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DAVID S. ROBINSON & ASSOCIATES, INC.

Marine Archaeological Consultants

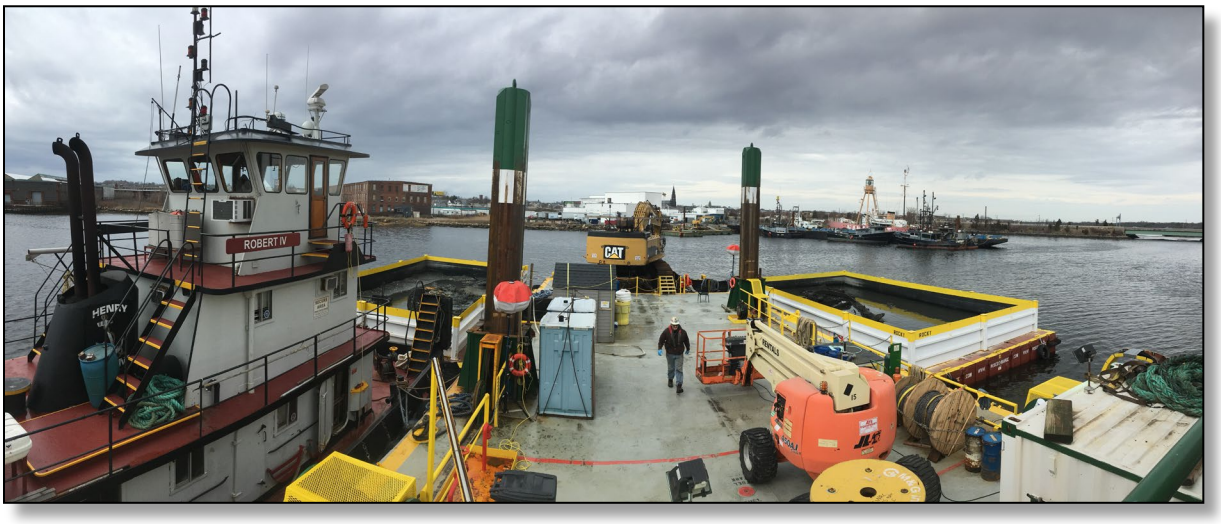
FINAL REPORT

Marine Archaeological Investigation

Removal and Documentation of the
New Bedford Harbor Superfund Site Unanticipated Discovery Shipwreck #3
from the Lower Harbor Area

Acushnet River, New Bedford, Massachusetts

APRIL 2019



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1.0 INTRODUCTION

1.1 Project Location and Description

This report presents the results of a marine archaeological investigation conducted by David S. Robinson & Associates, Inc. (DSRA) between October 2017 and December 2018 in the New Bedford Harbor Superfund Site (NBHSS), located in New Bedford (Bristol County), Massachusetts (**Figure 1**). This investigation involved the recovery and documentation of the submerged and buried partial hull remains of an historical wooden sailing ship encountered as an "unanticipated discovery" on October 4, 2017 in the Acushnet River within the "Lower Harbor Area" of the NBHSS south of the Route I-195 Bridge (**Figure 2**). The submerged vessel remains, termed here, "NBHSS Unanticipated Discovery Shipwreck #3" (NBHSS UAD SW#3), were found by the harbor dredging contractor, Cashman Dredging & Marine Contracting Co., LLC (Cashman) during their contaminated sediment removal operations within the previously-surveyed and archaeologically-cleared NBHSS Lower Harbor area (**Figure 3**). Contaminated sediment removal is part of the ongoing federal program of environmental remediation activities presently being conducted within the NBHSS by the U.S. Environmental Protection Agency – Region 1 (EPA) and their federal agency partner at the NBHSS, the U.S. Army Corps of Engineers, New England District (USACE-NAE). Cashman is the dredging contractor selected by the EPA to conduct remediation of contaminated soils and sediments within the marine portion of the NBHSS Lower Harbor Area. Although DSRA serves as Jacobs Engineering Group's (Jacobs) principal 'on-call' archaeologist for the NBHSS Upper Harbor Area through a contract DSRA has with CR Environmental, Inc. (CR) (Jacobs's principal geophysical survey and mapping consultant for the Upper Harbor portion of the remediation project), Jacobs, CR, and DSRA were asked by the EPA, the USACE-NAE, and Cashman to assist them in addressing the Lower Harbor Area unanticipated discovery of NBHSS UAD SW#3.

As noted above, the NBHSS Lower Harbor Area where the unanticipated discovery was made was previously surveyed and archaeologically cleared, in compliance with the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), as a result of surveys conducted between 1999 and 2000 by John Milner Associates, Inc. (JMA) and its marine archaeological consultant, Dolan Research, Inc. (Dolan). While the unanticipated discovery of another wooden shipwreck in the NBHSS Upper Harbor Area in 2009 (i.e., "NBHSS UAD SW#1") led the EPA and USACE-NAE to adopt a new program of secondary and supplemental high-resolution marine archaeological site identification re-surveys of the marine and intertidal portions of the NBHSS Upper Harbor area by CR and DSRA (also surveyed previously by JMA and Dolan), to reduce the chances of similar unanticipated discoveries of additional shipwrecks from occurring, no similar program of marine archaeological identification re-survey has been performed to date within the NBHSS Lower Harbor Area. In order to remediate the contaminated sediments within the area of the unanticipated discovery, removal of the NBHSS UAD SW#3 find was required.

1.2 Project History

The unanticipated discovery of NBHSS UAD SW#3 occurred on October 4, 2017 during sediment remediation operations that were being performed by Cashman at the northern end of the NBHSS's Lower Harbor Area, a short distance south of the Route I-195 bridge, within the city of New Bedford

(see Figure 2). The encountered submerged wooden ship remains were identified when they were brought to the surface in Cashman's environmental bucket. Upon encountering the wooden ship remains, Cashman followed the protocols of the NBHSS Unanticipated Discovery Plan (UDP) developed by Jacobs in 2010 for their NBHSS Upper Harbor remediation work for the EPA and USACE-NAE. Cashman halted all remediation dredging work immediately within a 200-foot (ft) (61-meter [m]) radius of the find location upon making the unanticipated discovery. The EPA and USACE-NAE were then informed of the find, photographs of the recovered ship hull remains were taken (see Figure 3), coordinates for the find were recorded and reported (814848.57 / 2698955.62 [MA State Plane – feet], North American Datum 1983 [NAD83]), and the recovered wooden ship remains were placed temporarily in an on-site hopper barge partially filled with water to help preserve the wooden timbers while the plan for their disposition was developed (as documented in T. Rezendes's, USACE-NAE, email to M. Paiva, USACE-NAE, October 5, 2017 [**Appendix A**].

Continuing to follow the NBHSS UDP protocols, the EPA/USACE-NAE notified Victor Mastone, Director of Massachusetts Board of Underwater Archaeological Resources (MBUAR), and DSRA's David Robinson, the on-call marine archaeologist for the NBHSS, of the find on the same day it occurred [October 4, 2017]). The EPA, the USACE-NAE, Cashman, Jacobs, CR, and DSRA then coordinated and a teleconference was held on October 5, 2017 to discuss the next steps for addressing the unanticipated discovery. Given that this find was the third unanticipated discovery of historical wooden ship remains in the NBHSS since 2009, an established and agency-approved approach was available to guide the response and development of a work plan for addressing the NBHSS UAD SW#3 find. The teleconference concluded with the following next steps outlined:

a) EPA and USACE-NAE would continue to and/or initiate coordination and consultation with the Massachusetts Historical Commission (MHC), MBUAR, the Mashpee Wampanoag Tribe and Wampanoag Tribe of Gay Head (Aquinnah), and interested stakeholders, and would keep the project team informed of its status;

b) Cashman would provide coordinates and available dredging data from the area surrounding the NBHSS UAD SW#3 find location to the project team and would move the barge with the find's recovered timbers to the Jacobs's pier at the NBHSS Sawyer Street facility;

c) CR would conduct a high-resolution non-disturbance, engineering debris-delineation survey in the area around the reported find site to try to more fully characterize the nature and extent of the NBHSS UAD SW#3-related debris, and provide processed data to DSRA to review for the purpose of developing a marine archaeological assessment report and site-specific shipwreck recovery marine archaeological work plan; and

d) DSRA would: i) coordinate with CR regarding their debris-delineation survey methodology; ii) coordinate with MBUAR to request a revision to and expansion of the southern limit of their current Upper Harbor permit area (Special Use Permit 14-001) to encompass the location of the NBHSS UAD SW#3; iii) review CR's processed data and narrative description of their debris-delineation survey methods to interpret them from a marine archaeological perspective; and iv) prepare: 1) a brief technical summary report on the survey's methods and results;

and 2) a draft work plan outlining the tasks to be performed at the NBHSS UAD SW#3 find site that follows the same agency-approved research design model developed and employed in the cases of the previous two unanticipated discoveries of historical wooden shipwrecks in the NBHSS's Upper Harbor Area.

On October 6, 2017, DSRA coordinated with CR regarding their debris-delineation survey methodology and requested and obtained a map from CR showing the plotted location of NBHSS UAD SW#3 (based on the coordinates provided by Cashman) for DSRA to include in their MBUAR Special Use Permit-revision application (**Figure 4**).

On October 7, 2017, while DSRA's Principal, David Robinson, was at the NBHSS Sawyer Street facility to document NBHSS UAD SW#2 timbers, he examined and photographed from the Jacobs pier the timbers recovered at the time of NBHSS UAD SW#3's discovery, which were visibly exposed above the water inside of the barge in which they were being temporarily stored. Robinson observed that NBHSS UAD SW#3 framing timbers looked substantially larger than those from both NBHSS UAD SW#1 and SW#2. Given that NBHSS UAD SW#1 and SW#2 remains were digitally-reconstructed to be the remains of approximately 70 foot- (ft) (21.3 meter- [m]) and 60 ft- (18.3 m-) long vessels, respectively, the observed larger dimensions of the timbers from NBHSS UAD SW#3 find suggested that they were from a vessel that could have been significantly larger than either the NBHSS UAD SW#1 or SW#2 vessels.

Between October 10 and 12, 2017, CR conducted their high-resolution, debris-delineation, remote sensing survey (i.e., hydrographic and geophysical) of the NBHSS UAD SW#3 find location. Survey systems included sidescan sonar, magnetometry, sub-bottom sonar profiling, and multibeam bathymetry. The survey efforts were designed to provide the highest definition data possible to characterize and delimit the extent of the unanticipated discovery.

On October 16, 2017, DSRA submitted to Victor Mastone, Director of the MBUAR, the application for the revision (expansion) of their Special Use Permit (SUP) 14-001 (**Appendix B**), and coordinated with USACE-NAE archaeologist, Marcos Paiva, to inform him that the application had been submitted and to get an update on the status of the EPA and USACE-NAE's consultation with the State Historical Preservation Office (SHPO) (i.e., MHC), the Tribal Historic Preservation Offices (THPOs) of the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Gay Head (Aquinnah), and interested parties.

On October 17, 2017, provisional approval of the revision to DSRA's MBUAR SUP 14-001 was obtained from MBUAR Director Mastone. Formal approval by the full MBUAR was granted during their November 30, 2017 meeting. Only provisional approval, however, was required to include the NBHSS UAD SW#3 site in DSRA's expanded SUP Area and to move forward with the planning of additional marine archaeological investigation.

Between October 17 and October 19, 2017, DSRA received CR's initial plots of their processed high-resolution NBHSS UAD SW#3 debris-delineation survey data (**Figure 5**), and a narrative text description of their survey instrumentation and data acquisition and processing methodologies.

On October 17, 2017, DSRA's David Robinson and CR's Certified Hydrographer, Christopher Wright, conducted a first-pass joint-review of the data via an on-line link provided by CR/Wright to establish

about how much of the ship remains associated with NBHSS UAD SW#3 discovery were exposed and how much may be buried, and to assess whether or not physical probing, as was performed at the NBHSS UAD SW#2 find site to delimit its buried extent, would be feasible at the NBHSS UAD SW#3 site. This review session concluded with the observations that: a) there was only a 6-x-18-ft (1.8-x-5.5-m) area of exposed hull visible in the sidescan sonar data; b) framing timbers appeared to be approximately 1-ft (0.3-m) square in their molded and sided dimensions; c) there was an 8-x-1-ft (2.4-x-0.3 m) timber among the vessel remains that extended approximately 5 ft (1.5 m) above of the harbor floor; and d) there were multiple discontinuous acoustic reflectors suggestive of deeply-buried hull remains that were likely below the remediation prism's depth (see Figure 5). These findings indicated that a vast majority of the shipwreck was either: a) missing; or b) buried. While both CR and DSRA concluded that physical probing would be indicated as the most effective means for delimiting the extent of the buried hull remains, in this case, however, the location of the NBHSS UAD SW#3 find was in water too deep to effectively probe. The find was also on a slope in the harbor floor and just south of an area where the width of the harbor constricts; as a result, outgoing tidal currents were strong. Together, these data indicated, instead, that probing would be logistically infeasible considering the information that would be gained relative to the effort and time that would be required to gain it. Consequently, DSRA concluded from the joint data-review effort with CR that physical probing was not recommended.

On October 18, 2017, DSRA coordinated with the USACE-NAE's Paiva, Jacobs's Josh Cummings, and CR's John Ryther, Jr., to inform them of the preliminary findings and impressions they had gotten from the first-pass joint-review of the CR data with Wright, and the infeasibility of conducting physical probing at the NBHSS UAD SW#3 site. DSRA also discussed options for two different approaches for the shipwreck recovery phase at the NBHSS UAD SW#3 find site: a) conduct DSRA field-directed removal of all the ship remains, as accomplished at the previous two unanticipated discovery shipwreck sites; or b) conduct DSRA-monitored dredging operations at the site with only those elements of the ship's remains located within the dredging prism recovered. DSRA's Robinson requested planned remediation dredging depth limits at the NBHSS UAD SW#3 site from Jacobs/Cummings to assess the feasibility of shipwreck removal option 'b.'

On October 20, 2017, DSRA's Robinson coordinated with Jacobs/Cummings to get clarification/confirmation regarding the planned dredging depths, and informed Jacobs/Cummings that DSRA would review all of the available survey and dredging information and decide whether or not it would recommend shipwreck recovery option 'a' or 'b' the following week.

During the week of October 23-27, 2017, DSRA determined that option 'a' made the most sense in terms of the benefits of proposing to continue to follow an established and agency-approved precedent, as well as from a logistics and equipment standpoint for archaeologically-guided shipwreck removal operations. DSRA continued its detailed review of CR's data and prepared and submitted a brief technical summary report on the archaeological assessment of CR's debris-delineation survey data on October 31, 2017.

DSRA's review and interpretation of the data from the more-detailed baseline engineering survey, as well as experience gained from working on NBHSS UAD SW#1 and SW#2, resulted in DSRA developing recommendations for recovering and documenting NBHSS UAD SW#3. These recommendations were presented to Jacobs, the EPA, and the USACE-NAE as an internal Draft Work Plan that DSRA submitted in October of 2017. DSRA's recommendations were then converted into a

work plan/project scope-of-work that was submitted to and approved by the EPA, USACE-NAE, MBUAR, and MHC in November of 2017 (**Appendix C**). A meeting between the EPA, USACE-NAE, Cashman, Jacobs, CR, and DSRA to discuss the work plan and review planned logistics for the field recovery operations was held on February 7, 2018. Implementation of the marine archaeological recovery of NBHSS UAD SW#3 was completed on February 10, 2018 (**Figures 6 and 7**) and the timbers were transferred to shore for documentation on February 13, 2018 (**Figure 8**). Documentation of recovered materials was completed between February 24 and June 23, 2018 (**Appendix D**). Analysis and report preparation were completed between September 2018 and February 2019.

1.3 Project Scope and Authority

Tasks outlined in the project work plan (see Appendix C) and performed for the marine archaeological investigation of NBHSS UAD SW#3 included the following:

Task 1. Coordination/Consultation
DSRA President & CEO, David S. Robinson, M.A., R.P.A., will serve as the Project's qualified marine archaeologist and principal investigator. DSRA will coordinate with and provide consultation services to CR, Jacobs, Cashman, EPA and USACE-NAE, as directed by CR and Jacobs, to assist Cashman, EPA and USACE-NAE in their technical communications and consultation with other federal, state, tribal, and local agencies, and interested parties (e.g., 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) related to compliance with the NHPA's Section 106, and other federal and state laws pertaining to project-related cultural resource management issues. DSRA assumes it will be required to attend and participate in a single on-site preparatory meeting with CR, Jacobs, Cashman, EPA, and USACE-NAE staff prior to the initiation of field operations, as well as in any other meetings that we are requested to attend and participate in during the course of the project.

Task 2: MBUAR Special Use Permit No. #14-001 Additional Revision and Submittal
Upon finalization of the marine archaeological work plan, DSRA will coordinate with MBUAR and prepare and submit the necessary documentation to revise again DSRA's existing MBUAR SUP#14-001 to include the recovery of shipwreck remains at the location of NBHSS UAD SW#3, in accordance with 312 Code of Massachusetts Regulations (CMR) 2.06(1)(c). Copies of the revised MBUAR Special Use Permit documentation will also be copied to CR and Jacobs, for Jacobs to distribute to Cashman, EPA, USACE-NAE, the MHC (i.e., SHPO), and the Mashpee Wampanoag and Wampanoag Tribe of Gay Head (Aquinnah) THPOs for their review and files.

Task 3: Supplemental Research
DSRA will perform, as necessary, supplemental research to identify to the extent possible the vessel type, purpose and identity of NBHSS UAD SW#3. Sources of information likely to be consulted include archival documentation assembled during the investigation of NBHSS UAD SW#1 and UAD SW#2, relevant cultural resource management reports, site files, and State and National Register files of the MHC and MBUAR, NOAA's AWOIS (Automated Wreck and Obstruction Information System), the Encyclopedia of American Shipwrecks (Berman 1972), historical charts and maps of the area, published and unpublished primary and secondary

sources on the area's history, and information gained from informal interviews with local persons knowledgeable about New Bedford's maritime history.

Task 4: Archaeological Monitoring of Removal, Transport & Storage of Ship Timbers

DSRA's David Robinson will help coordinate and monitor in the field the archaeologically-guided removal, transport and temporary storage of NBHSS SW#3's individual hull timbers. Removal will be accomplished by Cashman using equipment that is equivalent to that which was used to recover the remains of NBHSS UAD SW#2: a Komatsu PC-220 machine with an "Add-A-Stick" extension and hydraulic rake attachment (or equivalent) and operator on a 40-x-40-ft- (12-x-12-m-) long deck-barge fitted with spuds; a work boat and an operator; two 50-cubic yard (38-cubic meter) hopper-barges or scows for containment of recovered debris and shipwreck materials (one of which will be partially filled with water to keep recovered timbers wet prior to their transfer and storage onshore, and the other of which will be kept dry and will be for recovered materials deemed by DSRA to be unrelated debris or shipwreck elements in too poor of a condition to be identifiable or worthy of detailed documentation); and a gas-powered water pump and hose for gross decontamination of the timbers as they are recovered and brought onto the deck-barge for their initial photo-documentation and sorting.

DSRA will communicate directly with the machine operator to ensure that the removal of NBHSS SW#3's individual hull components is done in as systematic a manner as possible, progressing from one end of the vessel to the other. This systematic approach will better ensure that all of the shipwreck's remains have been removed as the process progresses, as well as facilitate and enhance DSRA's analysis, interpretation and "on-paper" reconstruction of the recovered hull remains. DSRA will maintain a field notebook in which they will record information concerning the dates and times they worked on-site, personnel who were involved, the details and progress of the removal process, and an inventory of items that were recovered and retained. Individual timbers will be recovered initially onto the deck barge for DSRA to determine whether they will be retained for detailed documentation or simply discarded. If the former option is selected, then gross decontamination, preliminary photo-documentation, and transfer to the nearby water-filled barge will occur. This process will be repeated until DSRA and Cashman have determined that all of NBHSS UAD SW#3 has been removed.

Once DSRA and Cashman have determined that all of NBHSS UAD SW#3's hull remains have been removed, the water-filled barge with the recovered timbers will be moved to Jacobs's temporary Sawyer Street facility pier. Water in the barge will then be pumped out and individual timbers will be removed from the barge to the pier where they will be wrapped in polyethylene sheeting secured with duct-tape and then transferred a short distance to an area that is adjacent to, but not contiguous with (to prevent mixing of the recovered timbers from two different vessels), the onshore temporary storage location within the NBHSS Sawyer Street facility where NBHSS UAD SW#2's timbers were stored. The detailed archaeological documentation task will occur at that location.

Task 5: Archaeological Documentation of NBHSS UAD SW#3's Hull Remains

Recovered ship timbers and other material culture finds associated with NBHSS UAD SW#3 will be subjected to detailed documentation, analysis, and interpretation utilizing the same

methods that were employed for NBHSS UAD SW#1 and SW#2. Documentation (i.e., documentation performed in addition to that which was completed during recovery operations) will consist of digital scale photographs and measured scale drawings of the dimensions, shapes and surface details of each individual timber (in plan and profile). Each timber will be analyzed and interpreted (to the extent possible) to determine its approximate age, function, and place within the vessel's hull.

Task 6: Reporting

DSRA will prepare and submit electronically to CR, Jacobs, Cashman, EPA and USACE-NAE for review and comment an internal draft marine archaeological report upon completion of Project Tasks 3, 4 and 5 (i.e., supplemental research and removal and documentation of NBHSS UAD SW#3's hull remains). Upon DSRA's receipt of internal comments, the electronic version of an external draft report will be prepared and submitted to CR and Jacobs for production and external distribution. Upon receipt of external reviewer comments, an electronic copy of the final report addressing those comments will be prepared and submitted to CR, Jacobs, Cashman, EPA and USACE-NAE for external distribution and archiving.

The reports will include the following elements:

- Introduction
- Research Design and Methodology
- Results of the Supplemental Research and Field Documentation
- Summary and Recommendations
- References
- Tables
- Figures
- Appendices

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 Code of Federal Regulations [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).

Health and Safety Protocols:

Fieldwork conducted on Jacob's, and/or Cashman's survey vessels, workboats, and deck barges, as well as the onshore shipwreck timbers documentation on-site fieldwork, will be conducted in close proximity to and, at times, in direct contact with the contaminated recovered remains of NBHSS UAD SW#3 and their associated contaminated sediments. DSRA will adopt and comply with the Jacobs and/or Cashman Project Health and Safety Plan for the NBHSS throughout the duration of its field investigations. DSRA fieldwork performed onsite at the NBHSS will be conducted wearing Level D personal protective equipment (PPE). This PPE will include, at a minimum, safety vest, hard hat, safety glasses, steel-toe boots, shirt with sleeves and long pants. For fieldwork conducted during the shipwreck timbers recovery phase of the project, DSRA personnel will wear "modified" Level D PPE consisting of hard hat, safety glasses, disposable Tyvek coveralls, steel-toe boots with disposable protective rubber

over-boots, and nitrile gloves (i.e., inner and outer gloves when handling ship timbers). The disposable Tyvek coveralls, rubber over-boots and nitrile gloves will be provided to DSRA by Jacobs. Additionally, the requisite PPE for all work conducted within 5 ft (1.5 m) of the water's edge, or on any floating plant will also include a personal flotation device (PFD). All of DSRA's archaeological field staff working on the project will have undergone 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training, have previous experience working on HAZMAT sites, have undergone the requisite 8-hour refresher training within the last year, and have physician certification for the ability to work on a hazardous waste site, per Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.120. They also will hold current certifications in first aid and CPR. Documentation of this training and the associated certifications is on file with CR and Jacobs. All DSRA on-site field personnel will sign in and out using the Daily Sign-In book located at the reception desk in the Jacobs trailer at the front of the NBHSS. All DSRA on-site field personnel will also check in with Jacobs personnel as notification of presence on site and to receive an update to any specific requirements for work to be performed. DSRA's on-site field personnel will also assist the Jacobs and Cashman Site Safety and Health Officers in complying with foul weather preparedness procedures, as needed and directed.

Remediation activities at the NBHSS are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which specify meeting substantive requirements for federal and state permitting. DSRA's marine archaeological investigations meet the standards outlined in Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S. Code [USC] 306108), and its implementing regulations (36 CFR 800), as well as: Massachusetts General Laws (MGL), Chapter 9, Sections 26–27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71); the Department of the Interior's *Standards and Guidelines for Archeology and Historic Preservation*; the provisions of the National Contingency Plan (40 CFR 300); and the OSHA HAZWOPER regulations (29 CFR 1910.120). DSRA's marine archaeological investigations of the NBHSS UAD SW#3 site were completed under MBUAR Special Use Permit No. 14-001, issued to DSRA, in accordance with 312 CMR 2, and the rules and regulations established by the MBUAR, under MGL Chapter 91, s. 63, as amended (see Appendix B).

1.4 Project Personnel

Qualified marine archaeologist, David Robinson, M.A., R.P.A., president & CEO of DSRA, served as the marine archaeological project manager/principal investigator for this investigation. Robinson performed/oversaw all aspects of the study's coordination, fieldwork, data analysis, archival research, and preparation of project deliverables. His professional qualifications meet standards established by the National Park Service (36 CFR Part 66, Appendix C). Robinson was assisted in the field during the shipwreck remains documentation process by DSRA marine archaeological specialist, Noah Robinson.

The marine archaeological recovery of the NBHSS UAD SW#3 remains was completed under the direction of DSRA's principal investigator and qualified marine archaeologist, David Robinson, working with supervisory, quality assurance/quality control, and field staff from Cashman (Gregory Banks, Michael Bowers, Dean Chambers, Tracy Clemmons, Anselmo Garza, Timothy Landry, Steven Lestille, Oziel Martinez, Michael McBride, Victor Perrira, Jose Pondo, James Sholomith, and Mason

Stump), under the supervision of the USACE-NAE's on-site Quality Assurance/Quality Control Specialist, Robert Christie. Documentation of the NBHSS UAD SW#3 remains was completed with the assistance and supervision of Jacobs's Joshua Cummings (scientist), Steven Fox (project manager), Mark Gouveia (site manager), John Oktar (superintendent/site manager), Anita Rigassio-Smith (senior environmental engineer), and William Kenyon (site health and safety officer), who was responsible for ensuring that all on-site field work was performed in conformance with the NBHSS's Site Health and Safety Plan, in accordance with the OSHA's Hazardous Waste Operations and Emergency Response Standard, Title 29 CFR Part 1910.120.

Pre-disturbance and post-recovery surveys and associated data processing and plotting of the NBHSS UAD SW#3 site were completed by CR's Christopher Wright (certified hydrographer) and Ben Maher (hydrographer). CR's Charlotte Cogswell (president and senior ecologist), and Chip Ryther (manager of Oceanographic Operations) were responsible for the management of CR and DSRA's project activities. Overall direction and management of the investigation was performed by: the EPA's David Lederer and Karen Lumino; and the USACE-NAE's Project Manager, Mary Ellen Iorio, and subsequently Marie Esten, and Archaeologist/Tribal Coordinator, Marcos Paiva.

1.5 Disposition of Project Materials

All supporting documentation collected during the course of this investigation is on file at David S. Robinson & Associates, Inc., 55 Cole Street, Jamestown, Rhode Island 02835. Raw and processed remote sensing survey data and products are on file at CR Environmental, Inc., 639 Boxberry Hill Road, East Falmouth, Massachusetts 02536. DSRA and CR Environmental serve as temporary curation facilities for this information until such time as the EPA, working in consultation with the USACE-NAE, and the Commonwealth of Massachusetts, designates a permanent repository.

2.0 RESEARCH DESIGN AND METHODOLOGY

2.1 Archival Research Methods

The primary goals of the archival research conducted for the investigation of NBHSS UAD SW#3 were the same as those conducted for NBHSS UAD SW#1 and SW#2. These goals were to: identify the wreck; determine its origin and specific age; trace its service history; and assess its historic significance within the historic contextual framework of New Bedford.

To accomplish these goals, DSRA reviewed and synthesized the historic contexts prepared for the NBHSS UAD SW#1 and SW#2 studies (Robinson et al. 2010; Robinson 2018), as well as those prepared for earlier phases of archaeological research conducted at the NBHSS (e.g., Cox, Jr. 2000; Kellogg and Klein 2001a, 2001b; Chadwick and Klein 2003; Waller and Robinson 2004a, 2004b; and Waller 2006), and some of the principal references cited in those documents. The synthesis of these reports and documents provided the general framework for interpreting the NBHSS UAD SW#3 hull remains and conducting more focused research to determine its identity.

As part of the archival research effort, DSRA's David Robinson also met with members of the curatorial/research staff of the New Bedford Whaling Museum (i.e., Akeia Benard, Jordan Berson, Christina Connett, Michael Dyer, and Mark Procknik) on February 22, 2018 to inquire about their collective knowledge about shipwrecks in New Bedford Harbor, and about any archival research materials in their collections that might include information specific to the NBHSS Upper Harbor Area and the location of the NBHSS UAD SW#3 find. Additionally, DSRA reviewed notes and materials from the archival research Robinson performed in 2009 and 2010 at the New Bedford Whaling Museum's Research Library, in the New Bedford Public Library's Special Collections, and in Special Collections at the Russell Memorial Library (i.e., the Acushnet Public Library). Specific sources that were re-examined included:

- Photography and map archives, Old Dartmouth Historical Sketches, and the New Bedford Ship Registers held at the Whaling Museum;

- New Bedford Free Public Library's Special Collections' shelved holdings and on-site searchable "New Bedford Newspaper Digital Database" of news articles published in local newspapers, the *New Bedford Daily Mercury* and the *New Bedford Gazette and Courier*, between 1836 and 1837;

- Russell Memorial Library's Special Collections' shelved holdings, which included the *Fairhaven, Massachusetts - American Guide Series* (Works Progress Administration [WPA] 1939), Zeph. Pease and George Howe's *History of New Bedford* (1889), and Daniel Ricketson's *History of New Bedford* (1858);

- NOAA's online AWOIS database (https://nauticalcharts.noaa.gov/data/wrecks-and-obstructions.html);

- 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 these archival documents, research notes from conversations with the Chair of the Acushnet Historical Commission, Pauline Tiexiera, and senior Commission members, Joyce Reynolds and Allen Parker, were also re-examined for the information that they had provided on the harbor's history and vessels.

Finally, DSRA also requested and examined multiple documents recording the USACE-NAE's history of dredging and navigation improvement projects within New Bedford Harbor and the reported removal of a wreck "from the natural channel" in 1836, which were provided to DSRA by the USACE-NAE's Marcos Paiva and Mark Habel. These USACE-NAE documents included the:

- "Work History of Federal Navigation Projects in the New England District: Massachusetts" (New Bedford & Fairhaven Harbor section) (USACE-NAE n/d);

- Extract of the Annual Report of the Chief of Engineers (1837), Document #745, 25th Congress, 2nd Session, Report of the Secretary of War, 2 December 1837, from American State Papers Collection, Series V, Military Affairs, Vol. 7, 1837-1838, pp. 571-579, Part II – Internal Improvements (p. 635);

- Extract of the Annual Report of the Chief of Engineers (1836), Document #699, 24th Congress, 2nd Session, Report of the Secretary of War, 3 December 1836, from American State Papers Collection, Series V, Military Affairs, Vol. 6, 1832-1837, pp. 806-846, Part II – Internal Improvements (p. 851);

- Extract of the Act of 4 July 1836, 24th Congress, 1st Session (5 Stat. 128) (1836), Chapter 363 – Extracted from House Doc. #1491, 62nd Congress, 3rd Session, 1840 – Laws of the United States Relating to the Improvement of Rivers and Harbors for 11 August 1790 to 29 June 1838, Vol. 1; and

- House Report #491, 22d Congress, 1st Session (1832), Committee on Internal Improvements Report.

2.2 Archaeological Methods

2.2.1 Archaeological Recovery Methods

The archaeological methodology employed to recover the NBHSS UAD SW#3 hull remains was essentially the same as that employed in the recovery of the NBHSS UAD SW#1 and SW#2 ship timbers (see Robinson et al. 2010 and Robinson 2018). A machine fitted with a long stick and grapple attachment was deployed to the site on a spud-barge (see Figure 6). The spud-barge was accompanied on-site by two hopper-barges. One of the hopper-barges was kept partially water-filled for the temporary wet-storage of recovered ship timbers and artifacts, while the other was left dry and used for storing discarded debris and those ship timbers that were too heavily damaged to be identifiable and documented as anything more than splintered wood. 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 worn by all field personnel working within the identified hot-zone area on the spud-barge during the debris removal field activity. As noted above, the recovery of the NBHSS UAD SW#3 hull timbers was completed on February 10, 2018.

Prior to initiating recovery operations, a meeting was held on February 7, 2018 with the involved on-site personnel to discuss logistics and any questions members of the recovery team had. Plots of the pre-recovery geophysical survey data were uploaded to a laptop computer used by the machine operator to help further inform and guide the recovery process at the NBHSS UAD SW#3 site (see Figure 7). The recovery process involved moving the spud-barge into Global Positioning System-(GPS-) guided positions over the site and making a systematic series of sweeps with the arm and grapple. Recovery work progressed systematically with the spud-barge and machine moved as needed to allow the machine to make a series of overlapping passes over the find location. This conservative approach for obtaining comprehensive coverage resulted in multiple, overlapping search and recovery passes over the entire NBHSS UAD SW#3 find site. All operations were directed and monitored continuously by DSRA's marine archaeologist, who remained in direct communication with the Cashman machine operator throughout the operation.

Upon completion of the recovery operation, the water-filled hopper barge was transferred upriver to the Jacobs pier at the NBHSS Sawyer Street facility. On February 13 and 14, 2018, the hopper barge was drained of water and the ship's recovered hull timbers were removed onto the deck of the pier where they were double-wrapped by Jacobs field staff into polyethylene-sheet "timber packets." The timber packets were then moved onto the site's "pad" for temporary storage and documentation by DSRA (see Figure 8).

2.2.2 Ship Remains Documentation and Analysis Methods

Recovered NBHSS UAD SW#3 hull remains were documented by DSRA in either scale color digital photographs or in scale color digital photographs and detailed measured scale drawings (see Appendix D). Because of the suspected contaminated nature of the recovered hull remains, modified Level D PPE (i.e., steel-toed boots, high-visibility safety vest, nitrile inner and rubber outer gloves whenever handling or touching the timbers, safety glasses, and a hard-hat [only when working in the vicinity of heavy-equipment operations]) was worn at all times while working with the timbers.

Due to the relatively large size of many of the recovered ship remains, it was necessary to photograph them in a composite format. This, in turn, necessitated the time-consuming task of assembling photomosaics of each side of every photo-documented timber. Assembly of the photomosaics was facilitated by the use of the "merge" function in Adobe Photoshop's CC 2018 software program.

Scale drawings made of each hull element consisted of standard archaeological plan and profile views and, where appropriate, section and detail views. Annotations and notes were also included on the drawings as needed. Additional notes were recorded digitally in the notepad feature of an iPhone. Daily progress reports describing the work accomplished and any observations of interest were submitted at the end of each field day to project staff at CR and Jacobs, which could then be distributed to other members of the project team. Dimensions of individual timbers and of the overall length of the vessel (**Table 1**) were most-likely measured using standard English measure (i.e., feet and inches) during its construction; however, for ease of documentation and drawing to scale, the timbers were all measured and drawn to a metric standard. Whenever possible, wood grain, knots, bark, naturally curving surfaces and observations about the naturally grown features of "compass

timbers" used to create the different hull components were included and noted in the drawings. Also noted was the evidence of former locations of fasteners (i.e., holes and corrosion stains). Notably, unlike in the cases of NBHSS UAD SW#1 and SW#2, all of the NBHSS UAD SW#3 vessel's iron fasteners had not corroded completely. In addition to these characteristics, damages to the wood (e.g., from wood-boring marine organisms or from simple wear-and-tear from use) were also noted and recorded.

Unlike during the NBHSS UAD SW#1 and SW#2 documentation and analysis efforts, the ability to analyze, understand, and reconstruct the disarticulated ship remains and return some their elements to their approximate *in situ* pre-disturbance configuration was not predicted to be enhanced significantly by employing computerized three-dimensional (3-D) modeling techniques to the vessel's principal recovered framing members. This was due to the more fragmentary and disarticulated nature of the NBHSS UAD SW#3 hull remains, and the fact that only a small portion of the NBHSS UAD SW#3's hull (i.e., the lower- and aft-most bottom section representing only about 20 percent of the vessel's estimated overall length) was preserved, whereas in the cases of NBHSS UAD SW#1 and SW#2, preserved hull remains extended the full length of both vessel's hulls. Consequently, computerized 3-D modeling was not included as part of the documentation and analysis that was done for the hull remains comprising NBHSS UAD SW#3.

3.0 RESULTS

3.1 Archival Research Results

Archival research performed for this archaeological investigation focused on providing information pertaining to three related aspects of NBHSS UAD SW#3:

- The history of the development of the greater New Bedford area/Acushnet River as a port, and NBHSS UAD SW#3's place within the context of that development, including its possible association with the nineteenth and early twentieth century maritime commerce of New Bedford harbor;

- The name/identity of NBHSS UAD SW#3; and

- Its relative age, original size, and hull/rig type.

The first two areas of research were addressed by DSRA's review and synthesis of historic contexts presented in the Robinson (2018), Robinson et al. (2010), Cox, Jr. (2000), and Fitts et al. (2000) reports prepared for the earlier phases of archaeological investigations conducted in the NBHSS. These reports provided the basic context for the historical development of the greater New Bedford Harbor area spanning the late-eighteenth to middle-nineteenth centuries corresponding with the estimated age range of NBHSS UAD SW#3. This review was supplemented by an examination of the local histories of Bristol County, the City of New Bedford, and the immediate surrounding area published in the nineteenth and early twentieth centuries (i.e., Crapo [1840]; Gillingham et al. [1903]; Howland [1907]; Hurd [1883]; n/a [1887]; Pease and Hough [1889]; Ricketson [1858]; and Weeden [1890]), as well as primary documents obtained from the New Bedford Whaling Museum Research Library (WPA 1940; Worth n/d) and the New Bedford Free Public Library's Special Collections (Cyr n/d). Analysis of documented shipwrecks in the area included a review of the shipwreck list in Cox, Jr. (2000), the digital shipwreck database maintained by the MBUAR, and the reported vessel casualties published in Berman's (1972) *Encyclopedia of American Shipwrecks*. DSRA also reviewed the online NOAA AWOIS and 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 a discussion with the curatorial/research staff of the New Bedford Whaling Museum, and a review of notes from Robinson's informal interviews with the librarians/curators of the Russell Public Library (Acushnet Public Library) and the New Bedford Free Public Library, including the vessel types registered at New Bedford between 1785 and 1850 (**Table 2**). The third area of research was addressed by analyzing the comparative data compiled during the investigations of NBHSS UAD SW#1 and SW#2 (including the vessel types registered at New Bedford between 1785 and 1850 [WPA 1940]), as well as a review of eighteenth and nineteenth century ship design and construction details in William Sutherland's *The Ship-Builder's Assistant; Or, Marine Architecture* (1755) and William Crothers's *The American Built Clipper Ship: 1850-1856* (1997), respectively, and a review of fastener types in Michael McCarthy's *Ship's Fastenings: From Sewn Boat to Steamship* (2005), and general ship construction based on archaeological remains as presented in J. Richard Steffy's *Wooden Ship Building and the Interpretation of Shipwrecks* (1994).

3.1.1 Historical Context

The lands bordering the Acushnet River comprising the City of New Bedford and the adjacent 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 colonial 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 colonial settlements were initially spare and consisted of scattered farmsteads and garrisons up until the time of King Philip's War (i.e., 1675-1676). These settlements were overrun and largely destroyed during the exchange of war-time hostilities with local Native American populations.

Following the War, colonial settlers returned and rebuilt in the area. The Village of Acushnet was established at the head of the Acushnet River. Throughout the first half of the eighteenth century, Acushnet developed to a greater extent than any other area in Dartmouth or around the harbor 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, 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. In the early days of this enterprise, only smaller wooden sailing vessels were built there, 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 at Stetson's Acushnet shipyard 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. 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 harbor's whaling and freighting businesses.

Initially, the area that became the City of New Bedford had the smallest population of any part of Dartmouth. In 1760, New Bedford had only six houses and was inhabited by farmers (n/a 1887:60). The only public road in the central part of New Bedford at that time was the main road from Acushnet to Apponagansett, which is today's County Street. Joseph Russell, one of New Bedford's pioneers in the whaling industry, owned land and lived on a farm on the west side of this public road at its intersection with today's Court Street. Russell's farm extended east to the Acushnet River shoreline. Today's Union Street was originally Russell's farm lane leading to the shore, and is adjacent to the present locations of the New Bedford Whaling Museum and the State Pier Maritime Terminal (n/a 1887:60). The first waterfront houses and businesses in New Bedford came shortly thereafter when John Loudon, a ship-caulker from Pembroke, and others bought land and built several houses near the foot of Union Street. A boat-builder, block-maker, carpenter, and a blacksmith were among the first residents of this area and were employed in the repairing of whaling vessels (n/a 1887:60). In 1765, Joseph Rotch relocated from Nantucket to New Bedford before the outbreak of the American Revolution. Rotch, founder of the international whaling firm bearing his name, purchased 10 acres in the area where the Whaling Museum complex is today. While his son and grandson handled business from Nantucket, he built a home on the corner of William and North Water Streets. From this time onward, the village that became the City of New Bedford increased in population and trade. By 1776, there were approximately 40 structures and six piers in New Bedford (n/a 1887:62) (**Figure 9**). The area received its colonial name from Rotch, who, out of respect for Russell, named it Bedford after Russell's English city of origin. The village became "New" Bedford when it was incorporated as a town in 1787 to distinguish it from Bedford in Massachusetts's Middlesex County.

That same year (1787), Fairhaven (which at that time 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, New Bedford was incorporated as a city in 1847, and Acushnet separated from Fairhaven in 1860 to become its own town.

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 1776 (Morison 1921; n/a 1887:62; Pease and Hough 1889). Russell built the Central Wharf (at today's State Pier location), which became the headquarters of New Bedford's whaling industry. Adjacent to the wharf, Russell also established a try-works in one of his early buildings built along the shore. Whaling at that time was conducted in sloops of 60 to 80 tons burden that were hunting whales between George's Bank and the Virginia capes and bringing the blubber back to New Bedford to be tried. New Bedford's whaling industry expanded greatly under the stewardship of Rotch, who brought significant capital with him when he relocated to New Bedford. He soon thereafter became the principal and wealthiest person in the whaling business. Rotch's sons, William and Francis, became involved in their father's business and became the leading merchants of New Bedford. Francis was the owner of the first ship built in New Bedford Harbor – *Dartmouth*, constructed at the foot of Middle Street in 1767. *Dartmouth* was one of the vessels that was engaged in the famous "Boston Tea Party" demonstration in 1773.

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. However, as 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), British forces focused on New Bedford as a high priority target for attack and retribution (Howland 1907). On September 5, 1778, a British fleet launched an attack on New Bedford and Acushnet and the vessels within the harbor. With most of the area's fighting-age men away engaged in battles elsewhere, the port had few defenders, who were outmatched by 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). Upon completion of the attack, British forces had burned down: 10 homes (two in New Bedford, six in Acushnet, and two 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; 70 sloops and schooners of "inferior size;" and an indeterminate number of whale boats and other small boats (Howland 1907). The British navy was equally successful elsewhere in sweeping most of New Bedford's remaining whaling ships from the world's seas.

Following the end of the Revolutionary War in 1783, the greater port of New Bedford's economy and its whaling industry revived slowly. Several years passed before any new vessels were fitted out there. As of 1785, only eight vessels were registered in the port, several of which were engaged in whaling (WPA 1940).

England emerged as the world's principal market for whale oil as a result of Great Britain's "Industrial Revolution" and its growing demand for lubricants for machinery and fuel for lamps and street lighting in an increasingly urbanized countryside led to a rise in prices. Heavy duties on whale oil

imported into England made its sale to them by American whaling interests almost prohibitory. Compelled by the heavy domestic demand for oil and the high prices of imported oil, Great Britain became more extensively involved in whaling and expanded its whale fishery to include hunting for sperm whales in the southern hemisphere.

During the 1790s, New England's whaling fleet and industry continued to slowly rebound, as its ships also began heading into the Pacific Ocean for the first time in search of their quarry. At the turn of the century, the total number of vessels calling New Bedford home had risen back to pre-Revolutionary War numbers. Following the end of the Napoleonic wars in Europe, the whaling industry started to flourish again, as New Bedford and Fairhaven competed with Nantucket's whaling interests on their way to the former's eventual world dominance of the industry. Shipbuilding, ropemaking, and spermaceti candle-making, all expanded in New Bedford, as well. In addition to whaling products, merchants also began shipping cargoes of different types of freight 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 had 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). With Great Britain's introduction of free trade legislation and relaxation of tariffs on imports in 1824, and again in 1844, the prices of imported whale oil fell. While this reduction in prices had chilling effect on Great Britain's whaling industry, it was quite beneficial to the American whale fishery. The growth of the whaling industry is evident in the growth of the Village of New Bedford, which by 1834 had expanded dramatically and had a waterfront lined with wharves, piers, and vessels (**Figure 10**). By 1845, the number of vessels engaged in whaling in New Bedford had grown to include 246 ships and five smaller vessels (n/a 1887:62). In 1857, the number of whaling vessels in New Bedford peaked at 329 ships, whose value at the time was estimated at $12-million dollars (equivalent to more than $346-million dollars today). Collectively, over 10,000 men were employed in these vessels' operations (n/a 1887:62). The decline of the American whaling industry and that of New Bedford's came just two years later, when they sustained an economic blow from which they could not recover with the 1859 discovery of petroleum-based oil from the oilfields in and around Titusville, Pennsylvania, and the extraction of over 4,500 barrels of oil from them. European factories, and especially those in Great Britain, began importing large quantities of cheap American petroleum almost immediately during the 1860s. By 1869, over four-million barrels a year were being produced by the western Pennsylvania fields. Just four years later, that annual production had more than doubled to 10-million barrels a year (n/a 1887:62). The effect of the adoption of petroleum-based oils on New Bedford's whaling industry was sudden and severe. By 1887, the number of whaling ships owned in New Bedford had plummeted from 329 to 77 – a nearly 80 percent drop from its peak just 20 years earlier. Many of these vessels had been lost in the 1860s during the American Civil War, while others engaged in the Arctic whale fishery were lost in the ice, and their owners' finances ruined. As arctic whaling became increasingly important through the closing decades of the nineteenth century, more and more of New Bedford's whalers were sent to San Francisco and home-ported there. When the last of New Bedford's whaling ships, *Wanderer*, left the port to hunt whales in 1924, and then sank a short distance away, off of Cuttyhunk Island, its loss marked the closure of a centrally important aspect of New Bedford's role in America's whaling era and in maritime history.

The final fate of some of New Bedford's wooden sailing ships is poignantly captured in the childhood memories of Clifford W. Ashley (b. 1881 – d. 1947), a New Bedford native, artist, and author of multiple books on maritime history, including *The Yankee Whaler* (1926) and *Ashley's Book of Knots* (1944), who grew up on the harbor in the late nineteenth century and recollected the following about New Bedford Harbor:

> *The unpoliced ships and grass-grown wharves made a marvelous playground. We learned to swim from the bob-stays of the old hulks. We contrived to paddle and row on rafts fashioned of hatch covers, and used in boarding parties over the side. We swarmed over the rigging and slid down the backstays, spun the wheels and on rainy days gathered in the cabins and played games and pretended one thing or another; and always it was something wonderful that smacked of the sea* (Medeiros 2014).

Given the long history of commercial maritime activity and shipping in the Acushnet River and New Bedford harbor, and that abandonment of wooden sailing ships in the harbor, particularly after the collapse of the whaling industry and the end of other forms of shipboard trade in sailing vessels, it seems likely that NBHSS UAD SW#3 suffered the same fate as the vessels Ashley described.

Review of historic contexts prepared for the earlier phases of archaeological investigations conducted in the NBHSS, as well as local histories, primary documents, shipwreck lists, and secondary sources, and discussions with curators, researchers, and librarians in an effort to determine a potential identity and age for NBHSS UAD SW#3 all produced little evidence of a likely candidate that could be NBHSS UAD SW#3. The only archival information possibly related to NBHSS UAD SW#3 that was found were documents that were provided by the USACE-NAE's Marcos Paiva and Mark Habel in response to DSRA's request for information on the USACE-NAE's history of dredging and navigation improvement projects within New Bedford Harbor.

The first of these documents the USACE-NAE provided to DSRA was their undated "Work History of Federal Navigation Projects in the New England District: Massachusetts." It was in the "New Bedford & Fairhaven Harbor" section of this document that DSRA identified a possibly relevant clue and *terminus ante quem* date (i.e., the limit before which, or the latest possible date for something) for NBHSS UAD SW#3. The document notes in 1836 the "Removal of Wreck from Natural Channel" as among "Work Accomplished." This entry was compelling for several reasons. First, the archaeological remains of NBHSS UAD SW#3 display clear evidence that a majority of its hull remains were purposefully removed. Second, based on the sizes of timbers in the relatively small amount of hull remains that were left behind, the extent of the ship remains that were removed would have certainly represented a majority of the hull's length and would have extended into the channel. Third, contemporaneous charting shows that the bathymetry in the channel where NBHSS UAD SW#3 was located was natural and undisturbed by dredging for decades after the wreck was removed (see Figure 11) (**Figure 12**). Fourth, the wreck removal entry in the document is the only one like it for a wooden vessel in the USACE-NAE's New Bedford and Fairhaven Harbor work history records. Fifth, and finally, the removal of a relatively large wreck (NBHSS UAD SW#3 is estimated to be the remains of an over 130 ft- [39.6 m-] long) vessel) from the middle of the Acushnet River's main channel would not have been a trivial undertaking. It seems unlikely that an effort of this magnitude would have gone unnoted.

Additional archival documentation provided to DSRA by the USACE-NAE, noted above, provided a limited amount of additional information associated with the 1836 wreck removal entry. First, the 1832 House Report contained a Committee on Internal Improvements Report that called for "Examination of Certain Rivers and Harbors for Improvements" and included a project focused on the "removal of obstructions in New Bedford Harbor." Second, the 1836 Extract of the Act of 4 July 1836 authorized and appropriated funds ($10,000) for "Removing the Wreck from New Bedford Harbor, Massachusetts." Third, the 1836 Extract of the Annual Report of the Chief of Engineers reported that although the funds were appropriated for the 1836 fiscal year for the removal of a wreck from New Bedford Harbor, the lateness of the appropriation required that the work be

undertaken the following Spring (i.e., the Spring of 1837). Forth, and finally, the 1837 Extract of the Annual Report of the Chief of Engineers reported that the removal of the wreck was completed that year (i.e., 1837). After its review of these records, DSRA requested from the USACE-NAE logs and/or supervisor reports from the salvage vessel that removed the wreck; however, DSRA was informed by the USACE-NAE that such records do not exist in their archives.

Review of the online and on-site indices for the *New Bedford Daily Mercury* and the *New Bedford Gazette and Courier* newspapers from 1836 and 1837 produced no additional details about the wreck's removal, or about the vessel and its operational history. ***While it is possible that the wreck removed from the natural channel in 1837 recorded in the USACE-NAE documents is NBHSS UAD SW#3, archival research conducted to date for this study remains inconclusive and the vessel's identity and service history continue to be unknown.***

3.2 Archaeological Research Results

A total of 56 wrapped timber packets recovered from the NBHSS UAD SW#3 site location were opened and examined, and 50 individual pieces of wood from NBHSS UAD SW#3 were documented over 16 working days spread over a four-month period between February 24, 2018 and June 23, 2018. Heavily degraded, non-diagnostic, or intrusive wooden debris unrelated to NBHSS UAD SW#3 included in nine of the 56 wrapped timber packets were discarded without documentation. While the preserved remains of NBHSS UAD SW#1 and SW#2 extended the full length of their respective hulls, only a portion of the aft end of NBHSS UAD SW#3's lower hull (approximately 20 percent of the vessel's estimated overall length) was preserved. Hull timber types represented in the recovered assemblage of NBHSS UAD SW#3's remains included: the single, partially-preserved aft section of the keel; two small pieces, a long section, and a fillet (filler piece) of the aft deadwood; nine floors; nine first-futtocks; eight second-futtocks; three garboard hull planking fragments; eight (non-garboard) hull planking fragments; and several miscellaneous unidentified timbers. Unlike NBHSS UAD SW#1, no artifacts were observed or collected during the NBHSS UAD SW#3 recovery or documentation operations.

The documentation task comprised the bulk of the marine archaeological work that was done on NBHSS UAD SW#3 with thousands of measurements and photographs recorded, multiple photomosaics of individual timbers produced, and 41 scale measured drawings (nearly all of which are multi-view) made to create the visual catalog of NBHSS UAD SW#3's hull remains (see Appendix D). The brief narrative descriptions of individual hull components that follow are presented in approximately the same sequence they would have been assembled during the original construction of NBHSS UAD SW#3. Although every effort was made to present this information as clearly and concisely as possible, because of the complexity of some of the timbers' shapes and the technical nature of these descriptions, the reader is encouraged to refer frequently to the photographs and drawings included in the appendices. Information recorded during the documentation task was analyzed and interpreted by DSRA to assist in the effort to determine the vessel's approximate age, nation of origin, reason for sinking, and former purpose.

3.2.1 Fasteners

Documented fastenings employed in the joinery of NBHSS UAD SW#3's wooden hull components included wooden dowel-like "treenails," iron bolts, iron spikes, and iron nails (**Figure 13**). Many of the treenails and some of the iron bolts were preserved in the vessel's hull remains. Dimensions and

spacing patterns of missing fasteners were inferred from associated fastener holes and corrosion stains visible in individual hull timbers.

Treenails used in the construction of NBHSS UAD SW#3 included two types. The most frequently used type of treenail was 1.2-1.4 in (3-3.5 cm) in diameter, and round in section. These treenails were used throughout the hull to join structural framing timbers together, as well as to secure the vessel's hull planking to floors and futtocks and other framing elements. The other type of treenail documented in the NBHSS UAD SW#3 hull remains was 0.8 in (2 cm) square in section, and was used in just three places in one area of the starboard side of a long aft deadwood timber recovered from the site. It was observed that many of the treenails had evidence of "shipworm" damage visible at their ends from the wood boring marine mollusk, *Teredo navalis*. It appeared that the shipworms had preferentially targeted the ends of the treenails, burrowing into them along their lengths, and then had spread from the treenails into the surrounding planking and framing. This damage was observed to be present in the hull remains that were not only those exposed above the mudline, but also in those that had been buried below the mudline after the vessel had settled on the harbor floor, indicating that the shipworm damage must have occurred while the vessel was still afloat, because *Teredo navalis* is not a mud-burrowing mollusk.

