Technical Report
Marine Archaeological Documentation and Assessment

New Bedford Harbor Superfund Site
Unanticipated Shipwreck Discovery
Acushnet River
Acushnet, Massachusetts

September 2010

Prepared for:

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TECHNICAL REPORT

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New Bedford Harbor Superfund Site
Unanticipated Shipwreck Discovery

New Bedford Upper Harbor
Acushnet, Massachusetts

by

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MANAGEMENT ABSTRACT

In July 2009, an unanticipated shipwreck discovery was made during remediation activities at the New Bedford Harbor Superfund Site in Bristol County, Acushnet, Massachusetts. In response to the discovery, a marine archaeological documentation and assessment investigation was undertaken on behalf of the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers, New England District between August 2009 and August 2010. The investigation involved performing a marine remote sensing field survey to assess site integrity and identify additional shipwreck elements potentially still lying on the harbor floor, the subsequent recovery of identified additional shipwreck elements, the documentation and analysis of hull timbers and artifacts recovered from the site, and archival research to identify the wreck and assess its significance and National Register eligibility. The study resulted in the identification, recovery and documentation of the ship's remains, and the assessment that the site lacked contextual integrity. The recovered hull components and artifacts were determined to be either too degraded and/or too contaminated to be conserved and curated. Archival research in combination with the analysis of the remote sensing survey and archaeological data suggests that wreck dates from the late eighteenth century and likely represents the remains of a once-common class of ship - the 100-ton inter-colonial-West Indies merchant vessel. The discovered ship remains appear to be those of a vessel that was abandoned at the end of its service life and left derelict on the eastern edge of the Acushnet River. Given that the site lacks contextual integrity, it is assessed to be non-National Register eligible; therefore, no further investigation of the New Bedford Harbor Superfund Site's unanticipated shipwreck discovery location is recommended.

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1.0 INTRODUCTION

This report presents the results of a marine archaeological documentation and assessment investigation conducted between August 2009 and August 2010 by Fathom Research, LLC (Fathom), in association and under contract with CR Environmental, Inc. (CRE). The study was necessitated by an unanticipated shipwreck discovery made in July 2009 at the New Bedford Harbor Superfund Site (NBHSS) in Bristol County, Acushnet, Massachusetts. The unanticipated discovery occurred during debris removal operations conducted as part of a hazardous materials remediation project being undertaken at the NBHSS by the New England Office of the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers, New England District (USACE-NAE), and their contractors - Jacobs Engineering Group, Inc. (Jacobs), Sevenson Environmental Services, Inc. (SES).

To assist the EPA and the USACE-NAE in the compliance with federal, state and local legislation pertaining to the preservation and protection of submerged cultural resources within the NBHSS, a variety of project tasks were completed. These tasks included:

- archival research to identify the wreck and assess its historical significance;
- marine remote sensing field survey to assess site integrity and identify additional shipwreck elements potentially still lying on the harbor floor;
- field recovery of identified additional shipwreck elements; and
- documentation and analysis of the assemblage of hull timbers and artifacts recovered to date.

1.1 Project Location and Description

The unanticipated shipwreck discovery site is located within the NBHSS. The NBHSS encompasses an area extending from the shallow northern reaches of the Acushnet River estuary south through the commercial port of New Bedford Harbor and adjacent areas of Buzzards Bay (Cox, Jr. 2000). Sediments comprising the harbor floor within the NBHSS are contaminated with high concentrations of many pollutants, notably polychlorinated biphenyls (PCBs) and heavy metals deriving from the industrial and urban development surrounding the harbor. To more effectively address the remediation of these contaminants, the NBHSS was divided into three management areas – the Upper, Lower and Outer harbors – based on its geographical features and levels of contamination. The Upper Harbor management area where the debris removal activities were taking place at the time of the unanticipated shipwreck discovery extends from a point slightly north of the Wood Street Bridge to the Coggeshall Street Bridge. It is this portion (also known as the Upper Harbor) of the NBHSS that is the most contaminated with concentrations of PCBs, currently up to 4,000 parts per million (ppm) in some areas (David Robinson [Fathom Research, LLC (Fathom)], personal communication with Carl Wilson [Jacobs NBHSS Site Safety and Health Officer, July 2009]; Cox, Jr. 2000).

The unanticipated shipwreck discovery was made within the NBHSS's Upper Harbor management area on the eastern or Acushnet side of the Acushnet River, south of the Wood Street bridge along the undeveloped Acushnet shoreline and directly across from the former Aerovox property, which was the point source for the majority of the PCB contaminants (Figures 1-1 and 1-2). As a consequence of its location, the unanticipated shipwreck discovery site is in a highly contaminated area and the shipwreck

remains must be considered to be hazardous materials (Anthony Mackos, USACE-NAE, letter to Brona Simon, MHC, August 13, 2009 [included in Appendix A of this report]).

The debris removal process that was being conducted in preparation to remove the highly contaminated sediments from the Upper Harbor area is the precursor to the dredging and remediation of contaminated sediments within the NBHSS, and was being undertaken to remove debris that could impede the progress of, or cause damages to, the dredge (Figure 1-3). The debris removal process being performed in the NBHSS involves using a barge-mounted machine fitted with a large, hand-like "grabber" that can open and close to pick objects up off the harbor floor (Figure 1-4). The debris removal process is conducted in a systematic manner within each remediation cell in order to ensure that potentially damaging debris is removed from the sediments prior to the initiation of dredging operations. Impacts from the debris removal process to any submerged cultural resource embedded in the surface of the harbor floor, such as a wooden shipwreck, would be significant and permanent in nature.

To avoid such impacts, prior to the initiation of site remediation activities within the NBHSS, the terrestrial and marine portions of its Area of Potential Effect (APE), including the unanticipated shipwreck discovery location, were subjected to phased archaeological investigations. These investigations, conducted in 1999, consisted of an archaeological background study and sensitivity analysis of the surrounding lands and intertidal areas by Fitts et al. (2000) and a pre-disturbance marine remote sensing archaeological identification survey by Cox, Jr. (2000). The purposes of these investigations were to assess the NBHSS's archaeological potential and to identify submerged cultural resources (e.g. shipwrecks) located within it. These investigations were followed by a series of subsequent terrestrial archaeological investigations conducted by JMA and the Public Archaeology Laboratory, Inc. (PAL).

Background research and the sensitivity analysis conducted by Fitts et al. (2000) resulted in the development of comprehensive pre- and post-contact cultural contexts for the NBHSS APE, and the conclusion that the archaeological sensitivity of the Upper Harbor area on the shore and in the intertidal waters adjacent to where the unanticipated shipwreck discovery was made was limited to pre-contact period resources (Figure 1-5). Archival research conducted by Cox, Jr. (2000) to assess the archaeological potential of the underwater portion of the NBHSS prior to the performance of the marine remote sensing archaeological survey of the harbor focused specifically on the maritime history of the port of New Bedford and the adjacent harbor towns Acushnet and Fairhaven. The Cox, Jr. (2000) study concluded that the area had a long history of maritime activity dating back to the early 1600s, and that this activity would have produced a broad spectrum of different types and ages of vessels, an unknown percentage of which were deposited into the NBHSS's archaeological record. Included among these vessels were more than 30 ships that were burned within the harbor by British forces during the Revolutionary War in an attack on New Bedford and Acushnet carried out on September 5, 1778 (Cox, Jr. 2000; Crapo 1840; Howland 1907; Pease and Hough 1889; Ricketson 1858). Cox, Jr. (2000) also concluded that it was "high unlikely" that any intact wrecks would remain within the navigable portions of the harbor, since they would have been removed long ago as hazards to navigation (Cox, Jr. 2000). Shallow water depths in the Upper Harbor apparently precluded the use of all but the magnetometer during Cox, Jr. /Dolan Research, Inc.'s (DRI) survey of the area; therefore, no side scan or sub-bottom data were recorded at the location where the unanticipated shipwreck discovery was made (Figure 1-6). The DRI magnetometer survey produced no magnetic anomalies of significance at the shipwreck find spot (Figure 1-7) (Cox, Jr. 2000).

Events leading up to this study began on July 13, 2009, when USACE-NAE archaeologist, Marcos Paiva, was informed about the unanticipated shipwreck discovery by the USACE-NAE's on-site Project Engineer, Paul L'Heureux, shortly after the shipwreck timbers were encountered during debris removal operations. Following their discovery, the timbers were transferred from the debris removal barge to a secure spot on shore at the NBHSS Sawyer Street facility (Paiva July 16, 2009 [see Appendix A]) (Figure 1-8).

Immediately after the shipwreck's remains were encountered, the Unanticipated Discoveries Protocol developed by Foster Wheeler Environmental Corporation (FWEC) in 2003 for the NBHSS to address incidental discoveries of cultural resources and human remains was put into action. All remediation-related work in the area of the unanticipated shipwreck discovery was stopped, and a 100-x-250-foot (ft) (30.5-x-76 meter) (m) no-work buffer zone encompassing the find site was demarcated. Debris removal operations were redirected to other areas within the NBHSS, and the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (MBUAR) were notified of the discovery and invited to the NBHSS to meet with EPA and USACE-NAE representatives to inspect the find and discuss the next steps in the unanticipated discovery site management process (Paiva email to Edward Bell, Senior Archaeologist, MHC and Victor Mastone, Director, MBUAR, July 13, 2009).

On July 16, 2009, USACE-NAE Archaeologist, Marcos Paiva, MBUAR Director, Victor Mastone, and this report's principal author, David Robinson (who was invited to the meeting by Mastone), met at the NBHSS with representatives from the EPA, USACE-NAE, Jacobs, and SES to examine the recovered remains of the shipwreck and discuss options for moving forward (Figures 1-9 and 1-10).

This initial and preliminary examination of the shipwreck find revealed that it consisted of the completely disarticulated, broken, and partially intact remains of the lower hull of a wooden sailing vessel. Based on a paced distance along the five recovered fragments of the vessel's keel, the original length of the hull was estimated to be about 70 ft (21.3 m). In addition to the keel, the other vessel remains that were recovered during the July debris removal process included: 11 floors (i.e., the lowermost framing timbers that crossed the keel), all of which appeared to come from the after third of the hull; several futtocks (secondary framing timbers); and several large planking fragments, some of which appeared to be portions of the lowermost run of hull planking (i.e., the "garboard strake") that fitted into a horizontal groove or rabbet cut into the upper corners of the keel along its length. Use of single, instead of double-sawn frames, roughly hewn from naturally grown-to-shape "compass" timbers and fastened with faceted treenails and iron bolts, spikes and nails, indicated that the vessel probably dated from the late eighteenth to early nineteenth century.

Personnel who had been performing the debris removal operation at the time the shipwreck was encountered reported to Mastone and Robinson that upon its discovery, the keel and several of the floors were still intact and in their upright positions until they were removed from the harbor floor, thus suggesting that the remains of the vessel had been intact while still *in situ* (David Robinson, personal communication with machine operator, Frank Christiani, July 2009). In addition to the wooden timbers that were recovered, the NBHSS debris removal personnel also informed Mastone and Robinson that they had found a leather shoe in the vicinity of the shipwreck (Figure 1-11), and had encountered discrete piles of stone (either naturally occurring glacial till deposits or, alternatively, possibly ship ballast dumps) in various places throughout the harbor (see Figure 1-10) where debris removal activities had been conducted. Unfortunately, it wasn't possible to determine precise positions for the stone deposits from

the recollections of the debris removal personnel that could be used to conclusively associate them with the unanticipated shipwreck discovery.

The condition of the wooden timbers, particularly their surfaces, was observed to be poor during the July 16 inspection. This condition was presumed to be a result of the previously waterlogged timbers' uncontrolled exposure to air and direct sunlight following their recovery. Unfortunately, this post-recovery exposure had allowed the water in the timbers to rapidly evaporate, thereby causing irreversible damage (shrinking, splitting/cracking, and checking) to the structure of the wood. In addition to this recent damage, charred areas on the ends of the floors and on the surfaces of some of the planking fragments indicated that the vessel had burned (Figure 1-12).

The condition of the hull's iron fasteners was observed to be worse than that of the wood. In fact, the fasteners were essentially gone, as they were completely corroded with little or none of their ferrous parent metal preserved. In most cases, the only surviving evidence for their presence was the rust-stained holes left behind in the wood (Figure 1-13).

Mastone and Robinson discussed with Paiva their recommendations for addressing the management needs of the unanticipated shipwreck discovery. In summary, these recommendations were:

- to photograph and make measured drawings of each recovered hull timber to document the find;

- to perform a marine remote sensing survey during a period(s) of maximum high tide at the shipwreck find site utilizing high-resolution sidescan sonar to assess the site's contextual integrity and to identify any remaining timbers that might still been on the harbor floor and susceptible to damage or destruction as a result of continued debris removal activities;

- to have an archaeological monitor present during any future debris removal activities within the find site "buffer zone" to identify and assess the significance of any additional hull timbers and/or artifacts encountered within the find site. Ideally, any additional vessel finds would be placed in water immediately after recovery temporarily to aid in their short-term preservation prior to the recording process; and

- to prepare a report of findings that would be suitable for coordination with the MHC and other agencies in compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

If the wreck and/or its archaeological site was evaluated as not eligible for listing in the National Register of Historic Places (NRHP) as a significant historic property, than no further work would likely be required. If, however, the vessel and/or its site were assessed to be a National Register-eligible historic property that would be adversely impacted by future project debris removal activities, then further coordination and preparation of a Memorandum of Agreement (MOA) would be recommended for development to mitigate for this impact. The MOA would be developed in coordination with EPA, the USACE-NAE, the Advisory Council on Historic Preservation (ACHP), the MHC, the MBUAR, and others.

1.2 Project Scope and Authority

A letter report summarizing the results from the July 16, 2009 preliminary inspection of the shipwreck timbers and meeting at the NBHSS was submitted to the MHC by the USACE-NAE archaeologist (Marcos Paiva) and received by them on July 23, 2009. MHC responded with a letter to the USACE-NAE's archaeologist on July 24, 2009 acknowledging that:

- the wooden ship timbers are consistent with a vessel constructed in the late eighteenth to early nineteenth century and that some of the vessel elements showed signs of burning;
- the wooden ship remains could be those of a colonial vessel attacked and burned by British troops during the Revolutionary War; and
- even if the vessel were not from that event, it could still provide important information about naval architecture, technology, and maritime history in New Bedford,

and concurring with the EPA's and USACE-NAE's plans to:

- fully document, analyze and interpret the recovered ship timbers;
- conduct a remote sensing marine archaeological survey and any feasible inspection and evaluation of the discovery area to assist in determining if additional, previously undetected, significant historic resources are present and will be affected by the NBHSS remediation project; and
- prepare a report presenting the results of the remote sensing survey, the inspection and evaluation of the discovery area if feasible, a summary of the pertinent historical background and previous archaeological research, a research design and methodology for the proposed monitoring process, including a proposal for recordation, recovery, reporting and curation in accordance with professional archaeological standards and practices as a plan to mitigate adverse effects to the extent feasible.

If significant results ensued, the MHC recommended the EPA and the USACE-NAE consider means to disseminate the results of the study to the interested public and other constituencies.

The MHC also requested:

- a map showing the location of the unanticipated shipwreck discovery;
- that the EPA and USACE-NAE notify the ACHP, pursuant to 36 CFR 800.13(b)(3); and
- that the EPA and USACE-NAE consult with an archaeological conservator to assess the feasibility of conserving and curating any recovered ships timbers and artifacts, as well as records of the investigation, preferably at an appropriate and responsible local repository (Edward Bell, Senior Archaeologist, MHC, letter to Marcos Paiva, archaeologist, USACE-NAE, July 24, 2009).

In response to the MHC letter of July 24, 2009, Anthony Mackos, Acting Chief of the USACE-NAE's Engineering/Planning Division, submitted a letter to Brona Simon, Executive Director and State Historic Preservation Officer (SHPO), MHC, on August 13, 2009. The letter included the requested map of the unanticipated shipwreck discovery's location, confirmed that the ADHP would be notified of the discovery and the proposed actions to resolve adverse effects, and specifying the scope of the EPA and USACE-NAE's planned investigation of the site.

The final scope of the study proposed by the EPA and the USACE-NAE involved performance of three basic tasks:

- remote sensing archaeological survey of the wreck site's find spot using high-resolution sidescan sonar, sub-bottom profiler and magnetometer to identify the remainder of the vessel(s) that may be located below the harbor bottom and to assess the sites archaeological integrity;

- documentation, analysis and interpretation of the recovered ship timbers, and preparation of recommendations concerning the possible conservation and curation of the vessel timbers and other finds as part of this documentation effort; and

- preparation of a report summarizing the results and providing recommendations for further study, if necessary, and preliminary assessment of the NRHP eligibility of the vessel(s) and its site. In the event that the site was evaluated to be a National Register-eligible historic property and adversely impacted by future project debris removal and/or dredging activities, then a MOA would be developed to mitigate for this impact in accordance with 36 CFR 800.6 of the ACHP's regulations.

The remediation of hazardous materials by the EPA and the USACE-NAE at the NBHSS constitutes a federal undertaking. Section 106 of the NHPA (16 US 470f), requires that all federal agencies, including the EPA and the USACE-NAE, take into account, prior to initiating or authorizing an undertaking, the effects of the undertaking on historic properties listed or eligible for listing in the NRHP (36 CFR 60). The agency must also afford the ACHP, the SHPO, local Tribal Historic Preservation Offices (THPOs), and other consulting parties, such as the MBUAR (which holds title to submerged cultural resources located within Commonwealth waters from the Mean High Water mark to the state-federal waters boundary 3 miles [mi] [4.8 kilometers (km)] offshore), the Acushnet Historical Commission (AHC), and the public the opportunity to comment on the undertaking. The Section 106 review process is coordinated at the state level by the SHPO, which in Massachusetts operates within the offices of the MHC. In addition to Section 106 of the NHPA, compliance with MGL c. 9, ss 26-27C (950 CMR 70-71) and MBUAR Regulations (312 CMR 2) is also necessary.

The marine archaeological documentation and assessment investigation of the NBHSS's unanticipated shipwreck discovery was performed on behalf of the EPA and the USACE-NAE to assist them in meeting their regulatory obligations under Section 106 of the NHPA, as amended. This investigation supplements earlier phases of terrestrial and marine archaeological investigations that were conducted on behalf of the EPA and USACE-NAE by FWEC and its sub-consultants to identify cultural resources located within the NBHSS prior to the initiation of remediation activities, in accordance with the requirements of Section 106. All work conducted for this investigation, as well as the earlier phases of cultural resources investigations performed within the NBHSS, were completed in accordance with the above-referenced legislation and guidelines, as well as the Secretary of Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716 1983) and *Standards and Guidelines for Identification* (1983),

the NBHSS's Unanticipated Discovery Plan (FWEC 2003), the MBUAR's *Policy Guidance for the Discovery of Unanticipated Archaeological Resources* (updated September 28, 2006) included in the MBUAR Regulations (312 CMR 2), and the MHC's Historic Properties Survey Manual: Guidelines for the *Identification of Historic and Archaeological Resources in Massachusetts* (1992).

In accordance with 312 CMR 2, and the rules and regulations established by the MBUAR under M.G.L. Chapter 91, s. 63, as amended, prior to conducting the marine remote sensing field survey portion of the project, Fathom applied for a MBUAR Special Use Permit. Fathom received a provisional Special Use Permit (MBUAR No. 09-003) on August 22, 2009, and the full permit (after the MBUAR had reconvened following their summer break) on September 24, 2009 (Appendix B).

1.3 Project Personnel

David S. Robinson (archaeological principal investigator and project manager, Fathom) was responsible for the overall management and performance of the marine archaeological investigation, including the background research, field data acquisition, analysis, and interpretation tasks, and the production of the project report.

Three-dimensional computer modeling of the shipwreck's principal framing timbers used in the reconstruction and analysis of the ship's remains were created by Fathom sub-consultant, Jake Piskura.

Wood sample analysis and species identification was completed by Fathom sub-consultant, Dr. Brian Jordan.

Geophysical survey data (i.e., side scan sonar, magnetometer, and sub-bottom profiler data) utilized for this investigation were acquired, post-processed, plotted, and interpreted by Christopher Wright (project geophysicist, CRE).

On-site archaeological field investigation and supplemental debris removal/shipwreck timber recovery operations were coordinated and performed with the assistance of Paul L'Heureux [Project Engineer, USACE-NAE]; and NBHSS staff Mark Gouveia, Anita Rigassio Smith, Steve Fox, Carl Wilson, and Josh Cummings [Jacobs]; and Steven Derouchie, Frank Christiani, Brian Rajkovich, and Jacintho Mattos [SES]).

1.4 Disposition of Project Materials

All supporting documentation collected during the course of this study is on file at Fathom Research, LLC, Quest Center, Suite 315, 1213 Purchase Street, New Bedford, Massachusetts 02740. Raw and processed geophysical survey data products are on file at CR Environmental, Inc. 639 Boxberry Hill Road, East Falmouth, Massachusetts 02536.

2.0 RESEARCH DESIGN AND METHODOLOGY

The initially scoped final research design and methodology proposed for this investigation (outlined in the previous chapter), developed in consultation with the MHC and the BUAR, was focused on accomplishing three distinct objectives:

- to identify the remainder of the vessel(s) that were potentially located on or below the harbor floor at the location of the unanticipated shipwreck discovery and to assess the site's archaeological integrity;

- to document, analyze and interpret the recovered ship timbers and prepare recommendations concerning the possible conservation and curation of the vessel timbers and other finds as part of the documentation effort; and

- to prepare a project report presenting the results of the study, a preliminary assessment of the NRHP eligibility of the vessel(s) and its site, and recommendations concerning the need (or not) for its further investigation.

During the course of the project, after the first two of these objectives was completed, the project scope was revised by the EPA and the USACE-NAE (in consultation with the MHC, MBUAR, Fathom, Jacobs and CRE) as a result of the interim assessment by Fathom that found:

- the site's integrity was low;

- that additional controlled marine archaeological investigation or preservation in place of any site fragments was not a prudent course of action, and;

- that the poor condition and PCB contamination of the timbers recovered in July 2009 precluded their conservation and curation because of safety concerns and prohibitively high costs (Melville Cote, Manager, EPA Ocean and Coastal Protection Unit, letter to Simon, MHC, October 2, 2009; Simon letter to Cote, October 30, 2009 [see Appendix A]).

As a result of this interim assessment, the need to assess the National Register eligibility of the site as a means of providing it with some protection from future disturbance was obviated by the site's lack of integrity and its destruction as a result of the NBHSS remediation process. It was recommended by Fathom that the scope be adjusted to include the following:

- discard as hazardous materials the ship timbers recovered in July 2009 upon completion of their documentation and analysis;

- initiate as soon as possible a second phase of integrated archaeological study and remediation activities in the no-work buffer zone surrounding the unanticipated shipwreck discovery location, wherein Jacobs and SES proceeded with debris removal activities and recovered the remaining additional shipwreck timbers under the supervision of the project archaeologist. These timbers would be kept wet until they could be documented and analyzed by the project archaeologist, after which they too would be discarded as hazardous materials. Upon completion of the debris removal/additional timber recovery, Jacobs and SES would proceed with the standard

remediation dredging operations at the shipwreck site under the supervision of the project archaeologist, and

- prepare a technical report describing the results of all worked conducted as part of the unanticipated discovery investigation.

The MHC reviewed the interim assessment results and concurred with them and the revisions to the project's research scope (Simon letter to Cote, October 30, 2009 [see Appendix A]).

Ultimately, the research objectives of the unanticipated discovery investigation were accomplished through a combination of focused archival research, marine geophysical survey, data processing and analysis, documentation and analysis of the recovered ship remains, and consultation with the MHC, the MBUAR, the Acushnet Historical Commission, and other knowledgeable local authorities. A description of these methods is presented here.

2.1 Research Methods

The primary goals of the archival research conducted for the investigation were to identify the wreck, determine its origin and specific age, trace its service history, and assess its historical significance within the historic contextual framework of the greater New Bedford area. To accomplish these goals, Fathom reviewed and synthesized the historic contexts prepared for earlier phases of the NBHSS project and reported in Fitts et al. (2000) and Cox, Jr. (2000) and examined the principal references cited in these documents. The synthesis of these reports and documents provided the general framework for interpreting the shipwreck and conducting more focused research to determine its identity.

Archival research was performed in the New Bedford Public Library's (NBPL) Special Collections section, at the New Bedford Whaling Museum's Research Library (NBWMRL), and in the Special Collections at the Russell Memorial Library (RML) (i.e., the Acushnet Public Library). This research was performed in April, May and July of 2010, after the shipwreck timbers documentation task was completed. At each repository, the purpose and goals of the research effort were explained to the reference librarians (i.e, NBPL Special Collections Librarian, Paul Cyr; NBWMRL Librarian Laura Pereira; and RML Director Jayme Viveiros) and their assistance in locating potential sources of information was solicited. Specific sources that were examined included:

- the photography and map archives, *Old Dartmouth Historical Sketches*, New Bedford Ship Registers, and the Henry B. Worth Papers collection of legal documents, deeds and titles to land holdings in Old Dartmouth (Acushnet) held at the NBWMRL;

- the NBPL Special Collections shelved holdings and on-site searchable "New Bedford Newspaper Digital Database" of news articles published in local newspapers between 1792 and 1870 (i.e., the *Columbian Courier*, the *Daily Mercury*, the *Medley*, the *Mercury*, and the *Republican Standard*);

- the RML Special Collections shelved holdings, which included the *Fairhaven, Massachusetts - American Guide Series* (WPA 1939); and Franklyn Howland's *History of the Town of Acushnet* (1907); Zeph. Pease and George Howe's *History of New Bedford* (1889); and Daniel Ricketson's *History of New Bedford* (1858) (of particular interest in these sources were the accounts of the

1778 British raid and the burning of ships within the Acushnet River estuary and New Bedford harbor);

- National Oceanic and Atmospheric Administration's (NOAA's) online Automated Wreck and Obstructions Information (AWOIS) database;

- Bruce Berman's *Encyclopedia of American Shipwrecks* (1972);

- John Fish's *Unfinished Voyages: A Chronology of Shipwrecks - Maritime Disasters in the Northeast United States from 1606 to 1956* (1989); and

- MBUAR's Digital Shipwreck Database.

In addition to the archival research that was conducted, the Chair of the Acushnet Historical Commission (AHC), Pauline Tiexiera, and senior Commission members, Joyce Reynolds and Allen Parker, were also contacted and solicited for information on the shipwreck.

2.2 Supplemental Geophysical Field Survey Data Acquisition, Processing, and Analysis Methods

Supplemental geophysical survey of the unanticipated shipwreck discovery study area was conducted by CRE and Fathom on August 24, 2009 to assess the contextual integrity of the unanticipated shipwreck discovery find site and to determine what, if any, elements of the shipwreck remained on the harbor floor in that area that would be encountered and otherwise destroyed during subsequent pre-dredge debris removal activities. Remote sensing was selected by the Fathom project archaeologist as the preferred method for surveying the study area. It was selected over the option of performing visual and tactile reconnaissance survey using archaeological divers, because of remote sensing's ability to efficiently and systematically acquire multiple types of data characterizing site conditions above and below the harbor floor that would be comprehensive in their coverage of the investigated area. Furthermore, the site's contaminated sediments created a hazardous working environment for archaeological divers. Working in them would have also reduced the underwater visibility to virtually zero, which would have made visual survey of the area by divers not only dangerous, but extremely inefficient and unnecessarily time-consuming.

The supplemental geophysical survey design was developed by the Fathom project archaeologist and CRE's project surveyor to acquire as much detailed acoustic and magnetic data within the site as possible using an instrument suite that included sidescan sonar, magnetometer, and sub-bottom profiler. To provide comprehensive survey coverage of the unanticipated shipwreck discovery study area, parallel survey tracklines were established that were spaced 25 ft (7.6 m) apart and extended beyond the limits of the 100-x-250 ft (30.5-x-76 m) no work buffer zone.

Acquisition of useable data was complicated by a number of environmental conditions present at the site. The shallow depths of water present at the study area (6 ft [2 m] or less) greatly reduced the effective range of the sidescan sonar system and induced significant acoustic background noise as a result of the sonar's echoing off of the water's surface and the harbor floor. Acquisition of magnetic data was complicated by the close proximity of steel sheet piling, steel cables, and steel-hulled barges to the survey area, which induced significant background noise to the data. The prevalence of decaying organic

materials in the harbor floor sediments made them gaseous, which completely inhibited the sub-bottom profiling system from achieving sub-surface penetration.

2.2.1 Navigation and Survey Control

Prior to conducting the supplemental survey, Jacobs provided CRE's project surveyor with a digital file in a GIS .shp file format that contained the unanticipated shipwreck discovery study area's boundaries. This file was imported into Coastal Oceanographics' HYPACK MAX survey software to create a plot of the planned survey tracklines within the study area. In addition to the tracklines and study area boundaries, background imagery (i.e., bathymetric data from a previous survey and orthophotos obtained from the Massachusetts GIS [MA GIS] website) were added to the HYPACK MAX survey plan to aid on-site navigation and data analysis and interpretation both during and after the survey.

Navigation for the supplemental survey was accomplished using a Trimble AgGPS 132 12-channel Differential Global Positioning System (DGPS) system capable of receiving the U.S. Coast Guard (USCG) Beacon corrections as well as OmniStar subscription-based satellite differential corrections. This system is capable of sub-meter (i.e., less than 3.3 ft [1 m]) horizontal position accuracy. The DGPS system was interfaced to a laptop computer running HYPACK MAX hydrographic survey software. During the course of the survey, HYPACK continually recorded vessel position, DGPS satellite signal quality, and provided a steering display for the survey vessel captain.

2.2.2 Sidescan Sonar Data Acquisition and Processing

Sidescan sonar data were acquired using an Edgetech, Inc. Model 4100-P side-scanning sonar system. Sidescan sonar data were collected using a 500-kHz signal and 82-ft (25-m) range scale (the system's minimum selectable range). Survey transects were spaced 25 ft (7.6 m) apart or less to ensure 200 percent insonification of the harbor floor within the study area, based on the anticipated range of useable data given the shallow depths (6 ft [2 m] or less) within the study area. The sidescan sonar system's towfish was deployed directly beneath the DGPS antenna, thereby eliminating the need to correct for position layback or offset.

Sidescan sonar data were processed using a combination of Chesapeake Technology, Inc.'s SonarWeb and SonarWiz software and HYPACK's implementation of GeoCoder software developed by scientists at NOAA's CCOM Joint Hydrographic Center. Assuming an average towfish altitude of approximately 3 ft (1 m) above the harbor floor, acceptable sonar geometry was limited to a maximum range of just 33 ft (10 m) per channel for a total swath coverage of 66 ft (20 m) along each surveyed trackline. Therefore, SonarWiz was used to digitally reduce the range of the data from 82 ft (25 m) per channel to 33 ft (10 m) per channel. SonarWiz was also used to digitize and measure targets of potential interest. SonarWeb was used to create HTML navigable data files and GIS-formatted navigation .shp files. GeoCoder was used to create side scan sonar mosaics of the harbor floor within the study area, and was able to minimize the effects of signal attenuation with range through the use of its innovative beam-angle correction algorithms.

For all processing approaches, water column portions of the acoustic returns were removed through the inspection and processing of each survey transect. Data were then adjusted for signal attenuation with distance using moderate Time Varied Gain (TVG) corrections. Finally, georeferenced transect data and mosaics were created from these processed data.

Sidescan sonar data processed in SonarWeb were delivered in several forms including: georeferenced .jpg files, high-resolution annotated "waterfall" imagery of each survey lane, and GIS .shp files (polygons) of transect navigation data with the width of the polygons corresponding to sonar range settings. Also, a set of .html files for the project was created, allowing Web-browser access to all survey data and imagery. Georeferenced sonar data were incorporated into a GIS database for comparison with other data. Because of the degree of overlap between navigation polygons, the navigation .shp files are best queried and analyzed using ESRI's ArcMAP 9.0 (or later) software. It is also important to note that while the mosaics produced for this report included all projected sonar files, users of ArcMAP can create customized mosaics of areas of specific interest by selectively adding data for individual transects and adjusting image transparency and contrast. In some instances, selective removal of the extensively overlapped sonar data may result in a "clearer" image. Files produced using SonarWeb were projected (when applicable) to the Massachusetts State Plane Grid, NAD83, US Survey Foot. Mosaics created using GeoCoder have been projected to UTM Zone 19N, NAD83, U.S. Survey Foot.

2.2.3 Sub-bottom Profiling Data Acquisition and Processing

Sub-bottom profiler data were acquired using a SyQwest 10-kHz Stratabox sub-bottom profiling system along the same set of survey tracklines used for the sidescan sonar data acquisition. The Stratabox system consisted of a cone-shaped transducer mounted to a vertical boom secured to the survey vessel's rail at approximately amidships, an on-board signal processor and amplifier, and a data acquisition computer. Sub-bottom profiler data were recorded in an .odc file format using proprietary StrataBox software running on a dedicated laptop computer. The computer was interfaced to the DGPS through a serial port. Offset and layback between the sub-bottom profiler's transducer and the DGPS antenna were recorded to allow for position correction during data processing.

The Stratabox 10-kHz sub-bottom profiler's data were processed using Chesapeake Technology's SonarWeb software. Appropriate adjustments to TVG were made during processing. Sub-bottom profiles were exported in a .jpg file format with accompanying HTML-navigable indices and GIS .shp files (polygons) of transect navigation data with the width of the polygons corresponding to the system's range settings.

2.2.4 Magnetometer Survey Data Acquisition and Processing

Magnetic data were collected simultaneously with the sidescan sonar data along the same set of 25-ft-(7.6 m-) spaced planned survey tracklines. Magnetic data were acquired using Marine Magnetics, Inc.'s MiniExplorer high-resolution marine magnetometer system. The magnetic data acquisition system consisted of towfish-mounted Overhauser magnetic sensor and a pressure/depth sensor, an onboard power supply and serial interface, and a data acquisition computer. The 1-Hz data stream from the magnetic sensor was routed to the HYPACK MAX navigation computer via a serial port. HYPACK MAX recorded the acquired magnetic readings in gammas (1.0 gamma = 1 nanoTesla) as a separate field within the same raw data file containing bathymetric soundings. The position of the magnetometer towfish was calculated in real-time using a HYPACK MAX mobile device driver which considered "cable out" relative to the DGPS antenna, the magnetometer towfish cable's catenary, and the effects of vessel course corrections.

The magnetometer towfish was kept as close to the seabed as practical during the course of the survey to maximize its capabilities for sensing small amounts of ferrous materials potentially associated with the unanticipated shipwreck discovery site. The sensor was consistently deployed at a great enough distance

from the survey vessel to preclude the potential for magnetic interference from the survey vessel's hull or its electronics.

Magnetometer data were processed using HYPACK MAX's Single-Beam Processor Module. Each magnetic survey transect was first inspected in profile format for characteristic signals indicating the presence of magnetic anomalies resulting from ferrous masses. Due to strong interference associated with dredging equipment (i.e., nearby steel-hulled barges and steel sheet piling), however, point anomalies could not be reliably identified using profile inspection methods. Identification of magnetic anomalies in the data required an alternative approach. Magnetic measurements were merged into a single ASCII comma-delimited database containing all total field (TF) magnetic intensity measurements for each surveyed trackline. Fields for Northing, Easting, and magnitude were also included in the database. This combined data set was then imported into Golden Software, Inc.'s Surfer V.8.1 Surface Modeling Software. A grid of magnetic intensity was created using triangulation interpolation methods and a 5-ft (1.75-m) node interval. A contour map was created from this grid depicting TF magnetism using a 1-gamma contour interval and the map was exported in .shp and .dxf file formats. A second map was created using spectrum shading and exported as a geo-referenced .tif image file.

The final magnetic data processing procedure that was employed was the process sometimes referred to as the "Pole-Reduction" technique. This method minimizes background magnetic interference associated with geologic structures and temporal/diurnal magnetic variations by transforming total field measurements into gradient values. Data were transformed by subtracting sequential TF values and replacing the original values with the difference (e.g., Pole Reduced [PR] value: where PR = 54,390.91 gammas – 54,391.97 gammas = -1.06 gammas).

All TF magnetic data were transformed into this PR form and merged into a single ASCII comma-delimited database including fields for Northing, Easting, and "Gratio" (in gammas). This combined data set was imported to Golden Software, Inc. Surfer V.8.1 Surface Modeling Software. A grid of "relative" magnetic intensity was created using triangulation interpolation methods and a 5-ft (1.75 m) node interval. A contour map was created from this grid depicting PR magnetism using a 1-gamma contour interval and the map was exported in .shp and .dxf formats. A second map was created using spectrum shading and was exported as a georeferenced .tif image file.

2.2.5 Data Analysis for Archaeological Interpretation and Assessment

The project archaeologist's analysis and interpretation of the various types of survey data recorded during the supplemental geophysical survey of the study area (both the raw data reviewed in the field and the post-processed data reviewed after the survey) was focused on assessing the contextual integrity of the unanticipated shipwreck discovery site and identifying what, if any, elements of the shipwreck remained on the harbor floor. Selection of an anomaly or anomalies as targets of potential archaeological interest relied on a combination of factors. Generally speaking, these factors included the type of data being considered, environmental conditions, predicted types of archaeological materials likely to be encountered, the survey design parameters employed, and the project archaeologist's previous experience reviewing marine remote sensing data from shipwreck sites.

Consideration and interpretation of acoustic data produced by the side scan sonar and sub-bottom profiler was a relatively straightforward process. Acoustic targets appear as visual anomalies in the ambient visual field of the sea floor in either a photograph-like, high-angle oblique plan view (as in the case of a high-resolution sidescan sonar record) or in profile (as in the case of the sub-bottom profiler record). Sidescan

sonar targets are selected as possible archaeological targets based primarily on their appearance, that is, whether or not they appear to be vessel remains. The sizes of targets, their relief above the bottom, and the relative density and spatial distribution of their constituent parts are all obtainable from the sonar record, particularly when it is processed and presented in a mosaic format, as it was by the CRE surveyor for this study.

Sub-bottom profiles generally contain visual features of archaeological interest that fall into two different categories: targets that appear to be shallowly buried, discrete, anthropogenic deposits (i.e., shipwrecks, ballast dumps, pre-contact period shell middens, etc.), and those that appear to be buried geological deposits (e.g., paleolandforms, glacial till or bedrock). Shipwrecks and their surrounding debris fields are often associated with corresponding moderate intensity/moderate duration magnetic anomalies and subtle, yet distinct, changes in bottom composition visible as differences in the reflectivity of the bottom in the side scan sonar record. In contrast, sub-bottom reflectors that are geological in nature and buried beneath the bottom result from changes in the sediment density caused by post-inundation marine sedimentation processes, inundation sequences, pre-submergence depositional events, or older geological processes.

