ANOMALY 12: DREDGE

Anomaly 12 Summary Table	
Anomaly Identification	Dredge; NY Site Number 06740.012296
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	255
Magnetometer (2005)	684, 629, 253, 618, 646, 671, 659, 265
Side Scan (2010)	6/3/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/9/10
Diver Observations	9/2012: 12 dives totaling 18.8 hours of bottom time
Diver Videography	No
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A12 represents the remains of an early twentieth century dredge. This identification is based on the extensively preserved timbers of this vessel, which are extant up to deck level, though the deck itself is not present. The site rests in shallow water (3 to 5 feet [0.9 to 1.5m]) just off shore, and in proximity to other abandoned vessels, clearly visible on modern aerial photographs (Figure 75). The remaining structure of the barge consists of the well preserved sides, stern, and spud boxes. The bow is not as well preserved, and portions of the interior structure are obscured by bottom sediments, though enough is exposed to gain an understanding of its construction.

The site's identification as a dredge is based on its hull structure, in particular the presence of the large spud boxes on either side of the stern which are a defining characteristic of dredge barges. These features would have been used to support two large posts (spuds) that could be driven into the lake bottom providing a very stable platform for the operation of the dredge head. Both bucket and hydraulic cutter head dredges were commonly used in the early twentieth century to clear and deepen navigational channels on inland waterways. The absence of any machinery, and A12's proximity to other abandoned vessels indicate that this vessel was intentionally disposed of at the end of its useful working life.

During the Phase 1B fieldwork, site conditions were ideal for recording sector scan (Figure 76) and side scan imagery (Figure 77), as well as a detailed visual inspection due to excellent water clarity. In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, and still photography. The 2012 field effort required 12 dives, totaling 18.8 hours of diver bottom time. Study of this vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were poor, with underwater visibilities of 1 to 3 feet (0.3 to 0.9m) and significant aquatic vegetation. Videographic documentation was not possible on this site due to the extremely limited visibility.

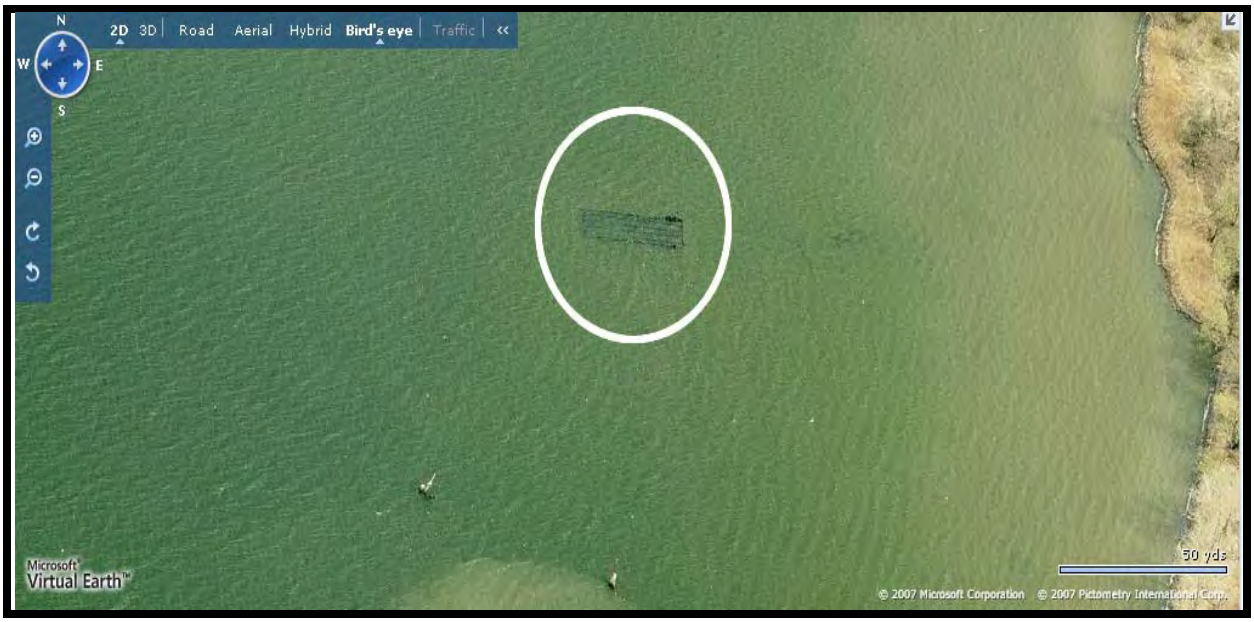
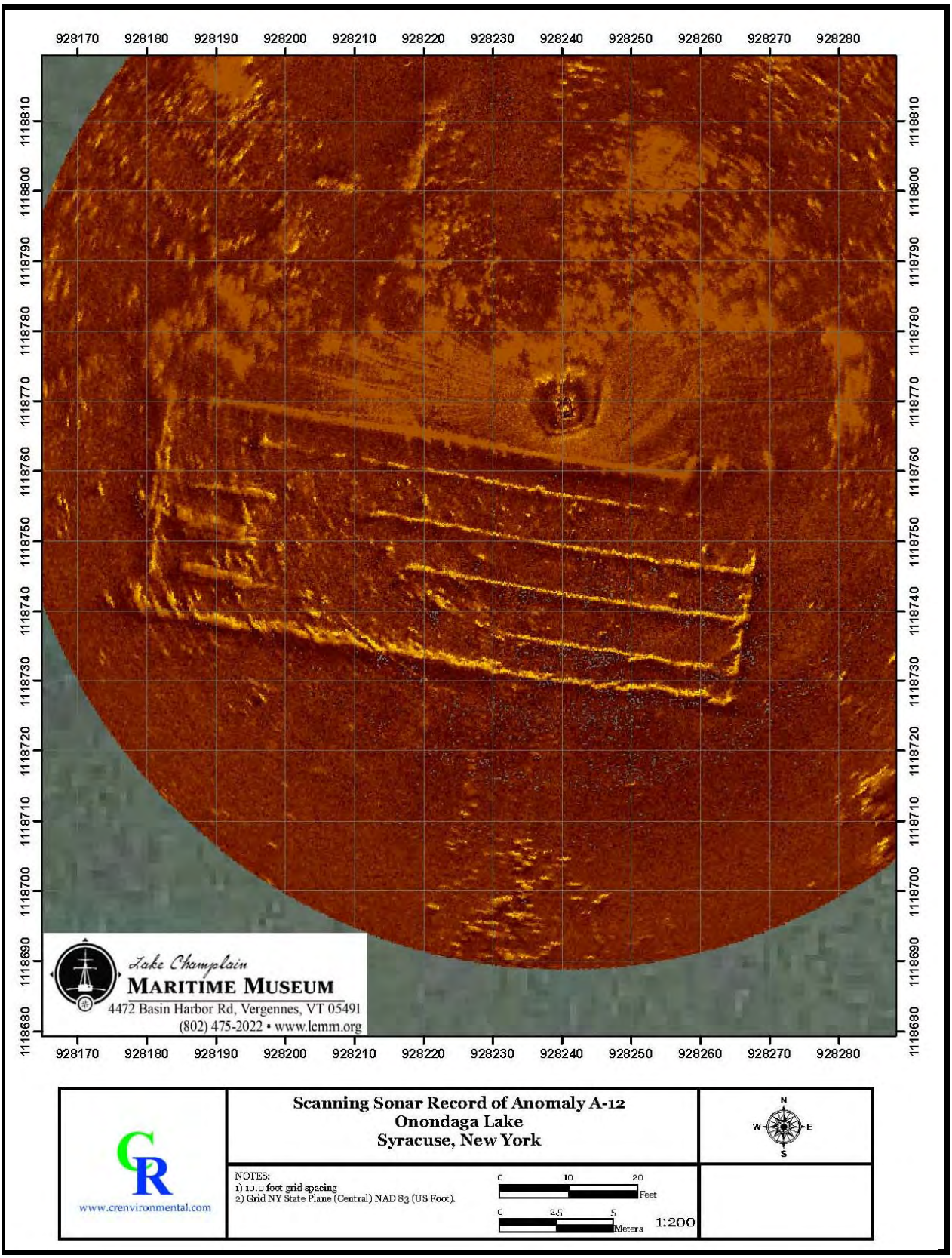


Figure 75: Anomaly A12 visible from aerial photography (courtesy Microsoft® Virtual Earth).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Lake Champlain
MARITIME MUSEUM
4472 Basin Harbor Rd, Vergennes, VT 05491
(802) 475-2022 • www.lcmm.org
CR
www.crenvironmental.com
Scanning Sonar Record of Anomaly A-12
Onondaga Lake
Syracuse, New York
NOTES:
1) 10.0 foot grid spacing
2) Grid NY State Plane (Central) NAD 83 (US Foot).
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Feet
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Figure 76: Scanning sonar image of A12.

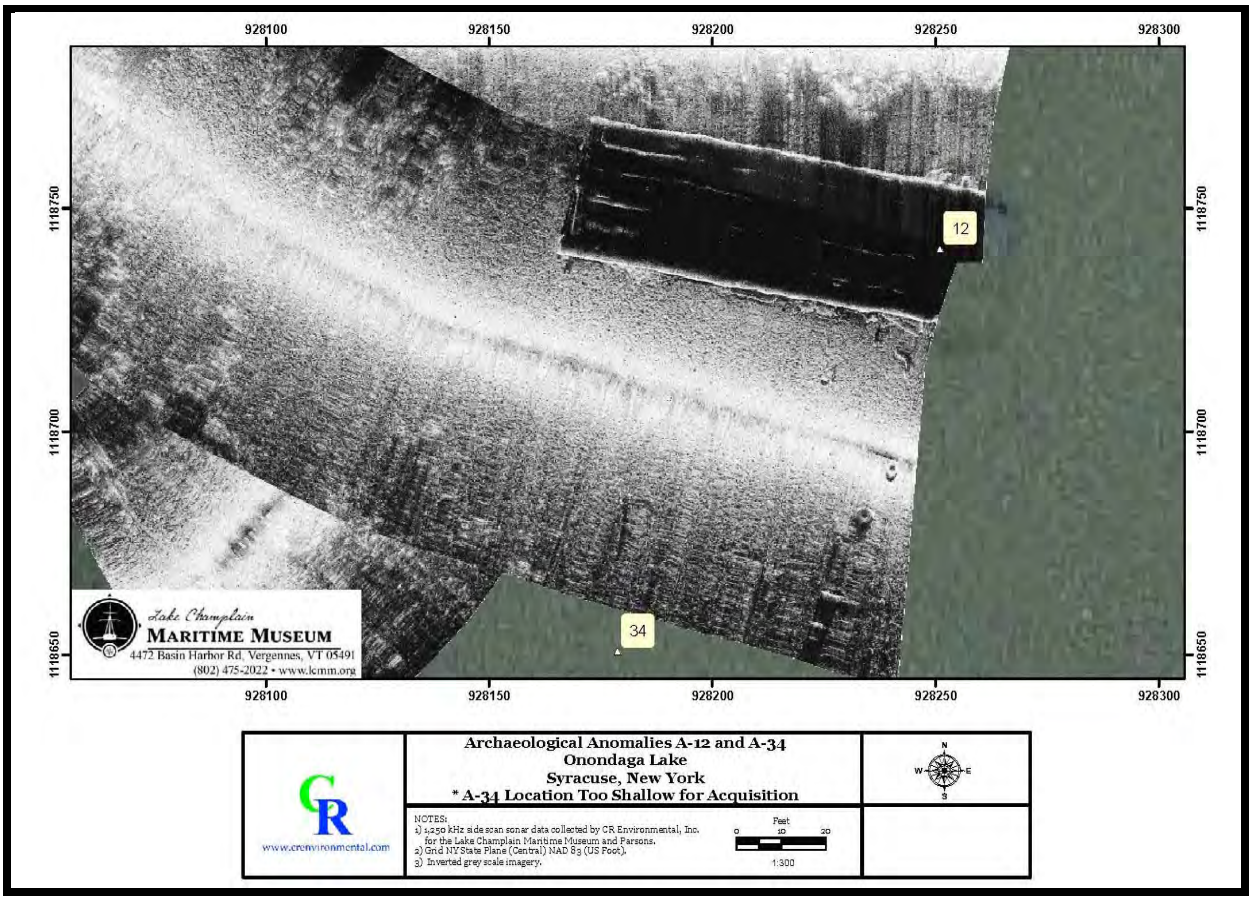


Figure 77: Side scan sonar mosaic of Anomaly A12.