The remaining fastener types used in NBHSS UAD SW#3's hull were made from wrought iron and consisted of bolts, spikes, and nails. The bolts were uniformly 0.8 in [2 cm] round in cross-section. Most were likely once clenched with a washer at their ends when intact, and used to secure each floor timber to the keel with one centrally located bolt per floor. Bolts were also used to secure joints between sections of the keel and to attach aft deadwood timbers to the top of the keel. One preserved bolt had a threaded end and was secured with a nut. Heavily corroded bolt remnants were the only iron fasteners to partially survive in the hull remains. Spikes were used to temporarily fasten hull planking to the frames prior to the drilling of holes and the driving of treenails into them. Based on the size of the spike holes in the ship's timbers, those used in NBHSS UAD SW#3 measured 0.4-inch-square (in^2) (1-centimeter-square [cm^2]) in section. Iron nails were used for repairs to hull planking and to fasten what is presumed to have been wooden hull sheathing that had once been attached to the exterior of the keel and to the outside of the garboard and hull planking. The iron nails used in the repairs were 0.2 in (0.5 millimeters [mm]) square in section. The sheathing nails were rectangular in section and measured 0.1-x-0.2 in (2.5-x-5 mm).

3.2.2 Keel

Preserved evidence of NBHSS UAD SW#3's structural spine was limited to a single aft section of its "keel," estimated to be only about 20 percent of the keel's total length. Also recovered with the keel were the associated and partially preserved components of the hull's aft "deadwood" assembly. Along with the vessel's stem and sternpost, the keel would have been among the first hull components to be cut, shaped, and assembled on the stocks and would have defined the vessel's overall length between perpendiculars. Its size and form were determined by the planned primary function of the vessel, specific construction requirements of the planned vessel type, economic concerns, the prevailing environmental conditions in the region of the vessel's construction and planned area of operation, the availability of materials, and the builder's working knowledge of shipbuilding theory and techniques.

NBHSS UAD SW#3's aft keel section is a complexly shaped single timber cut from the heartwood of a large tree with a preserved overall length of 35.8 ft (10.9 m) (see Appendix D). The keel tapers (i.e., gets smaller in size) in its athwartships or "sided" width from 11 in (28 cm) at its forward end to 9 in

(23 cm) at its stern end, and flares (i.e., expands/gets larger in size) in its vertical or "molded" height, from 11.8 in (30 cm) at its forward end to 24.4 in (62 cm) in at its aft end. The full keel would have been assembled in multiple sections. The forward end of the preserved aft keel section terminates in a vertically-oriented, "tabled," "boxing joint" scarf (Steffy 1994:292) (**Figure 14**), which was carved to join and interlock with the aft end of the next section of the keel. The tabled face of the tabled, boxing joint scarf measured 5 ft (1.52 m) long, and (viewed in plan) tapers in its sided dimension from 6.3 in (16 cm) at its aft end to 4.3 in (11 cm) at its forward end. The keel's tabled boxing joint scarf had been secured by five pairs of iron bolts (10 in total) with each pair oriented vertically, one bolt over the other. The holes for the bolts measured 0.8 in (2 cm) in diameter, were round in cross-section, and likely had been clenched or secured with a nut and washer at their ends. The tabled boxing joint scarf in NBHSS UAD SW#3's keel was a refinement typical of and used widely among European (especially English-built) wooden vessels, including those of the nineteenth century (Crothers 1997:120), and suggests an origin for the vessel outside of America.

A rabbet cut into the keel's upper corners accommodated and provided a secure seating surface for the lower edge of the lowest run of hull planking (termed the "garboard" or "garboard strake") that had been attached to both sides of the keel along its length with treenails. Flattened fibrous material that is likely "oakum" or "junk hemp" rope caulking was used to create a water-tight seal between the keel and the vessel's hull planking. Its remnants were observed in multiple places within the keel's garboard rabbet (**Figure 15**).

Viewed in profile, the top surface of the keel sweeps upward as it approaches the stern to connect with a vertical sternpost and make the transition from the horizontal keel. At the aft end of the keel on both of its sides are corrosion-stained recesses or "mortises" that once held iron "fishplates" that helped secure the connection between the bottom or "heel" of the sternpost and the top surface of the keel's aft end (**Figure 16**).

The top surface of the keel is penetrated by 13 round holes drilled to accept 0.8-in- (2-cm-) diameter iron bolts distributed along the longitudinal centerline of the aft keel section's length with a primary average spacing of 24 in (61 cm) on-center. Three additional bolt holes are also present and are spaced between 5.5-10.2 in (14-26 cm) apart from the next closest bolt hole. These holes correspond to the former locations of the hull's lowermost "ribs" or "framing" elements, termed "floors" that were oriented perpendicular to and passed across the top of the keel to which they were once fastened. If the entire keel had been preserved, these fairly regularly-spaced bolt holes would have been an important clue to the total number of floors that once spanned NBHSS UAD SW#3's hull.

The heavily worn and shipworm- (*Teredo navalis*) and gribble- (*Limnoria lignorum*) damaged condition of the bottom of the keel indicate that it had not been fitted with a protective sacrificial layer of sheathing or with a keel shoe (see Figure 15). Numerous small rectangular fastener holes for sheathing nails, distributed in a generally diagonal pattern and spaced 8.7-9.8 in (22-25 cm) apart that are visible on the sides of the keel (see Figure 15), indicate that it and the vessel's hull were once covered in protective wood sheathing that had extended down to a point about 5.1 in (13 cm) above the keel's bottom.

3.2.3 Aft Deadwood

Aft "deadwood" preserved in and recovered from the NBHSS UAD SW#3 hull remains consisted of:

- A large horizontal aft deadwood timber that once was fastened to the top of the aft end of the aft keel section between the aft-most full frame and the forward end of where the hull's "stern knee" would have been attached;

- Small remnants of the bases of two diagonal deadwood timbers that remain attached to the upper surface of the aft end of the aft keel section; and

- A separate fillet of wood that appears to have filled a gap between the top of the keel and the bottom of the aft end of the large horizontal aft deadwood timber.

These aft deadwood timbers were part of an assembly that would have connected (and made the transition between) the vertical sternpost assembly to the horizontal keel (see Appendix D). The purpose of the deadwood was to fill out the vessel's body at the ends of the hull and provide an adequate surface for securing short half-frames where the hull was too narrow for full framing. The large horizontal aft deadwood timber measured 15 ft (4.58 m) long. It expands in its molded height from 4.7 in (12 cm) at its forward end to 18.9 in (48 cm) near its aft end, and tapers in its sided dimension from 9.4 in (24 cm) at its forward end to 6.3 in (16 cm) at its aft end. Two fillets or blocks of wood that acted as half-frames are attached to opposite sides of the large aft deadwood timber. Differences in the shape and size of these two blocks indicate that there was some minor unintended asymmetry to the hull between its port and starboard sides where they terminated at the stern.

3.2.4 Floors

Just nine of NBHSS UAD SW#3's "floors," the horizontal framing timbers that span the bottom of the hull across the longitudinal centerline of the ship and were fastened to the top of the keel, were recovered from the preserved remains of the vessel's stern (see Appendix D). Floors are the lowermost component of a ship's multi-component frame and were identified based on their shape, size, and fastenings. Five of the recovered floors appeared to have been sawn to shape while four appeared to have been fashioned from timbers that were essentially grown to shape (i.e., "compass timbers"), as determined from the direction of their wood grain patterning (**Figure 17**). One of these compass timbers was cut "rough" and retained some of the rounded shape of log from which it was cut (see Figure 17). All of the floors exhibited damage from shipworms. Deterioration of the floors was much more extensive on one side of the hull, which was presumably the upslope side of the ship after it sank and had settled into its final position on the harbor floor. The side of the ship that was lower and had listed towards the harbor floor would have been buried first, and, therefore, was relatively protected beneath the sediments. Shipworm damage was most extensive at the ends of the floors and in the ends of and around the treenails that had secured the hull planking to the floors. While treenails have many advantages, they are susceptible to shipworm damage, because their exposed end grain on the outside surface of the hull makes them more easily penetrable (**Figure 18**). The shipworms appear to have burrowed inward along the treenails' grain and then spread out and into the surrounding planks and framing timbers (see Figure 18). This damage would have caused significant weakening of the hull's integrity and led to it leaking (McCarthy 2005:100). Given that the shipworm damage to the treenails that had spread to the surrounding wood was on portions of the hull that were buried beneath the harbor floor sediments, and not just the portions of the hull exposed above the mudline, this damage must have occurred while the vessel was still afloat. This suggests that the vessel was old and in poor condition by the time that it sank, presumably at anchor in the upper portion of New Bedford's lower harbor. NBHSS UAD SW#3's recovered floors measured between 7.9-13.8 ft (2.4-4.2 m) in their preserved lengths. Molded dimensions of the floors ranged from between 9.4-14.2 in (24-36 cm), measured at the floor's throats (i.e., their centers). Sided

dimensions of the floors ranged from between 9.4-11.8 in (24-30 cm). A curious feature of the floors was that none of them had limber holes. Limber holes are notches cut into the bottoms of the floors on either side of their centerline where they attach to the keel that permit water to pass between and under the floors to the base of the bilge pump tube at the lowest point in the hull from where water can be pumped out of the ship. Several of the floors were flattened or notched to fit flush with the top of or to seat onto the keel. One floor was chocked with a 2 in- (5 cm-) thick fillet of wood where it passed over the keel to give the floor additional molded height and strength at its throat.

3.2.5 Futtocks

All frames of relatively large ships, due to the fullness of their form and the change in direction the frame must take from horizontal in the bottom of the hull toward vertical in the sides of the hull, are composed of a number of separate pieces of wood, so that the grain of the wood follows the direction of the frame throughout its body. To accomplish this, added to the frame's floor on both sides of the hull were the first, second, and sometimes third and fourth "futtocks," the "top timber," and the "rail stanchion," all of which were fashioned from progressively lighter, smaller timbers as their positions in the hull extended up the side the ship (**Figure 19**). In the case of NBHSS UAD SW#3, only some of the floors, and first and second futtock elements of one side of the vessel's frames were preserved.

Ten first futtocks were recovered and documented in the hull remains of NBHSS UAD SW#3 (see Appendix D). These recovered first futtocks measured between 6.9-7.9 ft (2.1-2.5 m) long with maximum molded dimensions of 9.8-11.8 in (25-30 cm) and maximum sided dimensions of between 9.4-11.8 in (24-30 cm).

Eight second futtocks were recovered and documented (see Appendix D). The lengths of the second futtocks ranged from 3.3-6.6 ft (1-2 m). The maximum molded dimensions of the second futtocks ranged from 9.1-11.4 in (23-29 cm). The maximum sided dimensions of the second futtocks ranged from 9.4-11.4 in (24-29 cm). One of the second futtocks retained the naturally rounded shape of the tree branch from which it was fashioned.

All of the futtocks were shipworm damaged. All had round (in section) treenails or treenail holes. Treenails were used to fasten the hull planking and the futtocks together. The limited number of recovered futtocks and floors with horizontal treenails indicated that the floors and futtocks were not uniformly "articulated," or fastened together, as was the case in the "double-sawn" framing that was more typical of wooden vessels built in the middle nineteenth century and later. This partial use of compass timbers and use of single, rather than doubled, frames is suggestive of an earlier nineteenth century construction period for NBHSS UAD SW#3.

3.2.6 Hull Planking

A total of 12 hull planking fragments were recovered and documented from NBHSS UAD SW#3's hull remains (see Appendix D). Three of these fragments were from the garboard strake and ranged from 8.2-13.5 ft (2.5-4.1 m) long, 11.4-11.8 in (29-30 cm) wide, and 2.4-3.1 in (6-8 cm) thick. The nine non-garboard planking strake fragments ranged from 6.2-21.7 ft (1.9-6.6 m) long, 9.4-12.6 in (24-32 cm) wide, and 2.4-3.9 in (6-10 cm) thick. The garboard and non-garboard hull planking had been fastened to the ship's frames with treenails (generally two treenails per frame location). Holes for iron spikes were also visible in the hull planking. These holes were distributed randomly at different frame locations where they were driven to hold the hull planking in place prior to their permanent installation and fastening with treenails, which served as the primary fasteners holding the planking to the vessel's framing. The three garboard strake fragments were identifiable by their lower beveled

edge that would have fit into a groove or "rabbet" cut into the upper corners of the keel, thus indicating that these hull planking fragments were from the lowest "run" or "strake" of planking in the ship's hull. Fastening patterns in the garboard strake fragments indicate that the garboard was treenailed into every other frame (most likely the floors) with two treenails per frame that were generally set diagonal to each other. The treenail fastening pattern observed in the (non-garboard) hull planking fragments was the same (i.e., two treenails per frame with them set diagonally to each other), except that they were fastened at every frame location. The hooding ends of the hull planking were fastened to the framing with one and two treenails. Surface features observed in the hull planking included one roman numeral scribe-mark ("X") near the intact end of one of the non-garboard hull planking fragments, and saw marks clearly associated with a large circular saw (**Figure 20**). Round-bladed saws were commonly used in the wood-mills of the eastern United States by the 1860s, but were common in English shipyards much earlier (i.e., in the late 1700s). Tarred animal hair felting residue and numerous small sheathing nail holes preserved on/in the outboard surfaces of some of the garboard and hull planking strake fragments provided additional evidence of the use of sacrificial wood hull sheathing (**Figure 21**). Evidence of repairs was present in one of the garboard strake fragments and in one of the non-garboard hull planking fragments (**Figure 22**). In the garboard strake fragment, the repair had been made to the plank while it remained in place and consisted of a small (27.6 in-x-2.4 in wide [70 cm long-x-6 cm wide]) wooden butt-block patch that had been inserted into a hole cut into the garboard at the end of a double split in this particular plank. The repair was made presumably to prevent the plank from splitting further along its length. The other evidence of a repair also appears to have been made while the plank was in place. This repair consisted of two angular recessed or rabbeted areas that were cut into the exterior surface of the hull planking fragment. One is roughly square in shape and is located at one corner of the intact end of the plank where it encompasses the former location of a treenail. Small rectangular nail holes with iron staining indicate the type of fasteners that were used to secure the patch in place within this recess in the plank's surface. The other recess or rabbet is located near the edge of the plank and also corresponds with the location of a treenail. There is significant shipworm damage visible within this recess. It may have been that the repair was intended to replace a shipworm-damaged treenail and the surrounding wood.

3.2.7 Hull Sheathing

Use of wooden hull sheathing in the hull of NBHSS UAD SW#3 is inferred from the presence of sheathing nail holes in the outboard surfaces of the hull planking and keel (see Figures 15 and 21) and the absence of cuprous sheathing nails, cuprous corrosion staining, or cuprous or lead sheathing fragments embedded in the wood at the surface of the planking. No hull sheathing planks were seen to be preserved and recovered from the NBHSS UAD SW#3 site.

3.3 Analyses Results

Individual hull timber sizes documented in NBHSS UAD SW#3 were significantly larger than those found in the NBHSS UAD SW#1 and SW#2 hull remains (see Table 1). Logically, this indicated that they were associated with a commensurately larger vessel. A review of timber scantlings and overall hull dimensions from other nineteenth century ships included in the Crothers (1997:145-146; 386-416) book consulted as part of this study's research indicated that the projected length of NBHSS UAD SW#3's fully-preserved hull could have been in the 130-145 ft (40-44 m) range. A ship of this size may have been a transoceanic vessel, such as a whaling ship, or some other type of international trader. If the vessel's projected original hull length is close to being accurate, then the hull remains comprising the NBHSS UAD SW#3 find likely constitute only about 20 percent of the vessel's overall length, and represent an even smaller fraction of the overall fabric of the ship's hull. The partial preservation and disarticulated nature

of NBHSS UAD SW#3's recovered hull timbers severely limited the extent to which the timber assemblage could be analyzed. Lacking the necessary archaeological data to enable a determination of NBHSS UAD SW#3's precise hull size and form made it impossible to infer with any confidence what type of vessel NBHSS UAD SW#3 was and what had likely been its purpose. Despite these circumstances, the analyses that could be done working with the available hull remains did provide some insights into the nature of the NBHSS UAD SW#3 vessel and why it may have ended up on the bottom of New Bedford Harbor.

The fasteners used in NBHSS UAD SW#3's hull were essentially the same types as those documented in NBHSS UAD SW#1 and SW#2, except that the treenails were uniformly round, rather than faceted, in section (with the exception of the three square-in-section treenails used in the large horizontal aft deadwood timber), and none were "pegged" or "wedged" at their ends. The round-in-section shape and uniformity of the NBHSS UAD SW#3 treenails suggested some type of automated mass production and, thus, is perhaps indicative of a more recent date for the ship-find. This contrasts with the labor-intensive, manufactured-by-hand process that produced the faceted and wedged treenails documented in NBHSS UAD SW#1 and SW#2, which are from earlier/older vessels dating from the late 1700s. The less-corroded condition of NBHSS UAD SW#3's larger iron fasteners, as compared to those in NBHSS UAD SW#1 and SW#2, also suggests a more recent date for the vessel.

NBHSS UAD SW#3's preserved aft keel section contained the strongest diagnostic feature in its hull remains (i.e., the tabled vertical boxing joint keel scarf) that provided a clue regarding a potential region or nation of origin for the vessel – Europe, and most likely England. Tabling in scarf joints, which had to be hand-carved with a chisel and required precision shaping in order to create an interlocking joint between the two timbers being connected, was a labor-intensive refinement widely used in European ship construction, especially in England. American builders, in contrast, employed more expedient types of scarf joints that could be created easily with a saw (e.g., the horizontal flat-nibbed keel scarfs in NBHSS UAD SW#1 and SW#2) (Crothers 1997:120). Another unusual aspect of NBHSS UAD SW#3's keel was the aft-sweeping vertical flare of its molded dimension, which would have slightly reduced the need for deadwood in the stern and provided a strong point of attachment for the aft end of the garboard strake. Again, this contrasts with NBHSS UAD SW#1 and SW#2, whose molded keel heights were fuller at the bow and tapered towards the stern. Also, unlike NBHSS UAD SW#1 and SW#2, the keel of NBHSS UAD SW#3 lacked evidence of ever having had been fitted with a protective keel shoe. This absence is unusual and suggests that accidental groundings were considered unlikely by NBHSS UAD SW#3's builder, which would be more consistent with transoceanic service between well-known deep-water ports where groundings were improbable, rather than with coastal service where the risk of accidental groundings during transits closer to shore was much higher. Not surprisingly, the bottom of NBHSS UAD SW#3's keel was worn and exhibited shipworm (gribble [*Limnoria lignorum*]) damage, whereas the condition of the bottoms of NBHSS UAD SW#1 and NBHSS UAD SW#2's keels, both of which had been shod, were significantly better.

Other differences noted between the hull remains of NBHSS UAD SW#3 and those of NBHSS UAD SW#1 and SW#2 were associated with other aspects of their condition. The NBHSS UAD SW#3 hull timbers all seemed to be less waterlogged and the wood less degraded as a result of submergence than those of NBHSS UAD SW#1 and SW#2, which again suggested a more recent date for their deposition into the underwater archaeological record. Unlike NBHSS UAD SW#1 and SW#2, NBHSS UAD SW#3's recovered hull timbers also showed no signs of burning. NBHSS UAD SW#3's timbers displayed evidence of greater use age than either NBHSS UAD SW#1 or SW#2, that is the vessel appeared to have been older in terms of its operational life and in service longer than the other two vessels when it sank in New Bedford Harbor. This evidence included significant shipworm (*Teredo navalis*) damage to the undersides of its floor timbers and first futtocks with infiltration into these members appearing to have originated in the treenails, while the vessel was still afloat. This could have only occurred if the treenails' exterior ends

were directly exposed to seawater. This indicates that the hull's sacrificial wooden hull sheathing and its underlying tarred felting must have degraded or worn off to the point where they no longer offered protection from shipworm infiltration. This shipworm damage indicates that NBHSS UAD SW#3's hull would have been in a structurally weakened and leaky state when the vessel sank. Multiple repairs to damaged hull planking documented in NBHSS UAD SW#3's recovered timbers is another indicator of the vessel's advanced age at the time of its sinking.

Given the presence of circular saw kerf marks in some of NBHSS UAD SW#3's timbers and the facts that circular saws were not introduced in America until 1810s (Carroll 1973) and didn't become commonly used in America until the 1860s (Defebaugh 1907), DSRA had hypothesized initially that the vessel's remains likely dated from the middle- to late-1800s. However, circular saws started to be used in England almost 100 years earlier (late 1700s) than they were in America. So, with a keel scarf that indicates a possible English origin for the ship, and the earlier use of circular saws in England, combined with other characteristics visible in NBHSS UAD SW#3's framing (i.e., lack of uniformity, absence of double-sawn frame construction, and the significant use of compass timbers), it is possible that the vessel remains comprising NBHSS UAD SW#3 are older than originally thought and may, instead, date from the early 1800s.

3.4 Conclusions and Recommendations

Actions taken on behalf of the EPA following the October 4, 2017 unanticipated discovery of NBHSS UAD SW#3 enabled the NBHSS's required environmental remediation activities to proceed while preserving important information about a rare and unique submerged cultural resource. The combined archaeological and archival research completed for this investigation suggests that unlike NBHSS UAD SW#1 and SW#2, NBHSS UAD SW#3 appeared to be of European (English) rather than American origin, to date from the early nineteenth century instead of the late eighteenth century, and to be the remains of a transoceanic whaling ship estimated to have been about 140 ft (43 m) long and 430-450 tons, rather than a 60-70 ft- (18-21 m-) long regional or inter-colonial coastal trader/merchantman. The conclusion about NBHSS UAD SW#3's country of origin was based on the diagnostic morphology of its European- (English-) style keel scarf. The estimated age of the vessel was based on the use of a circular saw to create sawn-to-shape framing timbers, as well as the less-degraded condition of the wood and some of the larger iron fasteners in the timbers, and the USACE-NAE's documentary evidence from 1837 that a single ship was removed from New Bedford Harbor's natural channel during the Spring of that year. NBHSS UAD SW#3's estimated hull length is based on the dimensions of its hull planking and the breadth of some of its floor timbers. The conclusion that NBHSS UAD SW#3 may have been a transoceanic whaling ship is based on the hull's projected size, the dominance of the 'ship' hull-type as the most common in New Bedford between 1800 and 1845 (see Table 2), the absence of a keel shoe (indicating a lack of concern for grounding), and the large number of whaling ships that were active in New Bedford during the first half of the nineteenth century.

While NBHSS UAD SW#3 was assessed as historically significant for its information potential, its site is not National Register-eligible, because of its lack of contextual integrity. This lack of integrity is attributable to the historical removal of nearly all of the vessel's hull from the Acushnet River's main channel as a navigational hazard prior to the 2017 unanticipated discovery of the remaining small portion of the ship's hull. The subsequent required removal of these remaining hull components as part of the NBHSS's remediation process also contributed to the NBHSS UAD SW#3 site's compromised contextual integrity. Given that the removed shipwreck timbers from NBHSS UAD SW3# all need to be discarded as contaminated materials, the recovery and documentation of NBHSS UAD SW#3's hull remains completed for this investigation are considered by the EPA and the MHC, as they were in the

cases of NBHSS UAD SW#1 and SW#2, to constitute a mitigative measure for reducing the adverse impacts to the NBHSS UAD SW#3 site. With this investigation now complete, ***no further investigation of the NBHSS UAD SW#3 hull remains, or its discovery location, is recommended. However, care should continue to be taken during all future phases of the NBHSS remediation project, because of the possibility that additional unanticipated discoveries of submerged cultural resources (e.g., shipwrecks) could occur. Wooden vessel remains that are buried beneath gaseous harbor floor sediments and are, therefore, undetectable in side scan sonar and sub-bottom profiler data, and that have highly (or completely) corroded ferrous components and, thus, present weak or non-existent magnetic anomalies in collected data, are difficult or impossible to detect with a magnetometer. These limitations, combined with the large number of vessels of various types and sizes that were reported to have been sunk in New Bedford Harbor during the Revolutionary War, together indicate that that the NBHSS may contain additional, heretofore undetected shipwrecks within its Area of Potential Effect.***

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FIGURES

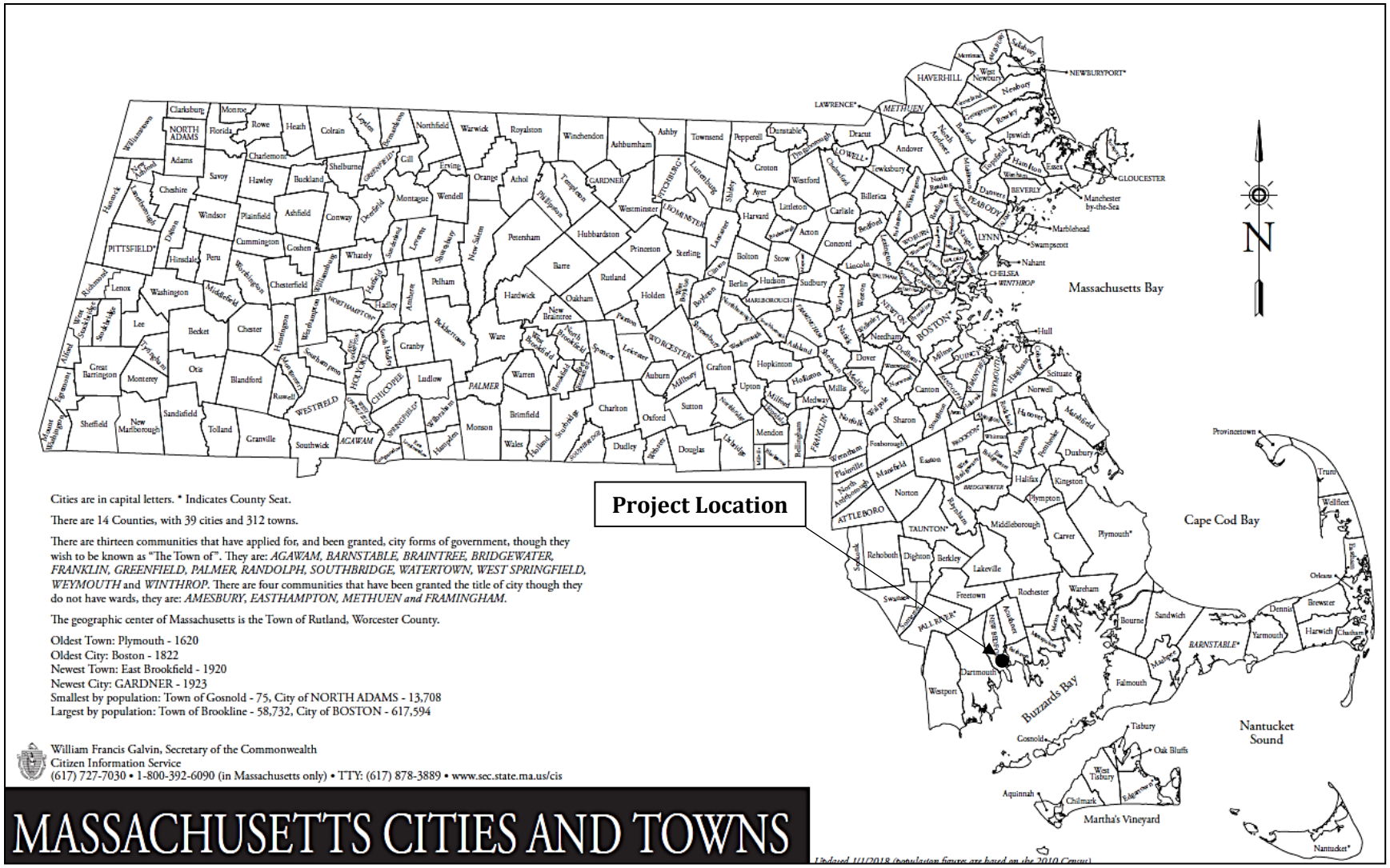


Figure 1. Project location within the Commonwealth of Massachusetts.

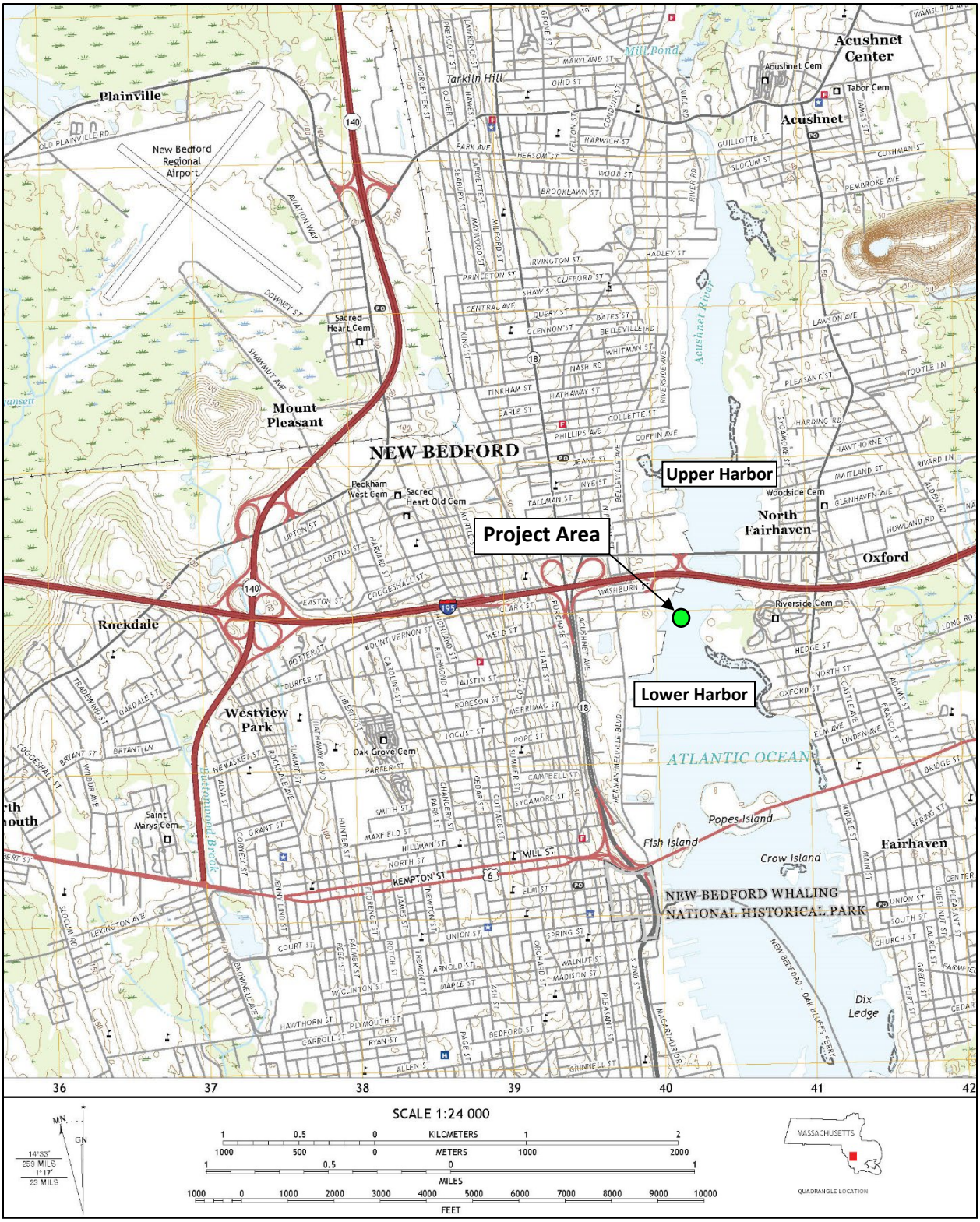


Figure 2. Annotated excerpt of U.S. Geological Survey (USGS) New Bedford North Quadrangle Massachusetts 7.5-minute series map showing project area location at the northern end of the New Bedford Harbor "Lower Harbor" area (after USGS 2018).

Figure 3. Ship remains encountered and recovered from the NBHSS UAD SW#3 site at the time of their unanticipated discovery on October 4, 2017 (photographs courtesy of Cashman).

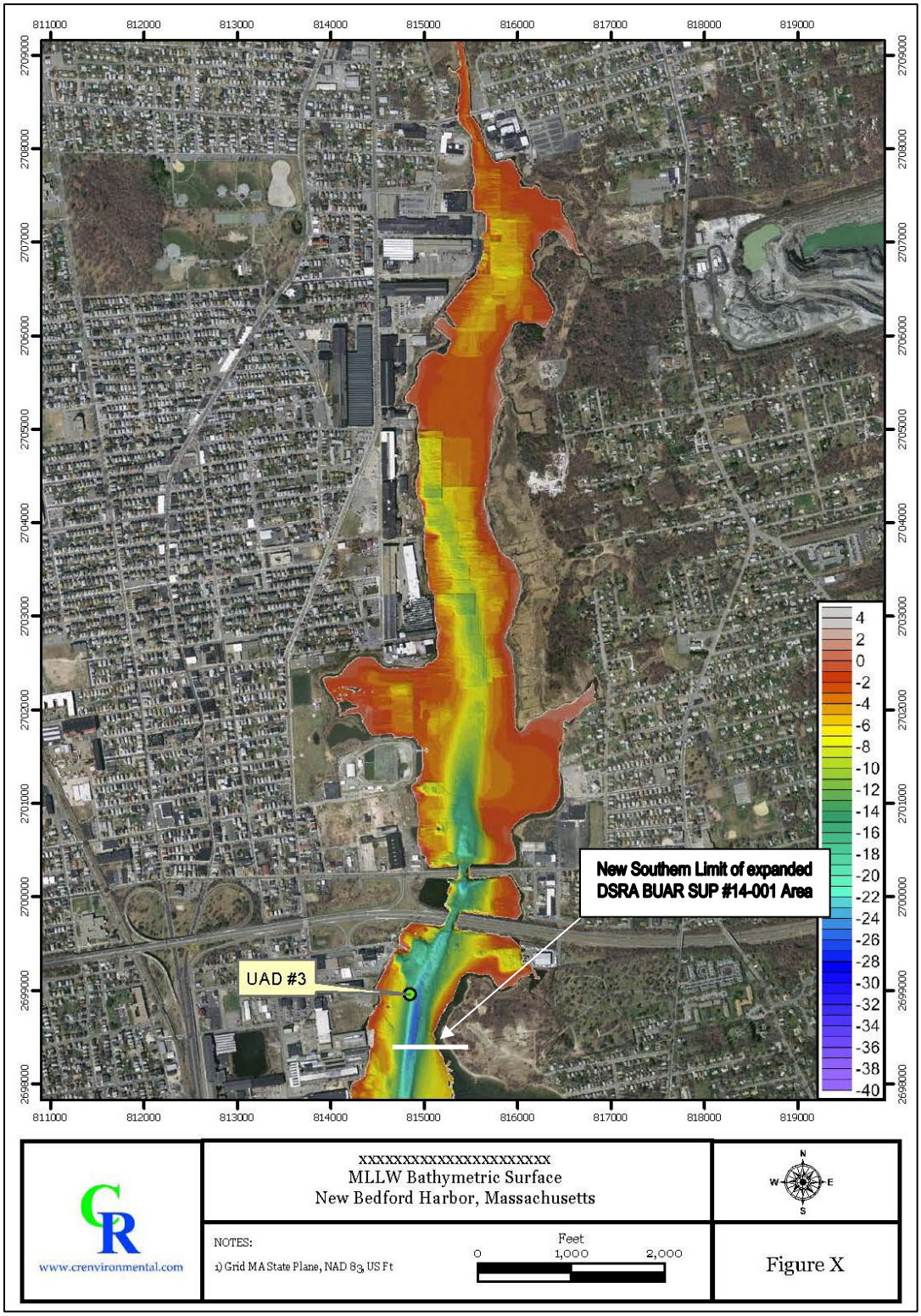
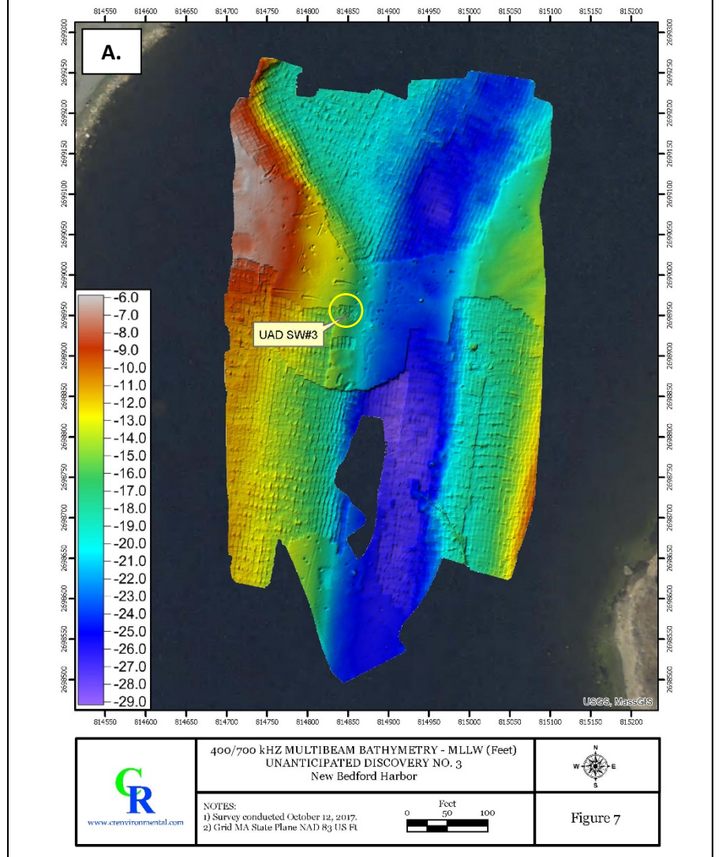
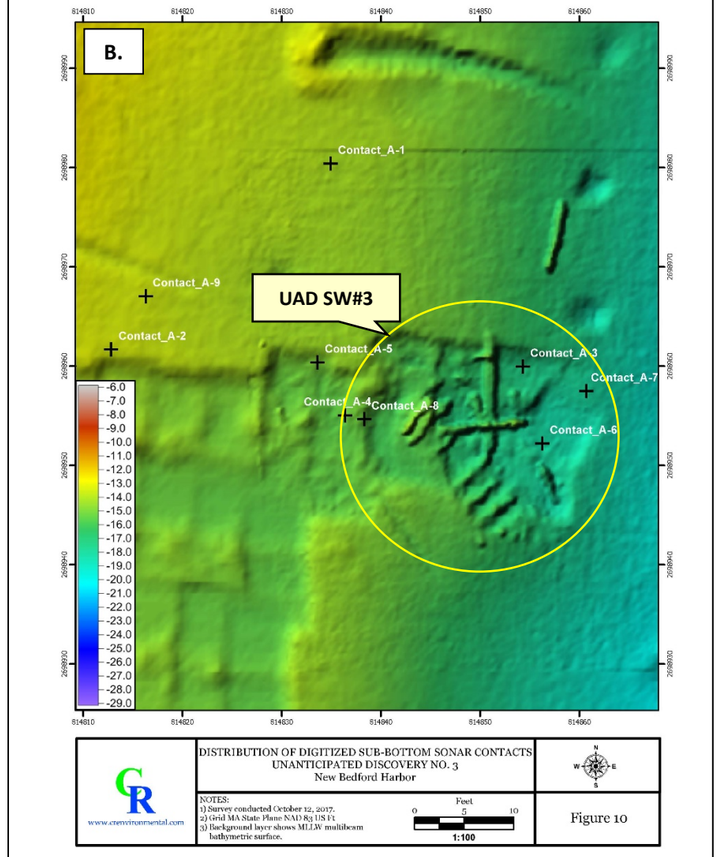


Figure 4. Locations of NBHSS UAD SW#3 and the extended southern limit of DSRA's BUAR SUP 14-001 permit area plotted onto a color-contoured bathymetry map of the Acushnet River (note NBHSS UAD SW#3's location at the edge of the dredged channel) (base figure provided by CR).





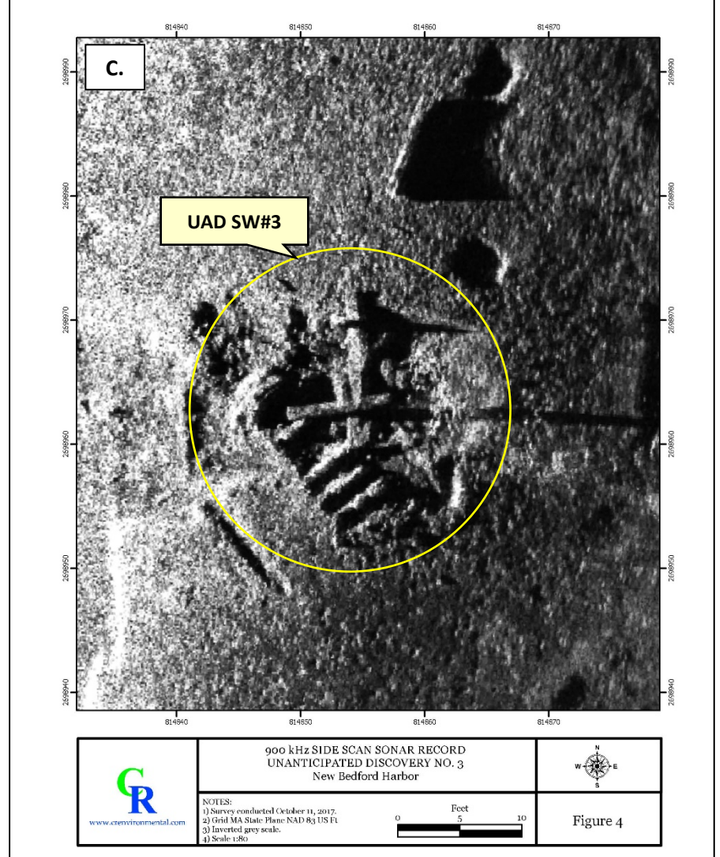


Figure 5. High-resolution acoustic remote sensing data plots (400-/700-kHz multibeam bathymetry [Images A and B] and 900-khz sidescan sonar [Image C]) acquired at the location of NBHSS UAD SW#3 on October 12, 2017 – eight days after its unanticipated discovery during contaminated sediment removal operations in the NBHSS Lower Harbor area (note the dredging scars in the harbor floor sediments in and around the location of the NBHSS UAD SW#3 find site) (images courtesy of CR).

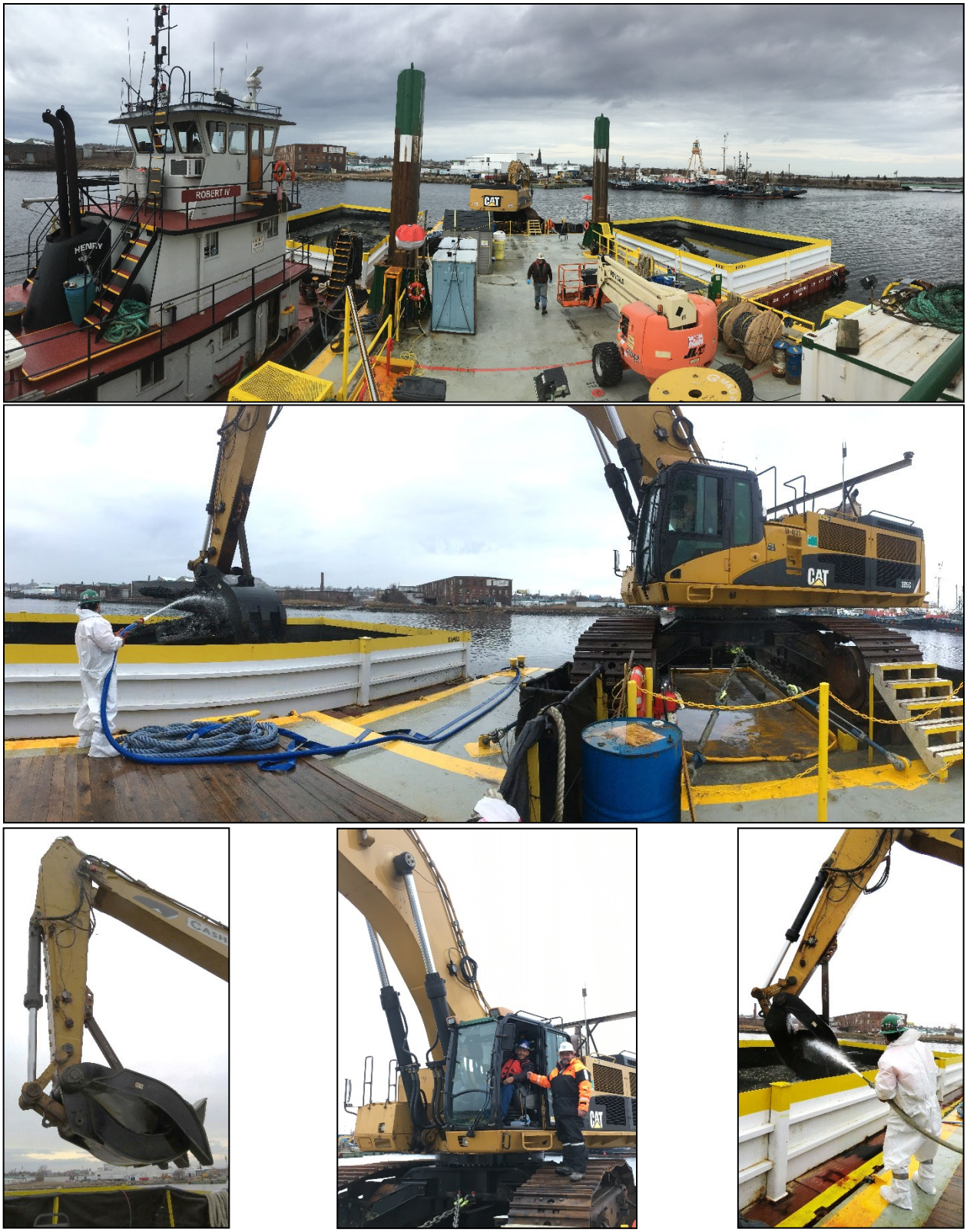


Figure 6. Cashman's marine archaeological recovery operations at the NBHSS UAD SW#3 site (February 10, 2018) (photographs by David Robinson, DSRA).

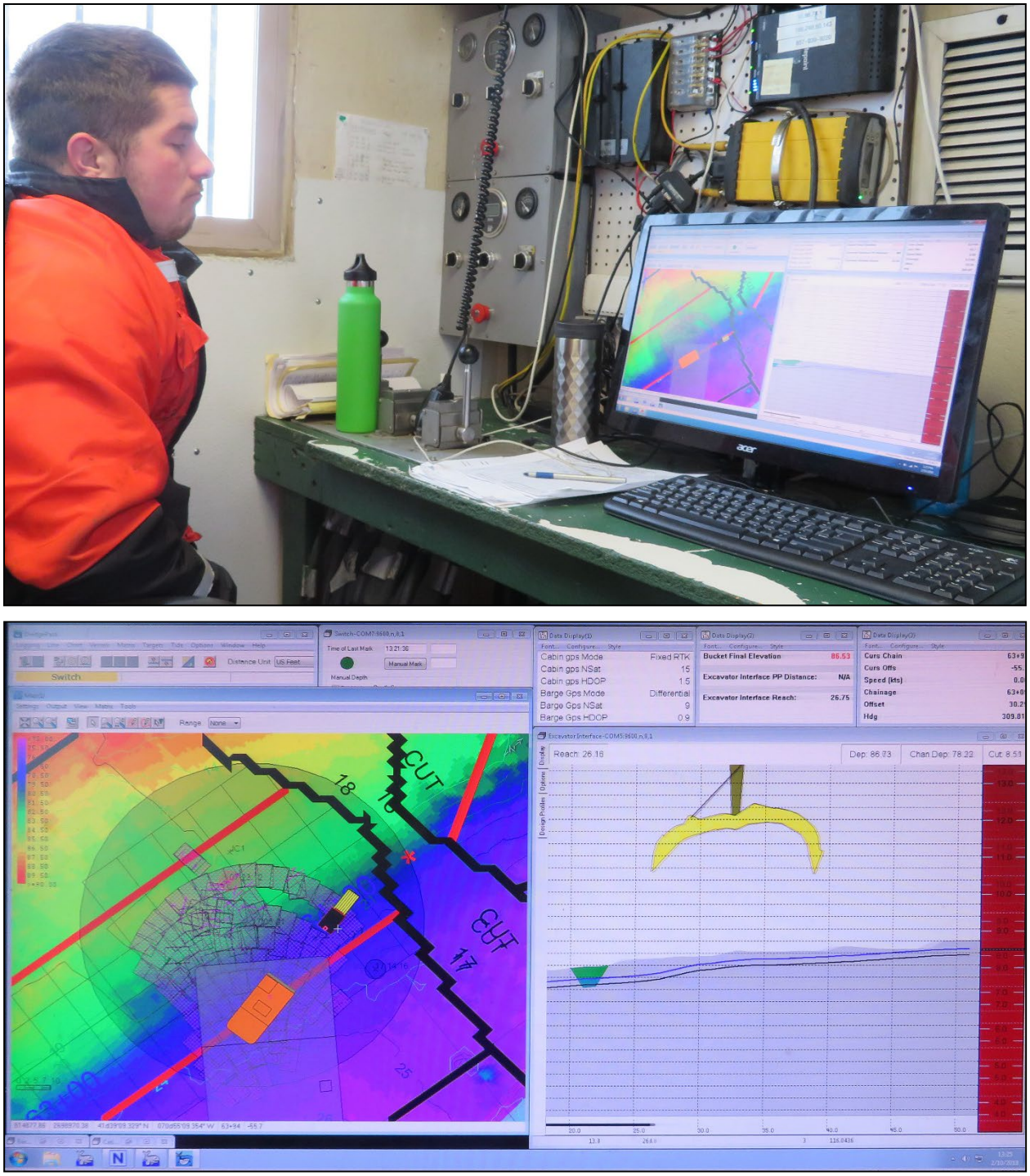


Figure 7. The horizontal and vertical positions of the recovery barge and machine-deployed grapple were controlled precisely during the systematic marine archaeological recovery of NBHSS UAD SW#3's timbers using a GPS and computer software interface that was monitored by Cashman's machine operator and their quality assurance/quality control staff in the control room of the recovery barge (photographs by David Robinson, DSRA).

Figure 8. Recovered NBHSS UAD SW#3 timbers were transferred from temporary post-recovery wet-storage in the hopper-barge to double-wrapped polyethylene "timber packets" that were then moved onto the NBHSS Sawyer Street facility pad for documentation (photographs by David Robinson, DSRA).

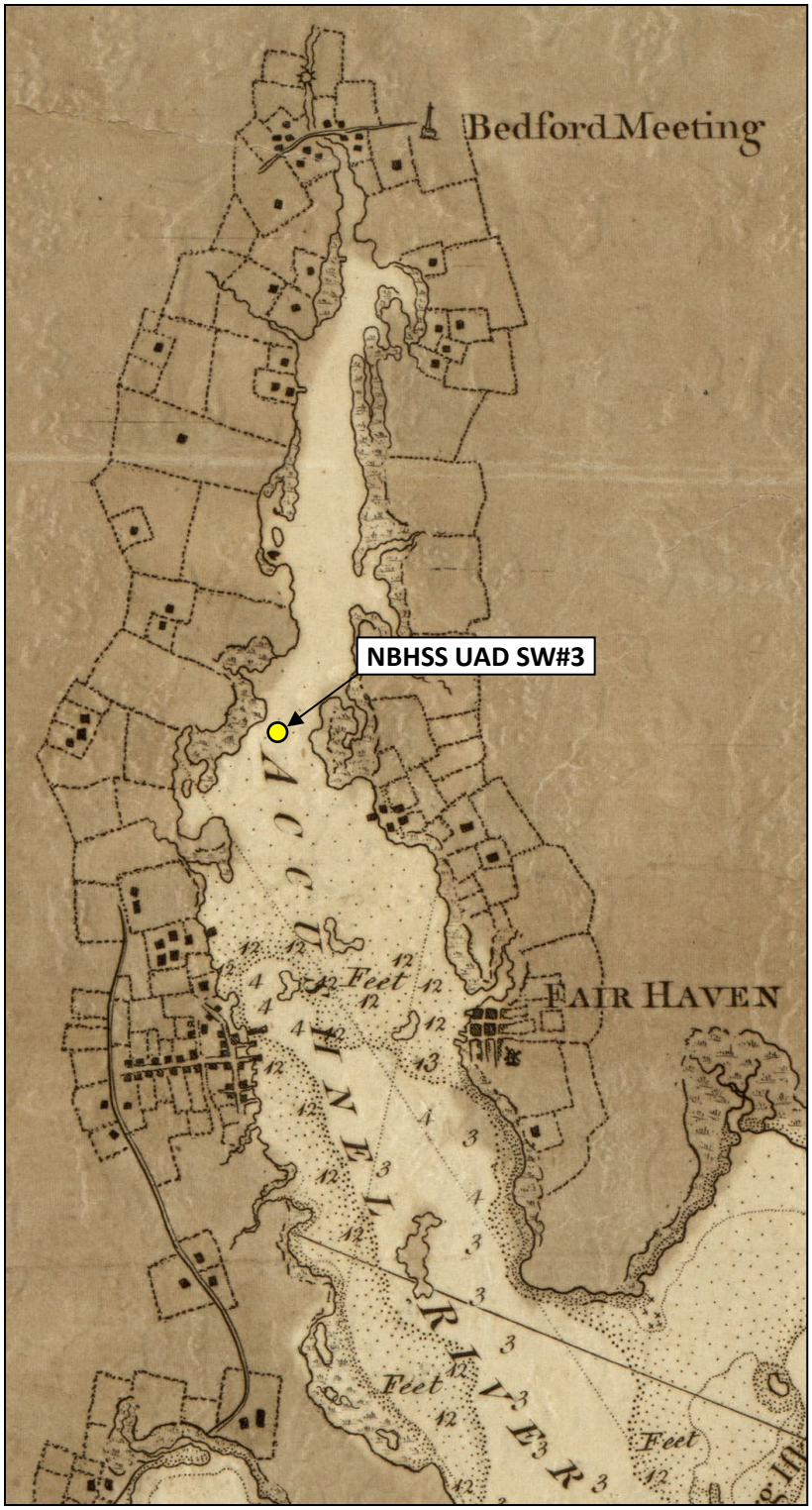


Figure 9. Excerpt from Joseph F. W. Des Barres's 1776 "Chart of Buzzards Bay and Vineyard Sound" showing the location of the NBHSS UAD SW#3 find relative to the then sparsely settled colonial villages along the Acushnet River, including the area on the river's western shore that would later become the township and then City of New Bedford (after Des Barres 1776).