Interpretation of magnetic data is typically less straightforward. Magnetic anomalies of archaeological interest can range from several to several thousand gammas in intensity, and extend tens or hundreds of feet or meters in duration, depending on the characteristics of their source and the source's distance from the point of measurement (i.e., the source-to-sensor distance). Even though a considerable body of magnetic signature data for shipwrecks is now available for comparison, it is impossible to positively associate any specific individual magnetic signature with a particular type or age of shipwreck or any other archaeological feature. Variations in iron content, condition, and distribution of a vessel's wrecked remains, as well as the survey's design parameters (especially trackline interval and sensor altitude) combine to influence the intensity and configuration of the anomaly produced.

A more effective method of interpreting magnetic data is through the analysis of the spatial distribution of multiple anomalies across multiple adjacent survey tracklines. Marine remote sensing archaeological surveys performed at the extremely conservative trackline interval utilized for this study (i.e., 25 ft [7.6 m]) provide magnetic data that is comprehensive in its coverage and, therefore, of adequate resolution to differentiate patterns in the data that are indicative of potential shipwreck materials and geological deposits.

Rather than select potential cultural targets from a single instrument's data set or individual trackline, all of the geophysical data recorded for this study were reviewed simultaneously as they were recorded in the field and after post-processing for the presence of any correlations between data sets and across multiple tracklines that provided clues regarding the possible identity of individual targets. Additionally, data associated with modern, external and/or spurious sources was recorded as such during the course of the field survey, so that they could be eliminated from further consideration as targets of potential archaeological interest. The remote sensing data recorded during the 2009 survey were also considered and interpreted within the context of the 1999 pre-dredge archaeological survey and research results.

2.3 Archaeological Monitoring of the Supplemental Debris Removal and Remaining Ship Timber Recovery Process within the Unanticipated Shipwreck Discovery Study Area

After the completion of the supplemental remote sensing survey and data analysis tasks, supplemental debris removal and recovery of the identified remaining ship timbers within the unanticipated shipwreck discovery area was performed by SES and Jacobs staff under the supervision of the project archaeologist.

The debris removal and ship timber recovery activity was conducted using a machine fitted with an extra-long arm with a grabber attachment at its end (see Figure 1-4). The machine was mounted on a spud barge to which were fastened two hopper barges - one for recovered ship timbers and the other for discarded debris (Figure 2-1). Modified Level D PPE consisting of steel-toed boots with protective rubber outer boots, taped-seam Tyvek coveralls, a personal flotation device, inner and outer rubber gloves, safety glasses, hard hat and ear plugs were used by all field personnel during the debris removal field activity. Continuous air monitoring for hazardous gases was also conducted throughout the performance of the debris removal and timber recovery field operations. The debris removal and supplemental ship timber recovery task was completed on November 5, 6 and 9, 2009.

Prior to the initiation of the supplemental debris removal and timber recovery activity, plots of the geophysical survey data were brought into the field and discussed with the machine operator to inform and guide the debris removal/timber recovery process. The procedure used by the SES machine operator to clear the unanticipated shipwreck discovery area of remaining timbers and debris was essentially the same systematic methodology they employed throughout the NBHSS. The procedure involved moving the spud barge with a push-boat into position at the northeast corner of the rectangular protective no-work buffer zone surrounding the shipwreck find spot. The machine operator then moved the machine towards the northeast corner of the barge, and from that static position used the arm of the machine to make a progressive series of sweeps of the bottom using a side-to-side and then forward-and-backward motion. The machine was then moved westward in a series of new positions across the width of the barge and the sweeps of the bottom repeated until the northwest corner of the barge was reached. The machine would then be repositioned back to its original corner location on the barge, and the position of the spud barge shifted into a new location adjacent to and westward of the first one, and the whole process of sweeping the bottom with the machine's arm and grabber repeated. In the same way that the machine was moved incrementally westward across the width of the barge, the spud barge was moved westward across the width of the study area until the opposite side at the northwest corner of the study area was reached and a continuous swath across the northern edge of the study area was cleared of debris. Once a full lateral pass across the width of the study area had been cleared, the position of the barge was shifted southward, down the long axis of the study area on its western edge and the process was repeated in the opposite or eastward direction, moving back across the width of the study area. It is in this systematic way that the debris removal process was conducted throughout the no-work buffer zone until the entire zone was cleared.

Using this technique, the machine operator was able to "feel" when the buried grabber end of the arm encountered something comparatively hard within the harbor floor's flocculent sediments. Once an object(s) was encountered, the grabber's articulating upper and lower palms could be actuated by the machine operator to pick up objects from the harbor floor and transfer them to the deck of the spud barge for detailed inspection or "excavation" of adhering sediments by the archaeologist and SES laborer (Figure 2-2). Upon inspection, the recovered object(s) was determined to be either of archaeological value to the interpretation of the shipwreck (e.g., an identifiable hull element or artifact) or not. Identifiable hull timbers were retained for documentation and stored in a water-filled hopper attached to the spud barge, and recovered artifacts were photographed and placed in water-filled polyethylene bags and buckets of water stored on the spud barge (Figure 2-3). Heavily damaged, unidentifiable elements of the hull or intrusive debris not associated with the shipwreck were discarded into a second hopper barge attached to spud barge (Figure 2-4).

After the debris removal and ship timber recovery task was completed, the retained hull timbers and artifacts were removed to the same secure location on shore at the NBHSS's Sawyer Street facility that

the original collection of shipwreck timbers recovered in July 2009 were brought. Unlike then, however, instead of leaving the timbers exposed to the elements onshore and allowing them to dry out, each was removed from the water-filled hopper barge and double-wrapped in polyethylene for temporary storage until which time it could be photographed and drawn by the project archaeologist. Retained artifacts remained stored in water-filled buckets onshore until they too could be documented. The transfer of the hull timbers and artifacts to shore was completed on November 12, 2009.

2.4 Ship Timber Documentation, 3-D Digital Modeling, and Analysis

Each of the recovered ship timbers, both those removed in July of 2009 when the shipwreck was first encountered, and the remaining timbers that were recovered in November 2009, were documented in photographs and detailed measured scale drawings (Figure 2-5). Documentation of artifacts recovered during the November 2009 fieldwork was limited to just photographs. The ship timber documentation task was completed by the project archaeologist between September 2009 and April 2010. Because of the contaminated nature of the timbers and use of heavy equipment at the NBHSS Sawyer Street facility where the ship timbers were stored, modified Level D Personal Protective Equipment (PPE) (i.e., steel-toed boots with rubber over-boots, a high-visibility safety vest, rubber inner and outer gloves whenever handling or touching the timbers, safety glasses, and a hardhat) was worn at all times while working with the timbers.

Due to the relatively large size of most of the recovered ship timbers, it was necessary to photograph the timbers in a composite format. This, in turn, necessitated the extremely labor-intensive and time-consuming task of assembling photomosaics of each photographed side of every timber. Assembly of the photomosaics was facilitated by the use of Canon's PhotoStitch Version 3.1 software program.

Drawings made of each timber consisted of the typical archaeological standard plan, profile, and (where appropriate) section and detail views. Although the dimensions of the timbers and the vessel they comprised were most-likely measured using standard English measure (i.e., feet and inches), for ease of documentation and drawing to scale the timbers were measured and drawn to a metric standard. Whenever possible, wood grain, knots, bark, naturally curving surfaces and observations about the naturally grown features of the compass timbers that were used to create the different hull components were included and noted in the drawings.

The ability to analyze and reconstruct the disarticulated ship remains and return them to their approximate *in situ* pre-disturbance configuration was enhanced significantly through the use of computerized three-dimensional (3-D) modeling of the vessel's principal recovered framing members (i.e., the five keel fragments, the sternpost, the stem, and all 15 floor timbers). Simplified digital 3-D model representations of the recovered framing timbers were created using Solidworks eDrawings Premium 2009 computer software (Figure 2-6). Each 3-D timber model was generated from the two-dimensional (2-D) measured plan and profile scale drawings that were made for each timber during the documentation process described above. This was accomplished by first digitally tracing the profile view from the scanned measured timber drawings. Due to the irregular shapes of the timbers, a combination of lines and spline curves was used to trace the outline of each drawn timber. Once a closed profile was created, it was extruded to create a virtual solid object. The outline of the plan view of the 2-D measured timber drawing was then digitally traced onto an orthogonal plane situated directly below the virtual solid body. A cut-extrude operation was then used to trim off the excess material from the virtual solid model, thereby creating an accurate, yet simplified, 3-D representation of the timber.

Once the digital 3-D timber models were created, the next step was to add the principal fastener holes in each timber. This was particularly important for the holes associated with the single clenched iron bolts that had been in the center of each floor and secured the floors to the keel. Lining up these holes made it possible to reconstruct the positions of the floors along the keel. These holes were "cut" into the digital timber models using the cut extrude operation again. The shape and placement of the holes were obtained from the 2-D plan view measured drawings. The fasteners' paths through the timbers, which were oriented at myriad different angles, were traced directly from the 2-D drawing's profile view.

Once all of the digitally modeled timbers were developed, they were combined into a single digital model or "assembly." Within this assembly, each of the individual timbers and the keel fragments could be moved about in the drawing like 3-D puzzle pieces to recreate a virtual approximation of the original *in situ* configuration of the timbers on the harbor floor. By measuring the angle of deadrise in each of the floors (i.e., the angle of the floors arms relative to horizontal), and assuming that the deadrise angle of the floors would decrease as you moved forward from the stern towards the broadest and fullest part of the ship' hull, it was possible to arrange the recovered floors in their estimated original, as-built order or sequence within the hull.

With the virtual 3-D composite model of all the principal, recovered hull framing elements reassembled, the virtual model of the shipwreck could then be visualized in 3-D from an infinite variety of perspectives (e.g., top, bottom, port side profile, starboard side profile, bow view, stern view, isometric views, etc.) for hull form analysis and output as 2-D images/projections (Figure 2-7).

2.5 Wood Analysis and Species Identification

Wood sampling, analysis and species identification was completed by the Fathom project archaeologist and archaeological wood specialist, Dr. Brian Jordan, on January 29, 2010. Because of the PCB contamination of the ship timbers, PPE (rubber gloves and safety glasses), was used during all phases of the sampling and wood identification processes, except when using the hand lens and microscope, when only gloves were used. Wood samples were extracted from the hull timbers by the project archaeologist using a hammer and wood chisel. Samples were placed in small polyethylene bags that were labeled and delivered to the NBHSS onsite laboratory trailer for examination by Dr. Jordan. The transverse faces of the wood samples were cleaned with a pocket knife and then faced with a single-edged razor blade. The clean face of each specimen was examined with a 10x to 15x hand lens for initial identification and for determining the appropriate areas from which to take thin sections (Figure 2-8). Thin sections were then taken of the transverse face of each sample, wet-mounted on slides, and then examined with an Olympus Zoom Stereo Microscope (Model SZ-Tr), 0.7x to 4x zoom, with a 20x eyepiece for an 80x maximum magnification. *Identifying Wood: Accurate Results with Simple Tools* by Hoadley (1990) and the *Commercial Timbers* wood identification key by Richter and Dallwitz (2000), developed for the Intkey for Windows program (version 5.11) were the primary reference works consulted during the wood analysis and species identification process. Upon completion of wood identification, all wood samples, slides, cover slips, and materials that had come in contact with the contaminated specimens were disposed of in the laboratory's HAZMAT waste bins.

3.0 RESULTS

3.1 Supplemental Geophysical Field Survey Results

Supplemental geophysical field survey of the unanticipated shipwreck discovery location performed by CRE and Fathom produced comprehensive sidescan sonar and magnetometer coverage of the area; however, the gaseous nature of the harbor floor sediments and shallowness of the water precluded obtaining sub-bottom profiles that could be used for archaeological assessment purposes. As a result, it was only possible to resolve objects exposed on the surface harbor floor and ferrous masses (exposed or buried) within the study area.

From the supplemental geophysical survey, approximately 20 individual sidescan sonar targets were identified (Figure 3-1 [see red triangles]). These targets appeared to be additional remaining timbers or timber fragments lying on the harbor floor at the location of the ship remains find site. With the exception of a single magnetic anomaly recorded southwest of the find site at the end of a survey line located just outside of the study area, no significant magnetic anomalies were recorded at the location of the unanticipated shipwreck discovery find site (Figure 3-2). This result was not completely surprising, given that the preliminary analysis of the ship timbers recovered in July 2009 indicated little or none of the parent ferrous metal of the timbers' iron fasteners was preserved. Instead, it appeared that the fasteners were completely oxidized and had little or no remaining ferrous mass. Without ferrous mass, they had virtually no magnetic properties that would have produced a detectable anomaly in the magnetic data.

In addition to the further evidence of more shipwreck remains, the sidescan sonar data also contained evidence of the adverse impacts the July 2009 debris removal process had on the contextual integrity of the shipwreck site and to the harbor floor. Timbers that were visible were clearly disarticulated and showed no evidence of patterning typically associated with intact ship remains, suggesting that they were no longer in their original positions on the harbor floor. Evidence of impacts resulting from the arcing side-to-side movement of the debris removal machine's arm and grabber head as it passed through the harbor floor sediments while the operator located debris was clearly visible in the 2009 sidescan sonar data as numerous, linear, arcing gouges and unnatural looking depressions in the harbor floor at and around the shipwreck find site (Figure 3-3). ***The conclusion drawn from the interpretation of data produced by the supplemental geophysical survey of the NBHSS shipwreck site was that the site's contextual integrity was severely compromised when the timbers were removed in July 2009.***

3.2 Supplemental Debris Removal and Remaining Ship Timber Recovery Results

The supplemental debris removal performed in November 2009 resulted in the recovery of 31 hull timbers consisting of four floors, seven large planking fragments, one partially preserved sternpost, one partially preserved stem, three cant frames, nine futtocks, and one miscellaneous timber (possible stern deadwood). Although waterlogged, all of the timbers recovered in November 2009 exhibited a high degree of preservation (especially their surfaces), which is typical of wooden artifacts recovered from underwater archaeological deposits that have been buried in anaerobic sediments, such as those present in this part of New Bedford harbor.

The systematic nature of the debris removal process resulted in a relatively high level of confidence that the area was cleared of all ship remains buried in the mud within the anticipated depth of impacts from dredging. One unexpected result from the debris removal process was the observation that small

amounts of a primary context matrix of sawdust and bilge muck, which in some cases contained artifacts, remained adhered to the faces of the recovered floors and planking fragments.

The 31 hull timbers that were recovered in November 2009 and the 19 hull timbers recovered in July 2009 (i.e., 11 floors, three large planking fragments, and five separate fragments of the keel) resulted in the recovery of a total of 45 documented hull timbers (i.e., five keel fragments, one sternpost, one stem, 15 floors, 10 large planking fragments, three cant frames, nine futtocks, and one miscellaneous timber) from the NBHSS shipwreck site. In addition to the hull timbers, one intact hearth brick and 25 brick fragments (two of which were intrusive, the remainder of which were hearth bricks), two vegetable-fiber rope fragments of different diameters, the broken base of a glass case-bottle, an iron barrel hoop, a wooden bucket base fragment, two wooden barrel base fragments, a wooden box panel fragment, a square-in-section piece of wood stock, and leather shoe sole (possibly intrusive) were also recovered and documented (Figure 3-4).

3.3 Wood Analysis and Species Identification Results

Gross examination of the recovered NBHSS shipwreck timbers prior to their sampling for detailed macro- and microscopic analysis revealed that all of the wood exhibited signs of decay that ranged from severe to mild and was consistent with being buried in a waterlogged environment for an extended period of time. Archaeological wood from wet and waterlogged environments is often degraded by microorganisms, such as fungi and bacteria (Jordan 2001). Although the wood may appear to be sound initially upon its recovery from the underwater environment, as was the case with the NBHSS shipwreck timbers, waterlogged wood's internal cell structure has been altered and degraded and, if allowed to dry, will shrink, warp, check, and split. Timbers recovered in November 2009 that had been wrapped in polyethylene were observed to in better overall condition than those that were recovered in July 2009 and subjected to uncontrolled drying in the heat of full summer sunlight. Initial examination of the recovered timbers prior to the extraction of wood samples for species identification revealed as well that all of the curved timbers were actually compass timbers fashioned from naturally-curved portions of trees. Several of the timbers were clearly made from the crook of a tree, while others were from the juncture of the bole (i.e., the trunk) and a limb. It was observed that some of the floors had been shaped in a rough fashion, perhaps as a time/cost savings measure, with the natural, rounded outer surface of the tree (and even the bark in one case) being left untouched. The outer layer of a tree, called the cambium or sapwood, is less durable than the inner area or heartwood, which often contains extractives that can repel insect and microbial attack. The sapwood section of the hull timbers was clearly more degraded than the heartwood section. Consequently, the sapwood section on many of the hull timbers was observed to have delaminated from the timbers' heartwood. It was observed, however, that many of the hull timbers (including the keel and sternpost) had actually been made from the stronger and more durable heartwood portion of the tree.

A total of 10 wood specimens forming a representative sample of the NBHSS shipwreck's principal hull components (i.e., the keel, frames, planking, deadwood, stern post, stem, and frame chocks) was removed for analysis and species identification. From the macroscopic visual inspection of the wood specimens, it was clear that all samples exhibited characteristics of ring-porous hardwoods. Microscopic analysis revealed that nine of the samples had extremely narrow growth rings (0.03 to 0.09 inches [in] [0.82 to 2.4 millimeters (mm)]) indicating that the wood used to create the hull timbers had been cut from very slow growing trees that were harvested from "old-growth" forests. The wood sample from Frame 03 was an exception with an average growth ring width of 0.5 in (13 mm), which appeared wider than normal. This sample was removed from the upper portion of a naturally curved branch portion of the frame, and thus

might represent "reaction" or "tension" wood, extracted from the upper surface of a limb. As its name implies, tension wood is under tension, and therefore stretched somewhat as compared to non-tension wood. This type of wood can be difficult to identify in archaeological wood samples. It is detectable as abnormally wide growth rings on the upper surface of naturally-curved timbers. The observation that the wood came from old growth forests is consistent with the shipbuilder's extensive use of naturally curved compass timbers. All but one of the samples was positively identified as oak, belonging to the white oak sub-group. The one variant was the keel sample, which was identified as the hickory group (*Carya*), belonging to the true hickory sub-group (*C. ovata*).

The white oak identification was based on the combination of unicellular and multicellular rays with the multicellular sections in excess of 20 cells wide (Figure 3-5). The white oak sub-group is comprised of several species, including *Q. alba* (white oak), *Q. bicolor* (swamp white oak), *Q. garryana* (oregon white oak), *Q. lyrata* (overcup oak), *Q. macrocarpa* (burr oak), *Q. petraea* (sessile oak), *Q. prinus* (chestnut oak), *Q. robur* (european oak), *Q. stellata* (post oak). While it was not possibly to identify the specific species of oak used in the hull, it was possible to differentiate the ring-porous genera into two sub-groups: red oak and white oak. The defining characteristics that separate white oaks from red oaks are the presence of abundant tyloses in the heartwood, combined with thin-walled latewood pores that are numerous, grading to indistinctly small. The distribution of white oak is throughout the eastern and southern United States, with one species (*Q. garryana)* indigenous to the West Coast. White oak was the most commonly used wood species in shipbuilding, because of its widespread availability, strength and decay resistance.

The wood sample taken from the NBHSS shipwreck's keel identified as hickory was ring-porous, but lacked the excessively large rays found in oaks. Additionally, the early-wood pores were distributed in a single row and pore multiples were present. When examining a thin section under the microscope, the presence of tyloses, combined with apotracheal banded parenchyma, led to the identification of the wood sample as hickory (Figure 3-6). Hickory can be narrowed to two sub-groups: true hickory and pecan hickory. The keel sample falls in the former sub-group based on several characteristics, most notably the absence of banded parenchyma cells in the early-wood section of true hickories. The true hickory sub-group is made up of several species, including *C. glabra* (pignut hickory), *C. laciniosa* (shellbark hickory), *C. ovata* (shagbark hickory), and *C. tomentosa* (mockernut hickory). True hickories are found today along most of the eastern half of the United States, and the wood is extremely tough, heavy, hard and strong with little to no decay resistance. Although extremely unusual in the archaeological record of eighteenth century shipwrecks, perhaps because of difficulties working with it and its limited decay resistance, hickory is among the hardest and strongest of woods native to North America. Denser, stiffer, and harder than either white oak or hard maple, hickory is commonly used where strength or shock-resistance is important. In the case of a keel, these properties would have been highly desirable.

The wood species utilized, the extensive use of compass timbers, and their old growth forest origins, particularly in the case of hickory, indicate a late eighteenth century date and North American origin for the wood, from the eastern-half of the continent and probably from the southern New England or Middle Atlantic region.

3.4 Ship Timber Documentation Results

Between September 2009 and May 2010, 45 hull timbers (i.e., five keel fragments, one sternpost, one stem, 15 floors, 10 large planking fragments, three cant frames, nine futtocks, and one miscellaneous timber [a possible stern deadwood timber]), as well as one intact hearth brick and 25 brick fragments

(two of which were intrusive, the remainder of which were hearth bricks), two vegetable-fiber rope fragments of different diameters, the broken base of a glass case-bottle, an iron barrel hoop, a wooden bucket base fragment, two wooden barrel base fragments, a wooden box panel fragment, a square-in-section piece of wood stock, and a leather shoe sole (possibly intrusive) were documented from the NBHSS shipwreck site (see Figure 3-4). This documentation task comprised the bulk of the unanticipated shipwreck discovery investigation with thousands of measurements recorded, over 1,200 photographs taken, 65 photomosaics of individual timbers produced, and over 120 individual scale measured drawings made to create the timber catalog comprising Appendix C at the back of this report. The brief narrative descriptions of individual hull components that follow are presented in approximately the same sequence as which they were assembled during the construction of the vessel that eventually became the NBHSS shipwreck. Although every effort has been made to present the information in as clear and concise a manner as possible, because of the complexity of many of the structures and the technical nature of these descriptions, the reader is encouraged to refer frequently to the photographs and drawings in Appendix C.

3.4.1 Fasteners

Documented fastenings employed in the joinery of the NBHSS shipwreck's hull components consisted of treenails and iron tacks or nails, spikes and bolts. As described above, only the treenails were preserved. Dimensions and spacing patterns of the hull's iron fasteners are inferred from fastener holes that were visible in individual hull timbers.

The treenails used in the construction of the NBHSS vessel were made from white oak, measured 1 in (3 cm) in diameter, were faceted (seven-sided), had ends sharpened into a point, and were scored with a chisel in an „X'-shaped pattern at their exterior ends, presumably to enhance their absorption of water and speed up the swelling, and thus tightening, process. Treenails were used to fasten hull planking to the floors and in the horizontal fastening of what was either the second or the third futtock. It was observed that most of the treenail-fastened joints appear to have held fast up until the time that the shipwreck was dismantled at the time of its discovery. Evidence of this is the fresh breaks in the keel and planking at treenail-fastened joints and in the fresh breaks in the treenails themselves.

All of the remaining fasteners in the NBHSS hull timbers were iron and consisted of tacks or nails, spikes and bolts. Tacks or nails were used to fasten wooden hull sheathing to the exterior of the keel and to the outside of the hull planking and measured 0.3 in (0.8 cm) square in section at their heads. Spikes were used to fasten hull planking to the frames and the hood-ends of the planks to the sternpost and the frames. It is presumed that the planking was initially spiked into place and then treenail holes bored and the treenails added afterwards. The spikes measured 0.4 in (1 cm) in section at their head. Bolts (1 in [2.5 cm] round in cross-section), clenched with a washer at their ends, were used to secure each floor timber to the keel (i.e., one centrally located bolt per floor), to secure the scarf joint in the keel, and in the joints between the keel and the stem, sternpost, and deadwood.

3.4.2 Keel

The NBHSS vessel's back bone was composed of three structural elements: the keel, the stem, and the sternpost. These elements were the first of the vessel's hull components assembled on the stocks and they defined the vessel's overall length between perpendiculars. The size and forms of these members were determined by economic concerns, the specific construction requirements of the vessel, the prevailing

environmental conditions in the vessel's area of construction and planned area of operation, availability of materials, and the builder's working knowledge of shipbuilding theory and techniques.

The NBHSS shipwreck's keel was broken into five separate pieces when it was recovered from the bottom of the harbor. It was originally made from two massive pieces of old growth hickory that were cut from the heartwood of a tree and flat-nibbed scarfed together about a third of the way along the hull's length from the stern. The keel measured 8.2 to 10 in (20.8 to 25.4 cm) sided (stern to bow) and 11.5 to 16 in (29.2 to 40.6 cm) molded (stern to bow), with preserved length overall of 56.6 ft (17.3 m). A "V"-shaped rabbet cut into the upper corners of the keel for the garboard strakes measured 2 in (5 cm) in width. Fastener holes and the reconstructed extension of the base of the stem 2.5 in (6 cm) below the keel's bottom provide evidence indicating the former presence of a false keel and suggest that the ship was operated in coastal shoal waters where protection of the keel from damages due to groundings was a concern. Additional fastener holes (tacks or nails) visible on the sides of the keel distributed in multiple overlapping diagonal and seemingly random patterns indicate that the keel was also sheathed in wood, which had been replaced on at least one occasion, if not more during the vessel's service life.

3.4.3 Stem

Only the base of the white oak stem, forming the "gripe," where the horizontal structure of the hull and the keel transition to the vertical orientation of the bow and the stem, is preserved, with the upper end of the stem ending in an eroded break approximately 5.3 ft (m) above its heel. The stem measured 7 to 9 in (17.8 to 23 cm) sided on its forward and aft faces, respectively, and 1.7 ft (52 cm) molded at its heel. In profile, the transition from the horizontal orientation of the keel to the more vertical orientation of the stem is striking in its angularity (measured at 40˚ from horizontal); typically this transition is made as a smooth arc rather than as an angle. Also striking is the peculiar manner in which the stem was scarfed to the keel's forward end, as it is not supported by or resting on top of the keel as is typical for this type of joint. The aft face of the stem above the scarf joint with the keel is beveled on its corners to create the rabbet for the forward hood-ends of the planking strakes. Upon its recovery during the supplemental debris/timber removal from the find spot, scalloping from shaping the timber with an adze was visible in the stem's sides.

3.4.4 Sternpost

The NBHSS shipwreck's strongly raking (70˚) white oak sternpost has preserved length of 6.2 ft (1.9 m), and is sided 8 in (20.32 cm) at its preserved upper end and 9 in (23 cm) at its heel and molded 10.6 to 14.8 in (27 to 38 cm) (head to heel). The aft portion of a 2 in (5 cm) -wide rabbet is preserved at the corners of forward face of the sternpost. Four bolt holes indicate that an inner sternpost was once attached to the recovered sternpost timber. At the base of the sternpost on its port and starboard sides are 0.8 in (2 cm) -deep cut dados and a 1 in (2.5 cm) bolt hole for the iron fishplates that once helped attach the sternpost to the keel. Also visible in the heel of the sternpost is a recess for the "stopwater" that was in place between the keel and the sternpost to prevent water from wicking into the seam between them and causing the vessel to leak. Approximately 20 in (50 cm) above the heel of the sternpost is the dado for the lowermost 3 in (7.5 cm) -wide gudgeon strap that was spiked to the sternpost and once supported the vessel's stern-rudder. The sternpost is one of two timbers (the other being a floor timber) that exhibited significant damage from being hacked with an axe.

3.4.5 Floors

A total of 15 white oak floors, all from the after half of the vessel's hull and all but one exhibiting charring on its surface and damages from burning were recovered and documented from the NBHSS shipwreck. Based on the spacing of the single centered iron bolt holes in the keel that correspond to the bolt holes in the center of each floor, the floors were fastened to the keel on 22 in (56 cm) centers all along its length. Spaces between the floors (and futtocks) indicated by fastener hole patterns and impressions left in the surfaces of the inboard faces of some of the planking recovered in November 2009 where the hull had worn down except in the areas where the frames had been located, suggests a sometimes tight, although variable, spacing once existed between the frames that measured between 2 and 8 in (5 and 20.3 cm) wide. The preserved lengths of the floor timbers ranged from 2.3 to 11 ft (0.7 to 3.4 m) in width. The sided dimensions of the floors measured 6.7 to 10.2 in (17 to 26 cm). Their average molded dimension was 9.4 in (24 cm), measured at the floors' throats (i.e., their centers). Limber holes measuring about 3 in (7.5 cm) wide and 1 in (3 cm) deep were cut into the bottom faces of the floors about 4 in (10 cm) on either side of the keel. In floors at the after end of the hull where it gets very narrow, the limber holes were reduced to simple "V"-shaped cuts. Beneath the center of the forward-most three of the 15 recovered floors was inserted a thin (2 in [5 cm]) fillet of wood, or a chock that was designed to increase the molded height, and therefore the strength, of the throat or center of the floor. The ordering of the 15 floors along the keel was determined by comparing their angles of deadrise (Table 3-1).

3.4.6 Futtocks

Nine futtocks measuring between 3.8 and 5.6 ft (1.15 and 1.7 m) long, with sided dimensions of between 5 and 9 in (12.5 and 22.5 cm) and molded dimensions of between 8 and 9.5 in (20 and 24 cm) were recovered from the NBHSS shipwreck site. Three different forms of futtocks appear to be represented in the hull timbers assemblage, suggesting that they may be the first, second and third futtocks of the hull's now disassembled floor and futtock frame components. For example, the largest of the futtocks, Futtock 01 in the field drawings included in Appendix C, is unique and probably represents a "first futtock." Futtocks 02, 04, 05, 07, 08, and 09 in the field drawings are smaller, lighter and similar to each other in their size and shape, and probably represent "second futtocks." Futtocks 03 and 06 are the lightest of the futtocks and are very similar in their size and shape, as well, and may represent "third futtocks." They also share a unique feature that none of the other futtocks have – single, horizontally oriented treenails. The absence of horizontal fasteners in the other futtocks indicates that the floor and futtock components of the frames of the NBHSS shipwreck were not "articulated" or fastened together until the level of the third futtock in the frame.

3.4.7 Cant Frames

Three small timbers that measured no more than 27.5 in (70 cm) long and were interpreted to be cant frames from the NHHSS shipwreck's bow were recovered from the wreck site. The timbers are cut at complex angles that appear to have been intended to permit them to be inserted into the hull at angles that were not normal to the centerline of the ship. The wood species of these timbers was not identified, but they appear to be white oak.

3.4.8 Miscellaneous Timber

A single timber tentatively identified as part of the stern deadwood was recovered from the wreck site. The piece measured 53 in (135 cm) long, 6 in (15 cm) sided and approximately 11 in (27.5 cm) molded.

At what appears to be its heel, the timber is cut at a 42˚ angle, which doesn't match the 70˚ aft rake of the sternpost, making its identification as part of the stern deadwood more tentative. However, its 6 in (15 cm) sided dimension is an exact match for the sided dimension of the sternpost forward of the rabbet in it. Numerous small square holes in the sides of the timber suggest that the timber was once wood sheathed, with the sheathing held in place with small iron tacks or nails.

3.4.9 Planking

Ten, 2 in (5 cm) thick, white oak planking fragments were recovered and documented from the NBHSS shipwreck site. The large planking fragments varied from 1.2 to 1.6 ft (36 to 49 cm) in width and 7.2 and 19.7 ft (2.2 and 6 m) in length, and were fastened to the ships frames with treenails and iron spikes. Six out of the 10 large planking fragments had a beveled edge that would have fit into the rabbet cut in the keel, thus indicating that they were from the lowest run of planking in the ship's hull (i.e., the "garboard strake"). Fastening patterns further indicate that the lower edge of the garboard was spiked into the keel or the lower outer corners of the floors, while its upper edge was secured into the floors with one treenail per frame. The remaining four large planking fragments did not have a beveled edge, thus appear to be from the first strake above the garboard. Fastening patterns in these planking fragments include a relatively small number of spikes that appear to be distributed in a seemingly random pattern constrained only by the positions of the frames into which they were nailed, and treenails – which are distributed in a non-random pattern of two treenails per frame. The random patterning of the spikes suggests that they were hammered in to temporarily hold the planks in place against the frames before the holes were drilled and the treenails hammered into place to fully secure the planking to the frames. Surface features observed in the planks included what may be scribe marks at the ends of some of the planks and saw marks that are clearly those associated with a water-powered, mechanized saw-mill alternatively referred to as an "up-down," "sash," or "frame" saw. These saws were in common operation in England's North American colonies and, later, the United States, from the late 1630s to the middle-nineteenth century (Figure 3-7).

3.5 Archival Research Results

Archival research performed for this archaeological investigation focused primarily on providing information pertaining to three related aspects of the NBHSS shipwreck:

1. the history of the development of the greater New Bedford area/Acushnet River as a port, and the shipwreck's place within that development, including its possible association with the British attack on New Bedford during the Revolutionary War;

2. the identification/name of the shipwreck; and

3. the determination of the shipwreck's relative age, nationality, size, and vessel type.

The first two areas of research were addressed by Fathom's review and synthesis of the historic contexts presented in the Cox, Jr. (2000) and Fitts et al. (2000) reports prepared for the earlier phases of archaeological investigations conducted for the NBHSS project. These reports provided the basic historic context for and narrative of the historical development of the greater New Bedford Harbor area, including the late eighteenth through early nineteenth centuries, which correspond with the estimated age of the NBHSS shipwreck. This review was supplemented by an examination of the local histories of Bristol

County, the city of New Bedford, and the towns of Acushnet and Fairhaven published in the nineteenth and early twentieth centuries (i.e., Crapo [1840]; Gillingham et al. [1903]; Howland [1907]; Hurd [1883]; Pease and Hough [1889]; Ricketson [1858]; and Weeden [1890]), as well as primary documents obtained from the NBWMRL (WPA 1940; Worth n/d) and the NBPL's Special Collections (Cyr n/d). Analysis of documented shipwrecks in the area included a review of the shipwreck list in Cox, Jr. (2000) compiled from the digital shipwreck database maintained by the MBUAR, and the reported vessel casualties published in Berman's (1972) *Encyclopedia of American Shipwrecks*. Fathom also performed an online query of NOAA's AWOIS and reviewed the shipwreck list in John Fish's *Unfinished Voyages: A Chronology of Shipwrecks - Maritime Disasters in the Northeast United States from 1606 to 1956* (1989). These lists and databases were supplemented by informal interviews with the librarians/curators of the Russell Public Library (Acushnet Public Library), the NBPL, and the NBWMRL, as well as the chair and senior members of the Acushnet Historical Commission. All of these sources were consulted in an effort to identify the name of the NBHSS shipwreck and assess its historical significance.

The third area of research was addressed by analyzing the comparative data included in Van Horn's (2004) synthesis of historical and archaeological information generated by previous studies of the wreck sites of British and North American colonial merchant vessels dating from the eighteenth century (Table 3-2), the vessel types registered at New Bedford between 1785 and 1850 (Table 3-3), and in the contemporary plans of vessels included in Frederick Henrik af Chapman's 1768 publication, *Architectura Navalis Mercatoria* (Figure 3-8)

3.5.1 Historical Context

The lands bordering the Acushnet River comprising the city of New Bedford and the towns of Acushnet, Fairhaven, Dartmouth, and Westport were purchased from Massasoit, Grand Sachem of the Wampanoag, and his son, Wamsutta, in 1652. The entire tract was originally called "Dartmouth" and was incorporated in 1654.

The first settlement of Dartmouth was established in 1660 on the east side of the Acushnet River in the southern portion of present-day Acushnet. Dartmouth's early settlements were initially spare and consisted of scattered farmsteads and garrisons up until the time of King Philip's War (1675-1676). During the War, the settlements were overrun and largely destroyed, including all of the homes in present-day Acushnet, as a result of hostilities with local Native American populations.

Following the war, settlers returned to and rebuilt in the area. The Village of Acushnet was established at the head of the Acushnet River, a short distance north of the unanticipated shipwreck discovery. By 1747, Bennett's sawmill and one of the earliest iron mills in the area had been established along Long Plain Road on the banks of the Acushnet River and Deep, or Morse, Brook.

Throughout the first half of the eighteenth century, Acushnet developed to a greater extent than any other area in Dartmouth and served as the region's center and chief port on the river. The first vessels constructed on the river were built at Stetson's shipyard, which was located about 500 ft (152 m) south of the village bridge (the present-day Wood Street Bridge), on the west side of the river where it widens. The narrowness of the river at the shipyard site reportedly required shipwrights to take great care during the launching of vessels, so as to not run them aground on the muddy bank on the opposite side of the river (Howland 1907). In the early days of this enterprise only smaller vessels were built, such as those used in the deep-water fishing and coastal merchant trades. However, during the latter part of the eighteenth century, larger vessels were built that were destined for use primarily by the whaling industry.

The Stetson yard was eventually abandoned and the center of shipbuilding activity shifted a short distance further south to the "Belleville" section of New Bedford, situated almost directly across the river from the NBHSS unanticipated shipwreck discovery location. This area became a busy center of maritime activity with the addition of storehouses, a cooper's shop, and other buildings used for ship construction, as well as for supporting the whaling and freighting businesses.

In 1787, Fairhaven (which included New Bedford and Acushnet) separated from Dartmouth. The three towns remained one municipality until 1812, when Fairhaven, which still included Acushnet, split off from New Bedford with the Acushnet River forming the natural boundary between the two communities. With the continued growth of New Bedford, Fairhaven and Acushnet, Acushnet eventually separated from Fairhaven in 1860 to become its own town. Because of the wetlands adjacent to the location of the unanticipated shipwreck discovery, the western portion of Acushnet appears from a review of historic maps of the region to have remained undeveloped before and after the NBHSS shipwreck was deposited into the archaeological record.

The spacious and natural harbor formed by the Acushnet River estuary has been used for more than three centuries by commercial, military and recreational vessels. As is the case today, the fisheries were the principal maritime industry of the greater New Bedford area during the earliest years of the port's development. Initiated in New Bedford in 1690, whaling replaced fishing between 1820 and 1857 as the area's primary maritime industry. Led by the enterprises of the Russell and Rotch families, New Bedford's whaling industry grew to include 50 vessels by 1775 (Morison 1921; Pease and Hough 1889).

New Bedford's harbor was the only port north of the Chesapeake Bay that was not occupied by the British during the early part of the Revolutionary War. Protected by a newly constructed fort situated at the present-day location of Fort Phoenix on the east side of the mouth of the Acushnet River, the port grew in stature as a noted rendezvous for Boston and Providence's Continental privateers that brought their prizes and unloaded their cargoes there (Pease and Hough 1889). As a result of this privateering activity and recognizing the value of New Bedford's significant commercial storehouses along its waterfront, British forces focused on New Bedford as a high priority target for attack and retribution (Howland 1907).

On September 5, 1778, a British fleet composed of two frigates, an 18-gun brig-of-war, and 36 transports carrying about 5,000 regular British army and naval troops commanded by Major General Charles Grey launched an attack on New Bedford and Acushnet and the vessels within the harbor. With most of the area's fighting-age men away to participate in battles being fought in Rhode Island and elsewhere, the port had few defenders. Those left behind mounted a defense, losing three with nine wounded in the process of killing nine British troops and causing 32 to go missing, but ultimately proved no match for the vastly superior numbers of the attacking British force. At the time of the attack, the inner harbor of New Bedford was described as being full of "all sizes and descriptions of vessels: fishermen, merchantmen, whalemen, privateers and prizes" (Howland 1907).

