

SIDE SCAN SONAR REPORT

**GOWANUS CANAL PRELIMINARY
BULKHEAD STUDY**

**BROOKLYN, KINGS COUNTY,
NEW YORK**



prepared for

HDR, Inc.
One Blue Hill Plaza
Pearl River, NY 10965

and

United States Environmental Protection Agency
Region 2
Division of Environmental Planning and Protection
290 Broadway, 25th Floor
New York, NY 10007-1866

by

J. Lee Cox, Jr.



Dolan Research, Inc.
30 Paper Mill Road
Newtown Square, PA 19073

December 2010

Page Intentionally Left Blank

Introduction

As part of the on-going Gowanus Canal Preliminary Bulkhead Study, high-frequency side scan sonar data were collected in Gowanus Canal, Brooklyn, NY. Side scan sonar data were collected along the entire length of the canal, from the mouth to the upstream limits above Douglas Street, including three large boat basins and a small boat basin (Figure 1). The purposes and goals of the investigation were to identify site conditions, anomalies, obstructions, and potential submerged cultural resources in the canal and boat basins and along the various bulkheads that canalized the waterway.

Description of Work Area

Sonar coverage extended from the mouth of the canal marked by a Hess marine terminal, all the way up to the head of the canal, including the four boat basins in the canal system. For the purposes of this side scan sonar survey, the four boat basins are referred to as Cove 1, Cove 2, etc. from north to south. Under our labeling designations, Cove 1 is the 5th St. boat basin, Cove 2 is the 6th St. boat basin, Cove 3 is the 7th St boat basin, and Cove 4 is the 11th St. (Lowes) boat basin.

At the mouth of the canal water depth generally exceeded 30 feet. While the entire canal is tidal water depth averaged 6-10 feet at mean low water (mlw) during our investigations. At the head of the canal and within the boat basins, water depth dropped to less than three feet (mlw). A large diameter aeration pipe extended from below the 3rd St. Bridge to Douglas St., near the head of the canal.

To access the entire range of the canal all work was conducted at or near high tide. Due to DGPS limitations while navigating under several of the five bridges that span the canal, accurate sonar coverage under the bridges was limited.

Summary of Field Survey and Equipment

Project horizontal reference is the New York (East) State Plane Coordinate System, NAD 83, in feet.

Side scan sonar survey operations were conducted from a 23-foot aluminum *SeaArk* survey vessel. A *Marine Sonic* Sea Scan HDS all-digital side scan sonar system with a dual frequency, 600/1200 kHz tow fish, was used to conduct the acoustic survey. *Hypack*, a laptop PC-based software package in conjunction with a Differential Global Positioning System (DGPS) onboard the survey vessel, provided positioning accuracy for the survey area of +/- three (3) feet. The sonar unit was operated at a 100-foot range within the canal and boat basins to provide comprehensive coverage and sufficient detail of all features. At the mouth of the canal, south of the Hamilton Avenue Bridge, the sonar was set to a range of 150-feet since the water was deeper and the project area was considerably wider at this location.

The side scan sonar derives its information from reflected acoustic energy that is recorded onto a laptop survey computer. Side looking sonar, which transmits and receives swept high frequency bandwidth signals from transducers mounted on a sensor that is towed from a survey vessel. Two sets of transducers mounted in an array along both sides of the towfish generate the short duration acoustic pulses required for high resolution images. The pulses are emitted in a thin, fan-shaped pattern that spreads downward to either side of the towfish in a plane perpendicular to its path. As the fish is towed along the survey trackline this acoustic beam sequentially scans the bottom from a point beneath the fish outward to each side of the trackline.

Sonar data were gathered to document the nature and condition of the submerged portions of the canal floor and the various bulkheads that canalized the canal and the boat basins. Acoustic energy reflected from any discontinuities on the canal floor or along the faces of the bulkheads (exposed portions of cribbing, gaps in the sheet piles or cribbing, or blow-outs where rip-rap or other fill material has failed and spilled out onto the canal floor) is received by the set of transducers, amplified and transmitted to the survey vessel via a tow cable. The digital output from state-of-the-art units is essentially analogous to a high-angle oblique photograph and it provided detailed representations of submerged features and structural characteristics in the canal.

Raw sonar data files were edited using software from *Chesapeake Technology*. Data files were processed by adding the appropriate layback, and removing the water column from the records. A layback program in *Chesapeake Technology* provided sensor positioning. The actual sensor position was calculated by integrating two components; 1) offsets from the GPS antenna to the towing point, and 2) cable out to the sensor. The software then automatically calculated the sensor position for every sonar ping. The layback calculation was checked for each sonar set-up by conducting reciprocal passes on one end of a bulkhead corner.

All processed sonar files were then compiled into a geo-referenced sonar mosaic of the canal. The sonar mosaic was then overlaid onto a geo-referenced aerial photograph of the canal. All sonar records were inspected for potential man-made features and obstructions present on the canal floor. Individual acoustic data files were initially examined using Marine Sonic's *SeaScan* acoustic data review software to identify any unnatural or man-made features in the canal. Individual targets, e.g. localized obstructions, are described and displayed independently in Table 1, below. Acoustic targets are normally defined according to their spatial extent, configuration, location and environmental context.

Data Analysis & Discussion

While detailed and comprehensive sonar data were collected throughout the canal and all four boat basins, a few limiting factors were encountered. Various locations between the 3rd Street Bridge and the head of the canal were being actively aerated. The aeration process generated large volumes of air bubbles into the water column that effectively blanked-out sonar returns in the immediate vicinity of the aeration outfall points. Double-berthed construction and work barges also prevented comprehensive acoustic coverage at two locations at the mouth of the canal.

Locations of sonar contacts were typically described relative to the closest side of the canal. Since the path of the canal changes directions, the listed side of the canal (starboard – right, or port – left) was oriented to ascending the canal, or moving upstream.

Sonar Findings

Sonar records confirm the presence of isolated debris and general debris scatters, ship and/or barge wrecks, debris from bulkhead failures, and isolated objects and obstructions at various locations across the canal. A sonar mosaic of the entire canal was produced (Figure 1). Details of the mosaic at five locations within the canal are presented in Figures 2-6. A total of 29 features/obstructions or other noteworthy bottom characteristics were identified in the canal. See Table 1, below, for a complete listing and description of the bottom features identified on the sonar records. Locations of the 29 targets are depicted in Figures 7-9.

The 29 sonar targets and target clusters can be generally characterized into four groups: potential submerged cultural resources (7); isolated debris – potential cars (2); linear and circular debris or

debris fields (13); and rip-rap debris associated with apparent bulkhead failures (7). Typical examples of all the target types are found in Figures 10 – 18.

Sonar contacts **31**, **31a**, **31b**, **37a**, **37b**, **37c**, and **39** are considered to be associated with potential submerged cultural resources. All seven contacts are located in Coves 1 and 2. A 60' long, round-ended shipwreck in Cove 1 was identified as Contact **31a**. Two large square-ended wood barges (contacts 37a & 37b) were identified in Cove 2. The other four potential submerged cultural resources are not intact ship wrecks but may represent material from ships.

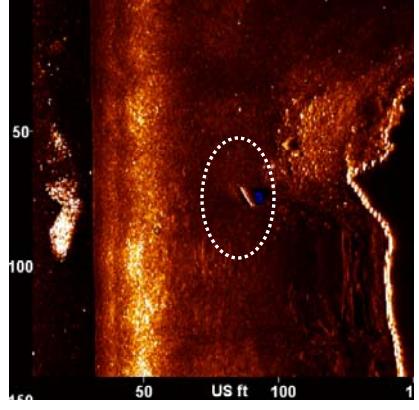
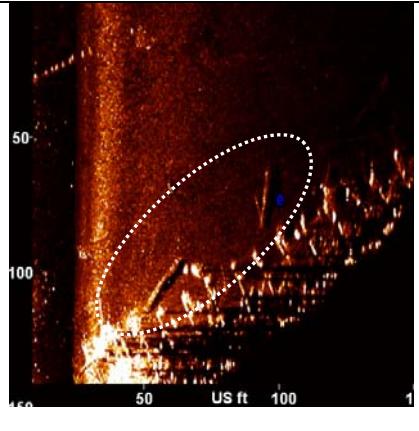
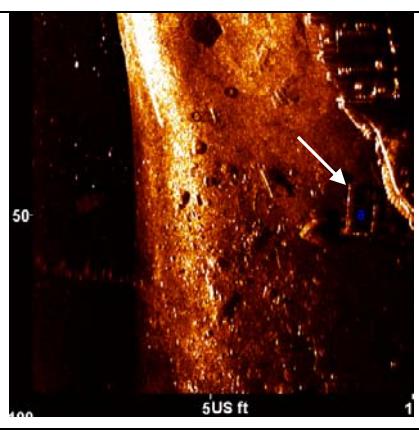
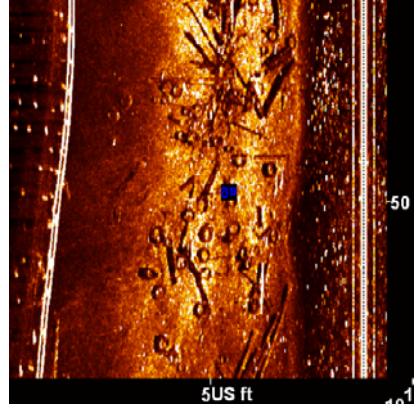
Sonar contacts **2a** and **2b**, rectangular features partially buried close to bulkheads, have the potential to be automobiles or large containers discarded from the shoreline. Sonar contacts **2**, **3**, **5**, **9**, **9a**, **24**, **26**, **28**, **31c**, **35**, **42a**, **48**, and **52** have been classified as linear or circular debris or debris fields. While debris is widespread across much of the canal these locations had prominent clusters or clearly defined individual objects and were designated as contacts. Sonar contacts **11**, **11a**, **11b**, **17**, **37**, **42**, and **42b** were associated with debris fields that have spilled away from bulkheads – that are assumed to be compromised.

