# Cultural Resource Survey of a Portion of the Northeast Cape Fear River

and

# Report on the Test Excavation to Evaluate the Steamship "Spray"


by

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and

Wilson Angley

Cover Photograph “View of Wilmington, North Carolina” from Gleason’s Pictorial Drawing-Room Companion, furnished by the New Hanover County Museum, Wilmington, North Carolina.

# Cultural Resource Survey of a Portion of the Northeast Cape Fear River and Report on the Test Excavation to Evaluate the Steamship "*Spray*"

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**November, 1982**

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## ACKNOWLEDGEMENTS

The interest that was generated among so many individuals and agencies while working on this project was overwhelming and greatly aided in the results. Some were asked, while many others came forward to volunteer their efforts and knowledge. It has been an honor and a privilege to work with so many distinguished researchers, scientists, administrators, students and lay persons. The following is a list of these individuals:

Richard Kimmel, Archaeologist with the Wilmington District Corps of Engineers, provided the first clue that the vessel might by the *Spray* by conducting historical research in the local library.

William M. Reaves, Researcher with the New Hanover County Museum, provided evidence that the vessel was the *Spray* and worked with us in identifying the locations of landmarks mentioned in the historical research conducted in efforts to identify the vessel.

Janet Seapker, Director, New Hanover County Museum, provided copies of a photograph of the Wilmington waterfront for the report.

Wilson Angley, Research Branch, North Carolina Division of Archives and History provided the historical overview of the Northeast Cape Fear River and provided additional information throughout the project.

William N. Still, Jr., Professor of History, East Carolina University, assisted in efforts to identify the vessel.

Roger Kamera, student at East Carolina University, assisted in efforts to identify the vessel and provided information on the *Spray.*

Susan Killey, Wilmington Star News, prepared several articles for the newspaper that described the project and appealed to the general public for information on the identity of the vessel.

Lyn Stallings, Reference Librarian, Historical Society of Delaware, provided information on the builders of the *Spray.*

Betty-Bright P. Low, Research and Reference Librarian, Eleutherian Mills Historical Library, Wilmington, Delaware, conducted research into their historical files and provided information on the builders of the *Spray.*

Peter Parker, Researcher, Historical Society of Pennsylvania, attempted to locate additional on the builders of the *Spray.*

Eleanor and David Carnell of Hampstead, North Carolina provided information on Wilmington, Delaware, historical societies.

Dale Floyd, U. S. Army Corps of Engineers Historical Division, Washington, DC, provided information on Corps archival records.

Professor Cedric R. Nevitt, New York, New York, provided information on the *Sylvan Grove* before it was eliminated as the "Band Wreck."

Michael P. Musick, Navy and Old Army Branch, National Archives, Washington, DC, provided information on sources for Civil War naval activities in the Wilmington area.

Robert Matchette, Navy and Old Army Branch, National Archives, Washington, DC, provided information on sources for Civil War naval activities in the Wilmington area.

Elizabeth Wheeler, Associate Professor, North Carolina State University, School of Forest Resources, carried out analysis of wood samples from the *Spray*.

R. C. Willis, operator of Hilton Railroad Bridge, Seaboard Coast Line Railroad Company, alerted watercraft (tugs, tankers, motor vessels) of our presence affording safety for our dive operations.

Donald Shomette, Government Printing Office, Washington, DC, provided historical information.

Al Honeycutt, North Carolina Division of Archives and History, assistance with artifact analysis.

David Black, North Carolina Division of Archives and History, assistance with artifact analysis.

John Clauser, North Carolina Division of Archives and History, assistance with artifact analysis.

Tom Funk, North Carolina Division of Archives and History, assistance with artifact analysis.

William S. Price, Jr., Director, North Carolina Division of Archives and History; John Little, Administrator, Archaeology and Historic Preservation Section, North Carolina Division of Archives and History; and Jacqueline Fehon, Chief, Archaeology Branch, North Carolina Division of Archives and History, for their interest in and support of the project.

Ken Hall, National Archives, Washington, DC, assisted in locating records on vessels considered as candidates for the "Band Wreck" and provided information after the vessel was identified as the *Spray*.

John Vandereedt, National Archives, Washington, DC, provided assistance in efforts to located information on the *Spray.*

Bruce Raynor, Assistant Marine Superintendent, Cape Fear Technical Institute, provided assistance in boat dockage and recovery of the steam engine from the wreck.

Larry Murphy, Submerged Cultural Resources, National Park Service, provided guidance in report presentation and evaluation formulization.

Gordon Watts, Professor of Maritime History, East Carolina University, provided assistance in evaluation criteria.

Paul Tidwell, Raven Enterprises, Inc., provided assistance in obtaining information on the history of the *Spray*.

Wes Hall, student at East Carolina University, volunteered dive time.

Steve Beuth, Marine Superintendent, Cape Fear Technical Institute provided boat dockage.

## Forward

Two main factors contributed to the successful completion of the American Coal Company turn basin survey and assessment project: the willingness of Atlantic Salvesen to conduct a systematic survey of the area to determine if significant submerged cultural resources were present, and the cooperation of the state of North Carolina in providing assistance to ensure the timely and effective conduct of this project. This interaction between government and the private sector continued after the field work when research efforts to identify the remains of a steam vessel located in the survey area led to contacting state, Federal, local, and private historians and repositories.

The following report is a description of all phases of this underwater archaeological investigation from the remote sensing survey and historical research to an assessment of specific cultural resource sites using archaeological test excavations and detailed historical research. The report serves as an outstanding example of the theory, techniques, and results of a submerged cultural resource survey and assessment project. The description of the field work, for example, demonstrates how the various remote sensing surveys - - magnetic, bathymetric, and sub-bottom - - complement each other. When this data was combined with historical map and land use information and proposed construction plans, it provided a realistic framework from which to evaluate survey data. Through this process, attention was then directed to those anomalies both in danger from construction-related activities and that held the highest potential for producing meaningful data.

The final section of the report concerning recommendations addresses the difficult question of site significance and what if any steps should be taken to mitigate the impact that construction activities will have on an archaeological site. The resolution of the conflict between historical preservation on one hand and economic development on the other is not a simple process and usually involves compromise on both sides. The recommendations made in this report are based on an analysis of site significance and mitigation options that are necessary to make responsible management decisions.

Finally, recognition must be given to Allen R. Saltus of Archaeological Research and Survey both in his direction of the field project and for the production of this report. His efforts have gone far beyond what was required by contractual obligation and are responsible for making this report a model for submerged cultural resource management.

[Richard W. Lawrence 1982]

## Introduction

This cultural resource survey incorporated a multidisciplinary approach combining aspects of history, geology, civil engineering, hydrology, cartography, marine architecture, and archaeology during the three stages of investigation designed to fulfill the requirements of existing environmental legislation. This survey provided a unique opportunity, taking the investigation from the unknown (basic remote sensing survey and historical overview) to the testing and assessment of magnetic features and ultimately to a complete evaluation of a mid-nineteenth century merchant sidewheel steam vessel, *Spray*. This report discusses the results and methodology combined in the three stages or phases that were used in an attempt to answer these questions in an economical, timely, and systematic fashion.

Atlantic Salvesen and the State of North Carolina cooperated to preserve a portion of our maritime heritage by jointly performing this cultural resource survey of a portion of the Northeast Cape Fear River. The information that was obtained does not exist in the historical documentation either graphically or in the written word. The only repository for most of this data lies submerged in the bottom of our oceans, bays, and rivers, as is the case with this investigation.

Atlantic Salvesen, representing Atlantic Coal Exporting Company (ACECO), Coal Exporting Terminal, Wilmington, North Carolina, was well into their planning and permitting process when they were informed by the State of North Carolina that a cultural resource survey was needed in the turn basin portion of their proposed project.

Atlantic Salvesen needed to have all permits secured by December, 1981, in order to proceed with the bidding for and contracting of the dredge work, which had to begin in January, 1982. If the dredging could not begin by this date, there would not be sufficient time to complete the anticipated work during the dredge season, which was dictated by other environmental restraints, and the project would have been delayed a year. Since the state of North Carolina wanted to afford protection to any and all significant cultural resources in this proposed construction area but did not want to delay the construction project, a joint work agreement with Atlantic Salvesen was arranged to implement an intensively-structured, phased cultural resource survey. The three phases included Phase One: historical overview, magnetic survey, review of cartographic data, and identification of possible cultural resource areas; Phase Two: diver evaluation of targeted areas; and Phase Three: intensive site investigation of identified vessel remains.

The first phase included both an historical overview by Wilson Angley, historian for the North Carolina Division of Archives and History, and a magnetic survey performed by Ocean Surveys, Inc. with Allen R. Saltus in conjunction with Henry Von Oesen and Associates, project

engineers. Thirty-six magnetic anomalies were located and documented. This data was then correlated with the historic data, bathymetric data, seismic data and proposed project plans (Figure 7). Twelve of the thirty-six anomalies were identified as needing further investigation. Five of these areas were in the dredge impact zone and seven were situated in areas which may be affected by the dredge cut (indirect impact). All twelve areas needed to be investigated visually or through probing to identify and evaluate the site significance.

The second phase was conducted by the staff of the Underwater Archaeology Unit, North Carolina Division of Archives and History, and A. R. Saltus, Jr. representing Atlantic Salvesen. The objective of this phase was to locate, identify, and evaluate the sources of the magnetic anomalies. All but one of the twelve magnetic features were found to be either modern and/or insignificant cultural material, i.e., metal plate, cable, trash piles of asphalt shingles, nails and boards, chain, tubing, etc. Anomaly "K" proved to be the remains of a side wheel steamboat that needed further investigation.

Phase Three was designed to investigate the limited remains of the steamboat by documenting and, where possible, reconstructing the vessel's structure, recovering the remaining portions of the steam plant, recording observations regarding the environmental setting and site dispersion, analyzing and identifying activity or specialty areas, and recovering a representative sample of the artifactual material remains. This last objective, hopefully, would identify a temporal period for the vessel that would enable us to determine when the vessel was lost and, with construction date, produce a tentative age for this vessel.

A second portion of this phase included additional historical research of the wreck site, preservation, cataloging and identification of artifacts, and preparation of this report covering all phases of investigation from initial survey of the study area to extensive site evaluation.

Drowned terrestrial sites were considered but the probability that intact deposits of prehistoric remains lie within the basin area is considered low. No physical or environmental evidence exists to suggest that the shorelines adjacent to the basin were inhabited during any period of prehistory. In addition, the bottom scour caused by both natural and manmade river channels further decreases the likelihood that intact deposits are present in the bottom lands to be affected. For these reasons, no techniques or methodology designed specifically for locating such resources were recommended (M. Wilde-Ramsing, personal communication).

**Location of the Study Area**

The Northeast Cape Fear River rises in the extreme northern portion of Duplin County, flows generally southward through Pender and New Hanover counties, and joins with the main branch of the Cape Fear at Wilmington, some thirty miles from the ocean. The stream is approximately 130 miles in length (seventy miles in a straight line), and drains an area of about 1,600 square miles.

The proposed turn basin for the ACECO Coal Export Terminal lies in the lower portion of the Northeast Cape Fear River just above the city limits of Wilmington, North Carolina (Figure 1).

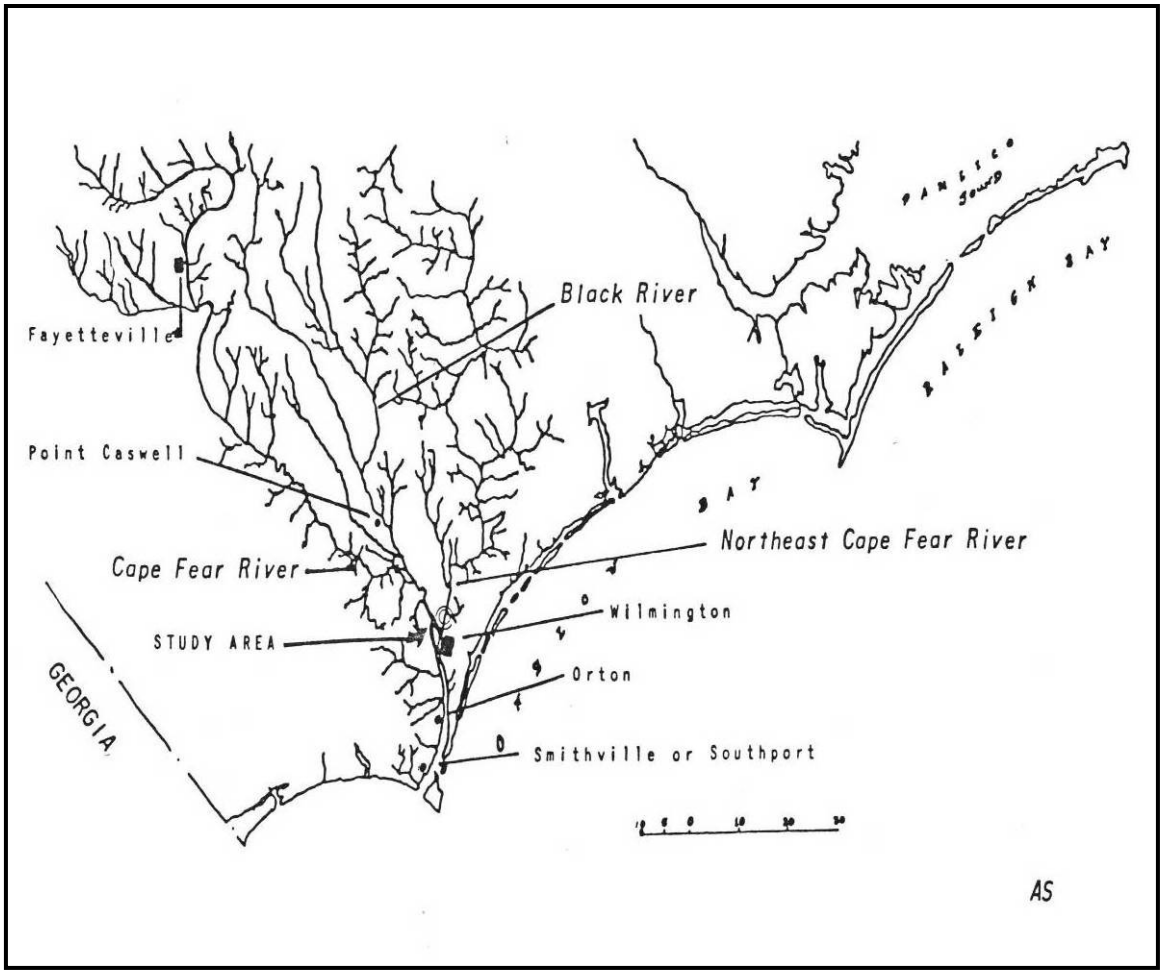


**Figure 1: General map of the Cape Fear River drainage system, southeast North Carolina**

The study area is bounded on both the east and west sides by the river banks. The north portion of the study area lies just below the southern boundary of the Horton Scrap Metal Yard on the west bank and Smith's Creek on the east bank. The southern boundary of the study area is the

Hilton Railroad Bridge, which is also the northern city limit of Wilmington (Figure 2). The turn basin is designed to have two different depths. The northern zone will be dredged to twenty-five feet and the larger southern zone will be dredged to thirty five feet. Both areas are to be studied with a two-foot over-dredge (error factor) or twenty-seven feet and thirty-seven feet respectively. The edges of the dredge cuts are the limits of the box cut and do not reflect subsequent natural slope. It has been assumed for this bottom type that equilibrium should be reached somewhere between a 1:2 and 1:3 bottom slope. The mid-portion of the study area has undergone somewhat drastic changes by the dredging of the present channel during the 1940s and the Smith's Creek channel dredged in the 1930s.

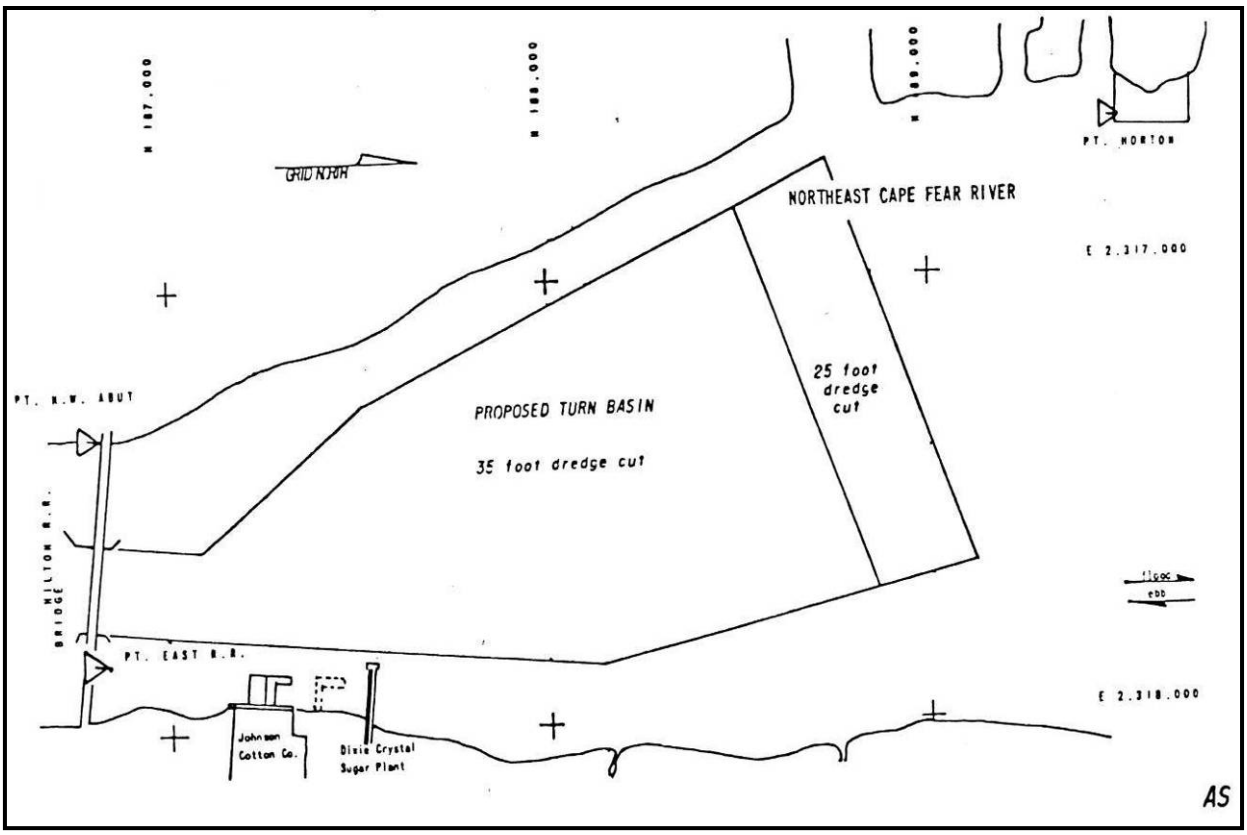


**Figure 2: Proposed construction area**

# PHASE I

# HISTORICAL OVERVIEW AND MAGNETIC SURVEY

**An Historic Overview**

From the early stages of European exploration and settlement of North Carolina, the lands along the Northeast Cape Fear and its tributaries were recognized as a prime area for agricultural development and the production of lumber and naval stores. In August, 1662, the New Englander, William Hilton, set sail from Massachusetts Bay aboard the ship *Adventure*, bound for the Cape Fear region. After several failures to reach his appointed destination, he entered the mouth of the Cape Fear on the morning of October 4, 1662. For more than three weeks Hilton and his associates explored the stream. Taking the *Adventure* as far as present-day Wilmington, he then proceeded by small boat up the Northeast branch, which he took to be a continuation of the main river. Hilton is thought to have reached a point approximately sixty miles upstream from the ocean bar. According to historian E. Lawrence Lee's reading of Hilton's own account:

> He and his associates were pleased with the fertile and abundant land, with its flourishing vegetation and plentiful game, and with the climate that was 'ye most temperate of ye temperate zone.' They were also impressed with the meadows and upland fields along the river.

During this initial voyage, Hilton and his men encountered only about one hundred Indians along the Northeast Cape Fear.

On the map that he prepared of his expedition, Hilton named a number of landmarks and tributary streams along the Cape Fear and Northeast Cape Fear Rivers. The Brunswick River was identified as "Hilton River" and Smith's Creek, just above Wilmington, appears as "Goldsmith River," after Samuel Goldsmith, a member of Hilton's crew. For some unaccountable reason, the map also showed the symbolic outline of a parapeted fortification downstream from "Goldsmith River," identified as "Janury" or "James Fort." No mention of such a fort appears in Hilton's written account. It is probable that the symbol was meant to indicate nothing more than a suggested location for a fort to be constructed in the future.

In October, 1663, Hilton returned aboard the *Adventure* to conduct a more extensive exploration of the Cape Fear region. Again he and his men ascended the Northeast Cape Fear in a small boat and on this second expedition other landmarks and areas far upstream were named, including "Turkie-Quarters," "Rocky-Point," and "Stag Park' - - the vast area later claimed by Governor George Burrington. Once more the expeditionary party was favorably impressed by the region: "As good tracts of land, dry, well wooded, pleasant and delightful as we have seen any where in the world."

Encouraged by Hilton's reports of the lower Cape Fear area, a group of hopeful colonists set sail in several ships from Massachusetts Bay Colony in the winter of 1663-1664. For reasons not entirely clear, this early attempt to settle in the area failed after a very short time.

From 1664 to 1667 there were several abortive and ill-fated endeavors to establish and maintain a colony of Barbadians along the lower Cape Fear, centered around the Charles Town settlement, on the west bank of the river and above the mouth of Town Creek. This colony was soon brought to an end by a combination of inadequate external support, internal dissension, and increasingly hostile relations with local Indians. Following the failure of the Charles Town settlement, the lower Cape Fear was returned to its Indian inhabitants for more than a half century.

Permanent white settlement along the lower Cape Fear finally began in the mid-1720s with the coming of Maurice Moore and others and the laying out of Brunswick Town. Between 1726 and 1731 some 115,000 acres of Cape Fear land were acquired by a closely associated group of about three dozen men. Lands were taken up not only along the lower reaches of the stream but also along both the Northwest and Northeast branches. The resulting concentration of large land holdings among a relatively few wealthy and influential men went far toward establishing the plantation pattern that remained dominant in the area until the Civil War.

During the half century preceding the American Revolution, vast plantations were layed off on the Northeast Cape Fear, extending far upstream from the fledgling settlement of Wilmington (formerly New Town or Newton). Moreover, the early landowners on the Northeast Cape Fear included some of the most prominent and influential men in colonial North Carolina. During this same period, less wealthy but more numerous English, Welsh, Swiss, and Scotch-Irish settlers established their homes, farms, and communities along the Northeast Cape Fear. Slaves were brought into the Cape Fear region in very large numbers and at an early date. It has been estimated that blacks constituted as much as ninety percent of the area's population in the 1730s.

Several plantations were established along the Northeast Cape Fear just above Wilmington and along the banks of Smith's Creek. By 1730 the future Patriot leader Cornelius Harnett had acquired a tract of some 320 acres on the east bank of the river and at the mouth of the creek on its southern side. This area is directly across the Northeast Cape Fear River from the massive coal export facility about to be constructed on the west bank. Originally called Maynard, Harnett's plantation home was not renamed Hilton until the nineteenth century, under the ownership of William H. Hill. The records do not reveal whether the improvements at Maynard included structures along the river bank, although it is safe to assume that wharves were constructed either on the river or along the shore of Smith's Creek. A map of 1780 shows the

"Harnett House" at the end of a road leading out from Wilmington, but indicates no other structures that might have been on the grounds or near the water's edge. Five years earlier, in 1775, the view of Maynard from the river was described in the following terms by Janet Schaw, the Scottish "Lady of Quality," who was visiting in the Wilmington area at the time:

> A few miles farther [south] and very near the town, I found another [plantation house] and must confess that in all my life I never saw a more glorious situation. It fronts the conflux of the north east and north west, which forms one of the finest pieces of water in the world. On this there is a very handsome house, and properly situated to enjoy every advantage. But the house is all, for I saw nothing neat done about it; tho' Nature has blocked out a fine lawn for them; down to the river is overrun with weeds and briars.

As late as the 1880s, rice was being grown on fifty-three acres of marshland at Hilton. The reported production for one year was 1,255 bushels. Indeed, a 1946 map of the Wilmington area identified the entire peninsula between Smith's Creek and the Northeast Cape Fear as "Old Rice Fields." During the 1890s Cornelius Harnett's house fell victim to progress and was pulled down, following the city fathers' refusal to move the structure to a different location. The area subsequently came to be called "Hilton Park."

Adjoining Harnett's plantation on the east and fronting along Smith's Creek was Halton Lodge, the home of Robert Halton, a member of the governor's council and one of the original commissioners of Wilmington. Halton's plantation comprised about 350 acres. A ferry across Smith's Creek was operated by Halton at the point of juncture between his land and that of his neighbor, Harnett. Following Halton's death, his land passed into the hands of the prominent James family, which retained it well into the nineteenth century.

Among other plantations on Smith's Creek prior to the Revolution were those of the merchant and ship owner, Rufus Marsden (Lotham); the wealthy merchant, alderman, and mayor of Wilmington, John Dubois; and the blacksmith Richard Player, Jr. Across Smith's Creek from Maynard and a short distance upriver was Sans Souci, originally the plantation home of Caleb Grainer, Sr., a member of the colonial assembly, sheriff of New Hanover County, and son of Joshua Grainer, one of the founders of Wilmington. During much of the nineteenth century, Sans Souci was the home of Arthur J. Hill. As late as the 1880s the marsh areas of this plantation were being used for the cultivation of rice.

The use of the Northeast Cape Fear River and its tributaries by colonial planters and settlers for travel, communication, and commerce was given added impetus by the growth of Wilmington from the 1730s onward - - a growth that soon caused the eclipse of the older settlement of

Brunswick, much nearer the south of the Cape Fear. E. Lawrence Lee has briefly described some of the reasons for Wilmington's rise as a maritime center at the expense of Brunswick:

> Wilmington flourished as a port from its earliest days . . . The basis of its commercial prosperity during the eighteenth century was the export trade of the Cape Fear Valley, the early growth of the seaport being a reflection of the settlement and development of this area. Large amounts of bulky naval stores and lumber produced in the area were sent down both branches of the Cape Fear River, as well as smaller quantities of farm products. Ocean-going vessels could not sail more than a few miles farther upstream than Wilmington, on either the Northeast or Northwest branch, but it was relatively easy and inexpensive for producers to float down the exports on rafts or piragua, for loading into vessel downstream. Since Wilmington was located below the confluence of the two branches, but above Brunswick, its merchants were better able to intercept and handle this trade. Many of them seem to have used the island in the river opposite Wilmington as a collection point for the naval stores and lumber of the Cape Fear Valley before loading these goods into larger vessels for export overseas.

Indeed, three of the reasons given for erecting the "Village of Newton" into the "Town and Township, by the Name of Wilmington" were the depth of its harbor, its "convenient situation at the meeting of the Two Great Branches of [the] Cape Fear River," and its "easy Access from all Parts of the different Branches of the said River."

In 1766 Governor William Tryon reported fifty sawmills in operation and "more building" on the two branches of the Cape Fear River and their tributaries, each mill equipped with two saws. He also reported that "these mills will saw upon a medium two hundred thousand feet apiece per annum." (Tryon later revised this figure downward to 150,000 feet per year.)

Writing in 1775, on the eve of the Revolution, Janet Schaw provided a rather detailed account of one large lumber and naval store operation - - that of John Rutherfurd, on his Hunthill estate, some 30 miles up the Northeast Cape Fear River from Wilmington:

> On this [plantation] he has a vast number of Negroes employed in various works. He makes a great deal of tar and turpentine, but his grand work is a saw-mill, the finest I every met with. It cuts three thousand lumbers a day, and can double the number, when necessity demands it. The woods round him are immense, and he has a vast piece of water, which by a creek communicates with the river, by which he sends down all the lumber, tar, and pitch, as it rises every tide sufficiently high to bear any weight. This is done on what is called rafts, built upon a flat with deals [i.e., sawn boards or planks], and barrels depending from the sides. In this manner they will float you down fifty thousand deals at once, and 100 or 200 barrels, and they leave room in the centre for the people to stay on, who have nothing to do but prevent its running on shore, as it is floated down by the tides, and they must lay to, between tide and tide, it having no power to move but by the force of the stream. This appears to me the best contrived thing I have seen, nor do I think any better method could be fallen on; and this is adopted by all the people up the country . . . . He is able to load a raft once a fortnight - - the plantation not only affording

> lumber, but staves, hoops and ends for barrels and casks for the West India trade, and he has a great number of his slaves bred coopers and carpenters.

It is of interest to note that not all vessels on the Northeast Cape Fear River at this time were of a crude and utilitarian design. The same John Rutherfurd, whose mill operation is described above, also possessed a rather refined and comfortable boat for his personal use - - a boat in which Janet Schaw was conveyed downriver to Wilmington:

> We came to town yesterday by water, and tho' it was excessively warm had a pleasant sail. Mr. Rutherfurd has a very fine boat with an awning to prevent the heat, and six stout Negroes in neat uniforms to row her down, which with the assistance of the tide was performed with ease in a very short time.

By the end of the colonial period, Port Brunswick (including Wilmington and the two branches of the Cape Fear River) was exporting approximately three-fourths of all sawn lumber shipped from North Carolina and about one-half of all its naval stores (tar, pitch, and turpentine). In addition, Port Brunswick was exporting significant quantities of corn, wheat, rice, and indigo.

Although the Wilmington area was a hotbed of revolutionary fervor, contributed numerous men to the Patriot cause, and fell under prolonged British occupation in 1781, preliminary research has revealed only one incident relating to the use of the Northeast Cape Fear River for the movement of men and supplies. In 1766 the colonial assembly had authorized Benjamin Heron to build a drawbridge over the Northeast Cape Fear River at an established ferry site well upstream from Wilmington. This bridge was to serve as a connecting link in the "Duplin Road" leading north from Wilmington to Duplin County. The assembly was careful to specify that the structure should

> have one wide arch of thirty feet for rafts and piraguas to pass through, and six feet high above high water mark, and be made to draw up occasionally for the navigation of vessels of large burthen [burden].

This drawbridge, perhaps the first built in America, was completed by 1770 and was indicated on the Collet Map of that year. Early in 1781 the Heron Bridge was destroyed by British troops under the command of Major Craig. A contemporary Whig description of the event reveals that several ships had been brought upriver from Wilmington as a protective measure:

> [Craig] detached a party up the North East River to the great bridge about 12 miles above the town, and there demolished the bridge [and] seized and burned some public store ships and their contents which had been run up the river for safety . . . .

Following destruction of the bridge, a Whig garrison of about seven hundred men, under the command of General Alexander Lillington, fortified the north bank of the bridge site. About three weeks later, this garrison withstood a British artillery barrage. The Whig troops subsequently remained in control of the site until receiving news that Cornwallis' army had reached Wilmington. They then retreated northward to Kinston. After the Revolution a new bridge was built at this location; and a bridge or ferry or both operated continuously there at the site from that time until the late 1920s.

In the late eighteenth century and throughout the antebellum period, the Northeast Cape Fear River served as a vital and convenient link between the Port of Wilmington and the rich upriver plantations. Cargoes transported downstream included large quantities of naval stores, lumber, cotton, corn, rice, tobacco, and other agricultural products. Vessels returning upstream brought salt, sugar, fertilizer, household goods, a wide variety of manufactured articles, and other essential commodities. The development of steam-powered vessels served to increase both the ease and speed of river transportation and commerce.

Throughout the Civil War, and especially during its latter stages, the Northeast Cape Fear River almost certainly became a principal life line of the Confederacy. Despite the vigilant patrolling of both the Old and New inlets by Federal ships, numerous blockade-runners were able to make their way stealthily into and up the Cape Fear River to deliver essential supplies. These they exchanged at Wilmington for cotton and other agricultural products. Although further research would be necessary to determine the precise role of the Northeast Cape Fear River in supporting the Confederate war effort, a significant portion of the cargoes loaded upon the outward bound blockade-runners must have been borne downstream to Wilmington on this river. In January and February of 1865 this role of the Northeast Cape Fear River was ended by the fall of Fort Fisher and the subsequent Federal occupation of Wilmington. On February 21, 1865, Confederate troops were compelled to evacuate Wilmington and march northward between the Northeast Cape Fear River and the Wilmington and Weldon Railroad. Within a few months, the fall of Wilmington was followed by the fall of the Confederacy itself.

It was in 1829 that the federal government had first become involved in the improvement of navigation of the Cape Fear River. This early work, based upon a survey by Captain Hartman Bache of the U. S. Army Corps of Engineers, concerned itself only with the lower reaches of the stream, especially with the dredging of the bar at the mouth of the river. Since the opening of New Inlet by storm in 1761, the older inlet to the south had grown progressively shallower. Once over this slowly rising bar, deep-draft vessels still faced a treacherous swash upriver to Wilmington. By 1829 this channel was, in some places, as shallow as seven feet. These factors,

of course, had a restrictive effect on Wilmington's trade; and her chief exports, naval stores, lumber, and cotton, required a great deal of expensive and time consuming lighterage. From 1829 to the present, there have been continual efforts to establish and maintain an adequate channel from the mouth of the Cape Fear River to Wilmington. It was not until 1889, however, that the federal government extended its efforts into the Northeast Cape Fear River above Wilmington. These efforts not only increased the maritime and commercial use of the stream, but also promoted the greater development of its shorelines.

Unfortunately, eighteenth century and pre-Civil War maps provide little information on the improvements that may have existed along the banks of the Northeast Cape Fear River between the site of the present U. S. Highway 117 bridge and the mouth of Smith's Creek. When the original town plan of Wilmington was drawn in 1733, the town extended northward only to Water (now Campbell) Street. The James Wimble Map of 1738 gives the name "Halton" to the land between Wilmington and Smith's Creek; the area directly across the river is identified in a general way as "Moore Fields," perhaps indicating its use as grazing land. The Sauthier Map of 1769 does not include those areas that lay to the north of the town limits, and does not extend as far as the residence of Cornelius Harnett. A previously mentioned map of 1780 does show the "Harnett House," but indicates no structures or improvement on either side of the river. A map of 1856 shows that the west shoreline, just downstream from Point Peter, had been developed to some extent; but no development is shown on the west bank above Point Peter. Though not conclusive, this map seems to indicate that there was no development on the east bank above the future site of the highway bridge.

It is on the post-Civil War maps that development begins to appear on the banks of the Northeast Cape Fear River in the general area of the proposed coal exporting facility. In 1882 there was a large timber pen on the east bank, extending upstream from the location of the present highway bridge to a point roughly west of Grafflin Street (as extended). Between this point and Hilton Street was an industrial complex, including the several buildings comprising the Parsley and Wiggins steam saw and planning mill. Directly on the river, at the foot of Hilton Street, was the O. G. Parsley Rice Mill.

In 1889 a preliminary report, examination, and survey of the Northeast Cape Fear River was compiled by the U. S. Army Corps of Engineers, under the supervision of Captain H. W. Bixby. Bixby had previously concluded that the stream was adequate to meet the needs of commerce. Further study, however, had substantially altered his views on the stream's potential and the existing difficulties of navigation. The channel from the bar to Wilmington had already been improved substantially by 1889; fourteen feet of water flowed over the bar, and the channel from

the bar to Wilmington had been dredged to a depth of sixteen feet. Between 1889 and 1905 the channel depth to Wilmington would be increased to twenty feet.

In his report of 1889, Captain Bixby shed considerable light on the conditions of navigation on the Northeast Cape Fear River, and on the use of the stream for trade and commerce prior to improvement. It can safely be assumed that the conditions and use of the stream in the late 1880s were similar to those which had existed throughout much of the nineteenth century, especially since the advent of steam power vessels:

> [The Northeast Cape Fear River] is tidal for about 50 miles above its mouth, and has a depth of at least six feet at all stages of tide and water, and is easily navigable for small steamers. For the next 40 miles the river has a depth of three feet at ordinary stages, with a gentle slope, and is suitable for navigation by sternwheel steamers of from 30 to 50 tons burden. Above this point for a distance of about 13 miles (up to Kornegay's Bridge) it becomes shallow, narrower, and more crooked, and is suitable for pole-boat and raft navigation only.
> .....
>
> A small steamer of about five feet draught makes bi-monthly trips at present over the lower 48 miles of the river to Bannerman's Bridge. More frequent trips are not made because the present blocked condition of the upper river prevents navigation and the descent of commerce, except during freshets. Another small steamer has lately succeeded in getting up 88 miles, to Hallsville; being troubled more by snags and trees than by want of depth and breadth of channel.
> .....
>
> The lands on both sides of the river are good, agriculturally, and well adapted to the culture of grains, vegetables, cotton, and to the raising of live stock. What they most need, especially on the eastern side of the upper river, is cheap transportation facilities. Cotton, naval stores (turpentine, tar, rosin), and timber are the most important products . . . . For the last eight or ten years much of the finer timber has been shipped to Holland and Brazil. The farm products of this region include tobacco, corn, oats, rice, wheat, rye, peas, beans, peanuts, Irish potatoes, sweet potatoes, squashes, turnips, melons, cabbages, berries, dog-tongue, etc.

By 1889 eleven settlements had grown up along the river between Wilmington and Kornegay's Bridge, "at most of which were stores, turpentine stills, cotton gins, grist-mills, and saw mills." Bixby estimated the annual value of downstream commerce at $429,000, and that of upstream commerce at $390,000. In light of his more thorough study of the Northeast Cape Fear River, he now recommended that the federal government undertake to "clear out its natural obstructions from Wilmington up to Kornegay's Bridge, at a total cost of about $30,000."

A survey conducted by the Corps of Engineers in 1891 (revised in 1893), shows that increased development had taken place along both banks of the Northeast Cape Fear River, from the approximate location of the present highway bridge up to the mouth of Smith's Creek. From

south to north along the west bank were: a ferry slip, the Hilton Railroad Bridge, Evans' Saw Mill, and a lumber pen. From south to north along the eastern shore were: Parsley's Mill, a ferry slip, the Hilton Railroad Bridge, Perogoy Lumber Company and the mouth of Smith's Creek. Well above Smith's Creek, and on the opposite shore, were the Powers, Gibbs, and Co.'s Fertilizer Works (the first of the fertilizer plants in this general area) and the C. W. Pike and Co. Saw Mill (Figure 3). These last two firms were a considerable distance upstream from the site of

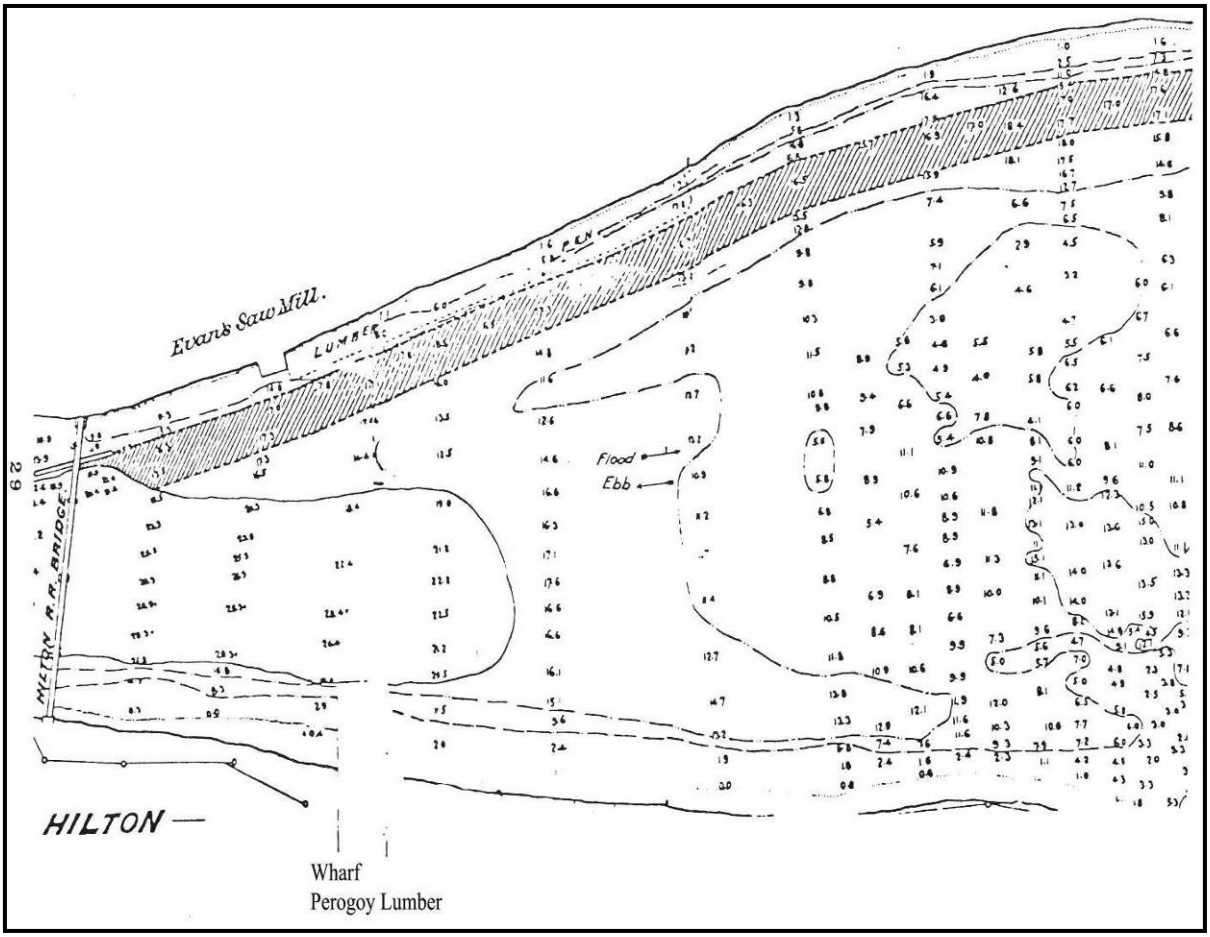


**Figure 3: Portion of the Merritt map from an 1891 survey**

the proposed coal export facility, but their establishment, and the subsequent establishment of other industrial facilities above Wilmington, had the effect of greatly increasing the volume of commerce on the lower portions of the river, especially in the shipment of fertilizers and chemicals. The Sanborn Insurance Maps of 1893 add to the above picture of industrial development the Clarendon Water Works, just south of the railroad bridge on the east bank ("Hilton Park" adjoins).