Landing at Clark's Cove on the southwest corner of the entrance into New Bedford Harbor, the British force marched to the river and then northward up its west side, across its head through the village of Acushnet, and then southward down its east side to the fort, before finally retiring to Sconticut Neck where they re-embarked upon their vessels. Facing comparatively light resistance, the British force put a torch to the port and burned houses, barns, stores, and mills, as well as buildings associated with the fort. They also torched the large number of vessels tied up at the wharves and at anchor within the harbor (although there were apparently some vessels "lying in the stream," and small craft up the river, that

proved inaccessible and were undamaged) (Hurd 1883). An inventory of the property destroyed as a result of the attack was reported at the time by Major General Grey in his official account of the engagement to his commander, General Sir Henry Clinton, as "the vessels and stores in the whole extent of Acushnet River (about six miles), particularly at Bedford and Fairhaven." These properties included:

- Ten homes (two in New Bedford, six in Acushnet, and several in Fairhaven);
- 20 storehouses filled with large quantities of rum, sugar, molasses, tea, coffee, medicines, tobacco, gun powder, sail cloth, cordage, etc.
- Two large ropewalks;
- Eight vessels from 200 to 300 tons, most of them prizes, nine armed vessels carrying from 10 to 16 guns, and 70 sloops and schooners of "inferior size," as well as an indeterminate number of whale boats and other small boats (Howland 1907).

Local resident, Gilbert Russell, cited by the historian, Ricketson (1858), reported a total of 34 vessels destroyed between Oxford Point and the old wharf at Belleville (known then as "McPherson's Wharf" and situated directly across the river from the site of the unanticipated shipwreck discovery). The 34 vessels Russell reported as destroyed included seven ships, one bark, one snow, eight brigs, seven schooners, and ten sloops (Ricketson 1858; Crapo 1840).

These 34 vessels were identified as:

ship *Harriet*
Continental ship *Mellish*
ship *Leopard*
ship *Fanny* (French prize)
ship *Heron*
ship *Spaniard*
ship *Caesar*
bark *Nanny*
snow *Simeon*
Continental brig *Sally*
brig *Rosin*
brig *Sally* (fishing vessel)
schooner *Adventure*
Continental schooner *Loyalty*
sloop *Nelly*
sloop *Flying Fish*
sloop *Captain Lawrence*
schooner *Defiance*
brig *No Duty on Tea*
schooner *Sally* (*Hornet*'s prize)
sloop *Bowers*
sloop *Sally* (12 guns)
brig *Ritchie*
brig *Dove*
brig *Holland*
sloop *Joseph R.*
sloop *Bociron*
sloop *Pilot Fish*
schooner *The Other Side*
brig *Sally*
sloop *Retaliation*
sloop *J. Brown's*
schooner *Eastward*
schooner *Captain Jenny.*

At least several of these vessels sunk at and off of McPherson's Wharf were reportedly "got up" (i.e., raised by divers from the harbor floor) shortly after the attack (Hurd 1883).

Given the large number of eighteenth century vessels burned during the September 5, 1778 attack, the evidence of burning in the NBHSS shipwreck's recovered hull timbers, and the proximity of the unanticipated shipwreck discovery's location to the Belleville section of New Bedford, archival

research conducted for this study indicated that it is possible that the NBHSS shipwreck was one of the vessels destroyed during the British attack.

Following the Revolutionary War, the port of Greater New Bedford's economy and its whaling industry slowly revived. Several years passed, however, before any vessels were fitted out there. As of 1785, only 8 vessels were registered in the port, several of which were engaged in whaling (WPA 1940). By the turn of the century, 51 vessels called New Bedford home, and the whaling industry had begun to flourish again as New Bedford and Fairhaven competed with Nantucket's whaling interests and started their rise to world dominance of whaling. By the 1790s, New England's whalers were heading into the Pacific Ocean for the first time in search of their quarry. As the scope and complexity of whaling grew, New Bedford's whaling-related ancillary maritime industries, such as shipbuilding, ropewalks and spermaceti candle factories, expanded as well.

In addition to whaling, merchants also began shipping cargoes out of New Bedford again. By 1802 there were 20 square-rigged merchantmen sailing from New Bedford to New York, the West and East Indies, and southern European ports. By 1805, the port boasted seven commercial wharves and 145 registered vessels, 65 of which were ships (12 of which were whalers) averaging 250 tons each. The remaining vessels were schooners, brigs, sloops and barks (Ricketson 1858; WPA 1940).

Given the long history of commercial maritime activity and shipping in the Acushnet River and New Bedford harbor, archival research also indicated that is possible that the NBHSS shipwreck was a merchant vessel that was abandoned and left derelict in the upper reaches of the undeveloped eastern side of the Acushnet River after the end of its service life.

Analysis of documented shipwrecks included in Cox, Jr. (2000) (compiled from MBUAR's shipwreck list and the reported vessel casualties published in Berman [1972]), as well as an online query of NOAA's AWOIS, a review of the shipwreck list published in Fish (1989), analysis of the NBWMRL's photographic archives involving the viewing of hundreds of images associated with the key search words:

- "Acushnet";
- "Shipwreck";
- "Fairhaven";
- "Marsh";
- "Hulk";
- "Derelict";
- "Waterfront";
- "Wreck"; and
- "New Bedford Shipwreck,"

a review of the NBPL's Special Collections' Newspaper Database, searching the key words:

- "Acushnet River";
- "Acushnet River Shipwreck";
- "Acushnet River Wreck";
- "New Bedford Harbor";
- "New Bedford Harbor Shipwreck";
- "Old Shipwreck";

- "Ship Burned";
- "Derelict Ship"; and
- "Abandoned Ship,"

and interviews with the chair and senior members of the Acushnet Historical Commission ***produced no evidence of a likely candidate that could be the NBHSS shipwreck. Consequently, the identity of the vessel and its service history remain unknown at this time.***

3.5.2 Comparative Analysis

The review of Van Horn's (2004) synthesis of historical and archaeological information on shipwrecks of eighteenth century British and North American colonial vessels, including 10 merchant vessels, provided comparative data that proved useful for determining the relative age, nationality, size, and vessel type of the NBHSS shipwreck (see Table 3-2). Van Horn (2004) identifies in her thesis several key factors that influenced ship design and construction during the period:

1. The transition in British merchant ships from defensive-style ships to bulk carriers that occurred in the late seventeenth century that resulted in both types being still in use at the beginning of the 1700s;

2. The timber shortage in Europe and the comparative abundance of timber in the New World, and their affect on the materials that were available to shipwrights for vessel construction, as well as the impact of the growing costs of compass timbers and its potential limitation on their use in merchant vessels where economy was essential;

3. The need to economize more in the construction of merchant ships than in naval vessels, where standardization took priority, greater hull strength was necessary for carrying heavy armament and deflecting enemy shot, and governments were better able to pay for higher quality construction than merchant owners;

4. The overall increase in vessel size over time and the fact that British merchant vessels were generally larger than colonial craft; and finally,

5. Potential distinctions between British and colonial vessels based on inferred trade networks and cargoes as well as the increasing need for speed during and after the Revolutionary War.

Absent of finding a cargo on a shipwreck site, general inferences from hull size and shape may be used to interpret the purpose and trade(s) for which vessels, such as the NBHSS shipwreck, was built. First, the archaeological remains of the ten merchant ships examined by Van Horn indicated that none of the vessels were larger than 300 tons. In fact, 50 percent of the ships fell into a mid-size range of about 100 tons. Four of the five 100-ton ships (i.e., 80 percent) were American-built, suggesting that this size was the most common for American-built trading vessels in the colonies. Three of the four 100-ton American-built ships (75 percent) (i.e., the 1725 to 1750 *Rose Hill*, the pre-1765 *Reader's Point*, and the 1770's *Otter Creek* shipwrecks) were used in the inter-colonial and West Indies trades, and probably represent typical sloops and schooners used for colonial maritime commerce. British and colonial-built ships did diverge on a few points in terms of the types of timber used, the sizes of timber, and the sizes of the vessels. British transatlantic trading vessels were larger than the West Indies/inter-colonial traders. They also used a narrower range of wood types than employed in colonial-built vessels, which included

many specific to their local regions of build in the New World. Colonial-built ships also tended to use larger pieces of compass timber, whereas the British vessels attempted to conserve timber by breaking up typically large pieces into multiple smaller ones.

In the same way that intended use of the vessel influenced decisions about its size, the archaeological remains of the ten eighteenth century merchantmen shipwrecks studied by Van Horn (2004) indicate that hull shapes were also related to trade. The hull design for the majority of the vessels, which served as inter-colonial traders, depended on whether the owner anticipated danger and, therefore, built the ship for speed and maneuverability to outrun pirates and privateers or not. The latter type of vessel was constructed with a full-bodied hull shape to maximize cargo space at the expense of speed. Examples of the former are the 1779 Continental privateer, *Defense*, and the 1759 Lake Champlain warship, *Boscawan*, which have near amidships hull-sections exhibiting 20˚ and 22˚ of deadrise, respectively (deadrise is the angle of the rise in the bottom of the hull from horizontal as it extends outboard of the hull's longitudinal centerline/keel as viewed in cross-section). Examples of the latter type of vessel are the three aforementioned 100-ton, American-built, West Indies/inter-colonial merchant ships comprising the *Rose Hill*, *Reader's Point*, *Otter Creek* shipwrecks, which have near amidships hull-sections exhibiting 8˚, 10˚ and 13˚ of deadrise, respectively.

The NBHSS shipwreck remains, as reconstructed for this study, are consistent with those of the most common of the American-built trading vessels – an approximately 70-foot (m) long, 100-ton sloop or schooner with a full, near amidships hull-section exhibiting between 6˚to 10˚of deadrise – engaged in the transportation of cargo in the West Indies/inter-colonial trade.

Additional historical and archaeological data provided by Van Horn (2004) regarding the types, dimensions, wood species, fasteners, and configuration of individual hull timbers of eighteenth century shipwrecks provide further clues to the relative age, nationality, size, and vessel type of the NBHSS shipwreck. Comparative hull timber data presented below follow the same approximate sequence that the timbers would have been laid down and installed during the NBHSS vessel's construction. The characteristics of eighteenth century vessels described below provide a technological context for interpreting the physical characteristics of the NBHSS shipwreck timbers that are presented in a narrative format in section 3.4 of this chapter and in the hull timber photographs and scale drawings comprising Appendix C of this report.

Archaeological investigations of the remains of eighteenth century shipwrecks performed to date indicate that keels varied in size and shape and could be made of a number of different wood types. White oak was the predominant choice for keels, as well as most other hull components, because of its widespread availability and greater durability, strength, and resistance to decay. Elm (*Ulmus*), hard maple (red maple and silver maple) (*Acer rubrum and A. saccharinum*) (prone to decay) and pine (*Pinus*) (a poor choice for a keel timber) were also found in the keels of the investigated vessels in the 2004 Van Horn study. The keels of these vessels were most often composed of one or more pieces joined or scarfed end-to-end. The rabbet for the garboard or lowermost planking strake was usually cut into the upper corners of the keel.

The shape of the keel would have influenced the vessel's sailing ability with a deeper keel helping to prevent lateral drift and a shallower keel providing better access to shoal waters. A false keel (a sacrificial shoe attached to the bottom of a keel to protect the keel from damages resulting from groundings) seems to have been an optional element of eighteenth century ships that was not consistently used.

In most of the archaeologically documented eighteenth century wrecks included in the Van Horn (2004) study, stem and sternpost remains were not well preserved. When present, these timbers would typically consist of a gripe or forefoot, the stem proper, and an apron in the bow, and a knee with deadwood and the sternpost at the stern.

Framing patterns exhibited in the archaeological examples examined by Van Horn (2004) present the best clues to the possible design methods used in the construction of a ship's hull. The frames may also reflect the vessel's trade and the availability of timber at the time and place of its construction, as well as shortcuts the builder took in an attempt to save costs. The most costly timbers for shipwrights to purchase were "compass" timbers (i.e., naturally curving) and long, straight pieces, such as those used for keels. Attempting to economize was important for all merchant vessels, but American builders, with a plentiful supply of timber, probably focused more on economizing labor than materials. As mentioned above, although oak was the preferred wood for shipbuilding, many of the merchant vessels incorporated other types such as pine, maple, and even beech, because they were readily available in the New World. Timbers were occasionally left unfinished to keep them as large as possible and reduce the time required for completion.

All of the vessels included in the Van Horn (2004) study had "squared double frames" that were placed square to the keel throughout the run of each hull, whereas the extreme ends showed a mixture of framing techniques that included "square" frames and "cant" frames. The framing of all the examined shipwrecks was almost entirely of white oak (*Q. alba*). Dimensions of the frames varied with intended use and matched the overall scantlings of the vessels. The more heavily built merchantmen had large floor and futtock timbers with frames spaced closely together in some cases. In other cases, lighter, more widely spaced frames were used to reduce building costs and improve sailing performance. In the American-built, 100-ton West Indies/inter-colonial merchantmen, dimensions varied significantly between timbers and the frames were often unevenly spaced (Van Horn 2004).

The late seventeenth century Phips wreck, the earliest of the merchant ships examined by Van Horn (2004), had futtocks without any horizontal joinery that were separated by gaps of varying size. These spaces and the lack of joinery suggest that the floors were installed first, with futtocks added as the hull was planked. The futtocks also clearly showed a lack of standardization, as the dimensions varied greatly and some of the timbers still had cambium and bark attached to them. In addition, to make the timbers thicker near the centerline and reduce the need for compass timbers, bottom and top fillets of wood were used, in a somewhat similar manner as that which was found in the NBHSS shipwreck. The wrecks of the late seventeenth century Port Royal warship and the mid to late eighteenth century Town Point vessel examined by Van Horn (2004) also had only disarticulated frames. For all of these vessels lacking articulated frames, the complete frames could not have been assembled prior to their installation on top of the keel, but would have, instead, been placed piece-by-piece as the hull was planked. After all the floors were installed, the second and fourth futtocks (if used) could be joined to the floors of the master frames, but the first and third futtocks could not be installed until the planking was attached. On the other hand, it is possible that no mold frames were used and timbers were added by eye and shaped using ribbands. This method of using only disarticulated frames could save time and money during construction, as the timbers did not need to be carefully shaped to fit closely together. Pieces could be left closer to their original shapes, requiring smaller compass timbers to meet the necessary size requirements.

Attempts to delineate a pattern of framing evolution over the course of the eighteenth century have not yet resulted in the recognition of any obvious patterns, although most of the earliest vessels did have only

disarticulated frames, and frames over the entire period were almost always double, with a floor and associated futtock arranged side-by-side.

While there may have been some type of transition from disarticulated to articulated frames during the course of the period, the most common framing method appears to have been the use of regularly spaced mold frames with intermediate filler frames. Double frames appear to have been the standard throughout the period. Spacing between frames generally was small, but varied widely. The earlier vessels appear to have had less space between frames than later vessels (Van Horn 2004).

In addition to providing clues to ship design, the frames indicate the quality of timber used for construction, whether this choice was based on expense or availability. Using frames of smaller scantling, spacing frames farther apart, and canting timbers in the extreme ends were all ways to reduce the costs of timber. Top and bottom fillets, as seen on the colliers included in Van Horn's 2004 study, allowed smaller pieces of compass timber to be used by the ships' builders. As compass timbers were the most expensive wood used in ship construction, reducing their needed size produced a large cost advantage (Van Horn 2004).

Framing the extreme ends of a wooden vessel was often a difficult task, because of the severe curvature of the hull and planking at those points. Two main methods for dealing with this problem are seen in the eighteenth century archaeological examples included in the 2004 Van Horn study: either 1) square frames (i.e., frames oriented perpendicular to the longitudinal axis of the hull) to the very ends of the hull with vertical hawse pieces running parallel to the keel supporting the planking near the posts; or 2) frame that were canted or angled to remain flush with the planking. The former method required a large bevel for the timbers to let the planking run smoothly and used an excessive amount of timber in order to avoid exposing the timber's rot-prone sapwood. In some cases, the shipwright developed a variation of one of these techniques in an attempt to improve them. Unfortunately, in many of the eighteenth century shipwrecks included in the Van Horn (2004) study, the frames in the extreme bow and stern do not survive or could not be examined, thus limiting the amount of available evidence for comparison with the remains of the NBHSS shipwreck.

The wreck of the Reader's Point vessel, as well as the *Betsy*, and the *Nancy* all had obviously canted frames. These timbers took the form of half-frames that were fastened directly to the planking after it was installed, but were not attached to each other or the centerline structure. In the Reader's Point vessel and the *Nancy*, the cant frames were only apparent in the bow, whereas in the *Betsy* they were clearly used in both bow and stern. In all three vessels some of the timbers came to a wedged point before touching the apron, while the other frames butted against it (Van Horn 2004).

Both framing styles were used in the bows and sterns of the various vessels included in the Van Horn (2004) study; however, there was no clear differentiation based on the vessel nationality. The earliest clear examples of cant framing are seen in the wrecks of the *Boscawen* and the Reader's Point vessel, dating to just after the middle of the eighteenth century. The earlier shipwrecks of the Ronson ship and the Rose Hill sloop had square frames in their bow and stern, although square framing of the bow and/or stern of ships does continue later in the period as evidenced by the Deadman's Island sloop and Town Point vessel from the last quarter of the eighteenth century. Regardless, the examples do suggest that cant frames were a later development than square frames (Van Horn 2004).

The planking of the eighteenth century vessels included in the 2004 Van Horn study was typically attached to the frames with wooden treenails, which were either wedged or unwedged, and iron spikes.

Treenails were the main type of fastener utilized on all but two of the vessels, which used iron nails almost exclusively, instead. This deviation from the common pattern may indicate that craftsmen without formal training in shipbuilding constructed these vessels; alternatively, the choice could have been made to save expense or time, as large auger-drilled holes were required for treenails. As noted above, the species of timber employed for the planking in most of the vessels was white oak, although red oak (*Quercus rubra*) and pine were also used. External and ceiling planking thicknesses were fairly consistent, averaging 1.5 to 3 in (3.8 to 7.6 cm) for the larger vessels and 1.1 to 1.25 in (2.8 to 3.2 cm) for the riverine craft. In the archaeological examples, the 100-ton merchant vessels all had inner and outer planking of about 2 in (5.1 cm) (Van Horn 2004).

In addition to the standard practice of caulking the seams of outer hull planking on wooden ships to prevent leakage, additional protection from damages from groundings or attack by wood-boring mollusks (i.e., the "shipworm" [*Teredo navalis*]) was provided to the hull by sheathing it in a thin, sacrificial skin of wood or, later, metal (e.g., copper or lead sheeting). The majority of the eighteenth century shipwrecks included in the 2004 Van Horn study had some type of coating and wood sheathing to protect the hulls from shipworm. Pitch or pine tar was usually combined with animal hair or felt and layered over the outside of the hull to prevent worms from penetrating the hull. Some type of wood or metal sheathing was then placed over the anti-worm coating to protect it and keep it in place. Wood sheathing or "sacrificial planking" was found on six of the 10 (60 percent) major merchant vessels. Sheathing was typically attached to the outer planking with small iron tacks or nails. The most common wood type used for the sheathing was pine, although white oak was also used, as on the keel (only) of the Reader's Point vessel. Oak may have been chosen for this vessel, because its keel was made from maple, which is more susceptible to rot than oak. The only other vessel reported to have sheathing on the keel was the *Betsy*, the posts and rudder of which were sheathed, as well. Sheathing varied widely in its thickness, ranging from 0.25 in (0.6 cm) on the Reader's Point vessel to 1.25 in (3.2 cm) on the *Betsy*. The thickest sheathing was on the two colliers and the Otter Creek wreck, all heavily built in their other scantlings as well. As most of the vessels had sheathing, it appears to have been a standard element on merchant ships of the period, especially for those engaged in the trans-Atlantic and West Indies trades. No mention was made of sheathing in the excavation reports of the Phips wreck, the Terence Bay vessel, or *Defence*; as these three were all built and operated in cold New England waters, it seems likely they would not have needed it (Van Horn 2004). Since copper sheathing did not become common on merchant vessels until the nineteenth century, it follows that only wood sheathing was present on the sheathed Van Horn study vessels.

While a ship's size, shape, and hull timbers can be indicators of a vessel's purpose as either a trans-oceanic, coastal or riverine trader, elements of the ship's equipment, such as the presence of a cookstove, can also be such an indicator. A cookstove was an essential feature for vessels intending to spend prolonged periods away from the shore. Coastal or riverine traders could potentially come ashore for cooking, but vessels making longer trading voyages, or involved in privateering, needed a way to prepare food while at sea. Two examples of cookstoves have been found on eighteenth-century shipwrecks: the Rose Hill sloop and *Defence*. Most of the ships examined in the 2004 Van Horn study likely had some type of cookstove, but the item may have been salvaged or not preserved. The actual structures could be large and carefully built, or relatively simple. At a minimum, they would have consisted of a brick hearth fitted with a spit or cauldron for cooking over a fire.

4.0 Summary and Recommendations

In response to an unanticipated shipwreck discovery made in July 2009 during remediation activities at the NBHSS in Bristol County, Acushnet, Massachusetts, a marine archaeological documentation and assessment investigation was undertaken on behalf of the EPA and the USACE-NAE. Performed between August 2009 and August 2010, the investigation involved a marine geophysical survey to assess site integrity and identify additional shipwreck elements on the harbor floor, recovery, documentation and analysis of the identified additional shipwreck elements, and archival research to determine the identity of the wreck and assess its historical significance.

The combined archaeological and archival research completed for the investigation suggests that the wreck dates from the late eighteenth century and likely represents the remains of a once-common class of ship - the 100-ton inter-colonial-West Indies merchant sloop or schooner. Research to determine the identity of the vessel and its place in the developmental history of the port of New Bedford was inconclusive. Archival research indicates that between 30 and 70 ships were burned and sunk by British forces during a 1778 attack on New Bedford Harbor, including an area in the vicinity of this particular ship find. While the age, location, and charring of timbers suggest the NBHSS shipwreck could be one of vessels that was destroyed during the war, other archaeological evidence (i.e., the near total absence of any artifacts or ship-related hardware that one would presume would have settled within the hull if it had been unexpectedly burned during an attack, and evidence of wear and tear and post-depositional abuse suggesting advanced age) indicates that the ship was abandoned at the end of its service life and left derelict on the eastern edge of the Acushnet River in the upper harbor.

Given that as a result of the remediation process, the site's contextual integrity was compromised, and the shipwreck timbers and the few artifacts comprising the site were removed and will be discarded as contaminated hazardous materials, the site was assessed to be historically significant for its information potential, but not National Register eligible, because of its lack of contextual integrity. The additional ship timber recovery and documentation conducted for this investigation was considered by the MHC to constitute a mitigative measure for reducing the adverse impacts to the unanticipated shipwreck discovery site, and remediation activities were completed in the location of the unanticipated discovery. Consequently, ***no further investigation of the NBHSS's unanticipated shipwreck discovery location is recommended. However, additional care should be taken during all future phases of the NBHSS remediation project to avoid similar impacts on additional submerged cultural resources (i.e., shipwrecks) that could be encountered. The significant limitations of available geophysical survey technologies utilized during the original 1999 identification survey within the NBHSS, combined with the large number of shipwrecks that were reported sunk in New Bedford Harbor during the Revolutionary War, together indicate that despite having been surveyed in 1999, the NBHSS has a high archaeological sensitivity for containing additional, heretofore undetected shipwrecks within its APE.***

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TABLES

TABLE 3-1: RECONSTRUCTED ORDERING OF RECOVERED FLOORS IN NBHSS SHIPWRECK BASED ON DEADRISE

Order in the Hull (Stern to Bow)	Floor Name	Frame Number in Field Drawings	Angle of Deadrise
1	A	12	50˚
2	B	13	43°
3	C	01	34°
4	D	02	27°
5	E	03	22°
6	F	04	20°
7	G	05	15°
8	H	10	13°
9	I	11	13°
10	J	06	12°
11	K	08	11°
12	L	14	11°
13	M	09	10°
14	N	15	10°
15	O	07	6° (10° w/chock)

TABLE 3-2: SCANTLINGS OF NBHSS SHIPWRECK AND OTHER ARCHAEOLOGICALLY DOCUMENTED COLONIAL MERCHANT VESSELS*

SHIPWRECK:	NBHSS	Phips	Ronson	Rose Hill	Terence Bay	Reader's Point	Bermuda Collier	*Betsy*	Otter Creek	*Defence*	*Nancy*	Clydesdale Plantation
DATE:	Pre-1800?	Pre-1690	1700s-1740s	1725-1750?	Pre-1750s	Pre-1765	Pre-1770s	1772	1770s	1779	1789	1790s
NATIONALITY:	Colonial – New England	Colonial – Virginia?	Colonial – Northern?	Colonial – Massachusetts	Colonial – New England	Colonial – Northern	British	British	Colonial	Colonial - MA	British Colonial	Southern
TONNAGE:	est. 100-110 tons	45 tons	260 tons	103 tons	100-120 tons	100 tons	170-210 tons	180 tons	100 tons	170 tons	100-120 tons	20-25 tons
LENGTH OVERALL:	est. 70 ft	–	100 ft	67 ft	70 ft	60 ft	–	–	58 ft	72 ft*	68 ft*	43 ft 9 in
LENGTH B/N PERP:	est. 57 ft	–	82 ft	–	–	–	Over 72 ft	73 ft 1.6 in	–	–	–	–
BEAM:	est. 22 ft	–	27 ft	22 ft	–	18 ft	24 ft*	23 ft 7.35 in	16 ft	22 ft*	22 ft *	15 ft 5 in
LENGTH-TO-BEAM RATIO:	est. 3.2:1	–	3.7:1	3:1	–	3.3:1	> 3:1	> 3.2:1	–	> 3.3:1	3.1:1	2.8:1
DRAFT:	–	–	11 ft	8 ft	–	–	–	9 ft 6 in	9 ft	–	–	–
HOLD DEPTH:	–	–	7.5 ft	8.5 ft	–	–	11.5 ft	9 ft 10 in	6.5 ft	–	7 ft 6 in	6 ft 3 in
KEEL LENGTH:	56.6 ft	–	68 ft	54.5 ft	–	42 ft 5 in*	69 ft 6 in*	68 ft 2.5 in	49 ft 3 in*	–	59 ft 9 in	–
KEEL MOLDED:	11.5 in to 16 in (stern to bow)	–	14 in	15 in	–	10.9 in	12 in	13.25 in	12 in	14 in	12-14.75 in	–
KEEL SIDED:	8.2 in to 10 in (stern to bow)	–	12 in	8 in	–	9.6 in	16 in	14.4 in	9-12 in	8 in	8-9.5 in	–
KEEL WOOD TYPE:	Hickory	–	–	Hard maple	–	Hard maple	Elm	White oak	White oak	Oak	Oak	Yellow pine
STEM LENGTH:	broken approx. 5.3 ft above heel	–	–	–	–	–	–	–	–	–	–	–
STEM MOLDED:	1.7 ft (at heel)	–	–	–	–	–	–	–	–	–	–	–
STEM SIDED:	9 in (aft face) to 7 in (fwd face)	–	–	–	–	–	–	–	–	–	–	–
STEM WOOD TYPE:	White oak	–	–	–	–	–	–	–	–	–	–	–
STERNPOST LENGTH:	6.2 ft	–	–	–	–	–	–	–	–	–	–	–
STERNPOST MOLDED:	10.6 in (uppermost prsrvd.) to 14.8 in (at the heel)	–	–	–	–	–	–	–	–	–	–	–
STERNPOST SIDED:	8 in (uppermost prsvd.) to 9 in (at the heel)	–	–	–	–	–	–	–	–	–	–	–
STERNPOST WOOD TYPE:	White oak	–	–	–	–	–	–	–	–	–	–	–
KEELSON LENGTH:	–	–	–	28 ft 9 in*	–	–	–	56 ft 10.6 in	–	–	53 ft	–
KEELSON MOLDED:	–	–	–	12 in	–	9.6 in	12.5 in	8.5-23 in	12 in	8 in	12 in	–
KEELSON SIDED:	–	–	–	10 in	–	10.9 in	18 in	14.4 in	13.5 in	11.5 in	9 in	–
KEELSON WOOD TYPE:	–	–	White oak	White oak	–	White oak	White oak	Pine and oak	White oak	Oak	Oak	Pine
FLOOR LENGTH (PRSVD LGTH):	2.3 ft to 11 ft	–	–	–	–	–	–	–	–	–	–	–
FLOOR MOLDED (AVG):	9.4 in (at the throat)*	–	8.5 in	10.5 in	6 in	10 in	12-13 in	–	12-13 in	8-15 in	7.5-9 in	–
FLOOR SIDED (AVG):	8.2 in (6.7 in to 10.2 in)	–	8.5 in	11 in	8 in	9.5 in	12 in	–	6-13 in	–	8-9 in	–
FUTTOCK MOLDED (AVG):	3 sizes (9.5 in; 8 in; 8.5 in)	4.7 in	8.5 in	10.5 in	–	8.5 in	4-10 in	7-9 in	12 in	8 in	8 in	–
FUTTOCK SIDED (AVG):	3 sizes (9 in; 7 in; 5 in)	6.3-10.2 in	8.5 in	11 in	–	8.9 in	10 in	9-10 in	–	8 in	8 in	–
FUTTOCK OFFSET FROM CTR LN:	–	–	0 in	11 in	–	12 in	6-8.5 in	10.75 in	13.5 in	–	7-10 in	–
SPACE B/N FRAMES (AVG):	16 in (b/n floors over keel - floors spaced on 22 in centers); variable (2 to 8 in [b/n floors/futtocks])	Various	6 in	0 in	2 in	0-4 in	1-4.5 in	1-5 in	3-27 in	5 in	5-9 in	–
FRAME WOOD TYPE:	White oak	White oak	White or live oak	Beech and white oak	Oak	White oak	White oak	White oak	White oak	Oak	Oak, red cedar	Live oak
EXT PLANKING THICKNESS:	2 in	2 in	2 in	2.4 in	2 in	2 in	3 in	2.25-2.5 in	2 in	2-2.5 in	2 in	–
EXT PLANKING WOOD TYPE:	White oak	White oak	White oak	White oak	Oak	White oak	White oak	White oak	White oak	Oak	–	Pine
INT PLANKING THICKNESS:	–	1.6 in	2 in	2 in	2 in	2 in	3 in	2.5 in	2 in	–	1.5 in	–
INT PLANKING WOOD TYPE:	–	White Pine	White Oak	Red Oak	Oak	White oak, yellow pine	White oak	White oak	White oak	Oak	–	Pine
FASTENERS:	Iron, treenails	Treenails	Iron, treenails	Iron, treenails	Iron, treenails	Iron, treenails	Iron, treenails	Iron, treenails	Iron, treenails	Iron, treenails	Mainly iron, some treenails	Mainly iron, few treenails
SHEATHING:	wood?	–	Thin wood	0.5 in hard pine	–	0.25 in pine, oak on keel	1 in scotch pine	1.25 in pine	0.9 in pine	–	–	–
NUMBER OF MASTS:	Two?	One?	Three	One	Two?	One	Two?	Two	Two	Two	Two	One
ARMAMENT:	–	–	6-6pdrs.	–	–	–	–	–	–	–	Unknown sizes	–
VESSEL TYPE/TRADE:	West Indies or Intercolonial?	Coastal Trader	Tobacco/Trans-Oceanic	West Indies or Intercolonial	Fishing	West Indies or Intercolonial	Collier/Transport	Collier/Transport	West Indies	Privateer	Lake trader	Coastal trader

* Source of data for "Other Archaeologically Documented Vessels": VanHorn (2004).

TABLE 3-3. VESSEL TYPES REGISTERED AT NEW BEDFORD (1785-1850)														
VESSEL TYPE	**YEAR**													**TOTAL**
	1785	**1790**	**1795**	**1800**	**1805**	**1810**	**1820**	**1825**	**1830**	**1835**	**1840**	**1845**	**1850**	
Bark	0	1	1	2	1	1	7	17	22	20	8	8	8	**96**
Brig	0	1	3	8	36	24	7	17	22	20	8	8	8	**162**
Brigantine	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Schooner	1	6	11	11	24	12	33	14	18	30	16	5	11	**192**
Ship	3	3	8	19	65	77	55	65	51	52	17	19	10	**444**
Sloop	4	3	10	9	19	19	38	14	8	5	2	0	0	**131**
Snow	0	0	0	2	0	1	0	0	0	0	0	0	0	**3**
SUB-TOTAL	**8**	**14**	**34**	**51**	**145**	**134**	**140**	**127**	**121**	**127**	**51**	**40**	**37**	**1029**

Data Source: Works Progress Administration (1940)

FIGURES

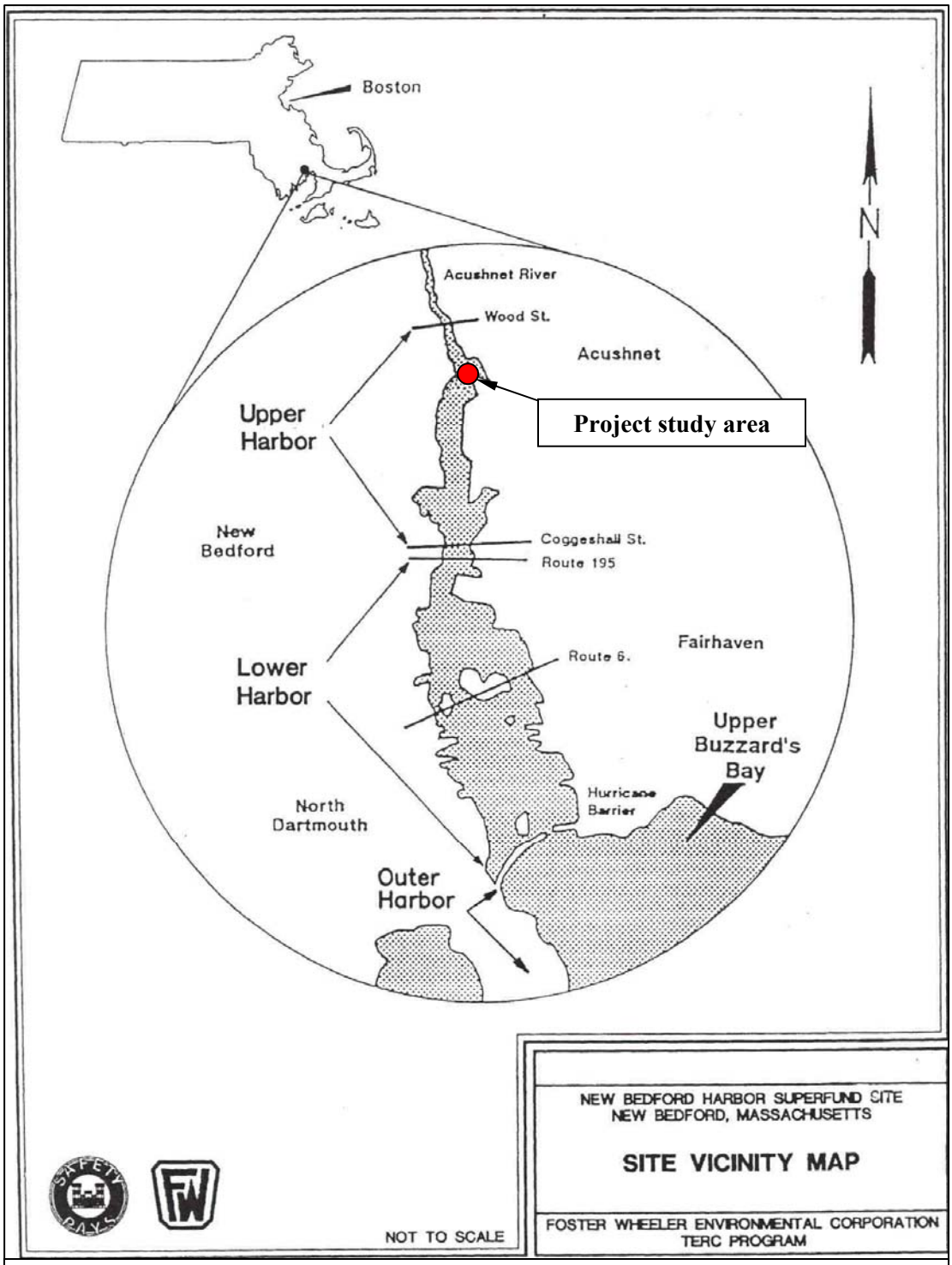

Figure 1-1. Location of the NBHSS unanticipated shipwreck discovery project study area within the Commonwealth of Massachusetts (after Fitts et al. 2000).

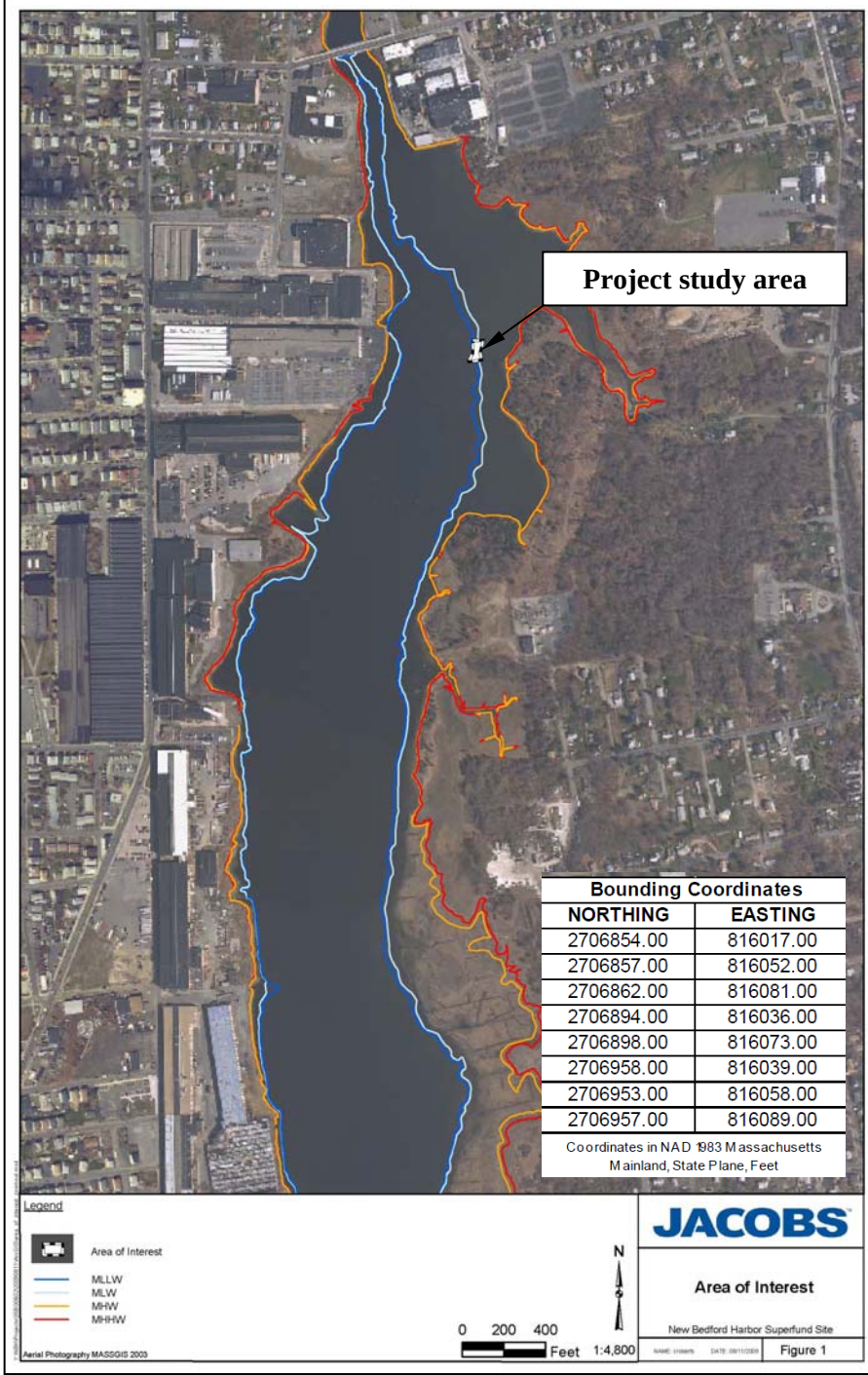

Figure 1-2. MASSGIS 2003 aerial photograph showing the location of the NBHSS unanticipated shipwreck discovery project study area with its bounding coordinates, Acushnet, Massachusetts (courtesy of Jacobs [with modifications]).

