INTEGRATED
FEASIBILITY REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT

COASTAL STORM DAMAGE REDUCTION

BOGUE BANKS, CARTERET COUNTY

NORTH CAROLINA

APPENDIX E

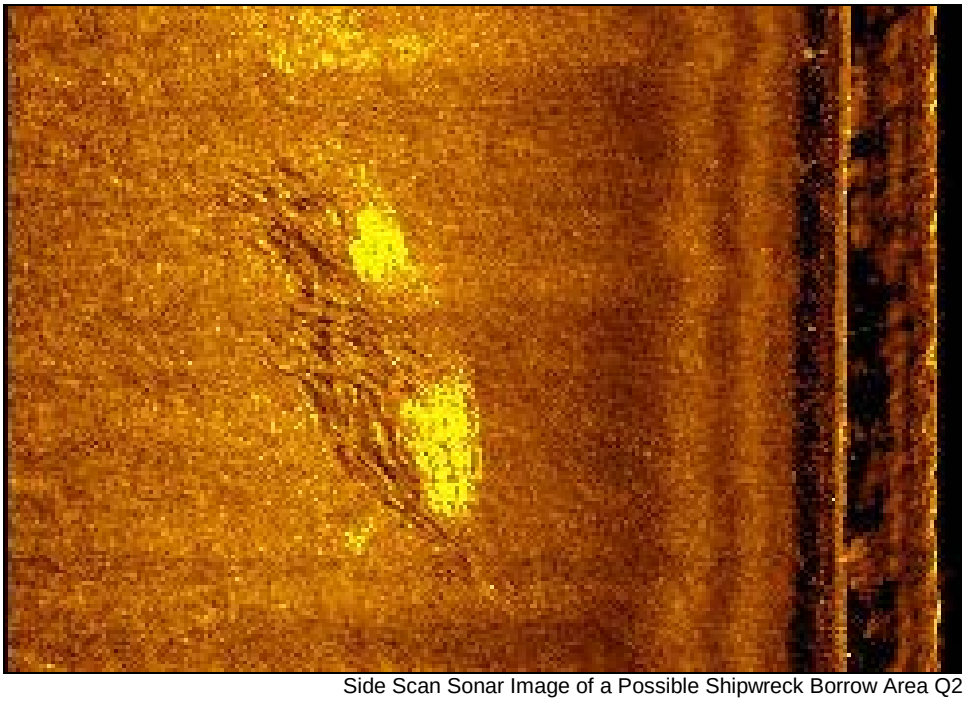
ARCHAEOLOGICAL SURVEY

US Army Corps of Engineers

Wilmington District

An Archaeological Remote Sensing Survey of Bogue Banks Offshore Borrow Areas, Carteret County, North Carolina

Contract Number: DACW54-03-D-0002 Delivery Order: CV04



Side Scan Sonar Image of a Possible Shipwreck Borrow Area Q2

Submitted to:
U.S. Army Corps of Engineers
Wilmington District

Submitted by:
Mid-Atlantic Technology and Environmental Research, Inc.

An Archaeological Remote Sensing Survey of Bogue Banks Offshore Borrow Areas, Carteret County, North Carolina

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Submitted To:

U.S. Army Corps of Engineers
Wilmington District
69 Darlington Avenue
Wilmington, North Carolina 28403

Submitted By:

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20 December 2008

ABSTRACT

The U.S. Army Corps of Engineers Wilmington District (USACE) is conducting preliminary investigations of four proposed sand borrow areas totaling +/- 18,500 acres, for beach re-nourishment projects at the communities of Emerald Isle, Indian Beach, Pine Knoll Shores, and Atlantic Beach, in Carteret County, North Carolina. As a part of these investigations, Mid-Atlantic Technology and Environmental Research, Inc. (M-AT/ER) of Castle Hayne, North Carolina, conducted marine magnetometer and side-scan sonar surveys of the proposed borrow areas for the purpose of identifying any potential archaeological resources that might be impacted by the offshore dredging activities during the sand mining process.

In addition to archaeological resources, M-AT/ER conducted a search to identify hard bottom/marine habitat areas, using side-scan sonar record analysis as part of the remote sensing investigations. M-AT/ER conducted historical research and field investigations for the project between 15 December 2006 and 10 July 2007.

A total of 33 magnetic and or acoustic anomalies were selected as targets or target clusters in Borrow Area Q2. One target was identified within Borrow Area Y. No unidentified remote sensing targets were identified within Borrow Area Q1 or U. Of the total 34 selected targets in Borrow Areas Q2 and Y, ten (10) did not demonstrate characteristics that have the potential to be associated with a significant submerged cultural resource such as a historic shipwreck. No addition investigations or mitigation has been recommended for these targets.

The remaining twenty four (24) targets or target clusters in Borrow Area Q2 and Y do have characteristic that could be associated with a significant submerged cultural resource. These targets are recommended for either additional underwater investigations to identify and access the target's cultural resource potential, or avoidance of potential impact by the creation of a no-impact buffer zone that surrounds the anomaly or cluster of anomalies.

No natural hard bottom was identified within Borrow Areas Q1 or Q2. However, Borrow Area Q1 does have large areas that are part of the North Carolina Artificial Reef Program including an area of widely scatter tires.

Relatively small areas of hard bottom were identified and mapped within Borrow Areas U and Y.

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INTRODUCTION

The U.S. Army Corps of Engineers Wilmington District (USACE) is conducting preliminary investigations of four proposed sand borrow areas totaling +/- 18,500 acres, for beach re-nourishment projects at the communities of Emerald Isle, Indian Beach, Pine Knoll Shores, and Atlantic Beach, in Carteret County, North Carolina. As a part of these investigations, Mid-Atlantic Technology and Environmental Research, Inc. (M-AT/ER) of Castle Hayne, North Carolina, conducted marine magnetometer and side-scan sonar surveys of the proposed borrow areas for the purpose of identifying any potential archaeological resources that might be impacted by the offshore dredging activities during the sand mining process. This work was conducted pursuant to provisions of Section 106 of the National Preservation Act of 1966 (36 CFR 800, Protection of Historic Properties) and the Abandon Shipwreck Act of 1987 (Abandon Shipwreck Guidelines, National Park Service, Federal Register, Vol. 55, No. 3, 4 December 1990, pages 50116-50145) [1].

In addition to archaeological resources, M-AT/ER conducted a search to identify hard bottom/marine habitat areas, using side-scan sonar record analysis as part of the remote sensing investigations. M-AT/ER conducted historical research and field investigations for the project between 15 December 2006 and 10 July 2007.

PROJECT LOCATION

The four survey areas are located between 2 and 5 nautical miles offshore of Bogue Banks and the towns Emerald Isle, Indian Beach, Pine Knoll Shores, and Atlantic Beach, North Carolina. Figures 1 and 2 show the project location and the relative position of each borrow area, followed by Figures 3 through 6 that provide detail of each survey area. North Carolina State Plane coordinates (NAD 83) are included for reference.

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[1] **A national policy for historic preservation has been established in accordance with authorization contained in Sections 106 and 110 (formerly E.O. 11593) of the National Historic Preservation Act of 1966, as amended following the Advisory Council on Historic Preservation Regulations (36 CFR 800). Executive Order 11593 and the Historic Preservation Act Amendments of 1980 specified that the Federal Government shall provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. In 1988, the Abandoned Shipwreck Act (Public Law 100-298) declared that the states (or territories of the U.S.) are to manage shipwrecks in state waters. As a result of these acts and other legislation, state and federal agencies are required to administer cultural properties under their control in a spirit of stewardship and trusteeship. Each agency is required to initiate such measures as are necessary to insure that policies, plans, and programs will preserve sites, structures, and objects of historical or archaeological significance that exist on properties owned by the Federal Government or that are subject to federal regulation.**

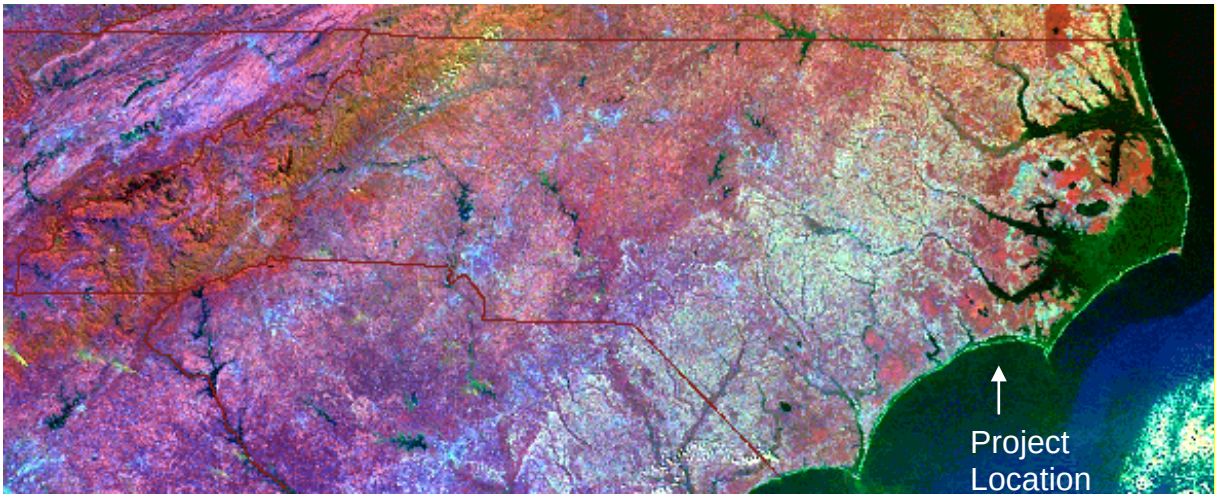

Figure 1. Project Location Map.

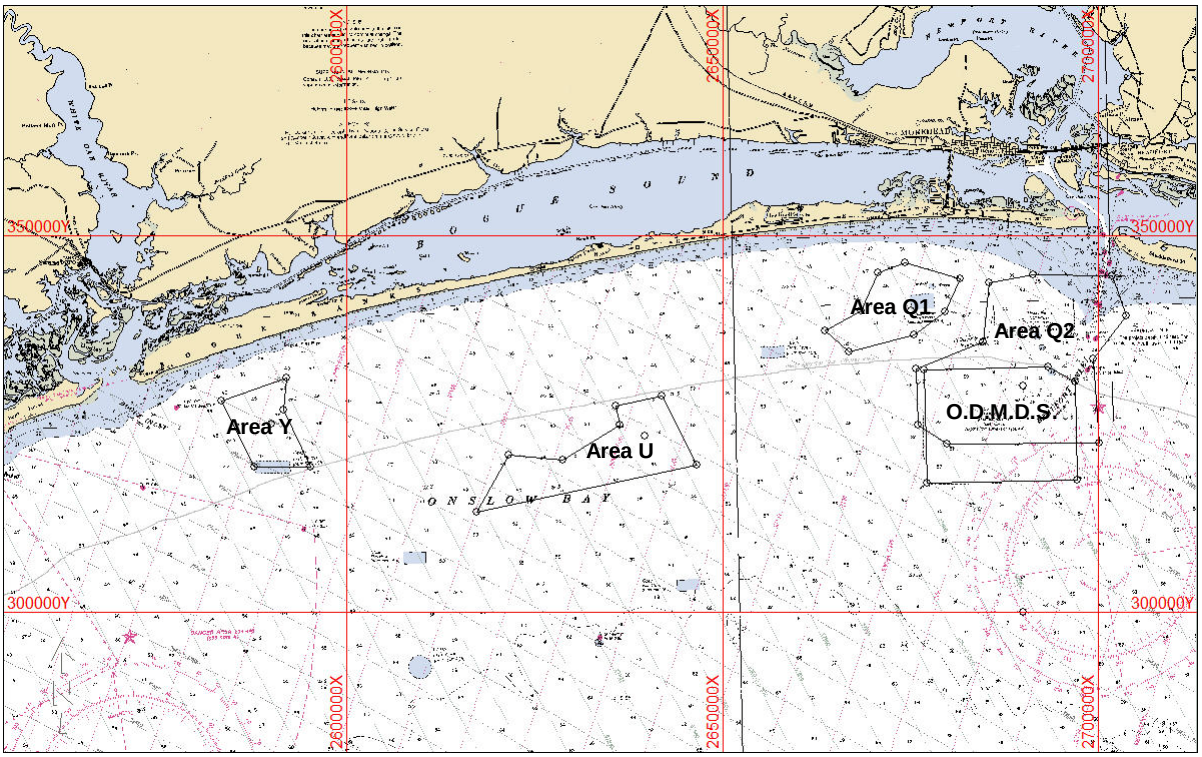

Figure 2. Relative Position of Borrow Areas.

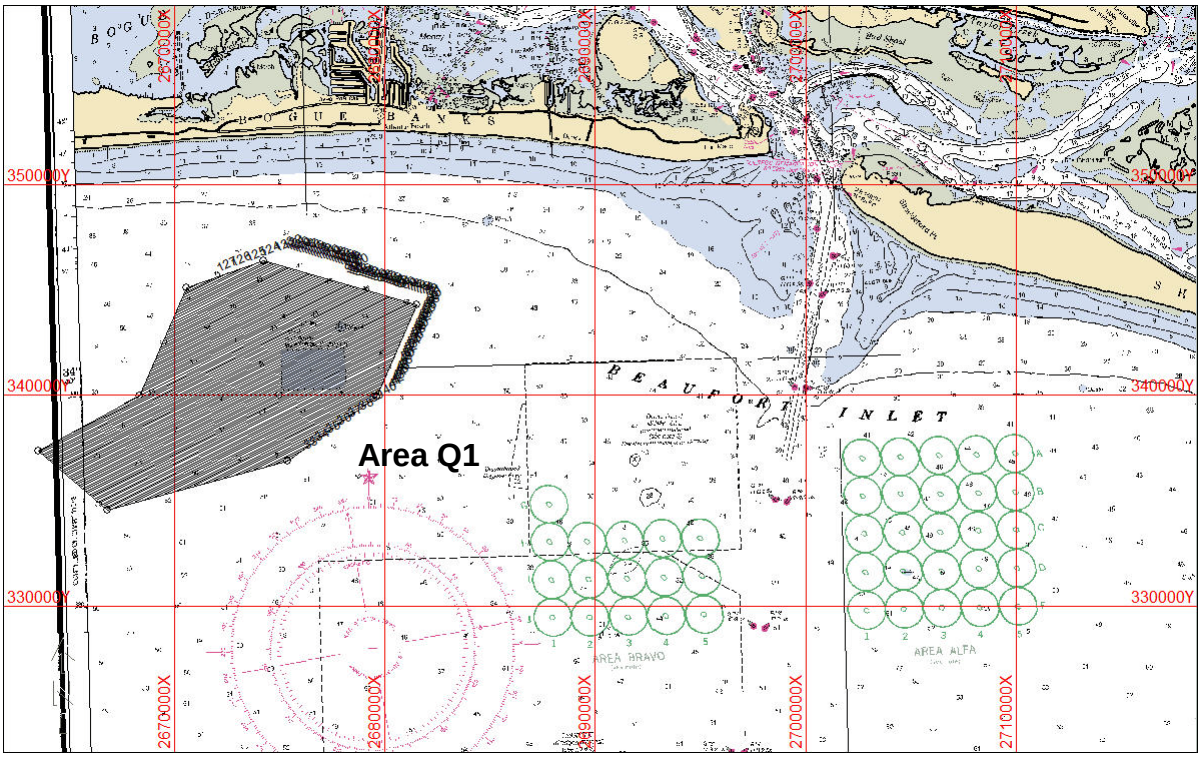

Figure 3. Borrow Area Q1.

The Borrow Area Q1 survey consisted of 127 lines @ 100ft/30m spacing, totaling more than 1,119,998 linear ft/302 nautical miles with water depths of 45 to 50 ft.

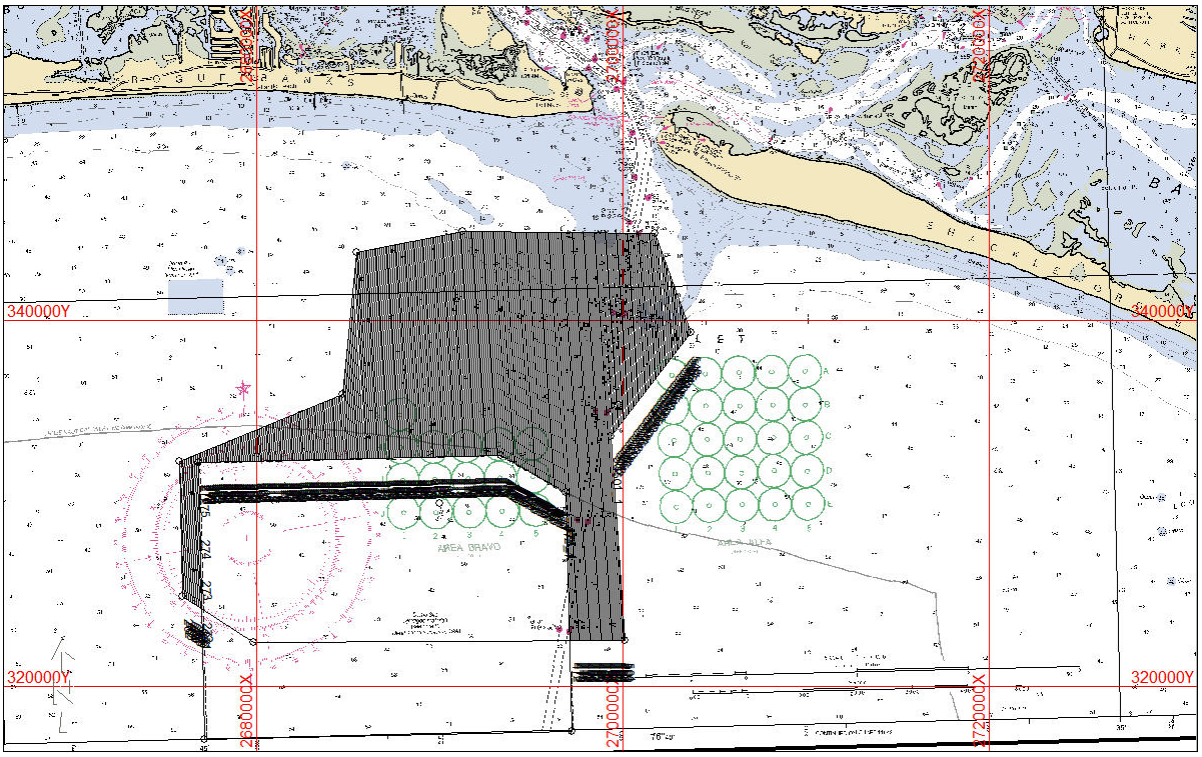

Figure 4. Borrow Area Q2.

The Borrow Area Q2 survey consisted of 480 lines @ 65ft/20m spacing, totaling 4,001,421 linear ft/658 nautical miles with water depths of 15 to 53 ft.