Site Description

The visible remains of A12 represent 70-80% of the vessel's original structure (Figure 78). Lake sediments cover the interior and bottom of the vessel obscuring the details of the bottom planking and structure; this is particularly evident in the interior of the bow and stern. Due to the potential contaminates in the lake bottom sediments, these buried portions of the site were not investigated. The visible remains are 93 feet 8 inches (28.5m) in length with a maximum beam of 40 feet (12.2m), 32 feet 6 inches (9.9m) excluding the spud holders.

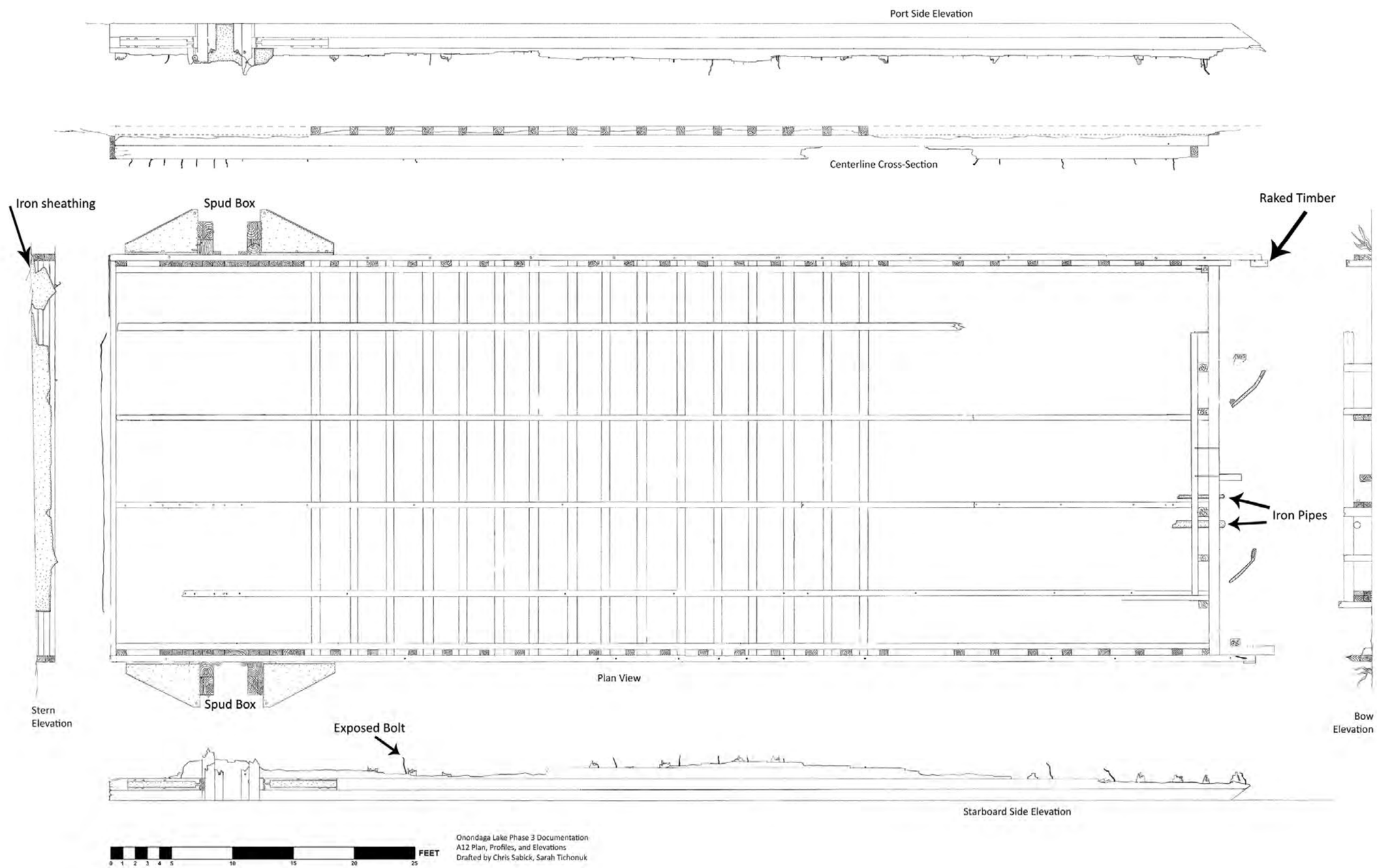


Figure 78: Plan and sectional views of A12 (LCMM Collection).

A12 lies in 3 to 4 feet (0.9 to 1.2m) of water in the southeastern corner of Onondaga Lake. The natural and cultural processes at this location have been a significant factor in its state of preservation. The site is in shallow water and has therefore been subjected to damage from ice and wave action as well as from biological growth on the vessel remains. This southeastern portion of the lake is subject to wave action due to the 4.5 miles (7.2km) of fetch which unfold to the northwest. Direct wave action on the wreck has led to damage occurring on the upper portions of the remains which is exacerbated by impacts from ice flows during the winter months. Additionally, annual aquatic vegetation growth and die-off is another means of mechanical degradation to the site.

Bow

The bow of A12 is heavily degraded with only portions of the support structure extant. No evidence of the bow planking remains. However, the presence of a single rake timber and the angle to which the bow ends of the side planking are cut demonstrate that this barge had a raked (angled) bow. The extant rake timber is on the starboard side of the bow and it is 8 inches (20.3cm) square. Other structures in the bow include a number of uprights, the ends of the bulkheads that run the length of the vessel, and two chain plates that were used to attach guy wires from the derrick for stability.

The six uprights that are present in the bow are situated approximately 6 feet (1.8m) aft of where the bow planking would have been located. These timbers vary in size from 6 to 8 inches (15.2 to 20.3cm) moulded and 12 inches (30.5cm) sided. All the uprights are 28 inches (71.1cm) in height and support an athwart ships timber that is 6 inches (15.2cm) by 9 inches (22.9cm) and 22 feet long (6.7m) The purpose of this timber is unclear, it may have been part of a bulkhead that delineated the angled bow from the rest of the barge. Alternatively the assembly of uprights and horizontal timbers in the bow may have been part of the structure that supported a third, center line, spud box. The location of a spud box in the center of the barge end opposite the dredge head was a common feature of dredges from this time period, though the fragmentary evidence remaining on this site makes this conclusion circumstantial.

Below the horizontal timber in the bow, two sections of iron pipe are suspended by metal brackets. One pipe is 6 inches (15.2cm) in diameter and the other is 3 inches (7.6cm) in diameter. Each of these pipe fragments is only 48 inches (121.9cm) long. The purpose of these pipes is hard to verify from the extant evidence, though they may suggest that this vessel was a hydraulic dredge rather than a bucket dredge. Hydraulic dredges used a cutter head suspended from a large boom to loosen sediment which was then sucked into a pipe located near the head that was attached to a large suction pump. The dredge spoil was pumped into waiting barges or through a floating pipeline to a location on shore. However, the identification of site A12 as a hydraulic dredge cannot be stated with any specificity due to the lack of additional supporting evidence.

Stern

The stern construction of A12 is well preserved in comparison with the bow. Unlike the bow, the stern is vertical, not raked. It is also sheathed with iron plating which would have protected the stern structure from impacts caused by the operation of the dredge equipment that was also situated at the stern of the vessel. The planking on the stern is supported by the four longitudinal bulkheads that run the length of the vessel as well as the ends of the sides. There are remains of three stern planks which are 3 inches (7.6cm) thick and range in width from 5 to 7 inches (12.7 to 17.8 cm). The iron plating that protected these planks is approximately ½ inch (1.3cm) thick and it has slumped away from the stern slightly leaving

a gap of between 5 to 9 inches (12.7 to 22.9cm) from the planking. The iron plating displays significant damage and is missing entirely from the starboard 5 feet (1.5m) of stern structure.

Sides

The sides of A12 are its most prominent feature particularly as they include the large spud boxes. Both port and starboard side hull planking is preserved up to, and at times above, the water's surface. On the starboard side there are extensive remains of three strakes as well as a fragment of a fourth strake found amidships. There are exposed bolts protruding from the planks upper surfaces which suggest at least one more plank was originally present. The remaining planks are 10 to 11 inches (3.0 to 3.4cm) wide and 5 inches (12.7cm) thick. These thick planks are fastened together internally by 1 inch (2.5cm) iron bolts that were driven vertically through them. This was a common construction technique in the late nineteenth and early twentieth centuries and has become known as "edge fastened construction." These bolts do not appear to have been installed in any particular pattern with extant examples present at random along the length of both sides. Each strake is composed of several planks that are fastened together with diagonal scarfs. The bow ends of the sides are cut to an angle matching that of the rake timber found in the bow.

The port side planking is nearly identical to that of the starboard side though only three strakes are extant. Like the starboard side, there are numerous edge fastening bolts protruding from the top surface of the extant planks, suggesting that there had originally been more planking present during the vessel's operational life.

Both sides are supported internally by vertical frames. The frames are 9 inches (22.9cm) sided and 5 inches (12.7cm) moulded. These frames are spaced evenly along the sides with a room and space of 36 inches (91.4cm), except in the vicinity of the spud boxes. To support the spud boxes the framing on both sides is massively reinforced with a continuous "wall" of frames that runs for 12 feet (3.7m).

Spud boxes

A feature unique to A12 is the spud boxes which are located on both sides of the stern (Figure 79 and Figure 80). These substantial features once supported the large spuds that were used to hold the dredge in position while the derrick was in use. The remains of the spud boxes suggest that they could have accommodated spuds up to 32 inches (81.3cm) square. In order to support such massive anchoring posts, the spud boxes were extensively reinforced. The main upright timbers of each holder consist of a pair of timbers 12 inches (30.5cm) sided and 15 inches (38.1cm) moulded. These are additionally strengthened by timbers that are 12 inches (30.5cm) sided and 18 inches (45.7cm) moulded. The upright timbers also are supported by large iron buttresses that extend forward and aft of the spud holders. These roughly triangular buttresses extend 6 feet (1.8m) to either side of the holders and extend out from the sides 45 inches (114.3cm). These structures consist of a heavy iron plate approximately 2 inches (5.1cm) thick that is fastened to the sides of the vessel and spud holder uprights by flanges and numerous threaded iron bolts 1 inch (2.5cm) in diameter. The planking of the barge in the area behind the spud holders is protected by a ¼ inch (0.6cm) thick piece of sheet iron. This would have prevented the spuds from damaging the planking when they were raised and lowered through the spud holders. No evidence of the spuds themselves was found on the site.

Figure 79: Inboard side of Anomaly A12's spud box (LCMM Collection).

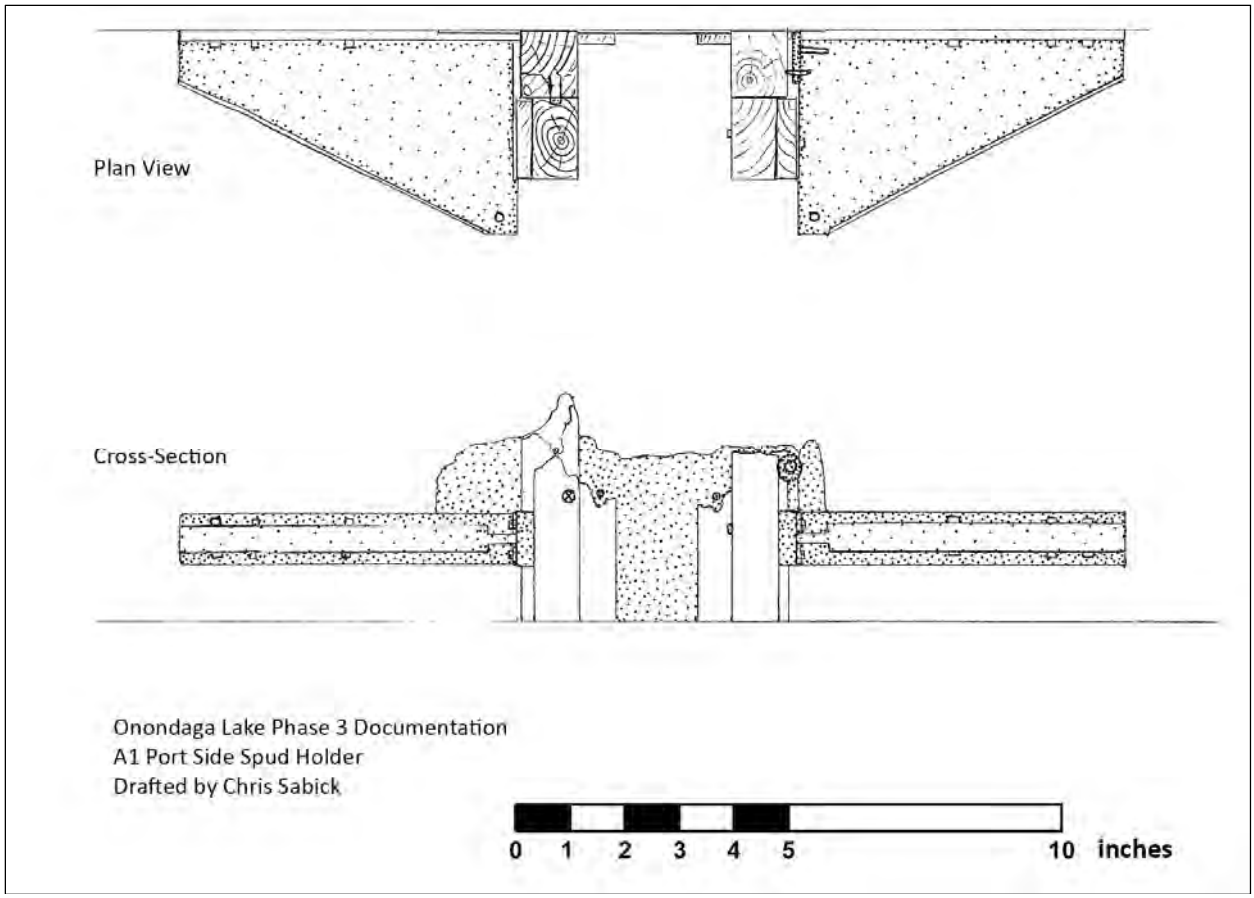


Figure 80: A12 Port Side Spud box (LCMM Collection).

