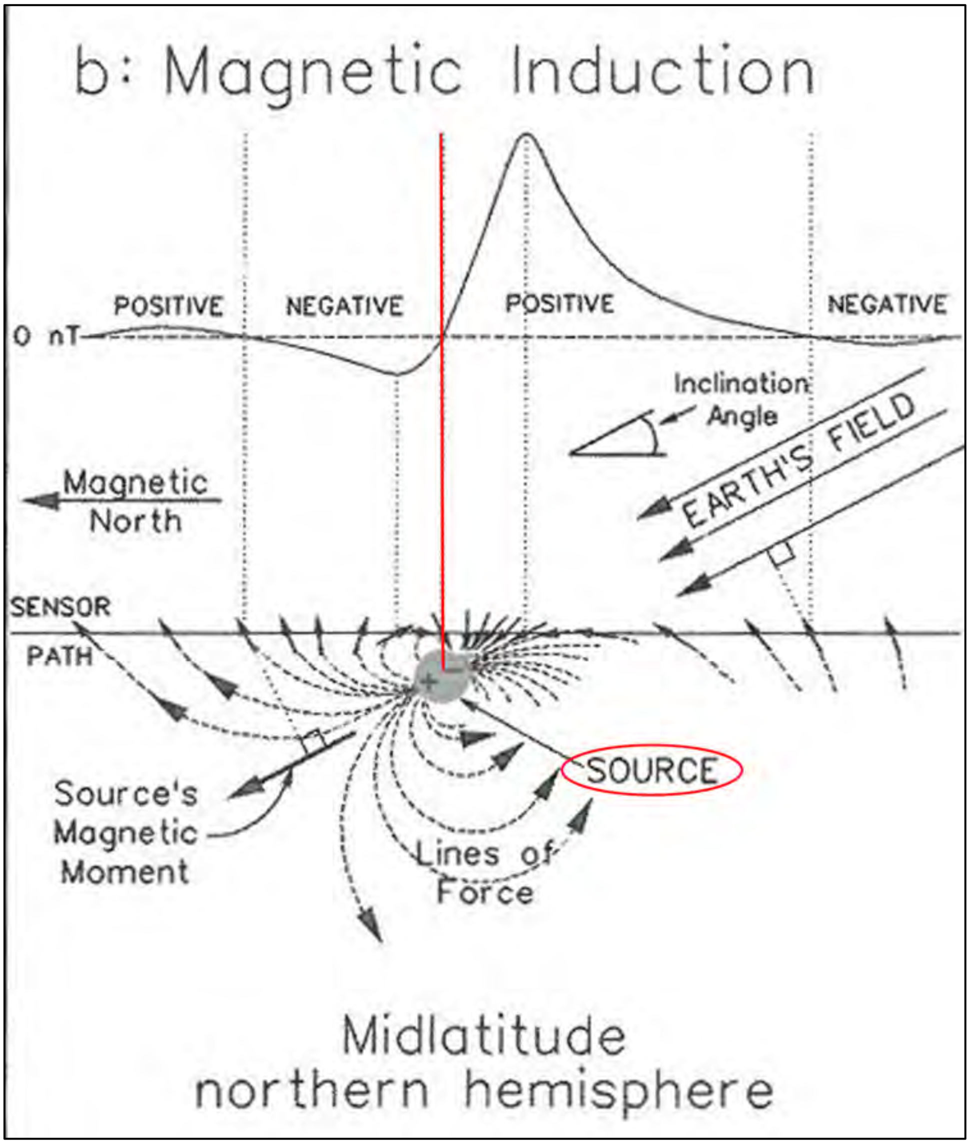

Figure 29. Location of source material between positive and negative magnetic readings of a dipole (as presented in Gearhart 2011:94).

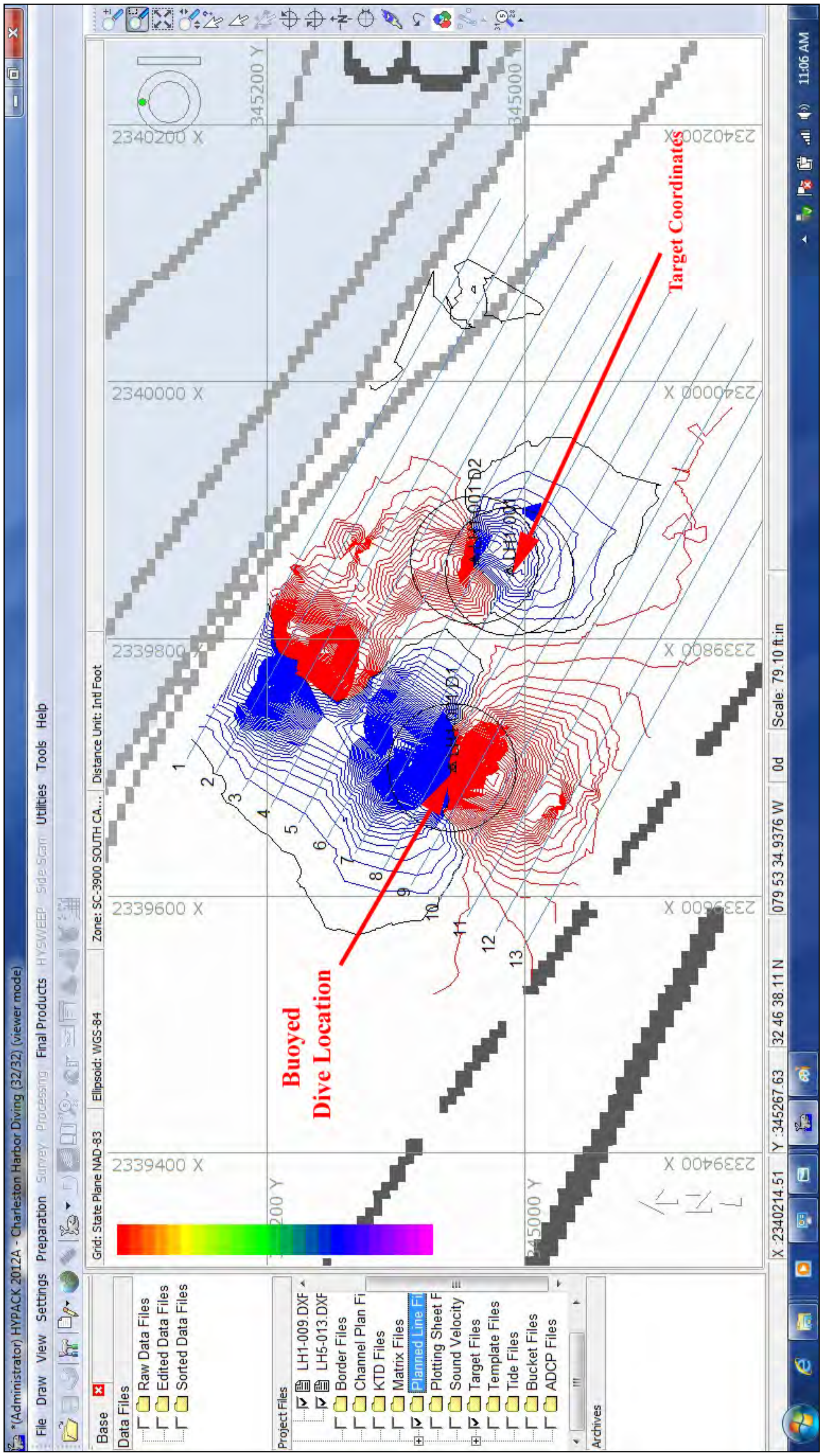

Figure 30. Refinement buoy for diving investigation is located between the positive and negative contours, the location of the source material with the highest nanotesla deviation; target shown is LH1-001.

DIVE INVESTIGATIONS

The second phase of the present project included an on site diver investigation of the three targets that had the potential to represent significant submerged cultural resources eligible for listing on the NRHP. Preliminary to this second phase of the project, a Dive Operations Plan (DOP) was submitted to the USACE prior to the diving operations. The DOP outlined procedures to (1) ensure the safety of project divers; and (2) effectively and efficiently complete project goals and objectives. Diving operations for this project met all federal requirements for safe diving. All diving activities were in accordance with the strictest provisions of the USACE, U.S. Navy, and Panamerican diving safety manuals and diving guidelines. During all diving operations, all persons diving and working under the auspices of Panamerican abided by this DOP.

Surface Supplied Air (SSA) was chosen as the most efficient and safe method of conducting investigations within the project area. Divers employed a Kirby-Morgan Superlite-27 dive helmet connected to a SSA source, radio communications cable, safety tether, and pneumo hose (Figure 31). On the surface, various individuals and pieces of equipment ensured safe diving operations. A dive tender was required to aid the diver in donning and doffing equipment and to tend the diver while submerged and moving about the sea floor. The radio communications operator kept in constant contact with the diver and relayed messages between the diver and the surface support team. A standby diver was required on site in the event of an emergency situation that would require aid to the primary diver. Finally, a dive supervisor was present on site at all times to coordinate the activity of the diver and surface support team to achieve the project goals.

Figure 31. Surface supplied-equipped diver (Jim Duff) preparing to enter the water with 8-foot hydroprobe.

Air for SSA diving was provided by a cascade system of two 240-cubic-foot K bottles, opened to supply air one at a time. Pressure gauges and check valves were included in the air supply system. Two levels of redundant backup air supply were used, including an aluminum 80-cubic-foot Self-Contained Underwater Breathing Apparatus (SCUBA) cylinder linked to the SSA cascade system and a 50-cubic-foot aluminum SCUBA cylinder worn by the diver and connected to the dive helmet. The dive supervisor acted as timekeeper and radio operator, monitoring the air supply system during each dive to ensure that air pressure was correctly maintained and adequate reserve air was always available (Figure 32). A certificate of air quality was obtained from the air supplier and submitted to the USACE, Charleston District Diving Coordinator for approval prior to commencement of diving activities.

