6-1980

Underwater Archeological Survey of the Wando River

Alan B. Albright

UNDERWATER ARCHEOLOGICAL SURVEY OF THE WANDO RIVER

by

Alan B. Albright

Research Manuscript Series 160

Prepared by the
INSTITUTE OF ARCHEOLOGY AND ANTHROPOLOGY
UNIVERSITY OF SOUTH CAROLINA
June, 1980

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ACKNOWLEDGMENTS

I wish to express my sincere appreciation to the many individuals who assisted in this project. John Sadler, Major Projects Engineer, South Carolina State Ports Authority, gave unstintingly of his time and advice and was particularly helpful in supplying detailed charts of the survey area. Robert L. Stephenson, State Archeologist and Director of the Institute of Archeology and Anthropology, and William H. Marquardt, Associate Director of the Institute of Archeology and Anthropology, both gave much needed advice, editing assistance, and encouragement throughout the project and in writing the final report. To Ralph L. Wilbanks of the Institute staff goes my appreciation for his valuable suggestions during field operations and for his assistance in the analysis of field procedures. James A. Williams of the Institute staff also performed services beyond those normally required.

Other Institute staff members to whom appreciation is extended are Darby Erd for his artistic contributions, Gordon Brown for his photographic expertise, Kenn Pinson for his editorial talents, JoLee Pearson for her supervision of the cataloguing and Dot Alford for helping me with many and varied last minute purchases and with keeping administrative procedures flowing. Marion Dantzler, Director of University Purchasing was very helpful in authorizing emergency purchases necessitated by the loss of supplies and equipment to fire.

I am indebted to Susan Bridges, Steve Howard and Bill Ciza, who, in carrying out the fieldwork, cheerfully gave much more than would normally be required, as well as Grady Harden and Sam Player who volunteered a day of diving at no cost to the project. Thanks also to Alan Saltus, Tim Mistovich and Gary Kozak for carrying out the electronic phase of the survey.

Thanks are also extended to Captain F. Wayne Avant of the South Carolina National Guard for permitting us to park our vehicles, trucks and boats during evening and weekends in the Headquarters Company Motor Pool of the 1st Battalion of the 118th Mechanized Infantry, Mt. Pleasant, South Carolina. Dr. Jerry Crosby, Hemingway Clinic, Hemingway, South Carolina graciously found time in his busy medical practice to give physical examinations required by Occupational, Safety and Health Administration to members of our dive crew. Jack Williamson, manager of the Wet Shop, provided valuable help in keeping us supplied with dive gear and in working after hours to help us acquire supplies and gear lost to fire. Appreciation is also owed to J. Percival Petit and James Scurry for their assistance in reconstructing the prehistoric and historic past of the area, and to Keith Derting for his assistance in identifying different rock types.

Last, but certainly not least, thanks goes to Laura Moore of the Institute staff for her patience and typing skills in the preparation of this report.

ABSTRACT

On 27 July, 1979 personnel of the Division of Underwater Archeology of the Institute of Archeology and Anthropology, University of South Carolina completed the three week field phase of the Wando River Environmental Impact Survey. The purpose of the survey was to determine if underwater archeological sites were present in the area in which construction and dredging was scheduled to take place during the building of new dock facilities for the South Carolina State Ports Authority. The survey was a requirement of the National Environmental Policy Act of 1970 and other Federal legislation, policies, and guidelines, and in compliance with the South Carolina State Law for the "Control of Certain Salvage Operations" of 1977.

The project was carried out in four phases. Phase one was the acquisition of preliminary data on historic and prehistoric river usage. The second phase was the electronic survey using a side-scan sonar and a proton magnetometer. The third phase was a visual survey and field examination of targets located in the electronic survey. The fourth phase was the integration of recovered data into the Statewide Archeological Site Inventory Record.

During the fieldwork eight electronically located targets were identified and each was investigated by visual and tactile methods. During these investigations numerous objects of glass, brick, rocks, ceramics, wire cable, cast iron, shell accumulations, fossil deposits, anchors and modern debris were found. These were all randomly located objects interpreted as normal river-bottom debris of minimal archeological significance. They do not represent archeological sites that would contribute significantly to the understanding of the river's usage. The relatively widespread concentration of fossils discovered during the survey have been reported to the South Carolina State Museum Commission. Two objects of archeological significance were found. These were two anchors, one of probable eighteenth century origin and the other of late nineteenth century or early twentieth century origin. Both were properly recovered and relocated for further display or study.

The river bottom in this project area has been examined with a high degree of intensity and it is believed that no archeological remains of significance remain within the project area. There is, therefore, no apparent reason that the proposed construction for the Wando River Terminal should not proceed as scheduled.

INTRODUCTION

In accordance with an agreement between the South Carolina State Ports Authority, Charleston, South Carolina and the Institute of Archeology and Anthropology, University of South Carolina, Columbia, South Carolina, the Institute conducted a three week underwater archeological survey of a portion of the Wando River that will be impacted during pier construction and dredging activities associated with the development of a new Ports Authority deep water terminal (Fig. 1). The survey was a requirement of the National Environmental Policy Act of 1970 and other Federal legislation, policies and guidelines, and complied with the South Carolina State Law for the "Control of Certain Salvage Operations," 1977, and the "Revised Uniform Rules and Regulations" adopted by the Institute of Archeology and Anthropology and the South Carolina State Museum Commission. Major funding was received from the South Carolina State Ports Authority with additional supplements from the Institute of Archeology and Anthropology.

The section of the Wando River examined during the survey was approximately 10,000 feet in length along the approximate center line of the river and ranged in width from 350 feet to 1200 feet in an irregular pattern. The downstream boundary of the survey was the junction at which the Wando River flows into the Cooper River. The upstream boundary was a line running directly across the river 10,000 feet upstream. At no place does the survey area extend from bank to bank. However, the upstream 2000 feet comes near to shore on the east bank (Fig. 2).

The project began with the implementation of the contract on April 11, 1979 and ended on June 30, 1980. Field operations took place on May 5, 1979, and from July 9, 1979 to July 27, 1979. Institute personnel involved in the operation consisted of Underwater Archeologist Alan B. Albright, Project Director; Assistant Underwater Archeologist Ralph L. Wilbanks, Field Supervisor; and Underwater Archeological Assistant, James A. Williams, diver and boat handler. Full-time contract personnel consisted of Steven Howard, diver and boat handler; Susan Bridges, diver and boat handler; and William Ciza, surveyor and boat handler. Grady Harden and Sam Player assisted as volunteer divers on one occasion.

Gary Kozak of Klein Associates, Salem, New Hampshire, operated the side scan sonar. Alan Saltus of Archaeological Research Survey, Prairieville, Louisiana, operated the magnetometer, and Tim Mistovich, also of Archaeological Research Survey in Louisiana, operated the distance measuring equipment. Archival research was carried out by J. Percival Petit, a maritime historian residing on the Isle of Palms, South Carolina, and James Scurry, Archeologist on the Institute staff. Keith Derting examined and identified the rocks recovered during the survey.

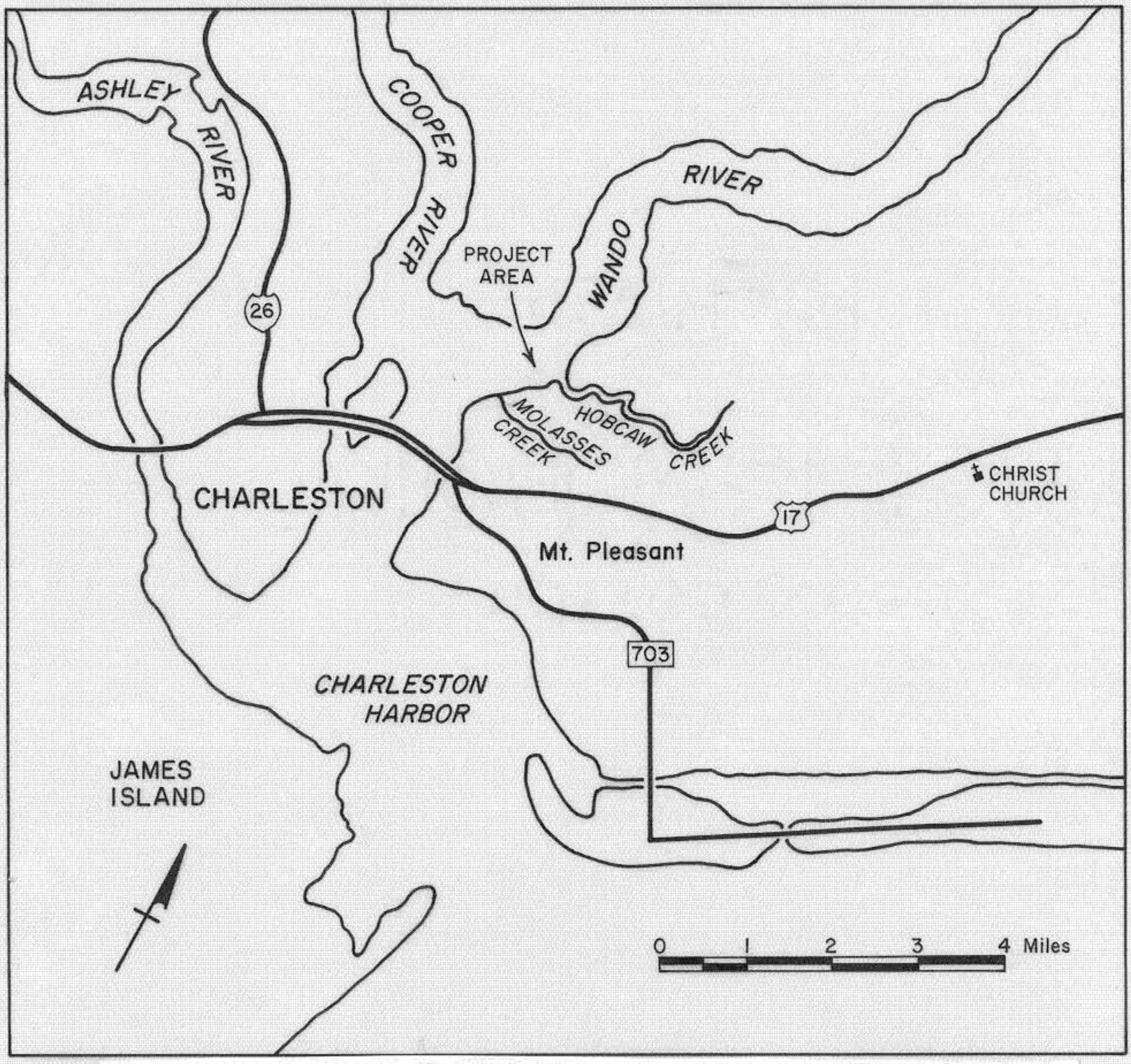

Figure 1: Locator map showing Wando River project area.

