

Archaeological Remote Sensing Survey of Topsail and West Onslow Beaches Offshore Borrow Areas

Contract Number: DACW54-03-D-0002

Delivery Order: 0003



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

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

Principal Investigator:

Wes Hall
28 December 2004

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Wilmington District
69 Darlington Avenue
Wilmington, North Carolina 28403

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*Mid-Atlantic Technology and Environmental Research, Inc.
441 Blossom Ferry Road
Castle Hayne, North Carolina 28429*

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ABSTRACT

The U.S. Army Corps of Engineers Wilmington District (USACE) is conducting preliminary investigations of eight proposed sand borrow areas totaling +/- 5,430 acres, for a beach re-nourishment project at Topsail and West Onslow Beaches, in Pender and Onslow Counties, North Carolina. As a part of these investigations, Mid-Atlantic Technology and Environmental Research, Inc. (M-AT/ER) of Castle Hayne, North Carolina, conduct marine magnetometer and side-scan sonar surveys of the proposed borrow areas for the purpose of identifying any potential archaeological resources that might be impacted by the offshore dredging activities during the sand mining process.

In addition to archaeological resources, M-AT/ER conducted a search to identify hard bottom/marine habitat areas, using side-scan sonar record analysis as part of the remote sensing investigations. M-AT/ER conducted historical research and field investigations for the project between 15 July and 20 September 2004.

No targets were found, therefore no further investigations are recommended.

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INTRODUCTION

The U.S. Army Corps of Engineers Wilmington District (USACE) is conducting preliminary investigations of eight proposed sand borrow areas totaling +/- 5,430 acres, for a beach re-nourishment project at Topsail and West Onslow Beaches, in Pender and Onslow Counties, North Carolina. As a part of these investigations, Mid-Atlantic Technology and Environmental Research, Inc. (M-AT/ER) of Castle Hayne, North Carolina, was contracted to conduct marine magnetometer¹ and side-scan sonar² surveys of the proposed borrow areas for the purpose of identifying any potential archaeological resources that might be impacted by the offshore dredging activities during the sand mining process. This work was conducted pursuant to provisions of Section 106 of the National Preservation Act of 1966 (36 CFR 800, Protection of Historic Properties) and the Abandon Shipwreck Act of 1987 (Abandon Shipwreck Guidelines, National Park Service, Federal Register, Vol. 55, No. 3, 4 December 1990, pages 50116-50145)³.

In addition to archaeological resources, M-AT/ER was required to search for and identify hard bottom/marine habitat areas using side-scan sonar record analysis as part of the remote sensing investigations. M-AT/ER conducted historical research and field investigations for the project between 15 July and 20 September 2004.

PROJECT LOCATION

The eight survey areas are located between 2 and 6 nautical miles offshore of New Topsail Inlet and the town of Topsail Beach. Figures 1 and 2 show the relative position of each borrow area, followed by Figures 3 through 10 that show detail of each survey area. North Carolina State Plane coordinates (NAD 83) are included for reference. The combined acreage for the eight borrow areas is +/- 5,430 acres.

¹ A magnetometer is an electronic instrument that measures localized changes in the earth's magnetic field. By using a magnetometer in a controlled survey, the presence of ferrous materials can be detected. Since most historically significant shipwrecks contain relatively large amounts of iron or steel in the form of fasteners, anchors, cannons, or engines, etc., their presence can frequently be detected by a magnetometer survey.

² Side-scan sonar is an underwater acoustic instrument that by electronic means generates a graphic representation of the bottom surface. By interpretation of these graphic records, the user can identify geographic changes in the bottom or man-made objects protruding above the bottom surface.

³ A national policy for historic preservation has been established in accordance with authorization contained in Sections 106 and 110 (formerly E.O. 11593) of the National Historic Preservation Act of 1966, as amended following the Advisory Council on Historic Preservation Regulations (36 CFR 800). Executive Order 11593 and the Historic Preservation Act Amendments of 1980 specified that the Federal Government shall provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. In 1988, the Abandoned Shipwreck Act (Public Law 100-298) declared that the states (or territories of the U.S.) are to manage shipwrecks in state waters. As a result of these acts and other legislation, state and federal agencies are required to administer cultural properties under their control in a spirit of stewardship and trusteeship. Each agency is required to initiate such measures as are necessary to insure that policies, plans, and programs will preserve sites, structures, and objects of historical or archaeological significance that exist on properties owned by the Federal Government or that are subject to federal regulation.

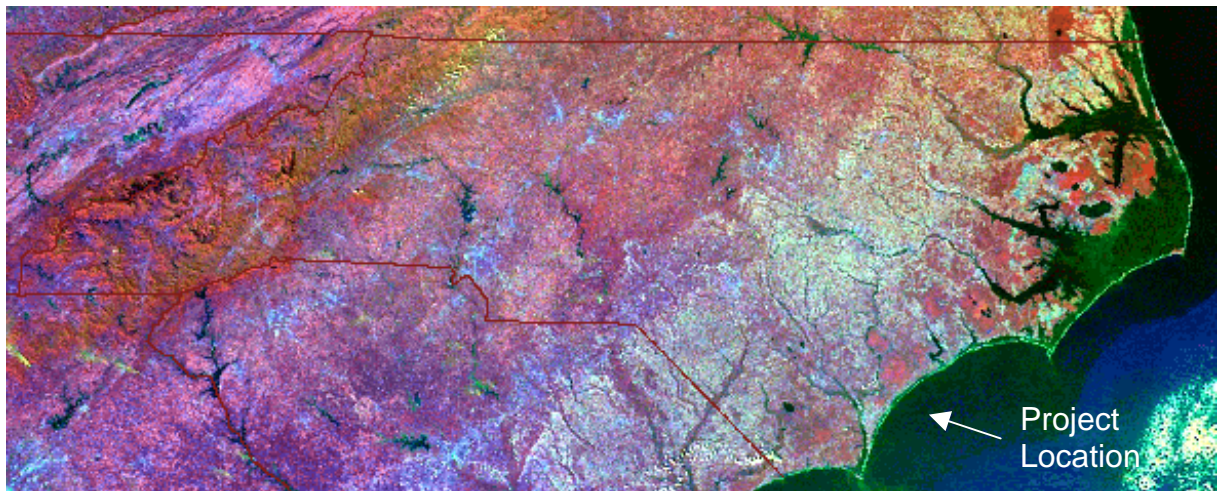


Figure 1. Project Location Map.

North Carolina State Plane Coordinates (NAD 83) for eight proposed sand borrow areas:

Area A1

x	y
2397577	202972
2403829	199725
2409694	197954
2412852	199615
2411981	202200
2407037	206616
2402788	208582

Area A2

x	y
2406166	211981
2407555	211262
2408003	207993
2410796	207647
2409658	213465
2407770	213855
2406166	211981

Area B

x	y
2412490	216781
2412810	212891
2411549	213007
2411307	211236
2416264	210190

Area C

x	y
2412681	204658
2412528	201657
2414813	198581
2417807	201592
2416507	202825
2416507	202825
2419613	204845
2415235	206017

Area D

x	y
2416225	191114
2422048	195469
2420857	195957
2414508	195004
2413597	193474

Area E

x	y
2423699	206578
2420485	208146
2422969	205359
2424638	204947
2427501	205729
2430153	208197
2428827	209783
2424615	208084

Area F

x	y
2432688	216048
2430261	209669
2433767	205739
2435377	209099
2434049	211390
2434129	213806

Area G

x	y
2436043	214919
2436790	212802
2439100	212749
2443410	215619



Figure 3. Relative Position of Project Areas.

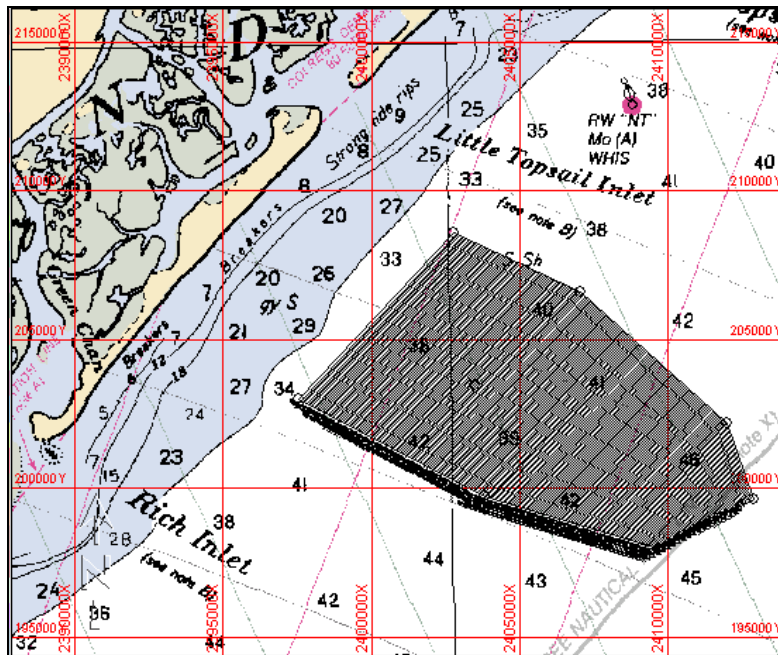


Figure 3. Area A1.

The Area A1 survey consisted of 207 lines @ 65ft/20m spacing, totaling more than 1,337,657 linear ft/220 nautical miles with water depths of 34 to 47 ft.