By 1895 the owners of the Powers, Gibbs, and Co. fertilizer plant (4,200 feet above the railroad bridge) and the C. W. Pike and Co. Saw Mill (5,400 feet above the railroad bridge) were requesting that a 100-foot-wide channel be established from the railroad bridge to their wharves, eighteen feet deep to the fertilizer plant and seventeen feet deep to the sawmill. The Corps of Engineers, however, determined that this project could not be justified for the exclusive benefit of those two firms. It was reported at this time that the existing channel from the mouth of the river to a point 1,000 feet above the railroad bridge was "an ample channel not less than 20 feet deep at mean low water." From the northern terminus of this channel there was a depth of fifteen feet to the fertilizer plant and twelve feet to the sawmill.

In 1905 the natural channel of the Northeast Cape Fear was still being cleared for use by small steamers to Hallsville, eighty-eight miles from the mouth of the river, and for use by pole boats to Kornegay's Bridge at the head of navigation, 103 miles from the river's mouth. These improvements were in line with the recommendations of 1889; and no additional measures were deemed necessary. Total commerce on the river in 1904 had been 105,800 tons, with about 72,000 tons of this in the form of raft-borne timber. Another 12,000 tons had consisted of fertilizer.

In 1909-1910 the Northeast Cape Fear River was examined and surveyed "from its mouth for a distance of two and one-half miles, with a view to securing a depth of 20 feet." That section of the stream that lay below the railroad bridge (approximately one and one-quarter miles) was now considered part of the Wilmington Harbor, and was being improved under an existing project for the Cape Fear River at and below Wilmington. A depth of twenty-four feet had already been achieved to the railroad bridge with a channel width of 150 feet. Above the railroad bridge no improvements had yet been made except for clearing the natural channel. The additional improvement now being considered was to provide a channel 150 feet wide and twenty feet deep," extending from Hilton Bridge slightly farther upstream than one and one-quarter miles so as to connect with deep water at that point." Projected cost of the project was $37,000. Again it was argued that the project would be for nearly the exclusive benefit of two upriver firms: the Virginia-Carolina Chemical Co. and the Swift Fertilizer Works. In recent years these two industries had contracted privately for the deepening of the channel through a shoal area that lay between the railroad bridge and their wharves. In 1906 this private dredging along the west bank and through the shoal had produced a depth of about fifteen feet to the Swift plant. A second dredging project, "just completed" in 1910, had increased the depth of the channel to sixteen feet. It was reported that "about 50,000 cubic yards of material" had been removed in the course of this

work. Increasing the depth of the channel to twenty feet, as requested by these two firms, was deemed a project "not worthy of being undertaken by the General Government."

Commerce on the Northeast Cape Fear River for the year 1910 was valued at $1,592,089. Cargo upstream consisted principally of brick, fertilizer materials, grain and hay, lumber and general merchandise. Downstream commerce was made up chiefly of lumber, shingles, timber, agricultural products and naval stores. Some 680 passengers had also been transported up and down the river. Vessels regularly engaged on the river included two steamers, eleven tugs, forty-four flats, and 100 rafts. One of the steamers, the shallow-draft Duplin, of thirty-seven net tons, made two trips each week between Wilmington and Smith's Bridge, "and occasionally to Chinquapin when the water is up."

The Sanborn Insurance Maps of 1910 recorded the following improvements on the east bank of the Northeast Cape Fear River, between the site of the present highway bridge and a point just above the railroad bridge: the Cape Fear Lumber Co., the Hilton Lumber Co., the City Water Works, and the Angola Lumber Co. The only improvement shown on the west bank was Koch's Saw and Shingle Mill, just downstream from the railroad bridge.

A survey done in 1909 (corrected in 1912) showed no improvements along the west bank of the river between the railroad bridge and a point nearly opposite the mouth of Smith's Creek. At that point there were "Old Saw Mill Buildings (abandoned)" and, just above these, the American Agricultural Chemical Co., a fertilizer plant completed in 1911 (Figure 4). Further upstream were the two fertilizer plants which had been operating for quite some time. On the east bank of the river was the Camp Manufacturing Co. sawmill, some 600 feet above the railroad bridge. A channel with a depth of twenty-five feet had been established along the east bank to serve this large sawmilling operation. Between this sawmill and the mouth of Smith's Creek was a timber pen, stretching along much of the intervening shoreline. The Sanborn Maps of 1915 show one significant addition on the west bank between the W. W. Koch Shingle Mill and the railroad bridge.

The original Hilton Railroad Bridge was constructed about 1888 and featured a draw of only sixty feet. In 1916 this bridge was replaced by a second structure, with a draw of about ninety-five feet. The thirty-five-foot increase in clearance significantly added to the potential of the Northeast Cape Fear as an artery of commerce, and this second bridge remained in service for more than half a century. The present railroad bridge, presenting even less of an obstacle to commerce, was put in place during the 1970s.

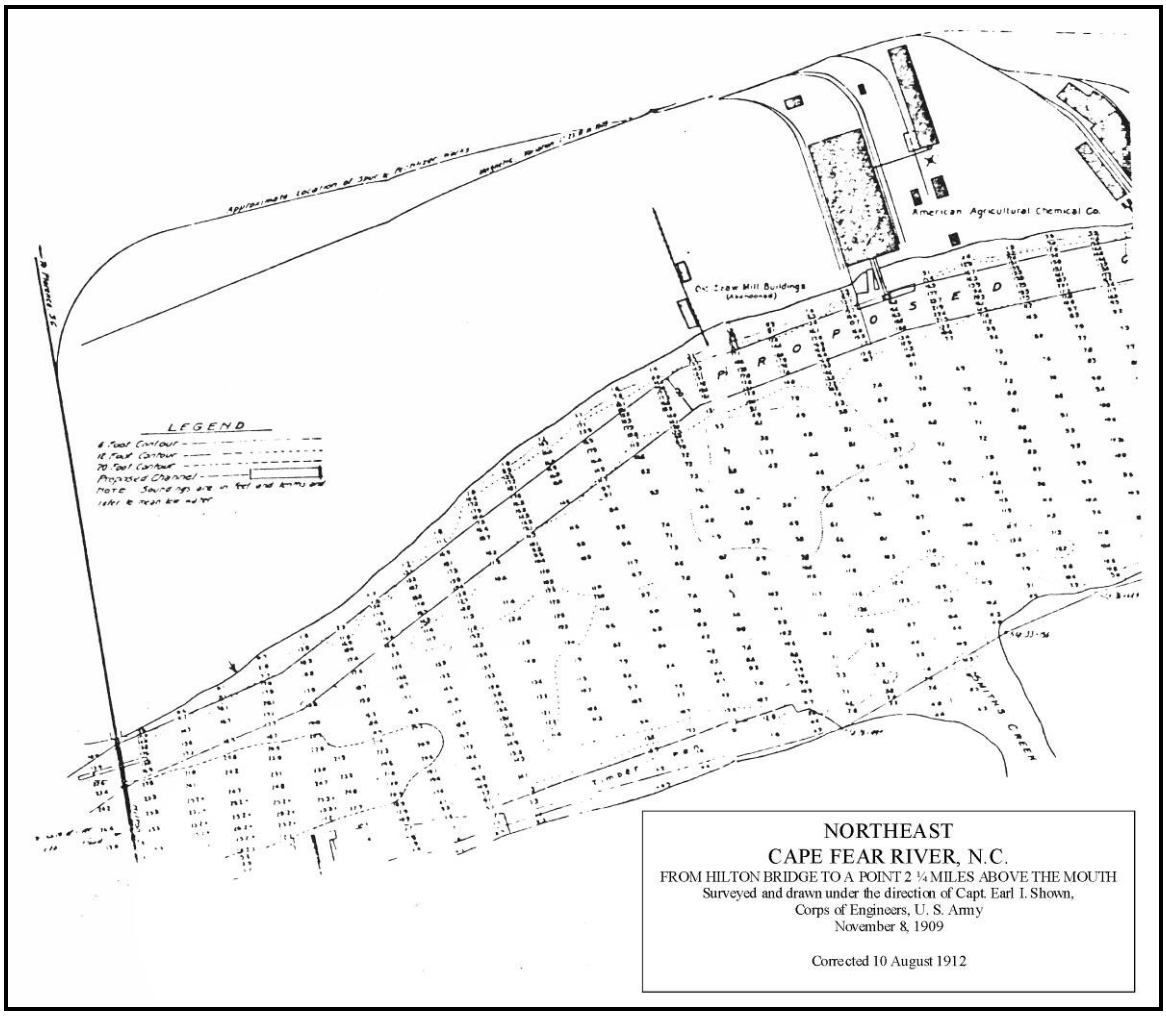


**Figure 4: Portion of the 1909 Corps of Engineers drawing**

By the early 1920s, significant changes had occurred on both banks of the river, from the site of the present highway bridge up to Smith's Creek. On the east bank, from south to north were: the C. C. Covington Molasses Warehouse, the Hilton Lumber Co., the Plate Ice Co., the City Water Works ("Hilton Park" on hill above), the railroad bridge, the N. B. Josey Guano Co., and the Naul Shipbuilding Co. No improvements were located between the shipbuilding facility and the mouth of Smith's Creek. Situated along the west bank, from south to north, were: Koch's Shingle Mill, the Hilton Compress and Warehouse Co., and the railroad bridge. No improvements were indicated between the railroad bridge and the American Agricultural Chemical Co., roughly opposite the mouth of Smith's Creek.

It was not until 1929, following considerable controversy that a highway bridge from U. S. 17 was finally thrown across the Northeast Cape Fear River into Wilmington. It was a double-leaf

bascule draw bridge, with a clear opening of 150 feet. This 1929 bridge was recently replaced by a larger structure, after nearly a half century of heavy use.

In 1931 it was proposed that improvements be made at the mouth of Smith's Creek. The existing shoal at the mouth of the creek produced a controlling depth of about seven feet at mean low water. Despite this impediment, nine industries had already located on the creek. Waterborne commerce on the creek in 1930 had amounted to 47,316 tons, all inbound, of which 40,716 tons consisted of raft timber. Seven gas boats were regularly employed on the stream, towing rafts and scows; reportedly, these vessels were able to deliver between 10,000 and 15,000 feet of timber per trip. It was argued that a 12-foot channel through the shoal at the creek's mouth would increase the ease and volume of traffic and lead to the shipment of sawn lumber and other wood products downstream and into the Northeast Cape Fear River.

Of special interest for the purposes of underwater archaeology are two wreck sites shown, on the 1931 survey map, just outside the mouth of Smith's Creek. One site was labeled only as "wreckage"; the other was identified as a "sunken scow." Below the creek's mouth, and running for a considerable distance along the east bank of the river, was a large timber pen.

In 1937, six years after it was proposed, a channel twelve feet deep was established at the mouth of Smith's Creek. The work was performed by the dredge Virginia, of the Lukens Dredging Co. of Baltimore, Maryland. The number of industrial facilities located on the creek had increased since 1931 from nine to about twenty.

When, in 1939, a survey was again taken of the Northeast Cape Fear River, from the railroad bridge to a point two and three-quarter miles upstream, virtually no improvements were shown on the west bank south of the American Agricultural Chemical Co. Along the east bank, from south to north, were: the Josey Fertilizer Co., the Atlantic Refining Co. (temporarily "abandoned"), and the large timber pen to the south of Smith's Creek. Just outside the mouth of the creek, a "wreck" site was identified. It appears very likely that this "wreck" was identical with the "sunken scow" indicated on the survey map of 1931.

By 1940 a channel thirty feet deep and 300 feet wide had been provided up the Northeast Cape Fear River as far as the Hilton Railroad Bridge; and a recommendation had been made that the depth of this channel be increased to thirty-two feet. No action had yet been taken to provide a channel twenty-two feet deep and 150 feet wide from the railroad bridge to a point one and one-quarter miles upstream, although such a channel had been proposed as early as 1910. It was reported that commerce on the Northeast Cape Fear River had remained "remarkably steady in volume at about 100,000 tons annually from 1929 to 1937." It was further reported that the river's commerce in 1938 had been "carried in 331 round trips of steamers, motor vessels, and

barges, of which total the great majority were of drafts under 12 feet and only 10 from 16 to 18 feet." It was now proposed that a channel twenty-five feet deep and 200 feet wide be provided from the railroad bridge to a point one and one-quarter miles upstream, with a turn basin there of the same depth as the channel and some 600 feet in width.

The Sanborn Insurance Maps of 1946 showed no improvement on the west bank between Point Peter and the highway bridge. Between the highway bridge and the railroad bridge was a relatively new fertilizer plant, the International Mineral and Chemical Corporation. No structures or improvements were shown between the railroad bridge and the three fertilizer plants well upstream. On the east bank, approximately one-hundred feet north of the highway bridge, was the Norfolk, Baltimore and Carolina Boat Line and Motor Freight Depot, built on pilings and extending out a considerable distance into the river.

In 1948 sixty percent of the work was completed on a federal project which included improvement of the channel from the ocean bar to Wilmington, a larger anchorage basin at Wilmington, and a turn basin thirty-two feet deep, 1,000 feet long and 800 feet wide, a short distance below the highway bridge. Work had not yet begun on the further improvement of the channel above the railroad bridge, although a recommendation for this work had been adopted three years earlier.

A survey map of 1947 recorded, on the west bank, the recently constructed fertilizer plant, between the highway and railroad bridges, and virtually no improvements between that facility and the area roughly opposite the mouth of Smith's Creek. On the east bank, two industrial facilities were located just above the railroad bridge: the Johnson Cotton Co. and the Riverside Terminal Co. No other improvements were shown on the east bank between the railroad bridge and the mouth of Smith's Creek. The present modern channel is shown on this map.

By the late 1950s the Horton Iron and Metal Co. had established a salvage yard on the west bank of the river, just above the site of the proposed coal exporting facility. In 1961 this salvage yard began to play a prominent role in dismantling the "mothball fleet" of nearly two-hundred World War II Liberty ships which remained in the lay-up basin on the Brunswick River. When opened in 1956 this lay-up basin had contained some 426 of these cargo vessels.

By 1969 ambitious plans were being formulated for additional improvements of the Northeast Cape Fear River, spurred on by the location of large new industries upstream such as the Ideal Cement Co., the Carolina Nitrogen Co., Hercules Co., and General Electric. It was reported that "all in all, more than 200 million dollars in new industries are already locating on the North East Cape Fear, or are building." Long range plans now called for the dredging of a thirty-four foot channel to a point four miles above the highway bridge, and for a twelve foot channel upriver to

Kornegay's Bridge. In 1976 the U. S. Army Corps of Engineers recommended a one-foot increase in the depth of this proposed channel, the widening of the two existing turn basins to 900 feet, and the construction of a third turn basin some seven miles upstream.

Currently under consideration is a plan for perhaps the largest industrial and shipping facility yet to be established on the Northeast Cape Fear River. The American Coal Export co. proposes to deepen approximately 4,000 feet of the existing 300-foot-wide channel from its present twenty-five foot depth to thirty-seven feet, from a point just south of the highway bridge northward to a point above the Hilton Railroad Bridge. At the upper end of this channel the firm plans construction of a 1,000-foot-wide, 2,500-foot-long turn basin and berthing area. Also included as parts of this project are extensive docking facilities and a loop railroad track around the general perimeter of the firm's property - - a tract of about eighty-five acres. The purpose of this extensive excavation and construction work is to establish a coal exporting facility capable of shipping six million tons annually. The proposed facility is to be located on the west bank of the river, between the Hilton Railroad Bridge and an existing barge slip approximately 1,800 feet upstream.

The area under consideration for development has been the scene of a least some industrial activity for nearly a century. Most recently, a marine dry dock facility was located in the area, preceded by facilities for the shipment of fertilizers. In addition to its industrial uses, the area has been used intermittently as a dredging soil depository since the 1930s.

## Magnetic Survey

Ocean Surveys, Inc. (OSI) conducted the field portion of this study during the period September 2, 1981, to September 5, 1981. The magnetic data acquired was processed, analyzed and submitted to Atlantic Salvesen on September 28, 1981, in the form of a magnetic anomaly contour map. This report, submitted with the data, outlined the procedures employed by OSI during data acquisition and processing and presented a discussion concerning the apparent significance of the magnetic features mapped in the study area.

All magnetic and positioning data were recorded on board a seventeen-foot fiberglass boat supplied to OSI by Henry Von Oesen and Associates, Inc. of Wilmington, North Carolina. In addition to supplying the survey vessel, Von Oesen, Inc. also provided technical support by recovering existing horizontal control stations, determining the coordinates of one new control station established for this survey, and supplying boat and transit operators.

Measurements of the total magnetic field strength in the study area were acquired along a total of forty-one survey tracklines (Figure 5) employing a Geometrics Model 806 proton precision magnetometer. The magnetometer is a precise electronic instrument that measures the

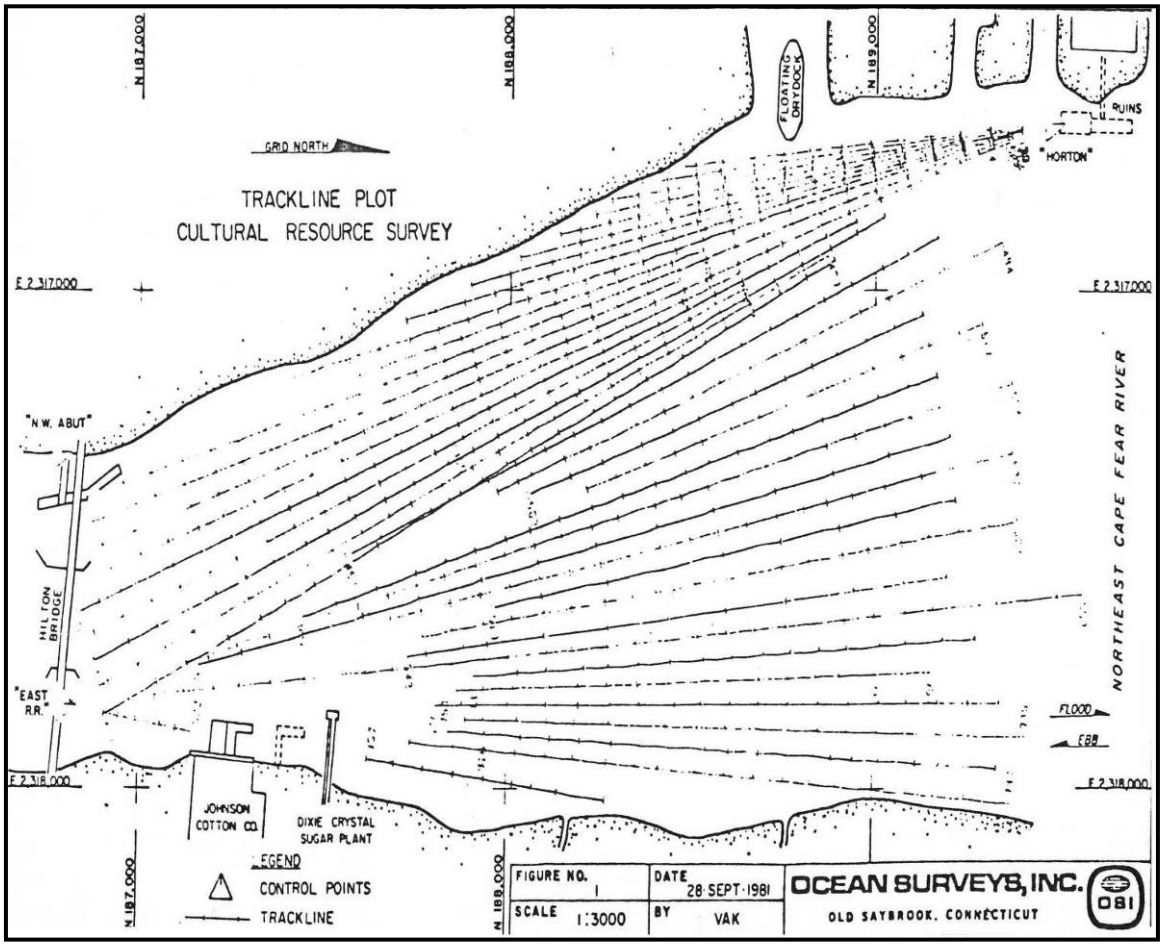


**Figure 5: Tracklines in the study area**

total magnetic intensity of the earth and its surroundings. Magnetic intensity is measured in units called gammas, which are usually displayed in a five-whole-digit readout and recorded on two tracks (0-99 to 0-999) on an analog recorder. In a survey, the gamma readings vary slightly as the magnetometer is moved from place to place. But when ferrous masses are encountered, the variance is accentuated so as to produce abnormal (or anomalous) readings.

A Hewlett-Packard strip chart recorder interfaced to the magnetometer console was used to record magnetic data. In water depths less than 25 feet an aerial magnetic sensor, mounted on a boom extending 10 feet off the bow of the boat, was employed. In water depths greater than 25 feet a marine sensor, towed approximately 18 feet below the water surface, was used. In addition

to magnetic field measurements, water depths were simultaneously measured with a Raytheon Model DE-719B survey grade echo-sounder.

The tracklines along which the data were acquired consisted of a series of transit bore-sites originating from control point "HORTON" for lines run on the west side of the river and from control point "EAST RR" for lines run on the east side (Figure 5). Each trackline was established by turning a pre-calculated angle from a known backsight. (The North Carolina state grid coordinates for each control station and the respective backsights are listed in Table 1.) The control points and backsights were chosen to give a set of tracklines oriented predominantly north/south and the angles were calculated to give a maximum trackline spacing of sixty feet. The survey vessel was guided along each trackline with course control provided by radioed instructions from the transit operator. Vessel position along each trackline was determined at nominal twenty-five meter intervals by measuring ranges from the transit location with a Motorola Miniranger III dynamic electronic positioning system. At each position "fix" the measured range was recorded in a field log and the magnetometer and depth sounder records marked and annotated accordingly.

| Control Points and Backsights | | |
|---|---|---|
| **West Bank Lines** | **East** | **North** |
| Control Point "HORTON" | 2,316,663.77 | 189,477.26 |
| Backsight "N. W. ABUT" | 2,317,328.18 | 186,782.71 |
| **East Bank Lines** | | |
| Control Point "EAST R.R." | 2,317,832.13 | 186,798.04 |
| Backsight "HORTON" | 2,316,663.77 | 189,477.26 |

**Table 1: Control Points and Backsights**

Processing of the raw field data was accomplished with the aid of OSI's DEC PDP 11/34A computer system. Initially, the North Carolina state grid coordinates for the control stations and backsights, the angles turned for each trackline, and the ranges recorded at each position fix were put into the computer which then calculated the XY grid coordinates for each fix.

The second step in the processing procedure was to enter the recorded magnetic data into the computer. This task was performed with the aid of a Summagraphics tablet digitizer. As the ambient geomagnetic field strength in the survey area was observed to be on the order of 52,000 gammas this value was subtracted from the raw field data in the computer, with the remainders being the measure of the magnitudes of geomagnetic field anomalies occurring within the area.

Following calculation of grid coordinates and anomaly values, the position and magnetic data were correlated in the computer and magnetic data points automatically plotted at 10-foot intervals along each trackline on a base map with a scale of 1 inch equals 50 feet. The plotted data was then hand-contoured at a 10 gammas interval (except in areas with very steep gradients where a 100 gammas interval proved more practical) producing a magnetic anomaly map of the survey area (Figure 6).

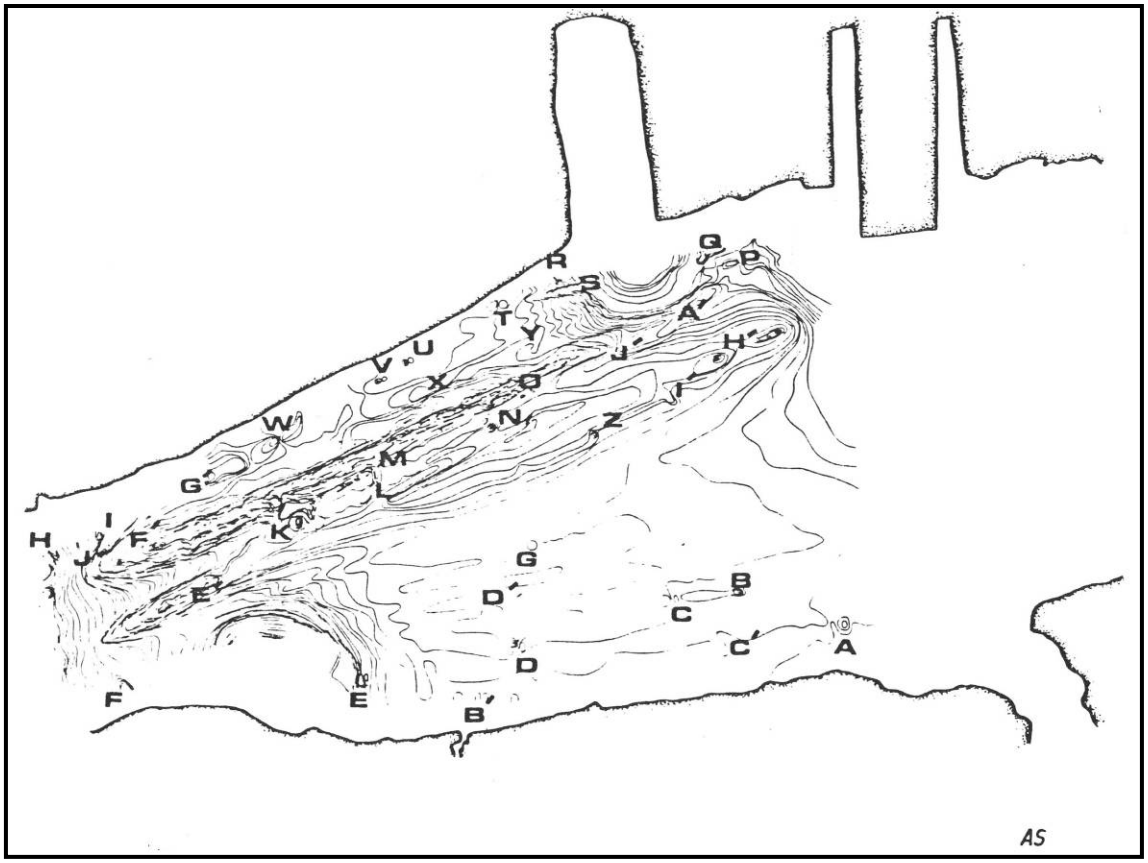


**Figure 6: Magnetic contour map of study area**

As evident on Figure 6, the survey area exhibits a complex pattern of magnetic anomalies. This complexity is partially due to the large magnetic effects produced by the ferrous structures associated with the Hilton railroad bridge at the south end of the site, the dock and loading equipment at the Dixie Crystal sugar plant on the southeast bank of the site, the barges, ships, and dry docking facilities on the northwest bank, and the Horton scrap metal facility also on the northwest bank. Evidence from the acquired sounding data and a recently completed seismic survey (OSI Report No. 72162-81-1002) suggested that local geologic conditions may also be responsible for some of the magnetic features mapped.

However, even after taking these structures and features into account, there remained a large number of anomalies within the site that may be due to cultural materials. A list of the designated anomalies with their respective magnitudes and aerial extents is presented in Table 2. Also included are interpretive comments as to the magnetic geometry of the anomaly and any apparent correlations to observed cultural and geologic features.

A cultural feature observed in the field but not apparent from the magnetic data consisted of the structural remains of a wooden vessel. These remains lie about two-thirds of the distance between the northern-most dolphin of the sugar plant dock and the east bank of the river adjacent to the dock. The vessel appeared to be of scow-type construction with many upright supports breaking the water surface at low tide. Due to the large magnetic effects from the sugar dock and the shallowness of the water, magnetic data from this location were not acquired.

| Magnetic Anomalies Northeast Cape Fear Turn Basin | | | |
|---|---|---|---|
| **Anomaly** | **Max. Gamma Inflection** | **General Area (in feet)** | **Comments** |
| A | 30 | 60 x 80 | Dipole |
| B | 50 | 120 x 30 | Dipole |
| C | 25 | 50 x 80 | Dipole |
| D | 70 | 70 x 90 | Dipole |
| E | 100 | 110 x 130 | Dipole, multiple targets |
| F | 130 | 90 x 60+ | Dipole, parallel to river bank |
| G | 15 | 70 x 140 | |
| H | 660 | 50+ x 80 | Dipole, parallel to river bank |
| I | 420 | 60 x 120 | Dipole, maybe one feature with J |
| J | 160 | 50 x 50 | Dipole, maybe one feature with I |
| K | 520 | 160 x 180 | Multiple dipoles |
| L | 40 | 70 x 125 | Dipole: related to channel buoy |
| M | 30 | 70 x 110 | Multiple dipoles |
| N | 100 | 70 x 90 | Dipole |
| O | 130 | 60 x 80 | Monopole, maybe geological |
| P | 30 | 40 x 55 | Dipole |
| Q | 300 | 40+ x 100 | Dipole parallel to river bank |
| R | 70 | 15+ x 55 | Dipole parallel to river bank |

| Anomaly | Max. Gamma Inflection | General Area (in feet) | Comments |
|---|---|---|---|
| S | 340 | 50 x 210 | Dipole may be related to Anomaly R |
| T | 30 | 60 x 65 | Dipole |
| U | 40 | 20 x 40 | Dipole |
| V | 30 | 20 x 40 | Dipole |
| W | 70 | 60 x 210 | Dipole |
| X | 70 | 100 x 120 | Dipole |
| Y | 15 | 60 x 60 | Dipole |
| Z | 20+ | 60 x 60 | Believed to be dipolar |
| A' | 30 | 60 x 240 | Dipole |
| B' | 20 | 20+ x 210 | Several small anomalies aligned parallel to the river bank |
| C' | 10 – 15 | 70 x 80 | Dipole |
| D' | 20 | 80 x 500 | May be associated with observed pilings |
| E' | 310 | 130 x 535 | Multiple monopoles: may be geological anomalies |
| F' | 110 | 120 x 1040 | Multiple monopoles: may be geological anomalies |
| G' | 50 | 120 x 120+ | Appears as monopole parallel to bank. Most likely a dipole |
| H' | 50 | 120 x 380 | Monopole, maybe geological |
| I' | 30 | 90 x 110 | Dipole: related to channel buoy |
| J' | 60 | 120 x 240 | Dipole |

**Table 2: Magnet Anomalies Northeast Cape Fear Turn Basin**

All the magnetic anomalies in the study area were evaluated to determine if further investigation was warranted after reviewing the historic cartography and bathymetry, geology and present anomaly setting (water depth, seismic and mineralogical correlations). The following criteria were used to make the determinations:

1. Is the anomaly associated with modern material, i.e., pipelines, well heads, channel markers, etc.?
2. Does the anomaly lie outside or below construction activity?
3. Within recent time has the area been drastically altered?
4. Is the anomaly associated with geological phenomena?

A magnetic anomaly would not need further investigation if an affirmative statement could be documented. All remaining anomalies would need further study to evaluate their cause and significance.

Anomalies I' and L are associated with extant or remnant channel markers (buoys) as noted on the Proposed ACECO Terminal, Atlantic Resources Corp., Wilmington, North Carolina Hydrographic Survey map by Henry Von Oesen and Associates, April 18, 1981. No further work is recommended.

Anomalies A, F, G, H, I, J, P, Q, R, S, A', B', C', E', and H' all lie outside the construction limits and anticipated secondary impact. Anomaly J' lies in 29 feet of water within an area that will be dredged to a depth of 25 feet, and an additional 2-foot buffer zone could take construction activity to 27 feet. As this area already has sufficient depth, 29 feet, no construction activity is anticipated, thus this anomaly should not be disturbed. No further investigation is recommended.

Anomaly Z lies in the modern main channel, an area that prior to the 1940s would have been in less than 10 feet of water (Northeast [Cape Fear] River, N. C. Map, May, 1891, by Robert C. Merritt, revised August, 1893, by Merritt and U. S. Corps of Engineers 1939 proposed channel improvements for the lower N. E. Cape Fear River). As this area now lies in excess of 25 feet it can be assumed that the anomaly represents either older cultural material that under went drastic change during present channel construction occurring during the 1940s or, most likely, it represents modern material. For these reasons further investigation cannot be recommended.

Anomalies O, E', and F' are large-inflection, long-length, multiple monopoles. The length and lack of dipolar effect with magnitude of inflection suggests geological causes.

Anomalies G and D' represent low magnetic inflection most likely reflecting magnetic variation in the bottom sediments or shallow rises and/or depressions in the river bottom. The area also lies in the Smith's Creek channel that was dredged in the 1930s and subsequently filled slightly. As this area has been heavily disturbed and the magnetics most likely represent geological features, these areas cannot be recommended for further investigation.

Anomalies K, M, N, and Y lie in conflict with the proposed dredge construction. Anomalies B, C, D, T, U, V, and W lie within the anticipated maximum 3 to 1 slope from the edge of the proposed dredge cut. All twelve of these anomalies needed to be identified as to what ferrous material they represented and evaluated as to historical, architectural and/or archaeological significance.

Table 3 is a synopsis of the above evaluation for the thirty-six anomalies located within the study area magnetically surveyed by Offshore Survey, Inc.

| Evaluation of Magnetic Anomalies | | | | | |
|---|---|---|---|---|---|
| **Anomaly** | **Determination** | **Anomaly** | **Determination** | **Anomaly** | **Determination** |
| A | Is not in conflict with construction activity. | M | Direct conflict with construction activity. | Y | Direct conflict with construction activity. |
| B | Indirect conflict with construction activity | N | Direct conflict with construction activity | Z | Drastically disturbed area, small amount of ferrous material, probably modern |
| C | Indirect conflict with construction activity | O | Associated with geological phenomena. | A' | Is not in conflict with construction activity |
| D | Indirect conflict with construction activity | P | Is not in conflict with construction activity | B' | Is not in conflict with construction activity |
| E | Is not in conflict with construction activity | Q | Is not in conflict with construction activity | C' | Is not in conflict with construction activity |
| F | Is not in conflict with construction activity | R | Is not in conflict with construction activity | D' | Drastically disturbed area, small amount of ferrous material, probably modern, Associated with geological phenomena |
| G | Drastically disturbed area, small amount of ferrous material, probably modern, Associated with geological phenomena | S | Is not in conflict with construction activity | E' | Associated with geological phenomena. |
| H | Is not in conflict with construction activity | T | Indirect conflict with construction activity | F' | Associated with geological phenomena. |
| I | Is not in conflict with construction activity | U | Indirect conflict with construction activity | G' | Is not in conflict with construction activity |
| J | Is not in conflict with construction activity | V | Indirect conflict with construction activity | H' | Is not in conflict with construction activity |
| K | Direct conflict with construction activity. | W | Indirect conflict with construction activity | I' | Associated with modern material |
| L | Associated with modern material | X | Indirect conflict with construction activity | J' | Is not in conflict with construction activity |
| Anomalies with indirect or direct conflict with construction activities need further investigation. | | | | | |

**Table 3: Synopsis of the Evaluation of 36 anomalies**

## PHASE II

## MAGNETIC FEATURE INVESTIGATION

## Magnetic Feature Investigation

The second phase, diver investigation, was initiated by analysis of the magnetic contours to determine the best predictive location within each anomaly. The predictive statement including position, relative size, compactor linear shape, and orientation of the anomalies are based on observations made in test situations that were applied and reported on in the Identification and Evaluation of Submerged Cultural Resources in the Tombigbee River Multi-Resource District, Alabama and Mississippi (Murphy and Saltus 1981). This was done for each of the twelve anomalies needing identification and evaluation. Their positions (an angle and a distance) were calculated using an instrument station on the Hilton Railroad Bridge and Point Horton as a backsight. The instrument station on the railroad bridge provided the least obstructed view of the river. The dive boat equipped with a radio and instrument mirrors was guided "on track" (angle) toward the pre-plotted position (distance) by an instrument man using an HP3810 "Total Station", Electric Distance Meter (EDM) and theodolite, and a radio. When the vessel arrived at the desired point, the vessel crew dropped a buoy on command from the instrument operator. The position of the boat was noted as the buoy was dropped, and any possible error was recorded in order to allow the divers to concentrate their search pattern accordingly.

The study area is subject to tidal fluctuation of slightly brackish water. The currents varied between still to slightly over 0.4 knots during maximum tidal flow. The visibility was only available using artificial light due to the high tannin and particulate matter in the water. The lighted visibility fluctuated from three feet to zero. The bottom was made up of silty clay material varying from over 6 to 20 feet. Floating and refloated debris was noted with some large timbers observed with substantial ferrous component, i.e., 2-foot iron bolts with nuts and washers attached above the surface as they floated by.

All diving was performed using self-contained breathing apparatus (scuba). Anomalies K, M, N, X, and Y occurring in deeper water and anomalies U and V in shallow water were all identified within a single dive. Anomaly K which turned out to be a shipwreck necessitated additional dives for further identification, delineation and initial evaluation.

Where evaluation and identification was not possible due to sediment build-up, a second dive was carried out using a Garret underwater metal detector; Anomaly T was the only area with covered ferrous material close enough to bottom surface to be found. Magnetic targets C and D were finally located using a hydro-probe. The hydro-probe (Watts 1980) was operated from an open water craft that held the operators and equipment over the magnetic feature. A Hale Fire Pump (25FA-B23), centrifugal type, with a nine-horsepower Briggs and Stratton engine provided

sufficient water volume and pressure for a hydro-probe. The water was carried to the probe by a 2 ½-inch hose. This was connected to the 1½-inch ABS pipe by a series of two 90-degree elbow joints that rotated to prevent the hose from kinking as the probe was used. Use of the outer ABS sleeve, as discussed by Watts, was unnecessary, due to the makeup of sediments and/or study area depth.

Prior to using the hydro-probe, seismic data (OSI 1981 Survey) and historical bathymetric data (1912 bathymetric data and 1981 bathymetric data) were compiled for a stratigraphic reconstruction between the edge of the dredge cut and the end of a 3-to-1 slope. By using the hydro-probe for magnetic targets B, C, D, and W, and a metal detector at T, depths and locations of each object causing an anomaly were plotted. With this information a determination of secondary impact (natural slope) and relative age could be made for each target.