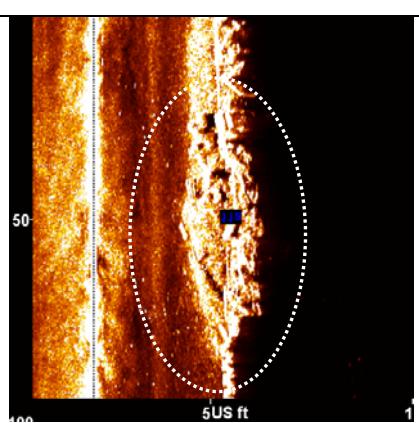
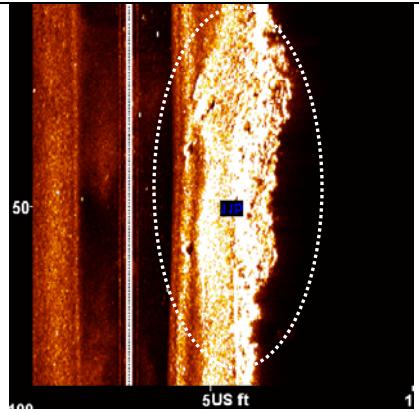
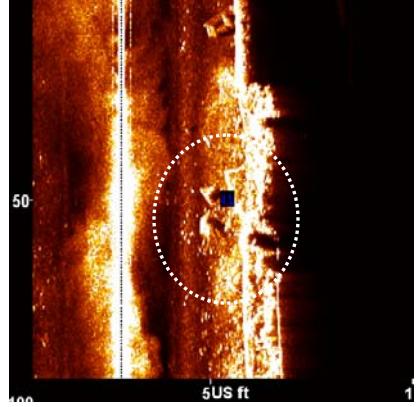
Page Intentionally Left Blank

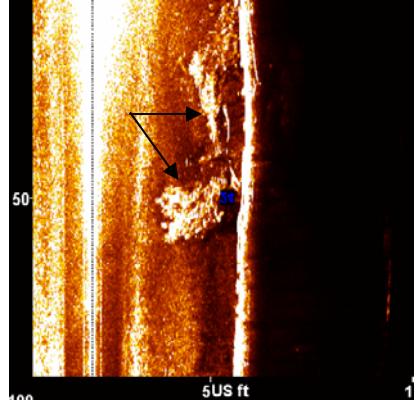
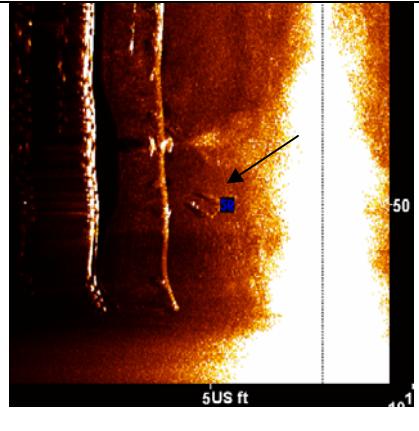
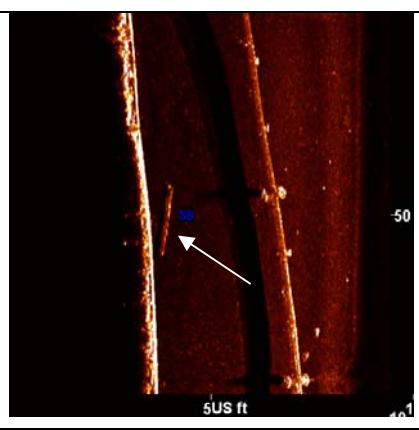
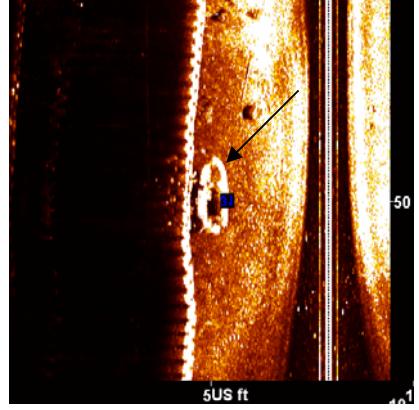
Table 1. Sonar Contacts in Gowanus Canal

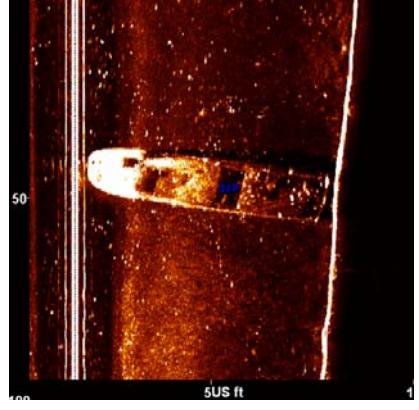
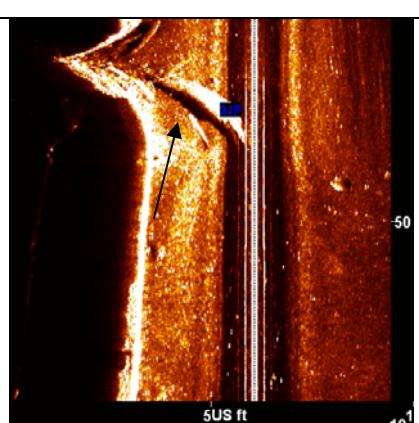
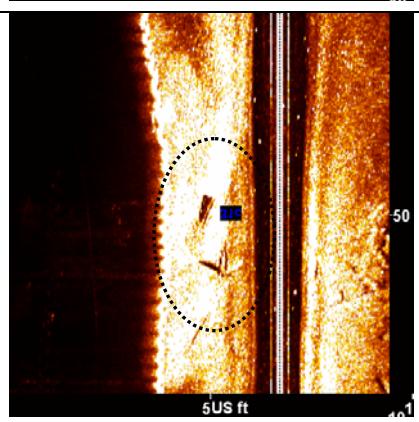
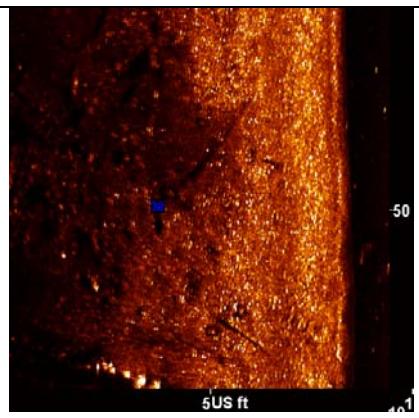
Note: Projected coordinates are expressed in New York (East) State Plane System (NAD83, feet)

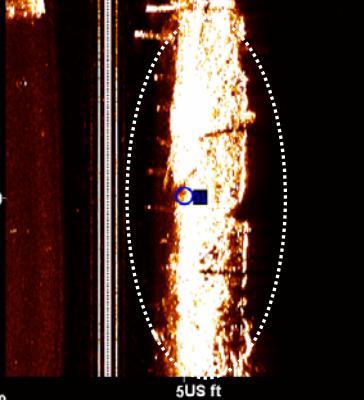
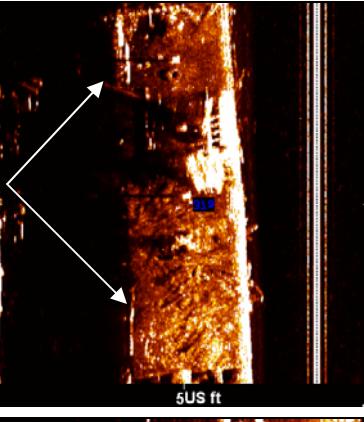
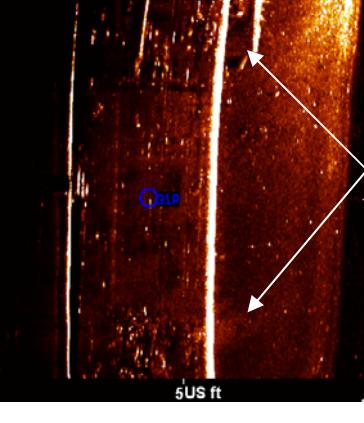
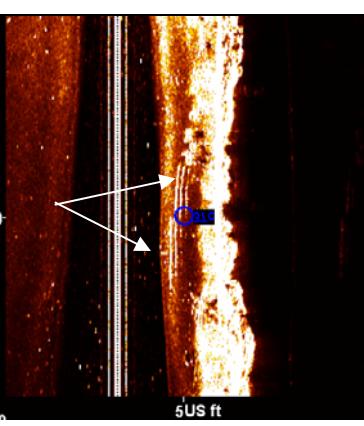
Contact Image	Contact Info	Comments
	<p>2</p> <ul style="list-style-type: none"> • Sonar Time at Target: 11/12/2010 15:32:45 • Click Position (Lat/Lon Coordinates) 40° 40.01747' N 074° 00.11718' W (WGS84) • Click Position (Projected Coordinates) (X) 630278.06 (Y) 668260.25 • Map Proj: • Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0002.sds • Ping Number: 2956 • Range to Target: 15.56 US Feet • Fish Height: 10.41 US Feet • Event Number: 0 • Line Name: FILE0002 	<p>Dimensions</p> <p>Target Length 35.2 US Feet Target Shadow: 0.0 US Feet Target Width: 3.8 US Feet</p> <p>Description: A 3.7' wide, hard square object with an associated linear feature that is over 35' long was located close to the ascending starboard side canal bulkhead, at the mouth of the canal</p>
	<p>2a</p> <ul style="list-style-type: none"> • Sonar Time at Target: 11/12/2010 15:32:50 • Click Position (Lat/Lon Coordinates) 40° 40.01380' N 074° 00.12359' W (WGS84) • Click Position (Projected Coordinates) (X) 630249.25 (Y) 668237.81 • Map Proj: • Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0002.sds • Ping Number: 3016 • Range to Target: 15.81 US Feet • Fish Height: 10.39 US Feet • Event Number: 0 • Line Name: FILE0002 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 10.6 US Feet Target Shadow: 0.0 US Feet Target Width: 4.6 US Feet</p> <p>Description: A rectangular object, 10.6' long and 4.6' wide (on its side), lying on the base of the rip rap associated with the ascending starboard side canal bulkhead. Feature may be an automobile.</p>
	<p>2b</p> <ul style="list-style-type: none"> • Sonar Time at Target: 11/12/2010 15:33:07 • Click Position (Lat/Lon Coordinates) 40° 40.00717' N 074° 00.14694' W (WGS84) • Click Position (Projected Coordinates) (X) 630141.31 (Y) 668197.13 • Map Proj: • Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0002.sds • Ping Number: 3208 • Range to Target: 12.02 US Feet • Fish Height: 10.36 US Feet • Event Number: 0 • Line Name: FILE0002 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 13.3 US Feet Target Shadow: 0.0 US Feet Target Width: 5.7 US Feet</p> <p>Description: A 13.3' long x 5.7' wide rectangular feature that is lying at the base of the ascending starboard side canal bulkhead. Feature may be an automobile.</p>