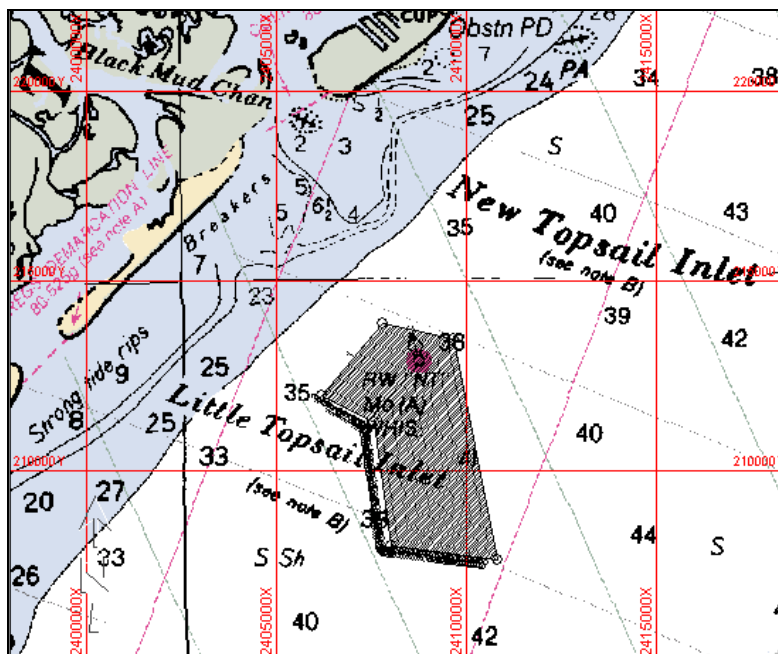


Figure 4. Area A2.

The Area A2 survey consisted of 96 lines @ 65ft/20m spacing, totaling 249,567 linear ft/41 nautical miles with water depths of 34 to 42 ft.

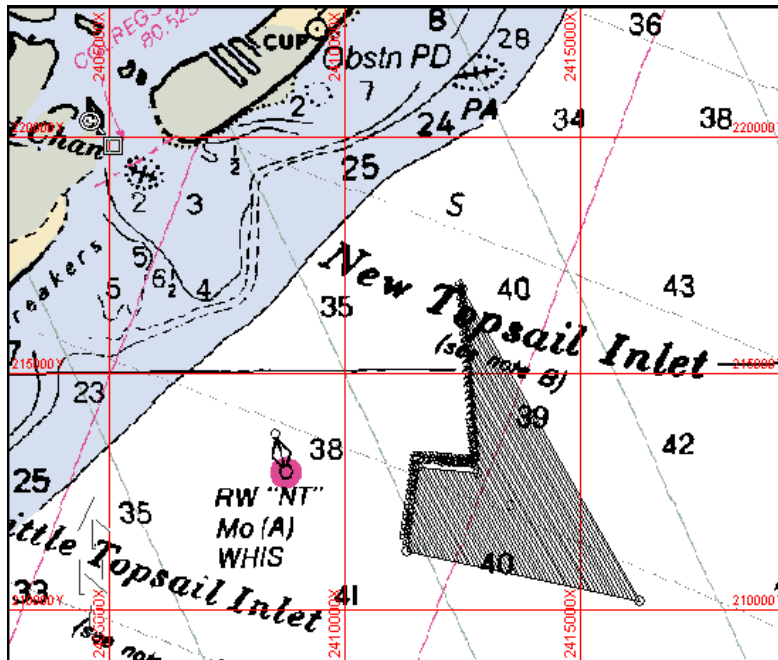


Figure 5. Area B.

The Area B survey consisted of 93 lines @ 65ft/20m spacing, totaling 336,683 linear ft/55.38 nautical miles with water depths of 38 to 42 ft.

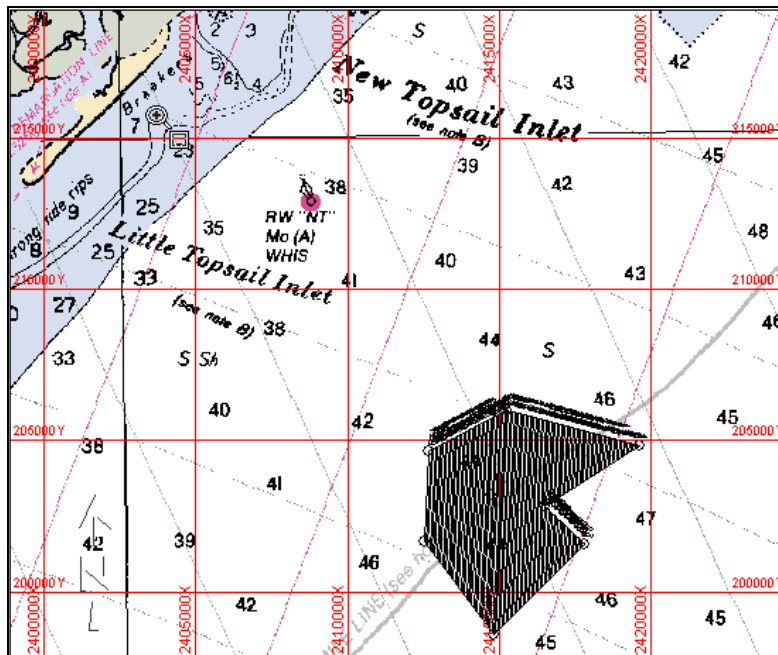


Figure 6. Area C.

The Area C survey consisted of 128 lines @ 65ft/20m spacing, totaling 434,986 linear ft/71.54 nautical miles with water depths of 32 to 47 ft.

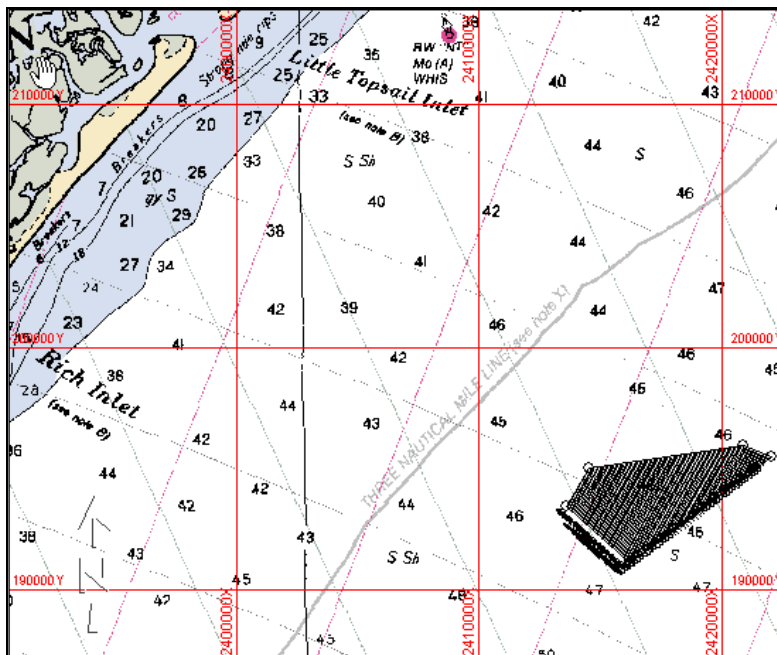


Figure 7. Area D.

The Area D survey consisted of 97 lines @ 65ft/20m spacing, totaling 311,535 linear ft/54.24 nautical miles with water depths of 36 to 48 ft.

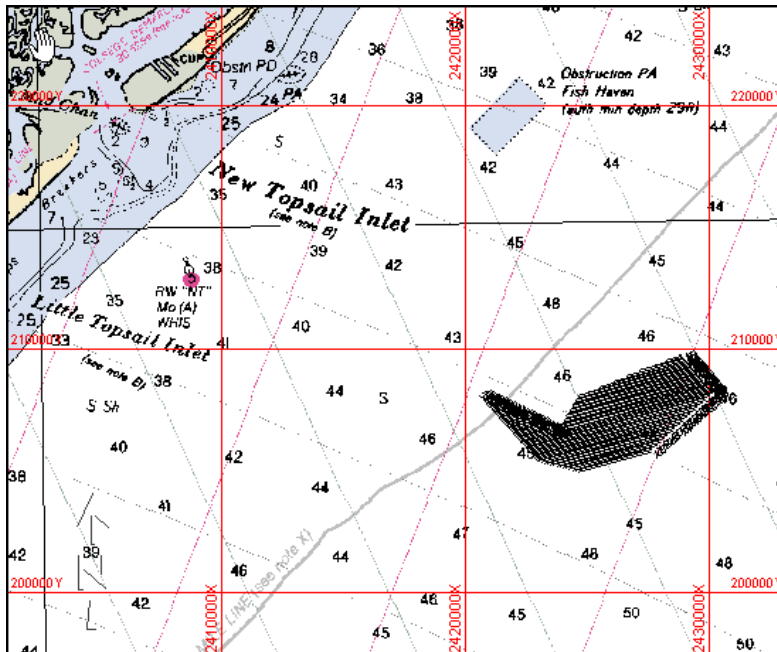


Figure 8. Area E.

The Area E survey consisted of 92 lines @ 65ft/20m spacing, totaling 320,507 linear ft/52.71 nautical miles with water depths of 35 to 47 ft.

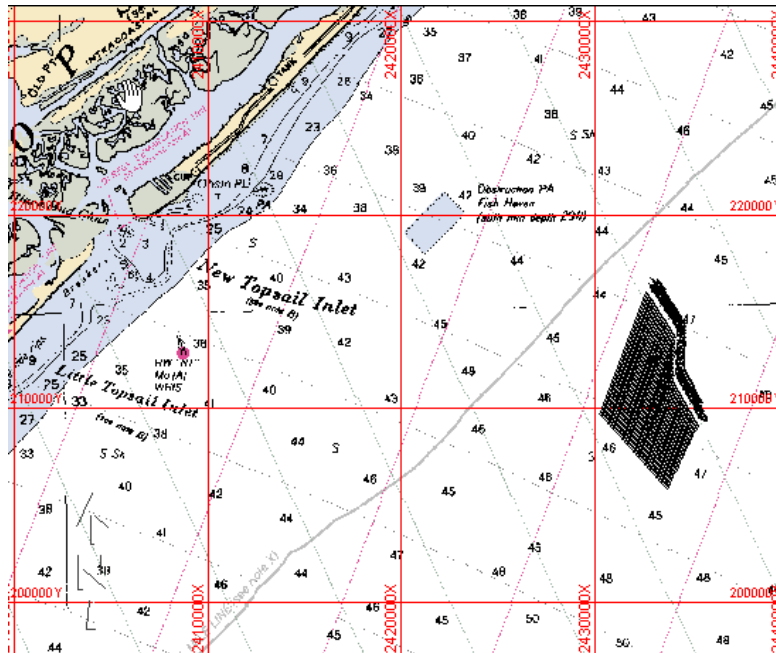


Figure 9. Area F.