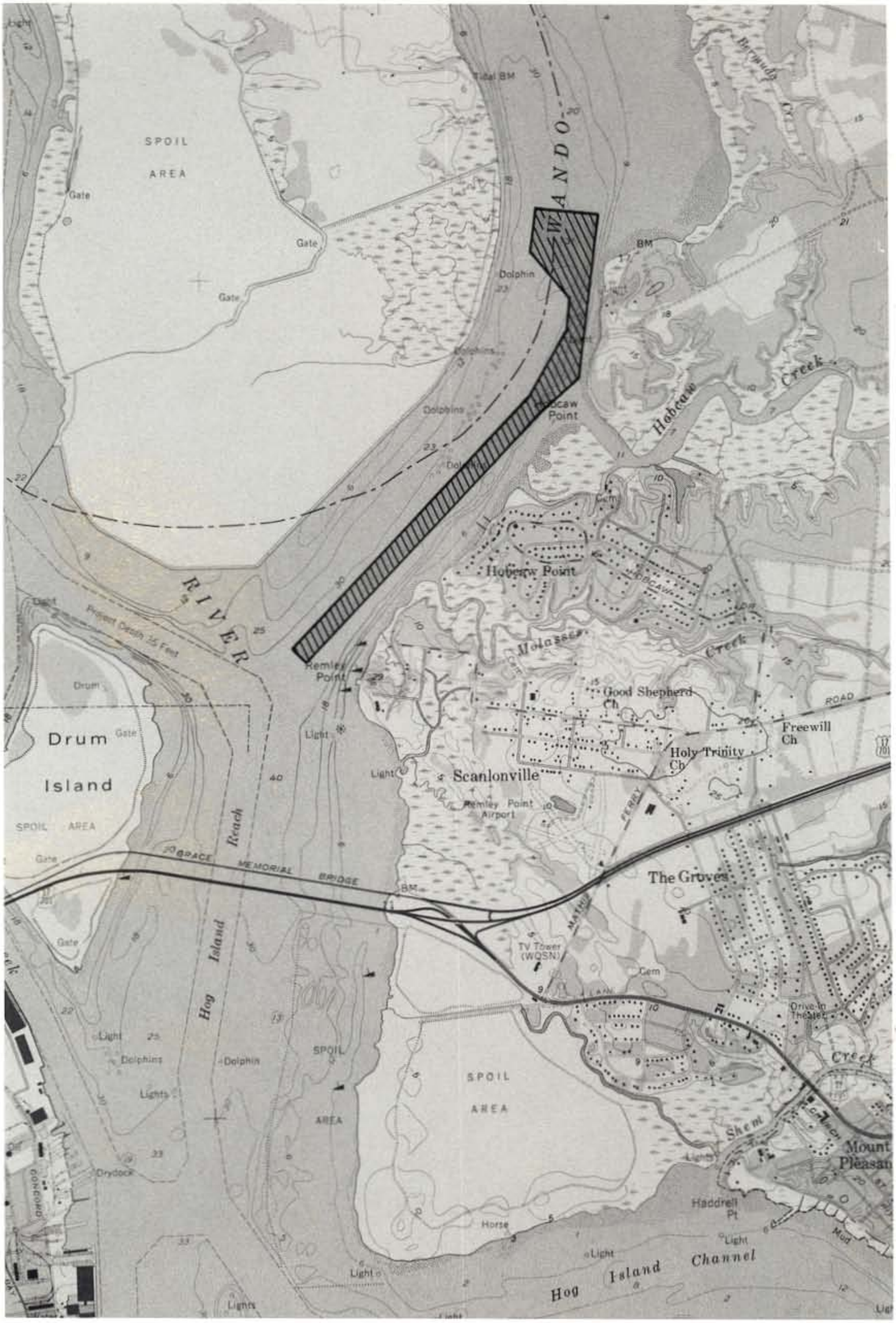

Figure 2: Survey corridor showing unusual shape of area to be surveyed.

RESEARCH PLAN

Introduction

The marine and river systems of South Carolina contain a priceless cultural heritage in their underwater archeological sites that represent the entire range of time in which man has been associated with the area. The purpose of this project was to carry out an intensive underwater archeological survey of that part of the Wando River that might be adversely affected by operations concomitant with the development of additional port facilities by the South Carolina State Ports Authority and to determine the archeological significance of the area. If the area was found to be archeologically sensitive, plans would be developed to mitigate any potential adverse affects to the cultural heritage. Remote sensing, electronic, and visual on-site investigatory results would be integrated with archival research results. The project was scheduled to take 60 days of which 15 days were scheduled for fieldwork.

Method

The project was carried out in four phases: acquisition of preliminary data on historic river usage; electronic survey using side scan sonar and magnetometer; visual survey and field examination of targets; and integration of data into the Statewide Archeological Site Inventory Record.

Preliminary Data Acquisition

Prior to field operations, it was necessary to develop detailed charts of the rivers. This was done by conducting historical research and combining information from old maps showing plantations, warehouses, docks, etc., with recent topographic maps, and superimposing this information onto aerial photographs of the areas to be surveyed.

Electronic Survey

The electronic survey phase of the project was relatively straightforward and was projected to take approximately six days. Two remote sensing electronic instruments were used: a side scan sonar, and a magnetometer.

Description of the Side Scan Sonar

The side scan sonar is an electronic instrument that detects and records topographic features of the sea or river bottom. Unlike a radar which depicts a momentary one dimensional image on a cathode ray tube, the sonar prints a three dimensional rendition of the river bottom on a

continuous role of paper. It works as well in fresh as in saltwater. The recorded image, like a photograph, is permanent. It is particularly useful in conducting underwater archeological surveys because many man-made objects such as collapsed piers and bridges, pilings, shipwrecks, and miscellaneous debris project a profile above the bottom and are recorded as bottom features.

The sonar is made up of three units: a towfish, a cable, and a recorder. The towfish is a cylinder, approximately 6 inches in diameter by 36 inches in length. It has cross vanes at the tail to keep it stable while under tow, and a bank of transducers on either side which transmit and receive acoustical signals while in operation. The cable transmits electrical impulses between the towfish and recorder and serves as the towing unit for the towfish. The towfish is trailed behind the vessel at a distance from the bottom so that the operator determines which will give the most usable signal considering the target sought. The recorder houses the main electronic components including the power supply, timing devices, and the strip chart recorder. Although the sonar accurately depicts bottom contours on the strip chart, it does not differentiate between natural relief and man-made debris lying on the bottom. A skilled operator is often able to make that differentiation between natural and man-made relief, but if he is in doubt, a diver must be sent to examine it on the bottom and make an assessment.

Description of the Proton Magnetometer

The proton magnetometer is an electronic instrument which can measure the earth's magnetic intensity at a given location or a series of locations either on land or underwater. It consists of three components: a towfish, a shielded electrical tow cable, and a recorder. The towfish is a cylinder approximately 8 inches in diameter and 24 inches in length containing a specially designed coil of fine wire. It is towed behind the survey vessel, near the bottom and generally is programmed to take one reading a second in order to develop a detailed magnetic background of the area. The towfish is connected to the recorder by a cable which serves two purposes: first to act as the towing medium for the towfish, and secondly, to transmit signals between the towfish and the recorder. The recorder consists of a power supply, timing devices, and a strip chart recorder.

Magnetometers were developed in the 1930s as an aid to assist geologists in their search for oil. It has been discovered that oil and certain mineral deposits subtly changed the earth's adjacent magnetic intensity. The magnetometer, when moved along the earth's surface and cycled at a rapid rate, could detect deviations from the norm. It was further refined and used during World War II to detect enemy submarines. It has now reached such a high degree of refinement, sensitivity and compactness, that it has become the major remote sensing instrument used in underwater archeology.

Its effectiveness in locating iron wrecks is based on the knowledge that the ferrous metal in a shipwreck, even after long immersion in water, still has a large magnetic component similar to a submarine. A wooden shipwreck has two elements with magnetic components; the cannon and other ship fixtures of iron, and the ballast rock. In order to detect the lesser

magnetic component of a wooden shipwreck, it is necessary to pass the towfish much closer to the shipwreck than would be necessary in searching for an iron vessel. The ability of the magnetometer, of a type normally used in surveys, to detect an object is related to four major factors: speed of the towfish through the water; cyclic rate of the magnetometer; size of the magnetic anomaly; and distance it is from the towfish. Although range is relatively short when compared to the side scan sonar, its sensitivity is omnidirectional and it can detect magnetic anomalies buried under the surface of the bottom. It cannot differentiate between modern ferrous debris on the bottom and the magnetic component of a piece of ancient iron. As with the side scan sonar, a diver must personally investigate each target in order to assess its value to the survey.

Visual Investigation

After the remote sensing charts are examined and the site locations transferred to the master chart, a team of divers will examine each submerged target. Although scattered finds, such as shipwrecks, might not have any association to nearby land features, docks, piers, trunks, and other plantation-associated discoveries might be identified to a particular land site or event. Since prehistoric and historic man often used the same criteria when choosing a site on which to live, the discovery of an historic land associated feature might also lead to the discovery of a nearby prehistoric settlement that had partially fallen into the river.

A second aspect of field investigation will be carried out by using divers to examine the bottom on a regular pattern. Circle searches or straight line surveys will be run depending on bottom conditions. In areas of deep silt, visual search operations will obviously be minimal but in areas of gravel, sand or hard bottom, detailed examination will be conducted.

