

APPENDIX 15
2015 TIDE WATER ATLANTIC RESEARCH, INC. CULTURAL RESOURCE REPORT
(Digital Copy Only)

*A Phase I Remote-Sensing Archaeological Survey Of
Two Proposed Borrow Areas
Offshore of Dare County, North Carolina*



(Extract from 1590 Theodor de Bry map produced for Sir Walter Raleigh)

Submitted to:

**Coastal Planning & Engineering of North Carolina
4038 Masonboro Loop Road
Wilmington, North Carolina 28409**

30 April 2015

Title Page:

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Offshore of Dare County, North Carolina*

Submitted to:

**Coastal Planning & Engineering of North Carolina
4038 Masonboro Loop Road
Wilmington, North Carolina 28409**

Submitted by:

A handwritten signature in black ink, appearing to read "Gordon P. Watts, Jr.", written over a horizontal line.

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30 April 2015

Executive Summary

Coastal Planning and Engineering of North Carolina, Inc. (CPE-NC) is working with the Dare County, North Carolina towns of Duck, Kitty Hawk and Kill Devil Hills to identify sources of beach nourishment quality sand to restore eroding beaches. As a consequence of those activities, two offshore areas were classified as potential borrow sites and are identified as Area A and Area C in this document. In order to determine the proposed project's effects on potentially significant submerged cultural resources, CPE-NC contracted with Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina to assist with the conduct a magnetometer, sidescan sonar, sub-bottom profiler and fathometer survey of the proposed borrow sites, to analyze the resultant data, to identify any evidence indicative of submerged cultural resources and to produce a report in accordance with Bureau of Ocean Energy Management (BOEM) standards. Field research for the project was conducted between 20 and 29 October 2014.

Analysis of the remote-sensing data generated during the survey of Area A identified ten sonar targets and nine magnetic anomalies. One of the sonar targets is a small single object, three are bottom surface features and the remaining six appear to be sections of pipe, cable, logs or pilings. None have an association with any of the magnetic anomalies. Four of the magnetic anomalies represent small single objects, three represent moderate single objects and two represent moderate single or multiple objects. Two of the moderate single or multiple object anomalies and one cluster of two moderate single objects are recommended for avoidance and are buffered. The buffered anomalies and anomaly cluster located in Area A have signature characteristics suggestive of potentially significant submerged cultural resources.

Analysis of the remote-sensing data generated during the survey of Area C identified 9 sonar targets and 65 magnetic anomalies. Six of the sonar targets represent small single objects and three are bottom surface features. Four of the targets have no association with any of the magnetic anomalies and five have possible associations. Three of the 65 magnetic anomalies lie outside the survey area. Nineteen represent small single objects, seventeen represent moderate single objects, twenty more represent moderate single or multiple objects and six represent complex or clustered objects. Twenty-seven of the anomalies are recommended for avoidance and buffered. The buffered anomalies and anomaly clusters located in Area C have signature characteristics suggestive of potentially significant submerged cultural resources and could be associated with the wreck charted immediately east of the survey area.

Avoidance of buffered anomalies and anomaly clusters is recommended. Should avoidance of the buffers prove impossible, additional investigation is recommended to identify material generating these anomalies and to assess their importance in terms of National Register of Historic Places (NRHP) eligibility.

In the event that unanticipated cultural resources are identified during proposed dredging, the on-site contractor should *immediately* cease operations in the subject area and notify the designated Point of Contact (POC) for CPE-NC, BOEM and the North Carolina State Historic Preservation Officer (SHPO).

Non-Technical Summary

CPE-NC is working with the Dare County, North Carolina towns of Duck, Kitty Hawk and Kill Devil Hills to identify sources of beach nourishment quality sand to restore eroding beaches. Two borrow areas have been identified offshore of Kitty Hawk and Duck. In order to determine the proposed project's impact on shipwreck remains and/or prehistoric submerged cultural resources, CPE-NC of Wilmington, North Carolina contracted with TAR of Washington, North Carolina to assist with the conduct a remote-sensing survey in October 2014 using a magnetometer, sidescan sonar, sub-bottom profiler and fathometer. The magnetometer identified ferrous metal objects that could be associated with shipwreck remains. The sidescan sonar used sound to produce images of the bottom surface and any exposed shipwreck or other material. The sub-bottom profiler employed sound to produce images of the bottom sediment layers and relict channels or other buried landforms.

Analysis of the data generated during the survey of Borrow Area A off Kitty Hawk identified ten sonar targets and nine magnetic anomalies. One of the sonar targets is a small single object such as a fish trap, three are natural bottom surface features and the remaining six appear to be sections of pipe, cable, logs or pilings. Four of the magnetic anomalies represent small single objects such as traps. The remaining five magnetic signatures have signature characteristics suggestive of potentially significant submerged cultural resources such as historical vessel remains. Analysis of the remote-sensing data from Area C off Duck identified nine sonar targets and sixty-five magnetic anomalies. Six of the sonar targets represent small single objects and three are bottom surface features. Four of the targets have no association with any of the magnetic anomalies and five have possible associations. Three of the 65 magnetic anomalies lie outside the survey area. Nineteen represent small single objects, seventeen represent moderate single objects, twenty more represent moderate single or multiple objects and six represent complex or clustered objects. Based on their signatures, twenty-seven of the Area C anomalies are recommended for avoidance and are buffered. The buffered anomalies and anomaly clusters located in Area C have signature characteristics suggestive of potentially significant submerged cultural resources such as historical shipwreck remains and could be associated with a wreck charted immediately east of the survey area.

If anomalies in the buffered areas prove impossible to avoid, additional investigation is recommended to identify material generating their signatures and assess their importance in terms of NRHP eligibility. In the event that unanticipated cultural resources are identified during dredging, the contractor should *immediately* cease operations in that area and notify the designated POC for CPE-NC, BOEM and the North Carolina SHPO.

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Introduction

Coastal Planning and Engineering of North Carolina, Inc. (CPE-NC) is working with the Dare County, North Carolina towns of Duck, Kitty Hawk and Kill Devil Hills to identify sources of beach nourishment quality sand to restore eroding beaches. Two offshore areas were classified as potential borrow sites and are identified as Area A and Area C in this document. In order to determine the proposed project's effects on potentially significant submerged cultural resources, CPE-NC contracted with Tidewater Atlantic Research, Inc. (TAR) of Washington, North Carolina to assist with the conduct a magnetometer, sidescan sonar, sub-bottom profiler and fathometer survey of proposed Borrow Area A and Borrow Area C, to analyze the data, to identify any evidence indicative of submerged cultural resources and to produce a report in accordance with Bureau of Ocean Energy Management (BOEM) standards.

The remote-sensing investigation conducted by CPE-NC was designed to provide accurate and reliable identification, assessment and documentation of submerged cultural resources in the two study areas. The assessment methodology was developed to comply with the criteria of the National Historic Preservation Act of 1966 (Public Law 89-665), the National Environmental Policy Act of 1969 (Public Law 11-190), Executive Order 11593, the Advisory Council on Historic Preservation Procedures for the protection of historic and cultural properties (36 CFR Part 800) and the updated guidelines described in 36 CFR 64 and 36 CFR 66.

TAR personnel prepared this report to comply with BOEM requirements identified in 30 CFR Part 585, Appendix B. The results of the investigation were designed to furnish CPE-NC with the archaeological data required to comply with Federal submerged cultural resource legislation and regulations.

Field Project Methodology

Field research for the subject project was conducted between 20 and 29 October 2014 aboard the M/V *Thunderforce*, which was contracted to CPE-NC to serve as a platform for the survey. CPE-NC personnel planned survey activities and operated all remote-sensing equipment during data collection. The location and configuration of the survey of Area A and Area C was based on a geophysical reconnaissance carried out by CPE-NC between 9 and 13 June 2014, and geotechnical investigations (vibracores) carried out by CPE-NC between 22 July and 4 August, and were authorized by BOEM (E13-002 and E13-003, respectively). Survey equipment and methodology were based on BOEM "Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR PART 585."

Project Personnel & Performance Roles

Project Management Personnel

CPE-NC project managers and their respective roles follow: Project Manager Kenneth Willson, overall management of the design and permitting of the beach nourishment projects, including offshore sand resource investigations; Functional Geophysical and Survey Manager Jeffrey Andrews, overall management of geophysical and hydrographic survey operations; Geophysical Lead Beau Suthard, management of geophysical data acquisition and processing; and Hydrographic Survey Lead Michael Lowiec, management of hydrographic survey data acquisition and processing.

Project Field Personnel

CPE-NC field personnel and their respective roles follow: Party Chief Franky Stankiewicz, lead investigator on board M/V *Thunderforce*, sidescan sonar operator, and protected species observer; Hydrographic Surveyor Ben Alocer, operated hydrographic survey systems and served as protected species observer; Sub-bottom Profiler System Operator Natasha Florez; and Protected Species Observer Stephanie Bush. Dr. Gordon Watts, director of TAR, served as the lead marine archaeologist and supervised magnetometer system operations.

Project Cultural Resources Management Personnel

Senior historian and Section 106 Specialist Robin Arnold carried out the historical background investigation under the supervision of Dr. Watts. Dr. Watts and Mr. Gregory O. Stratton carried out analysis of the scientific data. Dr. Watts and Ms. Arnold prepared this report document. All personnel associated with the conduct of historical and literature research, supervision of survey operations, data analysis and report preparation meet, or exceed, the standards identified by the U.S. Department of Interior (USDI) Secretary of the Interior's Professional Qualifications Standards (48 FR 44738-44739). Lead Marine Archaeologist Gordon Watts has over 40 years of experience in conducting high-resolution marine geophysical (HRG) surveys and processing and interpreting the resulting data for submerged cultural resource identification (30 CFR Part 585 Appendix B).

Data Analysis Overview

Analysis of the remote-sensing data generated during the survey of Area A identified ten sonar targets and nine magnetic anomalies. One of the sonar targets is a small single object, three are bottom surface features and the remaining six appear to be sections of pipe, cable, logs or pilings. None of the sonar targets have an association with any of the magnetic anomalies. Four of the magnetic anomalies represent small single objects, three

represent moderate single objects and two represent moderate single or multiple objects. Two of the moderate single or multiple object anomalies and one cluster of two moderate single objects are recommended for avoidance and buffered. The buffered anomalies and anomaly cluster located in Area A have signature characteristics suggestive of potentially significant submerged cultural resources.

Analysis of the remote-sensing data generated during the survey of Area C identified 9 sonar targets and 65 magnetic anomalies. Six of the sonar targets represent small single objects and three are bottom surface features. Four of the targets have no association with any of the magnetic anomalies and five have possible associations. Three of the 65 magnetic anomalies lie outside the survey area. Nineteen represent small single objects, seventeen represent moderate single objects, twenty more represent moderate single or multiple objects and six represent complex or clustered objects. Twenty-seven of the anomalies are recommended for avoidance and buffered. The buffered anomalies and anomaly clusters located in Area C have signature characteristics suggestive of potentially significant submerged cultural resources and could be associated with the wreck charted immediately east of the survey area

Project Location

The Dare County remote-sensing survey project areas are located offshore of Croatan Shores and Duck, North Carolina (Figure 1). The location off Croatan Shores, identified as Borrow Area A, lies approximately 6.5 statute miles east of the Croatan Shores shoreline. Borrow Area A lies in Lease Block Number 980 (Figure 2). The location off Duck, identified as Borrow Area C lies approximately 4.6 miles east of the Duck shoreline. Borrow Area C lies in Lease Block Number 802 (Figure 3).

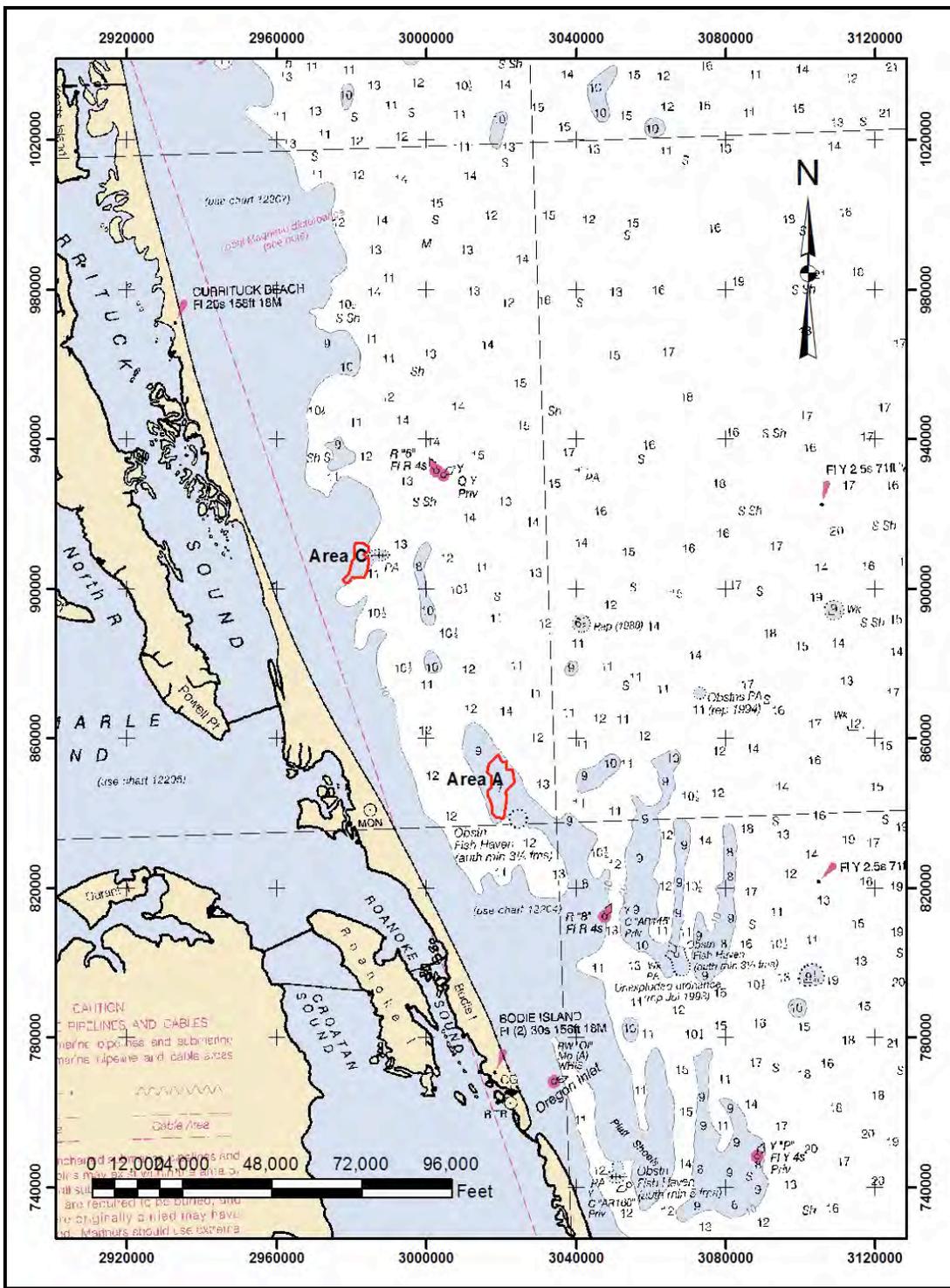


Figure 1. Project location (Extract of NOAA Chart 12200.)

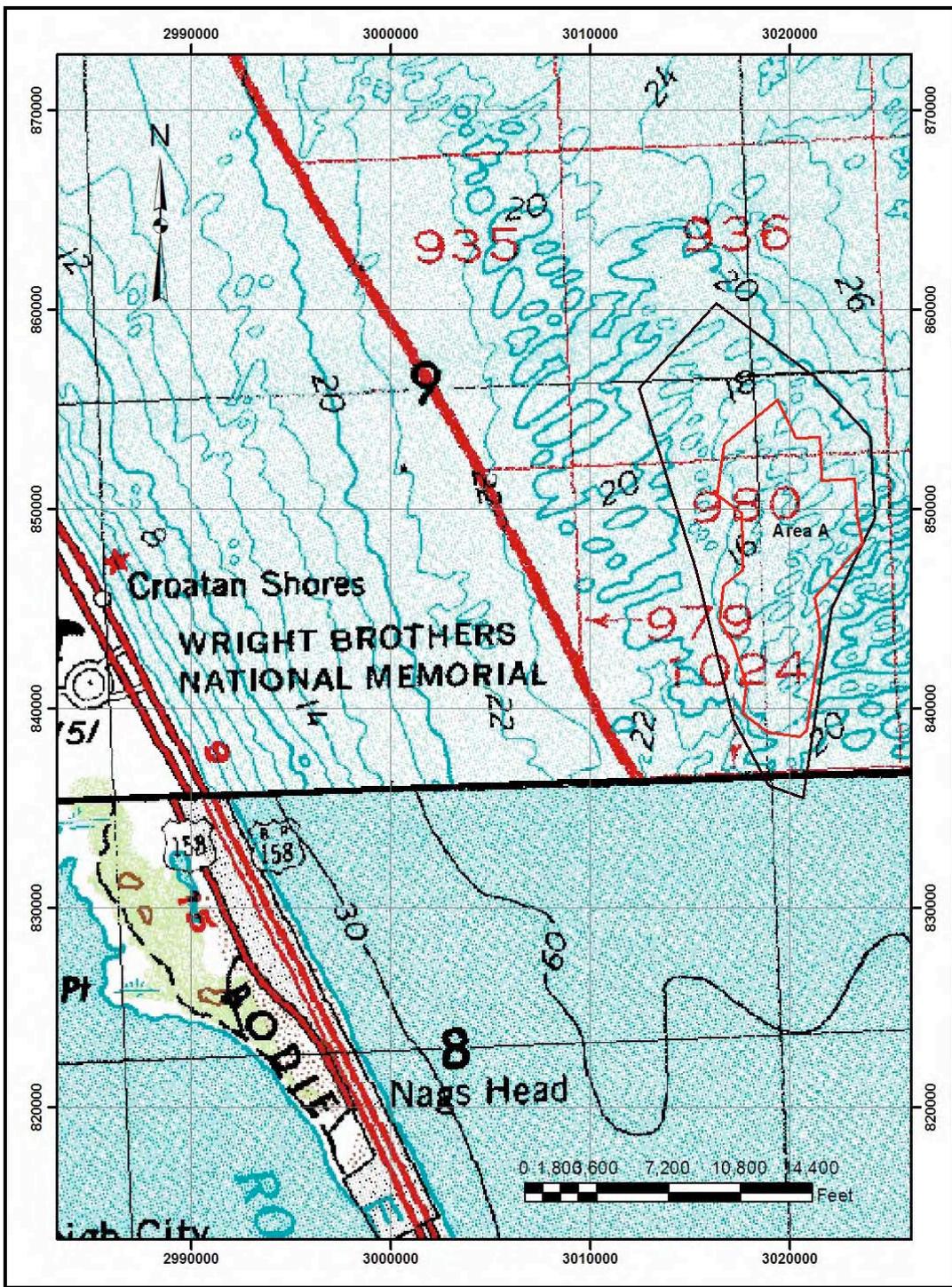


Figure 2. Geophysical survey area and Borrow Area A located off Croatan Shores in Lease Block 980 (Extract from Topographic Map C3674a1 Currituck Sound 1969; 250,000 Scale).

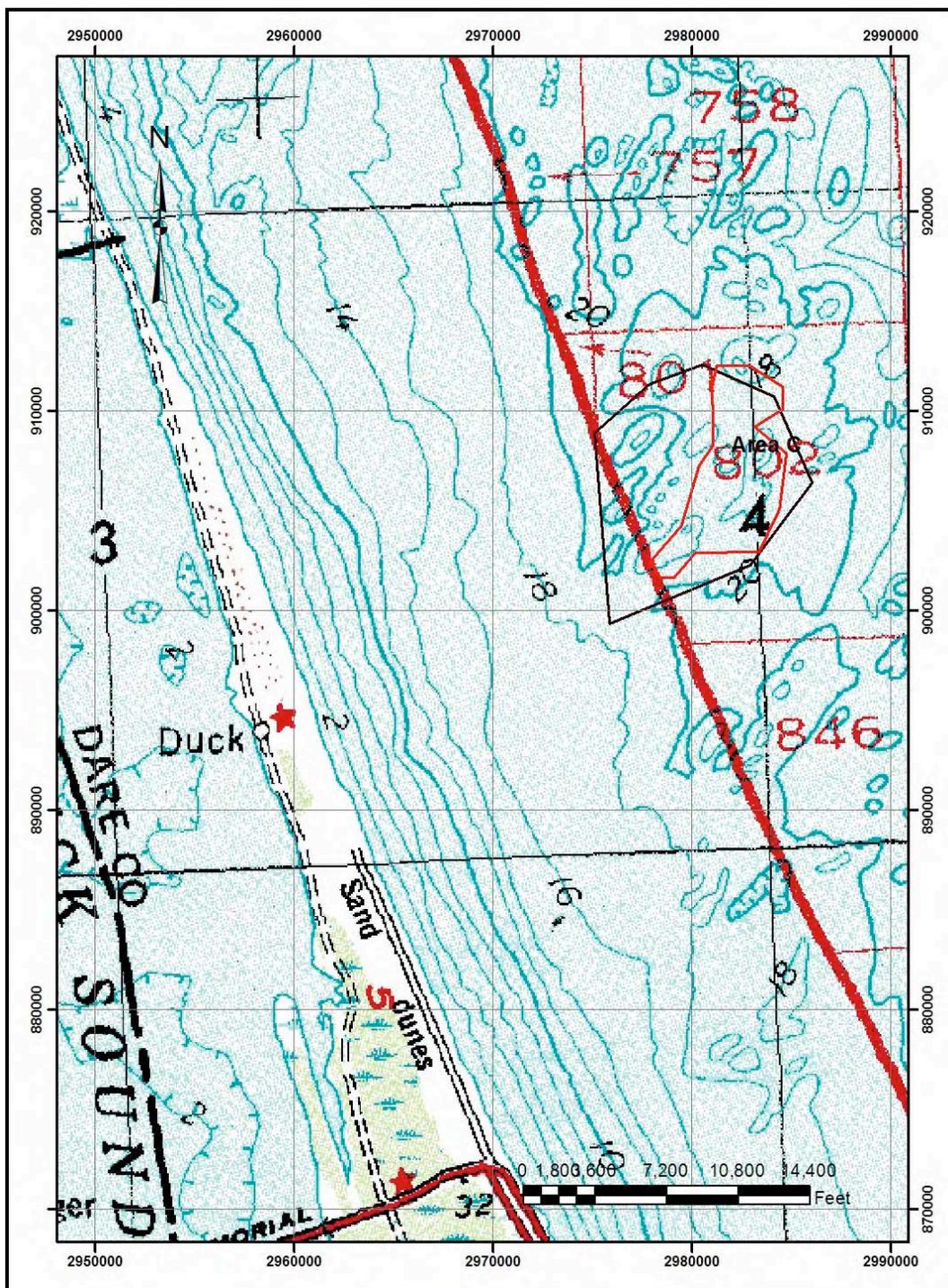


Figure 3. Geophysical survey area and Borrow Area C located off Duck in Lease Block 802 (Topographic Map C35074a1 Manteo 1972; 250,000 Scale).

The survey area for Borrow Area A is a polygon that measures approximately 16,900 feet in north-south length and 7,500 feet in east-west width at its extreme points. The Borrow Area A survey area covers an area of 2.6 square miles and 1701 acres (Figure 4).

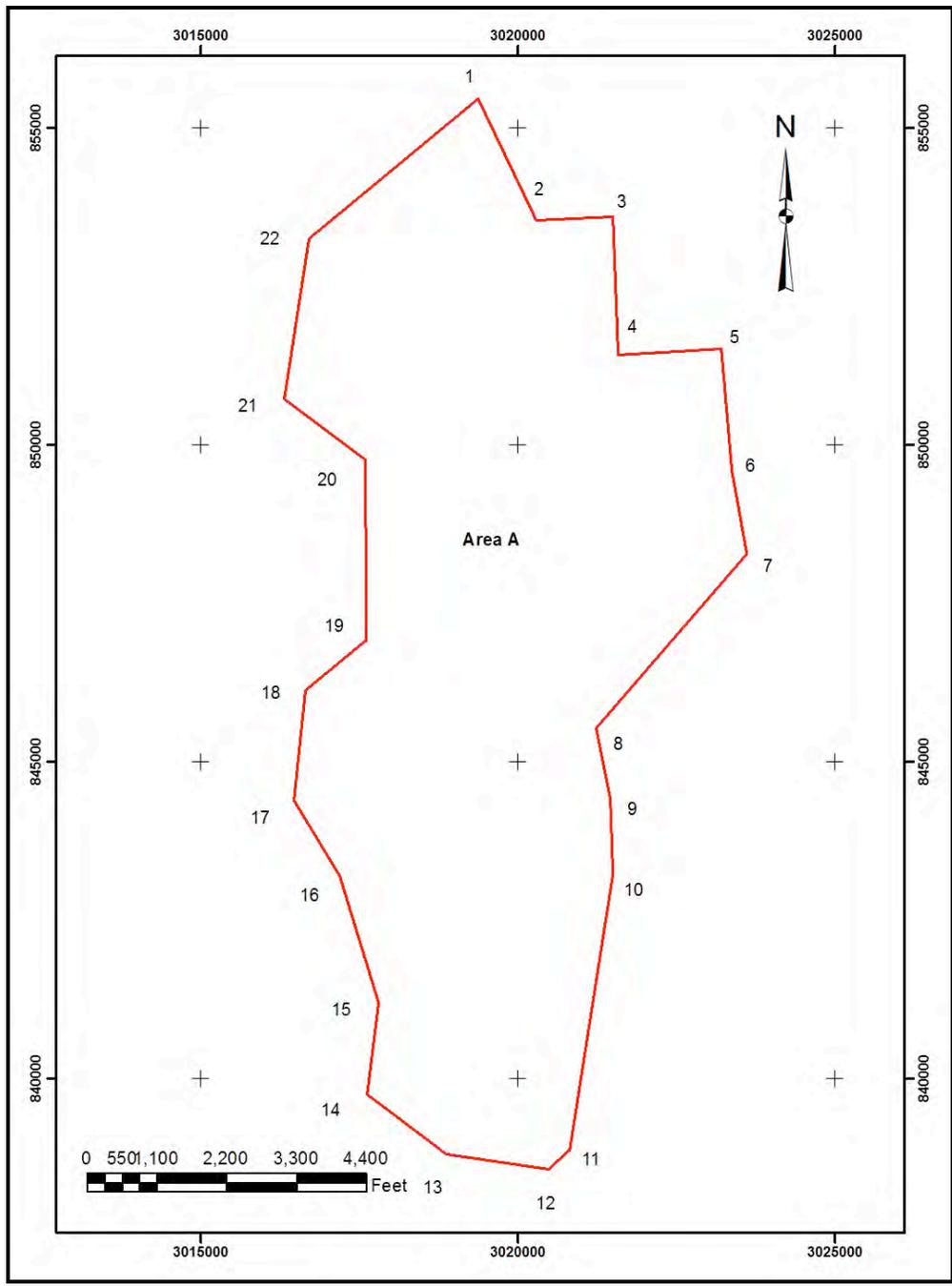


Figure 4. Borrow Area A survey border configuration and control points.

Survey boundary control points for the Borrow Area A survey perimeter, defined in North Carolina State Plane Coordinates (NCSPC), based on NAD 83, U.S. Survey Foot, are as follows:

BORROW AREA A SURVEY PERIMETER		
BORDER POINT	X COORDINATE	Y COORDINATE
1	3019374.6	855465.1
2	3020300.9	853540.8
3	3021496.4	853600.2
4	3021585.9	851422.2
5	3023214.7	851511.5
6	3023377.4	849590.1
7	3023618.1	848277.2
8	3021242.3	845533.3
9	3021466.4	844416.3
10	3021496.3	843222.6
11	3020823.9	838877.9
12	3020495.3	838564.5
13	3018881.5	838803.1
14	3017626.4	839742.9
15	3017805.6	841190
16	3017192.8	843189.3
17	3016475.7	844385
18	3016655.1	846130.6
19	3017611.4	846921.3
20	3017596.5	849768.9
21	3010326.4	850723.8
22	3016714.9	850256.2

Table 1. Borrow Area A survey perimeter coordinates.

Borrow Area C lies approximately 4.6 miles east of Duck, North Carolina. The survey area for that site is a polygon that measures approximately 10,500 feet in north-south length and 6,500 feet in east-west width at its extreme points. The Borrow Area C survey covers an area of 1.4 square miles and 868 acres (Figure 5).

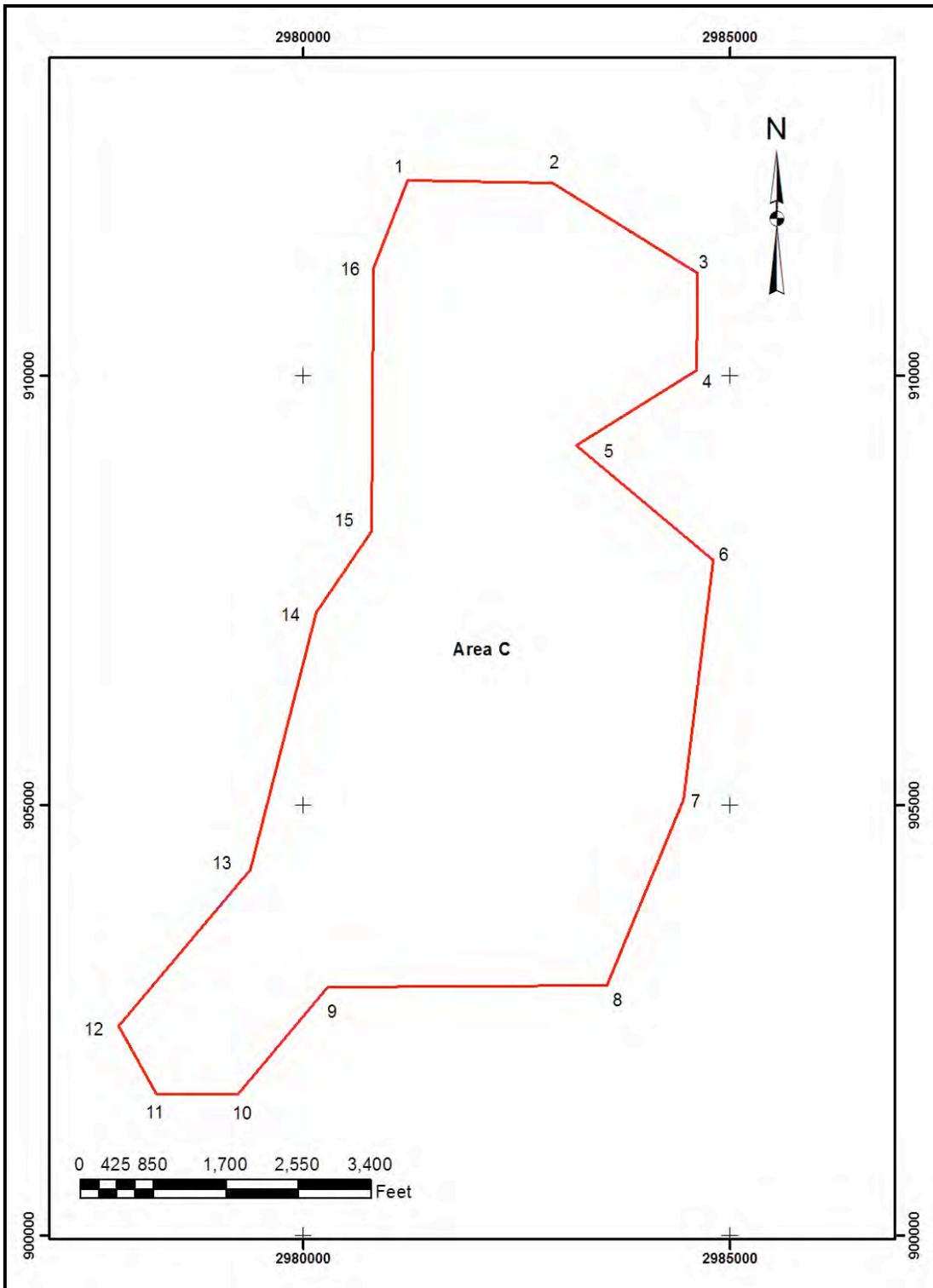


Figure 5. Borrow Area C survey border configuration and control points.

Survey boundary control points for the Borrow Area C survey perimeter, defined in NCSPC, based on NAD 83, U.S. Survey Foot, are as follows:

BORROW AREA C SURVEY PERIMETER		
BORDER POINT	X COORDINATE	Y COORDINATE
1	2981289.7	912258.4
2	2982922.9	912239.6
3	2984619.2	911187.8
4	2984608.2	910058.8
5	2983200.2	909184.2
6	2984807.7	907854.1
7	2984453.3	905060.1
8	2983424.1	902899.2
9	2980204.8	902899.2
10	2979130.3	901640.7
11	2978426.1	901640.7
12	2977941.7	902419.9
13	2979506.3	904225.1
14	2980390.7	907238.6
15	2981092.8	908236.5
16	2981069.9	911226.1

Table 2. Borrow Area C survey perimeter coordinates.

Research Methodology

Literature and Historical Research

In conjunction with the conduct of North Carolina Outer Banks remote-sensing surveys, TAR historians previously examined the shipwreck inventories of the former Mariners Museum Library in Newport News, Virginia [now housed at Christopher Newport University]; the N.C. Division of Archives and History (NCDAH) in Raleigh; the Program in Maritime History and Underwater Research at East Carolina University in Greenville, North Carolina; and the David Stick Collection at the Outer Banks History Center at Manteo, North Carolina. At the North Carolina Kure Beach Underwater Archaeology Branch (UAB) facility, files were surveyed for prehistoric and historic submerged archaeological sites in the study area. In respect to the current Dare County project, the principal investigator consulted the “Bibliography of North Carolina Underwater Archaeology” compiled by UAB staff (Brooks et al. 1996), and conferred with the UAB director to ascertain if any newly discovered submerged cultural resources have been added to that shipwreck inventory (John W. Morris, pers. comm., October 2014; John W. Morris, pers. comm., March 2015).

The literature and archival investigation focused on a survey of primary and secondary source materials associated with the historical development of the North Carolina Outer Banks. TAR historians focused on documented activities such as exploration, colonization, agriculture, industry, trade, shipbuilding, commerce, warfare, transportation, and fishing. These historical activities could be contributing factors in the loss of vessels in the project area. In examining each of these factors, special attention was committed to maritime activities associated with navigation along the project survey areas.

Wreck-specific information was collected from scholarly and ancillary sources that include; *National Political Manual* (1868), *Military and Naval Service of the United States Coast Survey* (U. S. Department of Commerce 1916), *Graveyard of the Atlantic* (Stick 1952), *An Oceanographic Atlas Of The Carolina Continental Margin* (Newton, Pilkey and Blanton [Newton et al.] 1971), *Encyclopedia of American Shipwrecks* (Berman 1972), *Shipwrecks of the Civil War* (Shomette 1973), *Merchant Steam Vessels of the United States 1790–1868* (Mitchell 1975), and supplements nos. 1-3 (Mitchell 1978, 1982, 1984), *Shipwrecks in the Americas* (Marx 1983), *The Naval War of 1812* (Dudley, 2 vols., 1985, 1992), *Official Records of the Union and Confederate Navies in the War of the Rebellion* (National Historical Society, series I & II, 31 vols., 1987), *Shipwrecks: Diving the Graveyard of the Atlantic* (Farb 1992), *Shipwrecks of North Carolina: from the Diamond Shoals North* (Gentile 1993), *North Carolina Shipwreck Accounts, 1709 to 1950, Including Over 1100 Named Wrecks* (Charles 2004), *Naval Documents of the American Revolution* (U.S. Department of the Navy, 11 vols., 1964-2005), *Shipwrecks of the Outer Banks* (Duffus 2007), and *Shipwrecks & Reefs of Oregon Inlet* (Hudy 2007).

Additional maritime casualty information was generated by gratis and premium Internet databases that included: AccessibleArchives.com, the Automatic Wreck and Obstruction Information System (AWOIS) sponsored by NOAA, Eastern North Carolina Digital Library, GenealogyBank.com, Fold3.com, HathiTrust, JSTOR, NewspaperArchive.com, Newspapers.com, The American Memory Collection [historical newspapers] (Library of Congress [LOC]), and *The New York Times*.

Technical reports provided another source of regional cultural resources analyses and shipwreck information. David Phelps's "The Archaeology of Colington Island" serves as an example of a report on the area's prehistory. Wilson Angley's "An Historic Overview of Oregon Inlet" provided a local historical background and shipwreck data. James Delgado's "A Preliminary Assessment of Environmentally Exposed Shipwreck Remains, Cape Hatteras, North Carolina" provided historical insight and shipwreck specific data. Timothy Thompson and William Gardner's "A Cultural Resources and Impact Area Assessment of the Pea Island National Wildlife Refuge, Dare County, North Carolina" contributed to an understanding of prehistoric site potential in the region. Dames and Moore's "Report on a Remote Sensing Survey of Oregon Inlet, North Carolina" provided confirmation that unidentified remote-sensing targets have been located south of the project area. Another credible source consulted for contemporary wreck-specific data for the region included "East Carolina Nearshore Expedition: The Shipwrecks" (National Oceanic & Atmospheric Administration [NOAA] 2012).

Cartographic Research

TAR historians previously examined relevant cartographic records preserved in The National Archives (Washington, DC., Suitland, Maryland [MD], and College Park, MD); the North Carolina Department of Archives and History (NCDAH) [Raleigh NC]; the UAB (Kure Beach NC); the Outer Banks History Center (Manteo NC); the University of North Carolina at Chapel Hill; Duke University (Durham NC); the USACE library (Wilmington, NC); the Duke Marine Laboratory (Beaufort NC); and Joyner Library (East Carolina University (Greenville NC). In addition to the large collection of North Carolina maps [originals and reproductions] located at TAR, numerous Internet sources of scholarly map collections were consulted during the current research phase including the American Memory Map Collection (LOC), the David Rumsey Historical Map Collection, and Old Maps Online.

National Register of Historic Places Listing

During the conduct of archival research and Section 106 compliance activities, the National Register of Historic Places (NRHP) database was queried on several occasions. The database was last queried on 30 April 2015 to check potential relevant updates. As of this date, the shipwreck of the USS *Huron* is listed in the vicinity (Nags Head) of the project area (National Park Service n.d.a.)

North Carolina State Historic Preservation Office Listing

During the conduct of Section 106 compliance activities, the North Carolina Listings in the NRHP was also queried. The state database was last queried on 30 April 2015 to check potential relevant updates. As of this date, one shipwreck (USS *Huron*) was listed in the vicinity of the project area off Nags Head (North Carolina State Historic Preservation Office 2015).

Remote-Sensing Survey

The remote-sensing survey, of Dare County borrow areas A and C, was designed to identify potentially significant submerged cultural resources that could be impacted by a proposed dredging of material for beach restoration. The survey methodology and equipment was based on standards identified by BOEM and the North Carolina SHPO. A combination of state-of-the-art seismic, magnetic and acoustic remote-sensing equipment was employed to generate sufficient data to reliably identify cultural material such as shipwreck sites and relict landforms that could be associated with prehistoric habitation. The offshore survey was carried out aboard the Florida registered 85-foot MV *Thunderforce* (Figure 6).