The Area F survey consisted of 77 lines @ 65ft/20m spacing, totaling 407,348 linear ft/67 nautical miles with water depths of 44 to 47 ft.

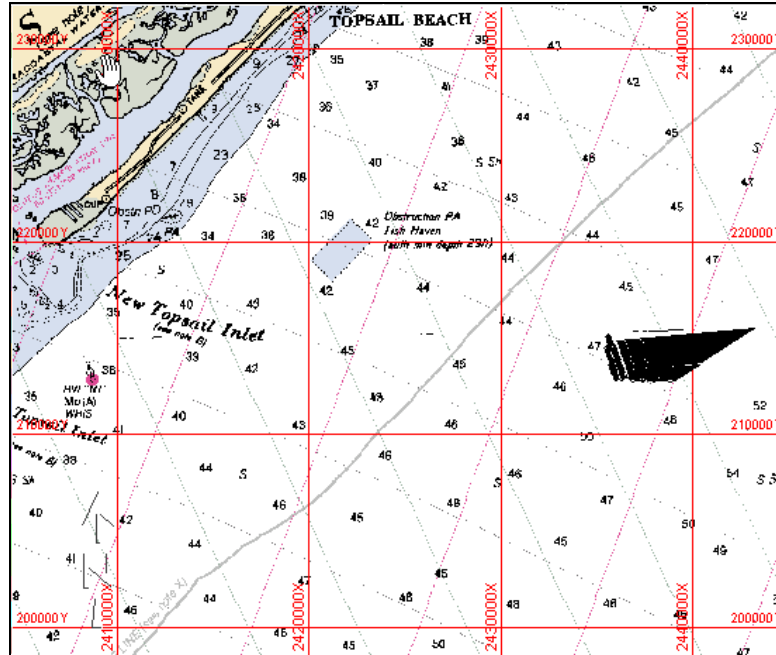


Figure 10. Area G.

The Area G survey consisted of 37 lines @ 65ft/20m spacing, totaling 173,052 linear ft/28.46 nautical miles with water depths of 47 to 50 ft.

HISTORICAL BACKGROUND

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

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

New Topsail Inlet is located at the lower end of Topsail Beach and connects the waters of the Atlantic Ocean with those of Topsail Sound, in Pender County. New River Inlet is to the north and Old Topsail Inlet to the south. The city of Wilmington is approximately 20 miles to the southwest.

Settlement

Permanent settlement of the Topsail Sound shoreline began in the early eighteenth century. One of the earliest land grants was issued in 1726 to John Baptista Ashe and was comprised of 800 acres "being the banks between Stumpy Sound and New Topsail Inlet" (Anglely 1984:1).

Around this same time, the Nixon family began to settle along Topsail Sound, evidenced by the label "Nixon" opposite the inlet on the Moseley Map of 1733. The Wimble Map of 1738 notes several plantations near the inlet as well as an anchorage point just inside the inlet, indicating its use as an artery of coastal trade. By the time of the American Revolution, several other families had settled along the nearby shoreline of Topsail Sound, including the families of Bishop, Price, Morris, and Harrison (Anglely 1984:1).

As early as 1755, New Topsail Sound was designated as an official inspection point for export commodities in New Hanover County, along with counties Brunswick, Wilmington, and New Exeter. In the following years of 1758, 1764, and 1770, the legislature again issued the designation. The New Topsail Inlet itself was made the point of inspection for the Topsail Sound area, in 1784. Inspections were conducted for export commodities of fish, flour, butter, flax seed, beef, pork, rice, tar, pitch and turpentine, staves and headings, sawed lumber and shingles (Anglely 1984:1).

Settlement continued in the area. By the mid-nineteenth century, new families had established residency. In 1845, in addition to existing sound property, Charles H. Alexander acquired some 75 acres of beach property on both sides of the inlet.

Owen Holmes was granted 76 acres on the upper side of the inlet and 361 acres between New Topsail and Old Topsail inlets, in 1859. Holmes Landing was established directly opposite New Topsail Inlet as a local shipping point, by the time of the Civil War (Angley 1984:2).

Environment

With a depth of 10 feet (presumably at high tide), the inlet was suitable for passage by schooners and small sloops. It appears that the position of the inlet remained relatively stable throughout the Colonial Period. However, the volume of trade was limited by the shallowness of adjoining sounds and a lack of direct communication with the mouth of a large navigable stream (Angley 1984:2).

During the latter part of the eighteenth century and throughout most of the nineteenth century, New Topsail Inlet migrated significantly to the north. According to the Mouzon Map of 1775 and the Price-Strother Map of 1808, the inlet migrated northward some two miles. While the Mac Rae-Brazier Map of 1833 indicates no significant change, the U.S. Coast Survey Map of 1865 shows that an additional migration of two miles occurred during that period. The migration appears to have abated during the end of that century, as is suggested by review of the Kerr-Cain Map of 1882 and the Post Route Map of 1896 (Angley 1984:7).

A detailed U.S. Coast Survey Map of 1885 indicates that the New Topsail Inlet was approximately 3,000 feet wide at that time.

Shipwrecks

Eleven vessels were reported or believed to have been lost in the area of Topsail Inlet (see also Shipwreck List).

In 1750, a hurricane struck the mid-Atlantic region, causing the loss of four vessels of the 1750 Spanish Plate Fleet. One of those ships, packet boat *El Salvador* was lost in the vicinity of Topsail Inlet on 18 August 1750 (Stick 1952:244). Due to the shifting sands, the surviving remains were buried in a matter of days, making salvaging operations difficult. The exact position of the vessel has been uncertain, although two locations have been suggested: modern New Topsail Inlet or Beaufort Inlet, which also was known as Old Topsail Inlet during that period (Tubby 2000:51).

Before the Civil War, the following vessels were lost in the vicinity: schooner *Superior*, driven ashore 24 November 1841 (Angley 1984:6); an unknown brig in September 1769, run ashore below Topsail Inlet (Tubby 2000:173); English merchantman *Betsy* in 1771 at Old Topsail Inlet (Tubby 2000:173); schooner *Mary Bear* on 9 September 1881 at New Topsail Inlet (Stick 1952:249); and schooner *William H. Sumner* on 7 September 1919, grounded at Topsail Inlet.

The Civil War activity in the area resulted in a number of wrecks. On 22 October 1862, sailing aboard the USS *Ellis*, Lieutenant William B. Cushing reported the seizure and scuttling of schooner *Adelaide* of Halifax. Abandoned about a mile from the mouth of New Topsail Inlet, the ship was loaded with about 600 barrels of turpentine, 36 bales of cotton, and tobacco. Unable to be floated to sea, the vessel was burned (Anglely 1984:4).

Eight days later, en route from Hampton Roads to its Wilmington station, the USS *Daylight* seized the blockade-runner *Racer* near New Topsail Inlet. The vessel, loaded primarily with salt, had been abandoned by her crew along Topsail Beach in order to avoid capture. The USS *Daylight* crew was able to refloat the vessel, which was later taken to New York (Anglely 1984:4). (*Graveyard of the Atlantic* lists this vessel as having wrecked at Diamond Shoals (Stick 1952:246)).

The USS *Daylight* again was successful in thwarting Confederate shipping, when they chased ashore and destroyed an unidentified schooner, westward of Stump Inlet (Anglely 1984:4).

On 23 September 1863, iron-hulled steamer *Phantom* ran aground and was burned near Rich Inlet. She carried a cargo of government stores including arms, medicine, lead ingots, and sundry items (Tubby 2000:173). It was later confirmed the *Phantom* actually ran aground in Topsail Inlet (Personal communication, Richard Lawrence, NC Division of Archives and History, Underwater Archaeology Unit, Fort Fisher).

About 5 miles to the northward of New Topsail Inlet, on 2 February 1863, the USS *Mount Vernon* destroyed an abandoned blockade runner loaded with salt (Anglely 1984:4), believed to be schooner *Industry* (Tubby 2000:173).

On 25 August 1863, Lieutenant Cushing, aboard USS *Shokokon*, captured the *Alexander Cooper*, which is believed to be the last vessel sunk or captured in the New Topsail Inlet vicinity during the Civil War (Anglely 1984:4).

Other vessels lost in the Topsail Inlet vicinity during the Civil War include an unknown schooner that ran ashore westward of Stump Inlet on 22 January 1863; and *Wild Dayrell* (or *Wild Darryl*), a side-wheel steamer that was grounded and burned near Rich Inlet (mistakenly placed in New Topsail Inlet Tubby's thesis). She carried a cargo of shoes, blankets, and valuable merchandise (Tubby 2000:173).

Maritime Commerce

As was indicative of vessels seized, the inlet was active with salt production. A 1864 military map shows at least 2 Confederate salt works situated on either side of Holmes Landing. The presence of the salt works is further substantiated in a letter of 1 November 1862 written by USS Lieutenant William Cushing to his superior.

The following year, on 22 August, Lieutenant Cushing and his men destroyed the second salt works on Topsail Sound, which apparently had been rebuilt later to the east of Holmes Landing (Angley 1984:3).

Twentieth Century Activity

As reported on a detailed map by surveyor Eric Norden in the mid-1920s, New Topsail Inlet had narrowed to a width of 2,550 feet.