An error factor of as much as 9 feet (2.74 meters) was noted from the magnetic pre-plotted positions. The error was most likely induced by the mini-ranger positioning system limitations of 2 meters to 3 meters accuracy. To more precisely define the location of the magnetic feature prior to probing, the magnetometer was again used. The resurvey further reduced the area of investigation to an error factor of 3 feet by conceptualizing the readings with previously recorded contours and further delineating the magnetic focus.

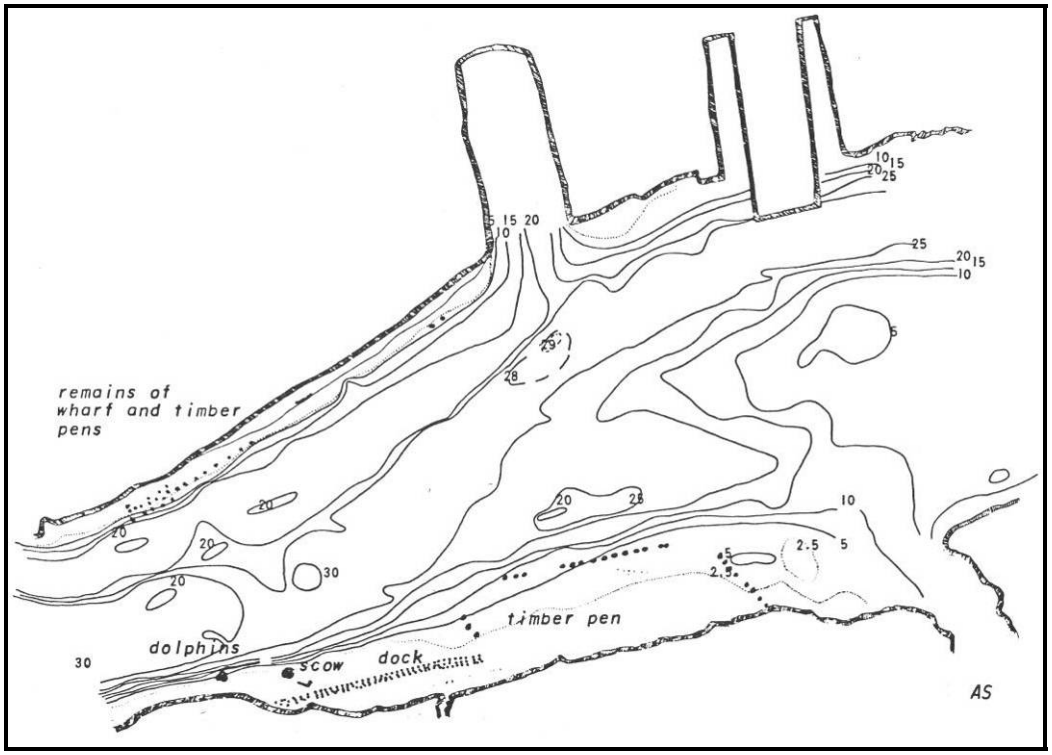


**Figure 7: Bathymetric map with historical remains. Depth data from Henry Von Oesen and Associates' hydrographic survey, March 25, 1981**

| Magnetic Feature "K"" | |
|---|---|
| **Location:** | N-187,660 E-2,317,397 17 feet mean sea level |
| **Diver's Bottom Time:** | 16 hours |
| **Anomaly Description and Prediction:** | This is a complex dipolar anomaly, having multiple components covering an area of over 160 by 180 feet, and associated spatially in part with the extremely long monopole (Anomaly F'). The anomaly represents either a wreck with internal power or a trash pile similar to the World War II refuse piles found in the Wando River, South Carolina (Watts 1979). If it is a wreck, its dimensions should be about 120 by 25 feet with either a north/south or northeast/southwest orientation. |
| **Identification:** | The buoy anchor placed at the predicted anomaly location was within a 5-foot diameter area containing the steam engine, crank shaft, and associated long iron rods. The ship was determined to be a steam-propelled vessel. Stern-wheel propulsion was ruled out due to the location of the power plant. The sparse artifact assemblage suggests it was operating in the 1860s. It seemed to have been in operation for a long time as the two inch planking had been eroded between the external iron bands as much as one inch. The vessel structure was limited from the keel to the chines or the bottom 37-40 inches. |

**Table 4: Magnetic feature "K"**

| Magnetic Feature "M" | |
|---|---|
| **Location:** | N-187,913 E-2,317,250 18 feet water |
| **Diver's Bottom Time:** | One (1) hour, 35 minutes |
| **Anomaly Description and Prediction:** | Magnetic feature "M" may be associated with a channel marker. Like Anomaly F', it is a reverse anomaly causing spread within the magnetic field. |
| **Identification:** | Within 6 feet of the set marker buoy anchor a short section of cable, 5 to 6 feet long was located by divers. Several feet away from the cable, a 4-foot section of chain was recovered, having 2-inch links made from 3/8-inch diameter stock. Also in this area many nodules were observed. These nodules were identified by Dave Bell, geologist for Offshore Surveys, Inc., as iron pyrite ($Fe_3S$). This material, according to Bell, has two possible commercial uses, both having to do with the sulphur end of the compound. The first use is for manufacturing of gunpowder and the second is sulphuric acid ($H_2SO_4$). According to J. G. Reams of Sulfate, Inc., from the 1890s to 1942 there were at least ten lead chamber plants in use on the Northeast Cape Fear River, burning the pyrite to extract the acid. He went on to say that for every ton of mineral burned, 60 to 75 percent was iron waste. As there were at least three chemical plants, American Agricultural Chemical Company, Virginia Carolina Chemical Company and Swift Fertilizer Plant - - within a half mile from our study, it can be assumed that the large complex monopolar anomalies are probably indicative of either the raw pyrite (prior to burning) or the waste material in the form of iron slag, as both were observed on the bottom. Large deposits of slag exist in the area today, and Reames stated that it is not surprising that a great deal could be found on the river bottom. The pyrite ore was brought in by both ships and barges, and by rail. |

**Table 5: Magnetic feature "M"**

| Magnetic Feature "N" | |
|---|---|
| **Location:** | N-188,268 E-2,317,172 18 feet water |
| **Diver's Bottom Time:** | 15 minutes |
| **Anomaly Description and Prediction:** | The magnetic feature looks like a linear object similar to a 20-foot section of pipe lying in a northeast to southwesterly orientation. |
| **Identification:** | An irregular section of ½-inch plate 5 feet long and a maximum of 3 feet wide was lying on the river bottom in the predicted orientation. |

**Table 6: Magnetic feature "N"**

| Magnetic Feature "X" | |
|---|---|
| **Location:** | N-188,095 E-2,317,065 17 feet water |
| **Diver's Bottom Time:** | 30 minutes |
| **Anomaly Description and Prediction:** | Magnetic feature "X" represents more mass than a 4-foot anchor or a larger accumulative mass if scattered lying in a northeast/southwesterly direction on the seaward edge of the historic channel. This anomaly lies within the larger magnetic disturbance caused by the dry docks and Horton's Scrap Yard, and was indicated only by folding in the magnetic contour lines of this larger anomaly complex. |
| **Identification:** | This area consisted of a large scattering of asphalt shingles, boards, and other modern building debris. |

**Table 7: Magnetic feature "X"**

| Magnetic Feature "Y" | |
|---|---|
| **Location:** | N-188,418 E-2,316,953 15 feet water |
| **Diver's Bottom Time:** | 30 minutes |
| **Anomaly Description and Prediction:** | This dipolar anomaly appears to be linear in shape, similar to a small anchor lying in a north/south orientation. Like "X", it is also characterized by folding of the magnetic contour within a large magnetic complex. |
| **Identification:** | Several sections of iron tubing 3/8-inch in diameter and from 3 to 5 feet in length were located in more or less the predicted orientation. |

**Table 8: Magnetic feature "Y"**

| Magnetic Feature "B" | |
|---|---|
| **Location:** | N-188,960 E-2,317,770 4 feet water |
| **Diver's Bottom Time:** | None |
| **Anomaly Description and Prediction:** | Magnetic features "B" and "C" could possibly be associated, appearing to be a strung-out dipolar anomaly, both simulating a linear feature(s) such as cable or chain with an anchor-like object at "C". |
| **Identification:** | Using the stratigraphic reconstruction (Figure 8), the magnetic feature was vertically plotted. It was determined to be positioned outside of the 3-to-1 slope of both the area of the 37-foot dredge cut and the area of the 27-foot dredge cut. Therefore, with no impact anticipated, the area was not investigated further. |

**Table 9: Magnetic feature "B"**

| Magnetic Feature "C" | |
|---|---|
| **Location:** | N-188,777 E-2,317,776 2 feet water |
| **Diver's Bottom Time:** | 2 hours, 40 minutes |
| **Anomaly Description and Prediction:** | Magnetic features "B" and "C" could possibly be associated, appearing to be a strung-out dipolar anomaly, both simulating a linear feature such as a cable or small chain with an anchor at "C". |
| **Identification:** | Through probing it was determined that a 3-to-4-foot diameter object with rounded edges lies under seven feet of mud. Using the reconstructed stratigraphic chart (Figure 9), this object lies above the 1912 river bottom. Therefore, it is believed that this unidentified object dates from the twentieth century. |

**Table 10: Magnetic feature "C"**

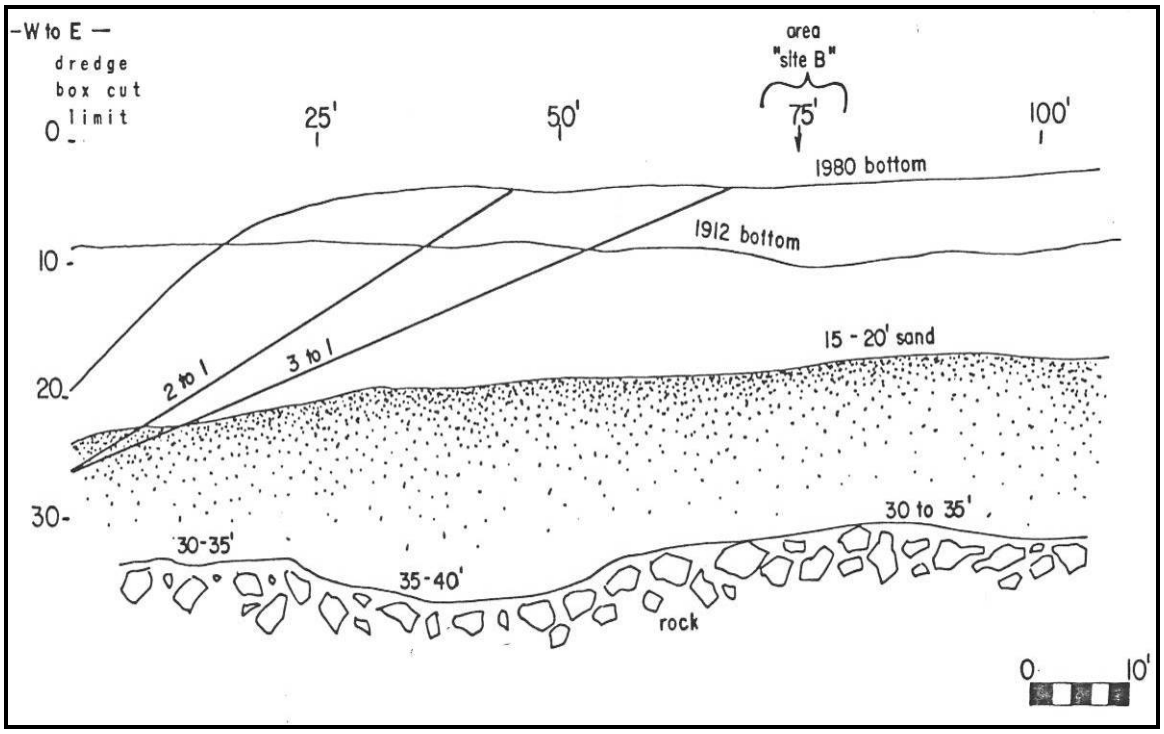


**Figure 8: Magnetic feature "B" stratigraphic reconstruction**

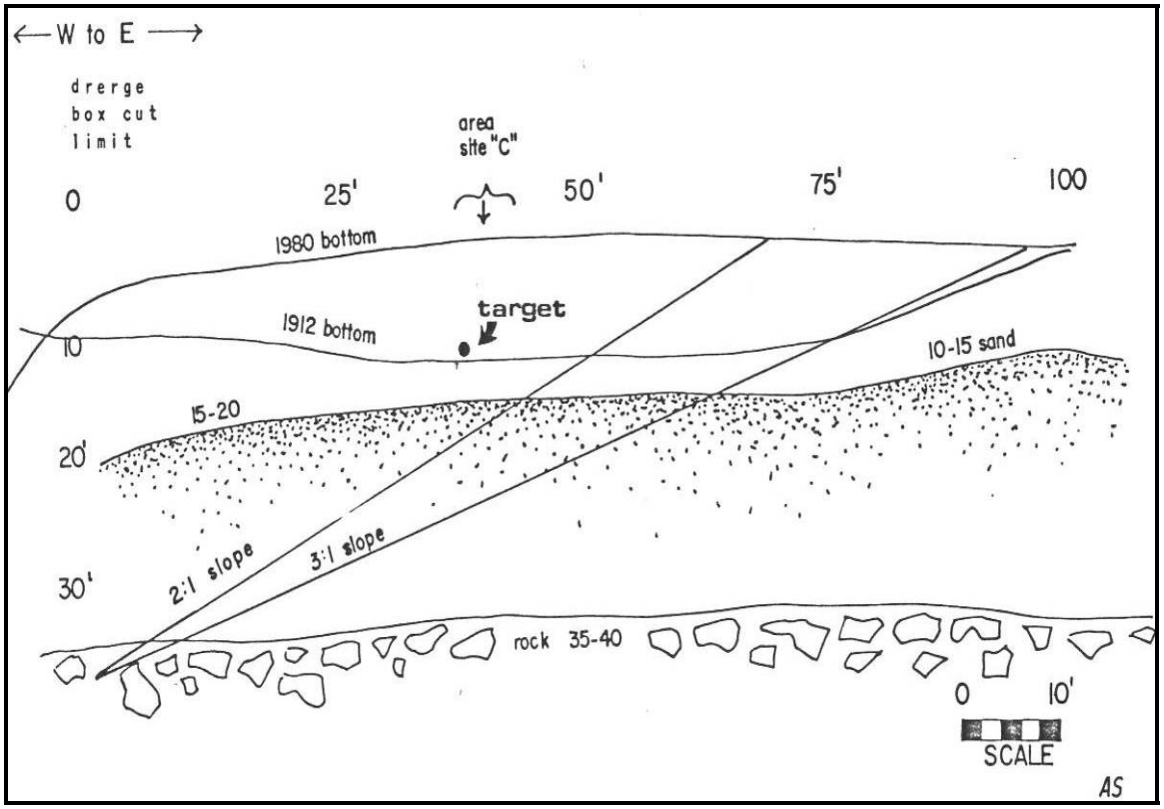


**Figure 9: Magnetic feature "C" stratigraphic reconstruction**

| Magnetic Feature "D" | |
|---|---|
| **Location:** | N-188,304 E-2,317,874 4 feet water |
| **Diver's Bottom Time:** | 30 minutes |
| **Anomaly Description and Prediction:** | This dipolar anomaly represents a solid mass, some 5 to 8 feet maximum length, lying in a north-northeast/south-southwest orientation, with the north end deeper in sediments. |
| **Identification:** | A hard object was located 9 feet below the mud bottom on the hard sand. The object was delineated as 3 feet by 3 feet and about 1-foot thick (Figure 10). As this target represents a single object, the State of North Carolina has agreed to monitor this position after dredging and further identify it when and if exposed by and in the dredge cut slope. |

**Table 11: Magnetic feature "D"**

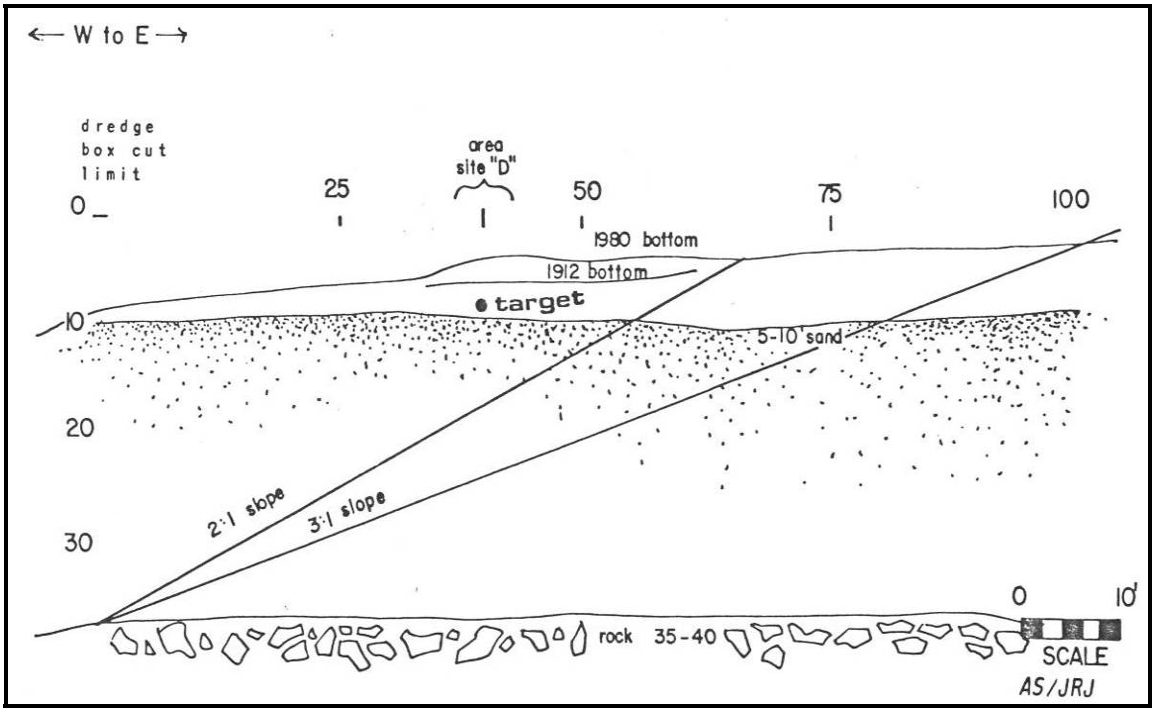


**Figure 10: Magnetic feature "D" stratigraphic reconstruction**

| Magnetic Feature "T" | |
|---|---|
| **Location:** | N-188,330 E-2,316,808 1 - 2 feet water |
| **Diver's Bottom Time:** | None |
| **Anomaly Description and Prediction:** | This dipolar anomaly suggests a small concentrated ferrous component lying in a North/South orientation. |
| **Identification:** | Modern debris (metal beer type cans, logs, boards with nails; i.e., trash) (Figure 11). |

**Table 12: Magnetic feature "T"**

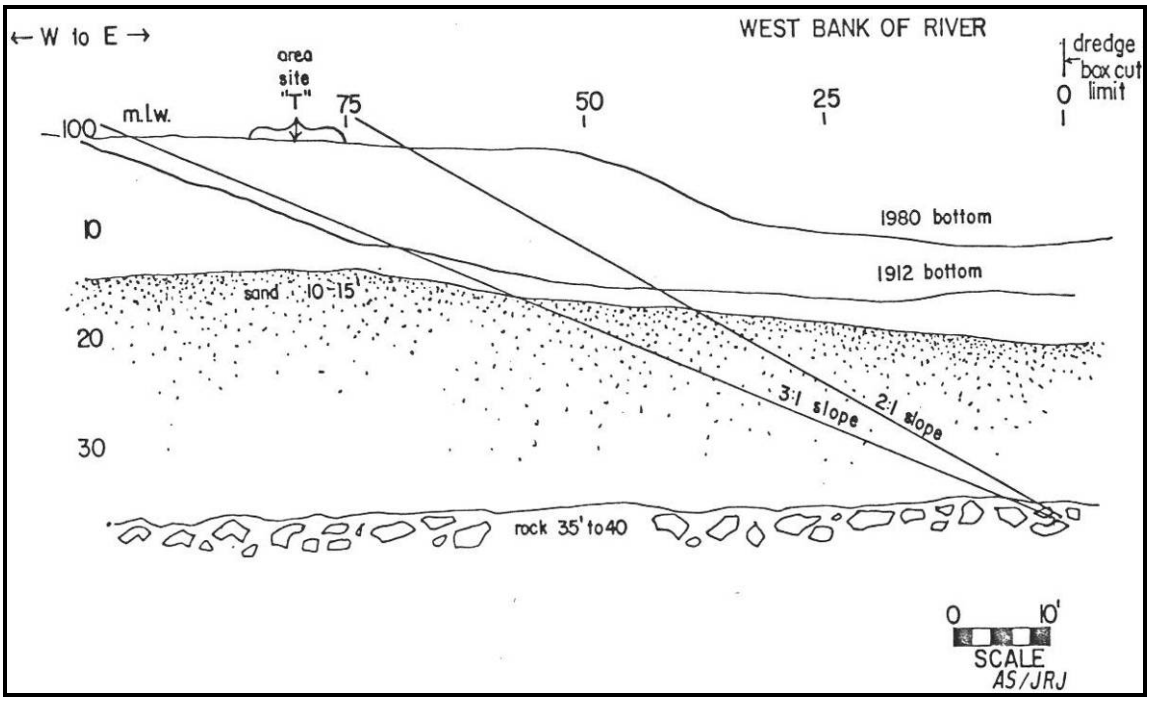


**Figure 11: Magnetic feature "T" stratigraphic reconstruction**

| Magnetic Feature "U" | |
|---|---|
| **Location:** | N-188,045 E-2,316,959 2 feet water |
| **Diver's Bottom Time:** | None |
| **Anomaly Description and Prediction:** | This dipolar anomaly represents a solid mass. |
| **Identification:** | Pipe exposed at low tide, less than 9 feet north of predicted location. |

**Table 13: Magnetic feature "U"**

| Magnetic Feature "V" | |
|---|---|
| **Location:** | N-187,954 E-2,317,002 3 - 5 feet water |
| **Diver's Bottom Time:** | 25 minutes |
| **Anomaly Description and Prediction:** | This dipolar anomaly suggests a linear object with north/south orientation. |
| **Identification:** | Nine feet north of the predicted location the investigation team found a 4-foot section of 1-inch diameter cable, with boards and logs to the east and southeast of the predicted location. |

**Table 14: Magnetic feature "V"**

| Magnetic Feature "W" | |
|---|---|
| **Location:** | N-187,620 E-2,317,154 5 - 10 feet water |
| **Diver's Bottom Time:** | 2 hours, 5 minutes |
| **Anomaly Description and Prediction:** | This dipolar anomaly displays a northwest/southeast orientation. It may be part of Anomaly "G" in the vicinity of Evans Lumber dock. |
| **Identification:** | In an attempt to more precisely define the area with the magnetometer, the magnetic high had changed from the original survey and was almost nonexistent within the magnetic field of Anomaly "G". This anomaly may be part of Anomaly "G", which was found to be caused by the remains of Evans Lumber Dock. At this dock area some sections of railroad iron were located underwater. Another alternative is that the target could have been caused by a floating object with a ferrous component lying within the magnetics of Evans' Lumber Dock during the initial survey (Anomaly "G"). During the magnetic survey, large articulated timbers were seen floating up and down the river. It is conceivable that through tidal fluctuations one of these objects with a ferrous component was deposited in this area only to have been refloated during a subsequent high or higher tide. A radius of 15 feet around the predicted location was probed by divers with penetration of 4 ½ to 6 feet, which is below the 2:1 slope predicted by Von Oesen and Associates at the box cut grade. The probing produced negative results (Figure 12). |

**Table 15: Magnetic feature "W"**

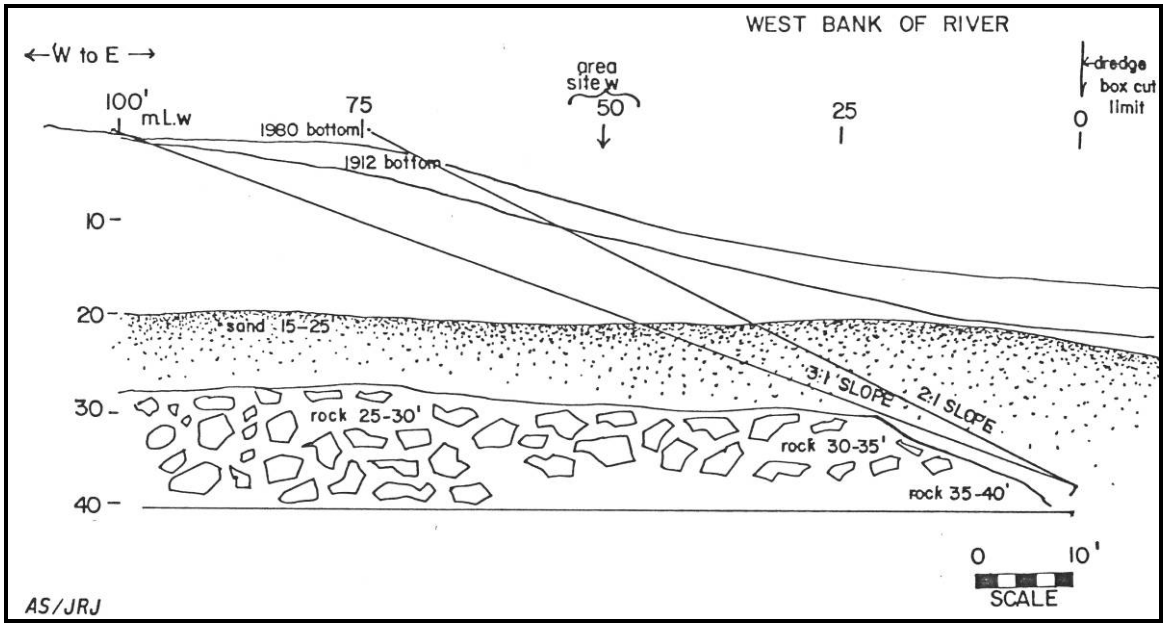


**Figure 12: Magnetic feature "W" stratigraphic reconstruction**

## Summary of Magnetic Investigation

The original magnetic survey produced thirty-six magnetic anomalies. Using this data and comparing it with bathymetric, historical and recent data, geological data, construction design data, and projecting the construction effects, all but twelve magnetic cultural features were eliminated. These features were judiciously located and evaluated. The average time to investigate these features was a little less than two and one-half hours per magnetic feature. This

time included preliminary investigation of the steamboat and use of the hydro-probe for subsurface testing. This time does not include placing buoys on the magnetic feature targets, rigging hydro-probe fear, logistical boat equipment and travel time, recording location of features in survey area (i.e., timber pens, docks, historic dolphins), which may possibly be lost in construction. The entire total field time for the investigation was twelve days or one day per magnetic anomaly plus travel time for the principal investigator.

Without the analytical use of the magnetic contours, the divers' time would have been greatly increased with a far less success rate in finding and identifying the magnetic features. The bathymetric historical reconstructions further reduced field time by evaluating the objects through probing. The alternative would have been to excavate needlessly to find a twentieth century object as was the case for magnetic feature "D".

Out of this investigation, only magnetic feature "K" required further investigation to determine its significance. None of the remaining magnetic features which were investigated are culturally significant (Table 16).

| Magnetic Anomalies | | | | | |
|---|---|---|---|---|---|
| **Anomaly** | **Location** | | **Depth (in feet)** | **Identification** | **Diver Down Time** |
| | **North** | **East** | | | |
| **"K"** | 187,660 | 2,317,397 | 17 | Wreck | 16 hours |
| **"M"** | 187,913 | 2,317,250 | 18 | Chain and cable | 1 hour, 35 minutes |
| **"N"** | 188,268 | 2,317,172 | 18 | Steel plate | 15 minutes |
| **"X"** | 188,095 | 2,317,065 | 17 | Trash | 30 minutes |
| **"Y"** | 188,418 | 2,316,953 | 15 | Iron tubing | 30 minutes |
| **"T"** | 188,330 | 2,316,808 | 1 – 2 | Piling and boards | - - wading |
| **"U"** | 188,045 | 2,316,959 | 2 | Pipe | - - wading |
| **"V"** | 187,954 | 2,317,002 | 3 – 5 | Cable | 25 minutes |
| **"W"** | 187,620 | 2,317,154 | 5 | Most likely part of "G", iron rail and parts of dock | 2 hours, 5 minutes |
| **"B"** | 188,960 | 2,317,770 | 4 | Outside study area | - - - |
| **"C"** | 188,777 | 2,317,776 | 2 | 3 to 4 feet diameter metal object | 1 hours, 40 minutes |
| **"D"** | 188,304 | 2,317,874 | 4 | 3 feet x 3 feet x 1 foot metal object | 30 minutes |

**Table 16: Magnetic Anomalies**

## Site Testing and Results

Prior to the test excavation it was known only that Site "K" represented the lower hull remains of a steam-propelled vessel which appeared to have sparse artifactual content. The vessel structure was known to be over 80 feet in length with at least a 15-foot width, dating somewhere in the mid-to-late nineteenth century. Iron strapping was observed over a portion of the hull remains approximately every 15 inches outside of the hull planking. On-site investigations were designed to record the following:

1. Architectural information
    a. Overall dimensions (statue length, actual length, beam width, etc.)
    b. Structural details and techniques
    c. Use of external iron strapping
    d. Wood analysis
    e. Functional areas
2. Technological information
    a. Type of machinery
    b. Placement of machinery
3. Artifacts
    a. Distribution
    b. Types and ownership; passenger, cargo, or vessel orientated
    c. Age and/or age distributions
4. Environmental and cultural setting

From the above data base it was hoped that most of the following questions could be answered following the test excavation and augmented with historical data where and if available: When was the vessel made? When was she lost and under what circumstances? What was the vessel's name? What was her history? How does she fit into and what can she tell us about our maritime history? How was she organized physically, functionally (or socially)? What part did the environment play during or after the loss? Was the site altered after the loss? The results of the excavation when compared with our maritime and local history, architecture and archaeology, would permit an assessment of the site and of the museum quality of the limited vessel remains. The shipwreck (for the site record) was named the Band Wreck in observance of its unusual construction and issued North Carolina Shipwreck Site No. 0009 NERlo (0009 for the ninth site recorded on NER, North East Cape Fear River and lo, lower river).

# PHASE III

# EVALUATION OF SITE NO. 0009NERlo

## Site Location and Description

The wreck is located in the Northeast Cape Fear River just above the northern city limits of Wilmington, North Carolina, on the eastern edge of the historic channel at state plane coordinates N=187,660 and E=2,317,397. This position is between the Hilton Railroad Bridge, the northern limits of Wilmington and Smith Creek. The vessel remains lie approximately at a five degree angle to the historic channel with its eastern end protruding slightly into the western slope of the modern twentieth century channel, which was cut some forty years ago (Figure 13). The west end of the wreck is located some 300 feet from the Evan's Lumber Dock, which was in operation in the late nineteenth century and abandoned prior to 1912, according to the historic bathymetric charts. The wreckage was not in 150 foot limits of the main historic channel, but did come in conflict with the historic channel when its width was expanded in the late nineteenth century. Figure 13 is a bathymetric map of the vicinity of the shipwreck, produced by OSI. The wreck outline has been incorporated and the upriver sediment build-up is evident.

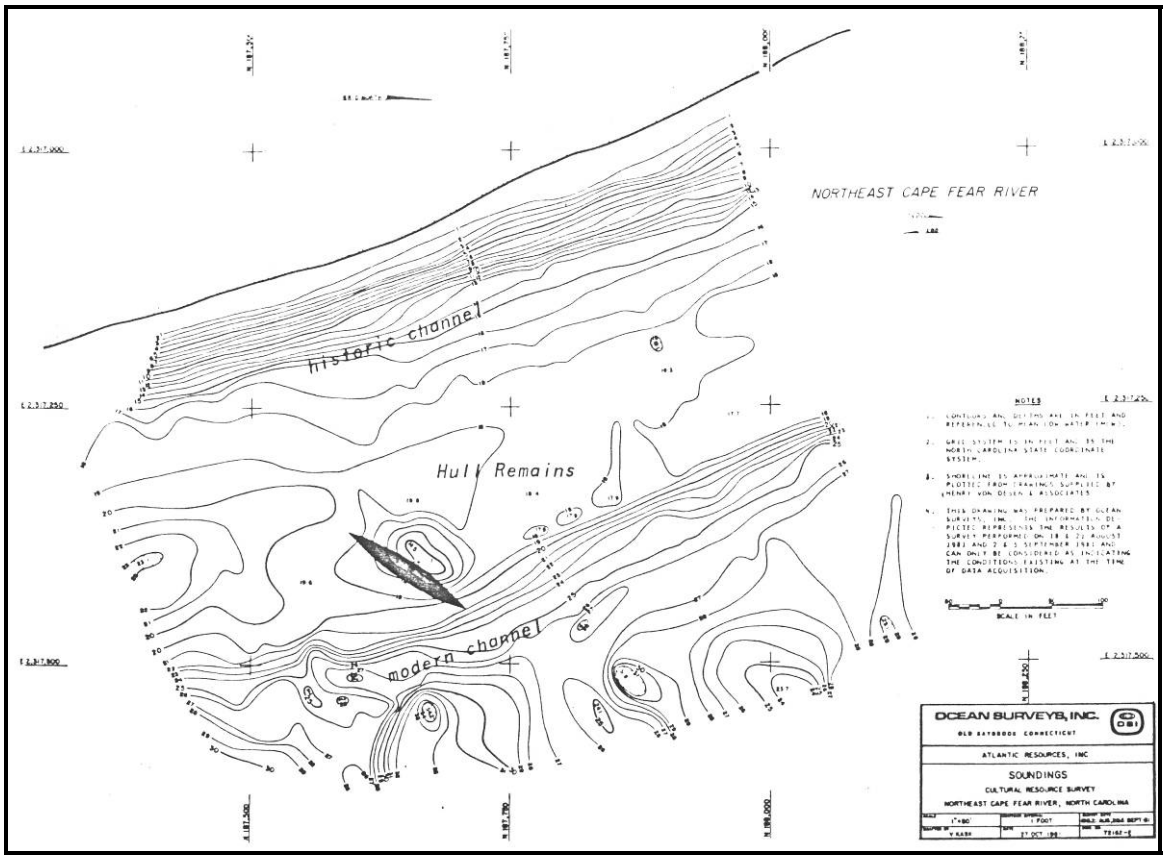


**Figure 13: Bathymetric map of site area**

The site lies in 17 feet mean sea level (msl) of water, with a tidal fluctuation of +2 feet msl. The wreck is apparently causing a build-up of sediment on its northern (up river) side, most likely due to wreckage trapping sediment as it migrates down river in the stream flow dynamics. There is a 2.5-foot build-up to the northern edge of the wreckage with a large depression in the river bottom to the south side (down river), probably caused by a net loss of material to the up river side of the wreck and/or an eddy effect from the current flowing over the site.

The observed current varied from 0.2 knots to 0.4 knots. The incoming tide seemed to channel surface current over the site while the main flow followed the modern channel to the east of the site as the tide was going out. Water visibility varied, being the best just before to after low tide. There was no visibility without artificial light and with lights visibility was from 0 to 4 feet.

The majority of the site was exposed with only 6 to 12 inches of sediment above the keel cap and bottom planking. Twenty to 30 inches of material in our test areas had to be moved toward the west end of the vessel to assure complete coverage, since in this portion the floors and planking were missing or disarticulated.

## Site Testing Procedure

The first task was to place a base line down the center of the wreck. A nail was driven for zero datum into the keelson, 6 inches behind the stem post. At 10-foot intervals along the base line a nail was driven into the keelson with washers and nuts attached. A washer denoted 10 feet and a nut denoted 50 feet. Thus two washers denoted 20 feet down the base line and a nut with a washer denoted 60 feet. The vessel's floor timbers were placed 90 degrees to the keelson/base line they were utilized as a natural grid. The floors, hull planking, and keelson were more or less intact from the bow to 90 feet down the base line. From there to the stern the structure was covered by sediment. The base line was extended to 145 feet. The same nut and washer system was utilized by pinning the nuts and washers to the base line using large safety pins.

While the base line was being established, an excavation was carried out between several floors 17 to 20 feet along the base line in an attempt to ascertain artifact density in the area. A few artifacts were encountered on top or near the top of the sediment but not resting on the hull planking as expected.

The next task was to locate the stern, which was disarticulated and covered with sediment and debris from the wreck. By placing 3-foot-by-3-foot test units every 10 feet along the downriver side of the base line beginning at 70 feet, the keel was followed to the stern post. After the stern post was located, the starboard side of the vessel was uncovered to the 120-foot mark where the

remains were disarticulated. Additional 18-inch-wide trenches placed perpendicular to the base line at 110 feet and 100 feet were void of articulated structure with the exception of sections of keel and false keel.

The data collected from these test units provided preliminary site dimensions and conditions upon which to base further testing. Systematic observations were made and data recorded in the areas of the stern, bow, fuel bunker, and machinery. Vessel cross-sections were recorded every 10 feet. The floors were checked for evidence of futtocks (negative), splines or fastenings in the hull planking above the floors (negative). Artifacts were recovered as they were encountered and recorded using distance down the base line from the bow and distance from the base line to either the port (north/up river side) or starboard (south/down river side) of the vessel. Only in the machinery area were dives planned for the sole purpose of collecting artifacts. These dives were carried out to recover the engine, pump, crank shaft, and related artifacts for an understanding of the steam plant technology and to remove these artifacts from a 10-foot-by-18-foot area to determine what was underneath.

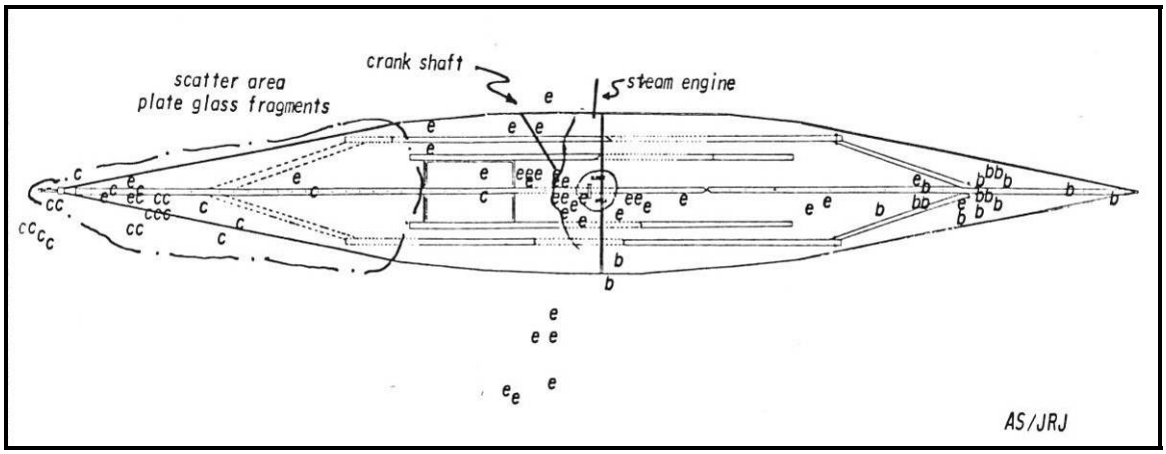


**Figure 14: Artifact distribution, b - bow area artifacts, c - cabin area artifacts, e - engine area artifacts**

The artifacts recovered from the vessel and the observations and measurements recorded on the internal structure of the vessel features can best be discussed by dividing the vessel and its contents into four functional components. These parts include the vessel's construction and rigging, including rudder gudgeons, strapping, nuts, bolts, nails, etc. The remaining three artifact divisions reflect both functional and spatial relationships. These include the stern area and presumably cabin area (c) with cut glass, crystal decanter, ceramic spittoons, plates, containers, lamps, door hardware, cabinet hardware, food remains, etc.; engine area (e) with steam plant and

related artifacts; and bow area with cargo and supply storage (b), including supplies, i.e., paint and/or caulking, paint brushes, loose nails, containers of nuts, bolts and shims, glass and ceramic spirit bottles, chain, cargo hooks, and tools (Figure 14). Artifacts found in the reconnaissance phase of the study were not included but follow and complement these divisions.