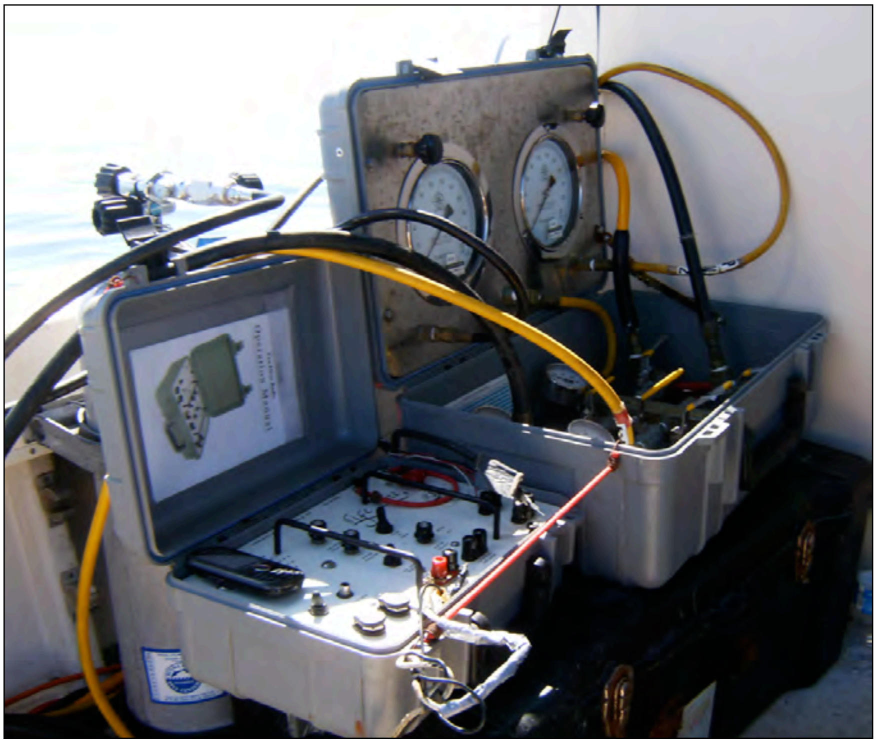

Figure 32. Dive station. Diver-to-Surface radio is box in the front. Dive manifold with pnuemo gauges is to the back right.

Prior to the commencement of diving operations, a Pre-Dive Safety Meeting was held with all members of the dive team and vessel crew. All safety and diving procedures were discussed in detail. Diving commenced upon completion of the meeting.

Based on the refined remote sensing survey data, each target was buoyed at its respective refined coordinate location. Prior to anchoring, the direction of the tidal current and wind direction relative to each target buoy had to be ascertained, so that when anchored, the distance from and the orientation of the survey vessel's stern to the buoy was optimal. The standard operating procedure for the diver was to enter the water and be directed to the buoy location. Employing the buoy as the center point, he then conducted a visual inspection of the bottom. Performing a series of arcs by pivoting on his umbilical, which was let out in 10-foot increments from the stern of the vessel, the diver covered an area approximately 100-feet square surrounding the buoy. With respect to Anomaly LH1-001, an extensive grid pattern of hydroprobes was conducted. Employing the 8-foot long hydroprobe, 31 probes were conducted between 5 and 10 feet in five arcs starting at the center of the anomaly source. The arcs were separated by 10 feet and covered the source location (Figure 33).

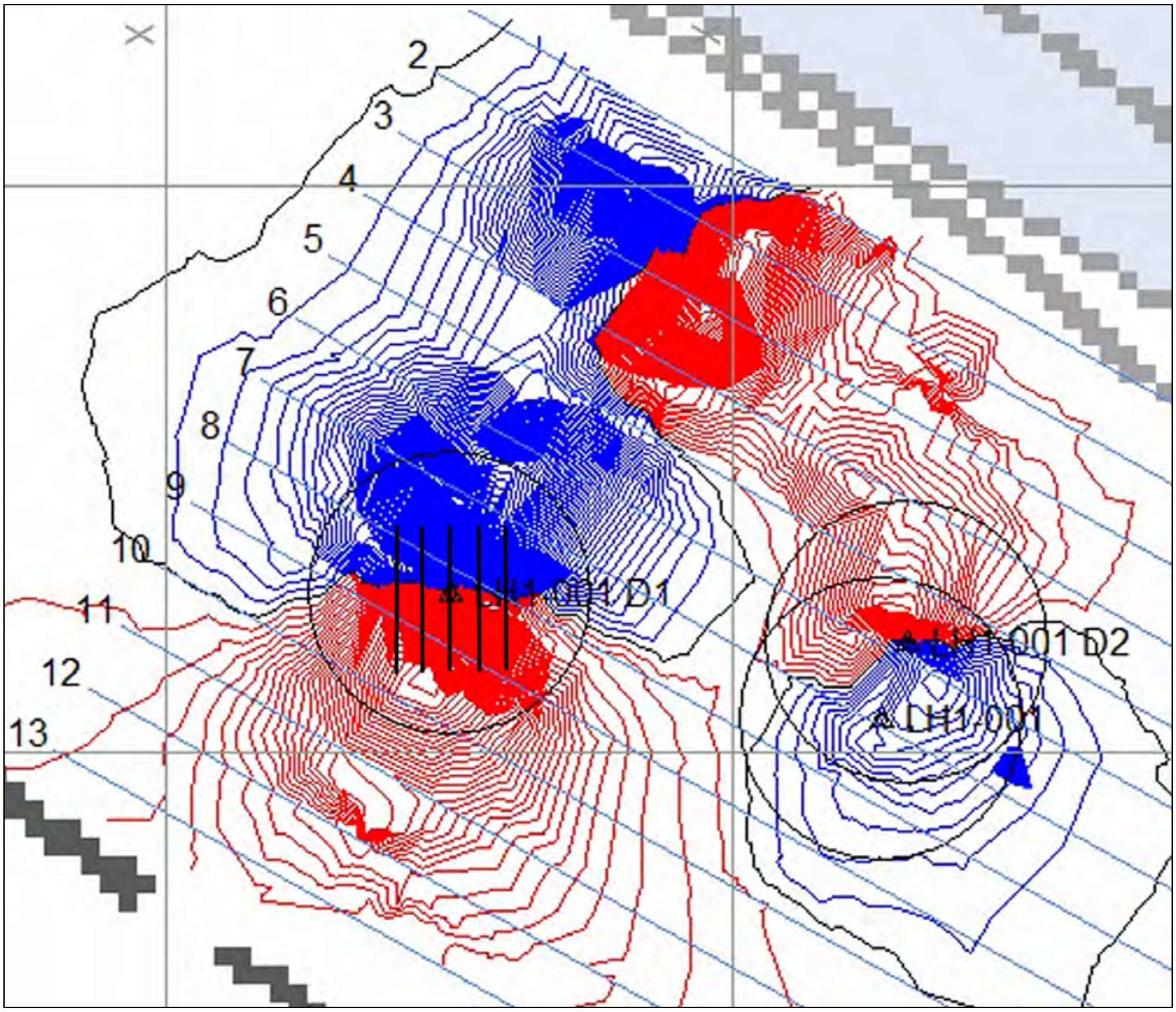

Figure 33. Probe arc schematic at Target LH1-001. Centered at the refined source location of the highest nanotesla deviation, five arcs (black lines) containing 31 8-foot deep probes were conducted.

Probing of anomalies or features is an effective means of determining the spatial extent and burial depth of a given target located beneath the sea floor. The hydroprobe apparatus consists of a water pump, lengths of garden hose, and the probe, which is 0.5-inch galvanized pipe. The hose was connected to the 0.5-inch diameter steel probe by a cam-lock. The hydroprobe used for this investigation was 10 feet in length and powered by a 5-horsepower Honda water pump. The basic function of the hydroprobe is to aid in determining the presence or absence of buried cultural material, and, if present, spatial extent of the material, types of overburden (i.e., sand, mud, shell), the type of cultural material, and depth of overburden. This is accomplished by forcing water through the 10-foot pipe attached to the water pump's effluent hose. The force of the water ejected from the pipe end effectively allows the probe to be inserted through sediments of varying density (e.g., sands, silts, shell hash) and depth, thereby contacting the feature if present and/or sediment layers. Differences are readily apparent when contacting wood, rock, brick, and or metal with the probe.

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IV. INVESTIGATIVE FINDINGS

INTRODUCTION

Three magnetic anomalies, two of which had associated acoustic images, were slated for investigation as having the potential for cultural resources (Table 3). Panamerican refined and tested all locations through "visual" diver assessment and hydroprobing methods as discussed in *Chapter III: Methods*. The combined results are as follows.

Table 3. Target Locational Data.

Area and Target	Easting (X)	Northing (Y)	Reference
LH1-001	2339852	345011	Gayes et al. 2013
LH1-009	2344643	341704	Gayes et al. 2013
LH5-013	2333606	354975	Gayes et al. 2013

*Coordinates in State Plane NAD 1983 SC International Feet and NAVD 88 datum.

TARGET LH1-001

Illustrated in Figure 34, Target LH1-001 was originally identified as:

> "…a dipolar magnetic anomaly of 513.68 nanoteslas and 21 seconds duration near the northern end of the survey area. It is detectable over a distance of approximately 95 m[eters] (312 feet). A sonogram of the harbor bottom shows small dispersed objects unlikely to generate a signal of this amplitude…The anomaly was recorded on three survey lines and is a significant magnetic distortion. Because this is a part of the harbor known to be the site of Civil War naval engagements and the demolition or disposal of shipwrecks from that era, it is a high priority to further investigate this anomaly if it is in an area that will be impacted by primary or secondary dredging activities" [Gayes et al. 2013:109].

Note that the acoustic image caption states "Anomaly LH1-001 sonogram showing buried pipes (top). Anomaly" (Gayes et al. 2013:110). This is confusing, however, because the discussion does not mention "buried pipes" anywhere other than in the caption.

As illustrated in Figures 35 and 36, the refinement survey recorded a large complex anomaly with a magnetic deviation of 1,172 nanoteslas at the largest anomaly located on the southeastern corner. The complex anomaly was detectible over a 300-square-foot area. Note that the original and refinement signatures contour similarly, but the current refinement magnetic deviation is much higher, most likely a result of a lower sensor depth or tighter transect spacing. Also, the refinement acoustic image is a much better image due, most likely, to a different sonar system and shows a featureless bottom.

A buoy was placed at the apex of the largest anomaly (southwest) between the positive and negative contours, the largest anomaly suggesting either a larger source object and/or shallower burial depth. Diver assessment of the buoyed location, which was in 44 feet of water, was conducted by hydroprobing. A series of 31 hydroprobes were conducted covering five arcs, with the arcs spaced at 10-foot intervals and the probes spaced 5 to 10 feet beginning at the buoy (Figure 37). All probes were negative to a depth of 8 feet, suggesting either a non-significant source difficult to detect with the probe (i.e., wire rope) or an object(s) deeper than an 8-foot burial depth. A review of the subbottom record shown in Figures 38, 39, and 40 indicates a lack of detectable buried structure. A faint geologic feature is visible in several of the records, but it does not correlate with the anomalies. While findings from the hydroprobing and the subbottom record indicate a non-detectable magnetic source like wire rope for the anomaly, because its identity remains unknown, it is recommended that dredging at this target be monitored.