Figure 10. Excerpts from J. Congdon's 1834 map of the Village of New Bedford showing a detail of the village center and developed waterfront (left image) and the location of NBHSS UAD SW#3 relative to the village (right image) (after Congdon 1834).

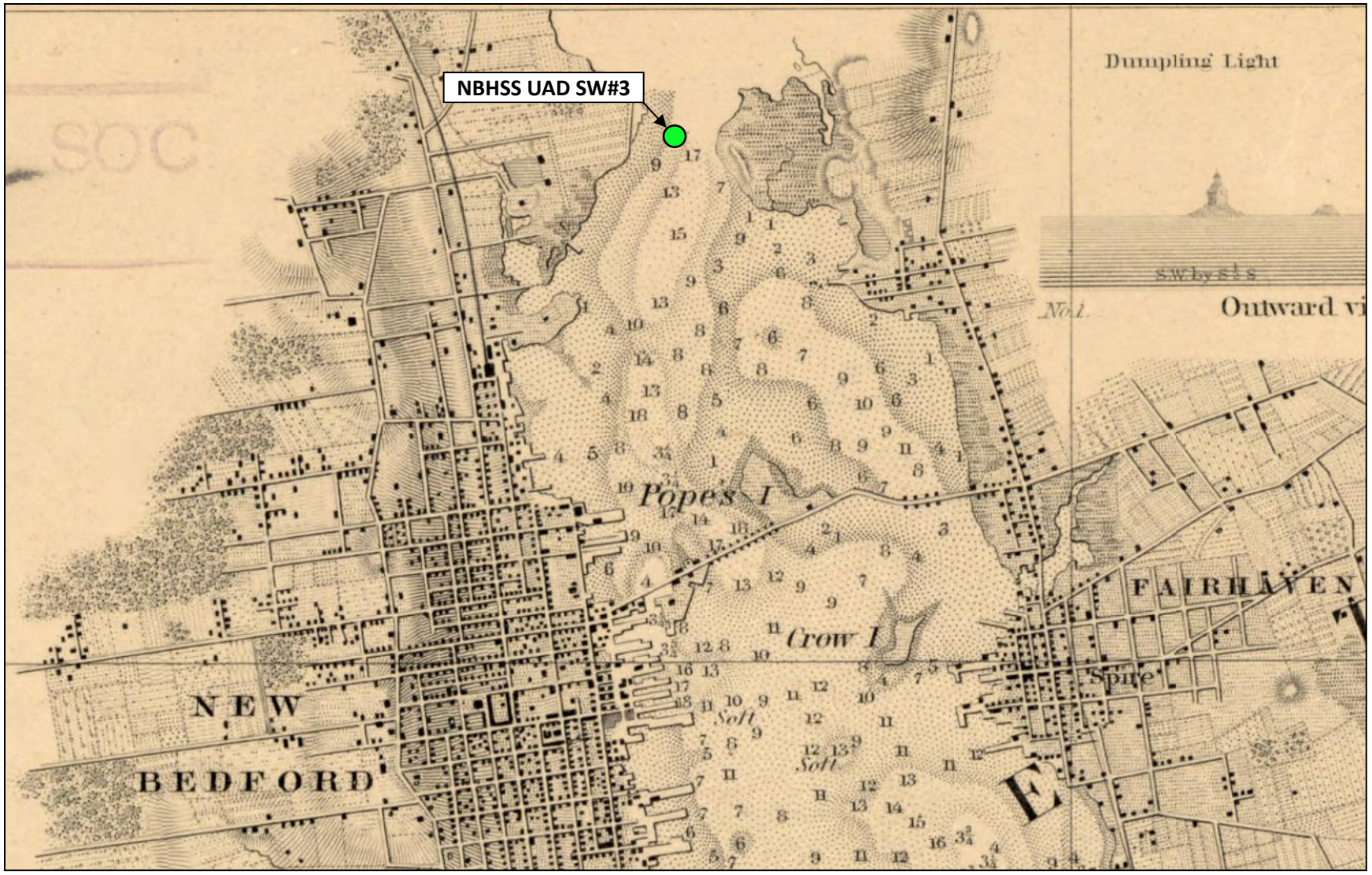


Figure 11. Excerpt of 1846 U.S. Coast Survey (USCS) navigation chart showing location of NBHSS UAD SW#3 within the Acushnet River's natural, un-dredged channel (after USCS 1846).

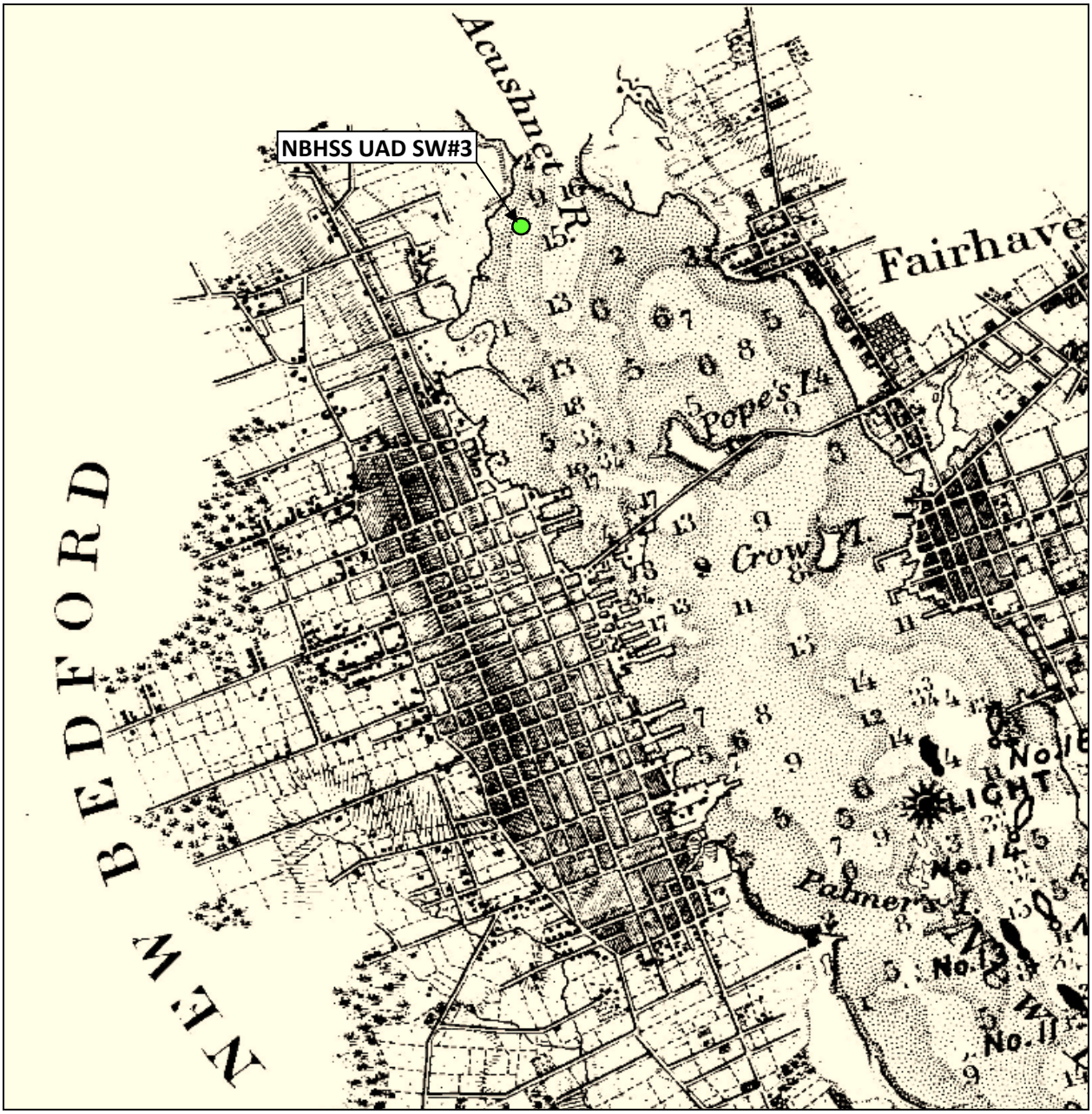


Figure 12. Excerpt from the 1877 U.S. Coast Survey (USCS) Buzzards Bay Massachusetts navigation chart showing the location of NBHSS UAD SW#3 within the natural and un-dredged channel (after USCS 1877).

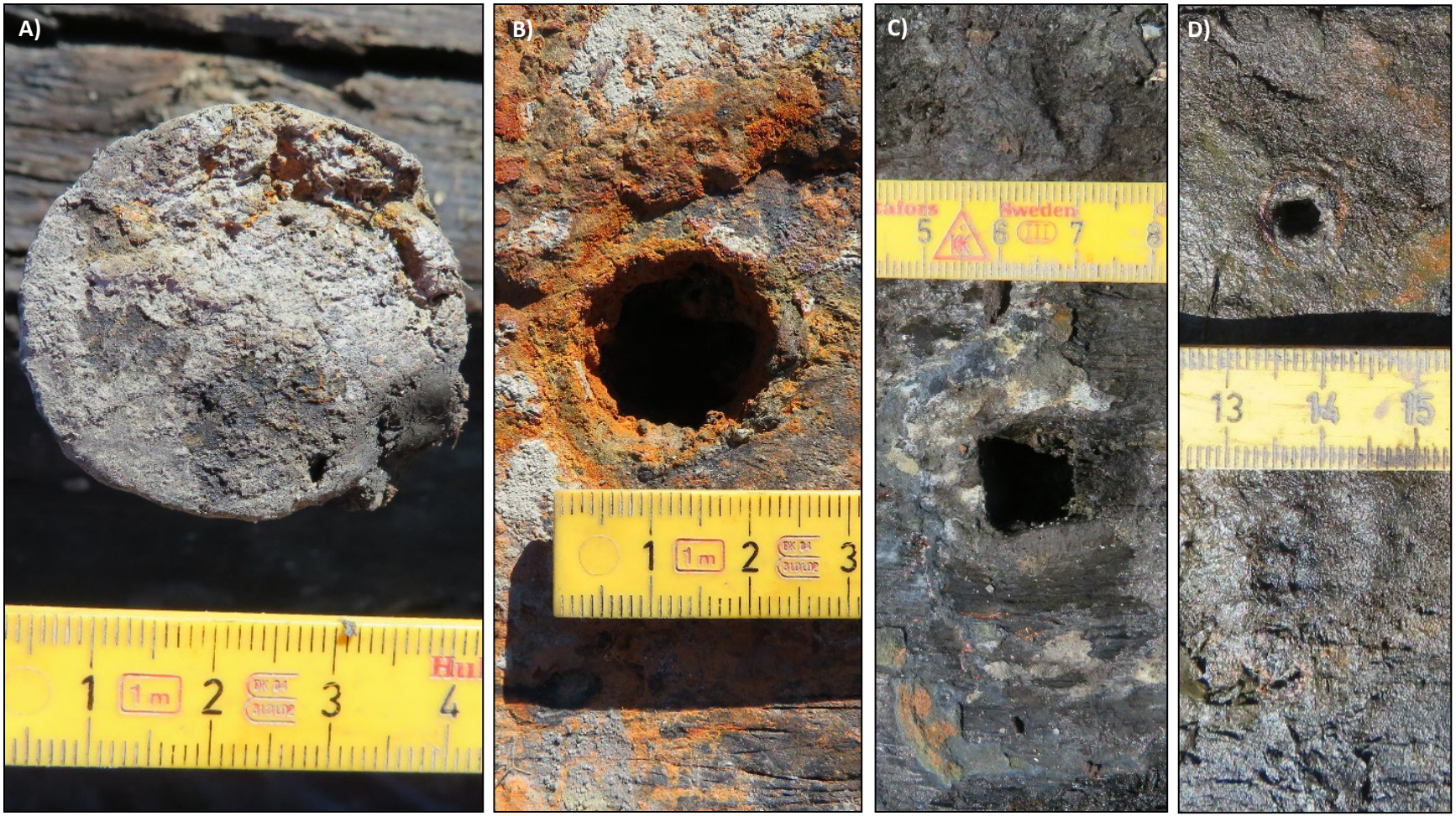


Figure 13. Fasteners documented in the NBHSS UAD SW#3 hull timbers included: A) treenails; B) iron bolts; C) iron spikes; and D) iron nails (photographs by David Robinson, DSRA).

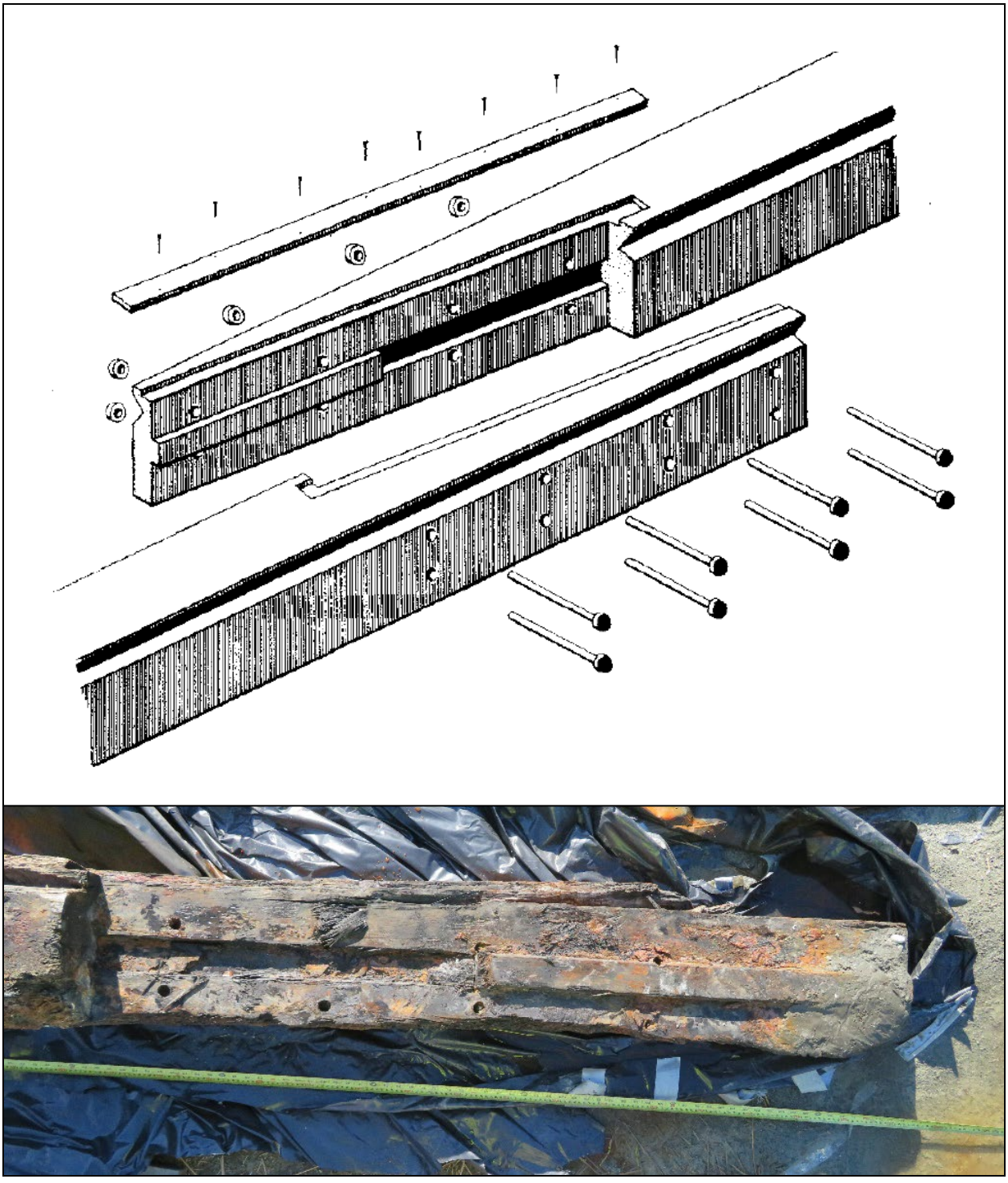


Figure 14. Diagram of the "boxing joint" "tabled" keel scarf documented during the archaeological study of the 1690 shipwreck of the British frigate *Dartmouth* (upper image; after Martin 1978), and the scarf in the keel remains of NBHSS UAD SW#3 (lower image; photograph by David Robinson, DSRA). The similarity between them provides evidence suggesting an English origin for NBHSS UAD SW#3.

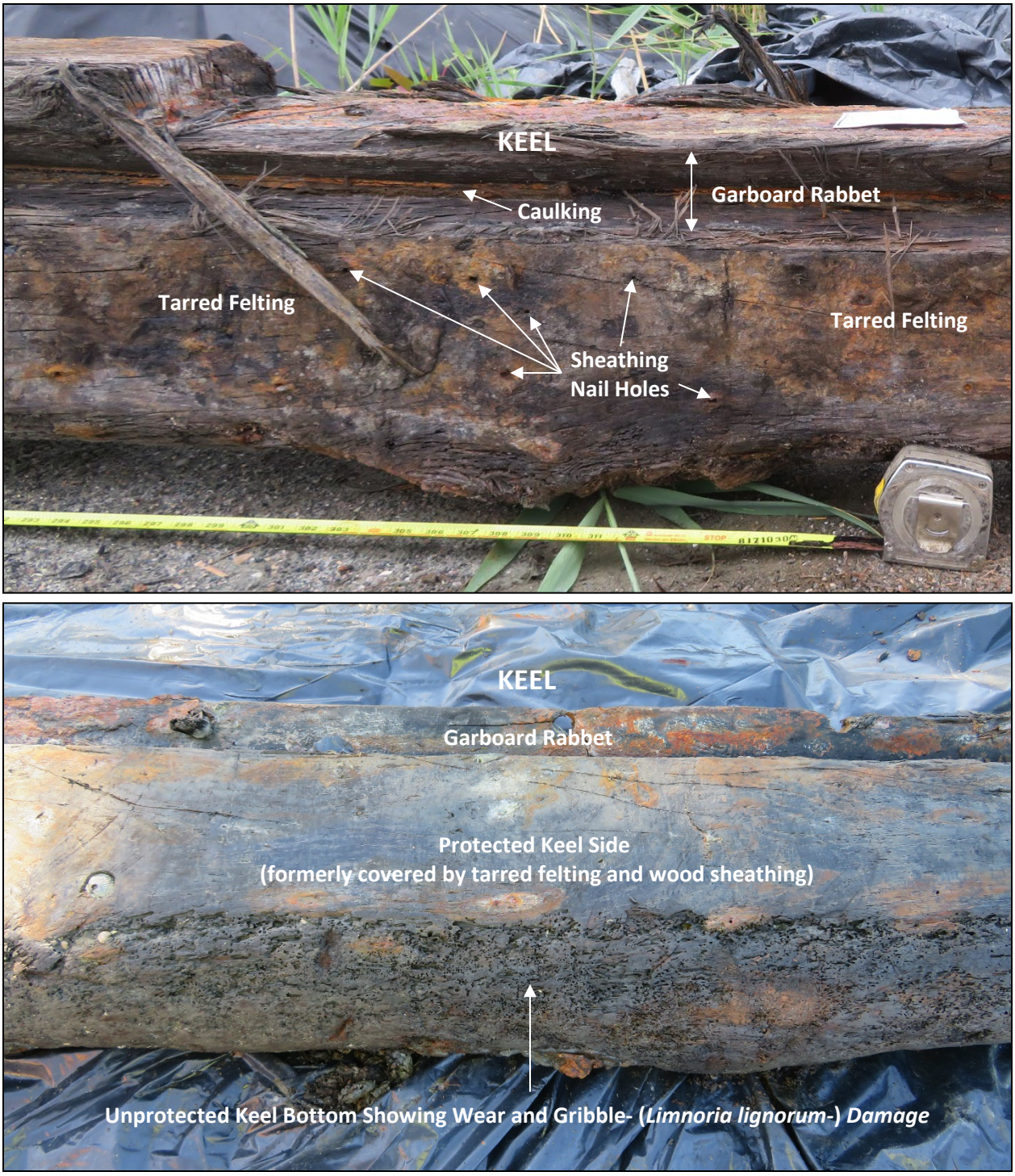


Figure 15. Detailed views of NBHSS UAD SW#3's keel showing evidence that sacrificial wooden hull sheathing, underlain by a layer of tarred animal-hair felting, had extended down and protected the sides of the keel, while the heavily-worn and wood-borer-damaged bottom of the keel does not appear to have been protected by sheathing or a shoe (photographs by David Robinson, DSRA).

Figure 16. Corrosion-stained recesses or "mortises" cut into both sides of the aft end of the keel once held the lower half of vertically-oriented iron "fishplates." These through-bolted iron plates extended up the sides of the keel and onto the sides of the lower portion of the sternpost and helped secure the connection between the bottom or "heel" the sternpost and the top surface of the keel's aft end (photographs by David Robinson, DSRA).

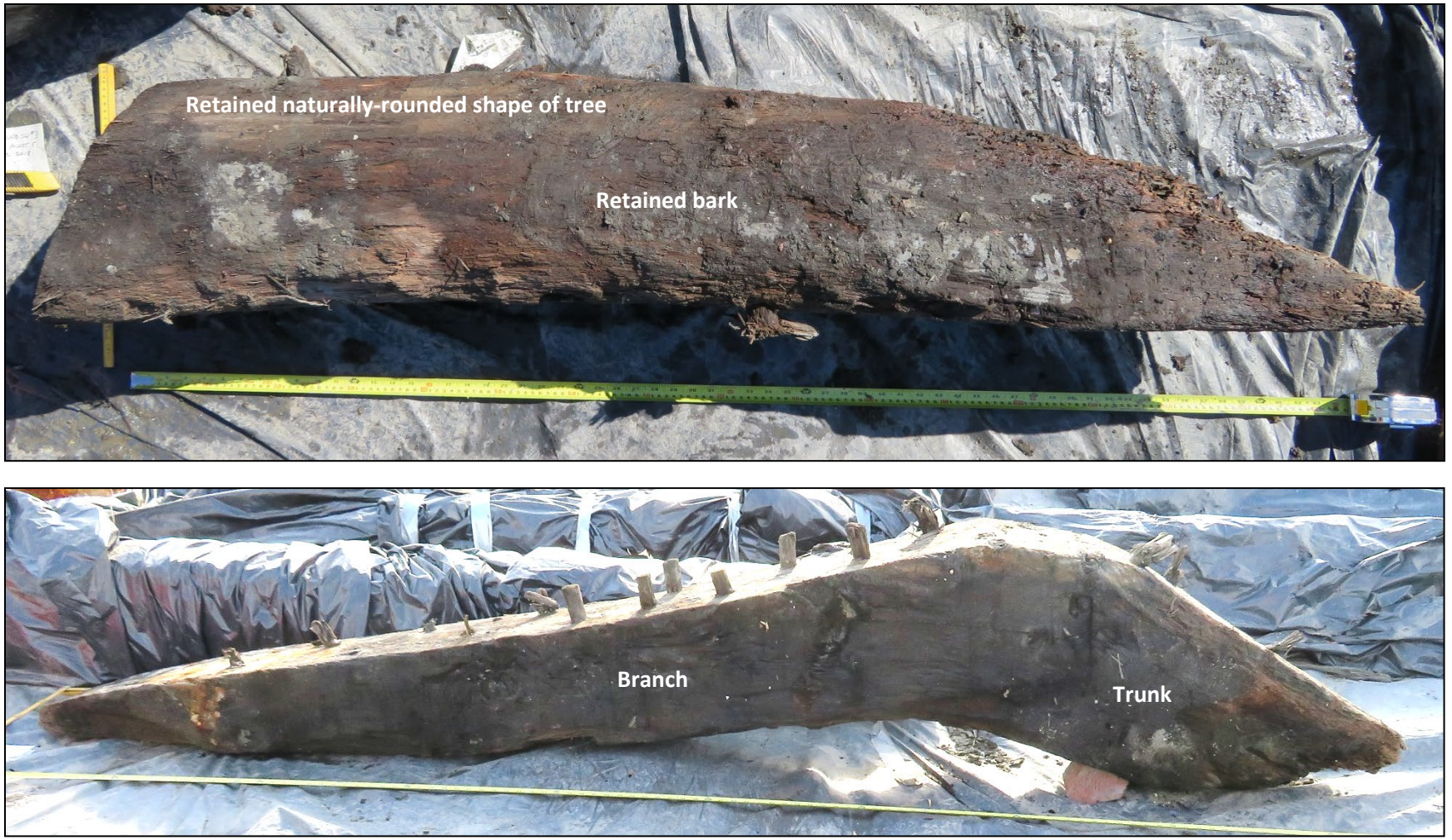


Figure 17. Examination of the surfaces, shapes, and wood grain of NBHSS UAD SW#3's framing timbers revealed several were "rough cut" and retained their source-tree's naturally rounded surfaces and shapes (upper image), and many were fashioned from "compass timbers" that were cut from parts of trees that were selected because their naturally grown shape fit the desired design shape of a particular timber (lower image) (photographs by David Robinson, DSRA).

Figure 18. The exposed end-grain of NBHSS UAD SW#3's treenail fasteners made them more vulnerable to shipworm (*Teredo navalis*) penetration and damage than the surrounding planking (upper image). Once infiltrated, the shipworms spread out laterally from the treenails into the surrounding hull planking and framing (bottom image). This damage, which was observed in NBHSS UAD SW#3's treenails, planking, and framing timbers, would have weakened the hull's integrity and caused it to leak (photographs by David Robinson, DSRA).

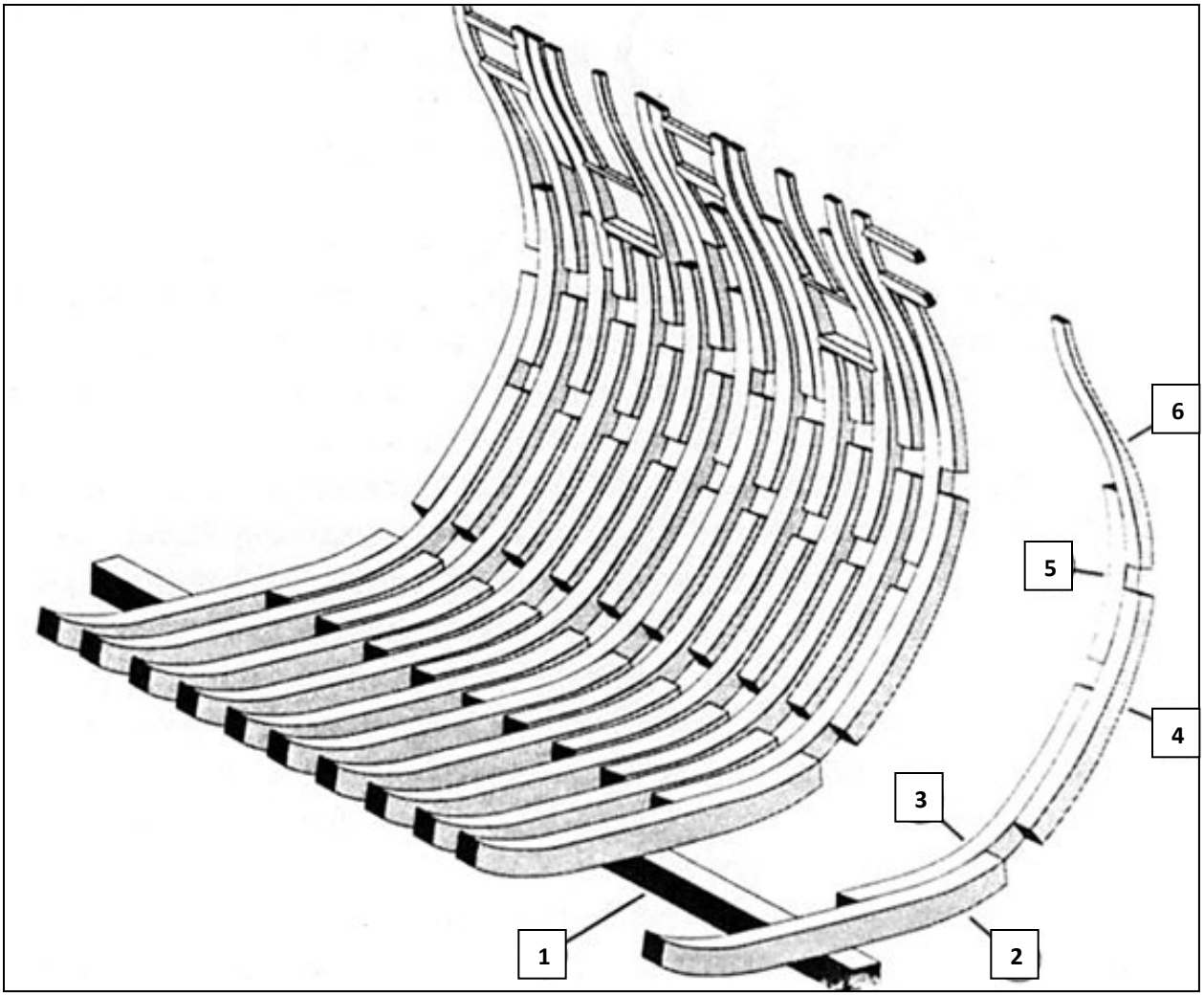


Figure 19. Representative diagram of basic ship framing elements at amidships (showing only on one side for clarity) that approximates what would have been the principal amidships framing elements in NBHSS UAD SW#3's hull when it was intact. The elements of each frame would have been secured to the keel (1) and have included the: 2) floor; 3) first futtock; 4) second futtock; 5) top timber; and 6) rail stanchion. Framing in NBHSS UAD SW#3 would have been much more irregular than is depicted here and would have exhibited more variation in curvature between frames as one moved forward or aft in the hull (after Kenchington 2017).

Figure 20. Surface features observed in NBHSS UAD SW#3's hull planking were limited to a single roman numeral scribe-mark ("X") near the intact end of one of the non-garboard hull planking fragments (upper image), and saw kerf marks that were clearly associated with a large circular saw (upper and lower images). Introduced in the 1830s, circular saw blades were commonly used in the sawmills of the eastern United States by the middle 1800s, but were introduced and adopted in English sawmills significantly earlier (i.e., the late 1700s) (photographs by David Robinson, DSRA).

Figure 21. Tarred animal hair "felting" and sheathing nail holes on the exterior surfaces of NBHSS UAD SW#3's hull planking and keel provided evidence that the vessel's hull had once been sheathed in protective sacrificial wooden hull sheathing (photographs by David Robinson, DSRA).

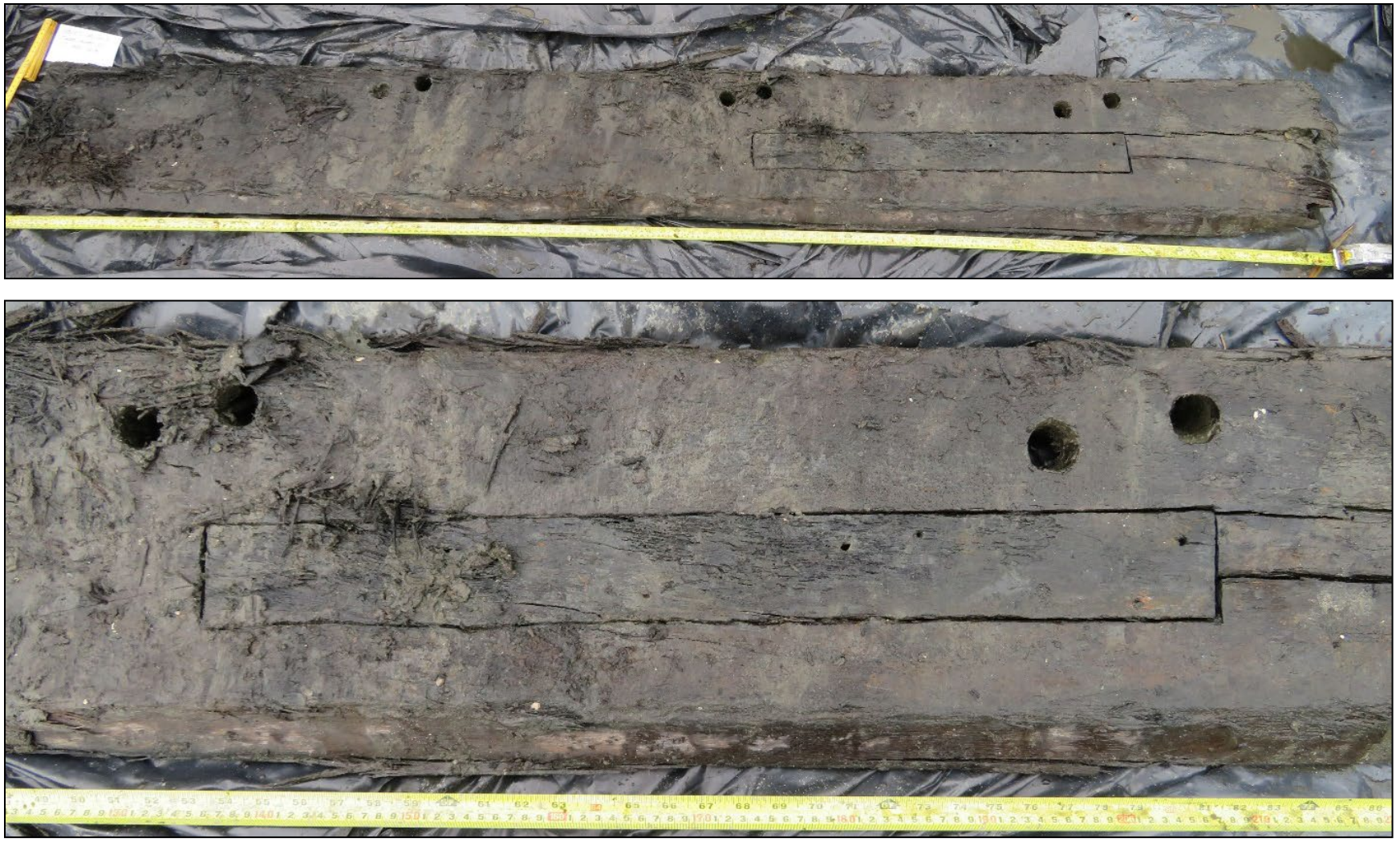


Figure 22. NBHSS UAD SW#3's hull remains included evidence of multiple repairs. Among them was a repair to one of the garboard strake fragments that had been made while the plank was in-place on the hull. The repair consisted of a small wooden "butt-block" patch that was inserted and nailed into place in a hole cut into the garboard near its end where the plank had split. The repair was made, presumably, to prevent the plank from splitting further along its length and causing the hull to leak (photographs by David Robinson, DSRA).

TABLES

TABLE 1. SCANTLINGS: NBHSS UAD-SW#1, NBHSS UAD-SW#2, AND NBHSS UAD-SW#3			
SHIPWRECK	**NBHSS UAD SW#1**	**NBHSS UAD SW#2**	**NBHSS UAD SW#3**
DATE	Late 1700s?	Middle 1700s?	Early 1800s?
NATIONALITY	Colonial – New England	Colonial – New England	European (English)?
TONNAGE	est. 100-110 tons	est. 90-100 tons	est. ca. 430-450 tons
LENGTH OVERALL	est. 70 ft	est. 60 ft	est. ca. 145 ft
LENGTH B/N PERP.	est. 57 ft	est. 51 ft	est. ca. 130 ft
BEAM	est. 22 ft	est. 18 ft	est. ca. 24 ft
LENGTH-TO-BEAM RATIO	est. 3.2:1	est. 3:1	est. ca. 6:1
DRAFT	–	–	–
HOLD DEPTH	–	–	–
KEEL LENGTH	56.6 ft	50.4 ft	35.8 ft (aft section only)
KEEL MOLDED	11.5-16 in (stern to bow)	9.4-13.8 in (stern to bow)	24.4-11.8 in (stern to aft section's forward end)
KEEL SIDED	8.2-10 in (stern to bow)	8.7-11 in (stern to bow)	8.7-10.2 in (stern to aft section's forward end)
KEEL WOOD TYPE	Hickory	–	–
STEM LENGTH	broken approx. 5.3 ft above heel	inner stem - broken 6.7 ft above heel	–
STEM MOLDED	1.7 ft (at heel)	inner stem - 7.9-13.4 in	–
STEM SIDED	9-7 in (aft to fwd face)	7.9-6.3 in (heel-to-head [aft face])	–
STEM WOOD TYPE	White oak	–	–
STERNPOST LENGTH	6.2 ft	–	–
STERNPOST MOLDED	10.6 in (uppermost preserved) to 14.8 in (at the heel)	–	–
STERNPOST SIDED	8 in (uppermost preserved) to 9 in (at the heel)	–	–
STERNPOST WOOD TYPE	White oak	–	–
KEELSON LENGTH	–	–	–
KEELSON MOLDED	–	–	–
KEELSON SIDED	–	–	–
KEELSON WOOD TYPE	–	–	–
FLOOR LENGTH (PRSVD. LGTH.)	2.3-11 ft	2.6-7.9 ft	8.0-13.7 ft
FLOOR MOLDED (AVG.)	9.4 in (at the throat)*	9.4 in (at the throat)*	11.4 in (at the throat)*
FLOOR SIDED (AVG.)	8.2 in (6.7-10.2 in)	8.2 in (6.7-10.2 in)	10.6 in (9.4-11.8 in)
1st FUTTOCK LENGTH (PRSVD.)	–	–	7.0-8.1 ft
1st FUTTOCK MOLDED (AVG.)	–	–	11.0 in
1st FUTTOCK SIDED (AVG.)	–	–	10.6 in
1st FUTTOCK OFFSET FROM CL	–	–	–
2nd FUTTOCK LENGTH (PRSVD.)	–	–	3.3-6.4 ft
2nd FUTTOCK MOLDED (AVG.)	3 sizes (9.5 in; 8 in; 8.5 in)	3 sizes (9.5 in; 8 in; 8.5 in)	10.2 in
2nd FUTTOCK SIDED (AVG.)	3 sizes (9 in; 7 in; 5 in)	3 sizes (9 in; 7 in; 5 in)	10.6 in
2nd FUTTOCK OFFSET FROM CL	–	–	–
SPACE B/N FRAMES (AVG.)	16 in (btwn floors over keel - floors spaced on 22 in centers); variable (2-8 in [btwn floors/futtocks])	14.5 in (btwn floors over keel - floors spaced on 20 in centers); variable (0-6 in [btwn floors/futtocks])	ca. 10.4 to 12 in (btwn floors over keel - floors spaced on 24 in centers); variable (0.8-3.1 in [btwn floors/futtocks])
FRAME WOOD TYPE	White oak	–	–
EXT. PLANKING THICKNESS	2 in	2 in	3-4 in
EXT. PLANKING WOOD TYPE	White oak	–	–
INT. PLANKING THICKNESS	–	–	–
INT. PLANKING WOOD TYPE	–	–	–
FASTENERS	Iron, treenails	Iron, treenails	Iron, treenails
SHEATHING	wood?	softwood - 0.6 in	wood?
NUMBER OF MASTS	Two?	One or Two?	–
ARMAMENT	–	–	–
VESSEL TYPE/TRADE	West Indies/Intercolonial?	Regional Coastal Trader?	Whaler?

TABLE 2. 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**	**1,029**

(data source: Works Progress Administration [1940])

APPENDICES

APPENDIX A

PROJECT CORRESPONDENCE

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

November 8, 2017

Ms. Karen Lumino
U.S. EPA - Region 1
5 Post Office Square, Suite 100
OSRR07-4
Boston, MA 02109

RE: Draft Technical Memorandum and Work Plan for Shipwreck #3, New Bedford Harbor Superfund Site, Acushnet River, New Bedford, Massachusetts

Dear Ms. Lumino.

The staff of the Massachusetts Board of Underwater Archaeological Resources has completed its reviewed of two documents provided by you via email on November 2, 2017. These are the *Draft Technical Memorandum, Marine Archaeological Review of Debris-Delineation Survey Data, New Bedford Harbor Superfund – Unanticipated Discovery Shipwreck #3* (dated October 2017) and the *Draft Work Plan, Marine Archaeological Investigation: Removal and Documentation of Recovered Hull Remains from NBHSS UAD SW#3, Lower Harbor Area (south of Route I-195 Bridge), Acushnet River, New Bedford, Massachusetts* (dated October 31, 2017) prepared by David S. Robinson & Associates, Inc. The Board concurs with the findings and recommendation of the draft technical memorandum and the draft work plan.

The Board appreciates the opportunity to provide these comments as part of the review process. Should you have any questions regarding this letter, please do not hesitate to contact me at the address above, by email at victor.mastone@state.ma.us, or by telephone at (617) 626-1141.

Sincerely,

Victor T. Mastone
Director and Chief Archaeologist

/vtm
Cc: Brona Simon, MHC
Bettina Washington, Wampanoag Tribe of Aquinnah (via email attachment)
Ramona Peters, Mashpee Wampanoag (via email attachment)
Marcus Paiva, USACE (via email attachment)
Paul Craffey, DEP (via email attachment)
Daniel Keefe, EPA (via email attachment)
Dave Lederer, EPA (via email attachment)

APPENDIX B

MBUAR SPECIAL USE PERMIT APPLICATION & PERMIT

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) 626-1141 Fax (617) 626-1240 Web Site: www.mass.gov/orgs/board-of-underwater-archaeological-resources

30 March 2018

David S. Robinson, M.A., R.P.A.
David S. Robinson & Associates, Inc.
55 Cole Street
Jamestown, RI 02835

RE: Supplemental Marine Archaeological Reconnaissance Survey, New Bedford Harbor Superfund Site Remediation, Acushnet, Fairhaven, and New Bedford, MA
Renewal of Special Use Permit 14-001

Dear Mr. Robinson:

This letter confirms the vote taken by the Massachusetts Board of Underwater Archaeological Resources on 29 March 2018 to renew Special Use Permit No. 14-001 to David S. Robinson & Associates, Inc. (DSRA) for marine archaeological reconnaissance survey as part of the in New Bedford Harbor Superfund Site Remediation in Acushnet, Fairhaven, and New Bedford for the areas detailed on the figures accompanying the application. The duration of this permit is one year from the date of issuance with its expiration date as 29 March 2019.

This permit is herein granted dependent upon DSRA'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, provide their proposed research design and methodology to, and obtain the approval of 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

/vtm

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

SPECIAL USE PERMIT APPLICATION

RENEWAL OF BUAR SUP PERMIT #14-001 FOR 2018-19

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, MA RPA
ORGANIZATION: David S. Robinson & Associates, Inc.
(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: 55 Cole Street, Jamestown, RI 02835

TELEPHONE NUMBER: 401-578-7233 **FAX NUMBER:** n/a
EMAIL ADDRESS: davidandhayley1@cox.net

PROJECT NAME: New Bedford Harbor Superfund Site Remediation (2014)
LOCATION OF PROPOSED ACTIVITY
Nearest City or Town: New Bedford
Name of Water Body: New Bedford Harbor
Depth of Water: 0-23 ft
Total Acreage of the Project Area: N/A
Description of Proposed Permit Area (narrative):
New Bedford's Upper Harbor Area - EXPANDED S TO ENCOMPASS LOCATION OF NBHSS UAD SW#3, South of Rte I-195 Bridge in the Lower Harbor Area at: 814848.57, 2698955.62 (MA State Plane, NAD 83, US FT)

Longitude and Latitude of Proposed Project Area (Project area of potential effect):
NE (N limit of upper harbor) NW (N limit of upper harbor)
SE 41 39'05" W70 55'05" SW 41 39'05" W70 55'16"

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)
CONTACT NAME/ORGANIZATION: Marc Paiva (USACE)
ADDRESS:
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):
(Already on file with MBUAR)

DESCRIPTION OF ANY KNOWN UNDERWATER ARCHAEOLOGICAL RESOURCE IN THE PROJECT AREA
No u/w arch. resources known in marine area. SW#2 and SW#3 removed.

Continued on page 2

Applicant initial DSR and date 2/26/18 to indicate concurrence with 312 CMR 2

DSR 2/26/18

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

- ☒ Reconnaissance Survey
- ☐ Intensive Survey
- ☐ Site Examination
- ☐ 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) Providing on-call marine archaeological supplemental reconnaissance survey and unanticipated discovery response to the US EPA/USACE in support of their on-going remediation activities in the NBHSS's Upper Harbor and upper Lower Harbor Areas.

(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)?
Work provided on an on-call capacity. Currently doing data-analysis for NBHSS UAD SW#2 and just beginning documentation of timbers recovered from NBHSS UAD SW#3.

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. (on file)

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)? (on file)

YOU MAY INCLUDE ANY OTHER INFORMATION YOU BELIEVE MAY ASSIST THE BOARD IN ASSESSING YOUR APPLICATION (Attach additional sheets as needed) This is an administrative renewal of DSRA's BUAR SUP #14-001, for on-call supplemental survey and unanticipated discovery response on behalf of the EPA and USACE in support of their on-going remediation activities being undertaken in the NBHSS.

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)	(Signature of Project Archaeologist)	2/26/18 (Date)
David S. Robinson, MA, RPA (Type or Print Name)	same (Type or Print Name)	same (Date)

FOR OFFICIAL USE ONLY (DO NOT COMPLETE THIS SECTION)

Date and Time Received: By:

2017 ANNUAL REPORT BUAR

Special Use Permit No. 14-001
NBHSS Dredging Project, Acushnet and New Bedford, MA
(MHC #RC.17682)
David S. Robinson & Associates, Inc.,
Jamestown, RI

In 2017, under BUAR Special Use Permit #14-001, David S. Robinson & Associates, Inc. (DSRA) continued serving as the on-call marine archaeologist for CR Environmental, Inc. (CR) and Jacobs Engineering, Inc. (Jacobs), in support of the United States Environmental Protection Agency's (EPA) and the United States Army Corps of Engineers' (USACENAE) ongoing remediation activities within the New Bedford Harbor Superfund Site (NBHSS). The harbor portion of the NBHSS was surveyed and reported on previously by Dolan Research, Inc. (Dolan) between 1999 and 2001 with the BUAR and MHC concurring with the survey's results and recommendations. Since the unanticipated discovery and subsequent marine archaeological investigation of an historical wooden shipwreck (i.e., "NBHSS UAD SW#1") in the Dolan-surveyed Upper Harbor Area in 2009, DSRA's David Robinson has served in an on-call capacity and has, working with CR, completed supplemental surveys of several portions of the Upper Harbor Area. Late in 2016, another unanticipated discovery of historical wooden sailing vessel remains (NBHSS UAD SW#2) was made in a portion of the Upper Harbor Area of the NBHSS that had been resurveyed by DSRA and CR. This was followed in 2017 by more unanticipated discoveries of submerged vessel remains in the non-resurveyed Lower Harbor Area by Cashman Dredging, the EPA and USACE's Lower Harbor Area dredging contractor. These vessel remains consisted of historical wooden sailing vessel remains (NBHS UAD SW#3) and the remains of a modern, small screw-propelled vessel (NBHSS UAD SW#4). Work Plan protocols for addressing NBHSS UAD SW#2 and SW#3 were prepared by DSRA and submitted to EPA, USACE, MHC, and BUAR for review, comment, and approval. The boundaries of DSRA's BUAR SUP No. 14-001 were also expanded southward to encompass NBHSS UAD SW#3's location. NBHSS UAD SW#4 was examined by DSRA and assessed as being the remains of a small, modern vessel not warranting additional archaeological investigation. The find locations of NBHSS UAD SW#2 and SW#3 were re-surveyed to help guide the systematic archaeological removal of the ship's timbers as hazardous materials. NBHSS UAD SW#2's timbers were recovered during the summer of 2017. SW#3's timbers were recovered in early 2018. The recovered timbers were transferred to shore for documentation, and double-wrapped in plastic to keep them wet. Post-recovery surveys were conducted at both find locations to confirm no elements of the shipwrecks were left behind. Documentation of NBHSS UAD SW#2 was completed in early 2018. Documentation of NBHSS UAD SW#3 began in early 2018 and is ongoing. Analysis of the timber documentation field notes and preparation of the supplemental memorandum report on NBHSS UAD SW#3 is underway. Completion and submittal of the NBHSS UAD SW#2 report is anticipated for July or August of 2018 with completion and submittal of the NBHSS UAD SW#3 report expected before in late 2018.

INTEGRITY • KNOWLEDGE • EXPERIENCE

DAVID S. ROBINSON & ASSOCIATES, INC.

Marine Archaeological Consultants

FINAL TECHNICAL MEMORANDUM
Marine Archaeological Review of Debris-Delineation Survey Data

New Bedford Harbor Superfund Site – Unanticipated Discovery Shipwreck #3
Acushnet River, New Bedford, Massachusetts

November 2017

Prepared for:

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

Prepared by:

David S. Robinson, M.A., R.P.A. (DSRA)
Christopher F. Wright, B.A., C.H. (CR)

TABLE OF CONTENTS

INTRODUCTION

This Draft Technical Memorandum presents the results and management recommendations from David S. Robinson & Associates, Inc.'s ("DSRA's") marine archaeological review of processed remote sensing data acquired by CR Environmental, Inc. ("CR Environmental") during a detailed debris-delineation survey conducted between October 10 to 12, 2017 within the Lower Harbor Area of the New Bedford Harbor Superfund Site ("NBHSS"), in the Acushnet River, Bristol County, New Bedford, Massachusetts. The survey was conducted at the location of an "unanticipated discovery" of historical wooden ship remains, termed here "NBHSS Unanticipated Discovery Shipwreck #3" (NBHSS UAD SW#3), that was made by Cashman Dredging & Marine Contracting Co., LLC (Cashman) on October 4, during their performance of remediation dredging operations conducted on behalf of the U.S. Environmental Protection Agency – Region 1 ("EPA") and the U.S. Army Corps of Engineers – New England District ("USACE-NAE") within the previously-surveyed and archaeologically-cleared portion of the NBHSS Lower Harbor Area (see Cox, Jr. 2000).

Cashman's dredging operations are part of EPA and USACE-NAE's ongoing federal program of environmental remediation activities being conducted within the NBHSS. As the remediation activities constitute a federal undertaking requiring federal funds and permits, compliance with Section 106 of the National Historic Preservation Act of 1966, as amended ("NHPA") (36 CFR 800), is necessary. 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 ("ACHP") 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 operates within the offices of the Massachusetts Historical Commission ("MHC"), working in consultation with the Massachusetts Board of Underwater Archaeological Resources ("MBUAR").

Cashman is the engineering/dredging consultant contracted by EPA to conduct remediation dredging of contaminated soils and sediments within the marine portion of the NBHSS Lower Harbor Area. Although DSRA serves as Jacobs's principal 'on-call' archaeologist for the NBHSS Upper Harbor Area through DSRA's contract with CR, Jacobs's principal geophysical survey and mapping consultant for the Upper Harbor portion of the remediation project, Jacobs, CR, and DSRA were asked by EPA, USACE-NAE, and Cashman to assist them with the Lower Harbor Area unanticipated discovery of NBHSS UAD SW#3. The NBHSS Lower Harbor Area where the unanticipated discovery was made was previously surveyed and archaeologically cleared, in compliance with the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), as a result of surveys conducted between 1999 and 2000 by John Milner Associates, Inc. (JMA) and its marine archaeological consultant, Dolan Research, Inc. (Dolan). While the unanticipated discovery of another wooden shipwreck in the NBHSS Upper Harbor Area in 2009 (i.e., "NBHSS UAD SW#1") led EPA and USACE-NAE to adopt a new program of secondary and supplemental high-resolution marine archaeological site identification re-surveys of the marine and intertidal portions of the NBHSS Upper Harbor area by CR and DSRA (also surveyed previously by JMA and Dolan), to reduce the chances of similar unanticipated discoveries of additional shipwrecks from occurring, no similar program of

marine archaeological identification re-survey has been performed to date within the NBHSS Lower Harbor Area.

The unanticipated discovery of NBHSS UAD SW#3 on October 4, 2017 during remediation dredging operations that were being performed by Cashman occurred at the northern end of the NBHSS's Lower Harbor Area, a short distance south of the Route I-195 bridge, within the city of New Bedford, Bristol County, Massachusetts (see Figure 1). The encountered submerged wooden ship remains were identified when they were brought to the surface in Cashman's environmental bucket (Figure 2). Upon encountering the wooden ship remains, Cashman followed the protocols of the NBHSS Unanticipated Discovery Plan (UDP), developed by Jacobs in 2010 for their NBHSS Upper Harbor remediation work for EPA and USACE-NAE. Cashman halted all remediation dredging work immediately within a 200-foot radius of the find location upon making the unanticipated discovery. EPA and USACE-NAE were then informed of the find, photographs of the recovered ship hull remains were taken (see Figure 2), coordinates for the find were recorded and reported (814848.57 / 2698955.62 [MA State Plane – feet], NAD 83), and the recovered wooden ship remains were placed temporarily in an on-site hopper barge partially filled with water to help preserve the wooden timbers while the plan for their disposition was developed (as documented in T. Rezendes' USACE-NAE, email to M. Paiva, USACE-NAE, October 5, 2017).