Longitudinal Support

The box-like construction of A12 was supported by a number of structures on the interior of the hull. There are four substantial bulkheads that run the length of the vessel as well as two sister keelsons located just inboard of the frames that support the side planking. These latter pieces, which consist of two stacked timbers that are each 6 inches (15.2cm) sided and 10 inches (25.4cm) moulded, serve to significantly strengthen the juncture of the sides and bottom of the barge. These are fastened together with ¾ inch (1.9cm) iron bolts.

The longitudinal bulkheads are spaced evenly across the interior of the hull and rest atop the floors (Figure 81). The extant remains of the bulkheads consist of two timbers stacked vertically each of which are 6 inches (15.2cm) sided and 10 inches (25.4cm) moulded and fastened together with 1 inch (2.5cm) iron bolts that were driven through the timbers vertically. These structures provided significant support for the A-frames that supported the dredge head and pumping equipment which were positioned on deck. In addition to giving the barge a tremendous amount of longitudinal stiffening, the bulkheads also support the stern planking and would have given the decking significant strength.

Besides the tall longitudinal bulkheads the vessel was also strengthened by four sister keelsons that run the entire length of the vessel. These are located outboard of the dump bay and unlike the above mentioned bulkheads these keelsons consist of only a single structural member resting on top of the bottom planking. These timbers are 8 inches (20.3cm) sided and have a moulded dimension greater than 5 inches (12.7cm); the exact moulded dimension could not be ascertained without excavating into the contaminated bottom sediment.

Conclusion

The archaeological evidence indicates that A12 was disposed of at the end of its working life. This conclusion is based upon the absence of machinery, spuds, or other artifactual remains and its proximity to other scuttled vessels in the southeastern corner of Onondaga Lake.

The identification of A12 as a dredge barge is supported by the visible extant vessel remains, in particular the spud holders located on the stern end of the barge, which are a defining feature of this class of vessel.[134] While it is unclear if A12 was a bucket dredge or a hydraulic dredge, the remains of piping in the bow recommend the latter option but are not extensive enough to prove it conclusively. The vessel type and the types of fasteners and other hardware that were found on site suggest that this vessel was built and operated in the early twentieth century (Figure 82 and Figure 83). A12 was most likely used to create and maintain navigational channels and in the construction of other in-water infrastructure projects in the Onondaga Lake area.

Figure 81: Photograph showing Anomaly A12's longitudinal bulkheads with the spud box in the background (LCMM Collection).

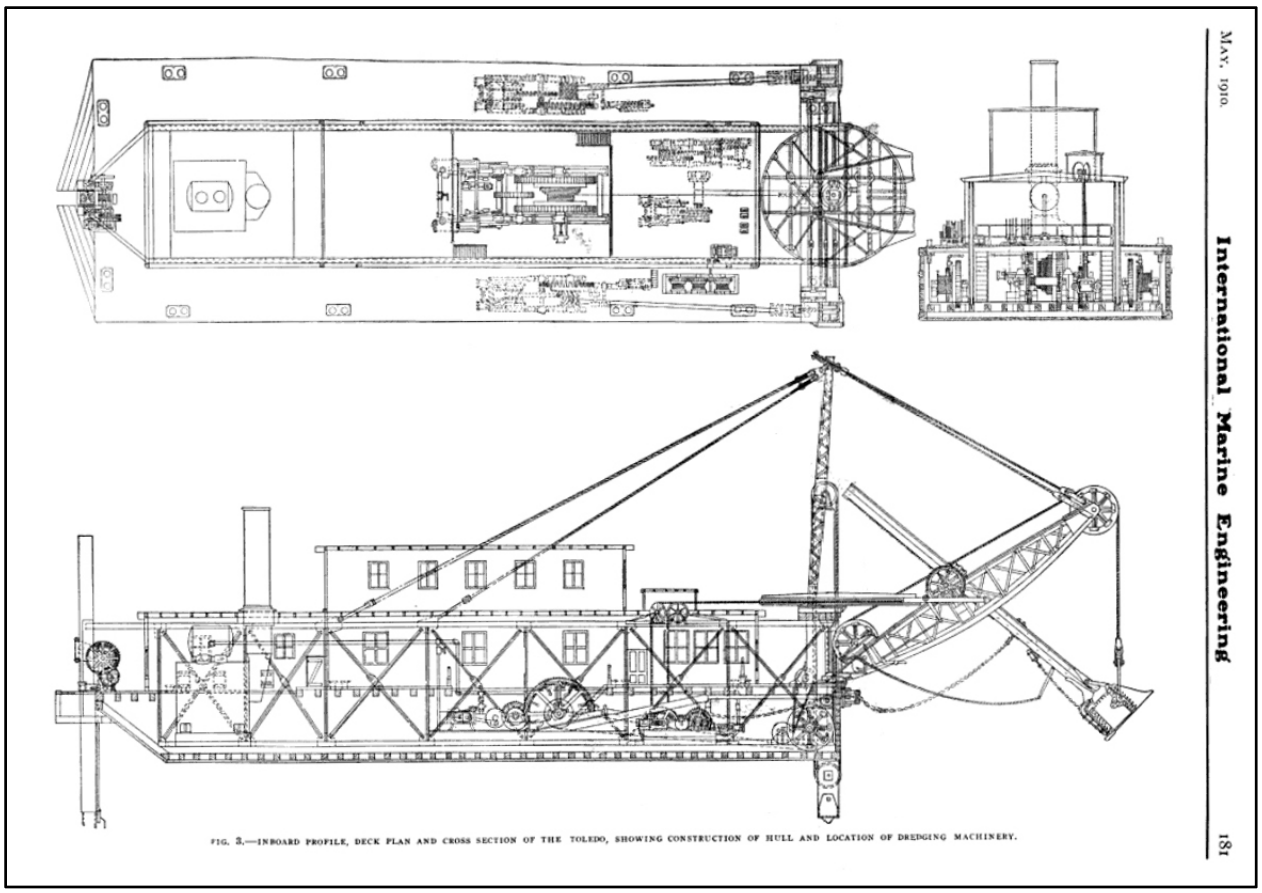


Figure 82: Inboard profile, deck plan, and cross section of *Toledo*, a wooden-hulled bucket dredge (*International Marine Engineering* 1910).

Figure 83: Photograph showing a bucket dredge with spuds excavating the barge canal in 1906 or 1907 with a dump scow in the foreground (LCMM Collection).

ANOMALY 45: CONCRETE BREAKWATER

Anomaly 45 Summary Table	
Anomaly Identification	Breakwater of Concrete Bags; NY Site Number 06740.012304
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Anomaly Dataset	
Side Scan (2005)	No
Magnetometer (2005)	705, 796, 810, 817, 732, 773, 766, 712, 797, 811
Side Scan (2010)	6/2/10
Sector Scan (2010)	6/7/10
ROV (2010)	6/10/10
Diver Observations	6/26/11, 9/2012; 4 dives, 3.7 hours of total bottom time
Diver Videography	Yes
Maps/Charts	Yes
Aerial Imagery	Yes
Historic Accounts	No

Introduction

A45 is a breakwater situated southeast of the entrance to the Syracuse Inner Harbor (Figure 84). Analysis of navigational charts suggests that the structure was installed between 1937 and 1942 (Figure 85), and was abandoned/partially submerged by 1947. The breakwater is 20 feet wide (6.1m) and extends 250 feet (76.2m) from the shoreline. This anomaly appeared on side scan sonar (Figure 86) and scanning sonar imagery (Figure 87). Dive verification in 2011 showed the site to be made of concrete bags, likely constructed by placing bags of concrete in the water (Figure 88). Each concrete block was pillow-shaped with two indentations from circular bands. Given the breakwater's location, its intended purpose was likely to dampen wave action at the harbor entrance for entering and exiting boats. The structure is densely packed along the exterior walls of the breakwater with an open gap containing only sporadic concrete bags in between. Only one tier is visible. The site lies in 2 to 3 feet (.61 to .91m) of water, and can be seen in modern aerial photography (Figure 84). No timber crib or other wooden structures were noted, suggesting that the site is a breakwater and not a pier.

In September of 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, videography, photography and the recovery of some breakwater elements for documentation before re-deposition (Figure 89). The 2012 field effort required 4 dives, totaling 3.7 hours of diver bottom time. Documentation conditions were fair to poor, with underwater visibility of 3-5 feet and significant aquatic vegetation.

Figure 84: Aerial view showing A45 (courtesy Microsoft® Virtual Earth).

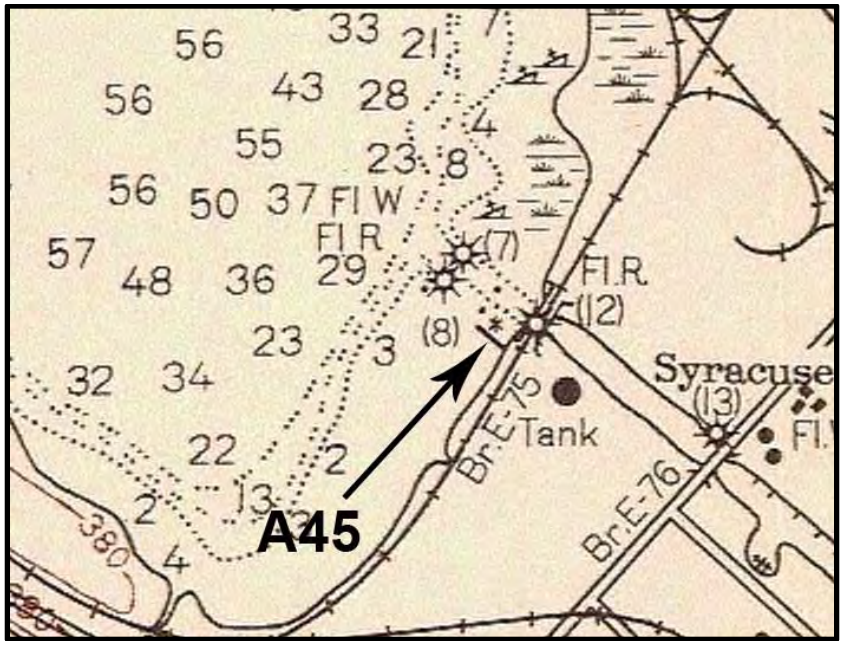


Figure 85: 1942 navigational chart of Onondaga Lake showing A45 (*NY State Canals, Chart No. 185,* 1942 (Detroit: U.S. Lake Survey Office, 1942).