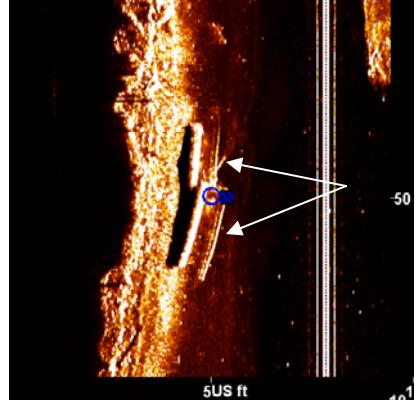
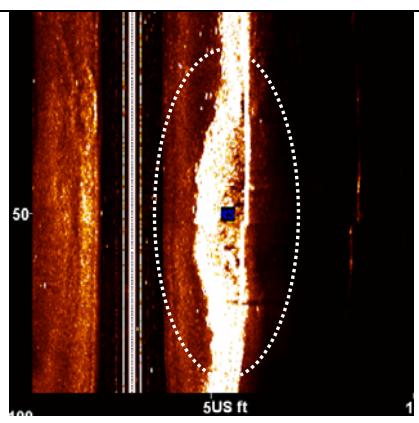
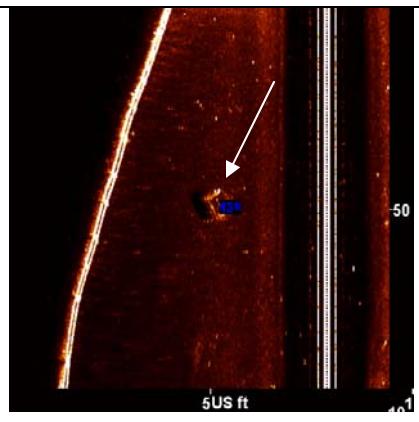
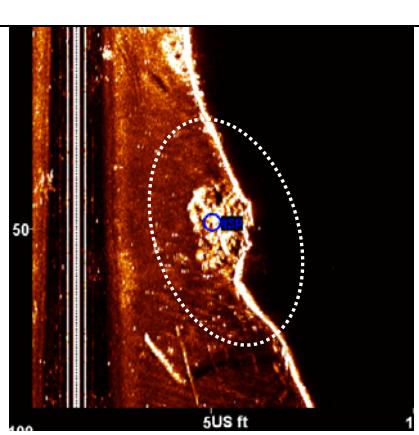
	<p>3</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 15:36:31 Click Position (Lat/Lon Coordinates) 40° 40.05958' N 074° 00.04486' W (WGS84) Click Position (Projected Coordinates) (X) 630612.63 (Y) 668517.63 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0003.sds Ping Number: 5283 Range to Target: 26.76 US Feet Fish Height: 10.55 US Feet Event Number: 0 Line Name: FILE0003 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length8.4 US Feet Target Shadow:0.0 US Feet Target Width:1.9 US Feet</p> <p>Description: An 8.4' long by 1.9' wide hard linear feature that is lying near the base of a pile of rip rap along the ascending starboard side canal bulkhead, at the mouth of the canal.</p>
	<p>5</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 15:47:53 Click Position (Lat/Lon Coordinates) 40° 40.12596' N 074° 00.03662' W (WGS84) Click Position (Projected Coordinates) (X) 630648.44 (Y) 668920.31 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0005.sds Ping Number: 10998 Range to Target: 29.21 US Feet Fish Height: 9.18 US Feet Event Number: 0 Line Name: FILE0005 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length19.8 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: Linear debris pieces are scattered on the bottom close to the ascending port side canal bulkhead. Typical features are approximately 20' long.</p>
	<p>9</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 15:55:54 Click Position (Lat/Lon Coordinates) 40° 40.18020' N 073° 59.93682' W (WGS84) Click Position (Projected Coordinates) (X) 631107.25 (Y) 669252.06 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0009.sds Ping Number: 16449 Range to Target: 25.61 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0009 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length13.9 US Feet Target Shadow:0.0 US Feet Target Width:7.3 US Feet</p> <p>Description: A 13.9' x 7.3' rectangular feature is lying amidst other debris adjacent to the ascending starboard side canal bulkhead, downstream of the Hamilton Ave. Bridge</p>
	<p>9a</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 15:57:18 Click Position (Lat/Lon Coordinates) 40° 40.26901' N 073° 59.93545' W (WGS84) Click Position (Projected Coordinates) (X) 631110.88 (Y) 669791.88 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0009.sds Ping Number: 17770 Range to Target: 11.50 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0009 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length0.0 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: A wide spread scatter of misc. debris across the entire canal floor, downstream of the Hamilton Ave. Bridge. Debris is primarily comprised of tires and linear features</p>

	<p>11a</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 16:19:13 Click Position (Lat/Lon Coordinates) 40° 40.55213' N 073° 59.56146' W (WGS84) Click Position (Projected Coordinates) (X) 632829.75 (Y) 671520.44 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0011.sds Ping Number: 26365 Range to Target: 8.81 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0011 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 0.0 US Feet Target Shadow: 0.0 US Feet Target Width: 0.0 US Feet</p> <p>Description: Pile of debris that has fallen away from the bulkhead on the ascending starboard side of the canal between Coves 1 & 2.</p>
	<p>11b</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 16:20:28 Click Position (Lat/Lon Coordinates) 40° 40.53749' N 073° 59.47494' W (WGS84) Click Position (Projected Coordinates) (X) 633229.50 (Y) 671434.63 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0011.sds Ping Number: 27407 Range to Target: 6.19 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0011 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 0.0 US Feet Target Shadow: 0.0 US Feet Target Width: 0.0 US Feet</p> <p>Description: A long pile of rip rap, almost 200' long, has fallen away from the bulkhead on the ascending starboard side of the canal, just below Cove 1</p>
	<p>17</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 16:34:13 Click Position (Lat/Lon Coordinates) 40° 40.60432' N 073° 59.39208' W (WGS84) Click Position (Projected Coordinates) (X) 633610.81 (Y) 671842.25 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0017.sds Ping Number: 34369 Range to Target: 6.74 US Feet Fish Height: 5.39 US Feet Event Number: 0 Line Name: FILE0017 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 0.0 US Feet Target Shadow: 0.0 US Feet Target Width: 0.0 US Feet</p> <p>Description: A pile of hard, square debris is present along the ascending port side canal bulkhead between the 3rd St. and Carroll St. bridges</p>

	<p>24</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 16:53:02 Click Position (Lat/Lon Coordinates) 40° 40.85243' N 073° 59.25567' W (WGS84) Click Position (Projected Coordinates) (X) 634232.88 (Y) 673351.31 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0024.sds Ping Number: 42226 Range to Target: 8.93 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0024 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length57.2 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: A large feature (suspected to be part of a tree), is present along the ascending port side bulkhead of the canal, above the Union St. bridge. Feature extends for more than 57' along the bulkhead.</p>
	<p>26</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 16:56:42 Click Position (Lat/Lon Coordinates) 40° 40.74142' N 073° 59.31701' W (WGS84) Click Position (Projected Coordinates) (X) 633953.13 (Y) 672677.06 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0026.sds Ping Number: 44324 Range to Target: 8.43 US Feet Fish Height: 4.95 US Feet Event Number: 0 Line Name: FILE0026 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length6.9 US Feet Target Shadow:0.0 US Feet Target Width:3.1 US Feet</p> <p>Description: A "U"-shaped object, 7' x 3', lying flat on the canal floor, next to the aeration pipeline between the Union St. & Carroll St. bridges</p>
	<p>28</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:20:24 Click Position (Lat/Lon Coordinates) 40° 40.61416' N 073° 59.36416' W (WGS84) Click Position (Projected Coordinates) (X) 633739.13 (Y) 671902.31 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0028.sds Ping Number: 46575 Range to Target: 18.29 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0028 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length20.1 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: Linear object, 20' long located adjacent to the ascending starboard side canal bulkhead, between Carroll St. and 3rd St. bridges</p>
	<p>31</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:40:44 Click Position (Lat/Lon Coordinates) 40° 40.52696' N 073° 59.42687' W (WGS84) Click Position (Projected Coordinates) (X) 633453.19 (Y) 671371.88 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0031a.sds Ping Number: 48477 Range to Target: 8.81 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0031a 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length18.9 US Feet Target Shadow:0.0 US Feet Target Width:8.1 US Feet</p> <p>Description: A small boat wreck, 19' x 8', lies on the canal floor adjacent to the ascending port side canal bulkhead in Cove 1. Misc. debris is located on the canal floor near the wreck.</p>

	<p>31a</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:42:06 Click Position (Lat/Lon Coordinates) 40° 40.47958' N 073° 59.39437' W (WGS84) Click Position (Projected Coordinates) (X) 633604.38 (Y) 671084.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0031a.sds Ping Number: 49376 Range to Target: 10.24 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0031a 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 59.8 US Feet Target Shadow: 0.0 US Feet Target Width: 13.0 US Feet</p> <p>Description: The hull of a sunken boat is located perpendicular to the ascending starboard side canal bulkhead in Cove 1. The rounded end of the vessel is located on the offshore side of the wreck. A deck and hatch like opening in the deck are visible. The wreck is 59.8' long and 13' wide.</p>
	<p>31b</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:43:09 Click Position (Lat/Lon Coordinates) 40° 40.46379' N 073° 59.34356' W (WGS84) Click Position (Projected Coordinates) (X) 633839.88 (Y) 670990.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0031a.sds Ping Number: 50002 Range to Target: 3.28 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0031a 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 24.5 US Feet Target Shadow: 0.0 US Feet Target Width: 6.1 US Feet</p> <p>Description: A hard rectangular feature, 24.5' x 6', with several feet of relief off the canal floor is located in the northeastern corner of Cove 1.</p>
	<p>31c</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:41:13 Click Position (Lat/Lon Coordinates) 40° 40.50613' N 073° 59.42138' W (WGS84) Click Position (Projected Coordinates) (X) 633479.31 (Y) 671244.81 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0031.sds Ping Number: 48823 Range to Target: 5.19 US Feet Fish Height: 1.93 US Feet Event Number: 0 Line Name: FILE0031 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length 9.3 US Feet Target Shadow: 0.0 US Feet Target Width: 4.4 US Feet</p> <p>Description: Two rectangular features, longer one is 9.3' x 4.4', are lying on the canal floor near the ascending port side canal bulkhead in Cove 1</p>
	<p>35</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:49:56 Click Position (Lat/Lon Coordinates) 40° 40.55351' N 073° 59.65438' W (WGS84) Click Position (Projected Coordinates) (X) 632400.31 (Y) 671526.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0035.sds Ping Number: 54513 Range to Target: 20.45 US Feet Fish Height: 4.77 US Feet Event Number: 0 Line Name: FILE0035 	<p>Dimensions</p> <p>Description: Wide scatter of debris across the canal floor at the mouth of Cove 2.</p>

	<p>37</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:52:39 Click Position (Lat/Lon Coordinates) 40° 40.51643' N 073° 59.61181' W (WGS84) Click Position (Projected Coordinates) (X) 632598.56 (Y) 671301.94 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0037.sds Ping Number: 56231 Range to Target: 5.78 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0037 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length127.5 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: A 127' long section of rubble/rip-rap that was spilled out of the ascending starboard side canal bulkhead in Cove 2.</p>
	<p>37a</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:53:02 Click Position (Lat/Lon Coordinates) 40° 40.51506' N 073° 59.58847' W (WGS84) Click Position (Projected Coordinates) (X) 632705.88 (Y) 671295.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0037.sds Ping Number: 56473 Range to Target: 10.01 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0037 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length110.1 US Feet Target Shadow:0.0 US Feet Target Width:32.2 US Feet</p> <p>Description: The sunken remains of a 110' long x 32' wide square-ended barge is lying on the canal floor in Cove 2. Some superstructure from the deck of the barge is visible above the water surface.</p>
	<p>37b</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:53:59 Click Position (Lat/Lon Coordinates) 40° 40.49858' N 073° 59.54452' W (WGS84) Click Position (Projected Coordinates) (X) 632910.44 (Y) 671196.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0037.sds Ping Number: 57062 Range to Target: 17.93 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0037 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length126.6 US Feet Target Shadow:0.0 US Feet Target Width:37.3 US Feet</p> <p>Description: The hull of a square-ended barge, 126' x 37' is lying on the canal floor in the northeast corner of Cove 2. The wreck of a small fiberglass boat is resting on the deck of this barge</p>
	<p>37c</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:53:53 Click Position (Lat/Lon Coordinates) 40° 40.48965' N 073° 59.55688' W (WGS84) Click Position (Projected Coordinates) (X) 632853.56 (Y) 671141.94 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0037.sds Ping Number: 57004 Range to Target: 5.00 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0037 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length29.7 US Feet Target Shadow:0.0 US Feet Target Width:0.0 US Feet</p> <p>Description: Two hard rectangular features, 29' long are lying on the canal floor next to the ascending starboard side canal bulkhead in Cove 2. These 2 rectangular features are in the middle of a pile of rip rap that has fallen away from the bulkhead.</p>

