Managing Alexandria's Derelict Merchant Fleet: Documenting, Preserving, and Interpreting Four Historic Ships from the Hotel Indigo (44AX229) and Robinson Landing (44AX235) Archaeological Sites

> By Alexandria Archaeology



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Alexandria Archaeology Office of Historic Alexandria

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How to Use this Report

This report is intended to provide a summary of the work undertaken on four historic ships found in Alexandria, Virginia, primarily focusing on the post-excavation and preservation phases. It is meant to provide a starting place for learning about the Alexandria fleet. Further details are available in the reports, websites, and presentations that are listed in the bibliography and some of which are linked within this document.

Learn about Alexandria's maritime history on page 15.

Learn about the discovery of the first ship found at the Hotel Indigo Site on page 39.

Learn about tree ring dating on page 60.

Learn about museum exhibits incorporating the ships on page 96.

Learn ship fast facts in <u>Appendix D</u>.

FAQs

How were the ships found?

The City of Alexandria has an Archaeological Protection Code (Section 11-411 of the Zoning Ordinance of the City of Alexandria) administered by Alexandria Archaeology. The Code, incorporated into the City's <u>Zoning Ordinance</u> in 1992, requires that development partners work with City archaeologists to evaluate and sometimes excavate archaeological resources before ground disturbance on construction projects. As Alexandria's waterfront is redeveloped, archaeological research is a component of these projects.

How many ships are there?

Since 2015, archaeologists discovered, excavated, documented, and preserved four ship hull remnants found within two city blocks. Archaeologists found one ship at the Hotel Indigo Site (44AX229) in 2015 and another three at the Robinson Landing site (44AX235) in 2018. Additionally, archaeological work documented 18th through 20th century vessels prior to construction at the Old Ford Plant (<u>Artemel et al. 1988</u>), formerly located on the 600 block of S. Union Street (44AX119), and during <u>Windmill</u> <u>Hill Park</u> improvements at the 500 block of S. Union Street.

How old are they?

Available evidence suggests that these ships date to the late 18th century, possibly the early 19th century. This was a time period when about 1,000 ships docked annually at the port of Alexandria, carrying people and goods. Dendrochronology on the ship from the Hotel Indigo Site suggests a construction date sometime after 1741.

Were the ships found on the bottom of the river?

These ships were found on a terrestrial archaeological site in an area that used to be mudflats of the Potomac River. They are not shipwrecks in the traditional sense, but instead ships that had passed their sailing life, been stripped of useable parts, and then reused as structures to make new land on the edge of the river in Alexandria.

Why couldn't you preserve them in place?

Archaeologists discovered these four ship hull remnants before the construction of a hotel and a mixed-used residential development, both with multi-level underground parking garages. In fact, the bottom of the garages extended deeper than the elevations at which the ships were found so they had to be removed from the sites.

Were they used to transport enslaved individuals?

We do not know the names of these vessels, where they sailed, or what exactly they carried. Without additional evidence this question is difficult to answer. However, contextual evidence suggests that these ships were buried in the ground before domestic slave trading ships became more prominent along the wharves of Alexandria in the 1820s and 1830s. Alexandria did not serve as a major port of disembarkation for the transatlantic slave trade, though records do indicate that ships arrived from West Africa and the Caribbean to the South Potomac Naval District before the Revolutionary War. The vast majority of ships entering the port of Alexandria during the late 18th and early 19th centuries carried goods for trade and sale. We acknowledge that enslaved people undoubtedly interacted with these ships in undocumented ways and that Alexandria's maritime economy was based on the institution of American slavery.

Why did they have to be taken apart?

Though archaeologists only found parts of these ships preserved in the ground, the remnants were huge (50-85 feet long and 12-30 feet wide). Working closely with the Maryland Archaeological Conservation Laboratory who had experience with similar features, the team devised a plan to carefully dismantle the remnants timber by timber for ease of transportation and storage in tanks of water.

How did you take care of the ships after excavation?

The waterlogged, oxygen-free environment of the deep mud at the edge of the Potomac River provided an ideal burial and preservation environment for the historic wooden ship timbers. As soon as they were exposed to air through excavation, the decay process started. Archaeologists worked quickly to document and take apart the remnants into individual pieces, spraying them with water to keep them wet. City staff then transported the timbers to tanks and pools of water for stabilization and to slow the decay process until future plans were determined.

Acronyms

AAC: The <u>Alexandria Archaeological Commission</u>. The Commission establishes goals and priorities for the City of Alexandria's program; and acquires, preserves, and displays all the artifacts found. It works with federal, state and local governments, private foundations, citizens, area schools, and colleges.

CIP: The City of Alexandria's Capital Improvement Program is a budgeting and finance mechanism for funding large projects outside of the general fund.

CRL: The <u>Conservation Research Lab</u>, Texas A&M University is one of the oldest continuously operated conservation laboratories that deals primarily with archaeological material from shipwrecks and other underwater sites. Operating under the Center for Maritime Archaeology and Conservation, CRL plays an important role in the Nautical Archaeology Program at Texas A&M University (TAMU).

CRM: The Cultural Resource Management field employs many archaeologists who conduct heritage management activities often ahead of development or to comply with federal, state, and local regulations including the City's Archaeological Protection Code.

DPI: The City of Alexandria's <u>Department of Project Implementation</u> was created in 2013 to expedite the completion of capital infrastructure projects within the City of Alexandria. Over the years DPI's role has expanded to include the design and implementation of a variety of projects.

FOAA: The <u>Friends of Alexandria Archaeology</u> began in 1986 to provide volunteer opportunities and increase public awareness of archaeology in Alexandria. This friends group works to develop a common movement to support, advocate for, and preserve Alexandria's archaeology and history.

MAC Lab: The <u>Maryland Archaeological Conservation Lab</u> is a state-of-the-art, archaeological research, conservation, and curation facility located at Jefferson Patterson Park & Museum, the State Museum of Archaeology, in southern Maryland.

NHHC: The <u>Naval History and Heritage Command</u>, headed by the Director of Naval History, is an Echelon II command headquartered on the Washington Navy Yard, D.C. tasked with preserving and presenting an accurate history of the U.S. Navy.

OHA: The <u>Office of Historic Alexandria</u> preserves and shares Alexandria's past to enrich the present and inspire the future. Alexandria Archaeology is one division of this office.

PEG: Polyethylene glycol is an inert, waxy substance that is used in the conservation of waterlogged artifacts made of organic material like leather or wooden ship timbers. It is available in a variety of different molecular weights and is also used in a variety of household products.

RMP: A Resource Management Plan is a scope of work and set of maps that recommends measures for mitigating construction impacts to significant archaeological resources determined, by the Archaeological Evaluation, to be present on a property. Learn more about RMPs and the archaeological review process.

RPCA: The City of Alexandria's <u>Recreation, Parks, and Cultural Activities</u> office creates meaningful experiences through public space, cultural activities, and programming.

Ship Glossary

From <u>An universal dictionary of the marine: or, A copious explanation of the technical</u> <u>terms and phrases employed in the construction, equipment, furniture, machinery,</u> <u>movements, and military operations of a ship.</u> William Falconer, New Edition, London, 1784; and supplemented by Alexandria Archaeology staff

Bow – the front of the ship

Caulk or Calk –oakum, or old ropes untwisted and drawn asunder, driven into the seams of the planks, or into the intervals where the planks are joined to each other in the ship's deck or sides, in order to prevent the entrance of water. After the oakum is driven very hard into these seams, it is covered with hot melted pitch or resin, to keep the water from rotting in.

Ceiling (or foot-waleing) – the inside planks of a ship, used to prevent any part of the ballast or cargo from falling between the floor-timbers.

Floor (or floor-timbers) – those parts of the ship's timbers which are placed immediately across the keel, and upon which the bottom of the ship is framed

Frame – see **Timbers.** It has been observed that one timber is composed of several pieces united into one frame, which is accordingly called a frame of timbers.

Futtock – the middle division of a ship's timbers; or those parts which are situated between the floor and the top-timbers

Garboard (or Garboard-streak) – the first range or streak of planks laid upon a ship's bottom next to the keel, throughout the whole length of the floor. The edge of this plank is let into a groove or channel in the side of the keel, which is called the rabbet of the garboard-streak.

Hull – the frame, or body of a ship, exclusive of her masts, yards, sails, and rigging

Keel – the principal piece of timber in a ship, which is usually first laid on the blocks in building. If we compare the carcass of a ship to the skeleton of the human body, the keel may be considered as the back-bone, and the timbers as the ribs. The keel is generally composed of several thick pieces placed lengthways, which, after being scarfed together, are bolted, and clinched upon the upper side.

Oakum (or oakham) – the substance into which old ropes are reduced, when they are untwisted, loosened, and drawn asunder.

Planking – the covering and lining on the sides of a ship made from an assemblage of oak planks, which completes the process of ship-building, and is sometimes called 'laying on the skin'

Ploc – similar to oakum, this hair and tar mixture was placed on the bottom of the ship to help make it watertight and to prevent shipworms from getting into the wood.

Port – the left side of the ship when the eye is directed forward, also referred to as larbord

Ribs – a figurative expression for any of the timbers

Scantling – the dimensions of any piece of timber with regard to its breadth and thickness in ship-building

Scarf – a particular method of uniting two pieces of timber together by the extremities.

Sheathing – a sort of casing or covering laid on the outside of a ship's bottom, to protect the planks from the pernicious effects of the worms; particularly in hot climates, as between the tropics

Starboard – the right side of the ship when the eye is directed forward

Stern – the posterior face of a ship

Stern-post – a long straight piece of timber erected on the extremity of the keel, to sustain the rudder, and terminate the ship behind.

Teredo Worm – a species of saltwater clam found in temperate and tropical seas. It will burrow into the exposed wood of a ship. Left untreated, these worms will damage and destroy the submerged portions of a ship's hull. Sacrificial planks are applied to reduce worm damage and must be replaced every several years. Covering the bottom of a ship in ploc can help prevent the impact of these worms.

Timbers – the ribs of a ship, or the incurvated pieces of wood, branching outward from the keel in a vertical direction, so as to give strength, figure, and solidity to the whole fabric.

Trunnel (or Tree-nails) – long cylindrical wooden pins, employed to connect the planks of a ship's side and bottom to the corresponding timbers. Tree-nails are justly esteemed superior to spike-nails or bolts, which are liable to rust, and loosen, as well as to rot the timber; but it is necessary that the oak of which they are formed should be solid, close, and replete with gum, to prevent them from breaking and rotting in the ship's frame. They ought also to be well dried, so as to fill their holes when they are swelled with moisture.





Executive Summary

On a cold day in January 2016, archaeologists working along the Potomac River excavated the fragmentary remains of a ship hull at the <u>Hotel Indigo Site</u> (Site 44AX229, Feature 53). This began a multi-year project, ultimately leading to the discovery of three more historic vessel remnants just one block south at the Robinson Landing Site (44AX235, Features 155, 159, and 200). Between 2015 and 2018, new development projects along the Alexandria waterfront unearthed amazing finds, including the four historic ship remnants, numerous wharves and other landmaking structures, dwellings and house lots with privies and wells, industrial structures, and thousands of artifacts primarily dating to the late 18th and early 19th centuries. Documenting, removing, researching, stabilizing, and conserving the ship hull remnants has been a massive undertaking that has required the dedicated efforts of developers, archaeology crews, City staff from multiple departments, a variety of specialists, volunteers, interns, and other stakeholders.

This report will summarize and contextualize the work undertaken on the four historic ships primarily focusing on the post-excavation and preservation part of these major archaeological projects. The City of Alexandria accessioned the ship hull remains and therefore assumed responsibility for the care and curation of these large-scale finds immediately after excavation. The archaeological site reports on 44AX229 (Baicy et al. 2020) and 44AX235 (Childs et al. In Progress; Parker 2022) document part of the ships' journeys through excavation but do not provide a holistic discussion of their preservation and interpretation post-excavation. This report serves as part of that record. It includes background information on the archaeological sites, explains how archaeologists excavated these large, waterlogged artifacts, discusses how archaeologists researched and documented the ships, and describes how the City of Alexandria is preserving and interpreting these artifacts.

Introduction

In the 18th century, Alexandria, Virginia's waterfront was figuratively and literally created by ships. Recent large-scale redevelopment, combined with the City's unique Archaeological Protection Code that allows City archaeologists to review development projects and mitigate their impact on archaeological resources, has led to the discovery and study of significant maritime sites along the Potomac River's shore. Excavations revealed the remnants of four historic vessels, numerous wharves, and other structures for holding soil to make new land (landmaking structures). These important pieces of maritime heritage have provided new opportunities for studying the past while simultaneously posing massive preservation challenges.

Between 2015 and 2018, archaeologists from Thunderbird Archeology, a division of Wetlands Studies and Solutions, Inc., (Thunderbird) excavated the remains of wharves, warehouses, industries, dwellings, privies, and four historic ship hull remnants at the Hotel Indigo Site (220 S. Union Street, 44AX229) and the Robinson Landing Site (2 Duke Street, 44AX235). These ships were found terrestrially because early Alexandrians extended their waterfront lots to reach deeper water by making new land using a combination of soil, timber wharves, and occasionally derelict ships through a process locally called "banking out." These landmaking projects were fundamental to the development of the city's port and created the modern shoreline. The vessels found at the Hotel Indigo and Robinson Landing Sites appeared to have been at the end of their useful life as sailing ships and were likely expediently reused to build out the shoreline (Niculescu 2019; Skolnik 2018). The level of preservation under these modern city blocks was astounding – 20th century slab-built structures nearly perfectly encapsulated entire remains of historic waterfront neighborhoods. In the process of constructing these two modern developments, archaeologists unearthed the remains of a much earlier time when white, Black, free, and enslaved Alexandrians were intimately connected to the maritime world. These intentionally reused ships and associated wharves formed the foundation of early urban Alexandria.

Sites 44AX229 and 44AX235 straddle the historic Point Lumley, the original southernmost point of Alexandria's crescent-shaped bay and were on blocks largely composed of made land. Excavation of the Hotel Indigo Site by Thunderbird beginning in 2015 revealed the foundations of one of the earliest buildings in Alexandria, a 1755 public warehouse that was rented by Andrew Wales, one of the town's first brewers, the wooden beams of which are currently undergoing conservation at the Maryland Archaeological Conservation (MAC) Laboratory. Archaeological excavations also

included the foundations of dwellings, a well, and four privies dating to the late 18th and early 19th centuries in addition to numerous industrial works from the late 19th and early 20th centuries and yielded about 38,000 artifacts (Baicy et al. 2020; Gough 2022). What garnered intense and international media attention was the discovery and excavation of the ship hull remnant, which had been pulled up to a bulkhead wharf and allowed to sink. It was eventually filled in with soil as part of the expanding shoreline sometime before 1798 (for example, see Waldek 2016; Golgowski 2016; Sky News 2016; Lewis 2016; Sullivan 2016; Dochterman 2016; Leshan 2016).

Excavations began at the adjacent site, Robinson Terminal South, in 2018. Quickly Thunderbird and City archaeologists realized the research potential of this site, particularly dating to the late 18th and early 19th centuries. Feature complexes included an 18th century store and warehouse operated by prominent Alexandria merchants, a ship-biscuit baking business, numerous other warehouses and trades shops, a paved alley, and dwellings associated with at least a dozen shaft features (for example wells or privies) located towards the back of lots. Early Alexandrians built these structures and later ones atop manmade land consisting of an extensive system of wharves, fill, and an additional three ship hull remnants. Material culture from this site fills over 200 boxes, excluding the ships, including organic material (like leather shoes) conserved or stabilized. A preponderance of accessible tax and census records, newspaper reports, insurance records, advertisements for fugitive enslaved people, and other documentary evidence for both sites allows for the development of a prosopography of late 18th-early 19th century Alexandria. On these two blocks during this time period, for example, we see professions directly related to Alexandria as a thriving seaport – mariners, merchants, seamen, and bakers – and varied urban trades including blacksmiths, joiners, tailors, and coopers. Again, the discovery and excavation of the ships eclipsed all other remarkable findings from the site in terms of media attention (for example, see PBS News Hour 2018; Blumberg 2018; The Maritime Executive 2018; Cochrane 2018; Sullivan 2018).

Archaeologists, conservators, and construction crews systematically recorded, dismantled, and removed all four ship hull remnants. The lower portions of the vessel remnants were relatively well preserved while the upper portions showed more deterioration due to their exposure to various agents of decay. Excavating the ships piece-by-piece required detailed documentation at each "layer" of construction, robust physical labor, creative problem-solving skills, and heavy lifting equipment. All four ships were documented and researched in the field using a variety of methods. These included traditional archaeological plan view drawings as well as current digital

recording techniques like photogrammetry and laser scanning.

Once excavated, the Hotel Indigo and Robinson Landing Sites' Ships were additionally documented and researched using specialized analyses, 3D laser scanning of individual timbers, and extensive historical research. Dendrochronology produced a usable date for the Hotel Indigo Site Ship (Worthington and Seiter 2016). However, repeated samples of the Robinson Landing Site ships were not conclusive, and no dates could be established (Worthington and Seiter 2019). Texas A&M University's Conservation Research Lab (CRL) worked with City staff and volunteers to capture 3D laser scans of each of the four vessels' individual timbers. The CRL then used these scans to create virtual and physical models of the ships' hulls that could be used for future research and interpretation (Grieco 2019; Ioset and Grieco 2022). Historical research in newspapers, customs records, maps, and property records has provided important context to these ships. While we do not know their specific identities or backgrounds, contextual research can help illustrate many details about the Alexandria ships, including what kinds of cargoes they may have carried, what ports they possibly traveled to, where they may have been built, and when they were retired and buried.

As soon as the ships surfaced from the mud along the Potomac River, City of Alexandria archaeologists realized the need for exploring alternative storage methods to protect these resources for future study and exhibit. Immediately after excavation City staff placed the timbers in water at a City-owned warehouse. Based on prior experience managing bulk waterlogged organics at the Maryland Archaeological Conservation (MAC) Lab, the artifacts were initially stored in metal roll-off bins, later fitted with custom-fit rubber liners based on conservator guidance. These metal bins and liners were later replaced with above ground swimming pools. City archaeologists monitored the condition of the timbers and changed the water in the pools regularly, approximately once a month.

Eventually, with the input of residents, stakeholders, and experts, the City of Alexandria decided to conserve the ship remains from the Hotel Indigo Site in their entirety. This vessel was shipped to the <u>CRL</u> in June 2017, is currently undergoing conservation, and is expected to complete the process in the next few years. Once conserved, the vessel will return to Alexandria for future interpretation and exhibition.

The three ships discovered at the Robinson Landing Site in March 2018 embarked on a different preservation journey, because full conservation was not a feasible option. A team of City archaeologists and Department of Project Implementation staff, nautical archaeologists, conservators, members of the Alexandria Archaeological Commission (AAC), and other residents and stakeholders considered

a full range of preservation options and their associated risks, opportunities, public support, and financial constraints. Ultimately, the project team recommended storing the Robinson Landing Site ships' timbers in Ben Brenman Pond (creating site 44AX253). Curation in Ben Brenman Pond allows the City to preserve the remains while reducing the amount of staff time needed to care for these important pieces of history and returns the City warehouse facility to its previous uses. This mediumterm storage solution (roughly 20 years) preserves the possibility of future study and/ or conservation. In May 2022, City staff worked with MAC Lab conservators and archaeologists and scientific divers from AECOM to submerge 1,185 timbers in Ben Brenman Pond at a depth of approximately seven feet below the surface (Parker 2022). A few diagnostic pieces selected for conservation, including bow or stern timbers, were not ponded and were retained in a separate pool of water for easier access before being transferred to the MAC Lab in November 2022. Additionally, City archaeologists with guidance from the MAC Lab selected five to six timbers from each ship for future monitoring. Monitoring will examine the state of preservation, assess and address any issues with timber storage, and occur one year after initial submersion and then once every five years. The City of Alexandria is committed to the continued preservation of the timbers and has allocated the necessary resources to monitor their condition and make any needed changes to the storage location.

Alexandria Archaeology designed public outreach and interpretation to explain how and why the ships were found and excavated, the time-sensitive decisions made, the significance of the archaeology, and the reasoning behind the preservation methods chosen. Staff developed new school lessons, organized special events, installed signage, produced exhibits, and created a weekly social media series to achieve these goals. Many of these activities and interpretive elements helped bring archaeology to new audiences beyond the Alexandria Archaeology Museum and Old Town.

Documenting, removing, researching, stabilizing, and preserving the ship hull remnants has been a massive undertaking that has required the dedicated efforts of developers, contract archaeology crews, City staff from multiple departments, a variety of specialists, volunteers, and other stakeholders. This report will summarize and contextualize the work undertaken on the four historic ships from the Hotel Indigo and Robinson Landing Sites. It begins by exploring Alexandria's maritime history and situating it within the larger theoretical literature on maritime cultural landscapes. Next, the report will provide background information on the archaeological projects, funding sources for these endeavors, and public and professional recognition for these projects. Subsequent sections will explain how archaeologists <u>excavated</u> these large, waterlogged

artifacts, discuss how archaeologists <u>researched</u> and documented the ships, and detail how the City of Alexandria is <u>preserving</u> and <u>interpreting</u> these important historic resources.

Alexandria History and Maritime

Cultural Landscapes

This section provides an overview of Alexandria's waterfront history, the significance of the sites found in the city, and a discussion of city's maritime cultural landscape.



Maritime Alexandria

"This town is built upon an arc of this bay; at one extremity of which is a wharf; at the other a dock for building ships, with water sufficiently deep to launch a vessel of any rate or magnitude."

In October 1759, Archdeacon Burnaby captured this image of the young tobacco town of Alexandria. The transformation of the town from a single wharf and dock to dozens, from a natural cove to a human-modified and regularized one that reached the deep waters of the Potomac River, from a small port that traded in tobacco to an internationally prominent one, is a story embodied by the ships archaeologically discovered in Alexandria since 2015.

Alexandria, Virginia grew up around Hugh West's 1732 tobacco warehouse. The town was originally constructed on the bluffs and mud flats along a crescent-shaped bay between two headlands or points – West's Point to the north (now the foot of Oronoco Street) and Point Lumley to the south (now the foot of Duke Street). Formally established in 1749, Alexandria quickly became an important regional center by the late 18th century. It was a major port of entry for vessels, goods, and people from around the world, and exported agricultural products like flour and hemp from the Virginia interior. Some of these ships never left Alexandria, becoming literally woven into the fabric of the city's waterfront through a process locally called "banking out." Early Alexandrians extended their waterfront lots to reach deeper water by making new land using a combination of soil, timber bulkhead wharves, and occasionally derelict ships. Banking out was fundamental to the development of the city's port and these landmaking structures created the modern shoreline.

Data compiled from marine lists, advertisements, announcements, and news items from the *Alexandria Gazette* and the *Virginia Gazette and Alexandria Advertiser* from 1784 to 1790 show the reach of this Potomac port town (Figure 1). Alexandria invested most heavily in regional trade with Baltimore and Philadelphia, but ships also frequently arrived from transatlantic ports like London and even from the Caribbean.

While the newspapers do not identify ships trading directly between Alexandria and the African continent during this period, transatlantic slave ships did land on the Virginia side of the Potomac River during the colonial period, including in Alexandria (Sweig 1985:507, 512-513). By the 1820s and 1830s, the town would become one of the largest centers of the domestic slave trade in the country (Ridgeway 1976:3, 45-49). White Alexandrians were involved in, and heavily profited from, the lives, labor, and trade of enslaved people from its founding through the Civil War.