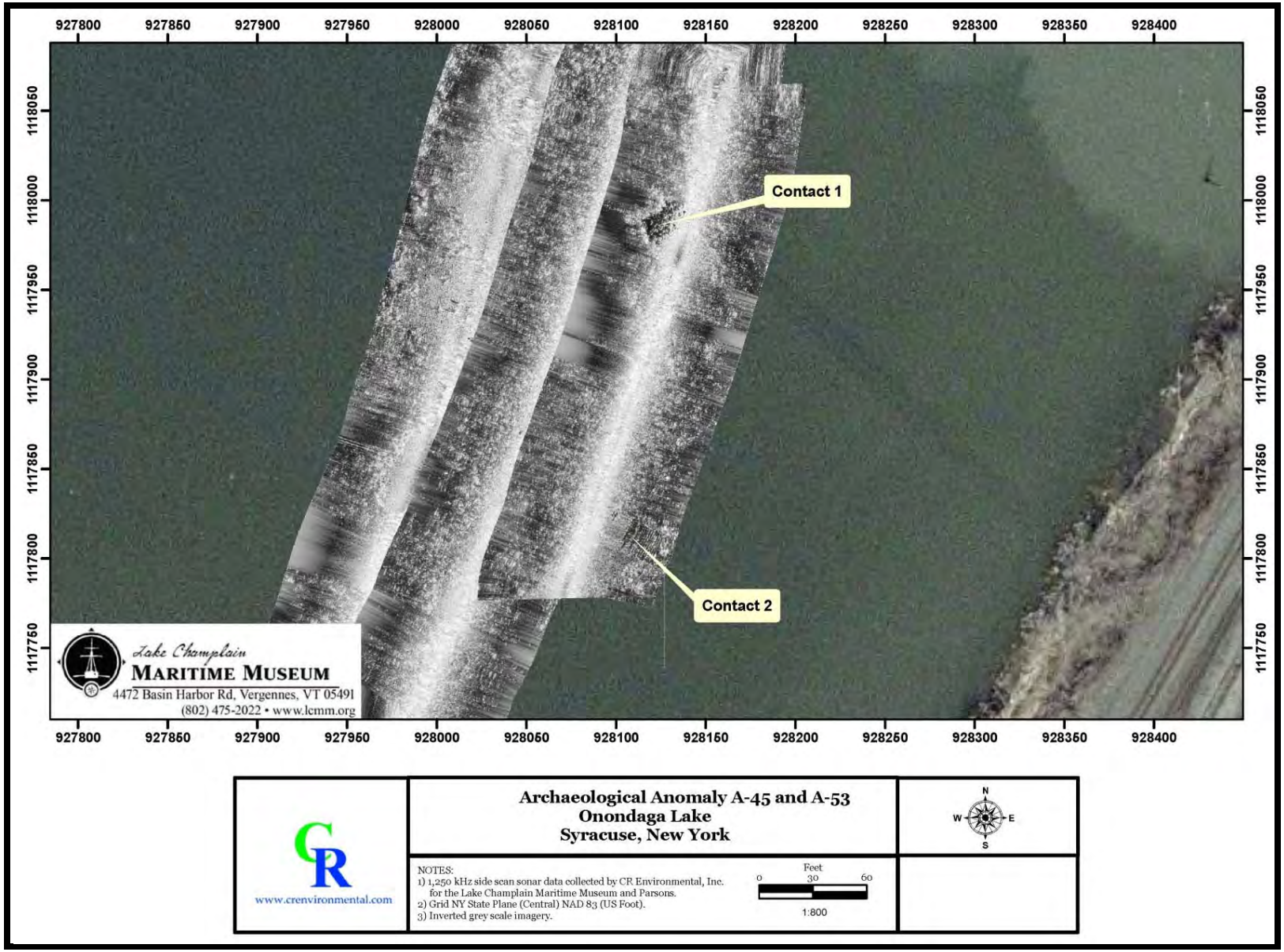


Figure 86: Side scan sonar mosaic showing A45 (Contact 1) and A53 (Contact 2).

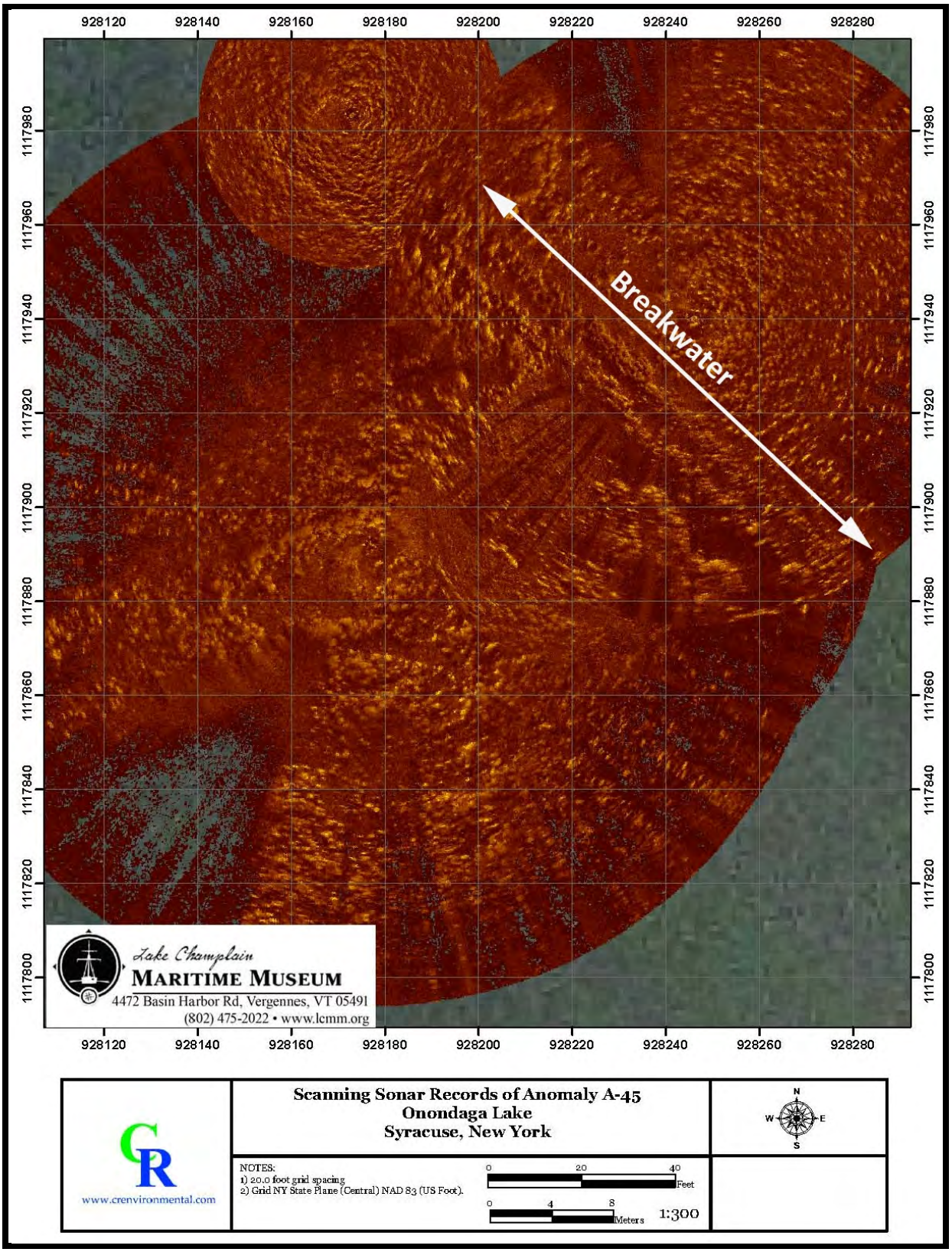


Figure 87: Scanning sonar image of A45.

Figure 88: A view of A45 from above the water's surface. Note the modern debris amidst the concrete pillows (LCMM Collection).

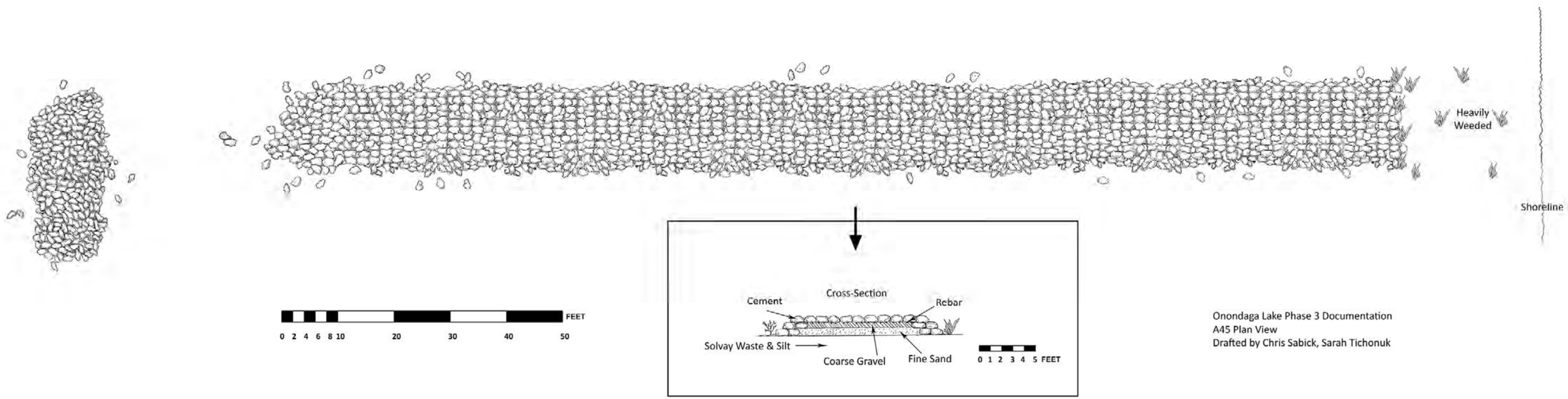


Figure 89: Plan and sectional views of A45 (LCMM Collection).

Site Description

The remains of A45 extend for a total of 250 feet (76.2m) and are roughly 20 feet (6.1m) wide (Figure 89). The breakwater extends for most of its length in a fairly uniform manner, except towards its lake side end where there is a 25 foot (7.6m) gap in the structure after which there is an additional section of structure that is 10 feet (3.0m) by 25 feet (7.6m). It is unclear whether this gap was built into the breakwater from its beginning or if it was modified at a later date.

One location along the main portion of breakwater was more thoroughly studied in order to gain an understanding of its interior construction. From the bottom up the breakwater was made up of three layers: 8 inches (20.3cm) of light gray brown sand, 4 inches (10.2cm) of coarse aggregate fill, and the visible surface of the breakwater of concrete "pillows" or blocks. The blocks were systematically positioned on top of the layer of aggregate which was also reinforced with 5 foot (1.5m) long sections of 1 inch (2.5 cm) rebar. The outer edges of the breakwater are delineated by a course of blocks two deep.

The blocks from this breakwater appear to have been created by filling burlap bags with wet concrete then placing them on the lake bottom to harden. This analysis is supported by the shape and appearance of the blocks. Three sample blocks were recovered from the site for detailed documentation above water, they were re-deposited on site afterward (Figure 90 and Figure 91). These three blocks all had slightly different shapes, though their rough dimensions were the same, 2 feet (0.6 m) long, 1 foot (0.3m) wide and 8 to 10 inches (20.3 to 25.4cm) thick. All three blocks displayed evidence that they had been formed in bags, with one (block 3) having a very clear impression of burlap fabric on its surface. All three blocks also contained impressions of the rebar support they had been placed on. The fact that the rebar was able to make an impression in the blocks supports the idea that they were placed in position before the concrete had fully hardened. Historic research has not revealed any other reports of this construction technique.

Conclusion

The archaeological evidence indicates that A45 is a breakwater constructed around 1940 that was positioned to offer protection to vessels entering and exiting Syracuse's Inner Harbor. The breakwater displays fairly common construction features including a stable foundation of sand and aggregate fill capped by concrete blocks. The design of the concrete "blocks" is unique however with no contemporary corollaries noted in the historic literature examined.

Figure 90: Sample concrete from A45 breakwater (LCMM Collection).

Figure 91: Details from two concrete masses from A45. Note the depressions in the concrete indicating that they were formed by using bags. The inset at right shows burlap-style markings. (LCMM Collection).

ANOMALY 53: CANAL BOAT

Anomaly 53 Summary Table	
Anomaly Identification	Canal Boat, NY Site Number 06740.012305
Remedial Impact	Dredge and Cap
NRHP Eligibility Recommendation	Eligible as Contributing Property to Syracuse Maritime Historic District
Dataset	
Side Scan (2005)	No
Magnetometer (2005)	No
Side Scan (2010)	6/2/10
Sector Scan (2010)	6/4/10
ROV Video Footage (2010)	6/10/10
Diver Observations	6/26/11 and 9/2012: 13 dives, 19.6 hours bottom time
Diver Videography	Yes
Maps/Charts	No
Aerial Imagery	No
Historic Accounts	No

Introduction

A53 represents the remains of a poorly preserved late nineteenth/early twentieth century wooden canal boat. The site rests in 2-3 feet of water southwest of the entrance to Onondaga Harbor. With a length of 96.5 feet (29.4m) and a beam of 17.5 feet (5.3m), A53 was built in accordance with the dimensions of the Erie Canal locks that existed between 1862 and 1915. The absence of cargo, its shallow-water location, and its proximity to other abandoned boats in Onondaga Lake indicates the vessel was intentionally disposed of at the end of its working life.