## The Vessel

This steam vessel does not conform to the standard maritime shipbuilding design. Merchant vessels produced in the nineteenth century almost always were constructed around a frame placed over a keel (H. Chapelle 1969; B. Greenhill 1976). Each section of frame, the "ribs" of the ship, were made up of a floor timber and futtock timbers. This shipwreck had floor timbers spaced at 21-inch intervals, but they were not attached to futtock timbers in any apparent fashion. Evidence of futtock-type frame timbers were sparse and found to be spaced at least 8 to 10 feet apart. In lieu of the traditional approach, this vessel was held together by a series of iron bands like a cistern or barrel. These external iron straps were placed approximately every 15 inches apart stem to stern. Apparently, this construction technique took the place of the internal futtock portion of the frame, thus reducing the weight of the ship and enabling it to either operate faster or more efficiently.

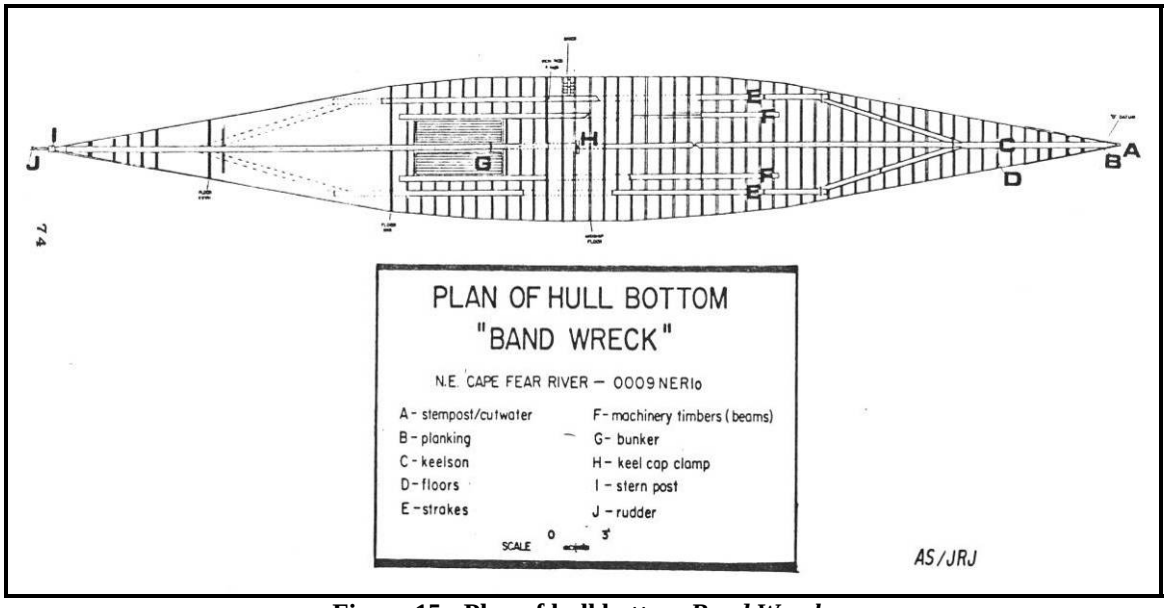


**Figure 15: Plan of hull bottom *Band Wreck***

The wreckage, as reconstructed from limited architectural remains, measured 133 feet from stem to stern along the keel line. Adding the rake of the stern post, its length was 137 feet. The vessel's width gunwale to gunwale, adding floor length, width of futtocks and gunwales, was 17.25 feet. The depth of hold was computed to be 4.46 feet. The length/beam ratio was 7.7:1 and the beam/depth of hold ratio was 3.9:1.

Wood samples were identified by the School of Forest Resources at the North Carolina State University. Samples of outrigger knee, hull planking, floor, gunwale, futtock frame, and keelson were all white oak (Quercus) and a tongue and groove plank sample was hard pine (Pinus).

The following is a description of the various architectural features observed on the bottom, recorded and/or recovered. All terms are from or adopted from available resource data (h. Chapelle 1969; A. Bates 1968; A. Austed 1972; L. Murphy and A. Saltus 1982).

*Keel and False Keel*

The composite structure of the keel and the false keel was made up of two sets of timbers that were 4 to 6 inches wide and tapered to 2 to 4 inches at both ends (Figures 16, 17 and 19). The keel was 131.25 feet long and the false keel 6 inches longer, going under the stern post. Both the keel and the false keel formed a butt joint with the stem post. The keel also formed a butt joint

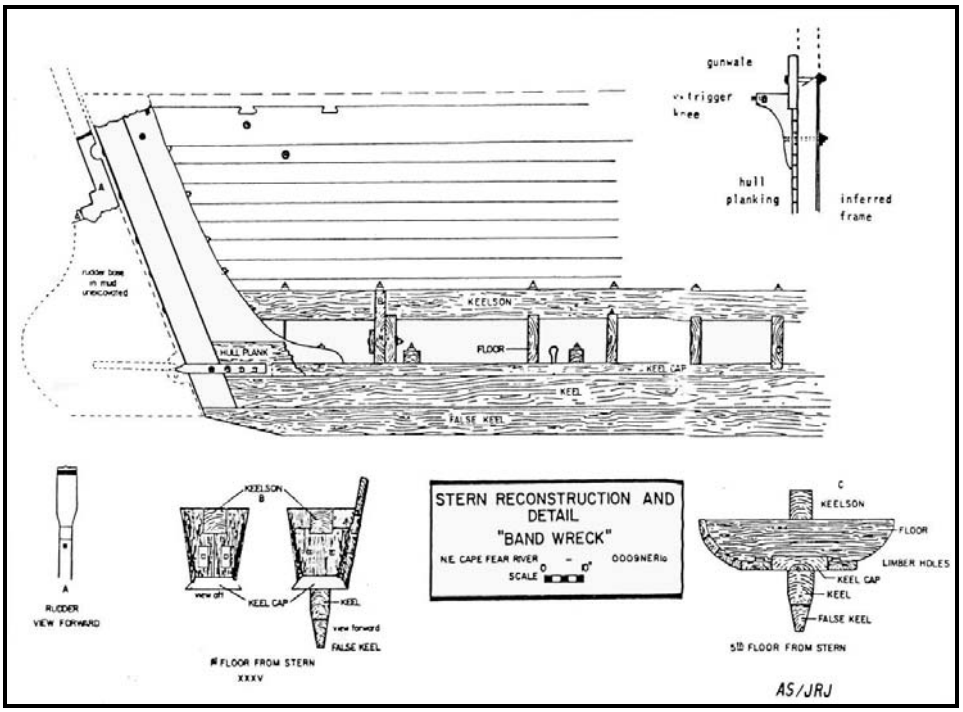


**Figure 16: *Band Wreck* stern reconstruction**

with the stern post but at a 22.5 degree angle. The keel was made up of sections, each 13 feet 5 inches long, with a common scarf at each of its ends. Unlike typical maritime construction, the scarfs were not parallel but alternate directions, thus sections of keel were trapezoidal in shape. The scarf at 90 feet down the base line was 38 inches long. A one-inch gap on the port side of this scarf appeared to be the results of poor workmanship rather than warping. The keel and false keel were nailed together at the center by two nails and at the scarf ends.

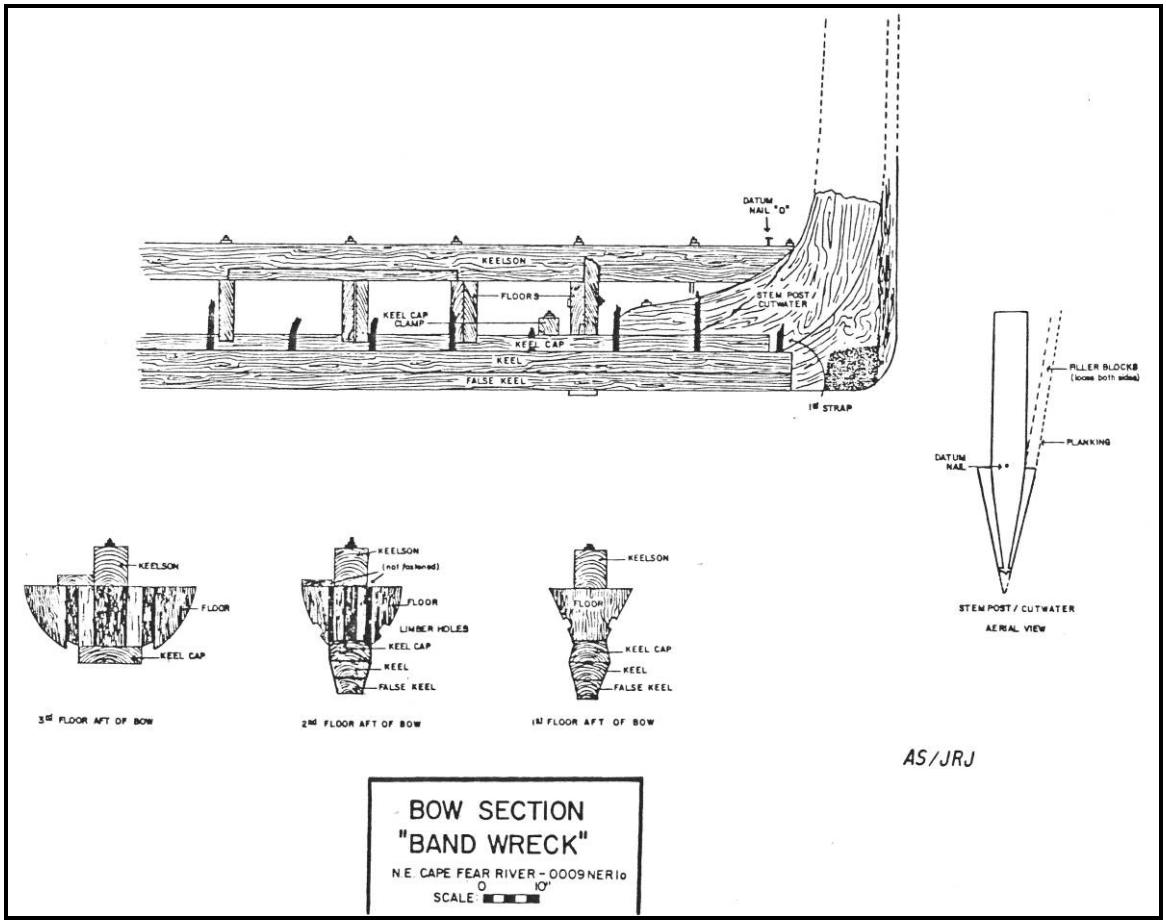


**Figure 17: *Band Wreck* bow section**

*Keel Cap*

On top of the composite keel was a keel cap. This term is used rather than batten as the planking butted to the edges of this structural piece. If it was a true batten, the planking would have been butted against the keel with the batten holding together and covering the keel and both garboard strakes in a true batten function, referring to either maritime (H. Chapelle 1969) or house and barn construction. The keel cap was 6 inches wide in both the bow and the stern, and

as much as 16 inches at mid ship. It was approximately 3.5 inches thick, being rectangular in cross section, except for the first 4.5 feet in the bow and the last 5 feet in the stern where the edges were beveled (Figures 16 and 17).

*Keel Cap Clamps*

The keel cap clamps were placed on top of the keel cap and were as long as the keel cap was wide. At their ends they were 3.5 inches square. They held the sections of the keel and the keel cap together by means of a ¾-inch bolt. They also secured the iron straps that were placed in between the keel and the keel cap.

*Iron Strapping*

Every 14.25 to 15 inches from the bow to the stern between the keel and the keel cap was a 1½-inch by ¼-inch iron strap. Each strap ran up the outside of the hull planking from the keel to the gunwale. Here the straps were fashioned into ¾-inch bolts 10½ inches long. These bolts went through the gunwales on either side of the vessel and were held in place and tightened by nuts. Presumably, with these straps on the outside of the planking, caulking would have been difficult, if not impossible to apply between planks, but by tightening the straps the vessel's planks could be sealed by compression. Only one source for this strapping use could be found:

> An advertiser was seeking to let a contract for construction of four flat boats (tidewater flatboats), two - 48 feet by 10 feet and two - 30 feet by 6 feet. They were to be made of heavy timbers and sides banded with strap iron (Johnson, 1977).

*Floors*

The majority of the floors were similar, being made of a single plank two inches thick and from 10 to 10 ½ inches wide, having curved ends. Table 17 lists the dimensions of the floors selected approximately every 10 feet from stem to stern. The first column is the portion of floor along the base line where the measurements were made. At one-foot increments the depth of the floor was taken and recorded. The second to last column is the length of floor from the base line, and the last column is the overall length of the floor.

The floors were quarter-cut sawn and displayed the marks of a twenty-four-inch diameter circular saw blade.

| Floor Profile Dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Distance of Floor Down Base Line | Width of Floor (inches) at One-Foot Increments from Base Line | | | | | | | Floor Length From Base Line | Overall Length of Floor |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| 2’11” | | | | | | | | 8” | 1’4” |
| 10’2” | 10 | | | | | | | 1’9” | 3’6” |
| 19” | 10 | 8 | 3 | | | | | 3”4” | 6’8” |
| 29”6” | 10 | 10 | 9 | 7 | | | | 4’9” | 9’6” |
| 40’ | 10 | 10 | 9.5 | 9 | 7 | 6 | | 6’6” | 13’ |
| 48’11” | 10.5 | 10.5 | 10.5 | 10 | 8 | 5 | 3 | 7’4” | 14’8” |
| 64’8” | 10.5 | 10.5 | 10.5 | 10 | 9.5 | 7 | 5 | 7’10” | 15’8” |
| 70’2” | 10.5 | 10.5 | 10.5 | 9 | 9 | 7 | 5 | 7’10” | 15’8” |
| 79’1” | 10.5 | 10.5 | 10 | 10 | 9 | 7 | 5 | 7’5” | 14’10” |
| 90’5” | 10.5 | 10.5 | 10 | 9 | 7 | 5.25 | | 6’8” | 13’4” XIIII |
| 100 | No Structure | | | | | | | | |
| 111 | 10 | 6 | | | | | | 3’1” | 6’1” XXVII |
| 120 | | | | | | | | 1’5” | 2’10” |
| 127’3” | | | | | | | | 9” | 1’6” |

**Table 17: Floor Profile Dimensions**

Slots in the floors, 1 ½ inches deep, were cut out allowing them to sit down over the keel cap except for the first three floors in the bow and the last four in the stern, which sat directly on the keel cap (Figures 16 and 17). In addition to the cut out for the keel cap, each floor had two 1-by-2-inch limber holes placed 12 to 14 inches on either side of the edges of the keel cap (Figure 16). The first floor and the last floor were made up of two boards bolted together with the last floor in the stern utilizing wooden clamps (Figure 16). The second and third floors in the bow were also made up of more than one plank (Figure 17).

The floors were spaced approximately every 21.5 inches. Roman numerals were noted on three recovered floors, artifacts #256, #315 and #344. These numbers marked the position of each floor and indicated the sequence from the midship floor and increased to the stern.

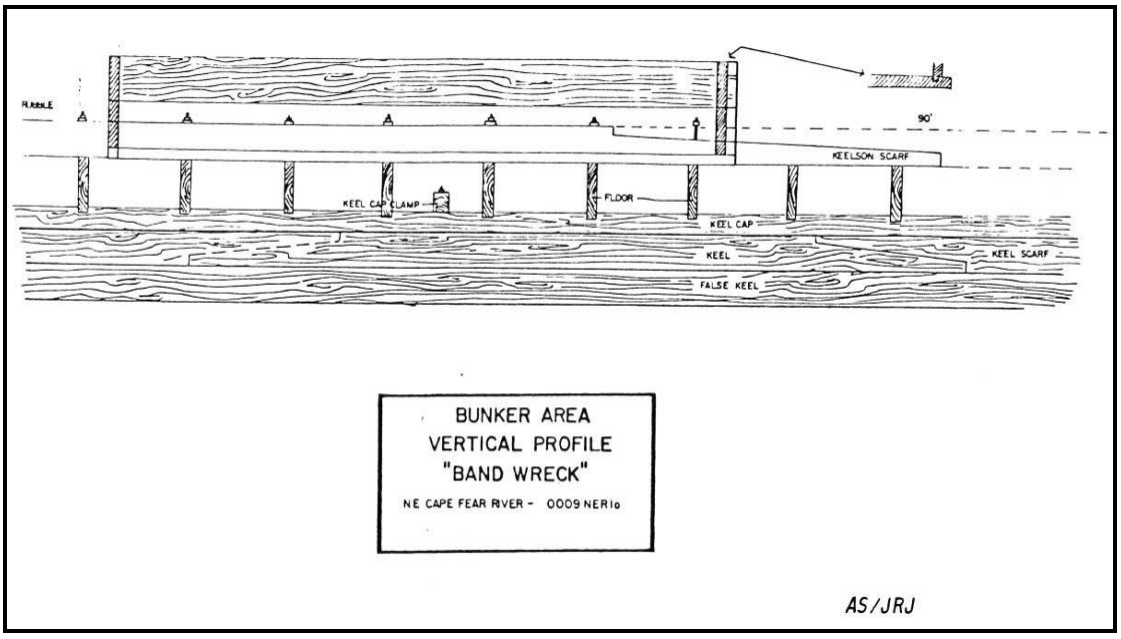


**Figure 18: *Bank Wreck* bunker area vertical profile**

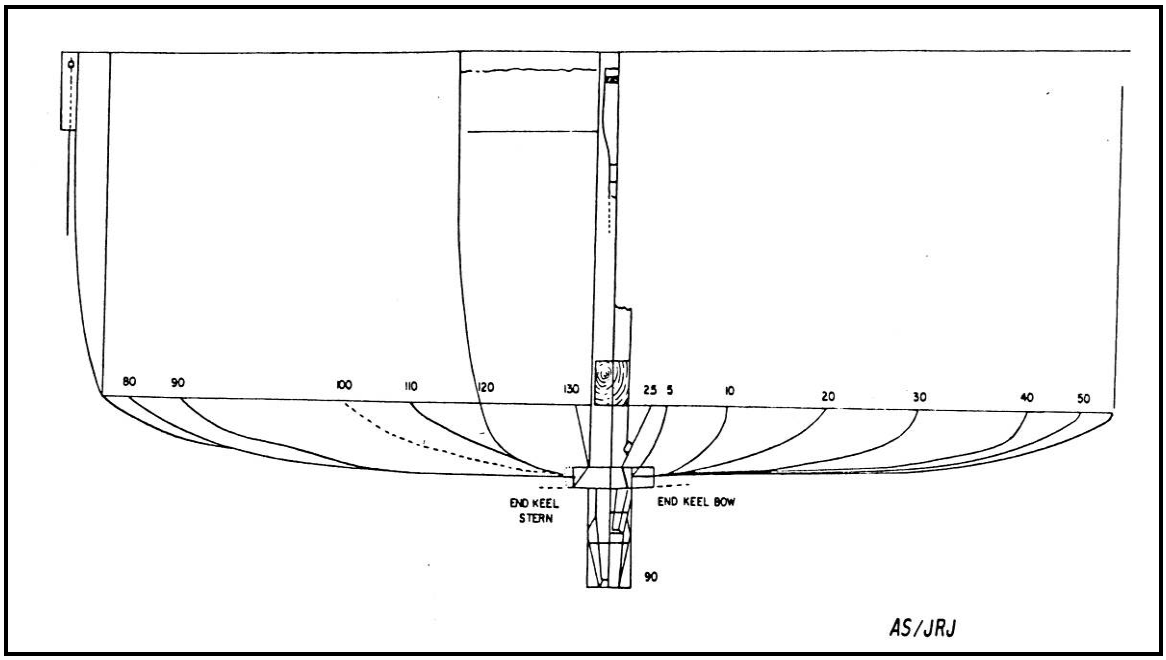


**Figure 19: Vessel cross sectional details**

*Keelson*

Sitting on the floors directly over the keel and keel cap was the keelson. This feature was approximately 6 inches square from stem to stern where it butts into both the stem and stern posts at an angle (Figures 16 and 17). The keelson was tied to the keel by a ¾-inch bolt which passes

through each floor. When the positions of these fastenings were plotted in the engine area and in the extreme stern, similar spacing appeared to have been maintained across the disarticulated area between 90 feet and 120 feet down the base line. This further indicates that even though this area had undergone extensive destruction, the stern area was left in place relative to the remaining portion of the intact vessel. Only two common scarfs were found in the keelson, one at 90 feet and a second at 39 feet, 2 inches down the base line (Figure 18). The scarfs in the keelson were 4.7 feet long. The angle of these scarfs also alternated similar to the keel scarfs.

*Strakes*

At 18 feet down the base line, timbers the same size as the keelson were notched into the keelson laterally, fastened with a single ¾-inch diameter bolt, and radiated out across the tops of the floors in each direction to points 4 feet 8 inches and 35 feet down the base line (Figure 15). At this point these timbers butted at an angle into and were fastened with by a single bot to other timbers, which continued towards the stern, running on side respectively parallel to the keelson. Due to structural disarticulation of the strakes in the stern, their original position has been estimated utilizing the data from the forward area (Figure 15).

*Machinery Timbers*

Starting at 41.67 feet down the base line and 3 feet on either side of the center of the keelson, 7-inch-by-10-inch timbers machinery timbers extended to 88.3 feet down the baseline. They showed evidence of extreme stress and were broken in many places. These timbers are discussed in further detail in the machinery section of this report.

*Fuel Bunker*

From 75.5 feet to 86 feet along the base line and positioned between the keelson and the machinery timbers were two fuel bunkers. The bottom of the bunkers was formed with 2-inch-thick-by-4-inch-wide boards placed flat over the floors with 9-inch-wide-by-2-inch-thick boards, two courses high, making up the sides for a total height of 18 inches. At 97 feet 2 inches, a 1-inch pipe was placed through the keelson and into the bottom adjacent sides of the fuel bunkers, presumably as a waterway. The ends of the bunkers were joined by a dado in the long side and an offset tongue along the short edge(Figure 18).

*Planking*

Since much of the planking in the vessel was either missing or covered with sediment, overall planking features were projected from two intact exposed area: bottom planking at 70 feet along the base line and side planking in the stern. All planking was 2 inches thick. In between the exterior iron straps, planking displayed wear up to forty percent of its thickness. Beginning at the keel cap at the lowest portion of the hull, a 2-inch-wide plank was followed by a 12-inch plank (the two-inch-wide limber hole was cut into the floor to be centered above this plank). The 12-inch plank was secured to the floor with three nails, and then a series of ten 6-inch planks were fastened to each floor by a single nail, with the exception of the second-to-last 6-inch board, which had two nails. Nails securing planking to the floors were made of iron and 20/40-penny weight. The outermost plank was fastened to the floor by straps rather than nails and may originally have been 8-inches wide. In the stern, a series of eight 4.5-inch-wide planks and a 12-inch to 13-inch gunwale made up the vessel's side. As the sides of the vessel constricted toward the bow and stern, the planking appeared to form stealers which came to a point. Examples of this were two recovered planks, artifacts #336 and #272, the latter of which had an end cut at a 66-degree angle that may represent a plank scarf joint.

*Futtock Frame and Outrigger Knee Composition*

Since only the last 20 feet of the vessel were intact, it was difficult to establish a frame pattern. Three frame-like futtock timbers; two of which were observed at 120 feet down the base line represented the port and starboard pair. Futtock timbers were made from 5-by-5.5 inch timbers contoured to the interior side of the vessel, conforming to the planking on one side and having molded edges, finished edges on the inside (Figure 20). The recovered futtock timber rose up over the gunwales several feet to form the sides of the cabin in the stern (Figure 20). The moulded edges of the futtock frame suggested that the cabin was situated within the vessel as opposed to being on the deck, as in the case with western river steamboats. The futtock frame had no nail holes to indicate that the hull planking was fastened to these timbers. There are two nails of undetermined use in the futtock timber at the lower end. The edges of the floors were examined with no indications for how the futtocks were attached. Futtock timbers, at least in the stern, appear to have been spaced over 10 feet apart since that was the distance the first one showed up forward of the stern post. Two 5/8 inch bolts, 14 inches apart went through the hull planking and into a corresponding outrigger knee (Figures 16 and 27).

The five outrigger knees that were observed extended out from the vessel by more than 8 inches at 120 feet down the base line to over 5 feet 5 inches elsewhere. On top of three outrigger

knees were 3-by-3.5-inch deck timbers apparently helped secure one side of the vessel to the other. The outrigger knees were notched 4 to 12 inches to join the gunwale (Figures 16 and 27).

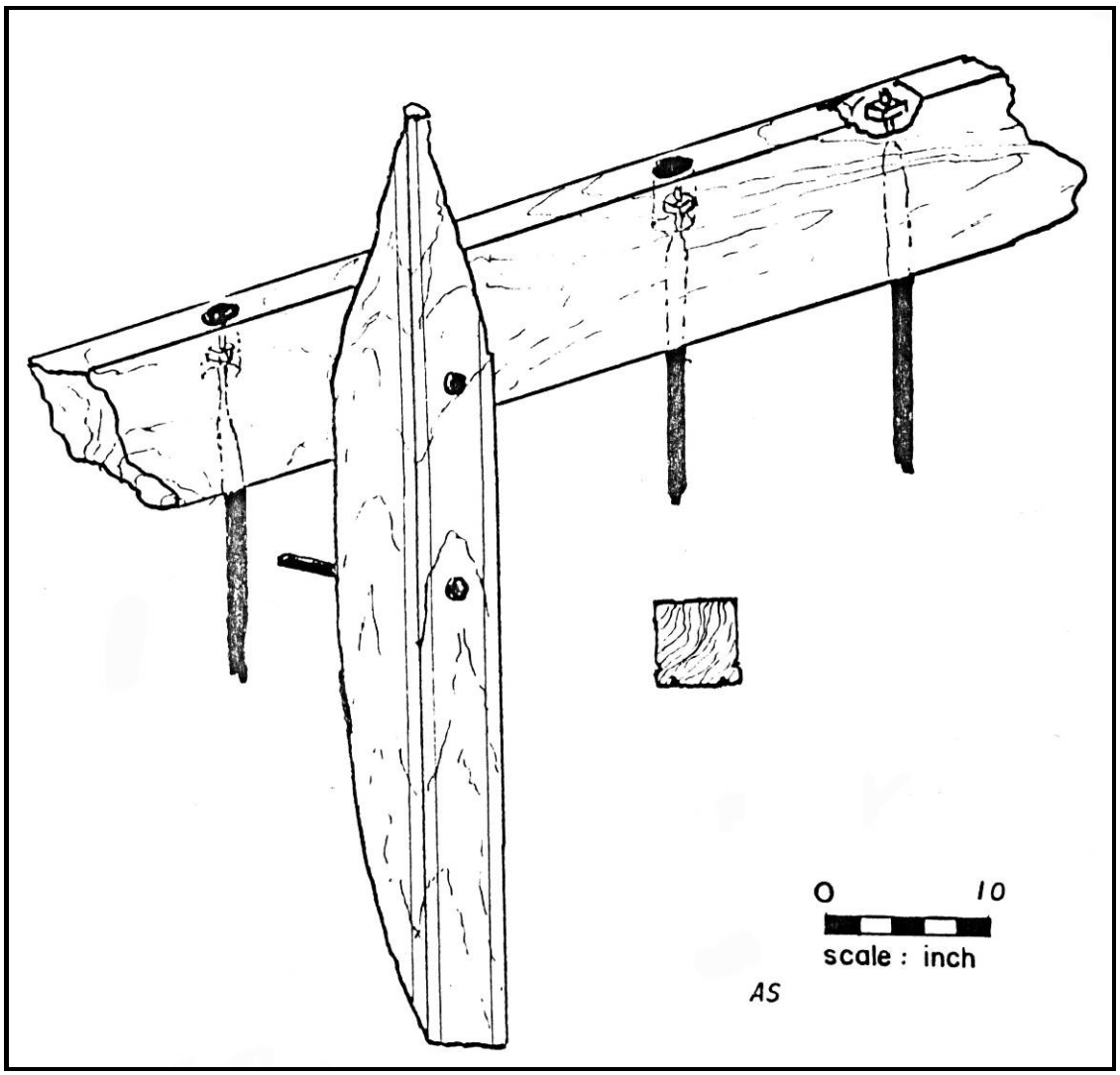


**Figure 20: Artifact #273, gunwale section with futtock frame**

*Stem and Stern Posts*

Both the stem and stern posts were made up of single pieces of wood shaped to meet and overlap the keel cap in a knee fashion. The stern post was lying over on its side, with one side of the planking intact to the gunwale while the planking on the other side had separated leaving the rabbet visible (Figure 16). A series of double-staggered nails held each plank to the stern post. The stern post lies on its side almost complete with a rudder gudgeon bolted to this post and keel cap. A gudgeon strap was bolted to the stern post 56 inches above the gudgeon. The top

gudgeon was a U-shaped band fastened to the stern post by two bolts. The lower gudgeon was conventional, acting as part of a hinge.

The stem post was eroded with less than 12 inches above the top of the keelson remaining yet appeared similar in fashion to the stern post and varied only in being at right angles with the keel rather than raked. The stem post was rabbeted to accept the hull planking, butted into the keel and false keel, and overlapped the keel cap in a knee fashion (Figure 27).

*Vessel Related Artifacts*

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 279 | Portion of keel, white oak, overall length projected to 13.36 feet along bottom, with two common scarfs each 2.1 feet long, radiating inward. It is 7 inches deep by 5.5 inches wide. Two ¾-inch-diameter bolts remain and the keel cap clamp with bolt. It appears that the keel was nailed to the false keel with two square nails at both ends and at its middle. | 98 to 111 feet down base line. |
| 344 | Starboard side of a floor timber, large Roman numerals XXVII cut on one side; 33 inches long by 2 inches thick by 11 inches deep. Waterway cut 9 inches to 10 inches away from center, 1 inch in height. There is a 1 ½-inch-diameter hole, 10.5 inches from end, 2.5 inches down from the top edge; 1 ½ -inch cut-out for keel cap. | 111 feet / starboard |
| 315 | Port side of a floor timber, white oak, large Roman numerals XIII cut on one side; 64 inches long by 2 inches thick. Waterway cut 14 inches to 15 inches from center, 1 inch high and 2 inches long; 1 ½-inch cut-out for keel cap, saw marks from 24-inch-diameter, cross-cut set circular blade (mark 5/16-inch space mark, 7/32-inch space mark, 5/32-inch space mark, 5/16-inch space mark ...) | 90 feet / port |
| 256 | Starboard side of a floor timber, large Roman numerals XV cut on one side; 51.5 inches long by 2 inches thick by 11 inches deep; waterway cut + 14 to 15 inches from center, 2 inches long and 2 inches high; 1 ½-inch cut-out for keel cap. | 91.25 feet / starboard |
| 272 | Hull planking; stealer 178 inches long, 2 inches thick and 4.5 inches wide, coming to a point. The wide end is cut at a 66-degree angle. Strap marks between 14.5 and 15.5 apart, most 15 inches between center of straps. Nail hole suggests this plank was attached to floors, with a treenail attaching plank to floor with exception of a double treenail toward the center and two nails at the wide end. The planking is 2 inches thick and is worn away between the 1 ½-inch straps up to 40 percent. | Bow |
| 336 | Hull planking, stealer, white oak, 36 inches long, broken, 2 inches thick, band marks 14.5-15 inches apart, tapered. | 120 feet / 3 ½ feet starboard |
| 273 | Gunwale section w/futtock frame, both white oak. The gunwale is made from a 12-inch-by-3-inch timber; the straps turn into bolts and fit through a hole in this timber approximately every 15 inches and the bolts have nuts on the other ends. Attached to this timber by a 5/8-inch bolt is a 5-inch-by-5 ½-inch futtock-type timber. This timber is curved for the lower 31 inches on the side adjacent to the gunwale and has ¼-inch grooves ½-inch in front with edges on the two opposite sides from the gunwale. Fourteen inches below a bolt holding these two timbers together is a second 5/8-inch bolt. The futtock is eroded away to a point 15 inches above the top bolt. There are two nail fragments on the flat side of the futtock 2 inches above the lower end, both in about 2 inches from the edge, and an additional nail 2 inches exposed with a ½-inch square head above these other two. | (Figure 20)<br>Stern post area. |

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 335 | Outrigger knee, 29.5 inches long, 15.5 inches deep, 3 inches deep at top edge, 4-inch notch for gunwale. Although eroded the knee seems to fit into the gunwale and side of the vessel at a 90-degree angle. There is a 3-inch-by-3-inch timber added on top of the knee affixed with two bolts. Two bolts held the knee to the side of the vessel, one 5 inches and the other 13 ½ inches below the top edge of the knee. Midway underneath the upper edge is a 3-inch-by-3-inch wooden remnant held by two nails. | 109 / gunwale area, starboard. |
| 356 | Outrigger knee, white oak, same shape as #335, extended out 52.5 inches, 28 inches extended down, 5 inches at top edge with 3-inches-by-3.5-inches timber on the top edge, notched to fit over entire gunwale. Held to vessel by single bolt 6 to 8 inches from top edge. | 133 feet / 5 feet starboard |
| 376 | Outrigger knee, same as #356 except extends 54 inches, drops down on hull 18 inches and notched 10 inches for gunwale. The 3-inch square timber on top of the knee is broken and extends several inches beyond the knee in both directions. Knee held to vessel by one bolt 8 inches down from upper edge. | 75 feet / 12 outside starboard side of wreck. |
| 317 | Notched tongue and groove board, hard pine, with tongue removed, 40 ¼ inches long, 3 ¼ inches deep, and 1 inch wide. Two corners on one side are notched 1 inch deep by 1 5/8 inches long. | 125 feet 8 inches across keelson. |
| 318 | This plank was with #317. It is 42 inches long, 3 ¼ inches deep, 2 ¼ inches thick, with nail holes along one edge. | 125 feet 8 inches across keelson. |
| 316 | Treenail fragment, wood, length approximately 2 ½ inches (broken off in keel cap – Figure 16). It is 7/8-inch diameter at its thickest end. It is whittled down and exhibits signs of paint. | 126 feet 4 inches / 2 inches to port. |
| 261 | Wooden shingle, cypress, length 25 inches, width 7 ½ inches, maximum thickness 3/8 inch. | 90 feet – 100 feet off center line. |
| 296 | Iron rudder post strap with bolts. Length 27 inches, width 1 ¼ inches, thickness ¼ inch, U-shaped, two holes on either side 3.5 inches apart, ½-inch diameter bolts, 7 ½ inches long with square heads and nuts missing. | On stern post, 6 inches below top. |
| 278 | Block and hook with rudder tiller band. The artifact assembly consisted of a 4 ¾-inch-square band made from 2 ¼-inch-by-12-inch stock, with two 1-inch diameter eyes on two opposing sides. Attached to one eye is a hook from a block. The hook is 3 inches long with a 1 ¾-inch throat. The block is made with a 7-inch-by-2 ¼-inch-square band made from 1 ¼-inch-by-3/8-inch flat stock. Inside the band is the remains of the wooden block which has deteriorated, giving the appearance of spacers on both sides of the 3-inch-diameter-by-a 1 1/8-inch – wide sheave (pulley) with its center 3 ½ inches in from the hook end. The sheave is held to the block and external strapping by a metal pin (the sheave does not have a bearing center). | (Figure 21)<br>140 feet base line. |
| 305 | Copper sheathing approximately 16-gauge, 15 ½ inches long, 7 inches wide, with a row of holes along two sides. The holes are 3/16-inch diameter, approximately 2 inches apart with several other holes of assorted sizes. | 1 foot down base line. |
| 300 | Nut and bolt, ferrous. Bolt is ½-inch diameter by 13 inches long, head eroded. Nut is ¼-inch square by ½-inch thick. | (Figure 22) 100 feet/ 0-5 feet port. |
| 326 | Nut and bolt, ferrous. Bolt is ¾-inch diameter by 11 ½ inches long. Hex nut at one end eroded. | 60 feet / starboard of keelson. |
| 270 | Bolt and rove, ferrous bolt, 1 inch diameter by 18 inches long. Rove is 3 ¾-inch-diameter by 1 inch, with tapering shoulder. | (Figure 23) General surface collection. |

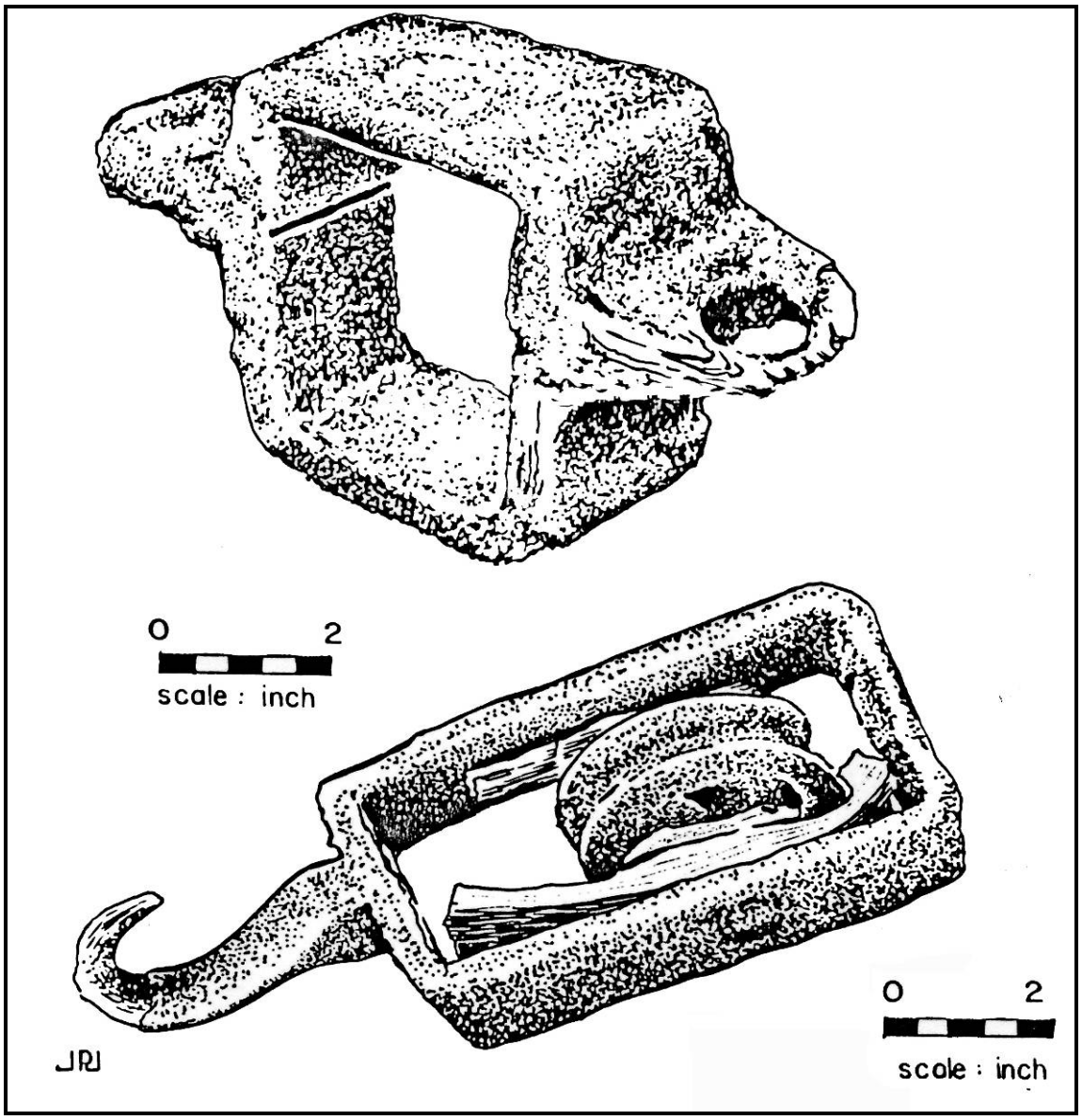


**Figure 21: Artifact #278, Block and hook with rudder tiller band**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 265 | Strap fragment, ferrous, 27 ½ inches long, 1 ½ inches wide, ¼ inch thick, forged; one end has ½-inch hole with a ½-inch square head bolt (threaded). Bolt is bent at strap at 90-degree angle to run parallel and away from strap. Bolt broken at 2 ½ inch length. | 70 – 80 feet starboard. |
| 250 | Two hull-strap fragments, ferrous, 1 ½ inches wide, ¼-inch thick. | 20 to 23 feet / on keelson. |
| 330 | Strap fragment, ferrous, 34 ½ inches long, 2 inches wide, ¼-inch thick. | 60 feet / starboard of keelson. |
| 333 | Strap fragment, ferrous, 28 inches long, 2 inches wide, ¼-inch thick. Two holes drilled at 2 inches and 7 ½ inches from end. Two nuts hold two strap fragments together through drilled holes. | 80 feet / port side of keelson. |

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 370 | Nail, ferrous, 40d, boat nail, held planking to floor. | 93 feet / 5 feet port side. |
| 371 | Nail, ferrous, 40d, boat nail, held planking to floor. | 93 feet / 5 feet port side. |
| 359 | Nail, ferrous, 40d, boat nail. | (Figure 24)<br>91 feet / third plank, port side. |
| 221 | Seven (7) nails; 5 ferrous (1, 60d; 2, 6d; 2, 7dcut nails) 2 brass (trunk or crate nails). 1 ½ inches long, 1/8 inch square shank, tapered at point | General surface machinery area. |
| 251 | Five (5) complete and 4 fragmented cut nails, ferrous, all 8d. | 20 – 23 feet / port side of keelson. |
| 302 | Nail, ferrous, 20d, cut nail. | (Figure 25)<br>110 feet / 2 feet starboard. |

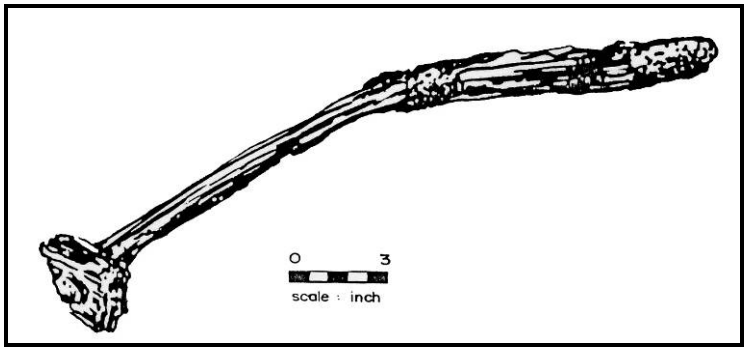


**Figure 22: Artifact #300, nut and bolt**

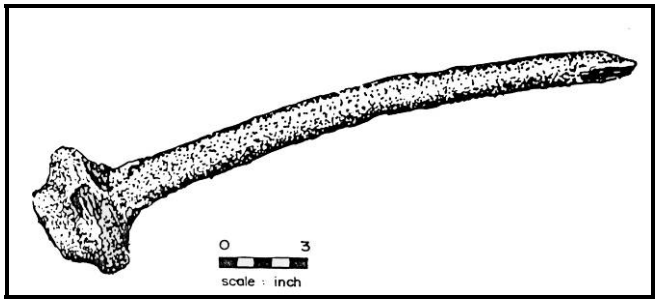


**Figure 23: Artifact #270, bolt and rove**

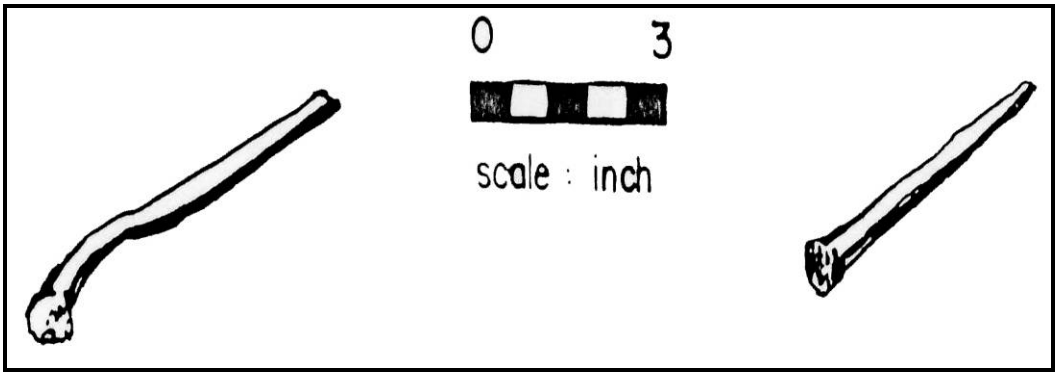


**Figure 24: Artifact #359, boat nail**

**Figure 25: Artifact #302, cut nail**

## Engine Area

The machinery area has been reconstructed in Figures 26 and 27. This was achieved using available data and projecting features found on one side of the vessel to the opposite side, assuming symmetry and projecting upward using the stern data and the intersection of the truss system. Figure 27 is a cross sectional reconstruction of the machinery association, including known and reconstructed vessel structure, steam engine data, crank shaft and paddlewheel artifacts. On the left side is the forward cabin roof and sky light configuration, with the hull planking from data recorded at 90 feet aft of bow.