Continuing to follow UDP protocols, EPA/USACE notified Victor Mastone, Director of Massachusetts Board of Underwater Archaeological Resources (MBUAR), and DSRA's David Robinson, the on-call marine archaeologist for the NBHSS, of the find, on the same day it occurred [October 4, 2017]). EPA, USACE-NAE, Cashman and Jacobs then coordinated and a teleconference with representatives from EPA, USACE-NAE, Cashman, CR, DSRA, and Jacobs was held on October 5, 2017 to discuss the next steps for addressing the unanticipated discovery. Given that this find is the third unanticipated discovery of historical wooden ship remains in the NBHSS since 2009, an established and agency-approved approach was available to guide the response and development of this work plan for the NBHSS UAD SW#3 find. The teleconference concluded with the following next steps outlined:

a) EPA and USACE-NAE would continue to and/or initiate coordination and consultation with the MHC, MBUAR, the Tribes, and interested stakeholders, and would keep the project team informed of its status;

b) Cashman would provide coordinates and available dredging data from the area surrounding the NBHSS UAD SW#3 find location to the project team and would move the barge with the find's recovered timbers to the Jacobs pier at the NBHSS Sawyer Street facility;

c) CR would conduct a high-resolution non-disturbance, engineering debris-delineation survey in the area around the reported find site to try to more fully characterize the nature and extent of the NBHSS UAD SW#3-related debris, and provide processed data to DSRA to review for the purpose of developing a marine archaeological assessment report and site-specific shipwreck recovery marine archaeological work plan;

d) DSRA would: i) coordinate with CR regarding their debris-delineation survey methodology; ii) coordinate with MBUAR to request a revision to and expansion

> of the southern limit of their current Upper Harbor permit area to encompass the location of the NBHSS UAD SW#3; iii) review CR's processed data and narrative description of their debris-delineation survey methods to interpret them from a marine archaeological perspective; and iv) prepare: 1) a brief technical summary report on the survey's methods and results; and 2) a draft work plan outlining the tasks to be performed at the NBHSS UAD SW#3 find site that follows the same agency-approved research design model developed and employed in the cases of the previous two unanticipated discoveries of historical wooden shipwrecks in the NBHSS's Upper Harbor Area.

On October 6, 2017, DSRA coordinated with CR regarding their debris-delineation survey methodology and requested and obtained a map from CR showing the plotted location of NBHSS UAD SW#3 (based on the coordinates provided by Cashman) for DSRA to include in their MBUAR Special Use Permit-revision application.

On October 7, 2017, while DSRA's Principal, David Robinson, was at the NBHSS Sawyer Street facility to document NBHSS UAD SW#2 timbers, he examined and photographed from the Jacobs pier the recovered NBHSS UAD SW#3 timbers that were exposed above the water inside of the barge in which they are being temporarily stored. Robinson observed that NBHSS UAD SW#3 framing timbers looked substantially larger than those from NBHSS UAD SW#1 or SW#2. Given that NBHSS UAD SW#1 was digitally-reconstructed to be the remains of an approximately 70-foot long vessel, the observed larger dimensions of the timbers from NBHSS UAD SW#3 suggest that they are from a vessel that could have been significant larger than the NBHSS UAD SW#1 vessel (e.g., an 80- to 100+-foot long vessel).

Between October 10 and 12, 2017, CR conducted their high-resolution, debris-delineation, remote sensing survey (i.e., hydrographic and geophysical) of the NBHSS UAD SW#3 find location. Survey systems included sidescan sonar, magnetometry, subbottom sonar profiling, and multibeam bathymetry. The survey efforts were designed to provide the highest definition data possible to characterize and delimit the extent of the unanticipated discovery.

On October 16, 2017, DSRA submitted to Victor Mastone, Director of the MBUAR, the application for the revision (expansion) of their Special Use Permit (SUP) 14-001, and coordinated with USACE-NAE archaeologist, Marcos Paiva, to inform him that the application had been submitted and to get an update on the status of the EPA and USACE-NAE's consultation with SHPO (MHC), tribes and stakeholders.

On October 17, 2017, provisional approval of the revision to DSRA's MBUAR SUP 14-001 was obtained from MBUAR Director Mastone. Formal approval by the full MBUAR is pending their next meeting on November 30, 2017. Only provisional approval is required to include the NBHSS UAD SW#3 site in DSRA's expanded SUP Area and to move forward with the planning of additional marine archaeological investigation.

Between October 17 and October 19, 2017, DSRA received CR's initial plots of their processed high-resolution NBHSS UAD SW#3 debris-delineation survey data, and a narrative text description of their survey instrumentation and data acquisition and processing methodologies.

All work conducted by DSRA and CR Environmental as part of this detailed marine archaeological remote sensing investigation of NBHSS UAD SW#3 in the Lower Harbor Area was 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 *Plans and Procedures for Addressing Unanticipated Discoveries of Cultural Resources and Human Remains* (Jacobs 2010), the MBUAR's P*olicy 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).

David S. Robinson, M.A., R.P.A., was responsible for the overall performance of the archaeological review and assessment of CR's remote sensing survey data acquired at location of the NBHSS UAD SW#3. Remote sensing survey data (i.e., sidescan sonar, magnetometer, subbottom profiler, and multibeam bathymetry) reviewed by DSRA for this investigation were acquired by CR Environmental, and post-processed and plotted by Christopher Wright (Certified Hydrographer, CR). Chip Ryther (Oceanographic Operations Manager, CR) and Charlotte Cogswell (Principal, CR) were responsible for the overall management of the data acquisition and the preparation of this report. This investigation was coordinated and performed with the direction and assistance of Jacobs's on-site NBHSS staff Mark Gouveia, Steve Fox, and Josh Cummings.

All supporting documentation collected during the course of this investigation is on file at David S. Robinson & Associates, Inc., 55 Cole Street, Jamestown, Rhode Island 02835. Raw and processed remote sensing survey data products are on file at CR Environmental, Inc., 639 Boxberry Hill Road, East Falmouth, Massachusetts 02536. DSRA and CR Environmental serve as temporary curation facilities for this information until such time as the Commonwealth of Massachusetts designates a permanent state repository.

METHODS

CR Environmental conducted detailed high-resolution, remote sensing debris-delineation survey of the NBHSS UAD SW#3 find area between October 10 and 12, 2017. Survey systems included sidescan sonar, magnetometry, subbottom sonar profiling, and multibeam bathymetry. The survey efforts were designed to provide the highest definition data possible to characterize the discovery. Data acquisition and processing methods are detailed below.

Data Acquisition

Navigation for the surveys was accomplished using a Hemisphere VS330 Real-time Kinematic Global Positioning System (RTK GPS). The horizontal accuracy of the system is approximately 0.4 of an inch horizontally and 0.8 of an inch vertically (Root Mean Squared 1-sigma). Horizontal accuracy in differential or float mode is approximately 1 foot. RTK corrections were provided via NTRIP internet connection by KeyNetGPS, Inc. The RTK GPS serial output was split and interfaced to shipboard computers running HYPACK navigation software, Chesapeake Technology, Inc. SonarWiz 5 software and Edgetech Discover software.

Sidescan sonar data were collected using an Edgetech, Inc. Model 4125 400/900 kilohertz (kHz) digital sonar system. Using the higher resolution 900-kHz signal, the system has an effective across-track (athwartships) resolution of 0.6 of an inch. Data were collected by occupying transects alongside and above the discovery using swath ranges from 33 to 164 feet with a resultant feature resolution of approximately 1.6 to 4 square inches. Digital data from 16 sidescan sonar passes were recorded in JSF format using SonarWiz software.

Subbottom profiler data were collected using an Edgetech, Inc. Model 3100P, 2 to 15 kHz digital profiling system. The vertical resolution of the system is approximately 2.4 to 4 inches. Data were collected by occupying a grid of transects alongside and above the discovery using a transect spacing of 10 feet. Data were acquired using a 20-millisecond wide-band pulse and 66-foot profile range. Digital data from 36 subbottom profiler passes was recorded in JSF format using Edgetech Discover software.

Magnetic data was collected using a Marine Magnetics, Inc. Explorer magnetometer. The sensitivity of the system is 0.02 nanoTeslas (nT). Data were collected by occupying north/south transects alongside and above the discovery using a transect spacing of 10 feet. Scans were recorded in Hypack at 2-Hz resulting in an approximately 2- to 3-foot scan separation distance. Digital data from 40 transects were recorded during the survey.

Multibeam bathymetric data were collected using an R2Sonics, Inc. 2022 Broadband echo-sounder. The system was configured to record bathymetry, sidescan sonar and acoustic backscatter data. A wide-area survey was conducted using a 400-kHz pulse (1-degree beam-width) using transects spaced to provide greater than 100 percent seafloor coverage with a 120-degree swath limit. A fine-scale survey was conducted in the immediate vicinity of the discovery using a 700-kHz pulse (0.5-degree beam-width) to increase the spatial resolution of data over feature elements. All data was recorded using HYSWEEP software. RTK tides were used to adjust the bathymetric data to mean lower low water (MLLW) elevations.

Data Processing

Processing of sidescan data included removal of the water column portion of records and correction of signal loss with distance using moderate Time Varied Gain (TVG) adjustments. Sonar imagery for each file were exported as georeferenced TIF image files using 0.05-foot per pixel resolution to facilitate accurate scaling of features. The images were projected to the Massachusetts (Mainland) State Plane grid, NAD83, US Foot. Waterfall imagery from each of the sonar files were exported in JPEG format using a resolution that honored the sonar system's 1.5 cm across-track resolution.

Subbottom sonar profiles were examined for the presence of acoustic reflectors characteristic of buried objects. Observed reflectors were digitized and incorporated into a GIS project to aid in data analysis. Imagery of each profile and digitized reflector (Contact) were exported in JPEG format.

Magnetic data were cleaned in Hypack and exported as ASCII comma-delimited files with fields for northing, easting and total field magnetism (nT). Exported data were used to create a grid of site magnetism using a 3-foot node density. The grid was used to create a GIS-compatible raster layer for comparison with other remote sensing data.

Multibeam bathymetric data were cleaned in HYSWEEP. Data for 400-kHz and 700-kHz files were exported separately using average elevation values for 0.5-foot and 0.2-foot cells, respectively. Separate bathymetric grids were created for each data set honoring the exported cell dimensions. The two grids were merged to preferentially accept the higher resolution 700-kHz data acquired near the discovery. Georeferenced TIF and contour layers were created using the combined 400/700-kHz grid.

RESULTS AND RECOMMENDATIONS

Marine Archaeological Analysis of Remote Sensing Survey Data

Processed survey data provided to DSRA for review by CR Environmental for the NBHSS UAD SW#3 find site included:

- 900 kHz sidescan sonar mosaic (Figure 3)
- 900 kHz sidescan sonar detail image of wreckage (Figure 4)
- Plot of contoured total field strength magnetic data and surveyed magnetometer tracklines (Figure 5)
- Detail of contoured total field strength magnetic data superimposed onto sidescan sonar detail image of wreckage (Figure 6)
- Plot of contoured 400-700 kHz MLLW multibeam bathymetry data (Figure 7)
- Plot of contoured 400-700 kHz MLLW multibeam bathymetric data detail image of wreckage (Figure 8)
- Plot of surveyed subbottom profiler tracklines superimposed onto the sidescan sonar mosaic (Figure 9), and
- Plot of digitized subbottom profiler acoustic reflectors/contacts at the find site (Figure 10).

These different data types were used synergistically and interpreted in a "weight-of-evidence" analysis approach that was intended to utilize multiple lines of converging evidence to determine the vertical and horizontal extent and nature of the debris constituting the wooden vessel's exposed and buried hull remains. Based on these data, the sidescan sonar and multibeam bathymetric data (see Figures 3, 4, 7 and 8) carried the greatest weight, as they provided the most information about the hull remains that are exposed and exhibited some relief above the harbor floor. These data indicated that the exposed wreckage consists of a section of hull framing and planking, similar to what was recovered at the find site when it was first encountered, that measures 6-x-18 feet and includes eight (approximately 1-foot square-x-4 to 5 feet long) frames, two of which are displaced (see Figures 4 and 8). One of the displaced timbers appears to be about 8 feet long-x-1-foot square and extends 5 feet off the bottom (see Figures 4 and 8). Based on the direction of the frames, the long axis of the hull appears to be oriented northwest-southeast. The subbottom profiler data provided more limited information, thus was weighted less than the sidescan sonar and multibeam bathymetry data. The subbottom data consisted of a series of anomalous acoustic reflectors/contacts that could be the result of/associated with buried hull remains. These reflectors/contacts were digitally traced (Appendix A) and their locations plotted for interpretation (see Figure 10). Unfortunately, the distribution of these reflectors/contacts did not provide a strong indication of cohesive buried hull remains or their extent. The subbottom profiler reflectors/contacts that were observed, if associated

with the shipwreck, indicated that some of the vessel's remains may be deeply buried (i.e., below the two-foot approximate maximum remediation dredging prism depth) beneath the harbor floor sediments. The magnetometer data (see Figures 5 and 6) displayed the least amount of information, and thus was considered to have the least weight, because it contained no indication of the presence of a shipwreck at the location of NBHSS UAD SW#3. Instead, only three, isolated, small magnetic anomalies, located away from the identified hull remains, and a large anomaly associated with nearby steel-hulled dredging barges were recorded in the magnetometer data (see Figure 5).

Based on the available evidence, and the relatively narrow width of the mapped hull remains, it appears that the NBHSS UAD SW#3 find constitutes only a portion of the original vessel, perhaps the lower part of one side of the hull, extending from its turn-of-bilge where the hull transitions from its side to its bottom. This kind of preservation (i.e., the lowest part of a tilted hull that settled to the bottom and was then buried relatively quickly in anaerobic sediments, protecting it from colonization and destruction by damaging marine life) is not atypical and was also seen in the remains recovered from the NBHSS UAD SW#2 find site. The acquired survey data indicates the types of materials that are preserved at the site include a portion of a vessel's wooden hull, but little else of the ship. Iron fasteners and any other ferrous hull components, hardware or cargo, do not appear to be present, based on the magnetic data that was acquired at the site (see Figures 5 and 6). This result is similar to what was observed in the remote sensing data associated with, and in the recovered materials from the NBHSS UAD SW#1 and SW#2 unanticipated discoveries – that is, that all of its iron fastenings and other iron hull components were corroded to the point where they no longer possessed any ferrous mass detectable with a magnetometer as single anomaly, or as a collection of anomalies, of significant size or duration.

The unanticipated discovery of NBHSS UAD SW#3, and NBHSS UAD SW#1 before it, as well as the July 6, 2016 unanticipated discovery of NBHSS UAD SW#2 (in the Upper Harbor Area), are all noteworthy, because they each occurred in areas of the NBHSS that had been subjected previously to marine archaeological investigations by different archaeologists, either as part of the original surveys conducted by JMA and Dolan between 1999 and 2000, or, as in the case of NBHSS UAD SW#2, to the subsequent re-surveys by CR and DSRA. In each case, a detectable diagnostic presence typically associated with shipwreck sites, such as an area on the harbor floor with an unusual surface texture or elevation change that is visible in the sidescan sonar data or bathymetric record, or a clustered distribution of magnetic anomalies detected over multiple adjacent and closely-spaced survey track lines, was absent from the recorded sidescan sonar, bathymetry, and magnetometer data. Additionally, the generally gaseous nature of the harbor floor's organic-rich sediments prevented acoustic penetration and acquisition of subbottom profiles, rendering it difficult or impossible to detect buried hull remains or ballast piles. The Lower Harbor Area where NBHSS UAD SW#3 was encountered had been subjected to a comprehensive marine archaeological remote sensing identification survey by JMA and Dolan in 1999 (Cox, Jr. 2000). Using a nominal 50-foot line spacing (considered within the industry to be a conservative standard line-spacing), the results of the survey led JMA and Dolan to conclude that the area was free of potentially significant submerged cultural resources (Cox, Jr. 2000). In the case of NBHSS UAD SW#2, the only remote sensing contact or anomaly that was recorded at its location as a result of the CR/DSRA re-survey was a single, isolated, and unremarkable low-amplitude (5 gammas) and short-duration (10 feet) monopolar magnetic anomaly (M111), which was detected on just one of the closely-spaced (i.e., effectively 12.5 feet apart) supplemental secondary re-survey track lines.

New Bedford Harbor's long post-European contact history of early colonization, intensive maritime use, urbanization and industrialization have led to the deposition of significant amounts of ferrous metal debris and trash into New Bedford Harbor's waters. The accumulation of these materials on the harbor floor has created a situation wherein literally thousands of isolated, low-amplitude, short-duration magnetic anomalies have been recorded during CR/DSRA's high-resolution supplemental secondary re-surveys of the Upper Harbor area. An isolated, single, low-amplitude, short-duration magnetic anomaly is analogous to a single star in a sky-full of similar stars, nearly all of which in the case of the NBHSS are caused by isolated debris or trash. If the shipwrecks had not been completely buried, or if the subbottom profiler had been able to penetrate the gaseous sediments of the harbor floor, it is likely that some element or elements of the ship remains would have been visible in the sidescan sonar record or in subbottom profiler data, as has been seen repeatedly in similar data recorded over shipwrecks in other study areas. However, absent of any magnetic or acoustic indication, the circumstances of NBHSS UAD SW#1, NBHSS UAD SW#2, and NBHSS UAD SW#3 are all the same – each was essentially undetectable within the particular environmental conditions present in the NBHSS with the available site identification marine remote sensing technologies that are available. Presumably, in the case of NBHSS UAD SW#3, if JMA and Dolan had seen something with the potential to be a submerged shipwreck during their review of the remote sensing survey data from the Lower Harbor Area location of NBHSS UAD SW#3, they most certainly would have identified it and provided recommendations for further investigation.

The noteworthiness of these findings is also a source of significant concern, both from the perspective of planning future marine archaeological identification surveys within the NBHSS and from a broader submerged cultural resource management and site identification perspective, as they indicate that there is a demonstrated likelihood that older, less-well preserved, but potentially more historically significant, wooden shipwrecks that are buried beneath gaseous organic-rich sediments and whose ferrous metal elements are completely corroded, are likely to go undetected during standard, or even high-resolution, marine archaeological remote sensing identification surveys. The implications of these findings and their potential impact on the perceived efficacy of marine archaeological identification survey methods warrant further analysis and consideration by the research community, as well as by historic preservation officers of federal, state, and tribal agencies who are required to conduct NHPA Section 106-compliant identification surveys within submerged environments.

Recommendations

The NBHSS UAD SW#3 find appears to be the remains of a historical wooden vessel possibly similar in age to the late eighteenth-early nineteenth century NBHSS UAD SW#1 and SW#2 finds of 2009 and 2016 (Robinson, et al. 2010; Robinson and Wright 2016). Consequently, DSRA recommends that a detailed Work Plan be developed for the NBHSS UAD SW#3 find that describes its systematic removal following the same agency-reviewed and -approved procedures that were employed to recover the ship remains from the NBHSS UAD SW#1 and SW#2 sites (i.e., GPS-guided and qualified marine archaeologist-directed recovery with the qualified marine archaeologist on-board the recovery barge working with the machine operator to preliminarily record what was recovered and discern in real-time shipwreck components to be wrapped in plastic and saved for documentation from the debris that can be discarded). DSRA also recommends that this removal process be scheduled during the fall of this year, before winter conditions arrive to the New England area, to facilitate and make safer

the recovery, handling, wrapping, and transfer of recovered vessel remains to the NBHSS Sawyer Street facility on shore.

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2012c Letter Report – New Bedford Harbor Superfund Site – Task 2 (Submarine Cable Crossing) Area Supplemental Survey, New Bedford, MA. Submitted to Steven Fox, Project Manager, Jacobs Engineering, New Bedford Harbor Superfund Site, New Bedford, MA. Fathom Research, LLC, New Bedford, MA.

Robinson, David S., Brian Jordan, Jake Piskura, and Christopher Wright
2010 *Technical Report: Marine Archaeological Documentation and Assessment New Bedford Harbor Superfund Site Unanticipated Shipwreck Discovery, Acushnet River, Acushnet, Massachusetts*. Prepared for CR Environmental, Inc., East Falmouth, MA. Prepared by Fathom Research, LLC, New Bedford, MA.

FIGURES

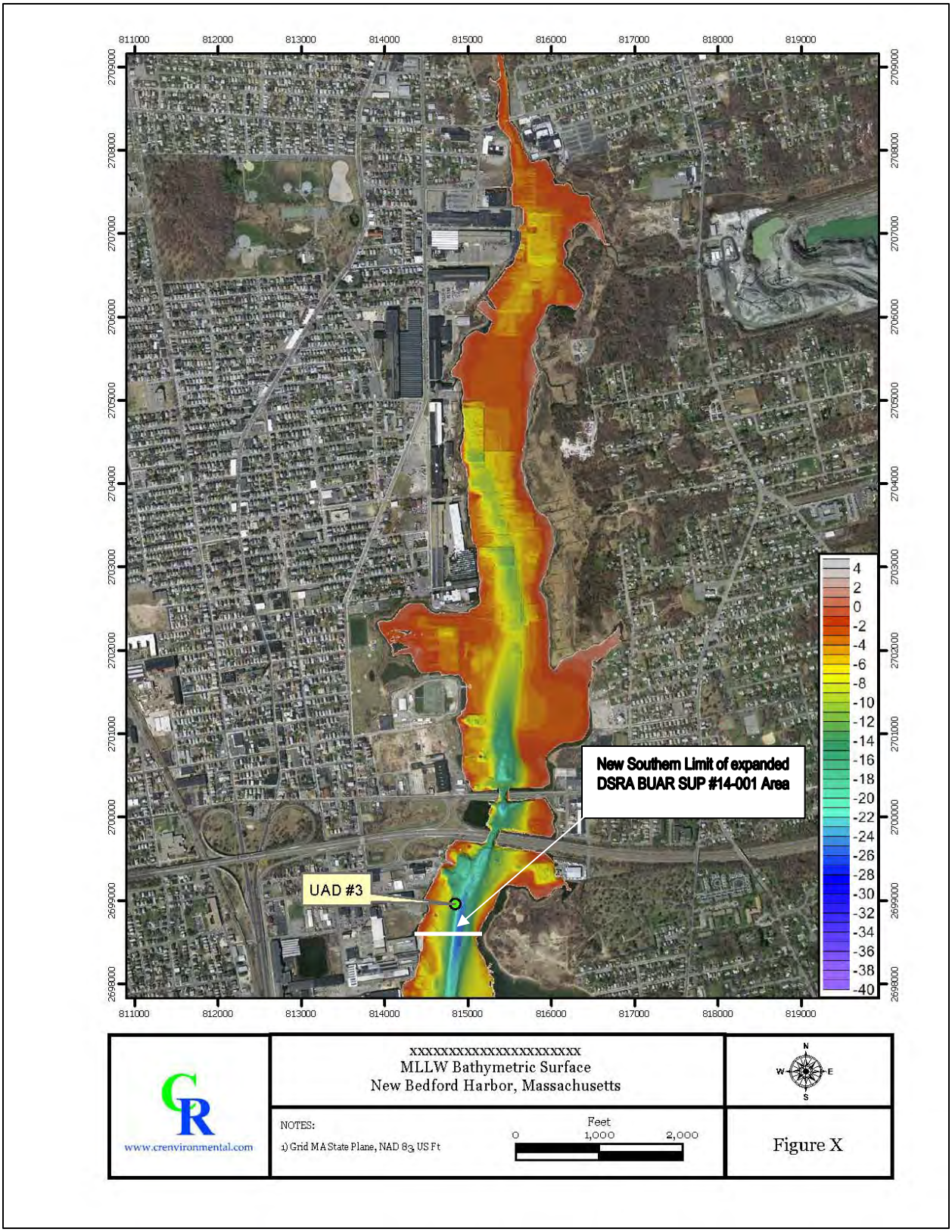


Figure 1. Map of NBHSS UAD SW#3's location in the NBHSS Lower Harbor Area and the revised and extended southern limit of DSRA's SUP 14-001 (base figure provided by CR).

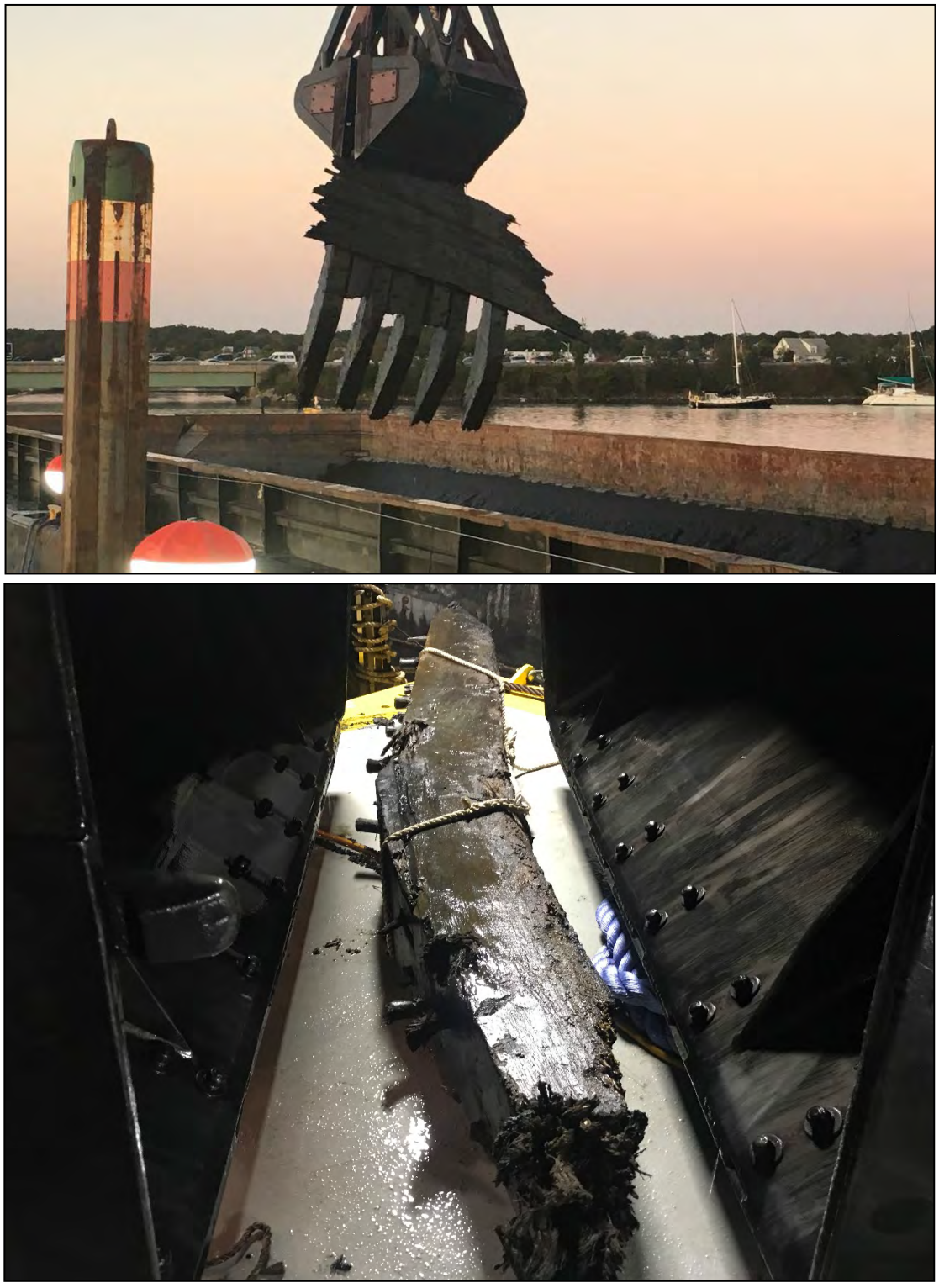
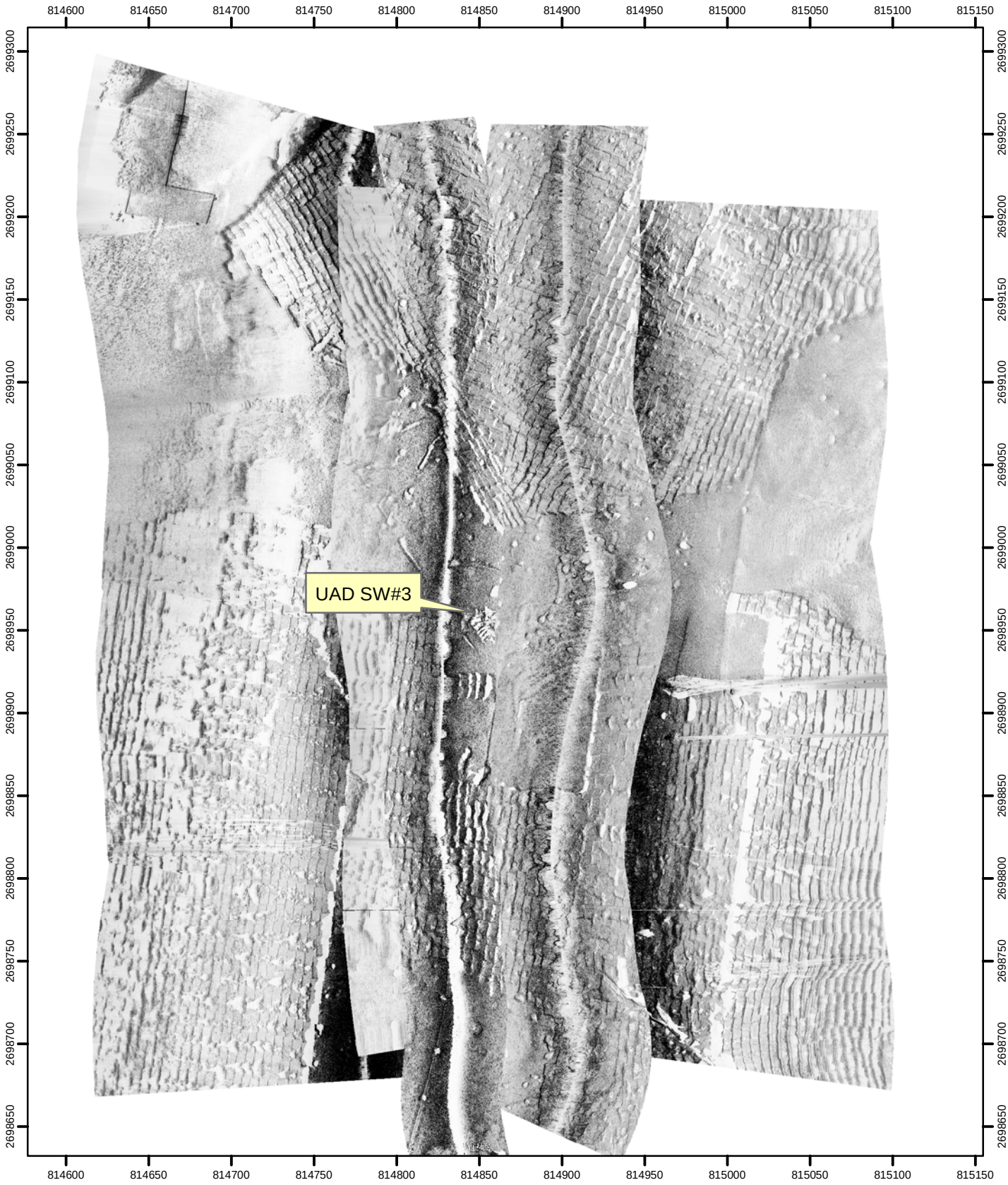


Figure 2. Ship remains encountered and recovered from the NBHSS UAD SW#3 unanticipated discovery find site at the northern end of the NBHSS Lower Harbor Area.



900 kHz SIDE SCAN SONAR MOSAIC
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

N
W E
S

www.crenvironmental.com

NOTES:
1) Survey conducted October 11, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 50 100

Figure 3

900 kHz SIDE SCAN SONAR RECORD
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

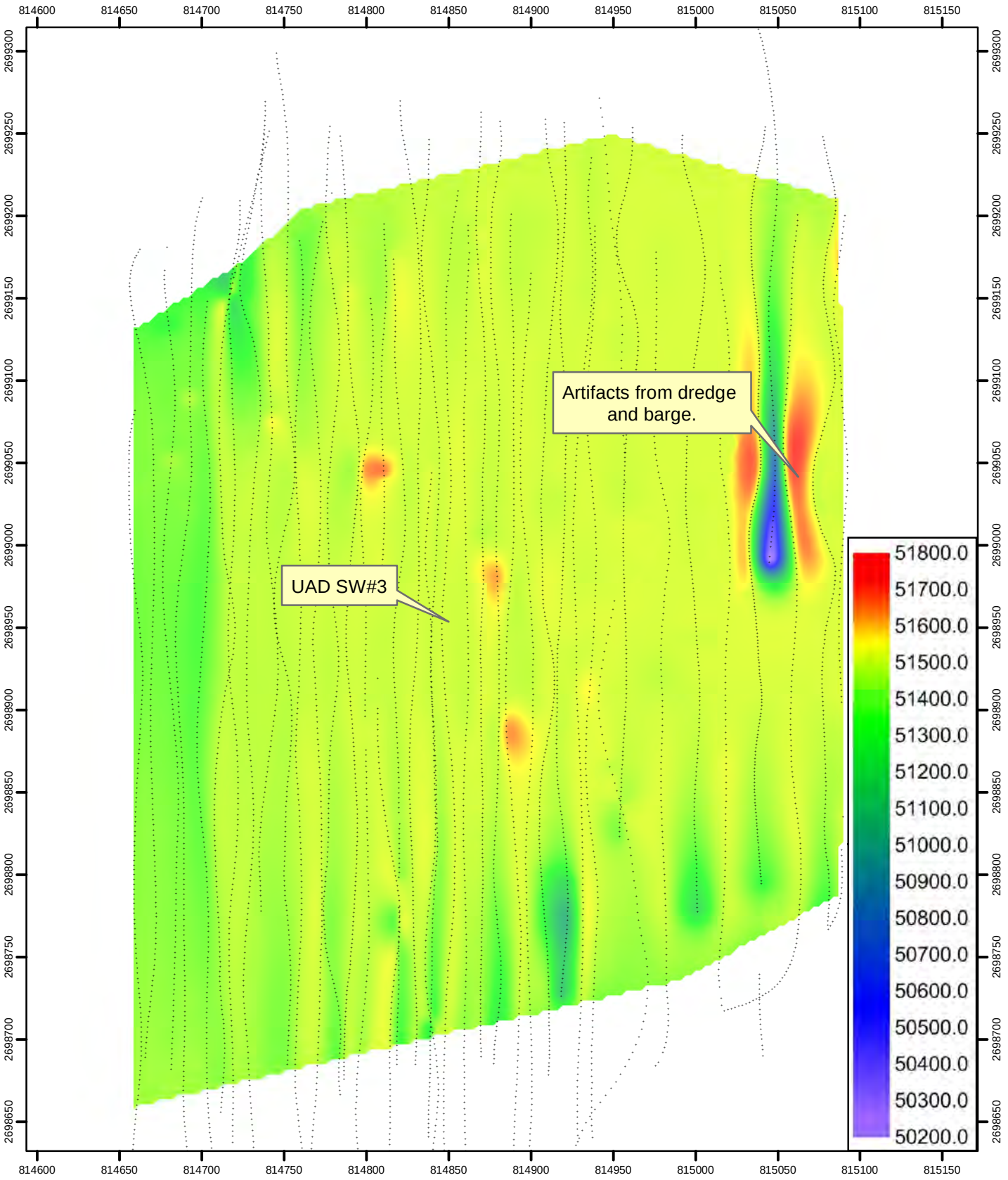
N
W E
S

www.crenvironmental.com

NOTES:
1) Survey conducted October 11, 2017.
2) Grid MA State Plane NAD 83 US Ft
3) Inverted grey scale.
4) Scale 1:80

Feet
0 5 10

Figure 4



www.crenvironmental.com

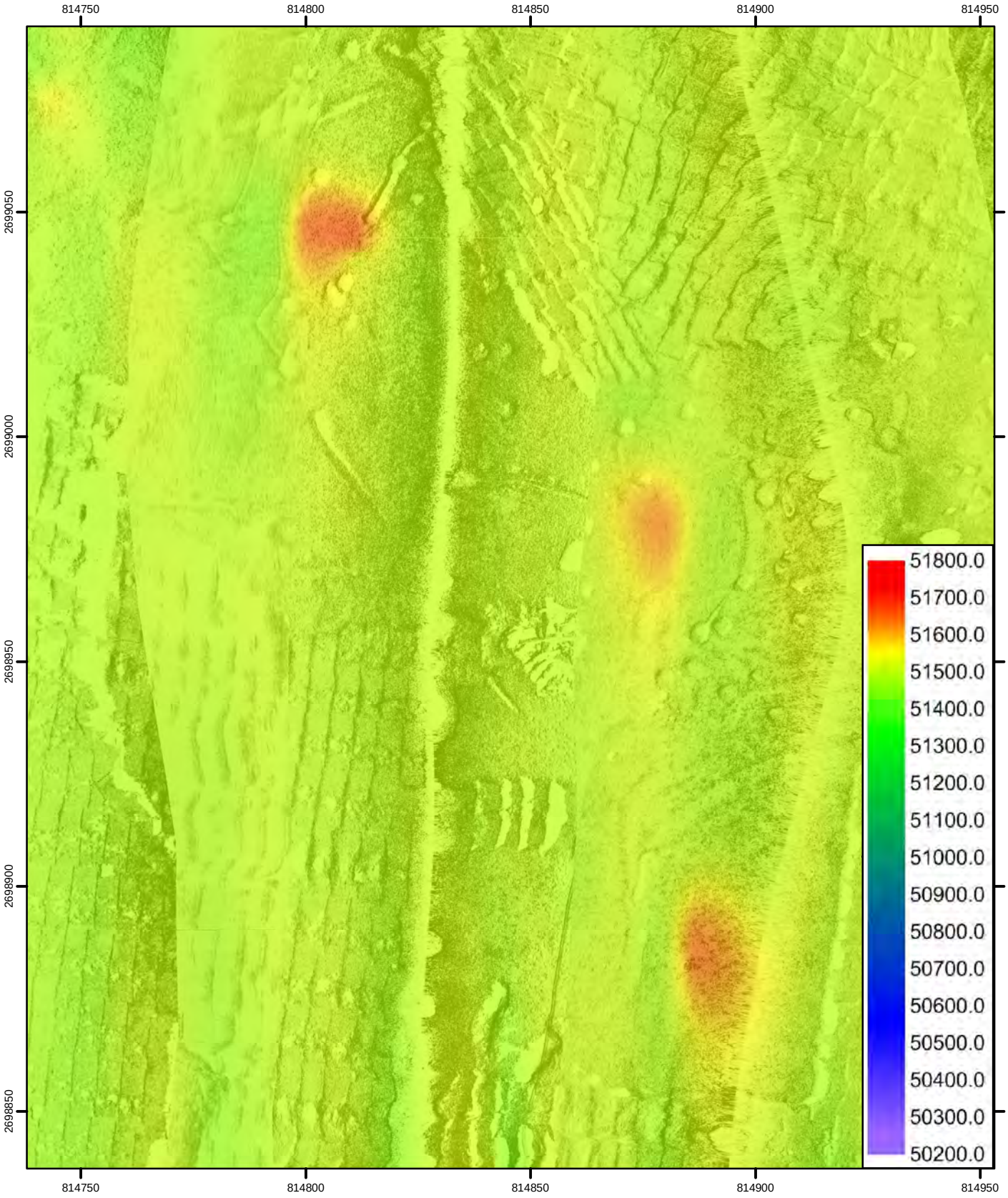
TOTAL FIELD MAGNETISM (nT)
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

N
W
E
S

NOTES:
1) Survey conducted October 11, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 50 100

Figure 5



www.crenvironmental.com

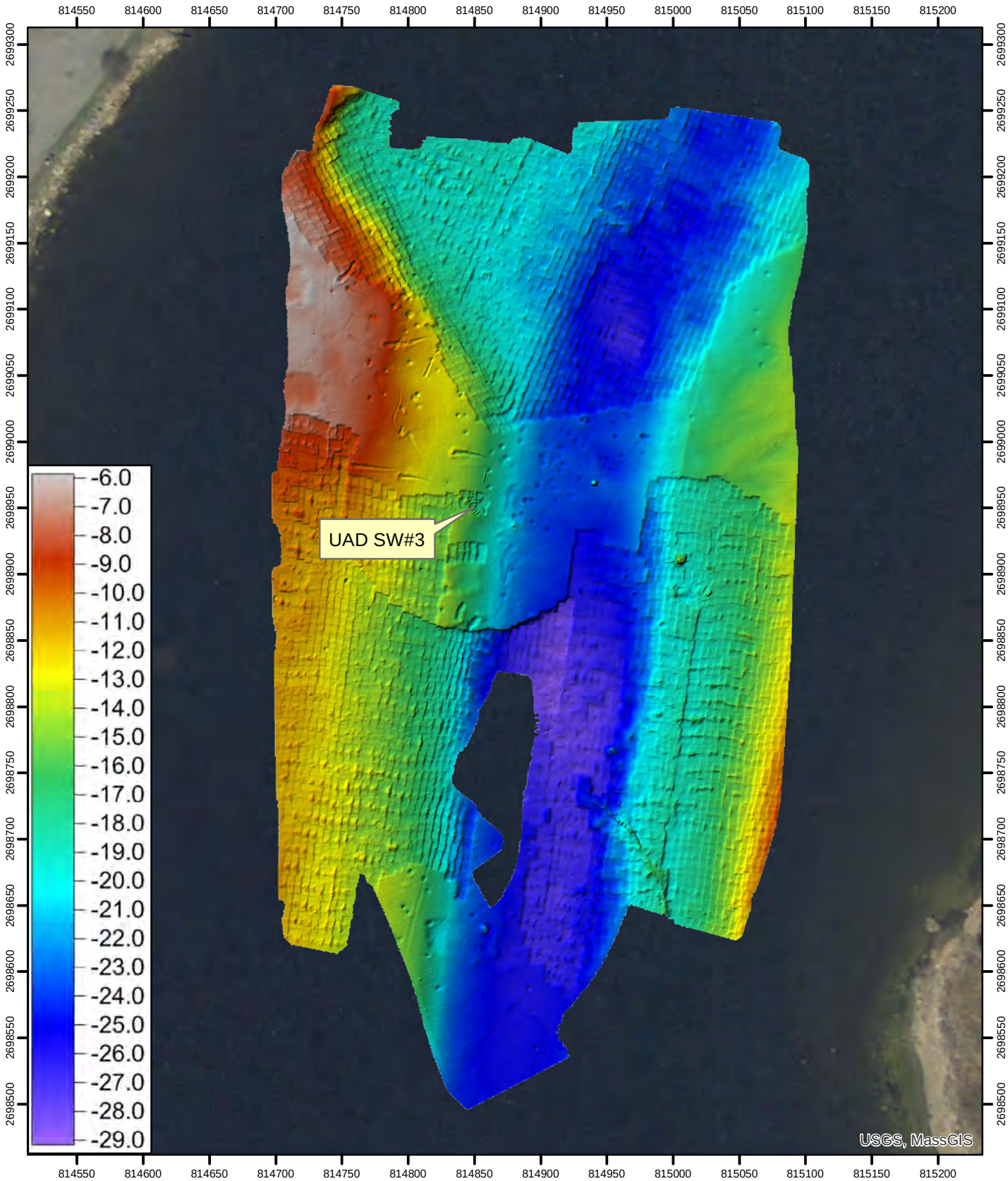
TOTAL FIELD MAGNETISM & SIDE SCAN
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

N
W E
S

NOTES:
1) Survey conducted October 11, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 20 40

Figure 6



400/700 kHZ MULTIBEAM BATHYMETRY - MLLW (Feet)
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

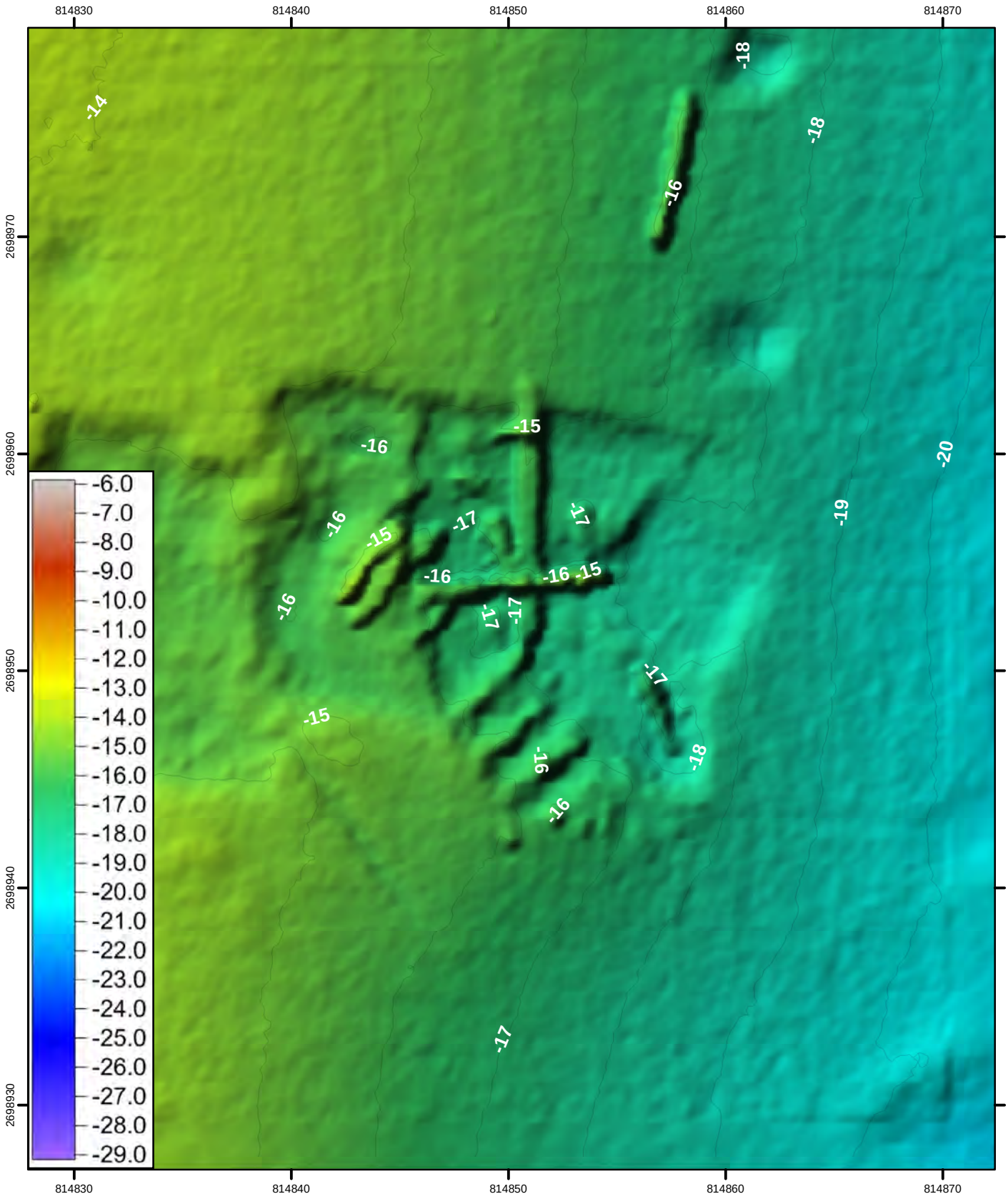
N
W
E
S

www.crenvironmental.com

NOTES:
1) Survey conducted October 12, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 50 100

Figure 7



700 kHZ MULTIBEAM BATHYMETRY - MLLW (Feet)
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

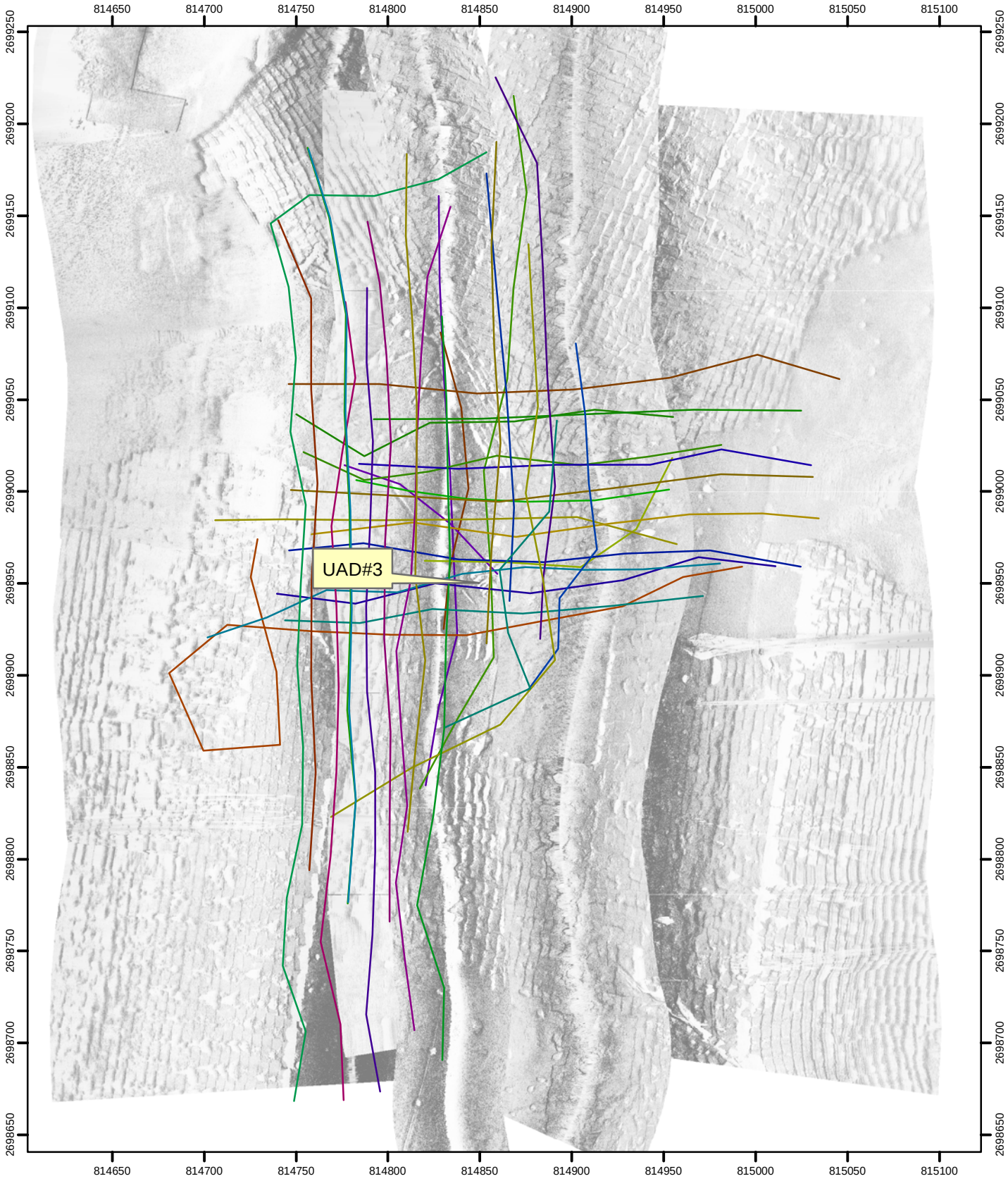
N
W E
S

www.crenvironmental.com

NOTES:
1) Survey conducted October 12, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 5 10

Figure 8



SUB-BOTTOM PROFILER SURVEY TRACKLINES
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

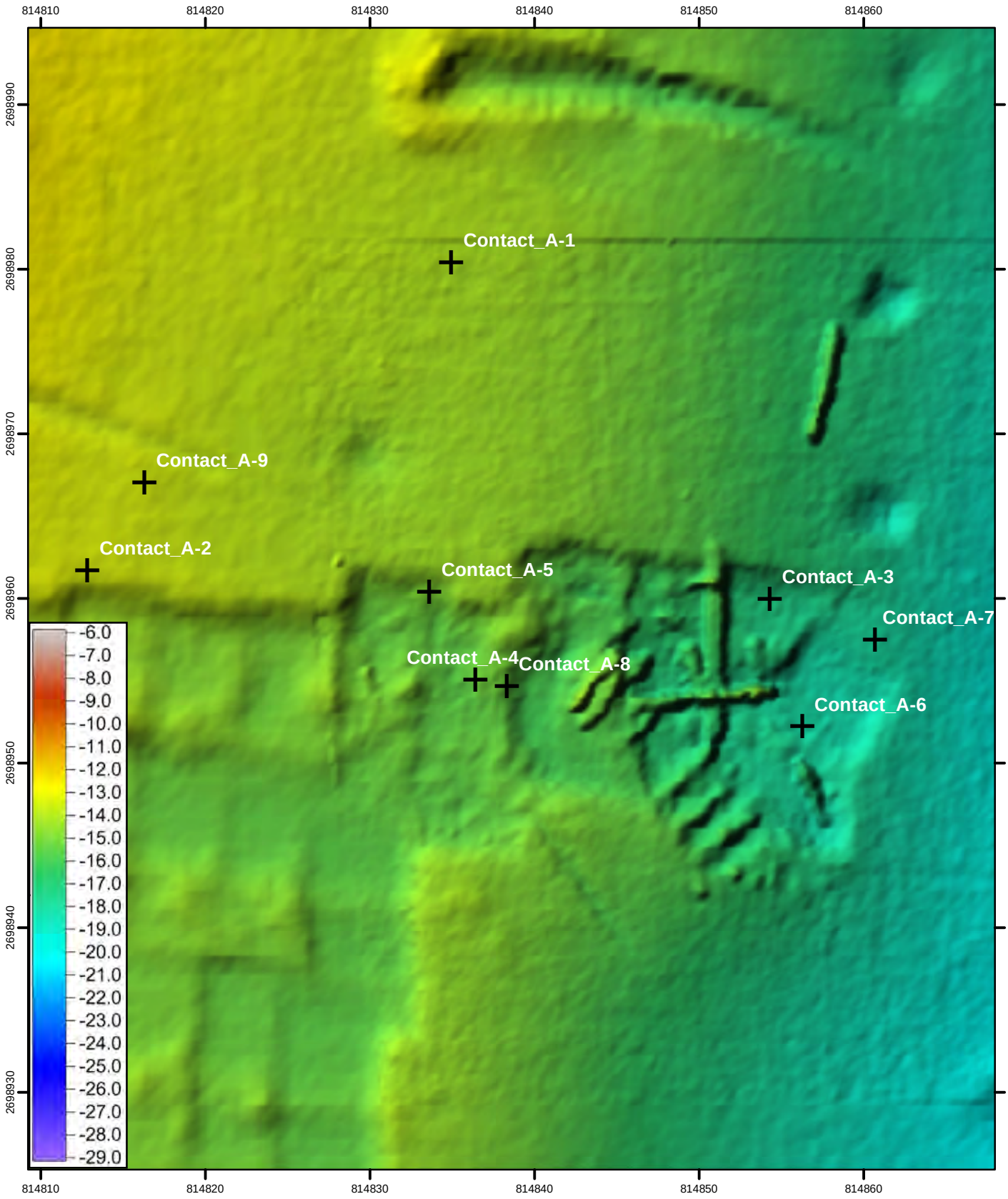
N
W E
S

www.crenvironmental.com

NOTES:
1) Survey conducted October 12, 2017.
2) Grid MA State Plane NAD 83 US Ft

Feet
0 50 100

Figure 9



www.crenvironmental.com

DISTRIBUTION OF DIGITIZED SUB-BOTTOM SONAR CONTACTS
UNANTICIPATED DISCOVERY NO. 3
New Bedford Harbor

N
W
E
S

NOTES:
1) Survey conducted October 12, 2017.
2) Grid MA State Plane NAD 83 US Ft
3) Background layer shows MLLW multibeam bathymetric surface.