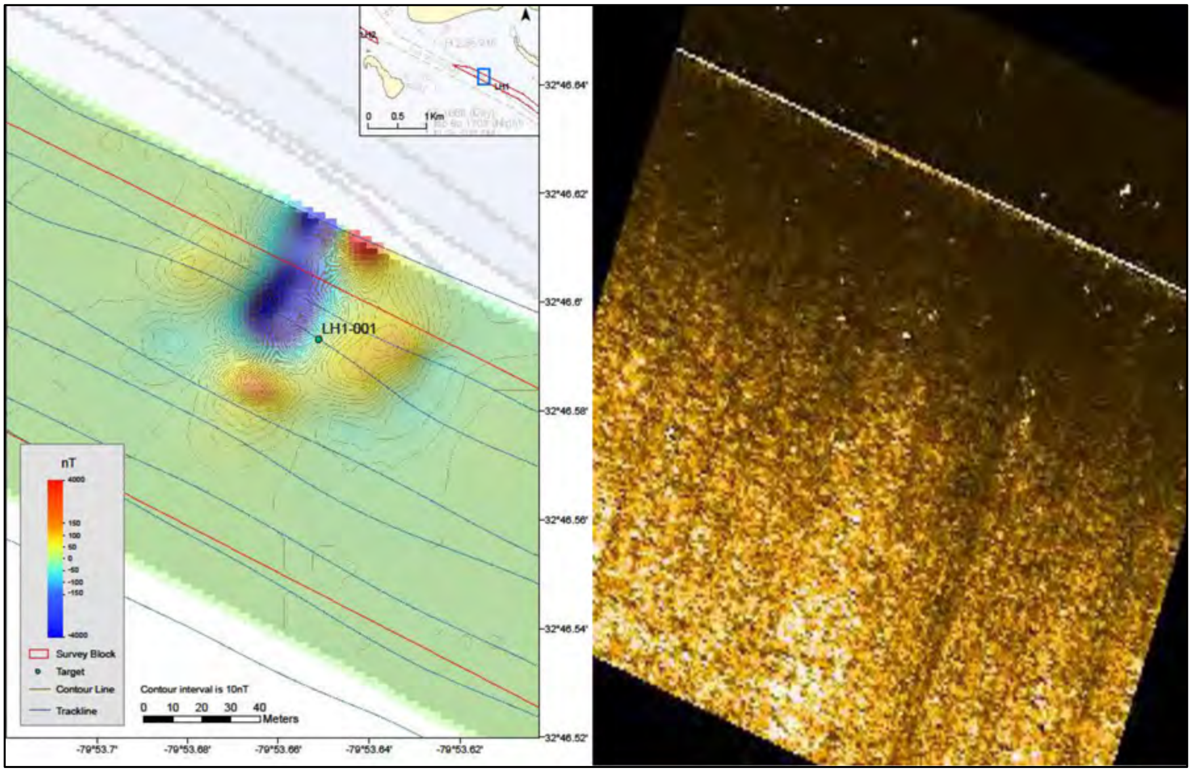

Figure 34. Magnetic (L) and sonar (R) signatures for Anomaly LH1-001 (as presented in Gayes et al. 2013:110-111).

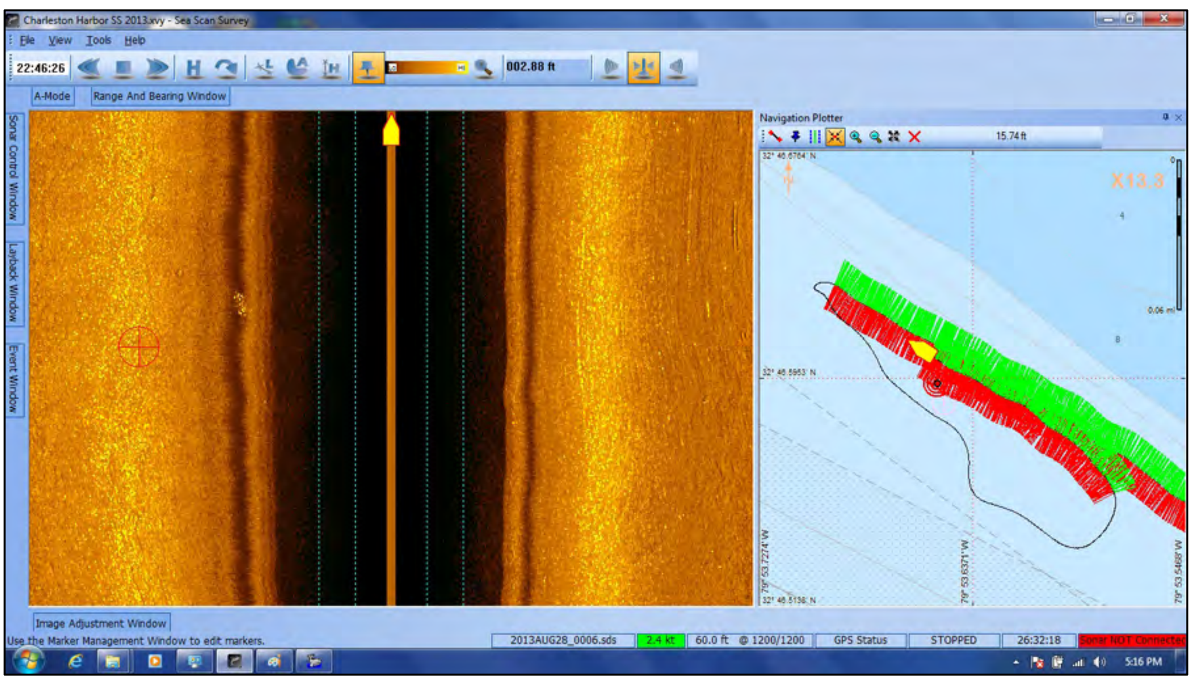

Figure 35. Refinement acoustic image of Anomaly LH1-001. Compare this image with original acoustic image above.

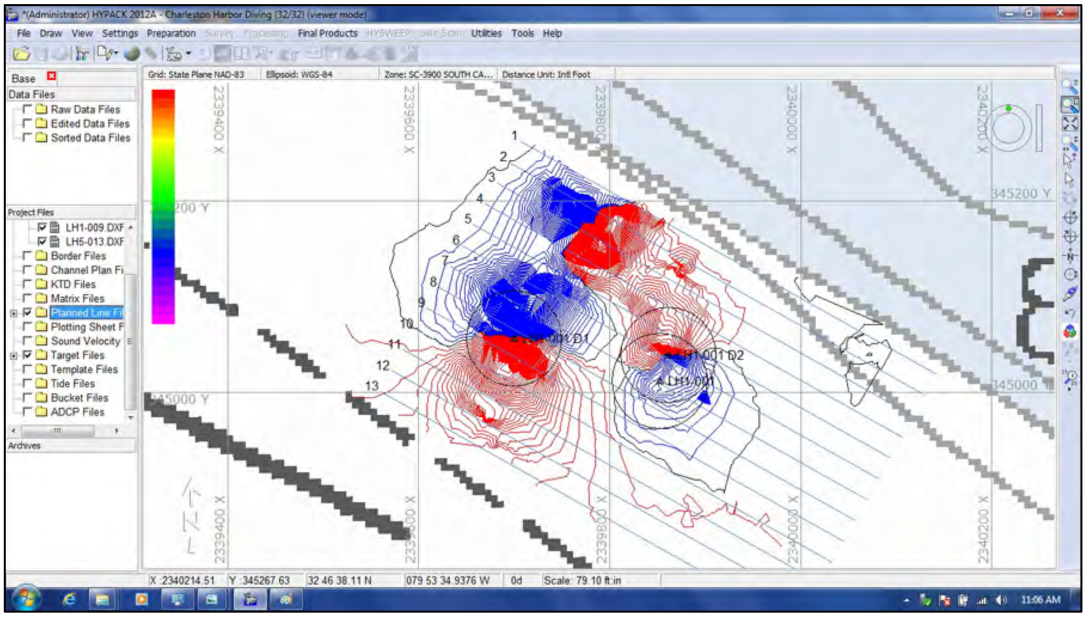

Figure 36. Refinement magnetic contour map of Anomaly LH1-001 (note location of refinement buoy drop at apex between the negative [blue] and positive [red] poles of the strongest anomaly).

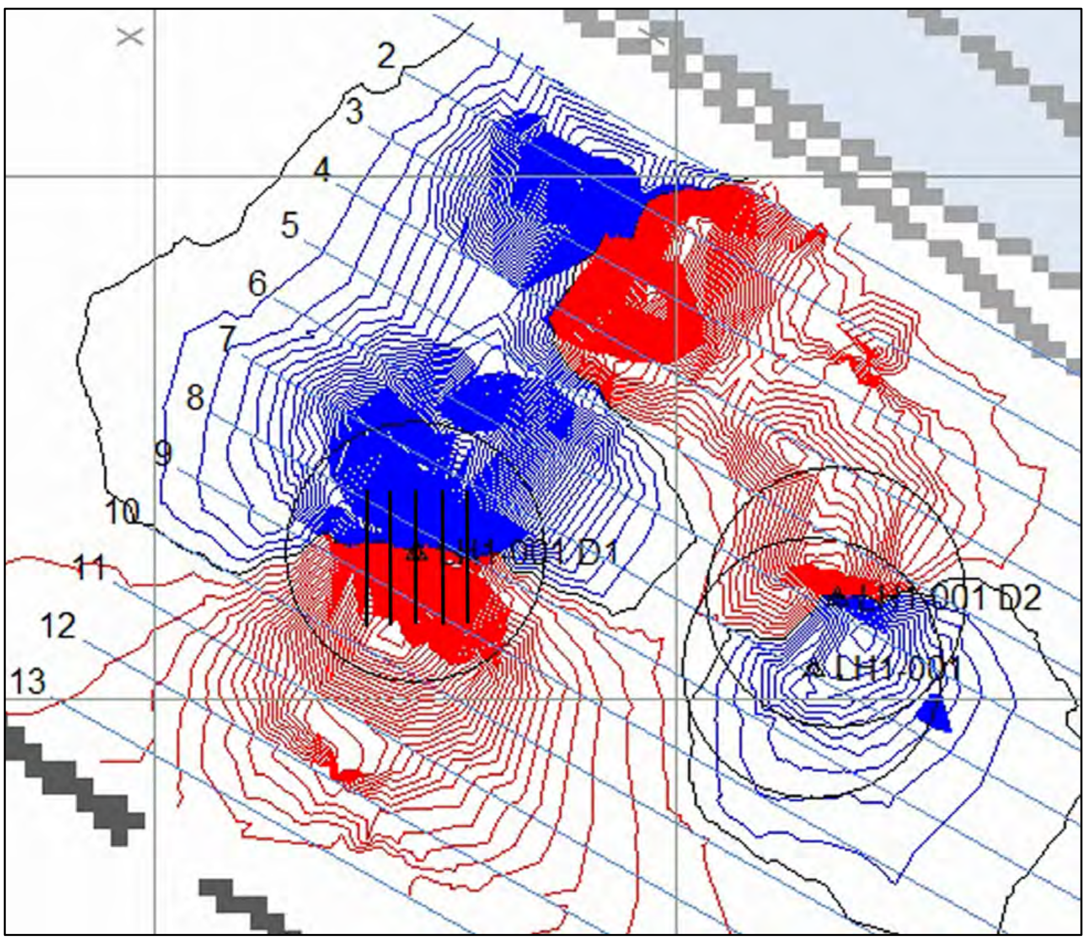

Figure 37. Schematic of hydroprobe arcs at the strongest magnetic deviation of Anomaly LH1-001 (note location of refinement buoy drop at apex between the negative [blue] and positive [red] poles of the strongest anomaly).