Figure 6. Survey vessel MV *Thunderforce*.

Data collection was controlled by the onboard computer (Figure 7) running precision survey software and connected to a differential global positioning system. Remote-sensing equipment employed in data collection during the survey was operated out of a small conex box wired for power and fitted for computer stations. The container was also

rigged for navigation hard and software and connected to the bridge for communication and navigation displays (Figure 8).



Figure 7. Navigation computers on survey RV *Thunderforce* bridge.



Figure 8. Conex box navigation control and data collection stations.

Magnetometer

An EG&G Geometrics G-882 marine cesium magnetometer, capable of plus or minus 0.001 gamma resolution, was employed to collect magnetic data in the survey areas (Figure 9). The cesium magnetometer provides a scalar measurement of the earth's

magnetic field intensity expressed in gammas. To produce the most comprehensive magnetic record, data was collected at 10 samples per second.



Figure 9. Geometrics 882 cesium vapor marine magnetometer.

In order to maintain a depth of not more than 6 meters above the bottom surface, the magnetometer sensor was towed approximately 20 feet behind the sidescan sonar at a speed of approximately 3 to 4 knots. Magnetic data were recorded as a data file associated with the computer navigation system. Data from the survey were contour plotted using QUICKSURF computer software to facilitate anomaly location and definition of target signature characteristics. All magnetic data were correlated with the acoustic remote-sensing records.

Sidescan Sonar

An EdgeTech 4200-HFL sidescan sonar system (Figure 10) was employed to collect acoustic data in the survey area (Figure 10). The 4200-HFL uses full-spectrum chirp technology to deliver wideband, high-energy pulses coupled with high-resolution and superb signal to noise ratio echo data. The sonar package included a portable laptop configuration running DISCOVER acquisition software and a 300/600 kHz dual frequency

towfish running in high definition mode. Dual frequency provided a differential aid to interpretation. Due to shallow water in the survey area the sidescan sonar transducer was deployed and towed at a depth no more than 10%-20% above the seafloor relative to the range of the instrument. Acoustic data were collected using a range scale of 50 meters (164 feet) to provide a combination of +250% coverage and high target signature definition. The digital sidescan data was merged with positioning data via the computer navigation system and logged to disk for post processing.

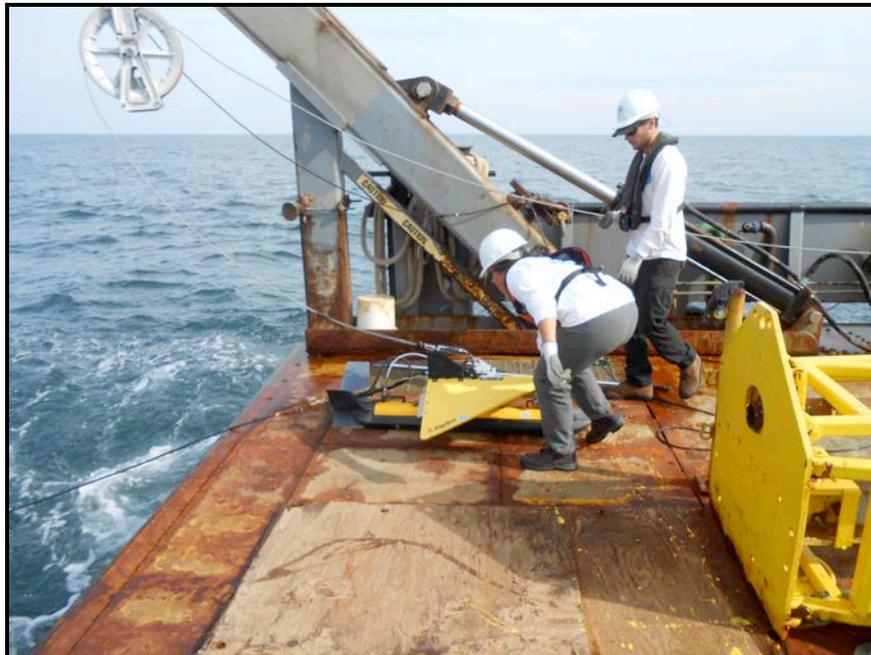


Figure 10. EdgeTech 4200-HFL sidescan sonar system.

Sub-Bottom Profiler

An EdgeTech 512i towfish (Figure 11) and Full Spectrum Sub-Bottom Topside Unit was employed to collect seismic data in the survey areas. The sub-bottom profiler sends an acoustic signal through the ocean bottom to record surface and subsurface geological features. Each distinct layer in the bottom sediment is indicated as a surficial trace, which is recorded in an electronic format onboard the survey vessel. The chart shows the presence of the sediment surface and other distinct layers or features within the sediment, such as buried river channels. The topside unit was utilized to control the 512i towfish and to display and archive the data, which was merged with positioning data via the computer navigation system. The area was surveyed using the 0.7 kHz to 12 kHz 20ms FM pulse setting. The pulse repetition rate was typically six pulses per second.



Figure 11. EdgeTech 512i sub-bottom profiler towfish.

Positioning and Data Collection

A TRIMBLE Real Time Kinematic (RTK) positioning system was used to control navigation and data collection in the survey area. That system has an accuracy of +/- one foot, and can be used to generate highly accurate coordinates for the computer navigation system. The RTK GPS was interfaced with HYPACK 2014, a state-of-the-art navigation and hydrographic surveying system. On-line screen graphic displays include the pre-plotted survey lines, the updated boat track across the survey area, adjustable left/right indicator, as well as other positioning information such as boat speed, quality of fix and line bearing. Navigation fixes (shot points) were recorded 10 times a second (approximately one fix every 0.9 feet) along all survey lanes. All data obtained were recorded on the computer's hard disk and transferred to an external hard drive to provide a backup of the raw survey data. Data generated were correlated to remote-sensing records by RTK GPS to facilitate target location and anomaly analysis. All data were plotted to North Carolina State Plane, NAD 83, U.S. Survey Foot coordinates.

Survey data were collected on survey lanes spaced to approximately 30 meters apart. That lane spacing was designed to provide complete lateral coverage with the sonar system and a representative sampling with the seismic and magnetometer systems. Survey lines in Borrow Area A were set up oriented northeast to southwest and run on headings of 49 and 229 degrees (Figure 12). Survey lines in Borrow Area C were set up oriented east to west and run on headings of 90 and 270 degrees (Figure 13).

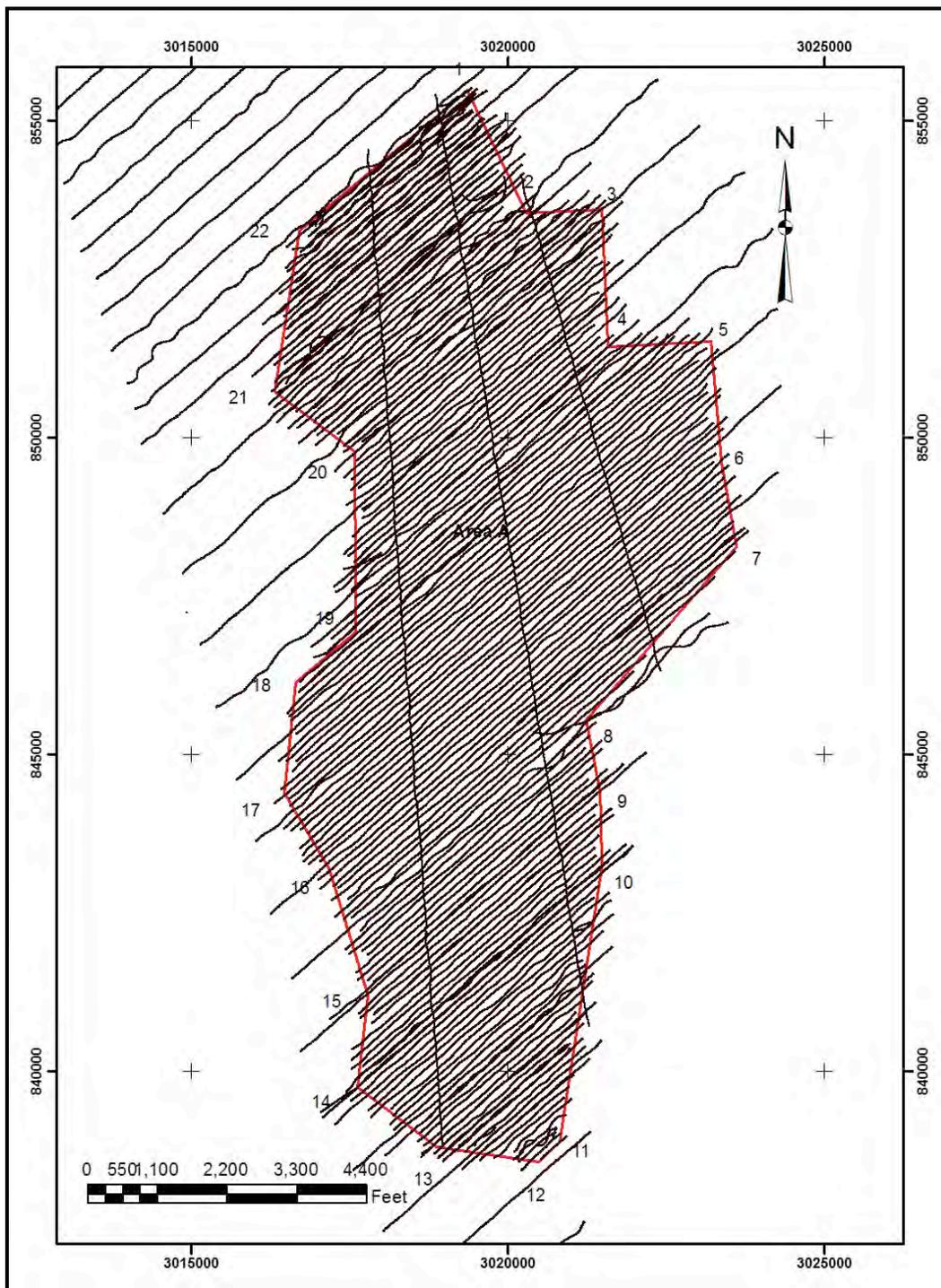


Figure 12. As run tracklines in Borrow Area A.

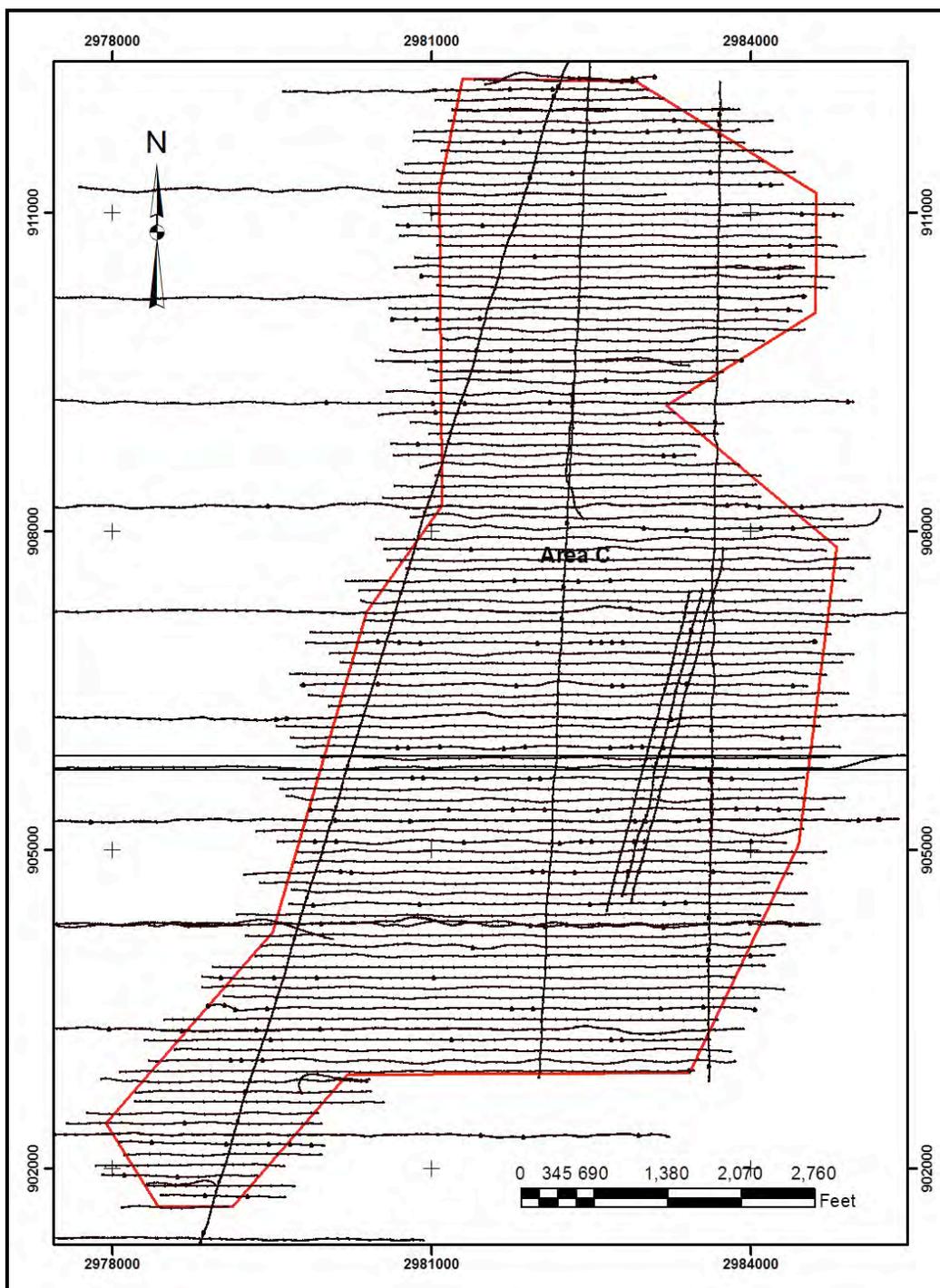


Figure 13. As run tracklines in Borrow Area C.

Signature Analysis and Target Assessment

While no absolute criteria for identification of potentially significant magnetic and/or acoustic target signatures exist, available literature confirm that reliable analysis must be made on the basis of certain characteristics. Magnetic signatures must be assessed on the basis of three basic factors. The first factor is intensity and the second is duration. The third consideration is the nature of the signature; e.g., positive monopolar, negative monopolar, dipolar or multi-component. Unfortunately, shipwreck sites have been demonstrated to produce each signature type under certain circumstances. Some shipwreck signatures are more apparent than others.

Large vessels, whether iron or wood produce signatures that can be reliably identified. Smaller vessels, or disarticulated vessel remains, are more difficult to identify. Their signatures are frequently difficult, if not impossible, to distinguish from single objects and/or modern debris. In fact, some small vessels produce little or no magnetic signature. Unless ordnance, ground tackle or cargo associated with the hull produces a detectable signature, some sites are impossible to identify magnetically. It is also difficult to magnetically distinguish some small wrecks from modern debris. As a consequence, magnetic targets must be subjectively assessed according to intensity, duration and signature characteristics. The final decision concerning potential significance must be made on the basis of anomaly attributes, historical patterns of navigation in the project area and a responsible balance between historical and economic priorities.

Acoustic signatures must also be assessed on the basis of several basic characteristics. Perhaps the most important factor in acoustic analysis is the configuration of the signature. As the acoustic record represents a reflection of specific target features, wreck signatures are often a highly detailed and accurate image of architectural and construction features. On sites with less structural integrity signatures often reflect more of a geometric pattern that can be identified as structural material.

Where hull remains are disarticulated the pattern can be little more than a texture on the bottom surface representing structure, ballast or shell hash associated with submerged deposits. Unfortunately, shipwreck sites have been demonstrated to produce a variety of signature characteristics under different circumstances. Like magnetic signatures, some acoustic shipwreck signatures are more apparent than others. Large vessels, whether iron or wood, produce signatures that can be reliably identified.

Smaller vessels, or disarticulated vessel remains are inevitably more difficult. Their signatures are frequently difficult, if not impossible, to distinguish from concentrations of snags and/or modern debris. In fact, some small vessels produce little or no acoustic signature. As a consequence, acoustic targets must be subjectively assessed according to intensity of return over background, elevation above bottom and geometric image characteristics. The final decision concerning potential significance of less readily identifiable targets must be made on the basis of anomaly attributes, historical patterns of navigation in the project area and a responsible balance between historical and economic priorities.

Seismic data generated by sub-bottom profilers can reveal evidence of relict landforms. Certain types of relict landforms such as river channels and confluences, lagoons and bays have a high potential for association with inundated prehistoric habitation sites. Although the process of inundation may have destroyed much of a prehistoric site's integrity, significant evidence of paleo and archaic habitation has been identified. Detailed analysis of the sub-bottom data can identify those landforms.

Cultural Development

Prehistoric Background

Modern archaeological research in North Carolina can be linked to the development of an archaeology program that commenced at the University of North Carolina at Chapel Hill in the 1930s. A few general works published in the 1940s and early 1950s summarized the available ethnographic and ethnohistoric data for the Coastal Plain (Phelps 1983:8). The first extensive archaeological survey of the Tidewater region was undertaken in 1954-1955. William Haag carried out this work in response to the development of the Cape Hatteras National Seashore (Haag 1958). Haag surveyed a considerable amount of coastline from the Neuse estuary northward to the Virginia border and recorded 81 sites, the majority of which were on Hatteras, Roanoke, Bodie, and Colington islands, the lower Currituck peninsula, and along the shores of the Pamlico estuary (Phelps 1983:9).

Archaeological research increased during the 1970s when regional programs were developed at universities and schools within North Carolina. Archaeological surveys were done at the Cape Hatteras National Seashore (Thompson 1977), the Pea Island National Wildlife Refuge (Thompson and Gardner 1979), Colington Island (Phelps 1981), and Roanoke Island (Phelps 1984). The cultural sequence of the Coastal Plain, first presented by Haag and South, is continually being refined through archaeological studies. An overview of the cultural sequence for the North Carolina Coastal Plain is discussed below.

The Cultural Sequence

Archaeologists have divided human occupation in the eastern United States into four temporal periods: Paleo-Indian, Archaic, Woodland, and Historic. Each temporal division is distinguished by the climate, technology, and subsistence patterns characteristic of the period. The Coastal Plain physiographic province can also be divided into two cultural-spatial units, the North Coastal and South Coastal regions, based upon cultural differences that seem to begin near the end of the Late Archaic period (Phelps 1983: 16).

The Paleo-Indian Period (12,000-8000 B.C.)

The Paleo-Indian period of eastern North Carolina is the earliest and obscure of the cultural divisions. The adaptive subsistence of humans during this period is generally associated with specialized hunting and gathering, or big game hunting during the end of the Wisconsin glaciation when its retreat brought about climatic and environmental changes (Willey 1966: 37-38). Evidence of this period is almost entirely limited to the surface distribution of fluted, Clovis, or finely worked Cumberland, Quad, Dalton, and Hardaway projectile points. By 1983 less than 50 Paleo-Indian fluted points had been recorded at sites in Bertie, Carteret, Edgecombe, Hertford, Nash, and Pitt counties (Phelps 1983:18). Fluted points have been recorded in private collections for Beaufort, Craven, and Gates counties.

For the most part, Paleo-Indian sites have been recorded in the uplands where the present conditions do not favor the preservation of early sites. Agricultural disturbance, erosion, and lack of appreciable soil accretion are factors that limit the preservation of Paleo-Indian sites. These sites lack the stratification needed for comparative analysis and dating. Paleo-Indian sites found in the Tidewater region would have been located on the Inner Coastal Plain at the time of their occupation. With the retreat of the last glaciers the sea level rose to near its present level, inundating coastal sites.

Settlement patterns of Paleo-Indian short-term-activity sites or longer-utilized base camps seem to be associated with access to lithic materials for tool manufacture, such as quartz, quartzite, slate, rhyolite, chert, and jasper which were brought down from the mountains and Piedmont areas by rivers (Phelps 1983: 21). Other factors that influenced site location included access to water, habitats favorable to game, and sunlight exposure (Thompson and Gardner 1979: 23). The environment of the Coastal Plain during the Paleo-Indian period was one of broad river valleys with braided stream channels around numerous sandbars, freshwater marshes along the stream edges, and a boreal pine-spruce forest on the interstream uplands (Whitehead 1972:313). The retreat of the Wisconsin glaciation brought about changes in the environment and the disappearance of the megafauna, which gave way to a new subsistence strategy.

The Archaic Period (8000 -1000 B.C.)

The change in climate following the glaciation must have produced a favorable environment for human subsistence, since numerous Archaic sites can be found in the Coastal Plain. The density of Archaic sites within the Coastal Plain is higher than for any other prehistoric period. These locations can be found in all microenvironments from saline estuary shores to stream margins and their tributary systems as well as pocosins and floodplain swamps (Phelps 1983: 24). Each of these environments produced a diverse and abundant food source that helped contribute to a slight rise in human population. There is also a strong relationship between site location and accessibility to streams.

Surveys that have documented Archaic sites in the Coastal Plain indicate that the majority of sites represent short-term-activity localities evenly distributed along streams. Fewer base camps that may indicate seasonal utilization of available resources appear to be found near the confluence of major streams. All sites, however, are found in the Inner Coastal Plain. Stratified Archaic sites are scarce, but probably do exist in select undisturbed areas within the Inner Coastal Plain. Archaic sites are missing from the Tidewater area as a result of the environmental change that has occurred over the last several thousand years. Those sites that were located on the coast have been obliterated, buried, or inundated like sites of the earlier period.

During the Archaic period a wider range of habitats were utilized for subsistence, and thus likely a wider range of plants and animals. A transition in climate brought pines, hemlock, birch, and northern hardwoods, such as beech and maple, replacing the earlier boreal forests. Diversity in faunal and plant types would also accompany these habitat changes (Phelps 1983: 23). Hunting strategies adapted to the diversification in faunal species with changes in lithic point styles. Spear points such as the Kirk corner-notched, which were gradually replaced by the Kirk stemmed type, are associated with hunting during the Early Archaic period. Other lithic tools, such as scrapers, blades and drills used for the processing of bone and hides are also identifiable to the Archaic period.

A warmer and drier period during the Middle Archaic, referred to as the hypsithermal, distinguishes this subperiod from the previous one. During this time the pine-birch-hemlock forests of the Coastal Plain were being replaced by oak and hickory hardwoods. The numbers of sites increase slightly from the Early to Middle Archaic. Lithic point types experience a transition from the Kirk stemmed to Stanly stemmed points. New point types such as Morrow Mountain, Guilford, and Halifax that appear are believed to represent introduction and possible trade with other areas. Polished stone and semilunar spearthrower weights also appear for the first time.

The Late Archaic is represented by less diversification with the Savannah River point style being prevalent. The Savannah River phase is generally associated with a higher degree of sedentism believed to be a result of improved subsistence adaptation. The appearance of steatite vessels for cooking and storage, as well as fiber-tempered ceramic wares seem to support this belief. A distinction between the North Coastal Plain and the South Coastal Plain can be based on the ceramic distribution of this ware (Phelps 1983: 26). Site diversity appears to remain relatively stable into the Late Archaic, but some localities show a noticeable reduction of Late Archaic site density along smaller tributary streams (Phelps 1983: 25).

The Woodland Period (1000 B.C. -1650 A.D.)

The Early Woodland period is marked by further development of the increased diversification in subsistence and use of ceramics that began to appear during the Late Archaic period. However, little is known about settlement patterns or subsistence on the Coastal Plain during this transition. Settlement patterns are believed to be continuous with

the preceding Archaic. It is thought that cultigens are also introduced during this period, but their immediate effect is not readily seen in the archaeological record. At a few of the sites with Early Woodland components in the Northern Coastal region, Stallings fiber-tempered ceramics are replaced with Thom's Creek sand-tempered ceramics, showing an introduction of new traits. Thom's Creek ceramics are eventually followed by the Deptford series (Caldwell and Waring 1939). Lithic projectile points are of the small-stemmed variety, considered transitional from the older Savannah River type (Phelps 1975: 68), and are now classified as Gypsy points (Oliver 1981).

In the South Coastal region New River is the named phase during the Early Woodland period. There is a similarity between the South Coastal New River phase and the Deep Creek phase for the North Coast, but the New River phase is believed to carry on characteristics found only in the Southeast.

The Middle Woodland period is better understood than the preceding period. Phase names for this period are Mount Pleasant for the North Coastal region, and Cape Fear for the South Coastal region. During the Mount Pleasant phase there is a change in settlement patterns. Small sites along the smaller tributary streams decrease in number, while there is an increase in the number of sites along major streams and estuaries (Phelps 1983: 33). Sites found on Colington and Roanoke Islands indicate seasonal subsistence that relied primarily on shellfish collection. Inland riverine sites have the same pattern but reflect adaptations to shellfish and other species of the riverine environment (Phelps 1983: 33).

Sedentary villages represent the largest single settlement type of the period. This shift in pattern from hunting and gathering camps is generally associated to an increased dependence on domesticated plants, including maize. Ceramics of the Mount Pleasant series are tempered with sand and inclusions of small pebbles with varying surface finishes of fabric-impressions, cord-marking and net-impressing, simple-smoothing to produce a plain type, and incising of plain surfaces (Phelps 1983: 32). Lithic projectile points of the small variety of the triangular Roanoke type are associated with the Mount Pleasant phase. Other artifacts known to occur in Mount Pleasant assemblages are blades (bifaces), sandstone abraders, shell pendants or gorgets, polished stone gorgets, celts, and mats woven of marsh grass (Phelps 1983: 33). Burial patterns found on the Inner Coastal Plain and on Roanoke Island at the Tillet site include both primary inhumation and cremation.

During the Middle Woodland period the Cape Fear phase of the South Coastal region is less known. Ceramic types are similar to those of the North Coastal region. The distinguishing trait seems to be the manner of burial. Found in the South Coastal region is an extensive distribution of low sand burial mounds unique to the region. The high frequency of secondary cremation, platform pipes, and other objects in the mounds, and the fact that at least some of the mounds seem to be placed away from their contemporaneous habitation sites, points to southern influence during this period (Phelps 1983: 35).

The two local phases of the Late Woodland period for the North Coastal region are the Colington phase for the Algonkian culture of the Tidewater zone, and the Cashie phase for territory occupied by the Tuscarora and northern Iroquoian Meherrin and Nottaway in the interior Coastal Plain. The settlement pattern during the Late Woodland was relatively dispersed with site locations found along the sounds, estuaries, major rivers, and their tributaries. Most of the sites that occur on the mainland are found adjacent to streams or other bodies of water on high banks and ridges of sandy loams. Types of sites include capital villages (chiefdoms), villages, seasonal villages, and camps for specialized activities, as well as farmsteads likely occupied by extended families (Phelps 1983: 39-40).

Except for the camps that appear to be directly related to seasonal gathering of shellfish, fishing, and perhaps collecting, all seasonal and larger villages are located where agriculture, hunting, gathering, and fishing could all be accomplished within the site catchment area (Phelps 1983: 40). Shellfish collecting and fishing camps have been found on Colington Island and major villages, except maybe for Hatteras Island, occur on the Inner Coastal Plain. Hatteras Island is one of the few barrier islands with sufficient area at its present south end to support the subsistence needs of a large population (Phelps 1983: 40). One chiefdom was located on the Outer Banks on Hatteras Island, with most sites reported by Haag destroyed through modern development. Limited evidence does remain at the Hatteras Village site (Phelps 1983: 40).

Subsistence during this period relied upon gathering and hunting to support some agriculture. Exploitation of a wide range of habitats provided the needed food sources. Maize, hickory nuts, faunal remains of bears, deer, and a wide variety of small animals; alligators, terrapins, and turtles; fish, and both marine and riverine shellfish have been found at excavated sites of this period (Phelps 1983: 40). By the end of the Late Woodland period, cultigens of squash, beans and sunflower would have been grown as eventually noted by explorers.

Colington ceramics of the Tidewater region are shell-tempered and divided into types based on surface decoration. In order of frequency are fabric-impressed, simple-stamped, plain, and incised. Shell tempering is either marine (oyster) or freshwater (mussel), depending upon the site location. Cashie ceramics associated with the Inner Coastal region are grit or pebble-tempered with the same surface treatments as those noted for Colington ware. Projectile points of the North Coastal region include the small variety of Roanoke triangular type with some occurrence of the smaller, equilateral triangular Clarksville points (Phelps 1983: 36-39).

Bifacial blades of various shapes, polished stone celts, gorgets, sandstone abraders, and milling stones are part of the lithic assemblage. Shell hoes, ladles and shell beads are also found. Bone artifacts include antler flakers, fish hooks, awls and punches of various shapes, bone pins, and a panther mask. Ceramic pipes with bowls attached to stems either horizontally or at an angle are also well known (Phelps 1983: 39).

Burial patterns during the Colington phase are those of Algonkian and Iroquoian ossuaries. Five ossuaries have been located and excavated within the Tidewater zone, with one located on Hatteras Island. The smallest contained 38 individuals and the largest contained 58 persons. The individuals ranged from newborn to the elderly and included both males and females. Few artifacts accompany the burials (Phelps 1983:42). Cashie burials of the Inland Coastal region are also ossuaries. Unlike the Colington ossuaries, Cashie burials usually contain two to five individuals deposited as secondary bundle burials and may represent family rather than community interments (Phelps 1983:46). Bone awls are sometimes included with a few individuals and shell beads are always found. A difference in the quantity of the shell beads included with the burial may indicate differing levels of social status or rank.

The Colington phase ends with the expansion of the European colonial frontier southward from Virginia into North Carolina. The Cashie phase, contemporary with Colington from A.D. 800, remained intact until A.D. 1715 when reservations were established for the Tuscarora and Meherrin after the Tuscarora War (Phelps 1983: 43). The Colington and Cashie phases of the North Carolina region are local variants of the same basic cultural tradition, but the South Coastal Plain has been presumed to be Siouian territory since the beginning of the Woodland period (Snow 1978:60-61).

The Southern Coastal phase of the Late Woodland is known as Oak Island and continues into the modern Waccamaw culture. The Southern Coastal region is less well defined than for the north. The local phase in the narrow Tidewater zone appears to have been similar to the Colington phase, but probably represents acculturation of south coast groups to north coast patterns (Phelps 1983:48).

Historical Background

Exploration and Colonization (A.D. 1524-1776)

Documented exploration along the present-day North Carolina Outer Banks commenced some 485 years ago. In 1524, Florentine pilot Giovanni da Verrazano sailed from the Cape Fear region northwards to Old Currituck Inlet. Verrazano was justifiably cautious, and stayed so far from the shore that he was unable to discern individual features and inlets in the area (Cumming 1988:4-7). The following year, Spanish pilot Pedro de Quejo sailed along the Outer Banks and entered two inlets north of Cape Hatteras and a third to the south of this promontory. The names and exact locations of these historic inlets are unknown (Hoffman 1987:3-4). Later that year, Portuguese pilot Estevan Gomez sailed as far as 40 degrees north along the Atlantic Coast of North America (Dunbar 1958:7).

By 1542, Spanish treasure ships regularly passed within 50 to 75 miles of Cape Hatteras and the Outer Banks before heading east towards the Azores [972 miles due west of Lisbon] (Cumming 1988: 24). Spanish pilot Angel de Vilfane searched for the Jordan River [South Carolina] circa 1561, and sailed north along the North Carolina coast until a

storm off Cape Hatteras sank one of his ships and forced him to head southeast (Hoffman 1987: 8). The intensity of sixteenth-century storms off the Outer Banks is confirmed by the number of ships that were lost off the North Carolina coast in the early years of exploration. Ships were reported lost near Cape Hatteras in 1528, 1545, 1551, 1553, 1559, 1561, and 1564 (Cumming 1988:44).

The first Europeans to consider permanent settlement in present day North Carolina were Englishmen. When the first explorers under Ralph Lane arrived in 1585, they found a thriving native Algonquian population that subsisted by hunting, fishing and cultivation of a variety of foods. Europeans soon established a reliance on the native population for subsistence. When the Indians of Roanoke Island tired of this one-sided arrangement the former group destroyed fish weirs that had been constructed for the Europeans and withdrew from Roanoke Island (Corbitt 1953:55).

At the time of the historic Roanoke voyages (1584-1590), there were two known inlets, Port Fernando [Hatorask Inlet] and Port Lane [closed before 1657] just north of present day Oregon Inlet. These inlets were in close proximity to one another, however, Port Fernando was considered superior and was used by English vessels to establish and supply the settlement on Roanoke Island. That inlet also served as a base for important reconnaissance operations. A slipway was built just inside the inlet to facilitate these activities (Quinn 1955:78). In 1585, Sir Richard Grenville (1542-1591) established a colony on Roanoke Island, and returned to the location in 1586.

Popular tradition relates that Tennyson's poem "The Revenge" is based on the nobleman-adventurer's adventures. Grenville's ship *Tyger* [or *Tiger*] is assumed to be one of the earliest shipwrecks recorded in North Carolina. A contemporary painting thought to be Her Majesty's *Tyger* flying the standards of Saint George was produced by John White in Puerto Rico during Grenville's expedition (Hulton 1984:9; Plate 3; Figure 14).

Shortly thereafter, Grenville returned to England for supplies leaving Ralph Lane in command of the colony. On 9 June 1586, Sir Francis Drake visited the settlement on his return from the Caribbean. Upon his arrival he determined Port Fernando to be an inadequate harbor for his fleet. His vessels, therefore, were anchored well offshore. On 13 June, disaster struck when a storm hit the Outer Banks. In the ensuing chaos several of Drake's smaller vessels were wrecked. The Colonists were disillusioned about the settlement and all but a small force decided to abandon the Roanoke Island and returned to England with Drake (Quinn 1955:passim).

A second attempt to establish a colony on Roanoke Island was made in the following year. The expedition, led by John White, also utilized Port Fernando as a base of operations. After a few months White returned to England. King Philip of Spain's 1588 attempt to invade England prevented White's return to the colony until 1590 (Figure 15). Upon his arrival, the governor found that the colonists had abandoned the colony and disappeared. Over time, due to the mystery, the unfortunate settlement became known as the "Lost Colony." During White's futile attempts to locate the colony, Port Fernando was still used to access the sound.

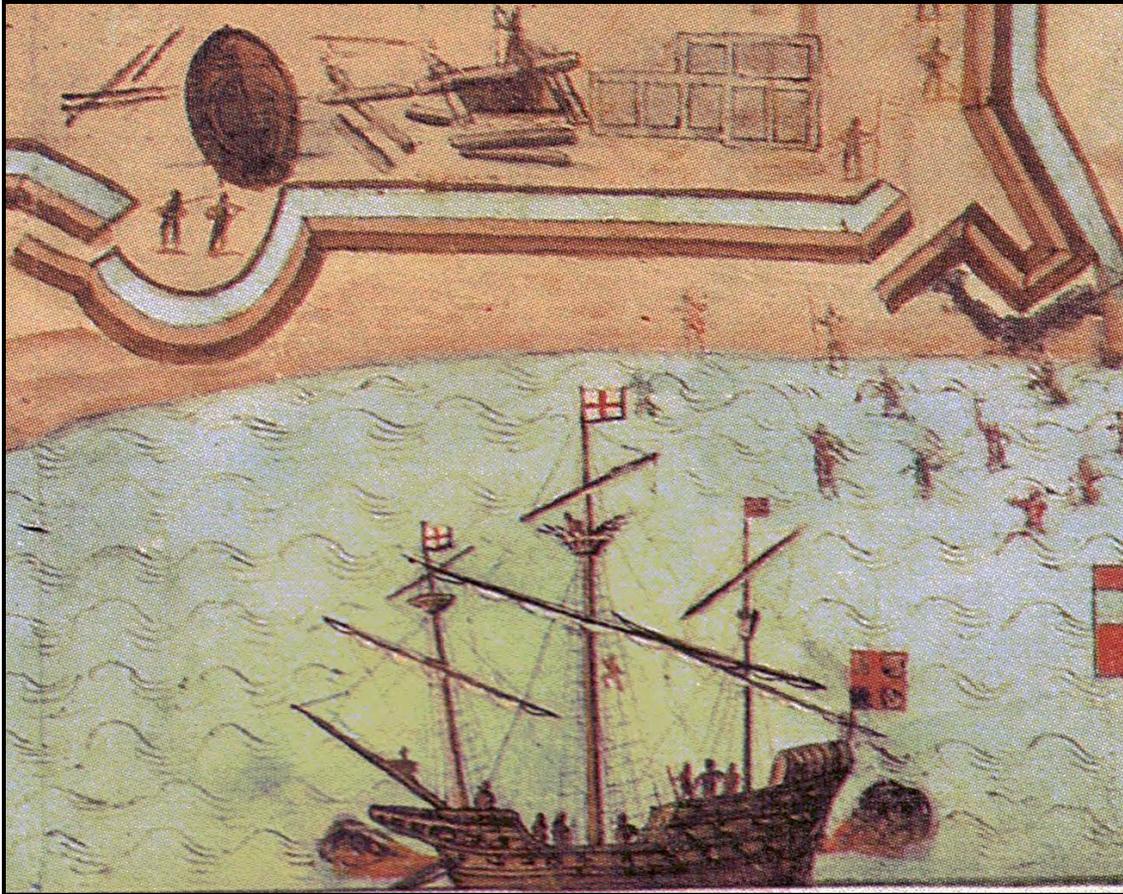


Figure 14. John White painting that may depict Her Majesty's *Tiger* (Hulton 1984:Plate 3).

On 17 August 1590, White sent out two small boats from his larger ships anchored off shore. One of these small vessels capsized while trying to cross the inlet bar, killing seven men. Ultimately, bad weather forced White to abandon his attempts to relocate the colonists (Quinn 1955:252-255, 468-506, and 553-560). English colonization efforts subsequently shifted to the Chesapeake Bay area where a successful settlement was established at Jamestown in 1607.

One of the few attractive features of Roanoke Island was the relative security afforded by the barrier islands (Figure 16). It would be difficult for the Spanish to find and destroy the settlement. Although the Spanish suspected that the English had been trying to establish a colony for some time, they did not send an expedition until 1588. The expedition's leader, Captain Vincente Gonzalez, believed that the repudiated English settlement was somewhere on Chesapeake Bay. Failing to find any evidence of an English colony in that area, Gonzalez sailed back to Florida. It was during this return voyage that the Spanish captain happened to discover the English slipway in Port Fernando. He remained unconvinced, however, that there could be any settlement nearby so he continued on his voyage without further reconnaissance (Quinn 1955:773-812).