In 1932, a 12-foot deep and ninety-foot wide segment of the Intracoastal Waterway between Beaufort and the Cape Fear south of Wilmington was completed. The channel allowed for an increase in vessel traffic from 33,710 tons in 1932 to 243,000 tons in 1939. As reported the previous year, the character of the vessel traffic – of around 9,000 vessel trips – consisted of approximately 8,500 motor vessels, 300 tugs, 200 barges, and a smattering of pleasure craft. Cargo vessels transported agricultural commodities, lumber, petroleum products, seafood, fertilizer, and general merchandise (Angley 1984:8).

No subsequent improvements of any kind were made to the New Topsail Inlet vicinity, or along Topsail Beach, according to a Pender County highway map of 1938. Although a few structures existed near the mouth of the Old Topsail Creek, other structures were located in the Sloop Point area, well to the northeast.

However, by 1947, development of Topsail Beach began. A bridge had been built across the sound (at the upper end of beach), and a road had been constructed along the beach to the mouth of the New Topsail Inlet. Between 1947 and 1970, considerable growth occurred on Topsail Beach, resulting in hundreds of cottages, other structures, a network of streets, and docking facilities at the lower end of the beach adjoining the mouth of New Topsail Inlet. Additionally, a new marked channel provided direct communication between the inlet and the Intracoastal Waterway, besides the associated old Banks and Howard channels.

By the mid-1970s, the New Topsail Inlet had narrowed considerably more – to a width of 1,250 feet from a mid-1920s width of 2,550 feet. During 1938 and 1972, the inlet moved southward some 2,680 feet, reversing the migration of the late eighteenth and early nineteenth centuries. Most of the migration occurred between 1948 and 1956 (Angley 1984:8).

Whereas the earlier maritime activity within the New Topsail Inlet vicinity was related to settlement and expansion, modern-day vessel traffic primarily consists of pleasure craft, sporting fishing boats, and some commercial vessels. Today, the inlet is maintained by the U.S. Army Corps of Engineers.

PREVIOUS INVESTIGATIONS

During 1963 and 1964, the United States Navy, at the request of the North Carolina Division of Archives and History, conducted salvage and exploration activities in the area. Location and preliminary examination was made of a Civil War period steam vessel in the immediate vicinity of either Rich or Topsail Inlet. Limited surviving records of this investigation do not confirm the site's location or describe the extent or nature of the work undertaken (Watts et al. 1975:57).

In 1975, the North Carolina Underwater Archaeology Unit (Fort Fisher) conducted a summer field school that included a general magnetometer survey of portions of the areas north of Carolina Beach to Topsail Island. The magnetometer survey identified four magnetic anomalies in the vicinity of New Topsail and Old Topsail Inlets. Data collected indicates that the two targets were low intensity, multi-component anomalies. These targets were not examined further because of poor weather conditions. The report recommended further magnetic remote sensing.

The third target ("The Phantom Site") was found at a location originally called the Colorado Site, which is located approximately 200 yards south of the southern end of New Topsail Inlet and in 16 to 18 feet of water. Only the boilers, steam machinery, and small portion of the hull were exposed. However, given the intense magnetic signature of 7,000 gammas, it is believed that more of the vessel lies below the bottom. The target was identified as the remains of a mid-nineteenth century iron hull, double screw steamer – possibly the remains of blockade-runner *Phantom*. Additional investigations were recommended in order to positively identify the specific vessel found (Watts et al. 1975:115).

The fourth anomaly indicated a target with "a considerable amount of material below the bottom", which was located 1.2 miles east of New Topsail Inlet. This target was deemed most worthy of additional investigation. Dive investigations failed to reveal any materials above the bottom (Kimmel 1998:2).

Prior to this survey, no previous attempts to locate submerged cultural resources were undertaken in this area.

Later, in 1988, the USACOE performed a magnetic survey inside New Topsail Inlet for a proposed borrow area. The survey reported no anomalies within the survey area. However, there is mention of a large object (250 feet in length), located offshore of the borrow area and visible from an aerial photo taken in 1963. The object is not visible on more recent photos.

In 2000, in an effort to locate the 1750 Spanish Plate Fleet *El Salvador*, a magnetometer and side-scan sonar survey was conducted around New Topsail Inlet in a 6-square-mile area centered on the inlet. Two sites were found, and dive investigations of these sites revealed the remains of a late nineteenth to early

twentieth century sailing vessel. The other site did not represent the remains of a broken up wreck. The *El Salvador* was not located.

PRE-SURVEY CONSULTATION AND DOCUMENTATION

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

The following offices and/or institutions were contacted:

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

Preliminary secondary sources examined:

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

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

DESCRIPTION OF INVESTIGATIONS

Using a 25-foot survey vessel, M-AT/ER's underwater archaeology team conducted a remote sensing survey of the eight proposed borrow areas. Two remote sensing devices were used: a Geometrics 881 cesium marine magnetometer, and a Marine Sonic 600-kHz side-scan sonar. Each instrument was interfaced with a Starlink Differential Global Positioning System. HYPACK MAX™ navigation software also

was interfaced with the DGPS system, being used to develop the survey lines and maintain vessel track during data collection.

Data was collected along parallel lines spaced at 65-foot (20-meter) intervals. Magnetic data, along with corresponding positioning data, was recorded at one-second sample intervals (or approximately every 8 feet along a track line at 5 knots) using MAGSEA and HYPACK data acquisition software. Since depths in each of the proposed borrow areas ranged from 40 to 50 feet, a 65-pound tri-fin stabilizer/depressor was used to keep the magnetometer sensor at an average depth of 18 to 22 feet above the bottom surface. Acoustic data was recorded with Sea Scan PC acoustic data acquisition software using an onboard PC computer system. At the end of each day, acoustic data was stored on 700 mb CDs. The side-scan sonar fish was maintained at an altitude (generally 20 to 30 feet) above the bottom, which provided the most detailed records.

To assist in data analysis, hydrographic data also was recorded entirely in HYPACK.

Data Analysis (General)

During field investigations, data being produced by the magnetometer and side-scan sonar was closely monitored. Targets (magnetic or acoustic) were identified and recorded as they were generated. Field logs were maintained, which included information about remote sensing targets, the local environment, man-made features (such as pipelines), channel markers, crab traps, and conditions that could influence magnetic or acoustic data.

After a survey area had been completed, archaeologists edited the magnetic data for detailed analysis and comparison to acoustic data. Editing was performed in three phases. The initial phase consisted of using HYPACK's single-beam editing program to review raw data (individual survey lines) and to delete any artificially induced noise or data spikes. While editing survey lines, a preliminary target table was developed, which included individual target coordinates, signature characteristics, intensity, and duration. Once all survey lines for an area were edited, the edited data was converted to an XYZ file (Easting and Northing State Plane Coordinates, and magnetometer data – measured in nanoteslas), also using HYPACK. Next, the XYZ files were imported into a Triangular Irregular Network (TIN) modeling program (HYPACK) that was used to contour the data in 1- to 10-nanotesla intervals. Once the data had been contoured, the contour graphic was converted to a DXF file and imported into AutoCAD in order to clearly view individual magnetic anomalies and compare their association with acoustic target signatures. (In AutoCAD, additional editing of the total magnetic intensity can be performed without effecting individual magnetic anomalies. For example, dramatic or pronounced diurnal changes that frequently can create a striped, zigzag, or herring bone pattern in the contour lines can be edited out and averaged across a survey area to create a more realistic and accurate contour map.)

A second major analytical technique employed was the subtraction of general background from each successive data sample to develop the actual field gradient. The gradient is the vertical difference (z) between samples. By subtracting successive data samples one from the other, the effects of diurnal change were completely eliminated. The resulting data represents only the localized changes in the magnetic background created by ferrous objects or geological features (i.e., anomalies). When graphically represented by contouring (using the same method described above), only the intensity and the local effect on the magnetic background are represented.

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

After magnetic data had been developed into a target list, acoustic data was examined using Sea Scan Review software to identify any unnatural or man-made features in the sonar records. Once identified, acoustic features were described, including length, width, and height from the bottom surface. The coordinates of the acoustic features was recorded and compared to those of the magnetic anomalies in AutoCAD.

Data Assessment

Target signatures were evaluated using the National Register of Historic Places criteria⁴ as a basis for the assessment. For example, although a historic object might produce a remote sensing target signature, it is unlikely that a single object (such as a single cannon ball or anchor) will have the potential to meet the criteria for nomination to the National Register of Historic Places.

Target assessment was based primarily on the nature and characteristics of the acoustic and magnetic signatures. Shipwrecks – large or small – often have distinctive acoustic signatures, which are characterized by geometrical features typically found only in a floating craft. Most geometrical features identified on the bottom (in open water) are man-made objects. Often an acoustic signature will have an associated magnetic signature. Generally, if the acoustic signature demonstrates geometric forms or intersecting lines with some relief above the bottom surface and has a magnetic signature of any sort, it can be categorized as a

⁴ To qualify for the National Register, a historic shipwreck must “meet one or more of the National Register criteria A, B, C, and D. Determining the significance of a historic vessel depends on establishing whether the vessel is 1) the sole, best, or a good representative of a specific vessel type; 2) is associated with a significant designer or builder; or 3) was involved in important maritime trade, naval, recreational, government, or commercial activities” The criteria is described thusly:

- A. [B]e associated with events that have made a significant contribution to the broad patterns of our history; or
- B. be associated with the lives of persons significant in our past;
- C. embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. have yielded, or may be likely to yield, information important in prehistory or history.

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

potentially significant target. Often, modern debris near docks, bridges, or an anchorage is easily identified solely based on the characteristics of its acoustic signature. However, it is more common to find material partially exposed. Frequently, these objects produce a record that obviously indicates a man-made object, but the object is impossible to identify or date. In making an archaeological assessment of any sonogram record, the history and modern use of the vicinity must be taken into consideration. Naturally, historically active areas tend to have greater potential for submerged cultural resources. The assessment process prioritized targets for further underwater archaeological investigations.

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

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

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

Broad, multi-component signatures (again, depending on bottom characteristics and other factors) often have the greatest potential to represent a shipwreck. On the other hand, high-intensity, multi-component, magnetic signatures (without an accompanying acoustic signature) in areas of relatively high velocity currents might be discounted as a historic resource. Many types of magnetic anomalies display characteristics that are not easily interpreted. The only definitive method of determining the nature of the object creating these anomalies is by physical examination.