Figure 1. Top three trade partners between 1784-1790 as seen from newspaper records that mention ships arriving to, and departing from, Alexandria.

By 1800, Alexandria arose as the premiere port on the Potomac River and a hub of maritime commerce and industry in the Atlantic world. Whereas many colonial port towns in the Chesapeake faltered and failed, Alexandria rapidly became a regional then international center, first exporting tobacco and later wheat and other agricultural products. The *Times and Alexandria Advertiser* (1797:3) remarked on September 5, 1797, that, "at Alexandria there are inspected in three months, upwards of 36,000 thousand barrels of flour, near 10,000 barrels more than exported during the same time, from Philadelphia." By 1800, Alexandria was the fifth busiest port in America and the third largest exporter of flour. Principal markets for Alexandria's exports included the West Indies, Spain, Portugal, England, and New England (Cuddy 2008:84; Shomette 1985:87). Between 1791 and 1843, more than 1,000 ships cleared the port of Alexandria in a given year (Shomette 1985:404).

The unprecedented growth in Alexandria's maritime commerce after the Revolutionary War demanded a well-developed and accessible waterfront. The cove of Alexandria, however, acted as a hindrance. Crews had to shuttle their cargo between land and ship using smaller vessels that could navigate the shallow waters. "Rapid increases in river siltation" due to deforestation and intensive agriculture affected the viability of many port towns including Alexandria in the late 18th century (Hayes 2023:3). Historical research into the history of early Alexandria, along with previous archaeological excavations, shows that toward the end of the 18th century, residents were actively filling in along the Potomac River waterfront in order to extend their properties toward the east in a process called "banking out". This was done for two primary reasons: to create valuable new waterfront real estate within the town of Alexandria; and to reach the deep-water shipping channel that passed close to the

shoreline. This right of waterfront landowners to bank out can be found in English common law and even as far back as Roman law (Slade et al. 1997:107-115). From a 1760 entry in the minutes book of the Trustees of the Town of Alexandria this right was reaffirmed during the initial sale of town lots on July 13 and 14, 1749 (Ring and Pippenger 2008:139-140). In 1782, the town council realized that remedying this geographic hurdle was crucial to Alexandria's success as a viable and competitive port and council began to act by improving and creating new roads along the waterfront (Shomette 1985:79-80).

In a massive, well-executed, and largely undocumented initiative, Alexandrians quickly expanded their town's riverine boundary eastward by cutting into the high bluff at the edge of the river and depositing that soil along the water's edge (Shephard 2006:4). By 1803, close to 25 acres of new land had been added (Shomette 1985:82, 86). In the end, approximately 13 city blocks¹ in Old Town between Pendleton and Wilkes Streets – the core of Alexandria's modern waterfront – were created as a result of banking out (Figure 2). As a witness to this process, axe marks on many of the archaeologically recovered ships' framing timbers and the absence of some of their port sides and sterns suggest that at the end of the vessels' useful lives, they were brought up to the shoreline and grounded, stripped of useful fittings, cut down to the waterline, broken for fuel, and integrated into landfilling infrastructure.

Based on documentary evidence and historic maps, the ships were sunk and abandoned between 1749 and 1845. However, the accuracy with which some of the map makers depicted the shoreline leaves room for potentially using other historic records to establish a shorter window of time in which these vessels were deposited and to bring in other lines of evidence (see <u>Physical Model Construction</u> and <u>Dendrochronology</u> sections). According to a plat submitted as part of a lawsuit over the eastern boundary of this parcel, the location in which the Hotel Indigo Site Ship was found would have been in the Potomac River in 1788. The 1798 George Gilpin map of Alexandria shows the same location landlocked, providing a 10-year bracket for when this ship was buried (1788-1798). Similarly, historic maps show that for the Robinson Landing Site, Ship 1 (Feature 200) was buried on or close to the original 1749 shoreline, Ship 2 (Feature 155) was buried in land that was created later, and Ship 3 (Feature 159) was buried in land that may not have been created until the turn of the 19th century or even later (Figure 3).

¹ Between Point Lumley and West's Point, early Alexandrians created about ten blocks of land, comprising parts of 13 blocks.



Figure 2. Map of land created along the Potomac River in Alexandria, Virginia. Orange line indicates the original 1749 shoreline.



Figure 3. Shorelines over time and the location of archaeologically recovered ships

Only three newspaper accounts provide a glimpse into the human effort and toll needed for this landscape transformation. On April 14, 1785, the *Virginia Journal and Alexandria Advertiser* (1785a:3) reported that, "Last week as a Negro Man was digging under the Bank, unfortunately a large Mass of Earth fell upon him and fractured his Thigh." The August 25th (1785b:2) edition noted: "A few Days ago a labouring Man was crushed to Death in this Town, but a sudden falling of a Bank of Earth, under which he was digging." The other, in the September 15th (1785c:3) issue, stated that "...a Labourer, on Messieurs Harper and Keith's Wharf, lost his Life, by the Falling of the Bank."

In 1985, the City of Alexandria commissioned a study on its maritime history. That study predicted that beneath the modern waterfront lay tangible evidence of Old Town's maritime past (Shomette 1985). The ensuing 30 years of archaeological work revealed a complex system of wharves, piers, cribbing, and scuttled ships forming Alexandria's waterfront (Table 1). Four sites show evidence of the shoreline extension: the 1759 Carlyle-Dalton wharf (44AX81) (Heintzelman-Muego 1983); the pre-1780 Lee Street Site wharf (44AX180) (Cuddy et al. 2006; Shephard 2006); the 1785 Roberdeau's Wharf (44AX114) (Knepper and Prothro 1989); and the 1785 Keith's Wharf (44AX119) (Engineering-Science 1993). Overlying the remains of Keith's Wharf were seven derelict vessels used to fill in Battery Cove in the 19th and 20th centuries and two additional vessels used as part of the construction of the late 19th-century shipway (Terrell 1990; Engineering-Science 1993). During the removation of Windmill Hill Park, archaeologists uncovered and documented the remains of an early-20th century barge or scow and an early-20th century support boat in the fill at the edge of the shoreline (Hutchins-Keim 2017). The Hotel Indigo Site (44AX229) and Robinson Landing Site (44AX235) Ships are the most recent discoveries of this larger waterfront expansion feature complex but will likely not be the last as new development and infrastructure upgrades continue.

Similarly, in New York City "during the wooden sailing ship period, a number of retired or derelict vessels – which were essentially ready-made soil retaining structures – were incorporated into the landfill surrounding Lower Manhattan. Some, lying parallel to the river, were intentionally sunk to form retaining walls holding in fill. Others, already sunk and abandoned on the river bottom were too much trouble to remove and were simply buried where they lay. In some cases, derelict vessels that were no longer sea-worthy were used as floating storage hulks" (Pappalardo et al. 2013:4-8). The discovery of various ship hull remnants in New York City (Pappalardo et al. 2013:4-8), including the World Trade Center Ship and the Ronson Ship, now identified as the *Princess Carolina*, most closely mirror the Alexandria findings to date.

Reclaiming land from water by purposely sinking derelict vessels was a common English practice as early as the 17th century (McDonald 2011; Ford 2013; Niculescu 2019). This process has been well documented in other cities such as New York with both the Ronson and the World Trade Center ships, Boston with the lime ship, and San Francisco with the Gold Rush fleet (Shomette 1985:81; Rosloff 1986; Pappalardo 2013; Annear 2016). Alexandria is unique among these in that it is a Southern city, largely dependent on trade in agricultural commodities, and located far inland.

Ben Ford (2013) applies an anthropological, comparative approach to study reused vessels as vernacular architecture and documents 31 examples throughout the world. He defines a reused vessel as a "boat, ship or barge that was adapted, either as a whole or in part, to form a permanent harbor structure" (Ford 2013:198). Examples

	Feature			
Site Number	Number	Description	Depositional Context	Relative Ship Dates
			overlies 18th-century wharf bulk-	
44AX119	27	Scow, round-ended	head	ca. late 19th-early 20th c.
44AX119	34	Scow, round-ended	overlies 18th-century wharf bulk- head	ca. late 19th-early 20th c.; iron fastenings sug- gests 1800-1850
44 A X 119	31	Baroe contare-ended	beached on late 19th-century shore-	ca late 19th-early 20th c
		nontro ample (against	heached on late 19th-century shore-	
44AX119	2	Barge, square-ended	line	ca. late 19th-early 20th c.
44AX119	30	Barge, longitudinally planked	underlies 19th-century bulkhead	possibly 19th c.
			used to construct 19th-century ship-	
44AX119	32	Barge section	way	19th c.
			used to construct 19th-century ship-	
44AX119	38	Barge section	way	19th c.
44AX119	35	Bateau hull	lying near 19th-century shoreline	hull style suggests 1800-1850
44AX119	37	Keeled vessel, bow and midship portion	unknown due to site conditions	probably built 1850-1900
Windmill Hill	unassigned	Barge or scow, prismatic hull	abandoned and later buried	ca. late 19th-early 20th c.
Windmill Hill	unassigned	Small Boat, lightly built support vessel	abandoned and later buried	early 20th c.
			abutting bulkhead, resting on mud-	ship timber dendrochronology
44AX229	53	Brig or large sloop	flats	dates post-1741
44AX235	155 (Ship 2)	Small sloop	integrated into bulkhead wharves at bow and stern, resting on mudflats	underlying wharf timbers with dendrochronology dates post-1785

Site Number	Feature Number	Description	Depositional Context	Relative Ship Dates
44AX235	159 (Ship 3)	Large merchant ship	integrated into wharf architecture, resting on steep slope of river bottom	ca. late 18th-early 19th c.
44AX235	200 (Ship 1)	Lighter	stern abutted by pilings likely associ- ated with wharf, resting on mudflats	ca. late 18th-early 19th c.

Table 1: Vessels discovered in Alexandria to date.

include ships used as prisons in San Francisco and Australia, as harbor obstructions for protection in Yorktown and Denmark, and as landmaking structures in the United States, England and Ireland, and Norway. Ford finds that this reusage is widespread but not universal, and several factors influence if and how vessels are reused. These include size, age, shape of vessel, ownership type, physical and economic environment of the area, and technological advancements of construction. Understanding when, where, and why ships are reused as harbor structures contributes to the broader historical context of commerce and the development of capitalism (Ford 2013:198).

In his comparative analysis, Ford (2013:203) categorizes the 31 examples as naval and state-owned vessels versus those under private ownership – each category with its own internal consistency. Interestingly, he characterizes the ship hull remnants found during the Keith's Wharf excavations in Alexandria as state-owned vessels, based on the hypothesis posited by Heintzelman (1986:135, footnote 31)² that they may have been associated with British naval vessels sunk or scuttled and reused as landfill. He does acknowledge that this theory is not "substantiated, nor has it been proven that any vessels were used in the extension of the Alexandria waterfront" (Ford 2013:203). Given recent findings and analyses of the four ships to date, it appears more likely that the ships found since 2015 and those found at Keith's Wharf in the 1980s were private merchant vessels used to fill in and extend Alexandria's waterfront, thus updating Ford's 2013 study. This scenario aligns better with Ford's (2013:199-202) findings that state vessels were rarely reused in commercial port-related construction activities. State-owned and naval vessels were also more often reused whole (as barracks, prisons, obstructions, or blockades, for example), rather than broken down into parts like the Alexandria examples. Ford finds that private vessels were broken down into "slab sides" of vessels, forming the foundations of wharves in rapidly expanding ports with growing economies.

Contextual evidence captured in official Alexandria records and newspaper accounts may speak to the presence of these ships in the archaeological record. In 1799, the Alexandria Corporation passed an act "To preserve the navigation of the Public Docks in the town of Alexandria." A growing problem existed in the busy port town where people were: "introducing into the public docks … the decayed and rotten hulks of old vessels, boats, and craft, of different descriptions, under the pretense of repairing the same, but in reality to serve the purposes of fuel, which when cut down to the surface of the water are willfully and negligently suffered to sink to the bottom of said docks where they remain obstructions to the navigation …" (*The Times and District*

² Heintzelman cites Shomette (1985). He (1985:81) discusses the use of Royal Naval vessels as breakwaters or harbor extensions in various both the Americas and Europe.

of Columbia Daily Advertiser 1799:3). To combat this problem, a \$50 fine was levied against any person who sank their ship at a public dock and allowed it to remain there for longer than 10 days, with an additional \$5 fine for every 24-hour period the ship stayed submerged beyond that limit. The issue does not seem to have been immediately resolved because the text of the ordinance was reprinted in local newspapers at least twice over the next decade (The *Times and District of Columbia Daily Advertiser* 1800:2; *Alexandria Daily Gazette* 1808:3). Not only are large sections of these four archaeologically recovered ships missing, but many of the recovered ship remains display evidence of similar processing and cutting down (Figure 4).

Ford (2013:214) proposes the "expanding frontier hypothesis of ship reuse" wherein predominately privately-owned ships were most often reused in existing ports "undergoing locally unprecedented growth." For Alexandria, that period was the 1780s and 1790s. Alexandria's period of port expansion and increased commercial activity

generally coincides with the reuse dates of the ships. Though the four Alexandria ships were excavated after the publication of Ford's article, the majority of his findings are directly applicable to the Alexandria case study, including the fact that instances of vessel reuse did not find their way into period newspapers. Ford (2013:209) speculates, "This omission was likely because of the reuse of ships as cribbing was too common to be notable during the 18th century." Archaeology, in fact, is often the best record of everyday life, including efforts such as landmaking. Why reuse certain ships and not others? Older vessels provided one last opportunity for owners to profit and medium sized vessels made the most sense for maneuverability and stability during wharf construction, which often took



Figure 4. Robinson Landing Ship 2, note cuts and processing on ship timbers.

place in muddy, tidal conditions. Trends in ship reuse reflect and are active in broader developments in maritime trade and harbor construction. Bringing the Alexandria "fleet" into conversation with Ford's study adds to and strengthens the majority of his conclusions.

Significance

The four Alexandria ship remains found are unique among ship discoveries in the mid-Atlantic because they were all documented using both traditional and state-ofthe-art methods; fully exposed, excavated, dismantled and immediately and continually stabilized; and will eventually be exhibited (in whole or in part). The corpus of technical data is or will be available to scholars. In their analysis of the World Trade Center ship, archaeologists found that of the mere 41 colonial-era vessels documented and/or excavated in North America, only nine had undergone any degree of conservation work and only one of those was from Virginia. Many were recorded before being either left in place or reburied in situ (Pappalardo et al. 2015:4-6, table 4-2). Another study from 2015 reported that despite the fact that the number of maritime museums has reached an all-time high, the United States has saved only 27 watercraft from archaeological contexts (Fix 2015:50, table 2.1). While the scuttled Alexandria ships are not complete their discovery still affords an extremely rare opportunity to rigorously collect and study data on 18th-century shipbuilding traditions, the diffusion of this knowledge, and the larger connections of this bustling port town to the Atlantic world. Detailed examination and systematic study have already begun to inform current scholarship on historic shipbuilding technology and develop the datasets needed for broader comparative research on the 18th century maritime Atlantic economy. The long-term preservation of these ships, detailed in this report, ensures appreciation and study will continue.

The well-preserved Alexandria ship remains are rare examples of excavated, recovered, documented, and conserved 18th-century merchant ships and are among the most critical evidence available to advance our understanding of colonial era British Atlantic merchant ships and shipbuilding. The vessels document the global nature of life in an 18th-century port town. They were constructed of wood from New England and other unknown origins, designed to move people (free and enslaved) and cargo across the Atlantic world, and occasionally tunneled by mollusks from warmer, saltier, perhaps Caribbean waters. They ultimately became part of a Potomac River port city. The scuttling of the ships is a part of a broader cultural practice of using retired ships to build out land along crowded and growing urban waterfronts like Alexandria's (Ford 2013). Once conserved and preserved, the ships can be exhibited as the centerpieces of a maritime heritage museum and all technical data will be made available to scholars for study.

Alexandria's Maritime Cultural Landscape

Though this report focuses on the excavation and stabilization of the four ship hull remnants, a maritime cultural landscape approach urges us to contextualize the features within the broader mindset of those living and working in a port town and to see them as an interconnected part of a larger trans-Atlantic world. While full application of this approach awaits the final archaeological report from the Robinson Landing Site, it is worth beginning to frame these discoveries within this context. The recent and past archaeological work affords a unique opportunity to study a densely packed commercial and residential waterfront neighborhood once brought to life by white, free, and enslaved tenants and laborers whose lives were adapted to the sea. Often described as maritime cultural landscapes, these studies "focus on how humans interact with the water, how those interactions shape both culture and landscape, and how those interactions manifest themselves in material culture broadly defined" (Ford 2011:6).

This lithograph (Figure 5) by Charles Magnus captures Alexandria's maritime cultural landscape during the Civil War, in 1863. The artist depicts the port city as a gateway, the intersection of commerce and transportation at the edges of land and water, with a population concentrated just off the river's edge. The roads and rail lines leading off to the horizon also hint at connections to western regions of Virginia. Contrast that with the City's connection to the water today, where the main river-bound transportation route is by water taxi to the Nationals' games in Washington, D.C. Eric Westerdahl (1998:n.p.) captures the modern reality of Alexandria when he notes that proximity to water is not enough to create a maritime culture; "if you do not possess a population attuned to maritime preoccupations, even if a current population is residing at the seashore, there is no maritime culture." Though living on or near the shores of the Potomac, Alexandrians today are not river bound in the same way as those living 200 years ago were.



Figure 5. Charles Magnus Birdseye View of Alexandria, 1863. LOC: 81694373

However, maritime cultural landscape studies recognize the relevance of their work to modern communities. Joe Flatman (2011:326) explains, "People care about the coastline, perhaps more so than virtually any other physical environment. Through caring they wish to understand that same environment, to visit it in their minds as well as with their feet, to travel through and experience that environment." Recent efforts to redevelop urban waterfronts, like Alexandria's, embody this value. The Hotel Indigo and Robinson Landing developments were designed to reactivate a previously industrial waterfront. Now the west Potomac's shore is dotted with townhomes, restaurants, and spaces for public events, re-orienting the public towards the water in new ways while simultaneously anchoring these changes in Alexandria's history. In fact, the very first Goal Statement for the Alexandria Waterfront Plan (2012:18) is to "create a unique Waterfront identity that is grounded in the City's history." Showcasing Alexandria's historic waterfront was a central tenet of the Small Area Plan guided by the work of the AAC and its resulting Waterfront History Plan. Infusing the City's redeveloping waterfront with Alexandria's history by creating a future waterfront interpretive plan and continuing to implement conservation, study, and preservation and/or exhibition of new archaeological discoveries from the waterfront is one of the Office of Historic Alexandria's primary goals in the 2020-2025 strategic plan. As the City continues to explore cost effective and sustainable alternatives for mitigating flooding along the waterfront and awaits implementation of the Waterfront History Plan, historic interpretation has found expression in both conventional and creative ways, summarized below.

Waterfront History Plan. Historic interpretation along the waterfront has sprung up in recent years as a result of the initial implementation of the Waterfront History Plan (City of Alexandria 2012: Appendix 6) in combination with the fulfillment of conditions placed on site plans during the development process (see Alexandria Archaeology Standards for additional information on the Historical Interpretation stage of the Archaeological Development Review Process). Approaches have ranged from standard Alexandria Heritage Trail signage on the history of 211 Strand St., the domestic slave trade, and the foot of King Street; to physical interpretation of the ever-expanding shorelines at Robinson Landing and at (and even inside!) the Hotel Indigo. Most stunning perhaps is the entryway graphic inside Hotel Indigo taken directly from Ed Johnson's (Thunderbird archaeologist) planview map of the ship discovered at the site complete with labels for the frames³ (Figure 6). EYA, the developers at Robinson

³ Frames are composed of floors and futtocks.

Landing, worked closely with City staff to develop an interpretive plan in addition to representation of the shorelines. They incorporated the archaeologically excavated foundation stones of Colonel Robert Townsend Hooe's 1782 warehouse into a large planter and seating area in the pedestrian section of Pioneer Mill Way; took inspiration for new street names from the site's history (Fleming Alley, Merchant



Figure 6. Hotel Indigo Lobby Entrance

Alley, Pioneer Mill Way, Bakers Way, and Annie Moore Place); and inscribed in stone pavers, steps, and a fountain a timeline of people, events, and activities that occurred on the block with careful attention to telling the full story. The City repurposed the 1854 foundation stones from Pioneer Mill as riprap along the riverfront just north of Point Lumley Park.

African American Waterfront Heritage Trails. The African American Heritage Trail Committee developed two trails, both beginning at Waterfront Park, that together span just over three miles from Old Town North to Jones Point Park. The trail is available as a webpage and a self-guided, online StoryMap that allows residents and visitors to walk the trails and experience 30 stops covering over two centuries of Alexandria's history (Figure 7). In the future, some of these stops will include interpretive signage, like the history of ship building at Point Lumley Park. This community history project was developed by members of the African American Heritage Trail Committee past



Figure 7. Start page of African American Heritage Trail StoryMap

and present: Councilman John Chapman, Susan Cohen, Gwen Day-Fuller, Elizabeth "Indy" McCall, Maddy McCoy, Krystyn Moon (Chair), McArthur Myers, and Ted Pulliam. Support from the Office of Historic Alexandria was provided by the Alexandria Archaeology Museum and Alexandria Black History Museum. *Public Art.* A popular, thought-provoking, and Instagram-worthy new temporary public art series in Waterfront Park has featured five installations at the time of this report, four of which take direct inspiration from history (*Mirror Mirror* 2019, *Wrought, Knit, Labors, Legacies* 2020; *Groundswell* 2021; and *Two Boxes of Oranges and Admonia Jackson* 2023) and two of those works stemmed directly from archaeological findings (*Groundswell* and *Two Boxes of Oranges and Admonia Jackson*) (Figure 8).

These history-grounded efforts reflect a care and consideration of the evolution of the landscape and a desire to have those past stories told even when remnants of the historic landscape are barely visible today. "People make cultural landscapes," observes Joe Flatman (2011:325). The people who moved, migrated, or were forcibly transported through these maritime-focused landscapes were active agents in the creation, maintenance, and destabilization of the cultures and identities that developed out of these spaces. Historic period maritime cultural landscapes – ships, people, shorelines, material culture – were inextricably linked to and dependent upon the institution of slavery and the efforts to escape that institution. Future application of the maritime cultural landscape approach seeks to extend beyond the individual ship remnants to the lives of those who interacted with the vessels, the landscapes they traversed, and the neighborhoods built on top of them.



Figure 8. Two Boxes of Oranges and Admonia Jackson by artist Nina Cooke John

Project Background

This section provides an overview of the ships project including funding information and recognition of this unique work.


The City of Alexandria has supported archaeological work since 1961 when archaeologists excavated the Northwest Bastion of Fort Ward, a Civil War fort built as a part of the defenses of Washington, D.C., one of the first municipally funded archaeological excavations in the country (Bromberg et al. 2017; Moon 2014:222). In the mid-1960s, when urban renewal threatened to demolish large portions of the city's historic district, preservationists argued against clear-cutting Old Town. Public outcry led to a significant reduction in the footprint of the proposed development and to salvage archaeology on the blocks that were redeveloped. In 1975, Alexandria was the first city in the nation to establish an Archaeological Commission and hired its first full-time archaeologist Dr. Pam Cressey in 1977. Since then, archaeology has become integral to the character of modern Alexandria (Bromberg et al. 2017). The goals of those early days – to commemorate the city's rich past and to manage the impacts of modern development on the archaeological record – continue to drive today's program.