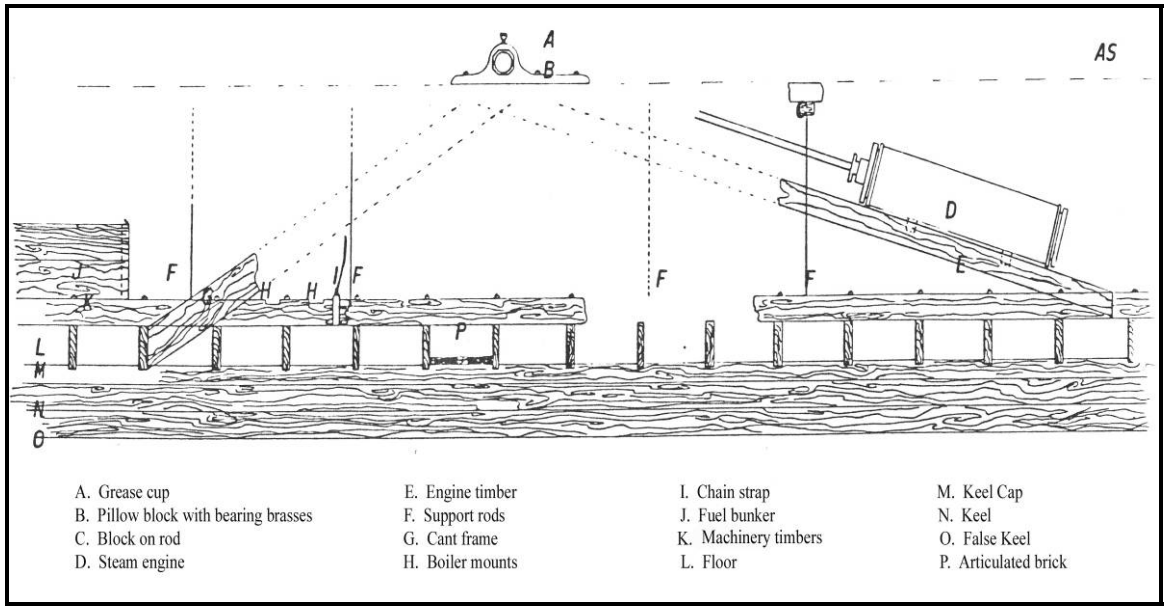


**Figure 26: Engine area details**

The machinery area was placed either side of midship from 51 feet down the base line to 74.75 feet down the base line. The machinery timbers extended to either direction from the machinery area. The truss system began with a cant frame butted to the floor just forward of the fuel bunker and the cylinder timbers aft of 51 feet down the base line. They came together at a vertex 20 inches aft of the midship floor, above which the crank shaft is believed to have been positioned. Long ½-inch-diameter iron rods were recorded and plotted as if symmetrical, side to side, in an attempt to reconstruct area of destruction or the area buried under concretion from the crank shaft and possible fire wall materials on the starboard side (Figure 26). They were arranged on either side of the crank shaft. A fourth set of rods most likely were located 4 feet aft of the forward set but this area from side to side is non-existent. With this, the rods would distribute themselves on either side of the truss vertex/crank shaft and have approximately 48 inches spacing. The iron rods were all eroded except one which was bent in several turns. This rod was over 40 inches long with a 3-inch-square timber at the top, broken off at either end.

On the starboard machinery timber, 40 inches forward of the fuel bunker were two notched areas 4 inches long, 8 inches spackling, then another 4-inch-long notch. Both notches were about an inch deep and may indicate mounting brackets (L. Murphy and A. Saltus 1982). Forward of the second notch is a 2 inch strap and chain assembly (Figure 26). From 50 to 70 inches forward of the first notch on the port side was an area of articulated brick located between two floors. This area from the brick to the notching in the machinery timber is most likely where the boilers sat, as it is located between the fuel bunker and crank shaft.

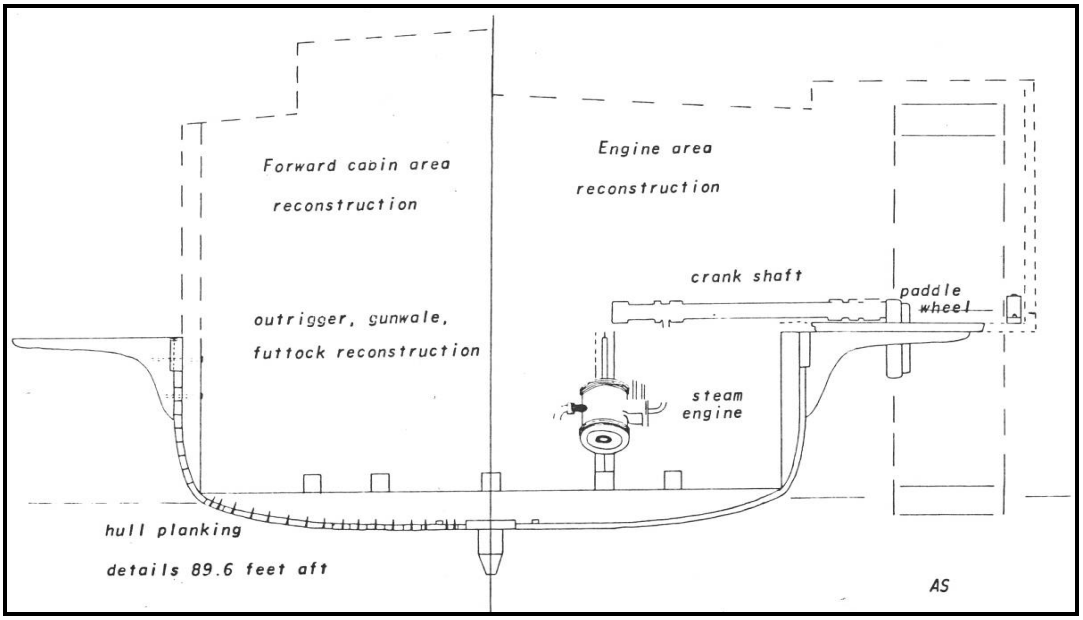


**Figure 27: Engine area reconstruction**

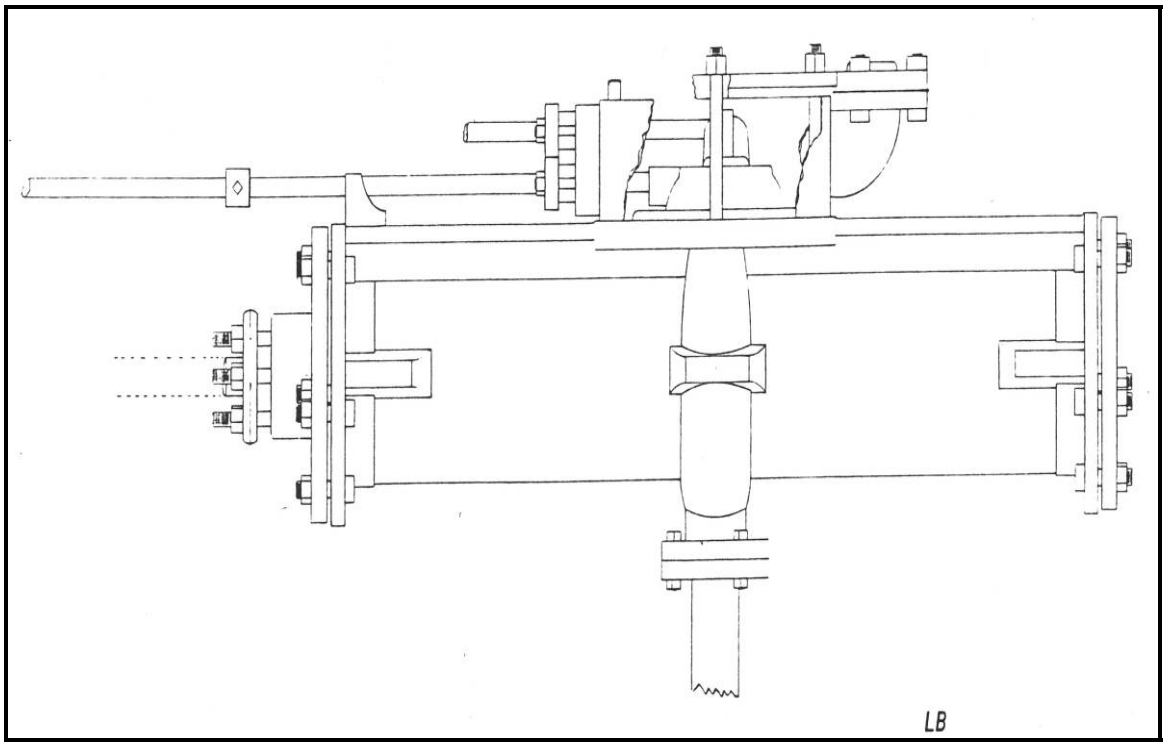


**Figure 28: Steam engine scale 1:10 inches**

The steam engine was recovered. It measured 5.46 feet long and 16 inches wide, with a 10-inch-diameter piston and 48-inch stroke (Figure 28). The steam chest was broken and both the slide valve and expansion valve were visible. Inside the slide valve there was an exhaust valve of a type that has not yet been identified. There was also damage done to the exhaust collar and an 8-inch to 10-inch gash from an external blow that broke the piston wall. The engine may have been inoperative, which may explain whit was not salvaged. The engine has only two mounting appendages perpendicular to the steam chest on one side. On the opposite side two others appear to have been removed.

The angle and offset of the engine piston shaft line up more or less with where the crank shaft should have been positioned. An insufficient number of articulated artifacts were found to reconstruct the crosshead slide guide, and no vestiges of a pitman were found. Without this data it is not known how the engine piston rod transmitted its force to the crank shaft.

The crank shaft was 8 feet, 1 inch long and has a 5-inch-diameter (Figure 27). The crank shaft was not recovered as planned since it was firmly concreted to a 5-foot-by-9-foot area lying just forward of the fuel bunker. It lay at an acute angle to the vessel's center line and apparently its outer end had been struck or pulled from its original position (Figure 14). The crank sat between two floors and was believed to be at least 22 inches deep. There is one set of bearing

brasses on the outer end of the shaft, with a second set recovered at the crank end. At the outer edge there is a partial flange. Usually the flange is circular or two half-circles (A. Bates 1979). This flange may have been composed of at least eight sections to form the inside central area of the paddle wheel. There are several appendages on the crank. One appendage is a 4.5-foot-by-2-inch-diameter rod intersecting at a right angle to the crank shaft 18 inches from the crank. This may have had some action in an offset manner with the slide and expansion valve rods of the steam engine. Several fly-wheel-like fragments were recovered under the shaft area and may be either cam sections or fly-type balance wheels for the crank shaft.

The paddle wheel artifacts consisted of several U-shaped bolts (stirrups), two parts of the paddle wheel's great circle, and one section of the great circle found on either side of the vessel. One section of the great circle still had a section of the paddle wheel's arm 4 ½ inches wide and 1 ¾ inches thick, broken off at 44 ½ inches. A 2-inch bucket thickness is projected from the stirrups and arm measurements. Using the arc distance between arms on the great circle times the number of arms produces various possible diameters for the paddle wheel. A six-arm wheel would not have sufficient length to reach the water and a twelve-arm wheel would extend below the keel. An eight-arm paddle wheel would have its buckets dipping below the chine of the vessel and the ten-arm wheel would dip well into the water with the great circle extending over 8 inches below the chine. Therefore, an 8-inch bucket paddle wheel seems to be the most likely configuration. If this is correct, then the wheel would have had an 11-foot 4-inch diameter.

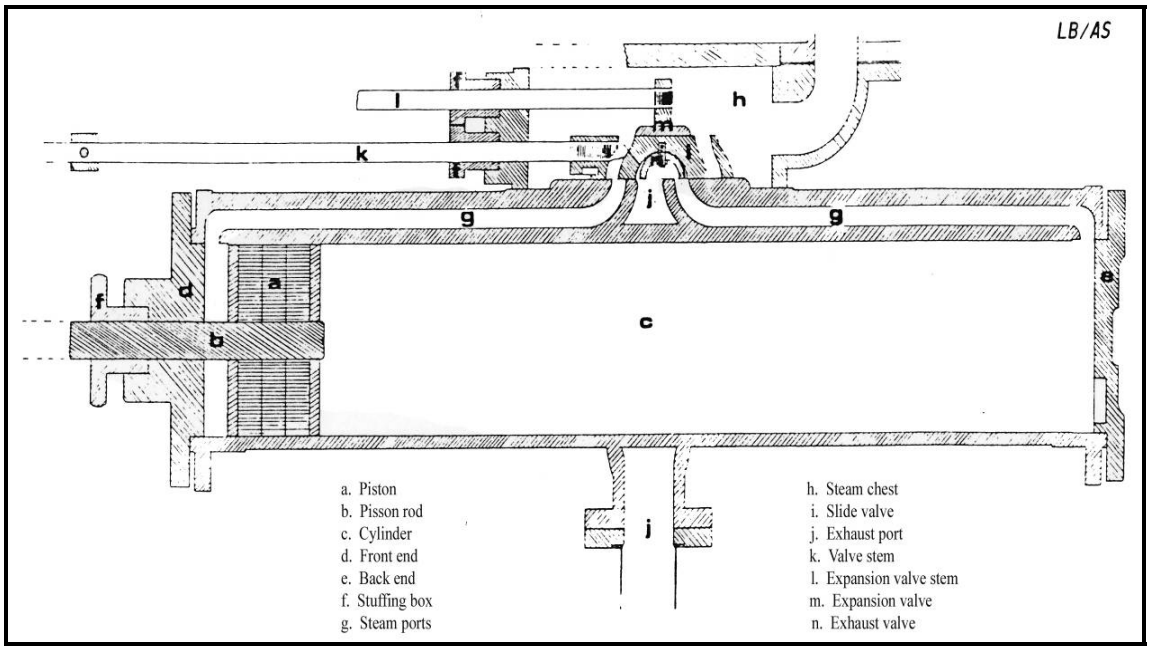


**Figure 29: Steam engine details**

An iron pillow block (shaft mounting bracket) was recovered with the same diameter as the crank shaft. This bracket has a grease fitting and may have been used on the external end of the crank shaft and paddle wheel assembly.

Using ratios derived for western river steam craft (Bates 1968) we can compare parts (Table 18). Using this vessel's engine dimensions and crank shaft dimensions with D indicating diameter of piston and S length of engine stroke (D is 10 inches and S is 4 feet), we can compare those vessel parts with the ones recovered from this wreck (Table 18).

| Comparison of Western River Steam Craft and the *Spray* | | | |
|---|---|---|---|
| **Item** | **Diameter/Length** | **Computed Value** | **Measured Value** |
| Shaft Diameter | D / 2+ 1 | 6 Inches | 5 Inches |
| Wheel Diameter | 3 S ± | 12 Feet | 11 Feet, 4 Inches |
| Flange Diameter | 3 D | 30 Inches | 50 Inches |
| Arm Pocket Depth | D | 10 Inches | 19 Inches |
| Number of Buckets | 2 1/2S+ | 10 Bucket | 8 Buckets* |
| Packet Pitman Length | 3 3/43S | 15 Feet | 6.9 Feet* |
| *Projected Data | | | |

**Table 18: Comparison parts of *Spray* and Western River steam craft**

In comparison, the Western vessel varies significantly in the flange area and pitman arm length. The latter being a variation of stern wheel and side wheel.

*Engine Area Artifacts*

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 360 | Steam engine slide valve with expansion valve and exhaust valve, 10-inch-diameter piston and 48 inch stroke (Figures 28, 29, and 30). The copper exhaust pipe is 1/32-inch thick, and 2.5 inches in diameter. | 65.5 feet/port side, 18 inches inside vessel, with remainder outside vessel. |
| 358 | Steam chest cover for steam engine #360 | Under steam engine |
| 349 | Pump, upright. Piston-type pump with external double valve, chamber bolted to a 6-inch-by-8-inch timber (Figure 30). Probably pump to replenish water for the boiler(s) and /or bilge system. | (Figure 30)<br>71 feet / 1-foot starboard |
| 319 | Pipe with "T" coupling, pipe ferrous, 76 inches long, 2 inches outside diameter, 2-inch coupling on one end, 4-inch "T" on other end of coupling, hemp or oaken packing where pipe fits into "T". | 69 feet / across base line |

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 294 | Pipe coupling, copper, 1 ¼ inches diameter, overall length 6 ½ inches, coupling brass, two solder joints. | 131 feet / 2 feet starboard |
| 342 | Pipe valve and flange, valve on/off type, soldered to 2-inch-diameter copper pipe, overall length 44 inches, flange 7 inches in diameter, ¼-inch thick, with rubber gasket 3/32-inch thick, six ½-inch holes, three bolt fragments still attached | 35 feet / 3 feet port |
| 357 | Bilge valve, 1 ¼ inches pipe, copper, valve brass, valve attached by two solder couplings, overall length 25 inches, valve height, 6 inches. | 123 feet / 18 inches starboard |

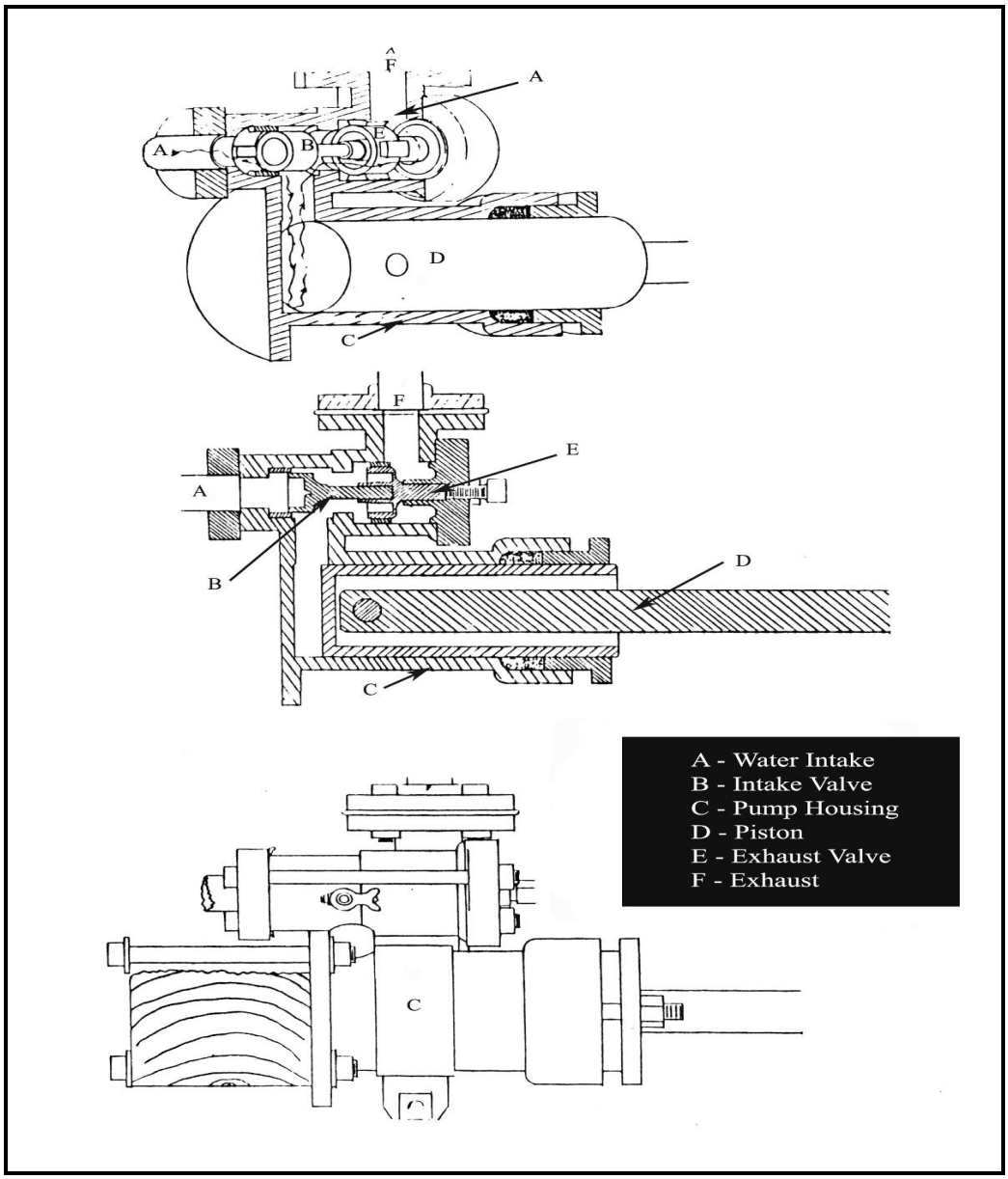


**Figure 30: Water Pump "Band Wreck"**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 350 | Valve, three-way, ferrous, housing 12 inches long, 18-inch valve handle, with 3.5-inch-diameter copper tubing attached to two of the three openings. This tubing is the size of the exhaust tubing on the steam engine. | (Figure 31) 71 feet under steam engine |
| 266 | Valve, brass, cylinder type with handle, fits 1 5/8 inch pipe, length 5 ½ inches, height 6 inches, 10 inches long by 1 5/8 inch copper tubing soldered on. | (Figure 32) Machinery area |
| 233 | Valve handle, 4 1/8 inches overall length, 1 1/4 –inch-diameter area with 5/8-inch square hole to attach to valve, handle portion 2 7/8 inches long, tapers slightly in middle. | 56 feet under keelson |
| 248 | Handle, fragment, S-shaped, 8 inches long, ¾-inch to ½-inch wide, ¼-inch hole at one end (similar to coffee mill handle). May be for valve handle. | 20 to 23 feet / starboard |
| 351 | Steam tubing (fragment), copper, 33 inches long, 1 5/8-inch-diameter; tube associated with pump #349 | 71 feet / 1 foot starboard |
| 247 | Tubing, copper, length 31 inches, 3 1/3-inch-diameter, approximately 16-gauge lap soldered seam. | 23 feet / starboard |
| 238 | Tubing (fragment), copper, 9 inches long, ¾-inch-diameter, 8-gauge, braised seam. | 58 feet / port |
| 277 | Pipe band strap, copper, holds 1 3/8-inch pipe, 6 inches long, 1-inch-wide, and 3/32-inch thick, four counter-sunk holes ¼-inch diameter, two holes on either side of bracket (bilge piping). | 121 feet / 2 feet starboard |

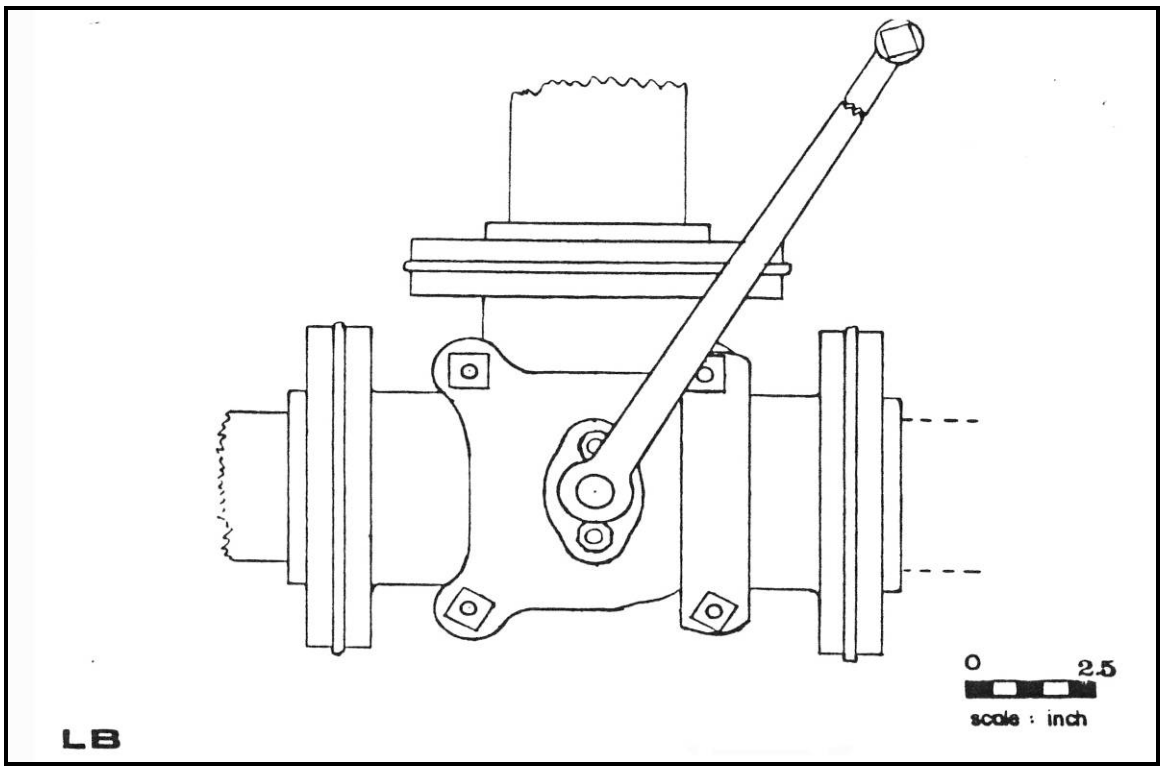


**Figure 31: Artifact #350, three-way valve**

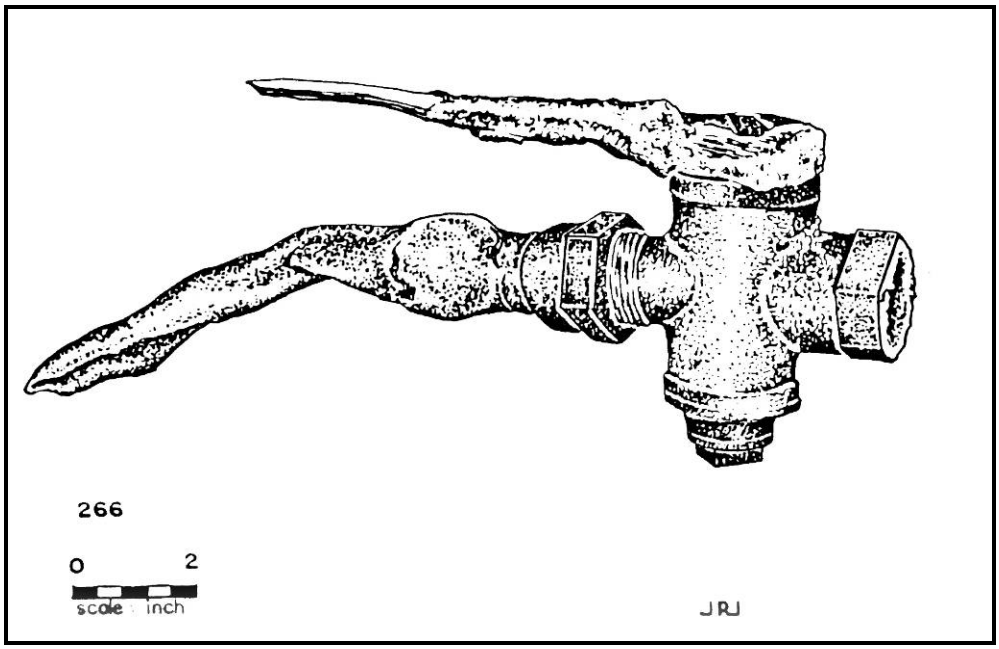


**Figure 32: Artifact #266, brass cylinder-type valve**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 245 | Bilge strainer, copper, length 21 inches, 2-inch-diameter pipe, crimped braised seam; strainer head cone-shaped but flat on one side to fit against the floor, bottom diameter 6 inches with approximately 50 ¼-inch holes. | (Figure 33) 37 feet 3 inches / 9 inches starboard |
| 348 | Bilge strainer, copper, cylinder shaped, 10 inches high, 3 ¼ inches diameter, closed at one end with no holes; 16 slotted holes around side of closed end, repaired with copper wire. | (Figure 34) 68 feet/1 ½ feet port(1 foot forward of shaft) |
| 287 | Bilge strainer and tubing, tubing 98 inches long, 1 ¼-inch-diameter pipe, cone-shaped strainer head approximately 4 inches in diameter with 30 holes ¼-inch-diameter. Valve, copper, 9 ½ inches from end opposed to strainer similar to #357 | (Figure 35) 123 feet / port side of base line |
| 285 | Flange washer, iron, round ring 4-inch outside diameter, 2 ¼-inch inside diameter, 3/8-inch thick, with a ¾-inch break in its circumference. | (Figure 36) 83 feet / 8 port |
| 298a | Flange washers, two, same as 285 | 100 feet /0-5 feet port side. |
| 298b | Strap fragment, 1 ½ inches wide, ¼-inch thick, 7 ½ inches long | Same as 298a |
| 298c | Rectangular iron bar, 3 ¾ inches long, 1-inch wide, 1-inch thick | Same as 298a |
| 298d | Rectangular iron bar, 3 ¾ inches long, ½-inch wide, ½-inch thick | Same as 298a |
| 298e | Coal clinker, 3-inch-diameter | Same as 298a |
| 325 | Metal block, cast iron, 9 inches long, 5 inches wide, 1 3/8 inches thick | 60 feet / starboard of keelson |
| 346 | Round wooden object with rubber gasket fragment, possibly lignum vitae, donut-shaped, flat on one side, round on the other, 3 ½ inches in diameter, width 1 ¼ inches, 1-inch hole at center. Three 3/8-inch holes around center. Chip-like marks on edge. Gasket 1/3-inch thick, 1-inch wide, projected 3 1/3 inches in diameter | 70 feet / 1 foot starboard (near pump #349) |