DESCRIPTION OF FINDINGS

Investigations to identify documented shipwrecks near the project area revealed that 11 ships have wrecked in the Topsail Inlet and Topsail Beach vicinities. Most of the shipwrecks occurred during the nineteenth century.

Shipwreck List

Reported Shipwrecks are as follows:

Wreck Name	Date Lost	Type Vessel	Location
<i>El Salvador</i>	18 Aug 1750	Nao	Topsail Inlet (suspected)
<i>Unknown Brig</i>	Sep 1769	Brigantine	Below Topsail Inlet
<i>Betsy</i>	1771	Merchantman	Old Topsail Inlet
<i>Adelaide</i>	22 Oct 1862	Schooner	Mouth of New Topsail Inlet
<i>Alexander Cooper</i>	22 Aug 1863	Schooner	New Topsail Inlet
<i>Industry</i>	2 Feb 1863	Schooner	5 miles north of Topsail Inlet
<i>Phantom</i>	23 Sep 1863	Steamer	200 yards offshore in 30 feet of water, Topsail Inlet
<i>Unknown Schooner</i>	22 Jan 1863	Schooner	Westward of Stump Inlet
<i>Wild Dayrell</i>	3 Feb 1864	Side-wheel Steamer	Rich Inlet
<i>Mary Bear</i>	9 Sep 1881	Schooner	New Topsail Inlet
<i>William H. Sumner</i>	7 Sep 1919	Schooner	Topsail Inlet

Remote Sensing Survey

No single isolated magnetic or acoustic targets or anomalies were identified during the survey of all eight borrow areas. A general geologically generated change in the magnetic background was noted in some areas that seemed to correlate to a slightly harder bottom return on acoustic records. These changes were particularly noticeable in Area A1. The gradient (background) change caused a large number of “false anomalies” to be generated during the contouring process once data was reduced to pole. However no isolated anomalies were generated along individual survey lines or in contouring of data prior to subsequent analysis.

The “false anomalies” created by the contouring of pole data seem to be a product of a combination of factors including change in gradient, line spacing, diurnal change, and the TIN analysis modeling program used to contour data. Most of the false anomalies were monopolar with less than 10 nanotesla in amplitude, and they were a product of data combined from separate survey lines.

BORROW AREA A1

No magnetic or acoustic targets were identified in Borrow Area A1 (Figure 11).

BORROW AREA A2

No magnetic or acoustic targets were identified in Borrow Area A2 (Figure 12).

BORROW AREA B

No magnetic or acoustic targets were identified in Borrow Area B (Figure 13).

BORROW AREA C

No magnetic or acoustic targets were identified in Borrow Area C (Figure 14).

BORROW AREA D

No magnetic or acoustic targets were identified in Borrow Area D (Figure 15).

BORROW AREA E

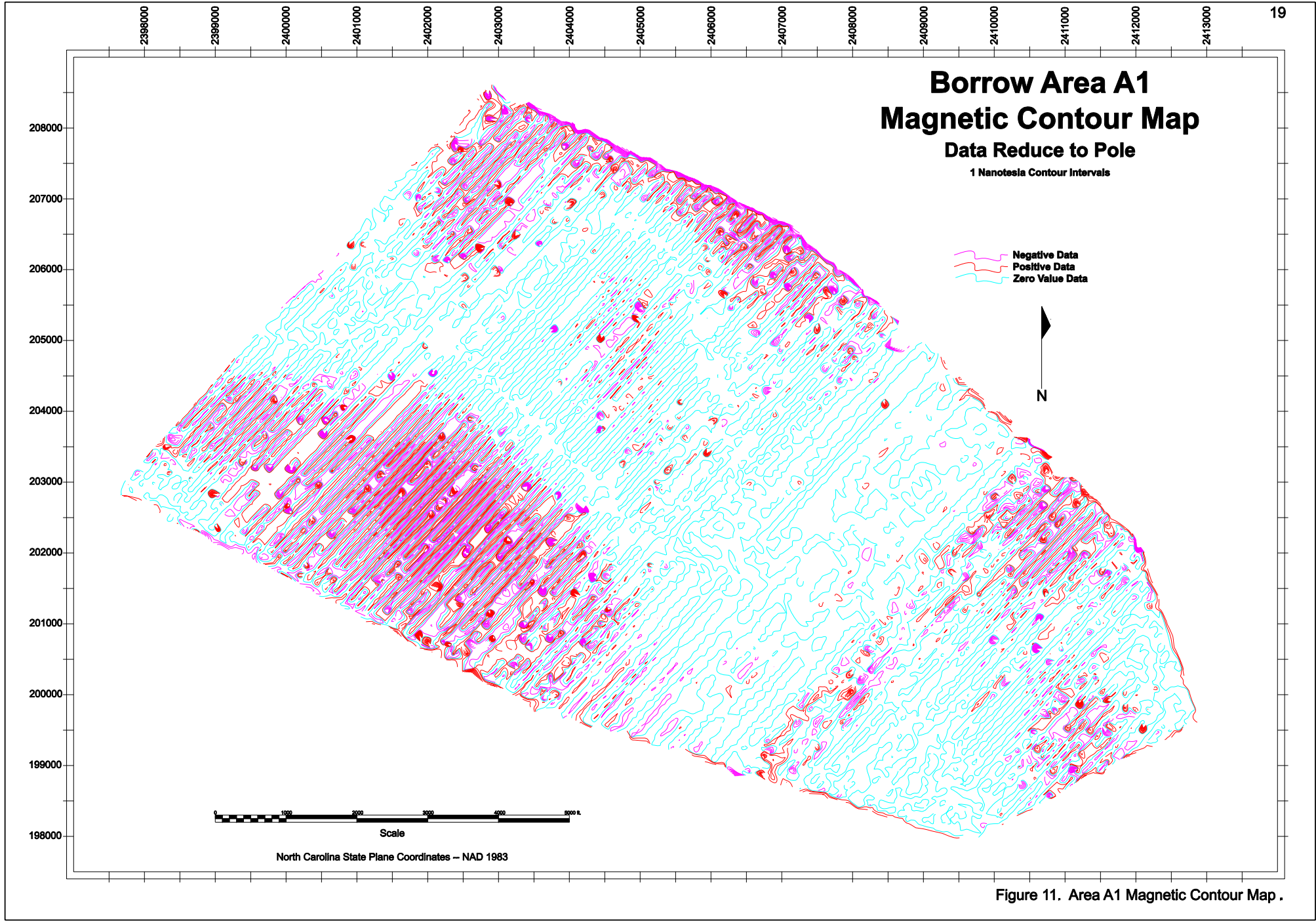
No magnetic or acoustic targets were identified in Borrow Area E (Figure 16).

BORROW AREA F

No magnetic or acoustic targets were identified in Borrow Area F (Figure 17).

BORROW AREA G

No magnetic or acoustic targets were identified in Borrow Area G (Figure 18).



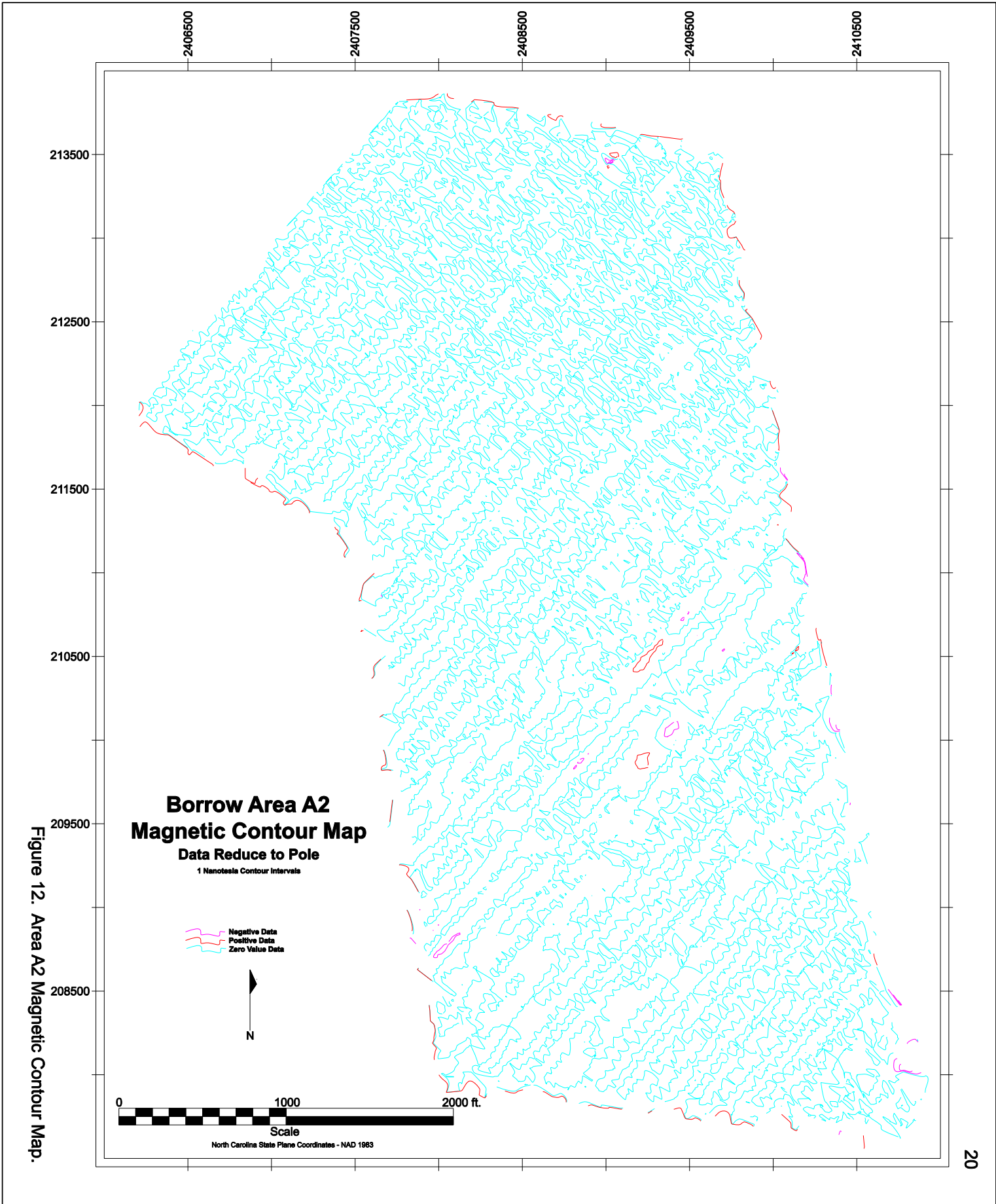


Figure 12. Area A2 Magnetic Contour Map.