In 1989, the Alexandria City Council adopted an Archaeological Protection Code, which was one of the first local ordinances in the country specifically designed to protect archaeological resources. Alexandria's Code requires archaeological review for all projects in the city that require permits for ground disturbance. Using a wide array of historical resources, City archaeology staff determine the potential for encountering significant archaeological resources on these ground-disturbing projects and weigh the proposed impacts to these resources. If it appears likely that significant archaeological resources will be negatively impacted by the proposed activities, the permit applicant is required to hire an archaeological consultant to mitigate the impacts.

Alexandria Archaeology has a long legacy of conducting community-based archaeology and these recent waterfront projects were no different. Staff engaged stakeholders for all portions of these projects from excavation to documentation to re-submersion for preservation. An important component of Alexandria Archaeology's decision-making process is reaching out to the community to provide information about a project, receive feedback, and answer questions about the proposed work (Bromberg et al. 2017). This process requires speaking with civic organizations, City commissions, and other stakeholder groups.

In 2012, after years of public engagement, City Council approved a <u>plan</u> to revitalize Alexandria's historic waterfront. The design imagines a waterfront free from vacant industrial buildings; that is walkable, mixed-use, and Instagram-worthy with new municipal amenities; and with proper infrastructure to mitigate flooding and sewer outflow events. Due to Alexandria's Archaeological Protection Code, in the 2010s City archaeologists geared up for waterfront redevelopment and a period of intensive focus on some of the most historically significant areas within the nation's third oldest National Register District. City staff provided the Alexandria Archaeological Commission (AAC) with regular updates on the work and opportunities for feedback. Background historical research triggered by the protection code indicated that both the Hotel Indigo and Robinson Landing projects would impact significant historic resources (Claypool and Johnson 2014; Mullen, Cao, and Carroll 2014). The unique discovery of the four ship hull remnants and massive wharf structures reflects Alexandria's significance as a historic port city and the importance and application of the local archaeology ordinance.



Figure 9. AAC members and OHA staff accepting the Virginia Association of Museums Endangered Artifact Award

Funding

Financial support for the ship excavation and preservation projects came from several external and internal sources. Funding for the conservation of the ship from the Hotel Indigo Site came from the City of Alexandria and donations raised by the Friends of Alexandria Archaeology (FOAA) as part of the "Save our Ship" (later "Ships") fund. Staff also received grants from the National Park Service's Maritime Heritage Program and the Virginia Association of Museums Endangered Artifact Program (Figure 9). A grant from the Historic Alexandria Foundation supported the creation of a new permanent exhibit in the Alexandria Archaeology Museum called "Preserving Alexandria's Maritime Heritage." The City of Alexandria funded the short-term storage and maintenance of the Robinson Landing Site ship remnants in a City facility between 2018-2022 and their medium-term preservation storage in Ben Brenman Pond.

Recognition

These projects and those who made them possible have been recognized professionally and publicly in a variety of ways. Additionally, the Alexandria Archaeological Commission (AAC) and the Friends of Alexandria Archaeology (FOAA) have recognized the efforts of multiple partners and volunteers who helped excavate, preserve, and interpret the ship hull remnants.

In 2018, Partners for Livable Communities, a non-profit dedicated to improving the livability of communities by promoting quality of life, economic development, and social equity, presented the Culture Builds Community Award to EYA, LLC and the City of Alexandria Archaeology program. This award recognized EYA and Alexandria Archaeology's unique partnership to preserve and highlight the historic importance of the Old Town Alexandria waterfront. EYA engaged and funded a team of archaeologists to research the history of the site and applied this information to painstakingly excavate the site over an 18-month period. This effort resulted in the discovery of more than 150 individual features and over 100,000 artifacts. The major discovery of three 18th century ships marked this as one of the most significant urban archaeological sites in Virginia. EYA gifted the artifacts, including the three ships, to the City to hold in trust and further public understanding and appreciation of Alexandria's rich history.

The AAC also recognized the many important partners who made excavating, preserving, and interpreting the ships possible. The AAC presented the 2016 Ben Brenman Awards before City Council to several individuals and organizations who made major contributions to waterfront archaeology. John Mullen, principal archaeologist and assistant manager at Thunderbird, received the Outstanding Professional Archaeologist award for his high standards of archaeological investigation and historical study at the Hotel Indigo Site, for providing new insights into the founding and development of Alexandria's 18th-century waterfront, and for his exceptional commitment to communicating these incredible discoveries to multiple audiences. Dr. George Schwarz of the Naval History and Heritage Command's Underwater Archaeology Branch received the award for Outstanding Maritime Archaeologist for volunteering to provide expertise and guidance in the documentation, careful excavation, and preliminary stabilization of the oldest ship discovered to date in Alexandria, and for sharing his knowledge about maritime history and the construction and use of the vessel, thereby helping to make possible the eventual exhibition of this rare artifact for future generations to study and appreciate. Michael Wilson, senior vice president for construction, Carr City Centers, received the Outstanding Developer award for the company's commitment to the highest quality archaeological preservation at the Hotel Indigo development project,

and for supporting and funding the documentation and recovery of significant artifacts, features, and information that will enrich the lives of residents and visitors by promoting an understanding of the past.

In October 2022, the Ben Brenman Awards fittingly honored additional waterfront contributions just after the ship timbers were submerged in Ben Brenman Pond in



Figure 10. 2022 Brenman Awardees

May (Figure 10). A 2022 Brenman Award for Outstanding Developer was presented to EYA RTS Construction, LLC for the company's commitment to the highest quality archaeological preservation and historic interpretation at the Robinson Landing development project. The award acknowledged their support and funding for the documenting and recovering of significant artifacts, features, and three ship hull fragments from the site. This work will enrich the lives of Alexandria residents and visitors for years to come. An Outstanding Conservation award was presented to the Maryland Archaeological Conservation (MAC) Laboratory for the organization's expertise, innovation, and leadership in preserving Alexandria's buried past and the excavation, conservation, and creative curation of significant waterfront artifacts, features, warehouse timbers, and ship hull fragments. AECOM's team of archaeologists and scientific divers received the Outstanding Cultural Resources Management award for their extraordinary efforts to rehouse the Robinson Landing ship timbers in Ben Brenman Pond to preserve the possibility of future study and conservation.

Each year at the annual volunteer party, the Friends of Alexandria Archaeology and Alexandria Archaeology present the Anna Lynch Volunteer of the Year Award in recognition of significant contributions of personal time to the study of Alexandria's archaeological heritage. Awards were presented to the Bon Voyage Ship Volunteers in 2017 and the Ship Viewing Event Volunteers in 2018. The 2017 award was dedicated to the 55 volunteers who contributed 721 hours in a single week to the herculean effort to wrap and pack the fragile, wet 18th century ship timbers on a tractor trailer bound for the CRL at Texas A&M University. In June 2017, volunteers, City archaeologists, and CRL conservators spent a hot and exhausting week packing each timber individually, eventually using three miles of towels and one and a half miles of foam. The team then loaded the timbers onto the truck and watched it drive away with fingers crossed that all the timbers would arrive still damp and in good condition. In April 2018, the public was invited to view the remnants of the Robinson Landing ship remnant partially underlying Wolfe Street. Volunteers helped City archaeologists to put together an event that attracted over 3,000 people to see the site. The 2018 Anna Lynch Volunteer of the Year Award honored these volunteers.

Excavation

This section provides an overview of the excavation of the ships and details how they were moved from the two sites.



Overview

Between 2015 and 2018, development projects along Alexandria's waterfront altered the 20th century industrial landscape, slowly replacing warehouses with 21st century hotels, townhomes, and mixed-use developments, many with deep impacts along the water's edge. Archaeologists from Thunderbird, hired by the developers, documented, and excavated two properties at the foot of Duke Street, resulting in some of the most extensive archaeological efforts to date in Alexandria. Both the Hotel Indigo Site (44AX229) to the north of Duke Street, and the Robinson Landing Site (44AX235) to the south of Duke Street, straddle historic Point Lumley, the original southernmost point of Alexandria's crescent-shaped bay located on blocks largely composed of made land. Excavations at both sites revealed an array of significant archaeological discoveries, including the foundations of one of the city's earliest buildings (a 1755 public warehouse); the foundations of more than a dozen domestic and commercial structures dating to the late 18th and early 19th centuries; as well as associated wells, privies, and miscellaneous features; and numerous industrial works from the late 19th and early 20th centuries. In addition, archaeologists uncovered the remains of four derelict ships, portions of which had been purposely buried to create land for wharves and other infrastructure.

Hotel Indigo Site (44AX229)

In 2015, developers announced plans to build an upscale boutique hotel on Alexandria's waterfront. The Hotel Indigo Site, at 220 South Union Street, was the first in a series of waterfront development projects. Given the project area's location on historic Point Lumley and the deep subterranean parking garage needed for the new hotel, Alexandria Archaeology required the developer to hire archaeologists to identify, document, and excavate any archaeological features encountered during the project. Carr City Centers hired Thunderbird to compile a documentary study of the project area and implement any archaeological work triggered by the City's preservation code (Carroll and Mullen 2014).

Thunderbird submitted a scope of work for an archaeological evaluation of the site to Alexandria Archaeology. This scope included plans for initial monitoring and machine trenching with provisions for shovel test pit and test unit excavations if potentially significant archaeological features were identified. The archaeological excavations began in September 2015 and were guided by four main research goals: identifying the original 1749 Alexandria shoreline through site-wide stratigraphy, identifying foundations and features associated with several 19th century buildings known to have stood on the property, identifying structural remains associated with the 1755 Carlyle warehouse, and identifying any 18th and 19th century wharves or structures utilized in the "banking-out" land creation process.

In December 2015, archaeologists from Thunderbird unearthed what looked like a possible ship at the Hotel Indigo Site. Further exploration confirmed that it was a ship hull (or half a ship hull) contiguous with a bulkhead wharf (Feature 54) and a wooden barrel feature (Feature 55) (Baicy et al. 2020:site map). The bulkhead, ship, and barrel together formed a continuous bulwark — the first archaeological evidence of the landmaking process within or adjacent to Point Lumley. Thunderbird, in consultation with City staff, determined these features to be significant and developed a resource management plan (RMP) to guide archaeological data recovery. Uncovering these features directly addressed the original research question regarding land creation along Alexandria's waterfront and the RMP outlined five expanded research questions to guide further field investigations. These included: what is the date of construction for the bulkhead; how was the bulkhead constructed, is it similar to others, and how did it relate to the historic waterline; what can the stratigraphy reveal about natural sedimentation versus human actions regarding the process of infilling; was the derelict vessel intentionally part of the land creation; what can be determined about its use and function; and what can the artifact assemblage reveal about activity areas and the socioeconomic status of site occupants. The excavation plan for the bulkhead and derelict ship was to expose both features entirely, document them through notes, photographs, and drawings; excavate four test units in each feature to sample the sediments for artifacts; and collect timber samples for dendrochronological analysis. Additionally, the crew would produce a 3D model of the vessel developed from laser scanning (see Documentation Section). The bulkhead was not saved.

In January 2016, a team of City staff, Thunderbird archaeologists, conservators from the MAC Lab, and the Naval History and Heritage Command (NHHC) excavated the vessel's remains (Figure 11). Excavation of the ship was underpinned by three further, more specific research questions: was the ship purposefully used for land creation, and if so, how was this accomplished/implemented; what can be learned about the ship's origin, construction date, use, and function; and what evidence exists supporting the theory that the ship was purposely dismantled. These questions sought not only to understand the banking-out process in Alexandria, but to also understand the history of the ship before it became artificial land. Following the plan laid out in the RMP, archaeologists photographed the ship and documented it using scale drawings and profiles. During this process the ship was continuously kept wet by hosing it down



Figure 11. Excavating the Hotel Indigo Site Ship

to protect the integrity of the fragile waterlogged wood for future research or display.

The archaeologically recovered remains measured about 46.5 feet long by 12.5 feet wide. While substantial, this did not represent the entire ship. The remains included the bow stem, but the entire stern was missing. The frames (or ribs) of the ship were intentionally sawn along the keel. The width of the ship is incomplete. The recovered portion starts at the keel and only extends to just beyond the turn of the bilge. Noticeably, many of the floor timbers that should span the centerline of the ship show strong evidence of having been sawn or chopped either at or just beyond the keel. The uppermost extremities of these frames show severe signs of decay and degradation where they were probably exposed to the elements longer than the lower portions of the timbers. The keelson is absent in this ship as is any evidence of decking, masts, or rigging. The remains do, however, include sacrificial planking (exhibiting extensive teredo worm damage), caulking, hull planking, frames, and some ceiling planks. The vessel was held together using iron fasteners and wooden pegs.

Timbers were labeled using an alphanumerical code denoting function and location, a system derived from the labeling process outlined by Richard J. Steffy in *Wooden Shipbuilding and the Interpretation of Shipwrecks* (2006). Each label specifies the timber type, whether the timber was located on the port or starboard side, the sequential order of timbers in relation to the bow stem and/or keel, and breaks incurred during excavation, storage, or transport (See <u>Appendix C</u>). The labels start with a letter or combination of letters denoting timber type and, if necessary, which side of

the ship the timber was located. Next is a numeral indicating the timber's location in a sequence, followed by a period and sub-sequential numeral if the timber had multiple components. Any cuts made in the field were indicated at the end of the label with a sequential lowercase letter. Pieces that broke at some point after excavation were labeled with Roman numerals at the end of the original code.

As the ship's timbers were removed, archaeologists excavated and screened the soil found underneath the ceiling planks and in between the frames. While exposing the ship, archaeologists recovered 131 artifacts, including English brown stoneware, Buckley ware, creamware, and free blown glass. These artifacts were found directly on top of the ceiling planking and are associated with the fill of the ship in the banking-out process. An additional 120 artifacts were recovered between the frames and hull planking. Temporally diagnostic artifacts from this context included tin glazed earthenware, Buckley ware, creamware, pearlware, and free blown glass. These artifacts are also likely associated with the land building process, potentially falling between the timbers during infilling. Once the ship's timbers were completely removed, archaeologists dug five, twofoot-deep shovel test pits (STPs) at 10-foot intervals beneath the base of the ship. Two of these STPs generated artifacts while the others only encountered natural riverbed sands. Of the 15 artifacts uncovered, only the tin-glazed earthenware sherds were temporally diagnostic and were also likely associated with historic landmaking at Point Lumley. Thunderbird archaeologists also took four soil samples from different parts of the frames and sent these to Paleoscapes Archaeobotanical Services for macrobotanical analysis (Puseman 2017). Faunal remains recovered were sent to IdBones for analysis (Andrews 2017). Fifteen timbers were sampled and sent to the Oxford Tree-Ring Laboratory for dendrochronological analysis (Worthington and Seiter 2016).

Robinson Landing Site (44AX235)

The Robinson Terminal South (now Robinson Landing) property was also slated for redevelopment in alignment with the <u>2012 Waterfront Small Area Plan</u> (City of Alexandria 2012). Developers planned to build new residential townhouses and retail spaces to replace the warehouse and offices for the Robinson Terminal Warehouse Corporation located on the site. Compliance with Alexandria's Archaeology protection code required the developers to hire consulting archaeologists to conduct a documentary study (Claypool and Johnson 2014; Mullen, Cao, and Carroll 2014) and assess the necessity of further archaeological evaluation of the site.

Much of the research and archaeology implemented ahead of the Robinson Landing Site development was informed by the results of the Hotel Indigo Site project. The Hotel Indigo Site excavations revealed information about land creation and subsequent economic and cultural development north of Point Lumley. The Robinson Landing Site excavations would inform the extent of this development south of Point Lumley. Thunderbird Archeology was contracted by developer EYA to perform all necessary archaeological investigations ahead of construction. In February 2017, Thunderbird submitted the final scope of work to Alexandria Archaeology for approval. The scope of work integrated findings from a property history (Claypool and Johnson 2014), a documentary study (Mullen, Cao, and Carroll 2014), and the excavations at the Hotel Indigo Site.

All three 18th century wooden ships excavated at the Robinson Landing Site appear to have been dismantled and portions of their hulls were purposely buried on the property as landfill, as property owners sought to extend the shoreline farther into the Potomac River. The buried ships served as the platforms for the construction of wharves. This is a brief review of the archaeological excavation of those three ships.

Ship 1 (Feature 200)

Archaeologists encountered Ship 1 in the northeast quadrant of the development site in October 2017. This feature appeared to be a ship, but its full extent could not be discerned initially, and it was unclear whether the visible frames were interconnected or simply represented disarticulated ship fragments. Eventually, in March and April 2018, after this section of the site was dewatered and an RMP was in place, archaeologists formally recorded a hull fragment some 13 feet wide and 23 feet long. The fragment extended to the west under overburden soils, so its full size was not known at that time. Two other features in proximity to the ship fragment were also identified. Feature 201 abutted the ship's stern and consisted of a series of planks with support pilings that suggested it formed a wharf structure. Feature 202 was a framework of tree branches and saplings laid out along the shoreline to serve as "grillage," or a temporary timber framework used for support in soft, wet, or unstable ground. Archaeologists mapped the exposed portions of Ship 1 and its associated features and then temporarily backfilled the area to facilitate work on the remainder of the site. This protected the ship hull, keeping the waterlogged wood wet, while work continued on other parts of the site.

Beginning in June 2018, archaeologists mechanically re-excavated Ship 1 by removing the temporary backfill, and then removing the overburden from the western end of the vessel (Figure 12). The exposed hull fragment was approximately 43 feet long and 16 feet wide at its maximum, and included the keelson, keel, floors, futtocks, and stern post. The hull section visibly listed on its side, and was oriented east to

west, perpendicular to the shoreline, with the stern to the east. Previous derelict hulls excavated along the waterfront had been cut roughly in half along the keel. However, the keel and portions of both sides of the hull remained intact on the eastern end of Ship 1, whereas on the western end the ship had been cut down the center, leaving only the port side of the hull.



Figure 12. Excavating Ship 1

Before dismantling Ship 1, archaeologists removed all soil and debris from the hull fragment and then cleaned the exposed surfaces of each timber with brushes and water. All soil removed by hand was sifted through ¼ inch steel mesh to recover artifacts. All the intact elements of the ship were drawn and mapped at ½ inch scale and photographed in situ. As the timbers were mapped, each received a unique number/letter designation, and a Tyvek label with this information was attached to each piece using non-corroding nickel alloy Monel staples. Like the Hotel Indigo Site Ship, labels for the Robinson Landing Site Ships also utilize an alphanumerical code denoting function and location drawn from Steffy's work (see Appendix C). While the functionality of the labeling was similar, there were some differences in formatting. A primary difference is the use of directional designators (east, south, north, west) to indicate timber location, instead of relying on port/starboard or fore/ aft conceptualizations. Based on the ships' in situ alignment, fore and aft sequences run from south to north, and east west sequences run from the keel outward. Each label starts with a timber function prefix, followed by a directional designator if necessary, and a sequential numeral. Timbers with multiple components then have sub-designate numerals and directional designators separated from the primary label with a hyphen. Breaks are notated at the end of the label with a period followed by a number. North arrows were added to pre-attached labels to aid in re-orientation after excavation.

In total, the intact portion of Ship 1 included much of the keel and keelson, some frames, hull planking, the stern assembly, and the stern post (Ioset and Grieco 2022). Builders had used trunnels (wooden pegs, also called treenails) to fasten both the hull and ceiling planking, and a combination of trunnels and iron fasteners to hold the floors and futtocks together.

Dismantling of the hull fragment began on June 20, 2018 and took four days. During the process, Thunderbird captured several rounds of photogrammetric data, including the fully exposed hull before disassembly. After the frames and keelson had been removed, photogrammetric data was collected on the exposed hull planking, which was subsequently removed. On June 26, the keel and stern were removed, completing the excavation of Ship 1. For additional information on excavation methods, see Baicy et al. 2020 and Child et al In Progress. The pieces of the ship were stored in pools of water at a City warehouse facility for four years for further research and preservation and in May 2022 they were moved to a pond as a medium-term curation solution (see <u>Preservation Section</u> for more details).

Ship 2 (Feature 155)

Archaeologists discovered Ship 2 in March 2018, while monitoring mechanical overburden removal in the east-central portion of the Robinson Landing Site. As exposed, the hull fragment was approximately 46 feet long and 12.5 feet wide, oriented roughly north to south, parallel to the Potomac River. The frames of Ship 2 had been cut at the keel, leaving only half the hull. Both the bow and stern ends of the ship remnant had been notched into bulkhead wharf structures. The preserved portions of the hull included the keel and keelson, the lower portion of the stem, an apron, stern knee, and frames. The wharf architecture was made of large cut beams and un-milled logs that appeared to have been partially secured by tie-back braces to the ship during its placement.

Prior to dismantling Ship 2, archaeologists removed all soil and debris from the hull fragment and then cleaned the exposed surfaces of each timber with brushes and water (Figure 13). All soil removed by hand was sifted through ¼ inch steel mesh to recover artifacts. Archaeologists mapped all the intact elements of Ship 2 at ½ inch scale and photographed them in situ. As the timbers were mapped, each received a unique



Figure 13. Excavating Ship 2



Figure 14. Mapping and Tagging Ship 2

number/letter designation, following the same conventions as the other ships excavated at this site (see <u>Appendix C</u>). This information was included on a Tyvek tag that was stapled to each piece using non-corroding nickel alloy Monel staples (Figure 14).

The first round of photogrammetry of the entire remnant took place on April 12, 2018. Soon thereafter, archaeologists began dismantling the frames and the keelson. After collecting photogrammetric data, archaeologists removed the hull and sacrificial planking. The keel was cut into sections to excavate and store it safely and efficiently. By the late afternoon on May 2, all the pieces of Ship 2 were resting in wet storage in a City warehouse facility for further research and preservation.

Ship 3 (Feature 159)

Archaeologists first encountered Ship 3 in March 2018 when mechanically removing soil in the southeast corner of the block, immediately to the north of Wolfe Street. The bow pointed to the west, roughly parallel to Wolfe Street, and the port side of the vessel appeared to extend under Wolfe Street, outside the property and project boundaries. Eventually, archaeologists exposed the top ends of the framing and upper hull planks to the north of Wolfe Street, an area measuring some 25 feet wide (north to south) and at least 50 feet long (east to west). The lower portion of the bow was intact, but the hull rested at a tilt, making the aft portion more deeply buried than the bow, and not visible at that time. Archaeologists did not expose the full interior of the hull at this point. After initially mapping and recording Ship 3, the exposed portions were packed with sand, and the area was backfilled in its entirety to facilitate continued work on the site and protect the ship while an RMP was developed for excavating the feature safely.

The developers planned to install a bentonite wall in advance of excavation for the underground parking garage in this section of the property, right up to the property boundary with Wolfe Street (Overman 2019). This meant that the three foot thick bentonite wall would cut roughly lengthwise through the ship, and that a portion of the ship would be outside the area of impact, beyond the parking garage and partially under Wolfe Street. The project archaeologists, in consultation with Alexandria Archaeology, maritime archaeologists, conservators, engineers, and the developer, weighed all available options for preservation during the development of the RMP. Ultimately, recovering the entirety of Ship 3 would have called for the excavation of a substantial portion of Wolfe Street creating safety risks for workers due to the depth of excavation and unstable perimeter slope; risking damage to underground gas, electric, and water utilities; and bringing construction excavation even closer to adjacent Harborside homes. The final RMP outlined a strategy that would leave an unknown portion of the

ship preserved under Wolfe Street for future archaeological study. The section of the ship north of the wall was to be excavated after the wall was put into place. In August 2018 contractors built the bentonite slurry wall and once this was complete, partially mechanically re-excavated to the top of the sand layer covering the ship. To ensure the safety of the archaeologists and stability of the perimeter wall during the ensuing excavation, contractors installed a heel block support structure over the area.