Integration of Data

This phase of the project will be carried out in the offices and laboratories of the Institute. Artifacts collected during the visual investigation phase will be cleaned, examined, identified, and catalogued. Those artifacts in an unstable condition will undergo treatment at the Institute's conservation laboratory. All field notes, including magnetometer and sonar charts, will be carefully examined and evaluated. From the total assemblage of information, a statement will be made that will reflect the Institute's assessment of the archeological significance of the survey area.

Underwater archeological sites discovered during this survey will be individually numbered and separately recorded on a standard site form. All pertinent data relative to the site, including an artifact listing, will be recorded on the site form. A copy of the site form will be sent to the Department of Archives and History as part of its reference file. The original will be housed at the Institute of Archeology and Anthropology, where it will become a part of the Statewide Archeological Site Inventory Record. Each individual site when examined by itself may not be significant, but when assessed within the context of a statewide site listing, might have significance not previously suspected.

PREHISTORIC AND HISTORIC STATEMENT

Prehistoric

There is archeological evidence that the coastal plain of South Carolina has been occupied continuously for at least 12,000 years. Small groups of nomadic hunters entered the coastal plain area during the late Pleistocene when the now extinct megafauna were still present. The subsistence pattern of early man evolved from nomadic hunting and gathering in small numbers to the more complex agricultural society reflected in the relatively settled, village oriented pattern present when the first European settlers arrived (Griffin 1967). The 12,000 years of man's occupation of South Carolina can be temporally divided into several distinct phases which are briefly described below.

Paleo-Indian

The Paleo-Indian period lasted for about 2000 years from about 10000 B.C. to the end of the Pleistocene at around 8000 B.C. These early inhabitants had a hunting and gathering subsistence believed to be based on the exploitation of now extinct Pleistocene magafauna. This period is characterized by the craftsman-like quality of the Clovis fluted point. These points are generally found in the riverine zone of the coastal plain and are seldom recovered from Piedmont sites (Michie 1976).

Archaic

The Archaic period lasted longer than any other period in Southeastern prehistory, approximately 7000 years from about 8000 B.C. to about 1000 B.C. It is characterized by a wide variety of lithic types and ended with the introduction of ceramics. Since this period covers such a long time within which are several recognizable horizons, it is generally divided into three cultural/technological phases: Early, Middle and Late Archaic.

The Early Archaic period lasted for about 2500 years during which the Dalton, Palmer and Kirk series of projectile points appear along with other specialized tool assemblages. The Middle Archaic period lasted for about 1500 years, from 5500 B.C. to 3000 B.C. during which time the Stanly, Morrow Mountain and Guilford biface types make their appearance (Coe 1964). The Late Archaic period, ending at about 1000 B.C. witnessed the emergence of the Savannah River, Otarre and Gary bifaces, but most importantly ceramics of the Thom's Creek variety first appeared toward the end of this period. Large shell middens also first appear in sites of the Late Archaic.

Woodland

The Woodland period lasted for about 2000 years, from about 1000 B.C. to A.D. 1000 and was characterized by the introduction of other ceramic types such as Deptford, Cape Fear and/or Wilmington. These new ceramic types exhibited a wide variety of surface motifs. The small Yadkin, Badin and Swannanoa biface projectile points also appear during this period (Coe 1964).

Mississippian

The Mississippian period, also known in the southeast as South Appalachian Mississippian (Ferguson 1971), extends from the end of the Woodland period, about A.D. 1000 into the Historic period up to the eighteenth century. Ceramic vessels became larger and surface designs were often complicated, encompassing a wide variety of surface designs (Griffin 1967). Thelma, Caraway and Pee Dee biface projectile points appear at this time. It was into this period that European man intruded into and became inextricably involved with the almost complete elimination of the areas first inhabitants.

Historic

Following the settlement of Charles Towne at Albemarle Point on the Ashley River in 1670, and especially after its relocation over the next few years to its present location on Oyster Point at the confluence of the Ashley and Cooper Rivers, the colonists' expansion into, and exploitation of, the area's natural resources developed along nearby rivers. Agricultural settlements, generally dependent on rivers for transportation of bulk cargo, soon followed. Early industry is represented near the survey area by the establishment in 1706 of Dearsleys Shipyard (Petit n.d.). Although the area has been used primarily for agricultural purposes since its original occupation by Europeans, small boats and shipbuilding has been continuously carried out in the area until the twentieth century (Petit n.d.). For a detailed overview of the land usage and occupation of the east bank of the Wando, adjacent to the survey area, refer to "An Intensive Archeological Survey of the South Carolina State Ports Authority's Bellview Plantation Located on the Wando River, near Charleston, South Carolina" (Scurry and Brooks 1980).

Statement

The few artifacts recovered from underwater during this survey reflect only two brief periods of adjacent land occupation throughout the entire period man was living in the coastal plain. Three of the four pieces of prehistoric ceramics are identifiable as Thom's Creek from the Late Archaic period. The remaining piece has been badly abraded by sand and is unidentifiable. The chert core is almost certainly prehistoric but not attributable to any specific time period. There are two main ways these artifacts could have gotten into the river: from an accidental overturning of a canoe carrying them, or from erosion of the bank at the site of a dwelling. It is not known which of the two methods were responsible for placing these artifacts on the river bottom. If they had come from an eroding bank, it would indicate that the river has changed its course a considerable amount because the mud and sand talus of the present bank extends over 50 feet into the river and completely covers any possible near shore artifacts.

The historic artifacts recovered represent a spread in time of approximately 200 years with most of the dating from the nineteenth century. They were mostly found off the bluff area above Hobcaw Creek. This area has a record of historic habitation from the early eighteenth century, but any

association between the land sites and the objects recovered from underwater is tenuous because the artifacts were found a considerable distance from the bank.

FIELD INVESTIGATIONS

Site Characteristics

The underwater archeological survey described in this report took place in the lower reaches of the Wando River in Charleston County, South Carolina (Fig. 2). Compared to most other major coastal plain rivers, the Wando is relatively short, having its origin in the low swampy lands of the Francis Marion National Forest and emptying into the Cooper River at the lower end of Drum Island Reach off Remley (Hobcaw) Point. It is approximately 17 miles long and is tidal for its entire length.

Its general orientation is northeast/southwest but above Cainhoy turns to a more east/west direction. Along the east bank in the survey area two creeks, Molasses and Hobcaw, enter the Wando. A secondary entrance to Hobcaw Creek is located downstream from the main channel with a low marshy island separating the two. Low natural land formations are located downstream from Hobcaw Creek. Above Hobcaw Creek the land rises rapidly to a bluff over 15 feet in height extending to within 600 feet of the end of the survey area, where it falls away to form a shallow bay. The east bank is rimmed with a belt of marsh grass up to 50 feet in width. Marsh grass can also be found on the west bank of the river which is bounded by Daniels Island and a large man-made spoils area edged by a dyke. An elevation of up to 12 feet is found on Daniels Island and the spoils bank. Within the survey area the river averages about 2,100 feet in width with a maximum depth of just under 50 feet mean low water.

The entire survey area is located in unsheltered open water. Due to the relative openness of the area and width of the river, the survey area often has moderate to high winds. Current flow is considerable, for diving operations, occasionally reaching three knots, but this was not a factor during the remote sensing phases of the project. Water quality is good, rated S.B. (suitable for bathing and other uses except shellfishing for commercial purposes) (Corp of Engineers 1977). The composition of the river bottom is differentiated with pluff mud, sand, shell, gravel, fossils and other miscellaneous sediments overlying compacted clay. Clay alone was often seen without the overlying materials. Bottom contours within the survey area are extremely gentle except near the east bank above Hobcaw Creek where the bottom rises rapidly. Although water temperature was not recorded, it was within the parameters of tolerable comfort and safety with the equipment used.

As might be expected on a semi-sheltered body of water close to a major population center, boat traffic was present in the project area. Traffic was divided into two categories: small boat and large boat. Small boat traffic consisted of occasional sailboats and outboard fishing boats. Neither of these interfered with the survey. Large boat traffic was occasionally heavy, consisting of vessels and barges travelling to and from Deytens Shipyard located several miles upstream. Very little time, however, was lost to large boat traffic in the survey area. Project boats always flew dive flags during diver operations. The internationally recognized BETA dive flag was flown from one boat and the standard SCUBA dive flag from the other.

Environmental Factors

The conduct of underwater archeological survey operations, such as the visual search phase with divers in the water, is not a simple operation in a coastal plain river like the Wando; it is affected by numerous environmental factors. Although these factors can be overcome to a lesser or greater degree, they add elements that affect efficiency by varying both cost and time necessary to complete a project. The following statements detail the major environmental factors encountered in the project, especially those operations involving divers.

Current Flow

The Wando is a tidal river in which the current reverses itself twice daily. Current flow can reach three knots. This velocity is too high for a diver to swim against, too high to crawl against along the bottom with safety and control, and too high to remain stationary on a slick marl or pluff mud bottom without assistance or a firm hand hold. The force of moving water on a diver attempting to work in three knot current underwater can be compared with the force of a wind in excess of 50 mph exerted against a person on land. Although a three knot current was not always encountered, it was the maximum that might normally be expected in the survey area. The best way to reduce the effect of current flow against a diver is to reduce the frontal area his body presents to the water. This is accomplished by crawling along the bottom laterally while facing into the current.

Current flow is not always uniform in velocity within the water column, tending to be less near both banks and bottom than in the center of the river. On a curved section of the river, current velocity is greater on the outside of the curves than the inside. Current flow is not always parallel to the center line of the river, which means that in a situation of zero visibility, current direction is not always a reliable indicator for a diver to use in order to hold a constant direction when crossing a river underwater. This problem was solved by using a compass for direction keeping with a suitable correction figured into the course to compensate for current velocity and direction.

Weather

Adverse weather conditions have little effect on divers when they are underwater; however, it can seriously affect the safety and efficiency of surface personnel working out of small boats in support of the divers. A concern small boats and crews face during bad weather conditions is lightning. It is not at all unusual for lightning to strike the surface of the water during a storm even when the river is rimmed on both banks with bluffs and high trees. A lightning strike on the water will also have serious consequences for nearby divers. However, the major problem the diver faces in inclement weather is the chance that the boat handler cannot find and retrieve him when he surfaces. Heavy surface chop caused by high winds can easily obscure a diver's head, the only part of him that is above the surface. Industrial smog, heavy rain, and fog can also make it very difficult for the boat handler to see a surfaced diver. To overcome this problem the recovery boat should remain as close as possible to

the projected area in which the diver will surface.