Figure 1-3. NBHSS hazardous sediments dredging barge. Note the horizontal auger-like dredge-head at the barge's bow (photograph by David Robinson).

Figure 1-4. NBHSS debris removal machine equipped with "grabber" attachment (photographs by David Robinson).

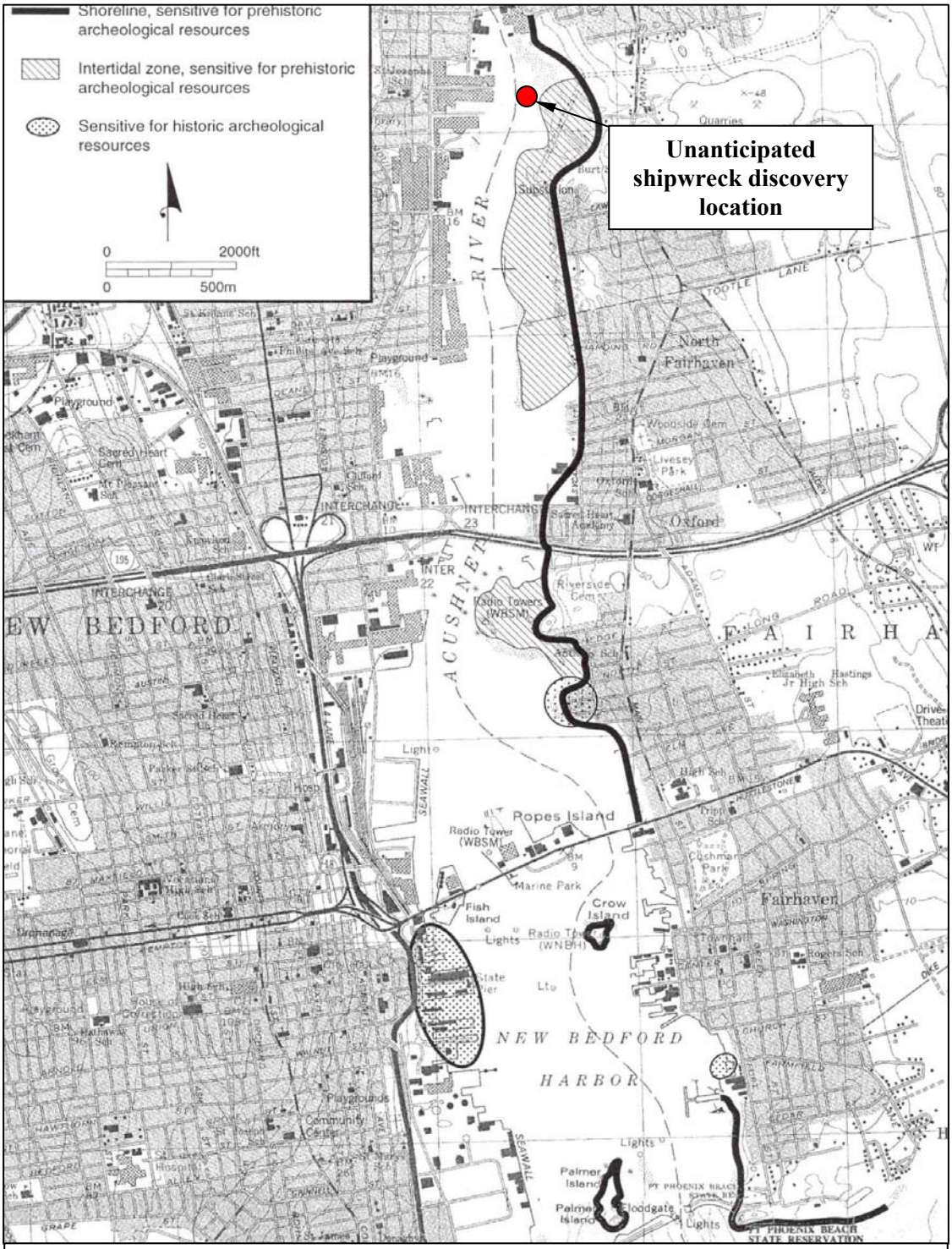

Figure 1-5. NBHSS predicted archaeological sensitivity map and the location of the anticipated shipwreck discovery project study area (after Fitts, et al. 2000).

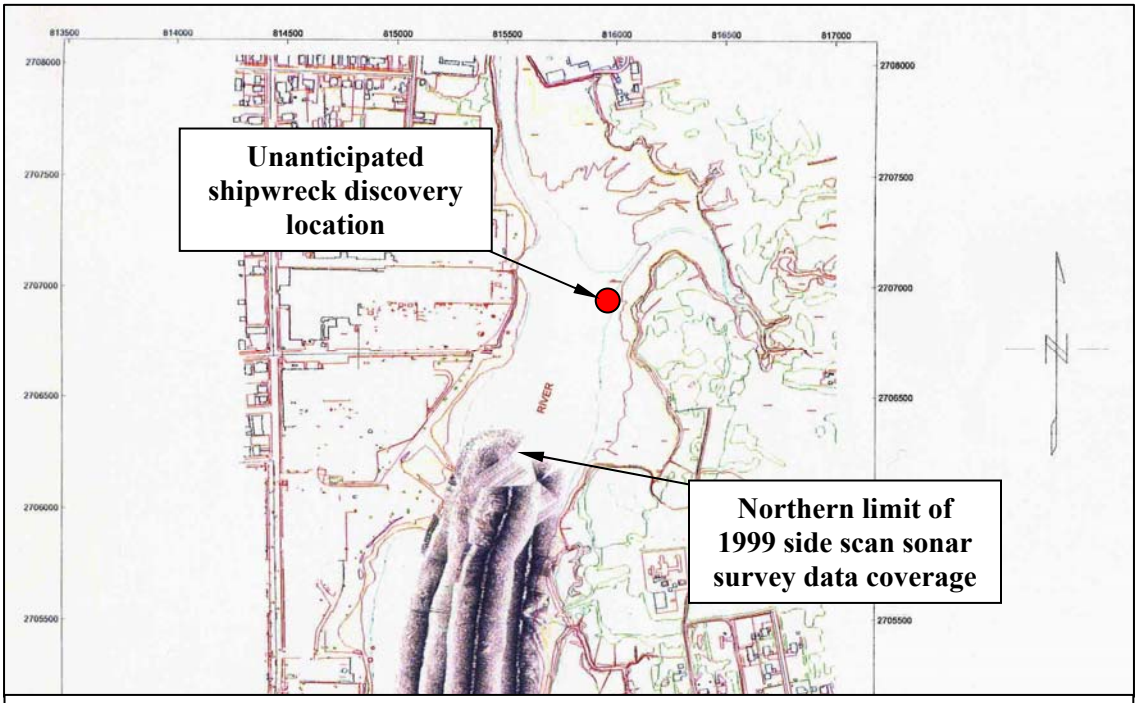

Figure 1-6. Excerpted plot of mosaiced side scan sonar data recorded during the 1999 pre-disturbance marine archaeological survey relative to the location of the unanticipated shipwreck discovery (after Cox, Jr. 2000).

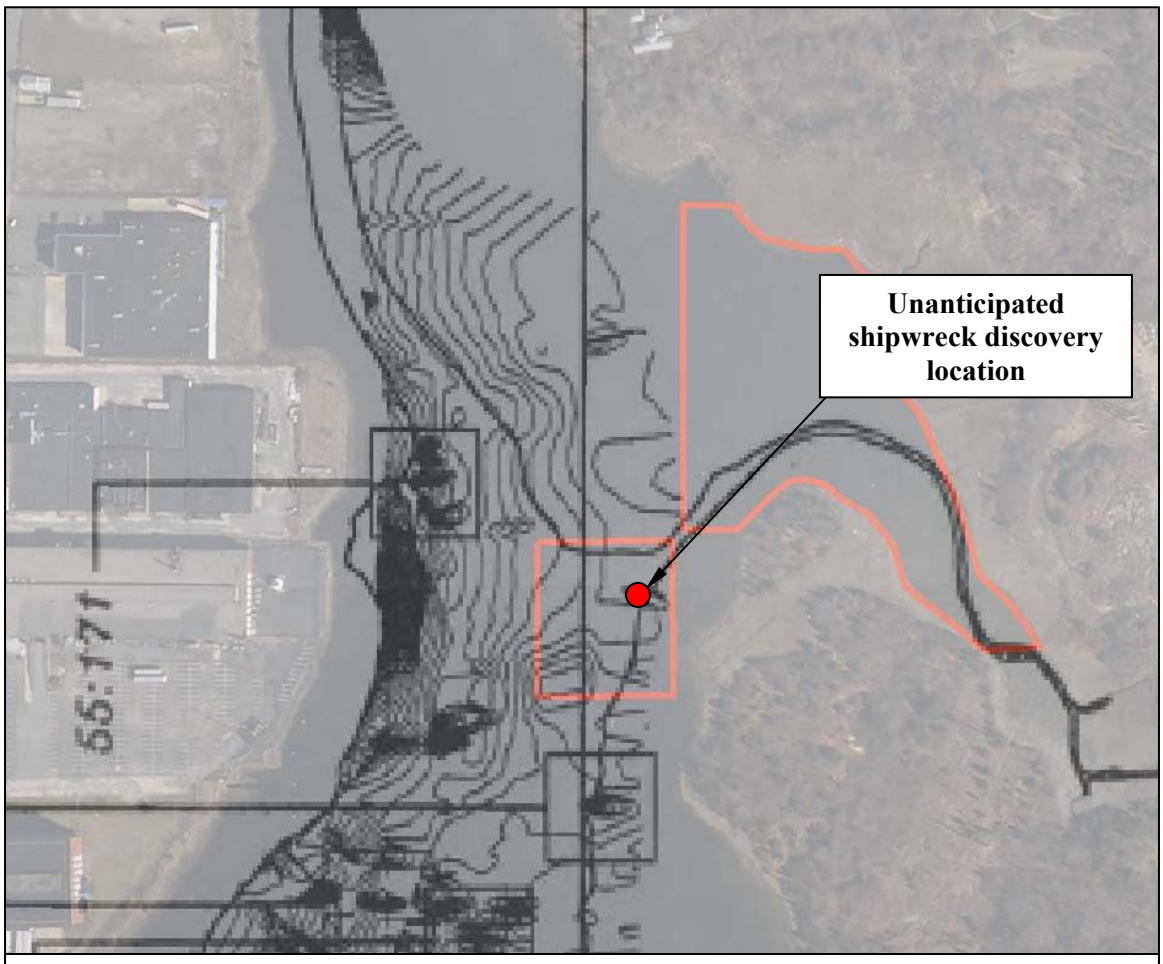

Figure 1-7. Excerpted plot of contoured 1999 magnetometer survey data (i.e., the black contours superimposed onto the MASSGIS 2003 aerial photograph of New Bedford's Upper Harbor) relative to the location of the unanticipated shipwreck discovery and the 2009 supplemental marine archaeological remote sensing survey area (i.e., the red-lined polygons). Note the absence of any significant magnetic anomalies at the unanticipated shipwreck discovery's location (after Cox, Jr. 2000).

Figure 1-8. Shipwreck timbers as they appeared shortly after their July 2009 recovery during debris removal operations (photographs by Josh Cummings, courtesy of the USACE-NED).

Figure 1-9. Shipwreck timbers recovered during July 2009 debris removal operations are examined by Jacobs's Environmental Engineer, Anita Rigassio-Smith, USACE-NED Archaeologist, Marcos Paiva, and MBUAR Director and Chief Archaeologist Victor Mastone, July 16, 2009 (photograph by David Robinson).

Figure 1-10. Stone, wood fragments, artifacts, and modern debris recovered in the general area of the unanticipated shipwreck discovery find spot during July 2009 debris removal operations are examined by USACE-NED Archaeologist, Marcos Paiva and MBUAR Director and Chief Archaeologist, Victor Mastone, July 16, 2009 (photograph by David Robinson).

Figure 1-11. Leather shoe reportedly recovered in the vicinity of the unanticipated shipwreck discovery find spot during the July 2009 debris removal operations (photographs by David Robinson).

Figure 1-12. Charring that was visible in places on the surfaces of the timbers, such as at the end of the floor timber in the middle of this photograph, indicated that the vessel was exposed to fire (photograph by Josh Cummings, courtesy of the USACE-NED).

Figure 1-13. Recovered ship timbers inspected on July 16, 2009 were in generally poor condition, their surfaces split and checked from shrinkage caused by their exposure to air (top image). Preservation of the ship's iron fasteners, even in the timbers recovered in November 2009 that were kept wet prior to their documentation, was minimal with holes and rust stains providing the primary archaeological evidence of their existence (bottom image) (photographs by David Robinson).

Figure 2-1. NBHSS debris removal spud-barge with machine and hopper barges (one for the recovered timbers and the other for miscellaneous debris) positioned over the unanticipated shipwreck discovery location in November 2009 (photograph by David Robinson).

Figure 2-2. Systematic debris removal and ship timber recovery were conducted within the unanticipated shipwreck discovery study area in November 2009 under the supervision of the project archaeologist, David Robinson (bottom image) (top photograph by David Robinson; bottom photograph by Josh Cummings).

Figure 2-3. Shipwreck timbers recovered in November 2009 from the unanticipated shipwreck discovery study area were stored temporarily in a water-filled hopper barge to keep them wet prior to their transfer to shore where they were double-wrapped in polyethylene to prevent them from drying out prior to their documentation (photographs by David Robinson).

Figure 2-4. Heavily damaged and non-diagnostic hull fragments and miscellaneous debris unrelated to the shipwreck recovered during the November 2009 debris removal and ship timber recovery task were examined by the project archaeologist and then discarded into a hopper barge (photographs by David Robinson).

Figure 2-5. Photographs (including photomosaics created using Cannon's PhotoStitch 3.1 computer software) and measured 2-D plan, profile, and section scale-drawings were prepared by the project archaeologist for each of the recovered timbers as part of the shipwreck's archaeological documentation process (drawings and photographs by David Robinson).

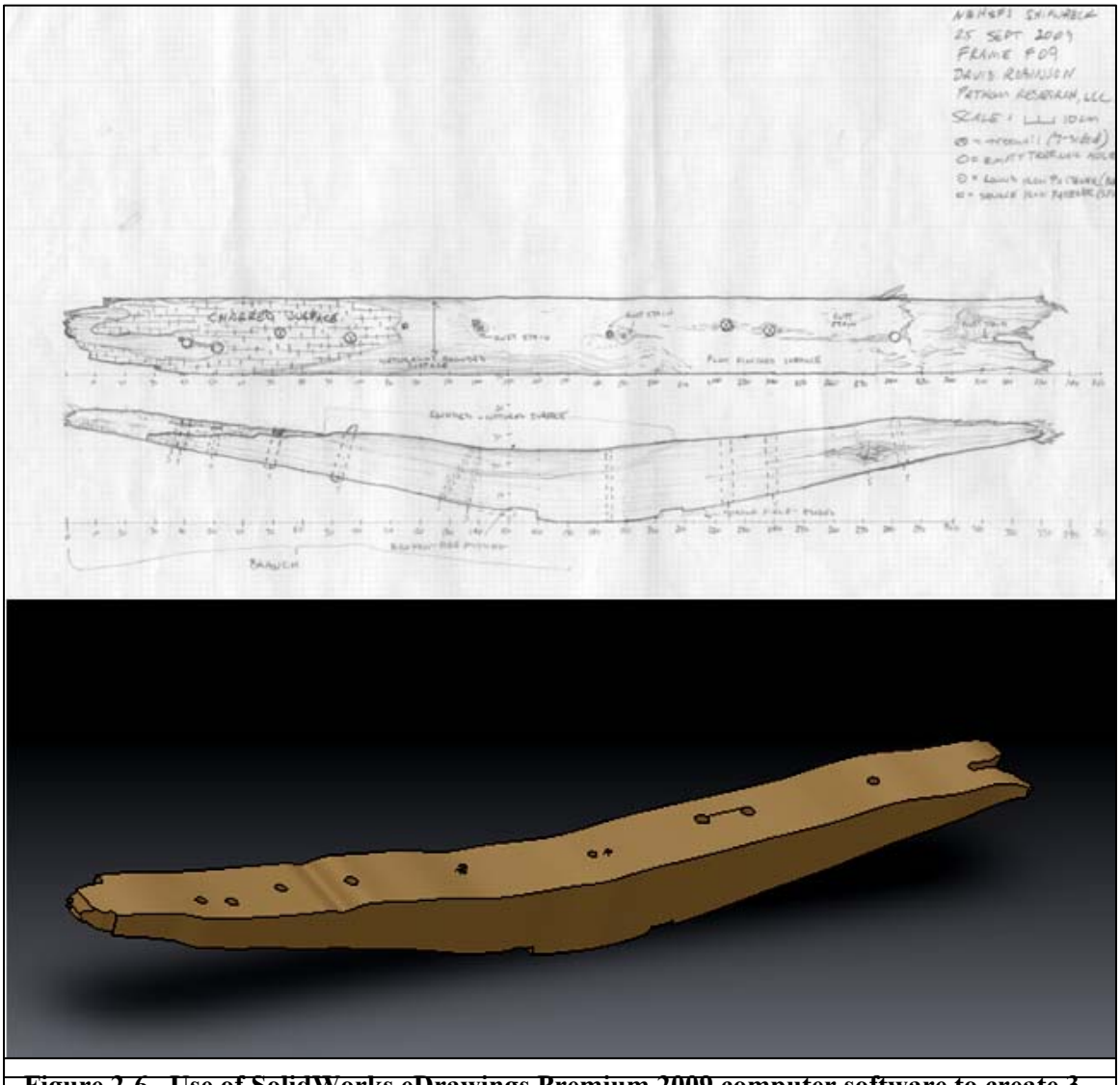

Figure 2-6. Use of SolidWorks eDrawings Premium 2009 computer software to create 3-D digital models of individual hull timbers from the 2-D measured scale drawings that were prepared as part of the ship timber's documentation facilitated the analysis and reconstruction of the shipwreck's remains (2-D drawing [top] by David Robinson; digital 3-D model [bottom] created by Jake Piskura).

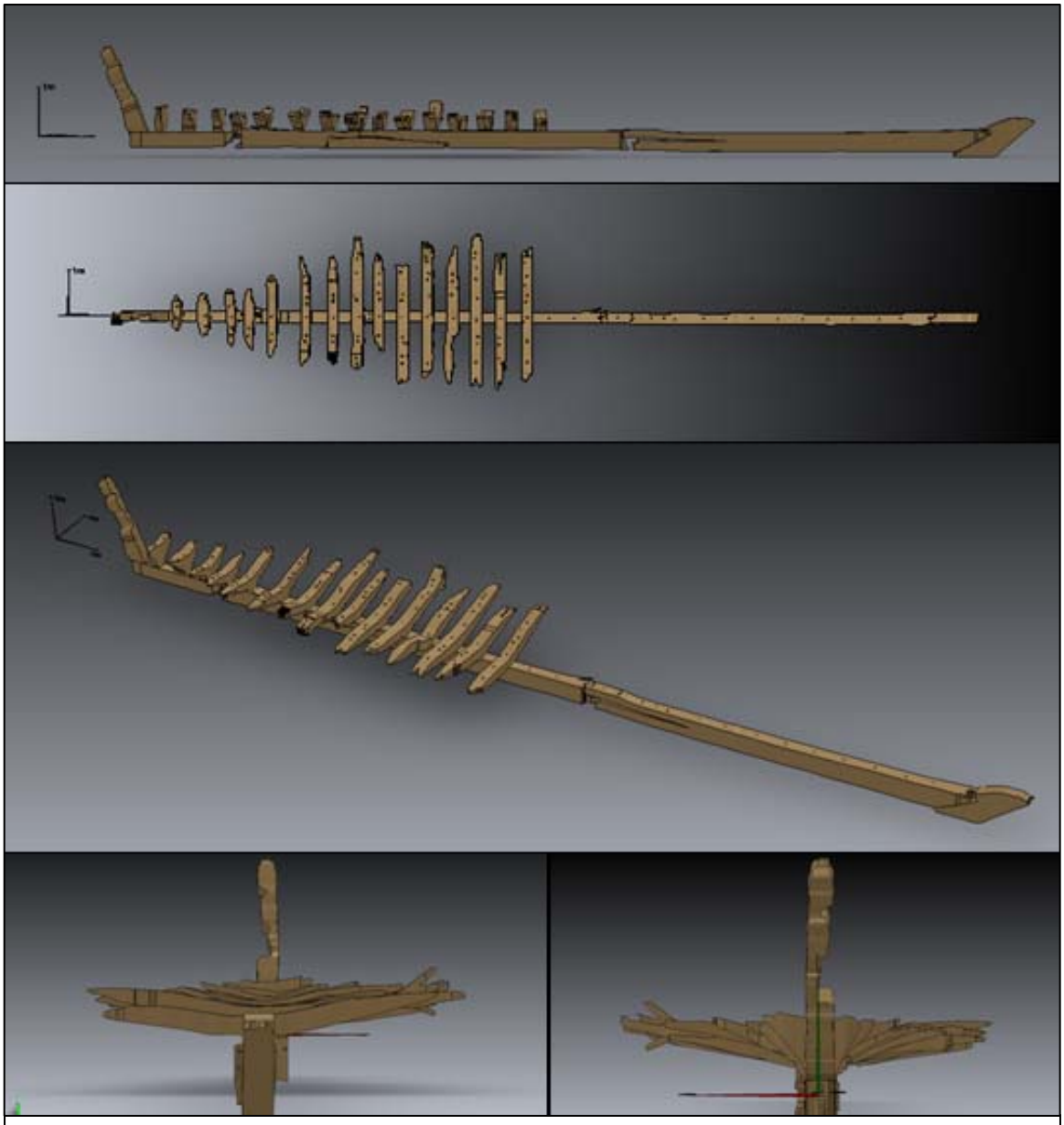

Figure 2-7. Multiple perspectives of the NBHSS shipwreck's digitally reconstructed framing were easily generated using SolidWorks eDrawings Premium 2009 computer software's free viewer (images produced from 3-D model created by Jake Piskura).

Figure 2-8. Wood samples from a select representative sample of key structural elements of the shipwreck's hull were extracted and subjected to macro- and microscopic analyses in January 2010 by the project archaeologist and archaeological wood specialist, Dr. Brian Jordan. The purpose of this analysis was to identify the wood species used in the vessel's construction, to determine whether the wood was extracted from "old" or "new" growth forests, and to develop hypotheses regarding the general age and origin of the raw materials used in the vessel's construction (photographs by David Robinson).

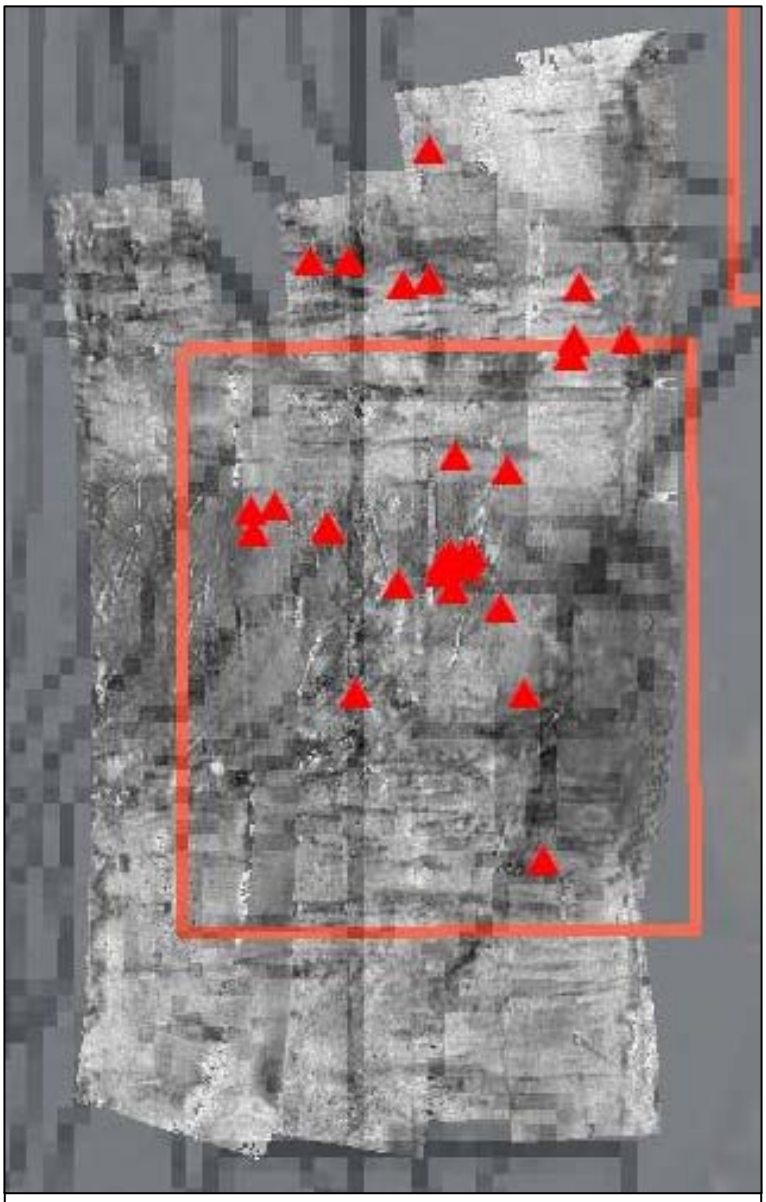

Figure 3-1. Sidescan sonar image of plotted acoustic anomalies at the NBHSS shipwreck survey area (image courtesy of CRE).

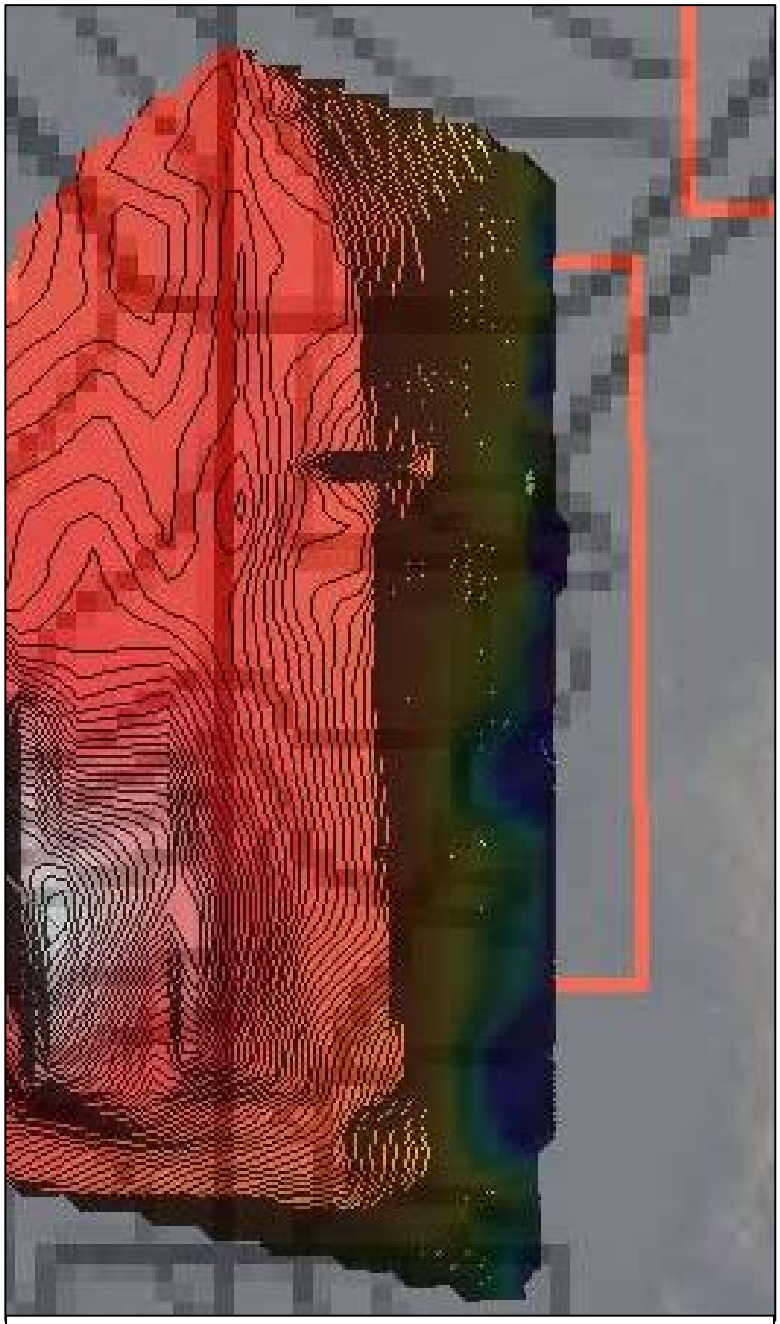

Figure 3-2. Color-coded contour plot of magnetic data recorded during the 2009 geophysical survey of the NBHSS shipwreck study area (image courtesy of CRE).

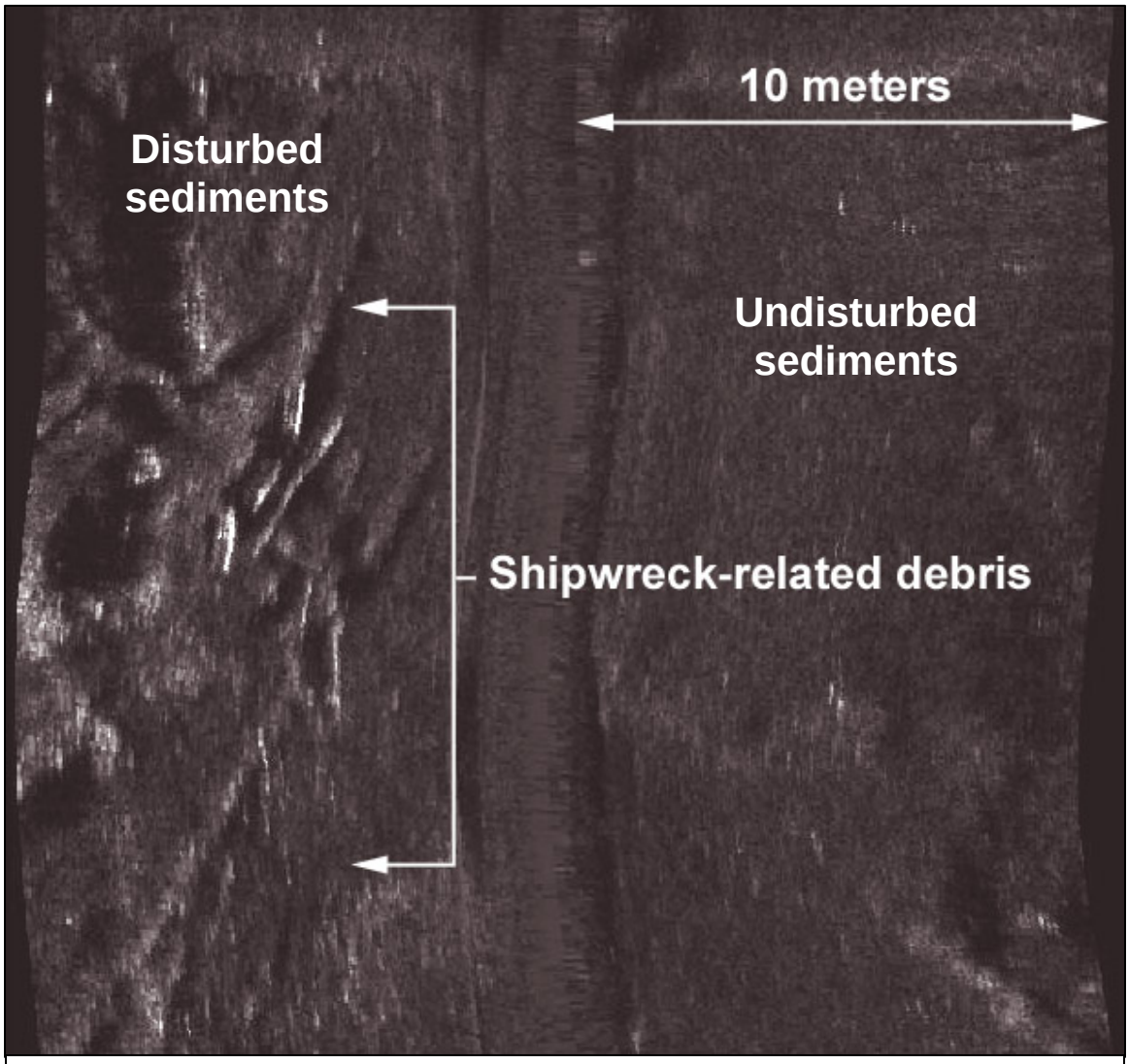

Figure 3-3. Sidescan sonar image clearly showing disarticulated hull timbers and the scarred and disturbed nature of the sediments on the harbor floor at the NBHSS shipwreck find spot (image after CRE).

Figure 3-4. Artifacts recovered from the NBHSS shipwreck during the November 2009 supplemental debris removal and timber recovery program (photographs by David Robinson).

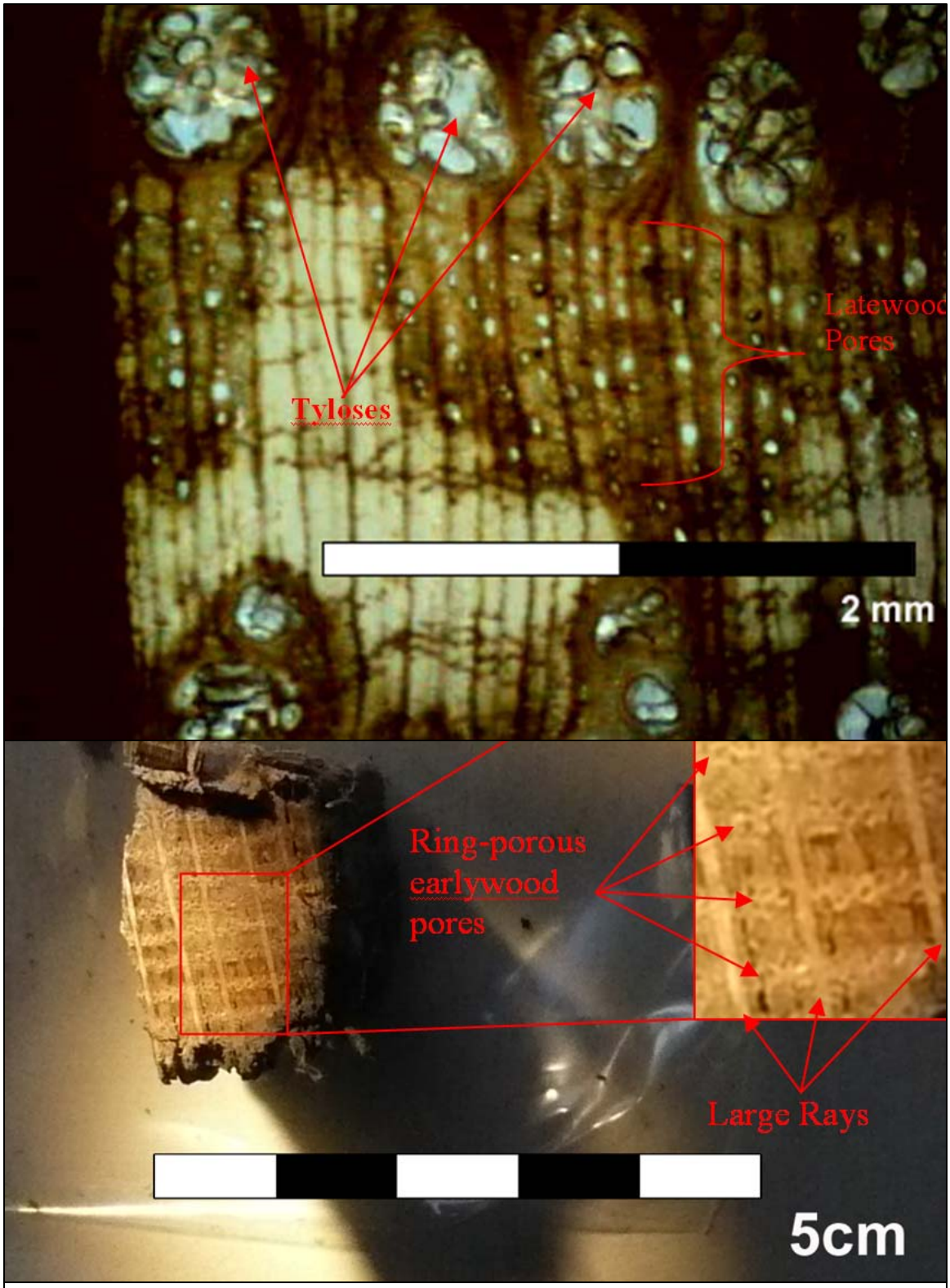

Figure 3-5. Microscopic structure of white oak NBHSS shipwreck timber (photographs by Brian Jordan and David Robinson).