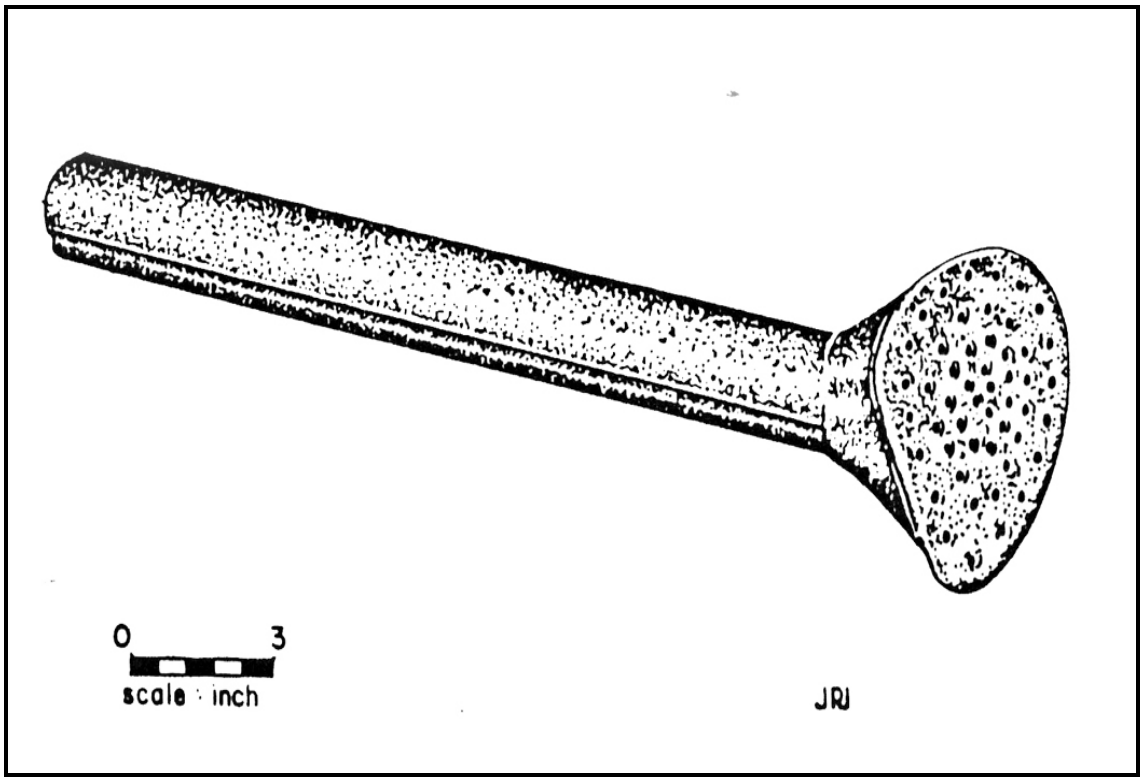


**Figure 33: Artifact #245, copper bilge strainer,**

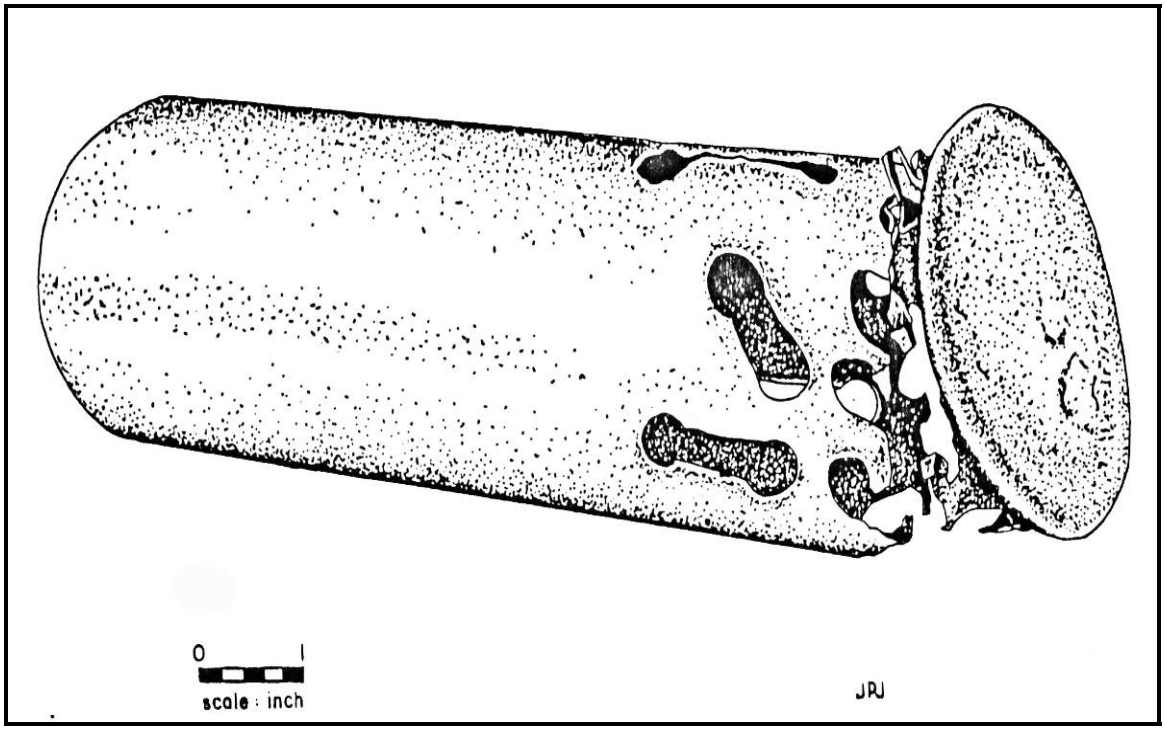


**Figure 34: Artifact #348, copper bilge strainer, cylinder-shaped**

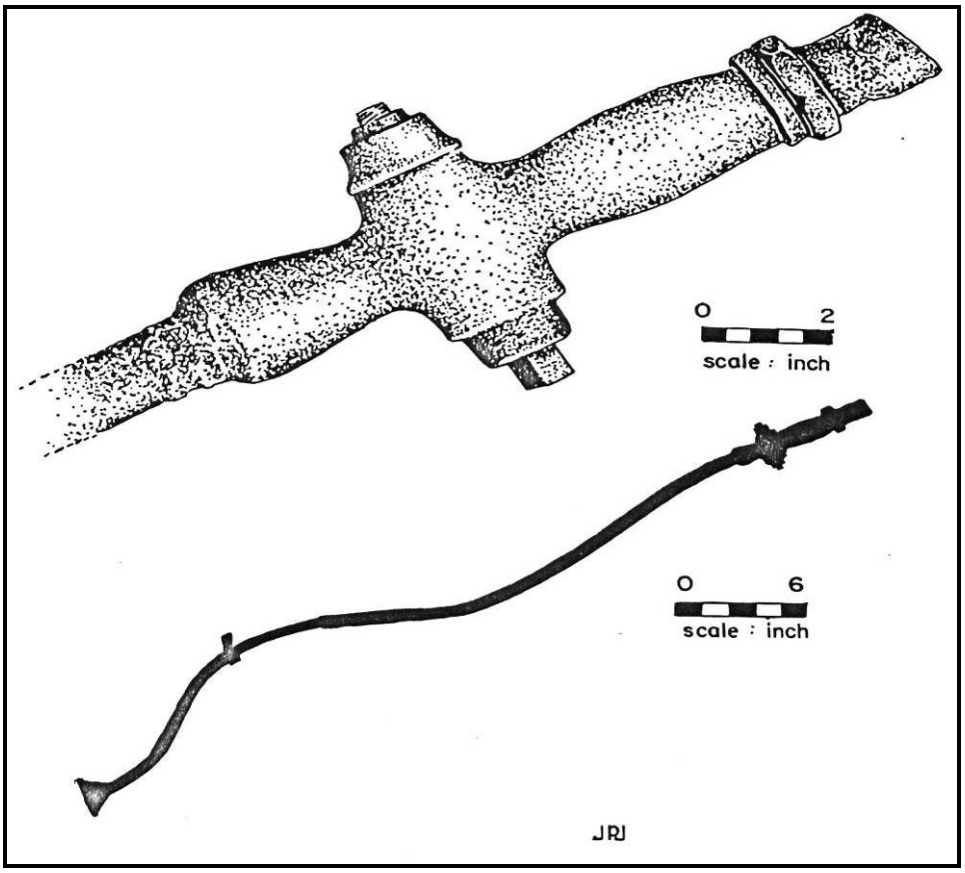


**Figure 35: Artifact #287, bilge strainer and tubing**

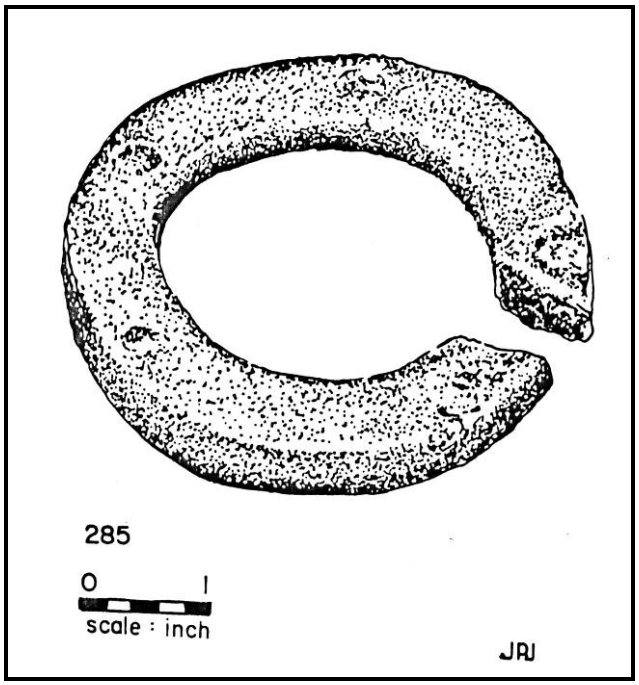


**Figure 36: Artifact #285, flange washer**

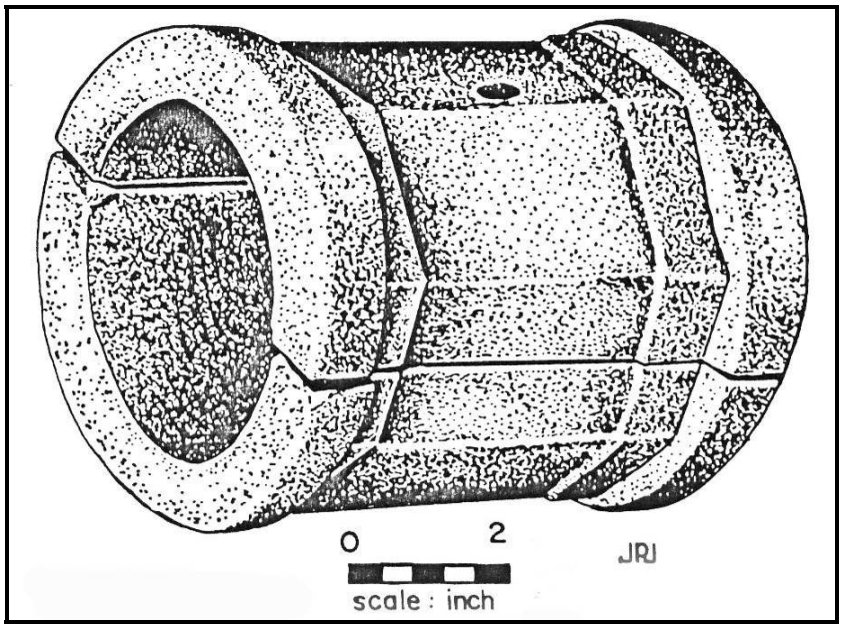


**Figure 37: Artifact #353, bearing brasses (two halves)**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 347 a, b, c | Three cam or balance wheel fragments, cast iron, from crank shaft, projected 9 inches in diameter, 2 inches wide, 1 inch tick, spoked. | 70 feet / port edge of vessel |
| 347d | Flat metal resembling hatchet blade, 2 ¾ inches long, 3 ¾ inches wide, 1/8-inch thick, one of the long edges rolled. | 70 feet / port edge of vessel |
| 347e | U-bolt, 7 ¾ inches long, 3 inches across, ½-inch rolled stock, possibly paddlewheel stirrup. | 70 feet / port edge of vessel |
| 347f | Square nut, ¾-inch square by 3/8-inch, with ¼-inch diameter threaded hole. | 70 feet / port edge of vessel |
| 334 | Cast-iron cam or balance wheel fragment similar to 347 a, b, and c | 70 feet / port base line |
| 353 | Bearing brasses (two halves), brass, 6 inches long, 3/8-inch thickness of bearing wall, crank shaft arc 4 ¾-inch-diameter, octagonal sides, grease fitting ½-inch hole top of one half, with inner grooves arching in opposite direction for grease flow, cast with ridges on both ends, ¾-inch wide, 1 inch thick. | (Figure 37) Crank shaft |
| 343 | Bearing brass (lower half), same as #353. | 70 feet / 7 feet port |
| 372 | Bearing brass (upper half), same as #353. | 75 feet/3 feet outside wreck |
| 373 | Grease cup for bearing brass, cup-shaped with nipple, brass, length 3 inches, nipple threaded, 7/16-inch shaft; cut thimble shape, containing fibrous cloth, diameter of cup 1 7/8 inches. | (Figure 38) 40 feet/5 feet outside starboard side of wreck |
| 352 | Shaft mounting bracket, iron, top section 14 inches long, 5 inches wide, 1 ½ – inch-thick with 1 ½-inch square grease-type cup; bottom section 27 inches long, 5 inches wide, 1 ¾ inches thick; two sections held together by 5/8-inch diameter bolt broken at 11 inches, suggesting that the bracket was fastened to at least a 6-inch timber. Second bolt same size, 11 inches from first on lower section. The 5-inch diameter opening for shaft precludes the brass bearings in assemblage of pillow block configuration. | (Figure 39) 71 feet / starboard of keelson. |

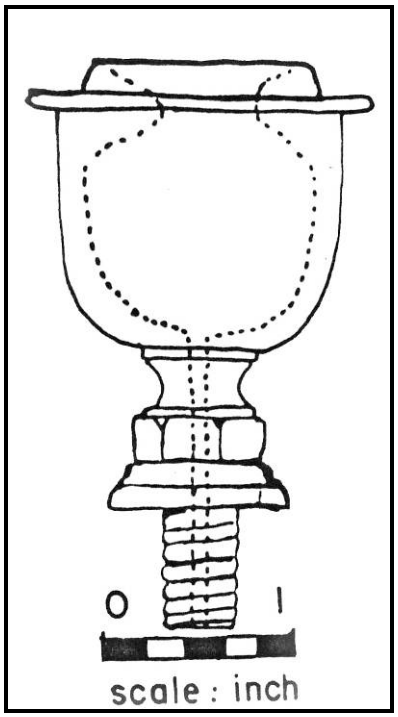


**Figure 38: Artifact #373, grease cup**

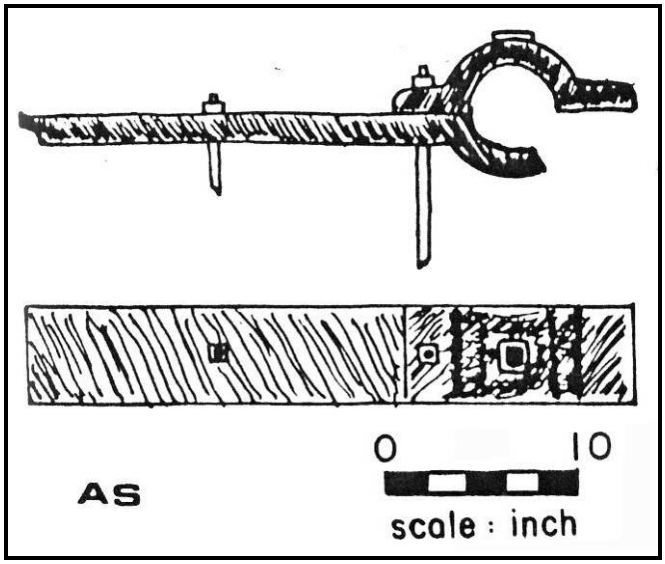


**Figure 39: Artifact #352, shaft mounting bracket**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 322 | Hooked bar, forged iron, 1 ¾-inch-square stock, 4 feet long, shaft bowed with section turning, 150 degrees for short straight run ending a 4-inch-by-1 ¾-inch nut-like bracket. | 56 feet / across keelson |
| 321 | Carved bar, cast iron, 1 ¾-inch-by-2-inch bar, 18 inches long | 72 feet 6 inches / 16 inches starboard |
| 320 | Case iron bar, similar to #321, 16 inches long. | 72 feet 6 inches/1feet 6 inches starboard |
| 271 | Swivel harness (cleat), ferrous, harness 23 inches long, carved arch, solid 3 inches diameter with "U" bracket on outside of curve to allow a pin 18 inches long, ¾-inch wide by a bolt 4 inches long ¾-inch in diameter | (Figure 40) machinery area |
| 293 | Connecting rod, ferrous, 37 ¼ inches long, ¾-inch diameter, eye on one end, 5/8-inch diameter, fork on other end with two 2 inch holes. | (Figure 41) 105 feet / 5 feet port |
| 340 | Turn buckle, ferrous, 4 ½ inches long, 2 inches wide, turn buckle for connecting rod #293. | 76 ½ feet / 1 ½ feet port |
| 341 | "U" Bolt, paddle wheel stirrup, forged iron, 5/8-inch stock with threaded ends, 8 ½ inches long, 3 ½ inches wide. | 76 ½ feet / 1 ½ feet port |
| 355 | Sections of the paddle wheel's great circle, iron, strap 2 ¼ inches wide, ½-inch thick, "U" shaped brackets are attached on 42-inch centers, "U" brackets are 5 inches across top, ½-inch wide and extend in to the great circle for 1 ¾ inches and project through the great circle secured by 5/8-inch nuts. The "U" brackets hold a paddle wheel arm (board) 4 ½ inches by 1 ½ inches and 43 ½ inches long, broken off at the inside end. | 70 feet / 8feet starboard |
| 286 | Section of the paddle wheel's great circle, same as #355, no wood attached. | 83 feet / 8 feet port |

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 324 | Coal stoker handle, ferrous, 45 inches long, broken, ¾-inch diameter stock; handle 4 ¾ inches by 4 inches, oval. | 60 feet / starboard of keelson |
| 234 | Ventilation tube, copper, overall length 39 inches, cone-shaped, small opening 3 inches in diameter, large opening 1 foot 9 inches in diameter. The small opening has ¼-inch flange and the large opening has 1-inch flange. The small opening is at a 45-degree angle. | (Figure 42) machinery area |

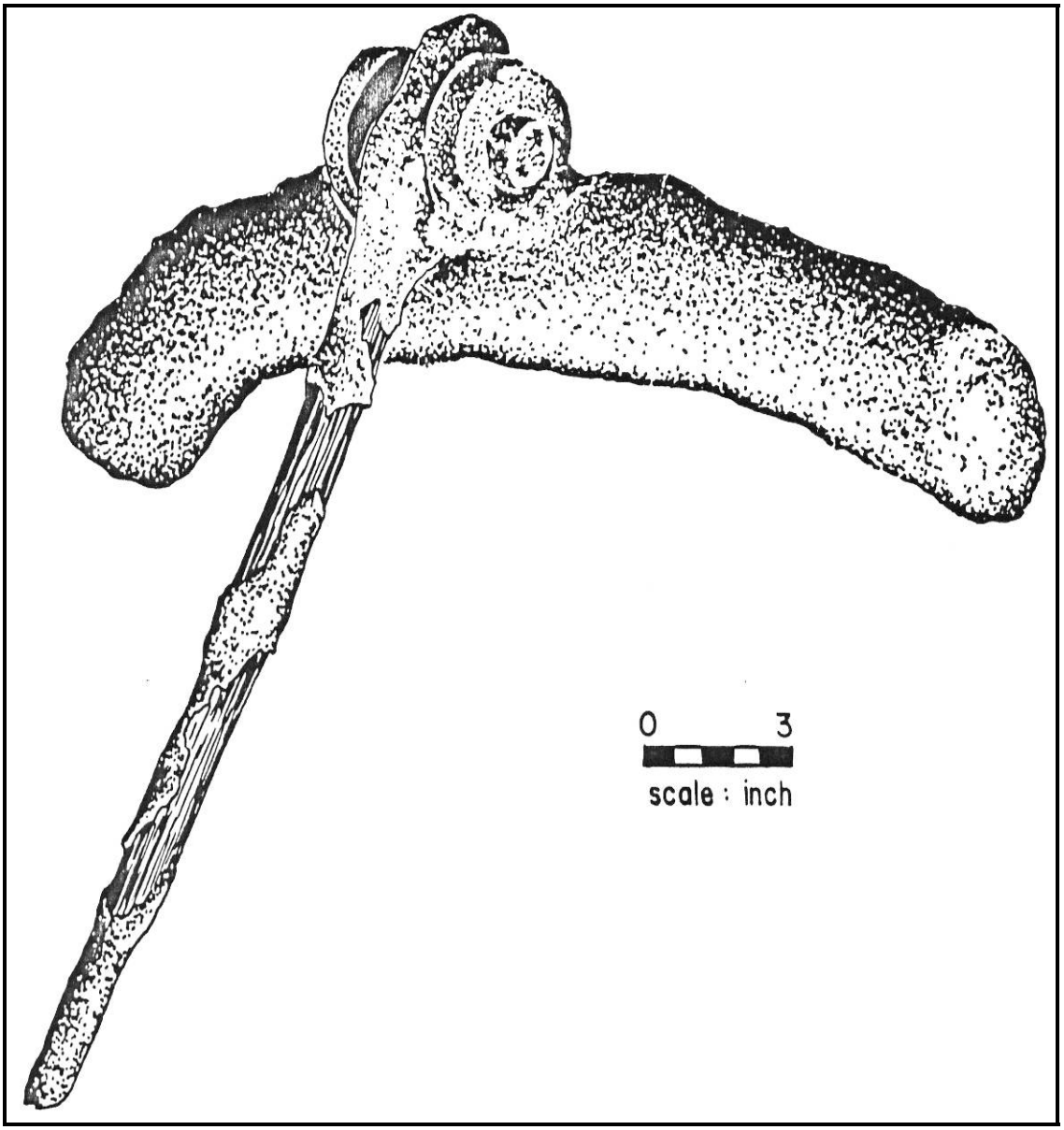


**Figure 40: Artifact #271, swivel harness (cleat)**

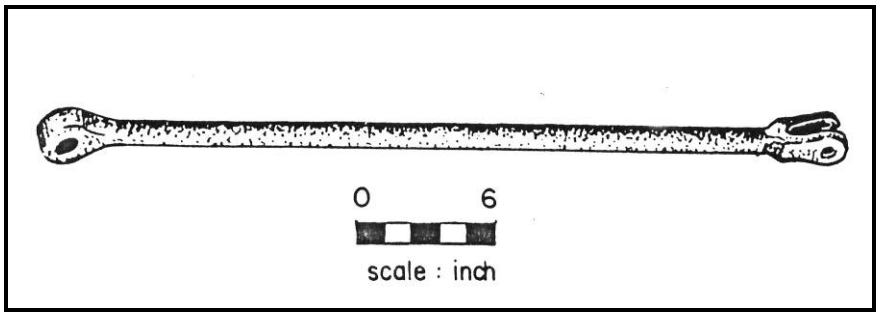


**Figure 41: Artifact #293, connecting rod**

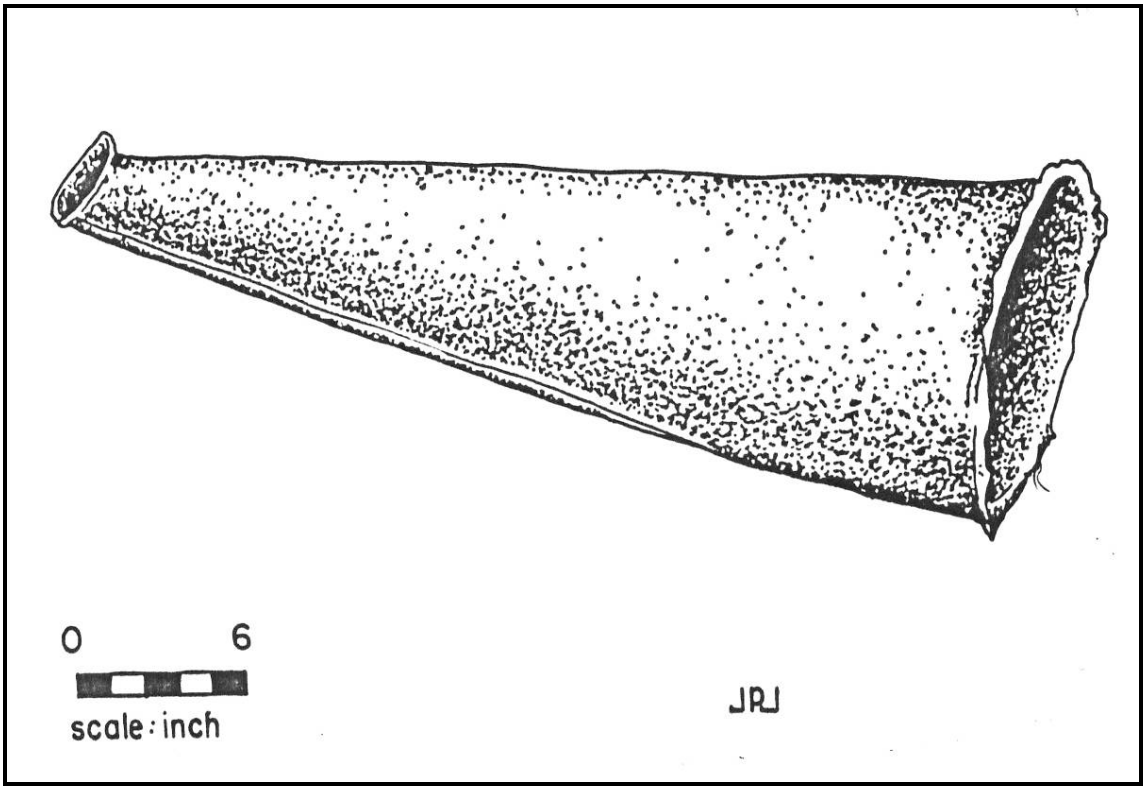


**Figure 42: Artifact #234, copper ventilation tube**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 332 | Boiler grate fragment, cast iron, 34 inches long, 3 inches wide, 4 ¾ inches maximum thickness. | 60 feet / port of keelson and parallel to keelson |
| 327 | Boiler grate fragment, same as #332 | 60 feet / starboard side |
| 235 | Brick (whole), red, 8 ½ inches long, 4 inches wide, 2 inches thick. | Machinery area |
| 236 | Brick fragment, same as #235. | Machinery area |
| 328 | Ferrous metal fragment, 2 ¼ inches by 1 ¾ inches by 1 ¼ inches. | 60 feet / starboard of keelson |

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 267 | Copper sheet fragment, 10 inches long, 1 ¾ inches wide, tapers to ½ inch, gauge 16. | Machinery area |
| 337 | Copper sheet, flat 12 ½ inches long, approximately 8 inches wide, badly crumpled, gauge 20. | 62 1/3 feet / port |
| 361 | Coal clinker | 104 feet / base line |
| 274 | Ore sample, pyrite, 2 pieces. | General vicinity of wreck |
| 276 | Castle Hayne marl | 125 feet / base line |
| 289 | Coal clinker or pyrite | 100 feet / 4 feet port |
| 367 | Crimping tongs, 26 ½ inches long, forged iron, for crimping bands, 2 inches by 2 ½ inches | (Figure 43)<br>70 feet / 8 feet outside wreck starboard side |
| 368 | Strap hinge, 15 ¾ inches long, 1 ¾ inches wide at pentil, then tapering, four ¼ inch holes. | 70 feet / 8 feet outside wreck starboard side |
| 369 | Bastard file, flat, 16 ¼ inches long, 1 ½ inches wide, 3/8 inch thick. | 70 feet / 8 feet outside wreck starboard side. |
| 365 | Bottle, clear glass, two-piece mold with applied lip; height 5 ¾ inches, shoulder height 4 ½ inches, base diameter 2 ¼ inches, lip diameter 1 3/16 inches, embossed; line around center (top to bottom) with words “Acid/Line” written above line, “R” in octagonal on base, contents to acid line is about 5 oz. (12.5 ml) of fluid. | (Figure 44)<br>75 feet / 12 feet outside wreck starboard side. |

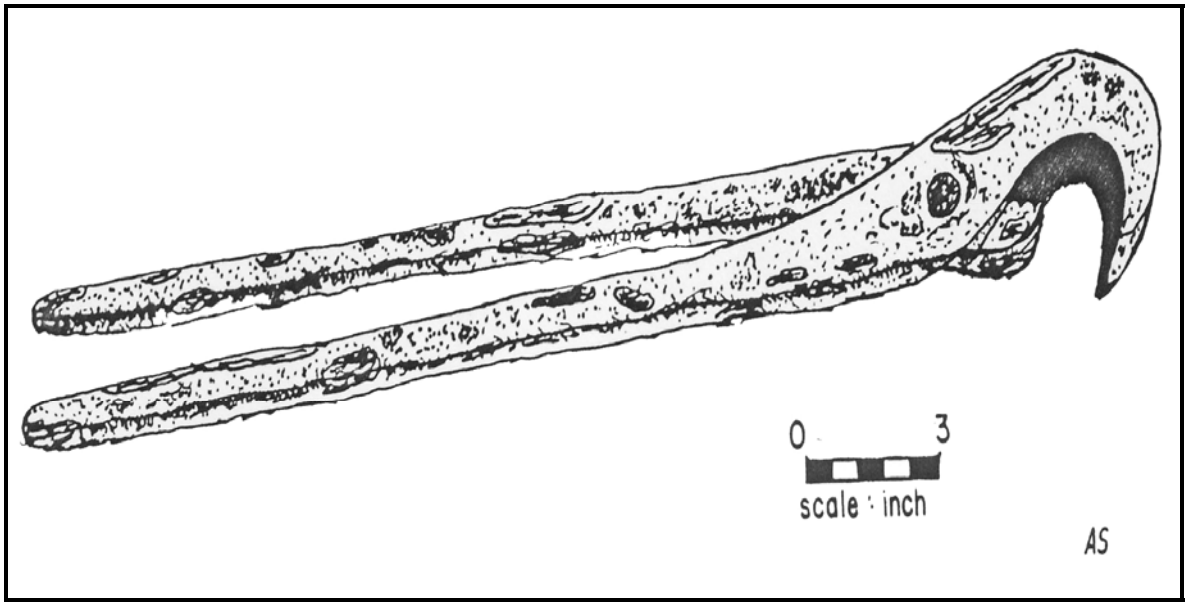


**Figure 43: Artifact #367, crimping tongs**

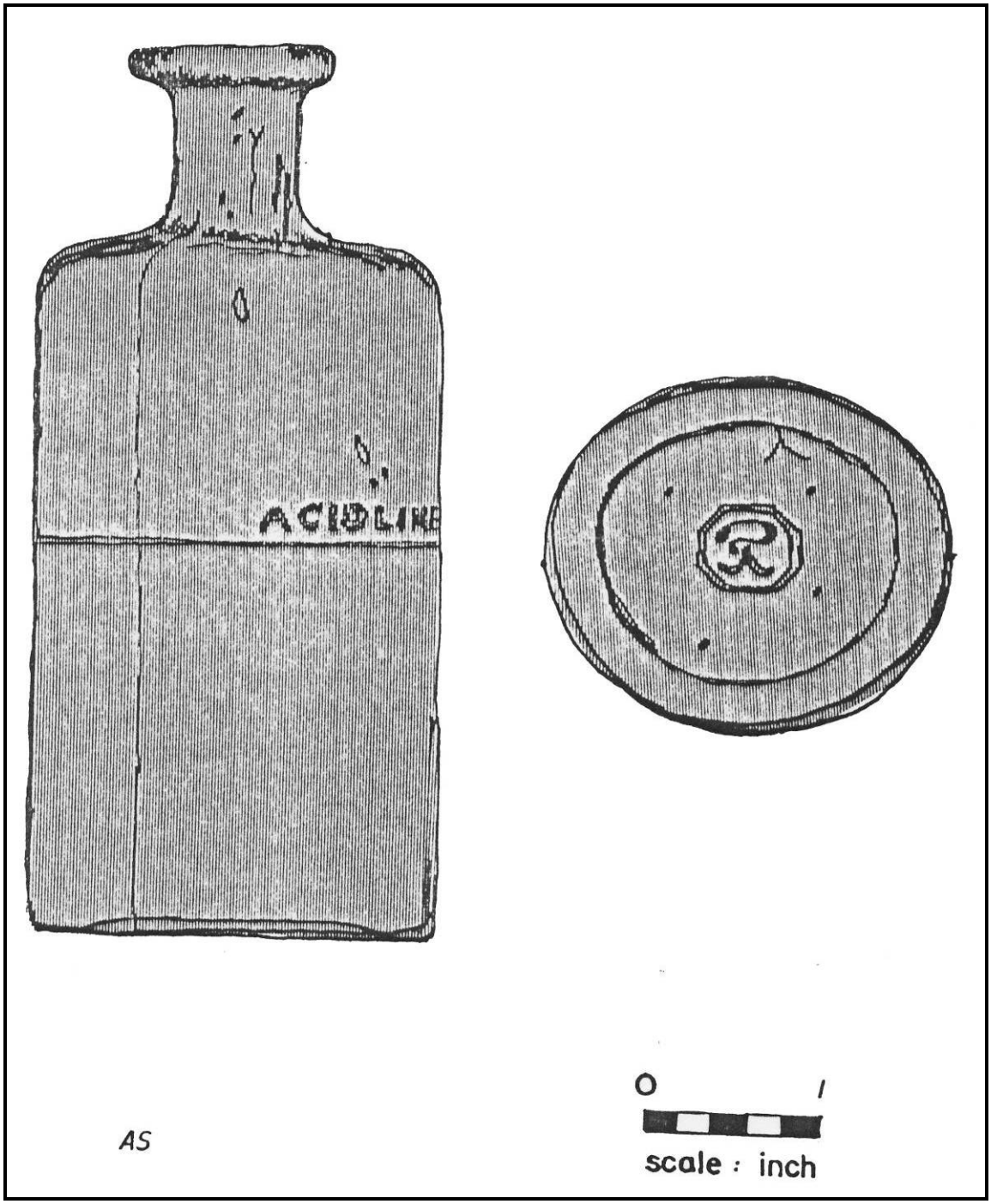


**Figure 44: Artifact #365, clear glass bottle**

**Stern Area (Cabin)**

The artifacts in the stern area are all associated with the comfort and convenience of the passengers. They include ceramics, (spittoons, plate and containers); glass (decanters, cruets,

tumblers or jars, lamp oil reservoirs, and stopper); metal (lamp bases, lamp wick holder, lantern bails, tin can fragment, iron urn and lid, pewter fragment, cabinet hardware and latches, door knobs and furniture) and food remains (pork bone and sawed long bone).

This area may have been burned as most of the cabinet and door hardware which was found were worn remnants of wood, as if they had been freed from the structure falling almost in place rather than floating off with the superstructure. The stern section and miscellaneous planks were recovered and/or observed in relatively good condition. An explosive charge may have been set to remove this area of the site from being a hazard to navigation. This idea is supported by the crater-like disturbance from 90 feet to 120 feet down the base line where only the keel remains with floors intact fore and aft of this area. Here the artifacts and vessel timbers were sparse, jumbled and disarticulated. It also may account for the large amount of broken window glass strewn virtually throughout this area to such an extent that the divers found these fragments where ever and whenever they probed with their hands in the sediment.

One interesting observation is associated with the shape of these functional/decorative manufactured artifacts. The spittoon, cruets, decanter, ceramic lid, urn and lid, pewter base, gas lamp fuel reservoir and glass stopper all are poly-sided and the tumbler or jars sides are square. Well over half of these artifacts, including cabinet hardware, door furnishings, lantern bails and spigot are faceted.

*Stern Area Artifacts*

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 231 | Spittoon made of earthenware, buff body with brown, mottled brown glaze. Molded flower pattern within the panes on the side of the vessel. Possibly American Rockingham (McClinton 1951). The shape of the vessel is octagonal, 4 inches height and 7 ¾ inches wide. The top slopes inward with a 1-inch-diameter hole in the center. The base suggests extended use through wear. The vessel has several areas missing and is about 90 percent whole. | (Figure 45) Stern area |
| 339 | One spittoon fragment, same as #231, 2 ¾ inches maximum length | 105 feet / 1 foot starboard |
| 231 | Three spittoon fragments, same as #231, but not part of the same vessel, indicating at least two spittoons on board the steamboat. Lengths of fragments, from 2 inches to 5 ½ inches. | Stern area |
| 222 | Plate fragment, 8 inches in diameter, ironstone, plain white with stamp on underside “Ironstone China” below unicorn, shield and lion mark. With additional fragment (#245) the plate is about 85 percent complete | (Figure 46) Stern area. |

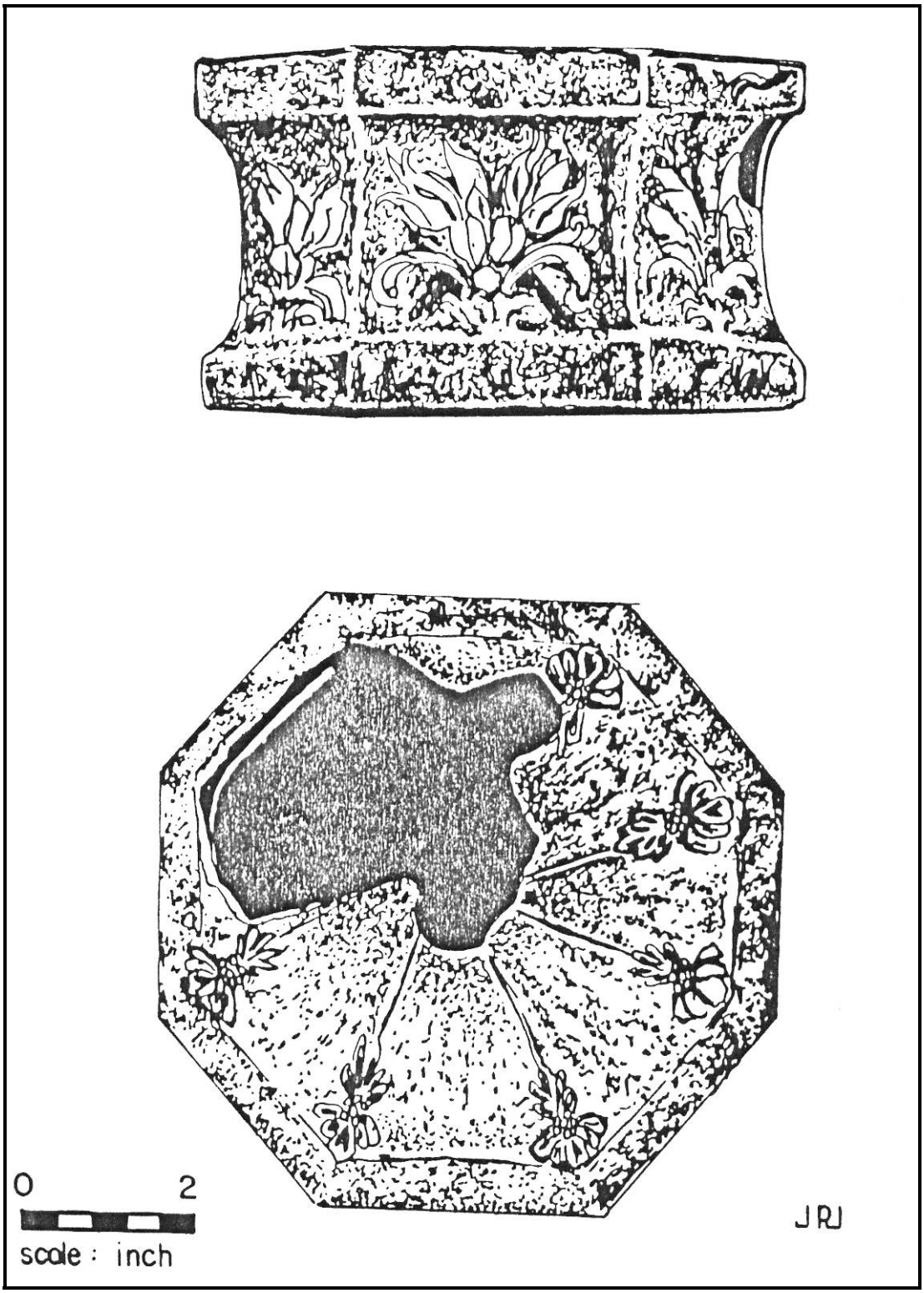


**Figure 45: Artifact #231, earthenware spittoon**

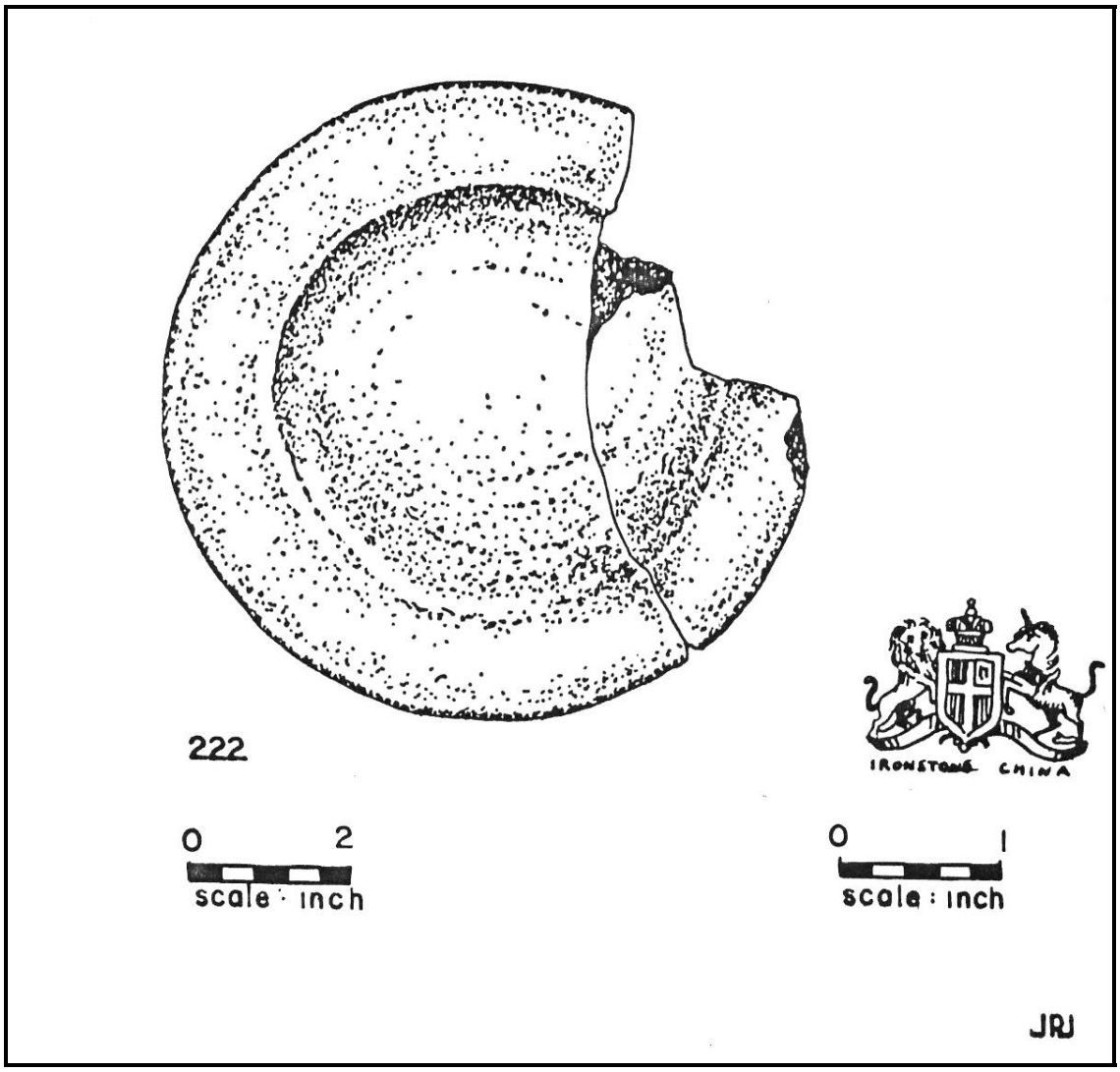


**Figure 46: Artifact #222, ironstone plate fragment**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 245 | Fragment of late, same as and part of #222. | Stern area. |
| 254 | Ceramic lid fragment, ironstone, white, no markings. Possibly portion of octagonal teapot, octagonal base area with fluted upper section, with slight pedestal cap. Height, 2 ½ inches, 3 ½-inch-diameter. | (Figure 47)<br>104 feet / base line |
| 289 | Ceramic fragment, red earthenware with clear lead glaze, white decoration. No slip apparent. Resembles locally made colonial period wares except for the lack of slip. | Stern area |
| 314 | Light brown stoneware fragment, overall length 2 ¾ inches, ¼-inch thick, cream paste. | 120 feet / 1 foot starboard of keelson |
| 243 | Stoneware fragment, gray with cobalt decoration, extreme length of 3 ¾ inches, with a projected diameter of 7 inches. It appears to be a lid to cover an opening of a vessel with a 5-inch mouth, similar to containers to dispense lemonade or iced tea. | (Figure 48)<br>Stern area |