Visibility

The ability to see underwater is an important consideration in carrying out a successful visual search phase of an underwater archeological survey. Visibility in coastal plain rivers is generally poor. There are three major factors which influence the ability to see underwater: depth of water, particulate matter in suspension, and tannin stain.

The deeper one goes in water the more difficult it is to see. Water filters out both the color and intensity of light even in clear water. Although the elimination of light because of water depth was not a major limiting factor in this survey, the light remaining due to depth was less than 5% of that available on the surface. Particulate matter in suspension caused the major loss of light while conducting the visual search phase. Underwater lights were almost always used in order to have any visibility at all. Shining a light in water with a high particulate count is like driving an automobile through a snowstorm using high beams. Particulate matter in suspension normally comes from eroding river banks and runoff from upstream agricultural activities. However, there is evidence that a large amount of particulate matter in the Cooper, Ashley and Wando Rivers is brought in from the near shore ocean on the incoming tides (Nieuwenhuise et al. 1978).

The third condition which affects visibility is the presence of tannin in the water. Tannin is a dark stain leached from submerged vegetable matter and is generally present in rivers which have their origin in, or flow through swamps. The light and visibility blocking abilities of tannin water can best be appreciated by comparing a glass of tea which is fairly light and clear in color to a large pitcher of tea which appears very dark because of its bulk. Except in rare cases, underwater lights are not usable in tannin waters beyond the distance that they can be hand held.

Diver Limitations

A diver conducting an underwater archeological survey or excavation has one factor to contend with not shared by his terrestrial counterpart: the underwater environment. It would not be unreasonable to state that about half of the diver's energies and abilities are often directed toward contending with the potentially lethal environment encountered underwater. For this reason his attention must constantly be focused in two directions: protection from adverse effects of the environment, and the work at hand. Unless a diver is working in extremely shallow water, he must always know his depth underwater. Exceeding a specified time limit at a specified depth, taken from diver tables developed by the United States Navy and commercial diving specialists, can result in serious injury or death. Energy expended in generating body heat, even when the diver is fully outfitted with a form fitting dive suit, can be enervating and under certain conditions can limit the time available for underwater work. Water temperature in South Carolina rivers is always colder than body temperature, so retention of body heat can be a problem. Dive suits tend to restrict normal body movement. Weight belts, tanks, life vests, tank harnesses, etc. are heavy and also

tend to limit body movements. The diver must rely on many different pieces of equipment and the failure of a vital one could be serious. Underwater lights tend to malfunction, and without a light a diver is very limited in what he can accomplish. For this reason, a diver often takes two lights underwater with him.

Other Considerations

The virtual inability of support personnel in the small boats to communicate with the divers when they are on the bottom is usually only an inconvenience. However, when a storm suddenly forms or when large boats are about to pass over the diver, instant communication is essential. The only method we have at present to call a diver to the surface is by prearrangement, to create a surface disturbance he can hear. This can be accomplished by racing the outboard motor in a particular sequence, or partially submerging a metal object, such as a dive tank or a thick iron rod and hitting it with a hammer. Fortunately metalic sounds carry a long distance underwater. Generally divers will surface at any unidentified surface noise or one that does not fit an understandable pattern.

Surface craft not associated with the project also pose a problem. Fishermen in boats trolling with hooked lures can cause serious injury to divers. Large vessels can create hazardous conditions for the diver by the displacement of large amounts of water with their hulls and propellers, thereby causing heavy underwater turbulence. A successful communication system can bring a diver to the surface before any immediate danger.

Electronic Operations

In order to conduct a successful and effective underwater archeological survey in a coastal plain river such as the Wando, it is necessary to employ electronic remote sensing instruments. The impracticability of relying only on divers to accurately survey a large area to a sub-bottom depth of several feet within the parameters of current, visibility, overburden and other factors previously discussed soon becomes obvious. Divers must be used in a more specific mode. Other means then must be employed to extend the senses of the surveyors. Over the years electronic remote sensing instruments have been developed that enable a survey to be carried out under adverse conditions to a degree of proficiency that is acceptable to those charged with managing submerged cultural resources. The two remote sensing instruments used in this survey were the Side Scan Sonar and the Proton Magnetometer. A third instrument often used in underwater archeological survey operations is a sub-bottom profiler. This instrument is similar in design to a sonar except that its coverage is extremely narrow, focusing directly below the towed unit. It differs from the sonar in that it can record shipwrecks or other objects at a considerable depth below the river bottom. It is more often used to define the extent of buried shipwrecks or other buried objects rather than to search for them. Its narrow coverage, requiring too many closely spaced lanes, made it impractical for use in this project.

Side Scan Sonar

The Klein Associates Model 521 side scan sonar was the first of two

remote sensing instruments used in this project. In addition to the features previously discussed, the sonar has the capability of utilizing several different scan ranges from 25 meters to 400 meters at the discretion of the operator. This capability is of vital interest to the operator because it permits him to match the various field conditions, such as speed of vessel, likely size of target, bottom contours, etc., to the range setting that would best record bottom conditions. The sonar phase of the investigation was carried out using 2 small boats, a 24 foot Stamas rented from the South Carolina Wildlife and Marine Resources Department and a 20 foot McKee craft owned by the Institute. The Stamas was used to carry the sonar and operator, project director, boat handler and radio operator. The McKee craft was used as the dive boat and carried three persons: a boat handler, who was also the radio operator, and two volunteer divers. The survey area was divided into two sections. The first consisted of the 8,000 foot long, 350 foot wide segment of the Wando beginning where it enters the Cooper River and ending near the downstream end of the projected terminal. The second encompassed the irregularly shaped area off the terminal and including the turning basin. The second section had an overall length of about 2,000 feet and varied in width from 350 feet to 1,200 feet.

At the beginning of Section I operations, the dive boat was positioned near the east river bank approximately 4,000 feet from the downstream boundary of the survey area. The survey boat began scanning operations near the Cooper River bridge, well outside of the survey area, on a scale that would span the proposed impact area and a considerable distance on either side. It was necessary to survey beyond the actual boundaries of the area to be dredged because activities ancillary to dredging operations might take place outside of the 350 foot channel. Possible indirect impacts include anchoring, accidental spoils deposition, and scouring by propellers of oceangoing vessels en route to Deytens Shipyard several miles upstream, traveling outside of regular channels to avoid dredging activities. By the time the survey boat crossed the downstream boundary, the proper sonar ranging scale had been established and fine adjustments had been made. Except while traveling to or from a suspected target, the dive boat was kept out of range of the sonar because its wake, easily detected by the sonar, might mask a small target. The survey boat entered the proposed impact area on a course that coincided with the area's longitudinal axis at a relative ground speed of approximately 4 knots. This speed was established as a reasonable compromise, taking into consideration potential target size, sonar response, bottom geological configuration, and directional controlability of the boat.

In Section I only one potential target was detected by sonar, but upon investigation by the divers, it was found to be a geological feature probably associated with the natural or dredged channel of Hobcaw Creek cutting into the Wando River. It was a mound with a heavy accretion of oyster shells capping it. An examination of the sonar strip chart showed Section I to have a relatively gentle bottom configuration with no outstanding features or areas of high profile. Differences in shading observed on the strip chart suggested the river bottom did not have a uniform composition. Later examination by divers in the survey phase confirmed this observation.

Section II of the sonar survey encompassed the remaining area under consideration. Survey procedures were identical to those used in Section I, except that it was necessary to make more than one run in order to cover the entire area with some overlap. No targets were detected in this area. The bottom configuration appeared to be similar to that in Section I. At the conclusion of the sonar phase, the Stamus was returned to the Department of Wildlife and Marine Resources. For the remaining part of the project the Institute's 20 foot and 17 foot McKee boats were used.

Proton Magnetometer

The Geometrics G-806 proton magnetometer was the second of two remote sensing instruments used in the electronic phase of the survey. It was used in conjunction with a Hewlet Packard H/p 3810 Total Positioning System. The latter, an infra-red, electro-optical distance measuring device, was used to accurately plot the magnetometers position during the survey. Precise positioning information was essential in order to be certain the entire survey area had been covered and also to be able to return to the magnetic anomolies for diver investigation. Magnetometer survey lanes were spaced 70 feet apart. This was considered reasonable for the size of the magnetic anomoly that might be encountered, specifically a river or coastal merchant vessel.

As previously described, the survey area for this phase was also divided into two segments: Section I and Section II. The first section surveyed was Section I (Fig. 3). Six transit stations were established upstream on a curving bluff of the river, so placed that each of the six parallel survey lanes would be oriented on its own transit station. The H/p 3810 measuring device was emplaced on Daniel's Island approximately midway between the two ends of Section I. The transit operator and H/p 3810 operator each had a walkie-talkie that was tuned to different frequencies. In the survey boat the boat operator's radio was tuned to the transit operator's radio frequency and the magnetometer operator's radio was tuned to the H/p 3810 operator's frequency. The other boat, with its own radio, was positioned so that it could relay messages if distances were too great for the walkie-talkie to be usable, as was sometimes the case at the beginning of a run when the survey boat was at its maximum distance from the transit operator.

By observing the vessel through the transit telescope, the surveyor could radio course corrections to the boat operator when necessary and keep the vessel on the proper bearing. At extreme distance under hazy conditions, it was sometimes difficult to see the vessel and several false starts were made.

For the first run, the transit was set up on the station that was oriented to the near bank boundary of Section I. To begin the magnetometer survey the vessel began its run outside of the survey area and with radio directions from the transit operator was brought into the survey area on the proper heading for the run.

The operator of the H/p 3810 kept his instrument pointed at reflecting mirrors located in the boat and recorded exact bearings and distance to the boat and radioed the time of the readings to the magnetometer operator (Fig.4).