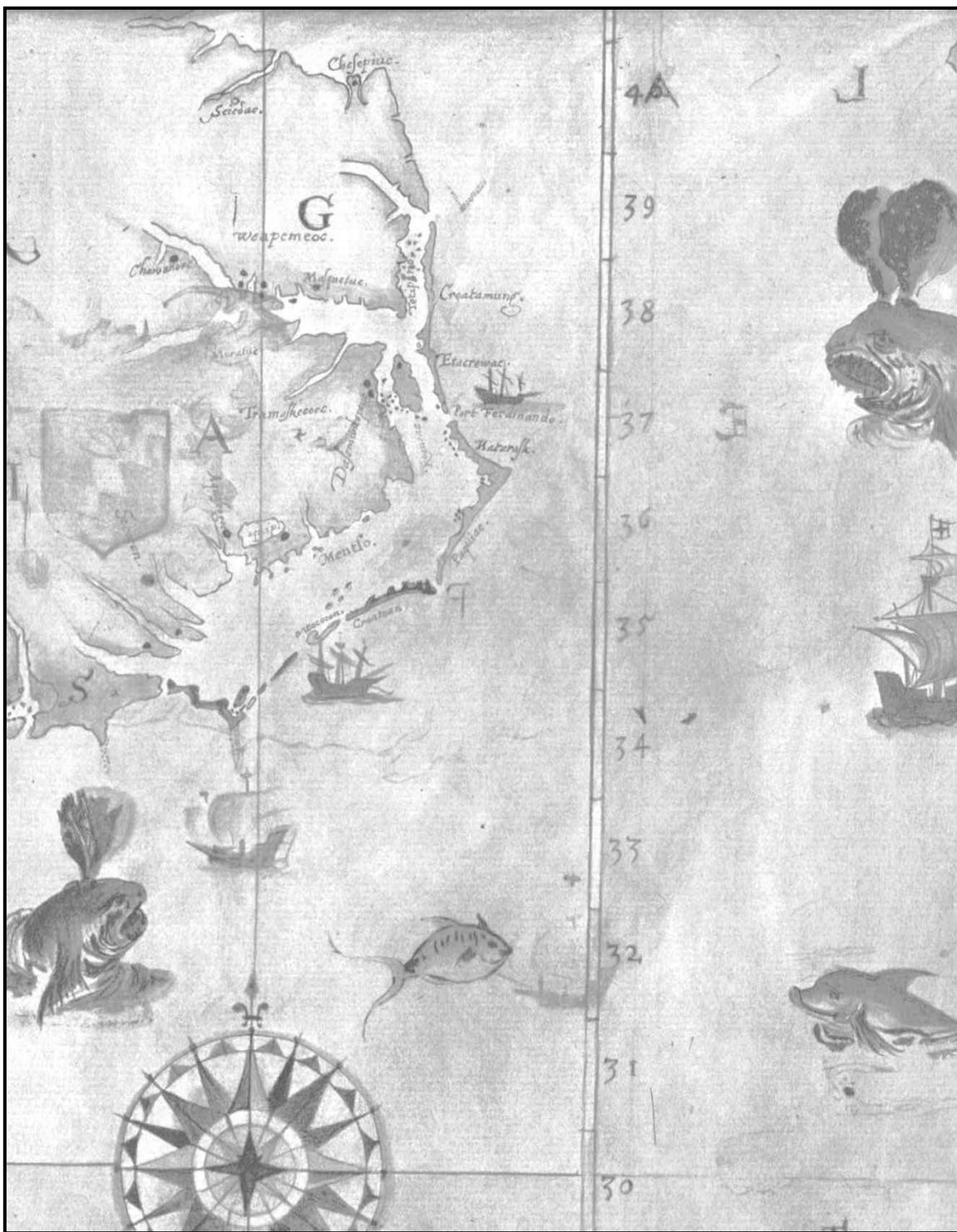


Figure 15. John White map dated 1585.



Figure 16. White-DeBry map dated 1590.

Roanoke Island was a focus of attention of explorers and settlers in the years that followed the historic Roanoke Voyages. The Claes Visscher panorama produced in 1616 illustrates the variety of English and other European vessels of the time (Figure 17), which may have reconnoitered the modern Dare County coast. In 1620 Marmaduke Rayner made a venture to Roanoke Island to explore (Dunbar 1958:16). Four years later, Francis Yardley, the governor of Virginia, noted in a letter that small sloops were trading in Carolina sounds with the local Indians for beaver skins. Later that year Yardley sponsored a group that visited Roanoke Island and bought land in eastern North Carolina from the local Indian tribes. These local Indian tribes died out or were absorbed by the close of the colonial period in eastern North Carolina (Dunbar 1958:16, 19).



Figure 17. Oceangoing ships depicted anchored and at sail in Thames River in Visscher's 1616 panorama (shown in: Noël Hume 1994:115).

In 1664, interest in the North Carolina Outer Banks resumed when Sir John Colleton established a plantation (Figure 18) on what is currently known as Colington Island. The nobleman planned to grow tobacco, which had been shown to be a successful cash crop in the Chesapeake Bay area, and prosper from the increased demand for tobacco in Europe. Tobacco proved to be a failure and the only financial gain from the plantation venture was derived from oil extracted from beached sea mammals some years later (Stick 1958:22).



Figure 18. Engraving of earthfast [or post-in-the-ground] dwelling that may represent Outer Banks construction of the mid-seventeenth century (Noël Hume 1994:315).

John Colleton's failure at growing tobacco on the Outer Banks was chiefly due to the instability of the ground surface and lack of soil development. The introduction of stock husbandry on the barrier islands further contributed to the deterioration of the ground cover and accelerated the natural processes of wind and water erosion. Figure 19 shows the area circa 1672; Colington Island, shown just to the right of Roanoke Island, is not named.

The lack of a suitable agricultural environment, combined with the hazards of navigating the barrier islands, limited the growth of the Outer Banks for several years. Those that attempted to make a living in the area managed their income from the sea. Fishing and shell fishing proved to be profitable, as well as salvaging or piloting of the vessels that dared enter the Outer Banks. Until the hardwood forests of the barrier islands were depleted, boat building also provided a source of income for some individuals living on the Outer Banks. However, the rapid loss of the forests further contributed to the destabilization of the sandy soil and produced migrating dunes which threatened some communities (Stick 1958:286).

In 1696, the *Hady*, a British ship, was driven ashore between Roanoke and Currituck inlets (Figure 20). The early trappers and fishermen camping along the Outer Banks pillaged the ship, transported some of her cannons ashore, and fired them into the vessel's side to ensure that the ship would never be refloated (Ashe 1908:149; Dunbar 1958: 20). The salvage and destruction of the *Hady* was not an extraordinary occurrence as wrecking developed as one of the earliest, albeit sporadic, occupations along the Outer Banks.

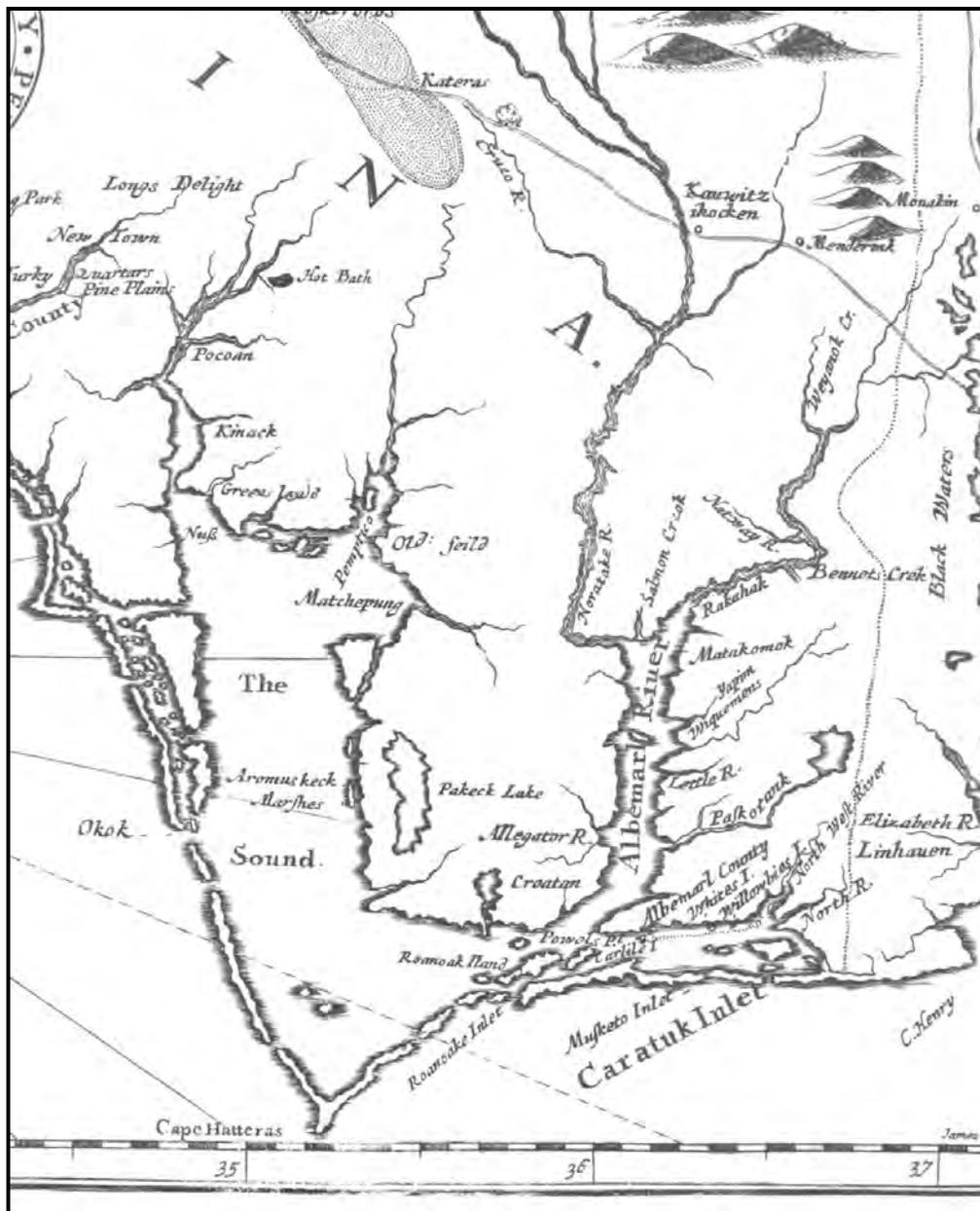


Figure 19. Ogilby map dated ca. 1672.

More than a century after the last Roanoke voyage the first permanent white settlement and residence near Oregon Inlet was established. Mathew Midget, who lived near the Alligator River, received title to Bodie Island in the 1720s. Upon his death in 1734 he left the island to his four sons (Stick 1958:78). It appears that Midget's descendants were still living on the island at the time that Oregon Inlet opened in 1846 (Angley 1985:4-5).

Bodie Island went by many names over a period of years, including Bodys Island, Bodies Island, Body Island, Micher Island, and Cow Island. The island was originally 9.5 miles long and contained about 1900 acres (Stick 1958:278). The name Bodie Island first appeared on maps in the early 1700s, and the 1709 John Lawson map identifies “Body I.”, where the famous surveyor-general searched for coney [rabbits] (Figure 20).



Figure 20. John Lawson map dated 1709.

During the colonial period villages were established on *Hatterask* Island on small wooded tracts on the sound side of the barrier island. Over time the English rendition for the Algonquian term, which translated to “there is less vegetation” was replaced with “Hatteras” (Powell 1968:216). On the islands of Roanoke and Colington, villages were also established within small wooded tracts that afforded protection from the harsh winter environment. There were also several villages located to the north of Roanoke Inlet (Dunbar 1958: 24). Although the shallow depth of Roanoke Inlet prevented it from being used by large vessels, navigation was sufficient to appoint a pilot in 1715. New Englanders frequently brought their vessels in through Roanoke Inlet and off-loaded their cargoes without payment of the required dues (Dunbar 1958: 21-23).

The Quidley family appears to have settled at The Cape [present-day Buxton] circa 1720 according to genealogist and descendant Dallas E. Quidley, Jr. In that year, the wife of Patrick Quidley (formerly of Virginia) gave birth to William Quidley (Quidley 2013). As an adult, the younger Quidley was identified as a captain and his progeny, including John Quidley, figured in the early history of the maritime community. One descendant of John Quidley born on Hatteras Island would serve as a surfman at Kinnekeet “riding a horse watching for sailing ships” and later as a lighthouse keeper (Quidley 2013).

The attention to vessels navigating along The Cape served several purposes for early eighteenth-century coastal families, whose lives and livelihoods depended on the goods being transported aboard the watercraft, as well as often having a familial connection to those on board. The Herman Moll map dated 1729 (Figure 21) illustrates the Shoals of Hatteras, which became popularly known as “Diamond Shoals” or “graveyard of the Atlantic”. Renowned North Carolina historian William Powell (1968:142) described the treacherous series of three shoals that extend in a southeasterly direction from Cape Hatteras as such:

Nearest the Cape is Hatteras Shoals; Inner Diamond Shoal is in the middle, and Outer Diamond Shoal extends farthest [sic] into the Atlantic. The channel between Hatteras Shoals and Inner Diamond Shoal is Hatteras Slough; Diamond Slough is the channel between the two Diamond Shoals. At this point warm Gulf Stream waters collide with cold arctic waters from the north causing a constant turbulence in the Atlantic.

Despite the obvious and constant dangers wrought by the Shoals of Hatteras, by the middle of the eighteenth century, a considerable trade had developed along the North Carolina coast. While Ocracoke was the dominant marine facility, Port Roanoke provided services important to the development of the Albemarle region. Port Roanoke has since developed into present-day Edenton. Commerce that left Port Roanoke travelled along three main routes according to 1772 customs records. Approximately two fifths of outbound cargoes were transported to the West Indies, one third went to the New England area, and one fifth was exported to the British Isles.



Figure 21. "Sholes of Hatteras" from Herman Moll Map, 1729 (Cumming 1998:Plate 50).

It bears note that during the subject period, and in fact to 1846, that Hatteras Inlet was joined to Ocracoke Island as the fluctuating inlet had closed in 1760-70 (Powell 1968:217). Contemporary customs' records indicate that of the incoming commerce one-half was from New England, one-fourth originated in the West Indies, and one-fifth was imported from the British Isles. At this date, eastern North Carolina residents were still not major consumers of goods. Of the incoming shipping, some 6,200 tons, which cleared Port Roanoke nearly one-fifth was ballast. A large proportion of the ships that passed through Port Roanoke were owned by merchants in the Albemarle area, as the 1772 custom records show that nearly one-third of the tonnage of ships that entered Port Roanoke were also registered there (Crittenden 1936: 70-71, 77-78, 105).

Revolutionary and Ante-Bellum Period 1776-1860

During the Revolutionary War, Roanoke and New Currituck inlets gained greater significance. Their shallow depths and constantly moving sand bars prevented strangers or the Enemy from safely navigating the waterways and afforded American coastal vessels safety within the sounds. Extracts from the 1770 Collett map show The Cape and “Occacock” Island (Figure 22) and three distinct inlets north of Hatteras (Figure 23), which depict the difficulties late-eighteenth-century mariners encountered as they sailed along the Outer Banks. Port Roanoke, although plagued by shallow and migrating channels, became a major North Carolina port that briefly rivaled Wilmington and the Cape Fear region (Crittenden 1936:42).

While British warships captured numerous vessels in or near the inlets of the Outer Banks, and even made sorties across the barrier islands into the sounds to harass small coastal vessels, the dangerous inlet provided a means of escape from pursuing warships and privateers. (Dunbar 1958:22; Crittenden 1936:122). The hostilities that led to the Revolutionary War did little damage to the commerce that passed through Port Roanoke, and custom records show that for the period 1774 to 1776 exports at Port Roanoke increased. In 1775, there were 40 percent more exports than in 1772. Growth continued so that by 1778 Port Roanoke cleared 15,000 tons in commerce that year alone (Crittenden 1936:119-120, 158).

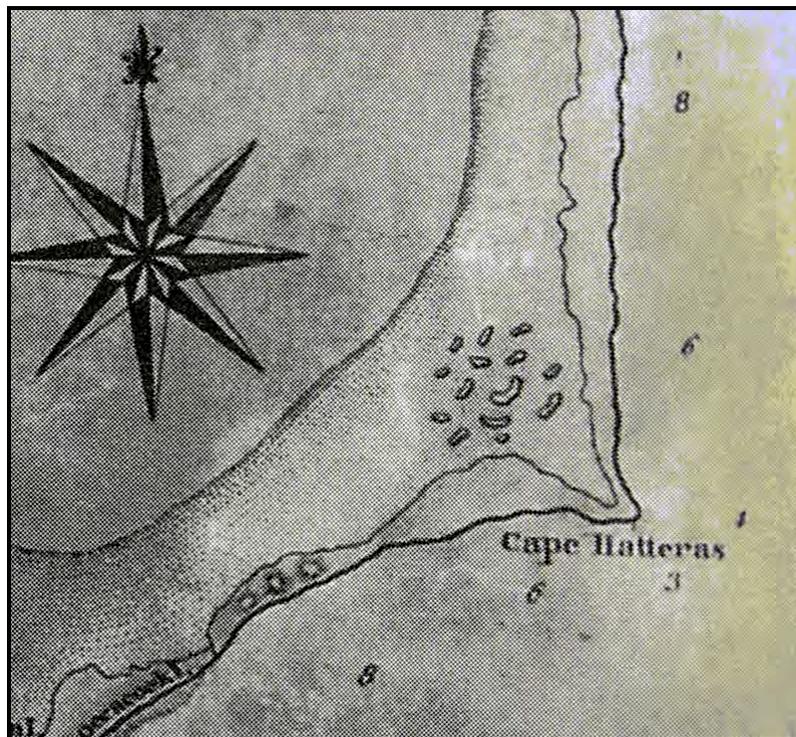


Figure 22. Cape Hatteras depicted in 1770 Collett Map (Cumming 1998:Plate 63).



Figure 23. The Collett map dated 1770 showing the inlets north of Hatteras.

Under the dynamic leadership of its secretary, Alexander Hamilton, the newly-formed U.S. Treasury Department sought and received the authority to construct a beacon on the headland of Cape Hatteras in 1794. According to Cape Hatteras Lighthouse authority Kevin Duffus (2003:17):

[T]he proposed lighthouse was among the first commissioned by the nation warning mariners to avoid a specific navigational hazard. Previously, colonial lights had been established to guide vessels into port. Urgency was paramount...As the young nation's growth was being fueled by the cargoes of merchant vessels, an increasingly and disproportionate number of hulls were disgorging their wares on the dark and low-lying beaches along the Outer Banks.

After a lengthy exercise to master numerous obstacles, the U.S. government purchased four acres of land for \$50 from a Currituck family [and estate] named Jennett. When the deed was finally conveyed to the Federal government, the "lighthouse had already been under construction for two seasons and its castle-like, octagonal stone rampart was by far the tallest manmade structure on the island" (Duffus 2003:19). Despite constantly combatting erosion due to storm surges and gales especially during the annual hurricane and northeaster cycles, the builders prevailed and the lighthouse was illuminated in October 1803 (Duffus 2003:19).

By 1808, a series of small islands developed in the sound immediately west of Roanoke Inlet, and navigation became especially hazardous. Trade through Port Roanoke finally ceased when the inlet closed in 1811. In 1828, Currituck Inlet to the north also closed, leaving the Albemarle region dependent upon facilities at Ocracoke, a considerable distance to the south. Figure 19 shows the coastline as of 1833. As part of a program to improve coastal navigation that was heavily supported by North Carolina legislator Archibald Murphy, construction of an inlet near Roanoke Island was proposed in 1816, 1820, 1829, 1840, and 1853. None of the proposals received necessary statewide political support (Dunbar 1958:26; Lefler 1965:199-205).

In 1837, Congress did appropriate 5,000 U.S. dollars to build a lighthouse on Pea Island, near New Inlet. Captain Charles W. Skinner upon inspecting the site for the Navy Board found it unsatisfactory and recommended that the lighthouse be built upon another site farther north on Bodie Island. This seems to be the first printed use of "Pea Island", but it must have been in use earlier as Pea Island was no longer an island after Roanoke Inlet between the former and Bodie Island closed in 1811 (Stick 1958: 282). The MacRae-Brazier Map of 1833 clearly illustrates the closed status of Roanoke Inlet (Figure 24).

When plans for the lighthouse to be constructed on Pea Island north of Chicamacomico Inlet were revealed, the inhabitants of the area demanded that it be placed farther north on Bodie Island. The uproar they created kept anything from being decided until 1848. One factor complicating the decision was the opening of new inlets during a storm in the fall of 1846. On 7 September 1846, an intense storm drove water across the Outer Banks and

created two relatively small inlets. An assistant superintendent with the United States Survey was stationed on Bodie Island when the storm occurred and observed that:

On the morning of the September gale the sound waters were all piled up to the southeast, from the effects of the northeast blow of the previous days. The weather was clear, nearly calm, until about 11 a. m., when a sudden squall came up from the southwest, and the waters came upon the beach with such fury that Mr. Midgett, within three quarters of a mile of his house when the storm began, was unable to reach it until four in the afternoon. He sat upon his horse on a small sand knoll, for five hours, and witnessed the destruction of his property and (as he then supposed) of his family also, without the power to move a foot to their rescue, and, for two hours, expecting every moment to be swept to sea himself. The force of the water coming in so suddenly, and having a head of two or three feet, broke through the small portion of sea beach which had formed since the March gale, and created the inlets. They were insignificant at first-- not more than twenty feet wide-- and the northern one much the deepest and the widest. In the westerly winds which prevailed in September, the current from the sound gradually widened them; and then in the October gale, they came about as wide as they are now. The northern one has since been gradually filling, and is now a mere hole at the low water... [but the southern one] between high water marks, measured on the line, is 202 yards [wide and] between low water marks, 107 yards (C. O. Boutelle quoted in: Stick 1958:279-280).

Although the northern inlet closed, the southern inlet continued to develop. It quickly became an important channel for vessels operating in both the Albemarle and Pamlico Sound (Anglely 1985: 6). The inlet is said to have received its name from the steamboat *Oregon*, which was owned by merchant W. H. Willard, of Washington, North Carolina, when it passed through the inlet in June 1848 (*Free Press*, 8 July 1848; Sharpe 1954:104).



Figure 24. The MacRae-Brazier map dated 1833.

While Oregon Inlet provided the Albemarle region with a new Atlantic access, the shallow bar and shifting channels in the inlet made navigation difficult. Consequently, this elusive waterway was principally used by shallow draft vessels. Even navigation by small vessels was not without risk and the U.S. Coast Survey Chart of Bodies Island produced in 1849 identifies three wrecks in the inlet (Figure 25). Within a few years of its formation, navigation in Oregon Inlet came to the attention of the U.S. Army Corps of Engineers. Considerable local support developed for improving Oregon Inlet and several proposals were made in Congress to provide support. Other priorities prevailed, however, and it would be more that a century before improvements to the channel would be approved and funded.



Figure 25. U.S. Coast Survey, topographic sheet, Bodies Island dated 1849.

While navigation in the inlet remained hazardous, Congress did approve the construction of a lighthouse near Oregon Inlet. The first Bodie Island Lighthouse was constructed south of the inlet during 1847-1848 (*Republican*, 5 May 1847, Angley 1985: 6-7). The lighthouse was 56.5 feet tall and its light had a range of 12 nautical miles (*North State Whig* 19 January 1848, *Free Press*, 8 July 1848). Unfortunately, it fell into disrepair shortly after its construction, and in 1857 an appropriation of 25,000 dollars was required for building a second structure and procuring a new lens. The second lighthouse began its operation on 1 July 1859 (*Times Daily* 18 July 1872; Stick 1958: 277-278).

The Bodie Island beacon was welcomed by those navigating North Carolina coastal waters, but it did not stop the loss of vessels in the Oregon Inlet vicinity. The same month that the second lighthouse began operations, the schooner *Spy* of Plymouth was wrecked on the beach three miles below the lighthouse (*Democratic Pioneer* 26 July 1859). The *Spy* carried a valuable cargo of pork, beef, fish, oils, paints, flour, sugar, bricks, gunney cloth, rope, shoes, hats, furniture, dry goods, doors, blinds, spirits, tobacco, butter, and cheese. Cargo salvaged from the wreck and rights to the vessel's remains were sold by Captain S. A. Baum [Commissioner of Wrecks] on 18 July 1859 (*Democratic Pioneer* 26 July 1859).

Civil War Period 1860-1865

During the Civil War, the Confederate States Government and the State of North Carolina initiated construction of a series of fortifications designed to provide for the defense of the Outer Banks of North Carolina, but both the plan and the resources to carry it out were limited. The result was a series of hastily constructed defenses that included Fort Oregon, located south of the inlet between the breakers and the Bodie Island lighthouse (Angley 1985:7).

North Carolina also began a buildup of naval forces to protect the sound and inlets. The "Mosquito Fleet" consisted of four vessels, the *Winslow*, *Ellis*, *Raleigh*, and *Beaufort*. The *Winslow*, under the command of Captain Thomas M. Crossan, was a side-wheel steamer armed with a single 32-pound gun. The other three vessels were small river boats such as the *Beaufort* which was 94 feet long, a 17-foot beam, carried a compliment of 35 officers and men, and mounted one 32-pounder on its bow.

These three small river craft were sent to operate on the inland sounds and waterways, while the *Winslow* was ordered to Hatteras Inlet (Figure 26) to harass the enemy and capture coastal shipping. She was able to capture sixteen enemy vessels (Stick 1958:118). When the United States government received information that "pirates" were operating out of Oregon Inlet and that supplies were being run through the inlet, plans were devised to block the channel. The plan called for scuttling a number of stone-laden schooners. However, there is no historical evidence that the plan was ever implemented (Angley 1985:8).

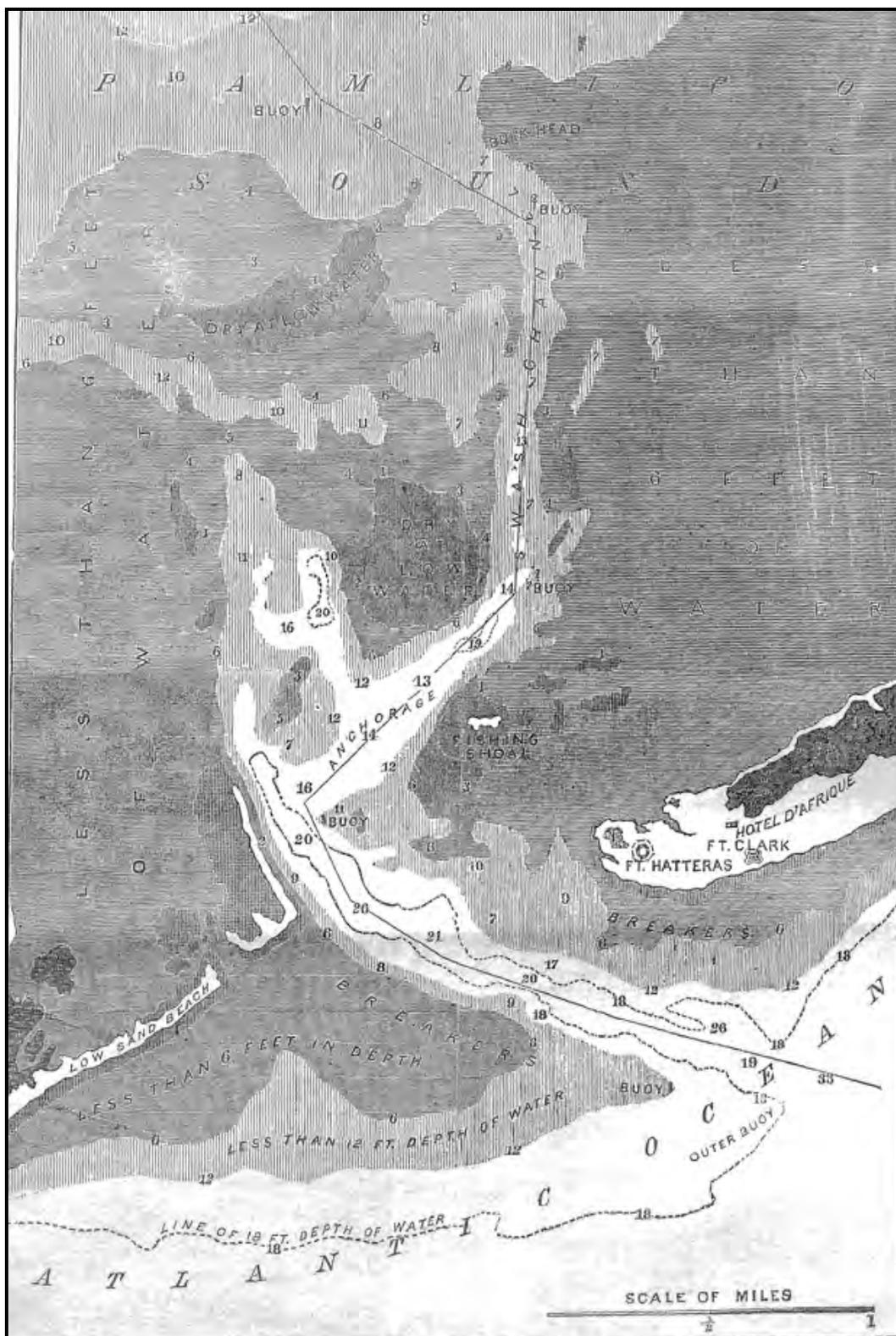


Figure 26. Contemporary chart depicting Hatteras Inlet details (*Harper's Weekly* 15 February 1862:103).

Instead, a joint Army and Navy force was dispatched to the North Carolina Outer Banks from Hampton Roads, Virginia, on 26 August 1861. The naval force, commanded by Commodore Silas H. Stringham, consisted of seven vessels mounting 143 guns. Stringham's fleet included the warships *Minnesota*, *Wabash*, *Susquehanna*, *Pawnee*, *Monticello*, *Harriet Lane*, and *Cumberland*. The land force, under the command of General Benjamin F. Butler, consisted of 880 men from the Ninth and Twentieth New York Volunteers, and detachments from the Union Coast Guard and Second U.S. Artillery. These troops were transported south on the tug *Fanny*, and the chartered steamers *Adelaide* and *George Peabody* (Stick 1958:120).



Figure 27. U.S. joint naval and army forces bombarding Hatteras Inlet fortifications in August 1861 published by *Currier & Ives* (Courtesy Library of Congress).

On arrival at Hatteras Inlet on 28 August, the warships began bombarding Fort Clarke. By the end of the day, it was under the control of Union officers. The next morning, the Federal force began shelling Fort Hatteras. After only a brief bombardment the Confederate garrison also surrendered (Figure 27). Upon learning of the attack on the forts, the Confederates sent a relieving force consisting of the Third Georgia Regiment from Norfolk onboard the steam tug *Junaluska*. The fall of both forts left the Confederate reinforcements without a practical mission and they landed on Roanoke Island on 30 August. After disembarking its troops the *Junaluska* went to Oregon Inlet and a council was held at Fort Oregon.

It was decided to evacuate the men and guns to Roanoke Island and join with other Confederate forces in resisting General Burnside. As they abandoned the fort, retreating Confederates destroyed the second Bodie Island Lighthouse (Stick 1958:129, 280). Meanwhile, supply lines were being established by the Federal force between Hatteras and Newport News, Virginia. In September, a detachment of men arrived to supplement those left to guard the Confederate forts. The Union gunboats *Ceres* and *Putnam* joined the three vessels that had been left by the original invading force, the *Pawnee*, *Monticello*, and *Fanny*. Fearing an attack, the commander of the Union detachments sent 600 men to the north end of Hatteras Island to set up a camp at Chicamacomico (Stick 1958: 130-131).

The Confederate force on Roanoke Island mounted a rifled naval thirty-two pounder on the bow of the side-wheel steamer *Curlew*. The vessel, under the command of Commodore Lynch and manned by recruits from the Third Georgia Infantry, set out with the *Junaluska* and *Raleigh* towards Chicamacomico.

Battle was initiated on 1 October 1861, when the small Confederate squadron met the Union steam tug *Fanny*. After only a 15-minute battle, the *Fanny* (Figure 28) was taken by Confederates, thus accomplishing their first capture of an armed ship (Stick 1958:132). On 5 October, two regiments of Confederate infantrymen were loaded onto the steamers *Curlew*, *Cotton Plant*, *Raleigh*, *Fanny*, *Empire*, and *Junaluska* and transported to a point about three miles off Chicamacomico in Pamlico Sound. The *Cotton Plant* was able to get about a mile closer in towards shore than the other vessels because of its shallower draft.

A company of artillery along with two 6-pound boat howitzers and two companies of infantry disembarked into the shallow water and waded towards the shoreline, firing at the Union troops stationed on the beach. The other vessels headed south in an attempt to land their troops behind the Union forces. Seeing that they might be encircled, the Federals rapidly retreated to Fort Hatteras. Their pursuit by Confederates has been called the “Chicamacomico Races” (Stick 1958:133-136).

Upon returning to Roanoke Island after the attack on Chicamacomico, Confederates set about fortifying their positions. Across Crotoan Sound, heavy pilings were sunk along with old sand-filled vessels. This strategy created a line of obstructions with only a few openings large enough to permit friendly vessel passage. An old canal boat was grounded opposite Redstone Point at the western end of the line of pilings and hulks. A battery of eight guns mounted upon the deck of the grounded hulk was called Fort Forrest.

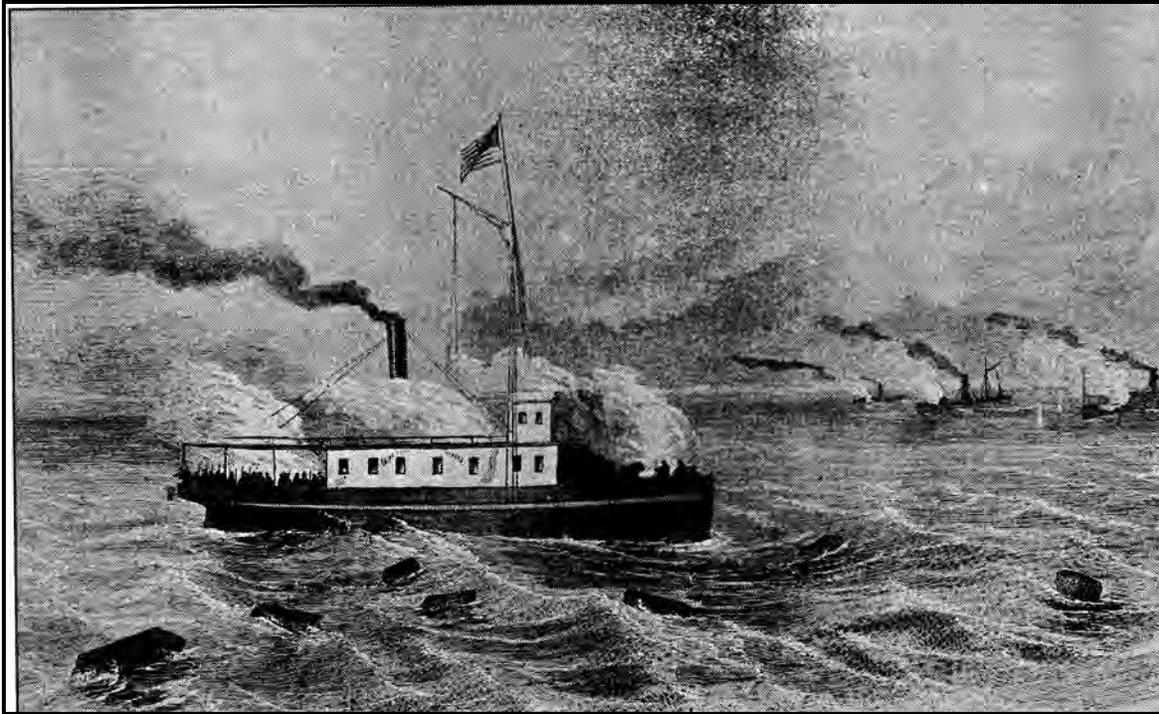


Figure 28. The US tugboat *Fanny* captured by Confederates (Carbone 2001:18).

On the eastern end at Roanoke Island, three forts were constructed. Fort Huger, which mounted twelve guns, was located at Weir Point, north of the piling line. Fort Blanchard, which had only four guns, was located a half-mile to the south of the line. Fort Bartow with eight guns was located on Pork Point near the line but invisible from the water (Stick 1958: 137).

On 11 January 1862, a flotilla of more than 80 Federal vessels, composed of sailing boats, North River barges, and large passenger steamers, sailed from Newport News and arrived off Hatteras Inlet on 13 January. Land forces were under the command of General Ambrose Burnside and U.S. Navy divisions were under the direction of Admiral Louis M. Goldsborough.

After arriving at the inlet, gales and storms prevented the Fleet from passing over the shallow sand bars and into the Pamlico Sound. The foul weather also caused the stranding and loss of five vessels; *City of New York*, *Grapeshot*, *Pocahontas*, *Louisiana*, and the *Zouave* (Figure 29; Figure 30; Figure 31).

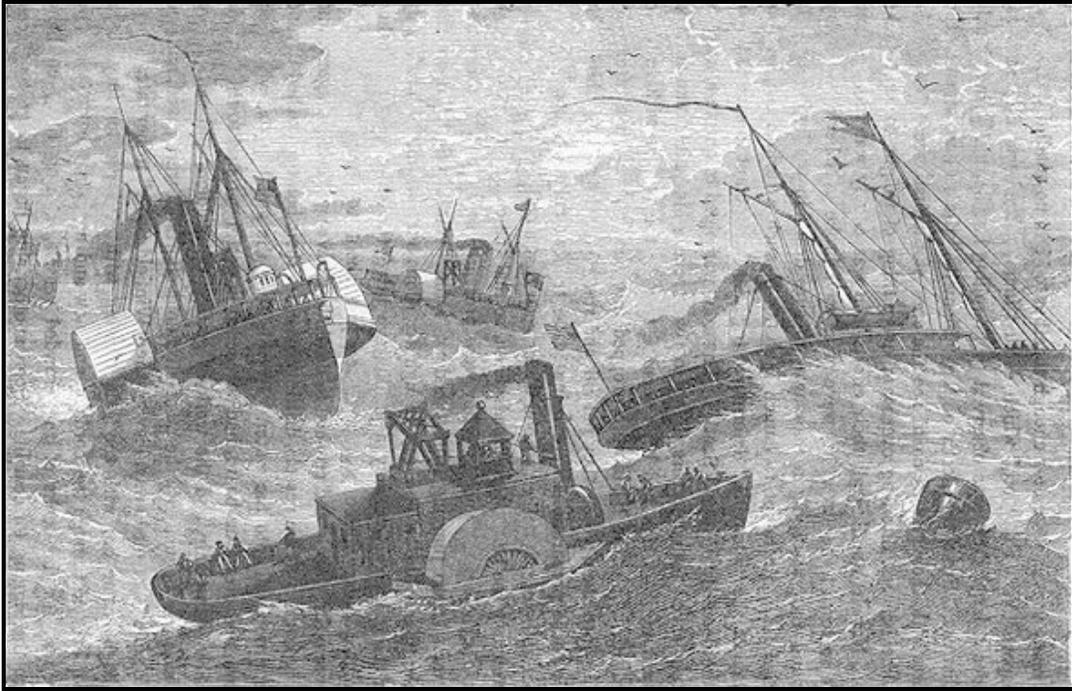


Figure 29. Federal vessels encountering foul weather off Hatteras Inlet.