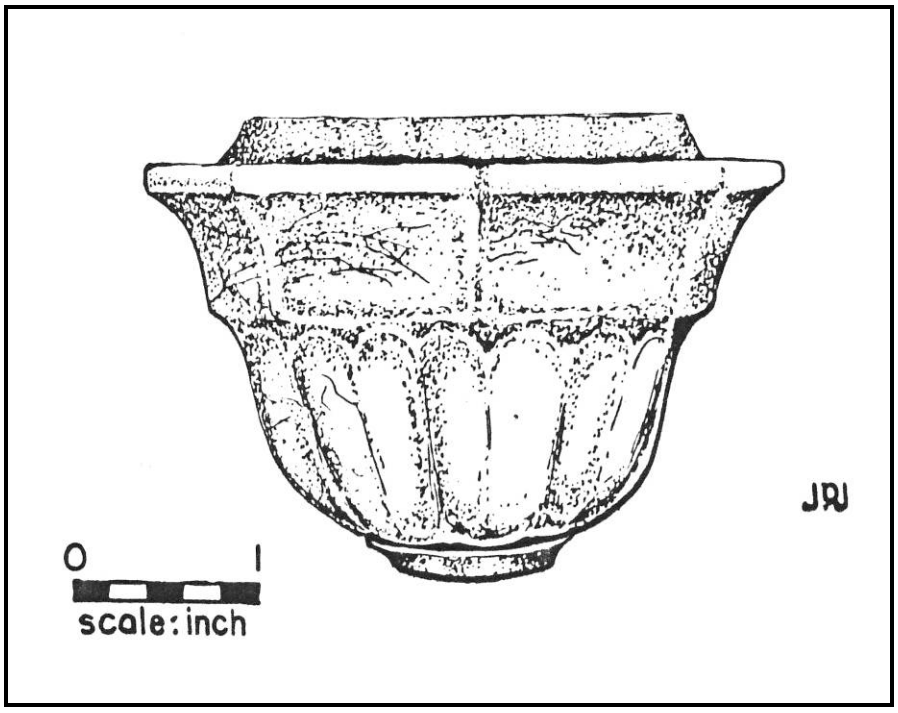


**Figure 47: Artifact #254, ironstone ceramic lid fragment.**

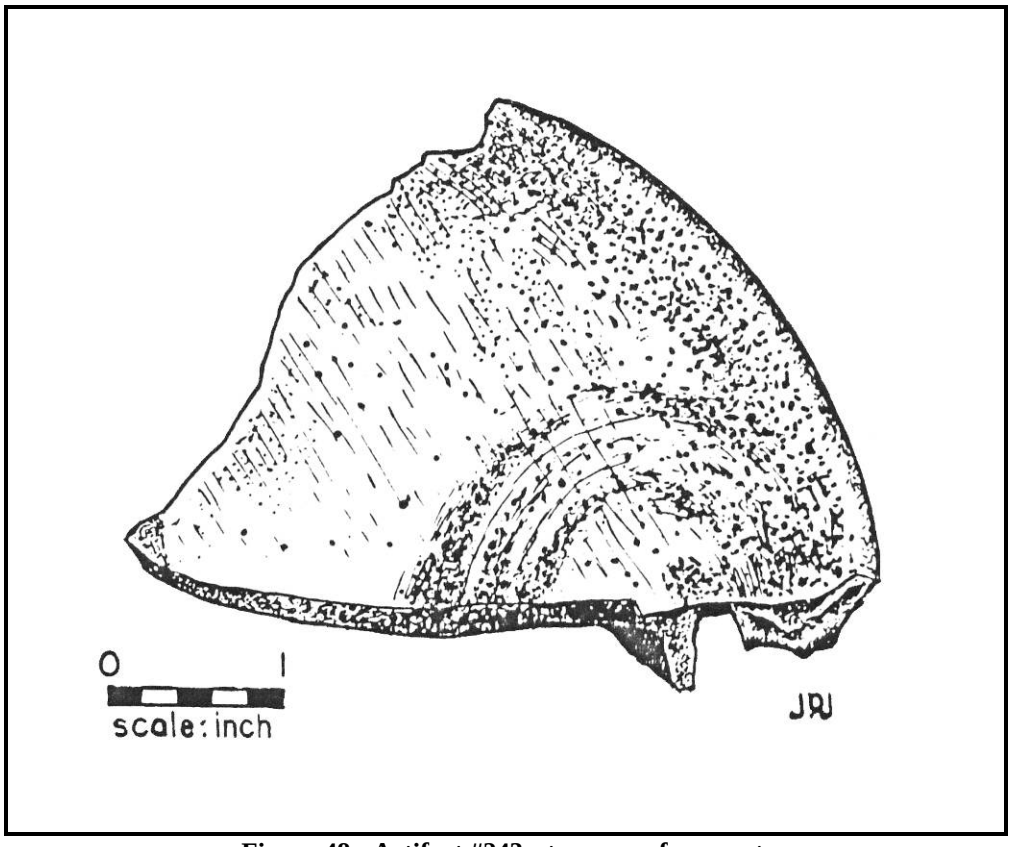


**Figure 48: Artifact #243, stoneware fragment.**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 264 | Brass spigot, overall length 4 inches with ¾-inch diameter at threaded end and ½-inch diameter at dispenser end, with a cylinder valve in between. It also has a lip on nozzle for holding container while filling. Could be for crock similar to 243 or for lamp oil, etc. | (Figure 49)<br>Stern area |
| 299 | Lamp wick holder, copper, 2 5/8 inches diameter, height 7/8 inch, three ¼-inch holes in center for wick screw, 5/8-inch length, 1/8-inch diameter. | (Figure 50)<br>100 feet / 5 feet port |
| 240 | Glass lamp fuel reservoir of clear glass, three-piece mold, and ornamental complex fluted design. Height 7 ¼ inches, maximum diameter 5 inches; holds one pint of fuel and has a glass stern at base to fit into holder. | (Figure 50)<br>Stern area |
| 241 | Copper, wall arm and base, 3 ½ inches diameter of concentric rings extending 2 inches to meet 9/16-inch diameter tube which extends lamp 3 inches further away from wall. The 3-inch tube turns into a 1 ¾ inches high, 1-inch-diameter base in which the glass oil reservoir sits. Below the reservoir is an ornamental nipple. The wall base has a 5/8-inch hole in the top. | (Figure 50)<br>120 feet / base line |
| 283 | Lamp wall arm and base, same as #241. | 120 feet / starboard 1 foot. |

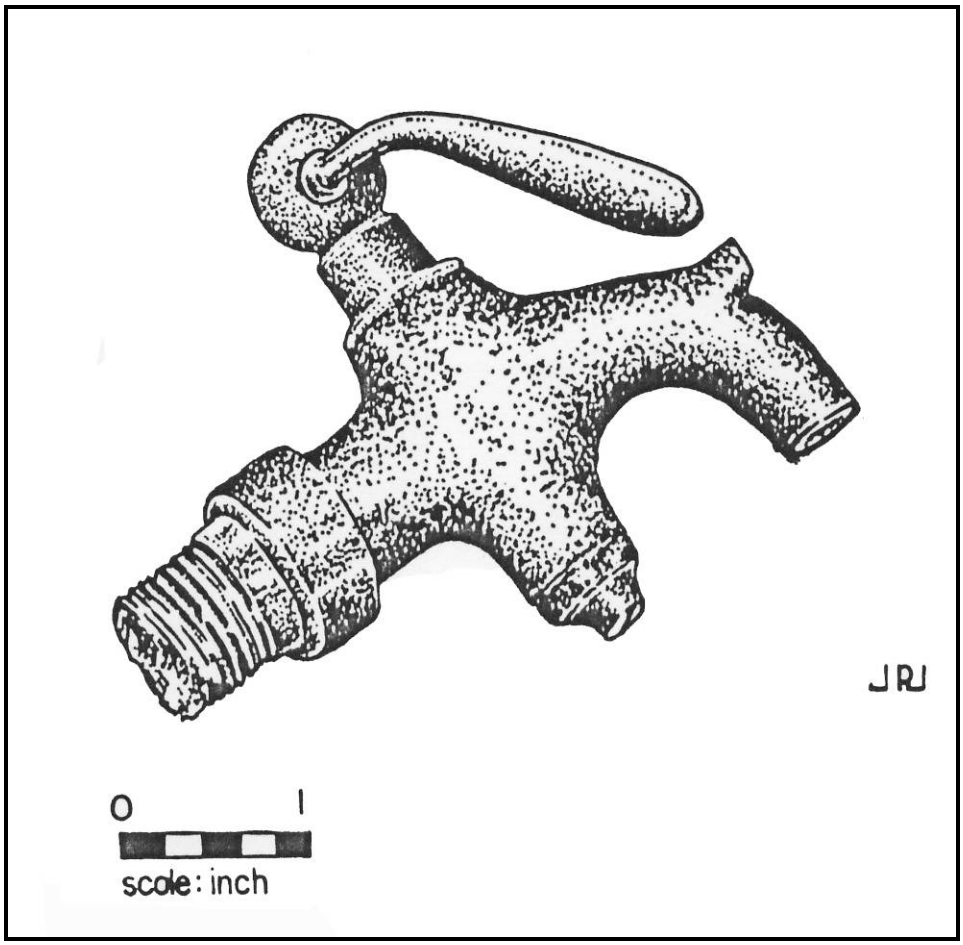


**Figure 49: Artifact #264, brass spigot.**

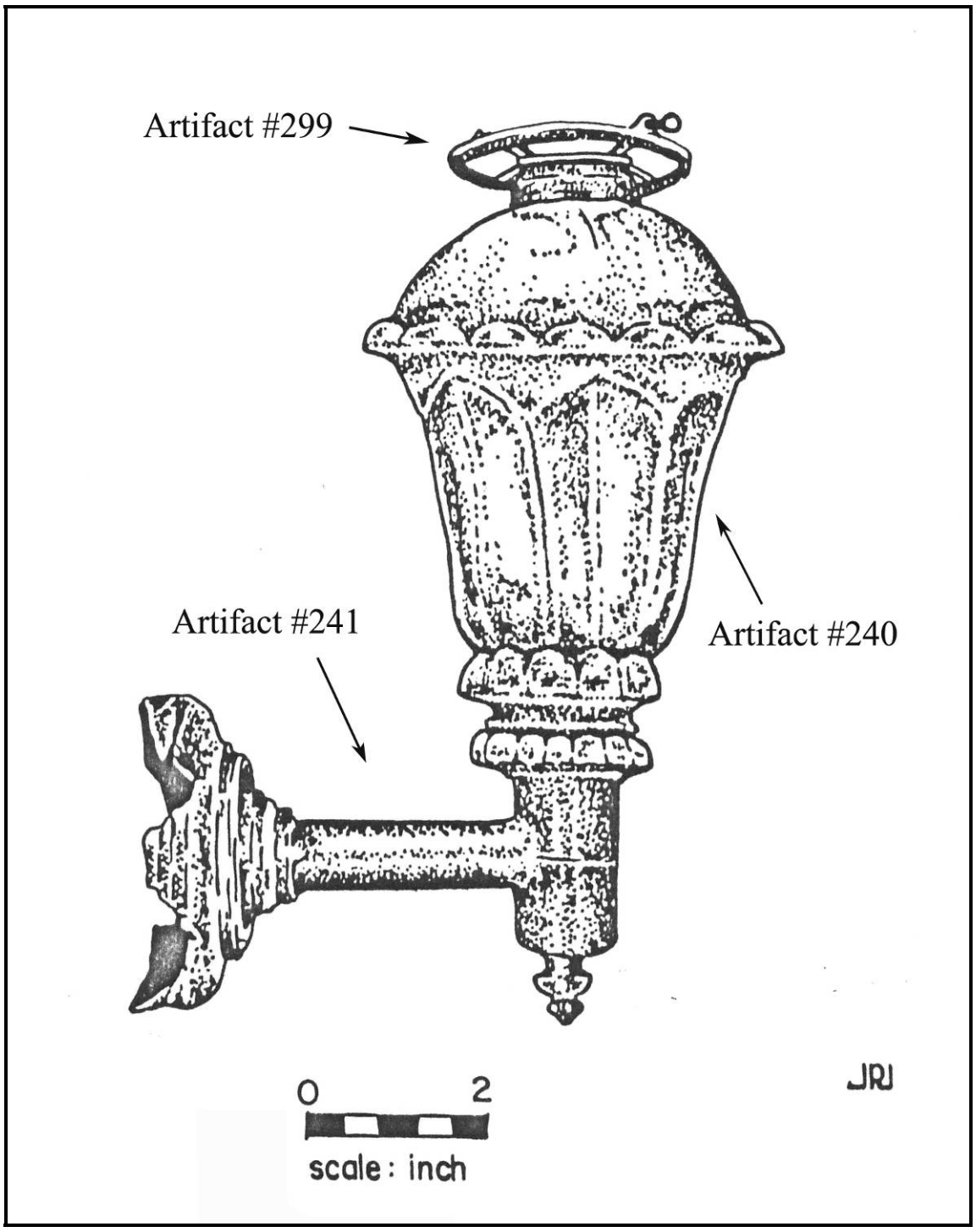


**Figure 50: Artifacts #299, #240 and #241, wick holder, fuel reservoir, and wall arm base.**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 260d | Oil reservoir fragment, same as #240 | Stern area |
| 255 | Oil reservoir fragment, same as #240 | 104 feet / base line |
| 295b | Oil reservoir fragment, same as #240 | 125 feet / 4 feet to port |
| 366 | Oil reservoir complete, same as #240 | 120 feet / 2 feet outside wreck, starboard side |
| 284 | Lantern handle, 1/8-inch wire, square, U-shaped, hook on each end, height 9 inches, width 3 1/3 inches. | 120 feet / 2 feet, starboard side |
| 377 | Lantern handle, same as #284 | 120 feet / 2 feet outside of wreck, starboard side |
| 282* | *Glass bottle, aqua/green, beer bottle, 2-piece open mold, A.B.C.M/Co and at center FS; 9 ½ inches high, 2 ½-inch-diameter base, applied lip, crown closure. | (Figure 51) Stern area |
| 229* | *Glass bottle, brown, beer bottle (similar to #282 in shape), encircled “2” on base, 9 ½ inches high, 2 ½-inch-diameter base. | (Figure 52) Stern area |
| * | Both 282 and 229 date close to the 1890 period as the open mold was replaced around 1880s (Kendrick 1966) and the crown cap went into commercial use in 1892 after ten years of development (Lorrain 1968) | |

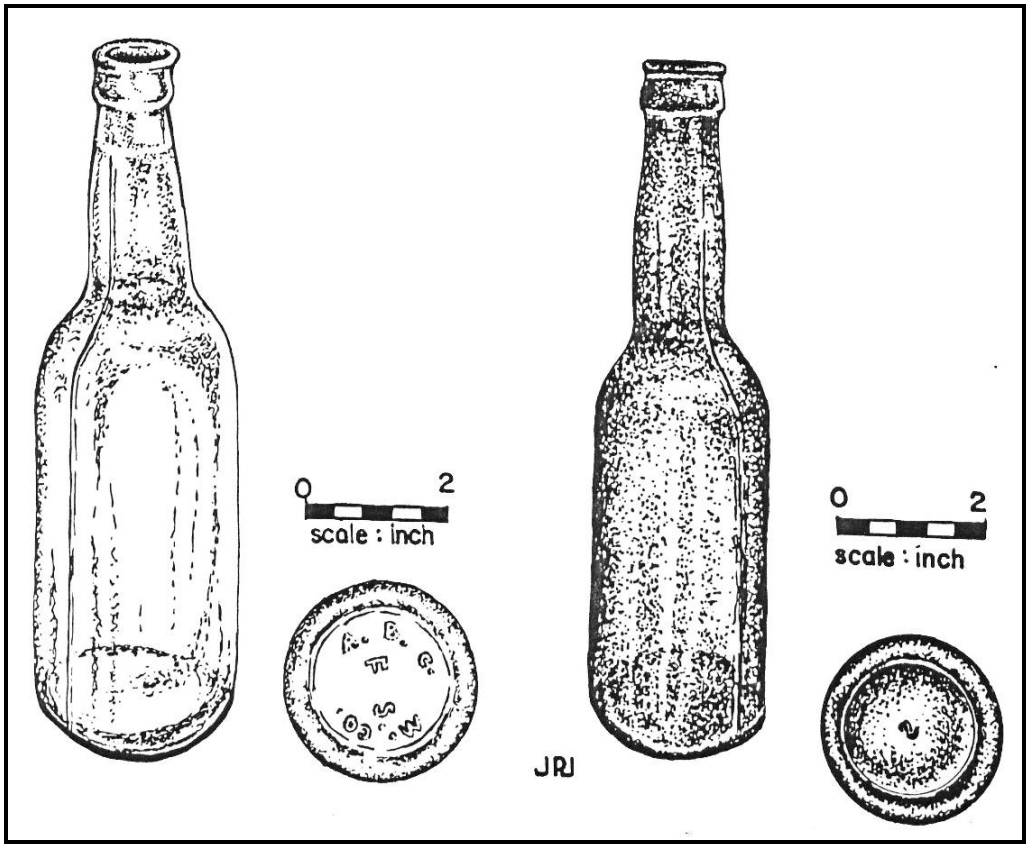


**Figure 51: Artifact #282, aqua/green glass bottle** **Figure 52: Artifact #229, brown glass bottle**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 232 | Glass container, major basal fragments, barrel mustard shape, open pontil, clear glass, 2 ¼-inch-diameter round base, four square sides, ornamental oval embossed on opposite sides with script F on one side and a partial script B on opposing side. Three rings on foot with raised dots in between second and third rings, pale green glass. Flint Bros. and Co., New York were in operation in the early 1860s and may have produced this ware (Zumwalt 1980). An identical whole jar is on display at the L. S. U. Rural Life Museum in Baton Rouge and was found in New Orleans, LA | (Figure 53)<br>Stern area |
| 281 | Glass container, same as #232, fifteen fragments | 122 feet / 1 foot starboard |
| 228 | Glass cruet or condiment container, clear glass, octagonal base tapered sides up slightly more than a third of its height, where it bulbs out and then constricts to a smooth, round 1-inch-diameter neck, lip missing, height 5 ¾ inches, 1 ½ -inch-diameter base. Appears to be designed to sit in a holder for shipboard use as well as household use. | (Figure 54)<br>Stern area |
| 295 | Glass cruet, 2 ½-inch fragment, same as #228 | 125 feet / 4 feet port |
| 252 | Glass stopper, clear glass, 2 ¼ inches high, 1-inch diameter, maximum width ½-inch ground stopper section, faceted tapering top. | (Figure 55)<br>76 feet / center line |
| 224 | Decanter, complete, clear glass, 2-inch diameter, applied lip, ten-sided angular bowling pin shape, 9 inches high with swirled neck, 3-inch diameter base with shallow uniform kick-up. Possibly part of a condiment or bar set. | (Figure 56)<br>Stern area |
| 375 | Decanter base, fragment, same as #224. | 4 feet starboard of stern post |
| 331 | Decanter neck fragment, 3 inches, same as #224. | 110 feet / outside starboard gunwale |
| 257a | Window glass fragment, 3/32-inch thick, with faint green tint. | 104 feet on base line (See Figure 14 for broken glass scatter) |
| 374 | Window glass fragment, 3-inch-by-3-inch range, 1/32 – 3/32 inches thick | Stern area. |
| 292 | Urn cast iron, “parfait dish” shape, height 6 inches, base diameter 4 ½ inches, lip diameter 5 ¾ inches. | 113 feet / 8 feet to port |
| 242 | Top to #292, cast iron ornamental dome shape, base 6 ¼ inches diameter, height 5 ½ inches, applied handle on top ornamental. | Stern area |
| 275 | Door furniture, door knobs, lock/latch bolt and keyhole plate, iron housing, 4-inch-by-3 ¼-inch-by-5/8-inch thick; knobs of brown marbled agate ware, porcelain, 2 ¼ inches in diameter with 6 inches knob to knob, keyhole plate ornamental 1 ¾ inches high by ¼-inch wide, wooden door fragment 1-inch diameter, grooved (tongue and groove), length 6 ½ inches, width 4 inches | (Figure 57)<br>125 feet / base line. |
| 239 | Lock, furniture, same as #275, missing knobs; brass lock face plate, 5 ¼ inches long, 7/8-inch wide, 1/8-inch thick, ¼-inch counter-sunk hole center, ¼-inch from either end. | Stern area / center line |
| 301 | Door knob and shaft, similar to #275. Shaft 4 inches long, ¼-inch square, with second knob missing. | 110 feet / 2 feet starboard |
| 290 | Cabinet door latch (sliding type) with hook and eye base. The latch is brass, 2 1/8 inches long by 1 ¼ inches wide, held on by four slotted screws (brass), to a wooden door fragment. Door fragment 5 ¾ inches long by 2 ½ inches width by 1 inch thick, with beveled edge. The hook eye base is oval 1 inch by 1 ½ inches, held by two slot brass screws. | 120 feet / 1 foot to starboard |
| 313 | Cabinet door latch (sliding type) with hook and eye base, complete (no hole). Same as #290 except eye of hook and eye is ¼-inch diameter. Wood fragment 5 inches long, 2 ¾ inches wide and 1-inch thick with beveled edge. | 120 feet / starboard |

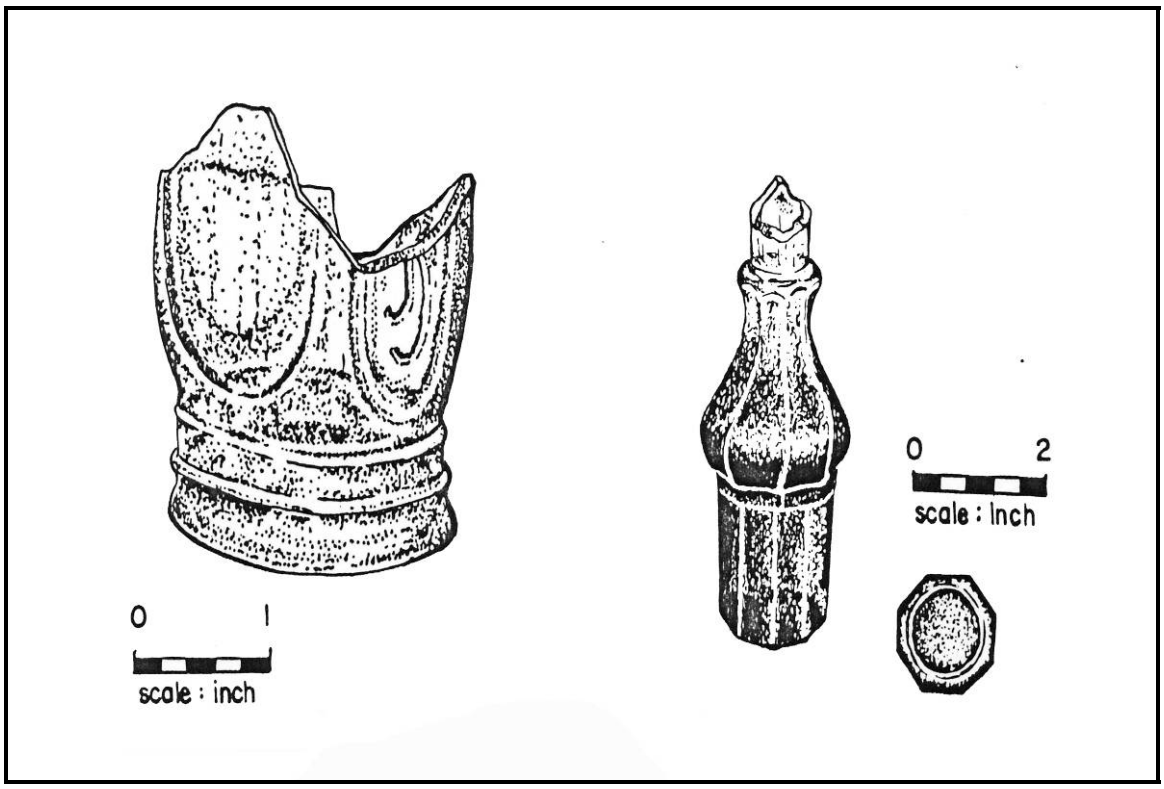


**Figure 53: Artifact #232, ornamental glass container** **Figure 54: Artifact #228, glass cruet container**

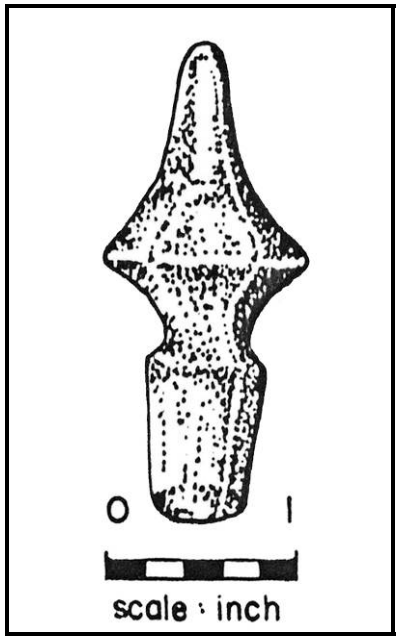


**Figure 55: Artifact #252, glass stopper**

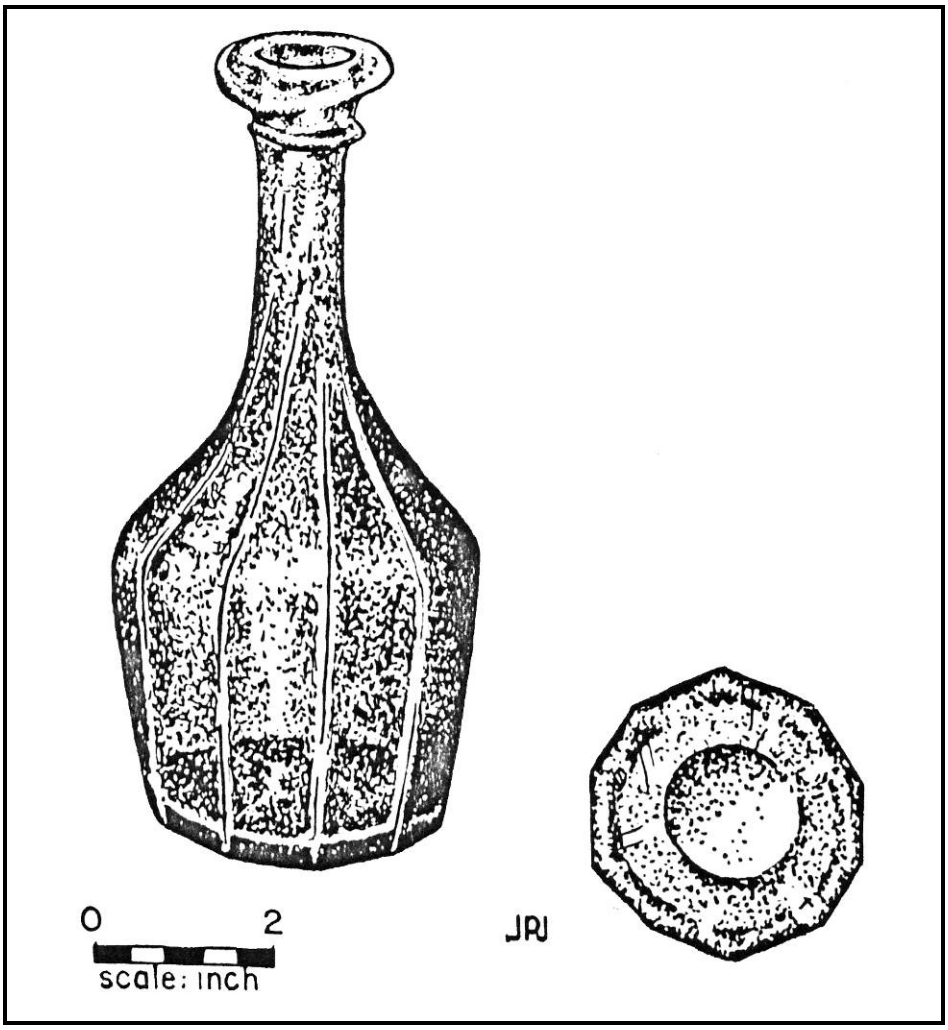


**Figure 56: Artifact #224, clear glass decanter**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 312 | Cabinet door latch, same as #313 | (Figure 58)<br>120 feet / starboard |
| 291 | Cabinet door hook, brass, ½ inches long, eye ½-inch diameter, may be associated with cabinet door latches 313. | 123 feet / 3 feet starboard |
| 253 | Tin can, fragmented, tin-plated sheet metal, 20 gauge, 2 ½ inches by 3 inches, trace of lip on one side. | 95 feet / starboard of base line |
| 280 | Pewter base fragment, 1/16-inch thick profile, diameter 4 inches. | 120 feet / on base line. |
| 297 | Pig humerus, length 5 ½ inches, saw cut proximal end. | 136 feet / 2 feet starboard (near rudder) |
| 244 | Bone, sawed long bone, 3/8 inch thick, 1 ¾ inches outside diameter. | Stern area |
| 269 | Stone, unidentified, possibly handle 4 inches long, 1 5/8 inches wide, and ½ inch thick. | Stern area |

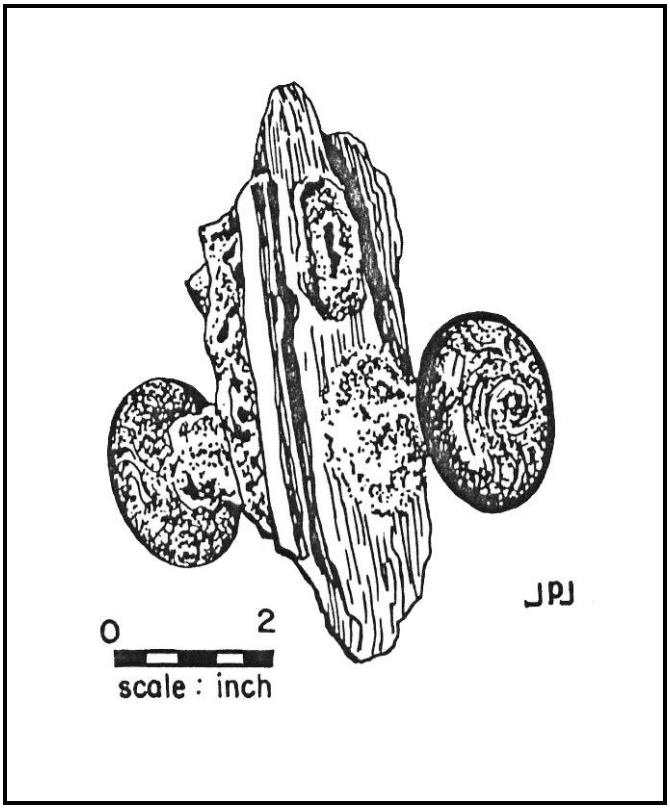


**Figure 57: Artifact 275, door furniture**

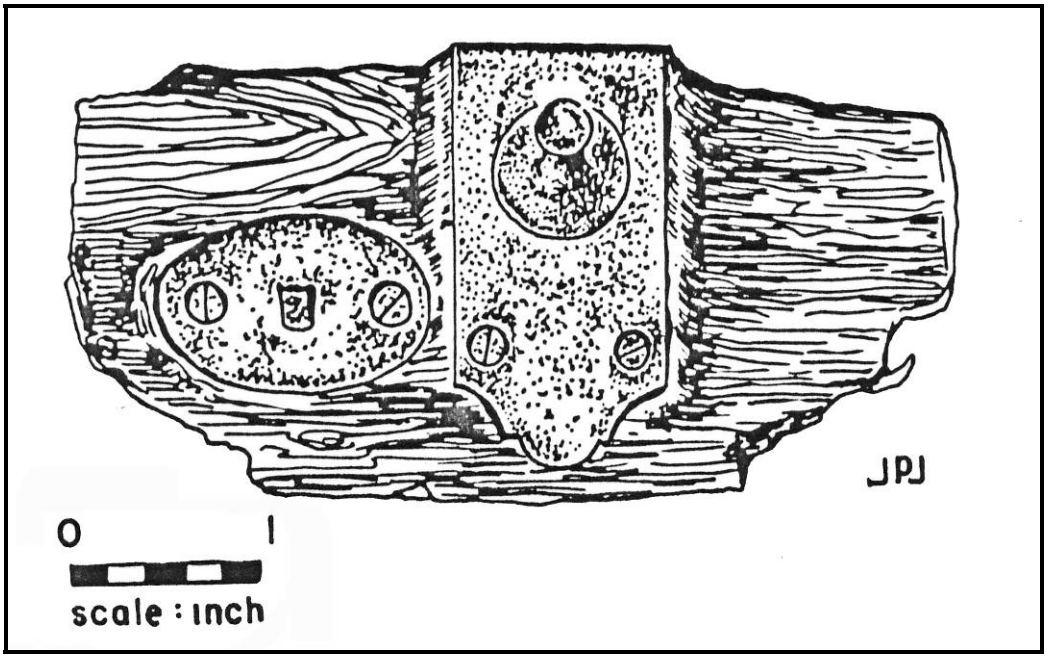


**Figure 58: Artifact 312, cabinet door latch**

## Bow Area

The bow area contained the effects, tools and supplies of the crew. The effects included both the glass and ceramic spirit containers. Tools included the scorper, axe, and cargo hooks. The supplies included paint or caulking, paint brushes, chain, copper wire, containers for the paint or caulking, and containers of nuts, bolts, washers and shims, etc.

A 3-inch-diameter hole in the hull planking was located 17 feet to 23 feet down the base line and some 2 to 4 feet off the center line. This feature was encountered during the initial evaluation and was not relocated for documentation.

*Bow Area Artifacts*

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 303 | Paint brush, horse hair, handle over 4 inches long, 1 ¼-inch in diameter, tapering to ½-inch (as the end is broken off, may have been 5 ½ inches total length like #310). Brush 2 ½ inches in diameter at wrap, held to handle by 10 wraps of 1/8-inch cotton cordage. Horse hairs 4 ½ inches long. Total projected brush length 8 inches. | 16 feet / starboard side of keelson |
| 230 | Wooden handle or fed, 7 inches long, 1-inch diameter, tapering to a point. | Bow area |
| 310 | Wood handle, 5 ½ inches long, 1 inch-diameter, tapering to a point with a tip missing. | 15 feet / 1 foot starboard |
| 309 | Paint brush without handle, horse hair type, heavily worn. | 15 feet / 1 foot starboard |
| 307 | Small keg, disarticulated, approximately one gallon volume, no head, 12 staves; 8 inches long, 6-inch in diameter, traces on white paint. Ferrous hoops (fragments) 5/8 inch wide by 1/32 inch thick. | 16 feet / 1 foot port |
| 306 | Small keg, similar to #307. | 15 feet / 1 foot starboard |
| 308 | Paint can base, tin with residue of paint, approximately 8-inch diameter, with traces of brush hair (horse tail). | 15 feet / 1 foot starboard |
| 354 | Paint block, cylinder shape, white, 7-inch diameter by 3 inches high. | 12 feet 6 inches / 6 – 8 feet starboard |
| 353 | Paint block, cylinder shape, white, 5-inch diameter, 2 inches high, probably from keg #307 | 12 feet 6 inches / 6 – 8 feet starboard |
| 338 | Brass bucket bail, made from 1/8-inch brass road, 10 inches long, loop on one end. | 72 feet / 1 foot port |
| 268 | Open scorper, ferrous, handle missing, cutting head 10 ½ inches. Blade width 1 ¼ inches, heavy wear evident (Post 1820; Slone 1964). | (Figure 59)<br>1 foot / 6 feet port |
| 258 | Axe head, rounded single rock-away bit, 4 ½ inches across, length 7 ½ inches. Poll 1 inch by 3 ¾ inches. Fragment of wooden handle remains in head. | (Figure 60)<br>59 feet / starboard, just outside bilge stringer. |

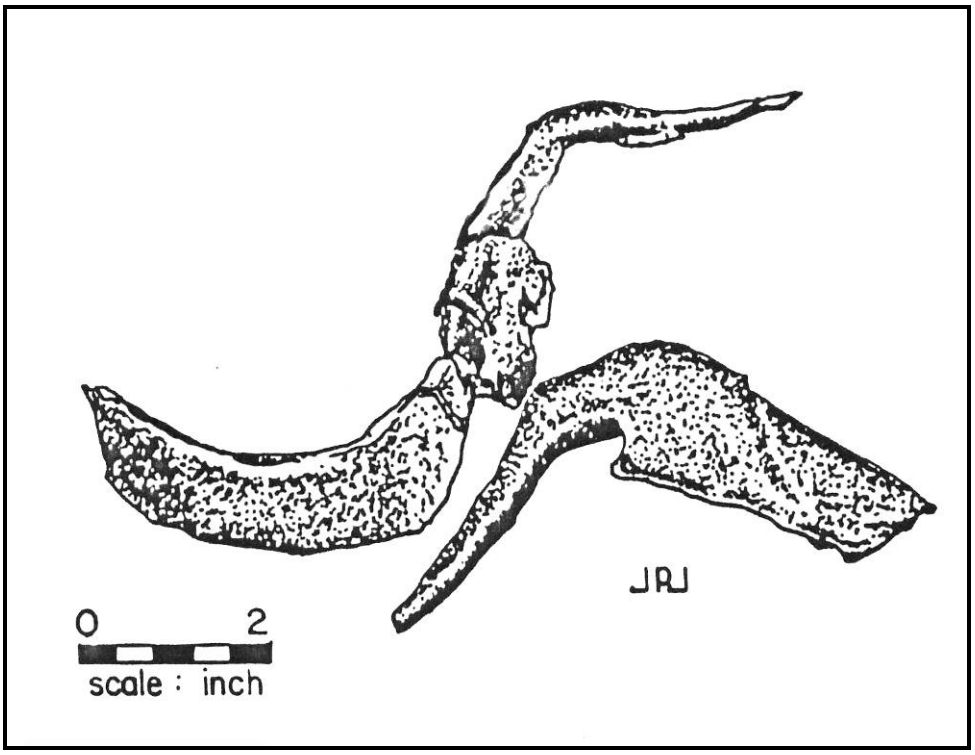


**Figure 59: Artifact #268, open scorper**

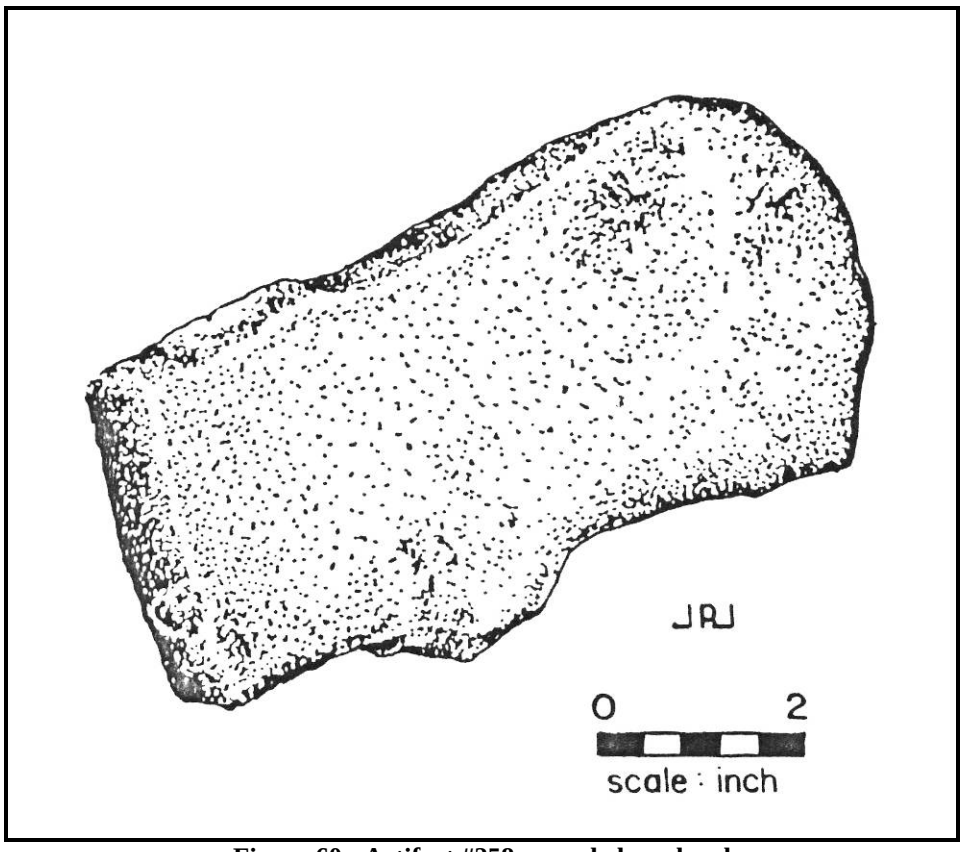


**Figure 60: Artifact #258, rounded axe head**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 311 | Chain, ferrous, 15 foot length, links ¼ inch stock, 1 ½ inches long; chain repaired twice with wraps of brass wire, and once with connecting link made of two piece of 2 1/8-inch-long, ¼-inch-thick iron and held together by two bolts. | (Figure 61)<br>15 feet / starboard |
| 288 | Cargo hook, ferrous, 11 ½ inches long, hook 1-inch, stock throat opening 3 inches, eye forged into 1 ¾ inches inside diameter. | (Figure 62)<br>4 feet / under bow |
| 249 | Cargo hook and thimble, ferrous, 5 ½ inches long, hook ¾ inch stock, throat opening 1 inch, eye forged into 2 ½ inches inside diameter; thimble 1 inch wide, 2 ¼ inches maximum outside diameter. | (Figure 63)<br>20 feet / starboard of base line |
| 323 | Cargo hook, ferrous, 10 inches long, hook 5/8 inch, round stock, throat opening 1 ¾ inches, 2 ¾ inches by ½ inch by ¼ inch, pin through end opposite hook. | 60 feet / starboard, just outside hull |