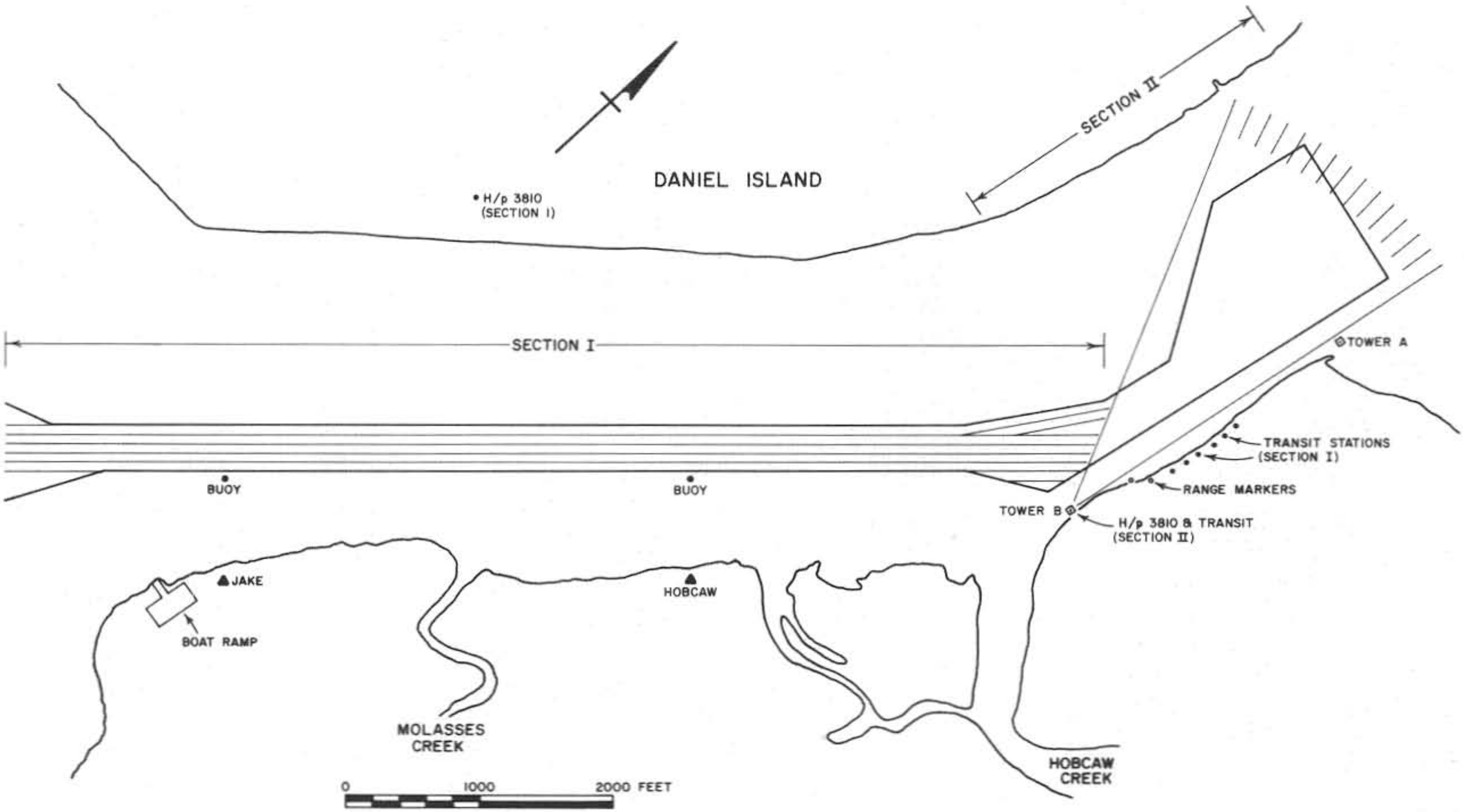

Figure 3: Diagram showing lane spacings and placement of navigation aids for magnetometer survey of Sections I and II.

Figure 4: Magnetometer in operation. (L to R) Alan Saltus operating magnetometer; Susan Bridges with binoculars; Ralph Wilbanks operating survey boat. Both Saltus and Wilbanks are in constant communication with shore based crew.

Figure 5: Ranging station on Platform B. (L to R) Bill Ciza on transit with walkie-talkie; Tim Mistovich operating H/P 3810 distance measuring device; James Williams assisting, also with a walkie-talkie.

That information was noted on the magnetometer strip chart. A magnetometer cyclic rate of one signal per second was established and readings were only taken while heading upstream in order to maintain a relatively stable speed relative to current flow and ground speed. At the end of each run, while the survey boat was returning to its starting position, the transit operator set up his transit on the adjacent station in preparation for the next run. This sequence was repeated until the magnetometer investigation of Section I was completed. Several targets were detected in the first phase of the magnetometer investigation.

Section II covered a much smaller area than Section I but without the visibility and communication problems occasionally encountered before. Two platforms, placed roughly at each end of the proposed pier area, were located in Section II. The upstream platform was designated Platform A and the downstream one, Platform B. The transit and H/p 3810 were set up on Platform B, just outside the southeastern corner of Section II (Fig. 5). The first survey run was made approximately parallel to the near bank. Each successive run was made 2 1/2° west of the previous one, resulting in a fan shaped configuration with Platform B as the hub. All runs began outside of the survey area and terminated at Platform B. Maximum lane spacings did not exceed 100 feet and then mostly outside of the survey area. Since they all merged on the same point, lanes averaged narrower than 70 feet. Several more targets were detected in Section II.

Once the magnetometer survey had been completed, the electronic data were analyzed. Distances and bearings to the targets were calculated and these locations were noted on a chart. A total of eight targets were recorded, three in Section I and five in Section II (Fig. 6).

Visual

The visual phase was begun near the upstream end of the survey area where Platforms A and B were located. An imaginary line between the two platforms and extending beyond Platform A gave a near shore boundary from which to conduct our river crossing. This line projected an azimuth of 23° magnetic (203° reciprocal). Platform A exactly coincided with one of the river crossing depth recordings marked on a chart acquired from the Ports Authority. It was decided that whenever possible the underwater visual survey would be conducted along, and at the same lane spacing, of the depth recordings which had been made at 200 foot intervals.

A dive boat, trailing a float on a 200 foot line, passed Platform A on a course of 23° magnetic, and when the trailed float passed Platform A, a weighted buoy was dropped from the boat, exactly establishing the adjacent 200 foot lane. This was repeated until the upstream boundary of the survey area was reached resulting in lanes 200 feet apart superimposed on the previously depth-recorded lanes. Using the same method, buoys were dropped at 200 foot intervals in a line between the two platforms (Fig. 7).

A diver placed on each buoy descended to the buoy weight and on a prearranged compass course crawled across the bottom carefully examining it for artifacts or fossils (Fig. 8). Underwater lights, compasses, depth and pressure guages, knives, and recovery bags were always carried by the divers (Fig. 9). Divers generally crawled on their knees and measured dis-

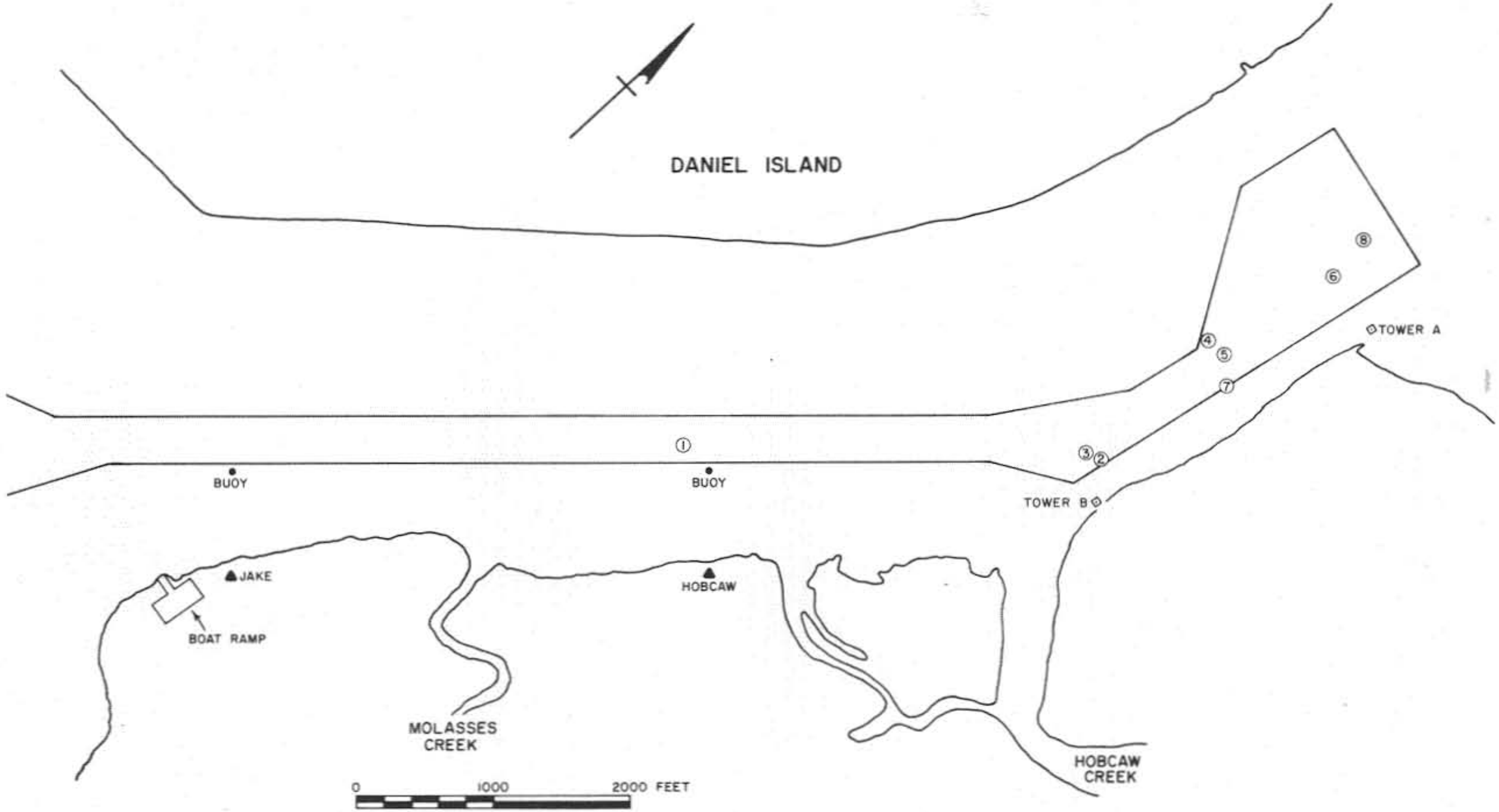

Figure 6: Magnetometer targets.