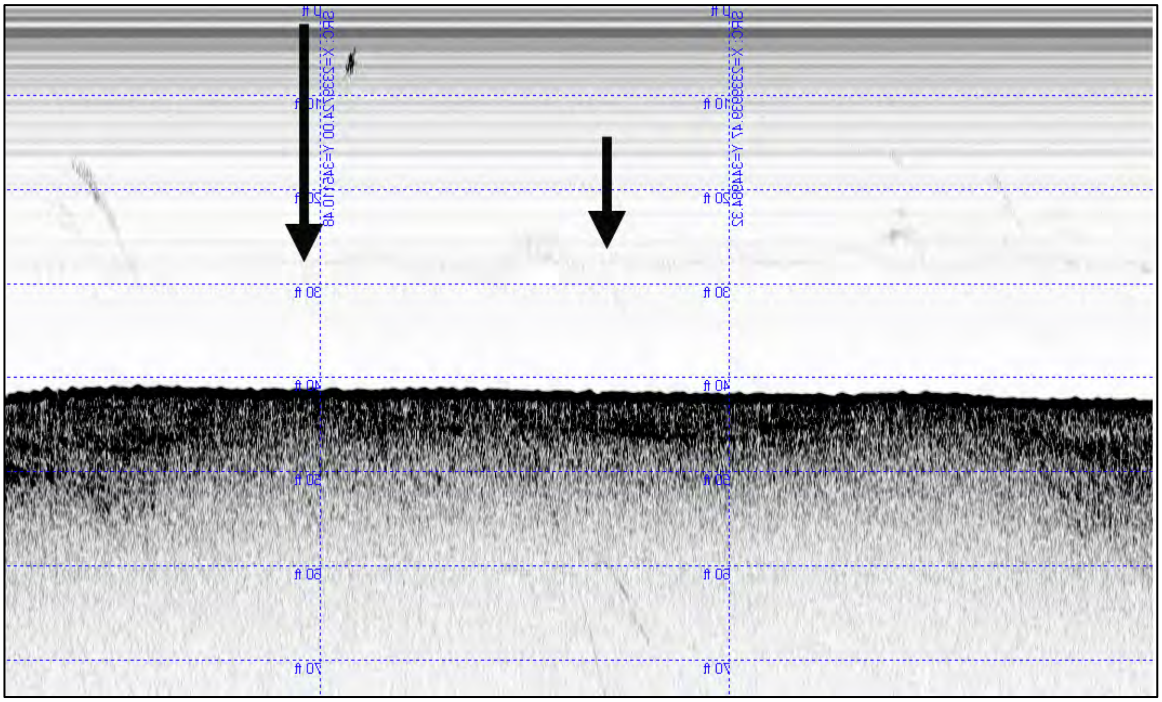

Figure 38. Subbottom record Survey Transect 6 (see above). Left arrow is center of large western anomaly (above), right arrow is center of southeaster anomaly; 200 feet between positioning fixes; depth intervals at 10 feet.

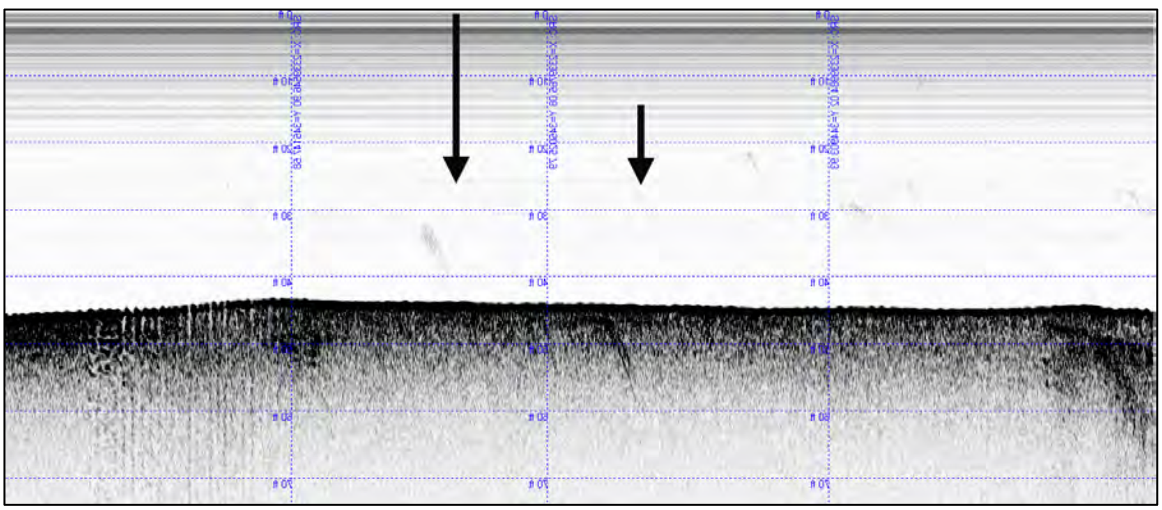

Figure 39. Subbottom record Survey Transect 8. Left arrow points to center of large western anomaly at buoy location, right arrow is center of southeaster anomaly; geologic return seen just to left of right arrow.

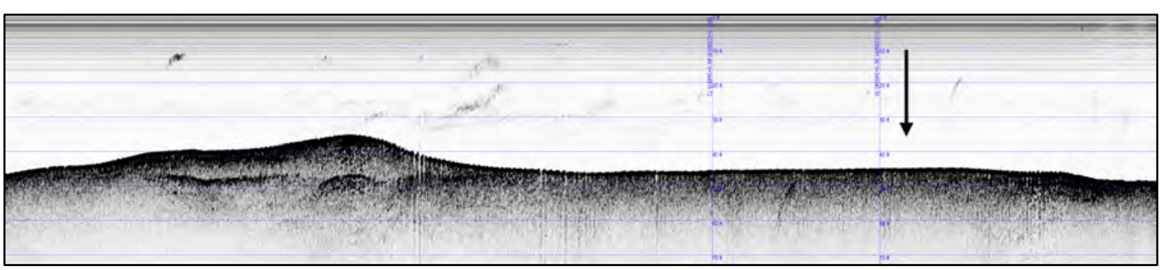

Figure 40. Subbottom record Survey Transect 9. Left arrow points to center of large western anomaly; geologic return seen well to the left (north) of anomaly.

Target LH1-009

Illustrated in Figure 41, Target LH1-009 was originally identified as a "dipolar magnetic anomaly of 76.59 nanoteslas and 8 seconds duration that coincides with a 50 m[eter] long, 17 m[eter] wide, and 0.6 to 1.0 m[eter] high mound on the sea bottom in sonogram records" (Gayes et al. 2013:113). As illustrated in Figures 42 and 43, the refinement survey recorded a large area of debris that produced a dipole anomaly of 279 nanoteslas with a duration of over 200 feet. Note that the original and refinement signatures contour similarly, but the refinement magnetic deviation is much higher, most likely a result of a lower sensor depth or tighter transect spacing. Also, the refinement acoustic image is a much better image due, most likely, to a different sonar system. A buoy was placed at the apex of this anomaly between the positive and negative contours. Diver assessment of the buoyed location, which was in 44 feet of water, revealed a large concentration of modern debris comprised mainly of concrete fragments, many that contained protruding rebar. Numerous sections of wire rope were present, as were small sections of 2-inch diameter pipe and small fragments of sheet iron. The debris field was identified as a modern deposit and no further work is recommended.

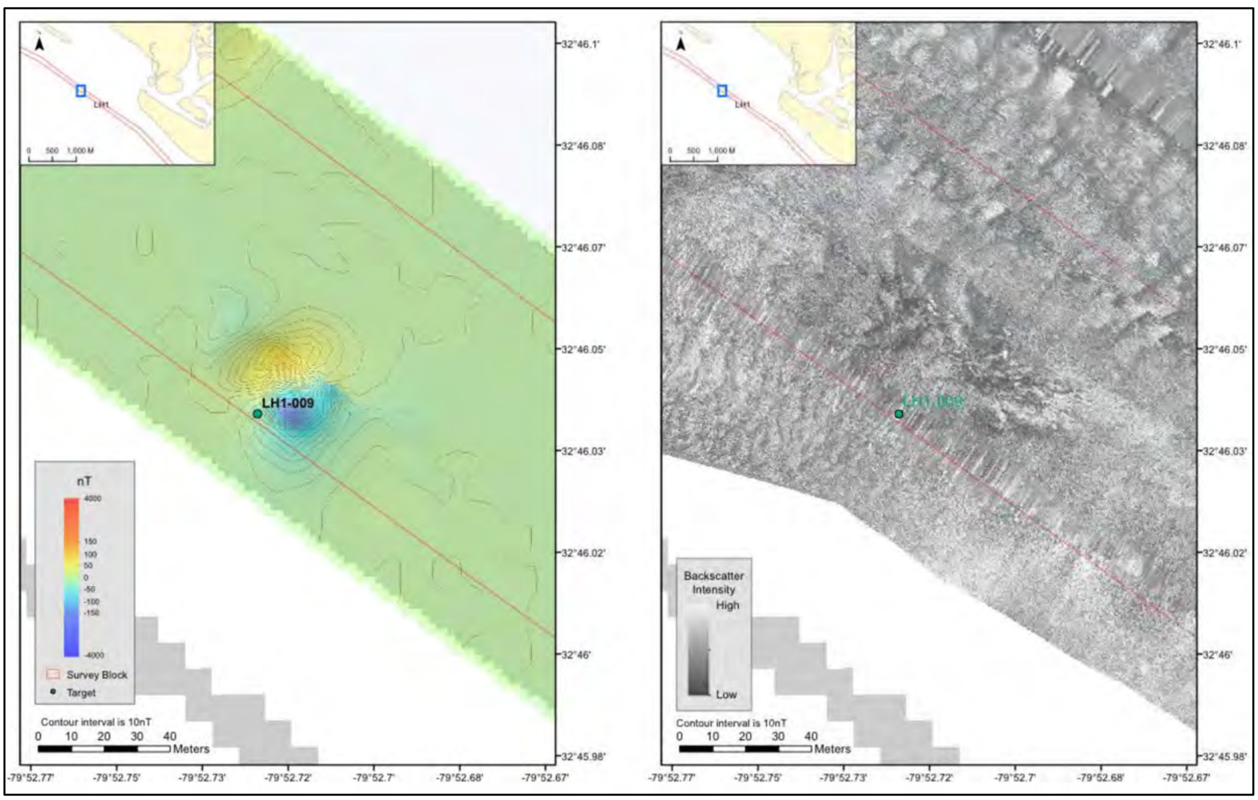

Figure 41. Magnetic (L) and sonar (R) signatures for Anomaly LH1-009 (as presented in Gayes et al. 2013:108).