A53 was located in 2010 during the Phase 1B archaeological survey of Onondaga Lake. Due to the site's very shallow location and coverage with aquatic vegetation, it was not found during the initial geophysical survey in 2008; rather it was discovered visually from the research vessel during the investigation of adjacent site A45. Subsequent documentation immediately following its discovery included videography with an ROV and high frequency side scan and sector sonar imagery (Figure 92). The site was subsequently dive verified in June 2011.

The Phase 1B report included A53 as a contributing property to the Syracuse Maritime Historic District, which was found to be eligible for the NRHP. The Onondaga Lake clean-up design for the area of A53 includes dredging and capping, which was determined to have an adverse effect on portions of the Syracuse Maritime Historic District, including A53. Archaeological mitigation of A53 was recommended, and further elaborated in the LCMM's Onondaga Lake Archaeological Mitigation Plan.

In September 2012, Phase 3 underwater archaeological documentation was undertaken which included direct diver measurements, the recovery and surface documentation of selected vessel elements, videography and wood samples (26) (Figure 93). The 2012 field effort required 13 dives, totaling 19.6 hours of diver bottom time. Study of vessel was limited to the remains exposed above the lakebed due to the potentially contaminated nature of the sediments. Documentation conditions were fair, with underwater visibilities of 4 to 8 feet (1.2 to 2.4m) and modest aquatic vegetation.

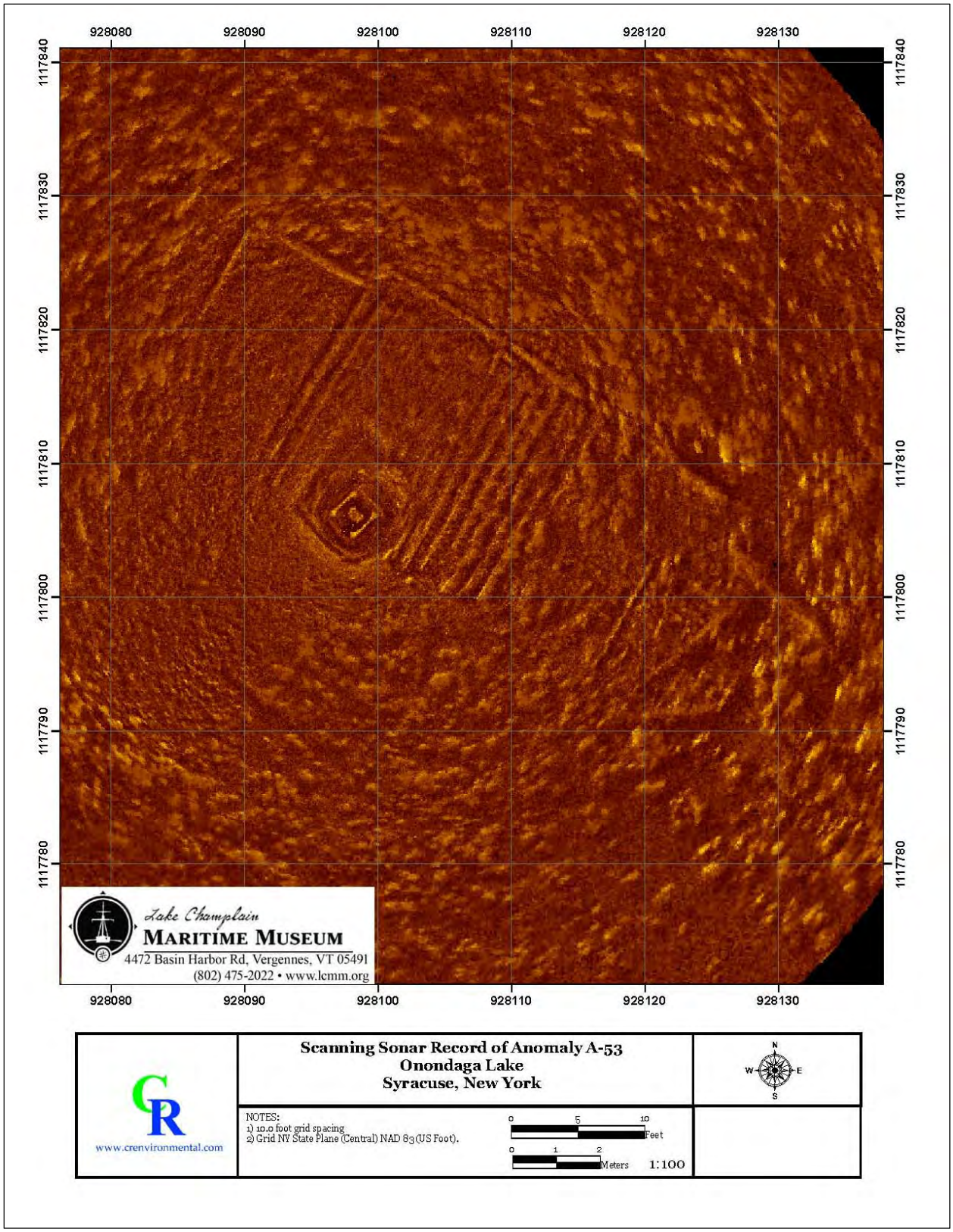


Figure 92: Scanning sonar image of A53 recorded in 2010.

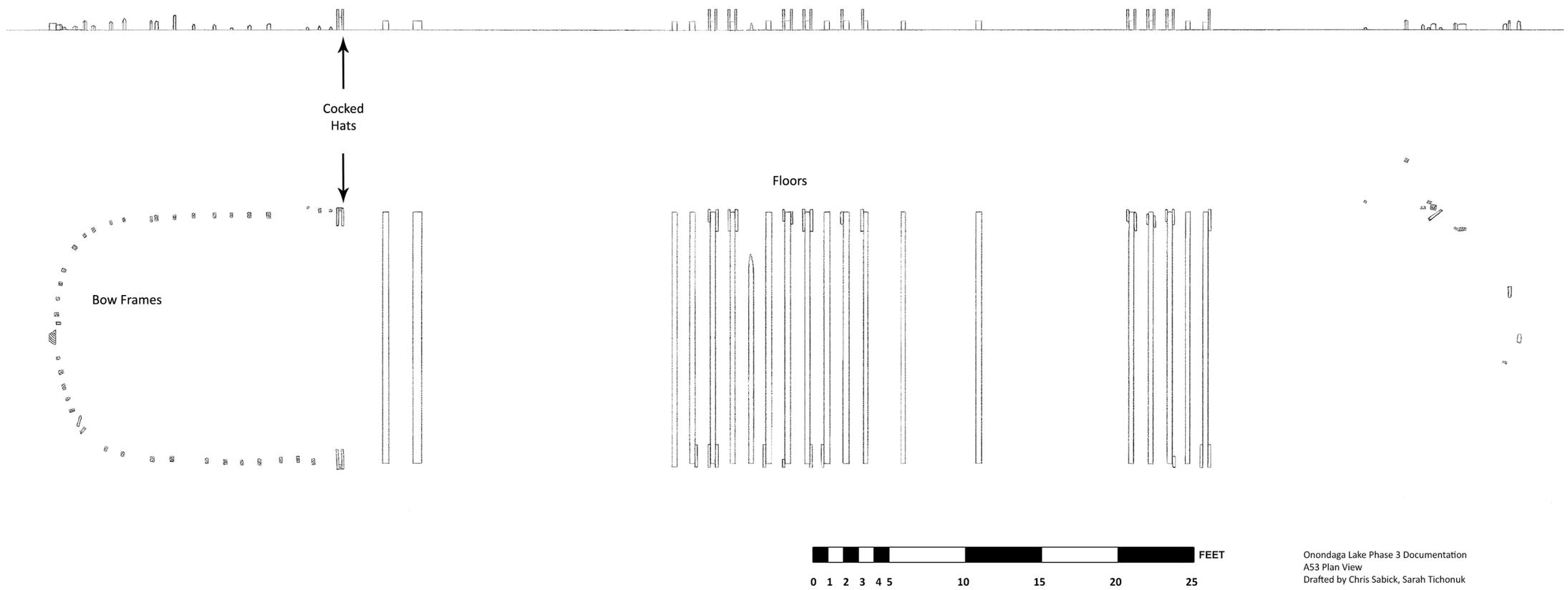


Figure 93: Plan and sectional views of A53 (LCMM Collection).

Site Description

The extant remains of A53 represent approximately 20% of the boat's original structure composed of the bottom of the hull up to the turn of the bilge, and the very lowest portions of the bow and stern framing (Figure 93). These scant remains are largely buried under 6 to 12 inches (15.2 to 30.5cm) of fine sand. The site is 96½ feet (29.4m) long and 17½ (5.3m) feet wide.

A53's shallow water deposition site is the most significant factor in its state of preservation. At the time of its abandonment approximately a century ago, A53 would have stood some 5 to 7 feet (1.5 to 2.1m) above the lake's surface. The remains were subject to continual wave action, particularly in this southeastern portion of Onondaga Lake due to the 4.5 mile (7.2km) of fetch which unfold to the northwest. This constant wave action and the movement of flotsam into, and eventually over, the site served to clip any above and near-surface remains. Moreover, although the surface of Onondaga Lake does not often freeze over entirely during the winter, the shallow waters do, which places A53 in an area of annual ice action. Abrasion from both the lake's frozen surface and ice elsewhere in the lake breaking up and being blow down the length of the lake have served to pull apart the vessel when it extended above the surface and abrade the below water remains in later years.

Bow

The shape of the bow is delineated by the stem and the rounded arc of frame tips which radiate from it. The stem is trapezoidal in plan; 10 inches (25.4cm) on its after face and 6 inches (15.2cm) on its port, starboard and forward faces. It stands 6 inches (15.2cm) above the bottom sediments and is composed of white oak. Due to its deteriorated conditions there is no longer any evidence of a rabbet on the stem.

The bow frames project 3 to 12 (7.6 to 30.5cm) inches above the bottom depending on their level of preservation. All represent only the bottommost portion of the frames. The recorded sided and moulded dimensions vary considerably based upon the preservation of each frame; however, the typical dimensions are 3 inches sided and moulded. All framing wood samples returned a species identification of white oak (*Quercus alba*).

The interior of the bow was devoid of intact visible structural remains. A toppled over futtock (A53-T1) was noted in this area; it was recovered and documented on the surface. It is a 5 feet (1.5m) tall futtock with a sided dimension of 2½ inches (6.4cm) and a maximum moulded dimension of 9¼ inches (23.5cm). The forward face of the futtock retained eight ¼ by ¼ inch (0.6 by 0.6cm) fastener holes. These now absent nails were used to secure the planking to the futtock. The profile of the frame shows a typical canal boat bow profile with vertical or near vertical sides and a rounded turn-of-the-bilge. The frame's rounded shape was cut from a straight-grained piece of lumber rather than from a naturally curved piece of compass timber. This is consistent with boat building in the late nineteenth/early twentieth century when stocks of shipbuilding timber, particularly hard to find compass wood, were dwindling.

The shape of the bow is characteristic of a canal boat. The frames outline a rounded, but very bluff bow. The transition from the bluff face of the bow to the run of the hull occurs within 8 feet (2.4m) of the stem; a sudden transition designed to maximize the cargo space inside the hull while complying with the canal rules which dictated that boats must have rounded bows to keep from digging into the canal prism.