Feet
0 5 10
1:100

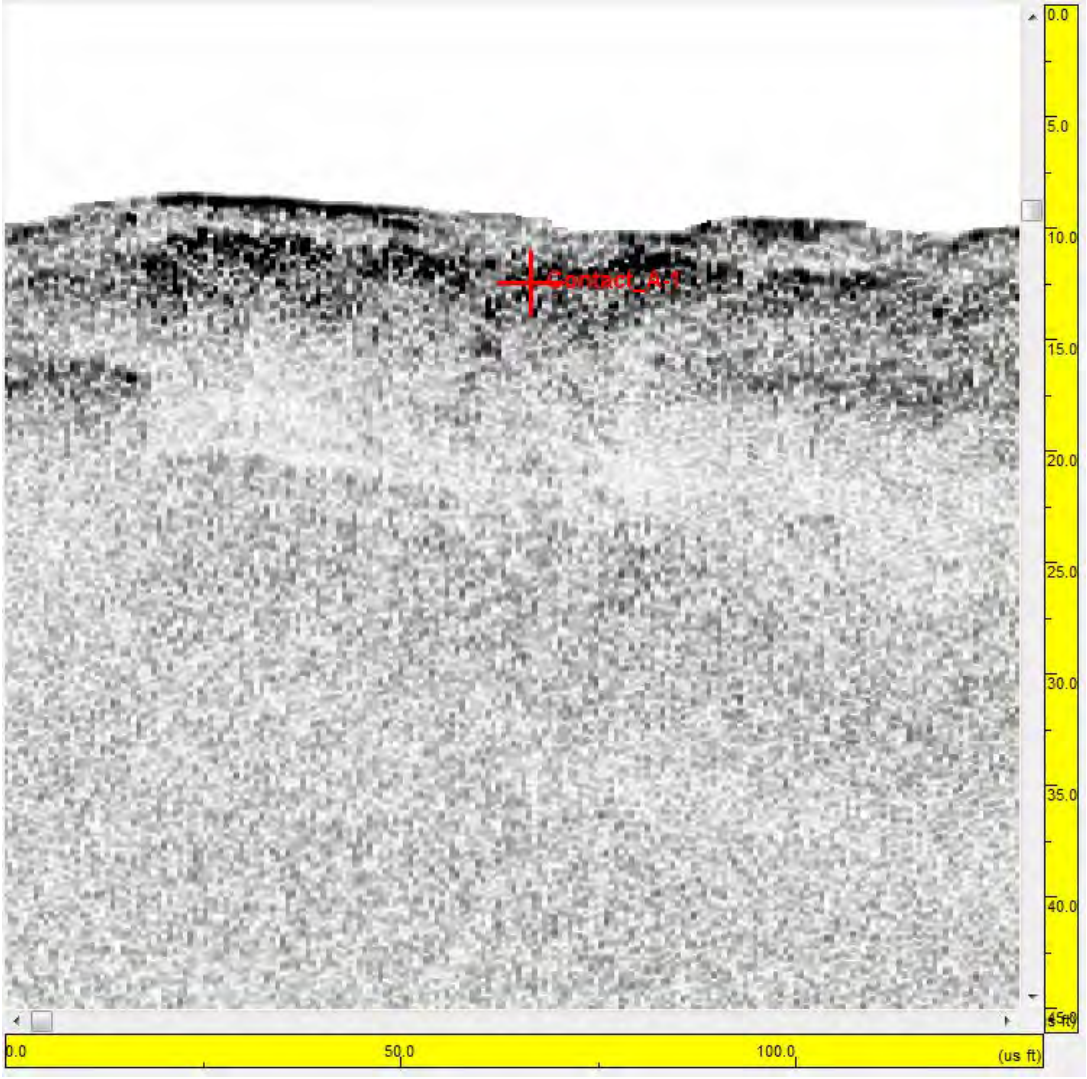
Figure 10

APPENDICES

APPENDIX A

SUB-BOTTOM SONAR CONTACTS

Contact_A-1

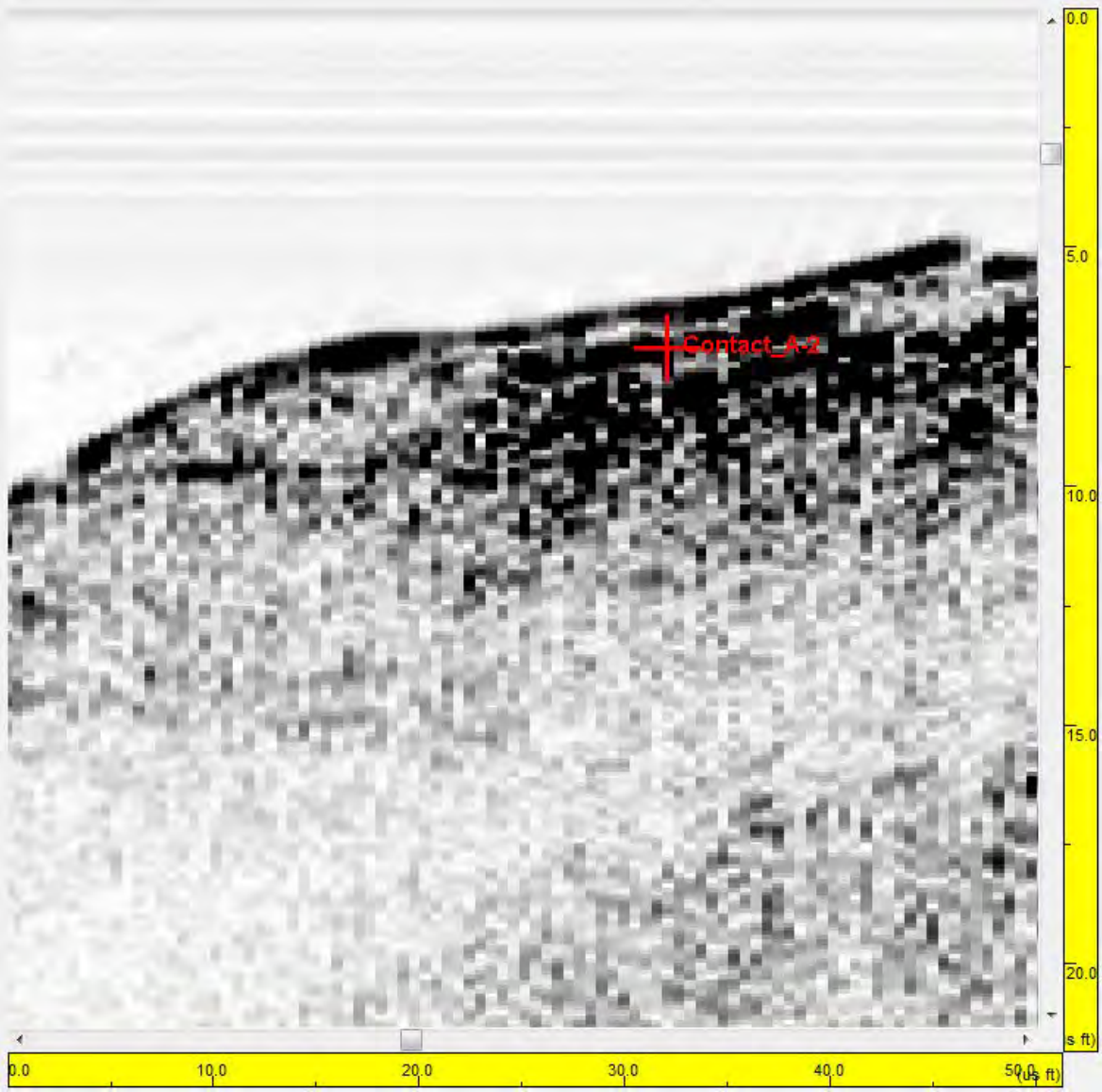


Contact Info: Contact_A-1

- Sonar Time at Target: 10/12/2017 12:03:23.546
- Click Position (Lat/Lon Coordinates)
  41.6526197890 -70.9194216795 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814834.96 (Y) 2698980.42
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.003.jsf
- Ping Number: 3994
- Range to Target: 5.46 US Feet
- Fish Height: 4.18 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.003

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 0.00 US Feet
Classification 1: Possible parabolic reflector NW of wreck

Contact_A-2

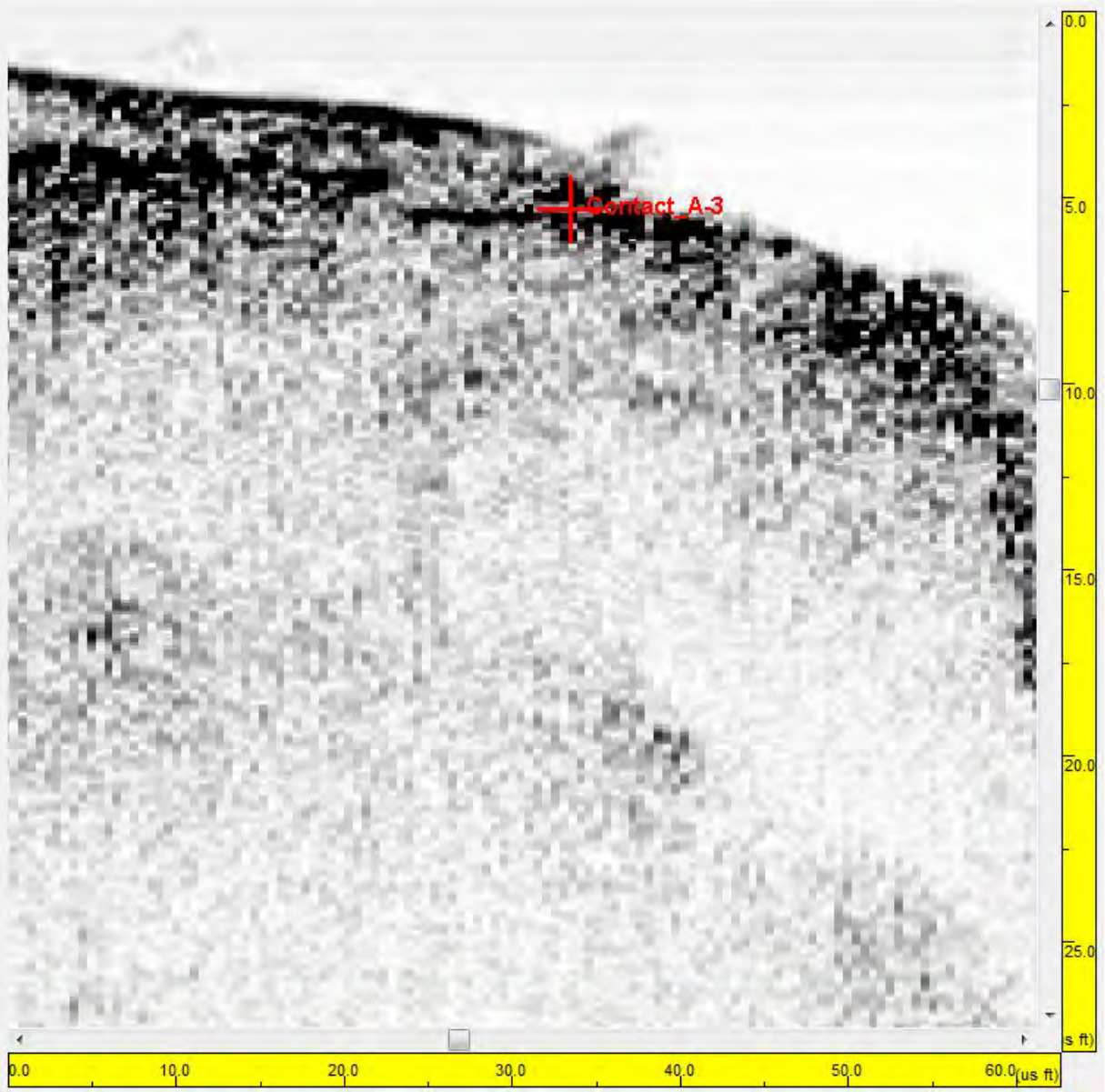


Contact Info: Contact_A-2

- Sonar Time at Target: 10/12/2017 11:53:00.064
- Click Position (Lat/Lon Coordinates)
  41.6525688417 -70.9195030788 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814812.84 (Y) 2698961.70
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.jsf
- Ping Number: 1508
- Range to Target: 4.27 US Feet
- Fish Height: 0.00 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB

Target Height: = 0.00 US Feet
Target Length: 2.05 US Feet
Target Shadow: 0.00 US Feet
Target Width: 23.32 US Feet
Classification 1: debris

Contact_A-3

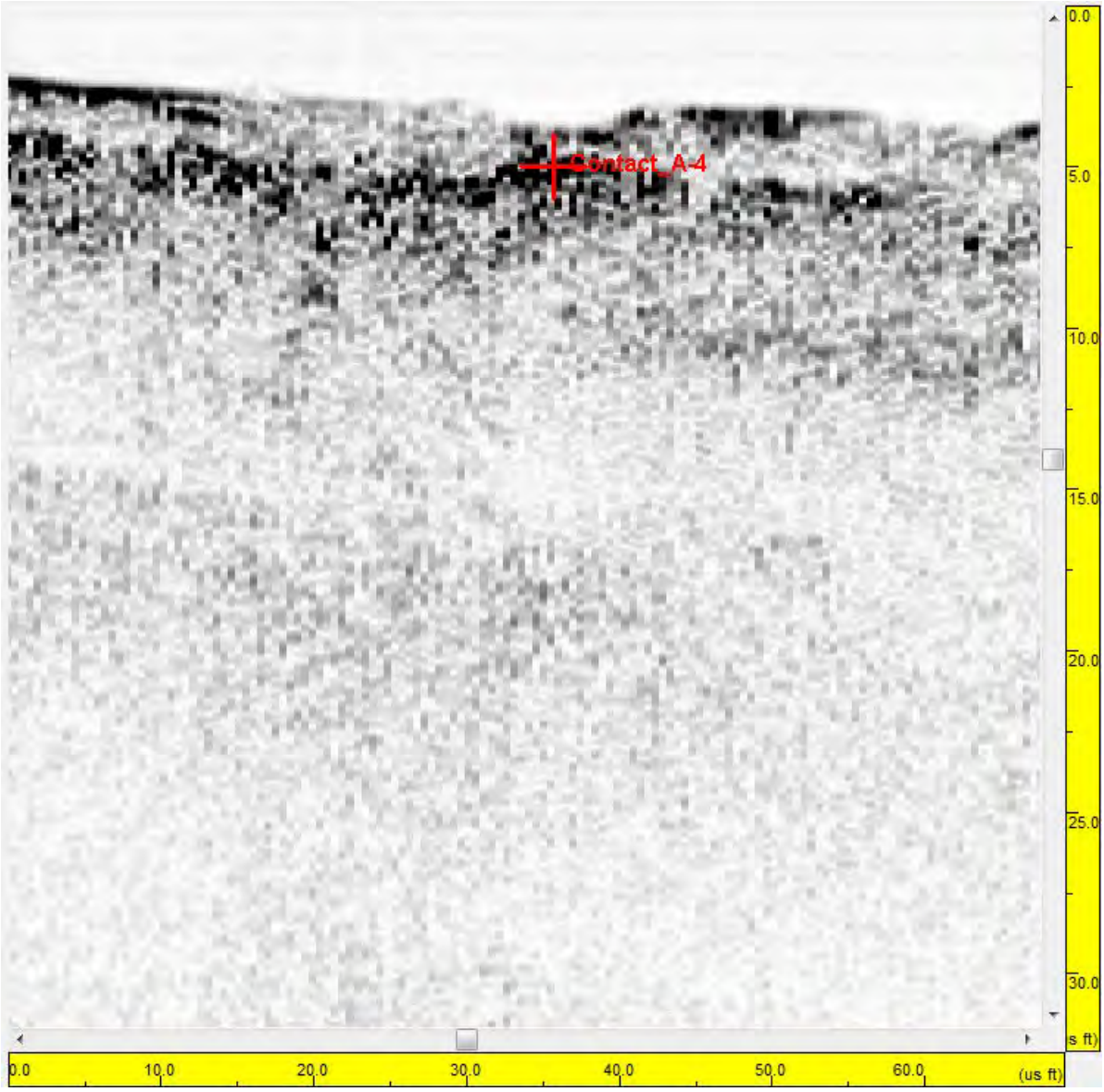


Contact Info: Contact_A-3

- Sonar Time at Target: 10/12/2017 11:50:16.565
- Click Position (Lat/Lon Coordinates)
  41.6525632722 -70.9193513752 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814854.31 (Y) 2698959.95
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\SonarData.001.jsf
- Ping Number: 854
- Range to Target: 5.31 US Feet
- Fish Height: 0.00 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: SonarData.001

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 27.38 US Feet
Classification 1: debris

Contact_A-4

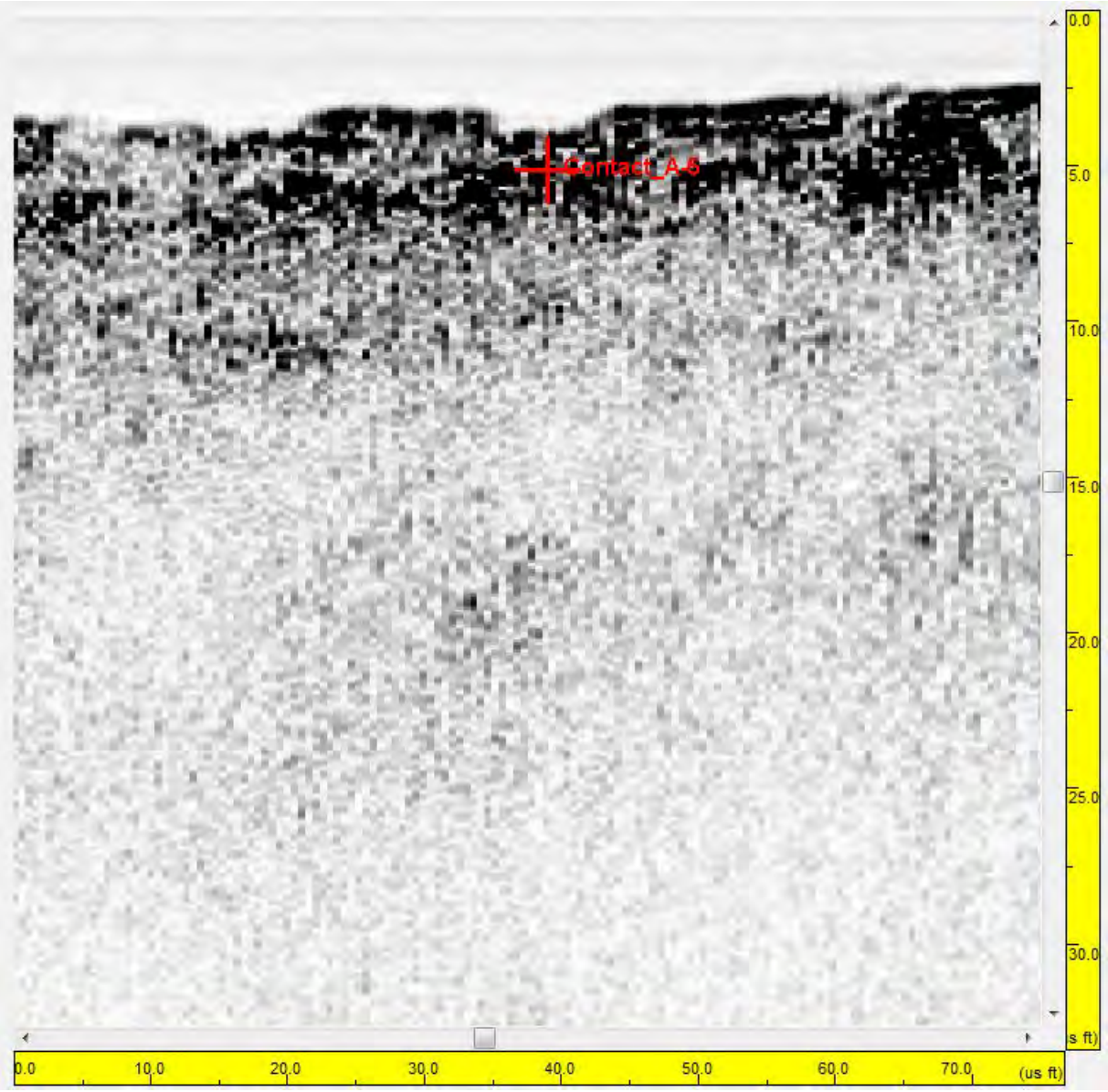


Contact Info: Contact_A-4

- Sonar Time at Target: 10/12/2017 12:03:29.296
- Click Position (Lat/Lon Coordinates)
  41.6525501673 -70.9194169194 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814836.43 (Y) 2698955.06
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.003.jsf
- Ping Number: 4017
- Range to Target: 5.01 US Feet
- Fish Height: 0.00 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.003

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 0.00 US Feet
Classification 1: debris

Contact_A-5

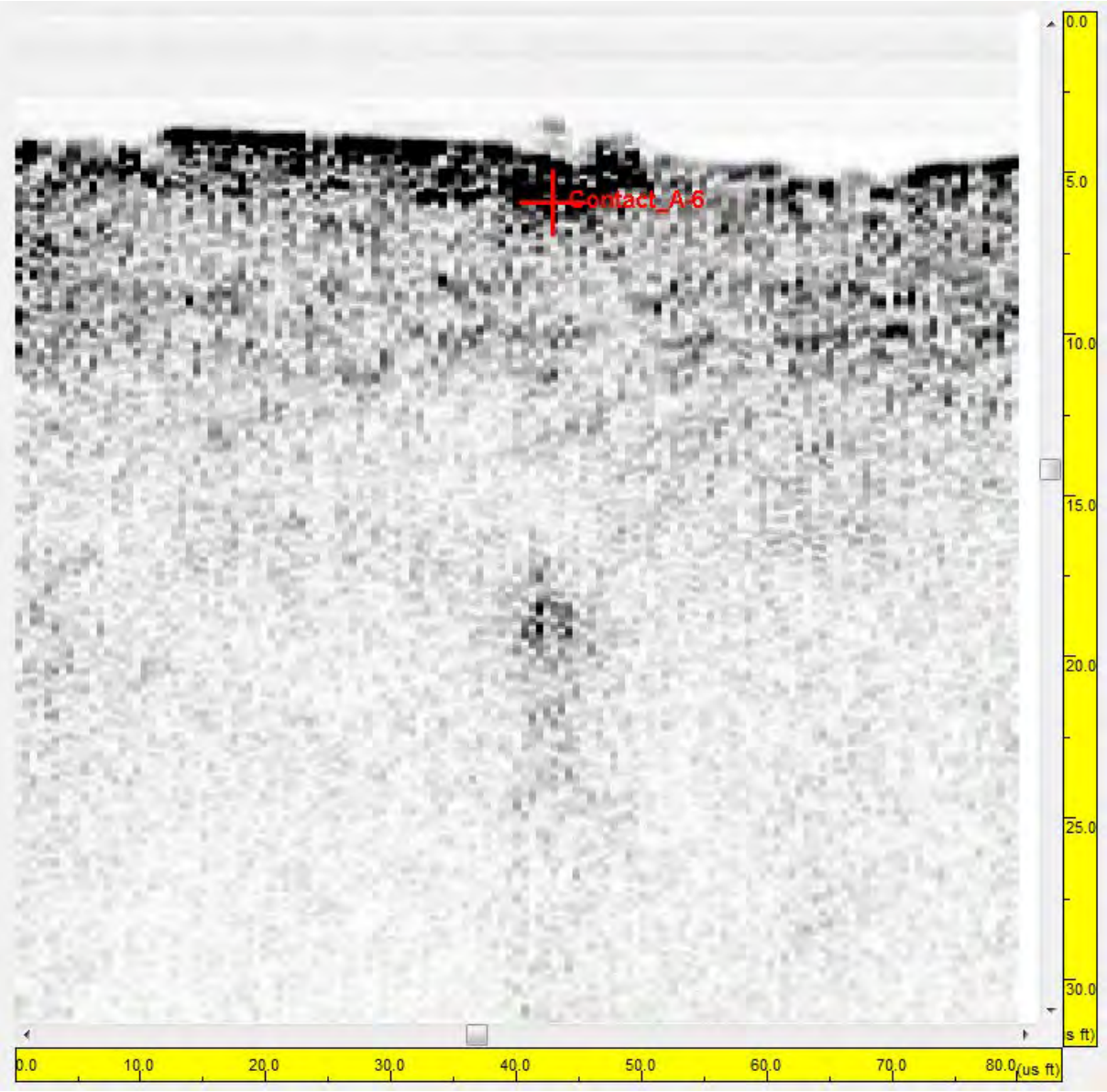


Contact Info: Contact_A-5

- Sonar Time at Target: 10/12/2017 12:06:24.545
- Click Position (Lat/Lon Coordinates)
  41.6525648527 -70.9194270833 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814833.61 (Y) 2698960.39
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.004.jsf
- Ping Number: 4718
- Range to Target: 5.03 US Feet
- Fish Height: 0.00 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.004

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 23.25 US Feet
Classification 1: debris

Contact_A-6



Contact Info: Contact_A-6

- Sonar Time at Target: 10/12/2017 12:44:54.002
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- Click Position (Projected Coordinates)
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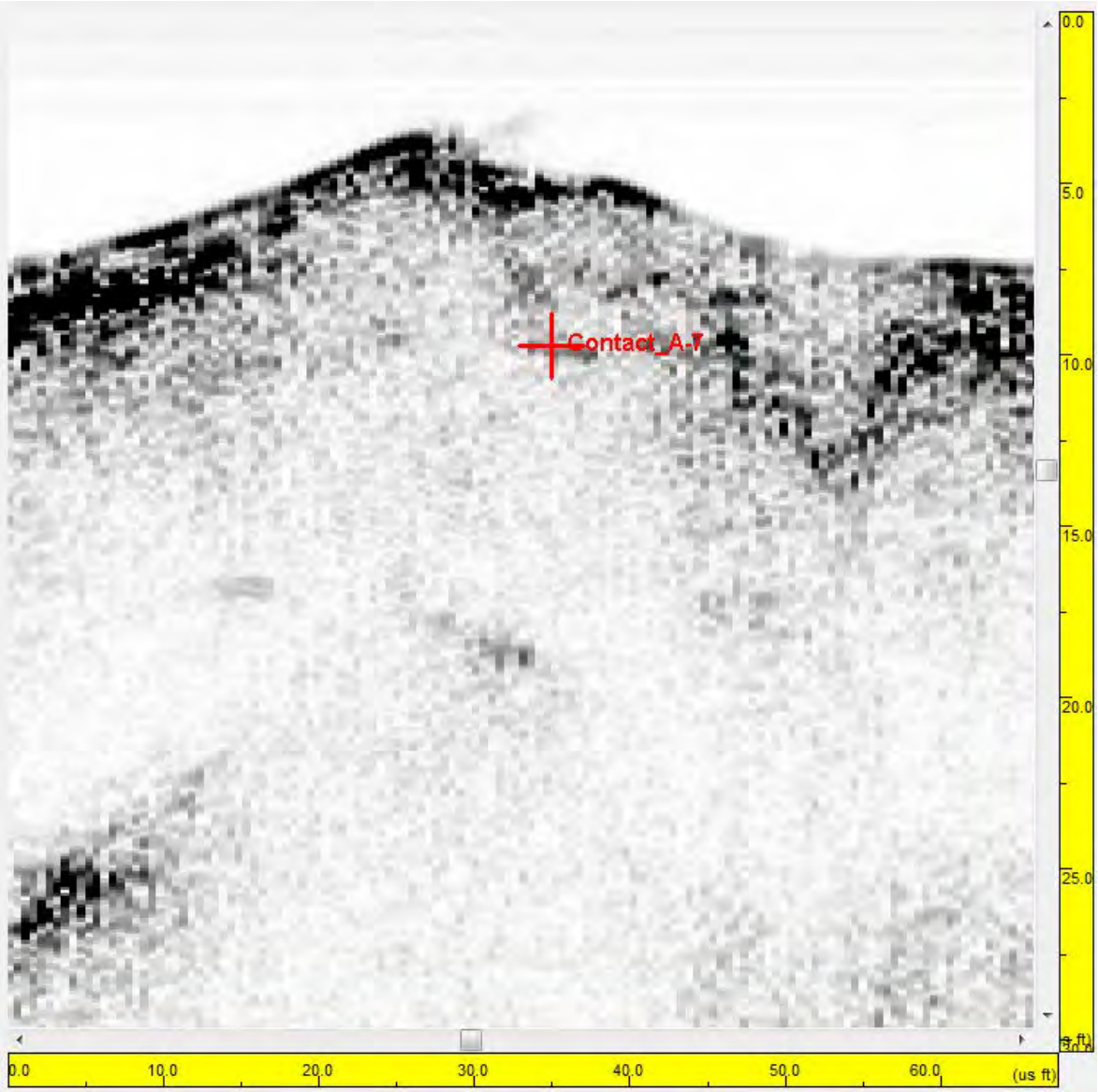
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.013.jsf
- Ping Number: 704
- Range to Target: 5.54 US Feet
- Fish Height: 4.67 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.013

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 22.67 US Feet
Classification 1: debris

Contact_A-7



Contact Info: Contact_A-7

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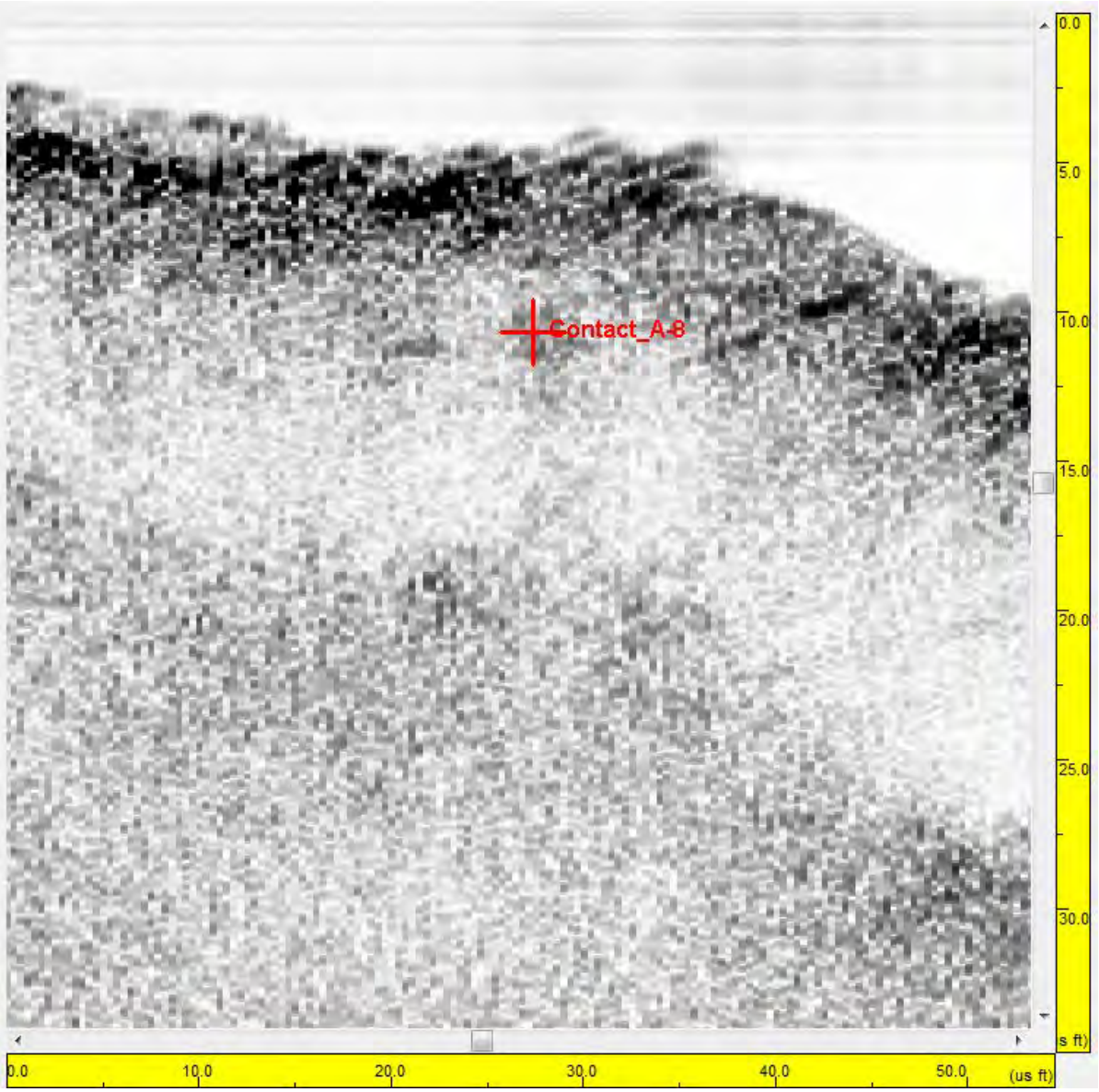
- Click Position (Projected Coordinates)
  (X) 814860.71 (Y) 2698957.50
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.014.jsf
- Ping Number: 1204
- Range to Target: 7.45 US Feet
- Fish Height: 5.29 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.014

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 29.92 US Feet
Classification 1: debris

Contact_A-8

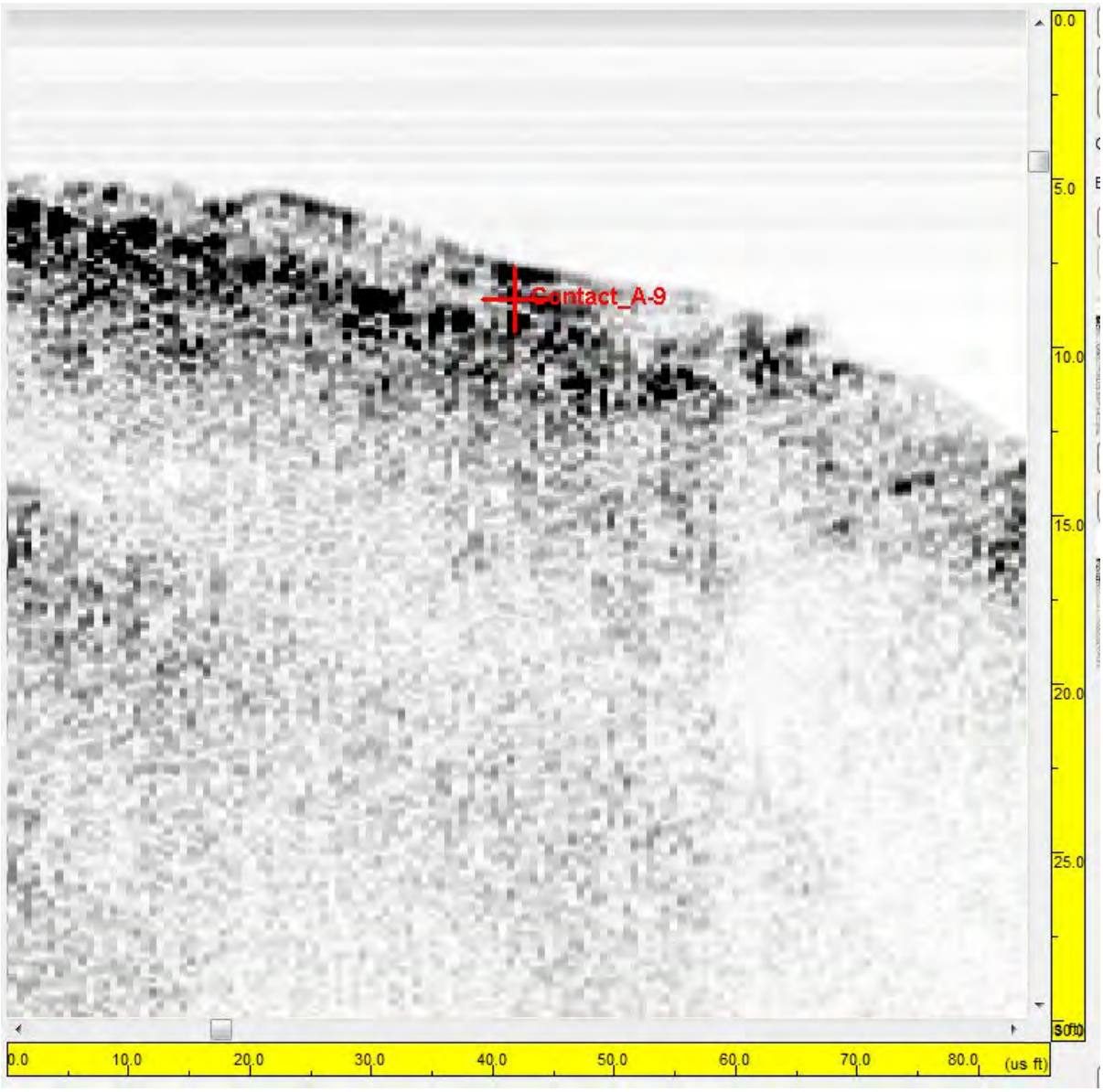


Contact Info: Contact_A-8

- Sonar Time at Target: 10/12/2017 13:00:29.257
- Click Position (Lat/Lon Coordinates)
  41.6525490346 -70.9194099875 (WGS84)
- Click Position (Projected Coordinates)
  (X) 814838.33 (Y) 2698954.66
- Map Proj: MA83F
- Acoustic Source File: E:\projects\2017_NBH_Wreck-3\SB\raw\NBHSB.019.jsf
- Ping Number: 4445
- Range to Target: 7.10 US Feet
- Fish Height: 4.49 US Feet
- Heading: 0.000 degrees
- Event Number: 0
- Water Depth: 0.00
- Line Name: NBHSB.019

Target Height: = 0.00 US Feet
Target Length: 0.00 US Feet
Target Shadow: 0.00 US Feet
Target Width: 15.64 US Feet
Classification 1: debris

Contact_A-9



Contact Info: Contact_A-9

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

4 December 2017

David S. Robinson, M.A., R.P.A.
David S. Robinson & Associates, Inc.
55 Cole Street
Jamestown, RI 02835

RE: Supplemental Marine Archaeological Reconnaissance Survey, New Bedford Harbor Superfund Site Remediation, Acushnet, Fairhaven, and New Bedford, MA
Board approval of permit area modification to Special Use Permit 14-001

Dear Mr. Robinson:

This letter confirms the vote taken on 30 November 2017 by the Massachusetts Board of Underwater Archaeological Resources to approve the request by David S. Robinson & Associates, Inc. (DSRA) to modify the boundaries for Special Use Permit (SUP) 14-001 issued. This modification expands the permit area to encompass the areas in the Lower Harbor, south of the route I-195 Bridge, as detailed on the figure accompanying the application (Figure X).

This permit modification is herein granted dependent upon DSRA'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. 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

/vtm

THE UNIVERSITY OF RHODE ISLAND

David Robinson <dsrobinson@uri.edu>

Request to Revise DSRA BUAR SUP #14-001 Permit Area

1 message

David Robinson <dsrobinson@uri.edu> Mon, Oct 16, 2017 at 7:40 AM
To: "Mastone, Victor (ENV)" <victor.mastone@state.ma.us>
Cc: "Paiva, Marcos A NAE" <marcos.a.paiva@usace.army.mil>, "Gouveia, Mark" <Mark.Gouveia@jacobs.com>, "Cummings, Josh" <Josh.Cummings@jacobs.com>, Charlotte Cogswell <charlotte@crenvironmental.com>, Chip Ryther <chip.crenvironmental@gmail.com>, Christopher Wright <chrisw.cre@gmail.com>

Dear Mr. Mastone,

Following up on our telephone conversation of last week, please find attached DSRA's requested revision to our BUAR SUP #14-001 permit area. This requested revision to DSRA's marine archaeological permit area is being made as per the direction of the US EPA and USACE. The requested revision to our existing permit area, which currently includes the entire marine portion of the NBHSS Upper Harbor Area extending northward of the Coggeshall Street Bridge, involves expanding the area southward of the Route I-195 bridge to encompass the location of the "NBHSS Unanticipated Discovery (UAD) Shipwreck #3." DSRA has been asked by the US EPA and USACE to include the assessment of this UAD among its on-going marine archaeological services tasks.

Please feel free to contact me anytime if you or the BUAR have any questions regarding our request.

A "wet ink" copy of the signature page will be going out to you in today's mail.

Best regards,
David

--
David S. Robinson, M.A., R.P.A.
Marine Archaeologist

Graduate School of Oceanography
University of Rhode Island
215 South Ferry Road Narragansett, RI 02882-1197 USA
office: (401) 874-6182
FAX: (401) 874-6157

DSRA_NBHSS_BUAR-SUP_14-001_REVISION FOR UAD SW3 - 10Oct17-optimized.pdf
2136K

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

SPECIAL USE PERMIT APPLICATION

REVISION OF BUAR SUP PERMIT #14-001

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, MA RPA
ORGANIZATION: David S. Robinson & Associates, Inc.
(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: 55 Cole Street, Jamestown, RI 02835

TELEPHONE NUMBER: 401-578-7233 **FAX NUMBER**: n/a
EMAIL ADDRESS: davidandhayley1@cox.net

PROJECT NAME: New Bedford Harbor Superfund Site Remediation (2014)
LOCATION OF PROPOSED ACTIVITY
Nearest City or Town: New Bedford
Name of Water Body: New Bedford Harbor
Depth of Water: 0-23 ft
Total Acreage of the Project Area: N/A
Description of Proposed Permit Area (narrative): New Bedford's Upper Harbor Area - EXPANDED S TO ENCOMPASS LOCATION OF NBHSS UAD SW#3, South of Rte I-195 Bridge in the Lower Harbor Area at: 814848.57, 2698955.62 (MA State Plane, NAD 83, US FT)

Longitude and Latitude of Proposed Project Area (Project area of potential effect):
NE (N limit of upper harbor) NW (N limit of upper harbor)
SE N41 39'05" W70 55'05" SW N41 39'05" W70 55'16"

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)
CONTACT NAME/ORGANIZATION: Marc Paiva (USACE)
ADDRESS:
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):
(Already on file with MBUAR)

DESCRIPTION OF ANY KNOWN UNDERWATER ARCHAEOLOGICAL RESOURCE IN THE PROJECT AREA
EPA-USACE reported unanticipated discovery of wooden hull remains encountered during pre-dredge debris removal operations by Cashman's in the NBHSS Lower Harbor Area.

Continued on page 2
Applicant initial DSR and date 10/10/17 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
- ☐ 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): Providing on-call marine archaeological supplemental reconnaissance survey and unanticipated discovery response to the US EPA/USACE in support of their on-going remediation activities, primarily in the Upper Harbor, but now including the upper Lower Harbor Area.

(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)?

High-resolution geophysical hazard survey was conducted in the area surrounding UAD SW#3 to better delineate the now partially-detectable limits of the shipwreck and aid in planning eventual removal & archaeological study. Data analysis underway to assess need for probing.

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. (on file)

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)? (on file)

YOU MAY INCLUDE ANY OTHER INFORMATION YOU BELIEVE MAY ASSIST THE BOARD IN ASSESSING YOUR APPLICATION (Attach additional sheets as needed) (see attached map of UAD SW #3 location and revised permit area)

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.

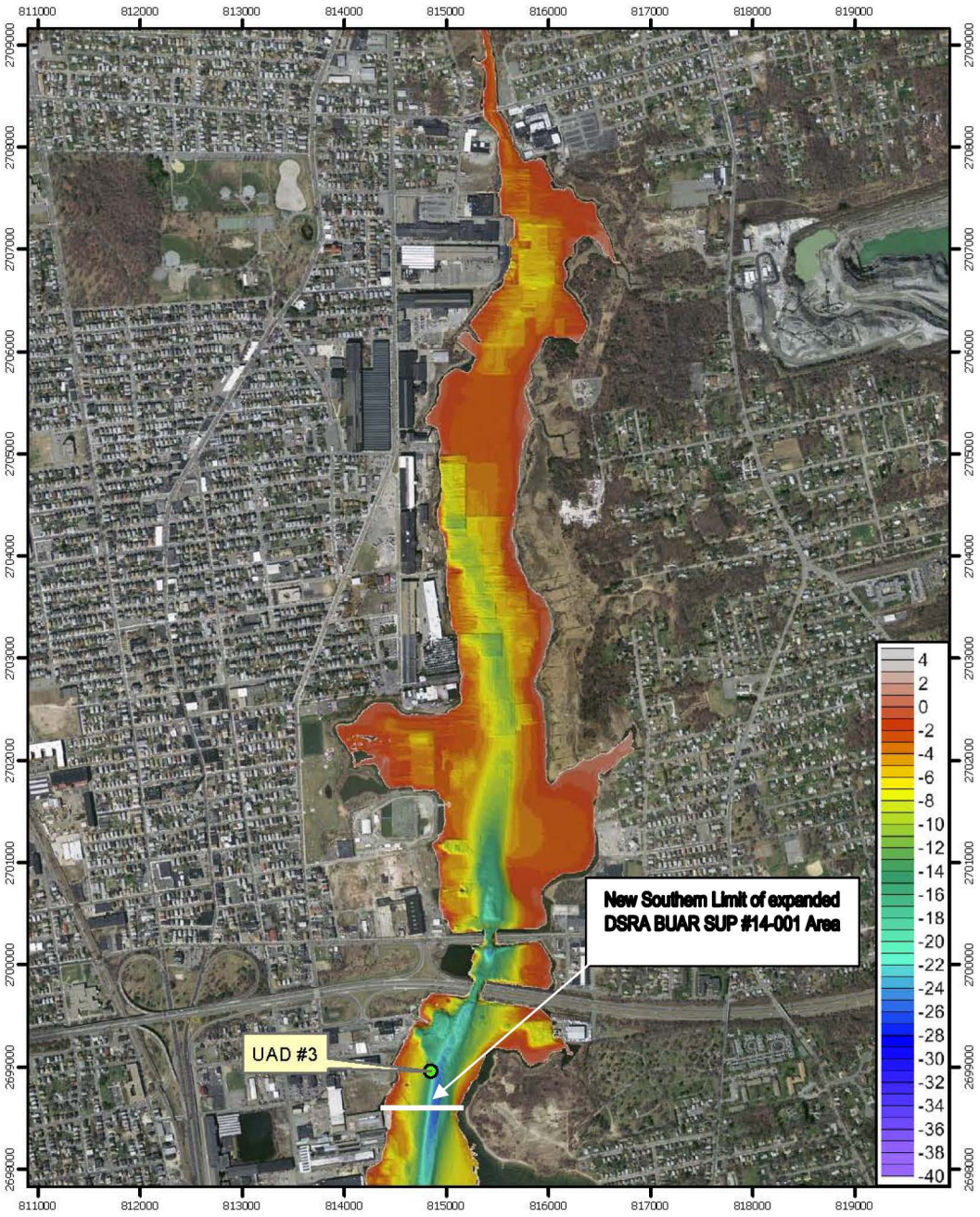
The undersigned understands and acknowledges that the Board may deny this permit application or revoke a permit granted whenever the Board determines that there is substantial fraud, deceit, corruption, or misrepresentation in the information or filing of this permit application.

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)	(Signature of Project Archaeologist)	10/10/17 (Date)
David S. Robinson, MA, RPA (Type or Print Name)	same (Type or Print Name)	same (Date)

FOR OFFICIAL USE ONLY (DO NOT COMPLETE THIS SECTION)

Date and Time Received: By:



xxxxxxxxxxxxxxxxxxxxxxx

MLLW Bathymetric Surface
New Bedford Harbor, Massachusetts

www.crenvironmental.com

NOTES:

1) Grid MA State Plane, NAD 83, US Ft

Feet
0 1,000 2,000

Figure X

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) 626-1141 Fax (617) 626-1240 Web Site: www.mass.gov/eea/agencies/czm/buar/

30 May 2017

David S. Robinson, M.A., R.P.A.
David S. Robinson & Associates, Inc.
55 Cole Street
Jamestown, RI 02835

RE: Supplemental Marine Archaeological Reconnaissance Survey, New Bedford Harbor Superfund Site Remediation, Acushnet, Fairhaven, and New Bedford, MA
Renewal of Special Use Permit 14-001

Dear Mr. Robinson:

This letter confirms the vote taken by the Massachusetts Board of Underwater Archaeological Resources on 25 May 2017 to renew, retroactive 30 March 2017, Special Use Permit No. 14-001 to David S. Robinson & Associates, Inc. (DSRA) for marine archaeological reconnaissance survey as part of the in New Bedford Harbor Superfund Site Remediation in Acushnet, Fairhaven, and New Bedford for the areas detailed on the figures accompanying the application. The duration of this permit is one year from the date of issuance with its expiration date as 30 March 2018.

This permit is herein granted dependent upon DSRA'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, provide their proposed research design and methodology to, and obtain the approval of 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

/vtm

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

SPECIAL USE PERMIT APPLICATION

RENEWAL OF BUAR SUP PERMIT #14-001 FOR 2017-18

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, MA RPA
ORGANIZATION: David S. Robinson & Associates, Inc.
(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: 55 Cole Street, Jamestown, RI 02835
TELEPHONE NUMBER: 401-578-7233 **FAX NUMBER**: n/a
EMAIL ADDRESS: davidandhayley1@cox.net

PROJECT NAME: New Bedford Harbor Superfund Site Remediation (2014)
LOCATION OF PROPOSED ACTIVITY
Nearest City or Town: New Bedford
Name of Water Body: New Bedford Harbor
Depth of Water: 0-23 ft
Total Acreage of the Project Area: N/A
Longitude and Latitude of Proposed Project Area (Project area of potential effect):
NE NW
SE SW
Description of Proposed Permit Area (narrative): New Bedford's Upper Harbor Area

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)
CONTACT NAME/ORGANIZATION: Marc Paiva (USACE)
ADDRESS:
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):
(already on file with the MA BUAR)

DESCRIPTION OF ANY KNOWN UNDERWATER ARCHAEOLOGICAL RESOURCE IN THE PROJECT AREA
EPA-USACE reported unanticipated discovery of wooden hull remains encountered during pre-dredge debris removal operations late in 2016.

Continued on page 2
Applicant initial DSR and date 4/25/17 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
- ☐ 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): Providing on-call marine archaeological supplemental reconnaissance survey and unanticipated discovery field response to the US EPA and USACE in support of their on-going remediation activities in the NBHSS Upper Harbor Area.

(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)?
Work provided in an on-call capacity. No work presently scheduled; however, the unanticipated discovery of wooden vessel remains in late 2016 will require work in 2017. Preparation of an addendum to this permit renewal is planned.

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.
(already on file with the BUAR)

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)?
Supplemental technical memorandum reports presenting methods, results, and management recommendations are prepared for each phase of work.

YOU MAY INCLUDE ANY OTHER INFORMATION YOU BELIEVE MAY ASSIST THE BOARD IN ASSESSING YOUR APPLICATION (Attach additional sheets as needed)
This is an administrative renewal of DSRA's BUAR SUP #14-001, for on-call supplemental survey and unanticipated discovery response services being provided to the US EPA and USACE in support of the on-going remediation activities being undertaken in the NBHSS Upper Harbor.

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)	4/25/17 (Date)
David S. Robinson, MA, RPA (Type or Print Name)	(same) (Type or Print Name)	4/25/17 (Date)

FOR OFFICIAL USE ONLY (DO NOT COMPLETE THIS SECTION)

Date and Time Received: By:

2016 ANNUAL REPORT BUAR

Special Use Permit No. 14-001

NBHSS Dredging Project, Acushnet and New Bedford, MA (MHC #RC.17682)

David S. Robinson & Associates, Inc.,
Jamestown, RI

In 2016, under BUAR Special Use Permit #14-001, David S. Robinson & Associates, Inc. (DSRA) served as the on-call marine archaeologist for CR Environmental, Inc. (CR) and Jacobs Engineering, Inc. (Jacobs) in support of the United States Environmental Protection Agency's (EPA) and the United States Army Corps of Engineers' (USACE-NAE) ongoing remediation activities within the Upper Harbor portion of the New Bedford Harbor Superfund Site (NBHSS). The Upper Harbor portion of the NBHSS was surveyed and reported on previously by Dolan Research, Inc. (Dolan) between 1999 and 2001 with the BUAR and MHC concurring with the survey's results and recommendations. Since the unanticipated discovery of an historical wooden shipwreck in the surveyed Upper Harbor area in 2009, DSRA and others have served in an on-call capacity and have completed supplemental surveys of several portions of the Upper Harbor area. Late in 2016, another unanticipated discovery of wooden vessel remains was made. The area of the discovery was subjected to additional engineering survey by CR to delimit its extent and inform the preparation of a marine archaeological research design for removing and documenting the unanticipated discovery during the summer of 2017. This research design will be submitted to MBUAR as part of an addendum to Special Use Permit #14-001, as well as to the Massachusetts Historical Commission (MHC), and the Tribes.

APPENDIX C

PROJECT WORK PLAN

INTEGRITY • KNOWLEDGE • EXPERIENCE

DAVID S. ROBINSON & ASSOCIATES, INC.

Marine Archaeological Consultants

Draft Work Plan

Marine Archaeological Investigation: Removal and Documentation of Recovered Hull Remains from NBHSS UAD SW#3, Lower Harbor Area (south of the Route I-195 Bridge)

Acushnet River, New Bedford, Massachusetts

October 31, 2017

Submitted to:

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

INTRODUCTION

In response to requests from the US Environmental Protection Agency – Region 1 (EPA), the US Army Corps of Engineers – New England District (USACE-NAE), Jacobs Engineering, Inc. (Jacobs), and CR Environmental, Inc. (CR), David S. Robinson & Associates, Inc. (DSRA) is pleased to submit the following Draft Work Plan for consideration. This Draft Work Plan summarizes the project description and history, and outlines the tasks necessary to perform a marine archaeologically-guided removal and documentation of the submerged and buried remains of an historical wooden ship encountered as an unanticipated discovery on October 4, 2017 in the Acushnet River/Lower Harbor Area portion of the New Bedford Harbor Superfund Site (NBHSS) within the city of New Bedford, Bristol County, Massachusetts (Figure 1). The submerged vessel remains, termed here "NBHSS Unanticipated Discovery Shipwreck #3" (NBHSS UAD SW#3) were located by Cashman Dredging & Marine Contracting Co., LLC (Cashman), during their performance of remediation dredging operations conducted on behalf of EPA and USACE-NAE within the previously-surveyed and archaeologically-cleared portion of the NBHSS Lower Harbor Area (see Cox, Jr. 2000).