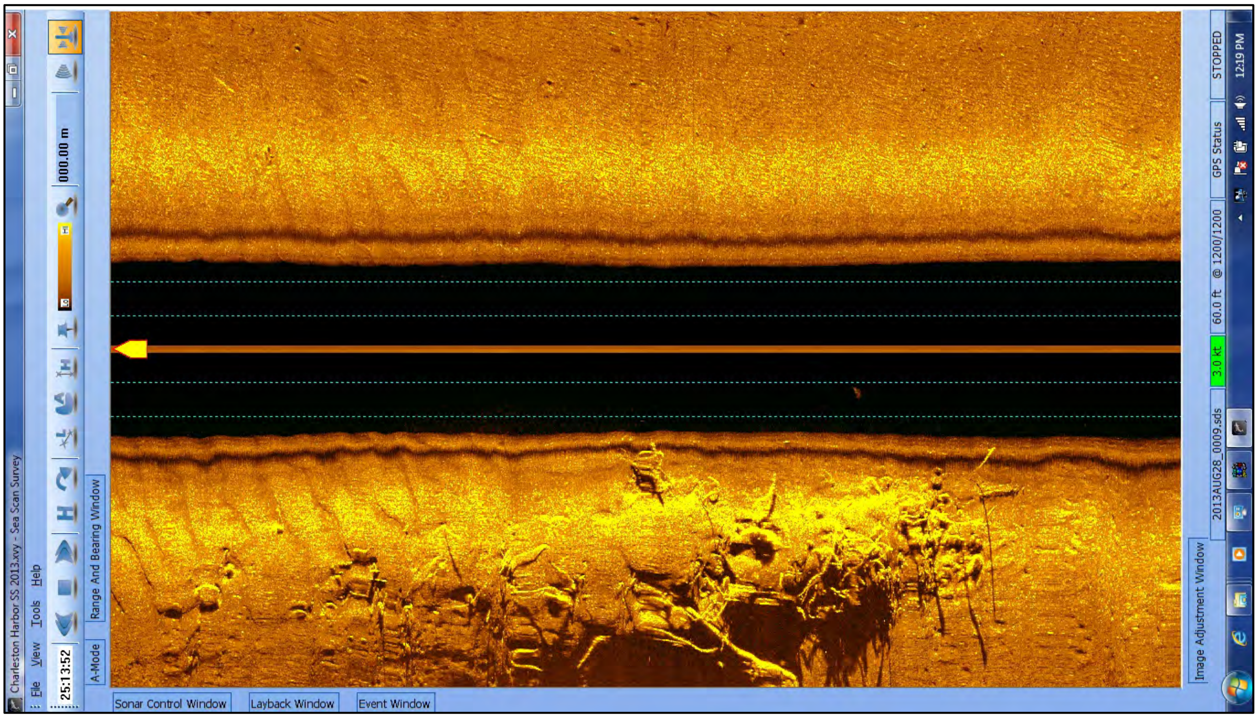

Figure 42. Refinement acoustic image of Anomaly LH1-009. Compare this image with original acoustic image above.

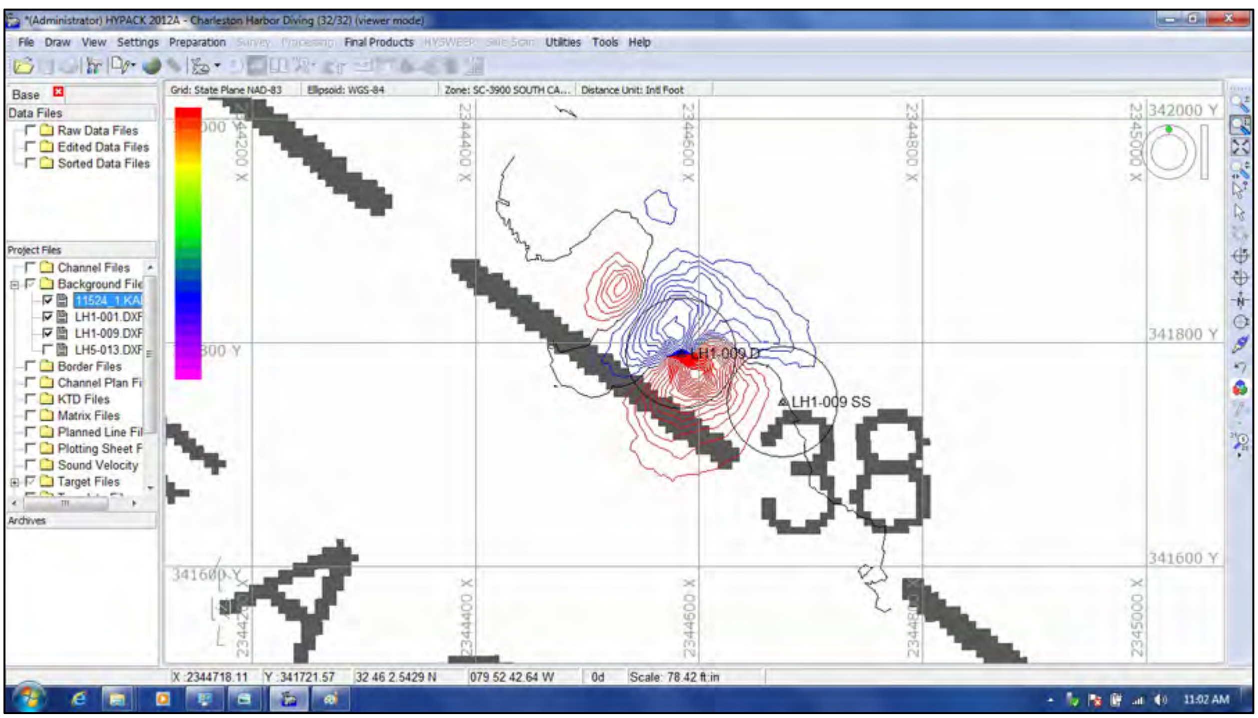

Figure 43. Refinement magnetic contour map of Anomaly LH1-009 (note location of refinement buoy drop at apex between the negative [blue] and positive [red] poles of the anomaly).

TARGET LH5-013

Illustrated in Figure 44, Target LH5-013 was originally identified as:

> "…a positive monopolar magnetic anomaly of 17.31 nanoteslas and 2 seconds duration that coincides with a 17 m[eter] long and 7 m[eter] high aggregation of what appears to be timbers fastened together on the sea bottom in sonogram records…The size, orientation, and appearance of the timbers in the sonogram record likely represents a feature associated with a previous bridge construction or a navigational aid, but the possibility exists that it may also represent part of a ship's hull. The area immediately around this feature suggests additional material may be present under a shallow sediment layer" [Gayes et al. 2013:113].

However, as illustrated in the acoustic image, the timber they identify is not readily apparent.

As illustrated in Figures 45 and 46, the current refinement survey recorded a large area of debris that produced a dipole anomaly with a deviation of thousands of nanoteslas that effectively covered or "masked" the entire refinement area including the target location. The acoustic image showed a large area of what appeared to be modern bridge debris, the target located at "Subm bridge ruins" marking the end of the former 1929 John P. Grace Bridge location. Regardless, a buoy was placed at the target location (Figure 47). Located in the channel in 43 feet of water, the diver identified wooden beams with iron fasteners, and numerous sections of square concrete pilings with iron reinforcement. All associated with bridge construction, the "wooden" structure that the Gayes et al. (2013) study mentions might be represented by that shown in the current acoustic image (Figure 48). It is thought to represent the wooden cribbing that surrounds and protects the bents of a bridge forming or facing the navigation channel (Figure 49). Regardless, the target is not historically significant and no further work is recommended.

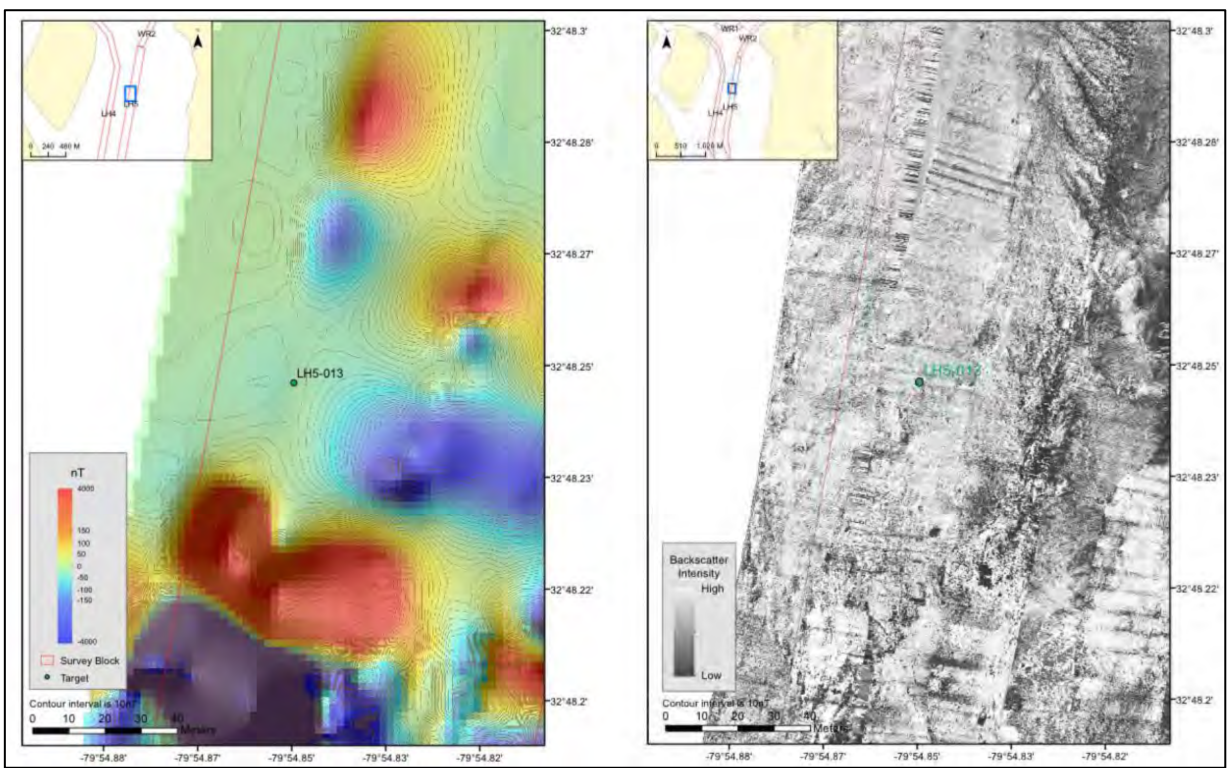

Figure 44. Magnetic (L) and sonar (R) signatures for Anomaly LH5-013 (note acoustic image at right is supposed to be Figure 48 which shows timbers [as presented in Gayes et al. 2013:131]; compare this acoustic image with the refinement image below).