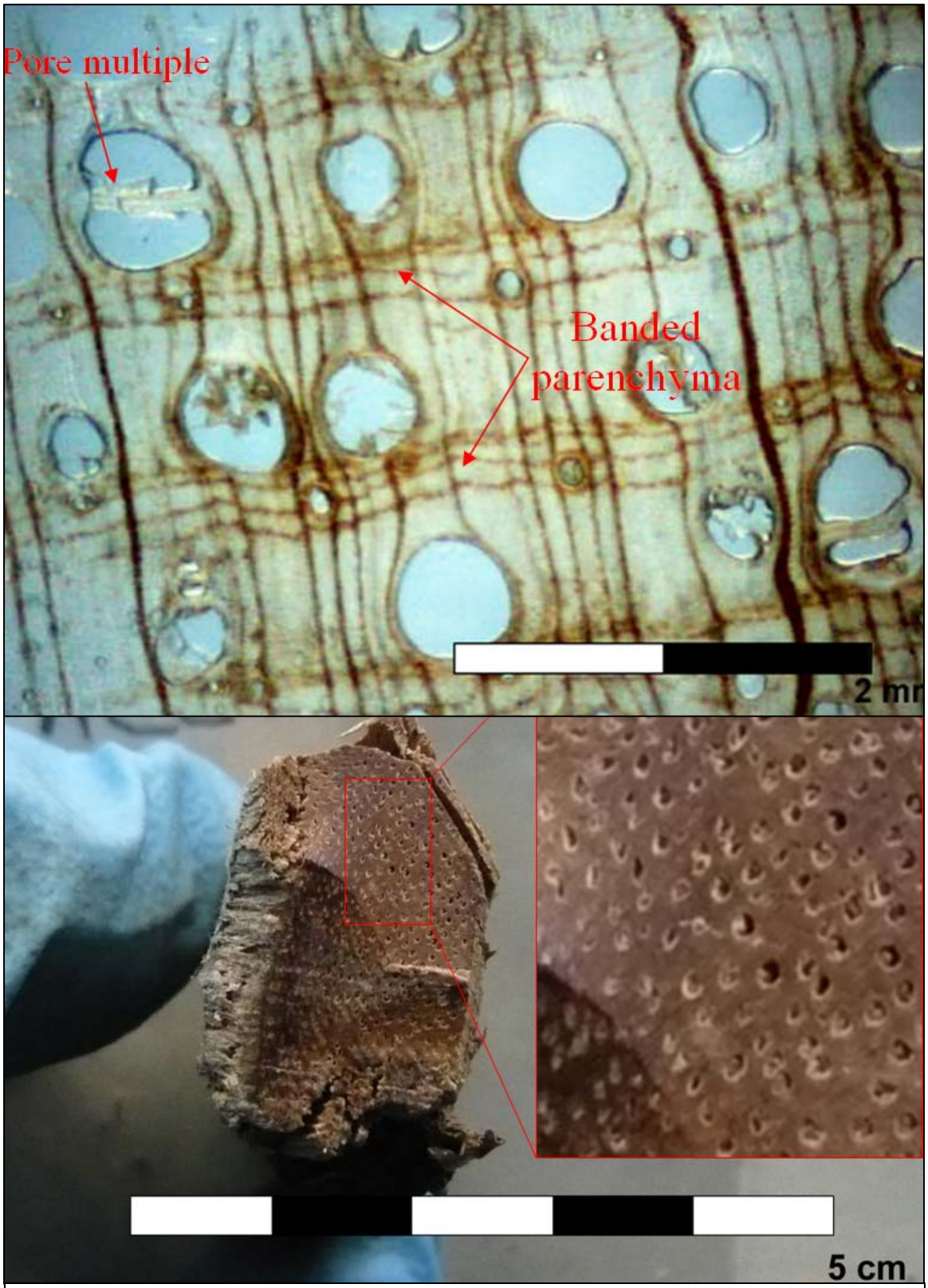

Figure 3-6. Microscopic structure of hickory sample collected from the keel of the NBHSS shipwreck (photographs by Brian Jordan and David Robinson).

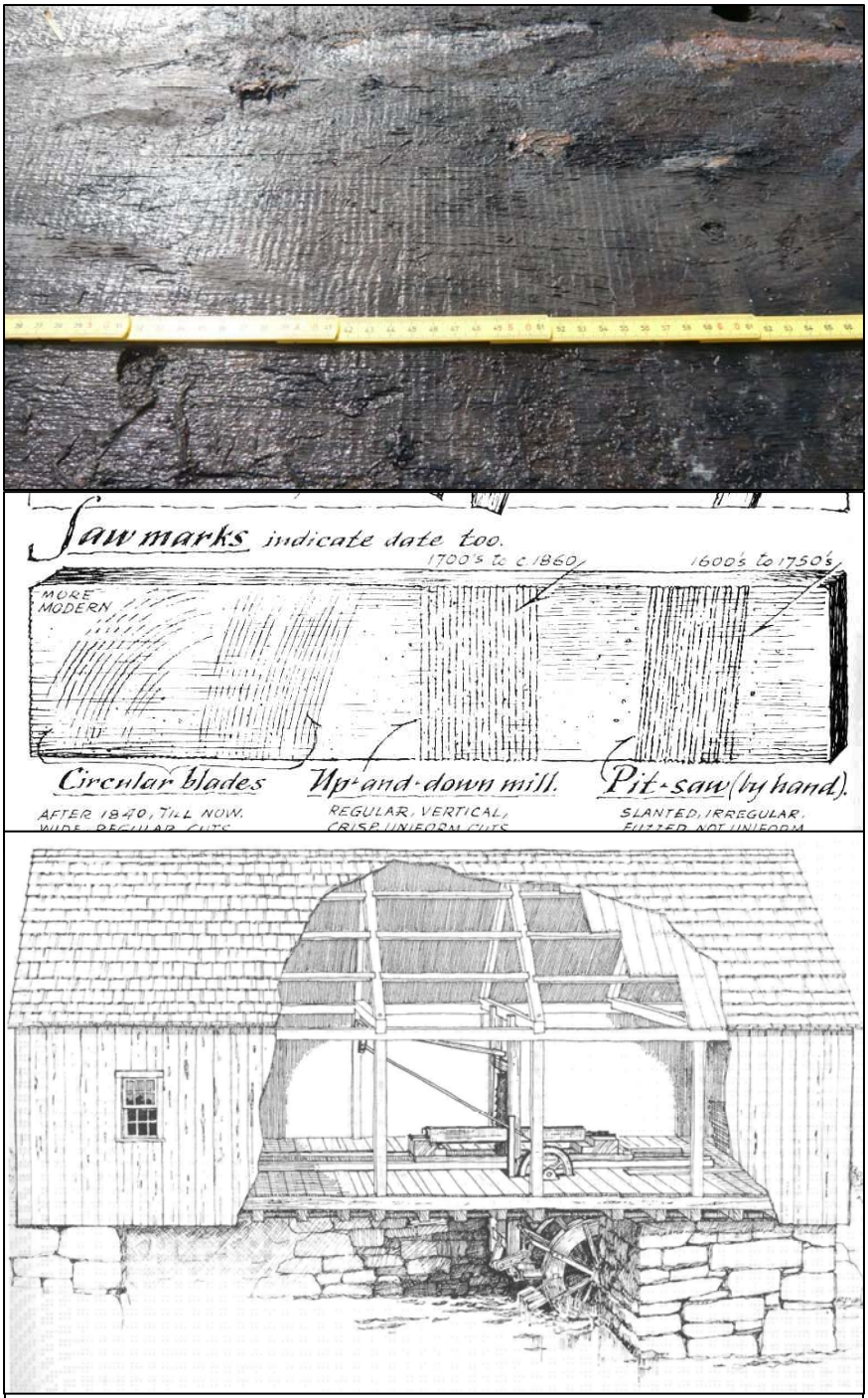

Figure 3-7. Clearl visible saw marks in the surface of one of the NBHSS shipwreck's hull planks produced by a water-powered, mechanized, "frame," "sash," or "up-down" saw (photograph by David Robinson; images from Sloan [1973] and Rivard [1990]).

APPENDICES

APPENDIX A

PROJECT CORRESPONDENCE

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

October 30, 2009

Melville P. Coté, Jr.
Manager
Ocean and Coastal Protection Unit
US Environmental Protection Agency
Region 1
1 Congress Street, Suite 1100
Boston, MA 02114-2023

RE: New Bedford Harbor Superfund Site Sunken Vessel Discovery, New Bedford, MA.
MHC #RC.17682.

Dear Mr. Coté:

Staff of the Massachusetts Historical Commission, the office of the Massachusetts State Historic Preservation Officer, have reviewed additional information, received October 7, 2009 and October 15, 2009, for the project referenced above.

Fathom Research, LLC indicates that the condition of the recovered vessel structure precludes conservation due to PCB contamination and shrinkage. Disposal after appropriate analysis and documentation is recommended for structure already recovered, and any subsequent structure recovered during ongoing remediation dredging. The extent of disturbance to the site suggests that site integrity is low and additional controlled marine archaeological investigation or preservation in place of any remaining site fragments is not prudent.

MHC concurs with Fathom Research, LLC's recommendations and looks forward to reviewing the technical report of the archaeological monitoring. In MHC's opinion, the ongoing analysis and documentation efforts and proposed monitoring plan constitute sufficient mitigation measures. A comprehensive technical report summarizing the results of initial identification efforts, additional survey, analysis, background research, and the results of the archaeological monitoring program should be produced for the project, and submitted to EPA, the Corps, MHC and the BUAR for review and comment.

If other, potentially significant historic properties may be identified, then EPA and the Corps should consider developing a Memorandum of Agreement (MOA) to document the measures undertaken to resolve any adverse effects. MOA stipulations should include means to disseminate the results of the archaeological analysis and documentation to the interested public and other constituencies, and may also include long-term conservation of recovered vessel structure and artifacts, if feasible.

MHC notes that the EPA and Corps have sought the comments of the ACHP and other potentially interested consulting parties, concerning the discovery, treatment, and the Corps' proposal to address additional discoveries and mitigate the project effects on significant historic properties during this

undertaking to the extent feasible. MHC would appreciate receiving copies of any comments received from these bodies, and the results of the EPA and Corps consideration of the comments.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). If you have questions or require additional information please contact Jonathan K. Patton at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
John Eddins, Advisory Council on Historic Preservation
Jeannie Brochi, EPA Region 1 Federal Historic Preservation Officer
Marc Paiva, USACOE-NED
Victor T. Mastone, BUAR
David S. Robinson, Fathom Research, LLC

October 2, 2009

Ms. Brona Simon, Executive Director and SHPO
Massachusetts Historical Commission
The Massachusetts State Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

Dear Ms. Simon:

The U.S. Army Corps of Engineers, New England District, and the Environmental Protection Agency, New England Office (EPA) have been coordinating with your office regarding the discovery of a sunken vessel at the New Bedford Harbor Superfund Site, New Bedford, Massachusetts.

Although the EPA is the lead agency for this project, the Corps is assisting with compliance under Section 106 of the National Historic Preservation Act of 1966, as amended.

We have received concurrence from your office dated September 3 (copy enclosed) on the Corps August 13 letter describing how this discovery will be handled in accordance with the Advisory Council's regulations for Post Review Discoveries (36 CFR 800.13(b)(3)) and the Council has been notified as well.

Fathom Research, Inc., our marine archaeological contractor, has provided us with the enclosed update of work completed to date, work yet to be completed, and their interim findings and recommendations for future monitoring and documentation efforts for the wreck site. As before, the intent is to complete these activities as expeditiously as possible while minimizing any disruption to the project schedule that includes the debris removal and dredging operations associated with the Superfund project. The project debris removal is scheduled to commence on October 19, 2009.

We would like to use this opportunity to forward these findings to several interested parties in the New Bedford area that should be involved in the event that a Memorandum of Agreement (MOA) is developed to mitigate for adverse impacts to the vessel site. Additionally, these interested parties may be able to assist Fathom Research and others with archival research on the vessel and the early maritime history of the New Bedford area. As indicated in your August 13th correspondence, interested parties may include the historical commissions of Acushnet, Fairhaven, and New Bedford; the New Bedford Whaling Museum; the Waterfront Historic Area League (WHALE), and the New Bedford Whaling National Historic Park managed by the Department of Interior, National Park Service.

We request you review the enclosed interim project findings and recommendations and provide any comments to us as soon as possible, so that the work may proceed on schedule. Once we have your approval on this recommended approach, we can proceed with the debris removal in the site area as described by Fathom Research. Since we are unable to present an eligibility determination on the vessel site until this work has been completed, a project MOA, if required, would be prepared at the conclusion of the technical report of initial findings and follow-up documentation of material retrieved from the site during debris removal activities.

If you have any questions, please contact Mr. Marc Paiva, project archaeologist of the Corps Evaluation Branch at 978-318-8796 or Jean Brochi, FHPO, EPA at (617) 918-1536.

Sincerely,

Melville P. Coté, Jr., Manager
Ocean and Coastal Protection Unit

Enclosure

ENCLOSURE

Fathom Research, Inc.
Interim Status Update on the Sunken Vessel Discovery
New Bedford Harbor Superfund Site
New Bedford, MA
Prepared September 28, 2009

Work Completed To Date
To date, the following has been completed:

- BUAR Special Use Permit was applied for; BUAR met, reviewed, and approved the application on Sept. 24, 2009 and Special Use Permit 09-003 was issued to Fathom;

- Copies of Foster Wheeler's *Archaeological Background Study and Sensitivity Analysis, New Bedford Harbor Superfund Site, New Bedford, Massachusetts* (2000) and *Underwater Archaeological Remote Sensing Survey New Bedford Harbor Superfund Site, New Bedford, Massachusetts* (2000) reports were obtained and reviewed;

- Completed marine remote sensing field survey of ship remains find site with CR Environmental (survey employed side scan sonar, sub-bottom profiler, magnetometer and single beam fathometer);

- Completed preliminary analysis of remote sensing data with CR Environmental surveyor Chris Wright (see attached side scan sonar of wreck site and preliminary map data files);

- Site-Specific Health & Safety Briefing was completed with, and contaminant levels information for the ship remains find site vicinity were obtained from, Jacobs Engineering (JE) Site Safety & Health Officer (SSHO), Carl Wilson;

- Conducted interview with Debris Removal Machine Operator who encountered and removed the timbers on July 13, 2009;

- Photo-documented all surfaces of 11 frames (F01 – F11), three large planking fragments LPF01, LPF02, and LPF03, and one keel fragment (KF01) (see sample F04profile1copy file attached);

- Prepared scale field drawings of frames F01 – F11, LPF's 01, 02, and 03, and keel fragment KF01 (see F04 sample drawing attached)

Outstanding Work To Be Completed
- Digital color photo documentation and scale field drawings of the keel fragments, and large planking fragments LPF 04 and 05, and digital color photo documentation of small

miscellaneous frame and planking fragments (to be completed the week of Sept. 28, 2009);

- Archival research and consultation with interested parties

- Final analysis and interpretation of field and archival research data and preparation of report

Interim Findings

- PCB/HAZMAT levels data collected to date and reviewed by the JE SSHO reveals PCB/HAZMAT contaminant levels in the vicinity of the ship remains find site are among the highest measured in the entire New Bedford Harbor Superfund Site, indicating that the recovered ship timbers and ship remains find site also contain high levels of PCB/HAZMAT contaminants. According to the JE SSHO, testing of individual timbers would cost $1000's of dollars per test, and, thus, is cost-prohibitive;

- Preliminary review of the survey plot from the previous investigation indicates that the area containing the ship remains was surveyed in 1999, but, because the remains likely produced no significant magnetic anomaly due to the heavily corroded nature of iron materials in the wreck and may have been buried beneath the surface of the harbor floor, they were not visible in either the side scan sonar or magnetometer data;

- Interview of the machine operator who encountered and removed the timbers suggests that prior to remediation activities the site was probably undisturbed, as the keel was intact and 3 or 4 of the frames were in their original and upright positions when the remains were first encountered and initially lifted clear of the water's surface. At the time the ship remains were initially encountered, it wasn't immediately clear that they were the remains of a shipwreck or simply large wooden debris (e.g., displaced harbor front wooden piers or bulk heading). It was during this initial lift that the keel broke and the upright frames detached from the keel. Additional disturbance to the ship remains find site occurred during the debris removal process. The contextual integrity of the ship remains find site was significantly impacted as the machine was moved side-to-side in the harbor floor sediments to find additional remaining debris to remove. This side-to-side motion of the machine is visible in the 2009 side scan sonar images as numerous arcing, linear gouges in the harbor floor at and around the ship remains find site. Fathom's assessment is that the site's integrity appears to have been compromised to the point where the safety risks and costs associated with conducting HAZMAT archaeological diving operations in highly contaminated sediments and in very low visibility water to attempt to map the heavily disturbed site wouldn't produce enough meaningful information to be warranted.

- Remote sensing conducted for this project in 2009 revealed what appeared to be several timbers/timber fragments on the harbor floor at the location of the ship remains find site (see attached remote sensing images). It's possible that smaller timbers and artifacts that were not visible in the remote sensing data may be present as well; however, it is unlikely that any are of ferrous metal, given that no significant magnetic anomalies were recorded

in the ship remains find site area. Analysis of recovered ship timbers has shown that the ferrous metal fasteners used in the ship's construction are completely oxidized and have little or no remaining ferrous mass, hence, have virtually no magnetic properties and would produce little or no magnetic signature;

- Analysis of the recovered ship remains continues to support our initial assessment that the remains are likely those of a late eighteenth or early nineteenth century wooden sailing vessel. The remains consist of frames, keel fragments, and garboard/first and second strake planking fragments from the bottom of the hull. Only the lowermost portion of the frames (i.e., the "floors") are preserved. They are formed from single, rather than doubled timbers, and appear to have been fabricated from naturally grown, curved "compass" timbers, which, in some cases, are not completely finished (cut/shaped) on all their surfaces, and in once case still has bark on its surface. They were fastened to the top of the keel with a single round iron bolt. Planking was fastened to the frames by a combination of faceted (7-sided) wooden treenails and square-shanked wrought iron spikes. Hull sheathing (perhaps made from thin wood, as no remains of the sheathing survives on the recovered hull timbers) was fastened to the outside of the hull planking, as evidenced by the patterns of holes left behind by the small square-shanked wrought iron sheathing nails that were used.

Interim Recommendations

On Thursday (September 17, 2009), JE NBHSS Site Project Manager, Steve Fox, requested from Fathom preliminary recommendations for the ship remains and ship remains find site, to assist him in planning/scheduling remediation work for the remainder of 2009.

Based on the results of work conducted to date on the project, our interim recommendations are as follows:

- Upon completion of the present documentation and analysis effort, we recommend discarding the recovered ship timbers at HAZMATs. They are simply too contaminated to handle, conserve and curate safely. Independent of safety concerns, their condition due to post-recovery exposure to air and the irreversible shrinking, splitting, and checking of the wood, is too poor to warrant any attempt at conservation.

- Initiate as soon as possible a second phase of integrated archaeological study and remediation activities in the ship remains find site.

During this second phase of work, JE would proceed with debris removal and recovery in the ship remains find site, although timbers that are removed would be kept wet until they could be documented by a qualified nautical archaeologist (myself or someone else) as soon as possible after their recovery. These newly recovered timbers would also be disposed of as HAZMATs upon completion of their documentation; and

After the debris removal is complete, JE would proceed with standard remediation dredging operations at the ship remains find site with addition of:

1. Archaeological monitoring by a qualified nautical archaeologist of the dredged materials during the NBHSS site's standard screening and dredged materials handling processes; and

2. Recovery and documentation by a qualified nautical archaeologist of any ship remains find site-associated cultural materials encountered in the dredged materials. These recovered materials would then be assessed on an individual basis for potential decontamination/conservation and curation treatment, based on their historical significance, or disposed of as HAZMATs following documentation and analysis.

- Upon completion of the project, the project nautical archaeologist would prepare a technical report for submittal to the involved agencies, the Advisory Council and interested parties that includes the findings of all work conducted as part of the unanticipated discovery investigation; in addition, the archaeologist would prepare a PowerPoint presentation to be given to the public at local museums and historical societies during MA Archaeology Month in 2010, as well as a peer-reviewed professional journal article addressing the questions and implications of the technological limitations of currently employed remote sensing instruments and survey techniques for identifying older, and potentially more significant, buried shipwrecks, such as that which was found in the New Bedford Harbor Superfund Site.

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

July 24, 2009

Marcos Paiva
Archaeologist
New England District
US Army Corps of Eng neers
696 Virginia Rd
Concord, MA 01742-27 51

RE: New Bedford Harb or Superfund Site Sunken Vessel Discovery, New Bedford, MA.
MHC #RC.17682.

Dear Mr. Paiva:

Staff of the Massachuse tts Historical Commission, the office of the Massachusetts State Historic Preservation Officer, ha ve reviewed your report of the discovery of timbers from an historical ship during the implementation of t e EPA project referenced above, received by the MHC on July 23, 2009. The report of the July 16, 20 09, field visit and consultation, and your recommendations supplements the photographs of the disc overy, received by the MHC on July 13, 2009. Please send a map showing the area of the discovery lo ation, in relation to the project impacts that are proposed.

Pursuant to 36 CFR 80(.13(b)(3), the EPA or the Corps should notify the Advisory Council on Historic Preservation.

The wooden ship timbe s are consistent with a vessel constructed in the late 18th to early 19th century, and some of the vessel e lements that have been recovered show signs of burning. A summary of background historical r search indicates that, "during the Revolutionary War, a British fleet blockaded the Harbor and destroye d 34 ships according to a local resident. There is also mention of the British sinking and burning shi s in the Harbor that may have been stolen by colonists." American colonists had taken "twenty or so Brit sh vessels and moored them in the [h]arbor. The [B]ritish were unable to recover them by sea because the harbor was well protected by a fort. The Brits attacked at night and sank or burned the boats in the h arbor. (One of the vessels was named the *James Brown*)."

It has not been determir ed if the well-preserved portions of the vessel discovered is one of these American or British shi s. If so, the discovery would be highly significant at the local and state levels, and possibly at the natic nal level, for its associations with an important event during the Revolutionary War. International inte est could be anticipated. Even if this vessel were not from that event, this well-preserved historic vesse would likely provide important information about naval architecture, technology, and maritin e history in New Bedford. The Corps is awaiting additional documentation to determine if the recove ed timbers are eligible for listing in the National Register of Historic Places.

MHC agrees that the re covered ship timbers should be fully documented, analyzed, and interpreted by a qualified marine archae ologist, and the documentation provided to the MHC, the Board of Underwater Archaeological Resourc es, and any local interested historical repository. The MHC recognizes that the wooden ship timbers ha ve been exposed and unprotected since their discovery so that

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www.sec.state.ma.us/mhc

conservation of the timb ers may not be feasible. MHC needs more information concerning the feasibility of conservation. An exp rienced archaeological conservator should provide recommendations for the timbers already discove ed, and be a member of the Research Team for any other significant finds that may be discovered and r eed conservation. Preservation of the historic ship timbers may be desired by constituents, and particu arly so if the vessel is associated with the Revolutionary War. A plan should be developed for appropria e curation of the artifacts and records of the investigation, preferably at an appropriate and respons ble local repository.

MHC agrees with the C rps for remote sensing survey, and any feasible inspection and evaluation of the discovery area. MHC ag ees that is it prudent to conduct supplemental remote sensing survey of the project impact areas to a ssist to determine if additional, previously undetected, significant historic resources are present an l will be affected by the project. Fathom Research LLC should prioritize their activities based on the p oject work area priorities.

MHC recommends that Fathom Research LLC should provide the results of the remote sensing survey, their inspection and eva uation of the discovery area if feasible, with a summary of the pertinent historical background and previou s archaeological research, a research design and methodology for the proposed monitoring process, incl uding a proposal for recordation, recovery, reporting and curation in accordance with professional archae ological standards and practices as part of a plan to mitigate adverse effects to the extent feasible. If signif cant results ensue, then EPA and the Corps should consider means to disseminate the results to the interes ed public and other constituencies.

MHC recommends that he EPA and Corps should also be seeking comments of other potentially interested consulting pa ties such as the New Bedford Historical Commission, the Waterfront Historic Area League in New Be lford, the New Bedford Whaling Museum, and the National Park Service's New Bedford Whaling Natio al Historic Park, concerning the discovery, its treatment, and the Corps' proposal to address additional dis coveries and mitigate the project effects on significant historic properties during this undertaking to the e ctent feasible.

These comments are pr vided to assist in compliance with Section 106 of the National Historic Preservation Act of 196 , as amended (36 CFR 800). If you have further questions please contact Edward L. Bell at this o fice.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservat on Officer
Executive Director
State Archaeologist
Massachusetts Historica Commission

xc:
John Eddins, Advisory Council on Historic Preservation
Jeannie Brochi, EPA Re gion 1 Federal Historic Preservation Officer
Victor T. Mastone, BUA R
David S. Robinson, Fat om Research LLC

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO:
ATTENTION OF:

August 13, 2009

Engineering/Planning Division
Evaluation Branch

Ms. Brona Simon, Executive Director and SHPO
Massachusetts Historical Commission
The Massachusetts State Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

SUBJECT: New Bedford Harbor Superfund Site Sunken Vessel Discovery, New Bedford, MA. MCH #RC.17682.

Dear Ms. Simon:

We are writing in response to your letter to Mr. Marc Paiva of my staff dated July 24, 2009 (copy enclosed) regarding the subject vessel discovery during debris removal activities in the upper portion of New Bedford Harbor in Acushnet, Massachusetts. Enclosed is a map depicting the discovery location in relation to the project impacts that are proposed. Pursuant to the regulations for Post Review Discoveries (36 CFR 800.13(b)(3)), the Advisory Council on Historic Preservation (Council) shall be notified of the discovery and the proposed actions to resolve adverse effects.

To summarize, we are proposing to conduct a remote sensing archaeological survey of the wreck site utilizing high-resolution side scan sonar and sub-bottom profiler during periods of maximum high tide to identify the remainder of the vessel(s) that may be located below the harbor bottom and to assess the site's archaeological integrity. It is noted that the vessel was relatively intact prior to being brought to the surface. This investigation will be conducted by a professional marine archaeologist with expertise in these types of surveys and in the technology of wooden vessels that represent the possible late 18th – early 19th Century period of this discovery. A 100 foot by 250 foot protection zone in the area of the finding has been created in which no dredging activities will take place until these surveys are performed.

Concurrent with and in addition to the remote sensing survey, the recovered ship timbers shall be documented, analyzed, and interpreted by a qualified marine archaeologist and the documentation provided to your office and the Massachusetts Board of Underwater Archaeological Resources (MA BUAR). Recommendations regarding the possible conservation and curation of the vessel timbers and other finds will be provided as part of this documentation effort. This effort should be conducted as soon as possible since the timbers are already in the process of deterioration.

When the survey is complete, the marine archaeologist contractor shall provide a report summarizing the results and providing recommendations for further study, if necessary. The findings should include a preliminary assessment of National Register of Historic Places (NRHP) eligibility (36 CFR 63) for the vessel(s) and its site. This report will be coordinated with the EPA, Corps, Jacobs Engineering, the Massachusetts Historical Commission, the MA BUAR, the Council, and other interested parties to be determined.

If it is determined that the wreck site is not eligible for listing to the National Register, than no further work is required. However, if the site is found to be a potentially significant historic property, eligible for listing to the NRHP and adversely impacted by future project debris removal and/or dredging activities, then a Memorandum of Agreement (MOA) will be developed to mitigate for this impact in accordance with 36 CFR 800.6 of the Council's regulations.

Since the location of the wreck site and any archaeological site in general is confidential information and protected from public disclosure (36 CFR 800.11(c)), at no time will specific locational data be provided to the general public. Realizing the highly contaminated nature of the area and the publicity that this discovery may generate, public notification outside of the regulatory agencies above will not occur until the survey investigation is complete and a preliminary assessment of the wreck site's significance is available. However, in accordance with 36 CFR 800.6(a)(4), the EPA and the Corps are required to afford an opportunity for the public to provide input on resolving adverse effects upon historic properties. During development of an MOA, the inclusion of interested parties will be identified and may include local historical commissions, the Waterfront Historic Area League (WHALE), the New Bedford Whaling National Historic Park, the New Bedford Whaling Museum, and others depending on the nature and significance of the vessel discovery.

If this discovery is indeed one of the American or British ships from the Revolutionary War era, it would be highly significant at a local, state, and possibly national level. Regardless of the date, a well-preserved wooden vessel would provide important information about naval architecture, technology, and maritime history in early New Bedford. However, in any case, we also realize the importance of the New Bedford Harbor Superfund Project and are committed to working with everyone in minimizing any disruption to the project schedule while this discovery is evaluated.

We will keep you apprised of our future efforts regarding this vessel discovery and continue our coordination with your office in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR 800.

If you have any questions, please contact Mr. Paiva, project archaeologist at (978)318-8796.

Sincerely,

for Anthony T. Mackos, P.E.
Acting Chief, Engineering/Planning Division

Enclosures

Copies furnished (with enclosures):
Mr. Victor Mastone, Director
MA Board of Underwater Archaeological Resources
251 Causeway Street, Suite 800
Boston, Massachusetts 02114-2136

Mr. David Robison, Principal
Fathom Research LLC
1213 Purchase Street, #4
New Bedford, Massachusetts 02740-6694

Mr. John Eddins, Program Analyst
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue NW, Suite 803
Washington, DC 20004

Copies furnished (without enclosures):
Mr. Dave Dickerson, Remedial Project Manager
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code HBO
Boston, Massachusetts 02114-2023

Ms. Elaine Stanley, Remedial Project Manager
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code HBO
Boston, Massachusetts 02114-2023

Ms. Jean Brochi, Federal Preservation Officer
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code COP
Boston, Massachusetts 02114-2023

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MA
SUNKEN VESSEL DISCOVERY
JULY 16, 2009

1. On Monday, July 13th, I received an email from Paul L'Heureux of the New Bedford Resident Office with several photographs of portions of wooden frames/floors and the keel from a sunken vessel. These finds were encountered during debris removal activity in the northern area of the Harbor south of the Wood Street bridge and along the Acushnet shoreline across from the Aerovox Building. The debris removal is the precursor to dredging and seeks to remove debris that could impede progress of the dredge.

Work in that area has stopped. The contractor will move to other areas while EPA, the Corps, Jacobs, MHC and the MA Board of Underwater Archaeological Resources (BUAR) determine the appropriate course of action. It should be noted that the finds were located in a highly contaminated environment consistent with PCB waste disposal in the Harbor. The site area has been demarcated and its location known by the Contractor.

2. On Thursday, July 16th at 10 AM, Marc Paiva, Corps Archaeologist along with Victor Mastone, Director of the MA BUAR and David Robinson, Principal and Director of Marine Archaeological Services at Fathom Research, LLC, met at the site along with representatives from Jacobs, the Corps and EPA. The wooden frames/floors and keel portion were measured (see below) and examined and the vessel was estimated to be at least 70 feet long. According to Mr. Robinson, the finds could represent a wooden sailing vessel dating from the late 18th Century to early 19th Century although further evaluation would be required to determine a more accurate date or range of dates. Some of the finds exhibited evidence of burning while others had undergone oxidation due to exposure to the air. It was determined that the vessel was probably relatively intact beneath the harbor bottom until portions of the ribs and keel viewed on-site had been disarticulated by the debris removal crew in the process of removing them from the water.

Background research indicated that during the Revolutionary War, a British fleet blockaded the Harbor and destroyed 34 ships according to a local resident (TtFWI 2000). There is also mention of the British sinking and burning ships in the Harbor that may have been stolen by colonists (TtFWI 2002; P. L'Heureux, personal communication).

Some general dimensions and measurements of the components:

-<u>Keel</u> – 13 inches molded (i.e., tall), 10 inches sided (i.e., wide).

-Garboard Plank (one that was next to and fitted into the keel) – 2 inches thick, 17 inches wide.

-Floor (part of frame that crosses the keel) – preserved length - 129 inches long, 11 inches molded, 10 inches sided.

-Treenails and iron fittings observed and some small nails. Treenails about 1.25 inches in diameter, although shrunken.

-Limber holes – about 3 inches wide

-Overall length of keel (which is broken in multiple places) estimated by pacing is no less than 60 feet, probably was originally around 70 feet.

-Floors appear to mainly be from vessel's after-third.

3. In late August and early September 1999, Dolan Research, Inc. in association with John Milner Associates, Inc., and under contract to Foster Wheeler Environmental Corporation (now TetraTech Foster Wheeler Environmental (TtFWI), conducted a remote sensing archaeological survey of the New Bedford Harbor Superfund project area to determine the presence of submerged cultural resources (e.g. shipwrecks). It appears from the 1999 survey data that several magnetic anomalies were identified in the area where the present vessel was recovered, likely related to modern shoreline debris and/or nearby power lines or cables. Most of the targets had little to no iron content; therefore magnetic anomalies may have been negligible. This is often the case for older and buried vessels that don't have much iron remaining and would have been unlikely to produce large magnetic anomalies. However, much of the upper harbor survey area had shallow water conditions that limited the collection of sonar data. Sonar equipment was only deployed in areas that had a minimum depth of 6 feet. There were no side scan sonar targets located in the area of the current wreck site, most likely because of the shallow water depth. It is likely that, given greater water depths and perhaps higher resolution sonar, this wreck could have been located during the original 1999 survey.

4. Discussions with Mr. Mastone and Mr. Robinson determined that photo-documentation and measured drawings of the wooden vessel finds would be appropriate. This type of documentation would likely take several days to complete. Additionally, a side scan sonar survey of the wreck site utilizing high-resolution sonar during periods of maximum high tide is recommended to identify the remainder of the vessel(s) that may be located below the harbor bottom and assess its archaeological integrity. Together with the finds already identified, this would provide a better idea of the size and configuration of the vessel and aid in its dating. This survey would likely take no more than 2-3 hours depending on weather and water conditions. Fathom Research, LLC is currently a consultant to CR Environmental and would be able to perform the survey and documentation.

Additionally, it may be appropriate to have an experienced maritime archaeologist available to monitor future debris removal in this area in order to document the discovery and assess the significance of any additional components that may be encountered. Ideally, additional vessel finds would be placed in water, at least temporarily, to aid in their preservation during the recording process. The remains viewed on-site were beyond the point for curation as they had been left out for several days and were too dried out.

At the conclusion of the documentation/survey effort, the contractor would prepare a report of findings that would be suitable for coordination with the MA Historical Commission (MHC) and others in compliance with Section 106 of the National Historic Preservation Act (NHPA) and the procedures for unanticipated discoveries. MA BUAR is primarily an interested party to the process as "title holder" to the historic property under state law. A protocol for addressing unanticipated discoveries of cultural resources and human remains was prepared by TtFWI (October 2003). This protocol can easily be adopted and/or modified for use by Jacobs for future unanticipated discoveries. It should be noted that the Contractor can proceed in other portions of the Superfund site and not delay overall schedule.

5. If it is determined that the wreck and/or its archaeological site is not eligible for listing on the National Register of Historic Places as a significant historic property, than no further work would likely be required. If, however, the vessel and/or its site is found to be a significant historic property that will be adversely impacted by future project debris removal, further coordination may be required and preparation of a Memorandum of Agreement (MOA) developed to mitigate for this impact. The MOA would be developed in coordination with EPA, the Corps, MA BUAR, MHC, and others as determined. In any case, all involved realize the importance of the New Bedford Harbor Superfund project are committed to minimizing disruption to the project schedule while this potentially significant find is evaluated.

Prepared by:

Marc Paiva, Corps Archaeologist

APPENDIX B

MBUAR SPECIAL USE PERMIT APPLICATION AND PERMIT

THE COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
251 Causeway Street, Suite 800, Boston, MA 02114

SPECIAL USE PERMIT APPLICATION

In accordance with 312 CMR 2, rules and regulations established by the Board of Underwater Archaeological Resources under MGL C. 91, s. 63, as amended, the undersigned herewith makes application for a permit to conduct archaeological research activities to identify and/or examine underwater archaeological resources located within the inland and coastal waters of the Commonwealth.

PLEASE TYPE OR PRINT LEGIBLY

NAME(S): DAVID S. ROBINSON
ORGANIZATION: FATHOM RESEARCH, LLC
(Applicant must be a qualified archaeologist or archaeological organization meeting the minimum qualifications under 312 CMR 2.09(4)(d); if multiple applicants, provide information for all parties and each must sign. If a corporation, include a copy of the certificate of incorporation with this application, and write both corporate name and contact information.)
ADDRESS: 1213 PURCHASE STREET, SUITE 315

TELEPHONE NUMBER: 401-578-5506 **FAX NUMBER:** 508-990-0887
EMAIL ADDRESS: drobinson@fathomresearch.info

PROJECT NAME: NEW BEDFORD HARBOR SHIPWRECK UNANTICIPATED DISCOVERY
LOCATION OF PROPOSED ACTIVITY
Nearest City or Town: NEW BEDFORD
Name of Water Body: NEW BEDFORD HARBOR
Depth of Water: < 10 ft
Total Acreage of the Project Area: 1.2
Description of Proposed Permit Area (narrative): AREA IS LOCATED ON ACUSHNET SIDE OF UPPER NEW BEDFORD HARBOR, SOUTH OF WOOD STREET BRIDGE (APPROX. 1,500 FT)

Longitude and Latitude of Proposed Project Area (Project area of potential effect):
NE 70.9143705/41.6746758 NW 70.9151488/41.6746767
SE 70.9143724/41.6740073 SW 70.9151548/41.6740093

Please attach a copy of the section of the NOAA nautical chart(s) or USGS topographic map(s).
(Clearly indicate the exact location of and the extent of the requested permit area on attached NOAA nautical chart or USGS topographic Map, specifying marker buoys, longitude and latitude, loran bearings and/or any other identifying features which define the requested Permit area. Use the space provided or attach additional sheets if necessary to complete this section.)

PROJECT PROPONENT (if not applicant) EPA (SUPERFUND SITE)/US ARMY CORPS OF ENGINEERS - NEW ENG. DIST.
CONTACT NAME/ORGANIZATION: MARC PAIVA / USACE
ADDRESS: 696 VIRGINIA ROAD, CONCORD, MA 01742-2751
TELEPHONE NUMBER: (978) 318-8796 **FAX NUMBER:**
EMAIL ADDRESS: marcos.A.Paiva@usace.army.mil
PROJECT DESCRIPTION WHICH INCLUDES THE PURPOSE AND GOALS (attach additional sheets as needed):
PROJECT AREA IS LOCATED W/IN U.S. EPA SUPERFUND SITE. REMEDIATION OF SUPERFUND SITE AT NEW BEDFORD INVOLVES DREDGING/REMOVAL OF CONTAMINATED SEDIMENTS W/IN HARBOR.

DESCRIPTION OF ANY KNOWN UNDERWATER ARCHAEOLOGICAL RESOURCE IN THE PROJECT AREA
UNRECOVERED REMAINS OF SHIPWRECK MAY BE PRESENT IN STUDY AREA REMOTE SENSING SURVEY PERFORMED BY ANOTHER CONSULTANT IN 1999 RESULTED IN NO HISTORIC PROPERTIES BEING IDENTIFIED IN THE MARINE PORTION OF THE SUPERFUND SITE.

Continued on page 2

Applicant initial DSR and date 22 AUG 09 to indicate concurrence with 312 CMR 2.