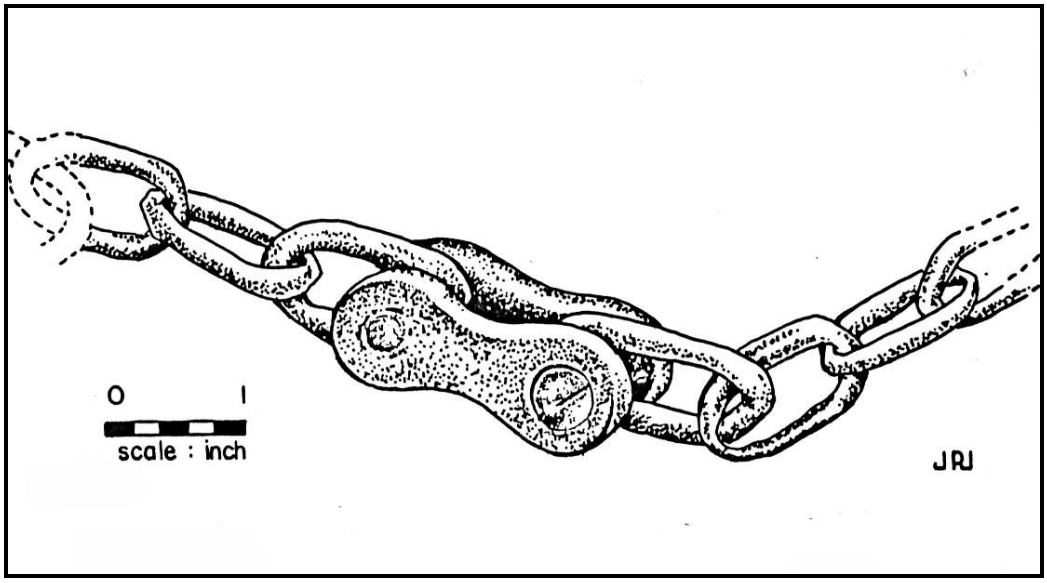


**Figure 61: Artifact 311, ferrous chain**

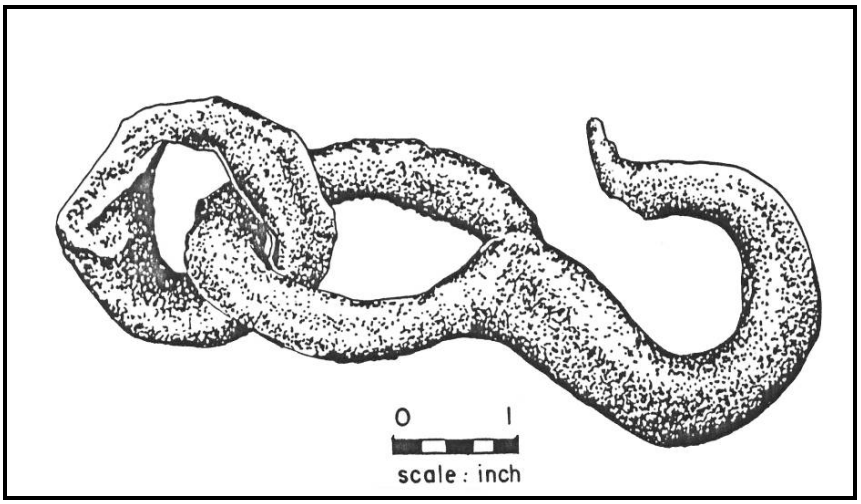


**Figure 62: Artifact #288, ferrous cargo hook**

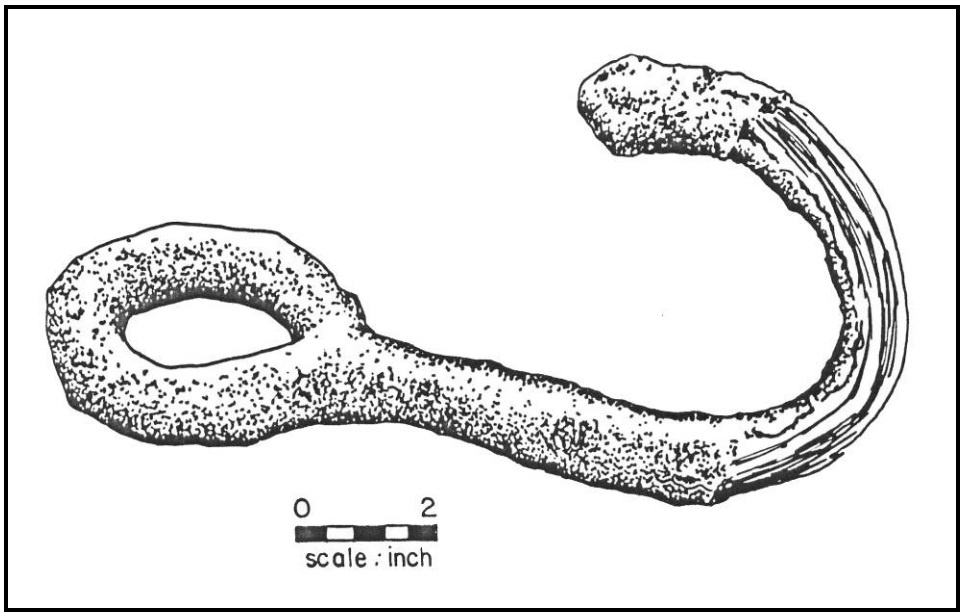


**Figure 63: Artifact #249, ferrous cargo hook and thimble**

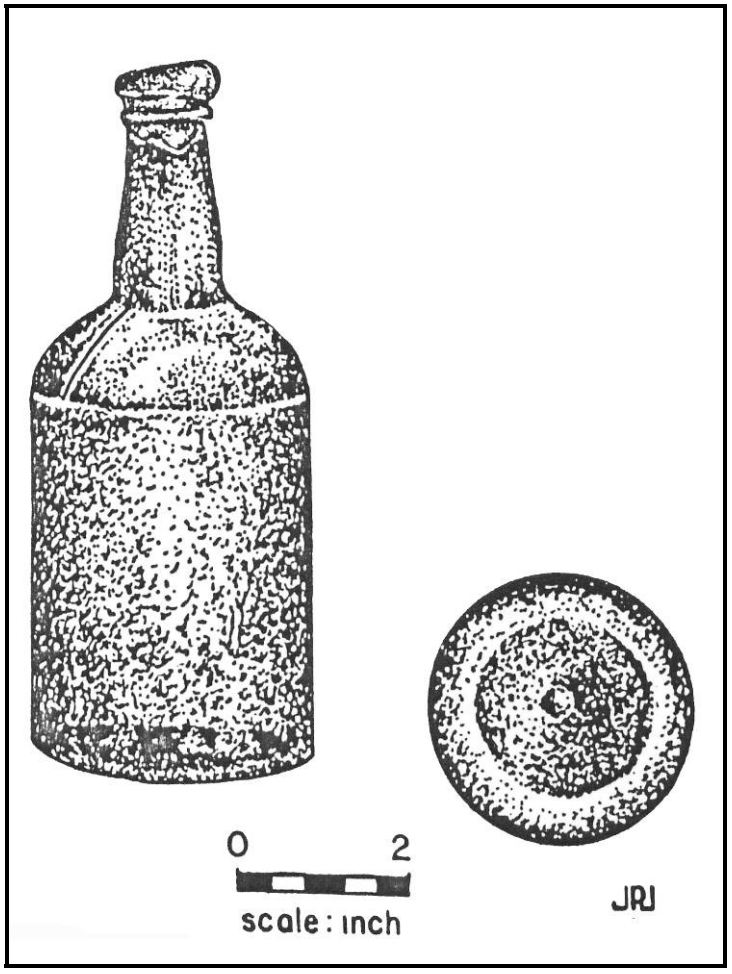


**Figure 64: Artifact #226, dark green glass bottle**

| Artifact Number | Artifact Descriptions | Provenience |
|---|---|---|
| 226 | Bottle, dark green ("black glass"); 3-piece mold, applied lip, height 8 ¼ inches, 3 inch diameter base, 4 inches high to body mold mark, shallow kick-up of base with raised dot at or about center. | (Figure 64)<br>12 feet / 12 inches port |
| 225 | Bottle, dark green, same as #226. | 12 feet / 12 inches port |
| 237 | Bottle, same as #226, lip broken, body cross section oblong rather than round. | 22 feet / 12 inches port. |
| 227 | Bottle, dark green ("black glass"), 3-piece mold, applied lip, height 8 ½ inches, 2 ¾ inches diameter, 4 ¼ inches height to body mold mark, shallow kick-up of base with raised dot off center. | (Figure 65)<br>21 feet / 12 inches port |
| 251a | Shoulder fragment, 2 inches by 2 inches, similar to #227. | 22 feet / 8 inches port |
| 362 | Bottle, same as #227. | 20 feet / starboard side of keelson |
| 363 | Bottle, same as #227 | 20 feet / starboard side of keelson |
| 364 | Bottle, same as #226 | 20 feet / starboard side of keelson |

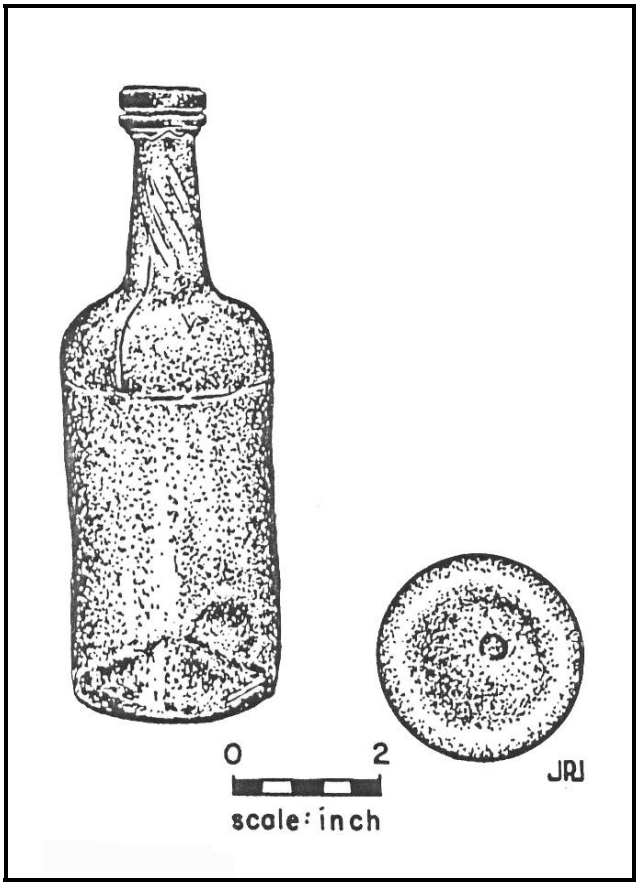


**Figure 65: Artifact #227, dark green glass bottle**

<table>
<tr><th>Artifact Number</th><th>Artifact Descriptions</th><th>Provenience</th></tr>
<tr><td>223</td><td>Ceramic bottle basal sherd, 3 inches diameter base, stoneware, “ginger” beer or ale type, no markings.</td><td>(Figure 66)<br>Machinery area</td></tr>
<tr><td>251b</td><td>Ceramic bottle sherds, five, stoneware, similar to #223</td><td>22 feet / 8 inches port</td></tr>
<tr><td>259</td><td>Concreted conglomerate, approximately ½ bushel containing wood, bolts, nails and nuts</td><td>63 feet / starboard, just outside hull</td></tr>
<tr><td>329</td><td>Concreted conglomerate, ferrous
<table>
<tr><th>Bolts Quantity</th><th>Diameter & Length in Inches</th><th>Head Size</th><th>Nut Size</th></tr>
<tr><td>15</td><td>3/8” x 4”</td><td>3/4” x 3/8”</td><td>3/4” diameter (6 sided)</td></tr>
<tr><td>10</td><td>3/4” x 2”</td><td>1 1/4” square x 3/8”</td><td>------</td></tr>
<tr><td>1</td><td>3/4 x 4 1/4</td><td>eroded</td><td>------</td></tr>
<tr><td>5</td><td>5/8 x 2 3/4</td><td>1” x 1/2”</td><td>1 1/2” sq. x 3/4”</td></tr>
<tr><td>1</td><td>1 x 6</td><td>eroded</td><td></td></tr>
<tr><td colspan="4">Shims hand-cut, all 1/8-inch thick; 21 shims 5/8-inch diameter hole 1 ½ by ¼-inch squarish; 21 shims ½-inch diameter hole 1 7/8 by 2 7/8 inches squarish.</td></tr>
</table></td><td></td></tr>
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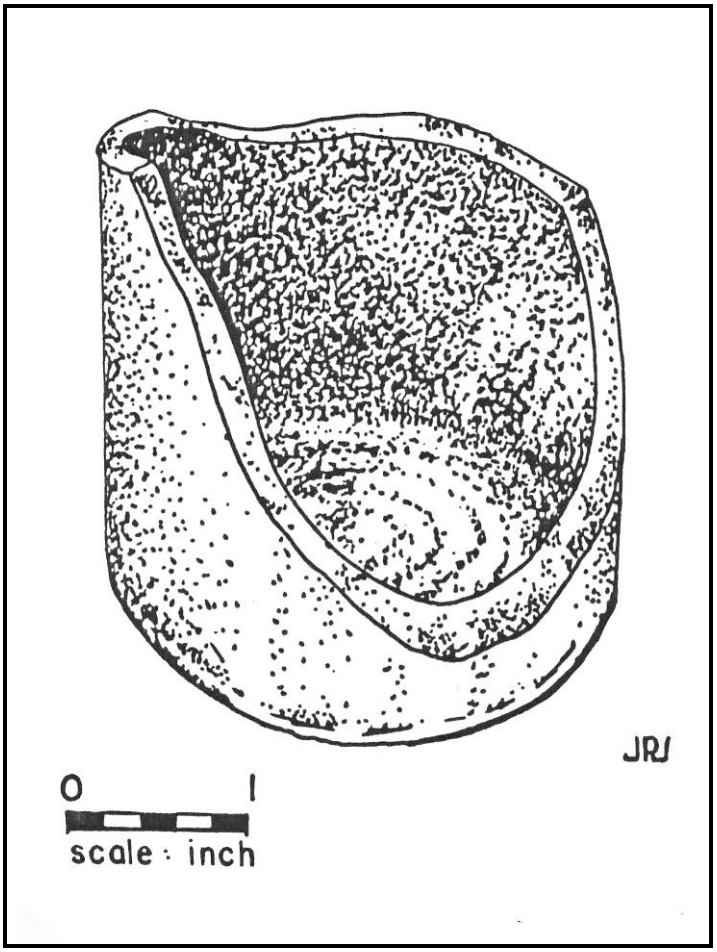


**Figure 66: Artifact #223, ceramic bottle basal sherd**

## History of the Steamship *Spray*

Based on the results of the archaeological investigation, it was estimated that the vessel remains located in the study area dated from approximately 1850 – 1870. The remains indicated that the vessel had been used extensively or for a relatively long period of time. Historical research designed to identify the vessel concentrated on steam vessels of the type and approximate dimensions, period, and location of the remains with particular attention directed toward the unique "banding" technique used in construction of this vessel. Of the more than eighty vessels known to have been lost in the Cape Fear River area since the sixteenth century, more than sixty of them were eliminated at the onset of the historical investigation due to vessel size, type and/or period and location of loss. Intensive research carried out in efforts to identify the remains initially centered on sixteen steam vessels lost in the general vicinity of Wilmington (Table 19). In the course of eliminating all of these vessels as potential candidates, information was located on several additional vessels, including the steamer *Spray*. Identification of the remains in the study area as those of the *Spray* was established six months after completion of the field work and was the result of an article in the Wilmington Star (North Carolina) dated October 23, 1891:

> Government wrecking crews yesterday succeeded in raising the boiler and engine of the steamer *Spray* which was sunk several years ago in the North East Cape Fear River just north of the railroad bridge at Hilton in the northern limits of the city.

The following are the sixteen vessels on which intensive historical research was conducted out of the more than eighty vessels reported lost in the Cape Fear River.

| Name of Vessel | Date Lost | Comment |
|---|---|---|
| *Washington* | 10-14-1870 | Screw, lost below Wilmington |
| *Thorn* | 3-4-1870 | Salvaged opposite Fort Anderson |
| *Sylvan Grove* | 1-9-1871 | Wrong location and engine type |
| *Magnolia* | 2-19-1858 | Below Fayetteville |
| *J. S. Underhill* | 12-24-1878 | Too small, screw, wrong location |
| *Charles Downing (Calhoun)* | 6-22-1855 | Of Georgetown, SC |
| *Twilight* | 11-14-1865 | Screw |
| *Robert E. Lee* | 8-13-1781 or 1785 | Burned, 14 miles below Fayetteville |

| Name of Vessel | Date Lost | Comment |
|---|---|---|
| *James Murray* | 2-16-1876 | Raised |
| *Northeast* | 12-23-1878 | Wrong location |
| *Governor Worth* | January, 1881 | Salvaged below Fayetteville (30 miles below) |
| *Clinton* | February, 1881 or 9-2-1882 | 22 miles up the Cape Fear River |
| *Wave* | 6-2-1884 or 3-6-1885 | Wrong location |
| *Bladen* | 2-21-1886 | Wrong location |
| *Excelsior* | 4-19-1887 | Screw |
| *Regulator* | 10-19-1887 | Wrong location |
| Sources: Lytle List, Proceedings of the Annual Meeting of the Board of Supervising Inspectors of Steam Vessel. The North Carolina Underwater Archaeology Branch Shipwreck files and the Wilmington Newspaper files. | | |

**Table 19: Vessels lost in the Cape Fear River**

There is relatively little historical data available on the *Spray*. It was built by Pusey and Jones in 1852 at Wilmington, Delaware, and appeared on the index of vessel plans for that firm, although no actual plans were identified. The document indicated that the vessel was powered by two engines, numbered nine and ten, both having a 10-inch-diameter piston and a 48-inch stroke. The engine data were confirmed by a history of engines made by Pusey and Jones (Eleutherian Mills Historical Library, M. S.). Table 20 compares the site data with historical structural data. Unfortunately, no plans or drawings for this vessel have been located. Enrollment Number 15, from Wilmington, Delaware dated May 20, 1852 gives the following information on the *Spray*:

> "Abrahan Statts having certified that the said ship or vessel has one deck and no mast and that her length is one hundred and thirty three feet her breadth eighteen and 5/10 feet her depth four and 5/10 feet and that she measures one hundred and six tons and 91/95 that she is a steam boat has no galley and head."

| Historical Structural Data | | | |
|---|---|---|---|
| | Enrollment Documents | Wilmington Newspaper | Site Data |
| **Length** | 133 | 140 | 133 |
| **Width** | 18.5 | 18 | 17.25 |
| **Depth of Hold** | 4.5 | --- | 4.46 |
| **Tonnage** | 106.96 | --- | --- |
| **Engine** | --- | Two 50 horsepower | 10 inch diameter piston and 48" stroke |

**Table 20: Historical Vessel Structural Data**

The *Spray* was purchased by A. H. Van Bokhelin of Wilmington, North Carolina, in January, 1853. In March of that year it was operating as a passenger vessel on a tri-weekly basis between Wilmington and Smithville (now Southport). When offered for sale by Van Bokhelin in 1854, the vessel was advertised as matching "the speed of any boat her size." Van Bokhelin owned the *Spray* until at least 1858, when newspaper advertisements listed it as still making regular trips between Wilmington and Smithville (Wilmington Journal, 1853-1858). After this date advertisements stopped for no apparent reason. A reference to the *Spray* appeared in a publication by Wilmington historian James Sprunt who cited the vessel as being in service between Wilmington and Smithville and described her as "shaped like a barrel, hooped up on the sides." In 1861 the *Spray* was turned over to the Confederacy (Lytle and Holdcamper 1975).

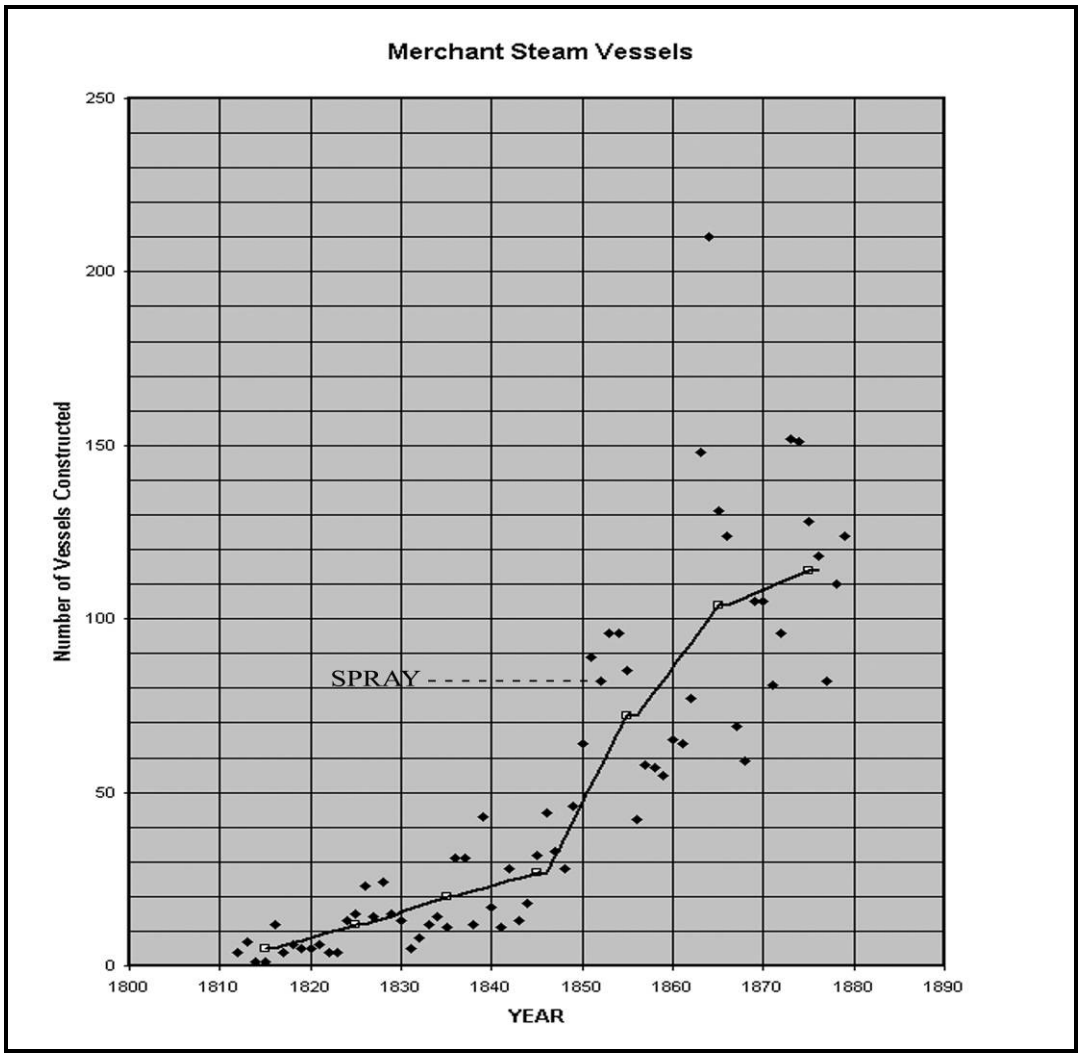


**Figure 67: Merchant steam vessel constructed per year.**

**Line represents vessels constructed per decade (Fassett 1949)**

The *Spray* was one of eighty-two steam propelled merchant vessels and 1,169 total merchant vessels built that year on the Atlantic Seaboard (Fassett 1949). The development of stout coastwise steamships was rapid, and by 1850 the primary steam coastwise and channel services had been established (Fassett 1949). The major ship building centers on the seaboard were at New York and Delaware where this vessel was constructed. Some locally built vessels were being produced on the Cape Fear River system itself, with the boats being fashioned at Fayetteville and the steam plant set in at Wilmington (Johnson 1977). Figure 68 illustrates the position of the *Spray* relative to other merchant steam vessels built on the Atlantic Seaboard between 1812 and 1880 (Fassett 1949). As mentioned previously, most of the development of coastal steam craft occurred prior to 1850. This was also the period when the least number of vessels per year were constructed. After 1850 the construction activity more than tripled that of any of the preceding periods. Almost all of the vessels constructed prior to 1850 were coastal or riverine craft. It was not until after 1848 that America started to build ocean-going steam vessels (Fry 1896) in any appreciable number and then it was a gradual increase. Therefore, the *Spray* cannot be considered an extremely rare site. Wreck sites prior to 1850 would tend to be fewer in number, with the greatest amount of variation in architecture and technology. Rarity is one factor used to access the museum quality of a site. Other factors are condition, history and scientific (information) value.

A documented date of loss for the *Spray* has not been located. It is possible that it was one of several vessels taken up river and burned and/or scuttled to avoid capture by Federal troops at the fall of Wilmington in 1865. The *Spray* has not been found again in any historical documentation until 1891 where in the Wilmington Star it states that the government wrecking crew removed the boiler and one engine from the *Spray*. The North East Cape Fear River came under the Corps of Engineers jurisdiction for improvements or maintenance in 1889 – 1890. A search of the Corps of Engineers Annual Reports from 1889 to 1915 came up with only one reference to a wreck removal in our study area. There appears in the 1893 Corps Of Engineers, Wilmington District Annual report in the summary of logs, snags, etc.: "Removed from the channel 215 trees, 209 logs, 129 stumps, 8 large snags, 90 cords of small snags, and parts of an old steamboat and boiler ..." At that time they were working between Smith's creek and the Hilton Railroad Bridge, two miles above Wilmington and clearing a channel one-half mile long with a width of three hundred fifty feet and a depth of six feet at low water (Vol.11., 1893 Corps of Engineers Annual Report for the Wilmington District). The evidence of boilers being removed in 1891 and in 1893 suggests that there were two boilers on the *Spray* or an error occurred in the Corps of Engineers

Annual Report preparation, including an event which took place two full years earlier. The vessel had to have extended above the bottom over nine feet. This would indicate that the stern cabin and paddle boxes would have been intact at that time.

As indicated the *Spray* was built as a packet steamship with passenger service as its primary economic purpose. To achieve speed and light draft, it appears that the builders varied from published formulas. Most of the internal structural members have been reduced by one-half from specifications given by Hedderwick, 1830. Examples of this reduction follow:

| Vessel Parts | Hedderwick's Formula | Suggested | Data |
|---|---|---|---|
| Depth of hold | Less than 5/9 breadth but more than ½ breadth | 10.20 feet<br>9.25 feet | 4.5 feet |
| Planks | 1/8 thickness for each four-foot length | 4.15 inches | 2 inches |
| Keelson | 3/4 inch for every foot breadth | 13.88 inches | 6 inches |
| Engine timbers | Same as keelson | 13.88 inches | 6 inches |
| Whales | 1/4 thicker than planks | 5.2 inches | 3 inches |

**Table 21: Hedderwick's formula for vessel construction**

The *Spray* specifications are similar with Hedderwick in several areas. His 6:1 ratio for length to beam is not far from the *Spray*'s 7:1. This difference is a function of change i.e. speed (Hedderwick 1830: Lindsay 1874) and is in accordance with the *Francis Skiddy* 1849 with an 8:1 ratio (Chapelle 1976), *Southerner,* 1852 with a 6.97:1 ratio (Johnson 1977), and the *Menemon Sanford* 1854, with a 7.26: 1 ratio (Short and Sears 1966), etc. Hedderwick notes that the engine timbers are to extend past the machinery area at least one-half the length of the beam, which for the *Spray* would be 9.25 feet. The machinery timbers are projected to extend 10 to 13 feet in either direction. The third point that appears to be the same is his commend "the trusses from the bilge upward with vertex below paddlewheel shaft", fit and elaborates on our reconstruction analysis (Figure 26).

## Site Evaluation and Recommendations

Evaluation of National Register significance for any site is rather subjective. In an attempt to more objectively view this cultural resource, the following aspects were considered: architecture (the vessel remains), archaeology (the vessel and its contents), history of the vessel and the museum quality of the vessel. These aspects were also viewed on an inter-site and intra-site basis.

*Architecture*

The *Spray*, built in 1852, is not an extremely rare vessel when compared with those built on the Atlantic Seaboard in the preceding four decades. It was built in Delaware at one of the two major Atlantic coast maritime centers after most of the merchant steamship building techniques had already been developed. Its gracile construction was novel, using banding to replace most of the upper frame and reducing the size and weight of its component timbers. This particular construction detail is known to be available only at this wreck site. Neither plans nor descriptive records other than what have been presented are known to be available and no photographs or drawings of the vessel could be located. It is felt that most of the construction data which could be documented from this site have been recorded. The costs in comparison to the data return precluded any further work, with the exception of the specific recommendations which will be discussed later.

The site's physical remains are limited to only ten to twenty percent of the vessel structure. The natural processes of the environment and the U. S. Army Corps of Engineers have reduced the site to just its lower 20 inches, not counting the composite keel, with 30 feet of this hull area missing.

The *Spray*, on an intra-site basis, cannot be viewed in the same way as either the *USS Monitor*, which revolutionized marine warfare, or the *Clermont*, the first commercially successful steam propelled water craft. Using the available historical data, this banding technique does not appear to be a milestone in maritime history.

*Archaeology*

Most of the remains of the vessel have been documented, along with a fair sample of its sparse artifactual content. The site did not possess a large quantity of cultural material. The inter-site contents have been discussed and documented, along with the environmental setting, which demonstrates the hydrological alteration to the environment caused by the shipwreck.

*History*

Relatively little is known about the vessel other than what has already been stated. Historically, this site does not appear to have been associated with any prominent local, regional or national events.

*Museum Quality*

As noted in the architectural section of this evaluation, very little of the vessel remains. What does remain, if recovered, would require an interpretive statement, as it is doubtful that very many viewers would recognize what they were observing.

The *Spray* seems to be of minimal scientific research value. Its unique construction has been documented. Accordingly, this site does not seem to be eligible for inclusion on the National Register of Historical Places. This determination could be changed if the Wilmington Historical District was altered to include this site. The site could then be a contributing factor to the district. The site might also be included on the register if the wreck were made a part of a thematic group along with other river craft that have been abandoned over a long period of time in the Cape Fear and the Northeast Cape Fear Rivers in the vicinity of the Wilmington waterfront. This thematic group could develop the general riverine activity for past periods in the history of the Wilmington waterfront, preserving variations in and evolution of watercraft and their propulsion systems.

If the site is placed in any danger of destruction, the following artifacts or artifact areas should be removed, using heavier equipment than was available during the initial investigation:

1. Rudder
2. Crank shaft
3. Large iron rods northwest of the crank shaft
4. Any diagnostic artifacts lying under the crank shaft.

The above recoveries would aid in the understanding of steam technology for this period. Several authors state that this technology was crude. At this time, however, the firm of Pusey and Jones not only were using the expansion valve touted for its efficiency in the late eighteen-hundreds, but an exhaust valve.

The above evaluation and recommendations are not meant to suggest that the site is not an extremely important contribution to our maritime history. It has furnished invaluable data on an unknown ship building technological tradition and an understanding of how poor and incomplete conventional historical source materials area.

**Appendix A**

Enrollment Documents

National Archives

Enrollment No. 15: May 20, 1852
Wilmington, Delaware

Richard B. Gilpin of the City of Wilmington, New Castle County and State of Delaware having taken or subscribed the affirmation required by the said Act, and affirmed that he the said Richard B. Gilpin is a citizen of the United States, sole owner of the steam ship or vessel called *Spray* of Wilmington whereof I. H. Timmons is at present Master, and as he hath sworn is a citizen of the United States and the said ship or vessel was built at Wilmington state of Delaware in the year eighteen hundred and fifty two as per certificate of Richard Gilpin Iron Steamer Boat Builder as per certificate remaining on file in this office dated May 20, 1852.

And Abrahan Staats having certified that the said ship or vessel has one deck and no mast and that her length is one hundred and thirty three feet her breadth eighteen and 5/10 feet her depth four and 5/10 feet and that she measures one hundred and six tons and 91/95 that she is a steam boat has no galley and head. And the said Richard B. Gilpin having agreed to the description and measurement above specified and sufficient security having been given, according to the said Act, the said St. Boat has been duly enrolled at the Port of Wilmington this Twentieth day of May in the year one thousand eight hundred and fifty two.

Abraham Staats D Coll (Deputy Collector)'

National Archives

District of Delaware Port of Wilmington
January (?) 4 1853 John F. (?) Robinson having taken the oath required by law is Master in lieu of I. H. Timmons late master.

Abraham Staats

I Abraham Staats C. Coll of the Port of Wilmington Delaware do certify the within Enrollment is a true copy of the original remaining on file in this office the former enrollment having been lost or mislain or in possession of former captain which he refuses ( lost ) to the owner. As witness my hand ( lost ) of office this 4th of Jan 1853.

Abraham Staats

National Archives

Wilmington, N. C.
Enrollment No. 4 March 7, 1856

A. H. van Bokelin owner ½ together with Herman H. Robinson
J. B. Price Master

National Archives

Wilmington, N. C.
Enrollment No. 31 8th day September 1855

Property change
A. H. van Bokelin Owner
John B. Price Master

## Appendix B

Newspaper Advertisements

*Spray*
Wilmington Daily Journal, December 22, 1854; January 5, 1855
Steam Boat for Sale
"The 'Steamer *Spray*' length 140 feet, breadth 18 feet, draws less than 24 inches has two engines of 50 horse power each, is fitted up for carrying passengers, having excellent accommodations for same, has capacity of large quantity of freight, speed equal to any boat of her dimensions, two years old, warranted in good order.
For terms, which will be accommodating, apply in person or by letter to the subscriber at Wilmington, North Carolina."
December 16, 1854 87.1 m A. H. Van Bokkelen

Wilmington Daily Journal, December 27, 1854 – March 1855
Steamer *Spray*
"All persons having claims against the Steamer *Spray* will please not fail to render the same immediately to the subscriber.
All persons who may be indebted to said Steamer will call and settle when convenient.
It is desirable that both sides of the question should be fully discussed in order that a final decision may be made upon the accounts of the steamer."
December 16, 1854 A. H. VanBokkelen

Wilmington Daily Journal, January 6, 1855
Copartnership
"I have this day associated with my brother William A. M. VanBokkelen under the style and form of VanBokkelen and Brother for the purpose of carrying on the business of purchasing and manufacturing Naval Stores also Cooperage, Wharfage, and Storage of produce of all kinds."
Wilmington, North Carolina, January 1, 1855.

Wilmington Journal, January 14, 1853
"A. H. VanBokkelen, commission merchant of Wilmington, N. C., has lately purchased the steam *Spray* of Wilmington, Delaware. The *Spray* will, we learn, be placed upon the Cape Fear River, between Fayetteville and Wilmington."

Wilmington Journal, March 18, 1853
The Steamboat *Spray*, commanded by Capt. Sterett, well known as a most skillful seaman, is now making regular tri-weekly trips between Wilmington and Smithville. The *Spray* is a handsome and swift boat."

Wilmington Journal, May 5, 1853
"Excursions to Oak Island – Steamer *Spray* will make excursions every Saturday during month of May to Oak Island, visiting Fort Caswell, and landing at Smithville and Orton. Tickets $1.00, children under 12 years half price."
May 5, 1853 A. H. Van Bokkelen

Wilmington Journal, June 10, 1853
"We are requested to state that the Steamer *Spray*, having been arranged in compliance with the new government law, resumed her regular trip to Smithville on Tuesday morning, 7th last."

(Note: The compliance notation most likely refers to the Merchant Steam Vessel Navigation Act enacted by Congress in 1852.)

Wilmington Journal, July 8, 1853
"German volunteers chartered the Steamboat *Spray* on 4th of July celebration in Wilmington."

Wilmington Journal, May 26, 1854
Advertisement for new schedule.

Wilmington Journal, June 15, 1855
"Steamboat *Spray* for Smithville – The U. S. Mail Steamer *Spray* John B. Price, Master, will leave Wilmington for Smithville on Tuesday, Wednesday, and Thursday afternoon at 3:00, and Saturday afternoon at 4:00. Leave Smithville for Wilmington Monday, Wednesday, and Thursday and Friday mornings at 6:00. Passage - $1.00, children and servants half price. Freight at customary rates. Apply to Captain on board or to A. H. Van Bokkelen, No. #5 Wharves."

Wilmington Journal, June 29, 1855
"4th of July excursion – Steamer *Spray* will make an excursion to Smithville, Fort Caswell, and Baldhead on Wednesday, 4th of July next, returning same evening. John B. Price, Captain."

Wilmington Journal, November 16, 1855
Steamboat *Spray* – change of schedule

Wilmington Journal, December 5, 1856
"Two men drowned when four men in a small boat attempted to board the Steamboat *Spray* at Orton and upset."

## Appendix C

Persons Involved with the *Spray*

| | | | |
|---|---|---|---|
| Pusey and Jones | 1852 | builders | Wilmington, Delaware |
| R. B. Gilpin | 1852 | owner | Wilmington, Delaware |
| I. H. Timmons | 1852 | master | Wilmington, Delaware |
| J. F. Robinson | 1853 | master | Wilmington, Delaware |
| A. H. Van Bokkelen | 1853 | owner | Wilmington, North Carolina |
| Captain Sterett | 1853 | master | Wilmington, North Carolina |
| J. B. Price | 1855 | master | Wilmington, North Carolina |
| H. H. Van Bokkelen | 1856 | co-owner | Wilmington, North Carolina |

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Report of Examination of Northeast River, North Carolina (United States Public Document, 59th Congress, 1st Session. House Document No. 229).

Report of Examination and Survey of Northeast Cape Fear River, North Carolina, from its Mouth to Hallsville (United States Public Document, 62nd Congress, 3rd Session. House Document No. 1356).

Report on Preliminary Examination of Northeast Cape Fear River, North Carolina, for a Distance of about 3 miles above Hilton Bridge (United States Public Document, 63rd Congress, 2nd Session. House Document No. 802).

Report on Preliminary Examination and Survey of Northeast Branch of Cape Fear River, North Carolina (United States Public Document, 61st Congress, 2nd Session. House Document No. 867).

Report on Reexamination of Cape Fear River at and below Wilmington, North Carolina (United States Public Document, 76th Congress, 1st Session. Senate Document No. 83).

Report, Together with Accompanying Papers and Illustrations, Containing a General Plan for the Improvement of Cape Fear River, North Carolina (United States Public Document, 73rd Congress, 2nd Session. House Document No. 193).

Report, Together with Accompanying Papers and an Illustration on Reexamination of Cape Fear River, North Carolina, at and below Wilmington (United States Public Document, 76th Congress, 1st Session. House Document No. 131).

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