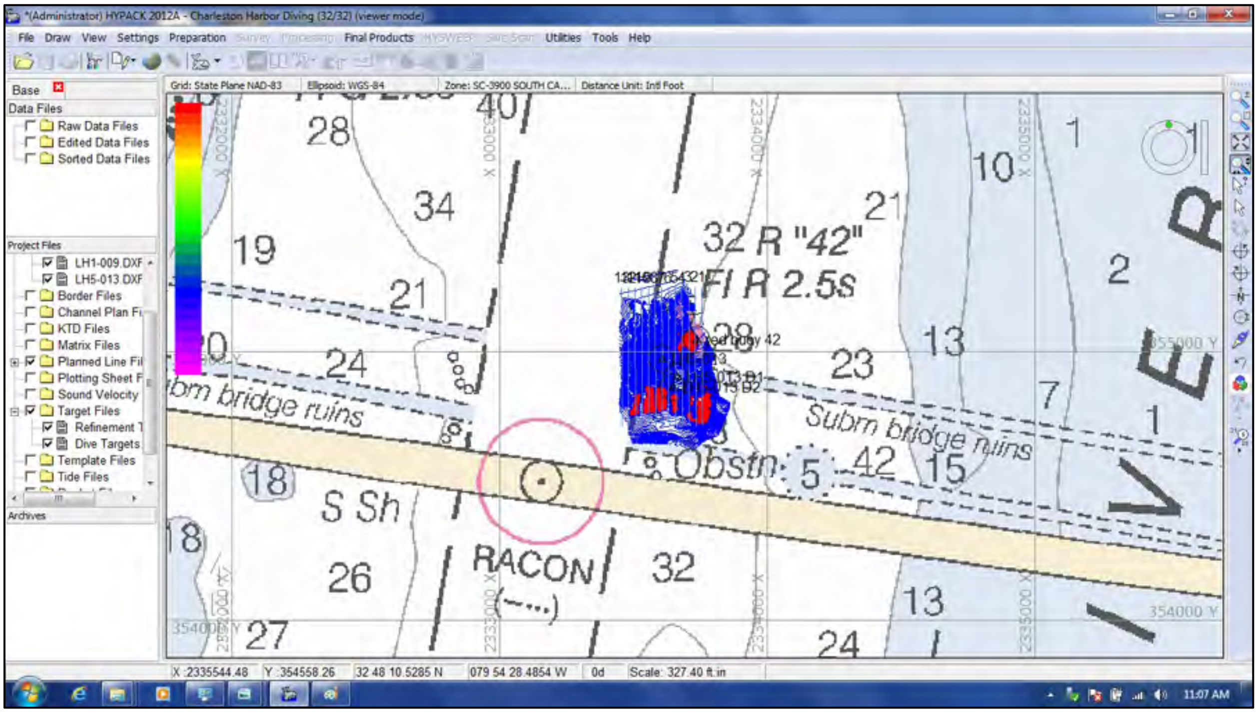

Figure 45. Refinement magnetic contour map of Anomaly LH5-0013 showing refinement block is one huge anomaly that "masked" the entire LH5-0013 target area (note "Subm bridge ruins" at anomaly location).

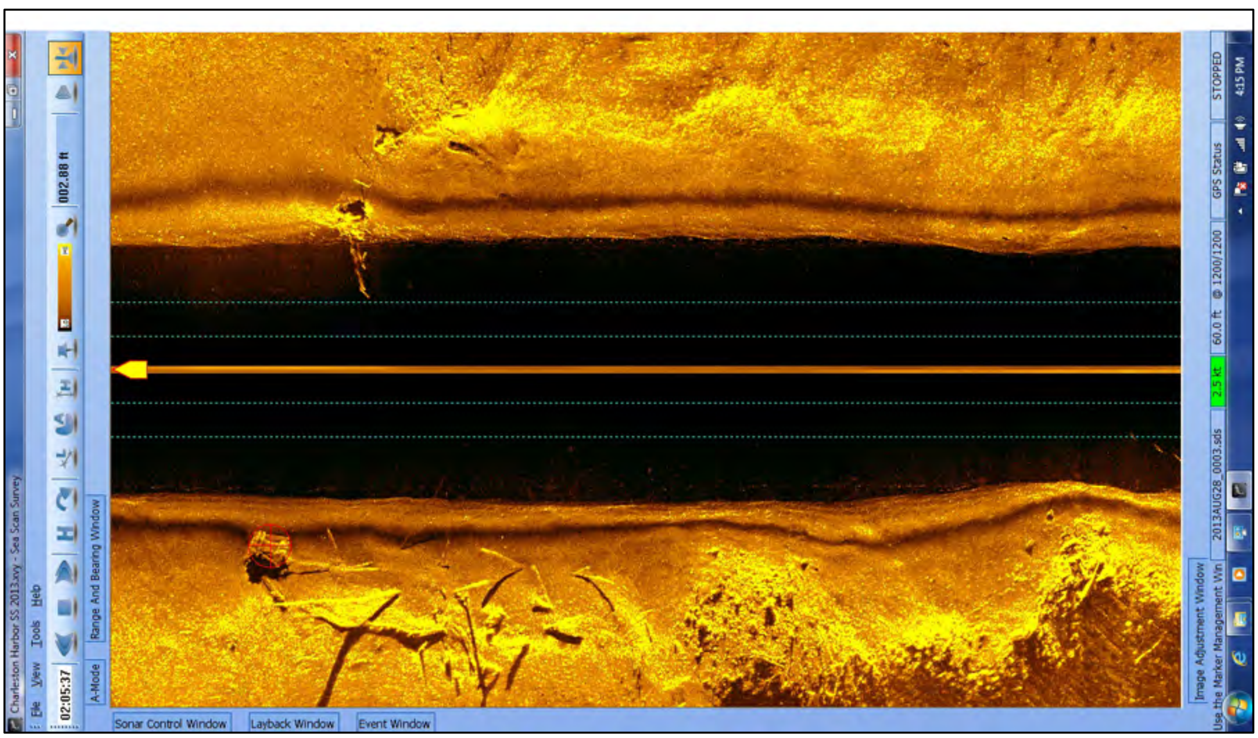

Figure 46. Refinement acoustic image of Anomaly LH5-013 (compare this image with original acoustic image above; also note rectangular object at left which is shown below).

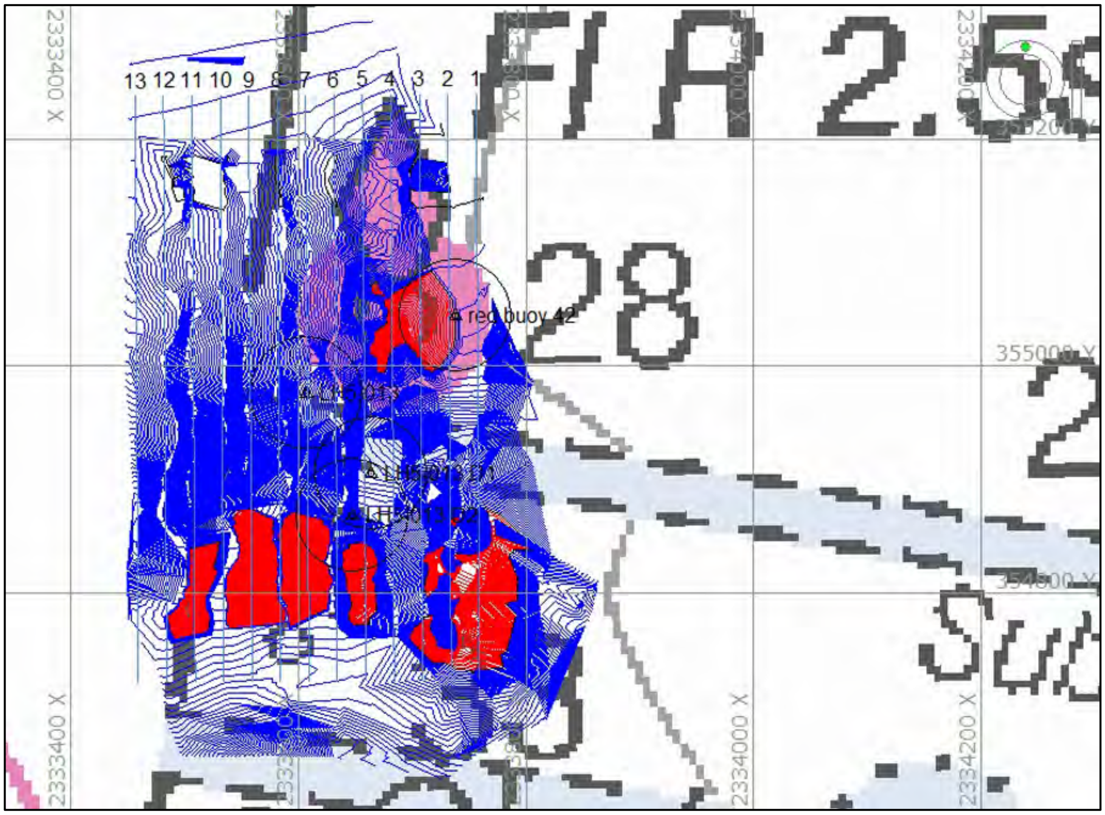

Figure 47. Refinement magnetic contour map of Anomaly LH5-0013 showing circled Navigation buoy and circled target to the southwest; two lower circles mark other debris images.