	<p>39</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 17:55:31 Click Position (Lat/Lon Coordinates) 40° 40.50018' N 073° 59.57565' W (WGS84) Click Position (Projected Coordinates) (X) 632765.25 (Y) 671204.31 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0039.sds Ping Number: 57830 Range to Target: 8.64 US Feet Fish Height: 0.00 US Feet Event Number: 0 Line Name: FILE0039 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length21.8 US Feet Target Shadow:0.0 US Feet Target Width:8.0 US Feet</p> <p>Description: Two rectangular objects are lying on the canal floor adjacent to the ascending starboard side canal bulkhead in Cove 2. One of the features is partially lying on top of the other feature. The top feature is 21.8' long x 8.0' wide.</p>
	<p>42</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 18:02:18 Click Position (Lat/Lon Coordinates) 40° 40.49537' N 073° 59.71893' W (WGS84) Click Position (Projected Coordinates) (X) 632103.13 (Y) 671171.88 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0042.sds Ping Number: 62674 Range to Target: 6.01 US Feet Fish Height: 2.76 US Feet Event Number: 0 Line Name: FILE0042 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length61.8 US Feet Target Shadow:0.0 US Feet Target Width:13.1 US Feet</p> <p>Description: A pile of rip-rap, 62' long x 13' wide has spilled away from the ascending starboard side bulkhead in Cove 3. Rip rap pile appears to correspond with a visibly sagging deck/parking area adjacent to the top of the bulkhead at this location.</p>
	<p>42a</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 18:02:53 Click Position (Lat/Lon Coordinates) 40° 40.48759' N 073° 59.68093' W (WGS84) Click Position (Projected Coordinates) (X) 632279.44 (Y) 671125.38 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0042.sds Ping Number: 63150 Range to Target: 8.74 US Feet Fish Height: 3.69 US Feet Event Number: 0 Line Name: FILE0042 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length5.7 US Feet Target Shadow:0.0 US Feet Target Width:4.9 US Feet</p> <p>Description: A square box-like object, 5.7' x 4.9' is lying on the canal floor in Cove 3.</p>
	<p>42b</p> <ul style="list-style-type: none"> Sonar Time at Target: 11/12/2010 18:03:26 Click Position (Lat/Lon Coordinates) 40° 40.46859' N 073° 59.65896' W (WGS84) Click Position (Projected Coordinates) (X) 632381.31 (Y) 671010.13 Map Proj: Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0042.sds Ping Number: 63560 Range to Target: 10.16 US Feet Fish Height: 2.49 US Feet Event Number: 0 Line Name: FILE0042 	<p>Dimensions</p> <p>Target Height >= 0.0 US Feet Target Length19.4 US Feet Target Shadow:0.0 US Feet Target Width:14.8 US Feet</p> <p>Description: A pile of rip-rap, 19.4' x 14.8' has spilled out on the canal floor from the ascending starboard side bulkhead in Cove 3.</p>

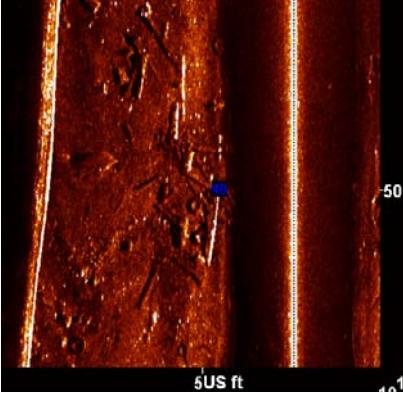
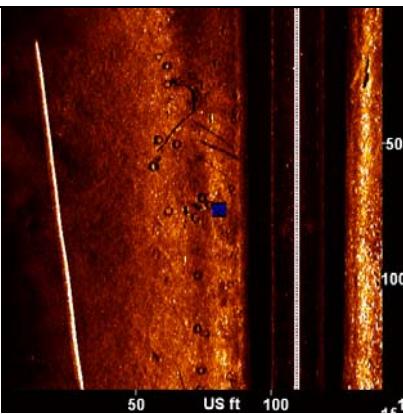
 <p>5 US ft</p>	<p>48</p> <ul style="list-style-type: none"> • Sonar Time at Target: 11/12/2010 18:13:12 • Click Position (Lat/Lon Coordinates) 40° 40.40199' N 073° 59.82467' W (WGS84) • Click Position (Projected Coordinates) (X) 631617.44 (Y) 670602.56 • Map Proj: • Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0048.sds • Ping Number: 67821 • Range to Target: 6.88 US Feet • Fish Height: 5.24 US Feet • Event Number: 0 • Line Name: FILE0048 	<p>Dimensions</p> <p>Description: Typical scatter of debris on the canal floor between the 9th St. and Hamilton Ave. bridges. Linear and circular debris is scattered across this portion of the canal.</p>
 <p>50 US ft 100</p>	<p>52</p> <ul style="list-style-type: none"> • Sonar Time at Target: 11/12/2010 18:27:41 • Click Position (Lat/Lon Coordinates) 40° 40.22026' N 073° 59.94918' W (WGS84) • Click Position (Projected Coordinates) (X) 631048.44 (Y) 669495.63 • Map Proj: • Acoustic Source File: I:\Sonar Data\Gowanus Canal\20101112\FILE0052.sds • Ping Number: 76366 • Range to Target: 10.54 US Feet • Fish Height: 0.00 US Feet • Event Number: 0 • Line Name: FILE0052 	<p>Dimensions</p> <p>Description: Numerous circular features, suspect tires, litter the canal floor, south of the Hamilton Ave. bridge.</p>



Figure 1. Sonar Mosaic Overlaid on Aerial Photograph

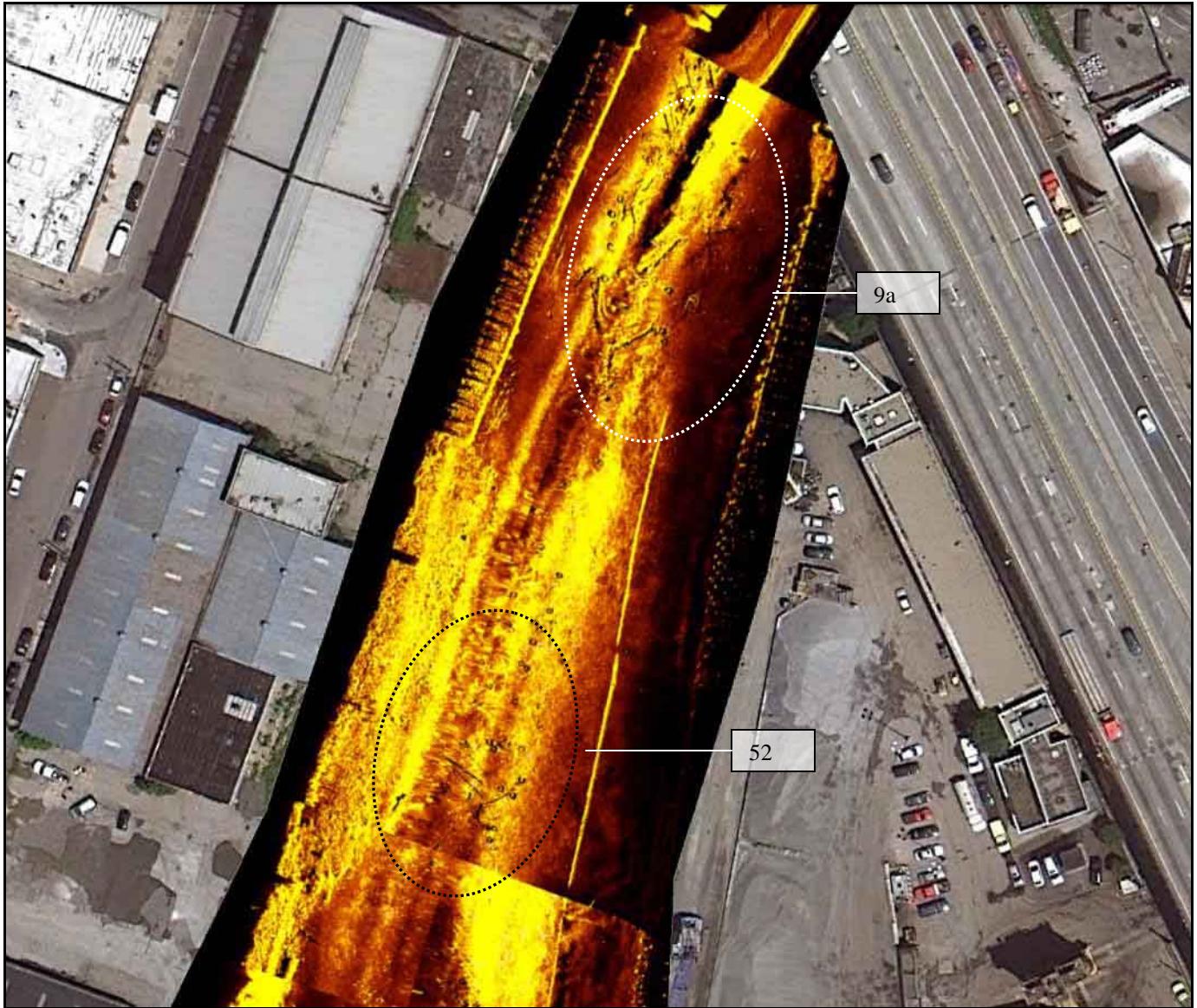


Figure 2. Detail of Sonar Mosaic at Hamilton Street Bridge

Note: Targets are listed in Table 1.