Once the heel block was in place, archaeologists recommenced excavation of Ship 3 in late September (Figure 15). Once again, the ship was mechanically exposed, this time to its full extent within the project boundaries, the hull fragment being approximately 85 feet long and 30 feet wide. Archaeologists then used hand tools to remove the remaining soil inside the hull and cleaned the exposed surface of each timber. All soil removed by hand was sifted through ¼ inch steel mesh to recover artifacts. All the intact elements of Ship 3 were drawn and mapped at ½ inch scale and photographed in situ. As the timbers were mapped, each received a unique number/ letter designation on a Tyvek tag attached using non-corroding nickel alloy Monel staples (see Appendix C). In total, the intact portion of Feature 159 included much of the keel, frames (floors and futtocks), primarily from the starboard side, the keelson, ceiling planking, hull planking, sacrificial planking, and fragments of a pump well. Builders had used trunnels to fasten both the hull and ceiling planking.

As the ship was dismantled, several rounds of photogrammetric data were captured, including the fully exposed hull before disassembly. On October 16, 2018, archaeologists began to take apart the ship by first removing the ceiling planking. After a round of photogrammetry, archaeologists removed the frames. Another round of photogrammetry, and then the hull planking was removed. Archaeologists then removed the sacrificial planking, collected photogrammetric data on the keel and bow, and completed the disassembly of the remainder of Ship 3 on November 1, 2018. For further information on excavation methods, see Child's et al. In Progress. After their removal, all the elements of the ship were stored in tanks of water at the nearby City warehouse facility.



Figure 15. Excavating and Documenting Ship 3

Moving the Timbers

After considering lifting each of the ship hulls en masse by crane, archaeologists instead chose to remove each ship timber by timber due to the potential costs and the logistical complications of removing them fully assembled in one piece. This was done under the guidance of Nichole Doub, a conservator from the MAC Lab with previous experience excavating and moving historic ships. Dismantling ship hulls piece by piece proved to be a challenging process that required teamwork, manual labor, creative problem-solving skills, and several pieces of heavy equipment to remove the timbers, many of which weighed hundreds of pounds. For those pieces too large to safely lift and transport whole, the project team strategically cut them in sections. In most cases cutting was documented and limited to the keel and keelson of each ship.

The dismantling process for each ship involved a crew of archaeologists using crowbars, wedges, mallets, and other hand tools to manually loosen each hull element (Figures 16 and 17). Conservators from the MAC Lab advised the crew on the best means for loosening, strapping, and moving the timbers to minimize damage to the artifacts and ensure the safety of all on site. Archaeologists were able to remove some of the smaller pieces by hand. However, most pieces were first loosened by hand and with hand tools, then straps were placed around them, connected to the bucket arm of a backhoe, mechanically pried apart and lifted out, and placed on a flatbed trailer for transport. Once the crew had strapped a piece, the supervising archaeologist communicated with the backhoe operator using hand signals to pull the timbers up and out (Figure 18). Once detached, the operator slowly swung the fragment onto a nearby flatbed trailer where archaeologists and other City staff unstrapped it. All trunnels, spikes, and nails were left in place in the ship timbers and hull planking unless they posed a danger to the crew at the time of removal. Those fasteners that posed a risk were either driven out of their holes or cut flush with the timber.

Once a flatbed trailer had been loaded, it was driven to a City-owned off-site storage facility and unloaded using straps and a forklift. Each piece was then submerged in 21 foot by 7.5 foot steel roll-off bins full of water. About three months after the initial placement, the tanks were outfitted with custom-made rubber liners based on further input from MAC Lab conservators. Later, the tanks were replaced by nine 12 foot by 24 foot aboveground swimming pools. Archaeology staff changed the water at two-and four-week intervals over the next four years to discourage biological growth (see **Preservation** section).



Figure 16. Excavating timbers



Figure 17. Excavating timbers



Figure 18. Mechanical assistance

Documentation

This section provides an overview of the various documentation methods used to learn more about the ships found at the Hotel Indigo and Robinson Landing Sites. All four ships were documented and researched using a variety of methods. These included traditional archaeological plan view drawings as well as modern digital recordation techniques such as photogrammetry and laser scanning. Historical research has provided important context to these ships and additional specialized studies were conducted on the ship remains and are described in this section.

In Field Documentation

Due to their complex, three-dimensional nature, each of the four ships was carefully recorded multiple times in the field, as each layer of construction was removed to reveal additional layers of construction. This documentation consisted of hand-drawn plan views, photogrammetry, and in the case of the Hotel Indigo Site Ship (Feature 53), laser scanning.

Over several frigid days in January 2016, the Hotel Indigo Site Ship was carefully documented as it was being disassembled with traditional pencil and paper drawings, photogrammetry, and LiDAR laser scanning. To show the complex construction of the ship, Thunderbird archaeologists created a new hand-drawn plan view of the ship prior to the removal of the ceiling planking, frames, hull planking, and sacrificial planking. The three ships recovered at the Robinson Landing Site were also documented with hand-drawn plan views. Archaeologists mapped Ship 1 (Feature 200) once when the highest portions of the frames were exposed prior to completely uncovering the ship and once after exposing the entire ship but prior to the removal of the keelson and frames. Ship 2 (Feature 155) was drawn prior to the removal of the bulkhead wall or any portions of the ship, and after the removal of the frames. Ship 3 (Feature 159) was drawn prior to the removal of the removal of the ceiling planking.

While not in the original scope of work, archaeologists from the NHHC documented the Hotel Indigo Site Ship with photogrammetry (Figure 19). They took a series of overlapping photographs of the ship after the removal of the ceiling planking and with the framing exposed to produce a 3D photogrammetric image and digital model of the vessel in the ground. NHHC printed this model of the ship in situ, and it is currently on loan to Alexandria Archaeology and on exhibit at City Hall. Photogrammetric documentation was included in the work plan for the three Robinson Landing Site ships and archaeologists from Thunderbird conducted several rounds of in situ photogrammetry for each of these ships as they were being disassembled. Ship 1 was photographed several times: prior to any disassembly, after removal of the keelson and frames, and after removal of the hull and sacrificial planking. Ship 2 was photographed prior to any disassembly along with the bulkhead wall on top of its bow (F155-2), after

removal of the bulkhead wall, after removal of the frames, and the keel after removal of the hull and sacrificial planking. Ship 3 was photographed prior to any disassembly, after removal of ceiling planking, after the removal of the keelson and frames, and of the keel after the removal of the hull and sacrificial planking.

Along with the plan views and photogrammetry, a sub-consultant completed several rounds of laser scanning (terrestrial LiDAR) on the Hotel Indigo Site Ship prior to removal of the ceiling planking, framing, and hull planking levels. In situ laser scanning was not conducted for the Robinson Landing Site Ships.



Figure 19. Photogrammetry image of Hotel Indigo Site Ship (Naval History and Heritage Command)

Additional Documentation

After the Hotel Indigo Site Ship was documented in the field, disassembled, and transported offsite, Alexandria Archaeology and NHHC working with volunteers and interns conducted several additional rounds of documentation on the disarticulated timbers. This included photographs of frames and planking and sided and molded drawings (plans/profiles) of select timbers, including frames, planking (sacrificial and ceiling), trunnels, and the stem. There was an attempt to create 1:1 annotated tracings of select timbers from the Robinson Landing Site Ships on clear mylar sheets using volunteers as a part of educational programming. The difficulty and labor-intensive nature of working with large water-logged timbers out of the water ultimately informed the adoption of the 3D scanning process employed by the Conservation Research Lab (CRL) on the Hotel Indigo Site Ship and the Robinson Landing Site Ships. To-scale orthographic views of each timber could be generated from the 3D scans. Therefore, hand drawn, post-excavation timber-level documentation was not systematically produced.

3D Scanning

After the Hotel Indigo Site Ship was transported from Alexandria to Texas, the CRL cleaned and documented each timber using a handheld laser scanner prior to conservation. A 3D model was generated for each element, which could then be manipulated individually or loaded together into 3D space to create a model of the entire ship (Figure 20). Chris Dostal (CRL) loaded the individual ship timber scans onto <u>Sketchfab.com</u> for public viewing. From the computer model assembled from the individual ship timbers, conjectural lines were extrapolated to estimate the missing portions of the ship. The individual timber scans also formed the basis for a physical model of the Hotel Indigo Site Ship that combines the archaeologically recovered portion of the ship with the conjectural lines extrapolated from the digital reconstruction. For additional information on the laser scanning process and the creation of these four ship models, see Dostal 2017, Grieco 2019, Grieco et al. 2020, and Ioset and Grieco 2022.



Figure 20. Digital models of all four ships

The timbers of the three Robinson Landing Site Ships were also cleaned and scanned with a handheld laser scanner; however, these stayed in Alexandria and the City contracted CRL staff to travel to Alexandria to complete the scanning on six separate trips and produce the digital and physical models (Figure 21). As with the Hotel Indigo Site Ship, these individual 3D scans were combined in digital space in order to extrapolate the original curvature of the ships' hulls and to aid in interpretation of these vessels. These extrapolated lines formed the basis for three additional physical ship models, each combining 3D printed scale replicas of the archaeologically recovered material with the extrapolated lines.



Figure 21. Laser scanning the Robinson Landing Ships

Physical Ship Model Construction

One of the deliverables created as a result of these two waterfront projects was the creation of four ship models. These 1:12 scale models combined the 3D printed versions of the archaeologically recovered remains with steel wireframes representing the conjectural outlines of the remainder of the ships' hulls. For all four of these ship models, the methodology used to create them was largely the same.

For the Hotel Indigo Site Ship, each timber was lightly cleaned and then scanned with a Faro 3D scanning arm at the Center for Maritime Archaeology and Conservation at Texas A&M University prior to entering conservation, whereas the timbers from the three Robinson Landing Site Ships were scanned by researchers from the CRL on six separate trips to Alexandria. These scans were reassembled digitally into a rough approximation of the original vessels and from these models, initial sets of lines were extrapolated. From these digital lines, custom jigs were created to hold each physical model during construction. All the scanned frame timbers were 3D printed with PLA plastic at 1:12 scale and were fitted together and assembled on the custom jig using 1/16" brass wire and epoxy (Figures 22 and 23). To facilitate fitting hull planking onto the frames, the planks were printed with NinjaTek Ninjaflex, a flexible, rubberized plastic that allowed them to be bent to shape. The printed timbers were painted with brown acrylic paint that approximated the color of the original wood timbers (Grieco 2019; Ioset and Grieco 2022).

From the lines created during the above process and from a study of several features of the ship timbers (including the midship frame and a scarf in the keel), researchers estimated the overall dimensions of the vessel. This information was used to search period literature and ship plans to find vessels of similar size and shape. The Hotel Indigo Site Ship was likely about 70 feet long and had a maximum beam of about 18.5 feet. Its form best matches that of a brig or large sloop, fitting well with the lines of Brig #38 of Plate XXVI in F.H. Chapman's 1768 *Architectura Navalis Mercatoria*



Figure 22. Hotel Indigo Site Ship model construction

1768 (Grieco 2019) (see <u>Appendix D: Ship Fast Facts</u>). The relatively flat floors and full hull shape, capable of holding a fair amount of cargo, suggest a merchant vessel (Grieco 2019).

Ship 1 from the Robinson Landing Site was probably about 45.4 feet long and had a maximum beam of 13.8 feet. It best matches Lighter No. 15 of Plate XXX from *Architectura Navalis* (see <u>Appendix D: Ship Fast Facts</u>). The vessel likely could carry up to 37 tons and would have been predominantly coastal especially towards the end of its use-life. A small sloop shown on Plate XX from the same work matches the hull shape of Ship 2 from Robinson Landing. This vessel would have likely been about 55 feet long and 19 feet wide and could have carried about 90 tons of cargo. The final ship from the Robinson Landing Site (Ship 3) matches well with drawings of the merchant ship the *Illustrious President* from lines drawn by Joshua Humphreys and copied by Howard Chapelle. The flat floors and full shape suggest a large colonial merchant ship⁴ of the

latter half of the 18th century that could have carried 264 tons of cargo (Ioset and Grieco 2022).

These hull lines were then used to inform the reconstructed wireframe portion of the models for which there were no archaeological remains. The model maker bent the steel wires by hand on a bending jig, then soldered them together, and painted the wires with a contrasting sand-colored spray-paint. Missing elements of the keels, stems, sternposts, and transoms were carved out of wood and fit into place, all on top of decorative wooden platforms or bases (Grieco 2019; Ioset and Grieco 2022).

These digital and physical models aid interpretation during the multi-year conservation process. They provide a



Figure 23. Wire frame construction

tangible view of the historic ships while the actual timbers are undergoing stabilization <u>treatment</u>. The scale physical models also show the public the process of archaeology 4 The term "ship" in this case refers to a particular type of vessel and not a generic ship. In the 18th and 19th century, a "ship" was a larger sailing vessel that had a particular mast or rigging pattern (three or more masts, square rigged). Though we don't know how this vessel was rigged, its size and shape are closest to those of an 18th century "ship" (Bennett 2005; Palmer 1975). that takes a fragment or piece of the past, studies the physical remains and brings in additional sources to create an interpretation of the past. The Hotel Indigo Site Ship model is on permanent exhibit in the Alexandria Archaeology Museum while the three other ship models have been on temporary exhibit at other sites beyond the museum. Based on the models, Alexandria Archaeology created a series of Ship Fast Facts for the public to summarize individual ship information derived from the research undertaken during model creation (see Appendix D).

Dendrochronology

Dendrochronology (comprised of the Greek roots "dendro" meaning tree, "chrono" meaning time, and "logy" meaning the study of), is a dating technique that counts and measures tree-rings to assign a calendrical year to a piece of wood. While the age of a freshly fallen tree can be calculated by counting rings backwards from the outside (the present) to the center (the year the tree started growing), dendrochronology goes a step further by allowing scientists to determine the age of wood samples of an unknown period. It works based on the premise that tree-rings are not uniform in thickness and that this variability is caused by several environmental factors that influence plant growth, such as annual rainfall, temperature, wind, drought, fires, or insects. Years with good growing seasons will produce thicker growth rings and years with poor growing seasons will produce thinner growth rings. Trees of a given species in a region will have similar patterns of thin and thick growth rings, much like a chronological and regional fingerprint. By matching the pattern of thin and thick rings from a piece of wood of unknown date to a master sequence of known tree-rings from a given region, a dendrochronologist can determine which year, which season in that year, and where a particular piece of wood was chopped down.

The Oxford Tree-Ring Laboratory, in Baltimore, Maryland, conducted dendrochronological analysis for the Hotel Indigo Site Ship. The analysis shows that the ship was constructed of white oak (*Quercus alba*) and the most recent ship timber sampled could be dated to sometime after 1741 (Worthington and Seiter 2016: 8, 12). This means that the trees used to build the ship were felled sometime after that date. The exact date is not known because the outermost (most recent rings) were removed when the wood was shaped into frame elements in the shipyard. Because the factors that determine tree-ring width are influenced by local environmental conditions, the study also determined where these trees grew by comparing the ring sequence to several known regional sequences. From this analysis, it appears that the trees were harvested in New England, probably in Massachusetts north of Boston. Samples collected from the bulkhead immediately west of the Hotel Indigo Site Ship indicate it could not have been constructed prior to the winter of 1773/4, a period of known wharf building at the site, which also corresponds to a change in the tenancy of the adjacent public warehouse. Historic maps suggest that the area near Point Lumley where this ship was found was still part of the river by at least 1788 and was filled in by the late 1790s (1798) (Worthington and Seiter 2016).

The Oxford Tree-Ring Laboratory was also contracted to conduct dendrochronological analysis on the three Robinson Landing Ships, along with several of the bulkheads and other wood found in relation to these ships (Worthington and Seiter 2019; 2022). The three ships were primarily constructed of white oak (Quercus alba). Unfortunately, the dendrochronology results for all three ships were not conclusive and no dates could be established. Explanations for this include the possibility of poor preservation of rings within the wood or a lack of comparative tree ring sequences for whatever region(s) or microregion(s) the ship wood originally grew. Several internally consistent chronologies could be established across several timbers within the same ship, suggesting good preservation of the wood; however, no dates could be ascribed to these sequences (Worthington and Seiter 2022). Dendrochronology was able to estimate a *terminus ante quem* for Ship 2 by analyzing timbers from the bulkhead associated with and overlying the ship hull. Samples from the bulkhead associated with Ship 2 were found to date from the summer of 1765, winter of 1771/2, spring of 1772, winter of 1772/3, and winter of 1784/5 (Worthington and Seiter 2019:2). These data suggest that the bulkhead wharf with the ship incorporated into it was not constructed until post-1785 when the latest dating timber was felled.

At this point, we can begin to synthesize information on the dates of construction and deposition of the four ships, while understanding that additional deed, dendrochronology, and other data may reveal additional information in the future. Our current hypotheses on the dates of deposition of the four ships are as follows. The Hotel Indigo Site Ship was buried sometime after its timbers were felled after — 1741. Its close proximity to the original shoreline suggests that it was buried fairly early on in the landmaking process and before Gilpin's map of 1798 (see Figure 3). Additional evidence from dendrochronology suggests this ship could not have been deposited until after the adjacent wharf was built in the winter of 1773/4. Similarly, Ship 1 from the Robinson Landing Site is in close proximity to the original shoreline and, with no available dendrochronology dates, all we can say is that it was buried sometime before 1798. The map-based evidence for Ship 2 from the Robinson Landing Site suggests it went into the ground between 1798 and 1845, though the 1798 Gilpin map does not record the

location and extent of the city's wharves which may or may not have been built out over Ship 2 prior to this date, even if the shoreline itself had not yet been extended here. In other words, the Gilpin map depicts a generalized waterfront and does not specifically map each wharf or shoreline build out. Dendrochronology generally aligns with an earlier deposition date. The overlying wharf may have been constructed after 1785, which suggests a pre-1785 deposition date for Ship 2. Finally, map data also suggests that Ship 3 was not in the ground until after 1798, but before 1845. Comparative research during the model making process suggests that Ship 3 matches well with merchant ships of the latter half of the 18th century.

Malacology and Caulking Analysis

Other analyses of the Hotel Indigo Site Ship included an attempt to gain information about the waters that the ship traversed and the ports visited through the identification of the species of teredo worms that bored many of the sacrificial planks of the hull. This work was undertaken by Kevin J. Eckelbarger, professor of marine biology at the University of Maine. No evidence of either the calcium carbonate trails which would have been secreted by the teredo worms or the teredo shells were visible in the field or in the samples sent to the lab (Baicy et al. 2020: 145).

Samples of caulking were not sent out for formal analysis from any of the four ships. According to Dr. Warren Reiss, Maritime Archaeologist and Historian at the University of Maine, the Hotel Indigo Site Ship contained horsehair and tar between the hull planks and sacrificial planks, but he said this is not oakum, a loose fiber used for caulking ships that often is made from old rope (John Mullen, 2016, elec. comm).

Ship Fasteners

Jason Lunze and others (Lunze et al. 2017) conducted an analysis of the fastenings of the Hotel Indigo Site Ship to illuminate the social aspects of constructing a large vessel in colonial America, and its long-term maintenance and repair. The team of staff and volunteers documented 141 trunnels and 67 iron fastenings. Several common repairs to the wooden fastenings suggest that the Hotel Indigo Site Ship had a long uselife before it was used to make land. Further construction details are illuminated by the different wrought iron fastenings used in the ship's initial construction, as well as later repairs to the lower hull, and the sacrificial sheeting. The findings of this project were presented at the 2017 Society for Historical Archaeology Conference in Fort Worth, Texas (Lunze et al. 2017).

Preservation

This section provides an overview of the conservation of the Hotel Indigo Site Ship and describes the measures taken to preserve the three ships from the Robinson Landing Site.

Excavating the ships was only the first step in a much larger preservation project. When the four historic ships were discovered, the City of Alexandria had limited experience in preserving waterlogged, organic remains on such a large scale. All four ships were discovered below the water table in an anaerobic (oxygen-free) environment that had stabilized the wood while it was buried. Without oxygen, the bacteria, mold, and fungi that would otherwise begin to break apart and decompose the wood cannot live. Burial and submersion kept the wood from freezing and thawing or alternating between drying out and rewetting, both processes that act to physically break apart the structure of the wood. The uppermost extremities of the ships' frames showed the greatest amount of deterioration because this is likely where they were more exposed to agents of decay while the lower portions of the vessels were well preserved with robust structural integrity. Upon examination of the cross-sections of the cut timbers, only the outermost two to three centimeters exhibited signs of anaerobic decay. Once re-exposed by archaeologists to oxygen and to the elements, the ships' timbers would rapidly break down and fall apart if left untreated. With the assistance of MAC Lab conservator Nichole Doub, City staff developed a temporary wet storage solution for all four ship remnants to stabilize the timbers and prevent the dimensional distortions associated with uncontrolled drying until other preservation options were explored.

Based on prior experience managing bulk waterlogged organics at the MAC Lab, the City stored the ship remains in metal roll-off bins, which were outfitted with custom-fit rubber liners in April 2017, about three months after the Hotel Indigo Site Ship was excavated, based on conservator guidance. These metal bins and liners were later replaced with above ground swimming pools during the Robinson Landing project (Figure 24). The pools have the benefit of being chemically stable, mechanically durable, cost effective, readily available, and have built-in ports for water filtration. While in storage, City archaeologists monitored the condition of the timbers and changed the water in the pools regularly, roughly once a month, to keep biological growth at bay and help purge absorbed salts and metals. Eventually, the ship remnant found at the Hotel Indigo Site embarked on a different journey than those found later at the Robinson Landing Site. The former is being conserved at Texas A&M University's (TAMU) Conservation Research Lab (CRL) while the latter three are being preserved in water, leaving the option for future study or conservation.



Figure 24. Pools and ship timbers at the City owned warehouse facility

Hotel Indigo Site Ship – Conservation

Once excavated in January 2016, the Hotel Indigo developer Carr City Centers deeded the ship to the City of Alexandria and staff transported the remains to a City-owned facility (the "bus barn") where the timbers were stored in water to prevent further deterioration of the waterlogged wood. The bus barn is a shared space that also houses public service vehicles such as school buses and fire trucks as well as a food assistance program during the height of the Covid-19 pandemic. The location was well suited to the temporary storage needs of the collection because it is indoors, provides some temperature controls against seasonal environmental extremes, and has water access. The timbers remained in two roll-off tanks of water for nearly a year and a half while City archaeologists worked with nautical archaeologists and conservators on a preservation and documentation plan. During this time, staff and volunteers collected and analyzed water samples from the tanks to monitor pH and the presence of chlorides. Over several months both the pH and chloride levels stabilized, indicating that the timbers had reached equilibrium in the tanks.

Due, in part, to intense public interest and the novelty of the discovery, the City decided to pursue full conservation treatment at the CRL. Operating under TAMU's Center for Maritime Archaeology and Conservation, the CRL is one of the oldest continuously operated conservation laboratories that deals primarily with archaeological material from shipwrecks and other underwater sites.