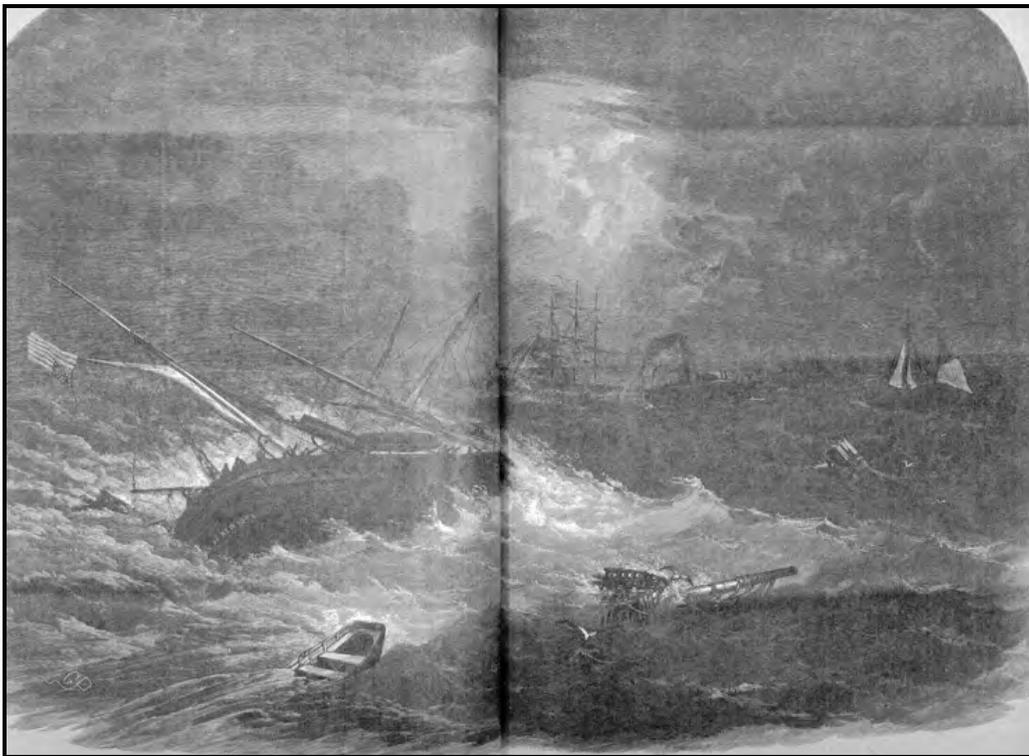


Figure 30. Loss of the *City of New York* at Hatteras Inlet (*Harper's Weekly* 15 February 1862:104-105).

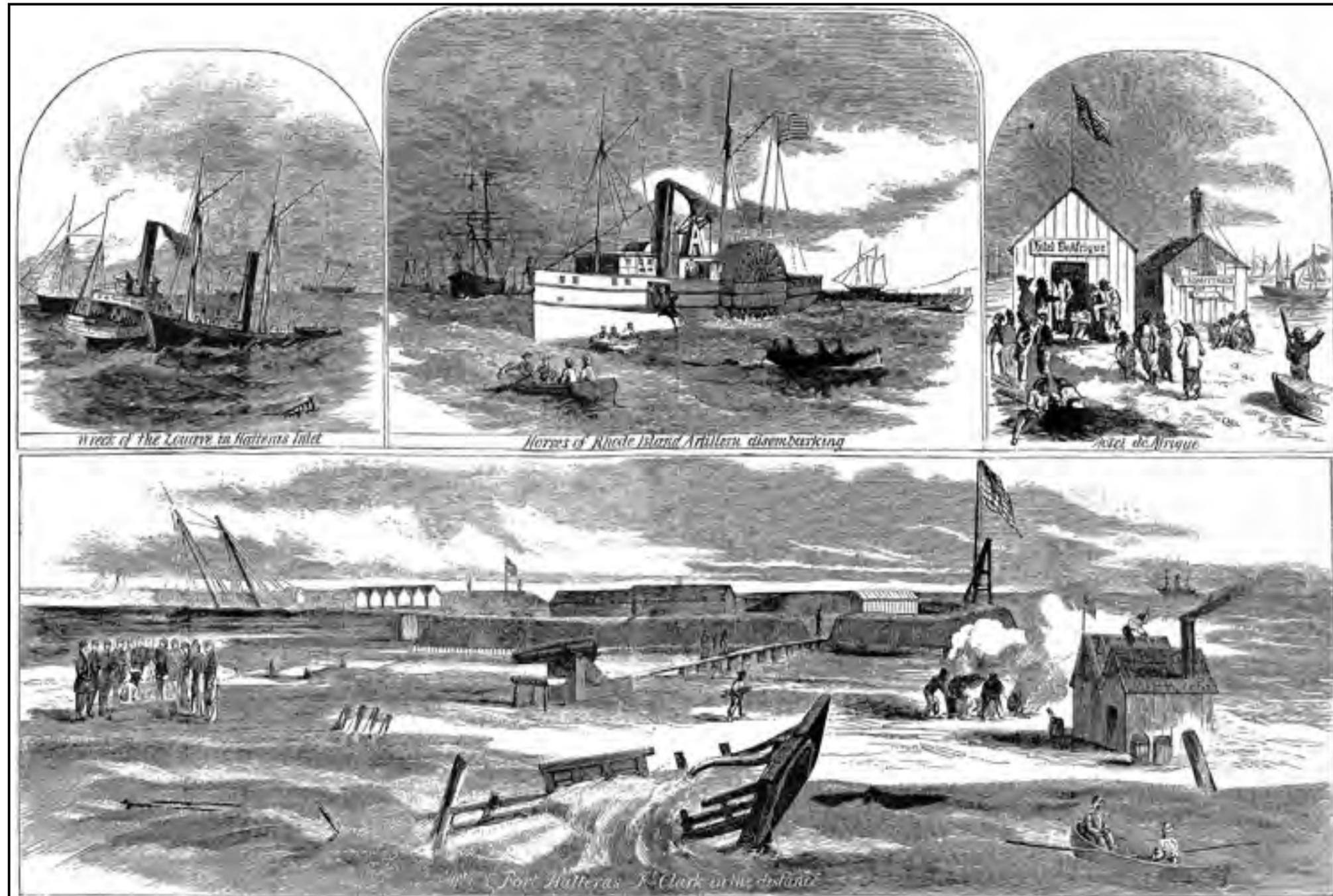


Figure 31. Contemporary montage showing wreck of the *Zouave* in Hatteras Inlet, Union transports and Hatteras Island scenes (*Harper's Weekly* 15 February 1862:101).

The *City of New York*, a 574-ton screw steamer transporting troops for the operation, foundered east of Hatteras Inlet on 13 January 1862 (Shomette 1973:36-37). The aging side-wheel steamer *Pocahontas* was also lost (Figure 32) while engaged in transporting horses and equipment to support the invasion of North Carolina near Rodanthe on 18 January 1862 (Delgado 1984:62). Once within the sound, grounded Union vessels were easier to refloat and losses were almost eliminated. On 4 February, the remainder of the Union fleet was finally able to pass the bar and sail for Roanoke Island.



Figure 32. Shipwreck of the *Pocahontas* near Rodanthe on 13 January 1862 (*Leslie's Illustrated Newspaper* 15 March 1862:273).

Confederate defense of Roanoke Island had been given to General Henry A. Wise, but as he was suffering from pneumonia, command was transferred to Colonel H. M. Shaw. Under the command of Commodore Lynch, a fleet of nine vessels--*Black Warrior*, *Seabird*, *Appomattox*, *Ellis*, *Curlew*, *Forrest*, *Raleigh*, *Beaufort*, and *Fanny*-- each with one 32-pounder, also guarded the island (Stick 1958:141-142). Union forces arrived off Roanoke and began shelling the Confederate batteries and gunboats on 7 February. The Confederate gunboat *Curlew* was hit and ran aground in front of Fort Forrest, blocking the battery's line of fire. The *Forrest* was also struck by enemy fire and forced to withdraw.

By nightfall the Confederate fleet was out of ammunition and retreated up Albemarle Sound toward Elizabeth City (Stick 1958:143). Union land troops continued to land at Ashby's Harbor until late in the night. The next morning the 7,500-man force began an attack on the Confederate defenses and by nightfall had captured the island with only light losses on each side (Stick 1958:144-148).

The fall of Roanoke Island, on 8 February 1862, provided the United States with a base of operations that supported the closures of Albemarle and Pamlico sounds to Confederate commerce for the duration of the war. Along with the captures of Hatteras Inlet and Fort

Macon, “organized Confederate resistance” on the Outer Banks was generally suppressed (Stick 1958:152-153). A routine account by Master Woodward of the USS *Shawsheen* stationed at Hatteras Inlet on 5 April 1862 described the local maritime scene with a variety of watercraft as such:

I proceeded to the inlet [Hatteras] with schooner *Napoleon* and towed her to sea without much trouble; she took lighter alongside the schooner *E. J. Raynor* to lighten her; supplied myself with coals from the *Charlotte Williams*, she being the deepest draft...gave orders to schooner *Neptune* to proceed to Roanoke island...these being all the coal schooners in the inlet for the Navy. Found the schooner *Charles H. Moller* with stores; gave him orders, after towing him over the swash...After lightening the *Raynor* up to 8 feet, towed him over the swash. Went to the steamer *Suwanee*, took 73 boxes of shell for 100 pounder Parrott guns, the boxes in bad condition, and one cask of packing; then took lighter up over the swash and put ammunition on board the *Raynor* again...Having done all as directed...I left the inlet for New Berne...Passed on the way here schooner *C. H. Moller*, bound here, and schooner *Palma*, bound out (National Historical Society, ser. 1, v. 7, 1987:202).

On the last day of December 1862, one of the more famous [modern perspective] Civil War Era shipwrecks occurred off Hatteras Island, when the USS *Monitor* foundered some 16 miles SSE of the Cape Hatteras Light in 225 feet of water (Figure 33). The ironclad steamer was being towed by the USS *Rhode Island*, in concert with the *Passaic* being towed by USS State of Georgia, when the Federal vessels encountered severe squalls (Berman 1973:148; Broadwater 2012 8-10). Owing to its historic status and the volume of public interest, the shipwreck site was “designated the first National Marine Sanctuary” on 30 January 1975 by the U.S. Department of Commerce secretary with approval by President Gerald Ford (Watts 1985:315).

At this time of the *Monitor*'s tragic demise, some 1200 individuals lived on Hatteras Island and of this number nearly half were housed west of the lighthouse (Figure 34). Approximately 100 slaves were included in the larger figure, and the majority of all residents were dispersed in just over 200 dwellings (Stick 1958:154). Only the contemporary village of Hatteras was known by its present-day name; and a nearby small village was simply called “The Cape” (Stick 1958:154).



Figure 33. Tragic loss of the USS *Monitor* off Cape Hatteras.

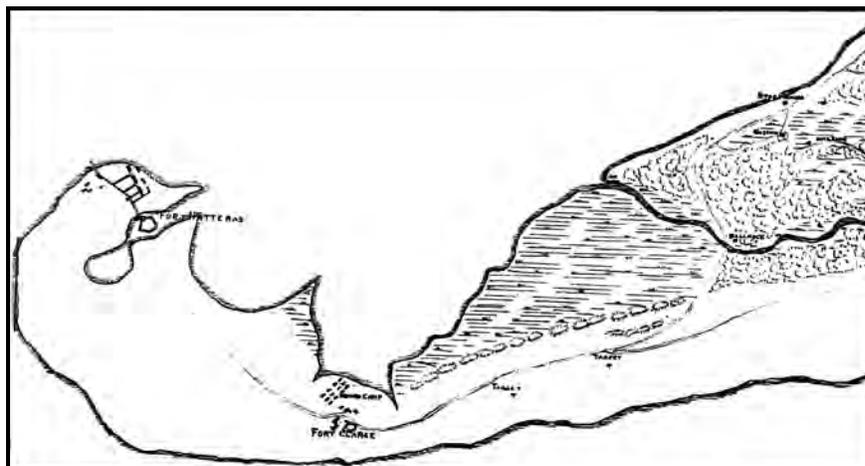


Figure 34. Map of Hatteras Island drawn 1864 by Union engineer (Courtesy National Archives Cartographic Section).

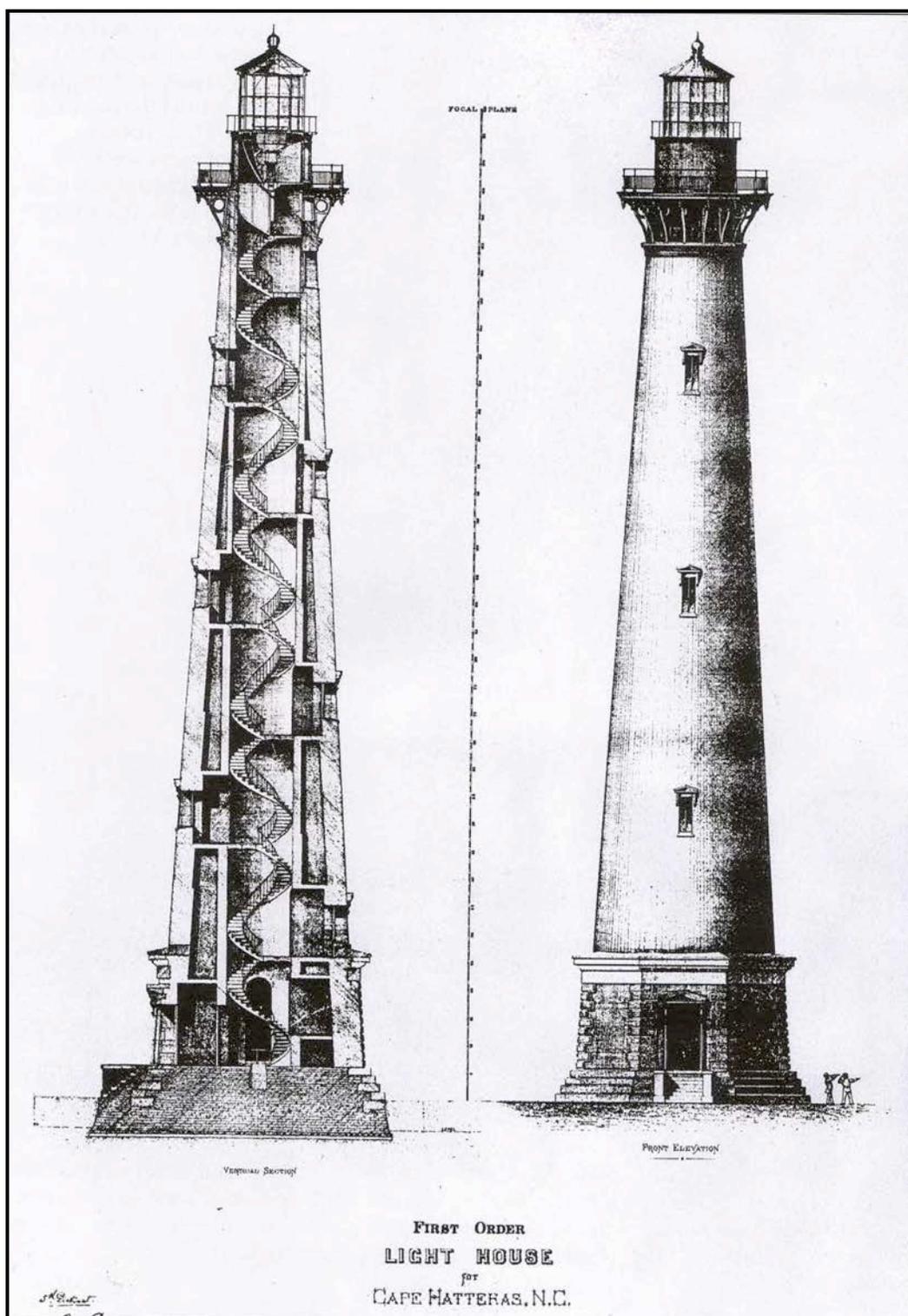


Figure 35. Architectural sketch of the Cape Hatteras lighthouse prepared in 1869 (courtesy National Archives).

Following the Civil War proposals were also developed for improving navigation in Oregon Inlet, but government surveys carried out in 1873-1874 and again in 1882 determined that dredging the inlet as impractical. Several other improvements to navigation were initiated (U.S. Congress 1874:85). The new Hatteras Light had been constructed (Figure 35) and was illuminated by 17 December 1870 (Duffus 2003:161-163). To provide a measure of safety for vessels navigating in the vicinity of Oregon Inlet, a third Bodie Island Lighthouse was built to replace the one destroyed by retreating Confederates. Constructed on a site bought for \$150 from John B. Etheridge in 1871-1872, that lighthouse ultimately cost \$14,000 (U.S. Congress 1883:2). Work began on the 150-foot structure on 1 October 1872 (Stick 1958: 277-278; Figure 36). During construction of the new lighthouse five sailing vessels were wrecked off Bodie Island, confirming the need for a navigation aid in the area (*Times Daily* 18 July 1872).

From December 1873 to December 1874, the U.S. Lifesaving Service built seven new stations at Little Kinnakeet, Chicamacomico, Bodie Island, Kitty Hawk Beach, Nag's Head, Jones' Hill, and Caffrey's Inlet. Due to continued loss of life on the Outer Banks from vessel losses, the service built eleven more stations during the winter of 1878-1879. These were located at Tommy's Hummock (located north of Oregon Inlet and later renamed Bodie Island), Pea Island, Cedar Hummock, Big Kinnakeet, Creed's Hill, Hatteras, Deal's Island, Old Currituck Inlet, Poyner's Hill, Paul Gamiel's Hill, and Kill Devil Hills. Later in 1883, the service built a station at New Inlet (Stick 1958: 173). The Pea Island Life Station, which was opened in 1879 operated until 1946. For 63 years this highly efficient facility operated as an all Negro-manned station (Sharpe 1954:103).

In 1870, the Church brothers from Rhode Island opened a menhaden processing plant at Oregon Inlet (Dunbar 1958: 231). The plant was closed two years later because of hazardous navigation in the inlet, the limited supply of menhaden, and the lack of oil in the fish that were being caught in the sounds (Dunbar 1958:149 and Angley 1985:8-9). Only a year after the Church brothers closed their plant, the Corps of Engineers surveyed Oregon Inlet to assess the feasibility of improving navigation. Their plan was designed to improve access to the Oregon Inlet passage to Albemarle Sound and thus reduce by 120 miles the distance vessels arriving from northern ports would have to travel to ports in the sound. The survey determined that the advantages of the plan did not justify its projected cost. A particularly important consideration in the decision was the southward migration of the inlet (Angley 1985:9; U.S. Congress 1874:85).

Although nineteenth-century commercial fishing registered only nominal success in the Oregon Inlet vicinity, independent fishermen enjoyed success at Oregon Inlet and sport fishing became an important source of local income. By 1875, plentiful blue fish represented an important resource for both commercial and sport fisherman (*Economist*, 24 November 1875). Drum also became an important source of revenue for the area. Two years later that same Elizabeth City newspaper reported that "the sound near Oregon is alive with old drums



Figure 36. Modern image of the Bodie Island light, built 1872 (courtesy National Park Service).

and trolling furnishes sport and happiness to many an angler" (*Economist*, 6 June 1877). Herring also became an important resource and smoked herring brought two cents apiece in 1877 (*Economist*, 9 May 1877). By 1891, Captain John Ward of Roanoke Island was offering "choice Oregon Inlet herrings" that were described as the "best in North Carolina" at \$5.50 per thousand (*Economist*, 5 May 1891).

By 1876, sizable ocean vessels were also using Oregon Inlet to gain access to the Albemarle. On 23 August 1876, the Elizabeth City *Economist* reported that six large vessels had navigated the inlet within the past month and the editor observed that "with proper help the water would be deepened all the way through" (*Economist* 23 August 1876). In April 1878, there was about 12 feet of water on the bar at Oregon Inlet and a schooner of 200 tons was reported to have crossed without incident (*Economist* 23 April 1878).

In 1882, increased use prompted the Corps of Engineers to re-examine plans for improving navigation channels at Oregon Inlet. However, the constant migration south and volatile nature of the inlet environment still proved to be major stumbling blocks to cost-effective improvements. The inlet was found to have moved south and widened to about 500 yards since the previous survey. The channel had deepened, however, and vessels drawing 11 feet could pass though at high water while those drawing nine feet could pass when the tide was out. The Corps of Engineers also noted that on the sound side, Old House Channel ran away to the southwest and was both crooked and highly active. The channel over the bar was more constant but still liable to change in response to storm energy. The high-energy environment made any attempt at improving the inlet costly if not futile.

In 1897, the Oregon Inlet Coast Guard Station was built on the north end of Pea Island. The building was remodeled in 1933 and 1970 and was in use up until December 1988. The station was evacuated due to the constant erosion on the end of the island from the southward movement of Oregon Inlet. The station is listed on the NRHP as being the "oldest active Coast Guard Station in the State of North Carolina" (N.C. Department of Transportation 1989:C-3).

A letter forwarded to the U.S. life-saving service superintendent in December 1895 confirms that the *Little Sampson* of Buxton was engaged in commercial fishing. On 13 October of that year the schooner sailed from Buxton “for Elizabeth City, North Carolina, with a cargo of fresh fish” (United States Life-Saving Service [USLSS] 1897:257). Later that day, the vessel “was driven ashore on a reef in consequence of a gale”, however, due to the efforts of the Gull Shoal station, the *Little Sampson* was refloated a few days later (USLSS 1897:257). At the time of the mishap, the seven-ton schooner was under the command of Master Barnett and carried finfish valued at \$120 (USLSS 1897:316-317).

Another contemporary and popular vessel plying late-nineteenth-century Dare County waters was the sharpie (Stick 1958:179; Figure 37). Contemporary records compiled by District Six station heads (Cape Henry to Cape Fear) identified Dare County vessels including the schooner *I. D. Jane* of Hatteras [Avon], the sloop *Little Inez* of Kinnakeet, the sailboat *Mary Caroline* of Roanoke Island, the sailboat *Rosette* of Roanoke Island, the schooner *Dorcas Jane* of Big Kinnakeet, and one unknown “Fish boat” of Hatteras. The outbound cargoes carried aboard these vessels appeared to be chiefly fish or oysters (Figure 38), and inbound cargoes brought to their homeports included corn and wood, and “General” merchandise (USLSS 1897:316-317).

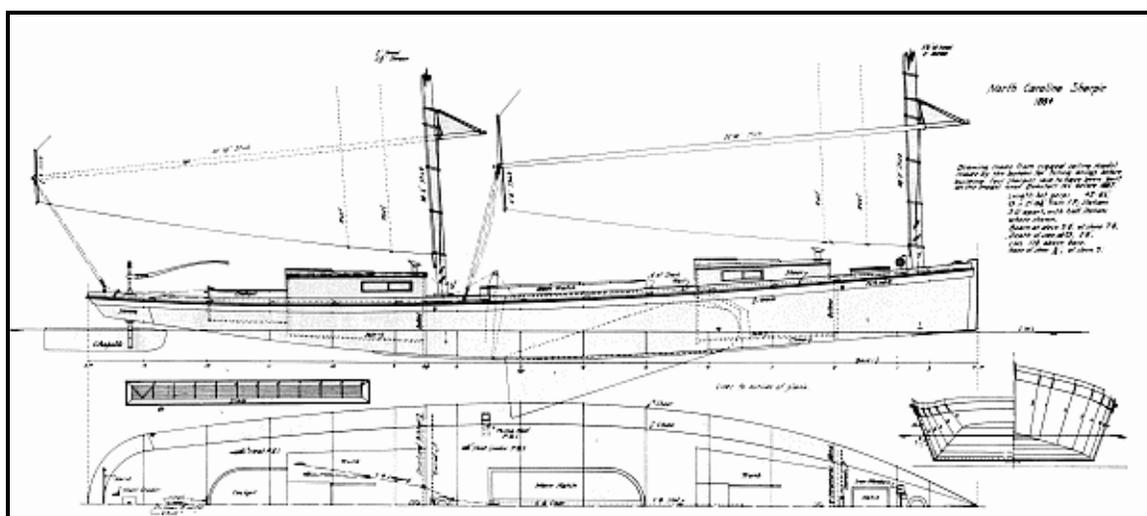


Figure 37. Drawing of North Carolina sharpie, 1891 (Chapelle 1961:143).

A highly visible vessel near Cape Hatteras seen at its official station was the Diamond Shoal lightship. This vessel served local watercraft, coastwise traders and foreign shipping in one of the most dangerous seaways in North America. Ironically, one of the lightships (Figure 39) survived the horrific effects of the San Ciriaco hurricane during August 1899, when the government-owned vessel was swept on the beach (Hairr 2001:72). Another would be destroyed some 19 years later by a German submarine stalking shipping along the Atlantic seaboard.



Figure 38. Outer Banks oyster boat (b. 1889) that sailed waters of Dare County for decades (Hairr 2001:81).



Figure 39. Diamond Shoals lightship beached after 1899 San Ciriaco hurricane (Hairr 2001:72).

Twentieth-Century Development

An interesting story published by *The Washington Herald* in January 1909 touched on local activities at Kill Devil Hills. Owing to the historic flight undertaken by the Wright brothers at that location, the small North Carolina town was known in international circles. An excerpt from the District of Columbian newspaper printed on 17 January follows:

Reliable information from Kill Devil Hills, N.C. is that the Wright brothers, now in Europe, are making preparations there for experiments with an improved aeroplane, said to be far in advance of the machine which they are now using...When the Wrights left Kill Devil Hills last spring after a series of flights, which startled the world, and proved that navigation of the air with heavier than air machines was a fact, they announced that they would 'probably return some day.' At Kill Devil Hills the combined aerodrome workshop and living apartments of the Wrights is still intact, and in it is much aeroplane paraphernalia. It is believed that the departure of Orville Wright for Europe is for the purpose of hastening the conclusion of business deals there, that the experiments at Kill Devil Hills may be continued (*The Washington Herald* 17 January 1909).

Although Dare County principally remained remote and underdeveloped in the years preceding The Great War, Gannon (1991:243) remarked that due to the brisk shipping passing along its barrier islands, "German U-boats worked the adjacent waters in 1918 destroying (by torpedo, mine, or driving aground) six tankers, a schooner, a bark, and the Diamond Shoals Lightship." Some of these war losses are identified in Attachment A. In respect to military activities carried out in the vicinity of Cape Hatteras in the postwar period, a controversial bombing experiment was conducted by Brigadier General William Mitchell.

According to Branch (2006), Mitchell "had demonstrated in 1921 what many naval strategists considered impossible-that battleships could be destroyed from the air-when he used airplanes to sink an old surplus battleship" off the coast of Virginia. In September 1923, Mitchell:

[S]et up the experiment off Cape Hatteras to determine if battleships could be sunk by high-level bombing and to measure the potential for aircraft being called into combat from long distances to intercept a hostile warship. The target vessels, which were to be scrapped under postwar naval limitation treaties, were the 14,949-ton *New Jersey* and *Virginia*, built between 1902 and 1906 at a cost of \$6 million each and anchored 18 miles southeast of Cape Hatteras (Branch 2006).

The initial air attack was made by planes flying in from Langley Airfield in Virginia, some 175 miles to the north, while Mitchell's own planes flew out to the site from a make-shift airfield located on Hatteras Island. In the aftermath, the two vessels were successfully

destroyed; the *Virginia* sank in 30 minutes, and the *New Jersey* disappeared in the ocean within minutes (Branch 2006). Due to his popularity with Hatteras Islanders, the airfield at Buxton was eventually named for “Billy” Mitchell (Hairr 2001:85).

The development of a lucrative fishing industry at Manteo increased pressure to improve navigation between that island and the Atlantic, which affected the region including the project area. In 1910 and 1911, dredging was begun to link Shallowbag Bay with Oregon Inlet. Proposed improvements called for a 6-foot-deep, 100-foot-wide channel across Shallowbag. Maintenance dredging of this channel was carried out in 1916, 1929, and 1934 (Angley 1985:12-13). The next step in the process of linking Manteo with Oregon Inlet was proposed in 1927. The Corps of Engineers investigated the feasibility of maintaining a 6-foot-deep, 150-foot-wide channel from Manteo through Roanoke Sound and into the main channel across the Pamlico Sound.

However, It was not until 1940/1941 that a channel of this nature was approved and work completed. It was approximately 13 miles long at the same depth as the 1927 proposal, but for economy the channel was dredged some 50 feet more narrow (Angley 1985:13). The improvements were designed to stimulate local commerce and improve navigation for the 5,000 to 15,000 vessels that navigated between Roanoke Island and Oregon Inlet (Angley 1985: 14). By 1940, local interest groups began to push for additional improvements to the channel from Manteo to Oregon Inlet and called for dredging and maintaining a channel through the inlet itself. They believed that this would "stimulate further growth in the fishing industry, increase salinity in the sounds, and provide a badly needed place of refuge for deep-sea trawlers fishing along the Outer Banks" (Angley 1985: 14).

Three years earlier the Elizabeth City *Daily Advance* reported that there were "100 boats occupied in the fishing industry around Oregon Inlet" and recorded that "President Roosevelt asked about fishing at Oregon Inlet" in conjunction with a visit to Roanoke Island in August 1937 (*Daily Advance* 23 June 1937). The newspaper went on to report the sport fishing for drum and channel bass at Oregon Inlet, "annually attracts thousands of sportsmen from northern cities as well as nearby towns" and each year brings approximately \$100,000 into the economy of Dare County (*Daily Advance* 23 June 1937).

Other significant regional infrastructure improvements were constructed and installed during the pre-World War II era as depicted by a 1938 Dare County map prepared by the North Carolina State Highway and Public Works Commission. In addition to relevant extracts taken from the publication that includes the Currituck County Township of Duck, the map's legend is also included to convey the impressive extent of the “modern” improvements (Figure 40; Figure 41, and Figure 42).

In *Operation Drumbeat*, Gannon (1991) provides an excellent overview of Germany's initial World War II Unterseeboot attacks along the vulnerable Outer Banks, which focused on the waters off Cape Hatteras. Specifically, the work sheds light on the remarkable albeit terrifying exploits of Reinhard Hardegen, commander of U-123 as the Bremen-born former Naval airman carried out Operation Paukenschlag. The German High Command astutely

recognized that the destruction of civilian maritime commerce making the critical turn at Cape Hatteras would cripple the United States military and its allies.

A dramatic photograph taken on 26 March 1942 shows the devastating torpedo attack on the *Dixie Arrow* off Cape Hatteras by U-71 (Figure 43). This “Second Battle of the Atlantic” period was boldly called [in translation] “The Second Happy Time” or the “American shooting season” by many German submarine commanders. An additional image depicts the massive tanker in the previous month (Figure 44). At the time of its destruction, the 8046-ton *Dixie Arrow* was transporting 96,000 barrels of crude oil from Texas to New Jersey. War losses from this period are identified, when possible, in Attachment A.

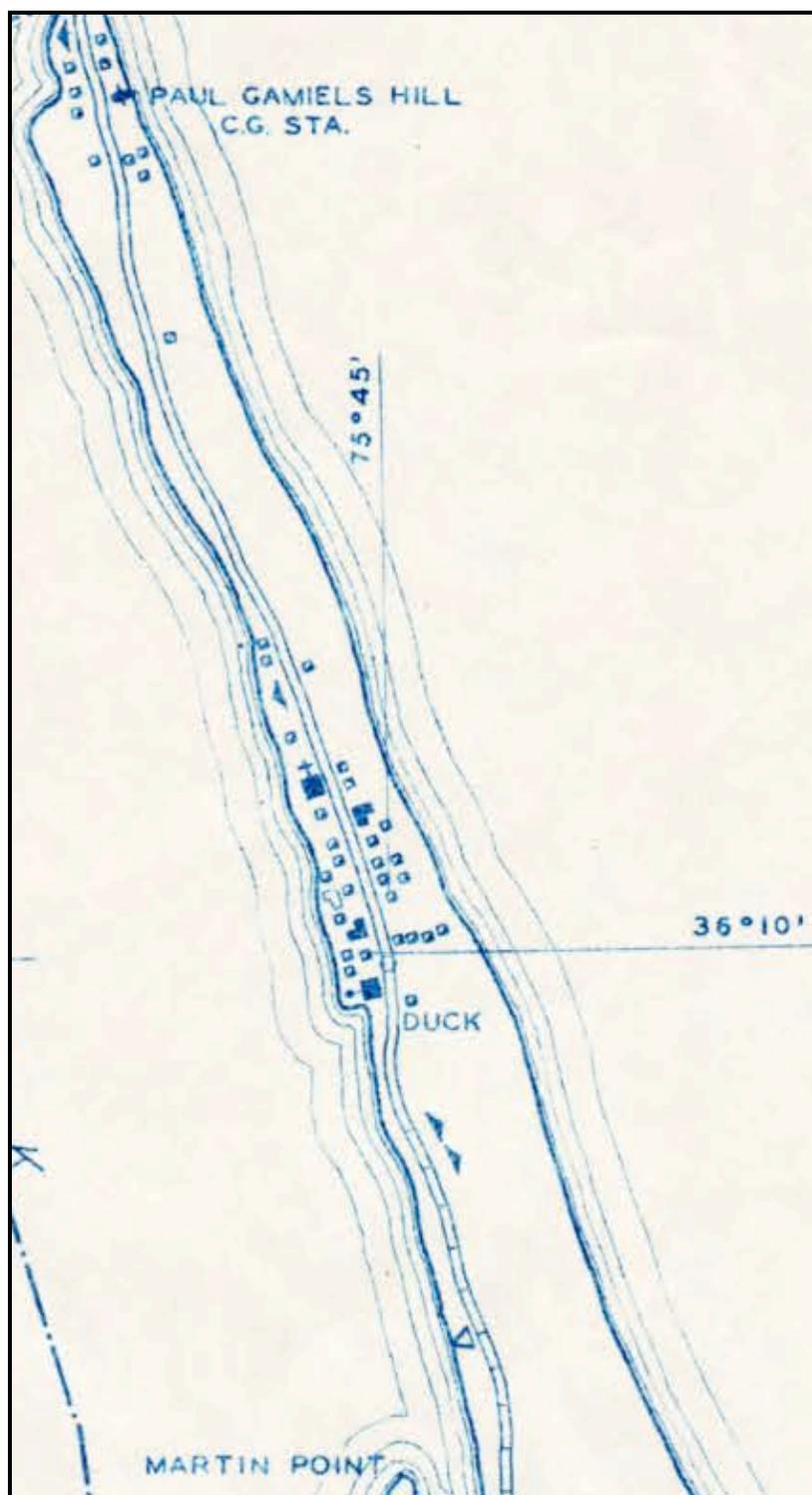


Figure 40. Extract from 1938 Dare County map (North Carolina State Highway & Public Works Commission [SH&PWC] 1938).

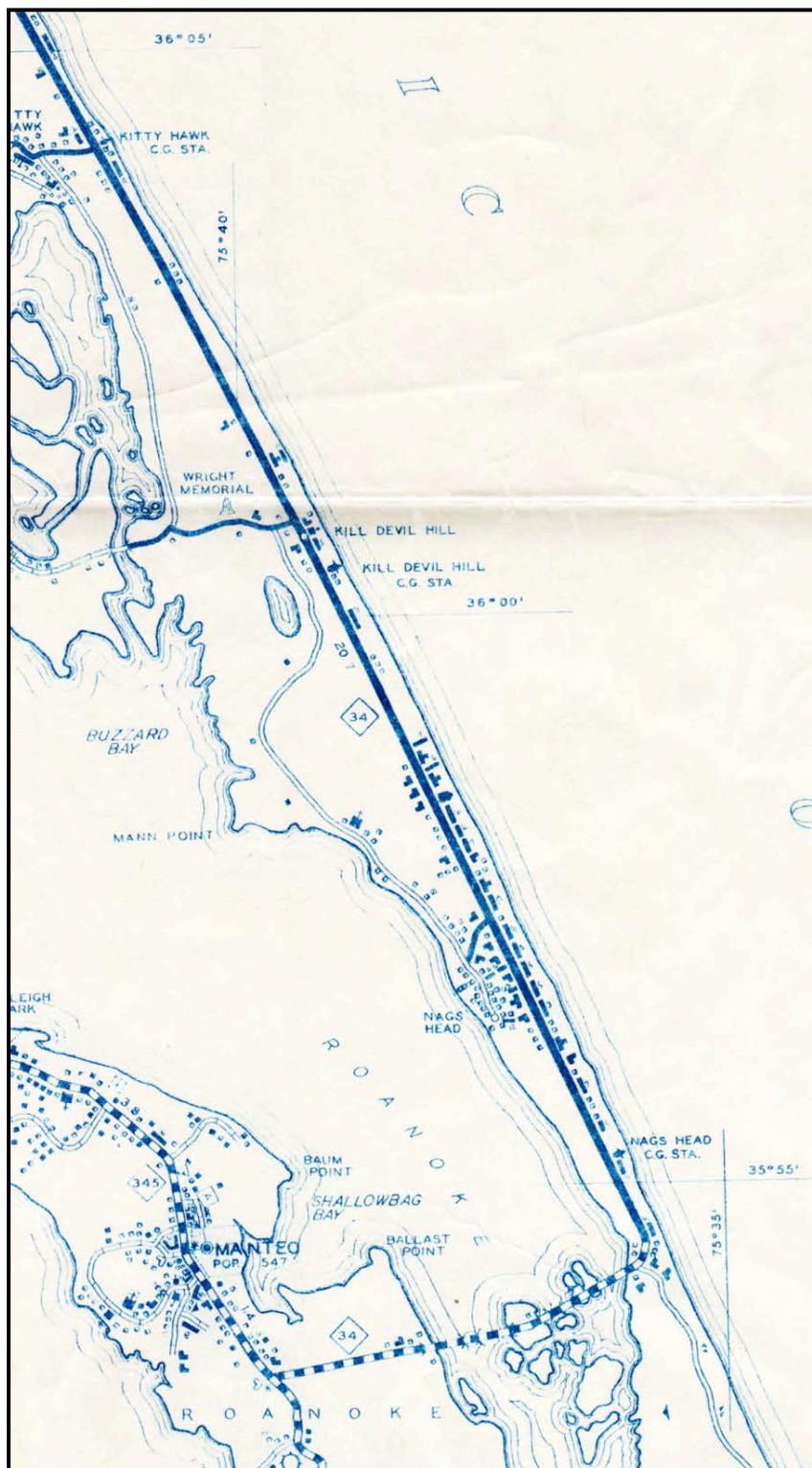


Figure 41. Extract of 1938 Dare County map (SH&PWC 1938).