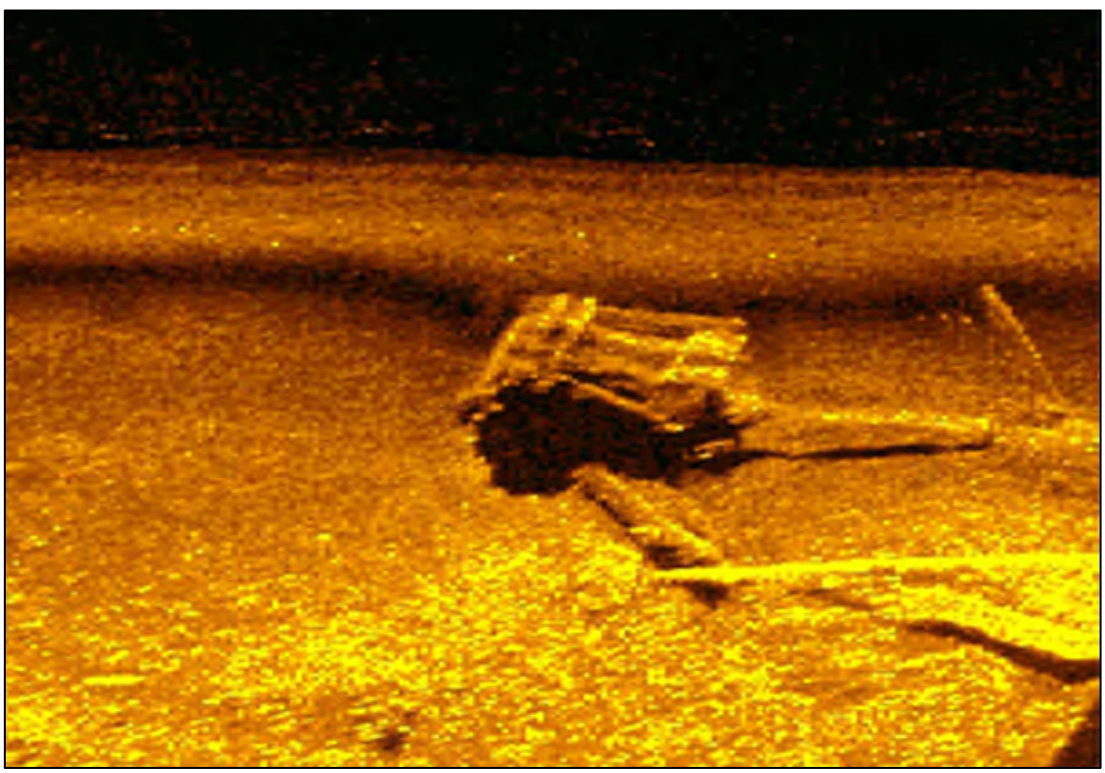

Figure 48. Close up of object at Anomaly LH5-013; it is thought to represent a section of bridge bent cribbing.

Figure 49. Bridge bent cribbing on the John P. Grace Bridge. A section from this bridge is thought to represent the wooden object noted in the acoustic image (photo by Sharon Bohn courtesy of www.notablephotos.com).

V. CONCLUSIONS AND RECOMMENDATIONS

The USACE, Charleston District is proposing channel deepening and modification of the existing Charleston Harbor Project as part of the Post 45 study. A Phase I survey of the Post 45 study area was conducted by Coastal Carolina University during the fall and winter of 2012 to 2013 in Charleston County, South Carolina. A total of 421 magnetic and acoustic anomalies were identified during the remote sensing survey. Of this total, three magnetic anomalies (LH1-001, LH1-009, and LH5-013) with sonar signatures could not be fully assessed for historical significance. In order to assist the USACE, Charleston District with meeting compliance requirements associated with the laws and regulations cited above, Panamerican, under subcontract to DCA/GEC, conducted a comprehensive submerged cultural resources investigation of each of the targets in response to the USACE, Charleston District's SOW entitled *Diver Identification and Assessment of Anomalies in the Lower Harbor of the Charleston Harbor Post 45 Study Area, Charleston County, South Carolina*, under Contract No. W912-HN-12-D-0016, Work Order No. DW03.

Conducted September 3 through 6, 2013, and comprised of a magnetometer, sidescan sonar, and subbottom profiler refinement survey and diver investigation designed to locate, identify, and assess NRHP significance, the results of the investigation indicate that two of the targets, LH1-009 and LH5-013, both represented by surface debris fields with large magnetic signatures, are comprised of modern debris and do not represent significant cultural resources sites. The third anomaly, LH1-001, is represented by an extremely large buried anomaly with no acoustic signature. Extensive subsurface probing failed to locate the anomaly source indicating it is too small to contact with a probe (i.e., wire rope) or is too deeply buried to locate (i.e., more than 8 feet below sediment). A review of the subbottom record indicates a lack of detectable buried structure. While findings from the probing and the subbottom record indicate a non-detectable magnetic source like wire rope for the anomaly, it is a large complex anomaly and its identity remains unknown. Figure 50 illustrates the main anomaly sources are located between 100 and 150 feet away from the top of proposed channel slope. Because the parameters for the proposed channel deepening and modification project are not known (i.e., depth of dredging, anchor spreads, etc.), it is unclear if the target will be adversely impacted by project activities. It is therefore, recommended that the USACE determine the exact parameters of the project activities and subsequently determine if any portion of Target LH1-001 will be adversely impacted. If dredging will be conducted at this target, it is recommended that an archaeologist monitor dredging at this target.

Procedures to Deal With Unexpected Discoveries

As indicated by the methodology and results described in the preceding chapters, reasonable effort was made during this investigation to identify and evaluate possible locations of historic archaeological sites (i.e. shipwrecks). However, the possibility exists that evidence of historic resources may yet be encountered within the project limits not previously identified in the above conclusions and recommendations. Should any evidence of historic resources be discovered during dredging activities, all work in that portion of the project site should stop. Evidence of historic resources includes aboriginal pottery, prehistoric stone tools, bone or shell tools, as well as historic shipwreck remains. Should questionable materials be uncovered during dredging of the project area, procedures contained in the Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800B) will take effect.

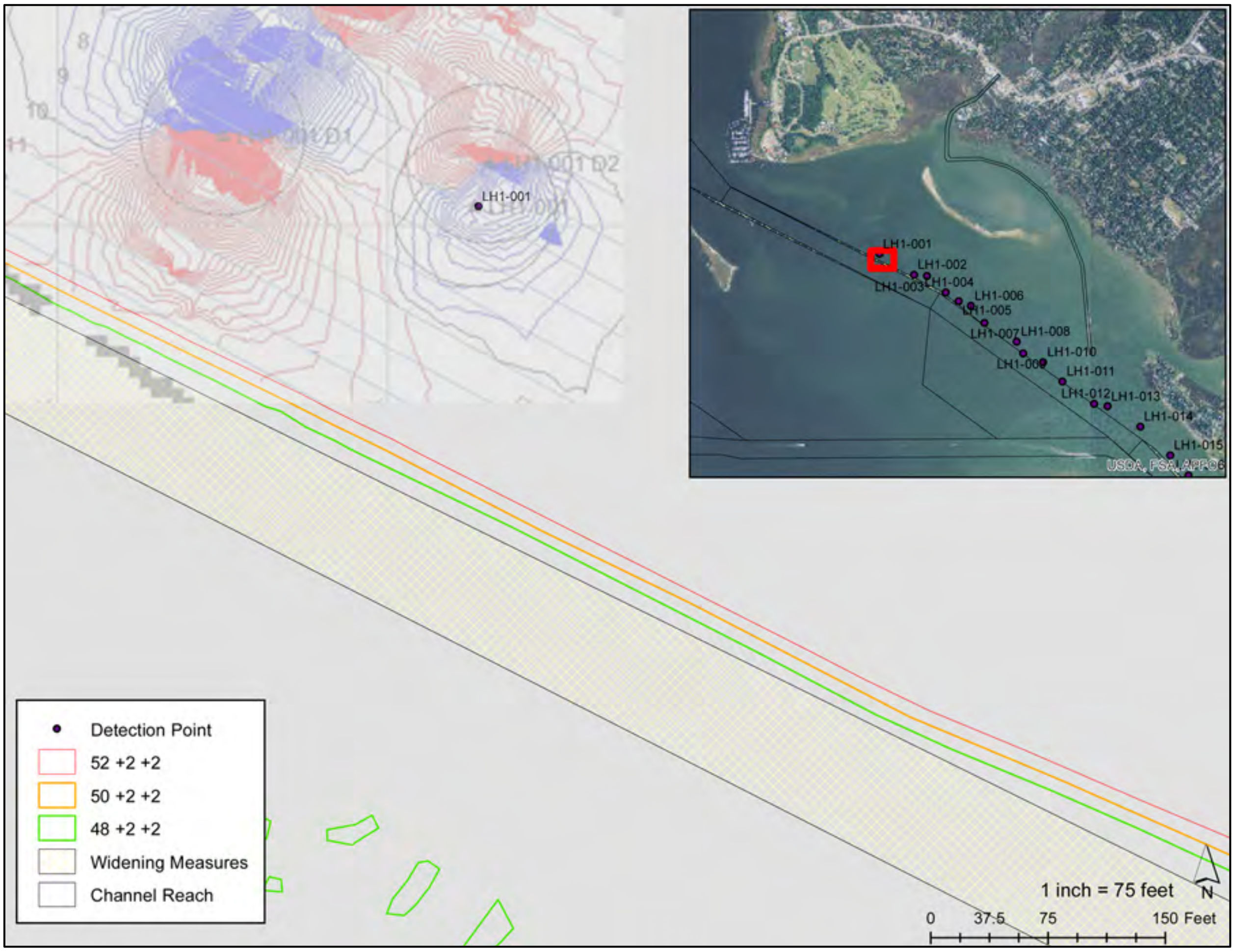

Figure 50. Magnetic contour map for LH-001 atop the channel dredge map illustrating its location relative to the channel (base map courtesy of the USACE, Charleston District).

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APPENDIX A: DOCUMENTATION OF VESSELS LOSSES AS PRESENTED IN GAYES ET AL. 2013

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5.3 Documentation of Vessel Losses

Table 2. This list of ship losses reflects consultation with archaeological and historical works and individuals (Spirek & Amer eds. 2004, Watts 1986, Gaines 2008, Spirek 2012). The Stone Fleets are composed of 14 and 16 ships; Spirek (2012) has identified the First Stone Fleet, but the Second has not been located precisely.