In June 2017, a team of City archaeologists and volunteers packed the remains of the Hotel Indigo Site Ship and sent them to the CRL for a multi-year documentation and conservation project (Figures 25 and 26). Over one week, 55 volunteers contributed 721 hours helping City staff photograph, catalog, and prepare the timbers for transportation to College Station, Texas. The team wrapped the timbers in layers of wet paper towels, followed by several layers of plastic wrap to prevent the water from evaporating, and then foam to help cushion the artifacts. The bundles were then loaded into hand-built crates on a tractor trailer truck and transported to the CRL.



Figure 25. Wrapping Hotel Indigo Site Ship timbers for transport



Figure 26. Truck to transport timbers to Texas A&M University

Over the last five years, the Hotel Indigo Site Ship has been undergoing conservation treatment. Once this process is complete, the vessel remains will be stable and will no longer need to be stored in wet conditions. Before beginning conservation treatment, the CRL 3D laser scanned each piece to produce a digital timber model, and photographed prominent timber elevations and diagnostic details. This information is stored in a database and copies are kept both digitally and on paper. Full conservation involves assessing the condition of the artifacts, removing iron from the timbers, mechanically cleaning the artifacts, impregnating the timbers with polyethylene glycol (PEG), and then freeze drying them to remove any remaining water. The CRL communicates the progress of the work to the City via quarterly conservation reports and meetings as needed. When the conservation process is complete, the CRL will produce a final conservation report outlining the treatment process. The final phase of this project includes the return of the timbers to Alexandria and the design, fabrication, and installation of a frame or cradle in which to reassemble the Hotel Indigo Site Ship for exhibition.

The first step in the conservation process requires removing iron fasteners from the timbers. The team at the CRL use both mechanical and chemical means to remove iron spikes and drift pins. Conservators have attempted to manually remove iron corrosion and fasteners by prying them, driving them out, and air abrading smaller sections. Manually removing pins and spikes is sometimes a slow process and a balancing act. It requires simultaneously applying enough force to remove the fastener while not damaging the surrounding wood. Conservators use a micro-air grinder to grind down the exposed heads of fasteners and a pneumatic air-scribe to pulverize concretions inside fastener holes. They also extensively use chemical means to loosen corrosion and break down stubborn fasteners. Chelating the iron requires soaking the timbers in several baths of ammonium citrate. This substance helps leach out the iron, which if it remained in the wood would likely interact with salts that are also in the wood and eventually create iron sulfide. Iron sulfide could potentially leach out of the fully conserved timber, possibly harming the artifact. Chelation is critical to avoid future problems and is taking longer than initially anticipated.

The CRL team is using X-ray technology to assist in removing the more stubborn iron fasteners and concretions from the timbers. X-rays help document the progress of the chelation process, showing how deeply embedded fasteners break down over time. By seeing inside the timber, conservators can make informed decisions about how to best remove pins, nails, and concretions. X-rays help conservators make plans for extracting blind pins (pins where only one end is exposed) because they show the angle at which the pin penetrates the wood. This can then inform their decision making on how best to remove the pin with minimal damage to the timber.

Once as much iron as possible is removed, the timbers will then soak in two different molecular weights of PEG. This process will slowly replace the water in the timber with PEG, an inert waxy substance that is stable under typical, indoor museum exhibit and storage environments. Once this step is completed, the CRL team will freeze dry the ship timbers, removing any remaining water from the wood. Then conservators will check the timbers, remove any excess PEG, and if necessary, develop a plan for mitigating the risks posed by any remaining iron fasteners that could not be removed before PEG treatment.

Trip to Texas

From February 27 through March 1, 2019, Alexandria Archaeology staff including Eleanor Breen, Tatiana Niculescu, and Ben Skolnik traveled to Texas to observe the status of the Hotel Indigo Site Ship conservation project first-hand. They also met with the team responsible for bringing the 17th-century ship *La Belle* from the sediments of Matagorda Bay through the conservation process, and finally to installation of the hull remnant and associated artifacts at the Bullock Texas State History Museum.
Peter Fix, CRL, coordinated the itinerary and the trip started with a meeting in Austin with archaeologists and collection managers from the Texas Historical Commission (Patricia Mercado-Allinger, Director; Amy Borgens, State Marine Archaeologist; and Brad Jones, Archaeological Collections Manager) and Bullock Texas State History Museum curators and exhibit planners (Franck Cordes and Kate Betz) to learn about their experiences and the requirements of properly installing, caring for, and exhibiting a historic, conserved wooden ship (Figure 27). Additionally, City archaeologists met with retired Texas state archaeologist Jim Bruseth who provided a broad overview of the project from the initial discovery of *La Belle* off the Texas coast through excavation and exhibition.



Figure 27. Alexandria Archaeologists learning about La Belle Exhibit at the Bullock Museum

Once in Bryan/College Station, Alexandria staff toured the Nautical Archaeology Program in the Anthropology Department of Texas A&M, visiting Chris Dostal's Analytical Archaeology Lab and Glenn Grieco's Ship Model Lab. The highlight of the trip was visiting the Hotel Indigo Site Ship timbers at the Conservation Research Lab at RELLIS Campus, just outside of College Station. There, City archaeologists met with Director Donny Hamilton, Project Manager Jim Jobling, and several students and graduate research assistants undertaking conservation efforts on everything from ship timbers from Alexandria to cannons from St. Augustine to pieces of the Confederate gunboat the *CSS Georgia*.



Figure 28. Texas A&M, CRL conservator Peter Fix inspecting La Belle

This trip was critical for overseeing and thoroughly understanding the conservation process and for planning the ultimate reassembly and exhibition of the Alexandria ship. City staff gained a better understanding of the necessary storage and exhibit environmental conditions needed to protect the conserved wood from deteriorating. Alexandria archaeologists also learned about the continual monitoring and maintenance that *La Belle* requires and that the conserved Hotel Indigo Site Ship would also need. Conservators from the CRL visit the Bullock Museum quarterly to check that *La Belle* is not leaching PEG or blooming with iron sulfides coming to the surface, and has not shifted on its exhibit furniture (Figure 28). The installation at the Bullock Museum was precisely mapped and surveyed and is outfitted with four environmental monitors that measure temperature, relative humidity, and movement (crack detector). Once back from Texas, the trip culminated in a presentation to the Alexandria Archaeological Commission so that they could effectively communicate the project's goals and progress to City Council, the City Manager, and other stakeholders.

Based on the visit to Texas, Alexandria Archaeology has begun planning the exhibition of the conserved, reconstructed remains by first focusing on the potential size of an exhibit. The Hotel Indigo Site Ship hull fragment measured roughly 50 feet long by 13 feet wide when it was discovered in the ground. When it is reassembled, the dimensions will likely change somewhat, though this measurement provides a starting point for planning. The CRL interprets the ship's total hull length at about 70 feet and the maximum beam width was likely 20 feet. It is important to keep the overall interpreted hull dimensions in mind for creative exhibit planning purposes. For comparison, *La Belle* measures approximately 55 feet long and 15 feet wide and sits within an open glass case measuring roughly 58 feet long by 19 feet wide. *La Belle*'s shape is different, and it is more or less complete from bow to stern, but overall dimensions are fairly similar to the Hotel Indigo Site remnant.

Robinson Landing Site – Ponding for Preservation

The three Robinson Landing Site Ship remnants have had a different preservation journey. After excavation in 2018, Alexandria staff moved the vessel remains from the archaeological site to a City warehouse where the timbers were stored in nine large swimming pools filled with water. The total volume of the recovered ship remnants from Robinson Landing was approximately 300 cubic meters or roughly four times the volume of the Hotel Indigo Site Ship remains. The precedent of conserving the remains was considered for the Robinson Landing Site Ships but proved to be unfeasible given financial and logistical constraints. The expense of treating such a large quantity of material was not reasonable and the storage and/or display of the conserved timbers within the limited space of Alexandria's properties would be challenging and expensive. City staff solicited feedback on the next steps for the ships from stakeholders including commissions, civic associations, and the public and communicated planned work via the <u>City's website</u> and social media.

Designing a Preservation Strategy

A team of Alexandria archaeologists and engineers, nautical archaeologists, conservators, members of the Alexandria Archaeological Commission (AAC), and other residents and stakeholders considered a full range of preservation options, from documentation followed by disposal, to selective sampling and disposal, to reburial with selective sampling for conservation (Doub and Niculescu 2023). This grassroots community involvement, which has defined Alexandria Archaeology from the beginning, means that staff did not make decisions without community input. Developing a feasible and appropriate preservation solution for the Robinson Landing ships was a multi-pronged and somewhat protracted process that involved carefully assessing risks, opportunities, public sentiment, and financial constraints. Ultimately, it was decided that the three ship remains from the Robinson Landing Site would be further documented using 3D laser scanning and then retained for future study and potential conservation.

To address the burgeoning questions about the best strategies for exhibiting, preserving, and storing the four historic ship remnants and related artifacts, the AAC formed a Ships Committee (Figure 29). These interested citizens met biweekly between March 2018 and June 2019 to develop recommendations for City Council on the preservation and interpretation of the ships found at the Robinson Landing and Hotel Indigo Sites. The primary goal was to analytically assess options, address critical needs, and define a strategy and recommendations for the ship timbers and other artifacts.



Figure 29. A meeting of the AAC Ship Committee

The Committee considered submersion for preservation early in the planning process and critically assessed the unique set of challenges this option could pose. Submersion as a preservation measure is not a widely used strategy largely because very few entities have such large waterlogged wooden collections in their care and mobilizing the necessary resources to submerge remains is a major undertaking – akin in the eyes of other City staff to a construction project. MAC Lab conservator Nichole Doub presented the submersion option to City staff and stakeholders, based on her previous experience placing the Nanticoke wreck in a pond at Jefferson Patterson Park (Enright, Fulk, and Linville 2017). For that project, the Maryland State Highway Association mitigated the adverse effects to the remains of an 18th century merchant vessel discovered during the removal of debris around the dolphin/fender system of the Highway 50 bridge over the Nanticoke River by removing the historic resource, conserving select elements, and submerging the remaining timbers indefinitely. Roughly 60 timbers were wrapped in geotextile, submerged in a deep pond, and covered with another layer of geotextile secured using concrete blocks (Enright, Fulk, and Linville 2017:98).

Doub consulted on another re-submersion project in Ohio in 2016 (Sewell and Zink 2017:22). For that project, archaeologists discovered the remains of the possible mid-19th century *Black Diamond* shipwreck in Buckeye Lake during the rehabilitation of the existing dam (Zink, Carmichael, and Sewell 2017). The Ohio State Preservation Office approved a mitigation strategy that involved documenting the timbers, conserving three of the timbers and resubmerging those that were not conserved. The submerged

timbers were first wrapped in geotextile, then palletized and lowered into Buckeye Lake. They were then covered with another layer of geotextile that was secured using sandbags and ratchet straps to prevent the timbers from floating away from the pallets (Sewell and Zink 2017:23, 35). The submerged timbers will be monitored annually for the first five years and then once every five years after that. Divers check the stability and condition of the submerged remains including the level of siltation.

City archaeologists further researched reburial or re-submersion for preservation to better understand the opportunities and risks of this strategy. Reburial of archaeological materials has seen more extensive study in Europe and Australia (Curci 2006), particularly through the Reburial and Analysis of Archaeological Remains (RAAR) project (Nystrom et al. 2009). Since 2001, the RAAR Project has buried, retrieved, and systematically analyzed historic material samples and modern packing and labeling materials to determine their degradation and the best ways to monitor and mitigate this deterioration. The results of the project are promising and indicate that burial can be a useful short- or long-term curatorial storage solution for waterlogged archaeological artifacts, provided that certain guidelines and restrictions are applied and consistent funding is maintained (Nystrom et al. 2012:360; Williams 2011:26). The RAAR Project emphasizes that reburial is a preservation strategy and artifacts cannot simply be dumped and forgotten. Objects in "reburial depots" require the same types of collections management strategies as those in more traditional storage facilities, including regular monitoring, and should be available for ongoing research and interpretation.

Curci's (2006) review of reburial projects from around the world indicates that though individual projects have seen varying levels of degradation and success, there is general agreement that the strategy is a cost-effective way for preserving waterlogged wood. The studies she synthesized suggest that the ideal burial environment would include about 50 centimeters of fine-grained sediments that help lower oxygen levels, low nitrogen levels, and the use of geotextile coverings. Ideally the reburial or submersion site would be monitored for temperature, pH, dissolved oxygen, redox potential, and electrical conductivity (Curci 2006: 24).

Doub's guidance and these other successful case studies from around the world formed the solid background from which to more concretely explore the next steps for the three ships from the Robinson Landing Site.

Using the Waterfront History Plan adopted as part of the Waterfront Small Area Plan (City of Alexandria 2012) as a guide, the AAC's Ships Committee reviewed a range of potential outcomes for the ships to create a decision-matrix for various dispositions.

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The committee heard updates on the progress of the waterfront archaeology projects, evaluated a range of options (from submersion to dry storage to exhibition), taking into consideration scholarly use, public access, community interests, interpretation, display, and budget issues. Main outcomes stemming from these meetings included a project partnership with the Washington-Alexandria Architecture Center, an extension of the Virginia Tech School of Architecture + Design; the completion of a public survey initiated by the AAC; and a draft report summarizing specific disposition recommendations for the ship remains and other artifacts and potential associated budgetary impacts. The pandemic interfered with the completion of the report, but AAC budget input and annual reports (Alexandria Archaeological Commission 2018-2021) communicated their findings to City Council and the public.

Virginia Tech's Architecture Studio class used the ship(s) museum concept as a creative prompt twice in three years, highlighting the importance of such a project and the logistical and aesthetic challenges posed by such an undertaking. In a 2019 studio class called *Plumbing the Depths: Alexandria's Waterfront*, students, professors, AAC members, and City archaeologists collaborated to explore the potential for a waterfront archaeology museum concept. The effort helped explore the future potential of a museum and reinvigorate the idea of a museum feasibility study as initially proposed in the Waterfront History Plan.

The AAC Ships Committee launched a public questionnaire (See Appendix E) to assess the awareness, perception, and sustained excitement for the discovery of ships and artifacts from the waterfront. The survey intended to gauge the public's interest in and visions for the four ships. The AAC worked with Alexandria Archaeology and Office of Communications and Public Information staff to develop the survey. It was distributed to Office of Historic Alexandria (OHA) E-news subscribers in January 2019 and yielded 492 responses. While those surveyed tended towards an interest in and support of history in Alexandria, the study provided a baseline for understanding a portion of the public's perception at the time and was truly an accomplishment for this all-volunteer organization.

Major findings included:

- In early 2019, one in four respondents had an unaided awareness of the discovery of the ships.
- Almost all (94%) were aware of the discoveries on an aided basis.
- Overwhelmingly, survey respondents were not only interested in the discoveries, but also found them important.

Generally, responses indicated that surveyed community members were enthusiastic about the importance of the ships and other artifacts and rallied around their conservation and exhibition.

In October 2019, the AAC wrote to City Council,

"For the past 18 months some members of the Alexandria Archaeological Commission and staff have analyzed the challenge(s) facing the City with the conservation, interpretation, storage, and exhibition of the thousands of artifacts and ship and warehouse timbers from the waterfront discoveries. Known as the Ship[sic] Committee, the group has presented five recommendations to the Commission with the need for a feasibility study as one of the most pressing. We request \$125,000 to contract for a professional assessment to develop a unique concept to exhibit and interpret Alexandria's diverse and complex history based on new archaeological discoveries that can range from waterfront to African American sites. Included in this assessment would be exploring alternative financial and governance models, community/stakeholder input and review, incorporation of existing and/or new structures, and the development of research programs to build context and strengthen the City's narratives."

Stemming from this advocacy, a Waterfront Museum Feasibility Study was funded in the FY21 CIP budget and began in 2023.

The recommendation for a feasibility study resulted from the careful analysis of existing potential sites to exhibit the ship from the Hotel Indigo Site during Ships Committee meetings. Creative options discussed included an Urban Archaeology Museum concept, showcasing the ship remnant at a renovated space on the roof of the Torpedo Factory Arts Center, and an Alexandria History and Cultural Center in line with the initial recommendations from the Waterfront Plan. Ultimately, the AAC determined that while their ideas were strong, the best next step was for a professional study. In addition to the museum feasibility study, the AAC also recommended that the ship timbers from the Robinson Landing Site be submerged or reburied with a few pieces reserved for selective conservation.

Storing over 1,000 ship timbers in above ground swimming pools at a shared City facility was a creative but short-term and expedient solution. Finding an appropriate location for storing these ship timbers in a city as densely populated as Alexandria was a challenge that was overcome through careful assessment and extensive community engagement. Based on the AAC's advice and recommendations, Alexandria Archaeology, in collaboration with other City staff from the Department of Project Implementation (DPI); Transportation and Environmental Services (T & ES); the Recreation, Parks

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and Cultural Activities Department (RPCA); and conservators from the Maryland Archaeological Conservation (MAC) Lab, sought a medium-term storage option for the ship remnants from the Robinson Landing Site.

The team weighed the benefits and risks associated with several different preservation options, including full conservation, keeping the timbers in pools of water at either a City-owned facility or a rented location, submerging the artifacts in a body of water, or reburying them beneath the water table. The group visited several sites around the city to gain a better idea of the options available and their opportunities and limitations. City staff and MAC Lab conservators considered the relative probability and severity of various risks including financial, environmental, logistical, and potential damage to the artifacts. Risk probability refers to the likelihood a particular risk factor will happen while risk severity refers to how bad that risk factor would be for the outcome of the undertaking. A combination of probability and severity was used to determine the overall risk factor for each option. Some risks included the sustainability of maintaining water tables, avoiding existing underground utilities, potential impacts to wildlife, difficulty of permitting, water quality concerns, potential overlap with other planned development projects, damage to artifacts, and cost (Doub and Niculescu 2023). City staff and contractors met to develop strategies to mitigate each perceived risk. For example, there was concern that hydrocarbons found in the original excavation soil may have leeched into the timbers which could, in turn, impact the new burial environment. Samples of the timbers were sent to an environmental testing lab (Cardno) for analysis which was able to alleviate that concern. Another location was determined to have a significant hydraulic grade, making it difficult to keep the timbers wet reliably. It was determined that irrigation could provide enough wetting of the timbers, but this strategy significantly increased the cost of this option. Through this collaborative process, the risk matrix was revised over time as some risks were mitigated while others remained. Some risk factors reduced in severity as solutions were found or additional information became available. Other risk factors increased in severity as new issues were discovered or if the solution had a high financial burden.

Ultimately, the project team recommended ponding many of these ship artifacts in Ben Brenman Pond. This option was chosen because the pond is large enough to accommodate the timbers; provides necessary accessibility for moving the artifacts into position, monitoring, and maintenance; and poses the smallest risk to the artifacts or the pond. Additionally, Ben Brenman Pond is a man-made stormwater pond; no fishing, boating, or recreation on the pond is allowed. Curation in Ben Brenman Pond allows the City to preserve the remains while reducing the amount of staff time needed to care for

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these important pieces of history and returns the City bus barn facility to its previous uses. This medium-term storage solution (roughly 20 years) preserves the possibility of future study and/or conservation. The project team also decided that a few diagnostic timbers, like bows or sterns, would not be ponded so that they could be conserved sooner.

Once the planning team determined that submersion in Ben Brenman Pond was the best choice from the list of alternatives, the City of Alexandria sought additional input from residents. This included updates to City commissions including Parks and Recreation and the Historic Alexandria Resources Commission, meetings with civic associations located near the project site to discuss potential impacts, and a public preconstruction meeting at the pond. Additionally, Alexandria Archaeology announced the project across its digital platforms including a dedicated <u>project webpage</u> that is regularly updated and through social media posts. This civic engagement allowed City staff to better understand and respond to stakeholders' concerns and questions. Public input ultimately made this project better and allowed residents to feel a sense of pride and buy-in to the City's decision-making process.

In Spring 2020, Alexandria Archaeology and DPI requested funding via the City's Capital Improvement Projects process for placing the ship timbers in Ben Brenman Pond (Figure 30). This request was funded for FY21. City archaeologists worked with staff from DPI and the MAC Lab to scope out the project and develop a request for proposals (RFP). In January 2022, AECOM, an engineering and archaeology firm, was awarded the contract. The City and AECOM worked together over the next several months to refine the scope and budget and delineate responsibilities.



Figure 30. Ship timber location in Ben Brenman Pond

Implementation

Submerging archaeologically recovered ship timbers is a complex operation that required coordinating several teams working in tandem. Using the lessons learned from previous reburial and re-submersion projects, in May 2022 City staff worked with MAC Lab conservators and archaeologists and divers from AECOM to submerge 1,185 timbers in Ben Brenman Pond at a depth of approximately seven feet (two meters) below surface. Work began with divers positioning a polypropylene (PP) biaxial geogrid in the designated regions of the pond using cement cinder blocks as anchors. The team laid out three separate sections of grids, one for each ship, and recorded the coordinates of the corners for each section on a map.

AECOM and City archaeologists at the City warehouse facility removed ship timbers from their storage pools, wrapped them in non-woven geotextile, and secured the ends of the bundles with polypropylene cable tie wraps (Figures 31 and 32). Those timbers exhibiting evidence of biological growth were treated with a five percent solution of sodium tetraborate (Borax) prior to wrapping. The crew at the warehouse wrapped large timbers individually, placed smaller timber fragments in bundles, and wrapped timbers with structural weaknesses together with a more robust timber of comparable size for support. Each timber has a Tyvek label acquired during excavation with its full provenience information and coded timber description. During the wrapping process, the team also attached custom printed polyurethane tags using copper nails on both the interior and exterior of the wrapping. These tags were marked with the site and feature numbers and unique numerical identifiers. This information was input into a project specific Fulcrum application that helped track the project progress and the chain of custody for each timber bundle.

The project team at the warehouse then used a forklift to load the wrapped timbers onto a trailer and transported them to the staging area at Ben Brenman Pond. At the pond, the team checked the inventory to ensure the continuation of the chain of custody. They then either hand carried or used a long-arm forklift to lift the bundles from the trailer and placed them along the shallow bank for the dive team to position (Figures 33-36). The dive team used a floating platform consisting of two floating docks (10 feet by 5 feet) connected by an A-frame windlass to stage the timbers and support the submersion process. Smaller timbers were placed directly on the raft, while larger timbers were attached to the sides to allow their natural buoyancy to assist with positioning. Longer or heavier timbers were strapped to side cleats with hoist straps or loaded within the windlass cradle and held in place by polypropylene rope. The dive team then moved and anchored the platform into position along the geogrid and



Figure 31. AECOM and City archaeologists wrapping timbers in geotextile



Figure 32. MAC Lab conservator Nichole Doub demonstrating timber wrapping

lowered the timbers into place where the bundles were attached to the grid with heavy duty polypropylene zip ties. Divers observed that while heavy out of the water, once entering the water, the timbers were much lighter and able to be maneuvered with general ease (Parker 2022:17). The team started by positioning the bigger timbers and then filling in the spaces with smaller bundles. They recorded the approximate position of each timber on a map.



Figure 33. Wrapped timbers waiting to be placed in the pond



Figure 34. Placings timbers on floating platform



Figure 35. Lowering timbers into the pond



Figure 36. Divers lowering timber into pond

As each timber was processed, tracking software established a chain of custody as the bundle moved from the storage facility to the staging area to the pond. Daily reports summarized the number of bundles created, number installed in the pond, staff present, and any pertinent notes. On average, a team of seven archaeologists prepared and transported the timbers (including drivers and forklift operators) and eight staff were located at the pond (four divers, including one nautical archaeologist, one archaeologist, one conservator, and two forklift operators). The timber preparation and ponding took place over 18 days.