2411500 2412000 2412500 2413000 2413500 2414000 2414500 2415000 2415500 2416000

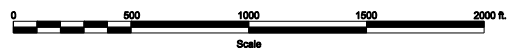
Borrow Area B

Magnetic Contour Map

Data Reduced to Pole

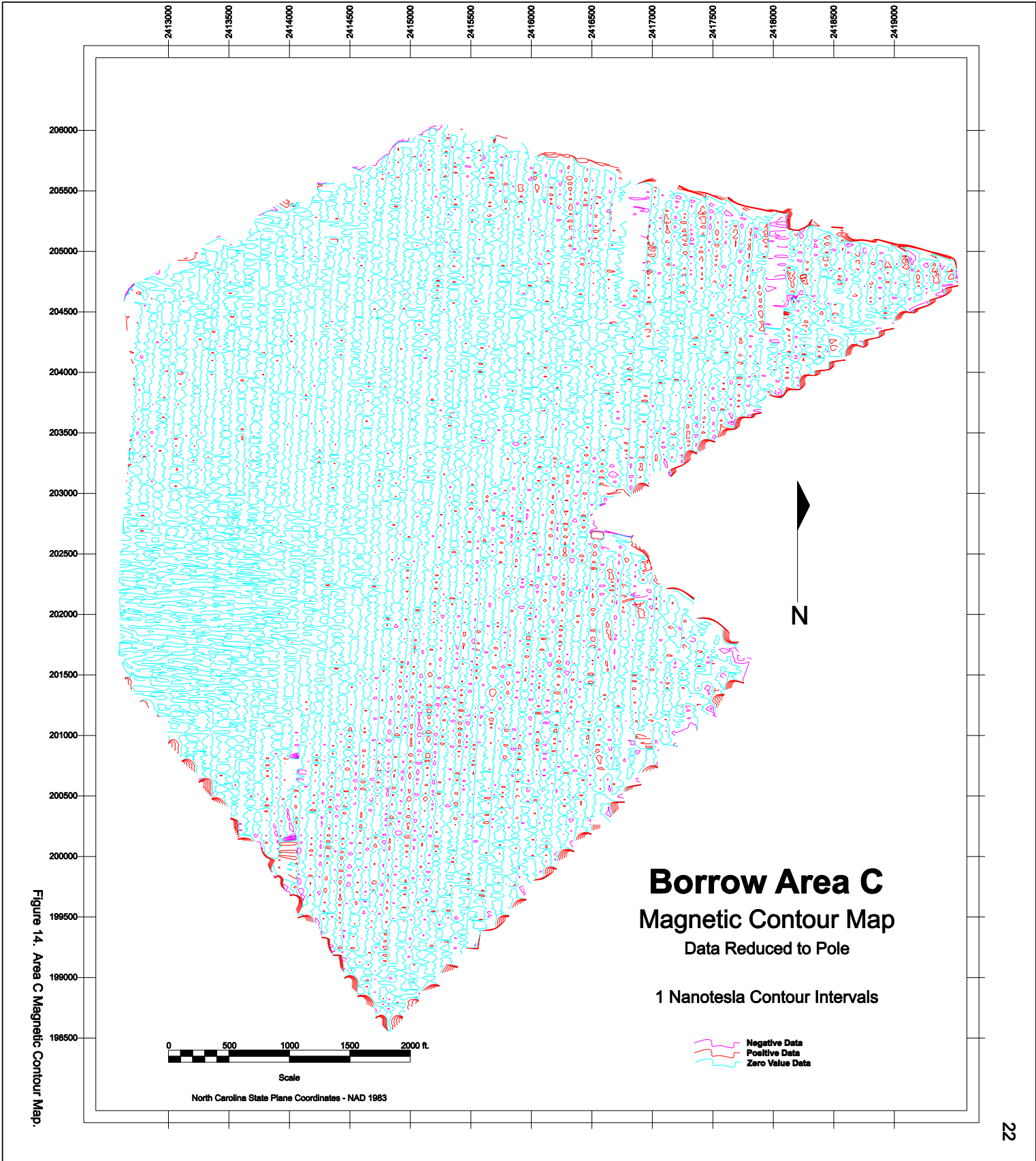
1 Nanotesla Contour Interval

Negative Data
Positive Data
Zero Value Data



North Carolina State Plane Coordinates - NAD 1983

Figure 13. Area B Magnetic Contour Map.