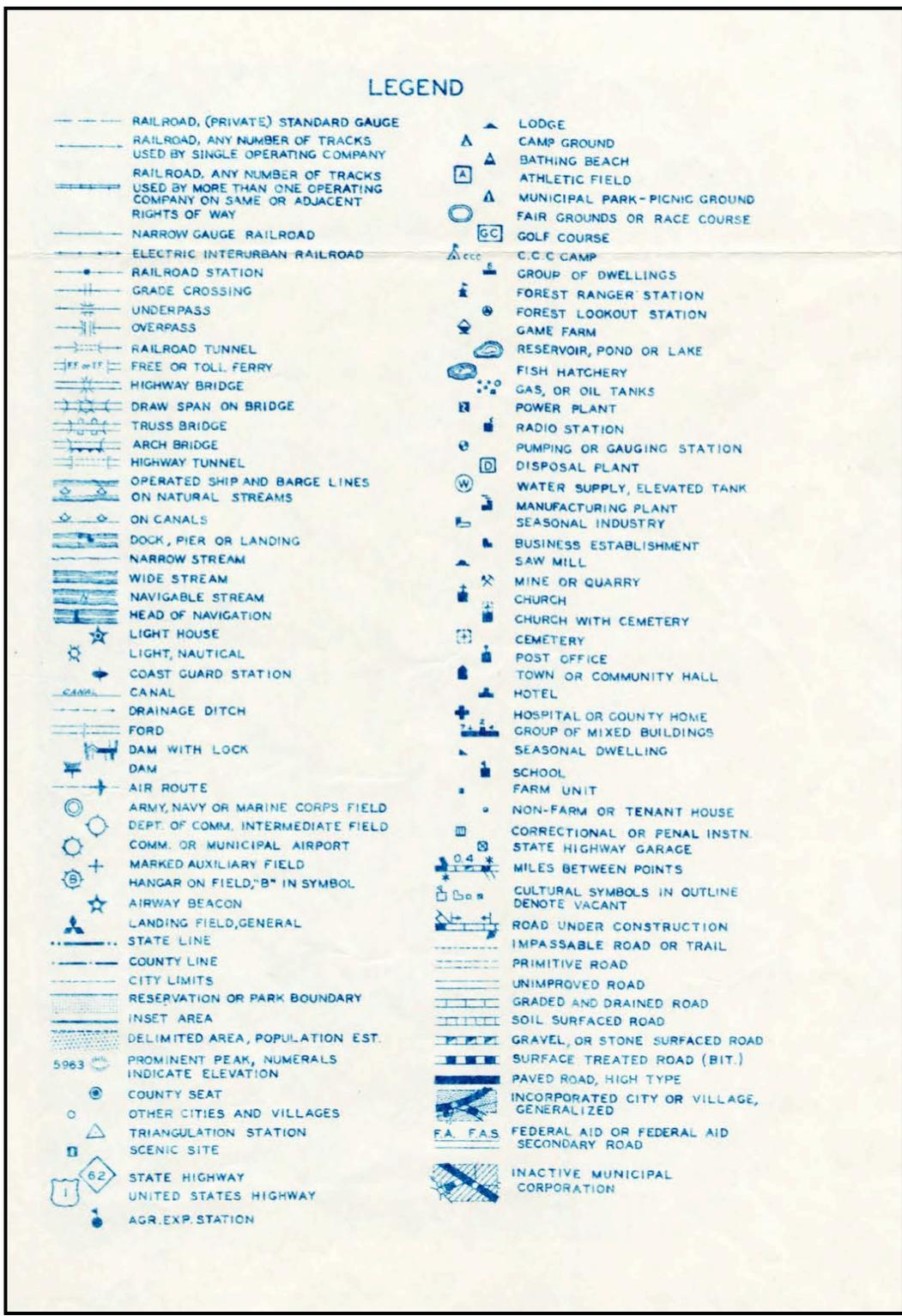


Figure 42. Legend from 1938 Dare County map (SH&PWC 1938).



Figure 43. U-71 attacks *Dixie Arrow* off Cape Hatteras in March 1942 (U.S. Coast Guard [USCG] photo from McKay Collection).



Figure 44. Image of *Dixie Arrow*, 11 February 1942 (USCG photo from McKay Collection).

In 1950, Congress gave approval for a 14-foot-by-400-foot channel across the ocean bar at Oregon Inlet and also authorized maintenance dredging of Old House Channel, Manteo-Oregon Inlet channel, and a channel from Manteo Oregon Inlet channel to Wanchese. A 200-foot-by- 600-foot basin was to be dredged at Manteo and a 200-foot-square harbor

created at Wanchese (U. S. Army Corps of Engineers 1987). To stabilize the inlet channel and deter its southward migration, the Corps proposed the idea of building two rubble-mound jetties. The jetties would extend seaward from either shoulder of the inlet and stabilize the channel. After careful consideration this plan was not deemed economical (Angley 1985: 16).

By 1950, the Outer Banks' reputation as a recreational area was increasing rapidly. The town of Nags Head became a popular resort and that popularity provided support for rapid commercial development of the oceanfront. In addition, sport-fishing boats catering to the tourist joined the fishing fleets operating out of Oregon Inlet. Vessel traffic substantially increased the demand for improvements to navigation and political support for such projects. Over the next ten years the Corps worked to meet the channel specification outlined in 1950.

After the National Park Service opened the Cape Hatteras National Seashore in 1953, demands for ferry transportation across Oregon Inlet increased dramatically (Angley 1985:17). By 1957, a 12-foot-deep channel was dredged across Oregon Inlet from the north ferry slip on Bodie Island to Pea Island. This channel was maintained over the course of the following two years by the hopper dredge *Barracuda*. Navigating the inlet remained a hazardous endeavor, however, and the ferry was frequently delayed by stranded fishing boats blocking the narrow channel (U. S. Army Corps of Engineers 1959; Angley 1985:16).

In response to these problems local residents began to lobby for an Oregon Inlet bridge. In August 1961, politician Herbert C. Bonner suggested to his colleagues in Congress that a bridge, financed by both state and Federal revenue, should be built across the inlet. Shortly after Bonner's petition was approved, specifications for the bridge were developed. According to Angley (1985:17), "the structure would be two and a half miles long, ...would curve westerly over the inlet, ...[and] would be twenty eight feet wide and elevated sixty-five feet above the water". The historic opening of the Bonner Bridge provided ready access to the Cape Hatteras National Seashore and attracted countless tourists to all parts of remote Dare County, including access to the northern Outer Banks. This event stimulated the origins of the modern economy of the project area.

Outer Banks Area Shipwrecks

Historical source materials for the earliest periods of exploration and colonization are extremely limited and contain few geographically specific details. This was primarily a factor of the state-of-the-art of navigation. In later periods shipwreck references become more frequent, but until well into the twentieth century, location data was rarely accurate. This was because of the limitations of navigational accuracy and the methods of communicating and recording wreck-specific information. In addition, the loss of a vessel, cargo, and crew was certainly more important than the precise location of the disaster. Those complications make exact correlation of historical shipwreck information with remote-sensing data difficult under most circumstances. However, an inventory of documented vessel losses off Dare County provides a basis for preliminary vessel specific association

with remote-sensing targets. This inventory, which covers the coast from Currituck Inlet to Hatteras Inlet, is added as Attachment A.

The remains of vessels from Sir Francis Drake's fleet preserve evidence associated with the earliest English colony in the New World on Roanoke Island. Other sixteenth-century shipwreck sites have provided information about the Spanish conquest and colonization of the Americas. Vessels lost during the seventeenth century represent sources of data concerning the exploration and earliest permanent settlement along the North Carolina coast. Evidence of our colonial development and Revolutionary War survives in association with shipwreck sites of the eighteenth century. Nineteenth-century vessel remains document one of the most dynamic periods of United States maritime history, during which dramatic changes took place in the design and construction of ships. During the Civil War considerable maritime and naval activity took place along the North Carolina Outer Banks and many Union and Confederate vessels were sunk. Evidence of modern ship development and the ultimate decline of American maritime power survives in the remains of twentieth-century shipwrecks. Those include the last working sailing vessels as well as steamers, submarines, and warships.

The remains of vessels provide valuable opportunities to examine and reconstruct important aspects of our maritime heritage that frequently have not survived in the written historical record. Historic shipwrecks contain information concerning the design and construction of vessels that was never a part of the written record. Well into the twentieth century, shipwrights continued to build vessels without benefit of plans or documentation. Although the displacement of shipwrights by engineers in the nineteenth and twentieth centuries brought increasing documentation, much of that evidence has not survived. This makes shipwrecks one of the most important sources of data concerning the evolution of vessel architecture and construction.

Ships and small vessels provided the most important element of trade and transportation system until late in the nineteenth century. They were the essential element of European exploration and development of the western hemisphere. Because of the instrumental role vessels played in that historical process, their remains contain an important record of the evolving material culture in the area. Artifacts associated with wrecks provide insight into shipboard life that permits the reconstruction of historic lifeways. Material carried as cargo reflects the development of the economic system that supported European development of North America. Cargo also reflects the development of technologies associated with virtually every aspect of life along the Atlantic seaboard.

Previous Remote-Sensing Investigations

Between 1997 and 1998, two surveys, under separate contracts, were undertaken by Mid-Atlantic Technology and Environmental Research, Inc. of Castle Hayne, North Carolina in order to ensure that no significant shipwrecks or cultural resources would be adversely impacted by offshore dredging designed to renourish beaches between Oregon Inlet and Kitty

Hawk (Hall 1999). Two separate borrow areas were surveyed; one offshore from Kitty Hawk, the other east of Nags Head. In addition, a terrestrial reconnaissance was conducted to identify any exposed shipwreck remains along the beach. As a result of these surveys, three single-source magnetic anomalies were identified in the borrow areas offshore from Kitty Hawk. No targets were discovered in the borrow area near Nags Head. No additional investigation was recommended.

In 2009, TAR carried out a remote-sensing survey of three offshore borrow sites located east of Nags Head, North Carolina. Those sites were surveyed for Coastal Science and Engineering, Inc. (CSE). CSE was working with the Town of Nags Head to identify a source of beach nourishment quality sand to restore local beaches. That survey was carried out between 2 and 5 July 2009. Analysis of the remote-sensing data generated during the survey identified a total of six magnetic and no acoustic anomalies in Area 1 and no magnetic or acoustic targets in Areas 2 and 3. These six magnetic anomalies, grouped in two clusters, had signature characteristics suggestive of potentially significant cultural material. Avoidance of these two target clusters was recommended by the creation of 400-foot diameter buffers around each site.

Survey Weather Conditions

Weather conditions during survey operations varied considerably as is almost always the case during any extended period in the autumn season off the North Carolina Outer Banks. At the start of the survey on 20 October 2014, winds were northeast at about 10 knots and seas were three to four feet under a partly cloudy sky.

On 21 October winds shifted to the southwest and remained about 10 knots. Seas moderated to between two and three feet under a partly cloudy sky. On the following day, conditions were overcast and the wind shifted to the northwest and increased all day from 15 to above 20 knots in advance of a storm. Due to inclement weather, survey operations were suspended and the *Thunderforce* cruised to Portsmouth, Virginia in eight to ten foot seas. Surveying resumed on 25 October. The sea state was two to three feet and winds were north-northwest from five to seven knots. The sky was clear with pleasant temperatures.

On 26 October 2014 wind increased early to 10 to 15 knots gusting to 20 and seas increased from four to six feet. By late afternoon conditions improved with winds and seas dropping. The sky remained clear all day. By 27 October, winds shifted from southwest to northwest with speeds from five to ten knots under a clear sky. On the final day of operations winds were southwest to south-southwest and blowing five to eight knots. Seas remained at two to three feet all day under a clear sky.

Survey Data Analysis

Magnetometer Data Analysis

Analysis of the magnetic data generated by the Borrow Site A and Borrow Site B surveys was carried out using HYPACK 2014 and QUICKSURF. Each line of raw magnetic data was reviewed and edited using HYPACK'S "single beam editor" to identify and characterize anomalies and remove spurious data. Edited data files were saved and then sorted to produce georeferenced x, y, z format data for contouring. Each anomaly was saved as a target file and the line number, target number on line, signature characteristics, gamma intensity and signature duration used to identify the anomaly. Using QUICKSURF contouring software, magnetic data generated during the survey were contour plotted at 5-gamma intervals for additional analysis, accurate location and graphic representation. An EXCEL spreadsheet, which contained each of those characteristics and an assessment of potential significance was created for the anomalies. This spreadsheet was used to create a shapefile for inclusion into a project GIS. The contoured data was edited in AutoCAD and the contours saved as a DWG or DXF for inclusion in the project GIS. Potentially significant anomalies and/or anomaly clusters were buffered and recommended for avoidance or additional investigation.

Sonar Data Analysis

Sidescan sonar acoustic records were analyzed using Chesapeake Technology's SONARWIZ software. Each line of data was reviewed to identify targets on the basis of configuration, areal extent, target intensity and contrast with background, elevation and shadow image. Each target image was imported into an Excel spreadsheet file that contained an assessment of potential significance for both of the survey areas. Those Excel spreadsheets were used to create shapefiles of Borrow Area A and Borrow Area C for inclusion in a project GIS. SONARWIZ software was also used to create a mosaic of each of the survey areas. Potentially significant sonar targets and/or target clusters were buffered and recommended for avoidance or additional investigation.

Sub-bottom Profiler Data Analysis

Sub-bottom profiler acoustic records were analyzed using SONARWIZ software. Each line of data was reviewed to identify features that could be associated with anomalies and sonar targets. Features that represent relict landforms were also identified to determine if there might be a potential association with prehistoric submerged cultural resources. Each landform image was captured and included in a target report produced with SONARWIZ software.

Description of Findings

Borrow Area A

Acoustic data generated by the survey of Borrow Area A produced in excess of 200 percent coverage of the bottom surface (Figure 45). Analysis of the acoustic data identified 10 sonar targets (Attachment B). One of the sonar targets is a small single object, three are bottom surface features and the remaining six appear to be sections of pipe, cable, logs or pilings (Attachment C). None have an association with any of the magnetic anomalies.

Analysis of the Borrow Area A sub-bottom profiler data confirmed excellent sediment penetration and revealed that no stratigraphic features are associated with either the sidescan sonar targets or the magnetic anomalies. No evidence of complex relict landforms such as channels, lagoons and estuaries that might be associated with prehistoric habitation are present. Only one image on a single lane contained evidence of such features (Figure 46).

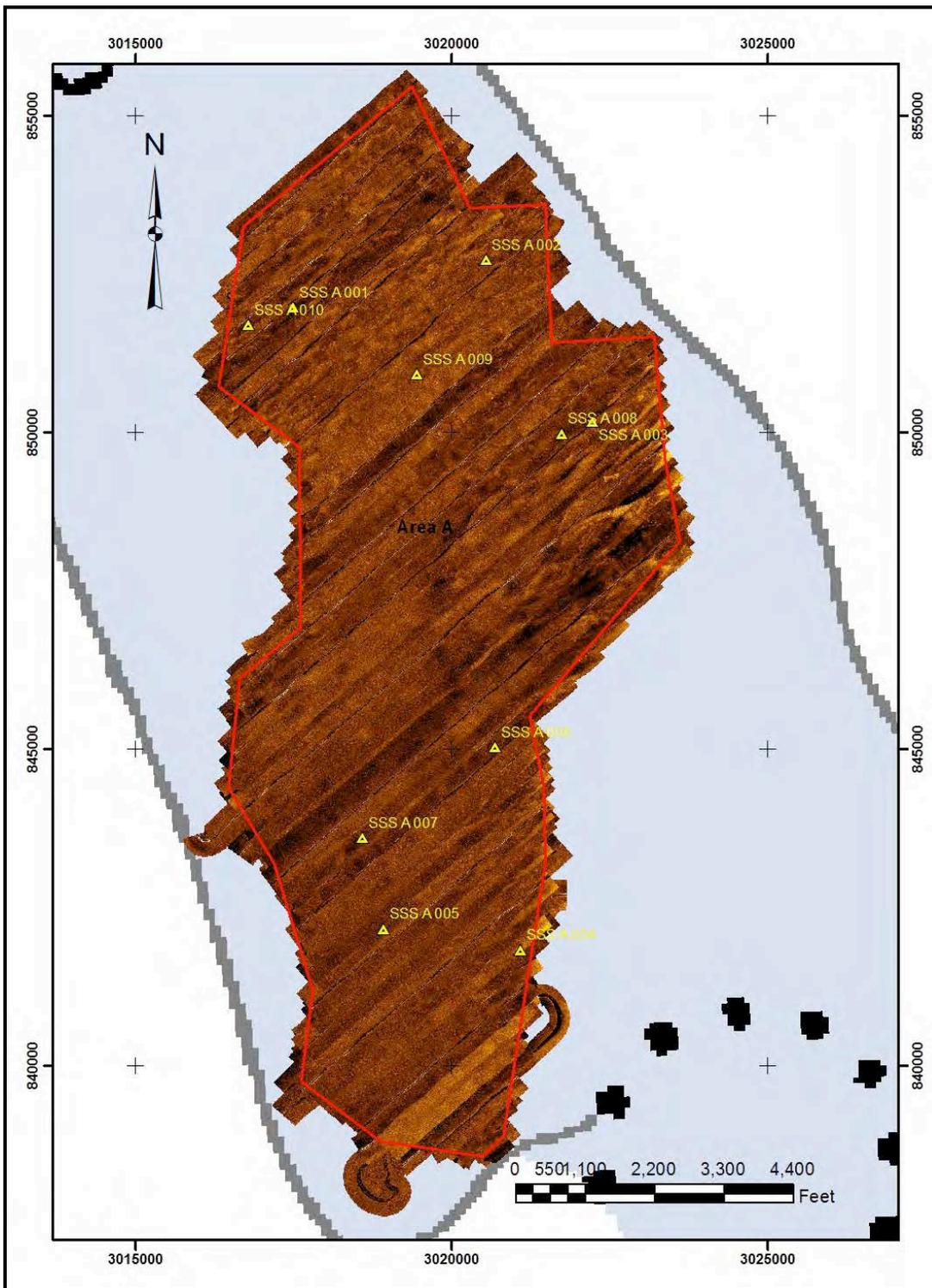


Figure 45. Borrow Area A sonar coverage mosaic with targets (NOAA Chart 12200).

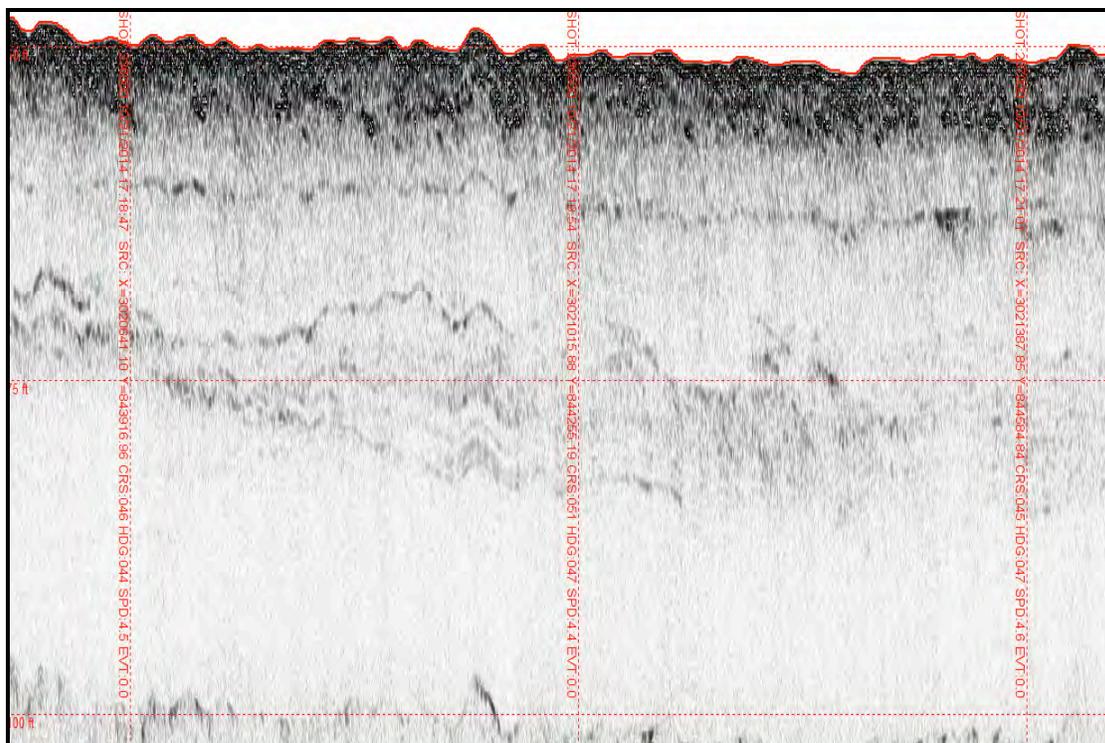


Figure 46. Sub-bottom profiler data example from Borrow Area A survey line 383.

Line by line analysis and contouring of the magnetic remote-sensing data generated during the survey of Borrow Area A identified nine anomalies (Figure 47). Four of the magnetic anomalies represent small single objects, three represent moderate single objects and two represent moderate single or multiple objects (Attachment D). One cluster of two moderate single objects, 360-1-pm-19.3g-102.1f and 360-2-nm-70.8g-122.8f (Figure 48), and two of the moderate single or multiple object anomalies, 352-1-nm-21.3g-398f (Figure 49) and 306-1-pm-101.1g-136.2f (Figure 50) are recommended for avoidance and buffered. The buffered anomalies and anomaly cluster located in Borrow Area A have signature characteristics suggestive of potentially significant historical vessel remains.

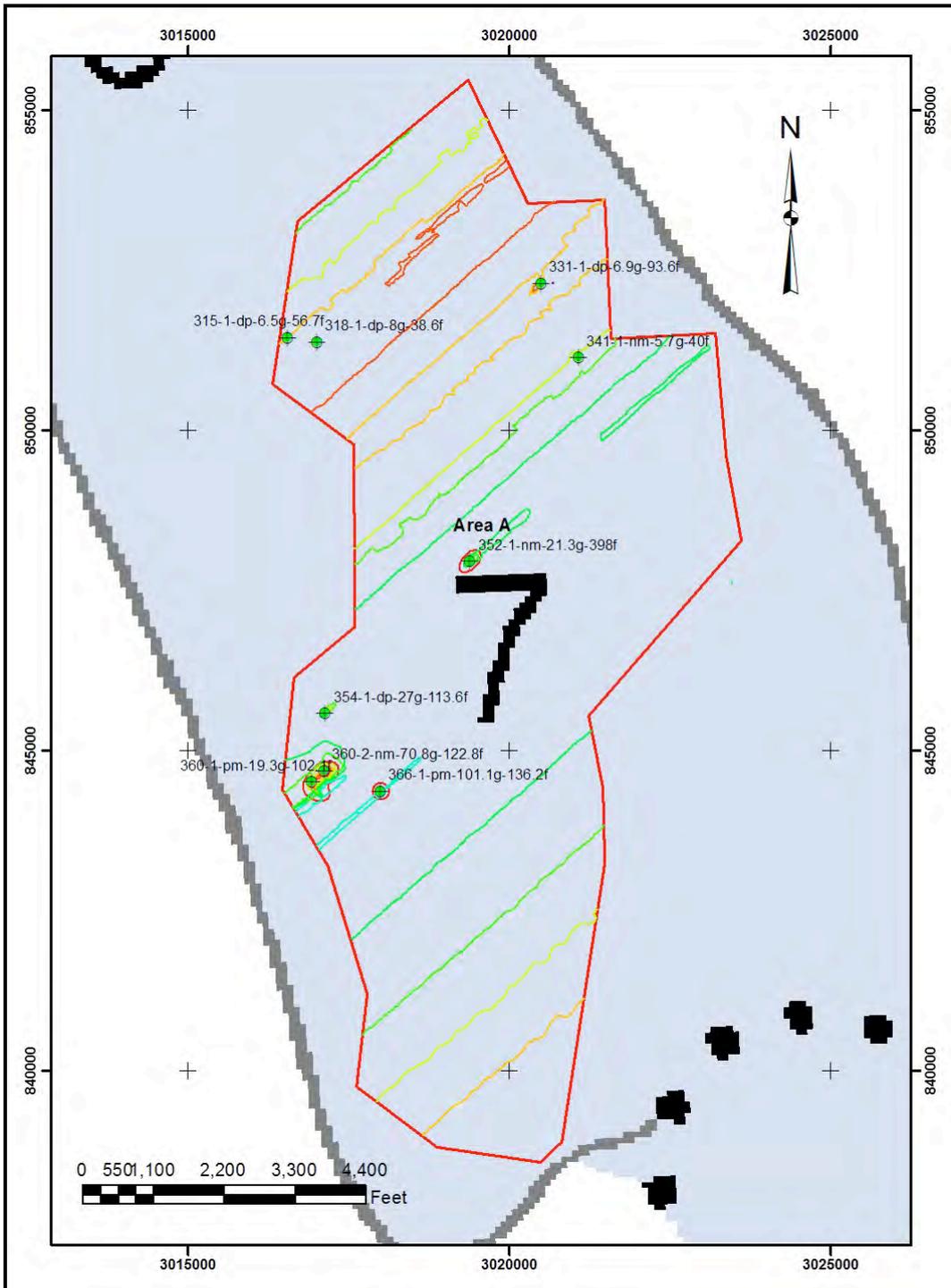


Figure 47. Borrow Area A magnetic contours, anomalies and recommended avoidance buffers (NOAA Chart 12200).

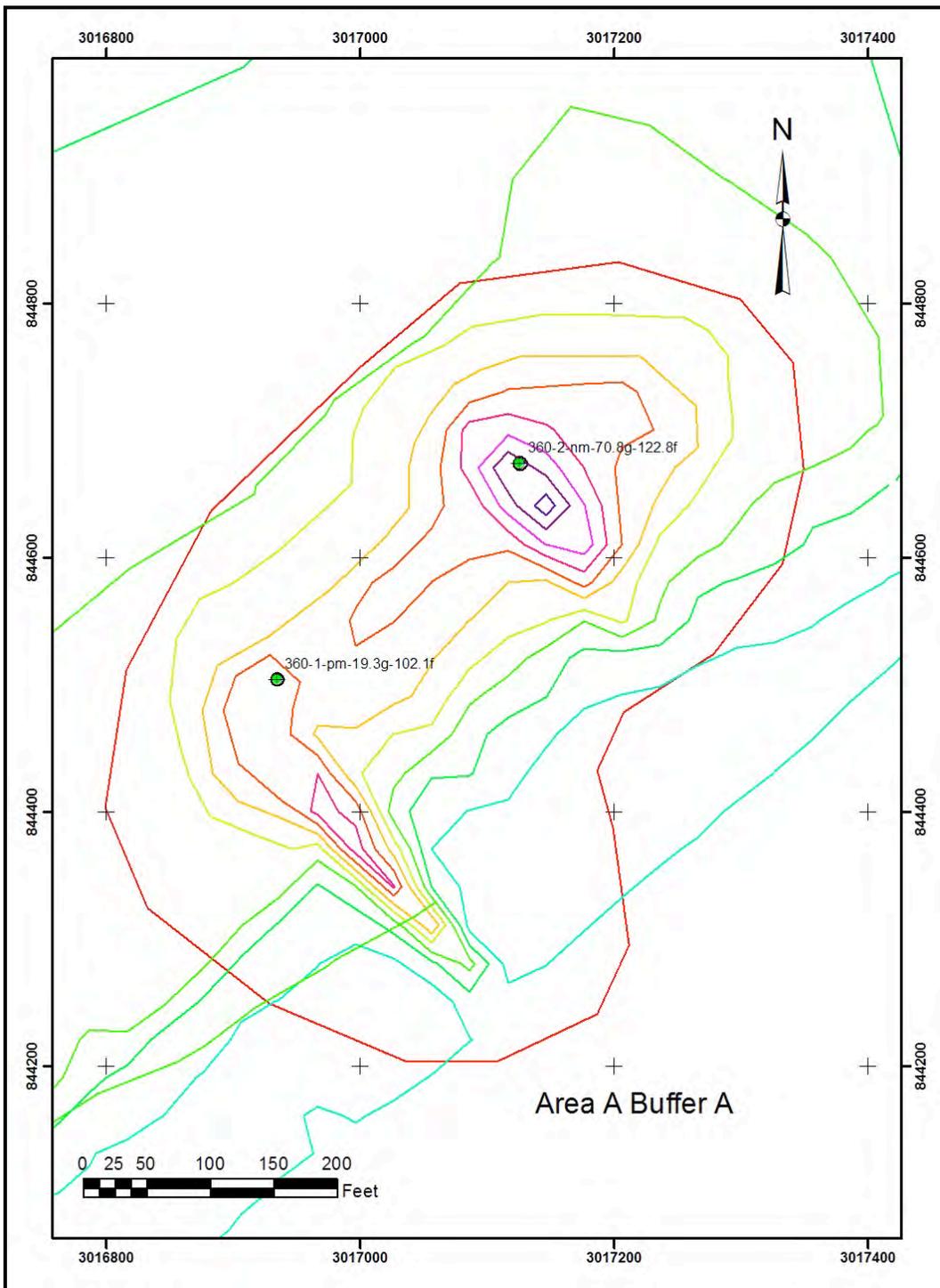


Figure 48. Anomalies recommended for avoidance and included in Buffer A.

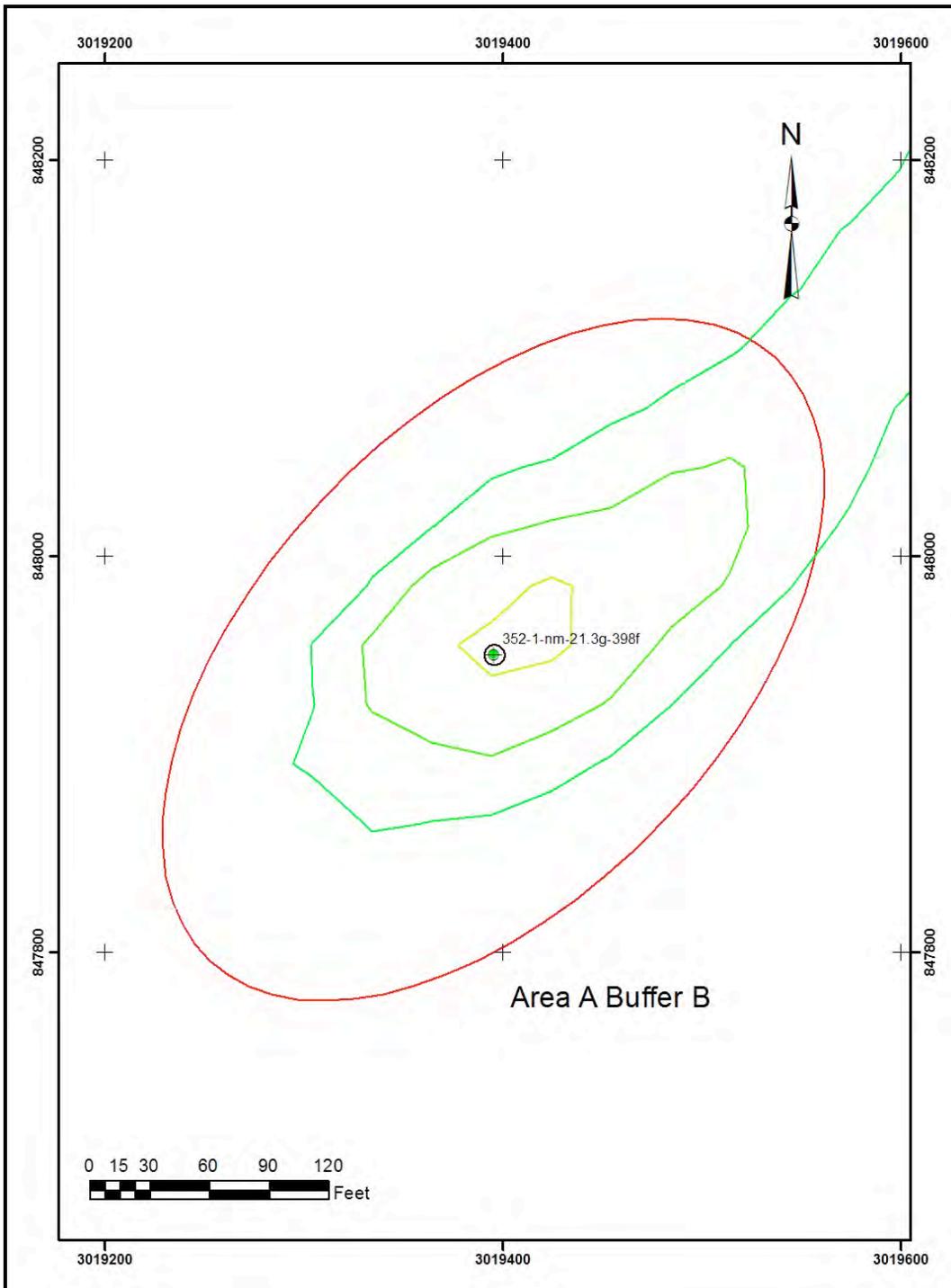


Figure 49. Anomaly recommended for avoidance and included in Buffer B.

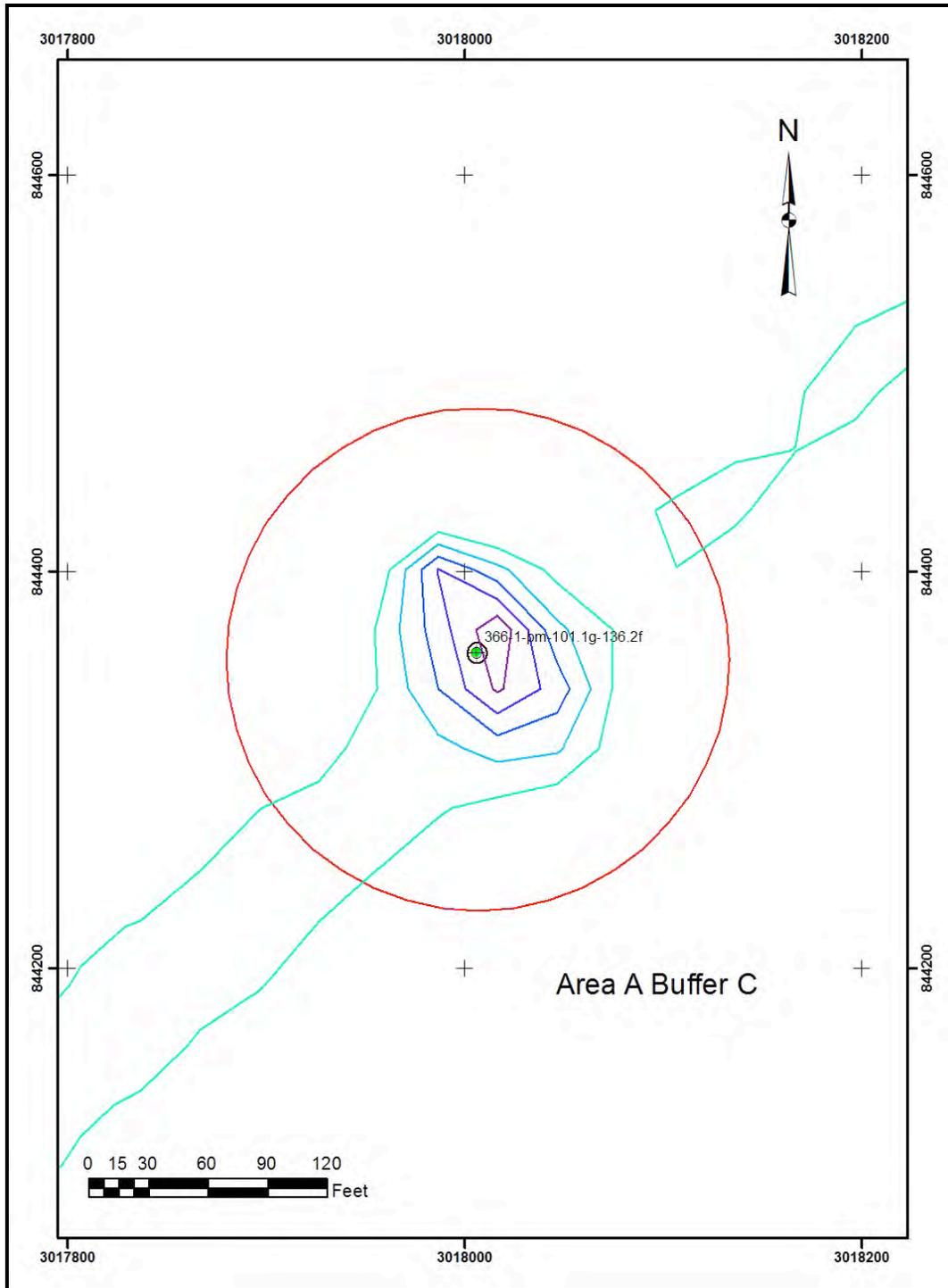


Figure 50. Anomaly recommended for avoidance and included in Buffer C.

Borrow Area C

Acoustic data generated by the survey of Borrow Site C produced in excess of 200 percent coverage of the bottom surface (Figure 51). Analysis of the acoustic data identified nine sonar targets (Attachment E). Four of the sonar targets represent small single objects, three are bottom surface features and the remaining six appear to be clusters of small objects (Attachment F). Four of the targets have no association with any of the magnetic anomalies and five have possible associations.

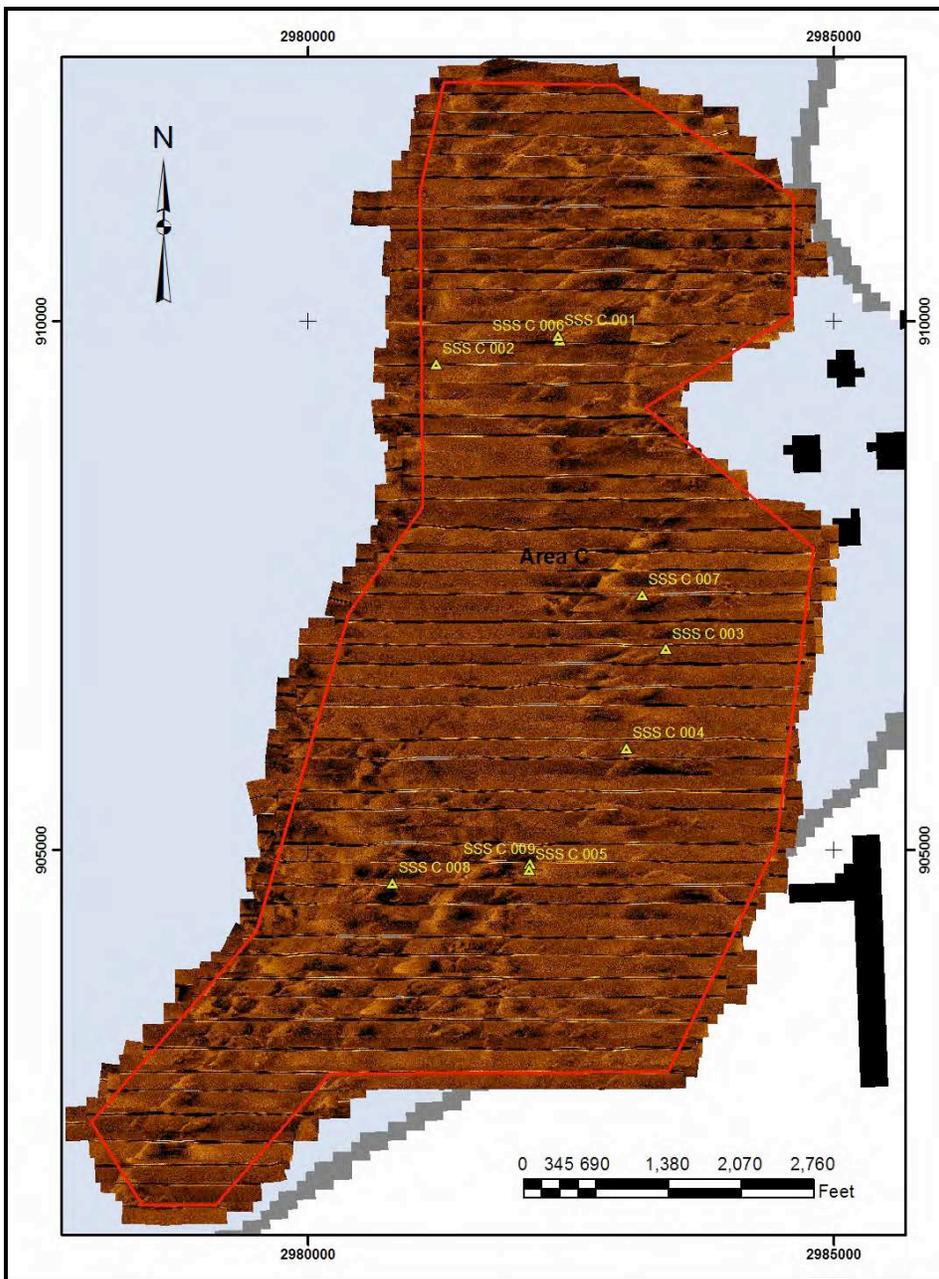


Figure 51. Borrow Area A sonar coverage mosaic with targets (NOAA Chart 12200).