The ship timbers may be submerged but they are not out of sight, out of mind. From the inception of the ship documentation and stabilization project, the City of Alexandria considered and planned for the long-term commitment necessary to ensure the continued preservation of these important historic resources. The original project scope for ponding included provisions for monitoring the submerged timbers at regular intervals in the coming years. As the timbers were wrapped, City archaeologists, with guidance from the MAC Lab, selected five to six timbers from each ship for future monitoring. The selected timbers were chosen to be easily manipulated by one to two divers without mechanical assistance and represent a sample of structural components (frames, planking). Their special status was noted using flagging tape and entered into the Fulcrum project management application. Divers placed all the timbers to be monitored in the same location within their respective ship areas of the pond. They then marked these three locations using buoys situated roughly two feet below the water surface and recorded these locations on a map. The buoys and maps will assist future divers and archaeologists in finding the precise location of the timbers to be monitored without needing to extensively search for them.

One year after the relocation was complete (June 2023), divers visited the site to assess any issues with timber storage including drift and sediment accumulation. They pulled the previously flagged timbers to the surface of the pond and a City archaeologist and MAC Lab conservator examined the timbers' state of preservation using visual surveys as well as pin density tests. Overall, the curation solution appears to be working as intended. The geogrid and anchors are still in position and have not shifted since last year. The submerged timbers remain well wrapped and well attached to the geogrid. A protective layer of silt has accumulated on the timbers which mimics the original burial conditions and helps minimize biological growth by creating an anaerobic environment. All fifteen timbers that had been previously chosen to be raised to the surface for a more thorough condition assessment were easily located. These timbers are in very good condition and the wood has maintained its physical integrity while submerged

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in Ben Brenman Pond. Monitoring inspections will now be carried out every five years with the next one scheduled for spring 2028. The City of Alexandria is committed to the continued preservation of the timbers and has allocated the necessary resources to monitor their condition and make any needed changes to the storage location. In addition to being a creative curation solution, this project will also contribute to the growing conservation literature on the viability of submersion for preservation.

One of the final steps to the main implementation phase was registering the new storage location in Ben Brenman Pond as an archaeological site with the Virginia Department of Historic Resources. This ensures that the location of the timbers is recorded in multiple places and the location is protected in the future. The listing will help future archaeologists and researchers understand how these timbers made their way from the waterfront to the City's West End.

Floaters and Selective Conservation

A total of 1,185 ship and wharf timbers were successfully placed in Ben Brenman Pond. However, 14 timbers could not be ponded and were returned to the warehouse facility (Parker 2022:19). These artifacts were not fully waterlogged and thus were too buoyant to be safely secured to the geogrid on the bottom of the pond, a testament to their level of preservation. Alexandria Archaeology is working on an alternative solution for these artifacts.

Roughly 30 distinctive timbers were chosen for conservation treatment. Before the project began, Alexandria archaeologists and the MAC Lab developed conservation guidelines for selecting items that would be best suited for interpretation and smaller scale exhibition. In the field this translated into City archaeologists selecting smaller (less than 12 feet long) and distinctive timbers, often having to make a quick decision as artifacts were being lifted out of a pool. In November 2022, these timbers were transported to the MAC Lab for treatment, which will likely take several years (Figure 37).



Figure 37. Robinson Landing Site Ship timbers ready for conservation at the MAC Lab

Interpretation and Public Outreach

This section provides an overview of Alexandria Archaeology's public outreach and interpretation efforts related to the historic ships. Alexandria Archaeology developed a public outreach and interpretation approach to explain the work done, the time-sensitive decisions made, the significance of the archaeology, and the reasoning behind the preservation methods chosen for the four ships. Residents and other stakeholders visited the museum regularly during excavation to hear the latest updates and continue to do so long after the vessels have been out of the ground. Public interest in the ships has endured far past their original discovery. Staff capitalized on this attention with outreach that catered to the public's desire for a personal connection to the ships with the goal of creating life-long advocates of the City's archaeological heritage.

As soon as the first ship was discovered, Alexandria Archaeology was heavily invested in public education and outreach. Staff developed new school lessons, organized special events, installed signage, produced exhibits, and created a weekly social media series. Between July 2016 and June 2022, in-person experiences related to ship discovery, research, and preservation alone reached over 20,500 people. This metric does not include social media engagement, video views, website visitation, or signage. Public outreach continues to fill the post-excavation interpretation gap before a more permanent exhibit or museum is created focusing on the four ships. Excited and well-informed stakeholders are partners – an essential part of continued support for the management and preservation of the City's archaeological resources. This stakeholder support and engagement will continue to be critical once the Hotel Indigo Site Ship returns to Alexandria after conservation, and as additional resources are needed to continue preserving the remains of the three Robinson Landing Site ships. Continued public support, accurate awareness of the ships and waterfront history, and public value of maritime cultural heritage serve as markers of the program's success.

Signs

Ben Brenman Park is a 59-acre park in Alexandria, featuring picnic benches and pathways, athletic fields, a dog park, a picnic pavilion, playground, and pond. The medium-term storage of the Robinson Landing Site ship timbers in the park's pond provided a unique opportunity to share the story of the four ships with Alexandria residents living in Alexandria's West End and visitors enjoying the park from around the region. The ships' storage location also posed a unique challenge. The timbers are hidden beneath the murky depths of the pond, leading to potential misconceptions of where they were excavated and their origin as shipwrecks. Alexandria Archaeology designed and installed three interpretive signs in high traffic locations around Ben Brenman Pond to dispel these common misconceptions and instead tell the story of the ships from excavation along the waterfront, through research and interpretation, and finally to submersion in the pond (<u>see Appendix F</u>). Each sign asks a leading question such as, "How do ships become land?" These questions were written to reach the park's diverse audience and mixed-age groups who otherwise may not stop to read an interpretative sign.

Events

The Hotel Indigo Site and the Robinson Landing Site were in the middle of a highly trafficked tourist and mixed business and residential area, placing archaeology in the public eye of sidewalk sightseers, as well as national and international news media. Once the discoveries of the ships were announced there were constant requests from the public and the media to view them. This was not an easy request to satisfy, as the archaeological work took place on an active construction site and located on private property with controlled access. In addition, the historic ships and other wooden landmaking structures were in waterlogged soil. As soon as they were exposed to the air the timbers were in danger of drying out and deteriorating, meaning the window from excavation to removal, and therefore possibility of public view, was narrow. Site access, safety, and resource preservation concerns meant permanent onsite interpretation was not possible, and site tours or public viewings had to be carefully coordinated between the developers of each site, Thunderbird Archeology, and several City departments.

The Hotel Indigo Site Ship and the Robinson Landing Site Ship 3 were both located close enough to public rights-of-way to be easily seen from the adjoining sidewalk without endangering the site or the public. On a frigid day in January 2016, the public was invited to view the Hotel Indigo Site Ship before archaeologists excavated it and moved it to off-site storage. Hundreds of people attended this event. In April 2018, a one-week window allowed for the possibility of viewing Ship 3 at the Robinson Landing Site. Wolfe Street was closed to vehicle traffic and volunteers, members of the AAC, and professional archaeologists came together to host an event that attracted over 3,000 people to see the site from the street. A 3D model of the Hotel Indigo Site Ship and visual aids supplemented what was not visible from outside of the fence. This event, and the similar successful event held in 2016 at the Hotel Indigo Site, continue to be referenced by museum visitors when they share that seeing the ships helped them form a personal connection to the City's maritime heritage.

After the ships' timbers were removed, Alexandria Archaeology hosted several events at the City warehouse storing the ships to allow visitors to once again view the hull remnants, this time while they were stored in water awaiting further

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documentation. In April 2016, over 667 people toured the facility to see the Hotel Indigo Site timbers that had been removed from their storage tanks for documentation and to install custom-fit rubber liners. Subsequent tours of the facility and the stored timbers were given for special interest groups. The following spring, a team of City archaeologists and volunteers packed the remains of the Hotel Indigo Site Ship and sent them to the CRL in College Station, Texas for a multi-year documentation and conservation project. A Bon Voyage event celebrated the next step of their journey and included the Mayor of Alexandria, members of City Council, and the public. Over 100 visitors took part in engineering activities to mimic the packing of fragile artifacts, tested super absorbent polymer materials to see how the wood was wrapped to remain wet on its long drive to Texas, and tried their hand at dendrochronology. When the Robinson Landing Site timbers arrived in the facility in 2018 for preservation and further documentation, a similar public event was held for Spring2ACTion (an annual fundraising event in Alexandria), followed by two new workshops to celebrate the Summer of Ships: "Dive into Archaeology" for K-12 and "Afternoon with Archaeologists"

for adults. "Dive into Archaeology" participants created a collaborative map of one of the Robinson Landing Ships (Figure 38), engineered their own mini boat to carry cargo, and created new land using a model of Alexandria's shoreline. Adults in the "Afternoon with Archaeologists" workshops were given a behind-thescenes tour of the storage facility, learned about the research and excavation of the ships, and then tried their hand at documenting planking and frames. These site viewings and timber tour events placed the ships in the spotlight and allowed participants to view or interact with the objects directly (Figure 39).



Figure 38. Hands-on Map



Figure 39. Spring2ACTion Ship Event

Public interest in the ships did not dissipate after the ships were no longer visible in the ground or available to see in tanks of water. Staff capitalized on this continued attention by developing new programs catering to the public's desire for a personal connection to the ships without needing to be physically at the site during recovery or interacting with the resources during the preservation process. Some of these events raised funds for ship conservation. In addition to professional publications, Alexandria Archaeology presented on the four ships and the city's maritime heritage to school and college groups, civic associations, neighborhood groups, and many others. Alexandria Archaeology also organized invited lectures by Phillip Reid in 2017 (see Reid 2020) and Christopher Dostal in 2022. Creative lecture programs included a successful fundraising event in 2019 that paired a wine tasting led by OHA director Gretchen Bulova with a taste of Alexandria's history via a talk by City Archaeologist Dr. Eleanor Breen called "Madeira Tasting: Discovering Seaport History." City staff also developed walking tours centered around the Hotel Indigo and Robinson Landing Sites. These 30-minute tours are offered as part of waterfront events and festivals and as a group booking option. At each stop, walking tour participants listen to a narrative about the location and use a laminated flipbook that shows photos from the excavations, historical maps and documents, and other images to help interpret the ships. These flipbooks allow walking tour groups to stand on the site of each ship and see the area as archaeologists first did, rather than the new development that exists today. Most walking tours end with a visit to one or more of the 3D printed ship models to talk in depth about ship construction and the process of preserving the timbers.

Hands-on activity tables at festivals and events sponsored by both the OHA and by outside organizations continue to be the most versatile and visible public outreach method. Activities were created to be interactive, transportable, reusable, appeal to a wide range of ages, and explain concepts that are otherwise difficult to understand about the ships. These activities are broken down into categories explaining maritime history, re-use of the ships for landmaking, the excavation of the ships, and the preservation of the ships after excavation.

Maritime history activities include ropemaking, ballast engineering, and ship biscuit making. The wooden ropemaking machine is used with either twine or cloth scraps that participants twist together to show why long ropewalks were required to make lengths of rope for ships. The ballast engineering activity involves making ships out of recycled materials and then testing them in water with types of weight to even the load and keep the ship stable. This activity is paired with information about coral ballast found at both the Hotel Indigo and Robinson Landing Sites. Ship biscuit events have been held each year in the Alexandria Archaeology Museum since 2017. Visitors knead historically accurate dough, press it with a maker's mark, add docker holes to allow it to bake evenly, and then take the biscuit home with a card that includes baking instructions and information on a ship biscuit found at the Robinson Landing Site. Along the way, visitors learn how Alexandria helped supply ships with food and the importance of food preservation on long journeys.

The use of derelict ships for landmaking was demonstrated using three activities: a small historic map overlay, a large magnet map, and a shoreline engineering activity. All are designed to explain the addition of new land along the waterfront and to address the common misconception that the ships were found in the water. The small historic map overlay is also used in the Ship Science lesson and as a museum interactive. Participants line up a semi-transparent 1798 map of Alexandria over a 1749 map of Alexandria. The ship locations are marked, showing that the new land created covers the ships. A larger version of this activity uses a reproduced 1749 map mounted to a large metal sheet, which is held in place in a floor stand. Participants use smaller magnetic pieces of a 19th century map to overlay on the original 1749 waterfront map to simulate the addition of land. The shoreline engineering activity was initially designed to be used for outside events and to target a broader age range than the previously described map activities. Participants are challenged to create new stable land that extends out into a model of the Potomac River (Figure 40). Shallow plastic tubs of large grit sand act as the model of the original shoreline of Alexandria. Participants use notched and un-notched wooden pieces to construct cribbing and cobbing structures, and then fill it in with the

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sand. Small plastic houses can be added on top to represent the wharves, warehouses, businesses, and homes. Once constructed, participants test their new land by adding water. A drain on one side of the tub allows the activity to be repeated throughout the course of the outreach event. In practice, this engineering challenge attracts both kids and adults alike. A dry version of this activity was later developed to be used indoors and with adults that would prefer to keep their hands free of wet sand. Both versions allow the public to see and experience firsthand why wooden structures, including ship remains, would be found underground along the waterfront.

A concerted effort was made to create



Figure 40. Shoreline Engineering Activity

an excavation activity that emphasized the importance of the documentation of the ships, rather than of discovery. A one-third scale version of one of the Robinson Landing Ship maps was replicated in gaffer tape on a large canvas floor cloth. The map of the ship was then divided into square excavation units. Participants use premade mylar sheets to lay over each grid square and then map the lines of planking and frames as seen within the square. This activity is paired with copies of the ship maps and photos of the photogrammetry used in the field.

The final educational goal was to share the efforts taken to preserve the ships once out of the ground. The hands-on activities used explored how archaeologists and conservators used polyethylene glycol (PEG) and forklifts to preserve the ships. The PEG activity used small pieces of kitchen sponges to represent the cellular structure of the ships' wood. When wet, the cells are supported by the water and maintain the sponge's shape. When dry, the cells of the sponge collapse and the sponge shrinks and bends, forming visible cracks in the surface of the sponge, like that of dried wood. Unlike their counterparts, sponge pieces that have been soaked in PEG and then dried retain their original shape, size, and structure. This activity is paired with empty bottles of common household products that include PEG, as well as different molecular weights of PEG to show it in both liquid and solid state. A mini forklift activity was introduced in 2022 when the ship timbers were moved into their medium-term storage location of Ben



Figure 41. Forklift hands-on activity at Portside History Festival

Brenman Pond. This stage of the ships' preservation journey was difficult for the public to understand and retain. Four mini forklifts were made using syringes, tubing, and colorful corrugated plastic. Participants of all ages could play with the forklifts and see clearly how hydraulics work to lift heavy loads like large wooden ship timbers (Figure 41). As they moved small 3D printed versions of the timbers from place to place on the mini forklifts, they learned why the decision was made to put them into a pond. This activity also was used to demonstrate that the ships were not being put into the pond as large ship remnants, but rather as individual timbers.

Lessons

In 2017 a new school program, Ship Science, was developed to reach the K-12 population. The lesson was first written with a focus on the Hotel Indigo Site Ship, and later incorporated the three Robinson Landing Site Ships. Ship Science is a 45-minute lesson recommended for students in grades 4 through 12 and is taught in-house at the Alexandria Archaeology Museum and as an outreach program. By the end of 2022, 73 school groups had taken part, reaching over 1,600 students from Alexandria City Public

Schools and the surrounding counties. The inquiry-based lesson was created to address the most common misconceptions about the four ships using models to convey key concepts. Students are asked to examine a photo of one of the ships being excavated and come up with their own research questions. This approach leads groups to ask four main questions:

1.Where did the ships come from?

2.How old are they?

3.Why were they found in the ground?

4.What were they originally used for?

The rest of the class is then used to follow these threads of inquiry using individual and group hands-on models.

Students use models of tree growth and dendrochronology to answer their first two questions. Small cross-cut samples of trees are used to form a background knowledge of how wood can show where and when a tree was growing. Students then follow the story of one tree used to build the ship. They use wooden beads to build a model of the tree's growth according to the weather each year, and then compare that model to samples from certain areas of the country to determine that the Hotel Indigo Site Ship's wood came from the Boston area and was felled in the 1740s. To answer the question of why the ships were found in the ground, students use selected primary source maps to see how Alexandria's shoreline has changed over time. By overlaying one transparent map on top of another, students discover that the four ships were eventually covered by soil. This leads to the students' discovery that early Alexandrians used wood, including derelict ships, to hold that soil in place. Finally, selected primary source documents are used to determine what ships were being used for during the window of time between ship construction and their use as landfill. This inquiry method allows students to follow a similar process as archaeologists, leaving them with the idea that archaeologists are guided by research questions, use many different methods and resources to gather evidence, and come to conclusions that can change as more evidence is found.

Other K-12 resources were created in addition to Ship Science, including video lessons for Mathnasium of Alexandria to show how math was used in the excavation, interpretation, and preservation of the four ships, and a digital version of Ship Science to use for virtual learning during the Covid-19 pandemic. Teacher trainings for Alexandria City Public Schools educators have included Ship Science lesson materials and have led to further field trip and outreach bookings.

Social Media and Digital Content

Alexandria Archaeology also uses digital content and social media to educate the public far beyond the museum's walls about the ships. Information on the documentation, historic research, preservation, interpretation, and conservation of these artifacts can be found both on City hosted sites and on the CRL's page dedicated to the Hotel Indigo Site Ship conservation project. In 2018 Alexandria Archaeology launched a weekly social media series, #WaterfrontWednesday, to focus on the history and archaeology of Alexandria's waterfront and provide context to the ships (Figure 42). These posts continue and now reach over 7,500 Facebook, Instagram, and Twitter followers. Over the last five years, this series has focused on topics such as ship terminology, use of wooden vessels as landmaking structures, merchant ship types, conservation and model-building updates, ship-related public events and web updates, the process of wood preservation and conservation, and the historical documents and artifacts that provide context to Alexandria's maritime heritage and role within the Atlantic World.

In 2020, much of the education and outreach transitioned to digital offerings. Alexandria Archaeology released new videos each week on social media and through the City's website during Virginia Archaeology Month 2020 to highlight staff work. One video focused on managing collections, both big and small, using ship timbers to illustrate the process objects go through once they have been excavated. This

video has garnered over 550 views. Other videos hosted on YouTube and promoted via Alexandria Archaeology's social media channels include <u>digital</u> <u>modeling animations</u> of the three Robinson Landing Site ships and a <u>conversation with Dr. Chris Dostal</u> on the Hotel Indigo and Robinson Landing Sites' wooden hull remnants.



Figure 42. Instagram Post from 3/23/2022

Exhibits

The Alexandria Archaeology Museum is located on the third floor of the Torpedo Factory Art Center in the heart of Old Town. The museum is dedicated to preserving and studying Alexandria's rich archaeological heritage and fostering within residents and visitors a connection between the past and present while inspiring a sense of stewardship and adventure. The museum and public lab welcome an average of 40,000 visitors each year, including over 195,000 since the first ship exhibits and hands-on activities were put on display in 2016. Tabletop exhibits highlight recent excavations and research, including interactives on ship dendrochronology, hands-on shoreline overlay maps with vessel locations, a microscope activity to see wooden planking, caulking, and trunnels from the Hotel Indigo Site Ship up close, and coral ballast and smaller nonarchaeological coral that can be picked up and handled by visitors.

Alexandria Archaeology unveiled the permanent exhibit, *Preserving Maritime Heritage* in the Museum during Virginia Archaeology Month in 2019 (Figure 43). The exhibit features a 1:12 scale model of the Hotel Indigo Site Ship made of 3D printed pieces representing the archaeologically recovered remains and a wire frame of the extrapolated hull lines, several maps, and an artifact case showing Alexandria's links to the world. It tells the story of this vessel from excavation to preservation, answering many common questions about this ship remnant, and contextualizes the find within the broader 18th century maritime world. The research, brainstorming, and work put into this exhibit will provide the basis for developing a larger exhibition around the Hotel Indigo Site Ship once the conserved remains arrive back in Alexandria and a suitable location for their display is secured. The museum has welcomed over 56,000 visitors



Figure 43. Preserving Maritime Heritage exhibit in museum

since the opening of the Preserving Maritime Heritage exhibit.

The Preserving Maritime Heritage exhibit tested new interpretive techniques and helped assess what worked and what needed improvement for future ship-related exhibits. On April 1, 2022 the SeeWorthy: Modeling Maritime Archaeology exhibit opened on the first floor of the Torpedo Factory Art Center. The exhibit featured 1:12 scale models of the three Robinson Landing Site ships that mirrored the model-building and interpretation methods of the Hotel Indigo Site Ship model. Visitors were able to view ship construction through the eyes of maritime archaeologists, learn how different technologies were used to digitally reconstruct the historic vessels, and find out how archaeologists use these digital and physical models to compare ship construction and answer questions about the age and use of the vessels. The models were accompanied by a looped video projection on one wall of the exhibit that showed the digital modeling process, as well as three interpretive panels following the ships' journey from excavation, through research and interpretation, and finally preservation at Ben Brenman Pond. Volunteer museum docents and staff signed up for select shifts during the two months of open hours. They answered questions about the project, the models, and the current stage of the ships' preservation. Over the course of the three-month temporary exhibit, over 2,000 people visited during docent hours. This visitation does not include the many hours per day that the exhibit was not covered by docents. The exhibit was deinstalled in June 2022 and will be kept in storage until another temporary exhibit space is secured.

Discussion and Conclusion

This section discusses comparable ships, provides an overview of future plans for the ships, and summarizes this report.



Broader Context: Other Ships, Other Places

The four Alexandria ships do not exist in a vacuum. Since the discovery of the ships along the Potomac River, Alexandria Archaeology has looked to several comparable sites and finds for inspiration and best practices for excavating, documenting, preserving, interpreting, and exhibiting vessels. Staff have looked to examples from Europe and the United States to develop a viable strategy for managing Alexandria's fleet.

The premier exhibited ship examples that often spring to mind are the *Mary* Rose in the UK and the Vasa in Sweden. The Mary Rose, a 16th century British warship, sank in 1545 in the Solent during a battle with the French. After several attempts over the centuries, a team of archaeologists, divers, and salvage professionals raised the Mary Rose whole in October 1982 (The Mary Rose Trust 2023b). The ship then underwent years of conservation work using chelation and PEG (The Mary Rose Trust 2023a). The vessel and many associated artifacts are now on display at the Portsmouth Historic dockyard, and museum staff also provide outreach programs beyond the museum's walls. The Vasa, designed to be the premier warship of the Baltic in the 1600s, sank only 1,300 meters into her maiden voyage in 1628 (The Vasa Museum n.d.). In the 1950s, salvage crews worked to raise the wreck whole out of Stockholm's harbor and preserve the ship. Conservation, using spraved PEG and slow drying, continued through the 1980s. In 1990, the Vasa became the centerpiece of a new purposefully built museum focused on interpreting 17th century naval life. Preservation and monitoring of the ship's condition are ongoing, including the remediation of accumulated sulfur compounds in the timbers (Fors 2008; Sandström, Fors, and Persson 2003).