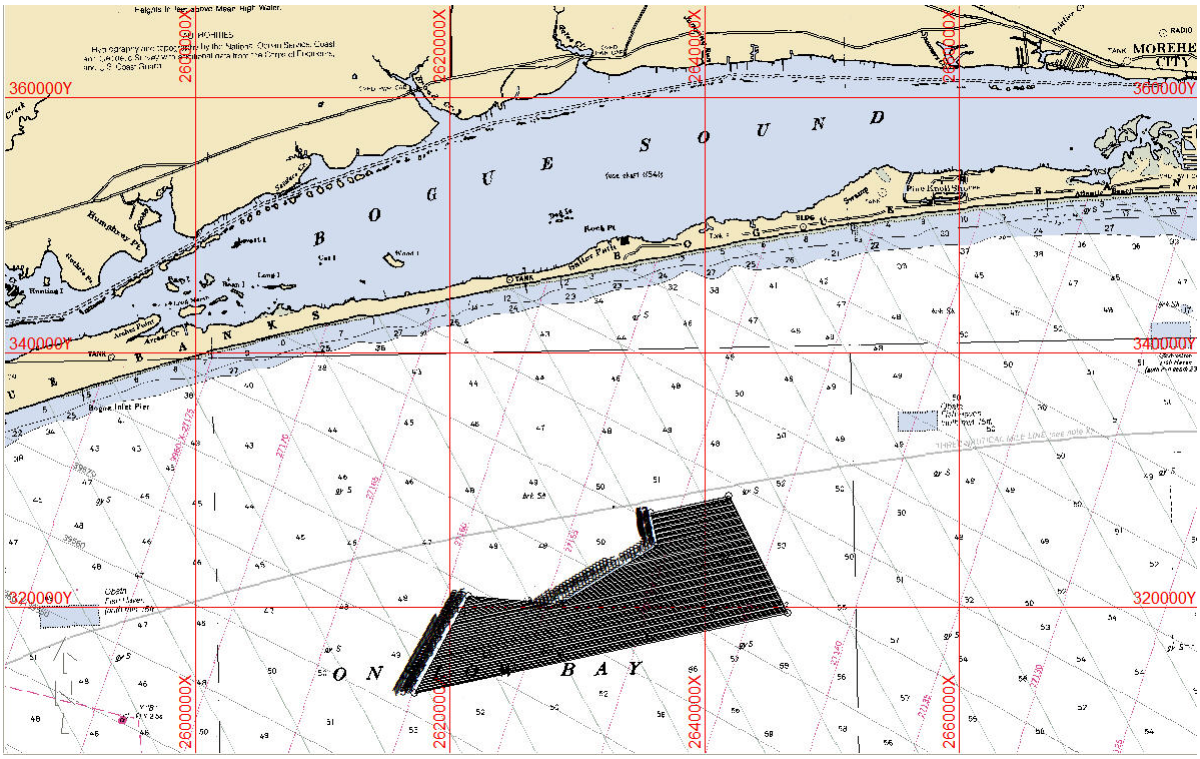

Figure 5. Borrow Area U.

The Borrow Area U survey consisted of 141 lines @ 100ft/30m spacing, totaling 1,839,554 linear ft/302 nautical miles with water depths of 51 to 57 ft.

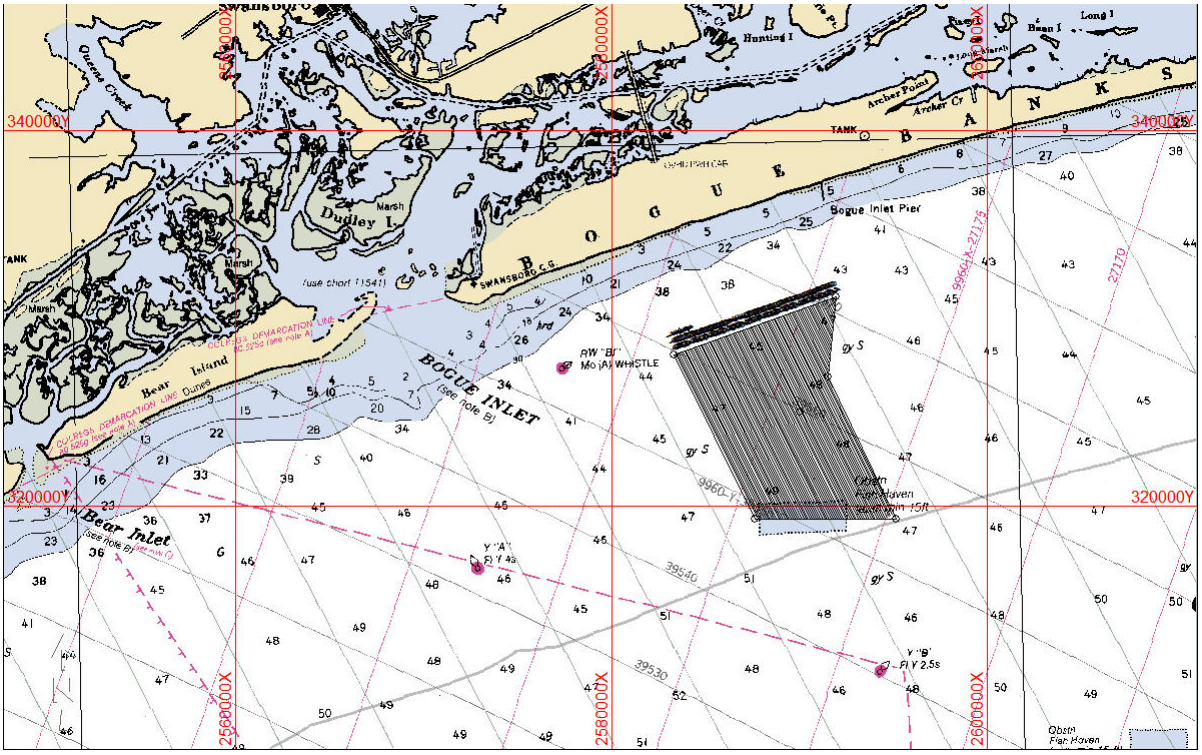

Figure 6. Borrow Area Y.

The Borrow Area Y survey consisted of 111 lines @ 100ft/30m spacing, totaling 795,834 linear ft/131 nautical miles with water depths of 44 to 49 ft.

HISTORICAL BACKGROUND

North Carolina's barrier islands formed nearly 18,000 years ago when coastal areas submerged during the Holocene epoch. High sand ridges built up along the mainland beaches by wind and water action, during the last period of glaciations. As the sea level rose, the ridge system failed, causing low-lying areas behind to flood. As a result, lagoons and shallow sounds were formed, leaving the existing dune ridges as barrier islands.

Inlets are formed by the wave action and shifting sands. Most of the inlets are temporary, either migrating along the coast or closing altogether as near shore currents transport sand parallel to the coastline. Permanent inlets occur along the southern coast where the mouths of significant rivers provide enough force to maintain stable inlets (Tubby 2000:59).

In the late seventeenth century, the region particularly around Cape Lookout was commonly visited by New England whalers where they set temporary camps among the dunes (Angley 1982:5). Permanent settlement of the Bogue Banks began in the early eighteenth century. In 1720 Cristopher Gale received a patent for 9,461 acres, "being on the banks and Marshes adjacent betwixt Topsail and Bogue Inlet and is commonly called Bogue Banks and Bogue Island" (Angley 1984:1).

In 1722, Beaufort was appointed as "a port for the unloading and discharging [of] vessels," it was clear that development and growth would depend on trade entering and clearing through Beaufort Inlet (Paul 1970:370373; Angley 1982:8). Unlike many of the inlets along the North Carolina coast, Beaufort Inlet was relatively stable and open and offered a safe and deep channel for ship traffic (Stick 1958:312).

Throughout the eighteenth century Beaufort and Bogue Inlets were of only local importance to trade and travel. As in most of eastern North Carolina, early trade centered around lumber products. Beaufort Inlet served the rich Newport River area plantations and the Bogue Inlet served the White Oak River and its tributaries. Naval stores, lumber, and agricultural goods from both these areas were exported to the West Indies in exchange for glassware, cloth, furniture, coffee and rum (Angley 1984:1).

Beaufort supported a strong, though small, shipbuilding industry (Tatham 1806). In 1810, Jacob Henry, a former representative from Carteret County to the North Carolina House of Commons, commented upon the local shipbuilding industry at Beaufort:

> The principal trade carried on here is ship building in which they have acquired a very considerable reputation. Live oak and Cedar are the timbers principally used but the stock is by no means so abundant as it has been. Some of the swiftest sailors and best built Vessels in the United States have been launch'd here, particularly the Ship Minerva, a well known Packet between Charleston and New York. There are at present five Vessels at the Stocks, two of which are ready to be launch'd (Newsome 1929:399 Watts 1997:5).

In 1815, a hurricane struck the Bogue Banks area and devastated Beaufort. The storm was described as "being one of the most violent and disastrous ever known upon the coast." Because of the storm Beaufort Inlet changed significantly; the bar was "injured so that but 12 feet could be brought over it at low water." Fortunately the channel eventually recovered from the storm's damage and by 1830 depth on the bar had increased to eighteen feet at mean low water. By 1854, the bar channel had decreased slightly to a depth of 15 1/2 feet and had migrated slightly to the south (Watts 1997:5).

The development of the railroad in the mid-nineteenth century brought significant changes to Beaufort and the development of a new port facility at Sheppard's Point creating a decline in commerce through Beaufort. In 1841, John Motley Morehead, then governor of North Carolina, began to promote the idea of the establishment of a port facility at the eastern terminus of the Atlantic and North Carolina Railroad. By 1858 the port and rail facility had become a reality. The editor of the Greensboro *Patriot* described the conditions and natural advantages which he believed would benefit maritime traffic through Beaufort Inlet to the new port facility at Morehead City in September 1858:

> Beaufort, is about three miles, this being about the widest part of the harbor. The channel is in the form of a half-moon, one horn running eastwardly along the Shackleford banks, called Core Sound, and the other westwardly by Morehead and Carolina cities, which are situated on Bogue Sound. The deepest water is along Newport River, which runs in nearly a north direction between Morehead City and Beaufort, touching the railroad wharf in the former place. The main channel is about one mile wide, so that the inside of the channel would be some two miles from Beaufort, though vessels drawing from nine to ten feet water can approach the Beaufort wharves at full tide. Running up the channel about three miles from the bar, we come to the railroad wharf at Morehead City, where vessels drawing eighteen feet can approach with ease, and unload and take in lading with the greatest safety (Konkle 1922:341-342).

Within six months the rail and port facility at Morehead City was prospering. Ships were continually calling at the wharfs and being loaded with cargoes directly from train cars (Konkle 1922:360-361).

The Civil War closed Beaufort Inlet to trade and disrupted the lives of the inhabitants of Morehead City and Beaufort. Union forces took Morehead City on March 22, 1862. Just days later Union troops crossed the Newport River and took control of Beaufort. Confederate forces still controlled Fort Macon, however. On April 22, several Union vessels anchored near Harker's Island to the east of Beaufort, including the steamer *Alice Price* which served as General Burnside's temporary headquarters. A Union gunboat and one or two smaller vessels were positioned inside Beaufort Inlet, controlling the approaches and exits to Bogue and Core Sounds. By April 25 a fierce battle ensued and the fall of Fort Macon was imminent, Confederate forces burned the bark *Glen* on April 25 to keep it out of Union hands.

On April 26, Colonel Moses J. White, commander of Fort Macon, surrendered to Generals Parks and Burnside on Shackleford Banks (Angley 1982:34; Stick 1958:148-153).

The occupation of Fort Macon and the surrounding vicinity provided Union naval forces with access to a deep-water port and place of rendezvous that was used to support the blockading squadron throughout the remainder of the war. During December 1864 and January 1865, a fleet under the command of Admiral David Porter massed at Beaufort Harbor in preparation for their assault on Fort Fisher in Wilmington, the last major stronghold of the Confederacy in North Carolina. During the Civil War at least five Confederate vessels were captured at sea in the Cape Lookout area: the schooners *Edwin, Julia, Revere,* and *Louisa Agnes,* captured in 1861; and the steamer *Banshee,* taken on November 21, 1863 (Angley 1982:35; Price 1948:n.p.). One Confederate vessel was totally lost in the vicinity as a result of enemy action. On July 9, 1864, the side-wheel steamer *Pevensey* was chased ashore and blown up on Bogue Banks, approximately nine miles west of Beaufort Inlet (Hill 1975:11-13). Not all known shipwrecks near Beaufort were a result of enemy action. On June 12, 1863, while en route from the Delaware Capes to Charleston, the U.S.S. *Lavender* ran aground in heavy seas near Cape Lookout Shoals. The *Lavender* was a screw tug of 173 tons. On July 20, 1865, the 186-ton Union screw steamer *Quinnebaugh* went ashore on Beaufort bar in rough weather after her machinery failed. The *Quinnebaugh* was transporting Union troops, refugees, and civilians north at the time of her loss (Shomette 1973:88-89; Berman 1972:141; Lytle and Holdcamper 1975:291).

Although of lesser importance, Bogue Inlet was also blockaded by Union forces. Because of ongoing concerns that the Confederates were using Bogue Inlet to supply the Confederate war effort, the U.S.S. *Ellis* under the command of William B. Cushing was sent to maintain the blockade in mid-October 1862. Use of Bogue Inlet to run the blockade appears to have been somewhat limited. Only a single schooner was reported lost at the inlet during the war years. The schooner was reported “ashore on the west breaker” at Bogue Inlet in mid-November 1863 (Angley 1984:6).

Just six years after the Civil War, the federal government began measures to reduce the severity of maritime disasters along the coast by establishing the United States Life Saving Service. In 1874, seven stations were established along the North Carolina coast. In 1875 a similar station was authorized by Congress for Cape Lookout. However, was not until ten years later that the station was finally built. Over the following years three other live saving stations were established on Core Banks, and a station was also established near Fort Macon (Angley 1982:35-36; Stick 1958:169-170, 310-313). It was not until the early twentieth century that Congress also recognized the need for a life saving station at Bogue Inlet (Angley 1984:11).

In the latter years of the nineteenth century the U.S. Army Corps of Engineers conducted several investigations on the feasibility of improvements to navigation of the White Oak River and Bogue Inlet. During that time produce including naval stores, cotton, peanuts, lumber, and fish from the White Oak River and Swansboro were transported to Beaufort Harbor by small boats that navigated the sound. After several studies, the various proposed projects including a jetty to help stabilize the inlet were disapproved as being at a cost that exceeded demand (Angley 1984:8-10).

Commerce on the White Oak River in 1906 was determined to be 21,532 tons most of which was timber and sawn lumber. The remaining tonnage consisted of seafood, agricultural commodities and some general merchandise. Almost all of the cargo passed from Swansboro through the inland channel to Morehead City or Beaufort (Angley 1984;13). Until the 1920s Beaufort was the southern terminus of of the Intracoastal Waterway along the Atlantic Seaboard. In 1932, the Intracoastal Waterway was extended from Beaufort to the Cape Fear River south of Wilmington. By 1938, traffic on the waterway consisted of 8,500 motor vessels, 200 barges, and 300 tugs conducting 9,000 trips. Intracoastal Waterway became a primary artery for cargo including seafood, fertilizer, agricultural products, lumber, petroleum product and other merchandise (Angley 1984;14).

Following the Civil War at Morehead City and Beaufort the fishing industry became an important source of income. Menhaden fishing was of particular importance. From 1865 to 1873, the State of North Carolina’s first menhaden processing plant was in operation on Harker's Island. By 1900 several menhaden plants were in operation at various locations on Bogue and Core Sounds including Beaufort (Hill 1975:16-18 Watts 1997:7).

Although the fishing industry was growing, the port at Morehead City developed slowly. Limited traffic through the port was mostly attributed to the depth of water over the bar of the entrance channel to Beaufort Inlet. The size of the shoals related to the bar was also increasing in size. By the 1880s the Federal government began to make improvements to the inlet in an attempt to increase maritime trade to port. Over the next eight years five jetties were constructed on Shackleford Point and another six jetties were constructed on Fort Macon Point. By 1889 the deterioration of the inlet had been halted (Angley 1982:40). To further improve the inlet the entrance channel across the Beaufort Inlet bar was dredged to a depth of 20 feet at mean low water in 1905 and 1907. A 20-foot channel, 200 feet wide, was also established between the inlet and the wharves at Morehead City. A smaller channel, seven feet deep and 100 feet wide, was created to serve the wharves along the Beaufort waterfront (Angley 1982:40).

In 1912 federal records indicate 12 sailing vessels and 35 gasoline powered vessels were registered at Morehead City. At Beaufort 175 sailing vessels, 240 gasoline powered vessels, and six barges were registered. Between 1 July 1898 and 3 June 1908, 82 vessels were reported lost off the North Carolina coast (Angely 1982:42).

In 1923 the tugboat *Juno* sank in the Beaufort Inlet channel creating a hazard to navigation and caused great difficulty to vessels attempting to use the inlet. The wreck of the *Juno* was eventually leveled with explosives but the need for channel improvements was clear. Beginning in 1926 the federal government made considerable improvements to the use of the Port of Morehead City by increasing the depth of the channel from Beaufort Inlet from 20-feet to 30-feet (Stick 1952:237-238 Watt 1997:9-10).

During World War Two German submarines brought war within sight of coastal communities. On one night, March 18, 1942, German submarines sank three tankers in the Cape Lookout area: the *Papoose,* the *W. E. Hutton,* and the *E. M. Clark.* Just five days later another tanker, the *Naeco* was sunk in the same vicinity (Stick 1952:234). Following the attacks, coastal communities of North Carolina were developed "black out" system along with coastal watches. In addition, a more efficient convoy system for tankers and other commercial vessels was devised. Additional planes and patrol vessels were also put into service particularly for the Cape Lookout area (Stick 1952:237-239 Watts 1997:10).

The value of deepwater ports was recognized by the North Carolina State Legislature in 1945 with the creation of the NC State Ports Authority. In 1949 the General Assembly approved the issue of $7.5 million in bonds for construction and improvement of seaports to promote trade throughout the state. Terminals equipped to handle oceangoing vessels were completed at Wilmington and Morehead City in 1952. Their positions nearly midway between major competing ports in Virginia and South Carolina made them more accessible to North Carolina traders. Morehead City has become a major port for products including phosphate, scrap metal, sulfur, rubber asphalt and other bulk products. At Morehead City, planning continues for expansion onto Ports Authority property on Radio Island and preparing for the larger ships of the future (ncstateport.com).

PRE-SURVEY CONSULTATION AND DOCUMENTATION

As part of the investigative effort, M-AT/ER first conducted a literature search to help document man's activities in the vicinity and to provide a historical context for the assessment of potential cultural resources discovered offshore. The search helped to determine the extent and type of commercial and naval activity offshore, which further assisted in the assessment of targets identified during field investigations. This research focused on primary and secondary materials, as compiled by environmental and archeological agencies responsible for managing the State's cultural resources and depositories, such as libraries and museums. In addition, research included consultation with local historians and the State Underwater Archaeologist at Fort Fisher.

The following offices and/or institutions were contacted:

- Underwater Archaeology Unit, Division of Archives and History, Fort Fisher, NC
- North Carolina Maritime Museum, Beaufort, NC
- NC State Archives
- Office of the Historian, U.S. Coast Guard, Washington, D.C.
- Marine Casualty Branch, U.S. Coast Guard
- Maritime Historian, Sanctuaries and Reserves Division, National Oceanic and Atmospheric Administration

Preliminary secondary sources examined:

- The Encyclopedia of American Shipwrecks
- Merchant Steam Vessels of the United States 1807 - 1868
- Shipwrecks of the Western Hemisphere
- Shipwrecks of the Civil War
- Official Records of the Union and Confederate Navies in the War of the Rebellion
- Automated Wreck and Obstruction Information System of the National Oceanic and Atmospheric Administration
- Web Site Review of http://anchor.ncd.noaa.gov/awois/search.cfm
- Historical Maps and Charts

Researchers reviewed source materials at each institution and conducted interviews with librarians/technical staff to determine the best potential sources for background information. A list of known or potential shipwrecks has been developed for the vicinity.

DESCRIPTION OF INVESTIGATIONS

Remote Sensing Survey

M-AT/ER's underwater archaeology team conducted the survey from two equally equipped survey vessels. One vessel was 25-feet in length and the other was 36-feet in length. Two primary remote sensing devices were used: a Geometrics 881 cesium marine magnetometer and a Marine Sonic 600 kHz digital, side-scan sonar. Each instrument was interfaced with a Starlink Differential Global Positioning System.