Figure 7: Placing buoys for proper lane spacing. When a float, trailed behind the boat on a 200 ft. line, passes the previously placed buoy, another weighted buoy is dropped. Susan Bridges is steering the boat as James Williams prepares to drop the buoy.

Figure 8: Diver at buoy. James Williams prepares to descend and begin visual survey of a cross corridor lane.

tances by knee steps or arm length. When they located objects or changing bottom conditions, they noted the number of steps and reported these at the end of the dive to the boat operator. Notes were written in pencil on water proof paper. At the end of each run the diver was retrieved by a small boat, debriefed and then taken to another buoy for a similar run. Using this method, the area between the upstream edge of the survey area and the downstream platform was visually examined.

Figure 9: Susan Bridges preparing to enter water to begin visual survey. Notice compass and depth guage on left arm, underwater light, and bag for artifacts.

Establishing a near shore boundary at the downstream end of the survey area presented difficulties because there were no strategically placed platforms from which measurements could be made. The only known datum points available in this stretch of the river were two Geological Survey benchmarks, JAKE near the river mouth, and HOBCAW almost midway between JAKE and Platform B. The near shore boundary of the survey area was determined to be approximately 800 feet into the river from the two markers. The divers began their investigation 50 feet outside of the survey area on a line 750 feet from each bench mark in order to insure a margin of safety relative to any underwater cultural remains.

The first attempt to place marker buoys 750 feet from JAKE and HOBCAW was not successful. For this attempt a hand-held optical coincidence rangefinder with a 12 inch baseline was used which, because of the distance involved, was not accurate enough to place the buoys properly. A second attempt to establish an accurate placement for the buoys opposite JAKE and HOBCAW was successful. For this operation a surveyor's transit aimed perpendicular to the river's axes was placed over JAKE and a small boat carrying a vertical stadia rod was guided to the proper position and the buoy was dropped exactly 750 feet from JAKE. The transit operator and boat crew were in constant radio communication during this operation. A buoy was also placed opposite HOBCAW in the proper location to form the second point along the 750 foot line.

With the two buoys properly placed off HOBCAW and JAKE, it was a simple matter to place range markers on and below the bluff on the first upstream bend in the river. A boat entering the survey area on a straight course toward the range markers and keeping the upper marker directly above the lower marker would travel along the 750 foot boundary line measured from JAKE and HOBCAW. The buoy 750 feet from JAKE was fortuitously located in the center of one of the depth marking lanes mentioned previously. From this buoy 200 foot lane spacings were established for the remainder of the visual search phase superimposed over the depth recorded lanes. By the end of the underwater visual search phase, a total of 55 crossings had been carried out (Fig. 10).

All of the environmental factors previously mentioned, and in several permutations, were encountered and handled safely. Care was taken to insure safe operating conditions for boat handlers, other surface personnel and divers. Because of the small number of divers, and for safety considerations generally, no more than two divers were underwater at one time. Time and depth limits for divers were maintained and surface rest time as specified in the United States Navy dive tables was taken. Divers were not always able to keep a straight course when traversing the search area because they were affected by river and tidal current flow of considerable velocity. Although an estimated correction was figured into the proper compass heading, it is probable that all traverse lines were skewed in some degree in the direction of current flow at that time.

All diver operations took place out of the two small open outboard motor boats previously mentioned. The boats served two purposes, first in support of diving activities, second they served as equipment storage containers. Their small size and manuverability proved to be a great asset during diver related activities. For the storage of equipment, however, they were much too small. Each boat also had a single side band, 40 channel Citizens Band radio and provision for mounting a compass and depth recorder. The large boat had a dive ladder attached to assist divers exiting the water. The gunnels of the smaller boat were much lower and the divers could enter over the side.

Chronology of the Fieldwork

The side scan sonar phase was carried out two months before the visual and magnetometer phases. At that earlier time the Institute was conducting a sonar survey of several rivers between Charleston and Beaufort. It sublet the sonar to the Wando Project and was able to finish the sonar work in one day. The cost to conduct the sonar phase normally would have been over $3,000 if the unit were rented for only this project, but with the sublease arrangements, costs were kept to $1,000.

Institute personnel returned to the Wando River on July 9, 1979, for the remainder of the survey. From the 9th to the 13th of July, visual searches were conducted at 200 foot intervals across the survey area. On the afternoon of July 13th, the Institute van burned destroying much of our miscellaneous supplies and dive equipment. One person, Steve Howard, was burned and hospitalized for 8 days. From the 16th to the 20th, the magnetometer phase of the survey was carried out including site investigation by divers.

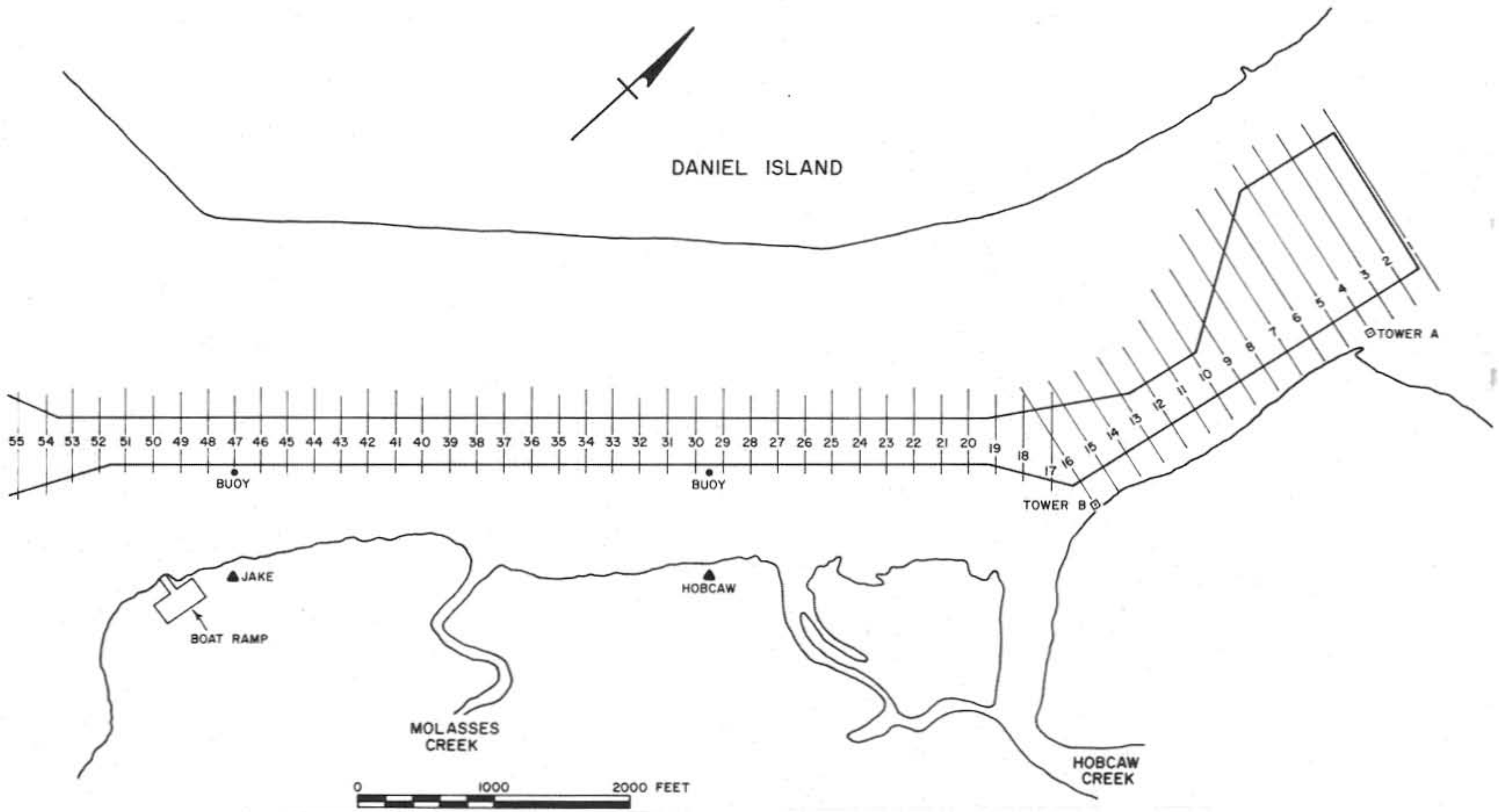

Figure 10: Visual lane investigations. Underwater inspection of the river bottom was carried out by dives at 200 ft. intervals along the length of the entire survey corridor and for a distance on either side of the corridor.

On the 23rd, the visual cross-river searches continued, ending on the afternoon of the 27th. That concluded the field aspect of the survey. Weather was not a major hindrance although on several occasions it caused delays. Since this was the most comprehensive underwater archeological survey carried out in South Carolina to date, it has proved to be an invaluable learning experience in planning for future survey projects.

INTEGRATION OF RESULTS

During the course of the Wando River Survey, many objects were recovered and others were observed but left on the bottom. The recovered objects were brought to the Institute where they were cleaned, examined, identified, and catalogued. Objects that were in an unstable condition were conserved in the Institute's Conservation Laboratory. Field notes, including sonar and magnetometer strip charts were examined and evaluated. Although artifacts were recovered throughout the survey area, there was not any realistically definable areas of concentration that could be considered as individual sites. For this reason the entire survey area was given one site number, 38CH425.

Two suspected concentrations of fossils were observed and their presence was reported to the South Carolina State Museum Commission which has the legal responsibility to manage this resource. The beds located between lanes 4 and 8, and 28 and 36 were not as deep a concentration as those often observed in the Cooper River but should be investigated further.