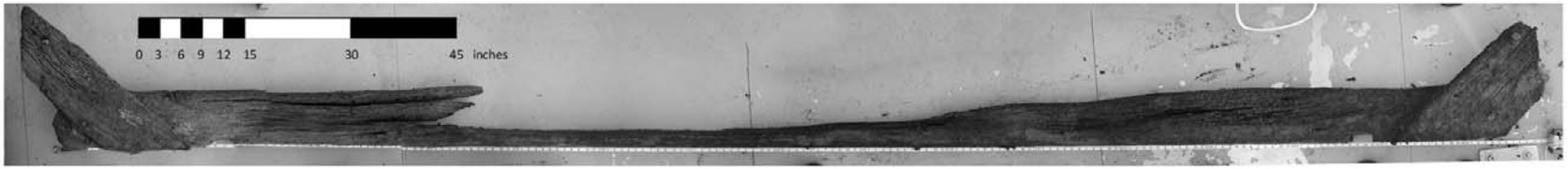
Run of the Hull

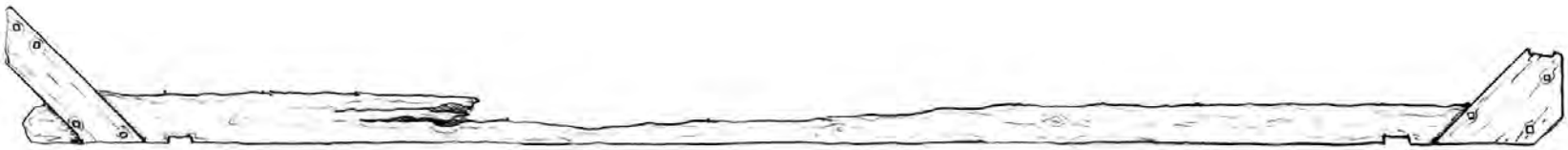
The run of the hull contains much of A53's extant structure, beginning within 8 feet (2.4m) of the stem and ending within 10 feet (3.0m) of the stern. This stretch contains 78½ feet (23.9m), or more than 80%, of the overall 96½ feet (29.4m) of hull remains. However the forward and after transitions into the bow and stern were buried so the details as to how or where the hull structure transitions from flat bottomed with vertical sides to the rounded ends is not known. Moreover, only 20 floors were visible along the run of the hull; however, based upon the frame spacing the original number of floors in this area of the hull was approximately 65.

A53's framing pattern is known as a cocked-hat style. This technique uses a trapezoidal or triangular timber, known as a cocked-hat, to join the boat's flat bottom to its vertical sides. The technique removes the need for naturally grown compass timber to construct the turn-of-the-bilge. All wood samples of framing members returned a wood type of white oak (*Quercus alba*).

During the documentation, two floors were recovered and documented on the research vessel, providing a clear view of A53's framing technique (Figure 94). One floor was found dislodged at 58½ feet (17.8m) aft of the stem, while the second was removed from its *in situ* location 42 feet (12.8m) aft of the stem. They were 16½ feet (5.0m) long, sided 2½ to 2¾ inches (6.4 to 7.0cm), and moulded 7½ inches (19.1cm). The frames were dead flat across the width of the vessel, and spanned the entire boat width. The outboard ends were cut, top and bottom, at 45° angles; the bottom cut corresponds with the adjacent outboard face of the cocked hat.

Each floor had two limber holes; cut outs in the bottom of the floors to facilitate water movement from one part of the vessel to another (Figure 95). Each was cut within 2 feet (0.6m) of the outboard end of the floors, 3 inches (7.6cm) wide and ¾ inch (1.9cm) deep. These cuts were made by drilling holes at the corners of the limber holes, and then sawing out the rectangular holes.





Onondaga Lake Phase 3 Documentation
A53 Frame
Drafted by Chris Sabick, Adam Kane

Figure 94: This dislodged frame from A53 was brought to the surface for documentation for photographs (top) and measured drawing (above). The image on the top was generated from twelve photographs stitched together, resulting in some minor distortion (LCMM Collection).

Figure 95: Limber hole of Timber 8 of A53. Note drilled holes in the corners, allowing for the rectangle to be sawn out (LCMM Collection).

A53's cocked hats were documented in detail; two were found lying dislodged from their frames and were documented on the surface (Figure 96 and Figure 97), while two additional cocked hats were recovered with the frame recovered 42 feet (12.8m) aft of the stem. Because the cross-section of the hull anywhere along the run of the hull is identical (flat bottom with vertical sides), these trapezoidal timbers have identical, or nearly identical dimensions. When viewed in section the interior face is 2 feet 2 inches (0.7m), the faces along the bottom and sides of the hull are 13 inches (33.0cm) and the chine face is 7½ inches (19.1cm). The sided dimension is between 1¾ and 2¼ inches (4.4 and 5.7cm). Each cocked hat is an isosceles right triangle with 90° corner cut off to form the chine. Each frame section consists of four cocked hats; two per side sandwiching the floor and first futtock. The run of cocked hats along each side of the hull was joined by a bilge keelson which is evidenced by a fastener consistently placed in the middle of cocked hat's interior face.

In a few places in the hull, spacers were noted spanning the distance between floors. These white oak (*Quercus alba*) timbers were longitudinally oriented, rectangular timbers. Their length was $11^{7}/_{8}$ inches (30.2cm) spanning the room and space between the floors. They were sided 2½ inches (6.4cm), and moulded 7½ inches (19.1cm), the same moulded dimension as the floors. The bottom side of each spacer had two 1 inch (2.5cm) square cut outs which served as limber holes. Due to the buried nature of the remains, it is not known how prevalent the spacers were in the hull.

A53's planking was almost entirely buried; however, the upper face of the chine plank was observed both port and starboard near the bow. The white oak (*Quercus alba*) plank was 1½ inches (3.8cm) thick, while its width could not be determined. On the outboard face of the chine plank there was a ½ inch (1.3cm) thick sacrificial plank made of beech. Beech is not a commonly used shipbuilding wood, but it does have durable characteristics if it is kept continually wet as would have been the case in A53's hull. The extent of the boat's sacrificial planking is not known, however, it was likely limited to this chine area which was subject to considerable wear and tear from contact with the canal prism and other submerged obstructions.

Inferred information about the planking and ceiling was recorded on the upper and lower faces of the two recovered floors. They were riddled with the remnants of square cut nails used to hold the ceiling and planking in place. Neither nailing sequence demonstrated a consistent enough pattern to determine the number of planks or ceiling. Moreover, the density of nail holes suggests that the boat had been re-planked during its career.

Figure 96: This cocked hat was found dislodged from its frame on A53 and was documented at the surface (LCMM Collection).

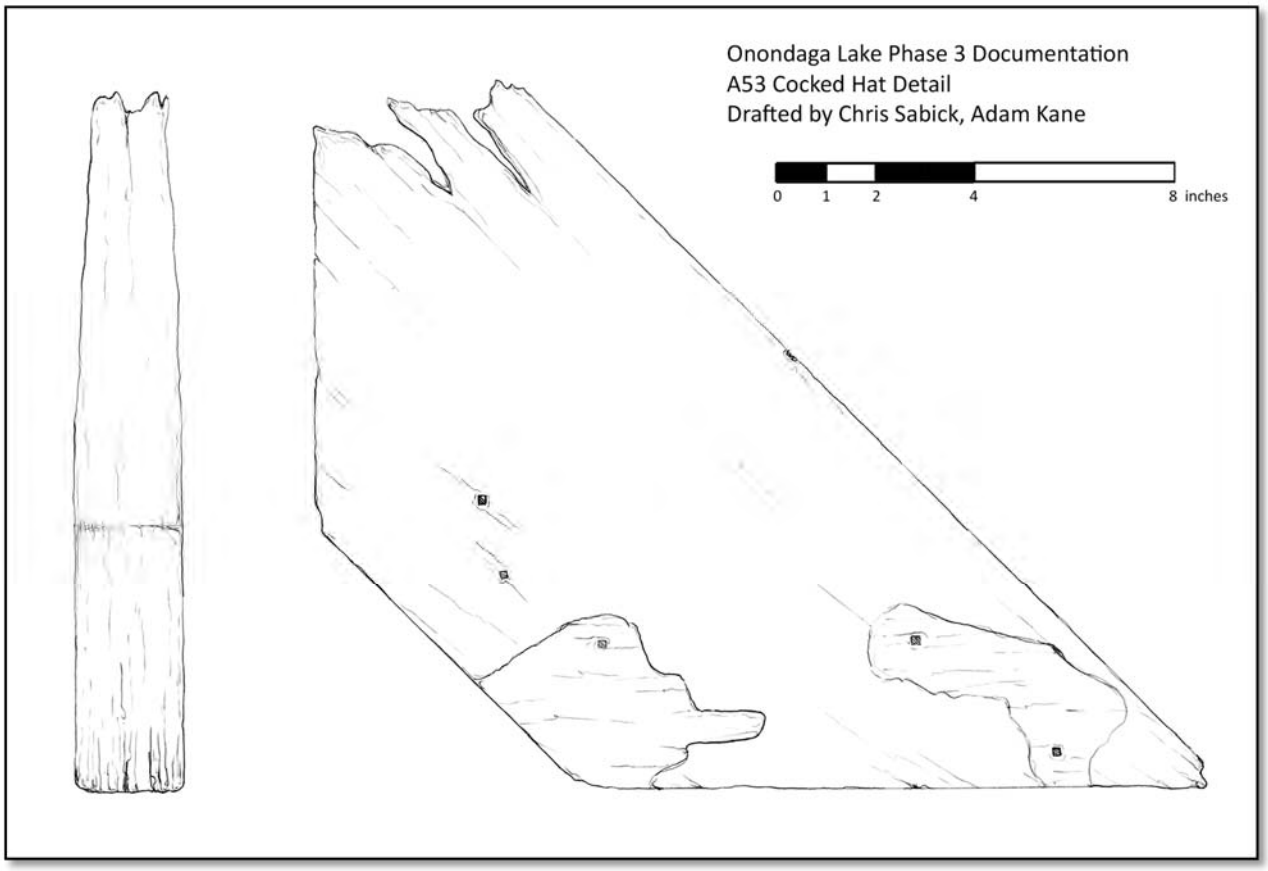


Figure 97: A53 cocked hat detail (LCMM Collection).

Stern

A53's stern was very poorly preserved, consisting of seven futtocks and four planks standing 2 to 12 inches (5.1 to 30.5cm) above the bottom; all constructed of white oak. From these scant remains, the shape of the stern was rounded. The planking, which rises near vertically out of the bottom, rather than horizontal or near horizontal, is typical of the upward sweep of stern planks in canal boats. There was no evidence of a sternpost or rudder.

Conclusion

A53's clear illustration of cocked-hat construction in a canal boat is an important contribution to the understanding of the late nineteenth/early twentieth century canal boat construction for NY's canal system. The vessel's standardized building technique with identical framing along the run of the hull suggests that the shipyard that built the vessel was replicating a well-established plan. Identical framing pieces were milled in volume and assembled in volume.

DATA ANALYSIS

INTRODUCTION

The following section will examine the research questions and archaeological results associated with this project in terms of NRHP-eligibility criteria for each of the six sites indicated in the Mitigation Report, as well as the types of data that are required to address these questions. Additionally, research questions and answers have been provided for the four sites found around Salina Pier during this project. The National Park Service has produced numerous bulletins designed to provide technical information on the survey, evaluation, registration and preservation of cultural properties as it pertains to the NRHP. The bulletins used in the evaluation of Onondaga Lake's submerged cultural properties include: *How to Apply the National Register Criteria for Evaluation*, *Guidelines for Evaluation and Registering Archeological Properties*, *Guidelines for Evaluating and Documenting Historic Aids to Navigation*, *Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places*, and *Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts*.

For a property to be included on the NRHP it must meet at least one of the following criteria:

A. Sites that are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Sites that are associated with the lives of persons significant in our past; or
C. Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Sites that have yielded, or may be likely to yield, information important in prehistory or history.

In the case of the Syracuse Maritime Historic District, criterion A, C, and D can be applied to most of the properties and have acted as the basis for the research questions generated for each contributing property.

Anomaly 1 & 2: Salina Pier

Criteria A: Recreation, Commerce, Transportation

1. What role did the Salina Pier play in the development of the southern end of Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

Archival research in local and regional museums/historical societies revealed few sources about Salina Pier resort and its impact on the development of the southern end of Lake Onondaga. From the limited information available, it appears that its primary historical role was as a rival to the larger, and ultimately more successful, Iron Pier resort. This is not to say that the Salina Pier wasn't an important player in the southern end of the lake during its short operational life – it was; at one time it supported a saloon and a pavilion that housed a concert hall and dining room. The pier itself served vessels that operated thorough the lake up until the late 1880's. However, in 1890, the Iron Pier resort purchased the Salina Pier facilities,

and covered the site with 4 feet (1.22m) of Solvay waste. This proved to be the end for what was regarded as a regional tourist attraction.

From the number of wrecks that were located around the pier during the survey work associated with the Onondaga Lake Superfund Site project, it is clear that, though it was no longer operational, the pier was used into the early twentieth century as a location were older vessels could be scuttled or disposed of without becoming obstructions to other forms of ongoing lake traffic.