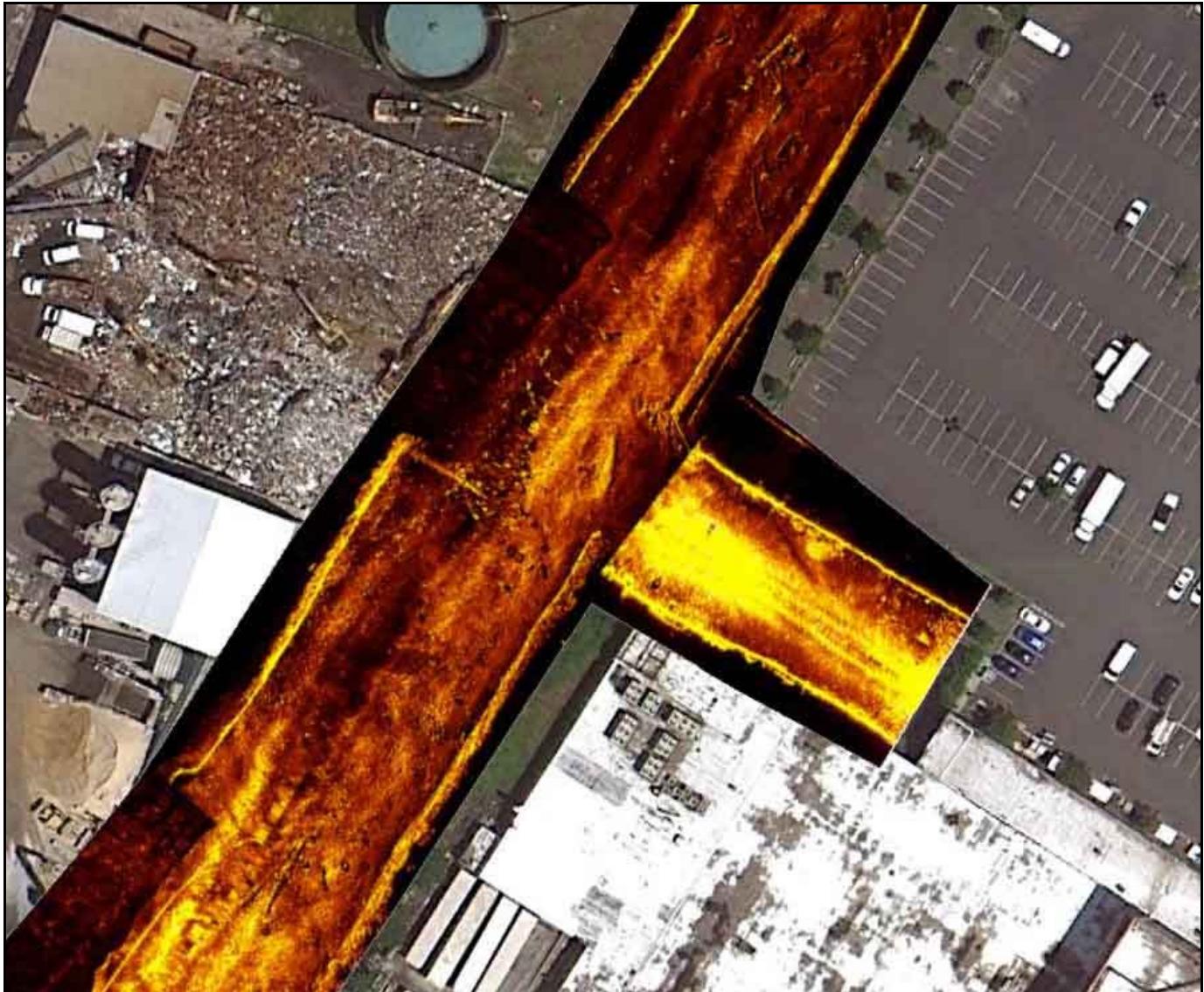


Figure 3. Detail of Sonar Mosaic at Cove #4 (11th St. Boat Basin - Lowes)

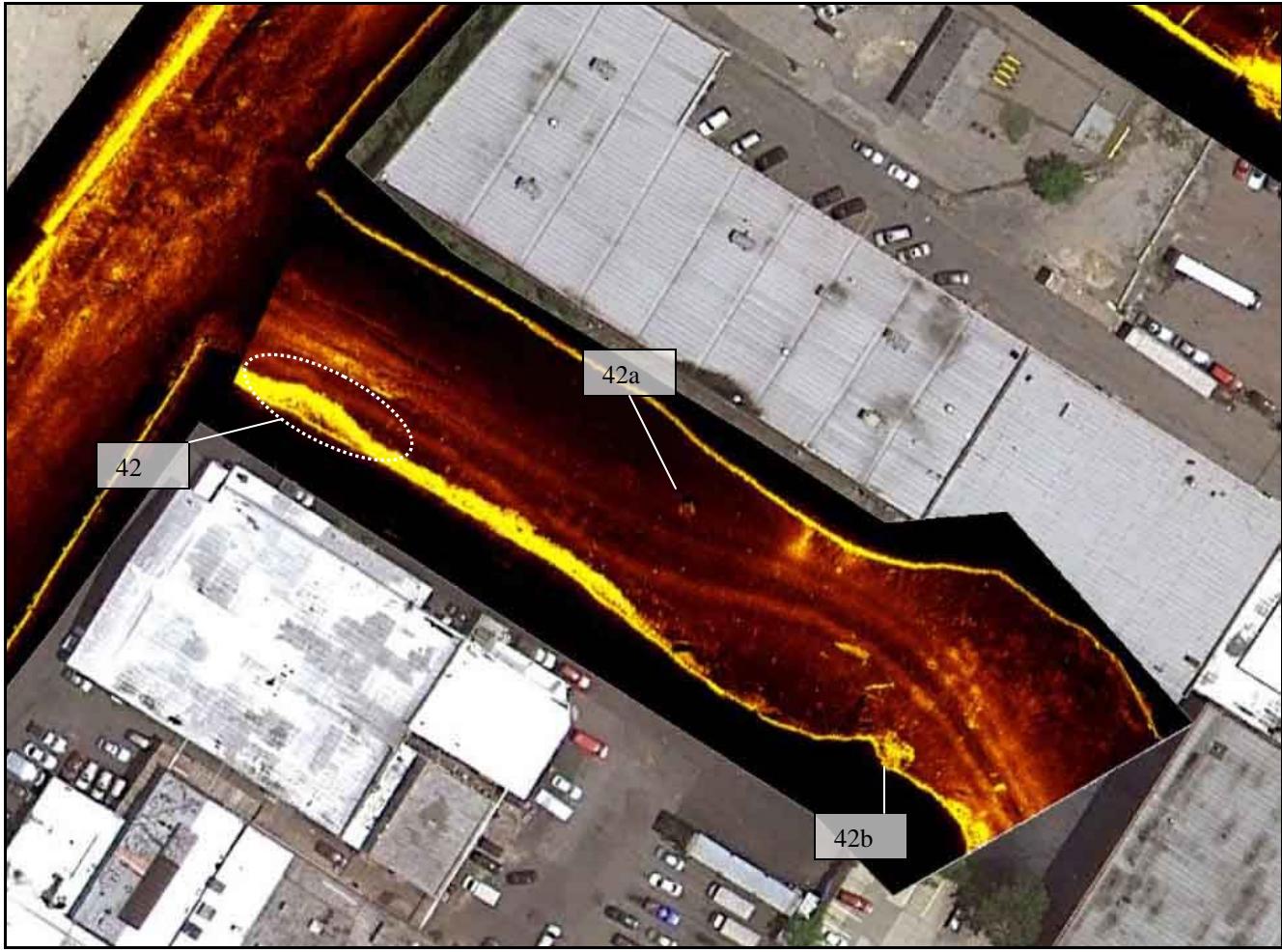


Figure 4. Detail of Sonar Mosaic at Cove #3 (7th St. Boat Basin)

Note: Targets are listed in Table 1.

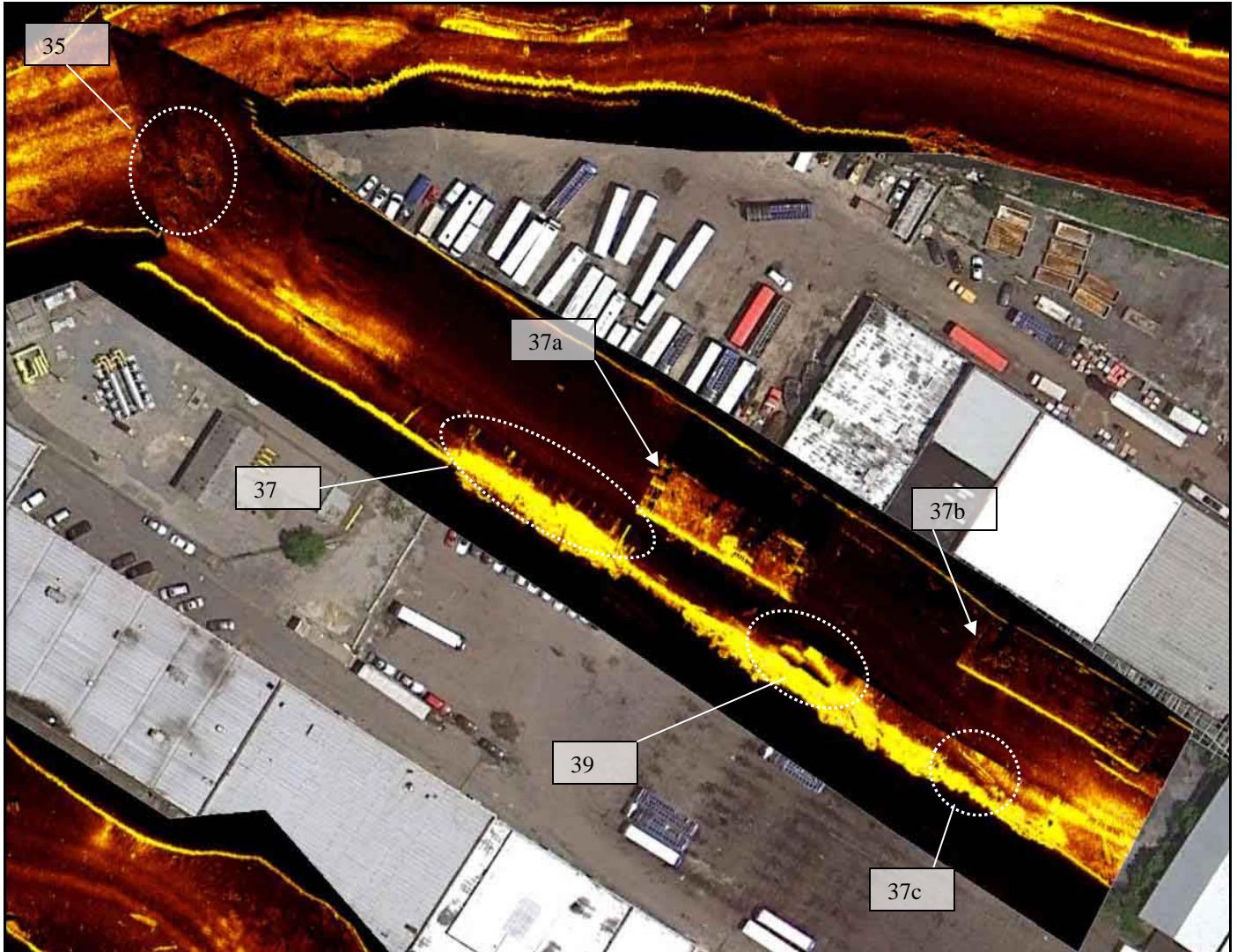


Figure 5. Detail of Sonar Mosaic at Cove #2 (6th St. Boat Basin)

Note: Targets are listed in Table 1.