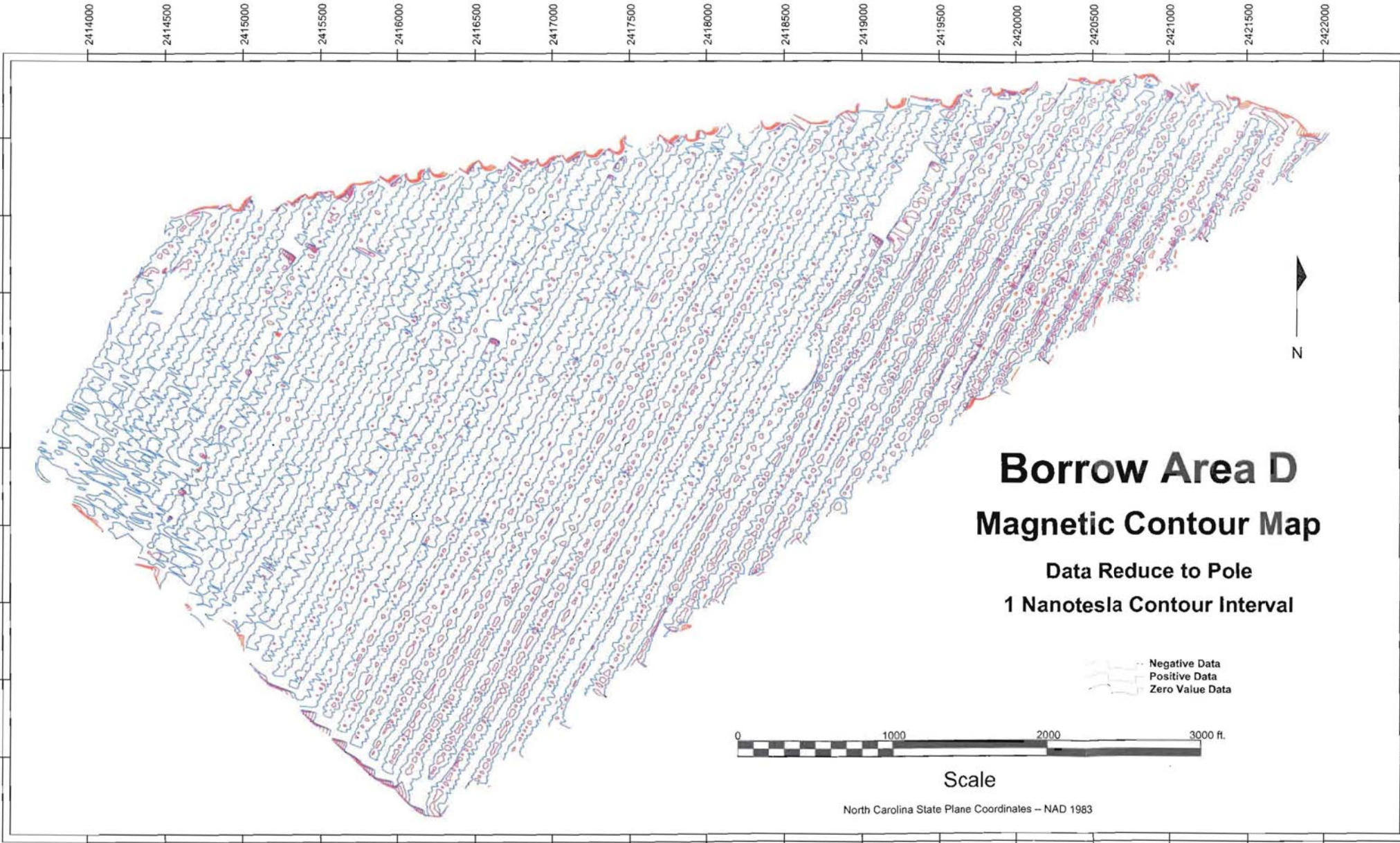
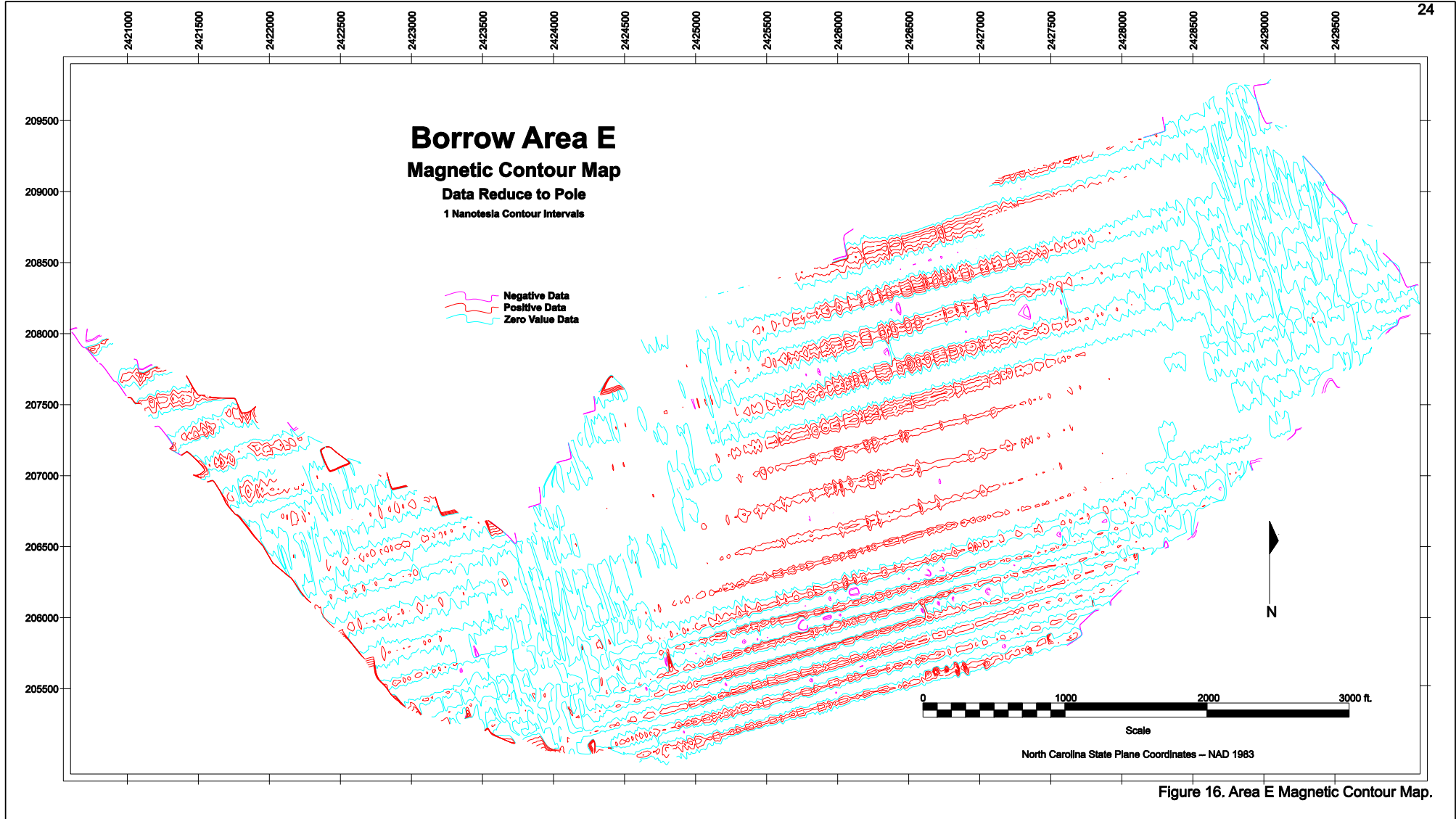
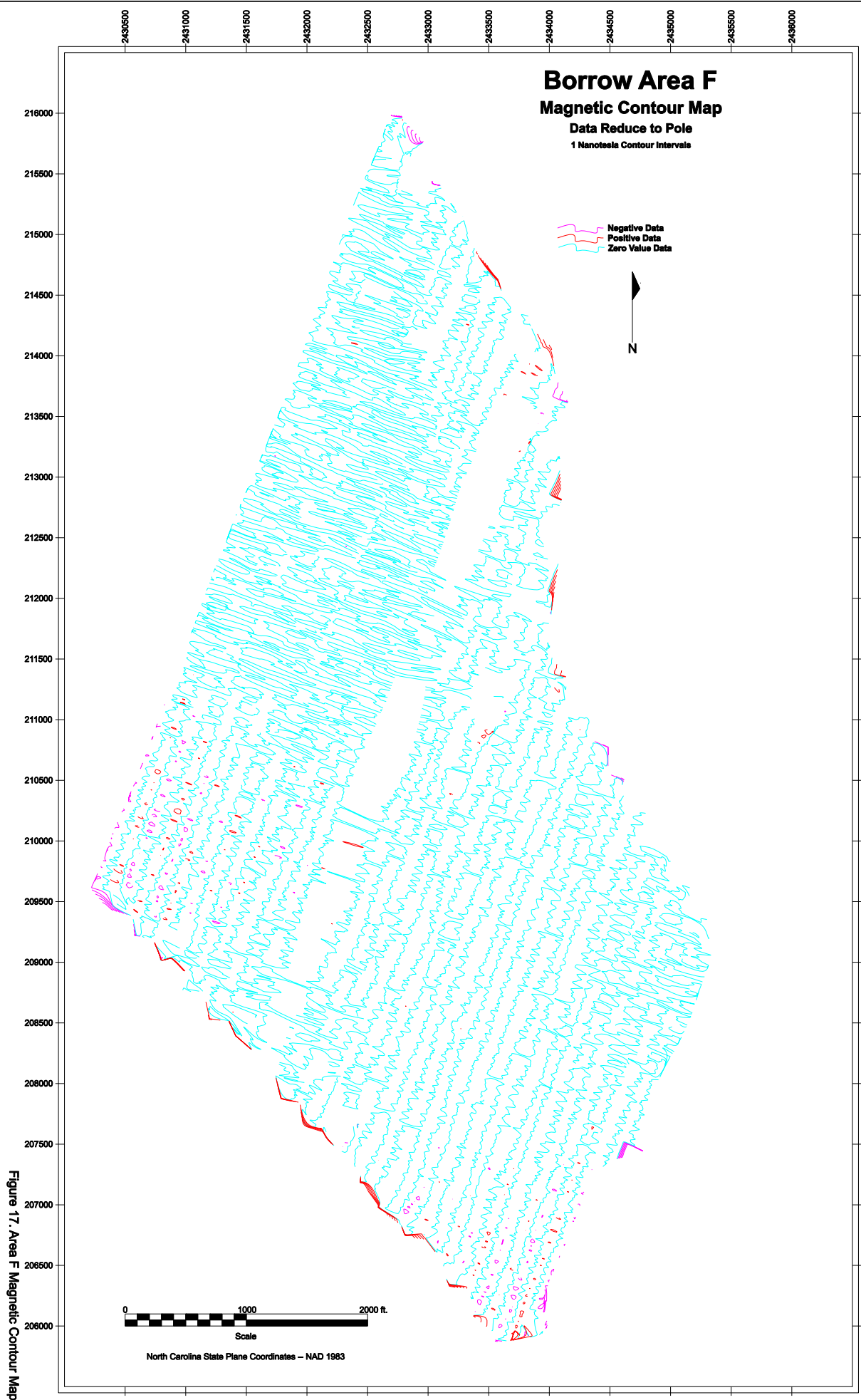


Figure 15. Area D Magnetic Contour Map.





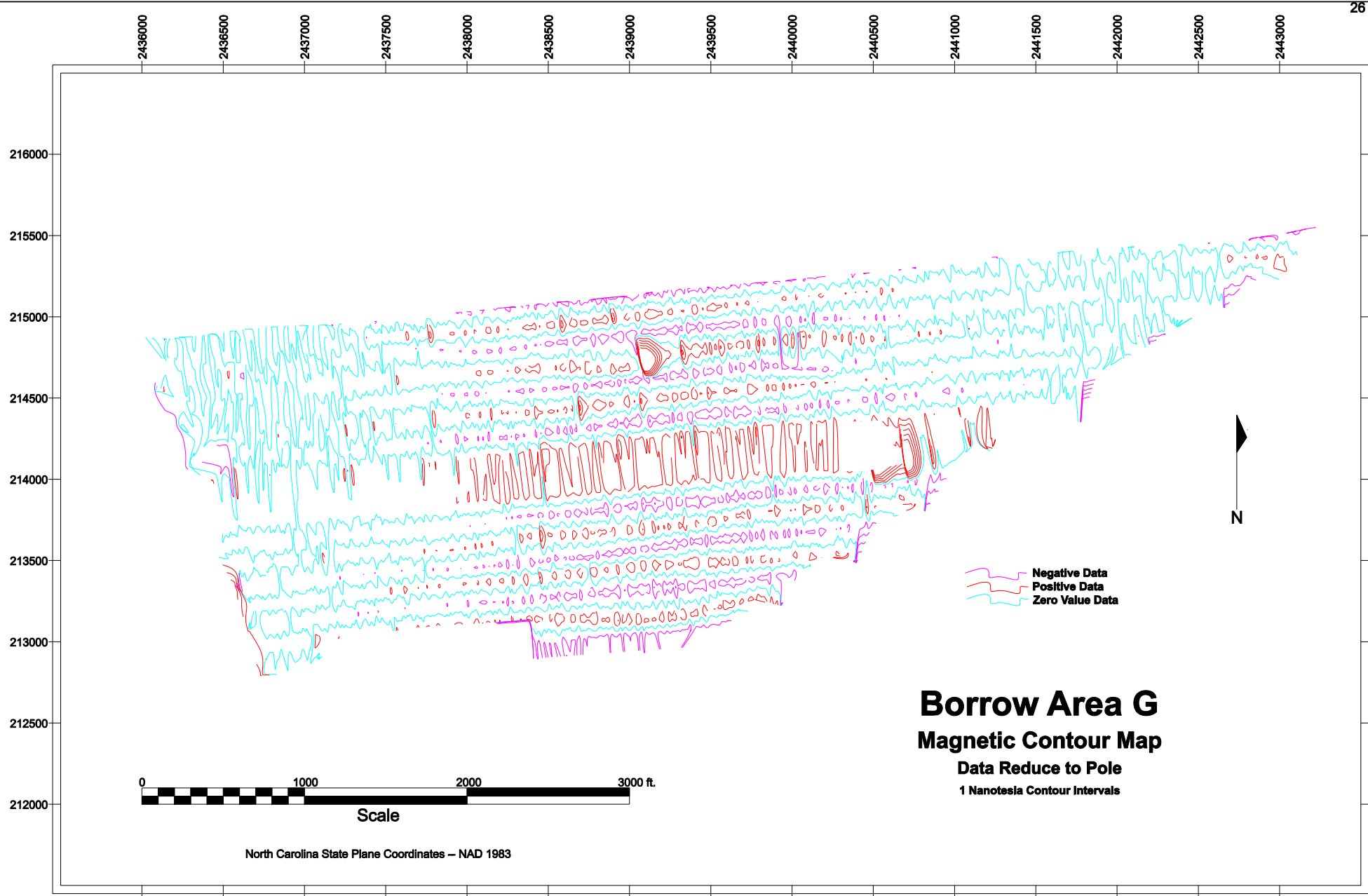


Figure 18. Area G Magnetic Contour Map.