In 2002, archaeologists in the UK uncovered the remains of a 15th century merchant ship in Newport along the banks of the Usk River during the excavation of a new riverfront theatre orchestra pit (Friends of the Newport Ship n.d.; Newport City Council 2023). This ship was lifted out of the ground timber by timber, and a team of specialists has worked to record and conserve over 2,000 ship timbers and many other associated artifacts. Once conservation is complete (anticipated in 2025), the Newport ship will be reconstructed and placed on exhibit. While the ship is undergoing conservation, the project team regularly reports their work via lectures, interviews, and publications, and interprets the ship at the Newport Ship Centre and through educational resources for schools (Newport City Council 2023). This project is supported by a partnership among the Newport City Council, the Welsh Government, and a non-profit friends group. Closer to home, archaeologists have recovered and interpreted ships across the U.S. including some that appear to have been used to make land. In 1981/1982, archaeologists working at 175 Water Street in lower Manhattan discovered the remains of a roughly 100 foot long, 18th century merchant vessel (Riess and Smith 2015). Like some of the Alexandria vessels, this ship also appears to have been notched into pier cribbing that had been used to make land in the East River (Rosloff 1986). Due to logistical and financial limitations, only the port side of the vessel was recorded and preserved. The timbers underwent conservation with the intention of exhibiting them, but no concrete plans for exhibition materialized and the ship is still in storage at the Mariners' Museum in Newport News, Virginia. In recent years the PEG-treated timbers have experienced damage due to sulfur oxidation, much like the *Vasa* and the *Mary Rose* (Altland 2020; Fisher 2014). Despite these setbacks, years of historical research may have yielded the name of the ship that held up Wall Street — the *Princess Carolina* — a vessel that was likely designed and constructed in Charleston, South Carolina (Riess and Smith 2015).

Archaeological excavations ahead of the redevelopment of the World Trade Center site also revealed the remains of a buried ship hull (WTC ship). Between July 2010 and August 2011, archaeologists from AKRF worked with a team of experts and conservators to recover the ship remains and stabilize them in anticipation of further documentation and conservation (Pappalardo et al 2013). Dendrochronology samples suggest that the ship was built sometime between the late 1770s and 1780s of wood from the Philadelphia region. The vessel was likely more than 20 feet wide and between 50 and 60 feet long and its hull shape is most like that of a Hudson River Sloop. Like some of the ships found in Alexandria, the WTC ship was incorporated into landfill, likely by the 1790s. This ship is also undergoing conservation treatment at the CRL in Texas. Once fully conserved the ship is intended to be exhibited at the New York State Museum in Albany (Dunlap 2015).

The Revolutionary era Gunboat *Philadelphia* was recovered from Lake Champlain in 1935 and was initially allowed to dry without conservation. In 1964, it arrived at the Smithsonian Museum of American History where it underwent some initial conservation treatment (Smithsonian Institution, n.d.). Now, the Smithsonian is undertaking a new project to retreat the *Philadelphia* using modern conservation techniques. They also hope to create a new exhibition space to better care for the artifact's needs and provide interpretation of this important piece of American history.

Future Plans

Though the four Alexandria ships have embarked on their different preservation journeys, planning for their future interpretation and further research is ongoing. As discussed in the <u>Preservation Section</u>, the ships from the Robinson Landing Site that are being curated in Ben Brenman Pond will undergo regular monitoring. Monitoring will help track the condition of these timbers and will contribute to broader research on submersion as a feasible storage option for waterlogged archaeological wood.

The conserved remains of the Hotel Indigo Site Ship and the conserved portions of the Robinson Landing Site Ships will eventually come back to Alexandria, where they are anticipated to be placed on exhibit at a to be determined location. In FY21, the City approved funding for a waterfront museum feasibility study. The study will consider the feasibility and viability of an exhibit to highlight Alexandria's significant history and archaeology. The study will, in partnership with the community, include components such as: evaluating space and program requirements for a museum; exploring renovation and/or new construction costs; describing the potential benefits to Alexandria and the greater community; conducting a market analysis/capital cost projections/projection of attendance, revenue, expenses; gauging visitor and community interest; providing cost estimates for annual museum operations; and identifying potential physical locations for the museum. The City has also provided future funding in support of implementation of the Waterfront History Plan. This will facilitate the creation of design plans based on the themes and stories identified in the Waterfront History Plan and additional research.

Following the completion of the archaeological site report for Robinson Landing, a wealth of material from the waterfront archaeological sites will be available for study by staff, interns and volunteers, students, and others working within the maritime cultural landscape framework. For example, Gough's (2022) work has shown that more nuanced dating and phasing of waterfront archaeology can allow researchers to more accurately determine the households potentially associated with those remains, especially when careful decoding of tax and census records and deeds is undertaken.

Additionally, continued comparative study of the ship hulls, their methods of construction and circumstances of deposition, and their lives as sailing vessels, could result in a well-developed statement of significance related to the late Colonial-Federal period merchant trade in Virginia. Customs records and other pertinent record groups could prove extremely useful for contextualizing ships and shipping on the Alexandria waterfront. Customs records were created primarily to ensure compliance with laws and regulations regarding shipping and to ensure the proper taxes and duties were

paid on cargoes coming into Alexandria, in first the British colonies and then the American states. The bulk of the relevant British records can be found at the British National Archives (primarily among the records of the Colonial Office, C.O. 5) and exist as quarterly reports that describe every ship entering and leaving the South Potomack Customs District (the Virginia side of the Potomac River). These reports provide the name of every ship, the date it entered or cleared port, the name of the captain, the name of the owner, the number of crew, the tonnage of the ship, where and when it was built, where and when it was registered, where and when it was bonded, sometimes a description of its rigging, the number of guns it carried, the kind of stern it had, where it was coming from or going to, and a listing of its cargo. This information could help contextualize the four historic ship remnants in the broader Atlantic maritime world.

Summary

Between 2015 and 2022, archaeologists documented, excavated, stabilized, laser scanned, and preserved (either through conservation or innovative storage) four historic ships found within two blocks on Alexandria's historic waterfront. Alexandria's unique Archaeological Protection Code enabled the discovery of these remarkable findings and Alexandria's dedicated residents and supportive partners working with staff archaeologists ensured that future generations will experience and learn from this once-buried history. The information contained in this report summarizes the journey of the ships from discovery in Old Town to conservation in College Station, Texas or ponding in West End, Alexandria. It draws from site and technical reports produced by archaeologists, dendrochronologists, conservators, and model makers. The results of this report fall into two themes: 1) the care and preservation of large-scale waterlogged archaeological artifacts and 2) the initial findings that emerge from a rare comparative dataset of four well preserved and very well documented 18th-early 19th century ship hull remnants.

Care and Preservation. Caring for these four historic ship remnants has highlighted the importance of having a few key resources and relationships. These include the importance of multidisciplinary collaboration and community partnerships, the necessity of advanced planning and long-term thinking, and the value of flexibility. Alexandria Archaeology would not have been able to recover, study, and preserve the ship timbers without the help of many other specialists. Our efforts relied heavily on the expertise of nautical archaeologists, archaeological conservators, dendrochronologists, environmental scientists, engineers, and General Services and Transportation and Environmental Services employees to name just a few of the key players. This project also reiterated the importance of strong partnerships with stakeholder groups like the AAC, other city commissions, civic associations, and other interested members of the public. Open dialogue about the project among all these groups and Alexandria Archaeology helped guide the work and ensure that staff were making informed decisions that were supported by public sentiment.

Additionally, caring for, documenting, and preserving over a thousand ship timbers requires thoughtful advance planning. This is not the kind of project that can be undertaken overnight; it took four years of planning and consensus building to pond the timbers from the Robinson Landing Site. Furthermore, properly caring for the timbers in Ben Brenman Pond and the conserved artifacts in the future requires longterm thinking. The story of the ships does not end in the pond or at the conservation lab. These items will need continual care and monitoring that will require space, resources, and staff time and expertise. For example, the ponding project was specifically written to include regular monitoring of the timbers. This innovative project will contribute to the growing conservation literature on the viability of submersion for preservation, and regular monitoring is key to understanding how effective a pond environment is for longer-term preservation. The City took and continues to take these future needs into account when planning.

These projects have also highlighted the importance of flexibility. Despite extensive planning, circumstances change, especially when undertaking projects that are as innovative as these. The ability to quickly adapt to rapidly changing conditions was critical for managing the recovery, documentation, and preservation of the ship timbers. For example, the Covid-19 pandemic interrupted the laser scanning documentation of the Robinson Landing Site timbers. However, Alexandria Archaeology and the Conservation Research Lab (CRL) were able to work together to develop a new plan to finish timber documentation in a timely manner while minimizing health risks to staff. Another example are the 14 ship timbers that refused repeated attempts to sink, even resurfacing after being tied down. Working together, the ponding team decided that the best course of action would be to return these to the City warehouse and develop another strategy for preserving the wood. This required quick thinking, clear communication, and a willingness to abandon the original plan as new information appeared.

Comparative Ship Dataset. This research is still in progress, but there are some patterns emerging that deserve mentioning and that potentially contribute to Ford's (2013) multi-site study. We do not yet know their names or when or where they were made, but we can draw some broad conclusions about these vessels. The four ships were

most likely privately owned and not military vessels, given the context of Alexandria as a merchant port city and the lack of evidence for any other use type. Three of the four ships (Ships 1, 2, and 3 from 44AX235) appear to have been intentionally used to make land; in other words, the ships all have evidence of their integration into an overlying or adjacent wharf structure. This evidence is strongest for Ships 1 and 2. Ships 1 and 2 from the Robinson Landing Site and the Hotel Indigo Site Ship appear to have been intentionally cut down at the keel in order to use sections as landmaking structures. Ship 3 is by far the best preserved and also differs in that the hull appeared to be resting on the steep drop of the bottom of the river into the deep channel. Derelict ships being reused as port structures are most common in locations with unprecedented local economic expansion (Ford 2013), which accurately characterized Alexandria during the late 18th and early 19th centuries. Finally, these ships and their reuse for landmaking are not well documented. In fact, reusing ships as landmaking structures appears to have been so common in the 18th century that Alexandrians hardly thought it noteworthy. The same could be said for the overall landmaking efforts as well. A wealth of digital data now exists for future archaeological study and comparison.
Appendix A: Project Partners and Volunteers

<u>Alexandria Community</u> Alexandria Archaeologists, Current and Retired Alexandria Archaeology Volunteers and Interns Alexandria Archaeological Commission, Ivy Whitlatch, Chair City of Alexandria Employees from the Department of Project Implementation; General Services; Recreation, Parks and Cultural Activities; Transportation and Environmental Services Friends of Alexandria Archaeology, Tom Macia, President

<u>Research Consultants</u> Ted Pulliam John Broadwater Bruce Terrell United States Navy - Naval History and Heritage Command

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Appendix B: Digital Datasets Curated by Alexandria Archaeology

Site	Resource	Format
44AX229	In-field Laser Scanning	• .las
	 Prior to disassembly After removal of ceiling planking After removal of frames 	
44AX229	Laser scanning of individual timbers	
44AX229	3D digital model of ship	
44AX229	In-field photogrammetry	• .jpg
	Ceiling planking removed, all other tim- bers in place	
44AX235	 In-field photogrammetry Ship 1 (Feature 200) prior to disassembly after removal of the keelson and frames after removal of hull and sacrificial planking Ship 2 (Feature 155) prior to disassembly after removal of the bulkhead wall after removal of frames keel after removal of hull and sacrificial planking Ship 3 (Feature 159) prior to disassembly after removal of ceiling planking after removal of the keelson and frames keel after the removal of the hull and sacrificial planking 	 .jpg, .cr2, .tif of photographs
44AX235	Laser scanning of individual timbers • Ship 1 (Feature 200) • Ship 2 (Feature 155) • Ship 3 (Feature 159)	 .xyz of point clouds .xrl of mesh model .stl/.obj, .xrl
44AX235	 Ship timber condition documentation photographs Ship 1 (Feature 200) Ship 2 (Feature 155) Ship 3 (Feature 159) 	• .jpg
44AX235	 3D digital models of complete ships Ship 1 (Feature 200) Ship 2 (Feature 155) Ship 3 (Feature 159) 	• .stl

Appendix C: Timber Labeling Notes

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DISCLAIMER

In mid-April, 2016, when the ship timbers were removed from the tanks for public tours, additional documentation, and the installation of tank liners, archaeologists discovered that what had been thought to be the stern post of the ship was in fact the bow stem. Re-labeling of the maps, forms, photographs, and all other associated documentation began in June to reflect the correct orientation of the ship. The "P" designation, indicating port side, was removed from all Tyvek labels, inventory forms, and associated drawings. References to port were changed to starboard, bow to stern, and aft to forward (and vice versa). Current labeling protocols are described below.

Labeling Protocols:

Exterior Planking

- Most of the planks begin with "H" these are starboard-side planks
- Two of the planks begin with "P" these are the only port-side planks associated with the ship.
- The planks are numbered 1-9 in ascending order from the keel.
- The strakes are numbered .1-.4 in ascending order from the bow stem.
- Strakes cut in the field during excavation are lettered a, b, c... in descending order from the bow stem.

Additional Notes

- Some of the in-field cuts were added to the "Feature 53 Planview Hull WSSI 22392.02" in April. Others were not:
 - 2.3a/2.3b
 - o 3.1a/3.1b
 - o 3.2a/3.2b/3.2c
 - o 4.2a/4.2b
 - o 5.2a/5.2b
 - o 7.2a/7.2b/7.2c
 - o 8.1a/8.1b
 - o 8.2a/8.2b
 - o 9.1a/9.1b
- There is no 2.4 on map 22392.02

Ceiling Planking (documentation in progress)

- Planks begin with "C" they are all starboard-side planks.
- The planks are numbered 1-5 in ascending order from the keel.
- Strakes cut in the field during excavation are lettered a, b, c... in descending order from the bow stem.
- An additional number was added after the letter if the plank broke during excavation, storage or transportation.

Keel and Bow Stem

- The bow stem is unlabeled.
- The keel is labeled in 5 sections from aft to fore: K2, K1a (4 foot scarf section), K1b (small 2 foot section), K1c (11 foot section), K1d (8 foot section).
- Letters represent sections cut in the field.

Sacrificial Planking (documentation in progress)

- Planks begin with "SP" these are starboard-side planks.
- The planks are numbered 3.1-10.2 in descending order from the keel.
- The strakes are numbered .1-.3 in ascending order from the bow stem.
- Strakes cut in the field during excavation are lettered a, b, c... in descending order from the bow stem.
- Because of the fragile condition of the sacrificial planking, some fragments broke and were unlabeled. During condition assessment and inventorying, a new system was introduced where the unlabeled ones were given a Roman numeral followed by a letter if there were multiple pieces. Timbers and associated fragments are indicated on the inventory form.

Additional Notes

- Currently unsure of where planks 1 and 2 were found possibly associated with the keel and therefore not on the Thunderbird sacrificial plank planview.
- There are many unlabeled pieces that became separated from a larger plank during transport or storage.

Framing

- Framing timbers were numbered in ascending order from the bow.
- Timbers beginning with F are the floor.
- Timbers beginning with FT are the futtocks.
- Timbers beginning with FS are the second futtocks.
- Labels were applied to the keel end of frame timbers.
- Some timbers broke and were assigned a letter.

Key:

- B Bow Works C - Cribbing D - Deadwood F - Frame FW - Foot Wale K - Keel KS - Keelson P - Hull Planking S - Stern Works UM - Unidentified Material
- N North S - South E - East W - West

General Labeling Notes:

Insofar as it was feasible, the labeling was kept consistent across all aspects of the hull remains. Fore-and-aft sequences were set up to run from south (starting at the presumed bow) to north (toward the presumed stern). East-and-west sequences were set up to work from the keel outward. All labels started with a one or two letter prefix denoting the timber's function on the ship. These prefixes are outlined fully in the above Key. If a directional designator (i.e. north, south, east, or west) was necessary, it directly followed the prefix. Each timber was then numbered according to the established scheme. Timbers that had more than one component (such as frames and hull strakes) were given a sub-designate separated from the primary identifying number by a hyphen. Fragments that broke off during transportation were given an additional sub-designate number, separated from the initial sub-designate by a decimal point. Due to the unpredictable nature of the breaks, the decimal sub-designates do not follow the south-to-north and keel-outward schemes. The nature of the breaks, themselves, will thus need to be used to match the fragments together. All pre-attached labels were also given north arrows in order to assist with the orientation of the timbers in analysis and reconstruction. As a general note, all labels were created to keep related pieces together as best as possible, but the labels do not reflect any form of analytical framework.

Framing Labeling:

The frames were labeled in a general sequence of south to north, with each timber labeled from the keel outward. Frame timbers were labeled together insofar as joinery between timbers was discernible. For the first approximately 19 feet (up to frame 10), the floors of the frames were joined to the futtocks forward of them. Frame 10 showed no discernable edge joining. In frames 11-23, the frame feet were all joined to futtocks that sat aft of them. Frames 24-32, which represent the start of the ship's rising and narrowing to stern, had no edge joinery visible prior to extraction (though some edge joining was found during the removal process). These frames were subsequently given individual numbers.

Frame numbering followed the general scheme designated for the ship, with the prefix F assigned to all frame timbers. As the floors crossed the keel, the [sic] were not given a directional designator. Futtocks that did not cross the keel were given a designator of either east (E) or west (W). Second futtocks were only found west of the keel. Subsequently, the general labeling pattern for the frames went as follows:

Floors: FX-0 East First Futtocks: FX-1E West First Futtocks: FX-1W West Second Futtocks: FX-2W

The following were noted breaks during the removal process. The list may not be exhaustive, as some fragments may have come off when being loaded onto the truck or at the warehouse:

- F10-1W broke into 2 pieces (F10-1W.1 and F10-1W.2).
- The southwest corner of 11-1W broke off.
- F17-3W broke into 2 pieces (F17-3W.1 and F17-3W.2).
- F9 broke into several pieces at multiple points during removal and transportation. These fragments were labeled to the best of the crew's ability on site.
- F19-1W broke into 2 pieces. F19-1W.1 represents the upper part of the frame, while F19-1W.2 sat toward the keel.
- F19-0 was through-bolted to the keel, and a small chunk from the top of the keel came up with the frame during removal.
- F21-1W broke into 4 pieces during removal. F21-1W.1 represents the majority of the futtock. F21-1W.4 came from the NW corner of the timber.
- F23-2E broke into 5 pieces over the course of removal and transportation. F23-2E.1 and F23-2E.4 are subfragments of the same piece.
- F-29-1E broke into 2 pieces, with F29-1E coming from the SW corner of the timber.
- F33-1W broke into 3 pieces.

Additionally, 3 small chocks were noted toward the bow of the ship. Per John Broadwater, these were identified as potential footwales, and given the prefix FW. FW-1 and FW-2 were removed with the frames as they were still partially attached to the foot during removal. FW-3 was removed with the hull planking, as it showed no attachment.

Hull Planking Labeling:

Hull planking was labeled by the strake in general accordance with the labeling standards for the ship. Strakes were given the prefix P, followed by a directional designate of E (east) or W (west) relative to the keel. Each strake was then given a numerical identifier, with 1 representing the garboard strakes, and each subsequent number working up and out from the keel. Individual planks within a strake were given a sub-designate separated from the numerical identifier by a hyphen. Sub-designates for planks moved from south to north. Those pieces which broke off from the main body of the plank during removal or transportation were given another numerical sub-designate, separated from the plank sub-designate by a decimal point, in much the same manner as the frames. The general labeling pattern for hull planking looked as follows:

East (presumed port) strake: PE X-X (e.g. PE 1-1) *West (presumed starboard) strake:* PW X-X (e.g. PW 3-1)

The following was noted during the planking removal process:

- FW-3 was removed along with the hull planking.
- PW 7-1 broke into 2 pieces.
- PW 9-1 broke into 2 pieces.
- PW 8-1 broke into 4 pieces.
- PW 5-1 did not break during removal, but showed significant fracturing such that is was preemptively labeled under the assumption that it would break into 3 pieces: PW 5-1.1, PW 5-1.2, and PW 5-1.3.

Keel and Keelson Labeling:

The keel and keelson were labeled in much the same fashion, as both represent major longitudinal timbers. The keel was given a prefix of K, while the keelson was assigned a prefix of KS. No directional prefix was necessary. As both the keel and the keelson were cut for removal, each section was assigned a numerical identifier, running south to north. The keelson was cut in 2 pieces, while the keel was cut in 4. Portions of either timber that broke off during the removal or transportation process were assigned a numerical subdesignate, separated from the numerical identifier by a decimal point. The labeling scheme for the keel and keelson thus went as follows:

Keel: K X (e.g. K1, K2, K3, K4) *Keelson:* KS X (e.g. KS1, KS2)

Due to the weakened wood of the keel, several pieces ranging in size came off during removal. Those pieces that were sturdy and substantial enough to spare were labeled with sub-designates. K3 and K4, in particular, had several fragments break free from the main keel section, most of which happened out of view of the individual tasked with labeling. Subsequently, the labels reflect the sections to which the fragments belong, but are not indicative of their placement within the sections.

Additionally, it should be noted that a scarf about 5 feet long was found aft amidships on the keel. The scarf was reinforced by a small ribband-like reinforcing strake. This strake was labeled as *scarf ribband*.

Bow and Stern Labeling:

Timbers that were integral to the bow and stern construction were largely labeled as S (stern works) or B (bow works) based off of their location at the extreme forward or aft of the ship. The stern knee, fragment of the inner stern post, and all fragments that fell off during removal were given a prefix of S followed directly by a numeric identifier. Any piece that broke off after labeling were provided with a sub-designate separated from the numerical identifier by a decimal point. The exception to this is the deadwood, which was provided with its own D prefix, and a numerical identifier immediately following. Since only one piece of deadwood was found, the only label created for the deadwood was D1. All bow works including the stemson/apron piece and the presumed base of the stem were given a B prefix, followed directly by a numerical identifier. Any pieces that broke off after labeling during removal and transportation likewise received a sub-designate separated from the numerical identifier by a decimal point. The labeling scheme for the bow and stern works was as follows:

Bow: B X (e.g. B1, B2) *Stern:* S X (e.g. S1, S2)

Unidentified Materials Labeling:

Four timbers were given the prefix of UM, standing for unidentified material. These materials were in situ with the rest of the hull remains, but were not easily identified by function during excavation. These pieces received a numerical identifier after the UM prefix. To the best of the recorder's knowledge, none broke during removal and transportation, so no sub-designates were necessary. The labeling scheme for unidentified material was as follows:

Unidentified Material: UM X (e.g. UM1, UM2)

UM1 was a designation given to the plank-like piece of wood found between frames 24 and 25 at the aft end of the hull. UM2 and UM3 were block-like pieces abutting one another between frames 26 and 27, with UM2 to the west, and UM3 to the east. UM4 was a designation given

to a block found between frames 1 and 2 toward the bow of the ship. It sat up above and to the west of the frames, somewhere between strakes 3 and 5 of hull planking. UM 1-3 were removed during the frame removal process, while UM4 was removed with the hull planking.

Cribbing Labeling:

The box-like cribbing structure sitting just aft amidships was labeled in a slightly different scheme than the hull remains, as the box did not directly relate to the ship's keel. Instead, all cribbing timbers received a prefix of C, followed by a directional designator. The directional designator referred to the direction of the wall along which the cribbing ran. So while a cribbing timber may have had an end in the south wall, if the length of the timber supported the west wall, the timber received a designation of CW (cribbing west). Directional designations were followed by a numerical identifier. Insofar as it was practical, these identifiers worked from the keelson out, and bottom to top. Due to the somewhat more complex labeling system, diagrams are included below to show the north and south cribbing walls. The photographs and profiles taken during excavation will be invaluable in interpreting the layout and construction of the cribbing.