PLEASE INDICATE THE TYPE OF INVESTIGATION BEING UNDERTAKEN FOR THIS PROJECT (check one):

- ☐ Reconnaissance Survey
- ☐ Intensive Survey
- ☒ *Site Examination *(PRELIMINARY)
- ☐ Data Recovery

PLEASE ATTACH A COPY OF YOUR RESEARCH DESIGN AND DESCRIBE IN AS MUCH DETAIL AS POSSIBLE WHAT YOU PLAN TO DO, INCLUDING DOCUMENTARY RESEARCH, REMOTE SENSING, ON-SITE ACTIVITIES, INCLUDING TESTING, EXCAVATION, RESOURCES RECOVERY, CONSERVATION AND CURATION, ETC. (attach additional sheets as needed): SEE ATTACHED FATHOM SOW

(This work plan should include, but not limited to, a description of: 1.) the plans to document activities and finds: 2. the inventory and catalogue which shall be maintained for all recovered artifacts; 3.) the artifact conservation program; and 4. the artifact repository)

WHAT IS YOUR PROPOSED WORK SCHEDULE (attach additional sheets as needed)?
SEPTEMBER – OCTOBER 2009

PROFESSIONAL QUALIFICATIONS OF APPLICANT: (1) ON A SEPARATE SHEET, PROVIDE A PERSONNEL OR ORGANIZATION CHART INDICATING THE NAMES, DUTIES AND RESPONSIBILITIES OF KEY PERSONNEL; (2) INCLUDE COPIES OF THE CURRICULA VITAE FOR THE PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR, PROJECT ARCHAEOLOGIST, AND OTHER KEY STAFF AS NECESSARY.

WHAT ARE YOUR PUBLIC BENEFIT PLANS, SUCH AS PUBLIC DISPLAYS, PUBLIC PRESENTATIONS, AND/OR PUBLICATION OF THE RESULTS OF YOUR WORK (Attach additional sheets as needed)?
A TECHNICAL REPORT WITH DRAWINGS OF SHIPWRECK TIMBERS, REMOTE SENSING SURVEY DATA, AND RESULTS FROM ARCHIVAL RESEARCH WILL BE SUBMITTED TO FEDERAL + STATE AGENCIES. RECOMMENDATIONS FOR FURTHER INVESTIGATION & PUBLIC DISSEMINATION OF RESULTS WILL ALSO BE PROVIDED.

YOU MAY INCLUDE ANY OTHER INFORMATION YOU BELIEVE MAY ASSIST THE BOARD IN ASSESSING YOUR APPLICATION (Attach additional sheets as needed)
SEE ATTACHED: 24 JUL 09 letter - Simon (MHC) to PAIVA (USACE-NED)
13 AUG 09 letter - MACKOS (USACE-NED) to Simon (MHC)

The undersigned understands and acknowledges that all underwater archaeological resources recovered under a special use permit remain the property of the Commonwealth of Massachusetts.

The undersigned understands and acknowledges that this permit does not authorize the excavation of human remains.

The undersigned understands and acknowledges that the Board may deny this permit application or revoke a permit granted whenever the Board determines that there is substantial fraud, deceit, corruption, or misrepresentation in the information or filing of this permit application.

I have read and agree to carry out the underwater archaeological investigations to the standards outlined in 312 CMR 2.

(Signature of Principal Investigator/Project Director)	SAME (Signature of Project Archaeologist)	22 AUG 09 (Date)
DAVID S. ROBINSON (Type or Print Name)	SAME (Type or Print Name)	22 AUG 09 (Date)

FOR OFFICIAL USE ONLY (DO NOT COMPLETE THIS SECTION)

Date and Time Received: By:

FATHOM RESEARCH, LLC.

Scope of Services (Rev. 1)

New Bedford Harbor Superfund Site
Sunken Vessel Discovery

Acushnet, Massachusetts

Marine Archaeological Survey, Documentation and Analysis

August 2 , 2009

Submitted to:

CR Environmental, Inc.
639 Boxberry Hill Road
East Falmouth, Massachusetts 02536

In response to a request from CR Environmental, Inc. (CRE), Fathom Research, LLC (Fathom), is pleased to submit the following scope of services and cost estimate for performing marine archaeological survey, documentation, and analysis of the site and remains of a shipwreck discovered recently during debris removal activities associated with the U.S. Environmental Protection Agency's (EPA's) and U.S. Army Corps of Engineers' (USACEs') remediation of the New Bedford Harbor Superfund Site, in Acushnet, Massachusetts. As the remediation of the New Bedford Superfund Site constitutes a federal undertaking by the EPA and USACE, compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (36 CFR 800), is required. Section 106 of the NHPA requires federal agencies take into account the effects of their undertakings on cultural resources listed or eligible for listing in the National Register of Historic Places (National Register) (36 CFR 60). The agency must also afford the Advisory Council on Historic Preservation the opportunity to comment on the undertaking. The Section 106 process is coordinated at the state level by the State Historic Preservation Office (SHPO), which in Massachusetts operate within the offices of the Massachusetts Historical Commission (MHC), working in consultation with the Massachusetts Board of Underwater Archaeological Resources (MBUAR).

In compliance with Section 106 of the NHPA, the marine portion of the New Bedford Harbor Superfund Site was subjected to a remote sensing archaeological identification survey in 1999 by Dolan Research, Inc. (Dolan), in association with John Milner Associates, Inc. (Milner), working under contract with Foster Wheeler Environmental Corporation (Foster Wheeler), to

determine the presence/absence of submerged cultural resources (i.e., shipwrecks) within the remediation project's Area of Potential Effect (APE). Survey of the shallow upper New Bedford Harbor area, where the unanticipated discovery of the shipwreck was made, was limited, however, by shallow water depths at the time of the survey, thus preventing the detection of the shipwreck at that time. A protocol for addressing unanticipated discoveries of cultural resources and human remains was prepared by Foster Wheeler at the conclusion of its archaeological identification survey effort in 2003.

This protocol was put into use upon the unanticipated discovery of ship remains in early July of 2009. The ship remains were encountered in the northern area of the Harbor, south of the Wood Street Bridge and along the Acushnet shoreline, in a highly contaminated environment across from the Aerovox Building - the point source of the New Bedford Harbor Superfund Site's PCB contaminants. Following the unanticipated discovery of the ship remains and the removal of a portion of them to the remediation project's Sawyer Street facility, the shipwreck site was marked, all work in the area stopped, and the EPA and USACE was contacted to inform them of the discovery.

The ship remains that had been removed from the site were inspected on July 16, 2009 by staff from the EPA, the USACE, the MBUAR, and Fathom. Archaeologists from the MBUAR and Fathom observed the ship remains to be damaged from their recent exposure to air and from fire that had occurred prior to their submergence. The ship remains were also observed to have features consistent with those of timbers from a vessel dating from the late eighteenth to early nineteenth centuries. Based on conversations with the debris removal crew who found and removed the ship remains, the shipwreck was apparently intact prior to its disturbance. Background historical research indicates that a number of ships were burned and sunk in New Bedford Harbor during the American Revolutionary War.

Pursuant to the requirements of Section 106 of the NHPA and the regulations for Post Review Discoveries (36 CFR 800.13(b)(3), and in consultation with the EPA, MHC, MBUAR, Fathom, and the Advisory Council on Historic Preservation, the USACE has proposed a number of actions to address the unanticipated discovery and resolve potential adverse effects from theirs and the EPA's undertaking. The tasks proposed by Fathom below are designed to assist the USACE in completing these actions.

PROJECT TASKS

Task 1: Administration/Coordination/Consultation

Fathom will administer, coordinate and consult with the federal, state, and local project review agencies and potentially interested consulting parties as required and directed by CRE, the EPA and the USACE to assist compliance with Section 106 requirements and to ensure the successful and timely

completion of all project tasks. David S. Robinson, M.A., R.P.A., Fathom's Principal and Director of Marine Archaeological Services, will serve as Project Manager/Principal Investigator/Conservator and be the primary Point-of-Contact for the project.

Task 2: MBUAR Permit Application

Fathom will prepare and submit an application for a MBUAR Special Use Permit for review and approval by the MBUAR for the proposed project, in accordance with 312 CMR 2.06(1)(c).

Task 3: Remote Sensing Survey

Fathom will assist CRE in performing a shallow-water, high-resolution, remote sensing marine archaeological survey of the wreck site to identify the remainder of the vessel(s) that may be located on or below the harbor bottom.

Task 4: Remote Sensing Data Analysis and Interpretation

Upon completion of the remote sensing survey, Fathom will review and analyze all of the collected raw and post-processed data with CRE's geophysicist to assess the integrity and define the limits of the wreck site, and evaluate the need and feasibility of further investigation of the site by archaeological divers.

Task 5: Ship Timbers Documentation, Analysis and Interpretation

Recovered ship timbers and other associated finds removed from the harbor floor will be documented, analyzed, and interpreted. Documentation will consist of color digital photographs and measured scale drawings of the dimensions and shapes of each individual timber in plan, profile, and section. Each timber will be analyzed and interpreted (to the extent possible) to determine its place and function within the vessel's hull.

Task 6: Research

Fathom will perform the research necessary to:

- summarize the pertinent historical background information and previous archaeological research conducted to date within the project area and;
- preliminarily assess the National Register of Historic Places (NRHP) eligibility of the shipwreck site.

This research will include a review of cultural resource reports, site files, and State and National Register files at the offices of the MHC and MBUAR, NOAA's AWOIS (Automated Wreck and Obstruction Information System), *Northern Maritime Research's Northern Shipwreck Database* (ver. 2002), *Encyclopedia of American Shipwrecks* (Berman 1972), Historic charts and maps of the area, and published and unpublished primary and secondary sources on the area and region's cultural and environmental histories, as well

as consultation with institutions and persons knowledgeable about the area's local history.

Task 7: Report and Ship's Timber Documentation

Fathom will prepare and submit five (5) copies (CD-ROM and hard copy versions) of a Draft Report to CRE for distribution and review by the agencies and interested consulting parties upon completion of Tasks 2 through 5. The report will include the following elements:

- results of the remote sensing survey, data analysis, and interpretation;
- results of the ship timber documentation, analysis and interpretation;
- summary of pertinent historical background and previous archaeological research;
- a research design and methodology for the proposed monitoring process, including a proposal for recordation, recovery, reporting and curation;
- preliminary assessment of the shipwreck's National Register eligibility;
- recommendations for future research, including archaeological diver inspection and excavation of the wreck site, steps to conserve and curate timbers already removed, and for any other significant finds that may be discovered and need conservation, as appropriate and feasible.

The report's contents and format will follow the reporting guidelines established by the National Park Service in the *Recovery of Scientific, Prehistoric, Historic, and Archeological Data* (36 CFR Part 66 Appendix A), MHC's *Historic Properties Survey Manual: Guidelines for the Identification of Historic and Archaeological Resources in Massachusetts* (1992), and MBUAR Regulations (312 CMR 2). Ten (10) copies of the Final Report (CD-ROM and hard-copy versions) will be prepared for submittal to CRE upon receipt of review comments for distribution to federal, state, and local agencies, and interested consulting parties.

PROJECT SCHEDULE

Fathom is prepared to commence work on the project immediately after execution of a signed Work Order from CRE.

PROJECT PERSONNEL

Fathom Principal and Director of Marine Archaeological Services, David S. Robinson, M.A., R.P.A., will serve as the project manager/principal investigator/conservator for the project. He will perform/oversee all aspects of the marine archaeological investigation and the preparation of project deliverables. Mr. Robinson will be assisted by Fathom's Senior Marine Archaeologist, David Trubey, M.A., R.P.A. Messrs. Robinson and Trubey's

professional qualifications meet standards established by the NPS (36 CFR Part 66, Appendix C), the MHC and MBUAR.

COST ESTIMATE

A separate detailed lump sum cost estimate is attached.

Bounding Coordinates	
NORTHING	EASTING
2706854.00	816017.00
2706857.00	816052.00
2706862.00	816081.00
2706894.00	816036.00
2706898.00	816073.00
2706958.00	816039.00
2706953.00	816058.00
2706957.00	816089.00
Coordinates in NAD 1983 Massachusetts Mainland, State Plane, Feet	

Legend

- Area of Interest
- MLLW
- MLW
- MHW
- MHHW

Aerial Photography MASSGIS 2003

N

0 200 400

Feet

1:4,800

JACOBS™

Area of Interest

New Bedford Harbor Superfund Site

NAME: croberts DATE: 08/11/2009

Figure 1

Y:\NBH\Projects\35BG0602\20090811\ArcGIS\area_of_interest_zoomout.mxd

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

July 24, 2009

Marcos Paiva
Archaeologist
New England District
US Army Corps of Eng neers
696 Virginia Rd
Concord, MA 01742-27 51

RE: New Bedford Harb or Superfund Site Sunken Vessel Discovery, New Bedford, MA.
MHC #RC.17682.

Dear Mr. Paiva:

Staff of the Massachuse ts Historical Commission, the office of the Massachusetts State Historic Preservation Officer, ha ve reviewed your report of the discovery of timbers from an historical ship during the implementation of t e EPA project referenced above, received by the MHC on July 23, 2009. The report of the July 16, 20 09, field visit and consultation, and your recommendations supplements the photographs of the disc overy, received by the MHC on July 13, 2009. Please send a map showing the area of the discovery lo ation, in relation to the project impacts that are proposed.

Pursuant to 36 CFR 80(.13(b)(3), the EPA or the Corps should notify the Advisory Council on Historic Preservation.

The wooden ship timbe s are consistent with a vessel constructed in the late 18th to early 19th century, and some of the vessel e lements that have been recovered show signs of burning. A summary of background historical r search indicates that, "during the Revolutionary War, a British fleet blockaded the Harbor and destroye 1 34 ships according to a local resident. There is also mention of the British sinking and burning shi s in the Harbor that may have been stolen by colonists." American colonists had taken "twenty or so Brit sh vessels and moored them in the [h]arbor. The [B]ritish were unable to recover them by sea because the harbor was well protected by a fort. The Brits attacked at night and sank or burned the boats in the l arbor. (One of the vessels was named the *James Brown*)."

It has not been determir ed if the well-preserved portions of the vessel discovered is one of these American or British shi s. If so, the discovery would be highly significant at the local and state levels, and possibly at the natic nal level, for its associations with an important event during the Revolutionary War. International inte est could be anticipated. Even if this vessel were not from that event, this well-preserved historic vesse would likely provide important information about naval architecture, technology, and maritin e history in New Bedford. The Corps is awaiting additional documentation to determine if the recove ed timbers are eligible for listing in the National Register of Historic Places.

MHC agrees that the re covered ship timbers should be fully documented, analyzed, and interpreted by a qualified marine archae ologist, and the documentation provided to the MHC, the Board of Underwater Archaeological Resourc es, and any local interested historical repository. The MHC recognizes that the wooden ship timbers ha ve been exposed and unprotected since their discovery so that

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

conservation of the timbers may not be feasible. MHC needs more information concerning the feasibility of conservation. An experienced archaeological conservator should provide recommendations for the timbers already discovered, and be a member of the Research Team for any other significant finds that may be discovered and need conservation. Preservation of the historic ship timbers may be desired by constituents, and particularly so if the vessel is associated with the Revolutionary War. A plan should be developed for appropriate curation of the artifacts and records of the investigation, preferably at an appropriate and responsible local repository.

MHC agrees with the Corps for remote sensing survey, and any feasible inspection and evaluation of the discovery area. MHC agrees that is it prudent to conduct supplemental remote sensing survey of the project impact areas to assist to determine if additional, previously undetected, significant historic resources are present and will be affected by the project. Fathom Research LLC should prioritize their activities based on the project work area priorities.

MHC recommends that Fathom Research LLC should provide the results of the remote sensing survey, their inspection and evaluation of the discovery area if feasible, with a summary of the pertinent historical background and previous archaeological research, a research design and methodology for the proposed monitoring process, including a proposal for recordation, recovery, reporting and curation in accordance with professional archaeological standards and practices as part of a plan to mitigate adverse effects to the extent feasible. If significant results ensue, then EPA and the Corps should consider means to disseminate the results to the interested public and other constituencies.

MHC recommends that the EPA and Corps should also be seeking comments of other potentially interested consulting parties such as the New Bedford Historical Commission, the Waterfront Historic Area League in New Bedford, the New Bedford Whaling Museum, and the National Park Service's New Bedford Whaling National Historic Park, concerning the discovery, its treatment, and the Corps' proposal to address additional discoveries and mitigate the project effects on significant historic properties during this undertaking to the extent feasible.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). If you have further questions please contact Edward L. Bell at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
John Eddins, Advisory Council on Historic Preservation
Jeannie Brochi, EPA Region 1 Federal Historic Preservation Officer
Victor T. Mastone, BUAR
David S. Robinson, Fathom Research LLC

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO:
ATTENTION OF:

August 13, 2009

Engineering/Planning Division
Evaluation Branch

Ms. Brona Simon, Executive Director and SHPO
Massachusetts Historical Commission
The Massachusetts State Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

SUBJECT: New Bedford Harbor Superfund Site Sunken Vessel Discovery, New Bedford, MA. MCH #RC.17682.

Dear Ms. Simon:

We are writing in response to your letter to Mr. Marc Paiva of my staff dated July 24, 2009 (copy enclosed) regarding the subject vessel discovery during debris removal activities in the upper portion of New Bedford Harbor in Acushnet, Massachusetts. Enclosed is a map depicting the discovery location in relation to the project impacts that are proposed. Pursuant to the regulations for Post Review Discoveries (36 CFR 800.13(b)(3)), the Advisory Council on Historic Preservation (Council) shall be notified of the discovery and the proposed actions to resolve adverse effects.

To summarize, we are proposing to conduct a remote sensing archaeological survey of the wreck site utilizing high-resolution side scan sonar and sub-bottom profiler during periods of maximum high tide to identify the remainder of the vessel(s) that may be located below the harbor bottom and to assess the site's archaeological integrity. It is noted that the vessel was relatively intact prior to being brought to the surface. This investigation will be conducted by a professional marine archaeologist with expertise in these types of surveys and in the technology of wooden vessels that represent the possible late 18th – early 19th Century period of this discovery. A 100 foot by 250 foot protection zone in the area of the finding has been created in which no dredging activities will take place until these surveys are performed.

Concurrent with and in addition to the remote sensing survey, the recovered ship timbers shall be documented, analyzed, and interpreted by a qualified marine archaeologist and the documentation provided to your office and the Massachusetts Board of Underwater Archaeological Resources (MA BUAR). Recommendations regarding the possible conservation and curation of the vessel timbers and other finds will be provided as part of this documentation effort. This effort should be conducted as soon as possible since the timbers are already in the process of deterioration.

When the survey is complete, the marine archaeologist contractor shall provide a report summarizing the results and providing recommendations for further study, if necessary. The findings should include a preliminary assessment of National Register of Historic Places (NRHP) eligibility (36 CFR 63) for the vessel(s) and its site. This report will be coordinated with the EPA, Corps, Jacobs Engineering, the Massachusetts Historical Commission, the MA BUAR, the Council, and other interested parties to be determined.

If it is determined that the wreck site is not eligible for listing to the National Register, than no further work is required. However, if the site is found to be a potentially significant historic property, eligible for listing to the NRHP and adversely impacted by future project debris removal and/or dredging activities, then a Memorandum of Agreement (MOA) will be developed to mitigate for this impact in accordance with 36 CFR 800.6 of the Council's regulations.

Since the location of the wreck site and any archaeological site in general is confidential information and protected from public disclosure (36 CFR 800.11(c)), at no time will specific locational data be provided to the general public. Realizing the highly contaminated nature of the area and the publicity that this discovery may generate, public notification outside of the regulatory agencies above will not occur until the survey investigation is complete and a preliminary assessment of the wreck site's significance is available. However, in accordance with 36 CFR 800.6(a)(4), the EPA and the Corps are required to afford an opportunity for the public to provide input on resolving adverse effects upon historic properties. During development of an MOA, the inclusion of interested parties will be identified and may include local historical commissions, the Waterfront Historic Area League (WHALE), the New Bedford Whaling National Historic Park, the New Bedford Whaling Museum, and others depending on the nature and significance of the vessel discovery.

If this discovery is indeed one of the American or British ships from the Revolutionary War era, it would be highly significant at a local, state, and possibly national level. Regardless of the date, a well-preserved wooden vessel would provide important information about naval architecture, technology, and maritime history in early New Bedford. However, in any case, we also realize the importance of the New Bedford Harbor Superfund Project and are committed to working with everyone in minimizing any disruption to the project schedule while this discovery is evaluated.

We will keep you apprised of our future efforts regarding this vessel discovery and continue our coordination with your office in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR 800.

If you have any questions, please contact Mr. Paiva, project archaeologist at (978)318-8796.

Sincerely,

for Anthony T. Mackos, P.E.
Acting Chief, Engineering/Planning Division

Enclosures

Copies furnished (with enclosures):
Mr. Victor Mastone, Director
MA Board of Underwater Archaeological Resources
251 Causeway Street, Suite 800
Boston, Massachusetts 02114-2136

Mr. David Robison, Principal
Fathom Research LLC
1213 Purchase Street, #4
New Bedford, Massachusetts 02740-6694

Mr. John Eddins, Program Analyst
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue NW, Suite 803
Washington, DC 20004

Copies furnished (without enclosures):
Mr. Dave Dickerson, Remedial Project Manager
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code HBO
Boston, Massachusetts 02114-2023

Ms. Elaine Stanley, Remedial Project Manager
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code HBO
Boston, Massachusetts 02114-2023

Ms. Jean Brochi, Federal Preservation Officer
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Mail Code COP
Boston, Massachusetts 02114-2023

The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1200 Fax (617) 626-1240 Web Site: www.mass.gov/czm/buar/index.htm

August 22, 2009

David S. Robinson, M.A., R.P.A.
Fathom Research, LLC.
Quest Center, Suite 315
1213 Purchase Street
New Bedford, MA 02740

Dear Mr. Robinson:

This letter confirms the acceptance and provisional approval of Fathom Research, LLC's Special Use Permit application by the Massachusetts Board of Underwater Archaeological Resources. This permit (09-003) is for the marine archaeological survey and related documentation as part of the New Bedford Harbor Superfund Site Unanticipated Shipwreck Discovery for the project area as detailed on the chart accompanying the application. The duration of this permit is one year from the date of issuance with its expiration date as 22 August 2010.

This permit is herein granted dependent upon Fathom Research, LLC's compliance with the Board's Regulations (312 CMR 2.00). All work must be conducted in accordance with Board directives, standard conditions and the Scope of Services included in the application. Activities allowed under this permit include remote sensing, archaeological site examination and reccovery to determine the presence or absence of potential submerged archaeological resources and undertake necessary recovery and documentation of these resources in the permit area. For projects subject to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), permittees are directed to consult with and provide their proposed research design and methodology to the State Historic Preservation Office/Massachusetts Historical Commission and the lead federal agency in accordance with 36 CFR 800.4, prior to conducting the field investigation

This permit does not relieve the permittee or any other person of the necessity of complying with all other federal, state and local statutes, regulations, by-laws and ordinances.

Review by the full Board of your provisional permit has been scheduled for Thursday, September 24, 2008 at 1:30 PM in the CZM Conference Room located on the 8th floor of 251 Causeway Street in Boston.

If you should have any questions or need further assistance, do not hesitate to contact the Board at the address above or by telephone at (617) 626-1141.

Sincerely,

Victor T. Mastone
Director

Cc (via email):
Brona Simon, MHC
Marc Paiva, USACOE
Bob Boeri, MCZM
David Janik, MCZM

The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1200 Fax (617) 626-1240 Web Site: www.mass.gov/czm/buar/index.htm

September 29, 2009

David S. Robinson, M.A., R.P.A.
Fathom Research, LLC.
Quest Center, Suite 315
1213 Purchase Street
New Bedford, MA 02740

RE: Special Use Permit 09-003, New Bedford Harbor Superfund Site Unanticipated Shipwreck Discovery

Dear Mr. Robinson:

This letter confirms the vote taken by the Massachusetts Board of Underwater Archaeological Resources on 24 September 2009 to issue a Special Use Permit, 09-003, to Fathom Research, LLC for the marine archaeological survey and related documentation as part of the New Bedford Harbor Superfund Site Unanticipated Shipwreck Discovery for the project area as detailed on the chart accompanying the application. The duration of this permit is one year from the date of issuance with its expiration date as 24 September 2010.

This permit is herein granted dependent upon Fathom Research, LLC's compliance with the Board's Regulations (312 CMR 2.00). All work must be conducted in accordance with Board directives, standard conditions and the Scope of Services included in the application. Activities allowed under this permit include remote sensing, archaeological site examination and recovery to determine the presence or absence of potential submerged archaeological resources and undertake necessary recovery and documentation of these resources in the permit area. For projects subject to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), permittees are directed to consult with and provide their proposed research design and methodology to the State Historic Preservation Office/Massachusetts Historical Commission and the lead federal agency in accordance with 36 CFR 800.4, prior to conducting the field investigation

This permit does not relieve the permittee or any other person of the necessity of complying with all other federal, state and local statutes, regulations, by-laws and ordinances.

If you should have any questions or need further assistance, do not hesitate to contact the Board at the address above or by telephone at (617) 626-1141.

Sincerely,

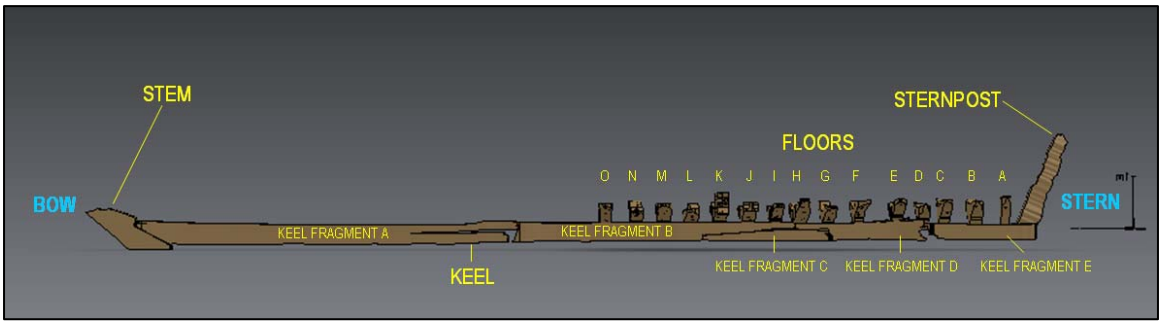
Victor T. Mastone
Director

Cc (via email):
Brona Simon, MHC
Marc Paiva, USACOE
Bob Boeri, MCZM
David Janik, MCZM

APPENDIX C

TIMBER DOCUMENTATION:
PHOTOGRAPHS AND DRAWINGS

TIMBER ARRANGEMENT KEY*

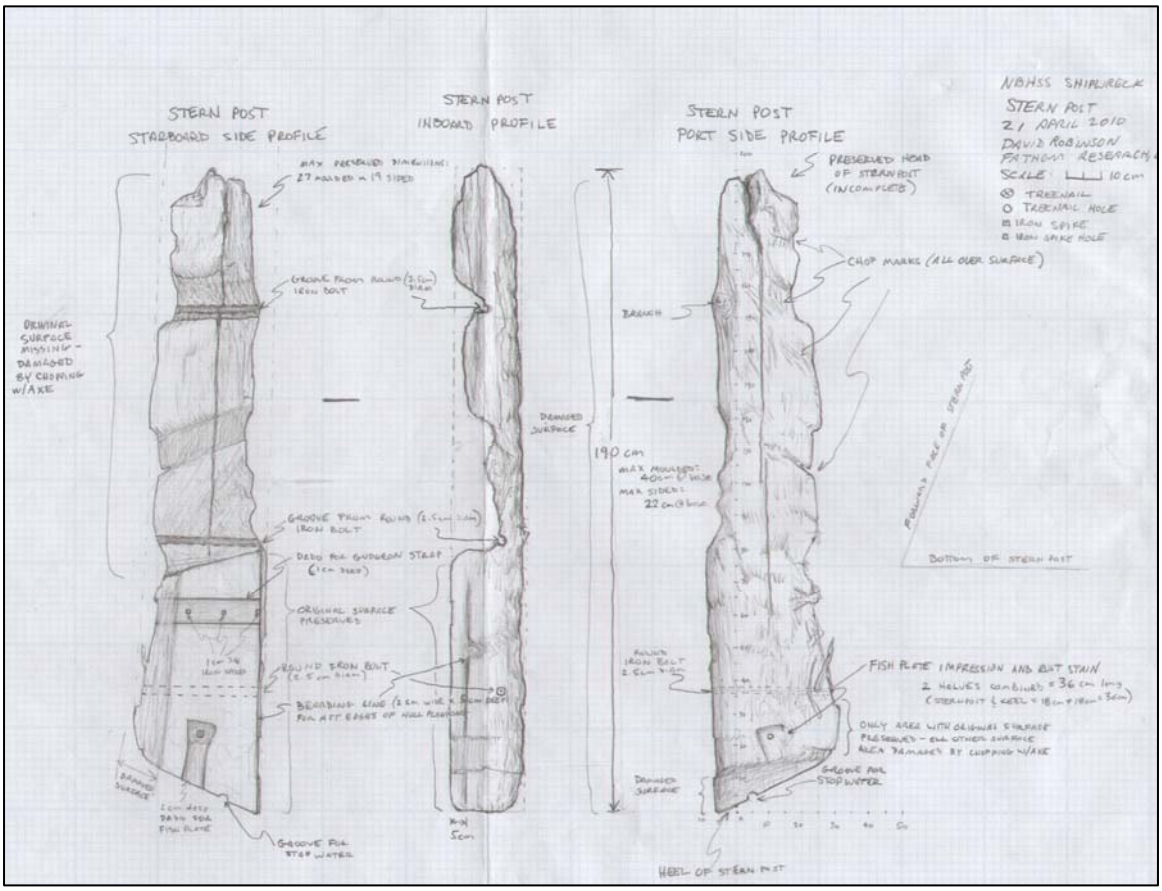


(*planking, futtocks, possible stern deadwood not included in key)

STERNPOST

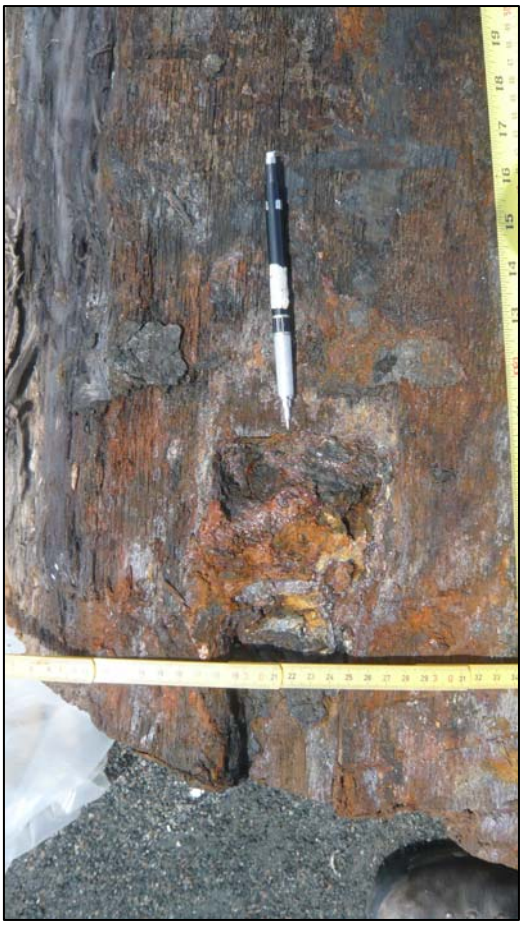
STERNPOST

STERNPOST


STERN POST
STARBOARD SIDE PROFILE
STERN POST
INBOARD PROFILE
STERN POST
PORT SIDE PROFILE
NIHSS SHIPWRECK
STERN POST
21 APRIL 2010
DAVID ROBINSON
FATHOM RESEARCH
SCALE: 10cm
TREENAIL
TREENAIL HOLE
IRON SPIKE
IRON SPIKE HOLE
PRESERVED HEAD OF STRAP BOLT (INCOMPLETE)
CHOP MARKS (ALL OVER SURFACE)
BRANCH
DRAWING SURFACE MISSING - DAMAGED BY CHOPPING W/AXE
DAMAGED SURFACE
190 cm
MAX MOULDED: 40cm (16 in)
MAX SIDED: 22 cm (9 in)
GROOVE FROM ROUND IRON BOLT
DADO FOR GUDGEON STRAP
ORIGINAL SURFACE PRESERVED
ROUND IRON BOLT
BEARDING LINE
FISH PLATE IMPRESSION AND RUST STAIN
2 HALVES COMBINED = 36 cm long
ONLY AREA WITH ORIGINAL SURFACE PRESERVED - ALL OTHER SURFACE AREA DAMAGED BY CHOPPING W/AXE
GROOVE FOR STOP WATER
HEEL OF STERN POST
BOTTOM OF STERN POST

STERNPOST

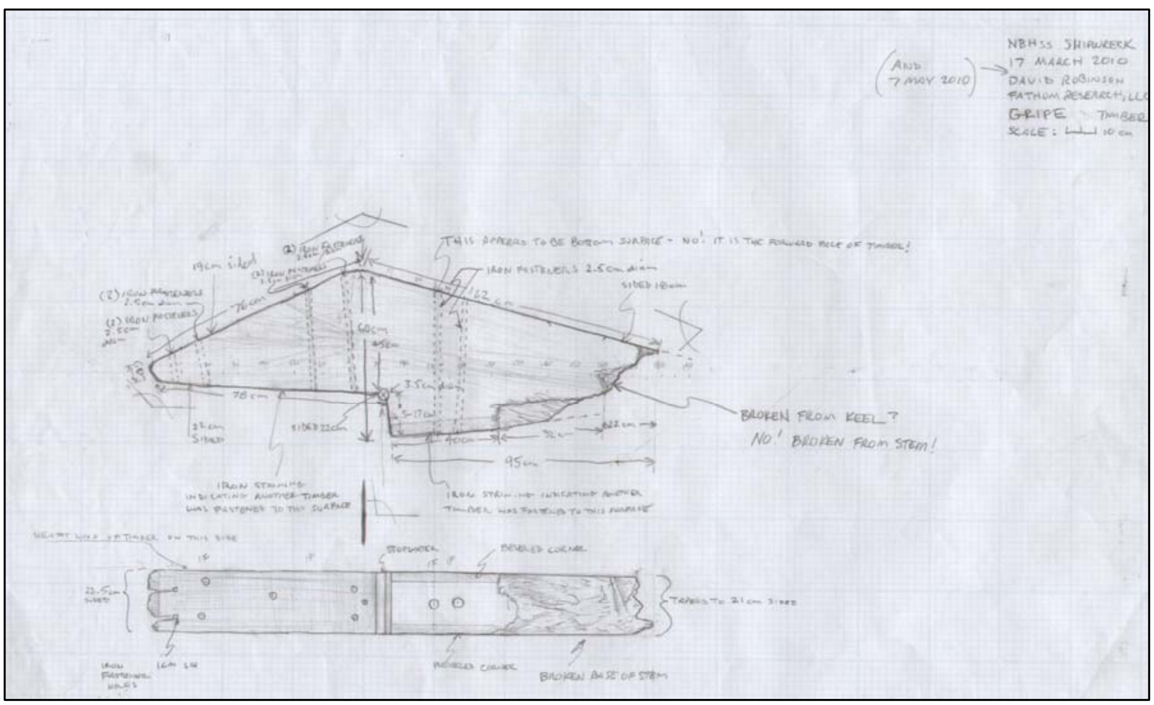
STERNPOST



STEM

STEM

STEM


(AND 7 MAY 2010)
NBHSS SHIPWRECK
17 MARCH 2010
DAVID ROBINSON
FATHOM RESEARCH, LLC
GRIPE TIMBER
SCALE: 10 cm
THIS APPEARS TO BE BOTTOM SURFACE - NO! IT IS THE FORWARD FACE OF TIMBER!
IRON FASTENERS 2.5cm diam
162 cm
76 cm
78 cm
60 cm
95 cm
BROKEN FROM KEEL?
NO! BROKEN FROM STEM!
BEVELED CORNER
BROKEN BASE OF STEM

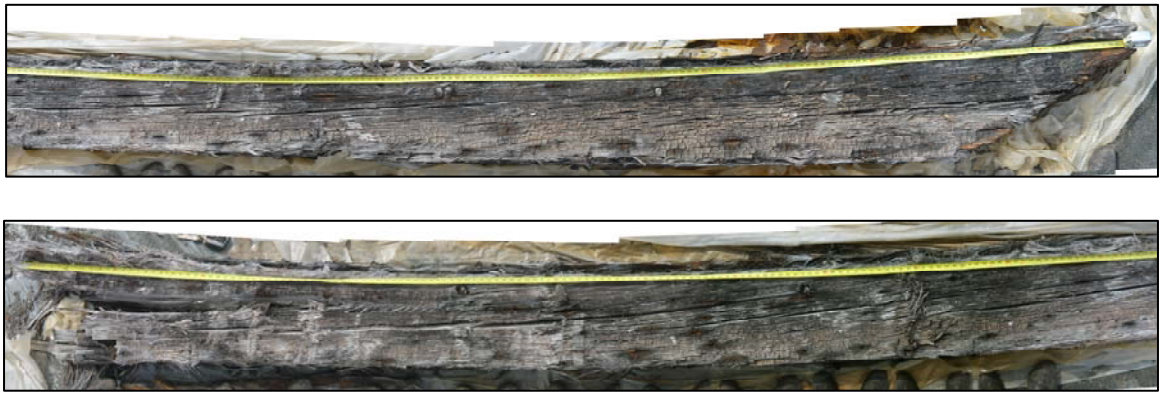
KEEL

Fragments A to E
(bow to stern)

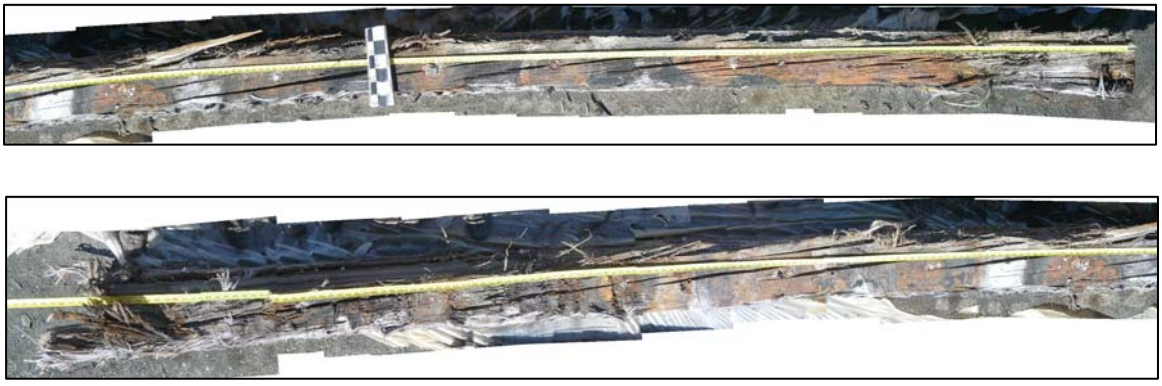
KEEL

Fragment A

(profile)