For each vessel, data was collected along parallel lines spaced at 100-foot intervals in Borrow Areas Q1, U, and Y and at 65-foot intervals in Borrow Area Q2. Magnetic data, along with corresponding positioning data, was recorded at .5-second sample intervals (or approximately every 5 feet along a track line at 6 knots) using HYPACK™ data acquisition software. A 50 pound tri-wing depressor was utilized to maintain the magnetometer tow sensor at a depth of 10 to 20 feet above the bottom within each survey area. The 881 sensor was trailed behind the depressor. At 6 knots the depressor's tow-line traveled at approximately a 40 degree angle to the transom of the survey vessel. Beginning at the offshore or deeper portion of each borrow area the magnetometer height was set. Using the angle of the depressor's tow line and its length, the height of the magnetometer sensor was adjusted to achieve a maximum of a 20-foot sensor height above the bottom.

Side scan sonar data was recorded with Marine Sonic Sea Scan® acoustic data acquisition software using an onboard PC computer system. Side Scan Sonar data was recorded at a scale of 164 feet (50 meters) per channel. The height of sonar fish was adjusted to achieve the best records for the conditions.

Magnetic Background Variation

Artificial induced variation in magnetic data or background noise was maintained at less than .1 nanoteslas at a sample rate of ½ second. Noise spikes, such as those produced by sharp turns or rapid changes in speed, were easily identified and removed during the data editing process. Once the data had been reduced to pole, the magnetic background was represented by the "zero value data" depicted in the magnetic contour maps.

Data Analysis / Cultural Resources

During field investigations, data being produced by the magnetometer, side-scan sonar and sub-bottom profiler were closely monitored. Targets (magnetic or acoustic) were identified and recorded as they were generated. Also noted on field records was information about the local environment, which included man-made features such as pipelines, channel markers, crab traps, and conditions that could influence magnetic or acoustic data.

After a survey area had been completed, archaeologists edited the magnetic data for detailed analysis and comparison to acoustic data. Editing was performed in three phases. The initial phase consisted of using HYPACK's single-beam editing program to review raw data (of individual survey lines) and to delete any artificially induced noise or data spikes. While editing survey lines, a preliminary target table was developed that included individual target coordinates, signature characteristics, intensity, and duration. Once all survey lines for an area were edited, the edited data was converted to an XYZ file (Easting and Northing State Plane Coordinates, and magnetometer data – measured in gamma), also using HYPACK. Next, the XYZ files were imported into a Triangular Irregular Network (TIN) modeling program (HYPACK) that was used to contour the data in 10-gamma intervals. Once the data was contoured, the contour graphic was converted to a DXF file and imported into AutoCAD in order to clearly view individual magnetic anomalies and their association with acoustic target signatures. Once in AutoCAD, additional editing of the total magnetic intensity was performed without affecting individual magnetic anomalies. For example, dramatic or pronounced diurnal changes that frequently will create a "striped," "zigzag," or "herring bone" pattern in the contour lines can be edited out and averaged across a survey area to create a more realistic and accurate contour map.

A second major analytical technique employed included the subtraction of general background from each successive data sample to develop the actual field gradient. The gradient is the vertical difference (z) between samples. By subtracting

successive data samples one from the other the effects of diurnal change is completely eliminated. The resulting data represents only the localized changes in the magnetic background created by ferrous object(s) (i.e. anomalies). When graphically represented by contouring (using the same method described above), only the intensity of variation is represented.

During the analysis process, magnetic anomalies were categorized using the anomaly intensity, duration and/or extent, and signature characteristics. In addition, the anomaly's geographic location was taken into consideration, as well as its association with acoustic target signatures.

After magnetic data was developed into a target list, acoustic data was examined using SeaScan™ acoustic data review software to identify any unnatural or man-made features in the records. Once identified, acoustic features were described using visible length, width, and height from the bottom surface. The coordinates of the acoustic features also were recorded.

Data Assessment (General)

Target signatures were evaluated using the National Register of Historic Places criteria[2] as a basis for the assessment. For example, although a historic object might produce a remote sensing target signature, it is unlikely that a single object (such as a cannon ball) has the potential to meet the criteria for nomination to the National Register of Historic Places.

Target assessment was based primarily on the nature and characteristics of the acoustic and magnetic signatures. Shipwrecks – large or small – often have distinctive acoustic signatures, which are characterized by geometrical features typically found only in a floating craft. Most geometrical features identified on the bottom (in open water) are manmade objects. Often an acoustic signature will have an associated magnetic signature. Generally, if the acoustic signature demonstrates geometric forms or intersecting lines with some relief above the bottom surface and have a magnetic signature of any sort; it can be categorized as a potentially significant target. Often, modern debris near docks, bridges, or an anchorage is easily identified solely based on the characteristics of its acoustic signature. However, it is more common to find material partially exposed. Frequently, these objects produce a record that obviously indicates a man-made

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2 To qualify for the National Register, a historic shipwreck must "meet one or more of the National Register criteria A, B, C, and D. Determining the significance of a historic vessel depends on establishing whether the vessel is 1) the sole, best, or a good representative of a specific vessel type; 2) is associated with a significant designer or builder; or 3) was involved in important maritime trade, naval, recreational, government, or commercial activities" The criteria is described thusly:

A. [B]e associated with events that have made a significant contribution to the broad patterns of our history; or

B. be associated with the lives of persons significant in our past;

C. embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. have yielded, or may be likely to yield, information important in prehistory or history.

(National Register Bulletin, U.S. Department of the Interior, National Park Service, Interagency Resources Division).

object, but the object is impossible to identify or date. In making an archaeological assessment of any sonogram record, the history and modern use of the waterway must be taken into consideration. Naturally, historically active areas tend to have greater potential for submerged cultural resources. The assessment process prioritizes targets for further underwater archaeological investigations.

Magnetic target signatures alone are more difficult to assess. Without any supporting sonogram record, the nature of the bottom sediments and the water currents become more important to the assessment process. A small, single-source magnetic signature has the least potential to be a significant cultural resource. Although it might represent a cannon ball or historic anchor, this type of signature has little potential to meet National Register criteria.

A more complex magnetic anomaly, represented by a broad monopolar or dipolar type signature, has a greater potential to be a significant cultural resource, depending on bottom type. Shipwrecks that occur in regions with hard bottoms, with little migrating sand, tend to remain exposed and are often visible on sonogram records. A magnetic anomaly that is identified in a hard bottom area and has no associated acoustic signature frequently can be discounted as being a historic shipwreck. Most likely, such an anomaly is modern debris, such as wire rope, chain, or other ferrous material.

Soft migrating sand or mud can bury large wrecks, leaving little or no indication of their presence on the bottom surface. The types of magnetic signatures that a boat or ship might produce are infinite, because of the large number of variables including location, position, chemical environment, other metals, vessel type, cargo, sea state, etc. These variables are what determine the characteristics of every magnetic target signature. Since shipwrecks occur in a dynamic environment, many of the variables are subject to constant change. Thus, in making an assessment of a magnetic anomaly's potential to represent a significant cultural resource, investigators must be circumspect in their predictions.

Broad, multi-component signatures (again, depending on bottom characteristics and other factors) often have the greatest potential to represent a shipwreck. On the other hand, high-intensity, multi-component, magnetic signatures (without an accompanying acoustic signature) in areas of relatively high velocity currents can be discounted as a historic resource. Eddies created by the high-velocity currents almost always keep some portion of a wreck exposed. Generally, wire rope or some other low-profile ferrous debris produces this type of signature in these circumstances. Many types of magnetic anomalies display characteristics that are not easily interpreted. The only definitive method of determining the nature of the object creating these anomalies is by physical examination.

DESCRIPTION OF FINDINGS

Identification of Submerged Cultural Resource

Investigations to identify documented shipwrecks near the project area revealed that numerous ships have wrecked in the vicinity of Bogue Banks, Beaufort Inlet and Bogue Inlet (see Historic Shipwrecks in the Vicinity of Bogue Banks - Appendix A). The historic shipwreck tentatively identified as the *Queen Anne's Revenge* and currently undergoing investigation immediately north of Borrow Area Q2 helps to demonstrate the potential for other historic shipwrecks in the vicinity of Beaufort Inlet. Several targets were identified within Borrow Area Q2 that have similar remote sensing characteristic to the Queen Anne's Revenge shipwreck site.

Borrow Areas Q1 and U

No magnetic or acoustic anomalies that could be attributed to potential submerged cultural resources were found in Borrow Area Q1 or U. All magnetic and acoustic targets identified within these two borrow areas were found to be associated with either the North Carolina Artificial Reef Program or a single pipeline or cable.

Borrow Areas Y and Q2

Only one magnetic anomaly with an associated acoustic signature was identified in Borrow Area Y. It has been recommended for additional investigations or avoidance. In contrast, hundreds of magnetic anomalies were identified within Borrow Area Q2. Many of these magnetic anomalies are isolated low intensity targets with little potential to be associated with a significant submerged cultural resource. Some of the magnetic anomalies are clustered together suggesting they may be related and could be associated with the scattered remains of historic shipwrecks. These were grouped into target clusters.

Borrow Area Q1

Although there were numerous magnetic and acoustic target signatures in Borrow Area Q1 none were found to be associated with historic submerged cultural resources. All target signatures were associated with a variety of purposely sunken vessels, craft, tires and debris associated with the North Carolina Division of Marine Fisheries – Atlantic Beach Reef AR-315 (Figures 7, 8, 9, 10, and 11).

The following is a list of vessels, craft, and materials deposited at the reef since 1974 (source: www.ncfisheries.net/reefs/ar315a.htm):

Material	Deployment Date	Position (Decimal min.)
440' liberty ship *Theodore Parker*	4-Jun-74	34° 40.350' / 076° 44.717' to 34° 40.350' / 076° 44.767'
Tires: 177,168	1974-1984	Throughout area N of Lib. Ship
Steel Hull Sportfishing Vessel *Finest Kind*	02-Aug-77	Unverified
40' Coast Guard launch	1980	Unverified
Trawler *Helen May*	6-Jan-83	Unverified
60' lash barge #1, with 450 tons of concrete rubble on both	9-Jun-89	34° 40.233' / 076° 44.600'
60' lash barge #2	9-Jun-89	34° 40.400' / 076° 44.483'
Aircraft F-4	1992	34° 40.350' / 076° 44.650'
Aircraft A-4 (2)	1992	34° 40.367' / 076° 44.650'
Concrete Rubble	1991, 1992	34° 40.383' / 076° 44.650' to 34° 40.383' / 076° 44.667'
Bridge Rubble	1989	34° 39.983' / 076° 45.033'
Steel bridge framing	1989	34° 40.350' / 076° 44.583'
		34° 40.383' / 076° 44.583'
Reef Balls	21-Feb-00	34° 40.383' / 076° 44.500' to
		34° 40.400' / 076° 44.500'
		34° 40.400' / 076° 44.483'
104' Navy tug *Takos*	2-Nov-00	34° 40.320' / 076° 44.806'
Newport DOT Concrete Pipe	2002	34° 40.316' / 076° 44.820'
Newport DOT Concrete Pipe, Misc. Concrete, Radio Island Pilings	2003	34° 40.330' / 076° 44.793'
T.D. Eure Const. Radio Island Ramp Pilings (6-12' length, ~500 pieces)	2003	34° 40.280' / 076° 44.534'
T.D. Eure Const. Radio Island Ramp Pilings (6-12' length, ~500 pieces)	2003	34° 40.217' / 076° 44.617'
Carteret County Sportfishing Association Concrete Pipe (Heavy Concentration)	2003	34° 40.243' / 076° 44.600'
Carteret County Sportfishing Association Pilings (Round Disperse Pattern)	2003	34° 39.908' / 076° 45.189'
Carteret County Sportfishing Association and T.D. Eure Const. Broadcast of pilings and concrete pipe: (Quadrate Area Coord.) This area is ideal for casual drift bottom fishing that is away from the heaviest reef trolling and diving activity.	2003	34° 39.957 / 076° 45.129'
		34° 39.925' / 076° 45.062'
		34° 39.863' / 076° 45.085'
		34° 39.839' / 076° 45.156'
Reef Balls: 50, Ultra Ball: 1,	19-Mar-04	34° 40.200' / 076° 44.800'

Figure 7. Magnetic Contour and Target Location Map Borrow Area Q1.

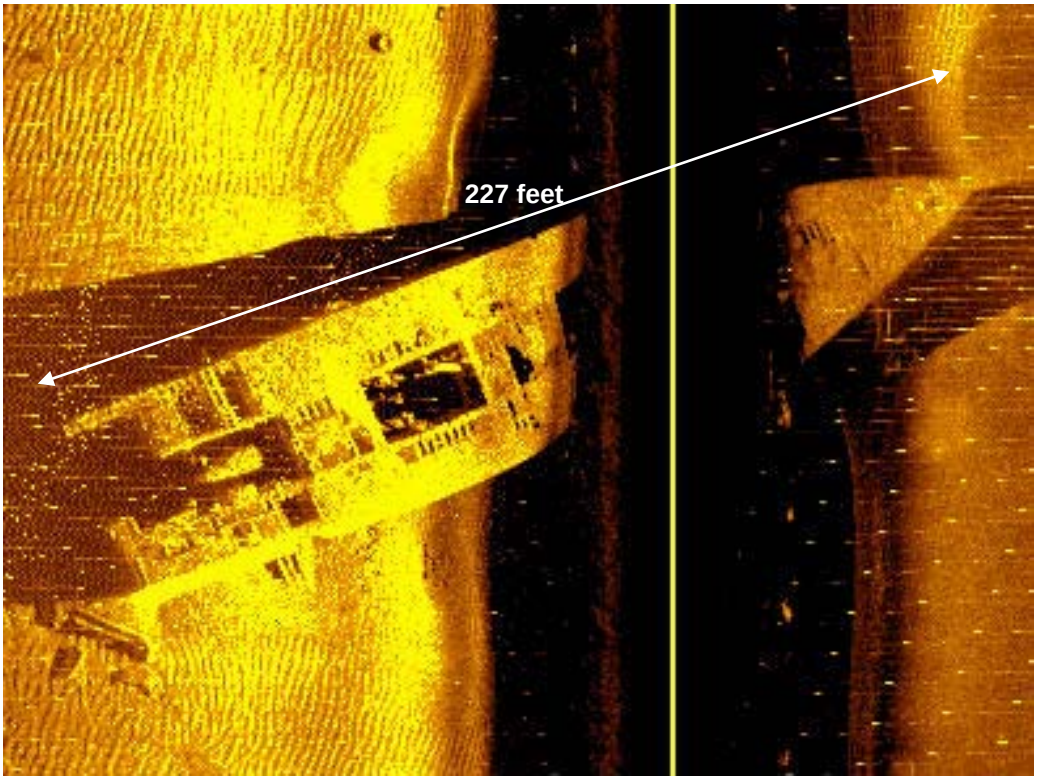

Figure 8. AR-315 Liberty Ship *Theodore Parker.*

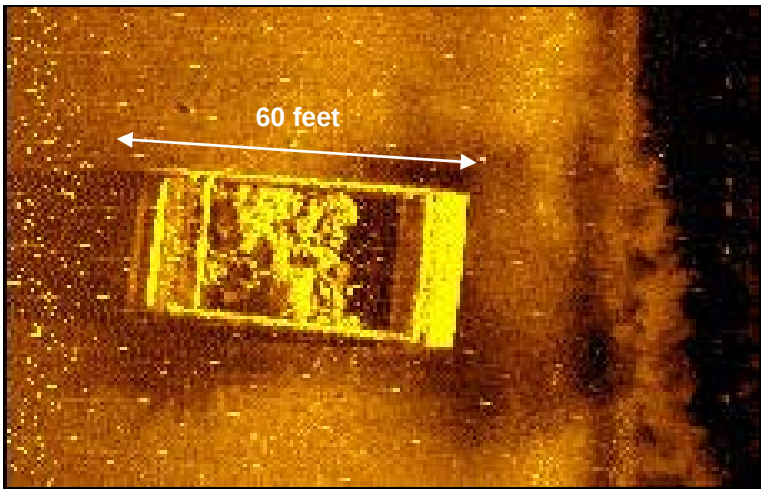

Figure 9. AR-315 Lash Barge.

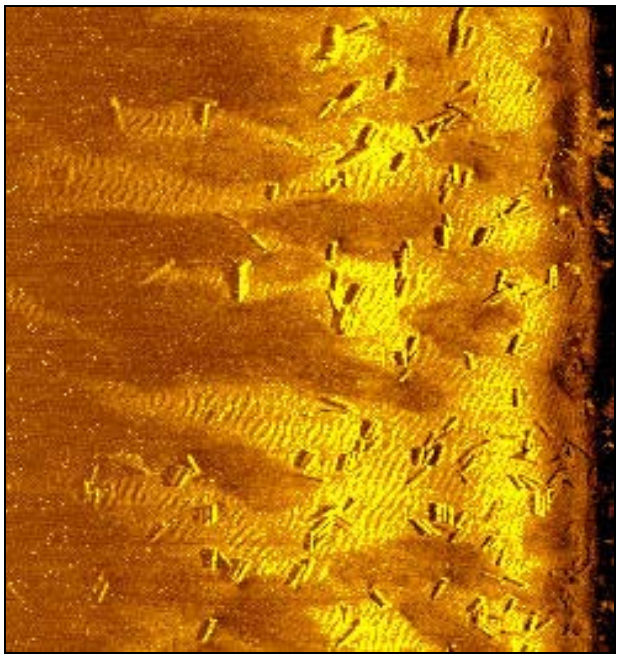

Figure 10. AR-315 Concrete Pipe.

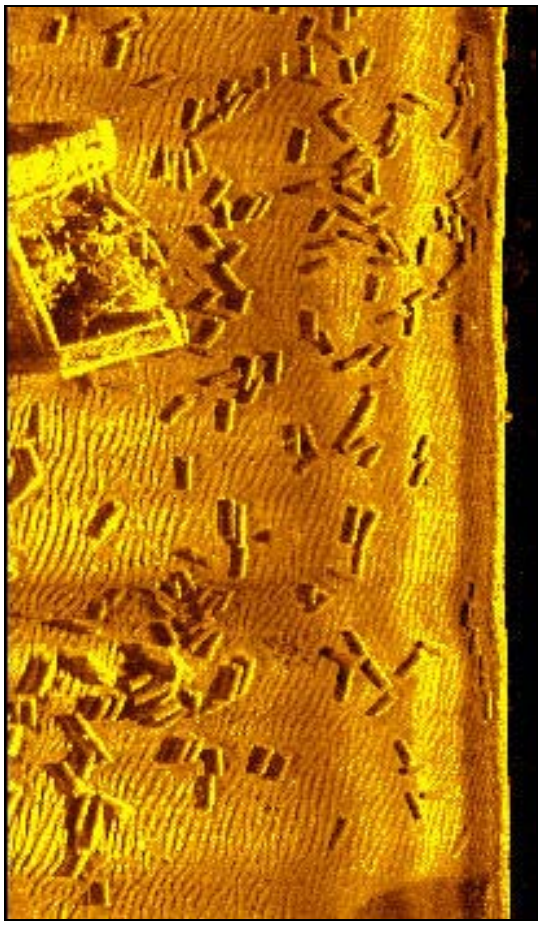

Figure 11. AR-315 Concrete Pipe and Lash Barge.

Borrow Area Q2

Borrow Area Q2 is positioned directly offshore to the South and West of historic Beaufort Inlet (Old Topsail Inlet). The eastern portion of Borrow Area Q2 includes the Beaufort Inlet entrance channel. There are numerous magnetic anomalies in Borrow Area Q2. Many of the anomalies are relatively low intensity as well as widely and randomly dispersed. Some of the magnetic anomalies are clustered together suggesting they may be related (Figure 13).