Criteria D: Information Potential

1. What does the artifact scatter presumed to exist around the Salina Pier reveal about its use?

Dataset: Contextual mapping of the pier remains and the associated artifacts

An insufficient number of artifacts were located during the examination of the Salina Pier remains to allow any conclusions to be made.

2. How was the Salina Pier constructed and modified during its operational use?

Dataset: Detailed documentation of the construction of the pier; archival research into similar structures built during the same time period

The documented remains of Salina Pier suggest four phases of construction during its operational life (sections A-D), each of which represented an addition or expansion of the original pier structure (section A). As detailed in the site description, each of these phases displayed a slightly different construction technique, allowing one section to be clearly distinguished archaeologically from another. Phase A of the Pier construction consists of two rows of vertical planks, 1 inch (2.5cm) thick that are separated by 12 inches (30.5cm). The interior of this section is filled with rip rap 2-6 inches (5-15.2cm) in size. The outside of Phase A is further buttressed by 8-12 (20.3-30.5cm) inch rip rap outside of the timber structure. Phase B demonstrates a single layer of 1 inch (2.5cm) thick vertical boards and is filled with a mix of 2-6 inch (5-15.2cm) rubble. Phase C also consists of a single layer of 1 inch (2.5cm) thick vertical boards but is filled with a mix of sediment including cobbles, coal ash, and soil. Phase D of the Salina Pier construction consists two layers of vertical boards separated by 12 inches (30.5cm) and supported by vertical pilings every 8-12 feet (2.4-3.7m). This section of the pier is filled with large rip rap measuring 8-16 inches (20.3-40.6cm) in size. The fact that the original pier was lengthened and expanded on a number of occasions does support other evidence that, for a period of time prior its purchase by the Iron Pier resort, the Salina Pier was a thriving and critical element of the economic and social activities taking place at the southern end of Onondaga Lake in the late nineteenth century.

While detailed descriptions of piers located on inland waterways from a similar time period to Salina Pier are not well documented in the archaeological record, general pier construction practices are described in the historical documentation.[135] These sources classify the Salina Pier's construction style as a "solid filled pier[136]." This type of pier consists of a retaining wall made of wood planks or metal sheet piles that are filled with rip rap or mixed sediments. This style of pier is particularly favored for smaller, shallow bodies of water where the structure does not face the same types of forces that an ocean front pier would be exposed to. Other examples of this pier type mentioned in the literature include various ore docks located on the Great Lakes, and some of the pier structures of Bush Terminal located in Brooklyn, New York.[137]

Anomaly 4-1: Dump Scow

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were dump scows employed on Onondaga Lake?

Dataset: Archival research into the development of the maritime infrastructure of Onondaga Lake

Archival research revealed no specific documented examples of the use of dump scows on Lake Onondaga. However as there were extensive and well-known in-water construction efforts and improvements carried out around the lake, it can be assumed that vessels like that represented by A4-1 were involved in those operations. This type of ship was capable of depositing a significant quantity of material onto the lake bottom quickly and efficiently, making it useful in the construction of piers, breakwaters, and other infrastructure projects. Dump scows like A4-1 would have also been employed in disposing of the large amounts of spoil generated by dredging operations around the lake and connecting waterways.

Criteria C: Design/Construction
1. How does the construction of Dump Scow 4-1 compare with other contemporaneous vessels that performed a similar function?

Datasets: Detailed examination and recording of the structure of the vessel remains; archival research into similar vessels from the same time period.

Examination of vessel remains and a comparison with examples noted in archival sources demonstrate that A4-1 shares many of the characteristics found on other vessels, while still possessing a few distinguishing features. The largest sample of dump scows and hopper barges that were studied for the project are those documented at Arthur Kill New York.[138] However those vessels were of a larger coastal variety, and while they were inventoried, they were not documented in significant enough detail to allow for a direct comparison of construction styles with A4-1. The hopper barges inventoried at Arthur Kill are considerably larger than A4-1 with vessel No. 238 measuring 150 feet (45.7m) in length with a beam of 30 feet (9.1m). This can be compared with the much small dimensions of A4-1, which measured 79 feet 6 inches (24.2m) in length and 28 feet (8.5m) in beam. Of the six dump scows inventoried by James at Arthur Kill, five of them featured six dump bays and one featured eight dump bays. In comparison, A4-1 had only five dump bays. Several of the Arthur Kill vessels were also noted as having rounded ends where A4-1 clearly has raked ends.

One photograph found at the Erie Canal Museum (Figure 98) depicts a dump scow with five bays similar in design to A4-1 though built partially of metal. This image, which was taken in the Syracuse Inner Harbor in 1914, shows a composite construction dump barge which has both metal and wooden components. The vessel is comparable in size to A4-1 though its hull appears to be made of wood that is clad in metal sheeting and the athwartships bulkheads are made entirely of metal.

The differences in construction style and size of the hopper barges surveyed in Arthur Kill and the one depicted in the photograph of the Syracuse Inner Harbor demonstrate that this is, overall, a poorly understood type of boat. The documentation of A4-1 will add considerably to our understanding of this

vessel category, particularly as it is also the only known archaeological example from an inland waterway setting.

Figure 98: Dump Scow in Syracuse Inner Harbor 1914. This example displays composite construction instead of wooden construction but is otherwise similar to A4-1. (The Erie Canal Museum, Syracuse, NY, eriecanalmuseum.org)

Criteria D: Information Potential

1. Is Anomaly 4-1 a Dump Scow?

Dataset: Detailed examination and recording of the structure of the vessel remains

Yes, Anomaly A4-1 is a Dump Scow. The detailed examination of the vessel remains revealed features that are only present on vessels of this type, including the dump bay doors and the watertight bulkheads that surround them.

2. What are the structural and mechanical requirements for wooden dump scows?

Dataset: Detailed examination and recording of the structure of the vessel remains

While much of the structure of A4-1 is very similar to the other barges that were examined during the archaeological work carried out on Onondaga Lake, there are a few characteristics of this wreck that identify it as a dump scow. The principal feature is the central dump bay. This structure ran for a length of 55 feet (16.78m) and was 7 feet (2.3m) wide. The bay was defined by watertight bulkheads that are located along both sides and atwartships on either end. These bulkheads would have extended from the interior of the bottom planking to the underside of the decking creating the enclosing the bay, through which material could be deposited onto the lake bottom. Inside of this enclosure are five dump doors. These were held closed by a series of chains and pulleys until the vessel was appropriately located, at which time the chains were released and the door fell open - allowing the material to dump directly onto the lake bottom.

Anomaly 7: Piling Clumps

Criteria A: Engineering, Industry, Commerce, Transportation
1. What role did Anomaly 7 play in the development of the southern end of Onondaga Lake and its connections to the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

The piling clumps that make up Anomaly 7 are not mentioned specifically in any of the resources that describe the development and use of the southern end of Onondaga Lake. However, the location and the function of A7 marking the navigable channel and entrance to the Syracuse Inner Harbor helped to ensure that vessels could safely enter and exit this commercially important feature of Syracuse's waterfront. The depth of water to either side of the designated channel is extremely shallow and would not allow vessels of any size to traverse the entrance to the inner harbor. The channel was initially marked with two lights sometime between 1915 and 1926. Additional piling clumps were added between 1937 and 1942, and the system was expanded to the current number of eight piling clumps sometime after 1952. In this final configuration these pilings continue to aid vessels in safely transiting into, and out of, the Syracuse Inner Harbor.[139]

Criteria D: Informational Potential
1. What types of wood were used in the construction of the piling clumps?

Dataset: Wood sample analysis

A sample analysis determined that the wood utilized was Hard Pine (Southern Yellow pine).

Anomaly 12: Dredge

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were Dredges employed in on Onondaga Lake?

Dataset: Archival research into the development of the maritime infrastructure of Onondaga Lake

Archival research revealed no historic records of dredges being employed on Lake Onondaga. However, as there are were extensive in-water construction efforts and infrastructure improvements carried out around the lake and in the associated canal system, it can be assumed that vessels like that represented by A12 were involved in those operations. In particular, the short canal that connects Onondaga Lake to the Inner Harbor of Syracuse would have needed regular dredging to ensure that it retained sufficient depth to allow cargo vessels to safely enter the harbor. This type of vessel would have also been useful in the construction of piers, breakwaters, and other infrastructure projects. Though no written accounts of these vessels being used was found, researchers did uncover one picture of a hydraulic dredge in the Syracuse Inner Harbor demonstrating that they certainly transited this area (Figure 99).

Figure 99: Ludington's Hydraulic Dredge at Syracuse Harbor in 1921 (courtesy of NY Canal Corp.)

Criteria C: Design/Construction

1. How does the construction of Dredge A12 compare with other contemporaneous vessels that performed a similar function?

Datasets: Detailed examination and recording of the structure of the vessel remains; archival research into similar vessels from the same time period

The construction details of both bucket and hydraulic dredges are not well represented in either the historic or archaeological record. In comparative terms, three vessels of this class were noted in the documentation carried out at Kill Van Kull, New York by Raber Associates[140] in 1996, but they were only inventoried and no details were recorded of their specific structure or design. The follow-up reporting of vessels in this area by Panamerican Consultants Inc. described[141] the three dredges in slightly more detail and identified them as one bucket dredge and two hydraulic suction dredges. While the details are few,

this latter report does highlight a few features of these wrecks that are also present on A12. Vessel 3 is described as having spud boxes that measure approximately 3 feet squared (0.28m squared) which is similar in size to those on A12, though in the case of Vessel 3 they are built into the interior corners of the deck structure rather than being attached to the outside of the barge hull as on A12. Vessel 3 and Vessel 36 are described as having one vertical end (in conjunction with the spud boxes) and one raked end. This is the same arrangement that was noted on A12. Two chain plates used to support the dredge support frame were also noted on the raked end of Vessel 3, this identical arrangement was noted on A12 in Onondaga Lake.

The only other documentation of a dredge found was a set of basic drawings of the bucket dredge *Toledo* that were produced in 1910 (Figure 82). Unfortunately, these drawings were presented without a scale, and because of this are of limited use in obtaining comparable measurements with the A12 remains. These drawing do however give us some idea of what the upper works that are no longer extant on A12, may have looked like.

Criteria D: Informational Potential

1. What are the structural and mechanical requirements for a dredge?

Dataset: Detailed examination and recording of the structure of the vessel remains

The structural requirements for a dredge that were revealed during the documentation of A12 include the presence of spud boxes in combination with a vertical end; that identifies the end of the vessel as where the dredge itself operated. The spuds were located on the working end of the platform in order to ensure that the ship was very stable and properly positioned during dredging operations. The vertical end of the boat allowed the dredging operations to take place without fear of the bucket or cutter head snagging on the underside of a raked end. The interior of the barge on which the dredge is mounted was also heavily reinforced with longitudinal timbers that greatly increased the strength of platform and made it capable of supporting the large machinery that was needed to operate the dredge itself.

Anomaly 45: Stone Breakwater

Criteria A: Commerce, Transportation

1. What role did Anomaly 45 play in the development of the southern end of Onondaga Lake and its connections to the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

The placement of breakwater A45 on the southern shore of Onondaga Lake helped to protect the entrance to the Syracuse Inner Harbor from wave action that may have interfered with shipping entering and leaving the harbor. This added protection allowed commerce to continue even when wave action on the broad lake would have restricted safe vessel movement into and out of the Syracuse Inner Harbor.

Criteria C: Design/Construction

1. How were the concrete “pillows” that this feature is constructed from, made?

Dataset: Detailed documentation of the breakwater using measured drawings and underwater photography and videography

No description of how the concrete pillows (that were observed on A45) were made has been found. However, from examination of a number of the pillows in detail, it appears that a measured quantity of wet concrete was placed into burlap sacks and allowed to dry. In appears these pillows are very similar to sandbags associated with emergency flood control, except in this case they were filled with cement and hardened into permanent "armor" for the breakwater.

Criteria D: Informational Potential

1. Was the use of concrete "pillows" a common construction technique for breakwaters in the early twentieth century?

Dataset: Archival research into construction techniques for other contemporaneous breakwaters

Extensive archival research into the development and construction of breakwaters has not revealed any other descriptions of concrete "pillows" of the design discovered on A45 being used. However, the use of concrete blocks or rip rap as "armor" for a rubble filled breakwater is common practice in breakwater design and installation. In essence, the rubble mound contained under the concrete pillows is the real barrier to wave action, the concrete pillows that were used to encase the rubble mound act as armor to dissipate the force of the waves and protect the rubble mound from erosion.[142]

Anomaly 53: Canal Boat

Criteria A: Engineering, Industry, Commerce, Transportation

1. What role did canal boats play in the development of the maritime industry and commerce on Onondaga Lake before and after the opening of the New York State Barge Canal?