Figure 6. Detail of Sonar Mosaic at Cove #1 (5th St. Boat Basin)

Note: Targets are listed in Table 1.

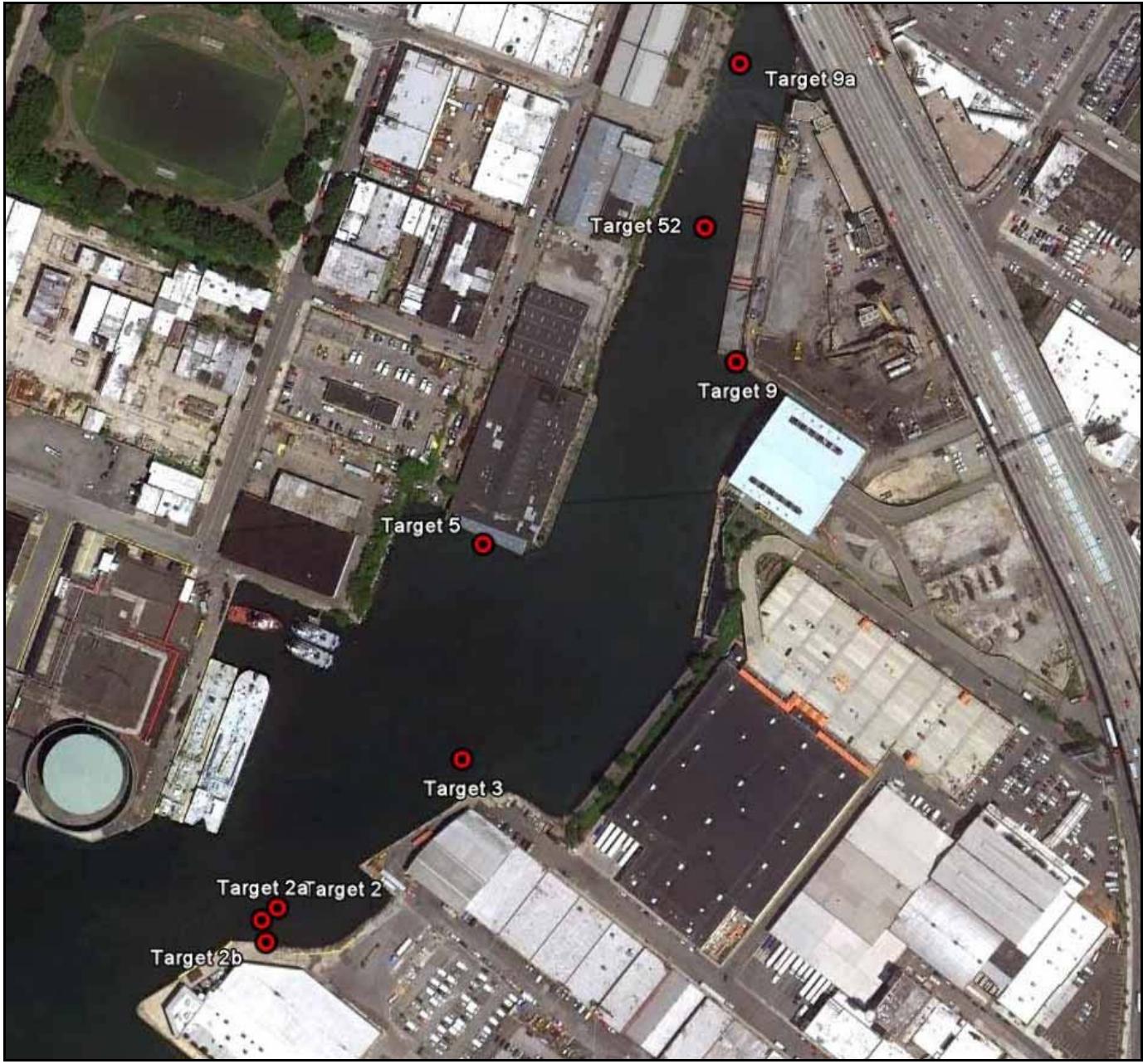


Figure 7. Locations of Sonar Targets in Mouth of Canal

Note: See Table 1 for target list.

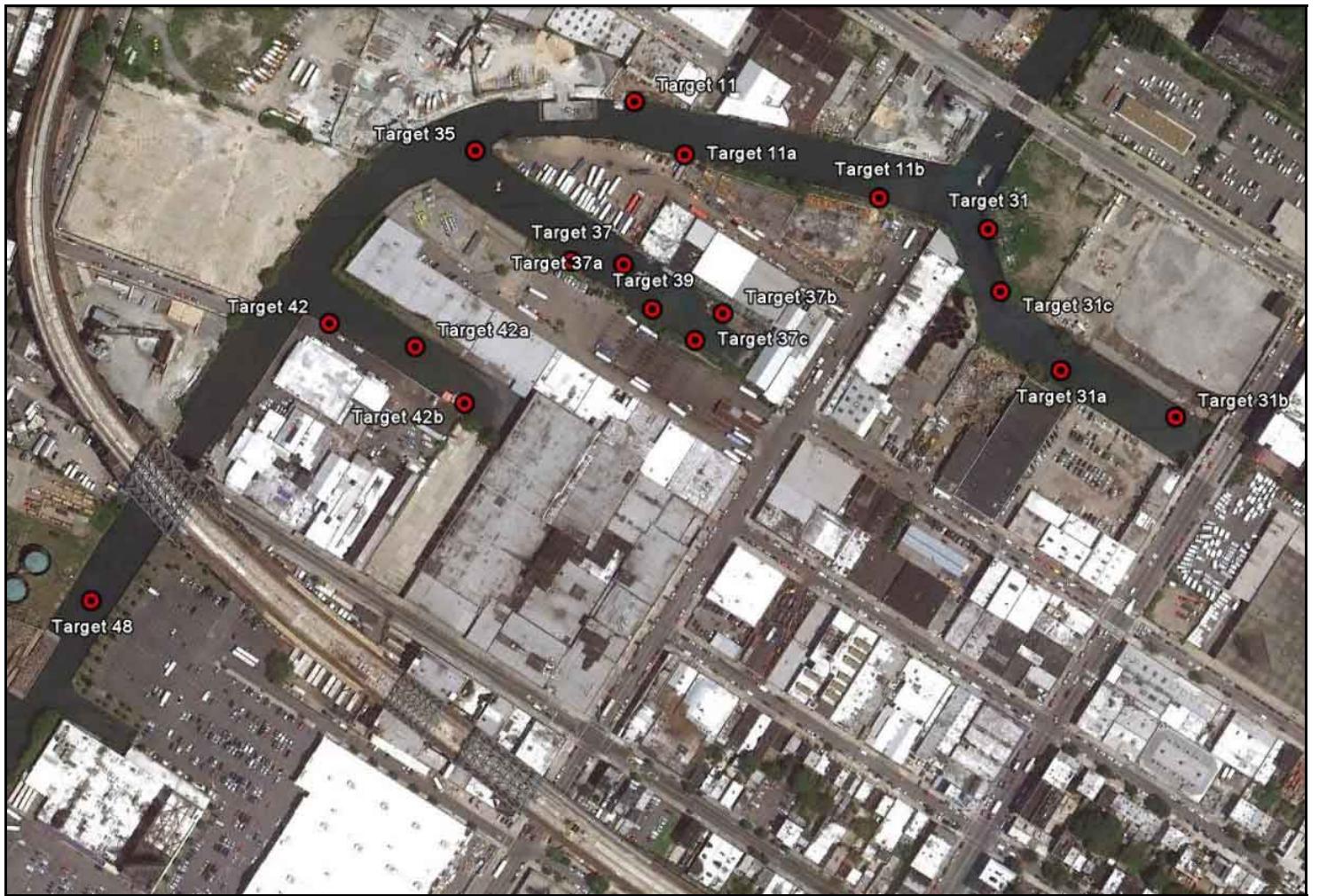


Figure 8. Locations of Sonar Targets in Middle Section of Canal

Note: See Table 1 for target list.

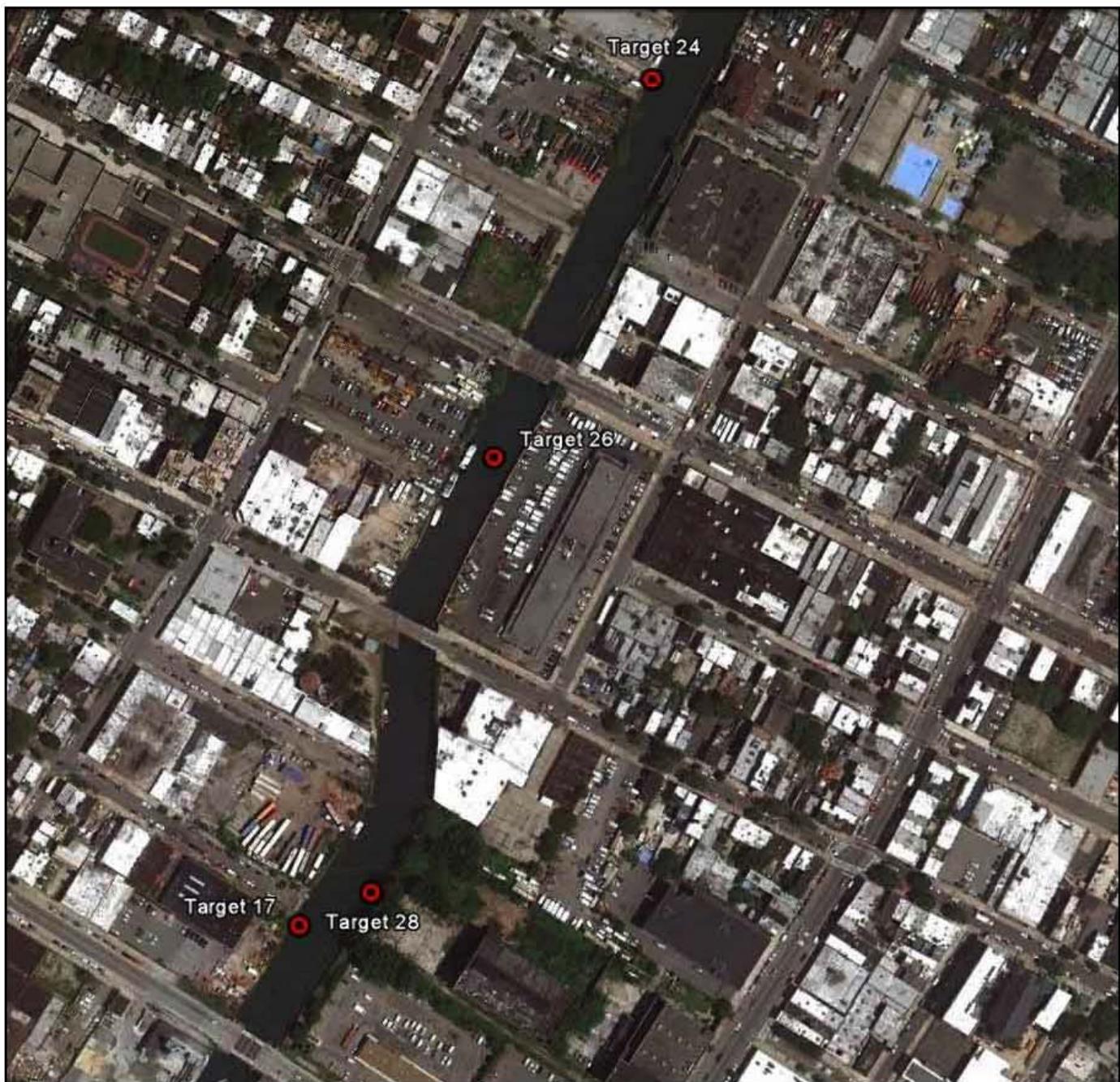


Figure 9. Locations of Sonar Targets in Upper Portion of Canal

Note: See Table 1 for target list.