Rather than selecting and describing each individual magnetic anomaly as a target, most have been grouped into clusters based on proximity or relation to a corresponding acoustic signature. Isolated low intensity (less than 20 nT) magnetic signatures without a corresponding acoustic signature are not generally included in target signature descriptions. This is because isolated targets have minimum potential to be associated with a significant cultural resource based on National Register Criteria.

A total of 33 targets and target clusters are describe below:

Q2-1 - Cluster
NC State Plane x=2691236 y=343661

Target Cluster Q2-1 consisted of at least three dipolar magnetic anomalies on three survey lines with a maximum magnetic intensity of 18 nT. No acoustic target signature was identified in association with the magnetic anomalies. The low intensity, proximity, and characteristics of the targets signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least three single source objects with similar magnetic characteristics or one linear object such as a wire rope over 300 feet in length. The nature of the target cluster suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 12).

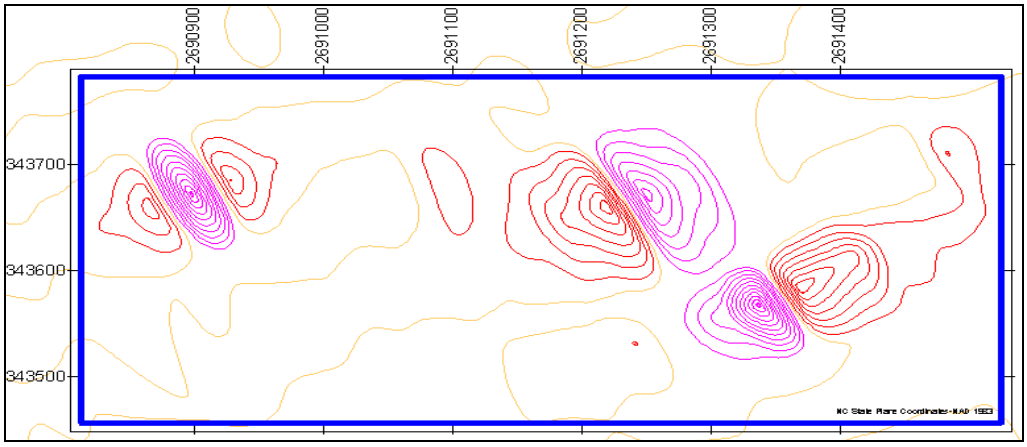

Figure 12. Target Cluster Q2-1 Magnetic Contour Signature.

Figure 13. Magnetic Contour and Target Location Map Borrow Area Q2.

Q2-2 - Cluster
NC State Plane x=2693713 y=343620

Target Cluster Q2-2 consisted of at least two dipolar magnetic anomalies on three survey lines with a maximum magnetic intensity of 15 nT. No acoustic target signature was identified in association with the magnetic anomalies. The low intensity, proximity, and characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least two single source objects with similar magnetic characteristics or one linear object such as a wire rope over 200 feet in length. The nature of the target cluster suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 14).

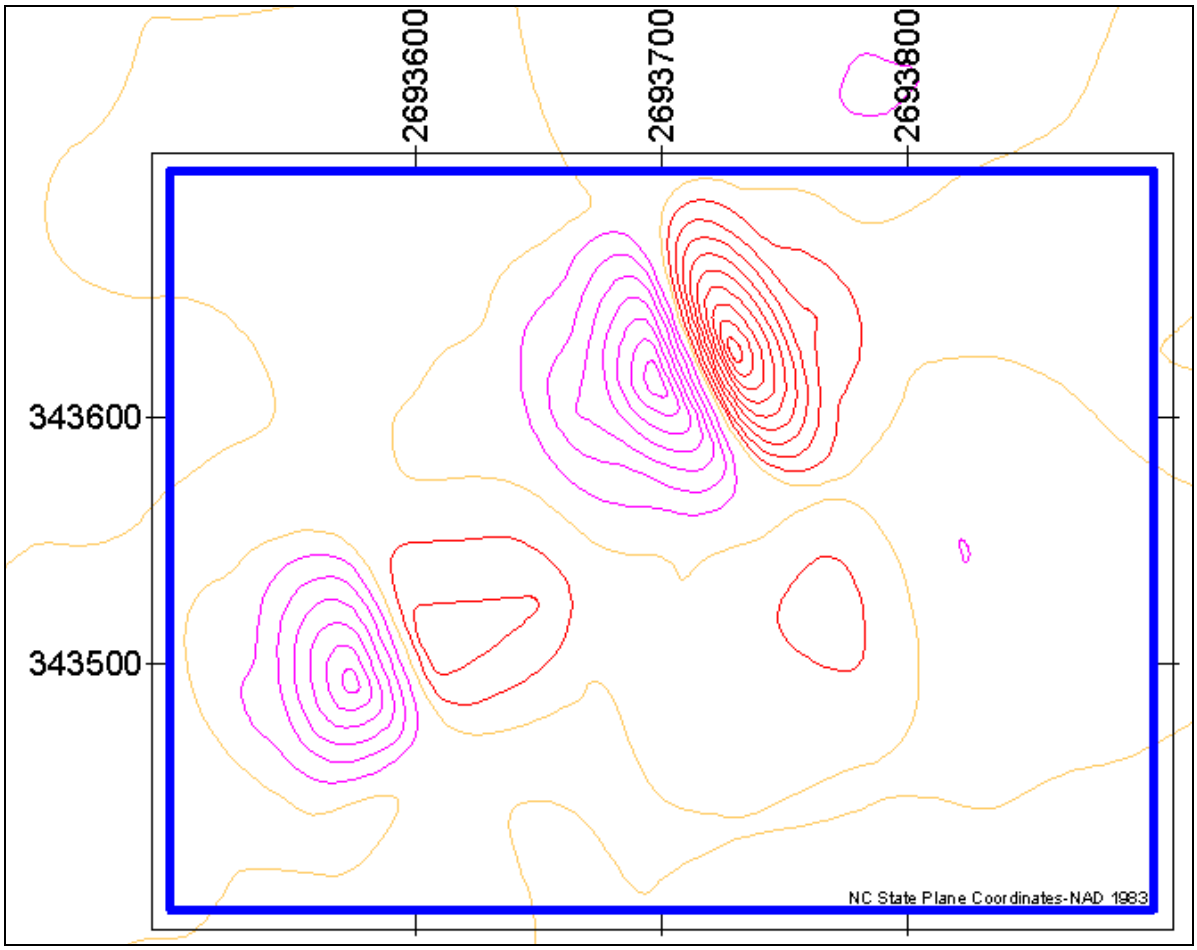

Figure 14. Target Cluster Q2-2 Magnetic Contour Signature.

Q2-3
NC State Plane x= y=

Target Q2-3 has a multi-component magnetic signature with an intensity of more than 51 nT measuring 72 feet between poles. No acoustic target signature was found in association with the magnetic signature. Q2-3 appears to be one or two single source anomalies in close proximity. The target is approximately 600 feet south of the known QAR (*Queen Anne's Revenge*) shipwreck site. The proximity to the historic shipwreck site in combination with the magnetic intensity and characteristics suggests the anomaly has the potential to be associated with a significant submerged cultural resource. Underwater investigations to identify the nature of the material producing the magnetic signature are recommended prior potential construction impacts. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The impact zone should include an area at least 600 feet to the north of Q2-3 and 200 to the south (Figure 15).

DELETED

Figure 15. Target Q2-3 Magnetic Contour Signature.

Q2-4
NC State Plane x= y=

Target Q2-4 has a multi-component magnetic signature with an intensity of more than 109 nT measuring 64 feet between poles. No acoustic target signature was found in association with the magnetic signature. Target Q2-4 appears to be a multiple source anomaly. The target has the potential to be associated with a significant cultural resource. Underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The impact zone should include an area at least 300 feet in diameter around the target coordinates (Figure 16).

DELETED

Figure 16. Target Q2-4 Magnetic Contour Signature.

Q2-5 - Cluster
NC State Plane x=2699997 y=344355

Target Cluster Q2-5 consisted of at least three dipolar magnetic anomalies on two survey lines with a maximum magnetic intensity of 5 nT. No acoustic target signature was identified in association with the magnetic anomalies. The low intensity, proximity, and characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least three single source objects with similar magnetic characteristics or one linear object such as a wire rope over 300 feet in length. The nature of the target cluster suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 17).

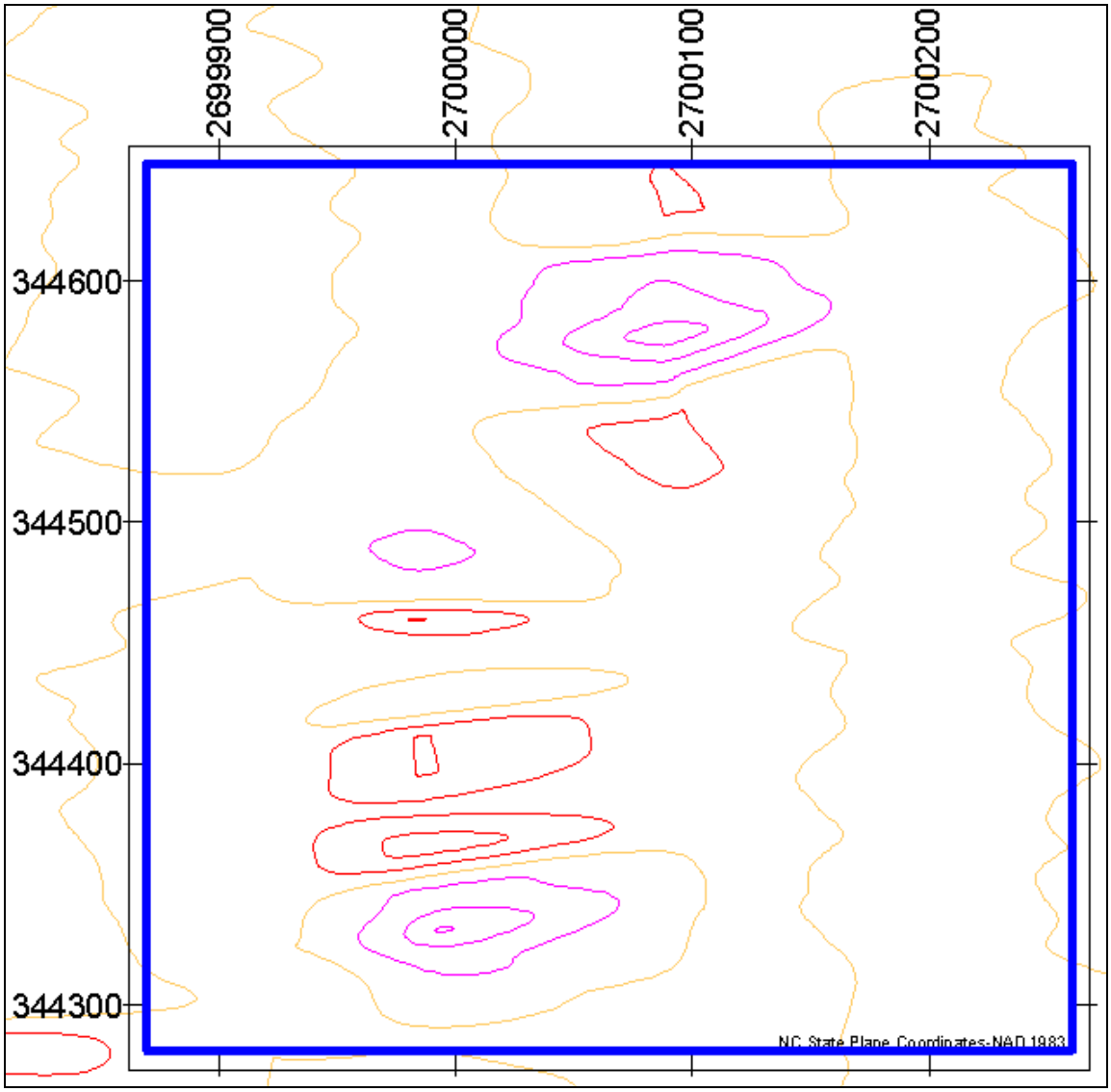

Figure 17. Target Cluster Q2-5 Magnetic Contour Signature.

Q2-6-Cluster
NC State Plane x=2700968 y=344019

Target Cluster Q2-6 consisted of at least two dipolar magnetic anomalies on two survey lines with a maximum magnetic intensity of 6 nT. A sonar image of 150 – foot long wire rope and 4 by 4 foot block buoy sinker was identified in association with the magnetic anomaly.

No additional underwater archaeological investigations are recommended (Figure 18 and 19).

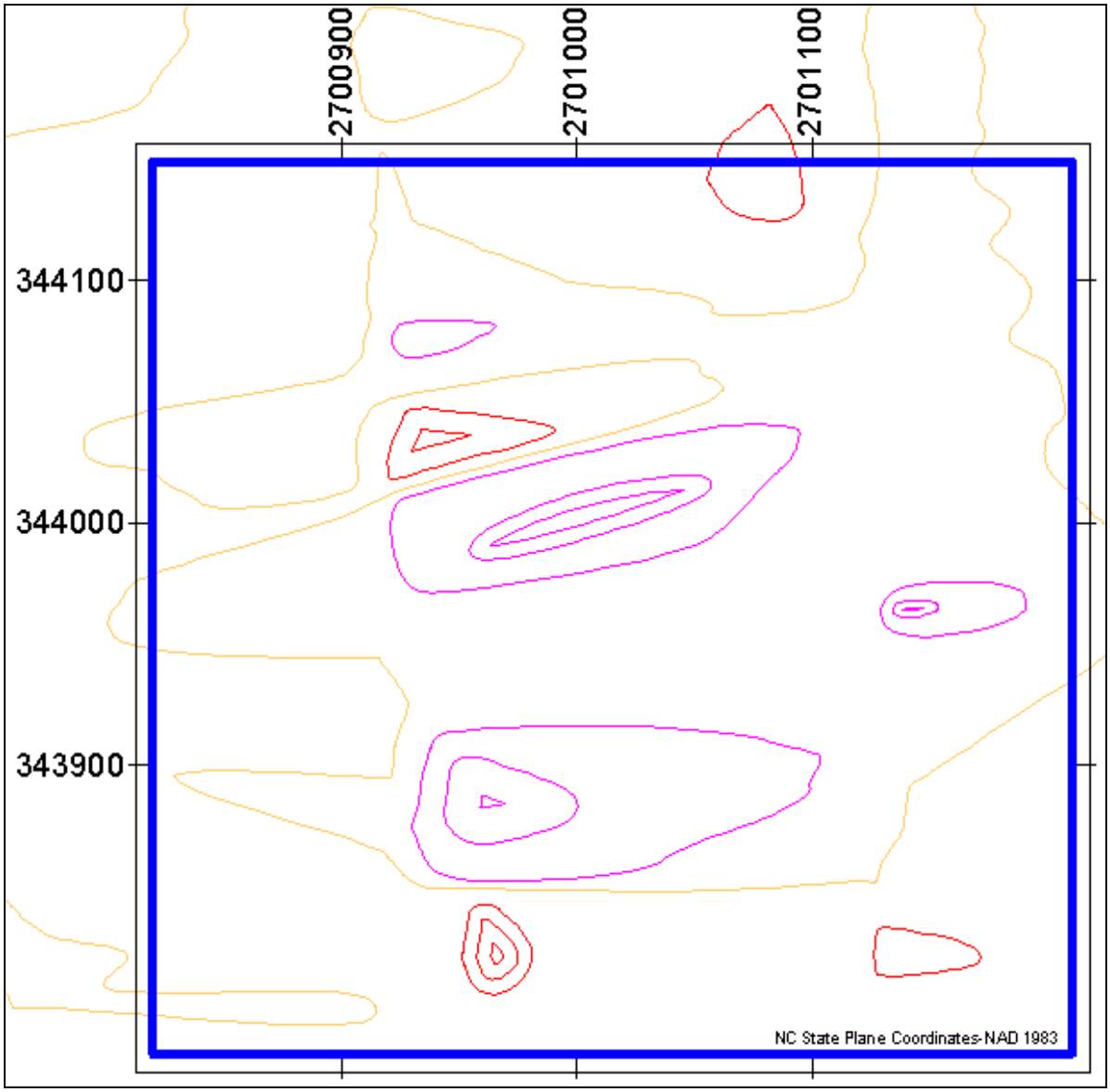

Figure 18. Target Cluster Q2-6 Magnetic Contour Signature.

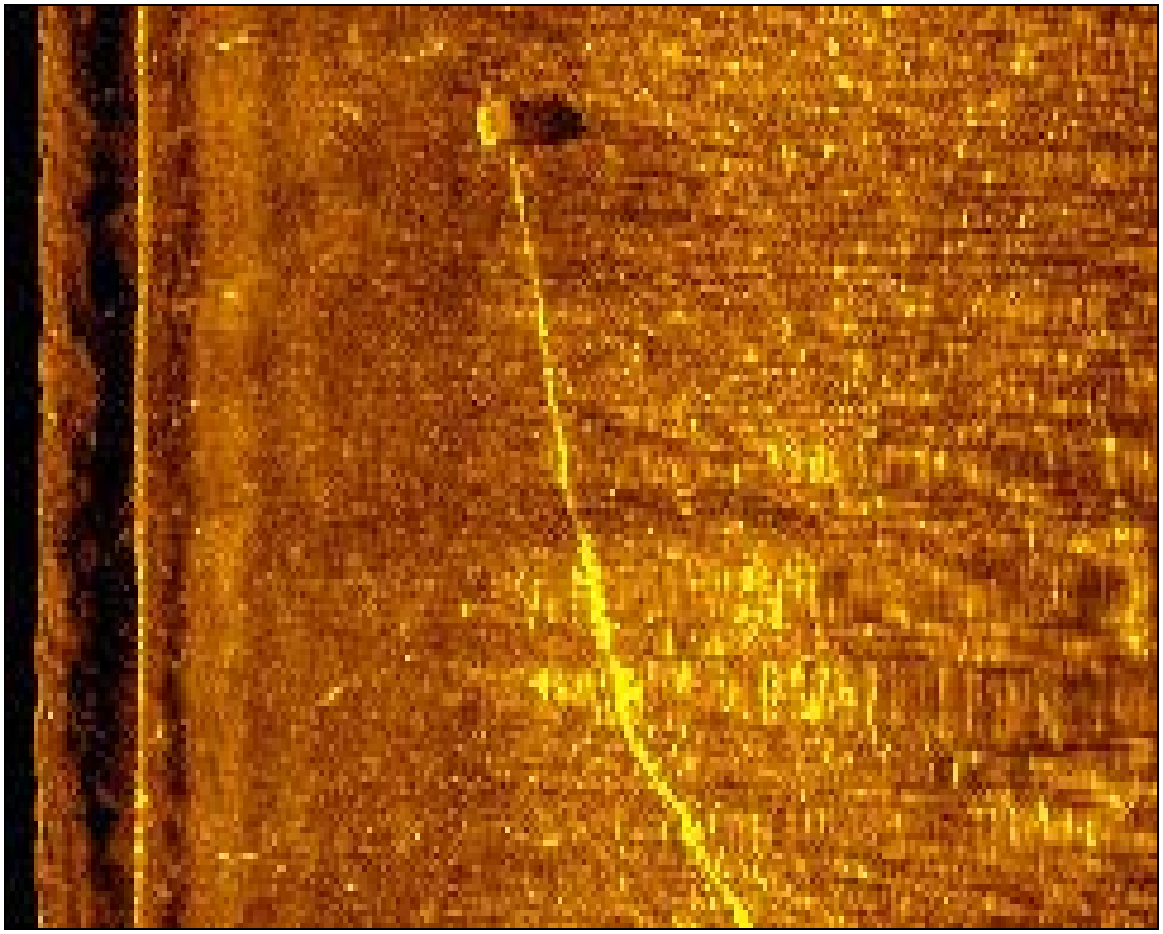

Figure 19. Acoustic Target Signature Q2-6.