(plan)



KEEL

Fragment B

(profile)

(plan)

KEEL

Fragment C

(profile)

(plan)

KEEL

Fragment D

(profile)

(plan)

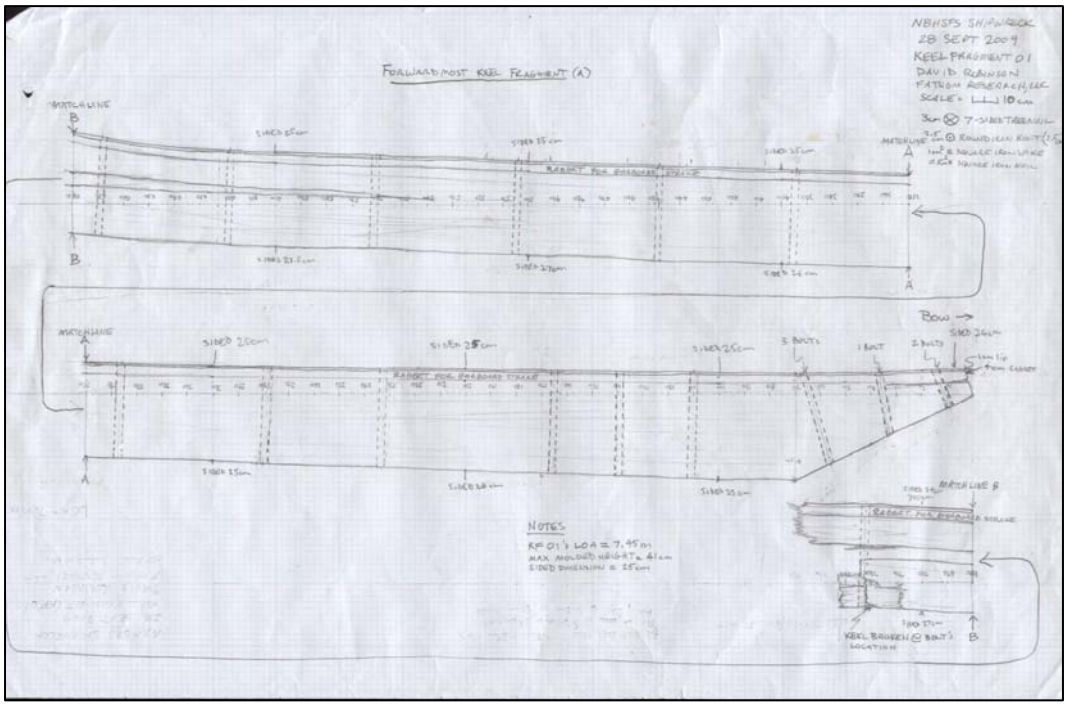
KEEL
Fragment E

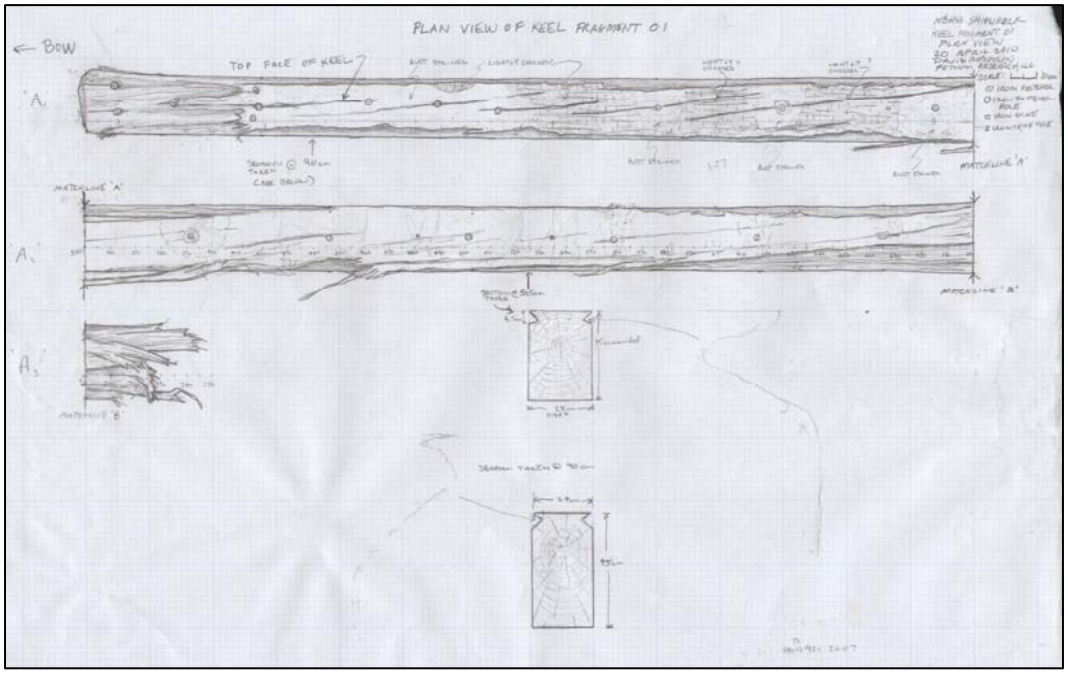
(profile)

(plan)

KEEL

Fragment A
(profile [top], plan and section [bottom])



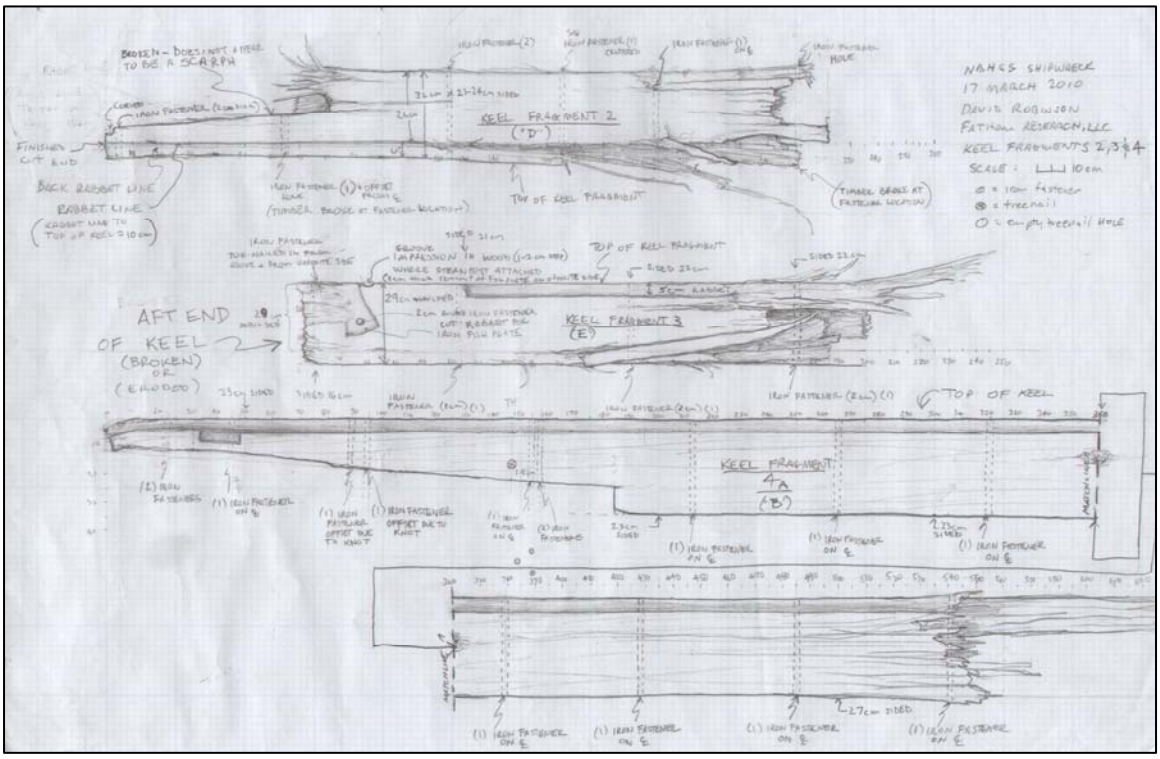


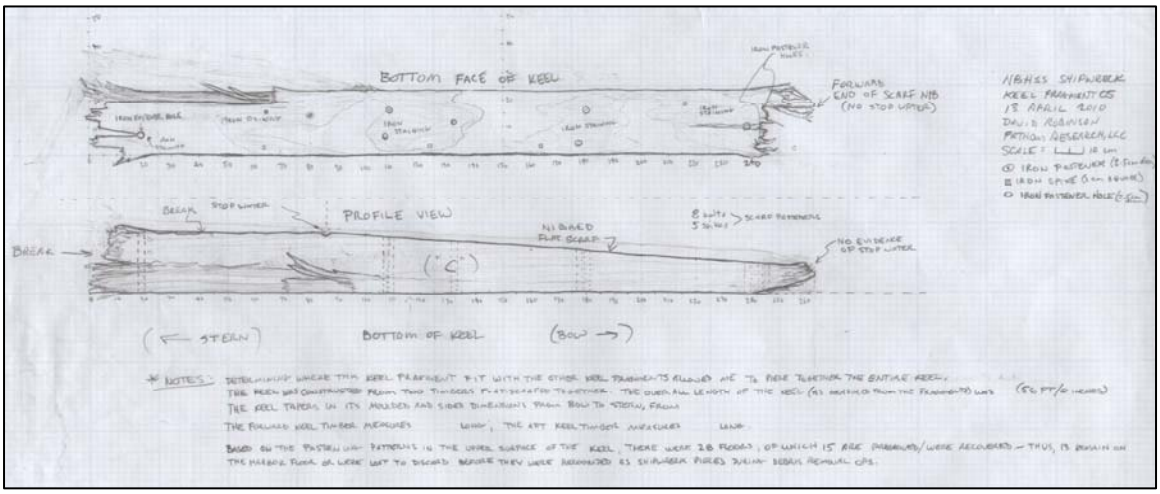
KEEL

Fragments B, D and E
(profile)

and

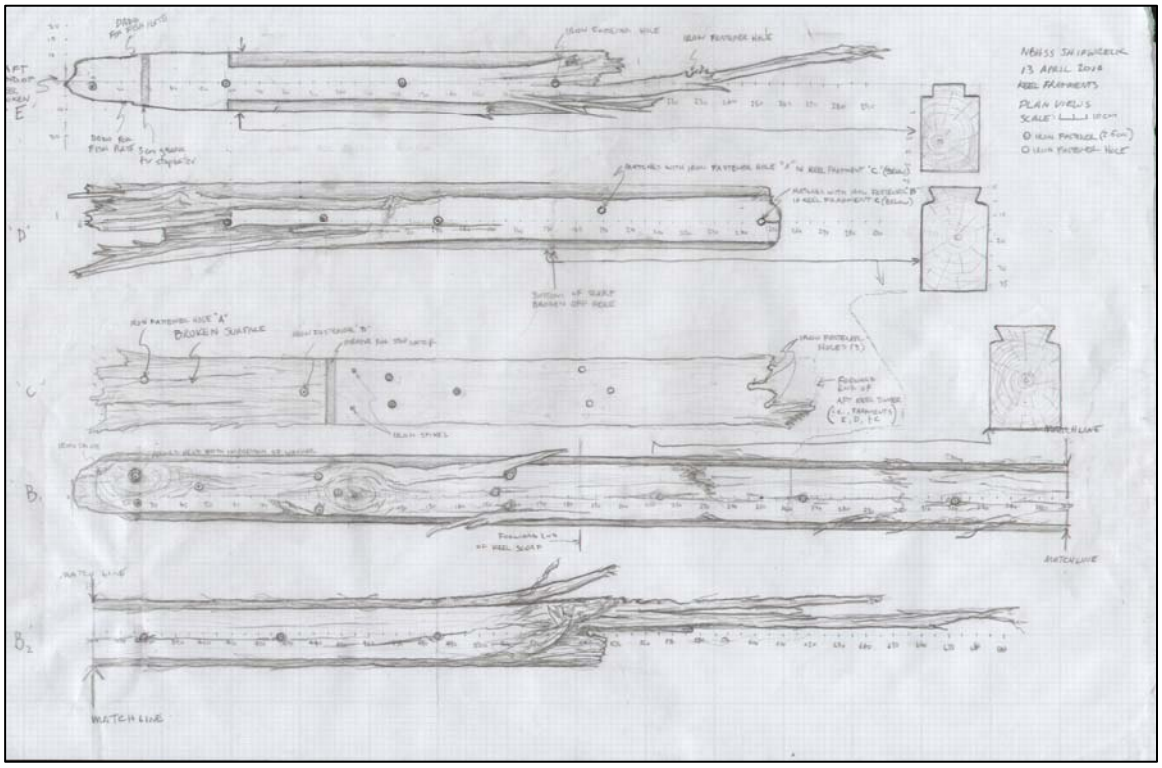
Fragment C
(plan and profile)





KEEL

Fragments B, C, D and E
(plan and section)



FRAMES

Floors, Futtocks, Cant Frames and Miscellaneous Timbers

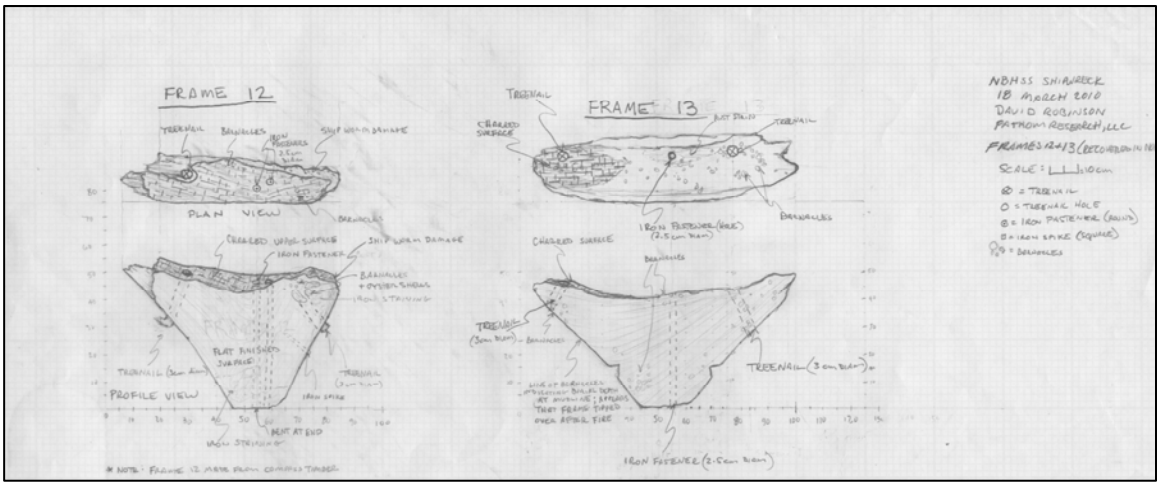
FRAMES

Floors A to O
(stern to bow)

FRAMES

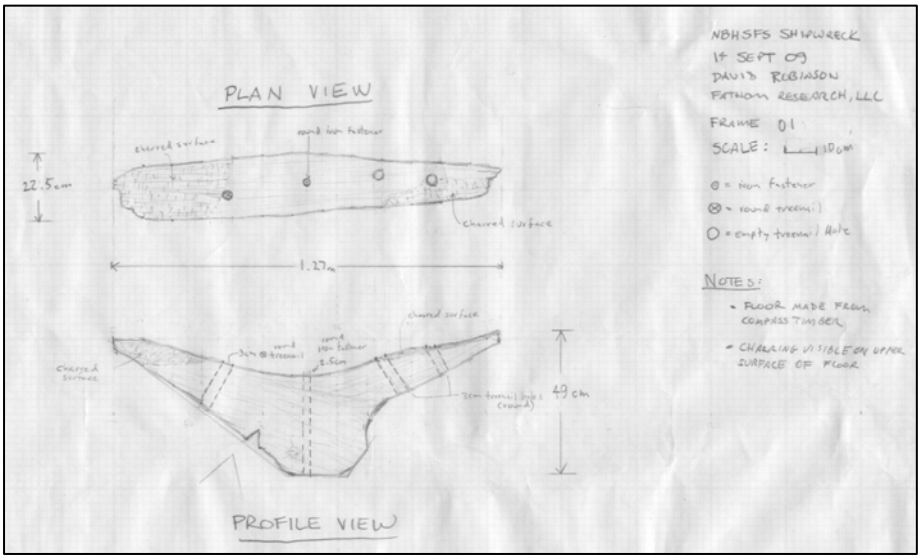
Floor A
(Frame 12 in the field drawings)

Floor B
(Frame 13 in the field drawings)



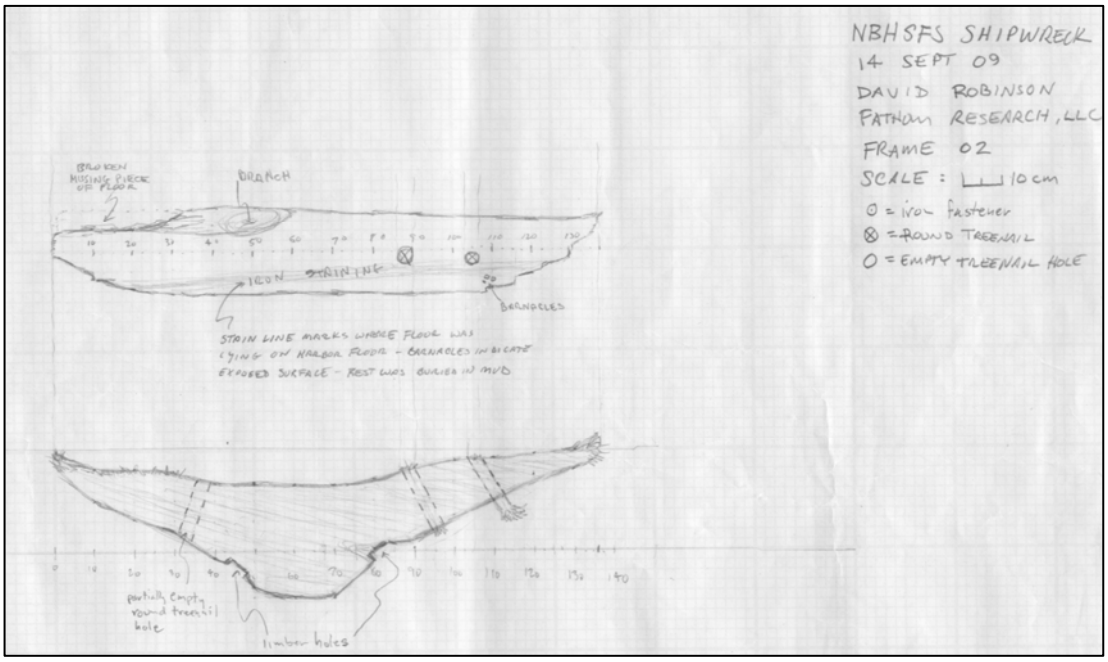
FRAMES

Floor C
(Frame 01 in the field drawings)



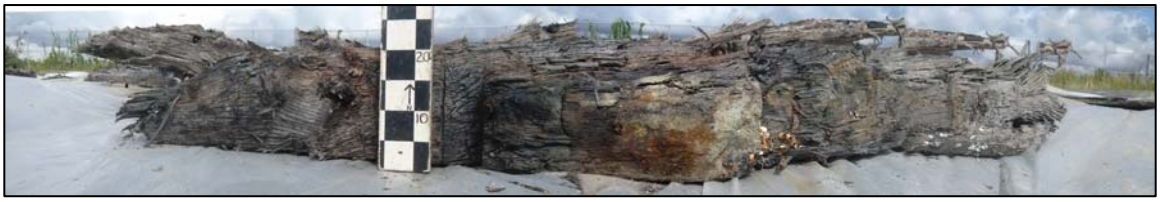
FRAMES

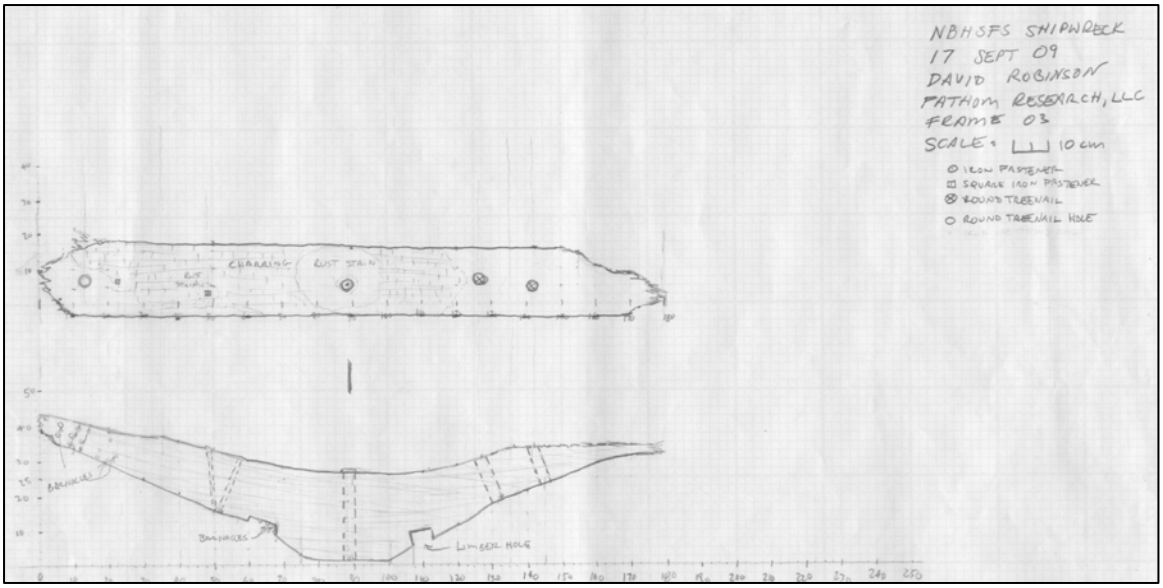
Floor D
(Frame 02 in the field drawings)



FRAMES

Floor E
(Frame 03 in the field drawings)





FRAMES

Floor F
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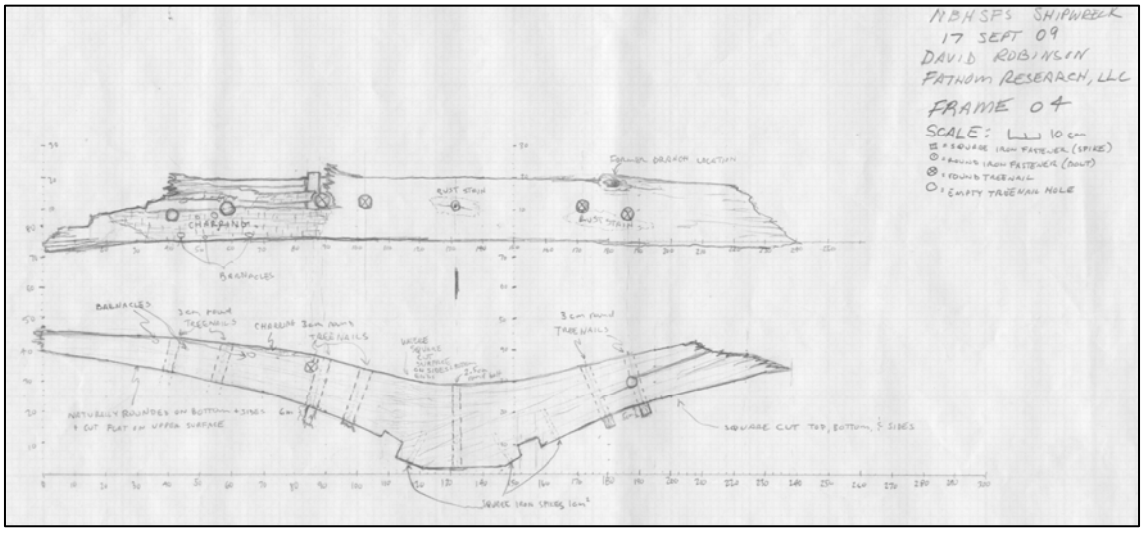
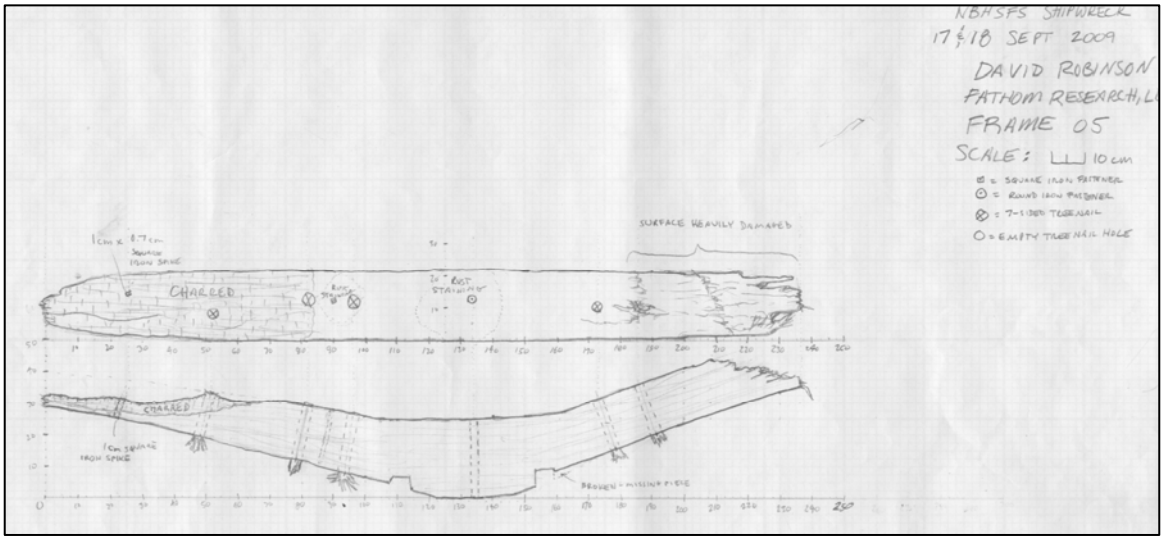


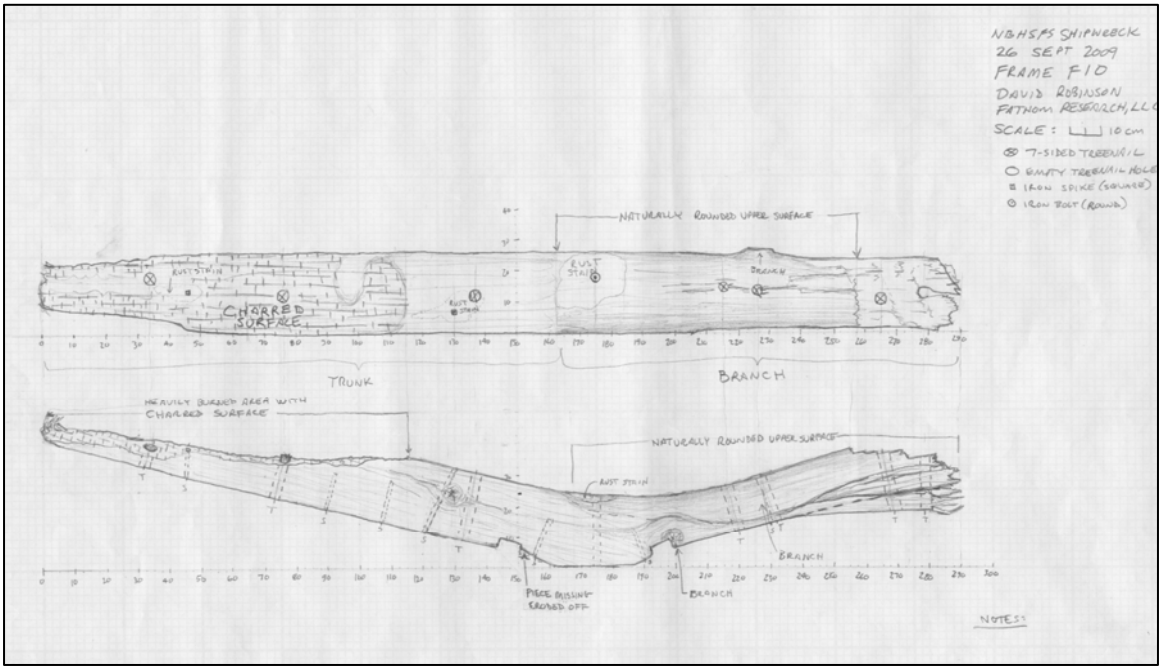
FRAMES

Floor G
(Frame 05 in the field drawings)



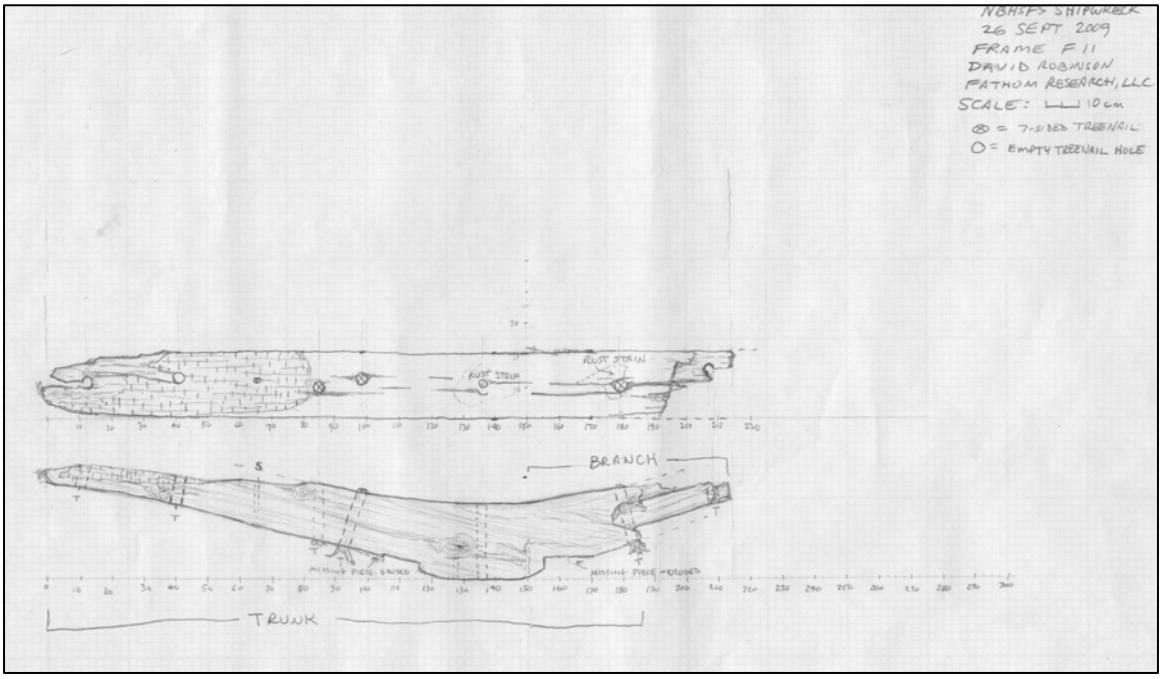
FRAMES

Floor H
(Frame 10 in the field drawings)



FRAMES

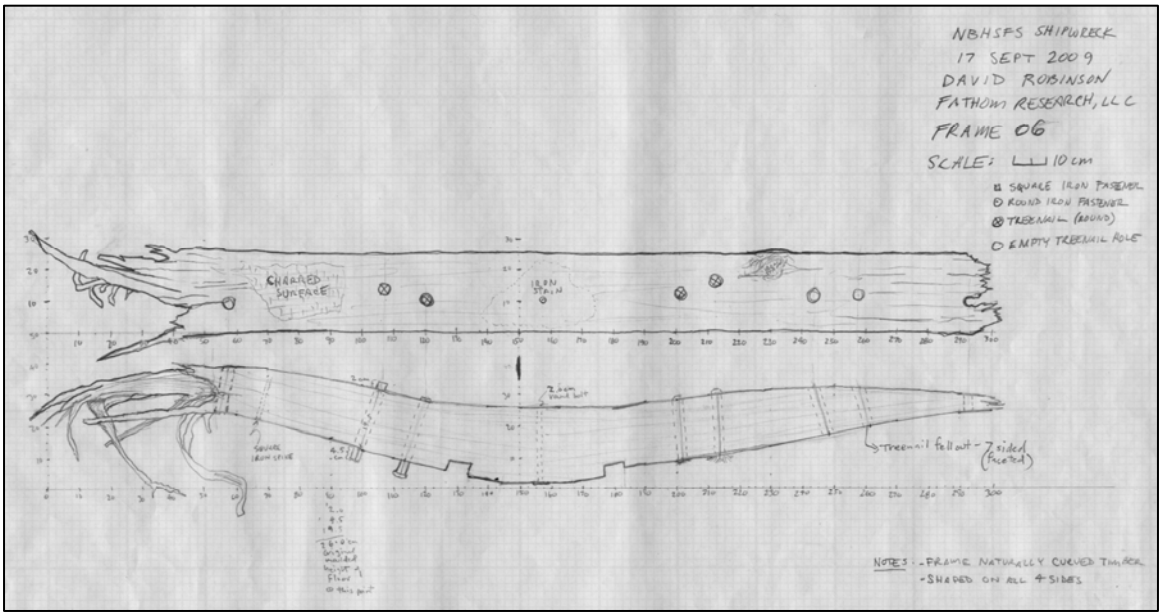
Floor I
(Frame 11 in the field drawings)



FRAMES

Floor J

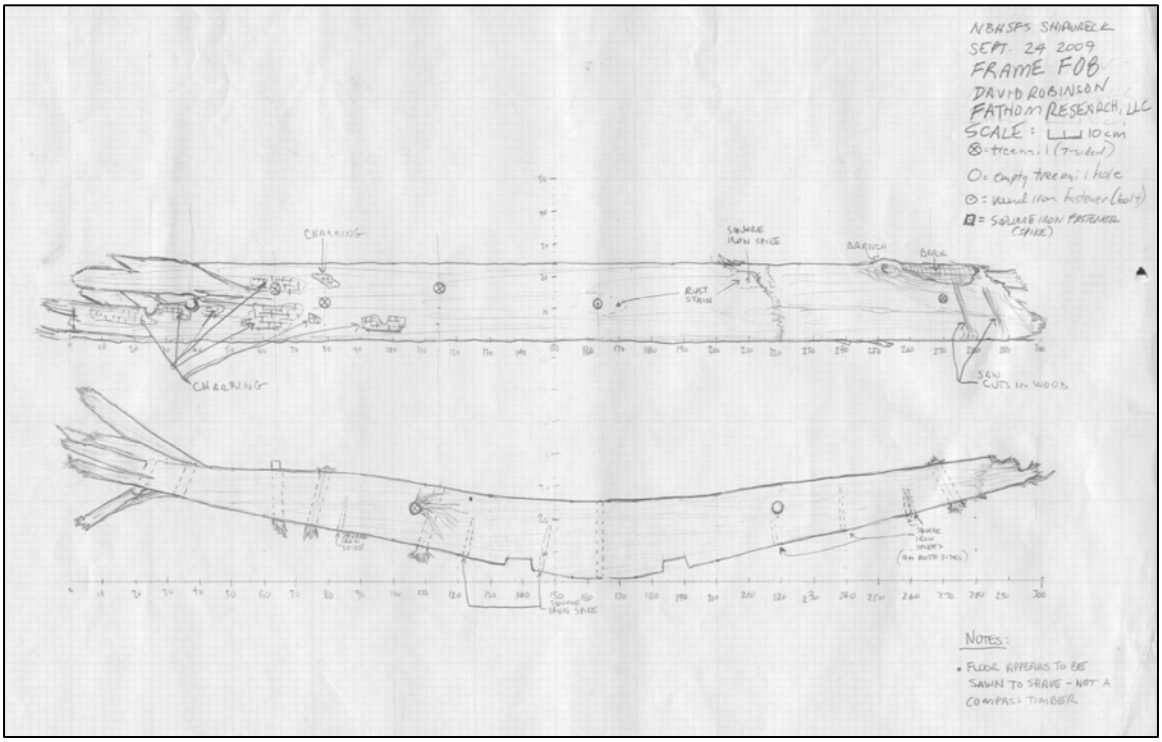
(Frame 06 in the field drawings)



FRAMES

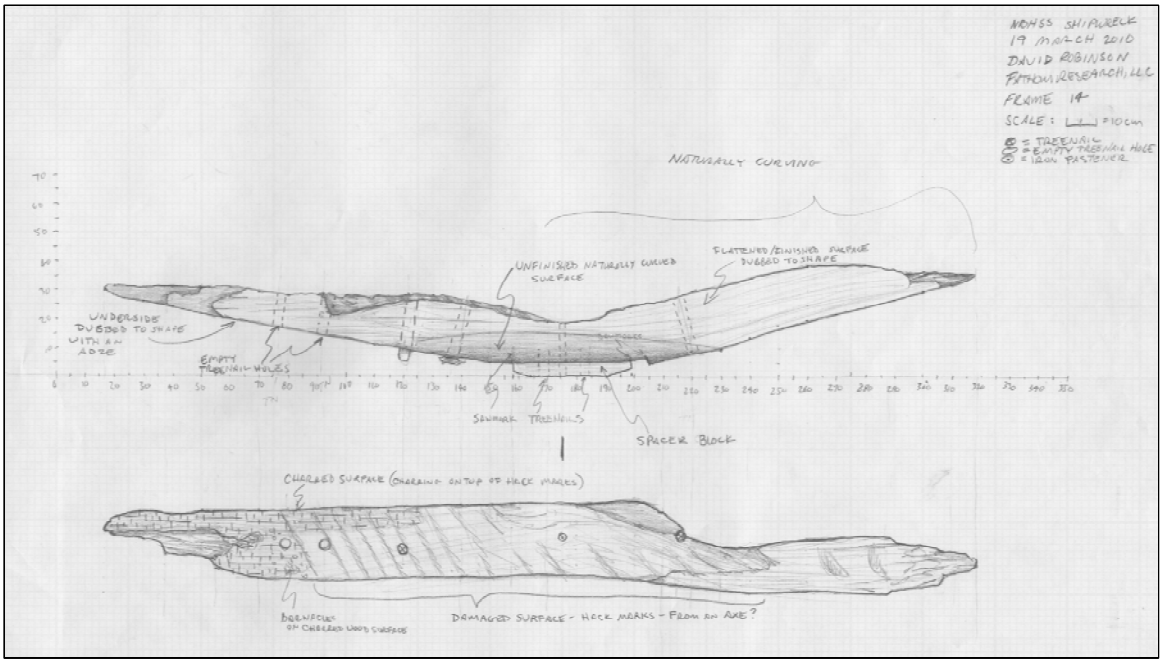
Floor K

(Frame 08 in the field drawings)