Dataset: Archival research into the maritime infrastructure of Lake Onondaga

Canal boats played a significant role in the development of the maritime industry on and around Onondaga Lake. The connection of the lake to the canal system allowed the industries along the lakeshore to ship their product out to a broad market at a reasonable cost. Canal boats were also able to bring in the raw material and equipment needed by these industries to operate in an efficient manner. For example, wood brought into Onondaga Lake on canal boats was used in the salt evaporation process. In turn, these same canal boats then carried the salt out of the lake, with more than 1,600,000 bushels of salt shipped in 1833 alone. This volume of salt only increased over time, and more than 9,000,000 bushels were shipped out in 1862.[143] In addition to their commercial uses, canal boats were also used to transport visitors to the growing resort industry along the shores of Onondaga Lake.

With the opening of the New York State Barge Canal in 1918, and the construction of the Syracuse Inner Harbor, Onondaga Lake became the route by which canal boats engaged with the industries of Syracuse. These vessels continued were active in the lake trade for at least a decade after the opening of the barge canal, but were soon replaced by larger steel barges that made more efficient use of the enlarged lock sizes on the barge canal.

Criteria C: Design/Construction

1. Why was "cocked hat" construction used on this vessel?

Dataset: Archival research into the construction of similar vessels from the same time period.

The reason that the builder of A53 chose to use the cocked-hat construction technique is not readily apparent and his decision most likely encompassed a number of considerations. First, this technique is an economical approach to joining the sides and bottom of a canal boat when compared to the use of naturally grown curved knees as would be expected in more traditional ship construction. Also, it is a fairly simple technique to master and therefore did not take particular skill to employ.

Criteria D: Informational Potential

1. Was "cocked hat" construction used on other contemporaneous vessels?

Dataset: Detailed examination and recording of the structure of the vessel remains

The cocked-hat construction technique is not widely represented in the archaeological record, but there are examples worth noting. In particular, this technique appears to have been employed in the construction of some western river steamboats. The wreck of the stern wheel steamboat *Andy Gibson,* located in the upper Mississippi River, demonstrates the cocked hat technique. *Andy Gibson* was constructed in 1884 and sank in 1892 in Akin County, Minnesota, a timeframe that fits well with the estimated date range of A53. Beyond the realm of the western river steamboat, cocked hat construction was also documented in a number of Civil War Era wrecks like the Confederate gunboat *Cairo*.[144]

While the cocked hat construction technique was employed, and has been archaeologically identified, on a number of vessels contemporaneous to A53, those examples are all from the western river portion of the American Midwest. The presence of this technique on vessels located in Onondaga Lake suggests that its usage was more widespread than previously understood.

2. Was "cocked hat" construction an effective alternative to traditional shipbuilding techniques?

Dataset: Detailed examination and recording of the structure of the vessel remains

The effectiveness of the cocked hat construction technique in comparison to traditional ship building practices is difficult to assess from the remains present at the site of A53. The junction of the sides and bottom of watercraft that have a "hard" chine like A53 is known as a potential weak point in their construction. Perhaps this is best illustrated on A53 by the complete absence of any remains of the vessel's sides. The lack of these structures, and the presence of the bottom timbers and associated cocked hats and floors, suggests that the sides broke away at the chine cleanly and either floated off or were removed as obstructions. These facts suggest that this construction method was not as effective as traditional techniques that employed naturally curved knees to form the chine junction. In all likelihood, the cocked hat construction technique was employed because it was quick and cheap in comparison to more established techniques. Shipbuilding is always a compromise between cost and durability. In the case of A53 it appears that lower cost and ease of construction outweighed the need for the vessel to be particularly long lived.

Anomaly 2-1: Steam Launch or Tugboat

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were Steam Launches and Tugboats employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

As with most waterfronts, steam launches and tugboats were used as general purpose vessels on Onondaga Lake. Tugs were often employed towing other vessels, including canal boats and barges, throughout the lake and local canal system. Where tugboats were used to move vessels and goods, excursion boats were used to move people around Onondaga Lake. Undoubtedly, launches were used by the large resorts located on the lake's shoreline to expose their visitors to the sights around Onondaga Lake as well as general transportation for people to, from and between various waterfront establishments (Figure 22).

Criteria C: Design/Construction
1. How does the construction of Steam Launch of Tugboat A2-1 compare with other contemporaneous vessels that performed a similar function?

Dataset: Detailed examination and recording of the structure of the vessel remains

The construction of A2-1 has very few comparative examples in the archaeological record. Several other tugboats dating to the late nineteenth century have been studied in some detail but all of these examples are from salt water environments and most represent larger vessels than that demonstrated by A2-1.[145] The waters of Onondaga Lake and the associated canal system required particular attributes and construction techniques that allowed the vessels built for these environments to operate in confined spaces and to access shallow water areas without running aground. These attributes are achieved in A2-2 by limiting its size and depth of hold. The goal of being able to operate in shallow water necessitated that A2-2 have a relatively flat bottom and a hard chine; these are not attributes that a salt water vessel of this class would typically display.

Perhaps the best comparative vessel to A2-1 in the archaeological record is the tug *Edward E. Gillen* which was launched in 1928 in Sturgeon Bay, Wisconsin.[146] Though *Edward E. Gillen* was built to operate on the much larger waters of the Great Lakes, it was of comparable size to A2-1 measuring 73 feet in (22.3m) length and 19 feet (5.8m) in beam. Unfortunately this vessel is located in heavily contaminated sediments in the Kinnickinnic River near Milwaukee. Due to the contaminated nature of the site, it has not been documented thoroughly and therefore we do not have detailed information about its hull construction to compare with the remains found at A2-1.

Anomaly 2-2: Canal Packet

Criteria A: Engineering, Industry, Commerce, Transportation
1. What type of activities were Canal Packets employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

By definition a canal packet was designed and built to carry people on the canal system and its associated bodies of water, like Onondaga Lake (Figure 100). This is best displayed on A2-2 by the fact that though

it shares many of the construction characteristics of a standard canal boat, its length is too short to take full advantage of the lock size within the canal system. As the construction of this vessel type was not trying to maximize its cargo capacity, it could be built to a shorter length than a standard canal boat and still perform its tasks adequately.

Figure 100: A Canal Packet Boat on the Erie Canal c.1895 (New York State Archives)

Criteria C: Design/Construction

1. How does the construction of Canal Packet A2-2 compare with other contemporaneous vessels that performed a similar function?

Dataset: Archival research into the construction of similar vessels from the same time period.

As A2-2 is the only known wreck believed to represent a canal packet, there are no contemporary vessels with which to compare its construction style. However A2-2 does share some characteristics with standard canal boats of the same time period.[147] The standard canal boats of the late nineteenth century have vertical edge fastened sides like A2-2 which allowed ship builders to construct a very rigid hull with a minimal amount of expensive timber. Additionally, A2-2 has a scow shaped stern which is also a common feature of standard canal boats. However, A2-2 does display a number of characteristics that are not found on canal boats of a similar age including its system of diagonal bracing and the laminated construction of its sides. Since there are no other known archaeological examples of a canal packet it is unclear if these features were common of this vessel type or unique to A2-2.

Anomaly 2-3: Steam Excursion vessel

Criteria A: Engineering, Industry, Commerce, Transportation

1. What type of activities were Excursion Vessels employed in on Onondaga Lake?

Dataset: Archival research into the maritime infrastructure of Onondaga Lake

Excursion vessels were used around Onondaga Lake for the transportation of passengers between establishments along the shoreline as well as for taking sightseeing tours of the lake. In this role they played an important part of the lakes transportation system (Figure 22).[148]

Criteria C: Design/Construction
1. How does the construction of Excursion Vessel A2-3 compare with other contemporaneous vessels that performed a similar function?

Dataset: Archival research into the construction of similar vessels from the same time period.

Research into the archaeological record has not revealed the study of any other steam excursion vessels to date. Additionally the scant remains of this vessel do not leave a lot of room for comparison with other contemporary watercraft. The construction of the exposed portion of A2-3's stern is similar to any number of late nineteenth or early twentieth century vessels and is fairly standard for freshwater boats of this period.[149] A2-3's scantlings are quite light and what can be determined about its length-to-beam ratio suggests that this was a very long and narrow vessel that would have allowed it to travel quickly through the water.

Anomaly 2-4: Barge Timbers

Criteria C: Design/Construction
1. How does the construction of Barge Timbers A2-4 compare with other contemporaneous vessels of this type?

Dataset: Archival research into the construction of similar vessels from the same time period.

The construction techniques displayed in the remains of the barge timbers at A2-4 suggest that they are the remains of the lower side structure of a barge, possibly representing the chine log of the vessel. The construction techniques displayed in this anomaly are fairly standard but this portion of a barge's construction is rarely accessible when additional structure is present (as is the case with the other barge sites on Onondaga Lake).[150] Therefore it is difficult to assess how this fragment compares with the chine log assemblies of other barges. The fact that this rarely seen portion of a barges construction is readily accessible with A2-4 adds to the significance of this otherwise mundane site.

Data Analysis Conclusions
As demonstrated by the answers to the research questions posited above, it is clear that the Syracuse Maritime Historic District encompasses a variety of historically important sites that offer a significant amount of information to our understanding of the maritime environment on Onondaga Lake, and the role it played within the larger canal system. The shipwreck properties that are contained within the historic district (A53, A12, A4-1, A2-1, A2-2, A2-3, A2-4) include a variety of vessel types that are demonstrative of the inland freshwater shipbuilding practices of the late nineteenth and early twentieth century. This was a time period when shipbuilding along the canal system, and its associated bodies of water, saw a number of new techniques being experimented with and deployed. The archaeological data set for vessels from this "niche" area of study is also quite small and poorly documented, making the data recovery that was carried out for this investigation even more valuable. In addition to the vessel remains, the marine infrastructure properties encompassed by the Syracuse Maritime Historic District (A7, A2, A45) highlight that fact that the northern end of Onondaga Lake was a vibrant and important portion of the larger regional maritime traffic system. These structures were put into place to ensure that traffic could safely traverse and this portion of the lake in order to carry out the commerce that was vital to the continued vitality of Syracuse and the surrounding area. The use of the Salina Pier complex (A2) as a "ship

graveyard" also demonstrated that these infrastructure components still had value and opportune usefulness beyond their commercial lives.

CONCLUSIONS

Since 2007, Lake Champlain Maritime Museum (LCMM) under subcontract to Parsons and on behalf of Honeywell, has been performing archaeological investigations of the Onondaga Lake bottom in support of the remedial activities of the Onondaga Lake Cleanup Plan. Recommendations from Phase 1B work were outlined in a mitigation plan for six historically significant properties located within the Syracuse Maritime Historic District that will be impacted during remedial activities in Onondaga Lake (A1/2, A4, A7, A12, A45, and A53). During mitigation fieldwork performed in 2012 and 2013, four previously unknown shipwrecks were also located and documented (A2-1, A2-2, A2-3, and A2-4).

In all, ten sites within the proposed Syracuse Maritime Historic District were documented in this Phase 3 work. In September and October 2012, and in May 2013, LCMM archaeologists carried out 29 days of archaeological fieldwork which included 89 dives totaling 126.4 hours of bottom time.

The archaeological activities complied with the NY State Office of Parks, Recreation and Historic Preservation's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in NY State* and the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation,* as amended and annotated (48 FR 44716).

The ten sites represent a variety of property types, and were documented with a variety of techniques, including videography, photography, detailed measured drawings, and the recovery and analysis of wood samples.

- Vessels: Dump scow (A4), Dredge (A12), Canal Boat (A53), Steam tug/launch (A2-1), Canal packet (A2-2), Steam excursion vessel (A2-3), Barge (A2-4)
- Marine Infrastructure: Salina Pier (A1/2), Concrete breakwater (A45)
- Aid to navigation: pilings (A7)

Scant information is available in the historic record about these workaday vessels or the infrastructure that supported them: often the best resource is what lies underwater. The documentation of these ten sites as mitigation within the Onondaga Lake Cleanup Plan has added to our knowledge base about late nineteenth and early twentieth century vessel and infrastructure construction techniques. This Phase 3 documentation has allowed a better understanding of the vessels and infrastructure themselves, the manner of their construction, and the relationship they had to the interconnected waterways surrounding Syracuse. Ultimately, at the end of their working life, they took on another association as an archaeological resource, ultimately becoming part of a collection of vessels known as the Syracuse Maritime Historic District. Through historical research and intensive fieldwork, and a better understanding of the proposed district and its contributing properties has been gained.

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