Q2-7-Cluster
NC State Plane x= y=

Target Cluster Q2-7 consisted of at least seven multi-component and dipolar magnetic anomalies on four to six survey lines with a maximum magnetic intensity of 106 nT. The low intensity, proximity, and characteristics of the targets' signatures suggest they may be related. No acoustic target signature was found in association with the magnetic signature.

The target cluster has the potential to be associated with a significant cultural resource. Underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The impact zone should include an area at least 1200 feet in diameter around the target coordinates (Figure 20).

DELETED

Figure 20. Target Cluster Q2-7 Magnetic Contour Signature.

Q2-8 - Cluster
NC State Plane x=2698151 y=343529

Target Cluster Q2-8 consisted of at least three dipolar magnetic anomalies on three survey lines with a maximum magnetic intensity of 33 nT. The low intensity, proximity, and characteristics of the targets signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least two single source objects with similar magnetic characteristics or one linear object such as a wire rope over 150 feet in length. The nature of the target cluster suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 21).

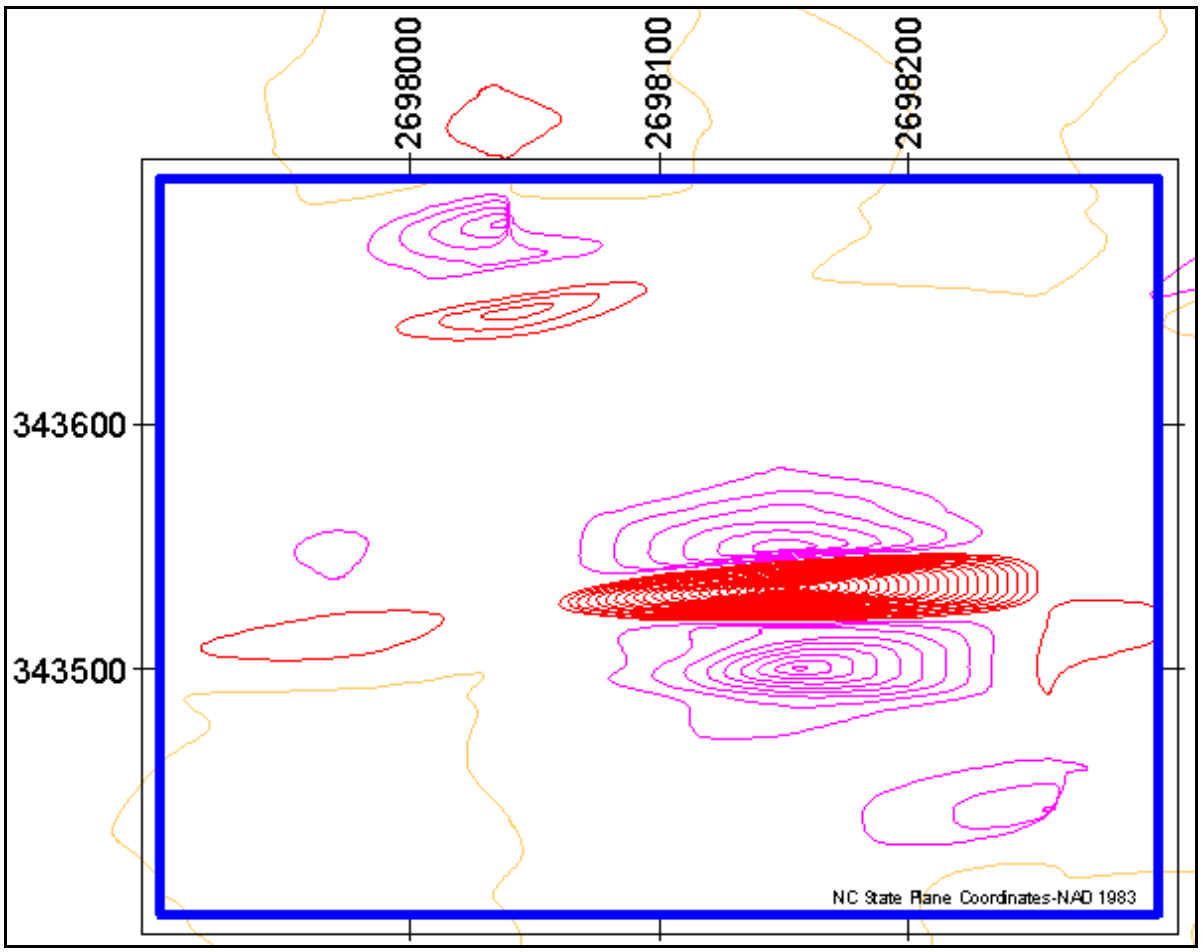

Figure 21. Target Cluster Q2-8 Magnetic Contour Signature.

Q2-9-Cluster
NC State Plane x= y=

Target Cluster Q2-9 consisted of at least five multi-component and dipolar magnetic anomalies on four to six survey lines with a maximum magnetic intensity of 266 nT. Acoustic records associated with the anomalies demonstrate materials over 60 feet in length by 15 feet in width exposed within a depression. Based on the acoustic signature the site appears to be a shipwreck.

The target has the potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 900 feet in diameter around the target coordinates (Figures 22, 23, and 24).

DELETED

Figure 22. Target Cluster Q2-9 Magnetic Contour Signature.

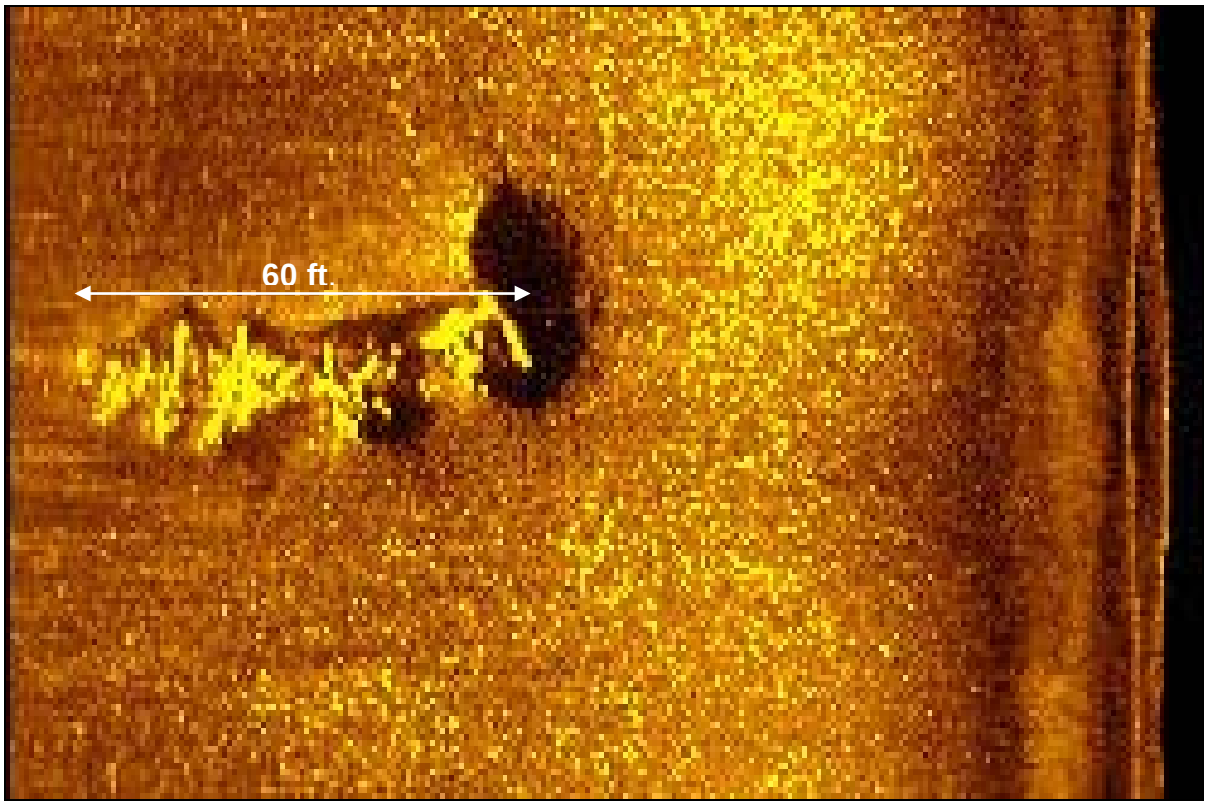

Figure 23. Acoustic image of Target Q2-9.

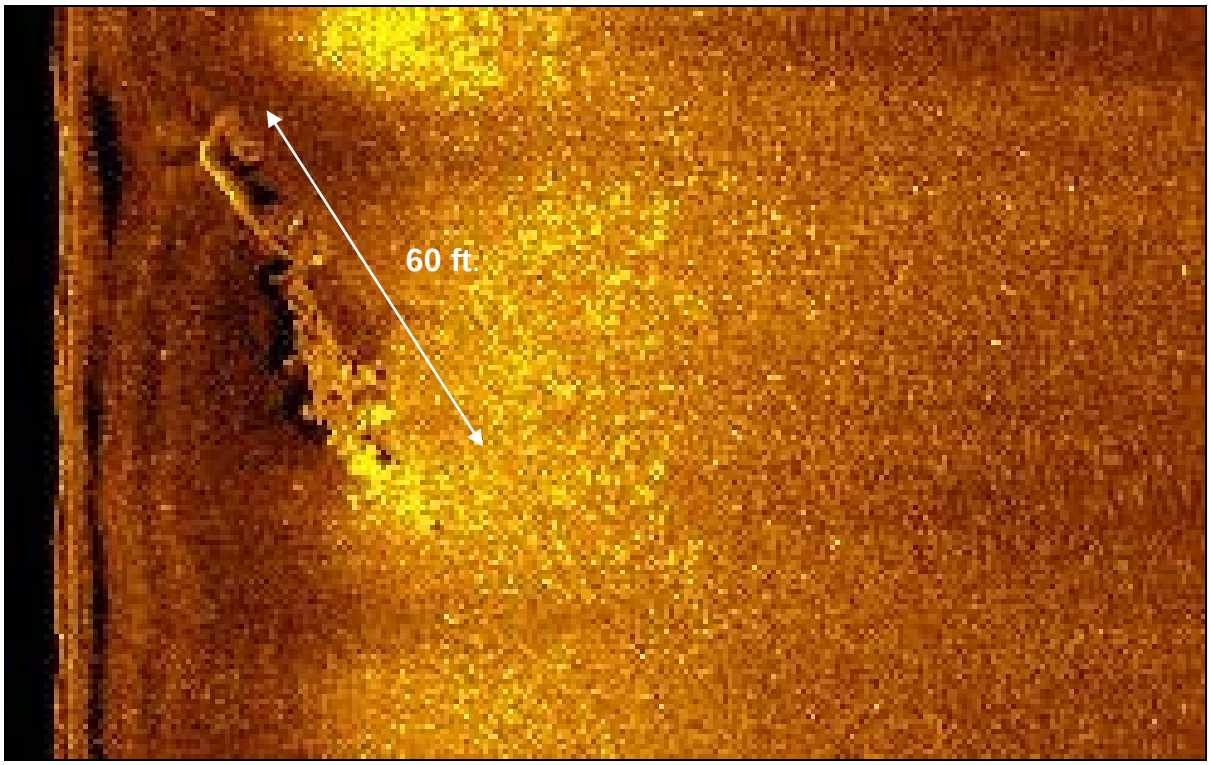

Figure 24. Acoustic image of Target Q2-9.

Q2-10-Cluster
NC State Plane x= y=

Target Cluster Q2-10 consisted of at least two dipolar magnetic anomalies on two survey lines with a maximum magnetic intensity of 86 nT. The relatively high intensity, proximity, and characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least two single source objects with similar magnetic characteristics. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 300 feet in diameter around the target coordinates (Figure 25).

DELETED

Figure 25. Target Cluster Q2-10 Magnetic Contour Signature.

Q2-11-Cluster
NC State Plane x= y=

Target Cluster Q2-11 consisted of at least three magnetic anomalies on two survey lines with a maximum magnetic intensity of 34 nT. The relatively high intensity, proximity, and similar characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest that there are at least three single source objects with similar magnetic characteristics. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 400 feet in diameter around the target coordinates (Figure 26).

DELETED

Figure 26. Target Cluster Q2-11 Magnetic Contour Signature.

Q2-12-Cluster
NC State Plane x= y=

Target Cluster Q2-12 consisted of at least three multi-component magnetic anomalies on four survey lines with a maximum magnetic intensity of 146 nT. The relatively high intensity, proximity, and characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 800 feet in diameter around the target coordinates (Figure 27).

DELETED

Figure 27. Target Cluster Q2-12 Magnetic Contour Signature.

Q2-13-Cluster
NC State Plane x= y=

Target Cluster Q2-13 consisted of at least three multi-component magnetic anomalies on four survey lines with a maximum magnetic intensity of 38 nT. Sonar images associated with the site show a single object approximately 8 feet wide and 8 feet long protruding over 6 feet above the bottom. The acoustic image is complex

and although it may be associated with a large modern anchor it may also be associated with historic material such as steam machinery. An underwater investigation to identify the nature of the material producing the magnetic and acoustic signatures is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 200 feet in diameter around the target coordinates (Figure 28 and 29).

DELETED

Figure 28. Target Cluster Q2-13 Magnetic Contour Signature.

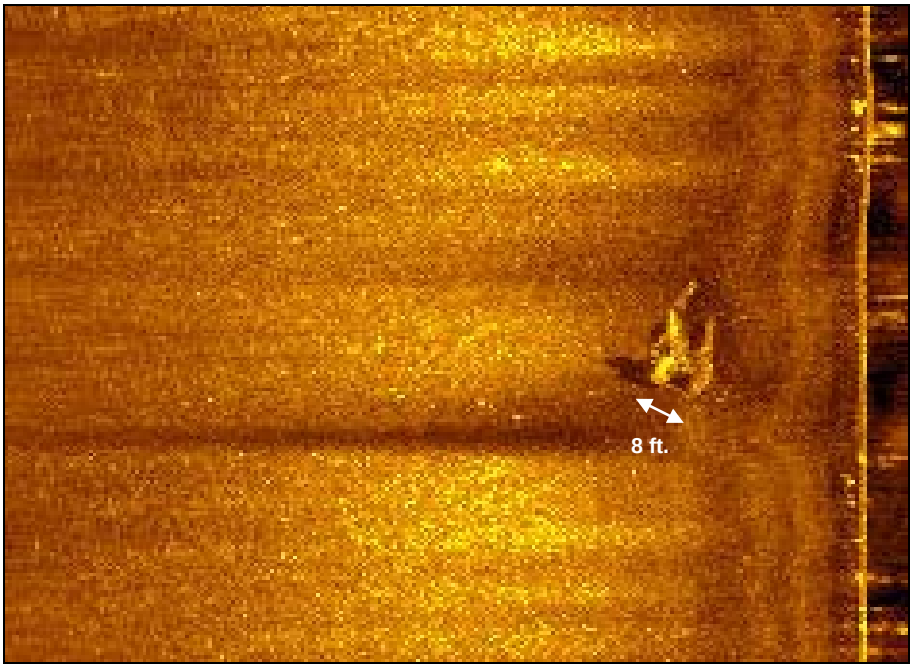

Figure 29. Sonar image associated with Q2-13.

Q2-14-Cluster
NC State Plane x=2702312 y=341477

Target Cluster Q2-14 consisted of multi-component and dipolar magnetic anomalies on four survey lines with a maximum magnetic intensity of 15 nT. No acoustic target signature was identified in association with the magnetic anomalies. The low intensity, proximity, and characteristics of the targets' signatures suggest they may be related.

The characteristics of the cluster suggest the material producing the magnetic signature is a linear object such as a wire rope over 300 feet in length. The nature of the target cluster suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 30).

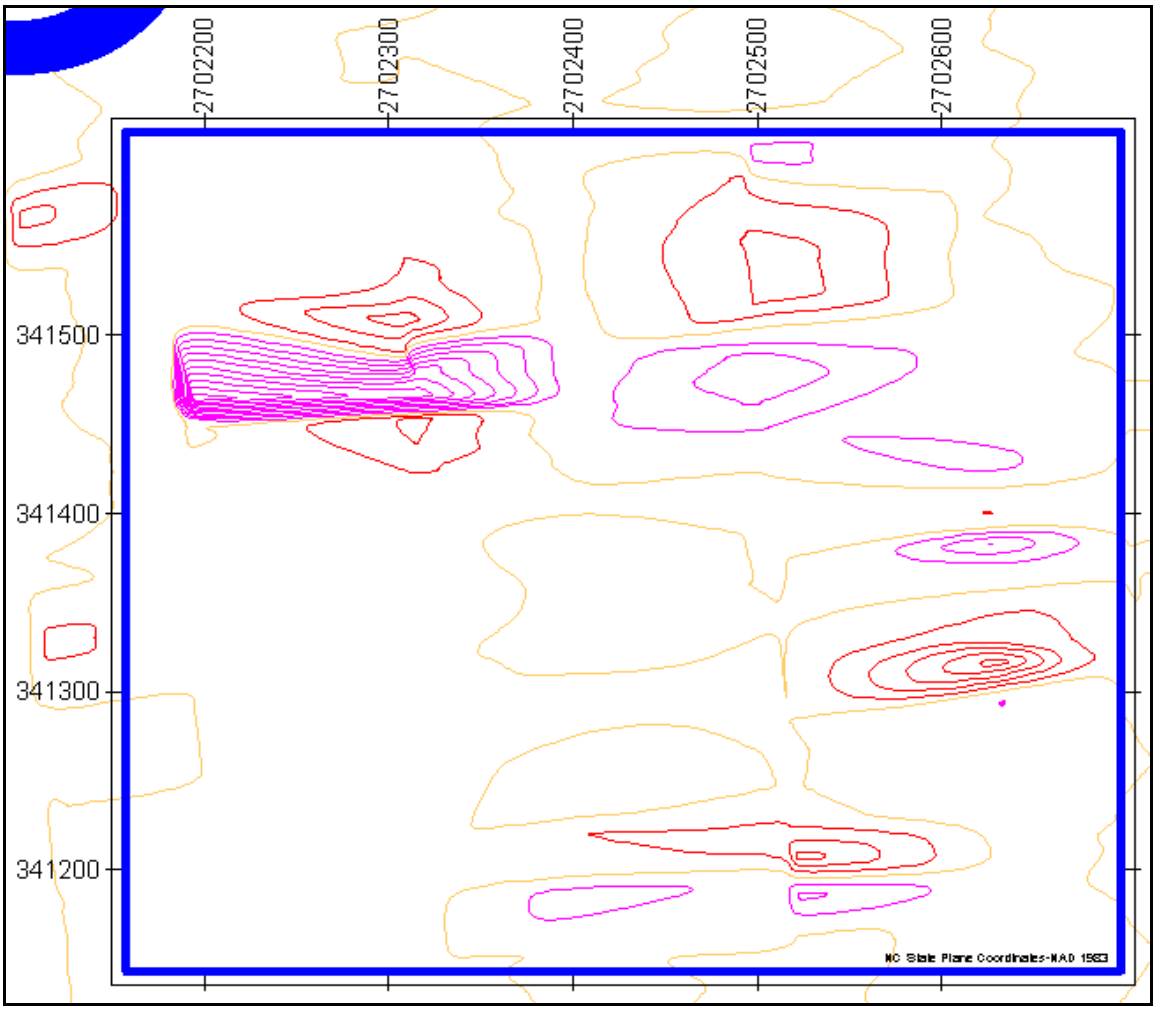

Figure 30. Target Cluster Q2-14 Magnetic Contour Signature.