Cashman's dredging operations are part of EPA and USACE-NAE's ongoing federal program of environmental remediation activities being conducted within the NBHSS. As the remediation activities constitute a federal undertaking requiring federal funds and permits, compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (36 CFR 800), is necessary. 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 (ACHP) 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 operates within the offices of the Massachusetts Historical Commission (MHC), working in consultation with the Massachusetts Board of Underwater Archaeological Resources (MBUAR).

Cashman is the engineering/dredging consultant contracted by EPA to conduct remediation dredging of contaminated soils and sediments within the marine portion of the NBHSS Lower Harbor Area. Although DSRA serves as Jacobs's principal 'on-call' archaeologist for the NBHSS Upper Harbor Area through DSRA's contract with CR, Jacobs's principal geophysical survey and mapping consultant for the Upper Harbor portion of the remediation project, Jacobs, CR, and DSRA were asked by EPA, USACE-NAE, and Cashman to assist them with the Lower Harbor Area unanticipated discovery of NBHSS UAD SW#3. The NBHSS Lower Harbor Area where the unanticipated discovery was made was previously surveyed and archaeologically cleared, in compliance with the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), as a result of surveys conducted between 1999 and 2000 by John Milner Associates, Inc. (JMA) and its marine archaeological consultant, Dolan Research, Inc. (Dolan). While the unanticipated discovery of another wooden shipwreck in the NBHSS Upper Harbor Area in 2009 (i.e., "NBHSS UAD SW#1") led EPA and USACE-NAE to adopt a new program of secondary and supplemental high-resolution marine archaeological site identification re-surveys of the marine and intertidal portions of the NBHSS Upper Harbor area by CR and DSRA (also surveyed previously by JMA and Dolan), to reduce the chances of similar unanticipated discoveries of additional shipwrecks from occurring, no similar program of marine archaeological identification re-survey has been performed to date within the NBHSS Lower Harbor Area.

The unanticipated discovery of NBHSS UAD SW#3, and NBHSS UAD SW#1 before it, as well as the July 6, 2016 unanticipated discovery of NBHSS UAD SW#2 (in the Upper Harbor Area), are all noteworthy, because they each occurred in areas of the NBHSS that had been subjected previously to marine archaeological investigations by different archaeologists, either as part of the original surveys conducted by JMA and Dolan between 1999 and 2000, or, as in the case of NBHSS UAD SW#2, to the subsequent re-surveys by CR and DSRA. In each case, a detectable diagnostic presence typically associated with shipwreck sites, such as an area on the harbor floor with an unusual surface texture or elevation change that is visible in the side scan sonar data or bathymetric record, or a clustered distribution of magnetic anomalies detected over multiple adjacent and closely-spaced survey track lines, was absent from the recorded side scan sonar, bathymetry, and magnetometer data. Additionally, the generally gaseous nature of the harbor floor's organic-rich sediments prevented acoustic penetration and acquisition of subbottom profiles, rendering it impossible to detect buried hull remains or ballast piles. In the case of NBHSS UAD SW#2, the only remote sensing contact or anomaly that was recorded at its location as a result of the re-survey was a single, isolated, and unremarkable low-amplitude (5 gammas) and short-duration (10 feet) monopolar magnetic anomaly (M111), which was detected on just one of the closely-spaced (i.e., effectively 12.5 feet apart) supplemental secondary re-survey track lines. New Bedford Harbor's long post-European contact history of early colonization, intensive maritime use, urbanization and industrialization have led to the deposition of significant amounts of ferrous metal debris and trash into New Bedford Harbor's waters. The accumulation of these materials on the harbor floor has created a situation wherein literally thousands of isolated, low-amplitude, short-duration magnetic anomalies have

been recorded during CR/DSRA's high-resolution supplemental secondary re-surveys of the Upper Harbor area. An isolated, single, low-amplitude, short-duration magnetic anomaly is analogous to a single star in a sky-full of similar stars, nearly all of which in the case of the NBHSS are caused by isolated debris or trash. If the shipwrecks had not been completely buried, or if the subbottom profiler had been able to penetrate the gaseous sediments of the harbor floor, it is likely that some element or elements of the ship remains would have been visible in the side scan sonar record or in subbottom profiler data, as has been seen repeatedly in similar data recorded over shipwrecks in other study areas. However, absent of any magnetic or acoustic indication, the circumstances of NBHSS UAD SW#1, NBHSS UAD SW#2, and NBHSS UAD SW#3 are all the same – each was essentially undetectable within the particular environmental conditions present in the NBHSS with the available site identification marine remote sensing technologies that are available. Presumably, in the case of NBHSS UAD SW#3, if JMA and Dolan had seen something with the potential to be a submerged shipwreck during their review of the remote sensing survey data from the Lower Harbor Area location of NBHSS UAD SW#3, they most certainly would have identified it and provided recommendations for further investigation.

The noteworthiness of these findings is also a source of significant concern, both from the perspective of planning future marine archaeological identification surveys within the NBHSS and from a broader submerged cultural resource management and site identification perspective, as they indicate that there is a demonstrated likelihood that older, less-well preserved, but potentially more historically significant, wooden shipwrecks that are buried beneath gaseous organic-rich sediments and whose ferrous metal elements are completely corroded, are likely to go undetected during standard, or even high-resolution, marine archaeological remote sensing identification surveys. The implications of these findings and their potential impact on the perceived efficacy of marine archaeological identification survey methods warrant further analysis and consideration by the research community, as well as by historic preservation officers of federal, state, and tribal agencies who are required to conduct NHPA Section 106-compliant identification surveys within submerged environments.

PROJECT DESCRIPTION AND HISTORY

The unanticipated discovery of NBHSS UAD SW#3 on October 4, 2017 during remediation dredging operations that were being performed by Cashman occurred at the northern end of the NBHSS's Lower Harbor Area, a short distance south of the Route I-195 bridge, within the city of New Bedford, Bristol County, Massachusetts (see Figure 1). The encountered submerged wooden ship remains were identified when they were brought to the surface in Cashman's environmental bucket (Figure 2). Upon encountering the wooden ship remains, Cashman followed the protocols of the NBHSS Unanticipated Discovery Plan (UDP), developed by Jacobs in 2010 for their NBHSS Upper Harbor remediation work for EPA and USACE-NAE. Cashman halted all remediation dredging work immediately within a 200-foot radius of the find location upon making the unanticipated discovery. EPA and USACE-NAE were then informed of the find, photographs of the recovered ship hull remains were taken (see Figure 2), coordinates for the find were recorded and reported (814848.57 / 2698955.62 [MA State Plane – feet], NAD 83), and the recovered wooden ship remains were placed temporarily in an on-site hopper barge partially filled with water to help preserve the wooden timbers while the plan for their disposition was developed (as documented in T. Rezendes' USACE-NAE, email to M. Paiva, USACE-NAE, October 5, 2017).

Continuing to follow UDP protocols, EPA/USACE notified Victor Mastone, Director of Massachusetts Board of Underwater Archaeological Resources (MBUAR), and DSRA's David Robinson, the on-call marine archaeologist for the NBHSS, of the find, on the same day it occurred [October 4, 2017]). EPA, USACE-NAE, Cashman and Jacobs then coordinated and a teleconference with representatives from EPA, USACE-NAE, Cashman, CR, DSRA, and Jacobs was held on October 5, 2017 to discuss the next steps for addressing the unanticipated discovery. Given that this find is the third unanticipated discovery of historical wooden ship remains in the NBHSS since 2009, an established and agency-approved approach was available to guide the response and development of this work plan for the NBHSS UAD SW#3 find. The teleconference concluded with the following next steps outlined:

a) EPA and USACE-NAE would continue to and/or initiate coordination and consultation with the MHC, MBUAR, the Tribes, and interested stakeholders, and would keep the project team informed of its status;

b) Cashman would provide coordinates and available dredging data from the area surrounding the NBHSS UAD SW#3 find location to the project team and would move the barge with the find's recovered timbers to the Jacobs pier at the NBHSS Sawyer Street facility;

c) CR would conduct a high-resolution non-disturbance, engineering debris-delineation survey in the area around the reported find site to try to more fully characterize the nature and extent of the NBHSS UAD SW#3-related debris, and provide processed data to DSRA to review for the purpose of developing a marine archaeological assessment report and site-specific shipwreck recovery marine archaeological work plan;

d) DSRA would: i) coordinate with CR regarding their debris-delineation survey methodology; ii) coordinate with MBUAR to request a revision to and expansion of the southern limit of their current Upper Harbor permit area to encompass the location of the NBHSS UAD SW#3; iii) review CR's processed data and narrative description of their debris-delineation survey methods to interpret them from a marine archaeological perspective; and iv) prepare: 1) a brief technical summary report on the survey's methods and results; and 2) a draft work plan outlining the tasks to be performed at the NBHSS UAD SW#3 find site that follows the same agency-approved research design model developed and employed in the cases of the previous two unanticipated discoveries of historical wooden shipwrecks in the NBHSS's Upper Harbor Area.

On October 6, 2017, DSRA coordinated with CR regarding their debris-delineation survey methodology and requested and obtained a map from CR showing the plotted location of NBHSS UAD SW#3 (based on the coordinates provided by Cashman) for DSRA to include in their MBUAR Special Use Permit-revision application.

On October 7, 2017, while DSRA's Principal, David Robinson, was at the NBHSS Sawyer Street facility to document NBHSS UAD SW#2 timbers, he examined and photographed from the Jacobs pier the recovered NBHSS UAD SW#3 timbers that were exposed above the water inside of the barge in which they are being temporarily stored. Robinson observed

that NBHSS UAD SW#3 framing timbers looked substantially larger than those from NBHSS UAD SW#1 or SW#2. Given that NBHSS UAD SW#1 was digitally-reconstructed to be the remains of an approximately 70-foot long vessel, the observed larger dimensions of the timbers from NBHSS UAD SW#3 suggest that they are from a vessel that could have been significant larger than the NBHSS UAD SW#1 vessel (e.g., an 80- to 100+-foot long vessel).

Between October 10 and 12, 2017, CR conducted their high-resolution, debris-delineation, remote sensing survey (i.e., hydrographic and geophysical) of the NBHSS UAD SW#3 find location. Survey systems included side scan sonar, magnetometry, sub-bottom sonar profiling, and multibeam bathymetry. The survey efforts were designed to provide the highest definition data possible to characterize and delimit the extent of the unanticipated discovery.

On October 16, 2017, DSRA submitted to Victor Mastone, Director of the MBUAR, the application for the revision (expansion) of their Special Use Permit (SUP) 14-001, and coordinated with USACE-NAE archaeologist, Marcos Paiva, to inform him that the application had been submitted and to get an update on the status of EPA and USACE-NAE's consultation with SHPO (MHC), tribes and stakeholders.

On October 17, 2017, provisional approval of the revision to DSRA's MBUAR SUP 14-001 was obtained from MBUAR Director Mastone. Formal approval by the full MBUAR is pending their next meeting on November 30, 2017. Only provisional approval is required to include the NBHSS UAD SW#3 site in DSRA's expanded SUP Area and to move forward with the planning of additional marine archaeological investigation.

Between October 17 and October 19, 2017, DSRA received CR's initial plots of their processed high-resolution NBHSS UAD SW#3 debris-delineation survey data, and a narrative text description of their survey instrumentation and data acquisition and processing methodologies.

On October 17, 2017, DSRA's David Robinson and CR's Senior Hydrographer, Chris Wright, conducted a first-pass joint-review of the data via an on-line link provided by CR/Wright to establish about how much of the ship remains associated with NBHSS UAD SW#3 discovery are exposed and how much may be buried, and to assess whether or not physical probing, as was performed at the NBHSS UAD SW#2 find site to delimit its buried extent, would be feasible at the NBHSS UAD SW#3 site. This review session concluded with the observations that: a) there was only a 6-x-18-foot area of exposed hull visible in the sidescan sonar data; b) framing timbers appeared to be approximately 1-foot square in their molded and sided dimensions; c) that there is an 8-foot-x-1-foot timber among the vessel remains that extends approximately 5 feet above of the harbor floor; and d) there are multiple discontinuous acoustic reflectors suggestive of deeply-buried hull remains that are likely below the remediation prism's depth. These findings indicated that a vast majority of the shipwreck is either: a) missing; or b) buried. While both CR and DSRA concluded that physical probing would be indicated as the most effective means for delimiting the extent of the buried hull remains, in this case, however, the location of the NBHSS UAD SW#3 find in water too deep to effectively probe in, on a slope in the harbor floor, and just south of an area where the width of the harbor constricts and, as a result, outgoing tidal currents are strong, together indicate, instead, that probing would be logistically infeasible considering the information that would be gained relative to the effort and time that would be required

to gain it. Consequently, DSRA concluded from the joint data-review effort with CR that they would not be recommending physical probing.

On October 18, 2017, DSRA coordinated with the USACE-NAE's Paiva, Jacobs's Josh Cummings, and CR's Chip Ryther to inform them of the preliminary findings and impressions they had gotten from the first-pass joint-review of the CR data with Wright, and the infeasibility of conducting physical probing at the NBHSS UAD SW#3 site. DSRA also discussed options for two different approaches for the shipwreck recovery phase at the NBHSS UAD SW#3 find site: a) conduct DSRA field-directed removal of the all ship remains, as accomplished at the previous two unanticipated discovery shipwreck sites; or b) conduct DSRA-monitored dredging operations at the site with only those elements of the ship's remains located within the dredging prism recovered. DSRA's Robinson requested planned remediation dredging depth limits at the NBHSS UAD SW#3 site from Jacobs/Cummings to assess the feasibility of shipwreck removal option 'b.'

On October 20, 2017, DSRA's Robinson coordinated with Jacobs/Cummings to get clarification/confirmation re: planned dredging depths, and informed Jacobs/Cummings that DSRA would review all of the available survey and dredging information over the weekend and make a decision re: whether or not it would recommend shipwreck recovery option 'a' or 'b' the following week.

During the week of October 23-27, 2017, DSRA determined that option 'a' makes the most sense in terms of the benefits of proposing to continue to follow an established and agency-approved precedent, as well as from a logistics and equipment standpoint for archaeologically-guided shipwreck removal operations. DSRA also continued its detailed review of CR's data and began preparing the brief technical summary report on the archaeological assessment of CR's debris-delineation survey data and this shipwreck removal Draft Work Plan.

The remainder of this Draft Work Plan presents the details of DSRA's proposed recommended research tasks for the archaeologically-guided removal and archaeological documentation of the NBHSS UAD SW#3 unanticipated discovery. These proposed tasks were developed based on the results of the more-detailed surveys, our experiences from working on NBHSS UAD SW#1 and SW#2, and with the exception of some minor site-specific adjustments are essentially the same and unchanged.

PROPOSED RESEARCH TASKS

Task 1: Coordination/Consultation

DSRA President & CEO, David S. Robinson, M.A., R.P.A., will serve as the Project's qualified marine archaeologist and principal investigator. DSRA will coordinate with and provide consultation services to CR, Jacobs, Cashman, EPA and USACE-NAE, as directed by CR and Jacobs, to assist Cashman, EPA and USACE-NAE in their technical communications and consultation with other federal, state, tribal, and local agencies, and interested parties (e.g., 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) related to compliance with the NHPA's Section 106, and other federal and state laws pertaining to project-related cultural resource management issues. DSRA assumes it will be required to attend and participate in a single on-site preparatory meeting with CR, Jacobs, Cashman, EPA and USACE-NAE staff prior to the

initiation of field operations, as well as in any other meetings that we are requested to attend and participate in during the course of the project.

Task 2: MBUAR Special Use Permit No. #14-001 Additional Revision and Submittal

Upon finalization of this marine archaeological work plan, DSRA will coordinate with MBUAR and prepare and submit the necessary documentation to revise again DSRA's existing MBUAR SUP#14-001 to include the recovery of shipwreck remains at the location of NBHSS UAD SW#3, in accordance with 312 CMR 2.06(1)(c). Copies of the revised MBUAR Special Use Permit documentation will also be copied to CR and Jacobs, for Jacobs to distribute to Cashman, EPA, USACE-NAE, the MHC (i.e., SHPO), and the tribes for their review and files.

Task 3: Supplemental Research

DSRA will perform, as necessary, supplemental research to identify to the extent possible the vessel type, purpose and identity of NBHSS UAD SW#3. Sources of information likely to be consulted include archival documentation assembled during the investigation of NBHSS UAD SW#1 and UAD SW#2, relevant cultural resource management reports, site files, and State and National Register files of the MHC and MBUAR, NOAA's AWOIS (Automated Wreck and Obstruction Information System), the *Encyclopedia of American Shipwrecks* (Berman 1972), historical charts and maps of the area, published and unpublished primary and secondary sources on the area's history, and information gained from informal interviews with local persons knowledgeable about New Bedford's maritime history.

Task 4: Archaeological Monitoring of Removal, Transport & Storage of Ship Timbers

DSRA's David Robinson will help coordinate and monitor in the field the archaeologically-guided removal, transport and temporary storage of NBHSS Shipwreck #3's individual hull timbers. Removal will be accomplished by Cashman using equipment that is equivalent to that which was used to recover the remains of NBHSS UAD SW#2: a Komatsu PC-220 machine with an "Add-A-Stick" extension and hydraulic rake attachment (or equivalent) and operator on a 40-x-40-foot- (12-x-12-meter-) long deck-barge fitted with spuds; a work boat and an operator; two 50-cubic yard (38-cubic meter) hopper-barges or scows for containment of recovered debris and shipwreck materials (one of which will be partially filled with water to keep recovered timbers wet prior to their transfer and storage onshore, and the other of which will be kept dry and will be for recovered materials deemed by DSRA to be unrelated debris or shipwreck elements in too poor of a condition to be identifiable or worthy of detailed documentation); and a gas-powered water pump and hose for gross decontamination of the timbers as they are recovered and brought onto the deck-barge for their initial photo-documentation and sorting.

DSRA will communicate directly with the machine operator to ensure that the removal of NBHSS Shipwreck #3's individual hull components is done in as systematic a manner as possible, progressing from one end of the vessel to the other. This systematic approach will better ensure that all of the shipwreck's remains have been removed as the process progresses, as well as facilitate and enhance DSRA's analysis, interpretation and "on-paper" reconstruction of the recovered hull remains. DSRA will maintain a field notebook in which they will record information concerning the dates and times they worked on-site, personnel who were involved, the details and progress of the removal process, and an inventory of items that were recovered and retained. Individual timbers will be recovered initially onto the deck barge for DSRA to determine whether they will be retained for detailed

documentation or simply discarded. If the former option is selected, then gross decontamination, preliminary photo-documentation, and transfer to the nearby water-filled barge will occur. This process will be repeated until DSRA and Cashman have determined that all of NBHSS UAD SW#3 has been removed.

Once DSRA and Cashman have determined that all of NBHSS UAD SW#3's hull remains has been removed, the water-filled barge with the recovered timbers will be moved to Jacob's temporary Sawyer Street facility pier. Water in the barge will then be pumped out and individual timbers will be removed from the barge to the pier where they will be wrapped in polyethylene sheeting secured with duct-tape and then transferred a short distance to an area that is adjacent to, ***but not contiguous with*** (to prevent mixing of the recovered timbers from two different vessels), the onshore temporary storage location within the NBHSS Sawyer Street facility where NBHSS UAD SW#2's timbers were stored. The detailed archaeological documentation task will occur at that location.

Task 5: Archaeological Documentation of NBHSS UAD SW#3's Hull Remains

Recovered ship timbers and other material culture finds associated with NBHSS UAD SW#3 will be subjected to detailed documentation, analysis, and interpretation utilizing the same methods that were employed for NBHSS UAD SW#1 and SW#2. Documentation (i.e., documentation performed in addition to that which was completed during recovery operations) will consist of digital scale photographs and measured scale drawings of the dimensions, shapes and surface details of each individual timber (in plan and profile). Each timber will be analyzed and interpreted (to the extent possible) to determine its approximate age, function, and place within the vessel's hull. Wood species identification, which can provide an indication of where the vessel was built and repaired, will also be attempted on select representative examples of each recovered hull component (e.g., stem, deadwood, keel, sternpost, frames (floors and futtocks), keelson, ceiling, planking, treenails, etc.).

Task 6: Reporting

DSRA will prepare and submit electronically to CR, Jacobs, Cashman, EPA and USACE-NAE for review and comment an internal draft marine archaeological report upon completion of Project Tasks 3, 4 and 5 (i.e., supplemental research and removal and documentation of NBHSS UAD SW#3's hull remains). Upon DSRA's receipt of internal comments, the electronic version of an external draft report will be prepared and submitted to CR and Jacobs for production and external distribution. Upon receipt of external reviewer comments, an electronic copy of the final report addressing those comments will be prepared and submitted to CR, Jacobs, Cashman, EPA and USACE-NAE for external distribution and archiving.

The reports will include the following elements:

- Introduction
- Research Design and Methodology
- Results of the Supplemental Research and Field Documentation
- Summary and Recommendations
- References
- Tables
- Figures

- Appendices

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).

HEALTH AND SAFETY PROTOCOLS

DSRA's planned marine archaeological fieldwork will involve working onboard either CR's, Jacob's, and/or Cashman's survey vessels, workboats, and deck barges. This fieldwork, as well as the onshore shipwreck timbers documentation on-site fieldwork, will be conducted in close proximity to and, at times, in direct contact with the contaminated recovered remains of NBHSS UAD SW#3 and their associated contaminated sediments. *DSRA will adopt and comply with the Jacobs and/or Cashman Project Health and Safety Plan for the NBHSS throughout the duration of its field investigations.*

DSRA fieldwork performed onsite at the NBHSS will be conducted wearing Level D personal protective equipment (PPE). This PPE will include, at a minimum, safety vest, hard hat, safety glasses, steel-toe boots, shirt with sleeves and long pants. For fieldwork conducted during the shipwreck timbers recovery phase of the project, DSRA personnel will wear "modified" Level D PPE consisting of hard hat, safety glasses, disposable Tyvek coveralls, steel-toe boots with disposable protective rubber over-boots, and nitrile gloves (i.e., inner and outer gloves when handling ship timbers). The disposable Tyvek coveralls, rubber over-boots and nitrile gloves will be provided to DSRA by Jacobs. Additionally, the requisite PPE for all work conducted within 5 feet of the water's edge, or on any floating plant will also include a personal flotation device (PFD). All of DSRA's archaeological field staff working on the project will have undergone 40-hour HAZWOPER training, have previous experience working on HAZMAT sites, have undergone the requisite 8-hour refresher training within the last year, and have physician certification for the ability to work on a hazardous waste site, per OSHA regulation 29 CFR 1910.120. They also will hold current certifications in first aid and CPR. Documentation of this training and the associated certifications is on file with CR and Jacobs. All DSRA on-site field personnel will sign in and out using the Daily Sign-In book located at the reception desk in the Jacobs trailer at the front of the NBHSS. All DSRA on-site field personnel will also check in with Jacobs personnel as notification of presence on site and to receive an update to any specific requirements for work to be performed. DSRA's on-site field personnel will also assist the Jacobs and Cashman Site Safety and Health Officers in complying with foul weather preparedness procedures, as needed and directed.

PROJECT SCHEDULE

Task 1 will be on-going throughout the Project. Task 2 will be completed within five business days of DSRA's receipt from CR of a formal notice-to-proceed on the project. Task 3 will be on-going throughout the project. Task 4 will be accomplished within an approximately one-week long period and is projected to start on an as-yet determined date sometime in November 2017. Task 5 is anticipated to take approximately 20, ten-hour long field-days to complete, which we be completed over the Spring of 2018. The internal draft report element of Task 6 will be initiated upon completion of Task 5, and completed within

an 80-hour work period spread out over approximately 90 days. Completion schedules for the external Draft and Final Report deliverables will be dependent upon receipt of comments from internal and external Project reviewers.

PROJECT PERSONNEL

Qualified marine archaeologist, David Robinson, M.A., R.P.A., president & CEO of DSRA, will serve as the marine archaeological project manager/principal investigator for the Project. Mr. Robinson has 26 years of professional supervisory and field experience conducting similar types of marine archaeological investigations throughout the mid-Atlantic and Northeast regions. Since 2003, he has served as a principal investigator on multiple marine and terrestrial archaeological investigations conducted in the NBHSS on behalf of EPA and USACE-NAE. These investigations have included the marine archaeological responses to the 2009 unanticipated discovery NBHSS UAD SW#1 and the 2016 unanticipated discovery of NBHSS UAD SW#2. He will perform/oversee all aspects of the Project's administration, fieldwork and the preparation of Project deliverables. Mr. Robinson's professional qualifications exceed the standards established by the National Park Service (36 CFR Part 66, Appendix C). Mr. Robinson may be assisted in the fieldwork during the shipwreck remains documentation task (Task 5) by a qualified DSRA marine archaeological field specialist.

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FIGURES

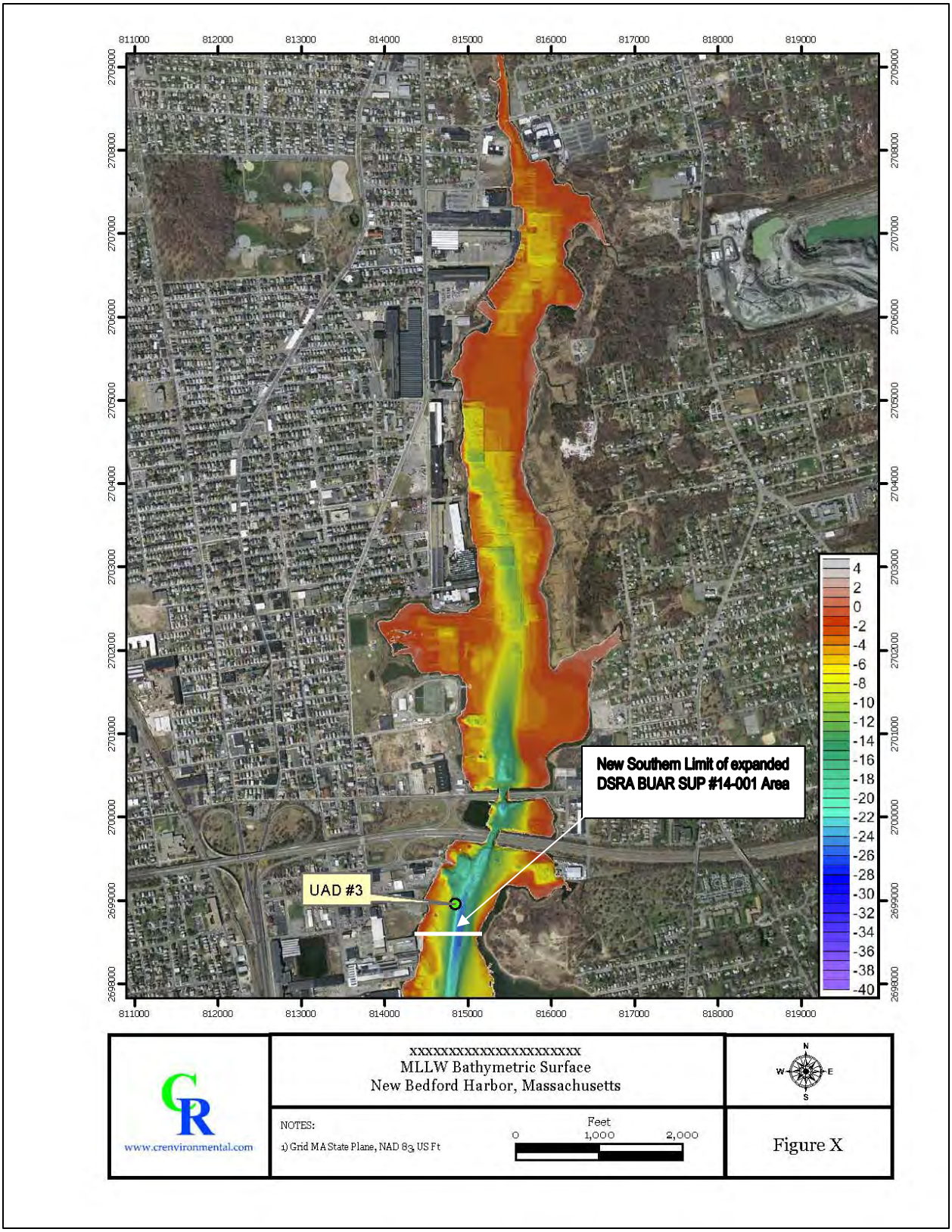

Figure 1. Map of NBHSS UAD SW#3's location in the NBHSS Lower Harbor Area and the revised and extended southern limit of DSRA's SUP 14-001 (base figure provided by CR).

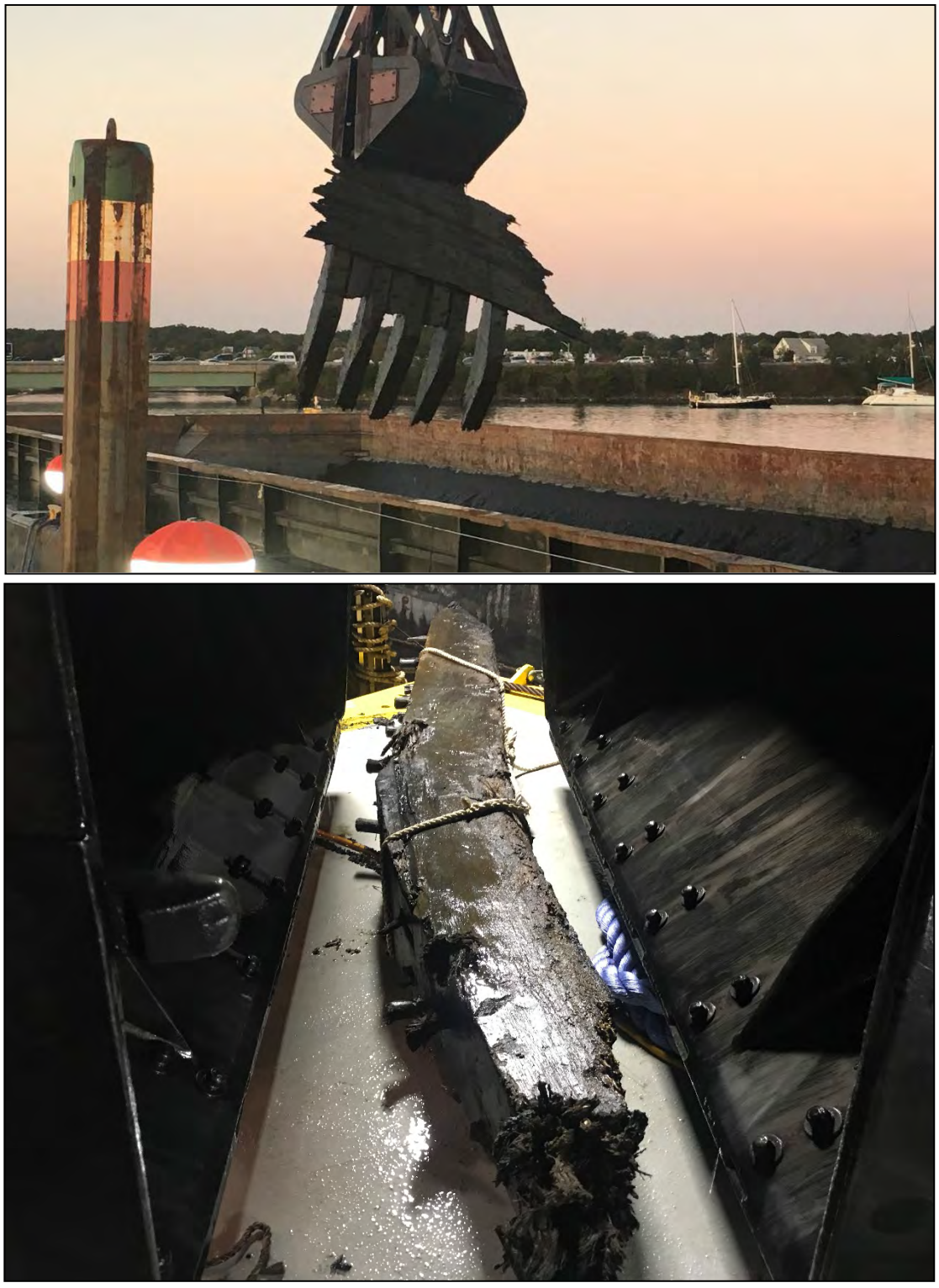

Figure 2. Ship remains encountered and recovered from the NBHSS UAD SW#3 unanticipated discovery find site at the northern end of the NBHSS Lower Harbor Area.

APPENDIX D

NBHSS UAD SW#3 DOCUMENTATION: PHOTOGRAPHS & DRAWINGS

AFT KEEL SECTION

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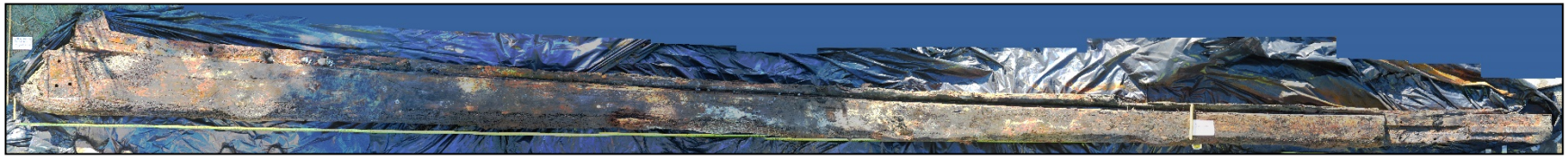
(aft keel section)



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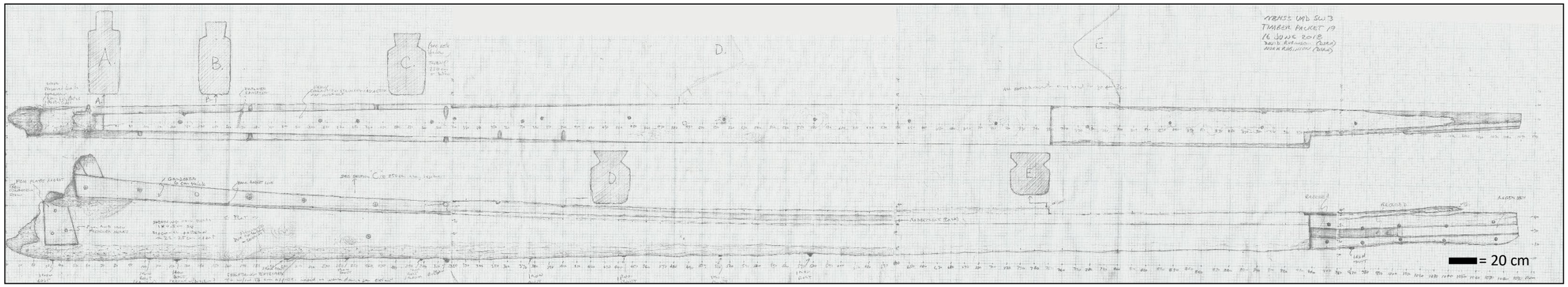
(aft keel section)

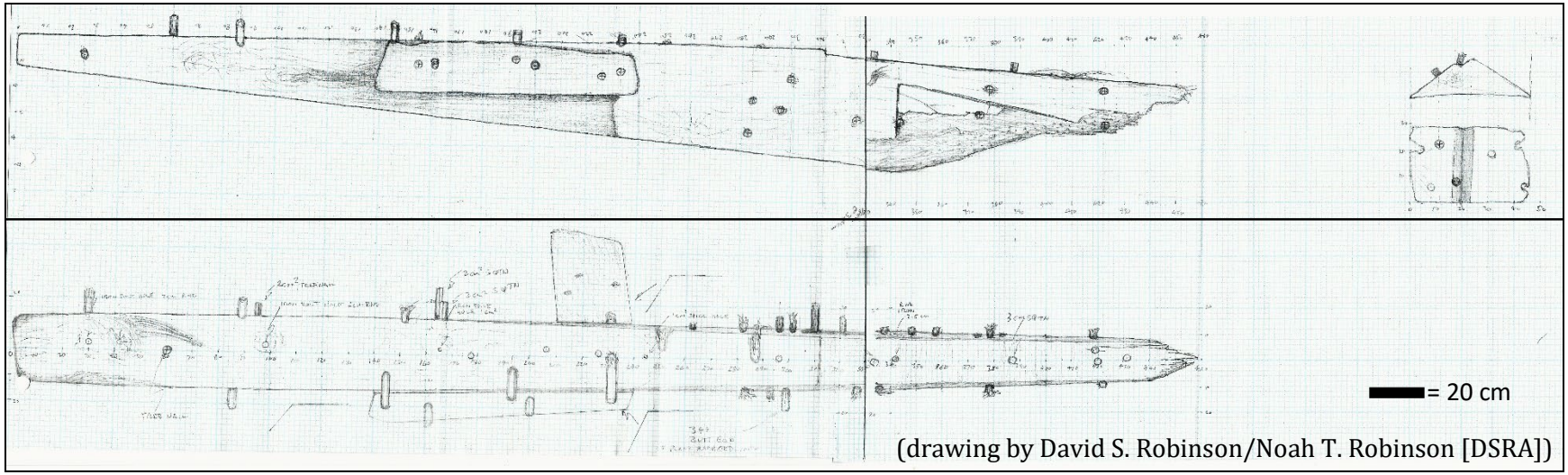


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

AFT DEADWOOD

TIMBER PACKET 23
(aft deadwood)

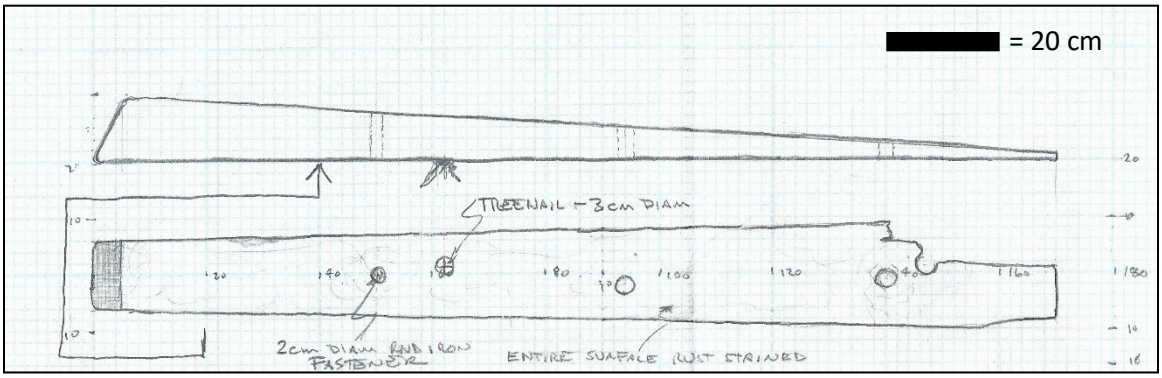
TIMBER PACKET 23
(aft deadwood)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 17
(aft deadwood)

TIMBER PACKET 17
(aft deadwood fillet)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

FLOORS

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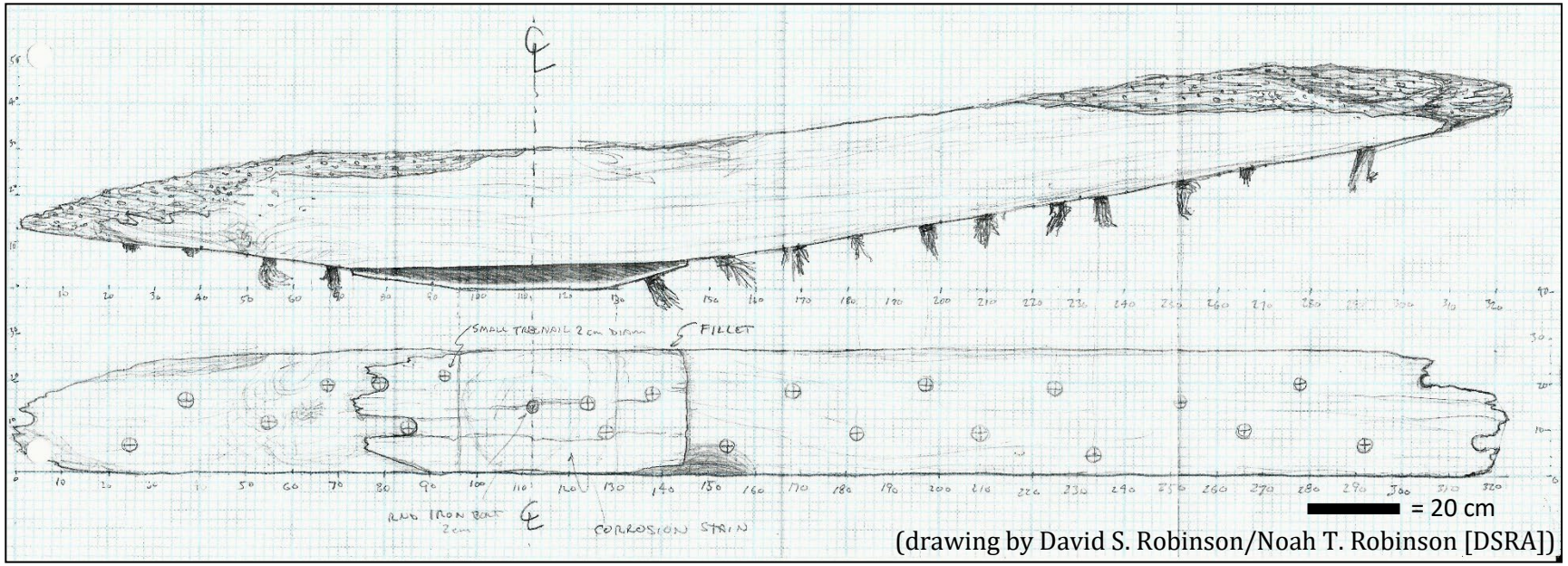
(floor)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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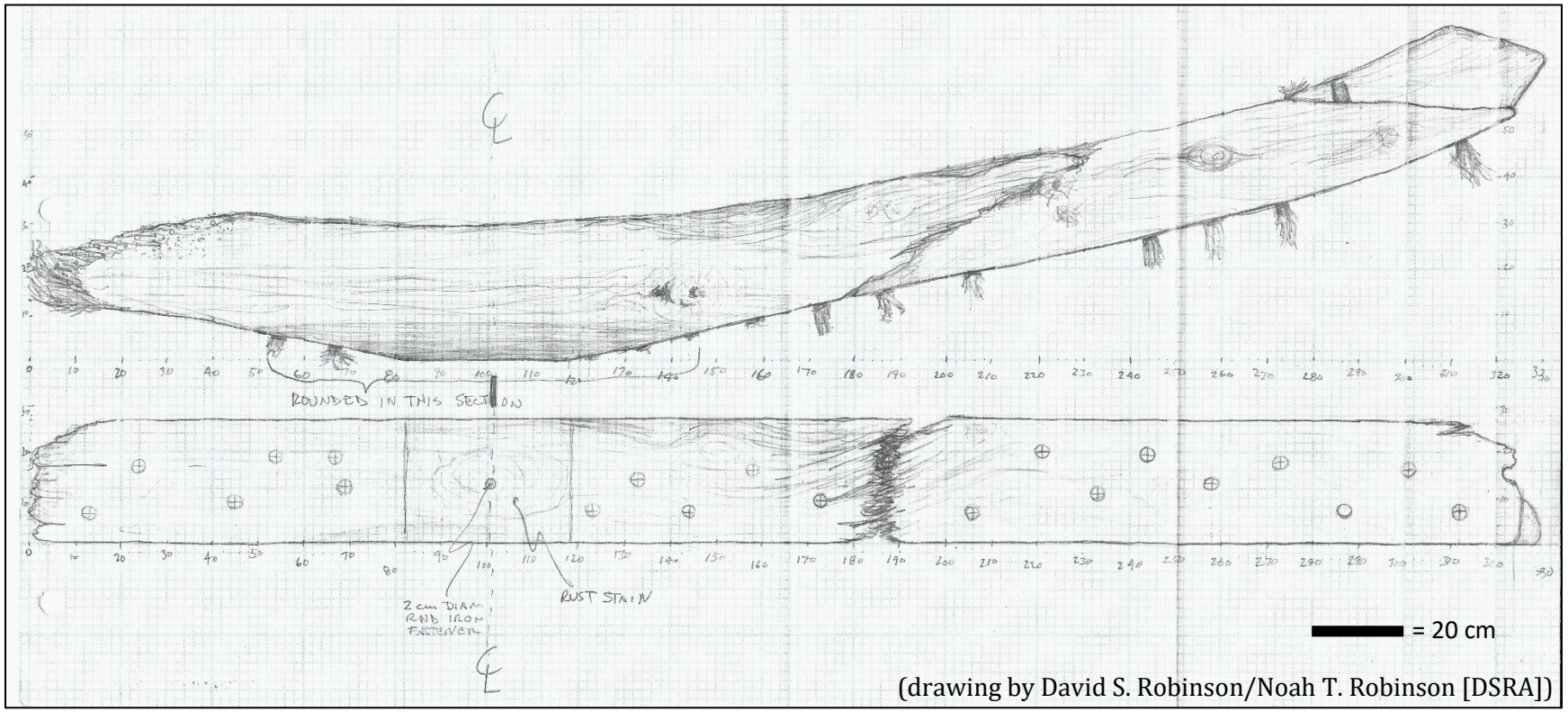

(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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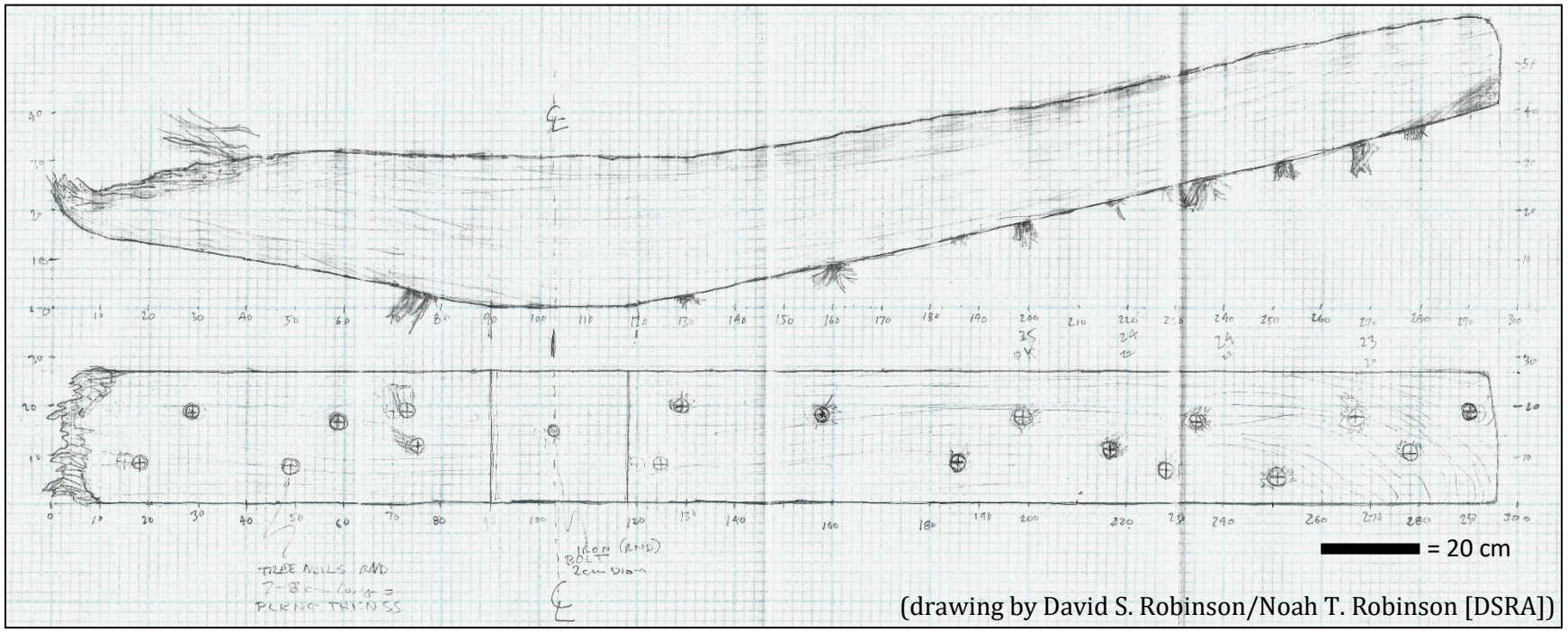

(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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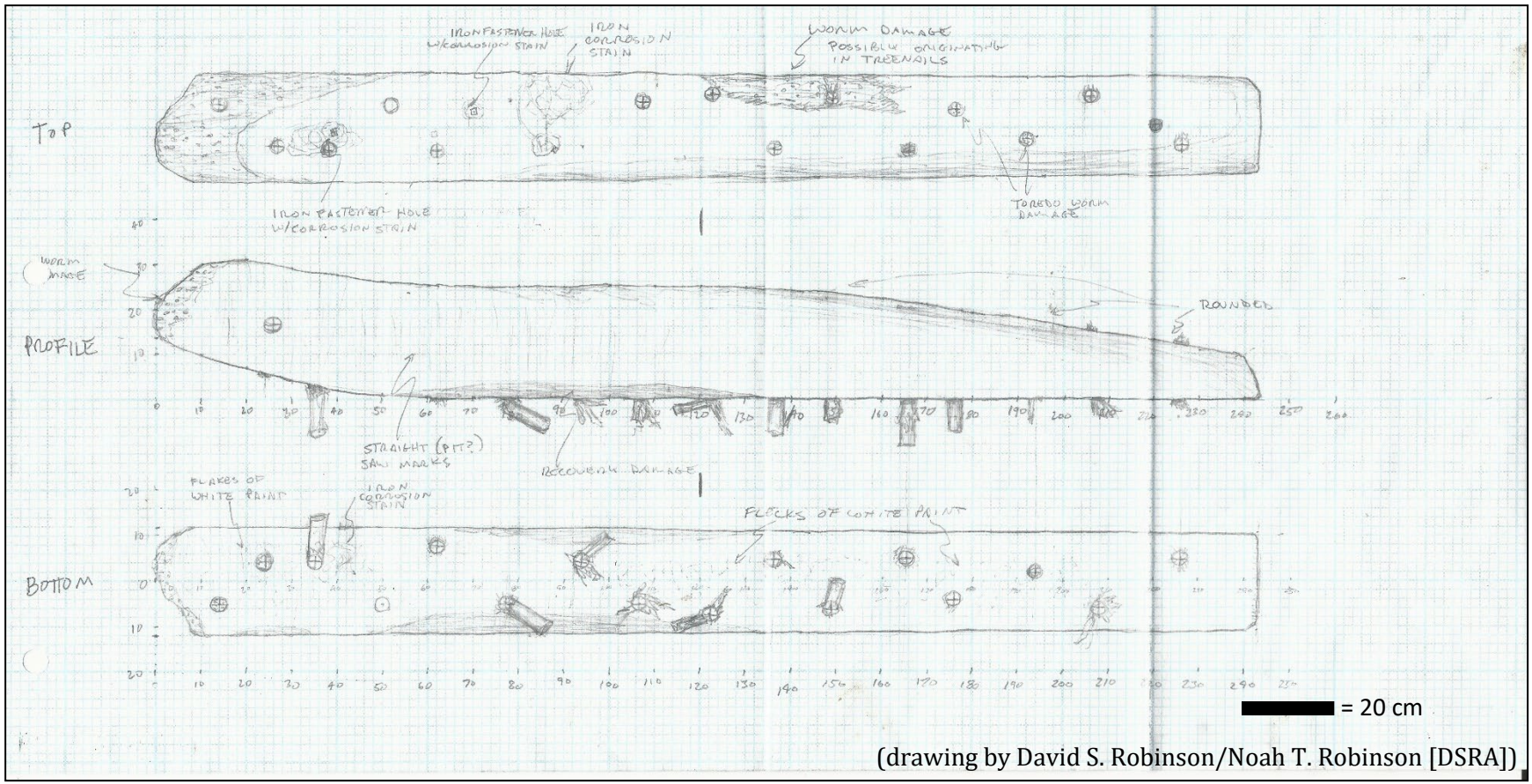
TIMBER PACKET 8
(floor)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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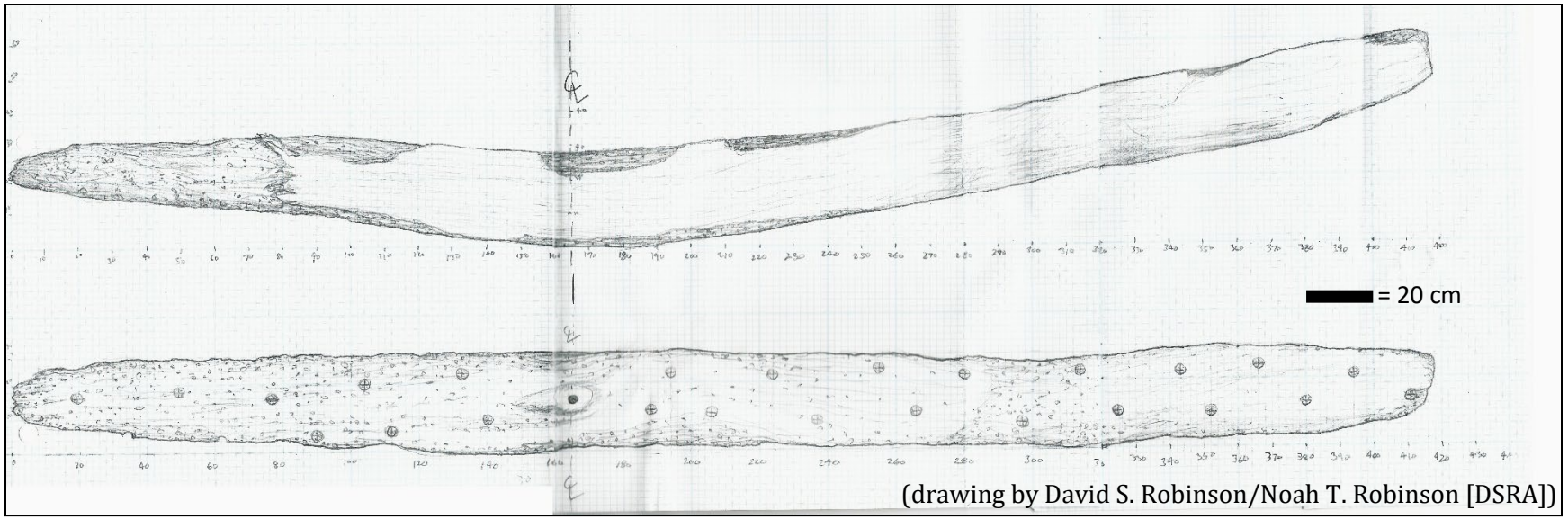