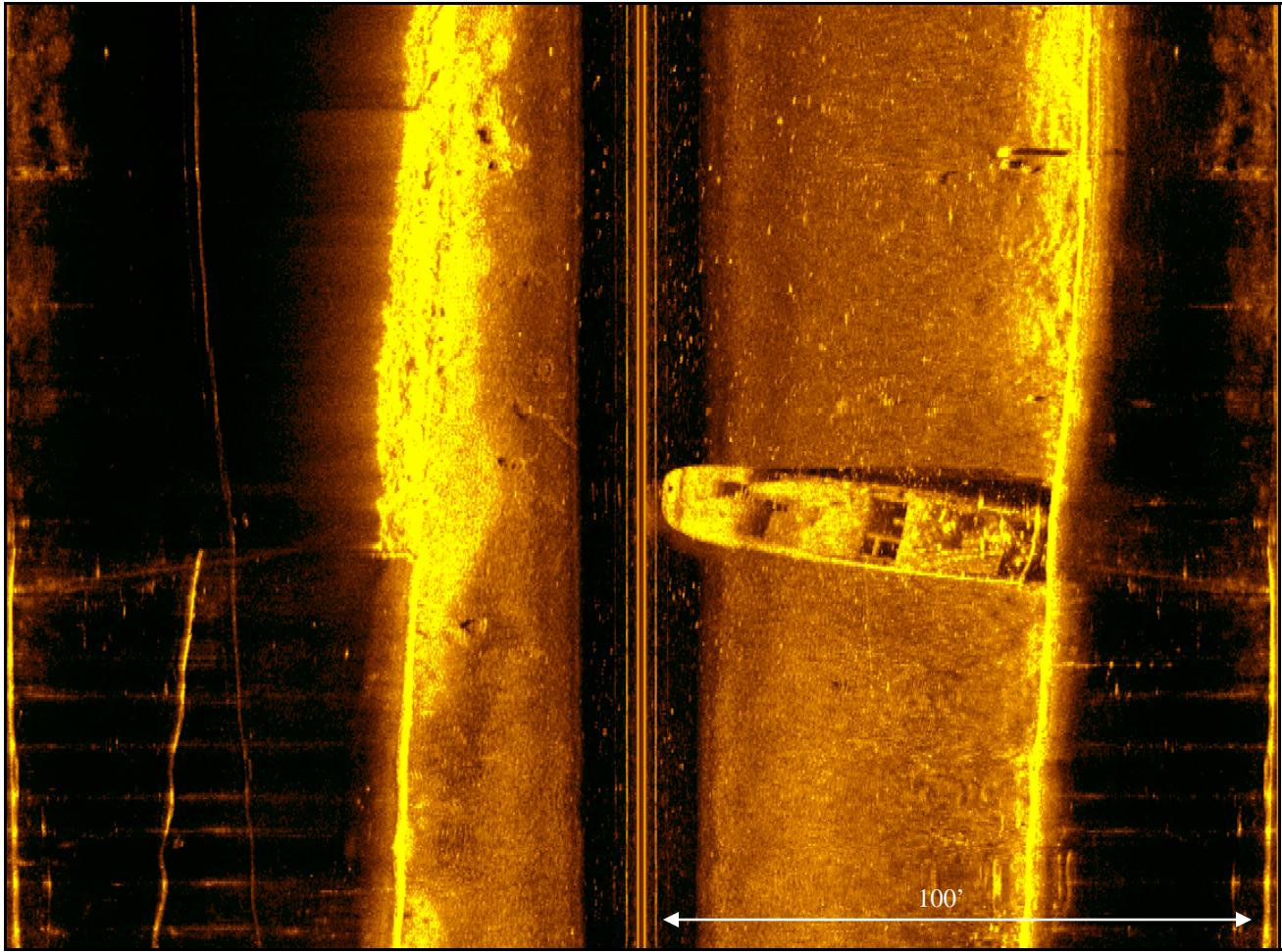


Figure 10. Wreck in Cove 1 (Target 31a)

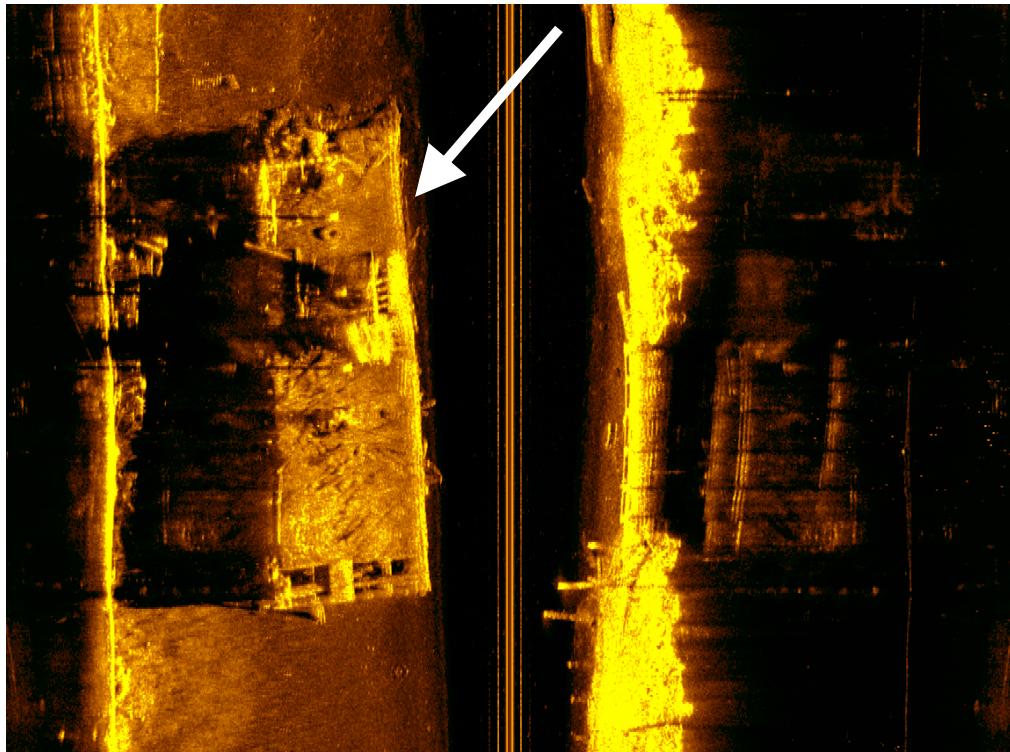


Figure 11. Wreck in Cove 2 (Target 37a)

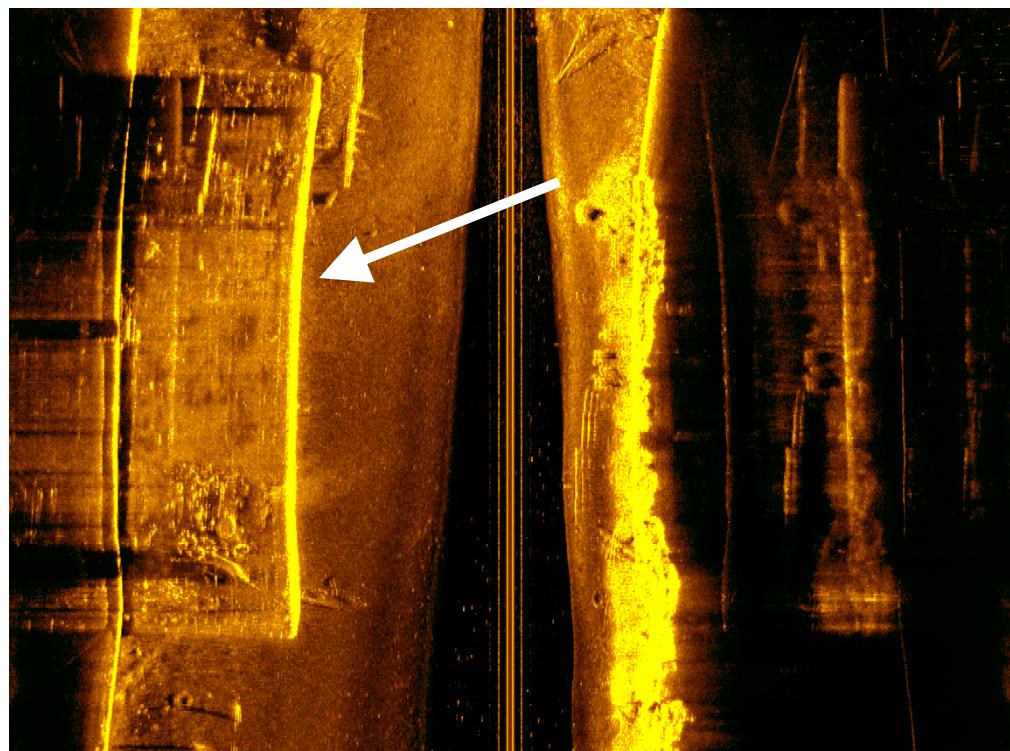


Figure 12. Wreck in Cove 2 (Target 37b)