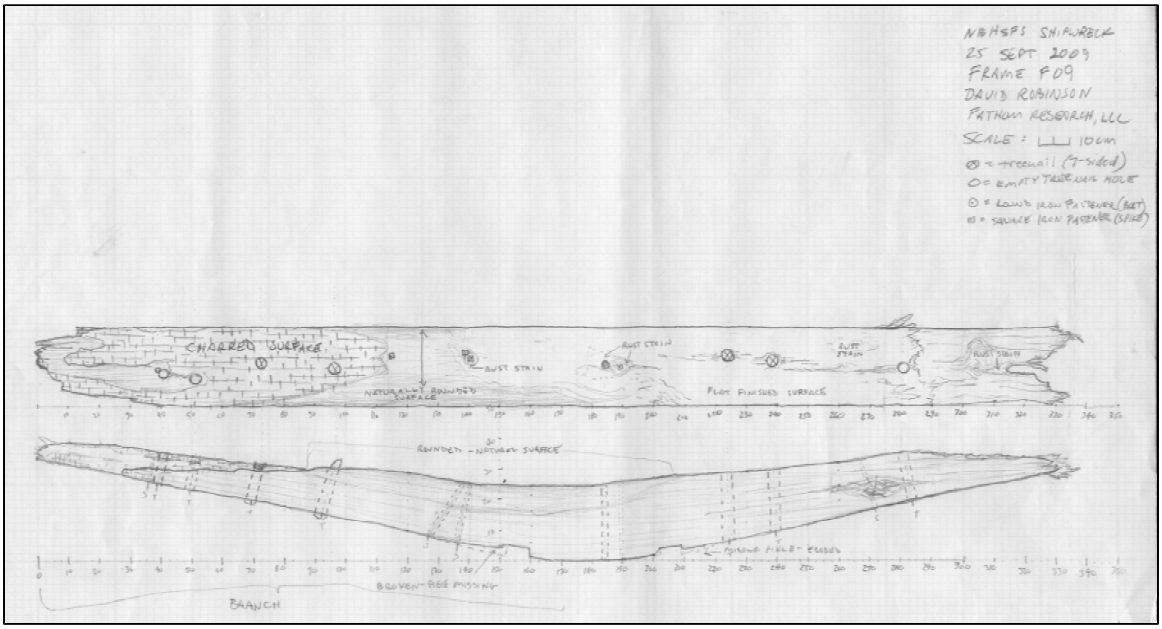
FRAMES

Floor L
(Frame 14 in the field drawings)



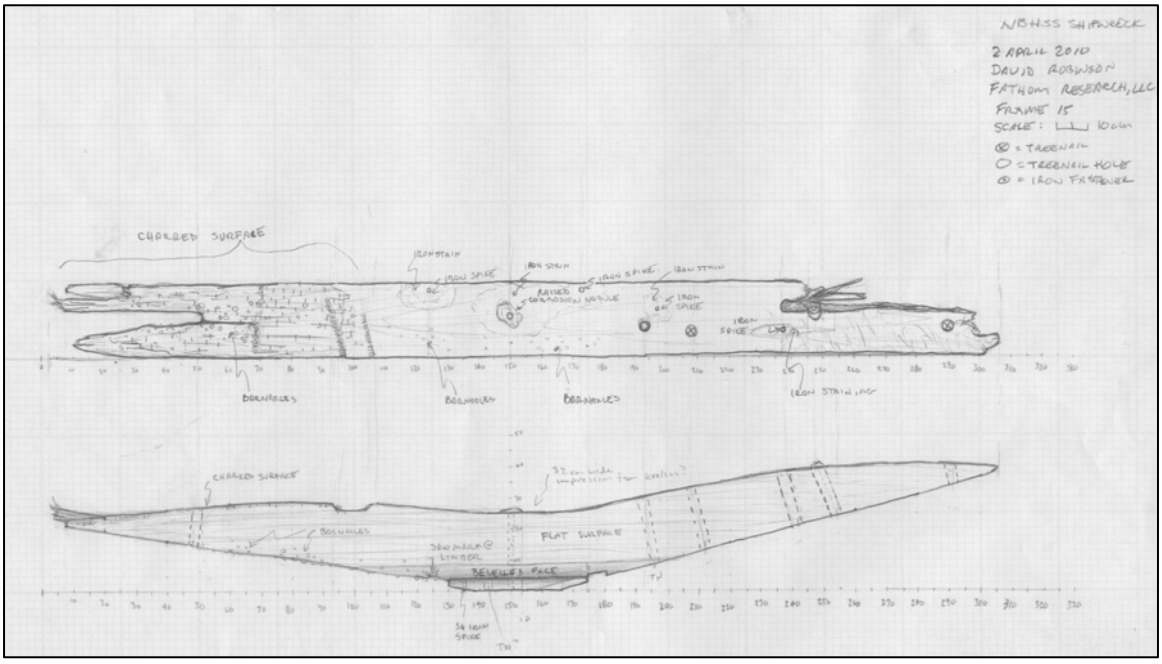
FRAMES

Floor M
(Frame 09 in the field drawings)



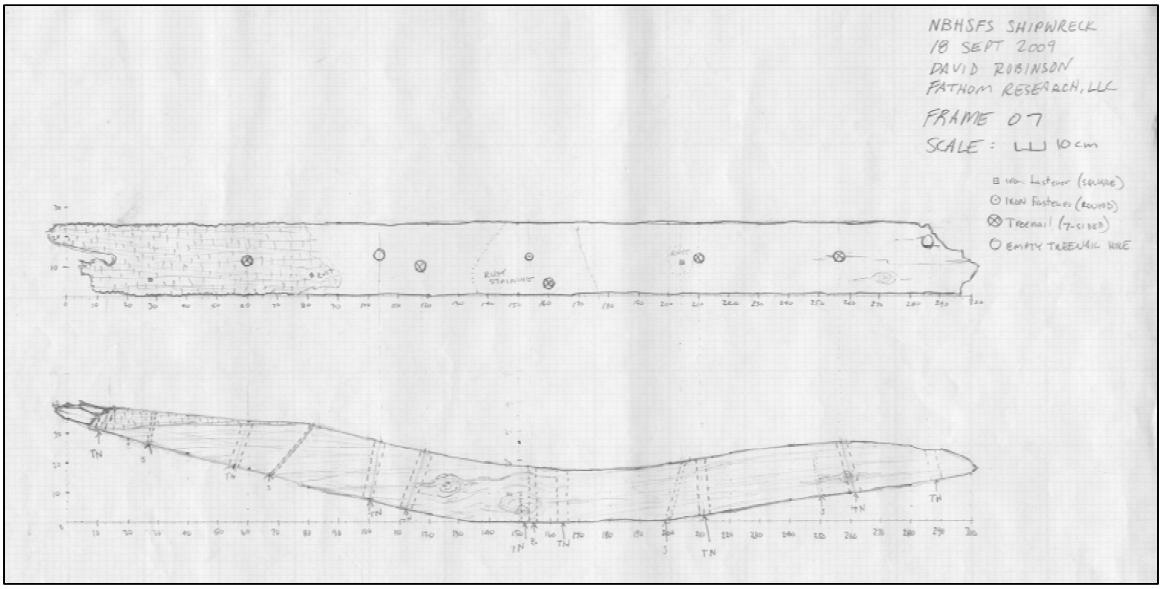
FRAMES

Floor N
(Frame 15 in the field drawings)



FRAMES

Floor O
(Frame 07 in the field drawings)



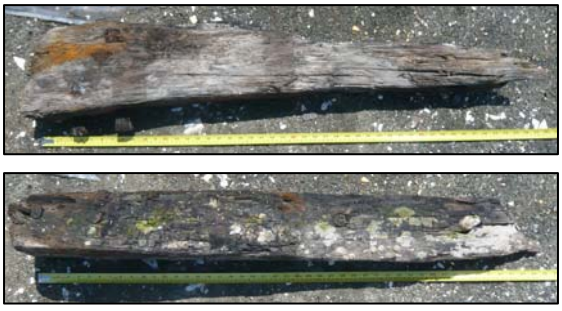
FRAMES

(Futtocks 01 to 03)

Futtock 01

Futtock 02

Futtock 03



FRAMES

(Futtocks 04 through 07)

Futtock 04

Futtock 05

Futtock 06

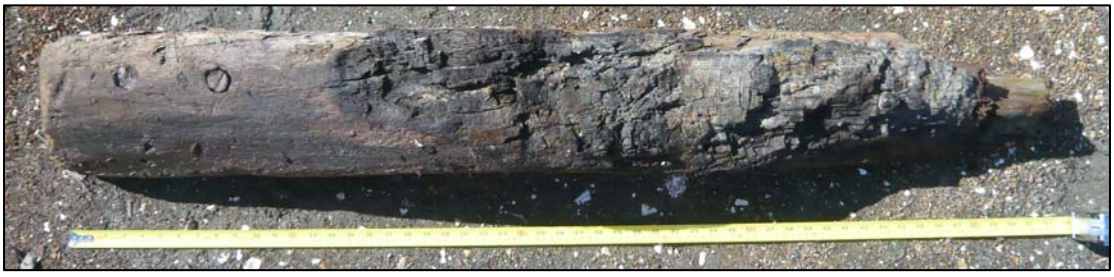
Futtock 07

FRAMES

(Futtocks 08 and 09)

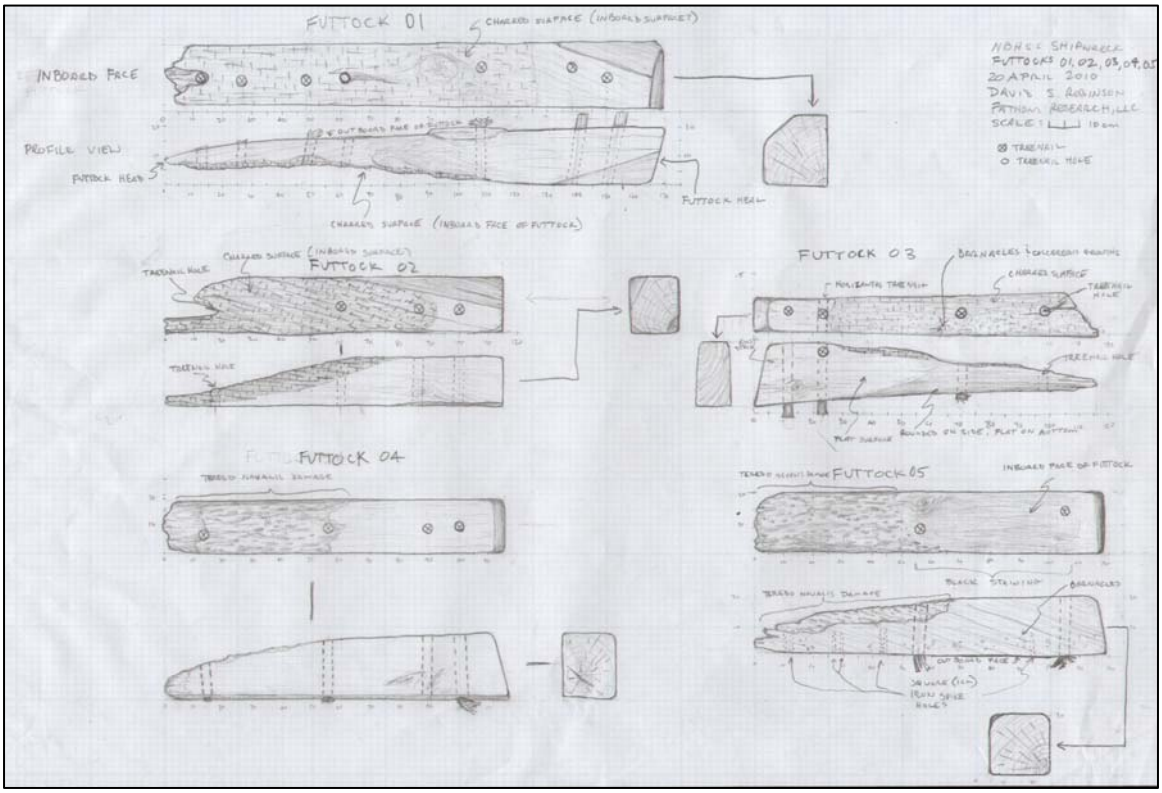
Futtock 08

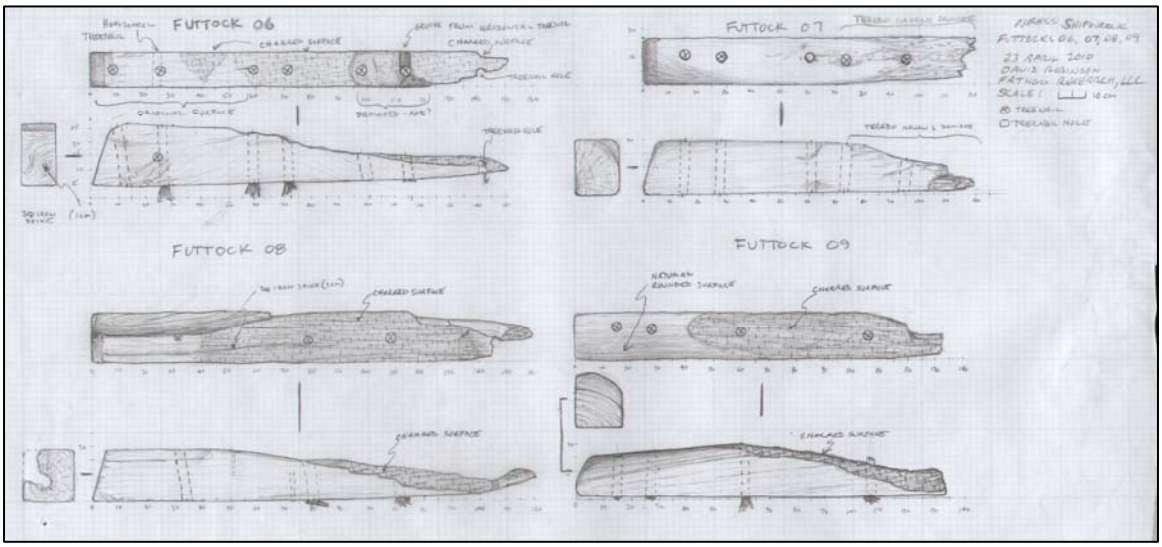
Futtock 09



FRAMES

Futtocks 01 through 09
(profile, plan, and section)





FRAMES

Additional Futtocks
(partially preserved - not drawn or numbered)

FRAMES

Cant Frames and Miscellaneous Timbers

FRAMES

Cant Frames and Miscellaneous Timbers

FRAMES

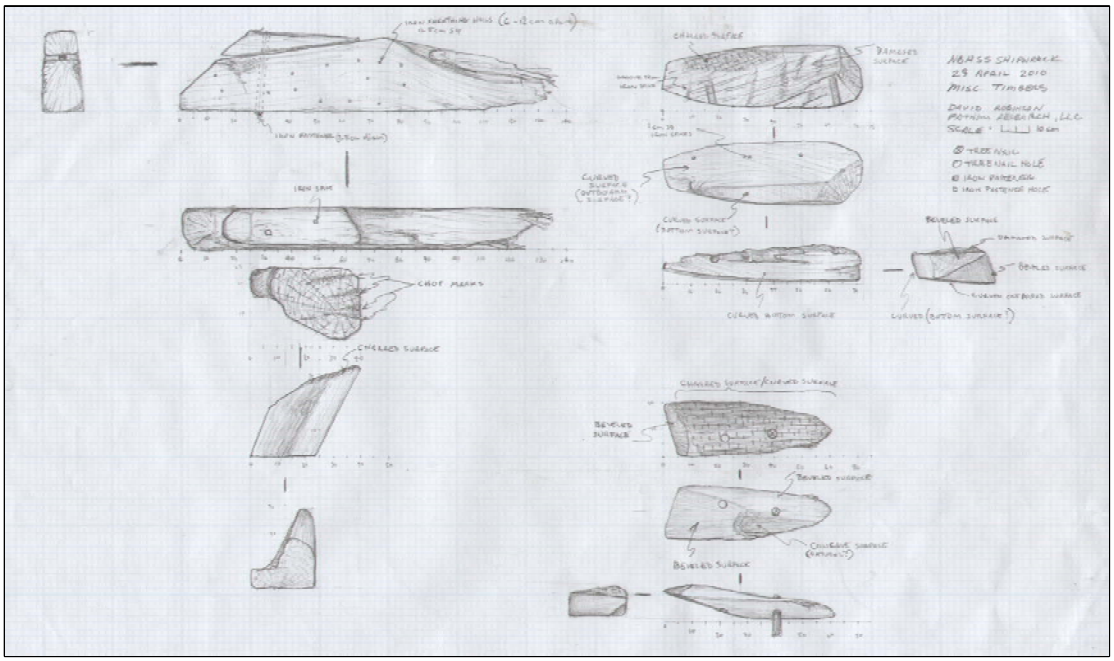
Cant Frames and Miscellaneous Timbers

FRAMES

Cant Frames and Miscellaneous Timbers
(Possible Stern Deadwood)

FRAMES

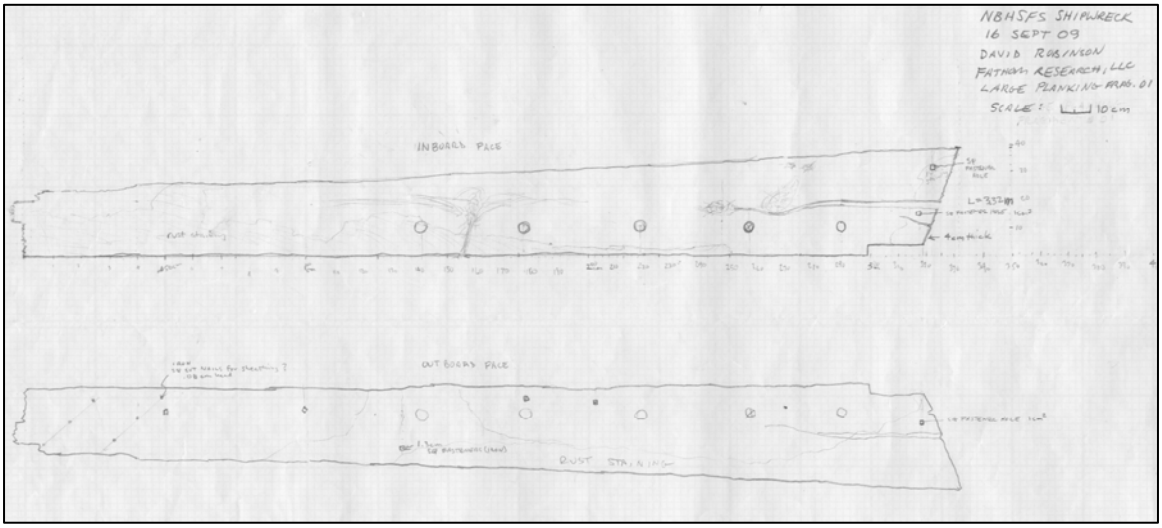
Cant Frames and Miscellaneous Timbers
(profile, plan and section)



PLANKS

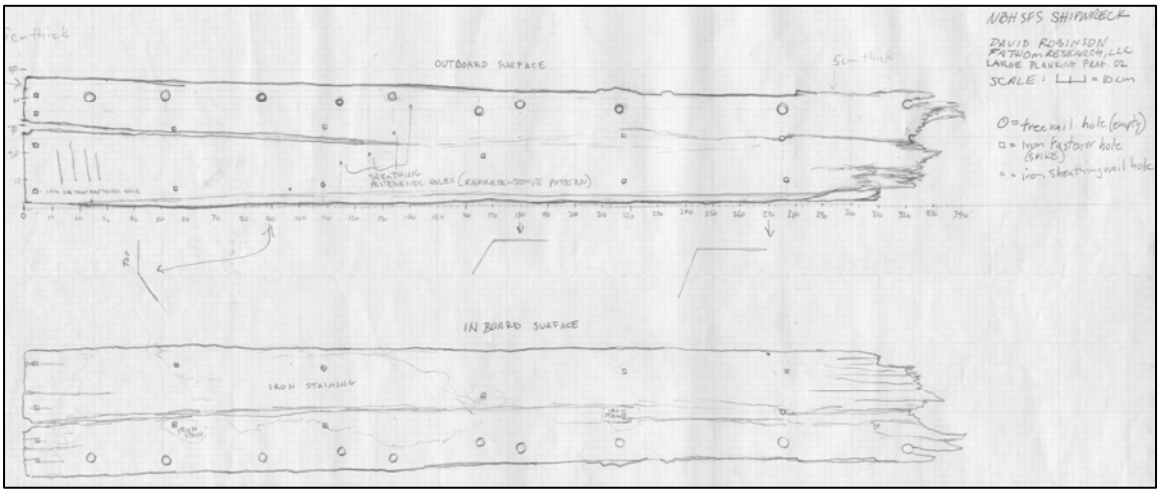
PLANKS

Large Planking Fragment 01
(aft end of starboard garboard strake)



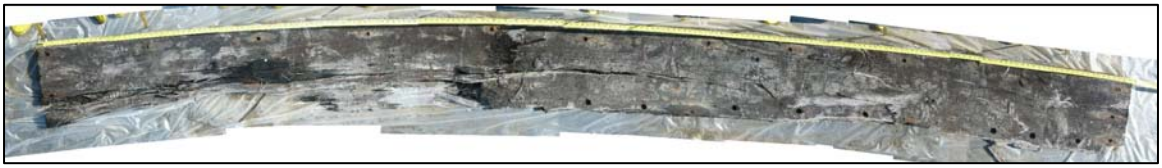
PLANKS

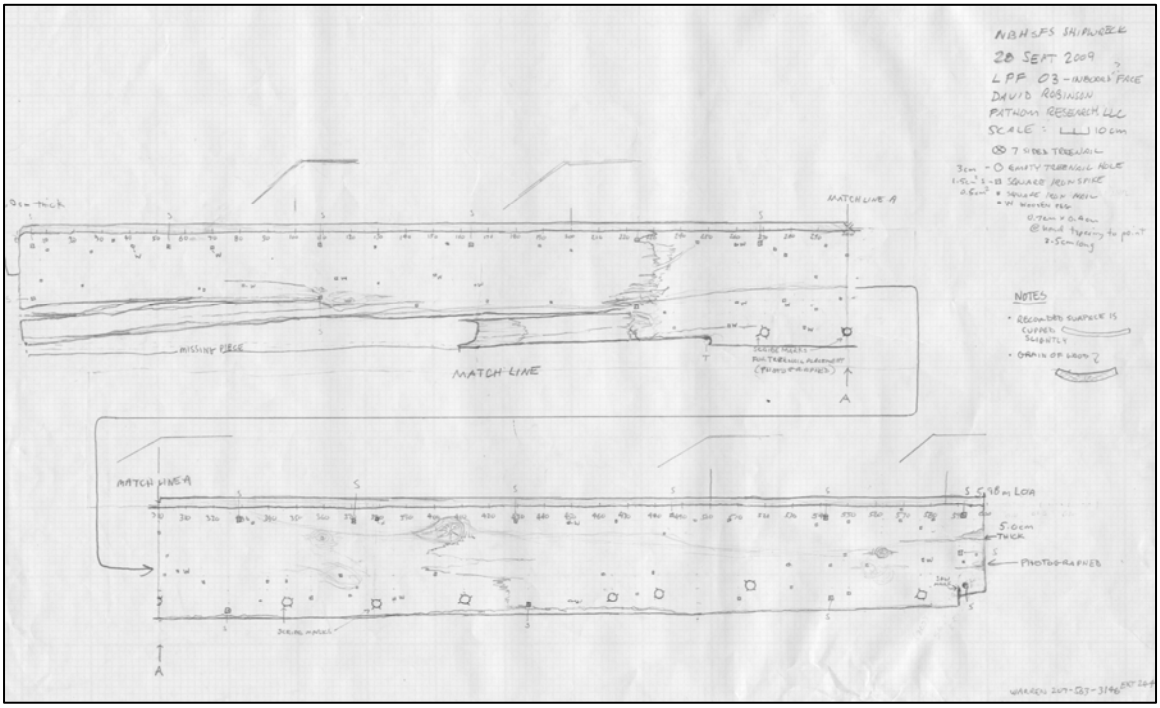
Large Planking Fragment 02



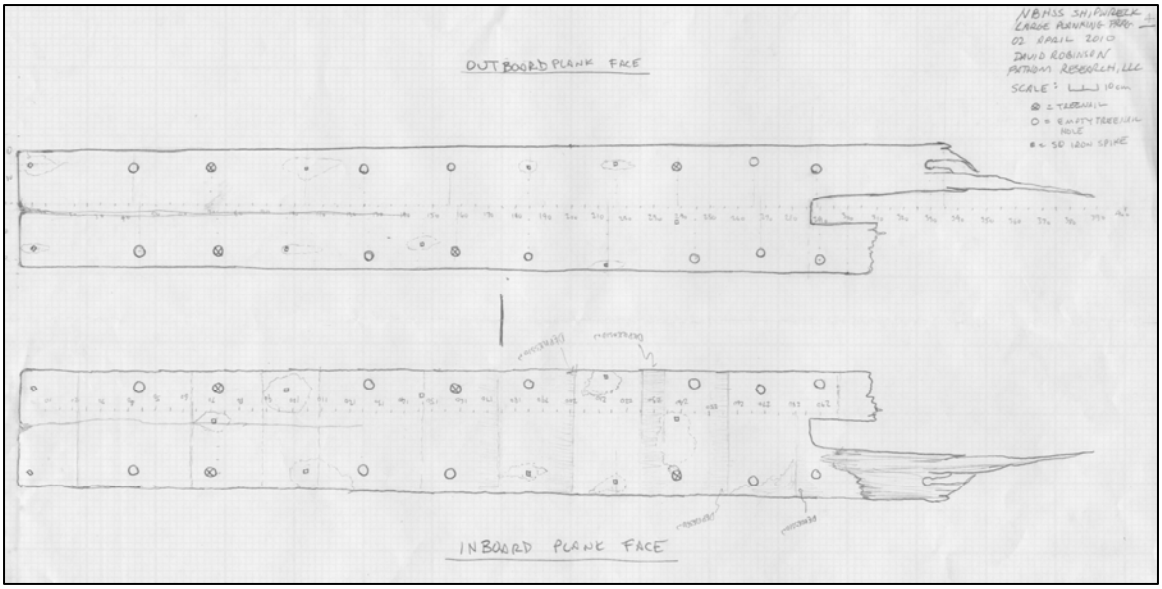
PLANKS

Large Planking Fragment 01
(complete plank – part of garboard planking strake)

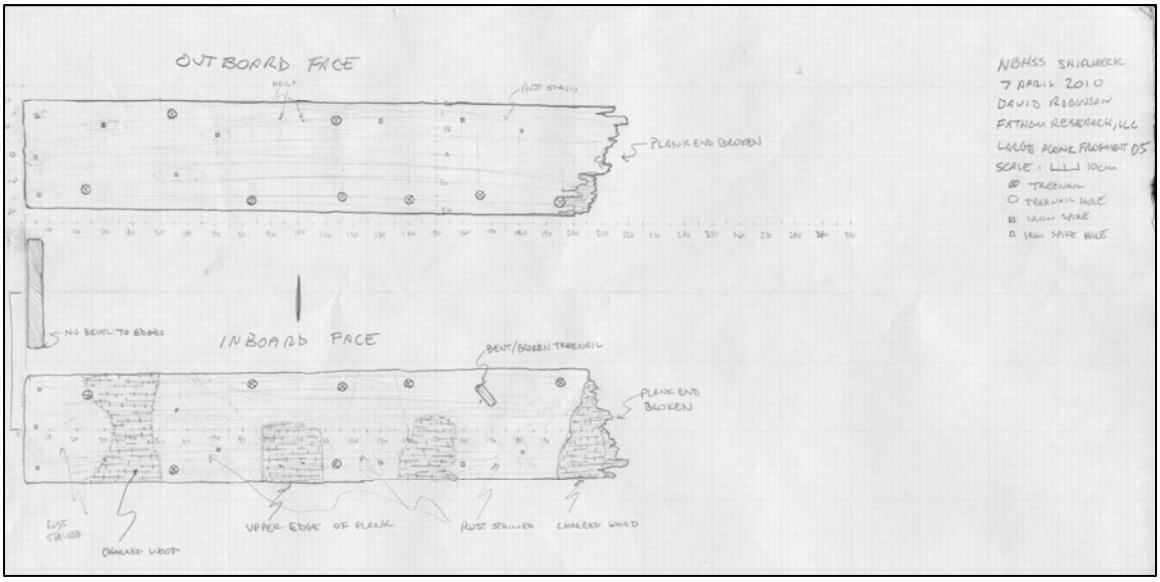




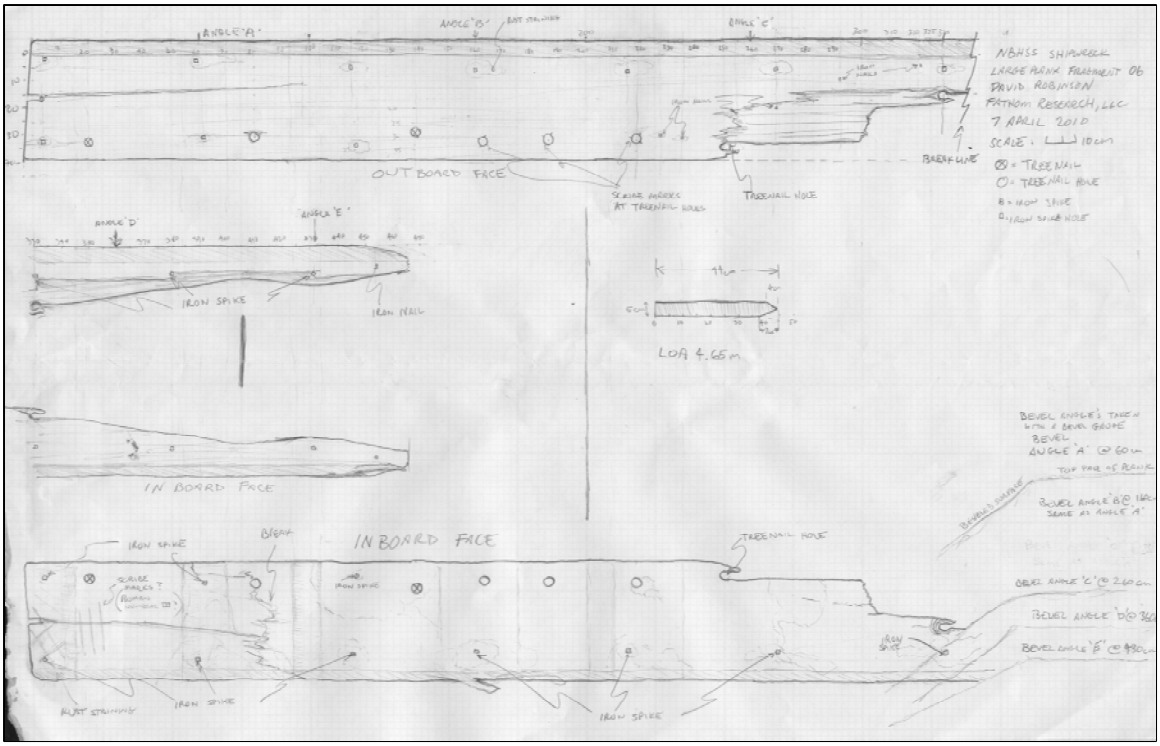
PLANKS
Large Planking Fragment 03



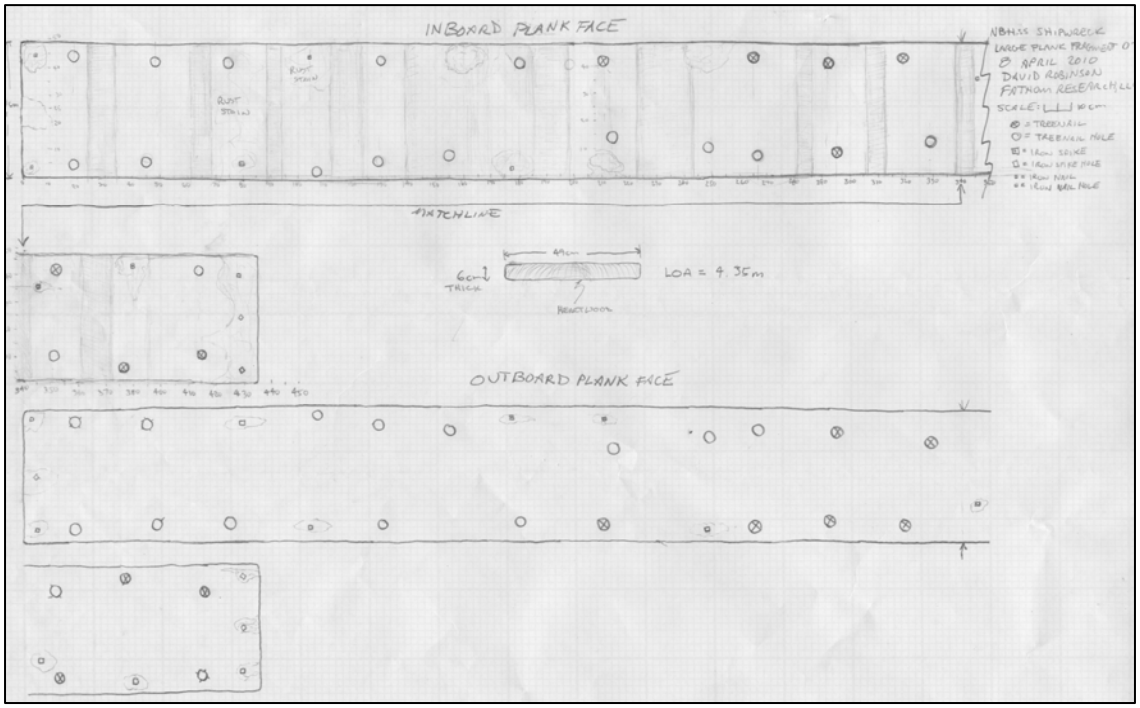
PLANKS
Large Planking Fragment 05



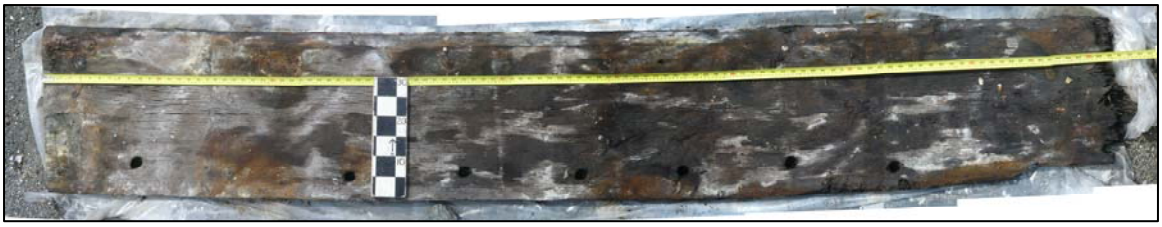
PLANKS
Large Planking Fragment 06
(aft end of starboard garboard strake)

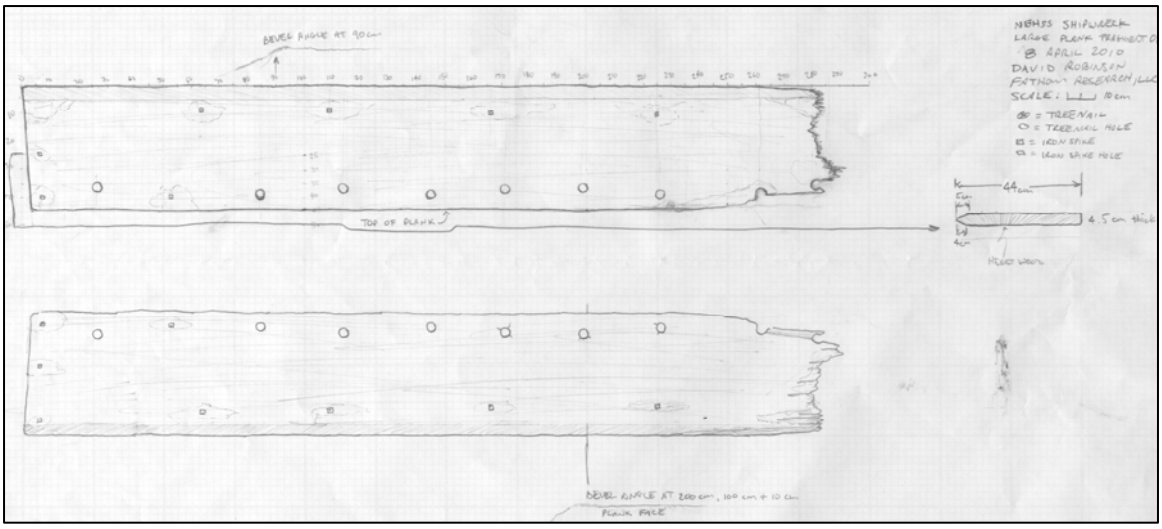


PLANKS
Large Planking Fragment 07
(complete plank)

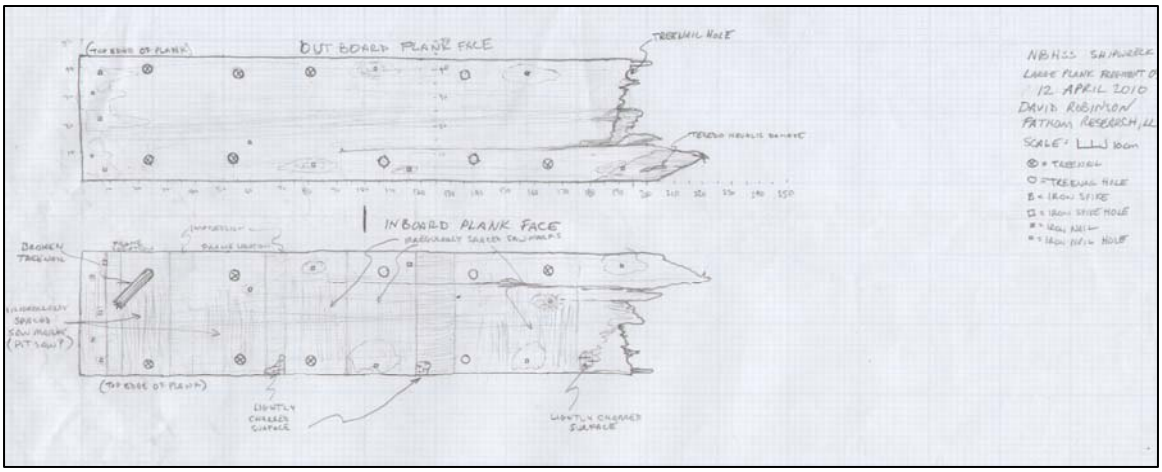


PLANKS
Large Planking Fragment 08
(part of garboard planking strake)





PLANKS
Large Planking Fragment 09



PLANKS
Large Planking Fragment 10
(from garboard planking strake)