Analysis of the Borrow Area C sub-bottom profiler data confirmed excellent sediment penetration (Figure 52) and revealed that no stratigraphic features are associated with either the sidescan sonar targets or the magnetic anomalies. No evidence of complex well-preserved relict landforms such as channels, lagoons and estuaries that might be associated with prehistoric habitation is present. However, along and outside the western perimeter of Borrow Area C a paleochannel feature is present (Figure 53). The almost vertical nature of the fill suggests a highly active progradational sequence that would not be conducive to prehistoric site preservation.

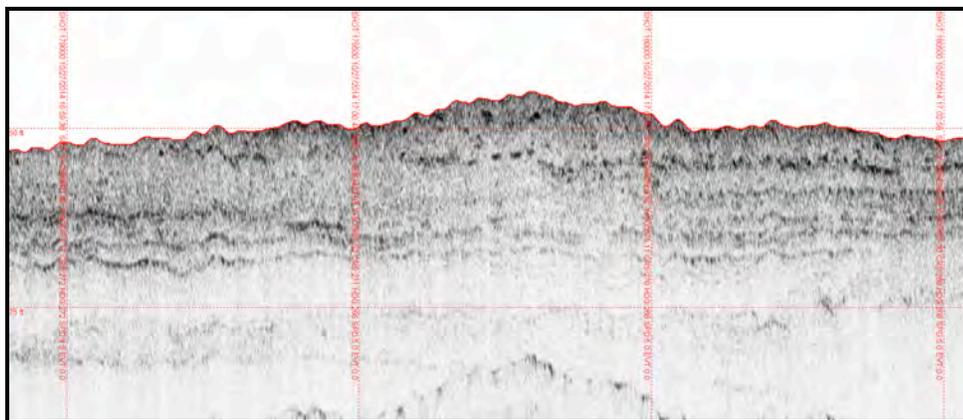


Figure 52. Sub-bottom profiler data example from Borrow Area C survey line 565 East.

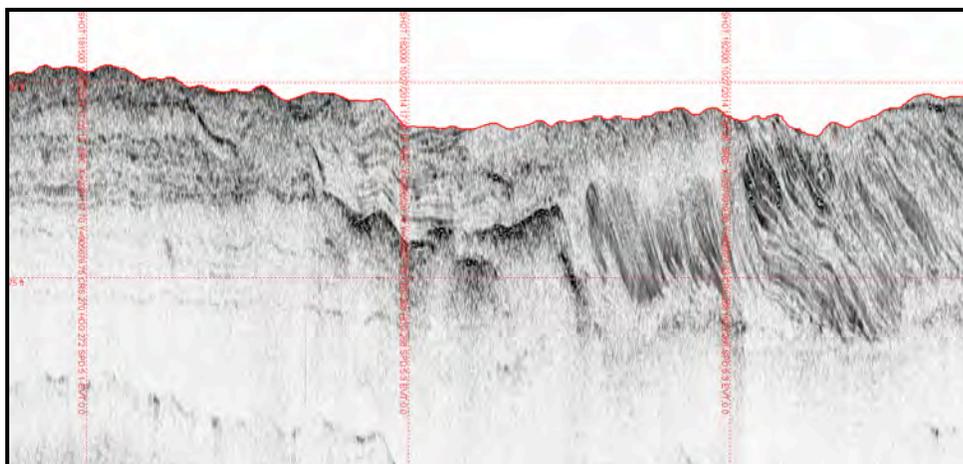


Figure 53. Sub-bottom profiler data example from Borrow Area C survey line 565 West.

Line by line analysis and contouring of the magnetic remote-sensing data generated during the survey of Borrow Site C identified 65 anomalies (Figure 54). Three of the 65 magnetic anomalies lie outside the survey area. Nineteen represent small single objects, seventeen represent moderate single objects, twenty more represent moderate single or multiple objects and six represent complex or clustered objects (Appendix G).

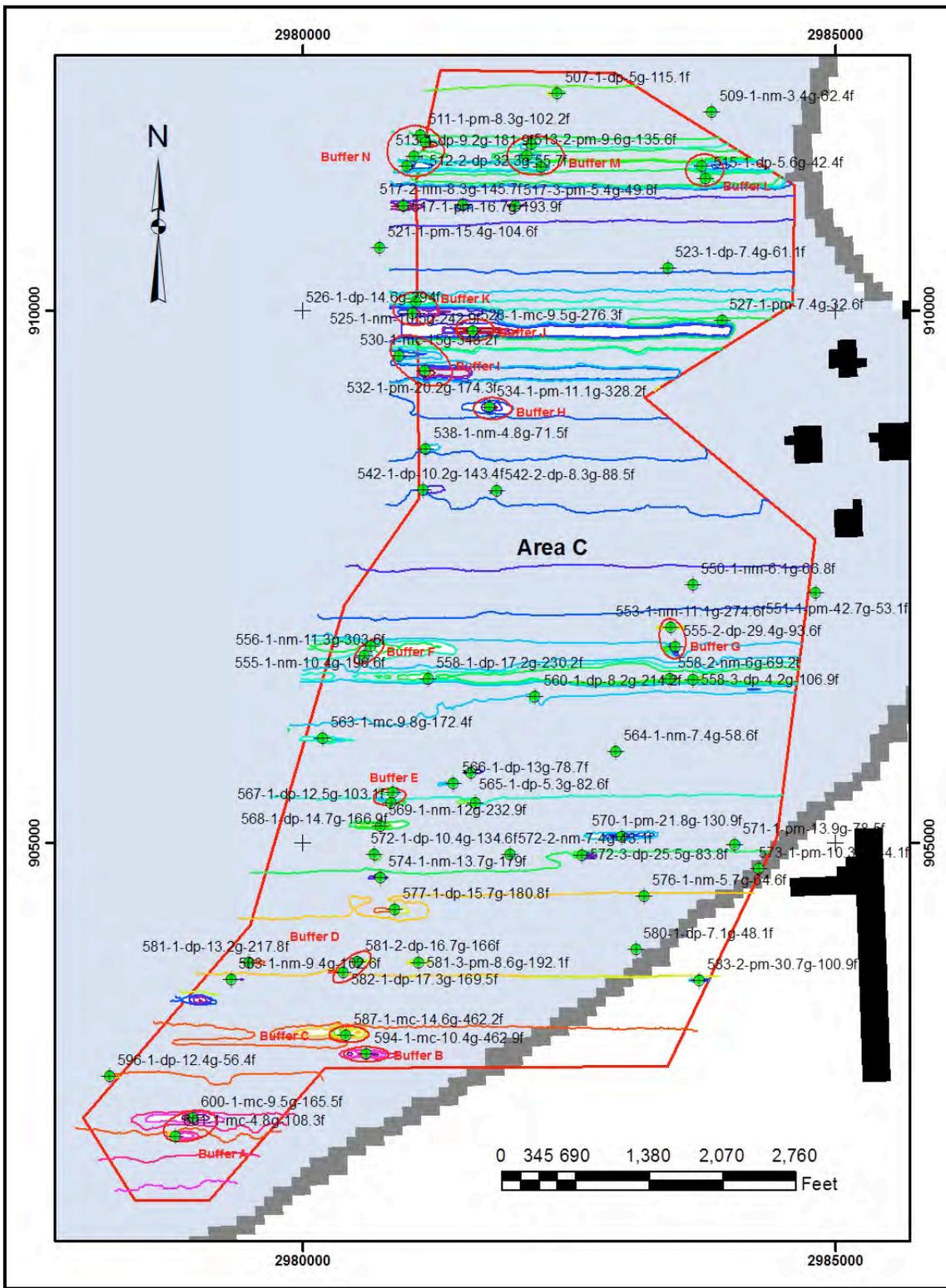


Figure 54. Borrow Area C magnetic contours, anomalies and recommended avoidance buffers (Extract from NOAA Chart 12200).

Twenty-seven of the anomalies are recommended for avoidance and are included in 14 buffers (A through L). The buffered anomalies and anomaly clusters located in Area C have signature characteristics suggestive of potentially significant submerged cultural resources and could be associated with the wreck immediately east of the survey area on NOAA Chart 12200. Buffer A (Figure 55) includes two anomalies 600-1-mc-9.5g-165.5f and 601-1-mc-4.8g-106.3f.

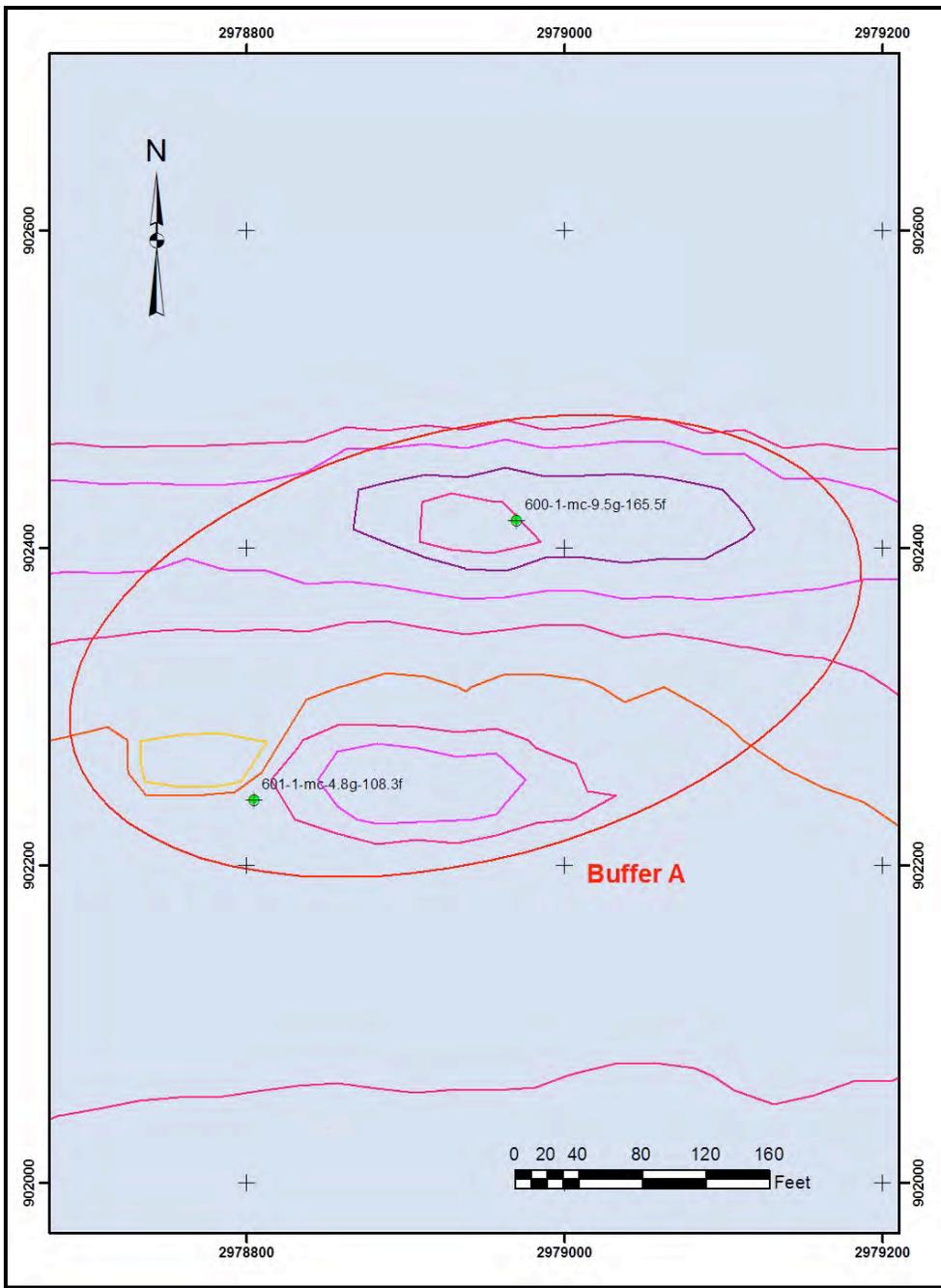


Figure 55. Anomalies recommended for avoidance and included in Buffer A.

Buffer B includes anomaly 594-1-mc-10.4g-462.9f and Buffer C includes anomaly 587-1-mc-14.6g-462.2f (Figure 56).

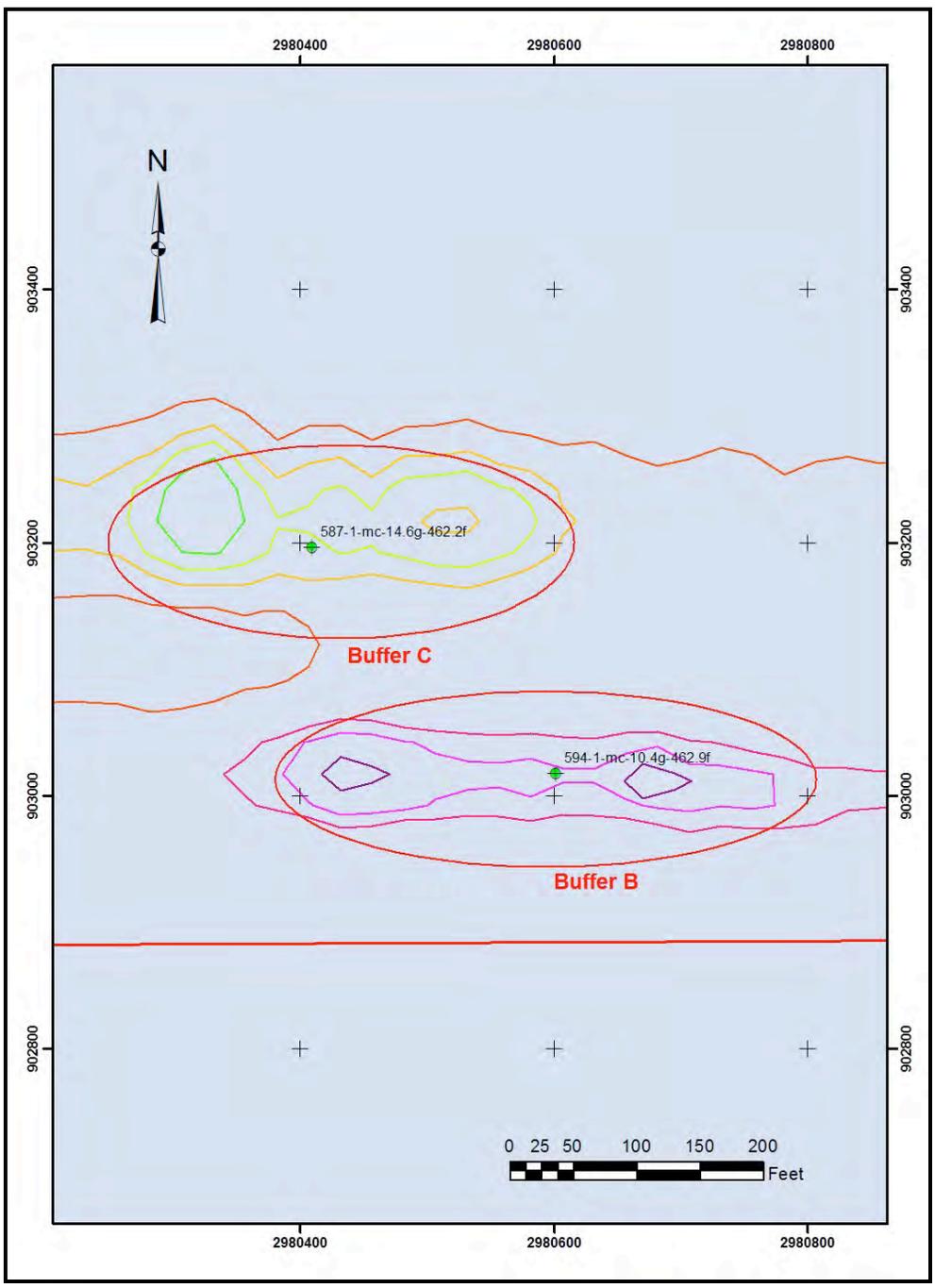


Figure 56. Anomalies recommended for avoidance and included in Buffer B and Buffer C.

Buffer D includes two anomalies 581-2-dp-16.7g-166F and 582-1-dp-17.3g-169.5f (Figure 57).

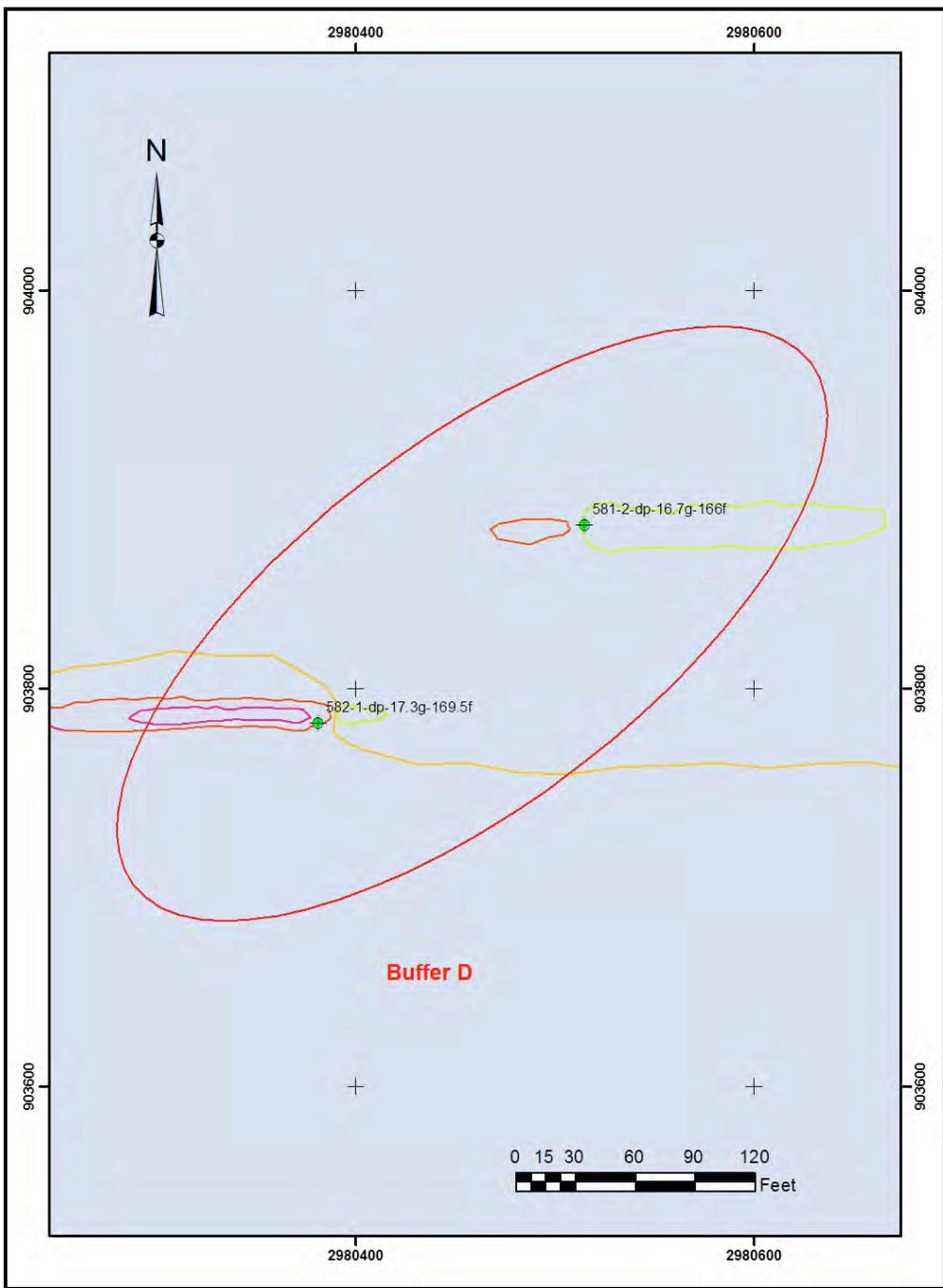


Figure 57. Anomalies recommended for avoidance and included in Buffer D.

Buffer E includes two anomalies 567-1-dp-12.5g-103.1f and 568-1-dp-14.7g-166.9f (Figure 58).

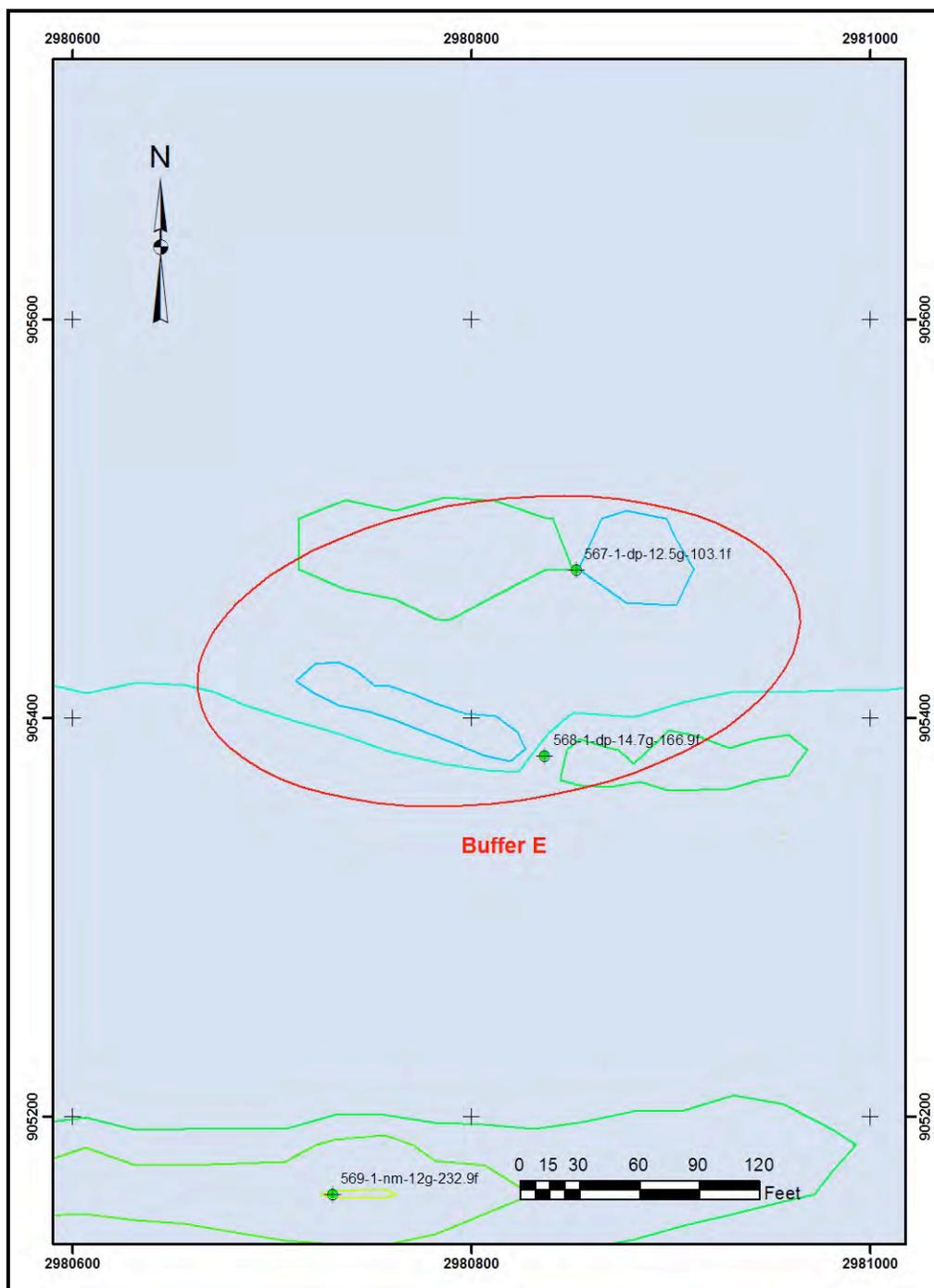


Figure 58. Anomalies recommended for avoidance and included in Buffer E.

Buffer F includes two anomalies 555-1-nm-10.4g-196.6f and 556-1-nm-11.3g-303.6f (Figure 59).

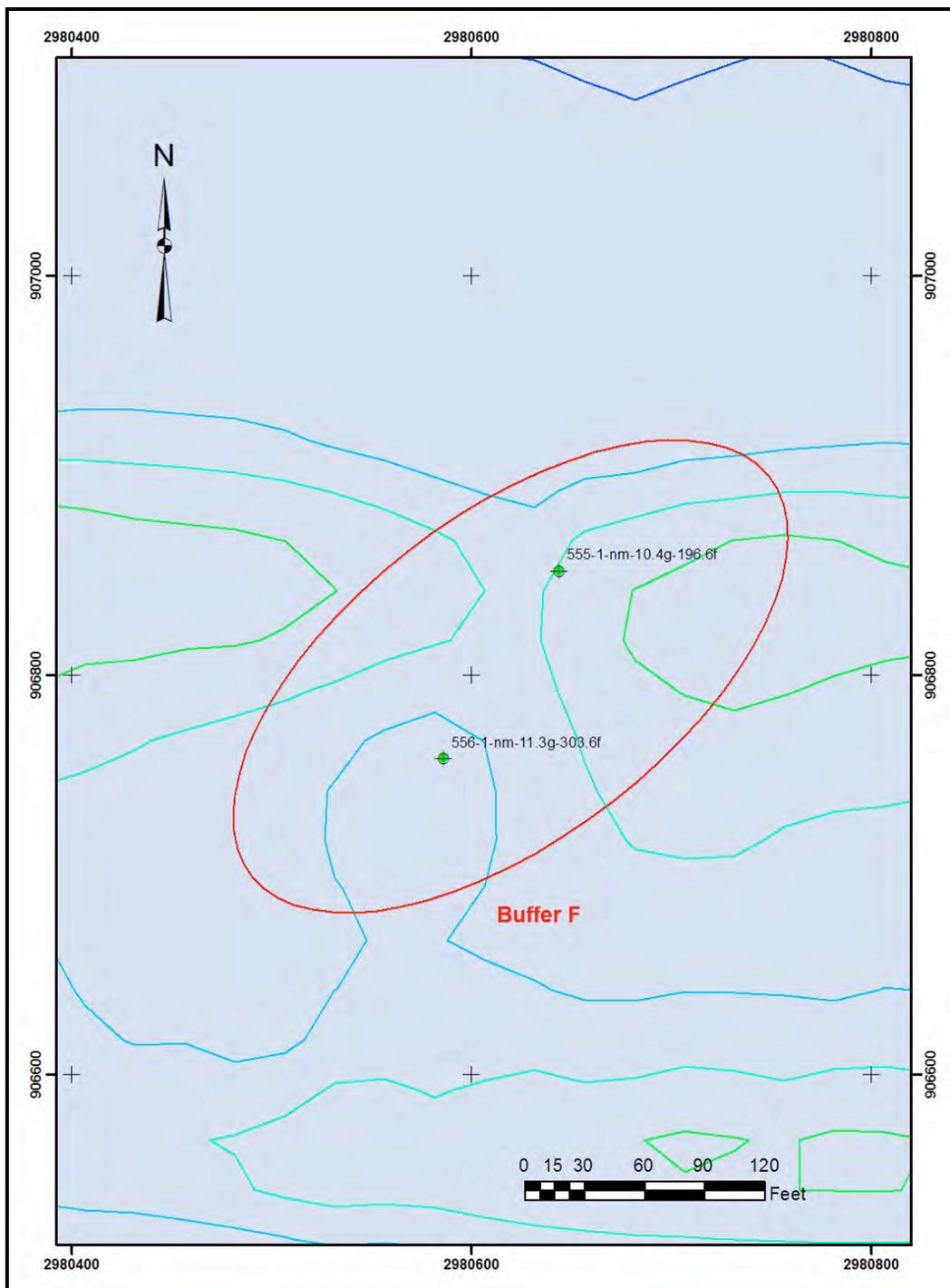


Figure 59. Anomalies recommended for avoidance and included in Buffer F.

Buffer G includes two anomalies 553-1-nm-11.1g-274.6f and 555-2-dp-29.4g-93.6f and sonar target SSS C 003 (Figure 60).

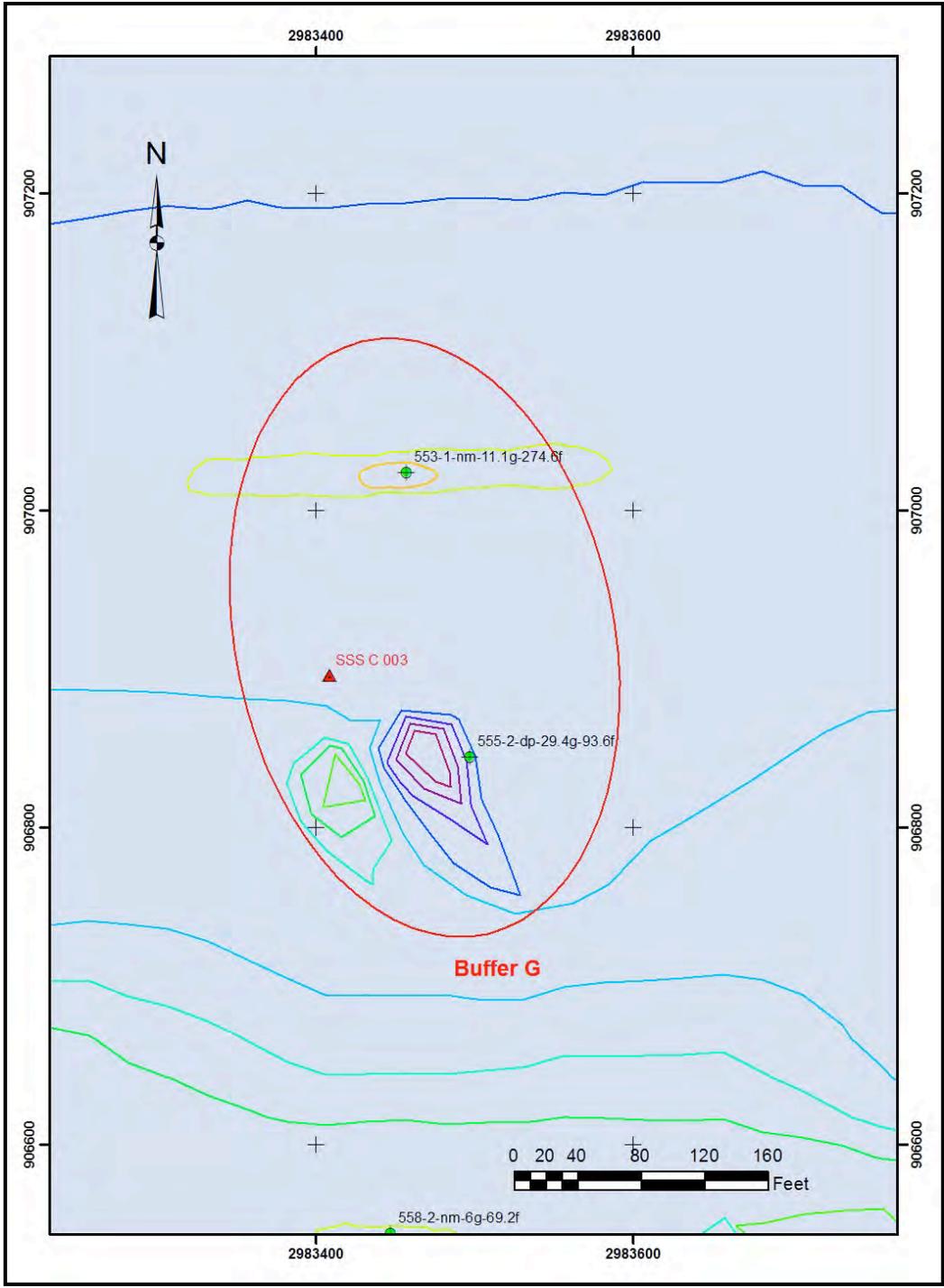


Figure 60. Anomalies and sonar target recommended for avoidance and included in Buffer G.

Buffer H includes anomaly 534-1-pm-11.1g-328.2f (Figure 61).

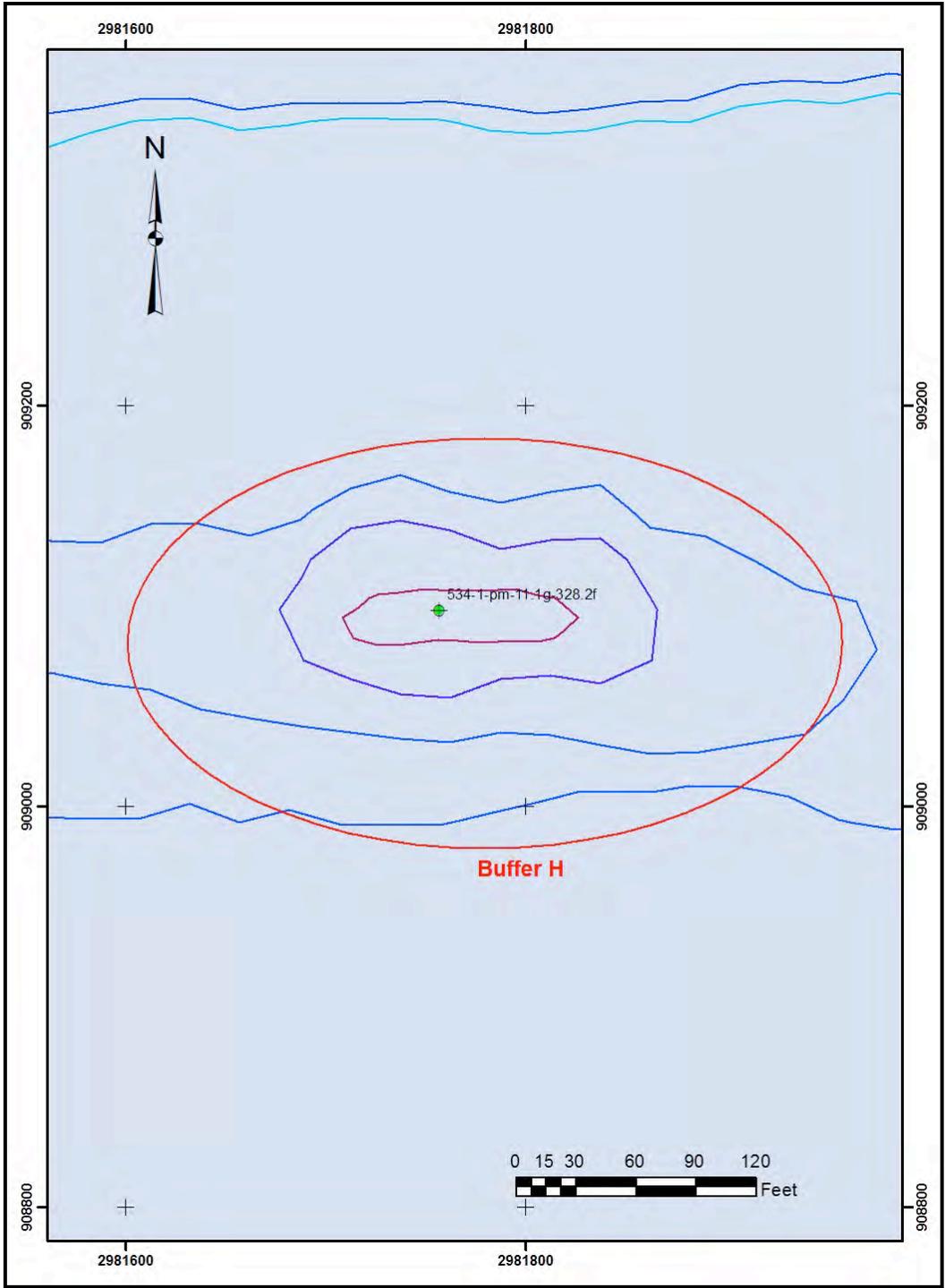


Figure 61. Anomaly recommended for avoidance and included in Buffer H.

Buffer I includes two anomalies, 530-1-mc-15g-348.2f and 532-1-pm-20.2g-174.3f, and sonar target SSS C 002. Buffer J includes one anomaly, 528-1-mc-9.5g-276.3f, and Buffer K includes anomalies 525-1-nm-10.5g-242.9f and 526-1-dp-14.6g-294f (Figure 62).