(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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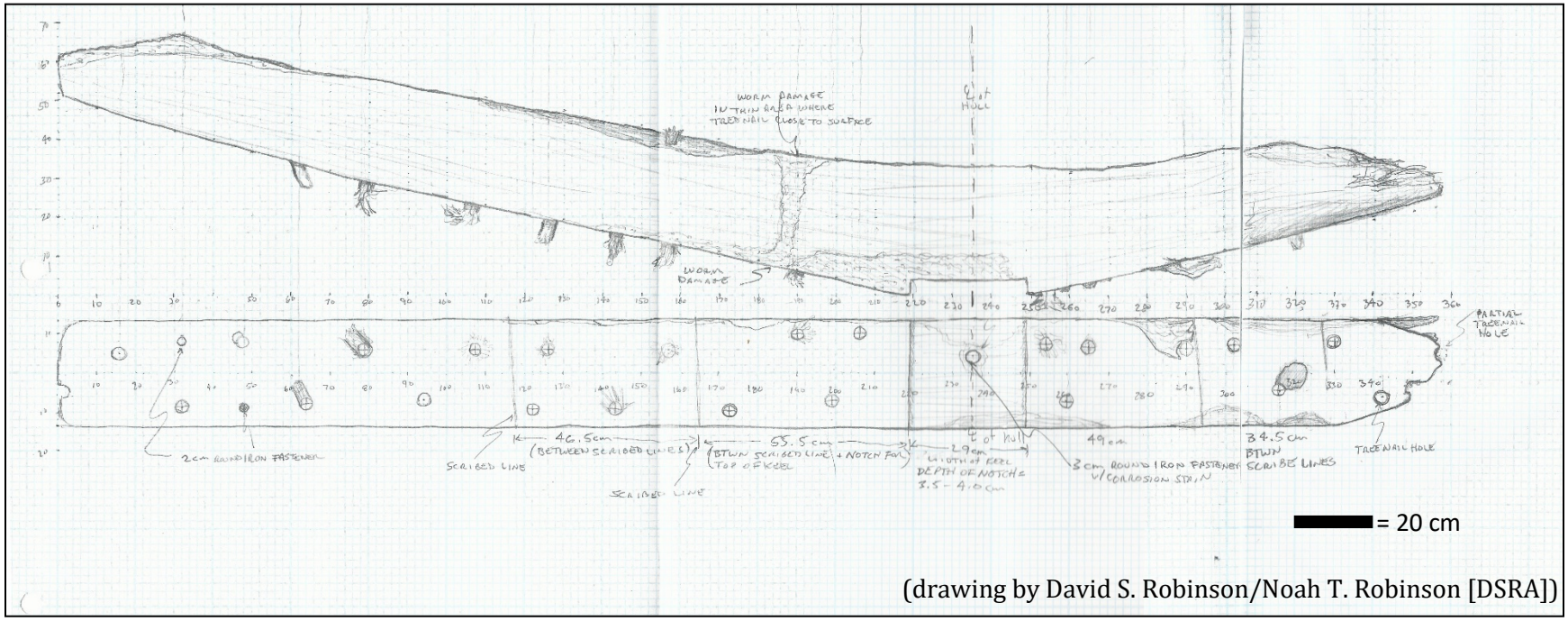

(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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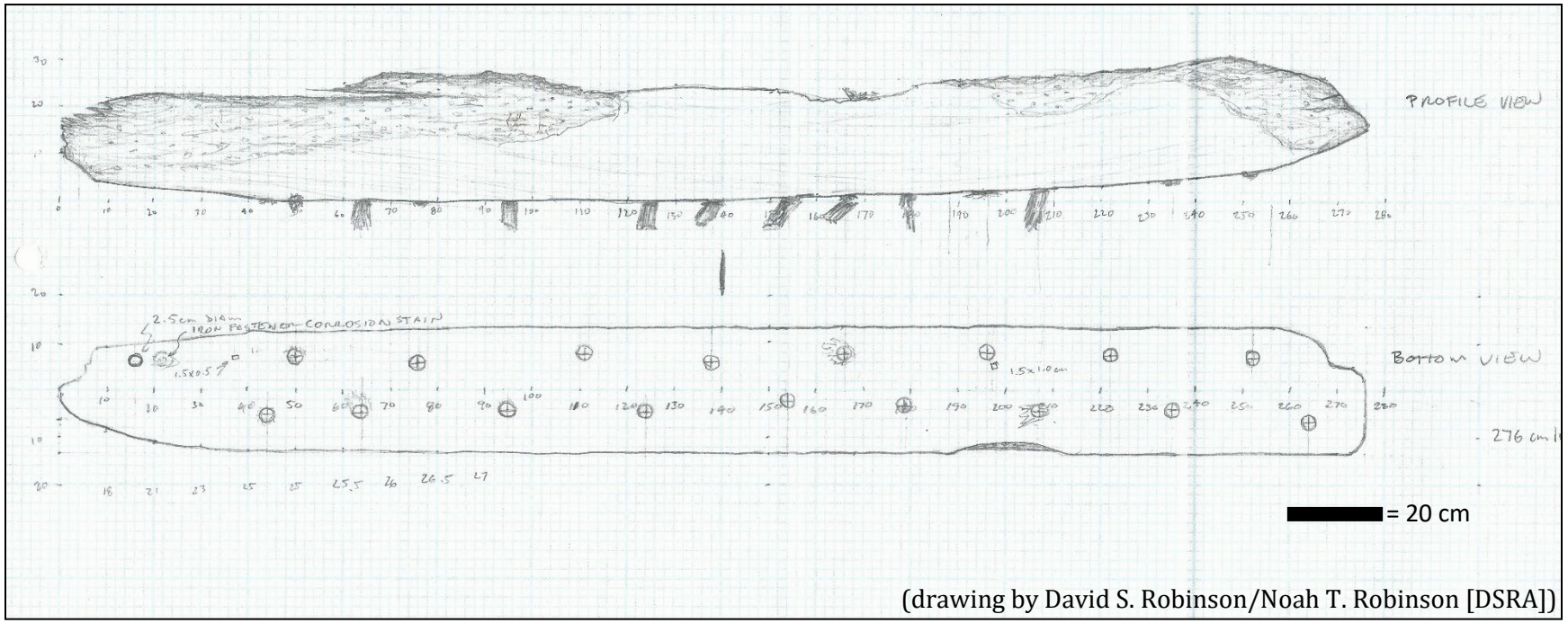

(drawing by David S. Robinson/Noah T. Robinson [DSRA])

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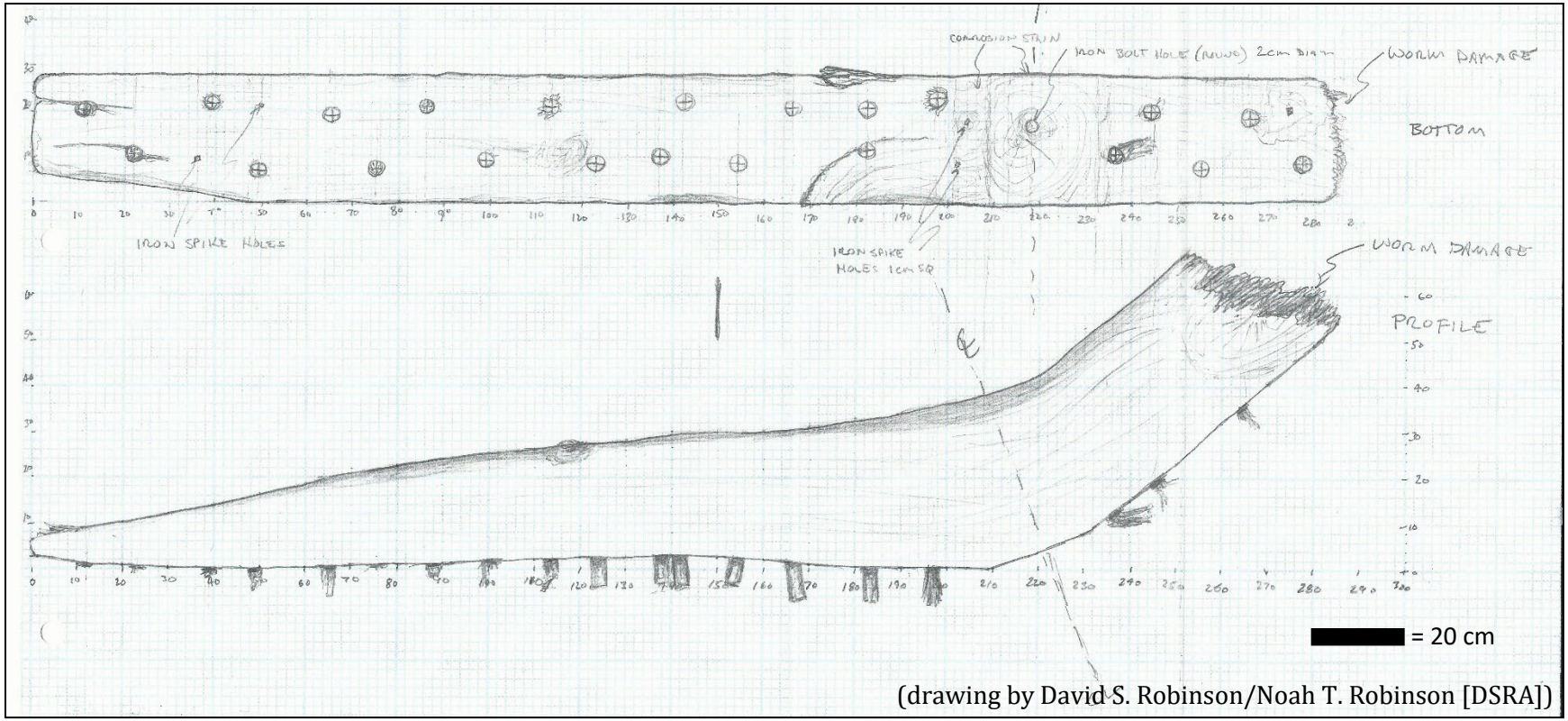
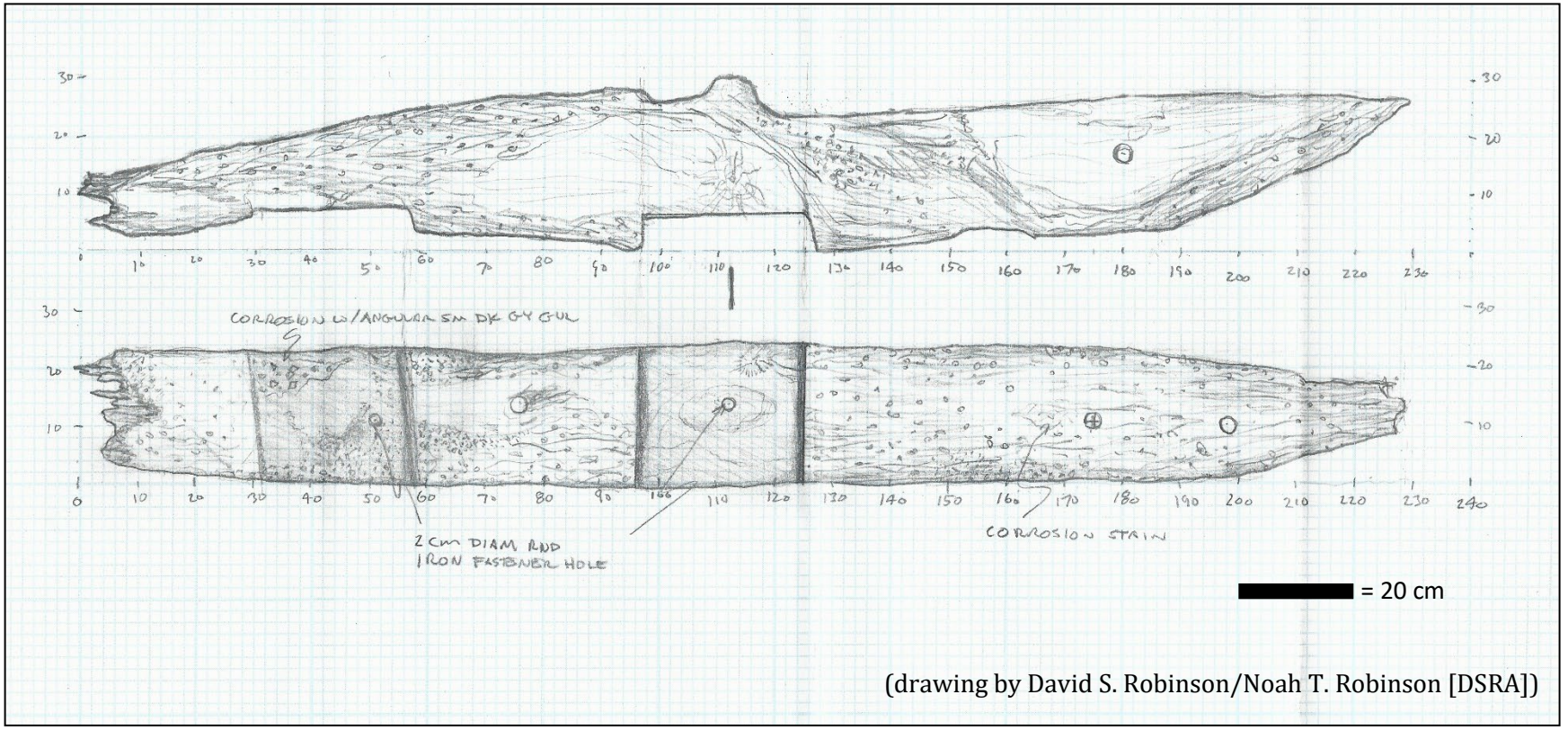
TIMBER PACKET 39
(floor)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 40
(floor)

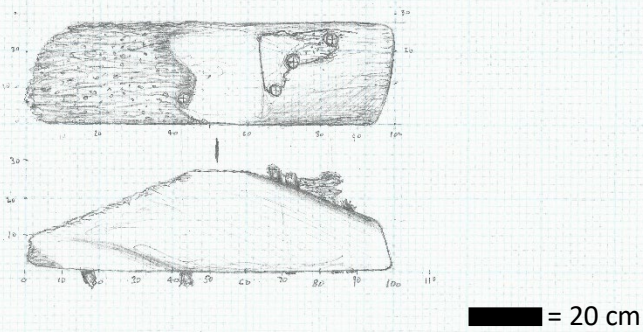
TIMBER PACKET 40
(floor)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 55
(floor fragment)

TIMBER PACKET 55
(floor fragment)

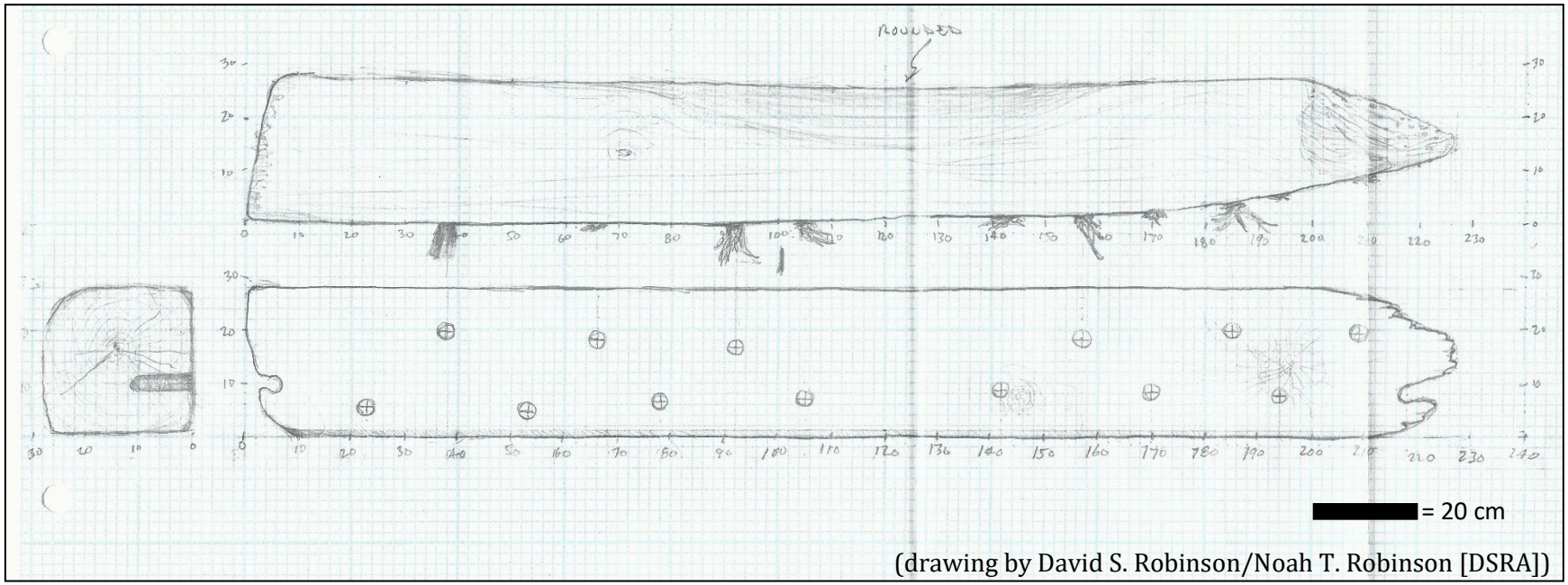


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

FIRST FUTTOCKS

TIMBER PACKET 3
(first futtock)

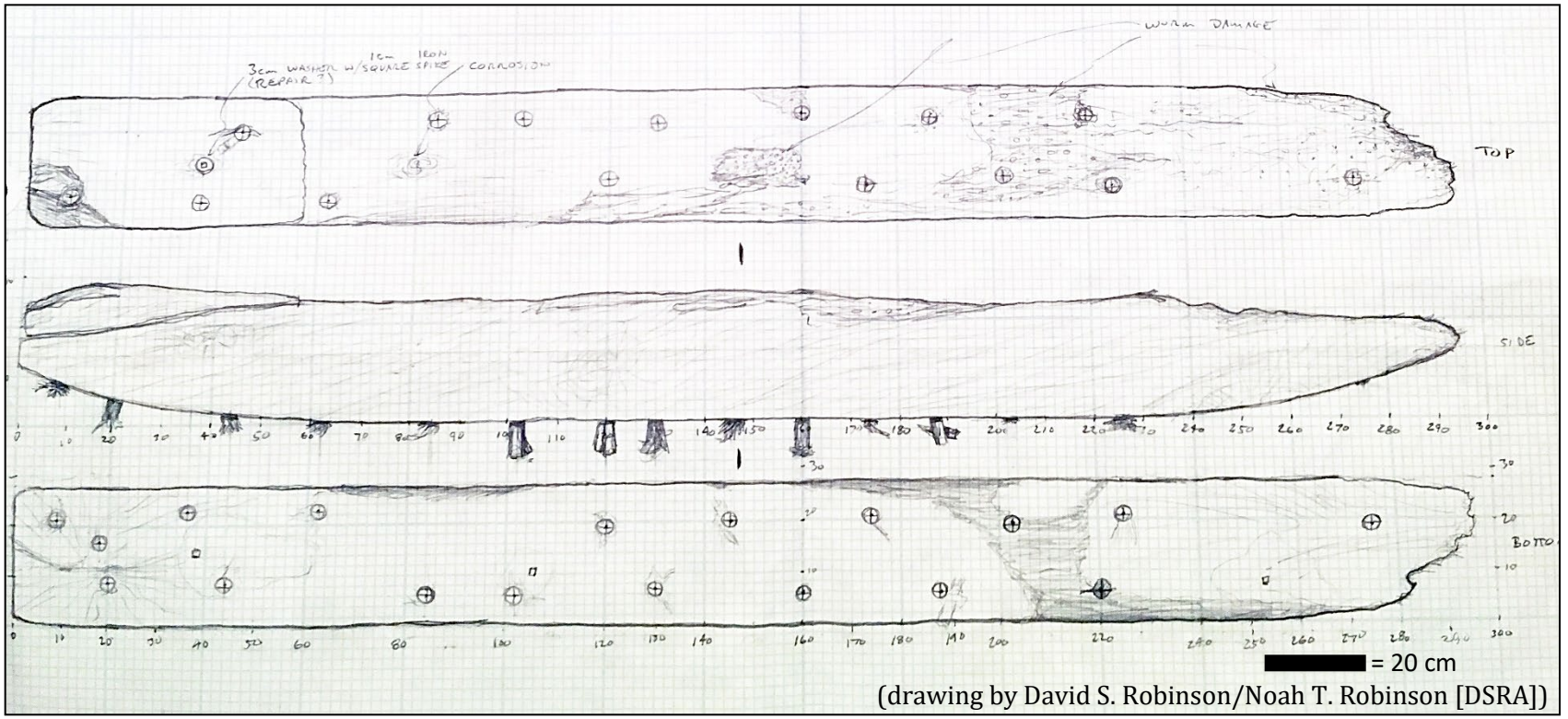
TIMBER PACKET 3
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

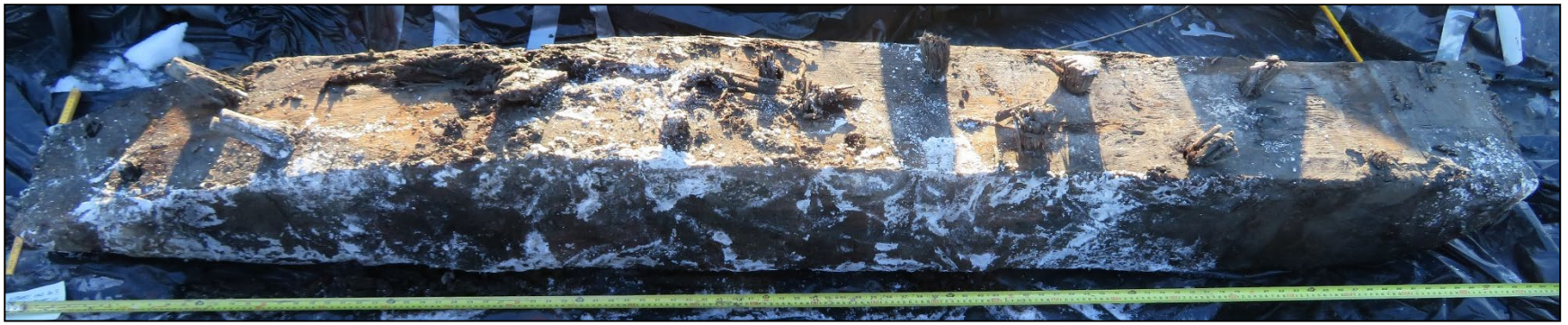
TIMBER PACKET 9
(first futtock)

TIMBER PACKET 9
(first futtock)

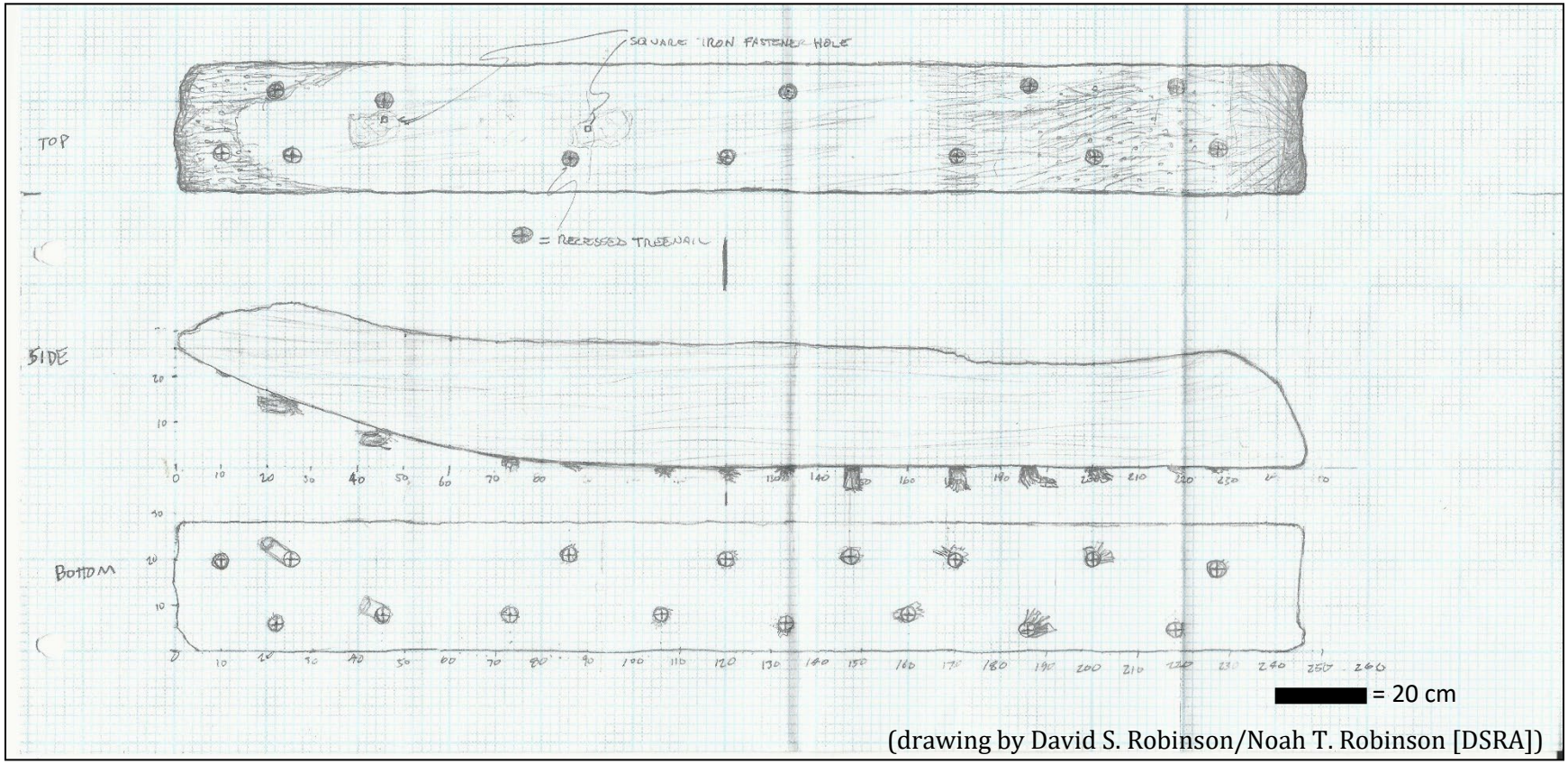


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 10
(first futtock)



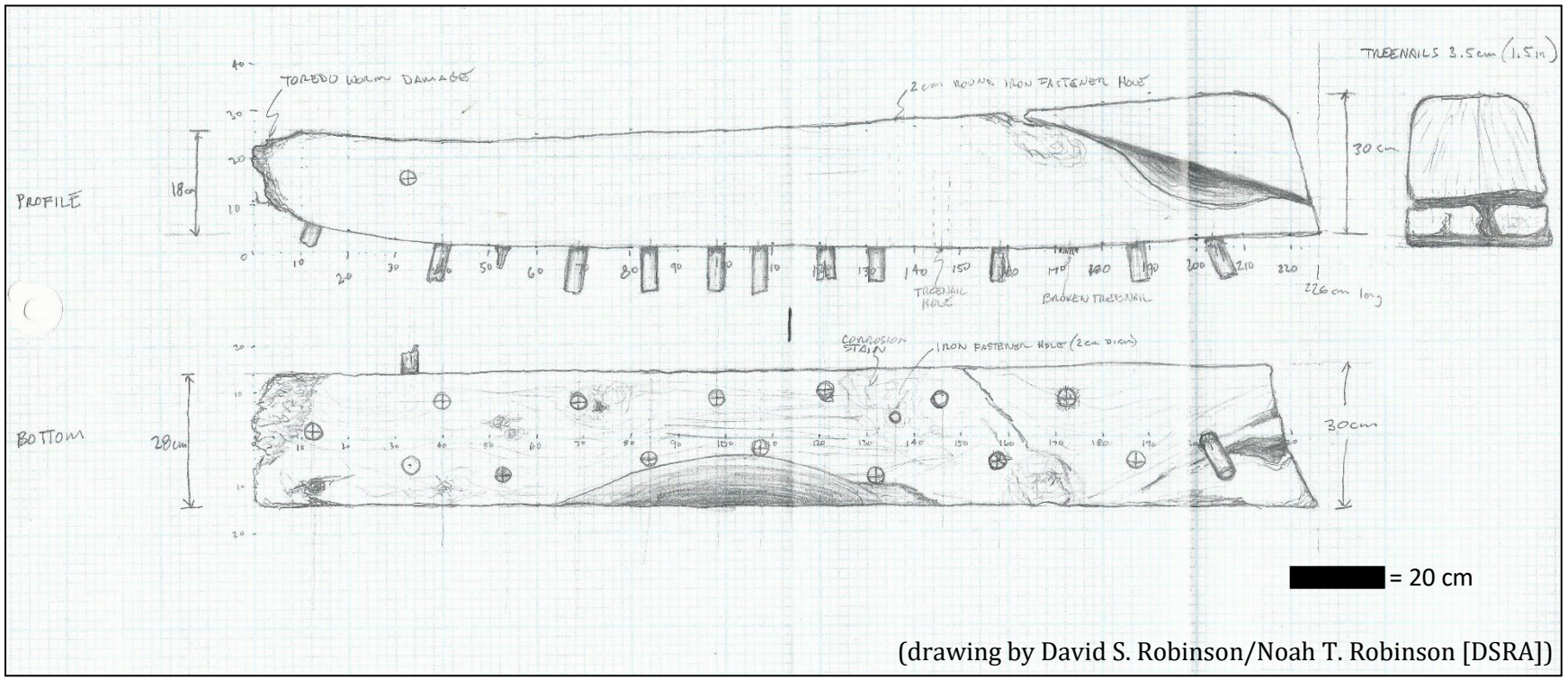
TIMBER PACKET 10
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 13
(first futtock)

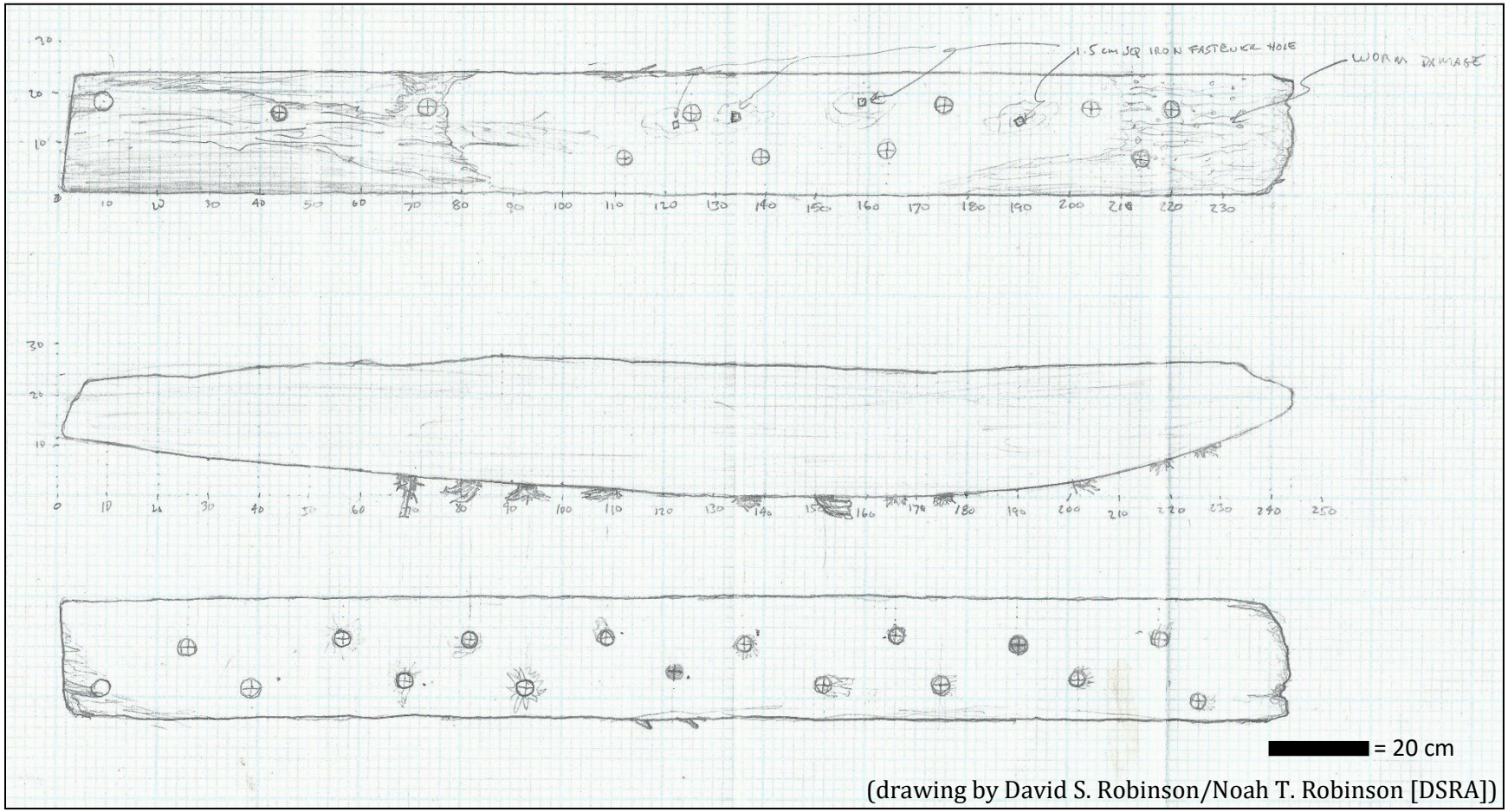
TIMBER PACKET 13
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

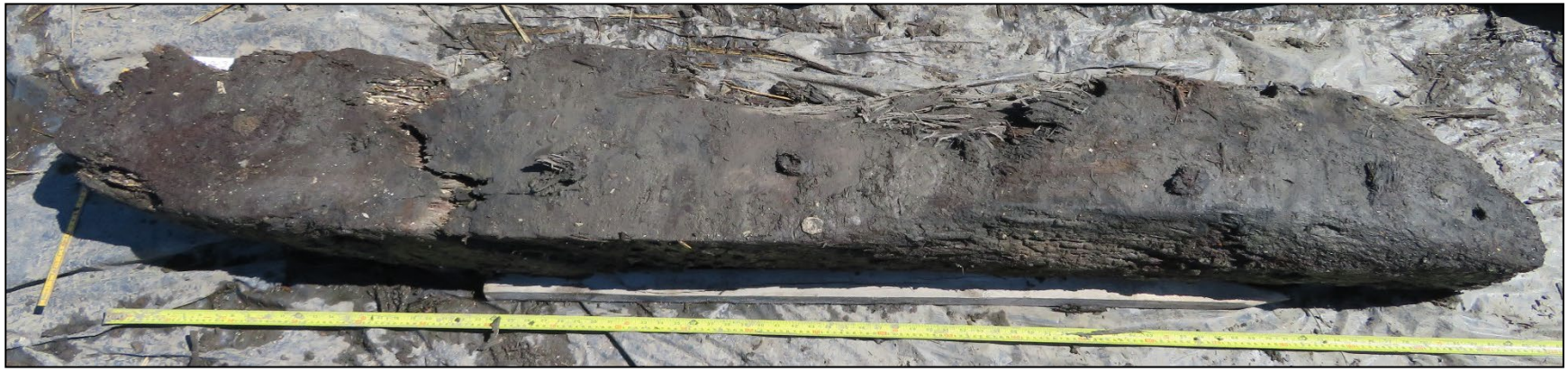
TIMBER PACKET 15
(first futtock)

TIMBER PACKET 15
(first futtock)

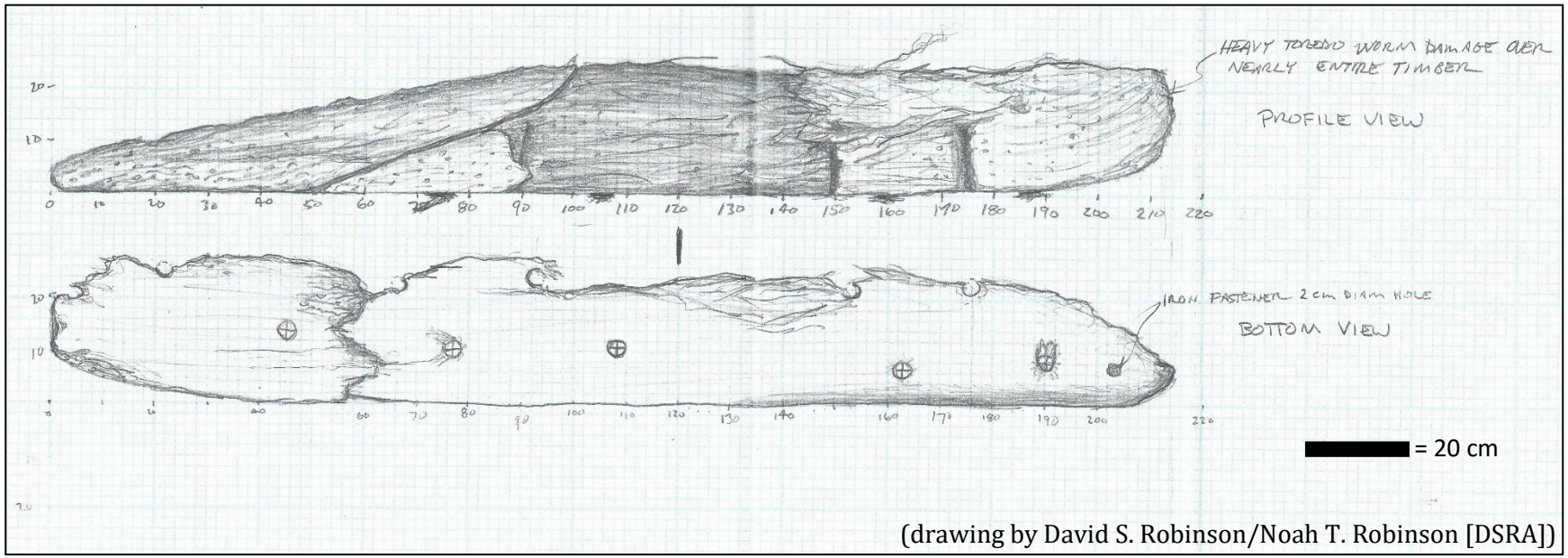


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 29
(first futtock)



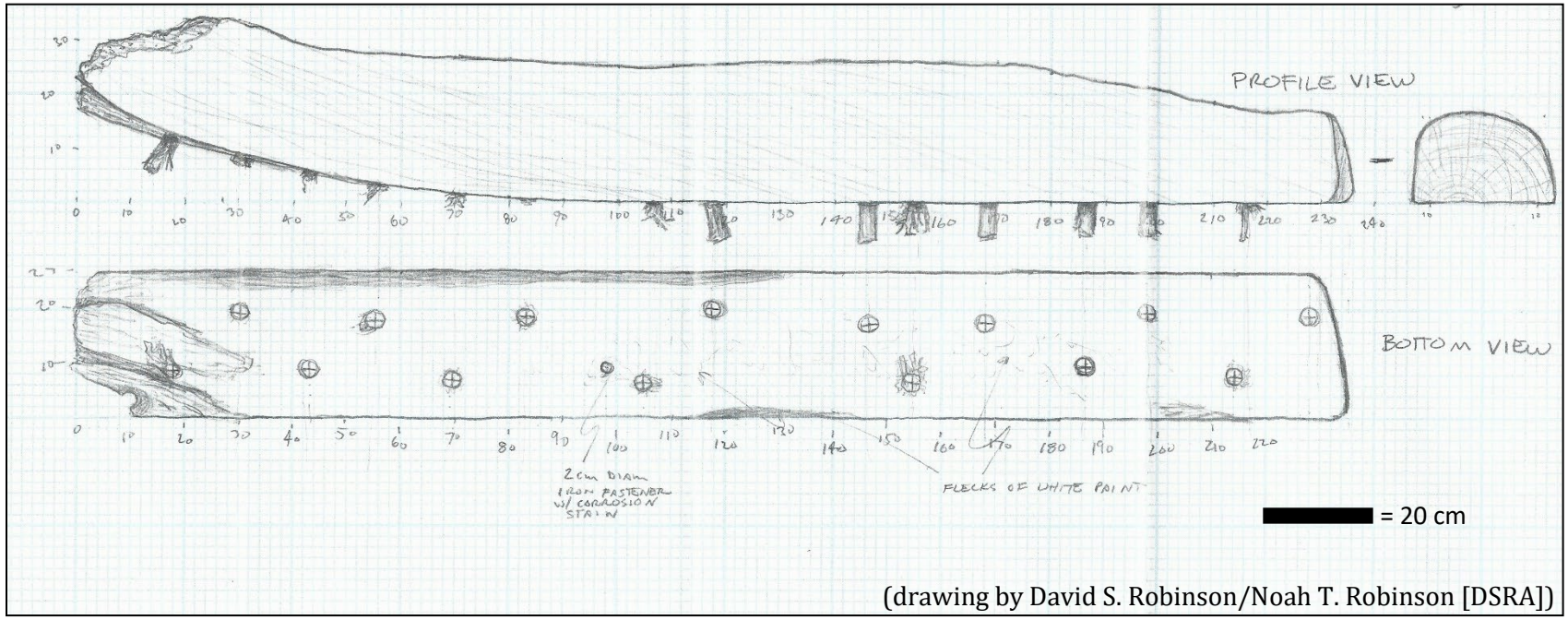
TIMBER PACKET 29
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

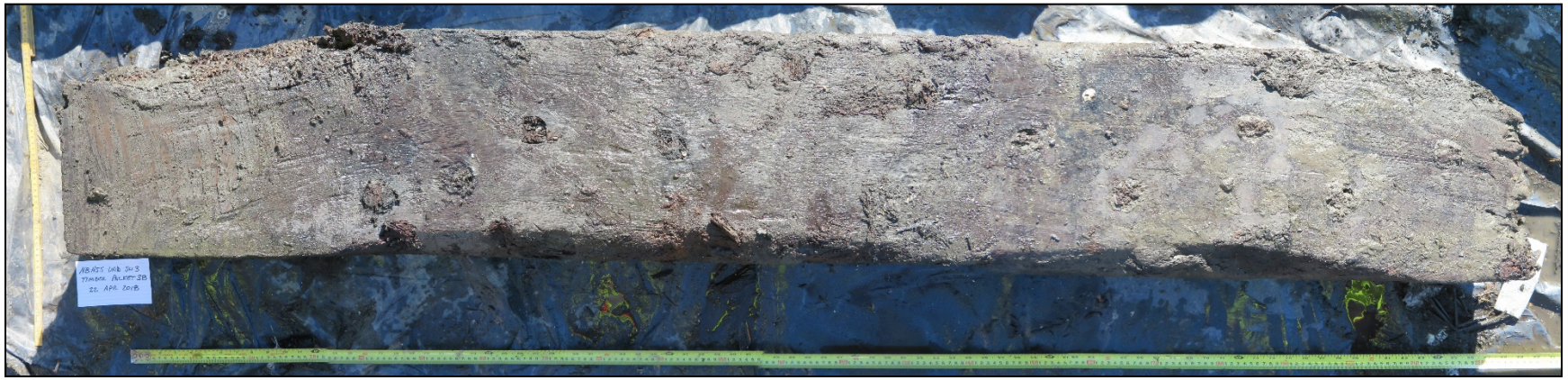
TIMBER PACKET 32
(first futtock)

TIMBER PACKET 32
(first futtock)

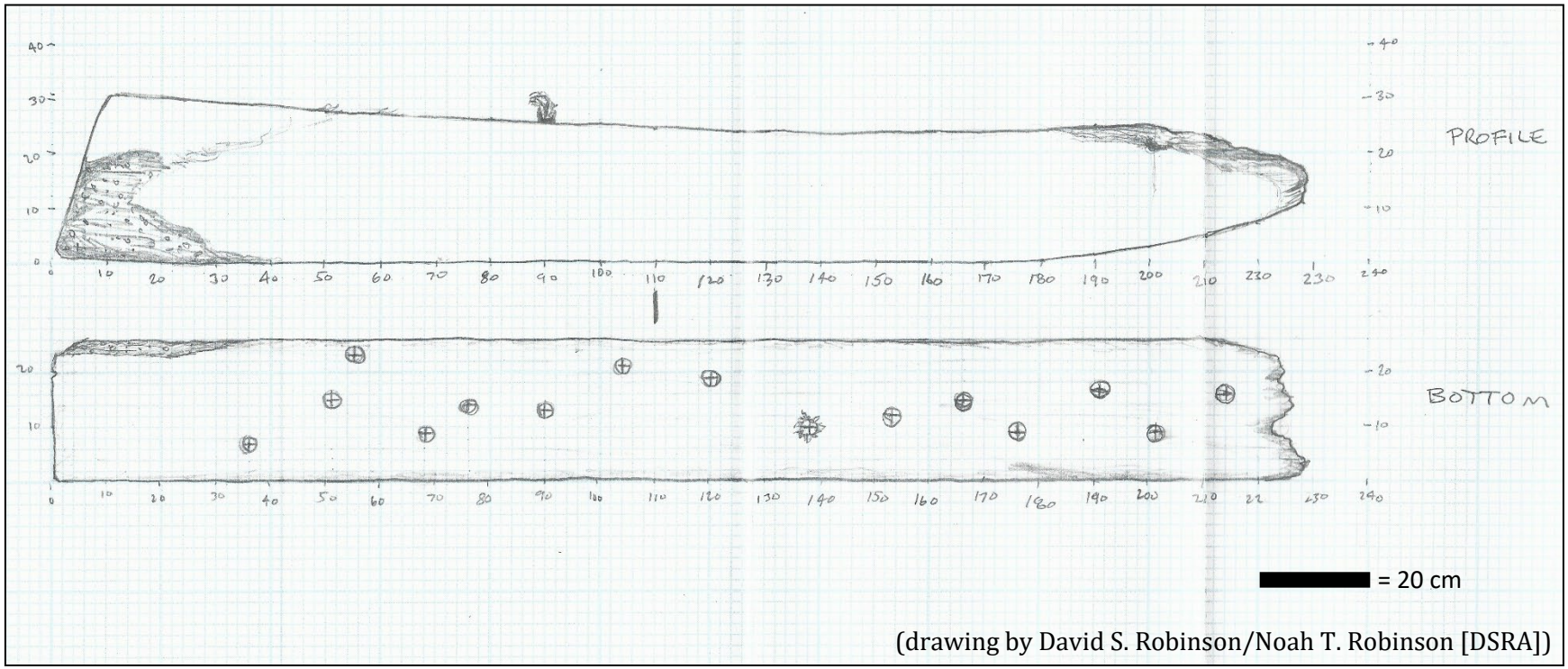


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 38
(first futtock)



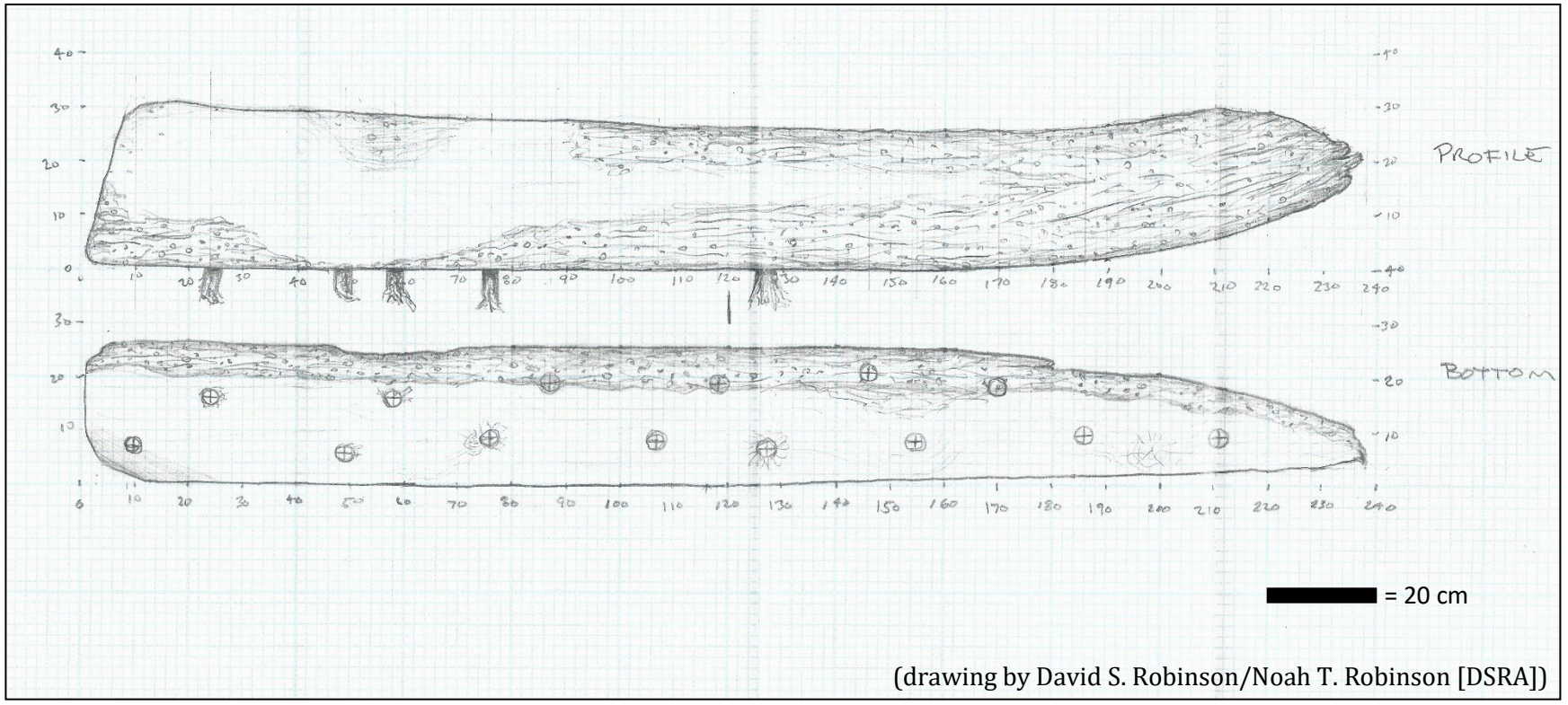
TIMBER PACKET 38
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 47
(first futtock)

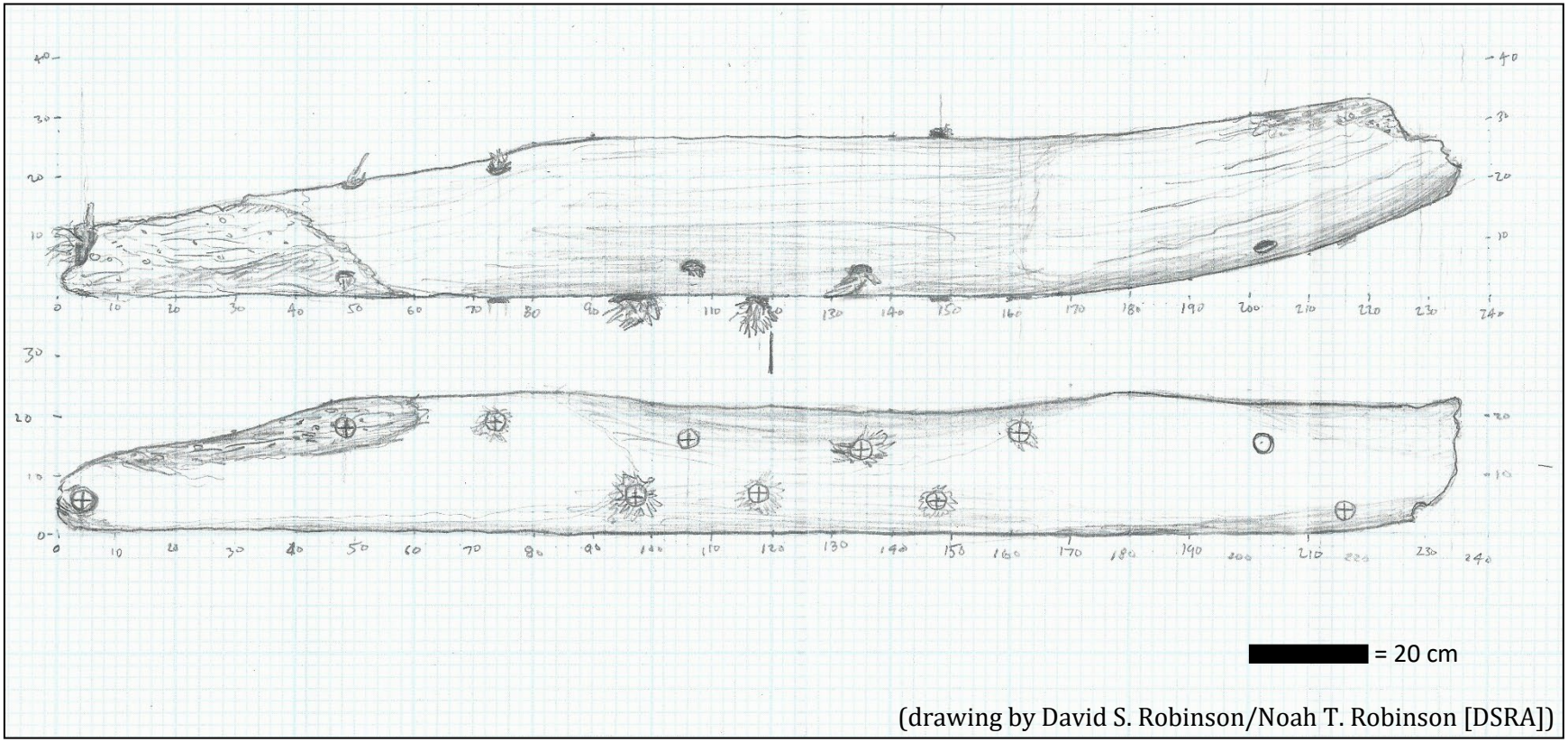
TIMBER PACKET 47
(first futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 50
(first futtock)