Fossils recovered by Institute personnel were transferred to the Museum Commission. Although the presence of the fossil beds and their probable destruction during dredging operations is of great concern to the State, it is not covered by a federal law and therefore mitigation of adverse effect to this resource is not required.

Data acquired in the survey becomes a part of the Institute's permanent records. Artifacts, after processing, are stored and will become a part of our reference collection. A copy of the site form, with its information, will be housed in the Department of Archives and History. The original will be kept at the Institute where it will become a part of the Statewide Archeological Site Inventory Record. Following is a description and assessment of each magnetometer target and recapitulation of field notes concerning the visual search dives made at each of the side scan lane crossings.

The artifacts and other objects recovered were so few and so widely dispersed throughout the survey area that collectively they have little archeological significance. What value they do have lies in their individual qualities.

There were five prehistoric artifacts recovered, four ceramic fragments and one piece of worked chert. The four ceramic fragments were small and severely sand abraded. Three are Thom's Creek type and one is unidentifiable. The chert core is also unidentifiable as to age. Five rock types were recovered. Three--chert, sandstone, and limestone--could be indigenous to the area, the other two, diorite and schist, have their origin in the Piedmont. How the latter two were transported to the Wando River is not known. The historic artifacts range in date from the late eighteenth century to the twentieth century, with most falling into the nineteenth century. A description of the two anchors can be found in Table 1. Table

3, a list of catalogued artifacts and objects, is at variance with those stated in Table 2 because some were discarded during the analysis phase as having no significance whatsoever for the project.

TABLE 1

VISUAL LANE INVESTIGATION RESULTS

LANE	DIVER	RECOVERED	OBSERVED	COMMENTS
1	Williams	NA	Bricks	Slick mud
2	Howard	NA	NA	Slick mud
3	Wilbanks	NA	55 gal. drum, bucket handle, fossils	NA
4	Bridges	Fossils	NA	Shell bed
5	Howard	Fossils	Bricks	Fossil recovered 300' from start
6	Williams	19th & 20th C. ceramics and frags, brick frag fossil	Pencil sharpener	NA
7	Bridges	Brick fragments, welders goggles, fossils	NA	NA
8	Wilbanks	Brick fragments fossils	Two stones that could be mill-stones	Brick fragments recovered 50' from start
9	Wilbanks	Rock	NA	NA
10	Bridges	Chamber pot fragment, case bottle base, two rocks, four brick frags	NA	NA
11	Williams	Brick fragment	NA	To 28' loose sand and shell, 28' to 45', slick mude, 45' to 50' sand
12	Wilbanks	Brick fragment, two rocks, fossil	NA	NA
13	Howard	NA	NA	NA
14	Williams	Iron keyed bolt	six or more rock	NA
15	Wilbanks	Brick fragment, chert, four rocks, fossil	NA	NA

LANE	DIVER	RECOVERED	OBSERVED	COMMENTS
16	Howard	Brick fragment, ceramic fragment	NA	NA
17	Howard	NA	NA	NA
18	Wilbanks	NA	NA	NA
19	Wilbanks	Brick fragment, four tile fragments, rock, three glass fragments, fossil	NA	Shells and hard bottom, last 200' sandy gravel, shell bed with rocks and pebbles
20	Williams	Brick fragment, rock fossils, tile fragment	Sawed 50' piling, rocks	Marl, marl & sand pockets, mud, marl and silt
21	Albright	NA	NA	Start to 300' packed shells, then silt with mud
22	Wilbanks	NA	Piling, rock	shells out to 150'
23	Wilbanks	NA	Large rock (100 lbs)	Hard bottom with silt and sand
24	Bridges	19th century bottle	Bricks	NA
25	Williams	NA	NA	Start to 250' hard sand and gravel with shells then gravel with silt
26	Albright	NA	NA	First 125' shell, 125'-150' sand, silt, occassional shell, 300'-400' sand ridges
27	Bridges	NA	Bricks 100' out	Sand and silt
28	Williams	19th century bottle base fossil	Bricks	For 350' hard sand, shells
29	Albright	NA	NA	Shells out to 200', then sand
30	Williams	NA	NA	Hardpacked and and gravel, small shells, soft sand and silt
31	Albright	NA	NA	Sand with shells, silt and sand

LANE	DIVER	RECOVERED	OBSERVED	COMMENTS
32	Wilbanks	Two rock, fossils	NA	First 200' gravel with silt remainder silt and mud
33	Wilbanks	Millstone, 19th century bottle, fossils	Bricks	Gravel bed
34	Bridges	NA	NA	Sand and gravel alternating with silt, then sand and mud
35	Williams	NA	Debris, wood, fossils, brick, modern small anchor	Gravel and sand, thick mud with gravel
36	Albright	Fossil	NA	Sand and shell, silt and sand
37	Bridges	NA	NA	NA
38	Wilbanks	NA	NA	Mud and silt
39	Albright	NA	NA	Mud
40	Williams	NA	NA	First 150' mud then sand
41	Wilbanks	Jug and brick fragments, rocks	NA	Mud
42	Williams	NA	NA	Mud, soft and hard sand
43	Wilbanks	NA	NA	Mud
44	Williams	NA	NA	Sand and mud, hard packed sand
45	Wilbanks	Oil can spout, brick fragments, rock	Scattered rock	NA
46	Williams	NA	NA	Sand and mud, shells
47	Wilbanks	Iron fragment, Brick fragments	NA	Sand and deep mud
48	Howard	NA	NA	Sand and mud
49	Wilbanks	NA	NA	Sand and mud
50	Bridges	NA	Bricks	Sand and mud
51	Williams	NA	Bricks	Sand and mud
52	Howard	NA	NA	Sand and mud

Lane	Diver	Recovered	Observed	Comments
53	Wilbanks	NA	NA	Sand and mud
54	Bridges	NA	NA	Sand and mud
55	Howard	NA	NA	Sand and mud

TABLE 2

VISUAL INVESTIGATION OF MAGNETOMETER TARGETS

TARGET #1

Magnetic Anomaly (Fig. 11)

Large anchor, probably late 18th century Admiralty pattern, wooden cross piece missing, large ring, heavy sand and shell encrustation. Approximately 9' in length and 6' between fluke tips. Removed to safe underwater storage area outside of potential impact area.

Other Observations

Appears to be fossil bed, poor visibility.

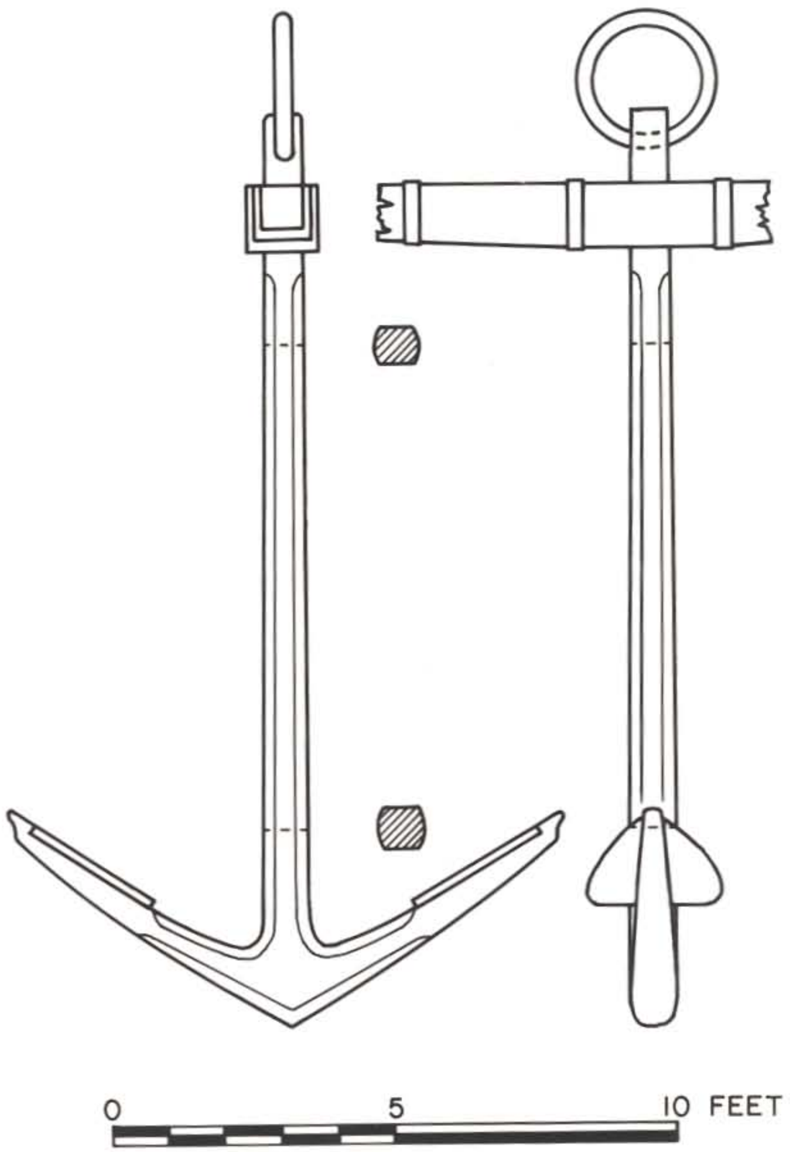

Figure 11: Large anchor.

Figure 12: Folding stock anchor encrusted with sand and shells.

TARGET #2

Magnetic Anomaly (Fig. 12)

Small anchor, late 19th to 20th century, folding stock design, moderate sand and shell encrustation. Approximately 6' length by 4' between fluke tips.

Other Observations

Late 18th century bottle neck fragment and ballast rock.

TARGET #3

Magnetic Anomaly

Probably associated material from Target #2, including wire cable and miscellaneous iron.

Other Observations

Same as Target #2.

TARGET #4

Magnetic Anomaly

Chain and wire cable lying approximately perpendicular to river axis running from Target #4 to #5.

Other Observations

Fossils observed and recovered, 18th century bottle base, 19th century bottle.