Q2-15-Cluster
NC State Plane x= y=

Target Cluster Q2-15 consisted of large multi-component and associated smaller anomalies on four survey lines with a maximum magnetic intensity of 57 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 600 feet in diameter around the target coordinates (Figure 31).

DELETED

Figure 31. Target Cluster Q2-15 Magnetic Contour Signature.

Q2-16-Cluster
NC State Plane x= y=

Target Cluster Q2-16 consisted of multi-component and associated smaller anomalies on five survey lines with a maximum magnetic intensity of 24 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 900 feet in diameter around the target coordinates (Figure 32).

DELETED

Figure 32. Target Cluster Q2-16 Magnetic Contour Signature.

Q2-17-Cluster
NC State Plane x= y=

Target Cluster Q2-17 consisted of multi-component and associated smaller dipolar anomalies on five survey lines with a maximum magnetic intensity of 24 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 900 feet in diameter around the target coordinates (Figure 33).

DELETED

Figure 33. Target Cluster Q2-17 Magnetic Contour Signature.

Q2-18
NC State Plane x=2690513 y=338750

Target Q2-18 consisted of relatively small multi-component anomaly on two survey lines with a maximum magnetic intensity of 18 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the target signature is created by a single source object with similar magnetic characteristics or one linear object such as a wire rope over 200 feet in length. The nature of the target suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations are recommended (Figure 34).

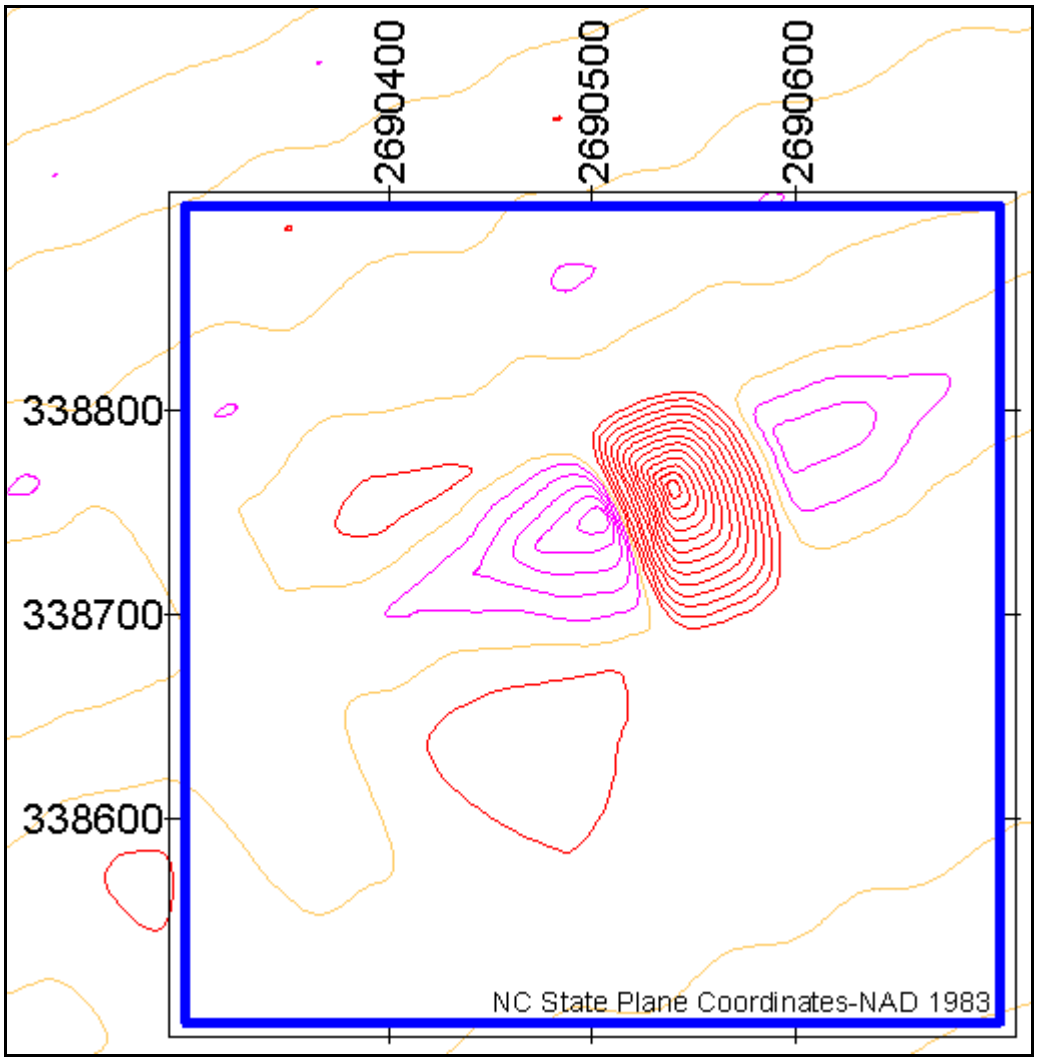

Figure 34. Target Q2-18 Magnetic Contour Signature.

Q2-19-Cluster
NC State Plane x= y=

Target Cluster Q2-19 consisted of large multi-component anomaly on three survey lines with a maximum magnetic intensity of 440 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 600 feet in diameter around the target coordinates (Figure 35).

DELETED

Figure 35. Target Cluster Q2-19 Magnetic Contour Signature.

Q2-20-Cluster
NC State Plane x= y=

Target Cluster Q2-20 consisted of multi-component and associated smaller dipolar anomalies on five survey lines with a maximum magnetic intensity of 145 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 1200 feet in diameter around the target coordinates (Figure 36).

DELETED

Figure 36. Target Cluster Q2-20 Magnetic Contour Signature.

Q2-21-Cluster
NC State Plane x= y=

Target Cluster Q2-21 consisted of several small widely scattered dipolar magnetic anomalies on 8 survey lines with a maximum magnetic intensity of 10 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 1200 feet in diameter around the target coordinates (Figure 37).

DELETED

Figure 37. Target Cluster Q2-21 Magnetic Contour Signature.

Q2-22
NC State Plane x= y=

Target Q2-22 consisted of multi-component magnetic anomaly encountered on three survey lines with a maximum magnetic intensity of 145 nT. No acoustic target signature was identified in association with the magnetic anomaly.

The characteristics of the target suggest that there are one to two objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 300 feet in diameter around the target coordinates (Figure 38).

DELETED

Figure 38. Target Cluster Q2-22 Magnetic Contour Signature.

Q2-23-Cluster
NC State Plane x= y=

Target Cluster Q2-23 consisted of widely scattered small multi-component and dipolar magnetic anomalies on 12 survey lines with a maximum magnetic intensity of 48 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 2000 feet in diameter around the target coordinates (Figure 39).

DELETED

Figure 39. Target Cluster Q2-23 Magnetic Contour Signature.

Q2-24-Cluster
NC State Plane x= y=

Target Cluster Q2-24 consisted of widely scattered small multi-component and dipolar magnetic anomalies on 13 survey lines with a maximum magnetic intensity of 44 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster suggests it has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 2000 feet in diameter around the target coordinates (Figure 40).

DELETED

Figure 40. Target Cluster Q2-24 Magnetic Contour Signature.

Q2-25
NC State Plane x= y=

Target Q2-25 consisted of multi-component anomaly over two survey lines with a maximum magnetic intensity of 8 nT. A scatter of material including linear features approximately 40-feet-long by 15-feet-wide was identified in association with the anomaly.

The characteristics of the target strongly suggest that the target is a shipwreck site. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 400 feet in diameter around the target coordinates (Figure 41).

DELETED

Figure 41. Target Cluster Q2-25 Magnetic Contour Signature.

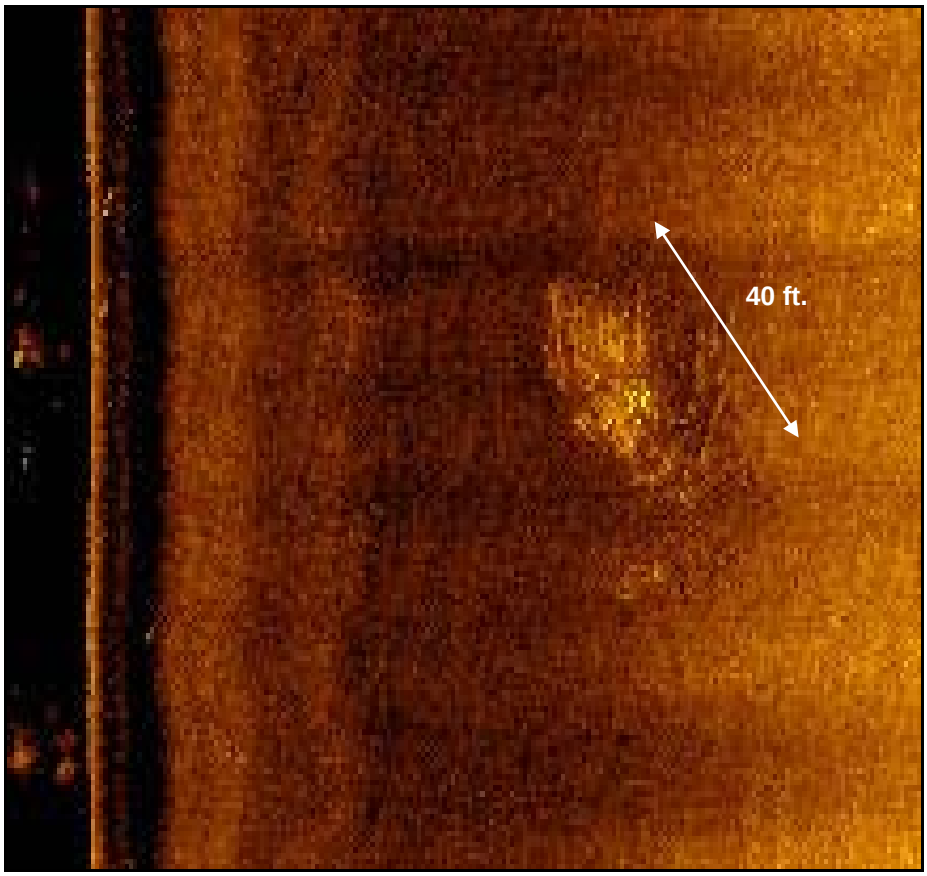

Figure 42. Target 25 - Acoustic Target Signature.

Q2-26-Cluster
NC State Plane x=2685058 y=334046

Target Cluster Q2-26 consisted of three low intensity dipolar anomalies on two survey lines with a maximum magnetic intensity of 7 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that the material producing the low intensity anomalies in over 400 feet in length and linear. The target is most likely wire rope and has low potential to be associated with a significant submerged cultural resource. No additional investigations are recommended (Figure 43).

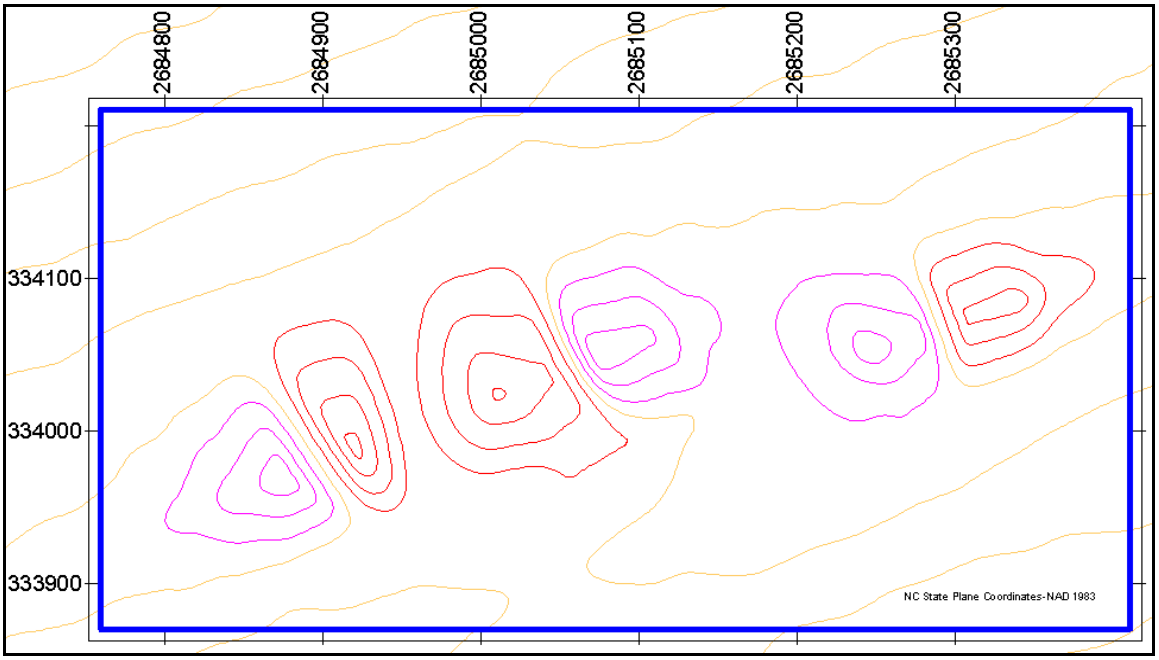

Figure 43. Target Cluster Q2-26 Magnetic Contour Signature.

Q2-27
NC State Plane x=2689273 y=334323

Target Q2-27 had no magnetic signature. The acoustic image suggested the target was a disk or dome-shaped object 16 feet in diameter with associated structural mountings still attached. The object appears to be of modern origin.

The nature of the target suggests it has little potential to be associated with a significant cultural resource. No additional underwater archaeological investigations or mitigation are recommended (Figure 44).

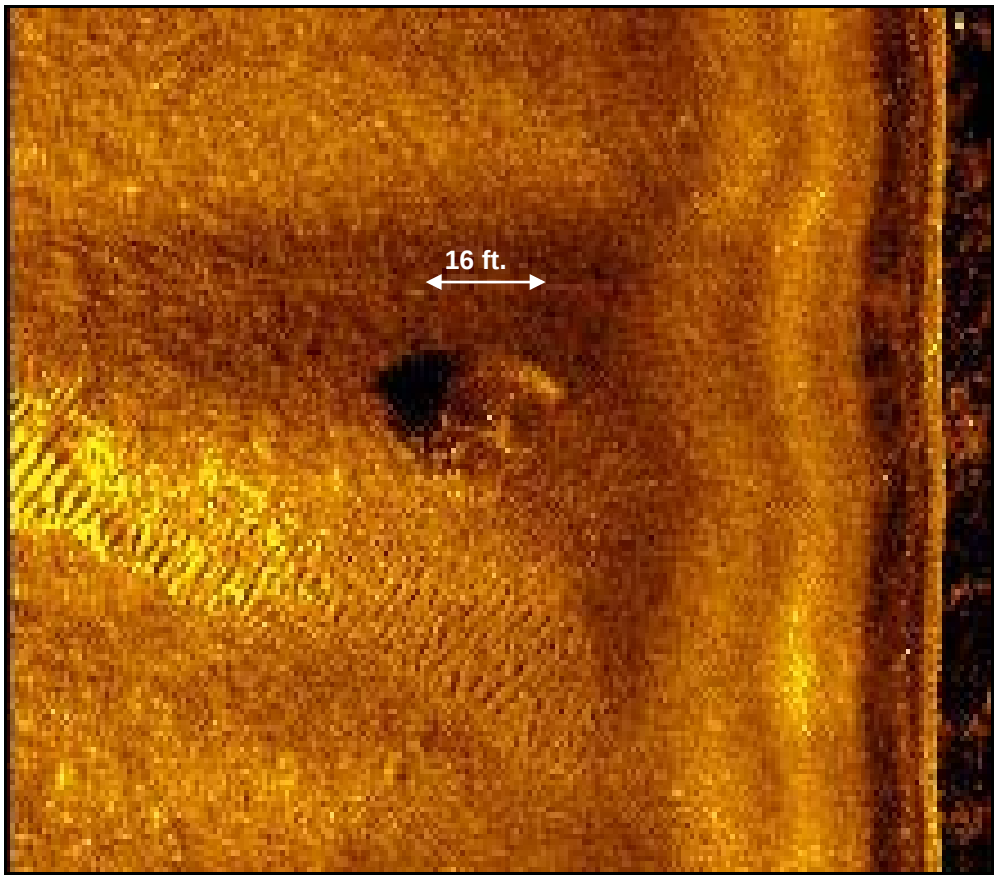

Figure 44. Target 27 – Acoustic Target Signature.

Q2-28-Cluster
NC State Plane x= y=

Target Cluster Q2-28 consisted of multi-component anomaly on three survey lines with a maximum magnetic intensity of 20 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that there are several objects associated with the site. The nature of the target cluster indicates sit has some potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 400 feet in diameter around the target coordinates (Figure 45).

DELETED

Figure 45. Target Cluster Q2-28 Magnetic Contour Signature.

Q2-29-Cluster
NC State Plane x=2688551 y=333005

Target Cluster Q2-29 consisted of two low intensity dipolar anomalies on two survey lines with a maximum magnetic intensity of 12 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The characteristics of the cluster suggest that the material producing the low intensity anomalies is over 300 feet in length and linear. The target is most likely wire rope and has low potential to be associated with a significant submerged cultural resource. No additional investigations are recommended (Figure 46).

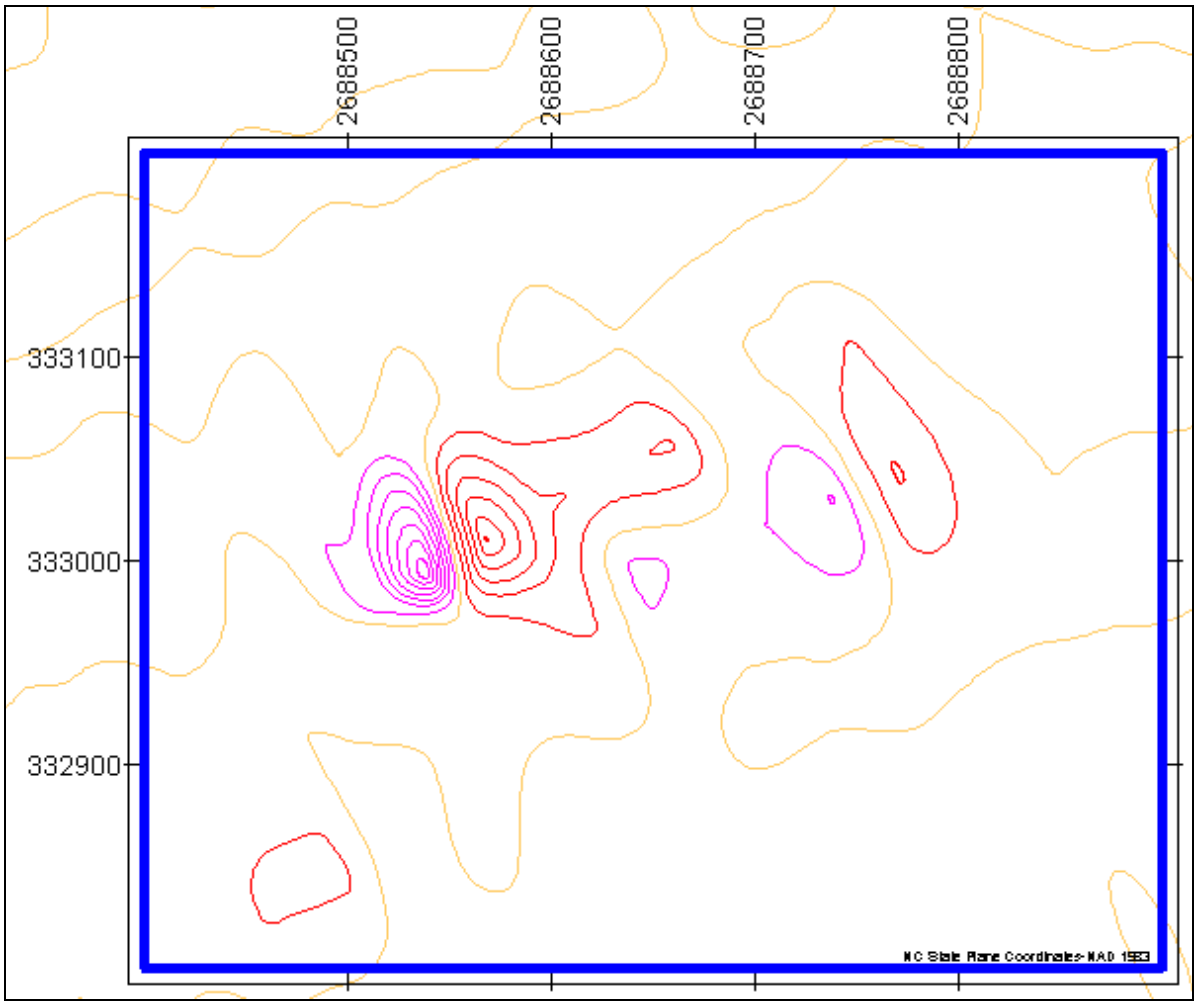

Figure 46. Target Cluster Q2-29 Magnetic Contour Signature.