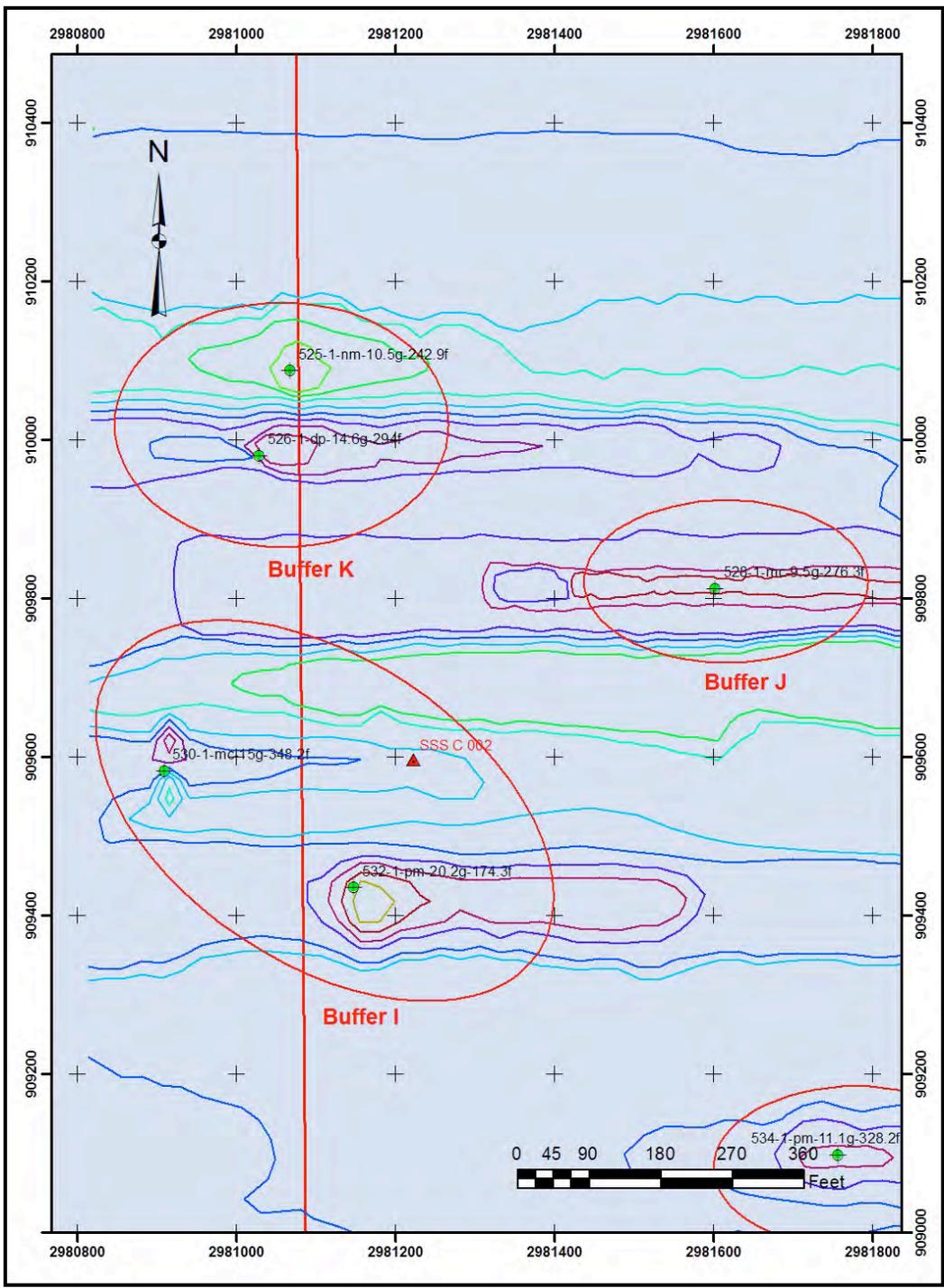


Figure 62. Anomalies and sonar target recommended for avoidance and included in Buffer I, Buffer J and Buffer K.

Buffer L includes anomalies 514-3-dp-27.7g-62.4f and 515-1-dp-5.6g-42.4f (Figure 63).

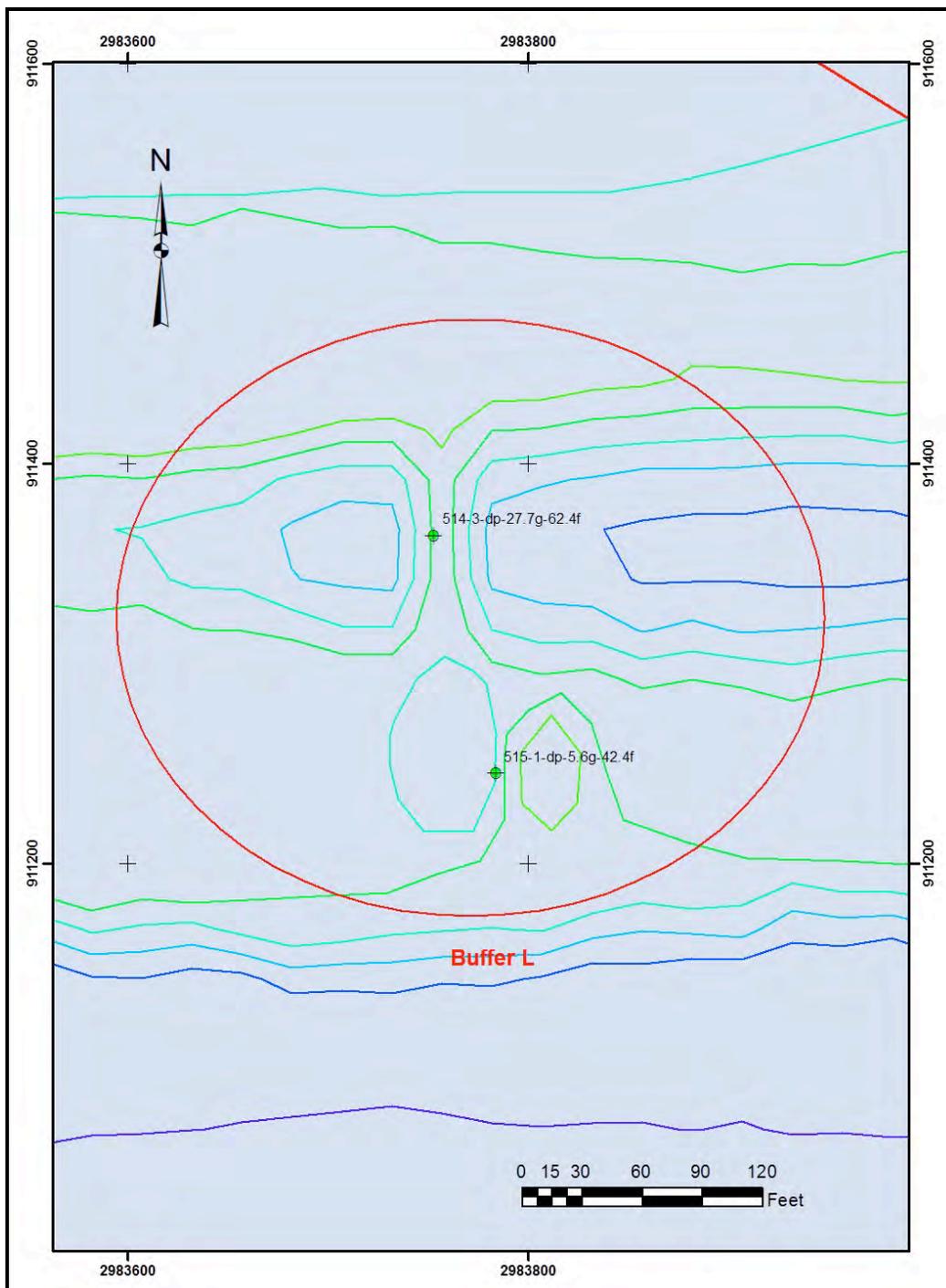


Figure 63. Anomalies recommended for avoidance and included in Buffer L.

Buffer M includes anomalies 512-2-pd-32.3g-55.7f, 513-2-pm-9.6g-135.6f and 514-2-dp-15.6g-372.2f (Figure 64).

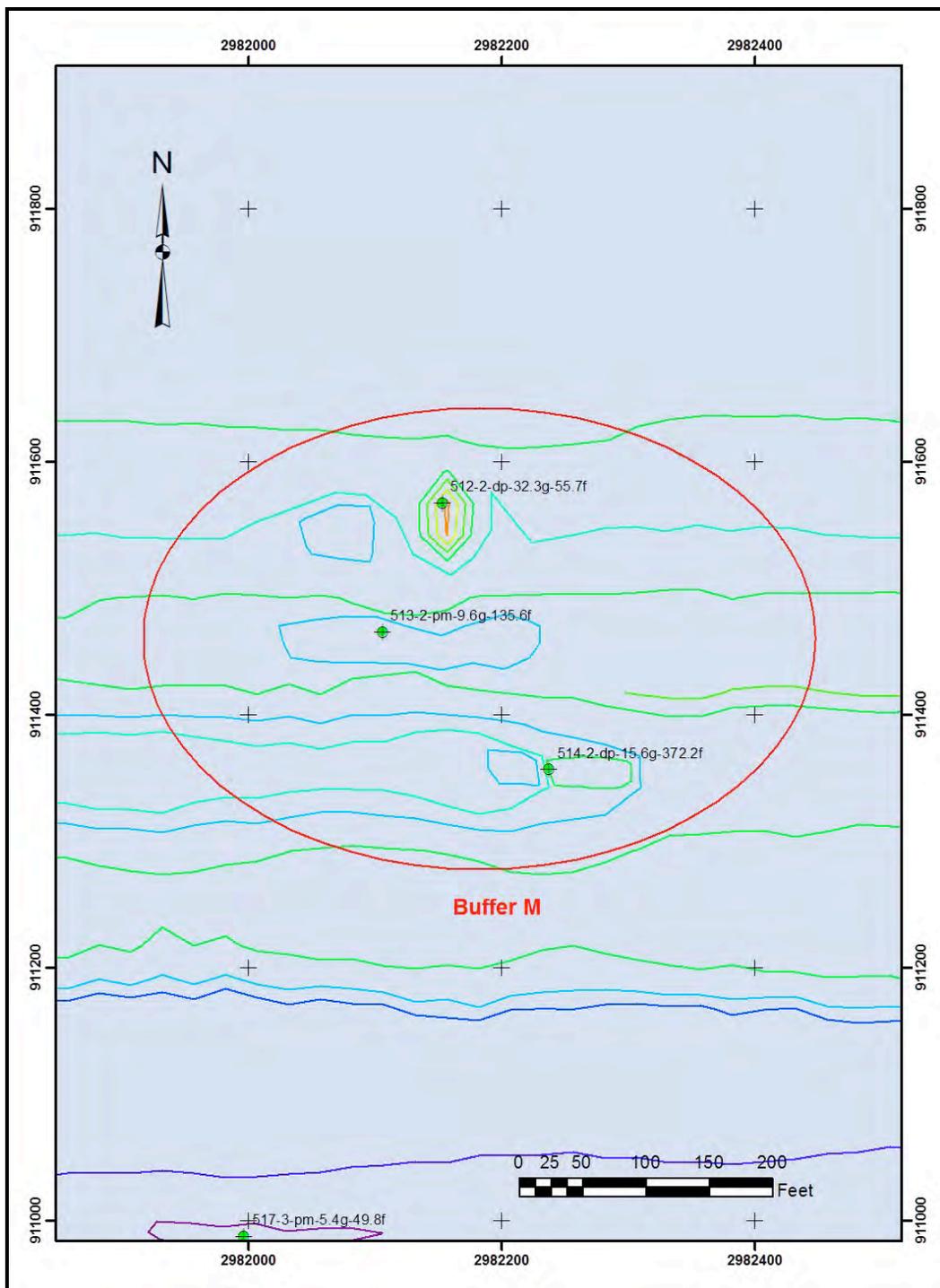


Figure 64. Anomalies recommended for avoidance and included in Buffer M.

Buffer N includes anomalies 511-1-pm-8.3g-102.2f, 512-1-dp-9.9g-181.7f, 513-1-dp-9.2g-181.9f and 513-1-mc-10.7g-235.4f (Figure 65).

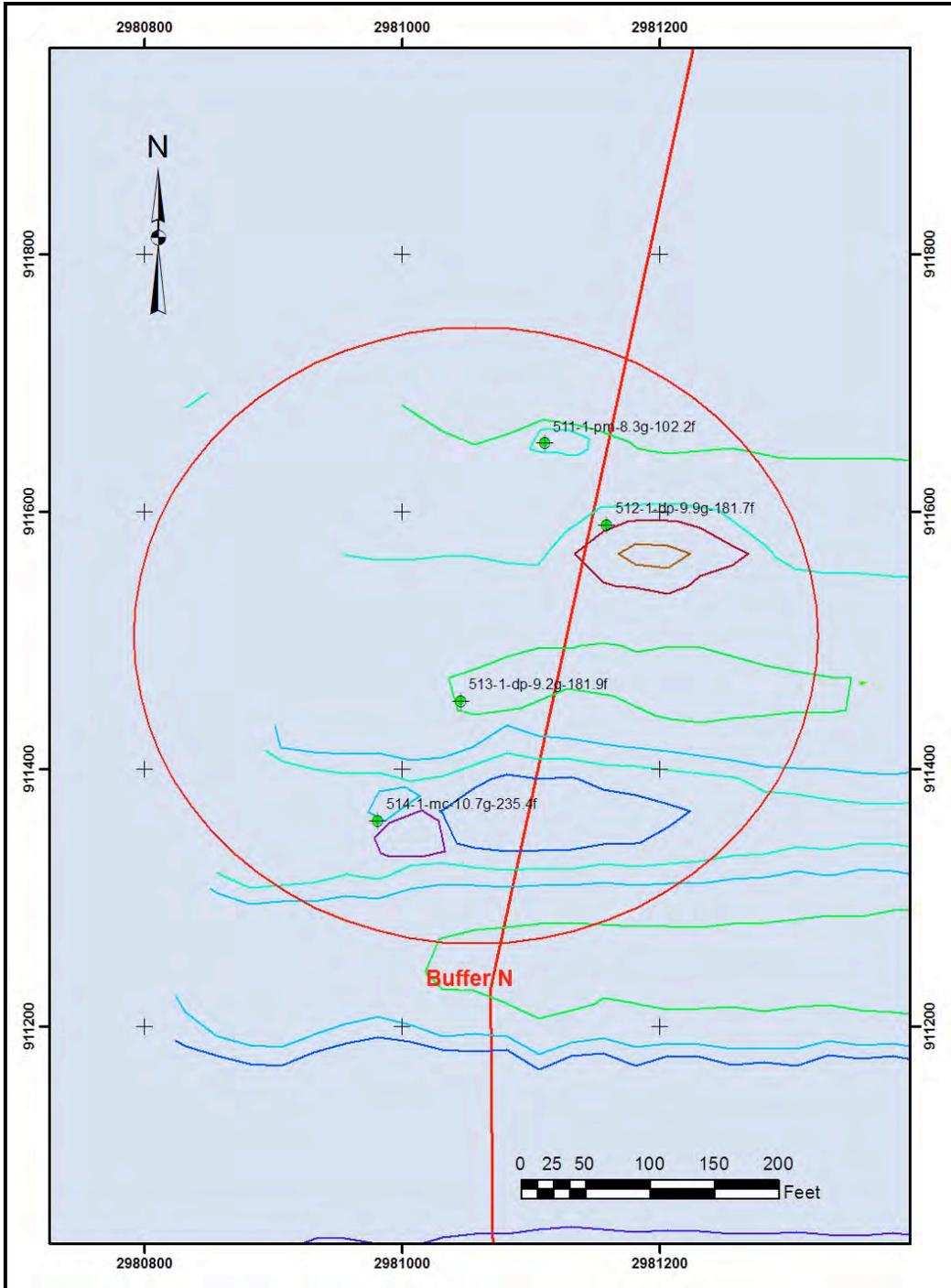


Figure 65. Anomalies recommended for avoidance and included in Buffer N.

Conclusions and Recommendations

Although the project area lies in the Graveyard of the Atlantic, no known or historically documented shipwrecks have been identified inside the survey areas. However the proposed borrow site locations correspond with the vicinity of sixteenth-century Port Fernando and the anchorage used by Sir Francis Drake and vessels that supported Sir Walter Raleigh's attempts to establish a colony on Roanoke Island. One charted wreck is identified immediately east of Borrow Area C. Because of the number of historically documented shipwrecks in the area and the geographical association with the first English attempt to establish a settlement in North America, the project locations should be considered as an area of high sensitivity for submerged cultural resources.

Although Dr. John G. Newton's superlative collaboration with Pilkey and Blanton (1971) entitled *An Oceanographic Atlas Of The Carolina Continental Margin* does not include the current project area, it sheds light on the potential to discover unknown cultural resources in Dare County's nearshore and offshore waters. The groundbreaking study confirmed that at least 368 documented shipwrecks occurred off one section of coastal Dare County (from the *Francis E. Waters* site located 2¾ miles N-NW of Nags Head Station to the *Richard H. Wyatt* site located at 34½° N, 74° W) (Newton et al. 1971:24-25, 28-29).

The methodically researched *North Carolina Shipwreck Accounts, 1709 to 1950* compiled by shipwreck authority Joan Charles confirms that at least 48 named or unknown vessels were lost "off", "near" or simply along the "coast" of North Carolina. Of the first classification, the earliest documented loss off the Colony of North Carolina was the *Adriatic* in February 1740/41 at some unknown site (Charles 2004:159). Several coasting or sea-going vessels (named and unknown) were lost off the North Carolina coast during the years preceding the American Revolution (Charles 2004:159-160).

Analysis of the remote-sensing data generated during the survey of Area A identified 10 sonar targets and 9 magnetic anomalies. One of the sonar targets is a small single object, three are bottom surface features and the remaining six appear to be sections of pipe, cable, logs or pilings. None have an association with any of the magnetic anomalies. Four of the magnetic anomalies represent small single objects, three represent moderate single objects and two represent moderate single or multiple objects. Two of the moderate single or multiple object anomalies and one cluster of two moderate single objects are recommended for avoidance and buffered.

Analysis of the remote-sensing data generated during the survey of Area C identified 9 sonar targets and 65 magnetic anomalies. Four of the sonar targets represent small single objects, three are bottom surface features and the remaining six appear to be clusters of small objects. Four of the targets have no association with any of the magnetic anomalies and five have possible associations.

Three of the 65 magnetic anomalies lie outside the survey area. Nineteen represent small single objects, seventeen represent moderate single objects, twenty more represent moderate single or multiple objects and six represent complex or clustered objects. Twenty-seven of the anomalies and 2 of the sonar targets are recommended for avoidance and are included in 14 buffers.

The buffered anomalies, anomaly clusters and sonar targets located in Borrow Area A and Borrow Area C have signature characteristics suggestive of potentially significant submerged cultural resources. The buffered anomalies and sonar targets in Borrow Site C could be associated with a wreck charted immediately east of the survey area. AWOIS data indicates that the wreck (RECORD 2440) is the tug “TEENS TOW” and this casualty was classified as “dangerous to surface navigation”. While that comment suggests that the vessel is relatively modern, additional investigation could provide more comprehensive data that would permit an assessment of historical significance. If modern, buffered anomalies potentially associated with the wreck could be reassessed.

At this point all of the buffered anomalies and sonar targets in Borrow Area A and Borrow Area C should be avoided during dredging operations. Should avoidance prove impossible, additional investigation is recommended to determine the nature of the material generating those anomalies and targets and more definitively to assess their significance in terms of NRHP eligibility.

Unexpected Discovery Protocol

In the event that any project activities expose prehistoric or historic cultural material not identified during the remote-sensing survey, the dredging company under contract to the Dare County townships should *immediately* cease operations in that vicinity and notify the respective Point of Contact for Dare County, CPE-NC, BOEM and for the North Carolina SHPO. Notification should address the exact location, where possible, the nature of material exposed by the project activities, and options for immediate archaeological inspection and assessment of the site(s).

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Attachment A

(Shipwreck Inventory)

Attachment A: Select Outer Banks Shipwreck Inventory

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>Tiger [or Tyger]</i>	English ship	29 June 1585	Ocracoke Inlet	K
Multiple Unknown		13 June 1586	Oregon Inlet	C
<i>HMS Garland</i>	English warship	29 November 1710	“a little southward of Currituck Inlet”	K
Unknown	English ship	1728	“wrecked 6 miles seaward from Ocracoke Inlet”	K
<i>Adriatick</i>	English merchantman	1739	“wrecked at Cape Hatteras”	K
<i>Hoylin</i>	English merchantman	1741	“lost off Cape Hatteras”	K
<i>Woolford</i>	English merchantman	1741	“lost off Cape Hatteras”	K
<i>George</i>	American coastal trader	1743	“near Oregon Inlet”	CK
<i>Katherine & Elizabeth</i>	English merchantman	1744	“on Diamond Shoals”	K
<i>Neptune</i>	English merchantman	1744	“on Diamond Shoals”	K
Seven Unknown	English merchantmen	7/8 October 1749	“sank inside the [Ocracoke] bar”	K
Two Unknown	English merchantmen	7/8 October 1749	“wrecked 5 miles north of the inlet”	K
Unknown	Unknown	August 1750	Cape Hatteras	A
<i>Nuestra Señora de la Soleda</i>	Galleon of New Spain Flota	18 August 1750	“wrecked 10 leagues north of Ocracoke Inlet”	K
<i>El Salvador</i>	Merchant <i>nao</i> of New Spain Flota	18 August 1750	“wrecked 15 leagues north of Ocracoke Inlet”	K
Unknown	English merchantman	18 August 1750	“off Cape Hatteras”	K
Two Unknown	Schooners-merchantmen	1752	“wrecked on the Ocracoke Bar”	K
<i>Union</i>	American merchantman	January 1757	“lost at Cape Hatteras”	K
<i>Virginia Packet</i>	English packet boat	1757	“lost at Cape Hatteras”	K
Unknown	American schooner	1757	“lost at Cape Hatteras”	K
<i>Friendship</i>	English merchantman	1758	“lost at Cape Hatteras”	K
<i>Peggy</i>	English merchantman	1758	“lost at Cape Hatteras”	K
<i>Princess Amelia</i>	English merchantman	1758	“lost at Cape Hatteras”	K
<i>Nancy</i>	English merchantman	1760	“wrecked near Cape Hatteras”	K
<i>Charming Betsey</i>	Scottish merchantman	1760	“foundered off Cape Hatteras”	K
<i>Shannon</i>	Scottish merchantman	1764	“wrecked at Currituck Inlet”	K
<i>Revenge</i>	English merchantman	June 1765	“wrecked...two miles north of Currituck Inlet”	K
<i>Good Intent</i>	English slaver	1767	“lost off Cape Hatteras”	K
<i>Charming Polly</i>	English merchantman	1770	“totally lost off Cape Hatteras”	K
<i>Lively</i>	English merchantman	1771	“lost off Cape Hatteras”	K
<i>Betsey</i>	English merchantman	Before September 1772	“lost crossing... [Ocracoke] bar”	K
(14/15) Unknown	Large merchantmen	Early September 1772	“totally lost near the Ocracoke Inlet bar”	K
<i>Charming Betsey</i>	English merchantman	1774	“wrecked on Ocracoke Island”	K
<i>Sally</i>	English merchantman	1774	“lost on Cape Hatteras”	K
<i>Clementina</i>	English merchantman	1775	“at Cape Hatteras”	K
<i>Austin</i>	English merchantman	1775	“lost off Cape Hatteras”	K
<i>Aurora</i>	English troop-transport	11 November 1777	“off Cape Hatteras”	K
<i>Peggy</i>	American merchantman	1783	“off Cape Hatteras”	K
(17) Unknown	Ships	23/24 July 1788	“wrecked at Ocracoke Inlet”	K

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>Molly</i>	English merchantman	1789	“wrecked at Cape Hatteras”	K
<i>Pitt</i>	English merchantman	1792	“lost on the Ocracoke Inlet bar”	K
<i>Experiment</i>	American merchantman	1792	“off Cape Hatteras”	K
(6) Unknown	Ships	2 August 1795	Ocracoke Inlet bar	K
Multiple Unknown	Spanish flota ships	2 August 1795	“off Cape Hatteras”	K
<i>Betsey</i>	American sloop	6 September 1797	“at Currituck Inlet”	K
<i>Industry</i>	American merchantman	1798	“on Cape Hatteras”	K
<i>Expectation</i>	English merchantman	1802	“on Cape Hatteras”	K
<i>Brunshell</i>	English merchantman	1802	“on Cape Hatteras”	K
<i>Lydia</i>	English ship	1804	“on Cape Hatteras”	K
<i>Molly</i>	American merchantman	1804	“wrecked near Cape Hatteras”	K
<i>Fortura</i>	Portuguese merchantman	1805	“on Cape Hatteras”	K
<i>Maria</i>	French ship	1810	Cape Hatteras	K
<i>Lively Lass</i>	American ship	Late September 1810	“drifted onshore at Ocracoke Island”	K
<i>Patriot</i>	American pilot boat	January 1813	Nags Head	K
<i>#140</i>	American gunboat	23 September 1814	Ocracoke Island	K
(20+) Unknown	Ships	Early September 1815	“wrecked or sunk at Ocracoke Inlet and on Ocracoke Island”	K
<i>Superior</i>	American merchantman	3 October 1815	“near Cape Hatteras”	K
<i>Sero</i>	English merchantman	25 September 1815	“off Cape Hatteras”	K
<i>Atlanta</i>	American brig	8 November 1815	Diamond Shoals	K
<i>Mary</i>	Ship	15 April 1816	Currituck Beach	K
<i>Eliza</i>	American merchantman	1816	Ocracoke Island	K
<i>Bolina</i>	American merchantman	26 September 1816	“Boddy Island”	K
<i>Mary & Francis</i>	American ship	March 1817	“near Cape Hatteras”	K
<i>Rosetta</i>	Ship	4 March 1817	“lost...crossing the Ocracoke Inlet bar”	K
<i>Emperor of Russia</i>	Ship	18 March 1817	“near Currituck Inlet”	K
<i>John Adams</i>	American merchantman	19 May 1817	“on Cape Hatteras”	K
<i>Voucher</i>	Ship	19 November 1817	Chicamacomico	A
<i>William Carlton</i>	American merchantman	15 May 1818 [or 22 May]	Kill Devil Hills	KQ
<i>Georgia</i>	English brig	15 July 1818	Currituck Inlet	K
(2) Unknown	American merchantmen	3 October 1818	“wrecked near Cape Hatteras”	K
<i>Revenge</i>	American sloop	January 1819	Currituck Inlet	K
<i>Phoenix</i>	American schooner	13 May 1819	Cape Hatteras	K
<i>Henry</i>	American sloop	January 1820	Ocracoke Island	K
<i>Islington</i>	American merchantman	16 March 1820	Cape Hatteras	K
<i>Horatio</i>	American ship	April 1820	“on Diamond Shoals”	K
Unknown	125-ton English merchantman	September 1821	“at Cape Hatteras”	K
<i>Charles K. Mallory</i>	American merchantman	10 September 1821	“on Cape Hatteras”	K
<i>Martha</i>	English merchantman	1821	Currituck Sands	K
<i>Nereus</i>	Ship	1 January 1822	“totally lost...on Cape Hatteras”	K
<i>Enterprise</i>	Schooner	27 October 1822	New Inlet	ACK
<i>Peter Francisco</i>	American ship	7 October 1823	“Bodies Island”	K

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>Caroline du Nord</i>	French merchantman	19 January 1824	Ocracoke Inlet bar	K
<i>Susan</i>	American schooner	1 June 1824	Ocracoke Inlet bar	K
<i>Emulous</i>	American schooner	22 January 1825	Off Kitty Hawk	E
<i>Diomede</i>	American schooner	23 January 1825	Kitty Hawk	K
<i>Washington</i>	American ship	24 January 1825	Ocracoke Island	K
<i>Nancy</i>	American ship	21 February 1825	Ocracoke Inlet Bar	K
<i>Horam</i>	American merchantman	6 April 1825	Ocracoke Inlet Bar	K
(25+) Unknown	Ships	4 June 1825	“wrecked north of Ocracoke Inlet”	K
<i>Harvest</i>	Schooner	18 November 1825	Bodie Island	ACK
<i>Victory</i>	American schooner	December 1825	Kitty Hawk	K
<i>Louisa Matilda</i>	Packet	24 August 1827	On Bodie Island	E
<i>Belle</i>	Packet	15 August 1836	On Bodie Island	EF
<i>William Gibbons</i>	Steamer	10 October 1836	New Inlet/Bodie Island	AE
<i>Victory</i>	Schooner	6 February 1837	Bodie Island	A
<i>Aurora</i>	Schooner	June 1837	Ocracoke Bar	F
<i>Hunter</i>	Schooner	19 August 1837	Kitty Hawk	E
<i>Alhambra</i>	Schooner	26 August 1837	Bodie Island	AEF
<i>Enterprise</i>	Brig	9 October 1837	Bodie Island	A
<i>Milledgeville</i>	Packet	30 August 1839	Chicamacomico	A
<i>William J. Watson</i>	Schooner	15 November 1840	Bodie Island	A
<i>Alonzo</i>	Schooner	24 August 1841	Currituck Beach	E
<i>American Trader</i>	Schooner	24 August 1841	Currituck Beach	E
<i>Astoria</i>	Bark	29 January 1842	Hatteras Inlet	F
<i>Trident</i>	Schooner	14 June 1842	Bodie Island	AC
<i>Kilgore</i>	Brig	24 August 1842	On Currituck Beach	E
<i>Marion</i>	Brig	4 November 1842	Bodie Island	AE
<i>William Taylor</i>	Brig	20 October 1843	Bodie Island	CD
<i>Danube</i>	Schooner	14 May 1844	Bodie Island	E
<i>C.C. Thorn</i>	Schooner	2 June 1846	New Inlet	A
<i>Antilla</i>	Schooner	6 November 1846	Nags Head	EF
<i>R.W. Brown</i>	Schooner	11 December 1848	New Inlet	AD
<i>Evergreen</i>	Schooner	9 January 1849	Currituck Beach	E
<i>Franklin</i>	Steamer	14 September 1850	Currituck	E
<i>Belle</i>	Brig	July 1850	Diamond Shoals	F
<i>America</i>	Side-wheel steamer	29 January 1851	Off Cape Hatteras	F
<i>P.B. Savery</i>	Schooner	11 August 1851	Chicamacomico	A
<i>Magnolia</i>	Schooner	3 December 1852	Chicamacomico	A
<i>Henrietta Pierce</i>	Schooner	16 January 1853	Kitty Hawk	E
<i>Augustus Moore [or Augusta Moore]</i>	Schooner	15 April 1853	Kitty Hawk	EFQ
<i>Bladen McLaughlin</i>	Steamer	6 May 1853	Kitty Hawk	EF
<i>Albemarle</i>	Brig	7 September 1853	Off Hatteras	F
<i>Rio</i>	Schooner	December 1853	Bodie Island	AC

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>A. S. Willers</i>	Schooner	September 1857	Off Cape Hatteras	F
<i>Baltic</i>	Schooner	November 1857	Currituck Beach	E
<i>Atlanta</i>	Steam side wheel	1 March 1858	Bodie Island, "Body Island"	EF
<i>Amanda Coons</i>	Brig	11 November 1858	Currituck Beach	E
<i>Charles</i>	Schooner	November 1859	Off Nags Head	E
<i>Lady Whidbee</i>	Schooner	17 January 1860	New Inlet	A
<i>Black Squall</i>	Brig	8 April 1861	Ocracoke	F
<i>B. T. Martin</i>	Brig	24 July 1861	Chicamacomico	AF
<i>Oriental</i>	Union Transport	8 May 1862	Bodie Island	ACE
<i>Volant</i>	Brig	September 1862	New Inlet	A
<i>Acton</i>	Schooner	9 September 1862	"Kill Devil Hills (ashore)"	Q
<i>USS Monitor</i>	Ironclad steamer	December 1862	16 miles SSE of the Cape Hatteras Light in 225 feet of water	FO
<i>Vera Cruz</i>	Steamer	12 April 1866	Bodie Island	E
<i>King Fisher</i>	Steamship	November 1866	"about six miles south of Hatteras"	I
<i>Martha</i>	Schooner	10 January 1867	Currituck Beach	E
<i>Alfred Thomas</i>	Schooner	10 March 1867	Chicamacomico	AC
<i>Quick</i>	Brig	March 1867	Oregon Inlet	ABCD
<i>Adamantine</i>	Schooner	November 1867	Bodie Island/Inlet	AEF
<i>Alliance</i>	Steamer	4 March 1869	Off Hatteras Inlet	F
<i>Ezra</i>	Bark	September 1869	Bodie Island	AC
<i>Eagle</i>	Steamer	4 March 1870	Bodie Island	ACE
<i>Kensington</i>	Steamer	27 January 1871	Chicamacomico	A
<i>Harriet N. Rogers</i>	Schooner	15 January 1873	Bodie Island	ACE
<i>Annie McFarland</i>	Brig	30 January 1873	Currituck Beach	E
<i>William</i>	Schooner	6 February 1873	Chicamacomico	A
<i>Ariadne</i>	Steam screw	7 February 1873	Oregon Inlet	F
<i>Waltham</i>	Brig	4 May 1874	Bodie Island	ABC
<i>J. Means</i>	Schooner	12 October 1874	Bodie Island	AE
<i>Blaisdell</i>	Schooner	May 1875	Off Cape Hatteras	F
<i>Mary H. Westcott</i>	Schooner	25 June 1875	Oregon Inlet	BCD
<i>Harvest</i>	Schooner	17 November 1875	Off Nags Head	E
<i>J.H. Lockwood</i>	Schooner	20 November 1876	Chicamacomico	AE
<i>America</i>	Bark	24 December 1876	Chicamacomico	AEF
<i>Iona</i>	Schooner	9 April 1877	Chicamacomico	A
<i>Benjamin W. Robinson</i>	Schooner	10 April 1877	Chicamacomico	AF
<i>Edward J. Hearaty</i>	Wooden Schooner	10 April 1877	Kitty Hawk LSS, N 5 miles	Q
<i>Hattie L. Fuller</i>	Schooner	13 April 1877	Oregon Inlet	ABCD
<i>Western Star</i>	Schooner	11 September 1877	Bodie Inlet [or Kitty Hawk LSS, N 12 miles]	AQ
<i>Huron</i>	Steam screw	24 November 1877	"short distance offshore from Nags Head"	EN
<i>Success</i>	Bark	15 January 1879	Bodie Inlet	AC
<i>M&E Henderson</i>	Schooner	30 November 1879 [or 3 December 1879]	Pea Island [or Kitty Hawk LSS, S 2 miles]	AQ
<i>Benjamin Dickerson</i>	Bark	18 October 1880	Off Cape Hatteras	F

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>A. B. Goodman</i>	Schooner	4 April 1881	Creed Hill Station-Diamond Shoals	F
<i>Thomas J. Lancaster</i>	Schooner	5 October 1881	New Inlet	A
<i>Resolute</i>	Steamer	1881	Oregon Inlet	D
<i>Mary L. Vankirk</i>	Schooner	5 February 1882	New Inlet	A
<i>Unqua</i>	Sloop	15 August 1882	Oregon Inlet	D
<i>Angela</i>	Italian bark	4 March 1883	¼ m. E of northern end of Kitty Hawk Beach	EF
<i>Luola Murchison</i>	Schooner	3 October 1883	Kitty Hawk	EQ
<i>Florence</i>	Schooner	5 January 1884	Chicamacomico	A
<i>A. F. Crockett</i>	Schooner	7 February 1885	Ocracoke	F
<i>Ella May</i>	Sloop	8 August 1885	Oregon Inlet	BCD
<i>Jennie Beasley</i>	Schooner	26 January 1886	Currituck Inlet	E
<i>Charles</i>	Schooner	23 August 1887	Oregon Inlet	BCD
<i>Annchen</i>	Barge	18 July 1888	Off Cape Hatteras	F
<i>Allie R. Chester</i>	Schooner	20 January 1889	Outer edge of Diamond Shoals	F
<i>Josie Troop</i>	Bark	22/23 February 1889	Chicamacomico	AE
<i>Hattie Lollies</i>	Schooner	7 April 1889	Nags Head	E
<i>Francis E. Waters</i>	American schooner	23 October 1889	Nags Head	N
<i>Lizzie S. Haynes</i>	Schooner	24 October 1889	Pea Island/Bodie Island*	ABCE*
<i>Annie E. Blackman</i>	Schooner	24 October 1889	New Inlet	A
<i>Sue Williams</i>	Schooner	22 March 1890	Chicamacomico	A
<i>Blanche</i>	Schooner	18 December 1890	Ocracoke Inlet	F
<i>Dudley Farlin</i>	Schooner	26 December 1890	Bodie Island	E
<i>J.W. Gaskill</i>	Schooner	16 February 1891	Pea Island	AE
<i>Strathairly</i>	Steamer	24 March 1891	Chicamacomico	AN
<i>Irene Thayer</i>	Schooner	19 November 1892	Oregon Inlet	ABCD
<i>Ravenwood</i>	Barkentine	13 October 1893	Chicamacomico	AD
<i>Florence C. Magee</i>	Schooner	26 February 1894	Bodie Island	AC
<i>A. P. Richardson</i>	Schooner	26 September 1894	Ocracoke	F
<i>Laura Nelson</i>	Schooner	30 March 1895	Bodie Island	AE
<i>Addie Henry</i>	Schooner	14 April 1895	Ocracoke	F
<i>J. W. Dresser</i>	American Barkentine	23 July 1895	“outer Diamond Shoal”	M
<i>Emma C. Cotton</i>	Schooner	27 December 1895	Pea Island	AC
<i>James Woodall</i>	Steamer	12 January 1896	New Inlet	A
<i>Maggie J. Lawrence</i>	Schooner	10 February 1896	Pea Island	ACE
<i>E.S. Newman</i>	Schooner	11 October 1896	Pea Island	E
<i>Mathilda</i>	Ship	27 October 1897	Bodie Island	A
<i>Samuel W. Hall</i>	Schooner	24 December 1897	Chicamacomico	A
<i>Samuel W. Tilton</i>	Schooner	17 February 1898	Chicamacomico	A
<i>Milton</i>	Schooner	27 April 1898	Bodie Island	AC
<i>George C. Fessenden</i>	Schooner	27 April 1898	Chicamacomico	A
<i>June</i>	Sloop	11 August 1899	Oregon Inlet	ABCD
<i>Minnie Berge</i>	Schooner	18 August 1899	Chicamacomico	A

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>Ariosto</i>	Schooner	24 December 1899	“3 miles south of Hatteras Inlet”	F
<i>Jane C. Harris</i>	Schooner	25 February 1900	Oregon Inlet	ABCD
<i>William H. Shubert</i>	Schooner	16 February 1903	Bodie Island	A
<i>J.F. Becker</i>	Schooner	26 April 1903	Oregon Inlet	ABCD
<i>Benjamin M. Wallace</i>	Schooner	26 March 1904	Chicamacomico	AF
<i>Montana</i>	Schooner	11 December 1904	Pea Island	AC
<i>Jennie Lockwood</i>	Schooner	13 February 1906	Pea Island	ACE
<i>Addie Morrill</i>	Barkentine	3 October 1907	Cape Hatteras	F
<i>Bluefields</i>	Iron steam screw	4 January 1908	Cape Hatteras	F
<i>Flora Rogers</i>	Schooner	23 October 1908	Bodie Island	AC
<i>Governor Ames</i>	Schooner	13 December 1909	Chicamacomico	A
<i>Charles J. Dumas</i>	Schooner	26/27 December 1911	Pea Island	ACE
<i>Annie F. Kimball</i>	Schooner	8 January 1912	Cape Hatteras	F
<i>Richard F.C. Hartle</i>	Schooner	2 September 1913	Chicamacomico	A
<i>Helen H. Benedict</i>	Schooner	6 February 1914	6.5 miles N Bodie Island Light	E
<i>George N. Reed</i>	Schooner	20 January 1915	Pea Island	AC
<i>Alice Murphy</i>	Schooner	3 April 1915	Cape Hatteras	F
<i>Josephine [The Josephine]</i>	Wooden Schooner	3 April 1915	$\frac{3}{4}$ mile S Kill Devil Hill Lightship [or KDH USCG Station]	EQ
<i>Hattie George</i>	Steam screw	29 June 1918	Oregon Inlet	BD
<i>Nordhav</i>	Bark	17 September 1918	Off Bodie Island	A
<i>Gracie D. Chambers</i>	Schooner	13 February 1919	Currituck Beach	E
<i>Black Hawk</i>	Yacht	6 November 1919	Oregon Inlet	AC
<i>Explorer</i>	Tugboat	12 December 1919	200 yds. Off Nags Head Pier	N
<i>Louisa M.</i>	Schooner	8 December 1920	Off Currituck light	E
<i>Laura A. Barnes</i>	Schooner	June 1921	Bodie Island	ACEN
<i>I. C. White</i>	Steam screw	21 January 1922	Off Bodie Island	E
<i>Blanche C. Pendleton</i>	Schooner	21 January 1922	Off Bodie Island	EF
<i>Agawam</i>	Gas yacht	16 March 1922	NE of Diamond Shoal Lightship	F
<i>Dorothea L. Brinkman</i>	Schooner	22 March 1924	Oregon Inlet	ABCDEL
<i>Irma</i>	Schooner	29 April 1925	Bodie Island	E
<i>Isabella Parmenter</i>	Schooner	1 November 1925	Chicamacomico	A
<i>Beatrice</i>	Gas yacht	27 January 1927	Cape Hatteras	F
<i>Adelaide Day</i>	Schooner	8 November 1927	Off Cape Hatteras	F
<i>Kyzikes [or Kyzickes]</i>	Greek?	4 December 1927	1.5 miles N Kill Devil Hills CG station	F
<i>Bainbridge</i>	Schooner	4 February 1929	Nags Head	F
<i>Brainbridge</i>	Schooner	5 February 1929	Nags Head	E
<i>Anna May</i>	Oil screw trawler	9 December 1931	Off Diamond Shoals	F
<i>St. Rita</i>	Oil screw	13 January 1932	Kitty Hawk	Q
<i>Glory</i>	Steamer	26 August 1933	Off Nags Head	E
<i>Blink</i>	Norwegian registry	11 February 1942	Off Cape Hatteras	F
<i>Anna R. Heidritter</i>	4-masted schooner	2 March 1942	Off Ocracoke	FL
<i>Ceiba</i>	Freighter	15 March 1942	Off Nags Head	EF

VESSEL NAME	TYPE	ACTUAL OR APPROXIMATE LOSS DATE	ACTUAL OR APPROXIMATE SHIPWRECK LOCATION	REFERENCE
<i>Acme</i>	Tanker	17 March 1942	"12 miles, 148° from Cape Hatteras Light"	F
<i>Dixie Arrow</i>	Steel tanker	26 March 1942	25 miles SW of Hatteras Light	F
<i>Agra</i>		20 April 1942	Off Cape Hatteras	F
<i>U-576</i>	German submarine	15 July 1942	30 miles off Cape Hatteras	P
<i>Bluefields</i>	American freighter	15 July 1942	30 miles off Cape Hatteras	P
<i>Benson H. Riffin</i>	Oil screw	3 December 1953	In Ocracoke Inlet	F
<i>Miss Pamlico</i>	Oil screw	20 June 1960	Oregon Inlet	BCD
<i>Sarah J.</i>	Oil screw trawler	14 January 1961	Oregon Inlet	BD
<i>Townsend</i>		April 1962	Oregon Inlet	BD
<i>W.J. Townsend</i>	Oil Screw	15 December 1962	Oregon Inlet	BCD
<i>Lois Joyce</i>	Trawler	12 December 1982	Oregon Inlet	CD
USS <i>LST-471</i>	WW-II ship	Scrapped-lost in transit	Near Rodanthe	N
USS <i>LST-292</i>	WW-II ship	Scrapped-lost in transit	1.4 miles S of Rodanthe pier	N

Shipwreck Inventory References:

A=(Stick 1952:244-257)

B=(Dames and Moore 1979:9-12)

C=(North Carolina Department of Transportation 1989: C5-C6)

D=(North Carolina Division of Archives and History, UAB Site File)

E=(Mitchell 1975)

F=(Berman 1972)

G=(National Park Service n.d.a; n.d.b.; n.d.c., n.d.d.)