TIMBER PACKET 50
(first futtock)

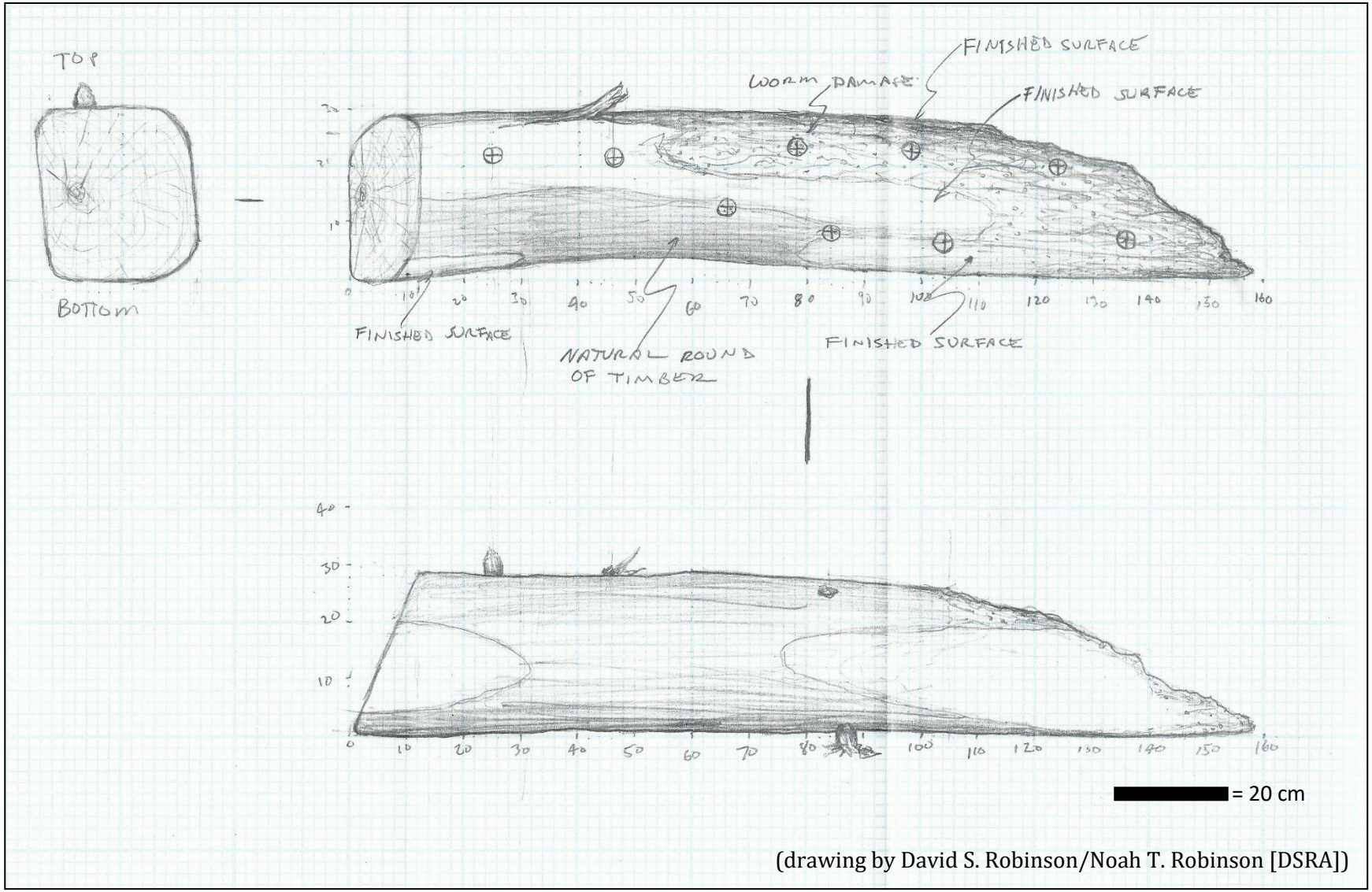


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

SECOND FUTTOCKS

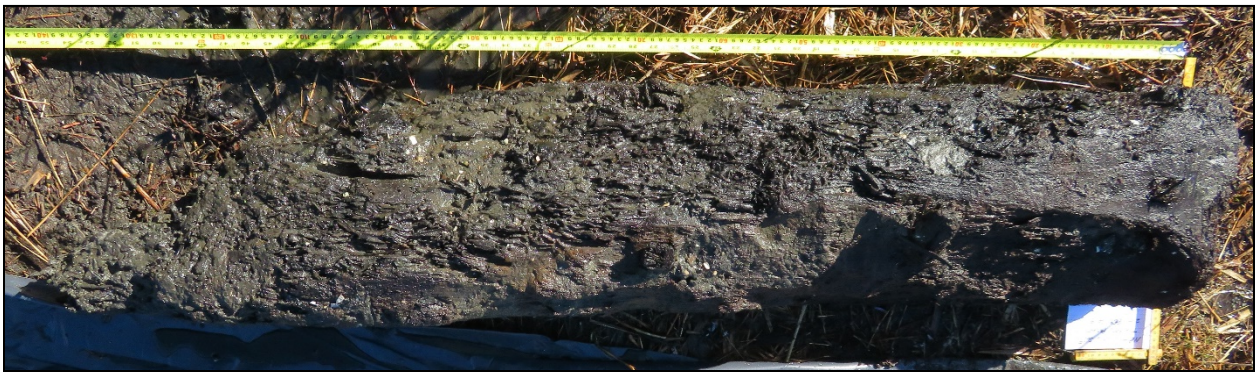
TIMBER PACKET 5
(second futtock)

TIMBER PACKET 5
(second futtock)

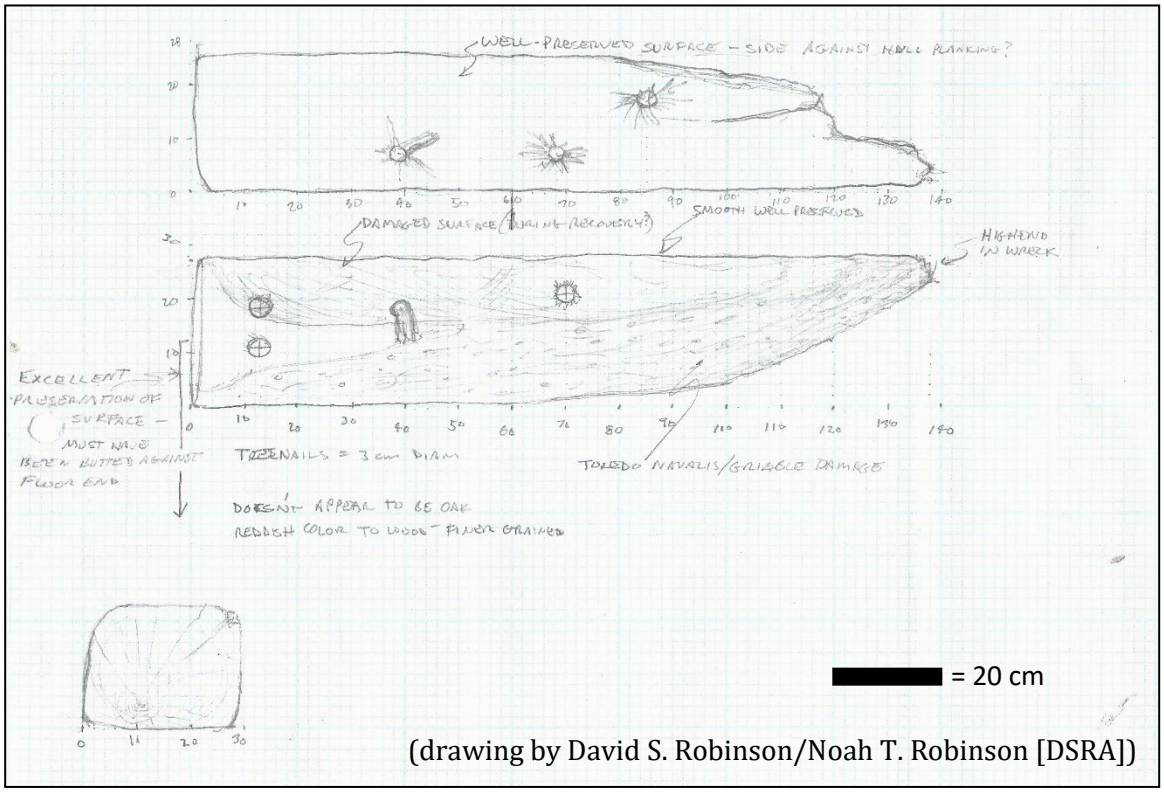


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 10
(second futtock)

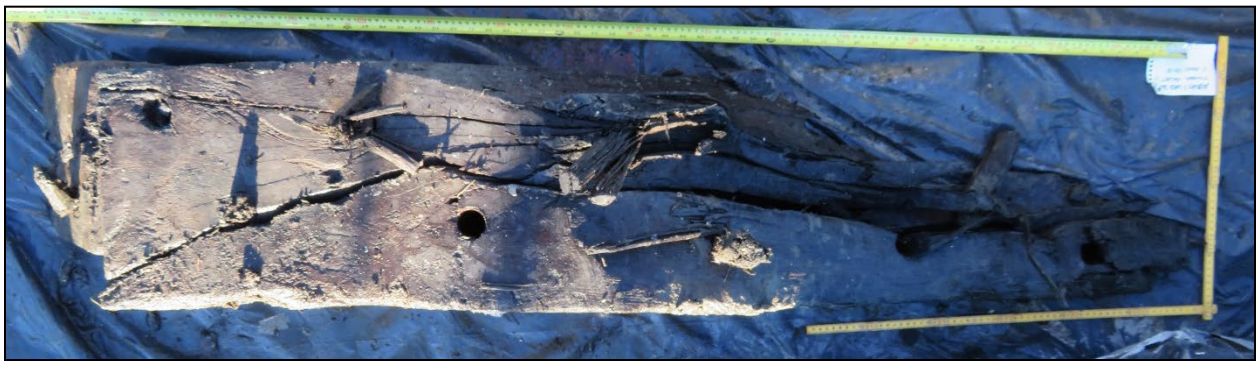


TIMBER PACKET 10
(second futtock)

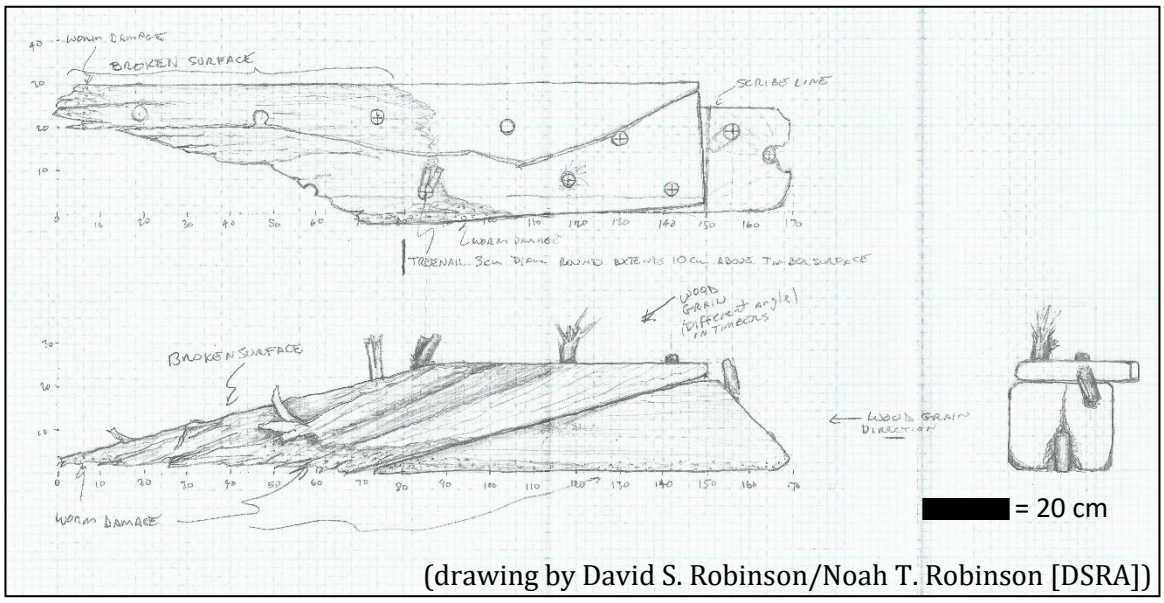


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 11
(second futtock)



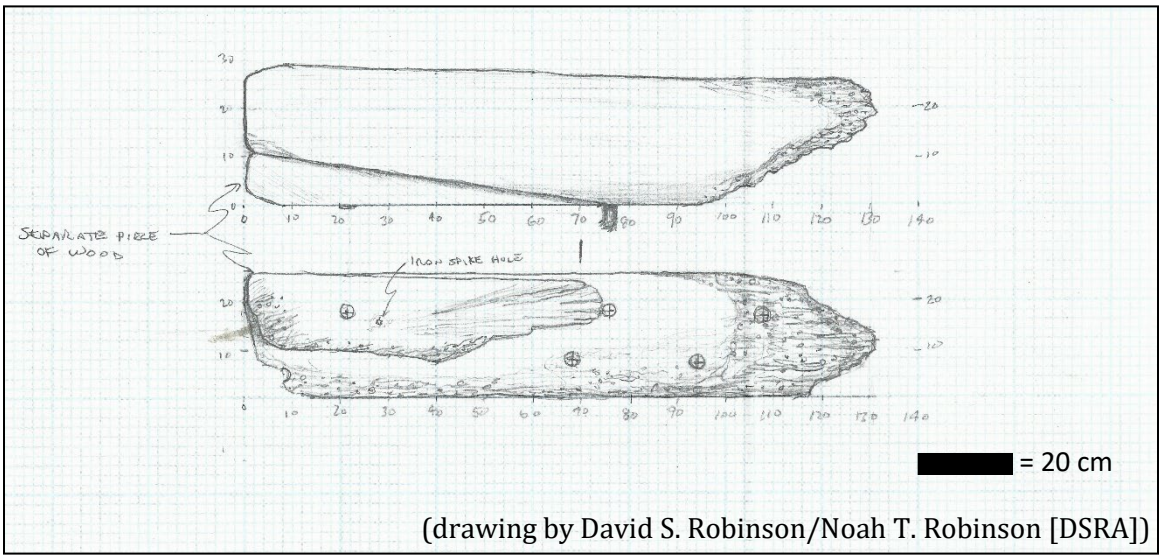
TIMBER PACKET 11
(second futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 17
(second futtock)

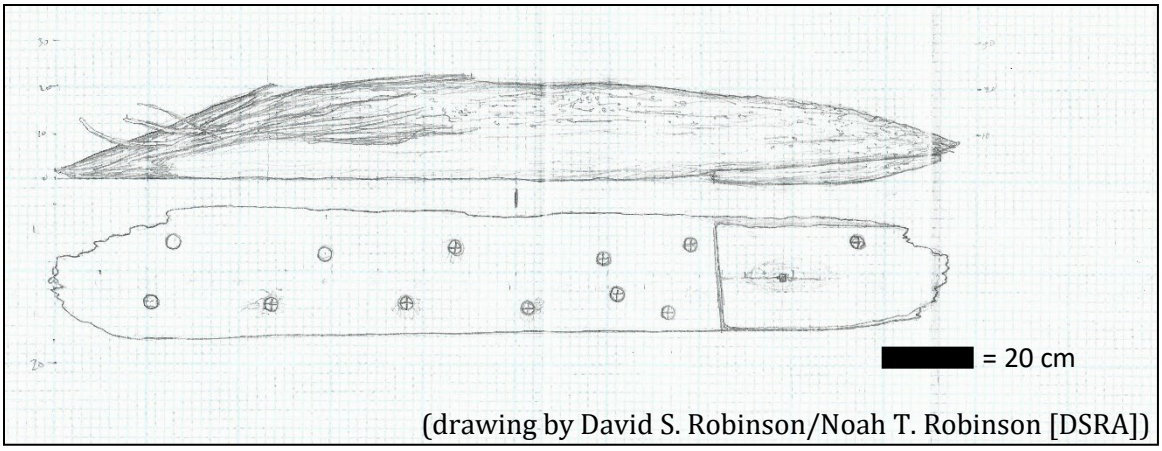
TIMBER PACKET 17
(second futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 21
(second futtock)

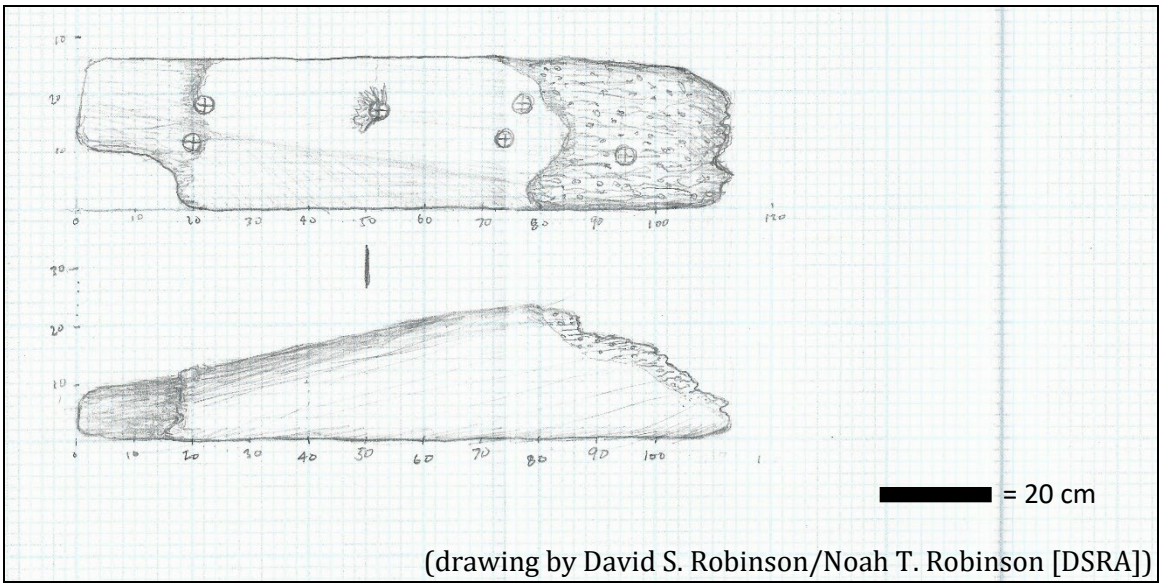
TIMBER PACKET 21
(second futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 48
(second futtock)

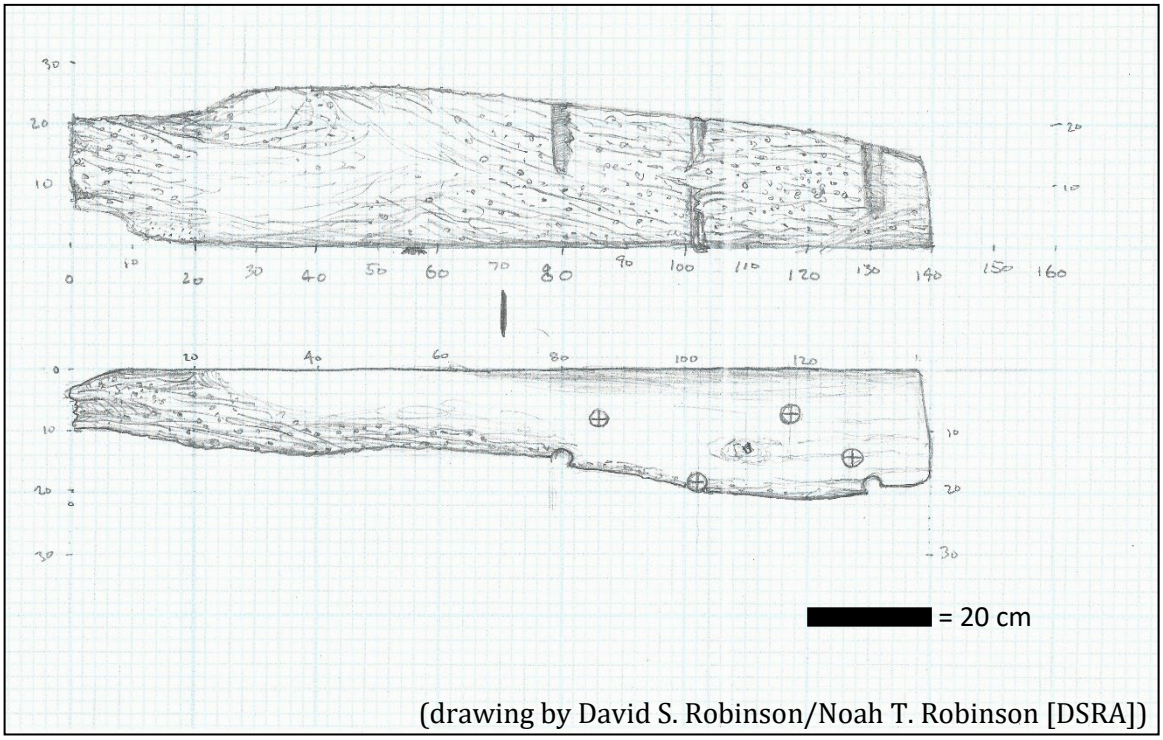
TIMBER PACKET 48
(second futtock)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 49
(second futtock)

TIMBER PACKET 49
(second futtock)

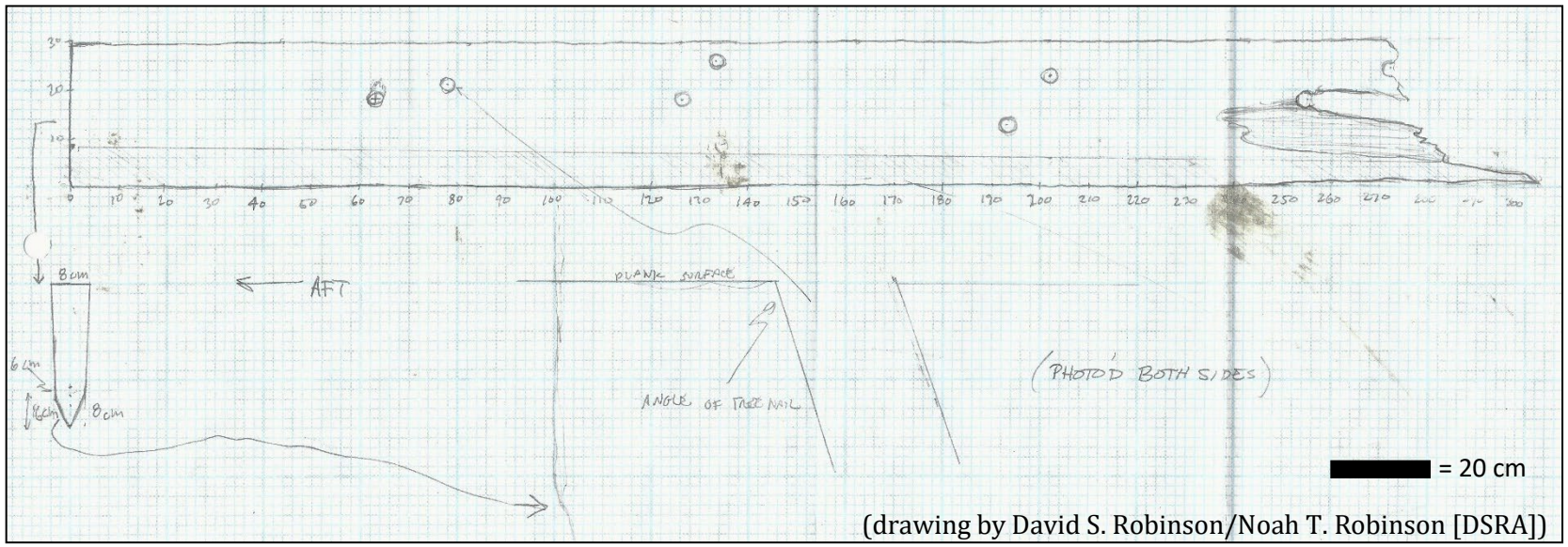


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

GARBOARD PLANKING

TIMBER PACKET 7
(garboard fragment)

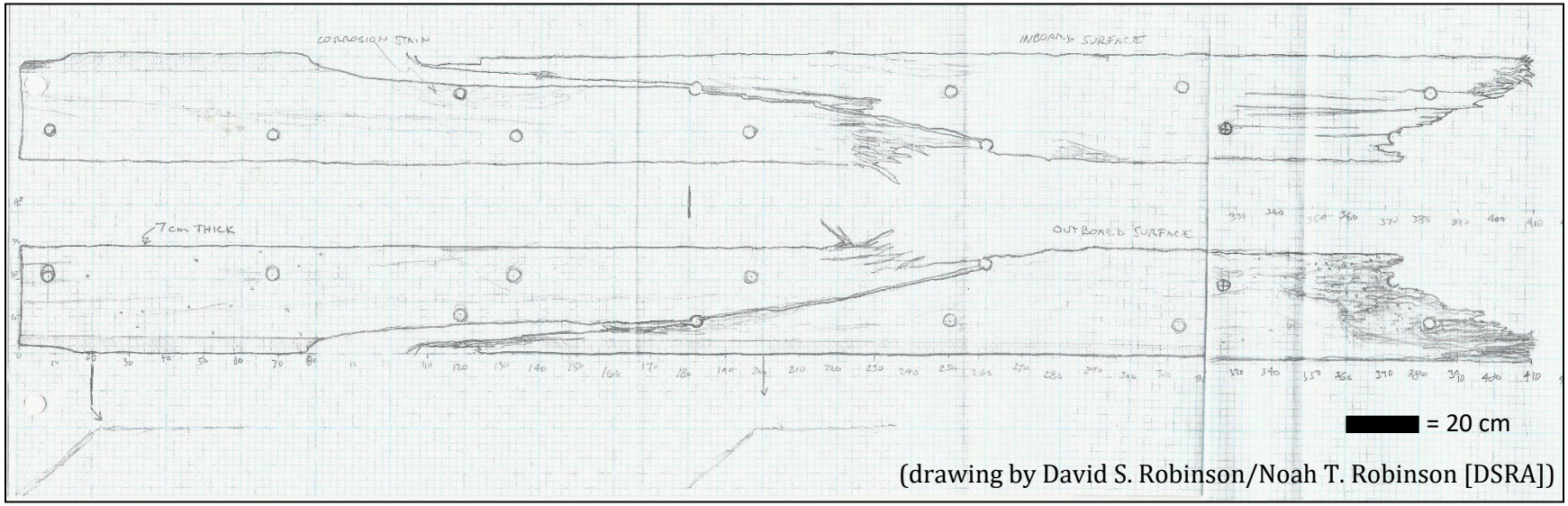
TIMBER PACKET 7
(garboard fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 20
(garboard fragment)

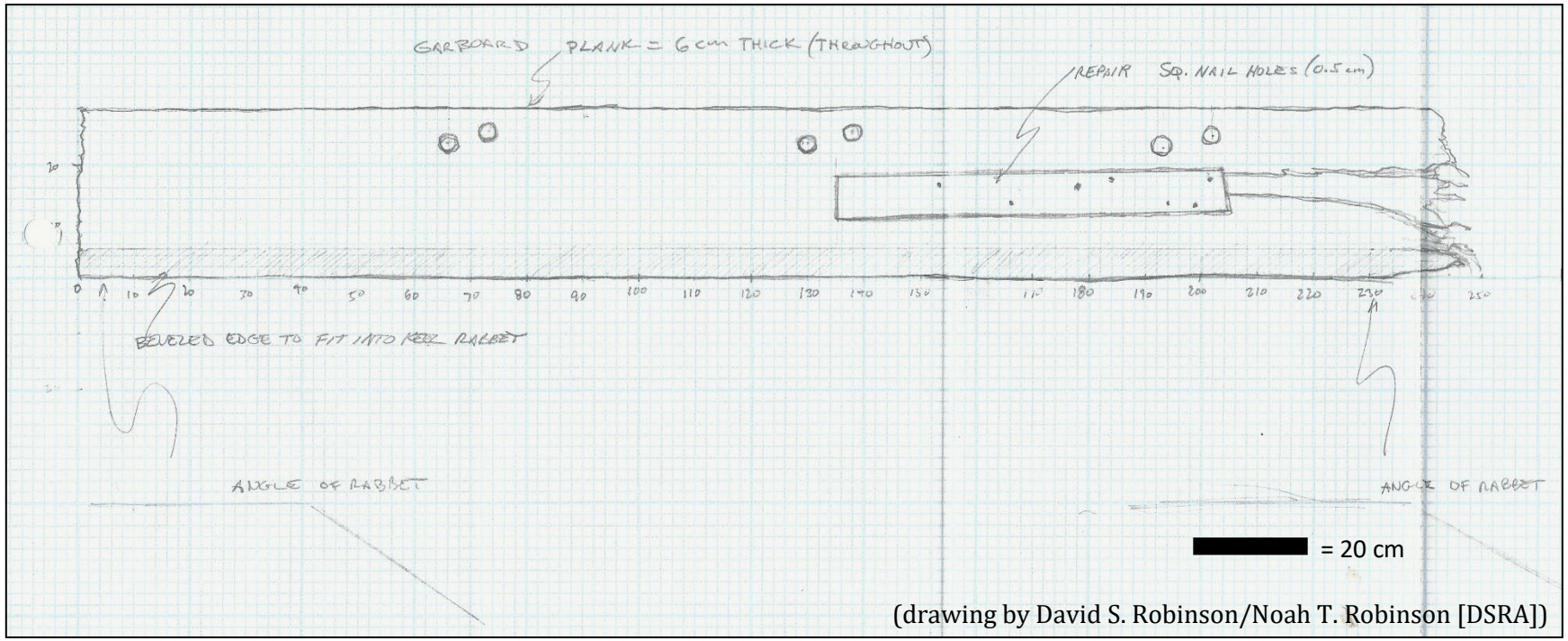
TIMBER PACKET 20
(garboard fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 35
(garboard fragment)

TIMBER PACKET 35
(garboard fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

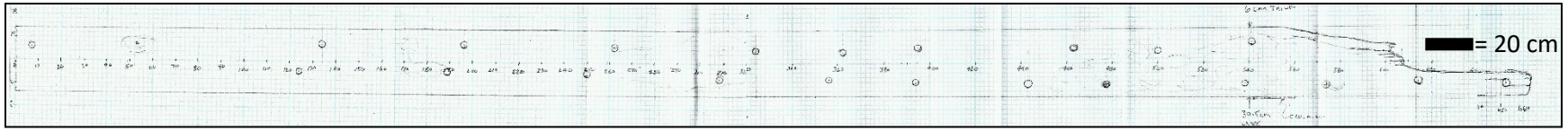
HULL PLANKING

TIMBER PACKET 16
(hull planking fragment)

TIMBER PACKET 18
(hull planking fragment)

TIMBER PACKET 22
(hull planking fragment)

TIMBER PACKET 22
(hull planking fragment)

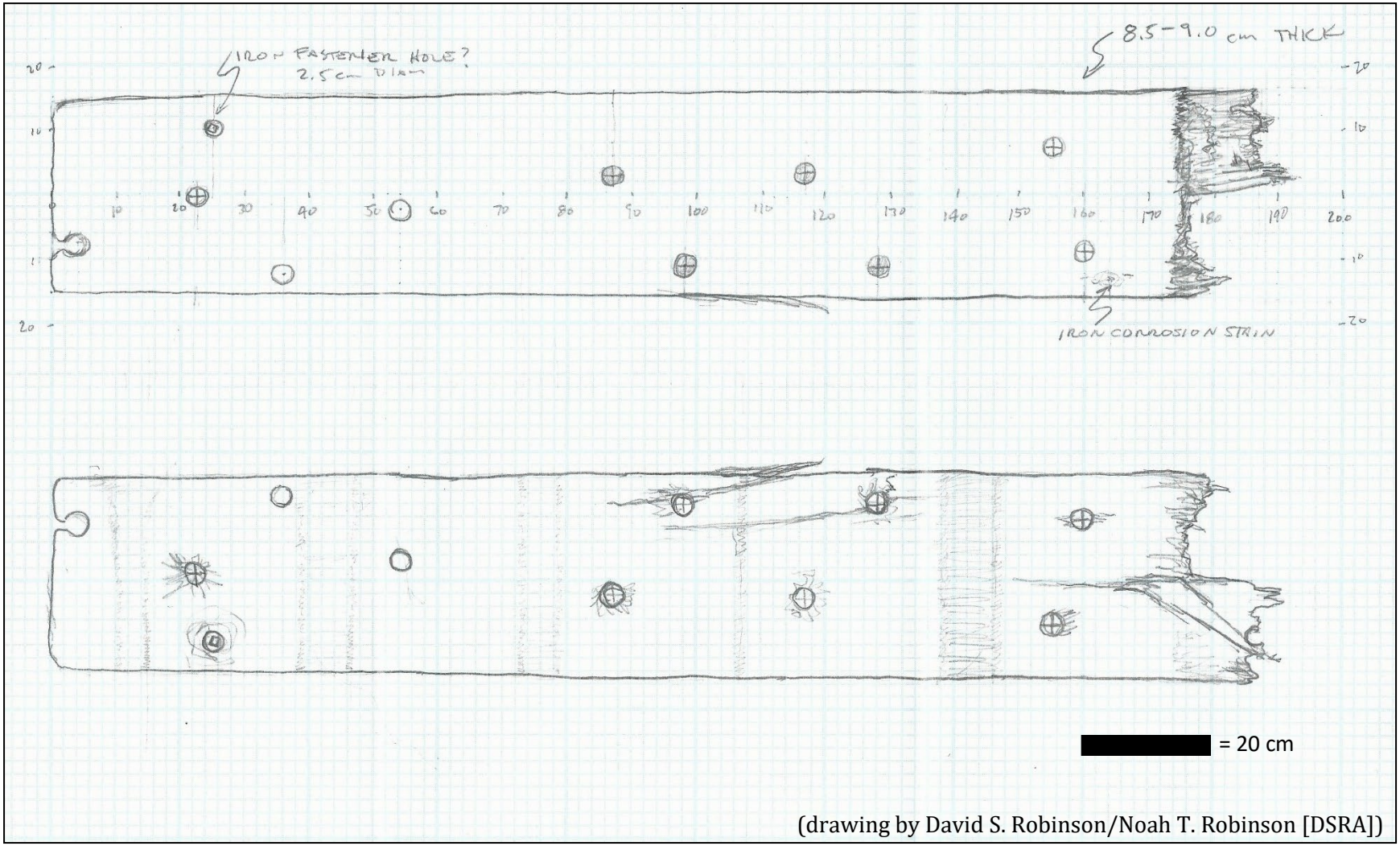


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 24
(hull planking fragment)

TIMBER PACKET 25
(hull planking fragment)

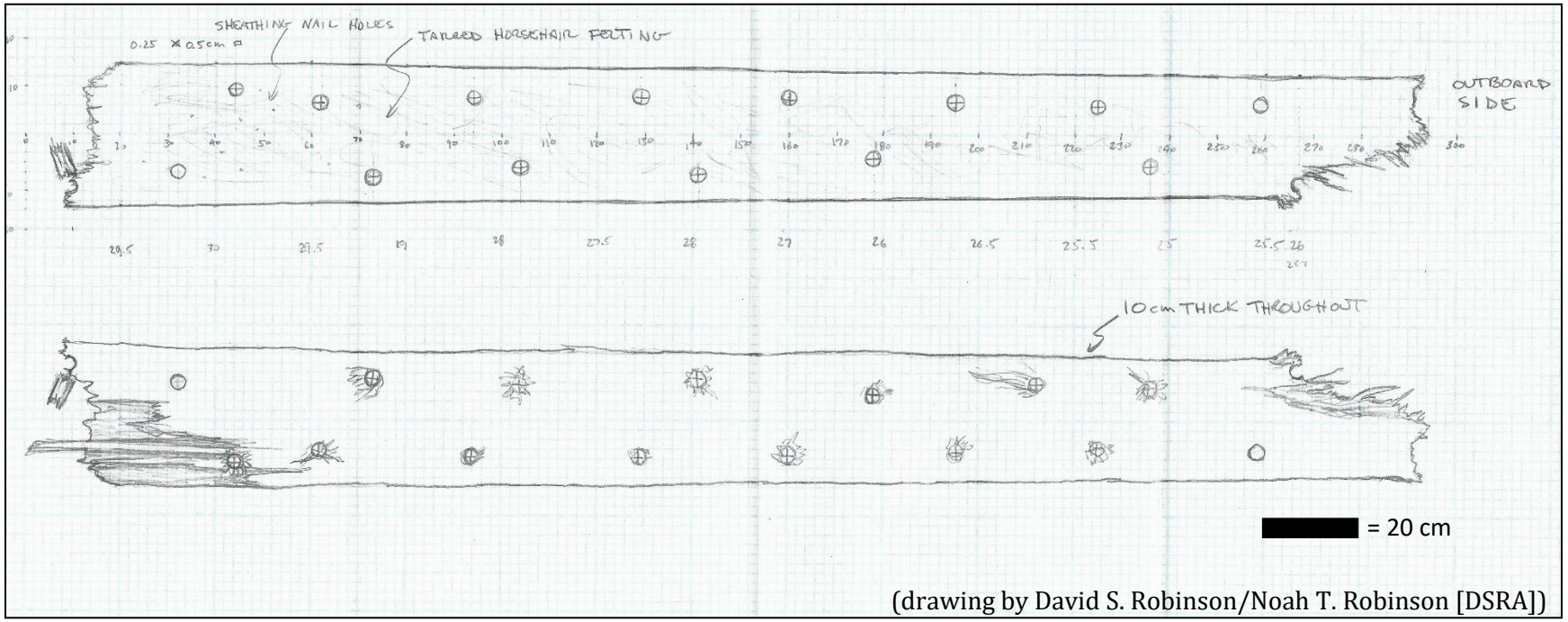
TIMBER PACKET 25
(hull planking fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

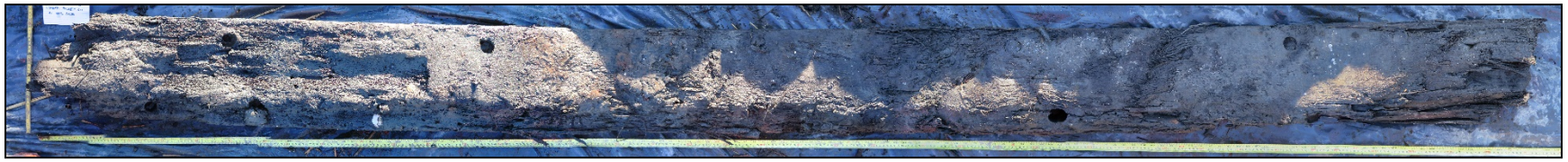
TIMBER PACKET 27
(hull planking fragment)

TIMBER PACKET 27
(hull planking fragment)

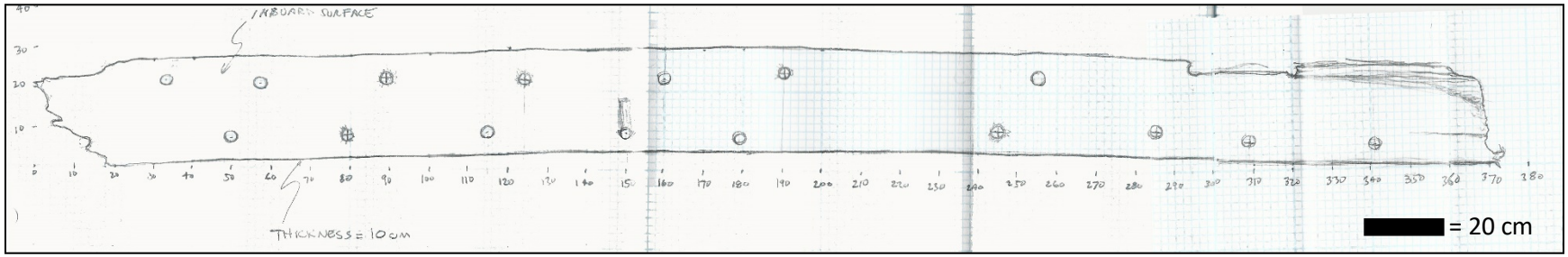


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 30
(hull planking fragment)

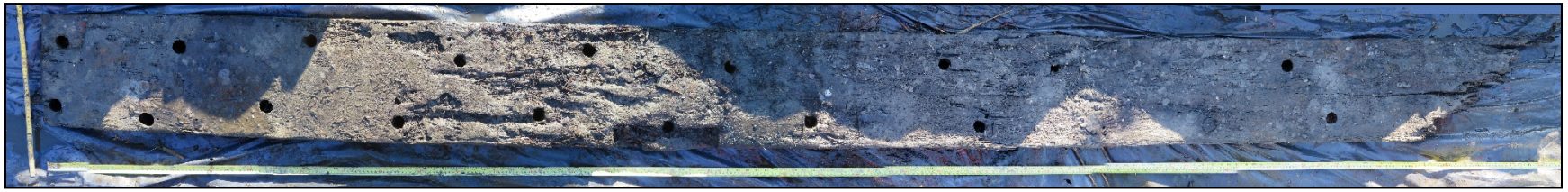


TIMBER PACKET 30
(hull planking fragment)

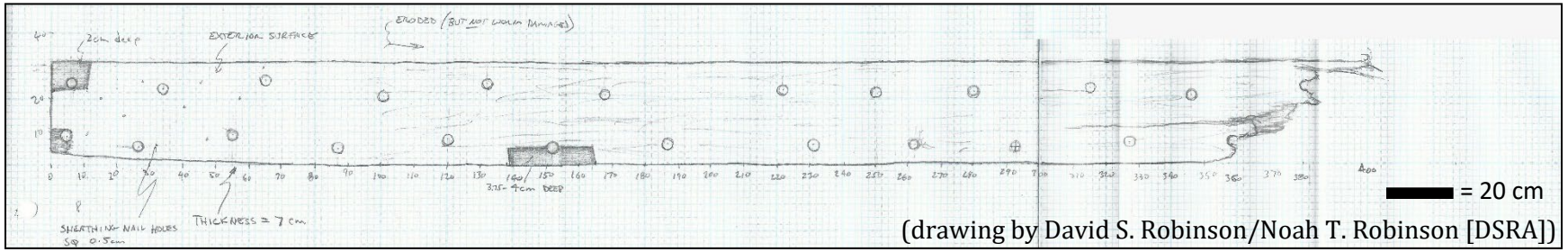


(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 31
(hull planking fragment)



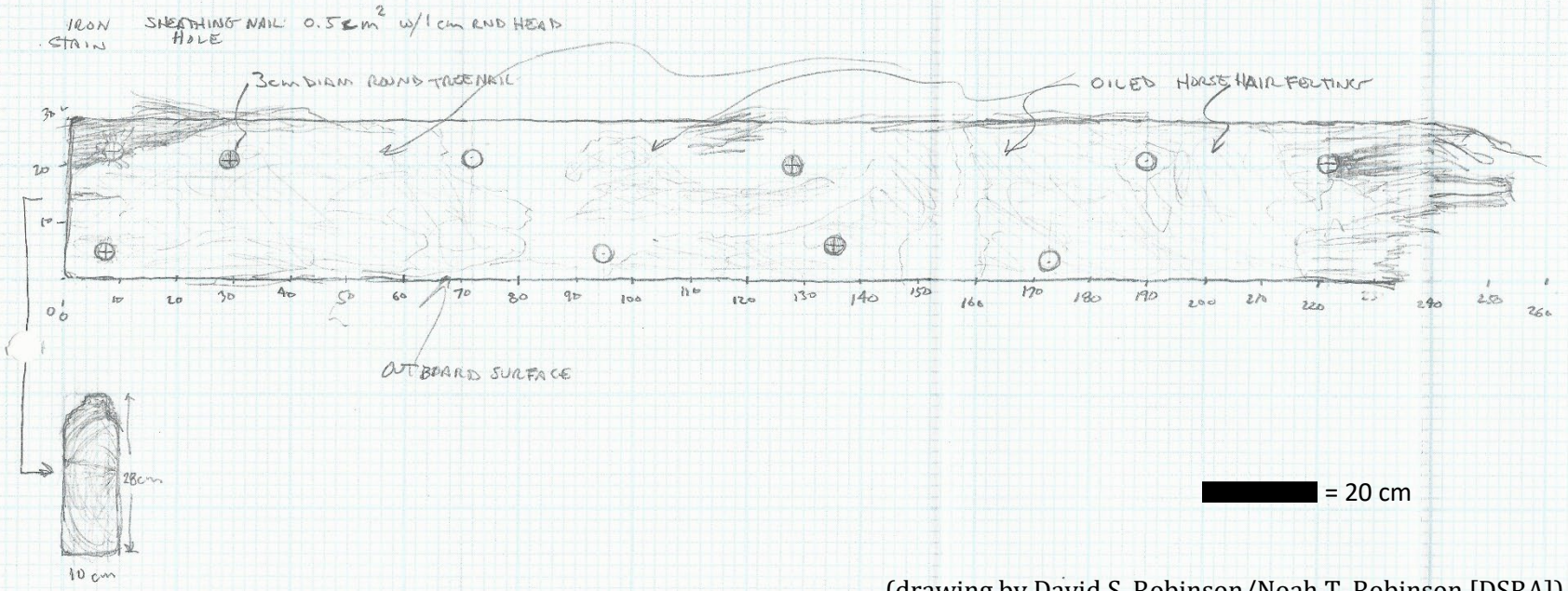
TIMBER PACKET 31
(hull planking fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 33
(hull planking fragment)

TIMBER PACKET 33
(hull planking fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

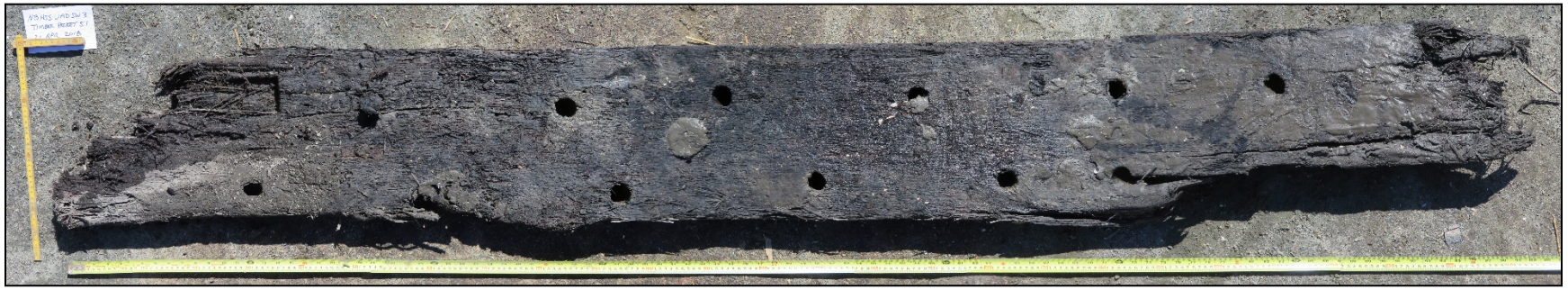
TIMBER PACKET 36
(hull planking fragments)

TIMBER PACKET 37
(hull planking fragment)

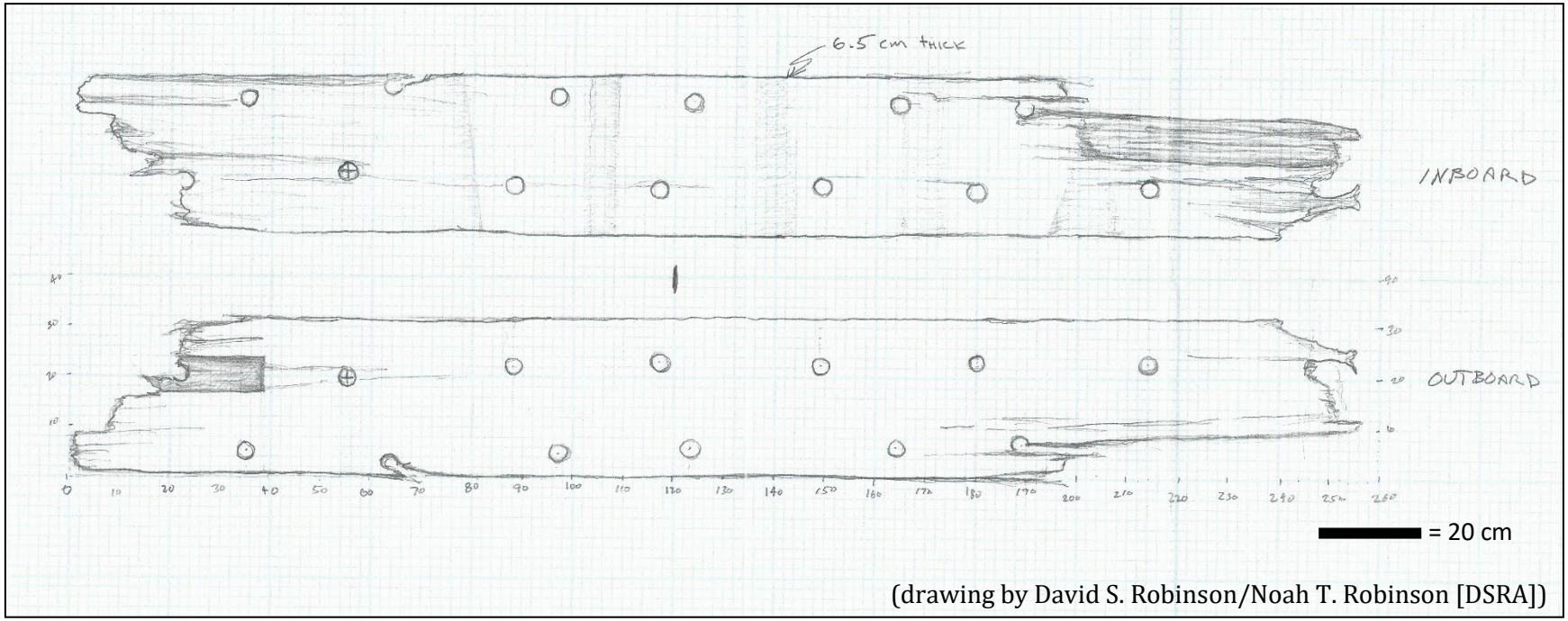
TIMBER PACKET 42
(hull planking fragments)

TIMBER PACKET 43
(hull planking fragments)

TIMBER PACKET 51
(hull planking fragment)



TIMBER PACKET 51
(hull planking fragment)



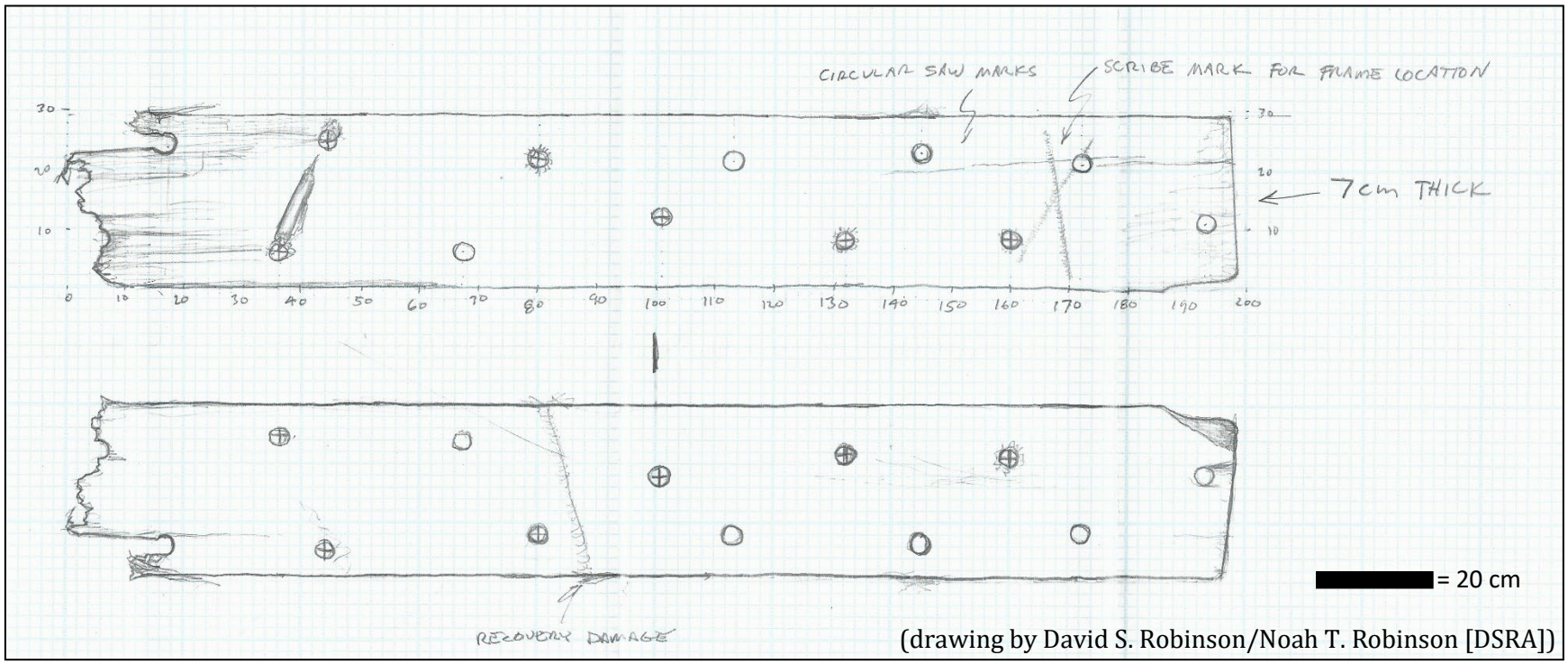
(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 52
(hull planking fragment)

TIMBER PACKET 53
(hull planking fragments)

TIMBER PACKET 54
(hull planking fragment)

TIMBER PACKET 54
(hull planking fragment)



(drawing by David S. Robinson/Noah T. Robinson [DSRA])

TIMBER PACKET 56
(hull planking fragments)