TARGET #5

Magnetic Anomaly

See above

Other Observations

See above, also late 19th century glass and ceramic brick fragments.

TARGET #6

Magnetic Anomaly

Miscellaneous metal objects, modern debris

Other Observations

Fossils observed and recovered, bottle, last quarter 18th century recovered.

TARGET #7

Magnetic Anomaly

Cast iron pipe of indeterminate length, approximately 6" in diameter.

Other Observations

Large shell accumulation observed.

TARGET #9

Magnetic Anomaly

One or more 55 gallon drums, miscellaneous iron including buckets, modern debris.

Other Observations

Sand and silt, might be covering other iron.

TABLE 3

CATALOGUED ARTIFACTS
38CH425

ARTIFACTS	DESCRIPTION	QUANTITY	PROVENIENCE	PREHISTORIC	18th CENTURY	19th CENTURY	20th CENTURY
Rock	Chert core, worked	1	1	x			
Bottle	Light green, intact	1	2			x	x
Bottle Neck	Black glass	1	3		x		
Bottle Base	Black glass	2	4		x	x	
Ceramic Fragment	Whiteware, plate rim	1	5			x	
Bottle Base	Black glass	1	5			x	
Coupling	Brass, hose coupling	1	6				x
Rock	Unknown	1	7				
Bottle Base	Case bottle	1	8		x	x	
Ceramic Fragment	Whiteware, chamber pot rim	1	8			x	
Rock	Diorite	2	8				
Brick Fragment	Red brick	1	9				
Brick Fragment	Red brick, flat brick	1	10				
Rock	Sandstone	2	10				
Rock	Chert	2	10				
Rock	Schist	2	10				
Ceramic Fragment	Terra-cotta pipe or tile	1	11				
Brick Fragment	Red Brick	1	11				
Flat Glass	Probably window glass	3	12			x	x
Ceramic Fragment	Terra-cotta pipe or tile	4	12			x	x
Rock	Dolomitic linestone	1	12				
Ceramic Fragment	Terra-cotta pipe or tile	1	13			x	x
Rock	Sandstone	2	13				
Bottle Base	Black glass, moulded base	1	14			x	
Bottle Base	Black glass, improved pontil mark	1	15			x	
Ceramic Fragment	Black alkaline glaze	1	16			x	
Rock	Diorite	1	17				
Ceramic Fragment	Glazed decorative redware	1	18			x	x
Ceramic Fragment	Thoms Creek, reed punctate, medium sand tempered	2	18	x			
Ceramic Fragment	Thoms Creek, periwinkle punctate, coarse sand tempered	1	18	x			
Ceramic Fragment	Undetermined	1	18	x			
Bottle Base	Medium green	1	18			x	
Bottle Fragment	Medium green, flat, "OM" in positive relief	1	18			x	
Metal Fragment	Unidentified	2	19				
Ceramic Fragment	Dark alkeline glaze inside, clear outside	1	19			x	
Ceramic Fragment	Flower pot	1	19			x	x
Bottle	Black glass, mostly intact, in poor condition	1	20		x		
Bottle Base/ Shoulder	Black glass, neck missing	1	21		x		
Bottle Base	Black glass	1	2		x		
Anchor	Admiralty pattern	1	22		x		
Anchor	Folding stock pattern	1	23			x	x
	TOTALS	54		4	7	19	10

CONCLUSIONS AND OBSERVATIONS

An underwater archeological survey of a section of the Wando River to be impacted by the proposed construction of new pier facilities was conducted by the Institute of Archeology and Anthropology during May and July, 1979. The result of this investigation reveals that work proposed to be done in support of the construction of new pier facilities on the Wando River will not adversely effect the underwater archeological resources of the state of South Carolina. This determination was made by the examination of the artifacts recovered, the analysis of the electronic and visual survey data acquired, and the examination of archival references concerning this area.

In assessing the results of this survey, consideration must be given to negative information: the relative lack of cultural material observed or recovered. This is puzzling. It might be assumed that a semi-protected body of deep water, such as the lower Wando River near Charleston Harbour, would have been used as a secondary anchorage during times of adverse weather. If that were the case, many disposable ship and crew associated artifacts should have been lost, possibly even one or more vessels. Ship traffic should have been considerable in this area considering both the needs of river plantations and Dearsleys Shipyard in operation in Hobcaw Creek from the first decade of the eighteenth century to the twentieth century. The only ship-associated objects observed and recovered were two anchors, one eighteenth century and one nineteenth-twentieth century.

Several theories can be advanced as to the lack of ship remains or associated artifacts in the lower Wando River. It may have been that plantations adjoining the river were more efficiently served by land transportation than by water. Conversely it may be that the river was so important to upstream plantation owners that vessels lost in the lower Wando were quickly salvaged in order to keep the channel open. It might also be that ship remains were not detected during the electronic phase and not encountered during the visual phase, but this is unlikely.

The side scan sonar, within its accepted limitations, is an instrument of primary importance in surveys such as this one carried out in the Wando River. Had the river bottom been of hard rock and relatively smooth, there would not have been a need for the magnetometer because any wreckage would have had a profile and would have been easily detected. But with the side scan sonar's inability to detect objects under mud or other cover, the magnetometer becomes necessary. There recently has been developed a side scan sonar of markedly increased sensitivity, but with the cost of a large reduction in range. For a survey of this type, however, the increased sensitivity is worth the added navigational problems that comes with a much narrower survey path. If another survey similar to this one is conducted, the more sensitive unit will be used. Recent tests carried out in the Cooper River with this new unit have clearly demonstrated its superiority for this type of survey where detection of small objects might be critical.

The magnetometer used in this survey is a major instrument in its own right. The detection of eight targets, two (the anchors) of which had

archeological significance, demonstrated its value. The technique with which the magnetometer H/p 3810, and transit were used to direct the course of the survey boat was very satisfactory. With accurate bearing and ranging information, targets were easily relocated and plotted with great accuracy. The only change we would make in future operations is to use a lane spacing of 50 feet rather than 70 feet. The magnetic signature of a ballast pile from a river boat might be small, and narrowing the lane spacings increases the chances of discovery; thus smaller anomalies would be more easily detected.

The Wando River survey was the largest underwater archeological survey carried out by the Institute and some new methodology was developed during the operation, such as equiping both boats and shore parties with radios. This added safety feature saved valuable time throughout the project. In times of poor visibility during the visual phase, the two boats, in constant radio communication, were more efficient in locating and retrieving divers than if they searched independently without communication. Without radio communication, the magnetometer phase would have taken longer and lane keeping less accurate. Emergency aid could be called for as needed on Channel 19 which is monitored 24 hours a day in Mt. Pleasant.

Conducting visual investigation of the river bottom in waters of low visibility, high current, and at a depth conceivably requiring occasional decompression, as was the case in this survey, is always a compromise. More detailed visual examination of the survey area would have taken months and the cost would have been unreasonably high. For this reason, it was decided to conduct lane searches across the area at regular intervals. A 200 foot interval was chosen because it duplicated the lane spacing of the depth readings made during an earlier survey. In the future, however, a lane spacing of 100 feet will be established instead of the 200 feet and in area of suspected sensitivity, other survey patterns will be carried out. Also, in future operations, divers will make several "drift searches" at intervals along the current flow axis of the river.

Underwater archeological investigations off bluffs in several other rivers in South Carolina have usually yielded a considerable quantity of prehistoric and historic artifacts. This was not the case off the bluff in Section II. This suggests that either the bluff was not a primary living area in prehistoric times, or if it was, artifacts associated with it are buried under deep mud from the eroding bank. Only one historic site was reported on the bluff near the shoreline and its location was far enough from the bank to preclude house associated artifacts from falling into the river. No prehistoric sites were found on the bluff near the shoreline.

Due to numerous vehicle break-ins at the boat ramp we used, it became obvious that we must carry all of our field equipment and supplies with us in the two boats. During the electronic search phase this did not present a problem because the equipment was small and easily carried on the survey boats. However, during the visual search operations using divers, the amount of equipment and supplies carried in the boats and needed to adequately support the divers in safety was considerable. This was a hindrance to the efficient utilization of the boats and presented a safety hazard of considerable dimension as the boats were often too cluttered to move about

safely. If possible, in future operations, a barge anchored near the center of activity will carry the bulk of the equipment and supplies and serve as a storage facility and command post from which to direct operations. Because of the expense of conducting underwater archeological activities, several times the cost of land archeological activities, the inconvenience of a heavy rain, so long as it does not dangerously reduce vision, is accepted. This does not usually affect divers waiting to enter the water as their normal mode is wet, but it does have a serious detrimental effect on boat handlers who must remain dry to handle radios and keep logs. For this reason, each boat handler in the future will have a complete set of foul weather gear.

REFERENCES

COE, JOFFRE L.
1964 The formative cultures of the Carolina Piedmont. Transactions of the American Philosophical Society, n.s. 54

FERGUSON, LELAND
1971 South Appalachian Mississippian. Ph.D. dissertation, Department of Anthropology, University of South Carolina.

GRIFFIN, JAMES B.
1967 Eastern North America Archeology: A Summary. Science 156: 175-191.

MICHIE, JAMES L.
1977 Early Man in South Carolina. Ms. on file, University of South Carolina, Institute of Archeology and Anthropology.

PETIT, J. PERCIVAL
n.d. The Wando River and its Environs. Ms. on file, University of South Carolina, Institute of Archeology and Anthropology.

SCURRY, JAMES D., MARK J. BROOKS
1980 An intensive archeological survey of the South Carolina State Ports Authority's Belleview Plantation, Charleston, South Carolina. University of South Carolina, Institute of Archeology and Anthropology, Research Manuscript Series 158.

U.S. ARMY CORP OF ENGINEERS
1977 Final Environmental Statement. Application by the S.C. State Ports Authority for a permit to dredge, fill, and construct a marine terminal on the Wando and Cooper Rivers, Charleston, South Carolina.

VAN NIEUWENHUISE, DONALD S., JEFFRERY M. YARUS, ROBERT S. PRZYGOCKI, ROBERT EHRLICH
1978 Sources of shoaling in Charleston Harbor Foarier Grain Shape Analysis. Journal of Sedimentary Petrology 48(2): 373-383.