H=(North Carolina Humanities Council)

I=(*Flake's Bulletin* 5 December 1866:11 [Galveston TX])

J=(Watts 1985)

K=(Marx 1983)

L=(Burgess 1978)

M=(USLSS 1897)

N=(NOAA 2010)

O=(Watts 1985)

P=(*The Washington Post*, 21 October 2014)

Q=(Charles 2004)

Attachment B: Borrow Area A Sonar Target Table

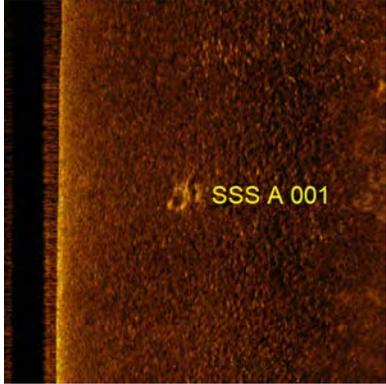
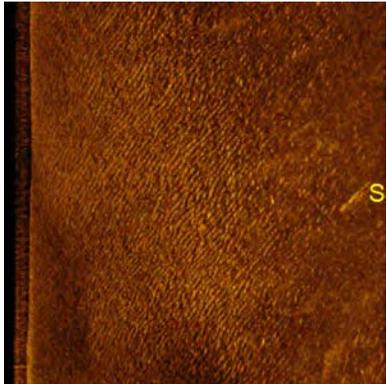
Borrow Area A Sonar Target Table

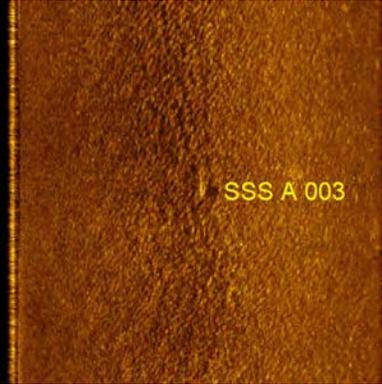
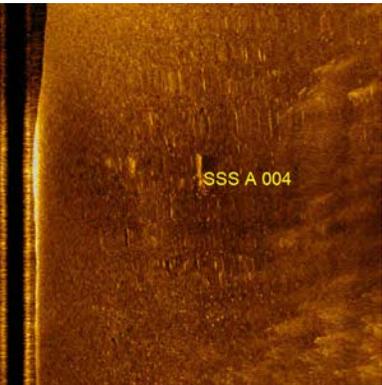
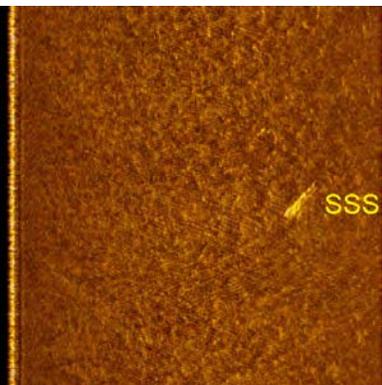
Target	X Coordinate	Y Coordinate	Assessment	Anomaly Association
SSS A 001	3017502.427	851974.1759	Bottom surface feature	No
SSS A 002	3020555.238	852726.1212	Possible pipe or cable	No
SSS A 003	3022241.534	850169.7206	Small single object	No
SSS A 004	3021100.723	841822.3953	Possible pipe or cable	No
SSS A 005	3018938.652	842158.7049	Possible pipe or cable	No
SSS A 006	3020700.7	845023.2802	Possible pipe or cable	No
SSS A 007	3018606.349	843592.662	Possible pipe or cable	No
SSS A 008	3021760.761	849979.1769	Bottom surface feature	No
SSS A 009	3019465.545	850917.5342	Possible pipe or cable	No
SSS A 010	3016791.406	851692.8774	Bottom surface features	No

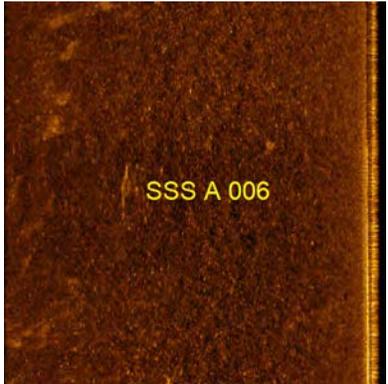
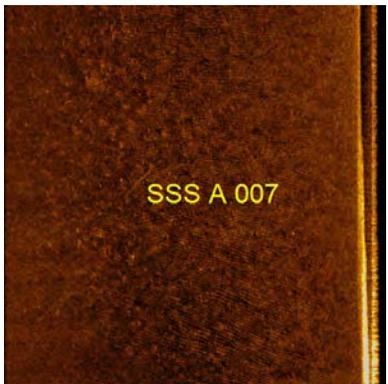
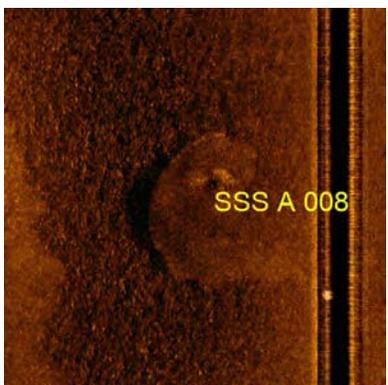
Attachment C: Borrow Area A Sonar Target Reports

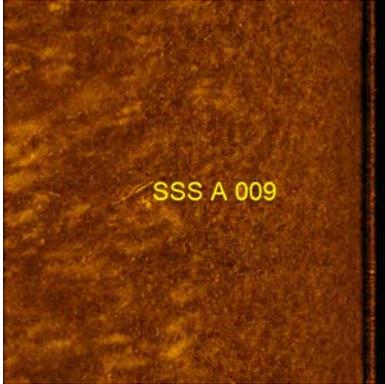
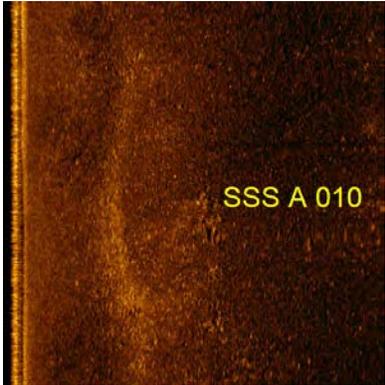
Borrow Area A Sonar Target Reports

Generated on 3/13/2015 2:55:57 PM

Target Image	Target Info	User Entered Info
	<p>SSS A 001</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/20/2014 2:18:10 PM • Click Position 36.0423936597 -75.5576635638 (WGS84) 36.0422240640 -75.5580466605 (NAD27LL) 36.0423936597 -75.5576635638 (LocalLL) (X) 3017502.43 (Y) 851974.18 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014 Sidescan\10.20.2014 OBII_A_14_Line_317_SW_2.jsf • Ping Number: 90227 • Range to target: 71.33 US ft • Fish Height: 0.00 US ft • Heading: 258.900 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_317_SW_2 • Water Depth: 38.45 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 21.21 US ft • Target Height: 0.00 US ft • Target Length: 14.87 US ft • Target Shadow: 17.16 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface feature
	<p>SSS A 002</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/20/2014 4:00:43 PM • Click Position 36.0441668499 -75.5472553984 (WGS84) 36.0439970507 -75.5476388500 (NAD27LL) 36.0441668499 -75.5472553984 (LocalLL) (X) 3020555.24 (Y) 852726.12 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014 Sidescan\10.20.2014 OBII_A_14_Line_327_NE.jsf • Ping Number: 156438 • Range to target: 223.60 US ft • Fish Height: 0.00 US ft • Heading: 41.190 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_327_NE • Water Depth: 33.64 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 2.02 US ft • Target Height: 0.00 US ft • Target Length: 27.69 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible piece of pipe or cable

	<p>SSS A 003</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/21/2014 11:46:25 AM • Click Position <ul style="list-style-type: none"> 36.0369873642 -75.5418560935 (WGS84) 36.0368172820 -75.5422399870 (NAD27LL) 36.0369873642 -75.5418560935 (LocalLL) (X) 3022241.53 (Y) 850169.72 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.21.2014\OBII_A_14_Line_354_SW.jsf • Ping Number: 111699 • Range to target: 132.91 US ft • Fish Height: 0.00 US ft • Heading: 255.090 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_354_SW • Water Depth: 36.34 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 4.87 US ft • Target Height: 0.00 US ft • Target Length: 12.82 US ft • Target Shadow: 7.20 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object
	<p>SSS A 004</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/22/2014 9:40:18 AM • Click Position <ul style="list-style-type: none"> 36.0141797750 -75.5466941568 (WGS84) 36.0140093105 -75.5470785881 (NAD27LL) 36.0141797750 -75.5466941568 (LocalLL) (X) 3021100.72 (Y) 841822.40 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.22.2014\OBII_A_14_Line_399_SW.jsf • Ping Number: 29897 • Range to target: 112.76 US ft • Fish Height: 0.00 US ft • Heading: 278.500 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_399_SW • Water Depth: 50.83 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 4.36 US ft • Target Height: 0.00 US ft • Target Length: 22.60 US ft • Target Shadow: 11.59 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible pipe or cable
	<p>SSS A 005</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/25/2014 11:06:51 AM • Click Position <ul style="list-style-type: none"> 36.0153094347 -75.5539608140 (WGS84) 36.0151391737 -75.5543449291 (NAD27LL) 36.0153094347 -75.5539608140 (LocalLL) (X) 3018938.65 (Y) 842158.70 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.25.2014\OBII_A_14_Line_386_SW.jsf • Ping Number: 103006 • Range to target: 196.25 US ft • Fish Height: 0.00 US ft • Heading: 261.900 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_386_SW • Water Depth: 58.21 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 4.09 US ft • Target Height: 0.00 US ft • Target Length: 31.10 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible pipe, wire or cable

	<p>SSS A 006</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/25/2014 12:33:10 PM • Click Position <ul style="list-style-type: none"> • 36.0230056991 -75.5476696044 (WGS84) • 36.0228354503 -75.5480537160 (NAD27LL) • 36.0230056991 -75.5476696044 (LocalLL) • (X) 3020700.70 (Y) 845023.28 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.25.2014\OBII_A_14_Line_375_SW.jsf • Ping Number: 151394 • Range to target: 165.54 US ft • Fish Height: 0.00 US ft • Heading: 259.190 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_375_SW • Water Depth: 65.42 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 0.00 US ft • Target Height: 0.00 US ft • Target Length: 0.00 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible wire or cable
	<p>SSS A 007</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/25/2014 1:21:40 PM • Click Position <ul style="list-style-type: none"> • 36.0192779111 -75.5549155232 (WGS84) • 36.0191077583 -75.5552994736 (NAD27LL) • 36.0192779111 -75.5549155232 (LocalLL) • (X) 3018606.35 (Y) 843592.66 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.25.2014\OBII_A_14_Line_420_SW.jsf • Ping Number: 178587 • Range to target: 165.54 US ft • Fish Height: 0.00 US ft • Heading: 256.500 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_420_SW • Water Depth: 62.01 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 1.57 US ft • Target Height: 0.00 US ft • Target Length: 30.85 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible wire or cable
	<p>SSS A 008</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/25/2014 6:24:12 PM • Click Position <ul style="list-style-type: none"> • 36.0365102375 -75.5435036219 (WGS84) • 36.0363401837 -75.5438874657 (NAD27LL) • 36.0365102375 -75.5435036219 (LocalLL) • (X) 3021760.76 (Y) 849979.18 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.25.2014\OBII_A_14_Line_351_SW.jsf • Ping Number: 348186 • Range to target: 93.09 US ft • Fish Height: 0.00 US ft • Heading: 259.800 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_351_SW • Water Depth: 41.69 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 58.12 US ft • Target Height: 0.00 US ft • Target Length: 101.53 US ft • Target Shadow: 17.29 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface feature

	<p>SSS A 009</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/26/2014 12:30:45 PM • Click Position <ul style="list-style-type: none"> • 36.0393056331 -75.5511515781 (WGS84) • 36.0391358195 -75.5515350315 (NAD27LL) • 36.0393056331 -75.5511515781 (LocalLL) • (X) 3019465.54 (Y) 850917.53 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.26.2014\OBII_A_14_Line_415_SW.jsf • Ping Number: 159923 • Range to target: 160.74 US ft • Fish Height: 0.00 US ft • Heading: 256.590 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_415_SW • Water Depth: 26.67 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 0.58 US ft • Target Height: 0.00 US ft • Target Length: 32.69 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Possible pipe or wire
	<p>SSS A 010</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/26/2014 3:21:00 PM • Click Position <ul style="list-style-type: none"> • 36.0416890795 -75.5601000736 (WGS84) • 36.0415195256 -75.5604830968 (NAD27LL) • 36.0416890795 -75.5601000736 (LocalLL) • (X) 3016791.41 (Y) 851692.88 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.26.2014\OBII_A_14_Line_316_SW.jsf • Ping Number: 255368 • Range to target: 128.59 US ft • Fish Height: 0.00 US ft • Heading: 255.500 Degrees • Event Number: 0 • Line Name: OBII_A_14_Line_316_SW • Water Depth: 42.73 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 14.73 US ft • Target Height: 0.00 US ft • Target Length: 35.23 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface features

Attachment D: Borrow Area A Magnetic Anomaly Table

Borrow Area A Magnetic Anomaly Table

Anomaly	X Coordinate	Y Coordinate	Line #	Target #	Signature	Intensity	Duration	Assessment	Avoidance Buffers
315-1-dp-6.5g-56.7f	3016556.2	851446.4	315	1	Dipolar	6.5g	56.7f	Small single object	No
318-1-dp-8g-38.6f	3017024.6	851377.7	318	1	Dipolar	8g	38.6f	Small single object	No
331-1-dp-6.9g-93.6f	3020502	852290.9	331	1	Dipolar	6.9g	93.6f	Small single object	No
341-1-nm-5.7g-40f	3021091.5	851133	341	1	Negative Monopolar	5.7g	40f	Small single object	No
352-1-nm-21.3g-398f	3019395.6	847949.9	352	1	Negative Monopolar	21.3g	398f	Moderate object(s)	Buffer B
354-1-dp-27g-113.6f	3017150.3	845576	354	1	Dipolar	27g	113.6f	Moderate single object	No
360-1-pm-19.3g-102.1f	3016934.9	844504.3	360	1	Positive Monopolar	19.3g	102.1f	Moderate single object	Cluster Buffer A
360-2-nm-70.8g-122.8f	3017126.4	844674.2	360	2	Negative Monopolar	70.8g	122.8f	Moderate single object	Cluster Buffer A
366-1-pm-101.1g-136.2f	3018006.3	844359	366	1	Positive Monopolar	101.1g	136.2f	Moderate object(s)	Buffer C

Attachment E: Borrow Area C Sonar Target Table

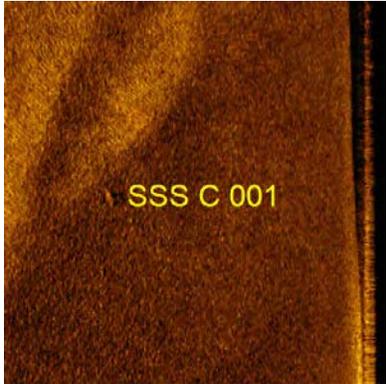
Borrow Area C Sonar Target Table

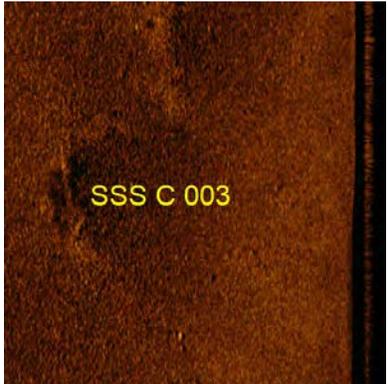
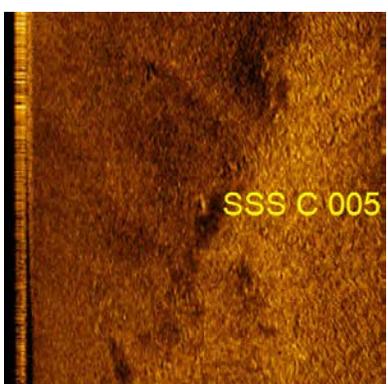
Target	X Coordinate	Y Coordinate	Assessment	Anomaly Association
SSS C 001	2982383.872	909862.2835	Small single object	No
SSS C 002	2981223.849	909594.9132	Small single object(s)	No
SSS C 003	2983408.851	906895.8117	Bottom surface feature	555-2 Possible
SSS C 004	2983032.328	905958.8844	Bottom surface feature	564-1 Possible
SSS C 005	2982110.086	904810.504	Small single object	572-2 Possible
SSS C 006	2982401.932	909813.5558	Small single object	No
SSS C 007	2983181.039	907410.2336	Small single object(s)	No
SSS C 008	2980809.053	904685.6529	Small single object	574-1 Possible
SSS C 009	2982121.612	904865.6474	Bottom surface feature	572-2 Possible

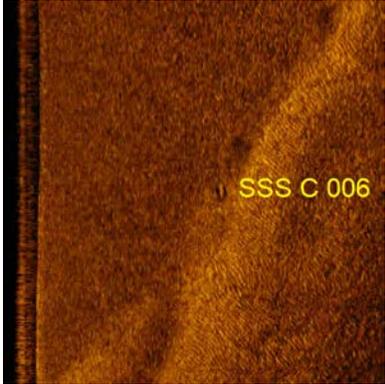
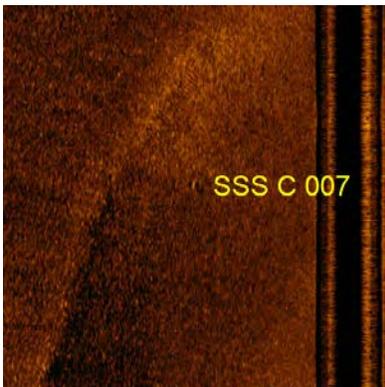
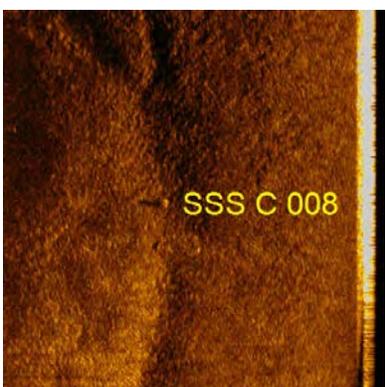
Attachment F: Borrow Area C Sonar Target Reports

Borrow Area C Sonar Target Reports

Generated on 3/13/2015 2:57:38 PM

Target Image	Target Info	User Entered Info
	<p>SSS C 001</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/28/2014 5:38:45 PM • Click Position 36.2046064363 -75.6698160347 (WGS84) 36.2044419671 -75.6701887817 (NAD27LL) 36.2046064363 -75.6698160347 (LocalLL) (X) 2982383.87 (Y) 909862.28 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.28.2014\OBII_C_14_Line_526_W.jsf • Ping Number: 499260 • Range to target: 119.64 US ft • Fish Height: 0.00 US ft • Heading: 291.800 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_526_W • Water Depth: 40.94 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 1.98 US ft • Target Height: 0.00 US ft • Target Length: 9.61 US ft • Target Shadow: 1.65 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object
	<p>SSS C 002</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/28/2014 5:09:03 PM • Click Position 36.2039792346 -75.6737758141 (WGS84) 36.2038148154 -75.6741484038 (NAD27LL) 36.2039792346 -75.6737758141 (LocalLL) (X) 2981223.85 (Y) 909594.91 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.28.2014\OBII_C_14_Line_532_E.jsf • Ping Number: 475085 • Range to target: 156.10 US ft • Fish Height: 0.00 US ft • Heading: 88.100 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_532_E • Water Depth: 50.67 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 10.15 US ft • Target Height: 0.00 US ft • Target Length: 12.86 US ft • Target Shadow: 7.60 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object(s)

	<p>SSS C 003</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/28/2014 2:59:52 PM • Click Position <ul style="list-style-type: none"> 36.1963681033 -75.6666816050 (WGS84) 36.1962034578 -75.6670547941 (NAD27LL) 36.1963681033 -75.6666816050 (LocalLL) (X) 2983408.85 (Y) 906895.81 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.28.2014\OBII_C_14_Line_556_E.jsf • Ping Number: 369891 • Range to target: 134.99 US ft • Fish Height: 0.00 US ft • Heading: 90.000 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_556_E • Water Depth: 42.75 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 10.05 US ft • Target Height: 0.00 US ft • Target Length: 39.37 US ft • Target Shadow: 7.31 US ft • Mag Anomaly: 555-2 • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface feature. Possible association with Anomaly 555-2
	<p>SSS C 004</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/28/2014 2:10:53 PM • Click Position <ul style="list-style-type: none"> 36.1938306654 -75.6680634452 (WGS84) 36.1936660016 -75.6684366642 (NAD27LL) 36.1938306654 -75.6680634452 (LocalLL) (X) 2983032.33 (Y) 905958.88 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.28.2014\OBII_C_14_Line_564_E.jsf • Ping Number: 330006 • Range to target: 93.73 US ft • Fish Height: 0.00 US ft • Heading: 85.100 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_564_E • Water Depth: 46.71 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 3.37 US ft • Target Height: 0.00 US ft • Target Length: 42.90 US ft • Target Shadow: 5.37 US ft • Mag Anomaly: 564-1 • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface feature possibly associated with Anomaly 564-1.
	<p>SSS C 005</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/28/2014 1:13:17 PM • Click Position <ul style="list-style-type: none"> 36.1907629729 -75.6713174618 (WGS84) 36.1905983124 -75.6716906460 (NAD27LL) 36.1907629729 -75.6713174618 (LocalLL) (X) 2982110.09 (Y) 904810.50 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.28.2014\OBII_C_14_Line_572_E.jsf • Ping Number: 283093 • Range to target: 84.45 US ft • Fish Height: 0.00 US ft • Heading: 94.290 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_572_E • Water Depth: 58.39 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 3.77 US ft • Target Height: 0.00 US ft • Target Length: 9.67 US ft • Target Shadow: 6.85 US ft • Mag Anomaly: 572-2 • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object possible association with anomaly 572-2.

	<p>SSS C 006</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/27/2014 1:23:36 PM • Click Position <ul style="list-style-type: none"> • 36.2044710003 -75.6697603982 (WGS84) • 36.2043065283 -75.6701331527 (NAD27LL) • 36.2044710003 -75.6697603982 (LocalLL) • (X) 2982401.93 (Y) 909813.56 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.27.2014\OBII_C_14_Line_527_E.jsf • Ping Number: 134181 • Range to target: 93.09 US ft • Fish Height: 0.00 US ft • Heading: 98.390 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_527_E • Water Depth: 50.57 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 1.43 US ft • Target Height: 0.00 US ft • Target Length: 6.87 US ft • Target Shadow: 2.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object.
	<p>SSS C 007</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/27/2014 3:33:50 PM • Click Position <ul style="list-style-type: none"> • 36.1978013537 -75.6673946928 (WGS84) • 36.1976367416 -75.6677677976 (NAD27LL) • 36.1978013537 -75.6673946928 (LocalLL) • (X) 2983181.04 (Y) 907410.23 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.27.2014\OBII_C_14_Line_551_E.jsf • Ping Number: 240226 • Range to target: 66.54 US ft • Fish Height: 0.00 US ft • Heading: 83.100 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_551_E • Water Depth: 36.09 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 6.28 US ft • Target Height: 0.00 US ft • Target Length: 5.42 US ft • Target Shadow: 0.00 US ft • Mag Anomaly: No • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object(s).
	<p>SSS C 008</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/27/2014 6:00:21 PM • Click Position <ul style="list-style-type: none"> • 36.1905399486 -75.6757379430 (WGS84) • 36.1903753543 -75.6761109364 (NAD27LL) • 36.1905399486 -75.6757379430 (LocalLL) • (X) 2980809.05 (Y) 904685.65 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.27.2014\OBII_C_14_Line_573_W.jsf • Ping Number: 359540 • Range to target: 95.96 US ft • Fish Height: 0.00 US ft • Heading: 291.900 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_573_W • Water Depth: 51.54 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 2.03 US ft • Target Height: 0.00 US ft • Target Length: 4.51 US ft • Target Shadow: 10.83 US ft • Mag Anomaly: 574-1 • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Small single object possible association with anomaly 574-1.

	<p>SSS C 009</p> <ul style="list-style-type: none"> • Sonar Time at Target: 10/27/2014 5:44:34 PM • Click Position <ul style="list-style-type: none"> • 36.1909132975 -75.6712721613 (WGS84) • 36.1907486386 -75.6716453420 (NAD27LL) • 36.1909132975 -75.6712721613 (LocalLL) • (X) 2982121.61 (Y) 904865.65 (Projected Coordinates) • Map Projection: NC83F • Acoustic Source File: F:\CB&I_OBX_II_2014\Sidescan\10.27.2014\OBII_C_14_Line_571_E.jsf • Ping Number: 346686 • Range to target: 125.71 US ft • Fish Height: 0.00 US ft • Heading: 95.290 Degrees • Event Number: 0 • Line Name: OBII_C_14_Line_571_E • Water Depth: 46.11 US ft • Positioning System to Sensor: 0.0000 	<p>Dimensions and attributes</p> <ul style="list-style-type: none"> • Target Width: 6.78 US ft • Target Height: 0.00 US ft • Target Length: 24.75 US ft • Target Shadow: 8.19 US ft • Mag Anomaly: 572-2 • Avoidance Area: • Classification1: • Classification2: • Area: • Block: • Description: Bottom surface feature possibly associated with anomaly 572-2.
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Attachment G: Borrow Area C Magnetic Anomaly Table

Borrow Area C Magnetic Anomaly Table

Anomaly	X Coordinate	Y Coordinate	Line #	Target #	Signature	Intensity	Duration	Assessment	Avoidance Buffers
507-1-dp-5g-115.1f	2982390.7	912045.9	507	1	Dipolar	5g	115.1f	Small Single Object	No
509-1-nm-3.4g-62.4f	2983840.7	911869.3	509	1	Negative Monopolar	3.4g	62.4f	Out of Area	No
511-1-pm-8.3g-102.2f	2981111.2	911652.8	511	1	Positive Monopolar	8.3g	102.2f	Small Single Object	Buffer N
512-1-dp-9.9g-181.7f	2981159.2	911589.3	512	1	Dipolar	9.9g	181.7f	Moderate Single Object	Buffer N
512-2-dp-32.3g-55.7f	2982153.2	911567.3	512	2	Dipolar	32.3g	55.7f	Moderate Single Object	Buffer M
513-1-dp-9.2g-181.9f	2981045.9	911452.6	513	1	Dipolar	9.2g	181.9f	Moderate Single Object	Buffer N
513-2-pm-9.6g-135.6f	2982106.5	911465.4	513	2	Positive Monopolar	9.6g	135.6f	Moderate Object(S)	Buffer M
514-1-mc-10.7g-235.4f	2980981.8	911359.2	514	1	Multicomponent	10.7g	235.4f	Moderate Object(S)	Buffer N
514-2-dp-15.6g-372.2f	2982237.9	911356.7	514	2	Dipolar	15.6g	372.2f	Moderate Object(S)	Buffer M
514-3-dp-27.7g-62.4f	2983753	911364	514	3	Dipolar	27.7g	62.4f	Moderate Single Object	Buffer L
515-1-dp-5.6g-42.4f	2983783.8	911245	515	1	Dipolar	5.6g	42.4f	Small Single Object	Buffer L
517-1-pm-16.7g-193.9f	2980950.3	910988.2	517	1	Positive Monopolar	16.7g	193.9f	Moderate Object(S)	No
517-2-nm-8.3g-145.7f	2981504.7	910993.2	517	2	Negative Monopolar	8.3g	145.7f	Moderate Object(S)	No
517-3-pm-5.4g-49.8f	2981996.5	910987.2	517	3	Positive Monopolar	5.4g	49.8f	Small Single Object	No
521-1-pm-15.4g-104.6f	2980721.2	910593.4	521	1	Positive Monopolar	15.4g	104.6f	Out of Area	No
523-1-dp-7.4g-61.1f	2983430.2	910404.9	523	1	Dipolar	7.4g	61.1f	Small Single Object	No
525-1-nm-10.5g-242.9f	2981068.1	910087.3	525	1	Negative Monopolar	10.5g	242.9f	Moderate Object(S)	Buffer K
526-1-dp-14.6g-294f	2981029.6	909980.4	526	1	Dipolar	14.6g	294f	Moderate Single Object	Buffer K
527-1-pm-7.4g-32.6f	2983938.7	909908.7	527	1	Positive Monopolar	7.4g	32.6f	Small Single Object	No
528-1-mc-9.5g-276.3f	2981603	909812.3	528	1	Multicomponent	9.5g	276.3f	Moderate Object(S)	Buffer J
530-1-mc-15g-348.2f	2980910.5	909582.1	530	1	Multicomponent	15g	348.2f	Moderate Object(S)	Buffer I
532-1-pm-20.2g-174.3f	2981148.3	909434.8	532	1	Positive Monopolar	20.2g	174.3f	Moderate Single Object	Buffer I
534-1-pm-11.1g-328.2f	2981757.2	909097.7	534	1	Positive Monopolar	11.1g	328.2f	Moderate Single Object	Buffer H
538-1-nm-4.8g-71.5f	2981158.6	908701.2	538	1	Negative Monopolar	4.8g	71.5f	Small Single Object	No
542-1-dp-10.2g-143.4f	2981134.5	908318.3	542	1	Dipolar	10.2g	143.4f	Moderate Single Object	No
542-2-dp-8.3g-88.5f	2981824.6	908313.7	542	2	Dipolar	8.3g	88.5f	Small Single Object	No
550-1-nm-6.1g-66.8f	2983669.5	907427.3	550	1	Negative Monopolar	6.1g	66.8f	Small Single Object	No
551-1-pm-42.7g-53.1f	2984818.2	907354	551	1	Positive Monopolar	42.7g	53.1f	Out of Area	No
553-1-nm-11.1g-274.6f	2983457.6	907023.9	553	1	Negative Monopolar	11.1g	274.6f	Moderate Object(S)	Buffer G
555-1-nm-10.4g-196.6f	2980644.2	906851.8	555	1	Negative Monopolar	10.4g	196.6f	Moderate Object(S)	Buffer F
555-2-dp-29.4g-93.6f	2983497.2	906844.3	555	2	Dipolar	29.4g	93.6f	Moderate Object(S)	Buffer G
556-1-nm-11.3g-303.6f	2980586.4	906757.8	556	1	Negative Monopolar	11.3g	303.6f	Moderate Object(S)	Buffer F
558-1-dp-17.2g-230.2f	2981187.3	906544.4	558	1	Dipolar	17.2g	230.2f	Moderate Single Object	No
558-2-nm-6g-69.2f	2983447.4	906543.5	558	2	Negative Monopolar	6g	69.2f	Small Single Object	No
558-3-dp-4.2g-106.9f	2983666.7	906534.1	558	3	Dipolar	4.2g	106.9f	Moderate Single Object	No
560-1-dp-8.2g-214.2f	2982187	906374.6	560	1	Dipolar	8.2g	214.2f	Moderate Object(s)	No
563-1-mc-9.8g-172.4f	2980188.3	905982.7	563	1	Multicomponent	9.8g	172.4f	Moderate Object(s)	No
564-1-nm-7.4g-58.6f	2982940.1	905858.9	564	1	Negative Monopolar	7.4g	58.6f	Small Single Object	No
565-1-dp-5.3g-82.6f	2981582.4	905660.8	565	1	Dipolar	5.3g	82.6f	Small Single Object	No
566-1-dp-13g-78.7f	2981418.4	905558	566	1	Dipolar	13g	78.7f	Small Single Object	No
567-1-dp-12.5g-103.1f	2980852.7	905473.9	567	1	Dipolar	12.5g	103.1f	Moderate Single Object	Buffer E
568-1-dp-14.7g-166.9f	2980836.9	905380.8	568	1	Dipolar	14.7g	166.9f	Moderate Single Object	Buffer E
568-2-dp-6.6g-162.5f	2981625.8	905380.2	568	2	Dipolar	6.6g	162.5f	Moderate Object(s)	No
569-1-nm-12g-232.9f	2980730.4	905160.4	569	1	Negative Monopolar	12g	232.9f	Moderate Object(s)	No
570-1-pm-21.8g-130.9f	2983000.6	905063.1	570	1	Positive Monopolar	21.8g	130.9f	Moderate Object(s)	No
571-1-pm-13.9g-78.5f	2984062.3	904988.5	571	1	Positive Monopolar	13.9g	78.5f	Small Single Object	No
572-1-dp-10.4g-134.6f	2980678	904894.1	572	1	Dipolar	10.4g	134.6f	Moderate Single Object	No
572-2-nm-7.4g-43.1f	2981949.6	904894.6	572	2	Negative Monopolar	7.4g	43.1f	Small Single Object	No

572-3-dp-25.5g-83.8f	2982623.1	904889.1	572	3	Dipolar	25.5g	83.8f	Moderate Single Object	No
573-1-pm-10.3g-144.1f	2984282.9	904763.2	573	1	Positive Monopolar	10.3g	144.1f	Moderate Object(s)	No
574-1-nm-13.7g-179f	2980732.4	904674.5	574	1	Negative Monopolar	13.7g	179f	Moderate Single Object	SSS C 008 Single Object
576-1-nm-5.7g-64.6f	2983213.2	904501.4	576	1	Negative Monopolar	5.7g	64.6f	Small Single Object	No
577-1-dp-15.7g-180.8f	2980869.9	904373.2	577	1	Dipolar	15.7g	180.8f	Moderate Single Object	No
580-1-dp-7.1g-48.1f	2983130.7	904002	580	1	Dipolar	7.1g	48.1f	Small Single Object	No
581-1-dp-13.2g-217.8f	2979498	903880.4	581	1	Dipolar	13.2g	217.8f	Moderate Single Object	No
581-2-dp-16.7g-166f	2980515.5	903882	581	2	Dipolar	16.7g	166f	Complex Object(s)	Buffer D
581-3-pm-8.6g-192.1f	2981091.4	903878.7	581	3	Positive Monopolar	8.6g	192.1f	Moderate Object(s)	No
582-1-dp-17.3g-169.5f	2980381.6	903782.4	582	1	Dipolar	17.3g	169.5f	Complex Object(s)	Buffer D
583-1-nm-9.4g-102.6f	2979328.5	903720.4	583	1	Negative Monopolar	9.4g	102.6f	Small Single Object	No
583-2-pm-30.7g-100.9f	2983723.2	903710.4	583	2	Positive Monopolar	30.7g	100.9f	Moderate Object(s)	
587-1-mc-14.6g-462.2f	2980409.6	903196.5	587	1	Multicomponent	14.6g	462.2f	Complex Object(s)	Buffer C
594-1-mc-10.4g-462.9f	2980601.9	903017.5	594	1	Multicomponent	10.4g	462.9f	Complex Object(s)	Buffer B
596-1-dp-12.4g-56.4f	2978189.8	902805.6	596	1	Dipolar	12.4g	56.4f	Small Single Object	No
600-1-mc-9.5g-165.5f	2978970.2	902417.2	600	1	Multicomponent	9.5g	165.5f	Complex Object(s)	Buffer A
601-1-mc-4.8g-108.3f	2978804.6	902241.1	601	1	Multicomponent	4.8g	108.3f	Complex Object(s)	Buffer A