The First Stone Fleet includes the barks AMAZON and LEONIDAS; whaling barks AMERICA, FORTUNE, AMERICAN; whalers ARCHER, COURIER, HERALD, MARIA THERESA, REBECCA SIMS, ROBIN HOOD, WILLIAM LEE; TENEDOS; merchant ship KENSINGTON; and ship L.C. RICHMOND among the 14. The Second Stone Fleet includes ships MAJESTIC, METEOR; barks MARCIA, MARGARET SCOTT; whalers MECHANIC, NEWBURYPORT, POTOMAC, NEW ENGLAND; ship PERI, whaling barks MESSENGER, NOBLE; merchant brig STEPHEN YOUNG, TIMOR, merchantman BOGOTA, and merchantman bark JUBILEE among others.

Date	Vessel name	Description	Disposition and Location
15 Dec 1733	ABIGAIL & ANN	10 guns	Wraggs Wharf
12 Sep 1742	Long boat	Lost with 4 cannon	Inside harbor from Fort Sumter
8 July 1743	William Pandridge's boat	Boat	Sunk between Ft. Sumter & Sullivan's Island
4 May 1752	BENNET GALLEY	rowed galley	Lost at Buchannan's Wharf
15 Sep 1752	Mr. Edward's pilot boat	Pilot Boat	lost at The Exchange
15 Sep 1752	POLLY	Unknown	Lost at Wappoo Creek
30 Sep 1752	VINE	Unknown	Lost off Cummings Pt.
21 Mar 1757	GOOD INTENT	Unknown	Lost between Shutes Folly and Crab Bank
4 May 1759	FRANKLAND	Snow	Lost 1/4 mile south of Fort Sumter
14 March 1760	ANNE	Unknown	Lost off Cummings Pt.
4 May 1761	DANIEL	Unknown	Lost in the Middle Ground
4 March 1769	unidentified	Unknown	Wraggs Wharf
25 Feb 1775	CHARMING SALLY	cargo vessel	79:54.20W 32:47.00N
Sep 1775	4 unidentified ships	Hulks	Hog Island Channel
28 July 1776	HMS ACTAEON	frigate (British)	Lost between Forts Sumter & Moultrie; burned

Table 2 continued

1 Nov 1777	LILANEEUR	ship (French)	Lost off Cummings Pt.
March 1780	11 vessels	includes 4 frigates	Scuttled in mouth of Cooper River
9 Mar 1780	BRICOLE	Frigate	Lost between Charleston city and Shutes Folly
9 Mar 1780	TRUITE	Frigate	Lost between Charleston city and Shutes Folly
9 Mar 1780	QUEEN OF FRANCE	Frigate	Lost between Charleston city and Shutes Folly
14 Oct 1780	FRIENDSHIP	Unknown	Lost in the Middle Ground
30 June 1781	LORD NORTH	Warship	79.53W, 32.46N
9 Aug 1781	HMS THETIS	Warship	79.55.40W, 32.47.30N
28 Dec 1781	JAMAICA	Unknown	Inside harbor from Fort Sumter
1 Feb 1785	SWIFT	Unknown	79.50.30W, 32.44N
9 Apr 1786	FRIENDSHIP	Unknown	Off Fort Johnson
5 June 1787	HOPE	Unknown	79.50.30W, 32.45N
13 May 1802	MARY	Unknown	79.53.30W, 32.45.30N
20 May 1803	SALLY	Schooner	Pritchard's Wharf
7 May 1804	BLAKE	Schooner	Lost off Cummings Pt.
7 Sep 1804	CHRISTOPHER	slave ship	Charleston Wharf
7 Sep 1804	CONCORD	Brig	Priolaeaus Wharf
7 Sep 1804	MARY	Schooner	Ham's Wharf
18 Jan 1805	unidentified	"Mr. White's sloop"	South end of Daniel's Island.
1 Feb 1806	GEORGE	Sloop	79.50.30W. 32.45N
2 Jun 1806	AURORA	Unknown	Lost off Cummings Pt.
13 Dec 1806	JOHN	slave ship	Lost off Cummings Pt.
18 Feb 1809	unidentified	SC coasting schooner	NW end of Sullivan's Island
1 Dec 1809	JOHN	Sloop	Lost off Cummings Pt.
31 Aug 1812	REGULUS	schooner (Spanish)	79.43.30W, 32.45.30N
1 April 1813	GALLATIN	Revenue cutter (U.S.A.)	Blakes Wharf
16 August 1814	ROSE	Unknown	Lost between Shutes Folly and Middle Ground
20 July 1818	MARY	Schooner	Lost between Shutes Folly and Crab Bank
16 Nov 1820	YOUNG ROMP	Sloop	Lost off Cummings Pt.

Table 2 continued

9 Mar 1822	unidentified	ferry boat	Lost between Shutes Folly and Crab Bank
28 Sep 1822	CERES	Unknown	79.55.00W, 32.46.55N
28 Sep 1822	ENTERPRISE	Sloop	Lost at SW end of Shutes Folly
28 Sep. 1822	GRAMPUS	Schooner	Lost between Shutes Folly and Crab Bank
28 Sep. 1822	MARK-TIME	Schooner	NW end of Sullivan's Island
28 Sep. 1822	PALMYRA	Brig (Spanish pirates)	Tip of Patriots Point
28 Sep. 1822	ROSALIE	schooner (Spanish)	Patriots Point, off bow of USS Yorktown
15 Sep 1824	unidentified	Sloop	79.53.40W, 32.47.10N
14 Nov 1824	S.S. COLUMBIA	Unknown	Western end of Sullivan's Island
26 Aug 1826	HELEN	Sloop	79.50.30W, 32.44N
8 Dec 1830	boat	Saylor Huffman's vessel	Western side of Drum Island, north of bridge
29 Aug 1851	MATAMORAS	Brig	Lost off Crab Bank
7 Sep 1854	ELSABELLA	Schooner	North Atlantic Wharf
7 Sep 1854	PARTIER	Schooner	Commercial Wharf
Jan 1861	4 unidentified ships	"hulks"	In channels outside harbor
19-20 Dec 1861	16 ships	First Stone Fleet*	In channels outside harbor
25/6 Jan 1862	14 ships	Second Stone Fleet**	In channels outside harbor
12 Apr 1862	SAMUEL ADAMS	wooden schooner	Western end of the Isle of Palms
20 Oct 1862	MINHO	iron screw steamer (British)	¼ mile south of Fort Moultrie
19 Mar 1863	GEORGIANA	steamer (iron blockade runner)	Lost off Isle of Palms (scavenged)
6 Apr 1863	C.S.S. ETIWAN	side-wheel steamer	79.53.30W, 32.45.00N
6 Apr 1863	C.S.S. MARION	side-wheel steamer transport (Confederate)	Mouth of Wapoo Creek
8 Apr 1863	U.S.S. KEOKUK	blockader (ironclad)	Shallows off Morris Island
11 Apr 1863	STONEWALL JACKSON (LEOPARD)	side-wheel, 2-masted steamer; British blockade runner	Off Sullivan's Island 1.5 mi from Breach Inlet Battery
19 May 1863	NORSEMAN	blockade runner	Isle of Palms (on land)
5 Jun 1863	C.S.S. STONO	Warship	Lost on breakwater near Fort Moultrie

Table 2 continued

10 Jun 1863	RUBY	side-wheel steamer; British blockade runner	West of Folly Island; Lighthouse Inlet
19 Jun 1863	RACCOON	side-wheel steamer (British)	Lost near Moultrie House; Drunken Dick Shoal East of Fort Moultrie
30 Aug 1863	C.S.S. SUMTER	Steamer	Main channel near Fort Sumter
6 Dec 1863	U.S.S. WEEHAWKEN	monitor-class iron ship	Sunk in a storm off Morris Island
2 Feb 1864	PRESTO	side wheel steamer (British)	Struck MINHO off Fort Moultrie
17 Feb 1864	H.L. HUNLEY	Submarine	Lost off Sullivan's Island (recovered)
17 Feb 1864	U.S.S. HOUSATONIC	sloop-of-war	Lost off Sullivan's Island (excavated)
28 Mar 1864	U.S.S. KINGFISHER	wooden sailing bark	Ran ashore on Combahee River bank
9 Aug 1864	PRINCE ALBERT	iron side-wheel steamer (British blockade runner)	Struck MINHO on Drunken Dick Shoal
31 Aug 1864	MARY BOWERS	sidewheel steamer (iron blockade runner)	Lost on GEORGIANA off Isle of Palms
6 Oct 1864	CONSTANCE DECIMA	sidewheel steamer (iron blockade runner)	Lost on GEORGIANA off Isle of Palms
22 Oct 1864	FLORA (ANNA)	sidewheel steamer (British, iron)	Southern bank of Maffitt's Chanel, sighted off three forts
23 Oct 1864	C.S.S. FLAMINGO	sloop-rigged sidewheel steamer	Drunken Dick Shoal east of Fort Moultrie near Battery Rutledge
27 Nov 1864	BEATRICE	iron screw steamer (iron, British)	Drunken Dick Shoal east of Fort Moultrie
4 Jan 1865	RATTLESNAKE	blockade runner	Burned between western jetty and Sullivan's Island off Breach Inlet
15 Jan 1865	U.S.S. PATAPSCO	blockader (ironclad)	Struck a mine below Fort Sumter (38CH270)
20 Jan 1865	JOHN RANDOLPH	transport (iron, Confederate)	Sullivan's Island
14 Feb 1865	CELT (COLT) (SYLPH)	blockade runner	Breakwater off Sullivan's Island (Buoy No. 2)
18 Feb 1865	C.S.S. CHARLESTON	steamer (ironclad)	Charleston Harbor; 79.55.21W, 32.47.29N
18 Feb 1865	C.S.S. CHICORA	steamer (ironclad ram)	Charleston Harbor; 79.55.21W, 32.47.29N
18 Feb 1865	C.S.S. INDIAN CHIEF	Schooner	Town Creek, Charleston Harbor

Table 2 continued

18 Feb 1865	C.S.S. PALMETTO STATE	steamer (ironclad)	South end of Drum Island
21 Feb 1874	PORDICHO	wrecking bark	South end of Daniel's Island.
13 Apr 1875	ELLA ANNA	Unknown	Between Forts Sumter and Moultrie
23 Apr 1908	STONEWALL	Sloop	Between Forts Sumter and Moultrie
?	"four hulks"	Unknown	Between the tip of Patriots Point and Castle Pickney, Shutes Folly Island
?	MAJOR BUTT	concrete wreck	Shoreline between Ravenel Bridge and USS Yorktown
?	unidentified	unknown vessel	W side Drum Island, just S of bridge
?	unidentified	unknown vessel	79.55.30W, 32.47.40N
?	unidentified	unknown vessel	Off bow of USS YORKTOWN
?	unidentified	two wrecks	S of Remely's Pt. boat ramp