Q2-30-Cluster
NC State Plane x= y=

Target Cluster Q2-30 consisted of multi-component and dipolar magnetic anomalies on six to eight survey lines with a maximum magnetic intensity of 16 nT. Acoustic records associated with the anomalies show a pile of linear objects over 70 feet in length by 20 feet wide exposed just above the bottom.

The target has the potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 700 feet in diameter around the target coordinates (Figures 47 and 48).

DELETED

Figure 47. Target Cluster Q2-30 Magnetic Contour Signature.

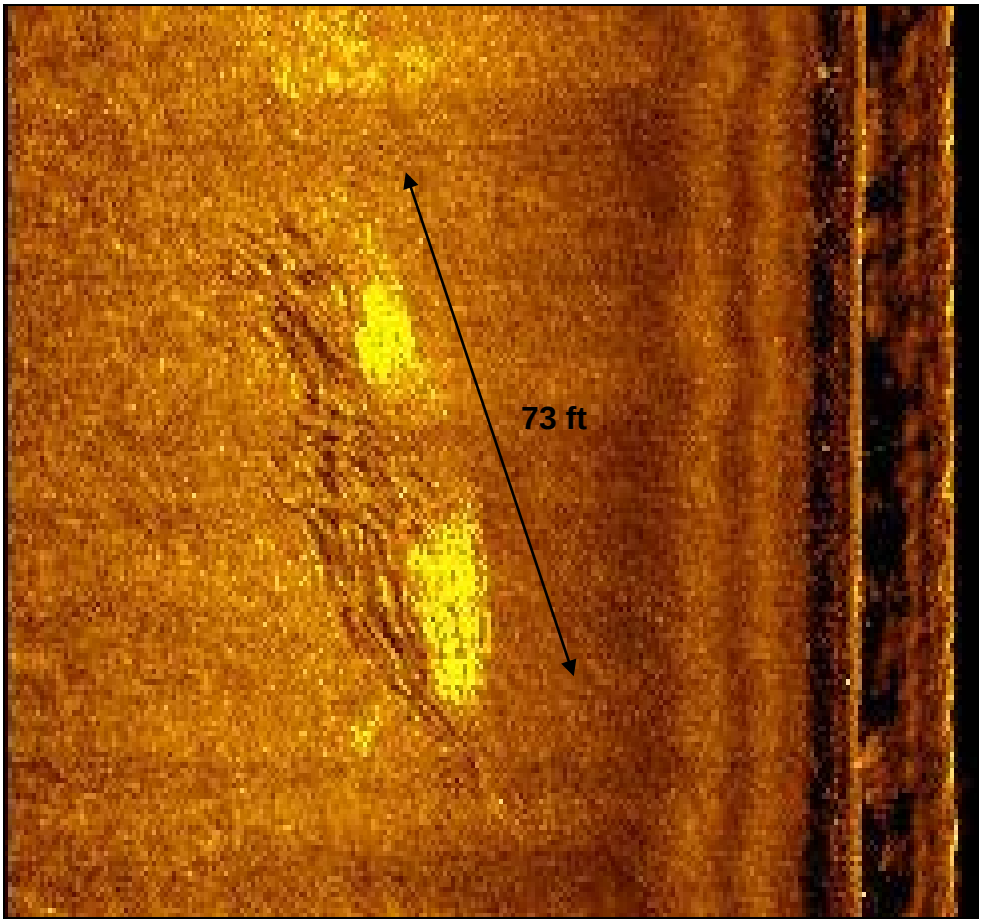

Figure 48. Target 30 – Acoustic Target Signature.

Q2-31-Cluster
NC State Plane x= y=

Target Cluster Q2-31 consisted of multi-component and dipolar magnetic anomalies on four to six survey lines with a maximum magnetic intensity of 24 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The target has the potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 900 feet in diameter around the target coordinates (Figure 49).

DELETED

Figure 49. Target Cluster Q2-31 Magnetic Contour Signature.

Q2-32-Cluster
NC State Plane x=2695255 y=332311

Target Cluster Q2-32 consisted of multi-component and dipolar magnetic anomalies on 12 to 14 survey lines with a maximum magnetic intensity of 38 nT. No acoustic target signature was identified in association with the magnetic anomalies.

The target has the potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 2000 feet in diameter around the target coordinates (Figure 50).

DELETED

Figure 50. Target Cluster Q2-32 Magnetic Contour Signature.

Q2-33-Cluster
NC State Plane x=2698949 y=331513

Target Cluster Q2-33 consisted of at least three multi-component magnetic anomalies on four survey lines with a maximum magnetic intensity of 11 nT. Sonar images associated with the site show a single object approximately 8 feet wide and a second circular object a short distance away. The acoustic image has characteristics that suggest the object is a large modern anchor. No addition investigations or mitigation is recommended (51 and 52).

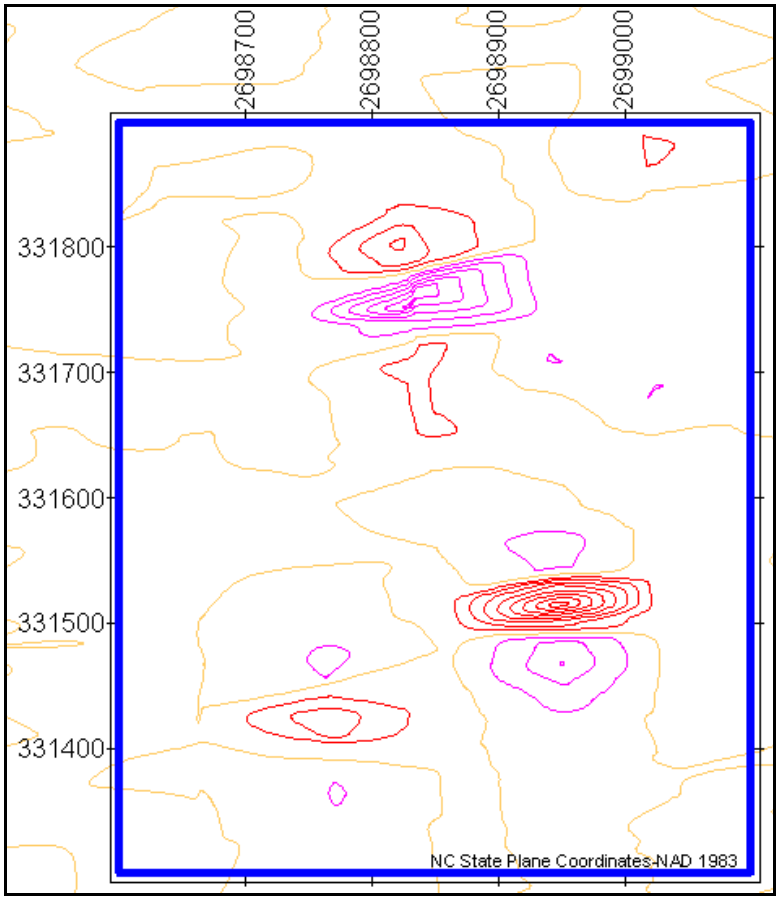

Figure 51. Target Cluster Q2-33 Magnetic Contour Signature.

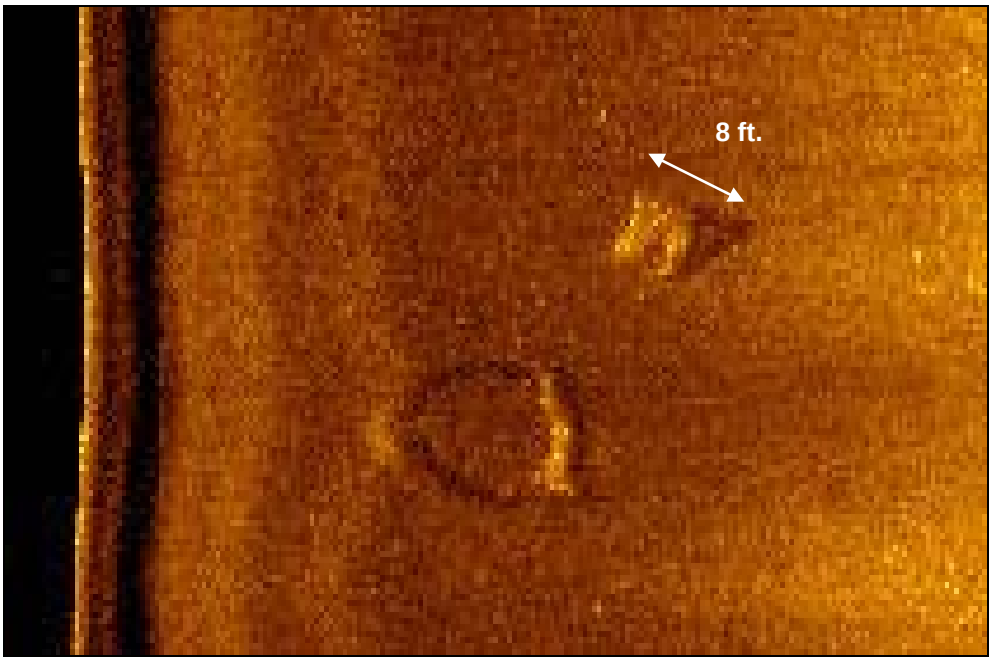

Figure 52. Target 33 - Acoustic Target Signature.

Borrow Area U

Borrow Area U is positioned well offshore and approximately half way between Bogue and Beaufort inlets. No magnetic or acoustic anomalies were identified that could be associated with potential submerged cultural resources within Borrow Area U. A linear series of magnetic anomalies were identified that are obviously associated with an over 1800-feet-long pipe or cable that extends into the borrow area from the north (Figure 53). No additional investigations or mitigation are recommend for the borrow area.

Figure 53. Magnetic Contour and Target Location Map Borrow Area U.

Borrow Area Y

Borrow Area Y is positioned offshore and east southeast of the Bogue Inlet. One magnetic anomaly with an associated acoustic target signature was identified within the borrow area (Figure 55)

Y-1
NC State Plane x= y=

Target Target Y-1 consisted of multi-component magnetic anomaly with maximum magnetic intensity of 16 nT. Acoustic records associated with the anomaly identified an unusually shaped object (much like an historic steam boiler) approximately 16 feet long by 7 feet wide.

The target has the potential to be associated with a significant cultural resource. An underwater investigation to identify the nature of the material producing the magnetic signature is recommended. If underwater investigations are not an option, a no impact buffer zone should be created around the target signature. The no-impact zone should include an area at least 300 feet in diameter around the target coordinates (Figures 54 and 56).

DELETED

Figure 54. Target Y-1 Magnetic Contour Signature.

Figure 55. Magnetic Contour and Target Location Map Borrow Area Y.

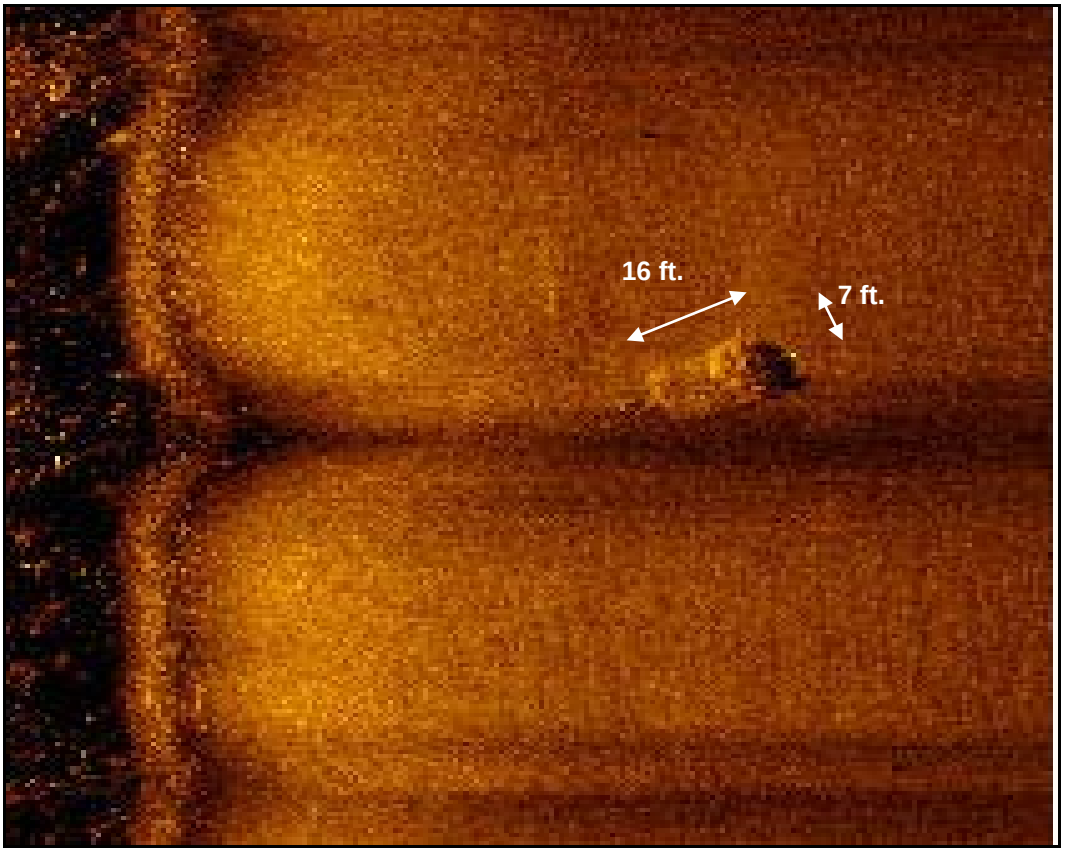

Figure 56. Target Y-1 Acoustic Target Signature.

IDENTIFICATION OF HARD BOTTOM AREAS

M-AT/ER reviewed acoustic records (side-scan sonar and depth) to identify and define areas that were hard bottom or habitats for marine animals. Hard bottom areas were defined as areas larger than 1,800 square meters. Other characteristics include low protrusions – the majority of the area less than .5-meters above the bottom; moderate protrusions – the majority of the area 1 to 2 meters above the bottom; and high protrusions – more than 2 meters above the bottom.

Borrow Area Q1

No hard bottom was identified in within Borrow Area Q1 however large areas of Q1 have been utilized as part of North Carolina's Artificial Reef Program. A list of vessels and materials deposited within the artificial reef as well as representative sonar images of the material has been previously presented on pages 16 through 20 (see figures 7,8,9 10, 57, 58 and 59).

Figure 57. Hard Bottom Map – Borrow Area Q1.

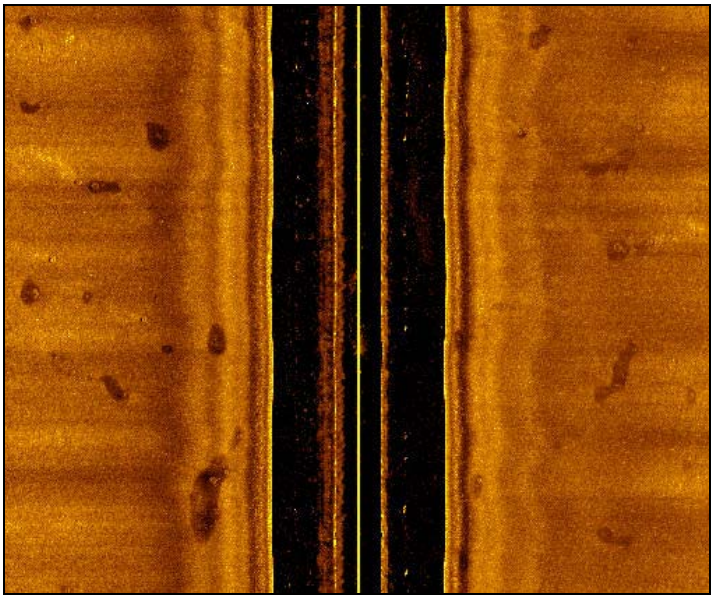

Figure 58. Example of Tire Scatter Borrow Area Q1.

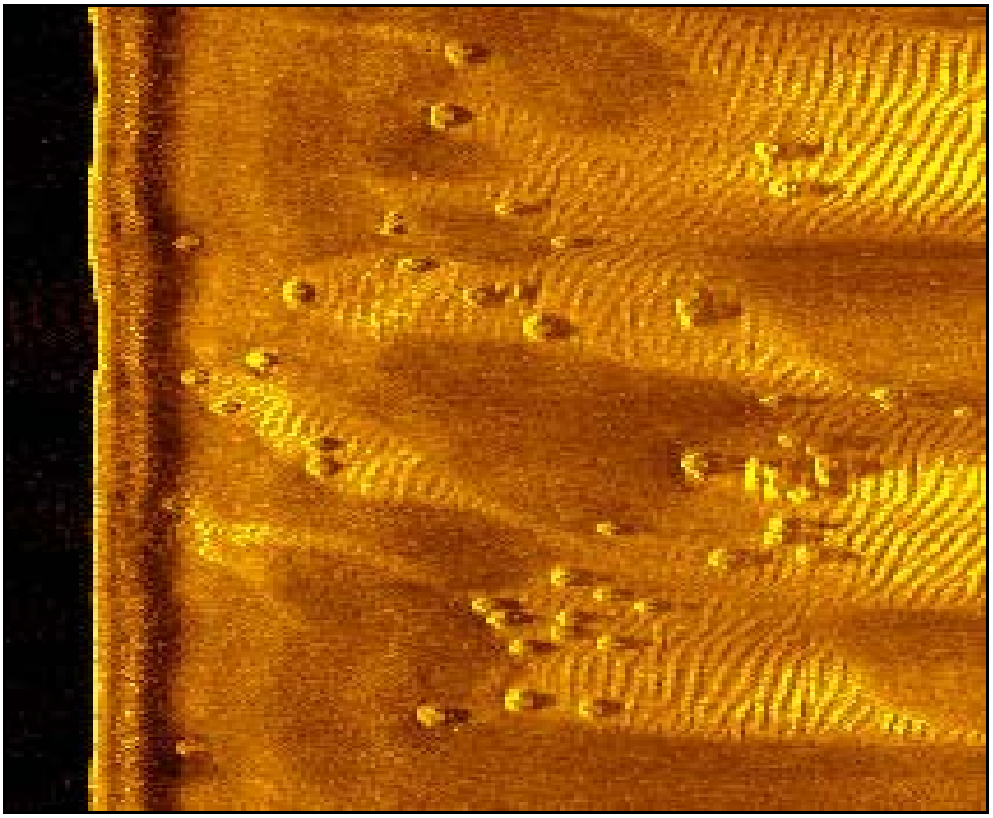

Figure 59. Example of Tire Scatter Borrow Area Q1.