South Wall:



North Wall:



Feature 159 (Ship 3) Notes:

1. Labeling:

- 1.1. The labeling system for this ship will follow the same general protocol as used for the other RTS ships. Labels will work from the presumed bow to the presumed stern, starting at the keel/keelson and running outward.
- 1.2. The first labels should be for the disarticulated materials. To date, these include the 2 deck stanchions and the 2 ship knees removed from the large pile of disarticulated materials and wooden debris toward the presumed aft of the ship. Since these do not need to be mapped on the ship, simple labels and a corresponding description of each disarticulated piece should be created. General dimensions would work best for the descriptions. Descriptions are a critical component of these labels, as they allow for the reattaching of an artifact number if the labels become dislodged.
- 1.3. The keelson should be labeled running from the presumed bow at the west to wherever it terminates within the site at the east. The section closest to the bow should be labeled as KS1, the following sections KS2, KS3, etc. The areas where cuts are made along the keelson should be noted on the feature plan. Additionally, the width of the saw blade and the overall width of the gap created by the saw should be noted for each cut.
 - 1.3.1. If at all possible, the keelson scarf should be left intact for future research and analysis
- 1.4. After the keelson has been labeled and carefully removed, the next process will be labeling the ceiling planking. The ceiling planking follows the same general pattern as described above. The ceiling planking gets the prefix CP and a directional designate, N denoting north of the keel, S denoting south of the keel. This will be followed by a strake number. Strake 1 will be the garboard strake, and the subsequent numbers will work outward toward the extend edges of the frames. Breaks in the strakes should be labeled with a hyphenate designating their position toward the forward of the ship.
 - 1.4.1. So, for example, the garboard strake to the north of the keel will be CPN 1. If it is cut into three pieces, the pieces will be CPN 1-1, CPN 1-2, and CPN 1-3, with CPN 1-1 representing the westernmost piece of the strake and CPN 1-3 representing the easternmost piece of the strake.
 - 1.4.2. If a piece breaks off of a labeled strake after removal or in transit, that piece gets a decimal sub-designate. So, for example, if CPN 1-2 breaks into 3 pieces, the pieces will be labeled CPN 1-2.1, CPN 1-2.2, and CPN 1-2.3
- 1.5. The frames will be labeled running from west to east. For the previous ships, frame timbers were labeled as portions of full frames. However, inconsistent and inconspicuous edge joining makes it difficult to plan out full frames for labels. Instead, the frames will be labeled in their pairings as either floors and futtocks or half frames and futtocks. Frames will be labeled with the prefix F and a numerical designate, with 1 representing the westernmost frame. Half frames and futtocks will received [sic] directional designates. Floor timbers cross the keel, and so will not receive a directional designate. A hyphenated sub-designate will be used to denote the timber's position in the frame. 0 denotes a floor, 1 denotes a half frame, 2 denotes a first futtock, 3 denotes a second futtock, and 4 denotes a third futtock.
 - 1.5.1. So, for example, if frame 1 consists of a floor and a futtock to either side of the floor, the timbers would be labeled as F1-0 (floor timber), F1-2N (first futtock to the north) and F1-2S (first futtock to the south). Frame 2 will then be 2 half timbers and 2 second futtocks labeled as F2-1N (half frame to the north) F2-1S (half frame to the south) F2-3N (second futtock to the north) and F2-3S (second futtock to the south).
 - 1.5.2. Due to the nature of frame constructions, a floor will always be paired with a first futtock and a third futtock, while a half frame will always be paired with a second

futtock.

- 1.5.3. As with the ceiling planking, if a frame timber breaks after removal, it will get a decimal sub-designate to indicate the timber to which it belonged. If F13-0 breaks into 2 pieces, for example, they should be labeled as F13-0.1 and F13-0.2.
- 1.6. Hull planking and sacrificial planking will both follow the same labeling method outlined for ceiling planking. However, the designation for hull planking will be P, while the designation for sacrificial planking will be SP (instead of CP).
 - 1.6.1. So if the garboard strake of hull planking is cut into 3 pieces for removal, the pieces will be labeled as PN 1-1, PN 1-2, and PN 1-3.
 - 1.6.2. Sacrificial planking will be labeled as SPN 1-1, SPN 1-2, SPN 1-3, etc.
- 1.7. The keel (if found intact) will be labeled in the same manner as the keelson, but will maintain a K designate (instead of KS). Like with the keelson, the location and width of any cuts made should be noted on the feature plan. Also as with the keelson, any scarf on the keel should be preserved as much as possible.
 - 1.7.1. If the keel is cut into 2 portions for removal, then, the western portion will be K1, and the eastern portion will be K2.
- 1.8. Bow works represent a number of pieces, but for the purposes of labeling it is sufficient to label them as part of the bow and denote where they came from on the feature plan. Bow pieces will get a B designate, followed by a number. So, for example, the large bow apron may be labeled as B1, while the cutwater may be labeled as B2.
 - 1.8.1.1. Stern works, if any should be found, should be labeled in the same fashion as the bow but using an S prefix (so S1, S2, etc.)
- 2. Unidentified materials are any large pieces of wood found during the excavation process that cannot be easily identified as any of the above categories. These materials are numbered in the sequence in which they are found, so drawing them into the plan view of the feature and labeling them are absolute necessities for understanding where these pieces originated. Unidentified materials get the prefix UM, followed by a numerical designator to differentiate between the pieces. Since it's not known if or when these pieces will be found, they do not work bow to stern or keel out. Instead, they are simply labeled as they are found (UM1, UM2, etc.). Should a UM piece break, it will receive a hyphenated sub-designate (UM1-1, UM1-2, ect. [sic]).
- 3. General observations
 - 3.1. Overall
 - 3.1.1. At the time of analysis, the overall site measured roughly 72 feet in length, with the presumed bow exposed and the other end of the ship yet to be exposed. A large pile of disarticulated wood in the presumed aft of the ship may have represented a point at which the articulated ship stopped, as after this point the ship frames appear more vertical. However, it is also possible that the ship continues after this point.
 - 3.2. Bow
 - 3.2.1. The exposed end of the ship contained multiple features that are presumed to be bow features. Among these are the remains of a single frame to the north of the keelson, likely representing a cant frame. Such frames are common bow features, though they have been seen in bluff sterns, as well. Additionally, a large, notched timber likely represents the stemson, which is the timber that connected the ship's stem to the keel. On the exterior of the hull remains, a blunt lateral timber was observed directly under the extent [sic] stemson, which may have functioned as a cutwater.
 - 3.3. Ceiling planking
 - 3.3.1. The ceiling planking was of comparable thickness to the hull planking, and

showed little evidence of rot or wear. This may indicate that the ship was built to carry heavy or frequently-shifting cargo. Unlike in the other ships, ceiling planking seemed to extend throughout the hull.

- 3.4. Keelson
 - 3.4.1. The keelson was found articulated in two parts with an s-scarf joining the sections. No mast step was found on the keelson up to the date of analysis, but two lateral, board-like pieces were found notched over the keelson. On some ships, such as the brig *Jefferson*, the mast step was not notched directly into the keelson but instead set aside the keel and held in with a series of partner timbers. No other observed data at the time of observation suggested that these timbers would be part of a mast step, but the possibility needs further analysis before it can be confirmed or dismissed.
 - 3.4.2. Additionally, the keelson was damaged and had a portion of it drilled through during the construction of the parking garage wall. This hole sits opposite a purposefully-constructed notch toward the bow of the ship.
- 3.5. Frames
 - 3.5.1. The ship frames follow a pattern of floors, half frames as first futtocks, and a series of additional futtocks. The ship frames are thick and close, but not as close as seen on ships 1&2. Additionally, while much of the frames were obscured under ceiling planking, those areas exposed showed no vertical joining between floors and futtocks, nor did it show any lateral joining between futtocks. Based on the areas that could be observed under the ceiling planking, the half-frames (first futtocks) seemed to come down to sit next to the keel.
- 3.6. Hull planking
 - 3.6.1. Most of the hull planking had yet to be exposed at the time of analysis. However, what could be observed of the hull planking was thicker than that observed on ships 1 or 2 (the exact thickness could not be ascertained at the time). The hull planking was preserved up to the level of preservation for the frames. It showed no signs of toredo [sic] damage upon early review.
- 3.7. Sacrificial planking
 - 3.7.1. Only a single plank of sacrificial planking could be observed at the time of observation. Like the ceiling and hull planking, the sacrificial planking seemed to be comparatively thick when considered alongside the planking of the other two ships found at this site. Likewise, the planking seemed to show no toredo [sic] damage, at least in the observable area.
- 3.8. Knees, stanchions, and disarticulated materials
 - 3.8.1. At the time of observation, two knees and two deck stanchions had been found disarticulated from the hull remains. Since the knees were disarticulated, it was difficult to tell if they served as hanging knees or lodging knees. They were not of the size expected for stem or stern knees, though, and showed no impressions or notching to suggest that they came from these areas. The assumption, then, is that these likely came from the interior works of the ship.
 - 3.8.2. The deck stanchions were notched on the bottom such that they aligned with the impressions on the keelson. The tops of both stanchions seemed to be broken or worn away, meaning their full height may not be preserved. At one point, it was suggested by a team member that such stanchions may be masts. These timbers are too small and of different shapes than would be generally expected of masts.
- 4. Overall interpretations
 - 4.1. Due to the incomplete excavations at the time of my analysis, I didn't have access to the same amount or types of information as was previously available for ships 1&2.

Subsequently, this analysis should be much more preliminary, and must be much broader.

- 4.2. The ceiling planking obscured some major details that were used to help estimate date on the previous ships. Edge joining between frame timbers were not easily observed between the current level of ceiling planking and the dirt still to be removed from the ship. Likewise, the distance between the frames and the keelson was obscured by the ceiling planking. However, the distance between frames and the fact that at least some frames appeared to have no lateral or vertical edge joining can help give a rough estimate of date. Based on the observable construction features, I would give a broad range of late 18th century to early-to-mid 19th century. Ship 3 may, then, be roughly contemporaneous with Ship 2, or possibly the youngest of the three ships found at this site.
- 4.3. Further, at the time of analysis, the extent of the site measured somewhere around 72 feet. It was unknown how much of this extent was intact, articulated ship, and how much was disarticulated. If the keel of the ship had reached that full 72 foot extent, a rough estimate for length-on-deck would be anywhere between 90 and 115 feet, depending on the construction standards and the rake of the posts. At this length, assuming a 3:1 length to beam ratio (which is a common place to start for investigation but not necessarily the exact ratio for any given ship), we can estimate the ship's overall breadth to be roughly 30-40 feet (30 to 38.3, to be more precise). These, again, should be taken as rough, as much of the ship had yet to be found or investigated.
- 4.4. None of the extent [sic] hull or sacrificial planking shows any sign of toredo [sic] damage. One possibility is that the routine use of thick sacrificial planking prevented toredo [sic] damage from reaching the hull planking. The current, intact sacrificial planking would have to be relatively new, then. The other possibility is that the ship operated in waters where toredos [sic] were not present. This would mean either fresh or cold waters.
- 4.5. While the overall beam of the ship is consistent with what we'd expect based on the estimated length, the sides of the ship were exceptionally steep and seemed to curve inward a little toward the presumed stern. This suggests that the sides have been compressed, probably through the process of deposition and the buildup of river silt and sand. This coincides with the assumptions made by Dr. Peter Fix during his visit to the site.
- 4.6. During the excavation of the ship, large amounts of burned wood were found under the ship fill on top of and between the ship's planking and frames. Comparatively little of this burned wood was found outside of the ship, suggesting it is endemic to the vessel. This, coupled with the fact that the ship does not seem to have been cut intentionally in the same ways as ships 1 and 2 brings up the potential that the ship was not intentionally scuttled, at least not in the same way seen with ships 1 and 2. The ship may have, instead, burned in place. This was a common practice when a ship caught fire and was past saving, wherein the remains would be allowed to burned [sic] down to the waterline, then infilled to deposit it on the riverbed. This is not a given for this ship, but the high level of deposition for burned wood endemic to the vessel suggests that this is a real possibility that needs to be considered. The wharf structure found above the ship is likewise different than those seen on ships 1 and 2. On the previous vessels, the wharf structures were integrated into the stern works of the ship in a very intentional way. Since the stern of this ship has not been found at the time of analysis, the integration may be present at that end. However, the dominant wharf structure seems to be set atop the ship toward the aft of the vessel, rather than intentionally integrated into the vessel. This may suggest that the builders of the wharf knew the ship was there and used it for

support, but that they were unable to create the same form of integration, which would have been the case if the burned hull had been infilled prior to the period of construction.

Appendix D: Ship Fast Facts

Hotel Indigo Site (44AX229) Ship

The first 18th century merchant vessel excavated in Alexandria.



Ship-building engraving of a brig by J. Taylor. Credit: Wellcome Collection.

Ship Type: Brig or large sloop

This ship's flat floors and full shape allowed it to carry up to 104 tons.



Recovered Remains

Shown in dark brown on the model and circled in white on the map.

Ship Measurements

Projected original ship: Length: 70 feet Width: 18.5 feet Depth: 4.75 feet

Recovered Remains: Length: 46.5 feet Width: 12.5 feet

Ship I, Feature 200 Robinson Landing Site (44AX235)

This small vessel carried goods short distances from moored ships.



Chapman's Lighter No. 15 (Adapted from Chapman 1765, Pl. XXX, no. 15)

Ship Type: Lighter

This small work vessel could carry up to 37 tons. It likely sailed along rivers and the coast, especially towards the end of its life.



Recovered Remains

Shown in dark brown on the model and circled in white on the map.

Ship Measurements

Projected original ship: Length: 49 feet Width: 13.8 feet Depth: 6.5 feet

Recovered Remains: Length: 43 feet Width: 16 feet

Ship 2, Feature 155 Robinson Landing Site (44AX235)

This mid-size merchant ship was built to carry cargo.



Chapman draught, Pl. XX, no. 29

Ship Type: Sloop

This small vessel could carry up to 90 tons.



Recovered Remains

Shown in dark brown on the model and circled in white on the map.

Ship Measurements

Projected original ship: Length: 62 feet Width: 19 feet Depth: 7 feet

Recovered Remains: Length:46 feet Width: 12.5 feet

Ship 3, Feature 159 Robinson Landing Site (44AX235)

This is the largest known colonial merchant vessel to be excavated.



Draught of the merchant ship The Illustrious President.

Ship Type: Ship

This ship's flat floors and very full shape allowed it to carry up to 264 tons.



Recovered Remains

Shown in dark brown on the model and circled in white on the map.

Ship Measurements

Projected original ship: Length: 102 feet Width: 25.25 feet Depth: 11 feet

Recovered Remains: Length: 85 feet Width: 30 feet

Appendix E: Ships Committee Survey Questions

Thank you for participating in this brief survey for the City of Alexandria. It should only take a few minutes and your opinions will greatly assist future planning.

You are receiving this request to participate in the survey because you are signed up for e-news thru the city. Please know all responses will be anonymous and the results will be tallied collectively.

1. Are you currently a resident of the City of Alexandria?

Yes No

2. Are you a professional who receives e-news for work purposes, such as a reporter, a member of a city board, committee, commission or city/municipal employee?

Yes No

3. When you think of events that have happened in Alexandria over the past few years, what events do you recall? Please mention as many as you like.

4. Below is a list of events that have occurred in Alexandria over the past few years. Please indicate which ones you are aware of.

Aware Not Aware

King Street Arts Festival Archeological discovery of ships, structures and artifacts at the waterfront Acquisition of Murray-Dick-Fawcett House at 517 Prince St George Washington Birthday Parade First Night In November 2015 remains of an 18th century ship were found at Alexandria's waterfront. Earlier this year, remains of three additional ships, wharfs, warehouses and artifacts were excavated at an adjacent site. Early residents filled ship sections with dirt to expand the original shoreline and create additional land for the port.

5. Overall, how interesting do you find the discovery of these structures, artifacts and ships?

Very interesting	Somewhat interesting	Not at all interesting
2	U	e

6. Overall, how important do you find the discovery of these structures, artifacts and ships?

Very important	Somewhat important	Not at all important
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7. Next is a list of statements about the discoveries. Please indicate how strongly you agree or disagree with each statement using the scale below.

Strongly	Somewhat	Somewhat	Strongly
Agree	Agree	Disagree	Disagree

Alexandrians should be proud of these archeological discoveries

I look forward to the discoveries being exhibited in Alexandria

The discovery of the ships, structures and artifacts is an opportunity to tell the story of Alexandria in a new way

City funds should be used for the future conservation and exhibition of the discoveries

8. Regarding the discovery of the ships, structures and artifacts on the waterfront, in the past several months, have you

Yes No

Attended an event to see the excavation

Donated money for conservation

Seen or heard any news stories about the discoveries

If yes, please specify_____

Followed the story of the discoveries on Facebook, Instagram or other social media

Shared a story about the discoveries on Facebook, Instagram or other social media

Volunteered on a project/event

Discussed with friends or family about the discoveries

Spoken with or written a city official about the discoveries

Participated in any other way

If yes, please specify_____

9. Briefly, we would like to know a little about you...

Does your household currently have children under the age of 18 living at home yes no

Do you consider yourself

Very interested in Alexandria history Somewhat interested in Alexandria history Not at all interested in Alexandria history

Do you, or anyone in your household currently..

Own a boat or regularly go 'boating' Volunteer at any of Alexandria's historical sites Member of any civic organizations, or a City of Alexandria commission or board Member of a school commission or board Volunteer for an Alexandria non – profit organization

Are you currently employed or retired or other?

Employed

retired

Other

What is your zip code?_____

Lastly, if you have other thoughts or opinions about the discovery of the ships, please feel free to describe below. We are very interested in your comments.

Thank you for participating. Your opinions will be very helpful in guiding the city's decisions on the future of the ships.

Appendix F: Ship Ponding Signs



Reconstructing the Past

Robinson Landing Site (44AX235). Over 200 years ago, Alexandrians repurposed these old merchant ships to create new land along the Potomac River. Archaeologists excavated four ship hull remnants along the Alexandria waterfront - one from the Hotel Indigo Site (44AX229) and three from the

Documentation in situ

Excavation is a destructive process. Once an object is taken out of the ground, it cannot be put back again. The job of an archaeologist is to first document everything *in situ* so that each object's location, or context, is not lost after excavation.



Digitally Rebuilding the Ships

Researchers used historic research and archaeological documentation to reconstruct the archaeologically recovered ship remnants.

The Conservation Research Laboratory (CRL) at Texas A&M University and Alexandria Archaeology used handheid laser scanners to create digital models of each timber. These scans were combined in a 3D modeling program to reconstruct a digital model of the ship. Missing sections were extrapolated based on historical research to show what would have looked like. the original vessels



Each ship timber was laser scanned (top left), reconstructed digitally, and 3D printed to cre a model (above). Credit: Texas A&M University Conservation Research Lab.



Researchers used a 3D printer to make scale models of each ship. Since only portions of the ships were found, wire was added to fill in the remaining structure of each vessel. These physical models show what these ships would have looked like before they were buried as landfill.

Wood Tells a Story



Most trees create a new layer of growth each year. These growth rings vary in thickness depending on the weather. Patterns of thick and thin rings can show where and when a tree was alive before being cut down to use as lumber. Dendrofornoology dates wood by comparing the tree ring sequences of unknown samples, like the ships' wood, to known tree ring sequences.

Samples from each ship were taken and compared with the growth rings of trees from around the word. The hore I indigo Sipi (44XX22), feature 33) samples show that its timbers came from Massachusetts sometime after 1741. Samples from the three Robinson Landing Site ships were not conclusive. Vince Galacci of Thunderbird Archeology samples timbers from 44AX235, Feature 159. Credit: Michael Worthington, Oxford Tree Ring Laboratory.

Digging into Documents

The names of each ship remain a mystery. Researchers studied the size and singles of the recoverse and compared them to documents showing similar ships arriving and departing from Alexandria. Local newspapers, customs records, ship registration forms, logbooks, maps, and property records are all useful sources to learn more about historic ships of this time. These documents helped show what cargo the merchant ships may have carried and what places they may have traveled.

In the late 18th century, Alexandria was a trading partner with the United Kingdom, Germany, France, Italy, Spain, the Caribbean, and ports along the east coast of North America. While newspaper records do not identify ships trading directly between Alexandria and the African continent, Alexandrians were involved in, and heavily profited from, the trade of enslaved people.

Nght: The "Ship News" section announced the arrivals and departures of ships. They appeared almost daily in 18th and 19th century Alexandria newspapers. Alexandria Gazette, August 17, 1810.

man Roly, Boys, Portadi Is and Roly, Boys, Portadi Is an al Posts.



What were the ships used for?

The flat floors and full shape of the ship hulls allowed these merchant ships to carry cargo. By the late 18th century, the Potomac River connected the bustling port city to the world.

Alexandria mainly exported raw goods like tobacco and wheat, and imported manufactured goods from Europe and sugar from the Caribbean. The forced labor and the trade of enslaved individuals formed Europe and sugar from the Caribbean. The fo the foundation of this trans-Atlantic network.

odels of the ships from the Robinson Landing and Hotel Indigo Site **Bottom right: Digita**





Ponding and Preservation

Archaeologists excavated four ship hull remnants along the Alexandria waterfront - one from the Hotel Indigo Site (44AX229) and three from the Robinson Landing Site (44AX235). Over 200 years ago, Alexandrians repurposed these old merchant ships to create new land along the Potomac River.

The Preservation Journey Waterlogged wood poses unique preservation challenges. These objects keep their shape and structural integrity if they remain wet. If they dry without conservation, the wood will and strink, and rack. Caring for Waterlogged Wood

The city first preserved the timbers by storing all four ship remnants in pools of water. For over five years, Alexandria Archaeology staff, interns, and volunteers charged the water each month to reduce biological growth like algae, mold, and mildew. Pools provided a short-term solution but longer-term options were needed, and the four ships embarked on two different stabilization journeys. hip timbers stored in swimming pools

Where did The four ship h different stabil

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aren't the same proces:

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ship

The ship from the Hotel Indigo Site was stored in water before being sent to Texas ABM University for conservation. The three remaining ship remnants from the Robinson Landing Site have embarked on a different stabilization journey: preservation in Ben Brenman Pond.



aeologists and scientific divers submerged the wrapped and tagged timbers in Ben Brenman Pond



Moving giant ships requires tearwork. Archaeologists, conservators, and divers must work together to wrap each timber in protective material, transport them, and then submerge and secure the timbers to a grid on the bottom of the pond. This medium-term storage solution stabilizes the timbers with less human intervention required.

Alexandria Archaeology will continue to monitor these important artifacts, ensuring that they have not shifted or deteriorated. This preserves the possibility of future study and conservation.

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Preservation	Robinson Landing Ships (44AX235, Features 155, 159, & 200)	Maintains existing state: Environmental conditions are controlled and the wood is kept wet by submerging the timbers in water	Less cost and allows for future study and conservation	
Conservation	Hotel Indigo Ship (44AX229, Feature 53)	Mechanical and chemical alteration: Iron is removed, water in the wood is replaced with a waxy substance, and the wood is freeze dried	Timbers are stable and can be stored, studied, and exhibited without keeping them wet	
	Ships	Method	Goals	
the ships go?	l remnants are on tion journeys. The	Indigo Site was e ships from the were preserved. vation both slow	object, but they	

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