IDENTIFICATION OF HARD BOTTOM AREAS

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

There was no evidence of any hard bottom or marine habitat areas identified in acoustic records in any of the eight proposed borrow areas. M-AT/ER conducted bottom grab sampling in areas of “moderate acoustic return” versus “weak acoustic return” to insure stronger returns were not hard bottom areas.

Grab samples suggest that harder returns were created by coarse sand mixed with shell hash. The coarse sand was typically associated with sand waves that were from 6 inches to 1 foot in height. The weaker acoustic returns were related to a fine to silty sand with little or no associated bottom relief or change (Figures 19 and 20).

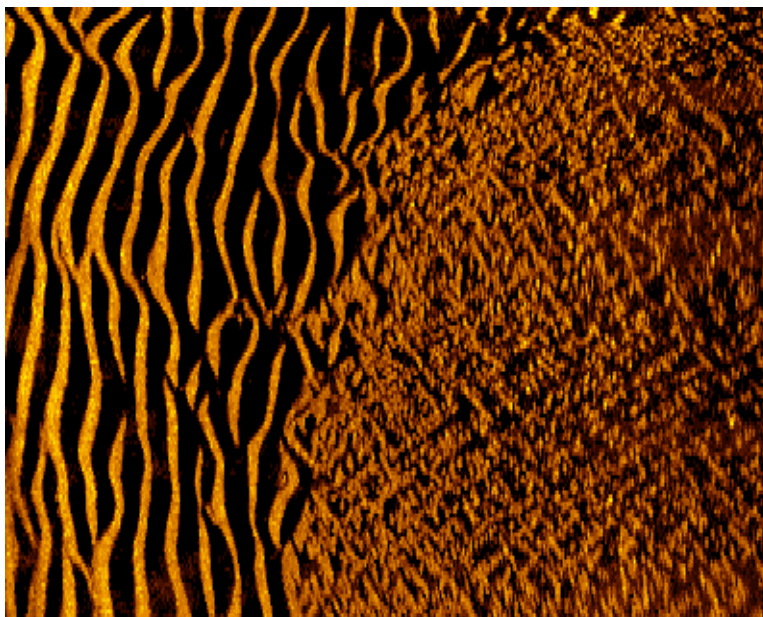


Figure 19. Coarse Sand (waves) versus fine sand Area A1.

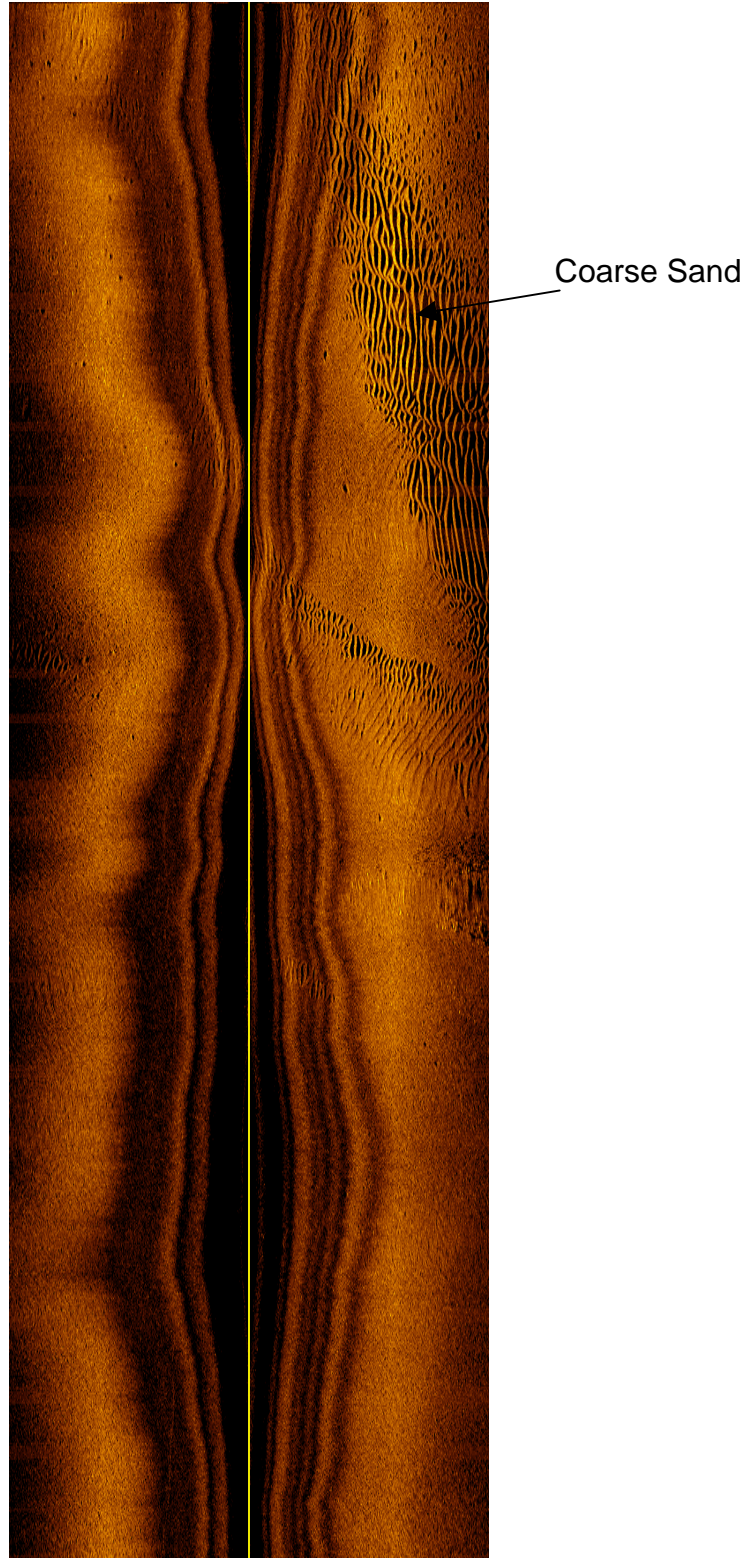


Figure 20. Enhanced sonar record from survey

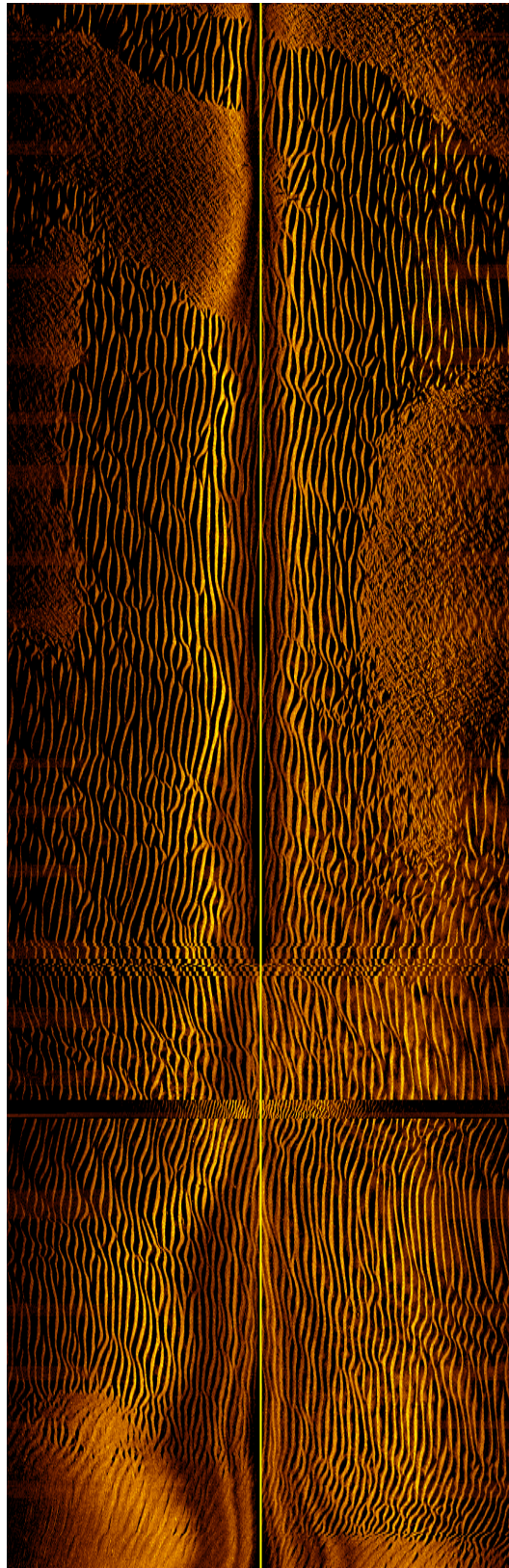


Figure 21. Mostly Coarse Sand.

RECOMMENDATIONS

The remote sensing survey identified no single-source magnetic anomalies or the acoustic targets within any of the eight proposed sand borrow areas. No additional archaeological investigations or actions are recommended.

No hard bottom or habitat area were identified within the eight proposed sand borrow areas. No area additional investigations or mitigation is recommended.

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