Borrow Area Q2

No hard bottom was identified within Borrow Area Q2 (Figure 60).

Borrow Area U

A small area (9 acres) of low relief hard bottom was identified in the western portion of Borrow Area U (Figures 62, 63 and 64).

Borrow Area Y

Areas of hard bottom totaling about 22 acres were identified along the eastern side and within Borrow Area Y. All of the hard bottom areas identified were of low relief. Just outside the borrow area to the south investigators also noted artificial reef material (Figures 61, 65, 66, 67 and 68).

Figure 60. Hard Bottom Map – Borrow Area Q2.

Figure 61. Hard Bottom Map – Borrow Area U.

Figure 62. Hard Bottom Map – Borrow Area Y.

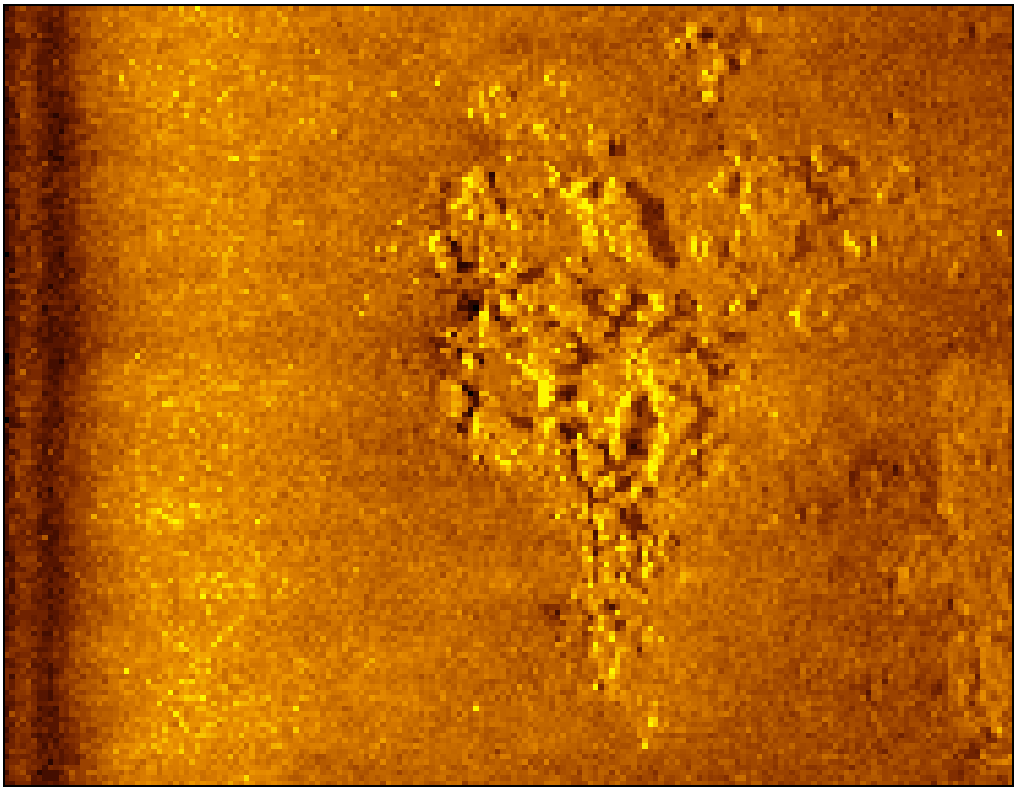

Figure 63. Example of Hard Bottom Borrow Area U.

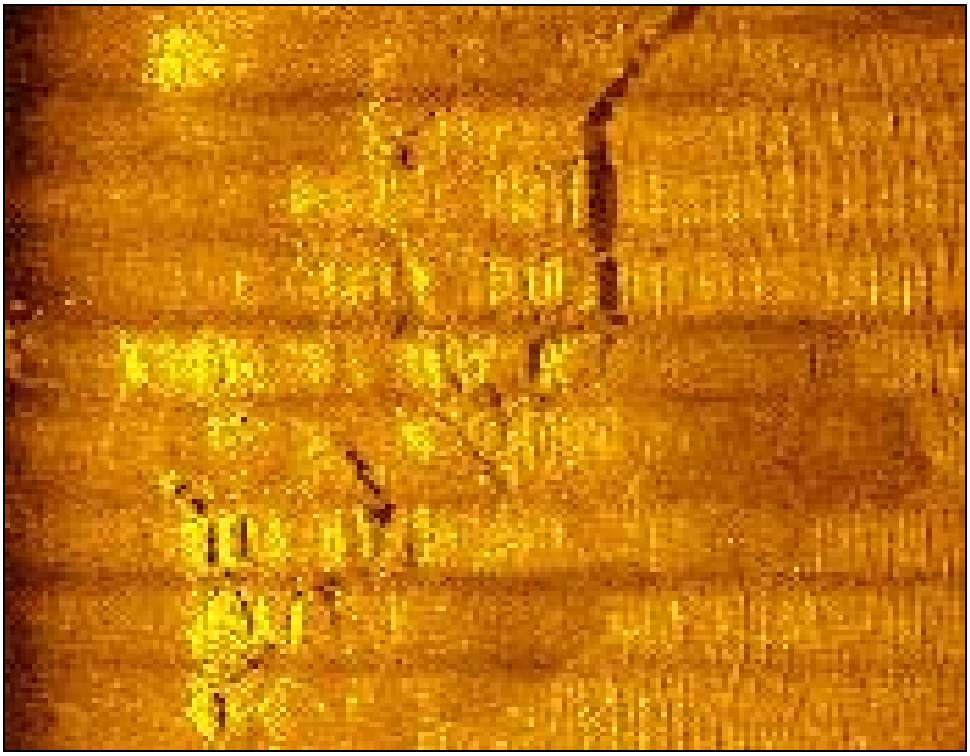

Figure 64. Example of Hard Bottom Borrow Area U.

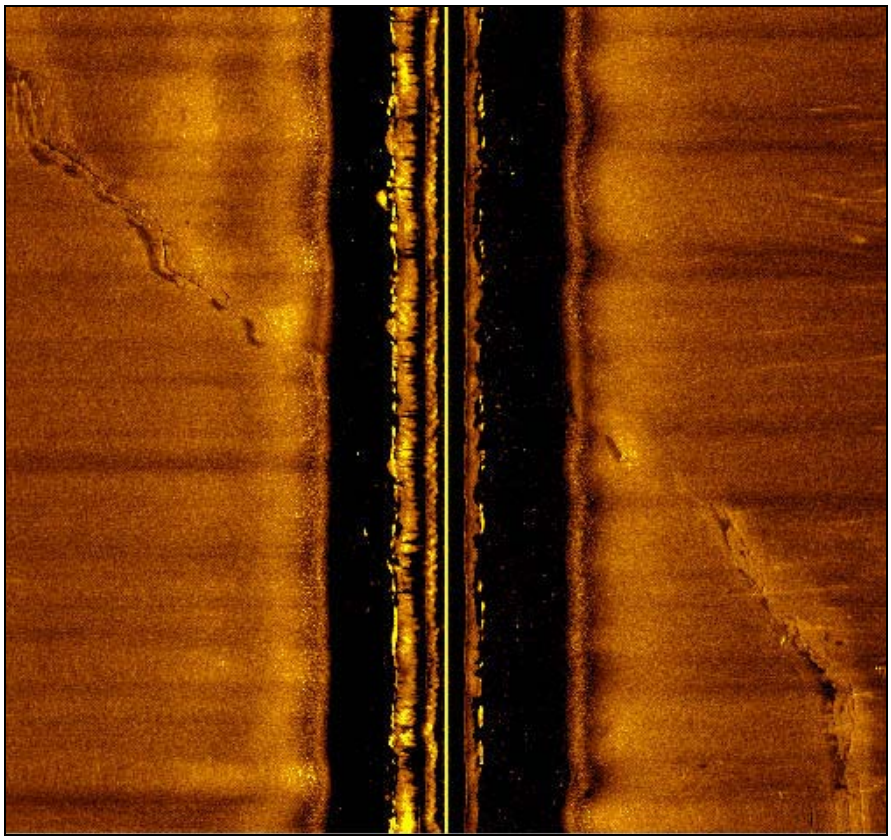

Figure 65. Example of Hard Bottom Borrow Area Y.

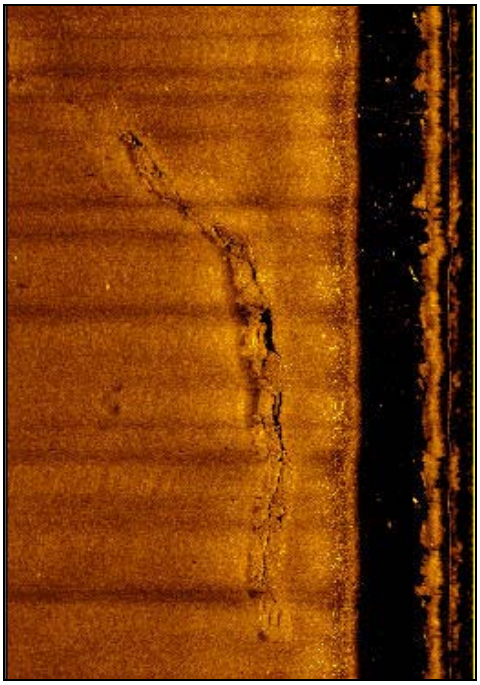

Figure 66. Example of Hard Bottom Borrow Area Y.

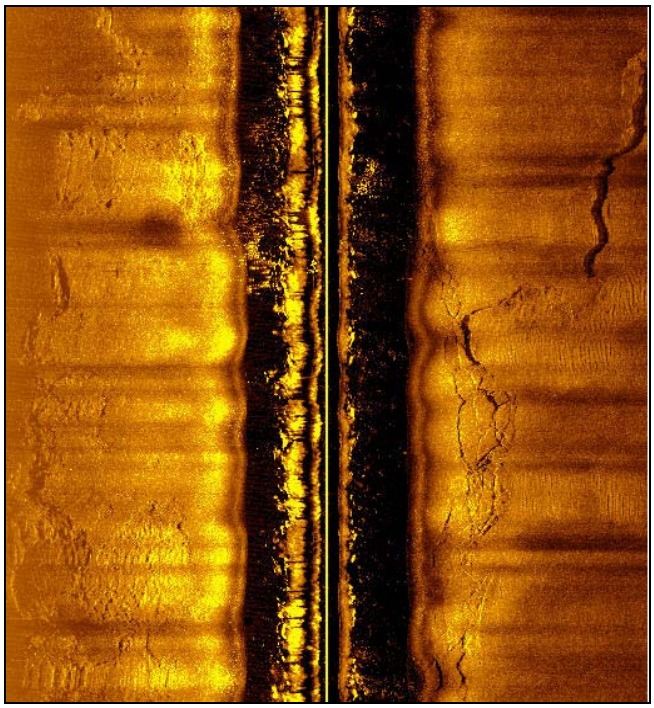

Figure 67. Example of Hard Bottom Borrow Area Y.

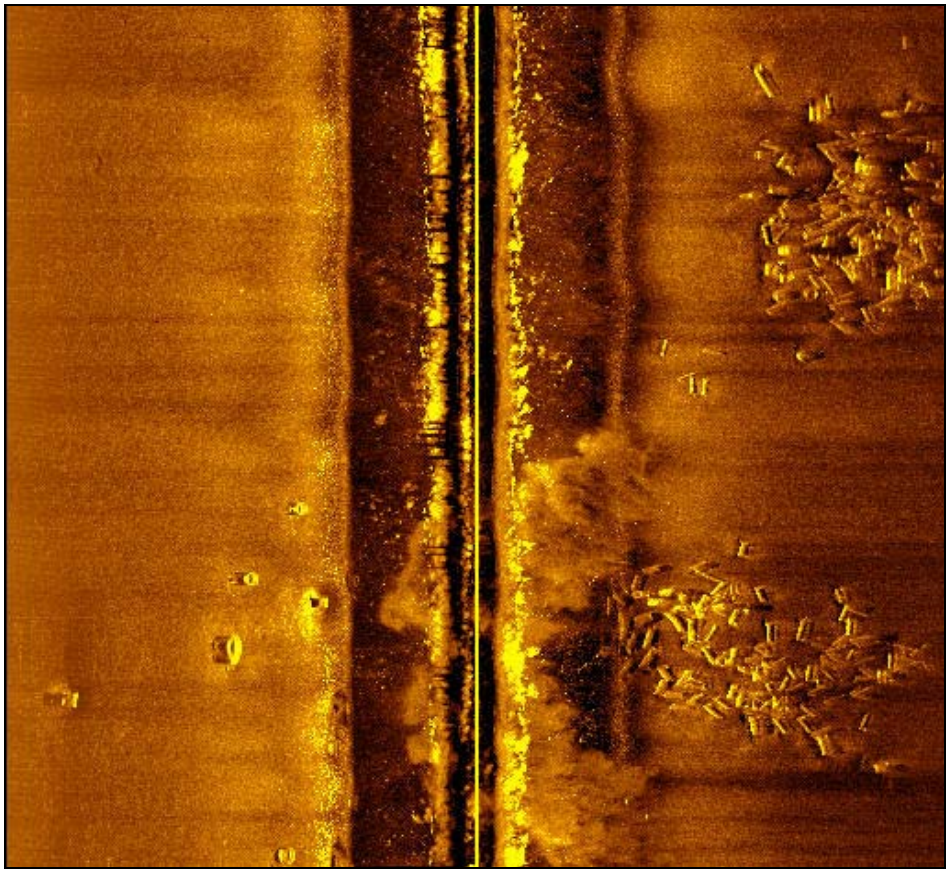

Figure 68. Artificial Reef Material located just south of Borrow Area Y.

CONCLUSIONS AND RECOMMENDATIONS

In Borrow Areas Q1 and U no remote sensing anomalies were identified that could be associated with a submerged cultural resource. All remote sensing anomalies were related to modern debris associated with either the North Carolina Artificial Reef – AR-315 or in the case of Borrow Area U a long linear ferrous object such as a cable or pipeline.

A total of 33 magnetic and or acoustic anomalies were selected as targets or target clusters in Borrow Area Q2. Of the 33 selected targets, ten (10) did not demonstrate characteristics that have the potential to be associated with a significant submerged cultural resource such as a historic shipwreck. No addition investigations or mitigation has been recommended for these targets (see Appendix B – Table of Unidentified Remote Sensing Targets).

The remaining twenty three (23) targets or target clusters in Borrow Area Q2 do have characteristic that could be associated with a significant submerge cultural resource. These targets are recommended for either additional underwater investigations to identify and access the target's cultural resource potential, or avoidance of potential impact by the creation of a no-impact buffer zone that surrounds the anomaly or cluster of anomalies.

One (1) target was identified within Borrow Area Y. This target was also recommended for additional investigations or avoidance by the creation of a no-impact buffer zone.

Hard Bottom Mapping

No natural hard bottom was identified within Borrow Areas Q1 or Q2. However, Borrow Area Q1 does have large areas that are part of the North Carolina Artificial Reef Program including an area of widely scatter tires.

Relatively small areas of hard bottom were identified and mapped within Borrow Areas U and Y.

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APPENDIX A - SHIPWRECKS IN THE VICINITY OF BOGUE BANKS

Name of Vessel	Type	Tons	Cause	Date Lost D-M-Y	Place	Comments	Reference
							6
Queen Anne's Revenge	ship	?	grounded	06-??-1718	Topsail Inlet/Beaufort Inlet		6
Adventure	sloop	?	grounded	06-??-1718	Topsail Inlet?Beaufort Inlet		6
El Salvador	snow	?	grounded	08-30-1750	Cape Lookout - South		3,4,6
Susannah	schooner	?	grounded	04-02-1753	At entrance to Old Topsail Inlet		4,6
unknown	brig	?	grounded	10-19-1769	At Old Topsail Inlet		6
unknown	brig	?	ran ashore	??-09-1769	Below Topsail Inlet		6
Betsy	sloop	?	grounded	01-01-1771	At Old Topsail Inlet		5,6
Hero	schnooner	?	grounded	02-09-1790	Beaufort Bar		5,6
Polly	sloop	?	unknown	07-16-1793	Ashore near Beaufort		5,6
unknown	brig	?	grounded	09-17-1814	Beaufort Bar		6
Antelope	schooner	?	grounded	03-10-1815	Near Beaufort		6
Eagle	brig	?	unknown	03-10-1815	Near Beaufort		6
Orleans	brig	?	unknown	03-10-1815	Near Beaufort		*6*
Harriot	ship	?	unknown	06-25-1817	Bogue Banks near Beaufort		*6*
Santa Maria	ship	?	grounded	03-22-1819	Beaufort Bar		6
Tionel	schooner	?	grounded	04-12-1842	West of Beaufort Bar		2
Delaware	schooner	?	unknown	28-12-1844	4 mi. SW Beaufort Bat		1
Colonel Hanson	schooner		ran ashore	04-09-1846	Bogue Banks	run ashore at Swansboro	1
Walter J. Doyle	schooner		unknown	03-??-1852	Beaufort Bar		2,3,4
Sun	schooner		unknown	01-13-1854	Beaufort Inlet		2,3,4
Charles M. Creese	schooner		unknown	09-??-1857	Beaufort Inlet		3
unknown	schooner		grounded	11-??-1863	Bogue Inlet		1
Pevensey	steamer	543	ran ashore	06-09-1864	Bogue Banks	iron hull blockade runner	2,3,
Quinnebaugh	steamer	186	stranded	07-20-1865	Shackleford Banks		4
Fearless	steamer	128	stranded	11-15-1866	Beaufort		4
Jonas Sparks	schooner	?	unknown	04-14-1867	Beaufort Bar		2,3,4
Katy Wentworth	schooner	294	unknown	18-11-1886	Bogue Banks	1 live lost	2,3,4
Bronx	sloop	24	unknown	06-21-1892	3 miles SW Beaufort		2,34
Carrie L. Davis	schooner	?	ran ashore	??-??- 1902	Bogue Inlet	total loss of cargo and vessel	1
Thomas L. James	schooner	?	ran ashore	??- ??- 1902	Bogue Inlet	total lost of cargo	1
Governor Safford	steamer	307	ran ashore	24-07-1908	near Bogue Inlet		1
Clifton	steamer	256	stranded	18-05-1909	Beaufort	built 1864	4
M.B. Davis	schooner	18	foundered	8-12-1917	near Bogue Inlet		1
Maside	steamer	39	unknown	12-14-1920	2 mi. S of Fort Macon		2
Louise Howard	schooner	173	unknown	14-04-1921	3 mi. S of Fort Macon station		1
Alela	power yacht	70	burnt	20-05-1923	2 mi. NE of Fort Macon station	built 1913	2,4
Juno	tug	62	foundered	22-07-1923	Beaufort	built 1876	4
Morris and Cliff	schooner	132	foundered	16-01-1926	near Bogue Inlet		1,2
W.E. Hutton	tanker	4359	sunk	18-03-1942	off Bogue Inlet	sunk by German Submarine	1,2
Senateur Duhamel	trawler	133	unknown	19-12-1942	34 41' 09"N, 76° 43' 18"W	built 1923	2
Libertad	cargo	93	foundered	08-12-1952	Beaufort Inlet		2
Doswell S. Edwards	cargo	93	foundered	12-08-1952	Beaufort Inlet	built 1926	2

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APPENDIX B- TABLE OF UNIDENTIFIED REMOTE SENSING TARGETS

DELETED

Archaeological Remote Sensing Survey of Bogue Bank Offshore Borrow Areas, Carteret County, North Carolina
Target