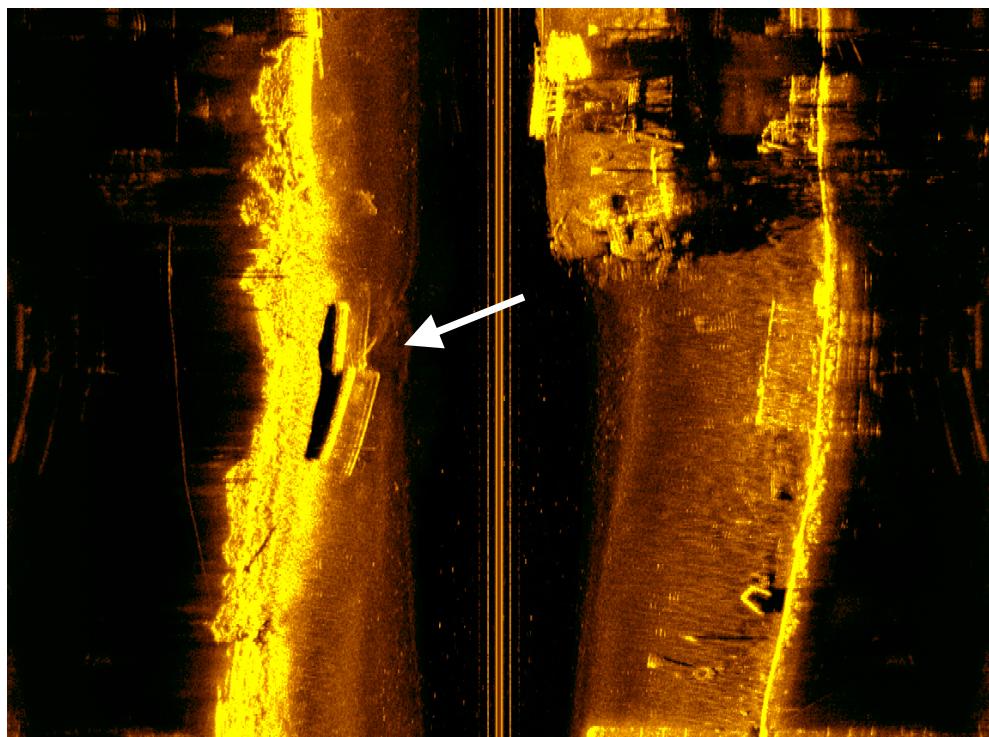


Figure 13. Potential Submerged Cultural Resource in Cove 2 (Target 37c)

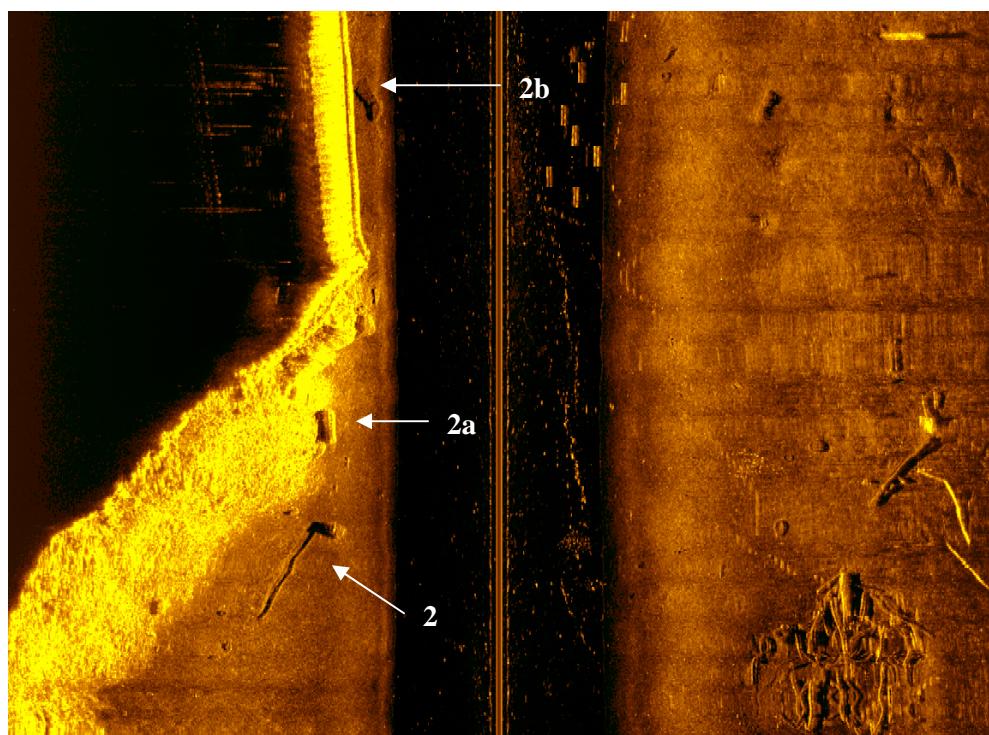


Figure 14. Targets 2, 2a, and 2b at mouth of Canal

Note: Targets 2a and 2b are suggestive of automobiles

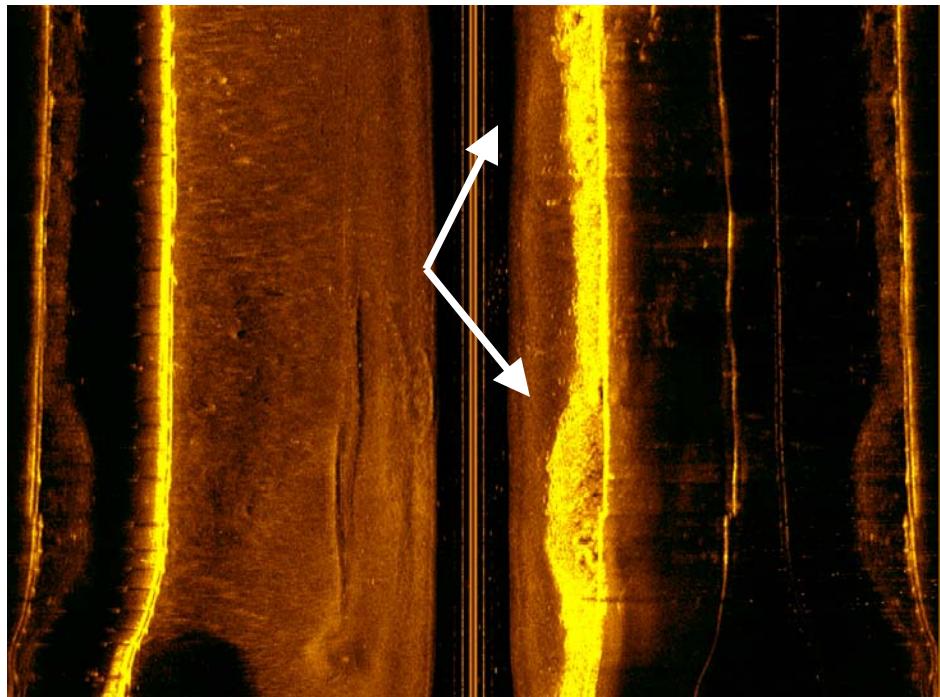


Figure 15. Rip-rap spilled out at Target 42

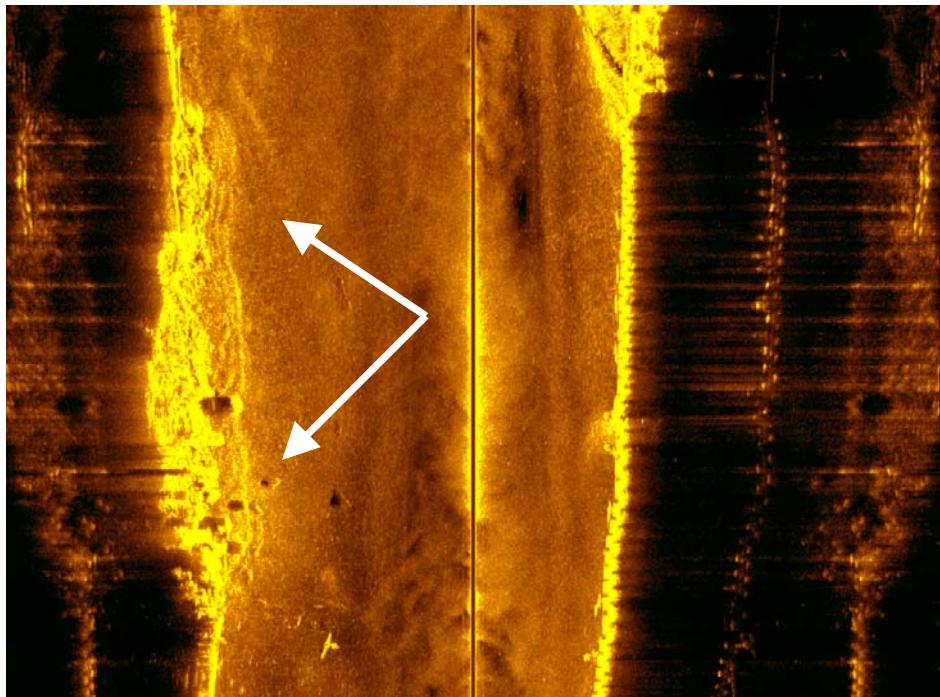


Figure 16. Rip-rap spilled out at Target 11a

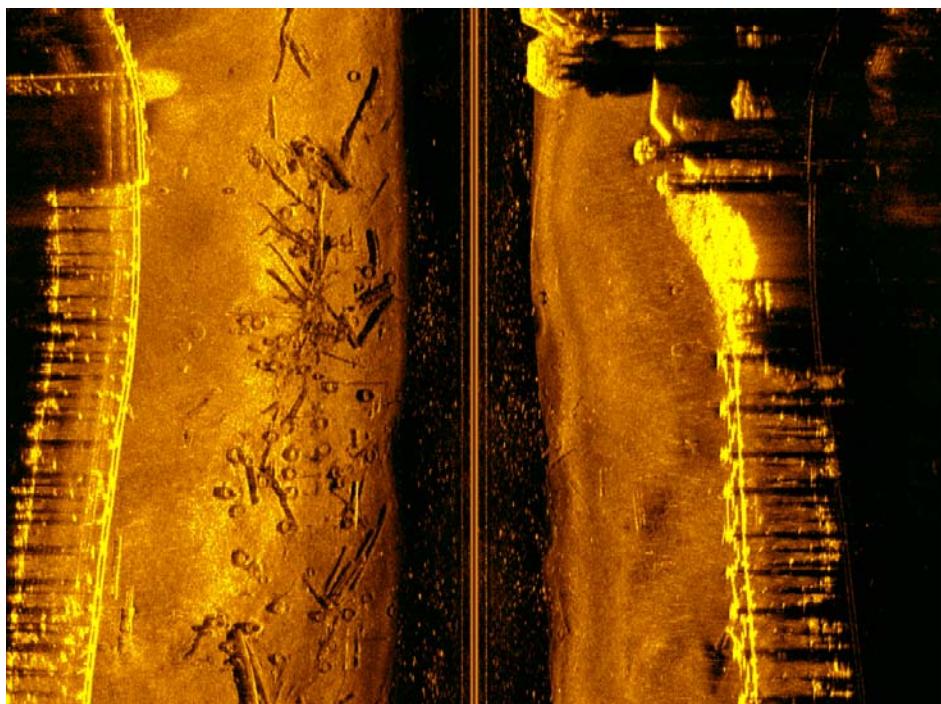


Figure 17. Typical Debris at Target 9a – South Side of Hamilton Ave. Bridge

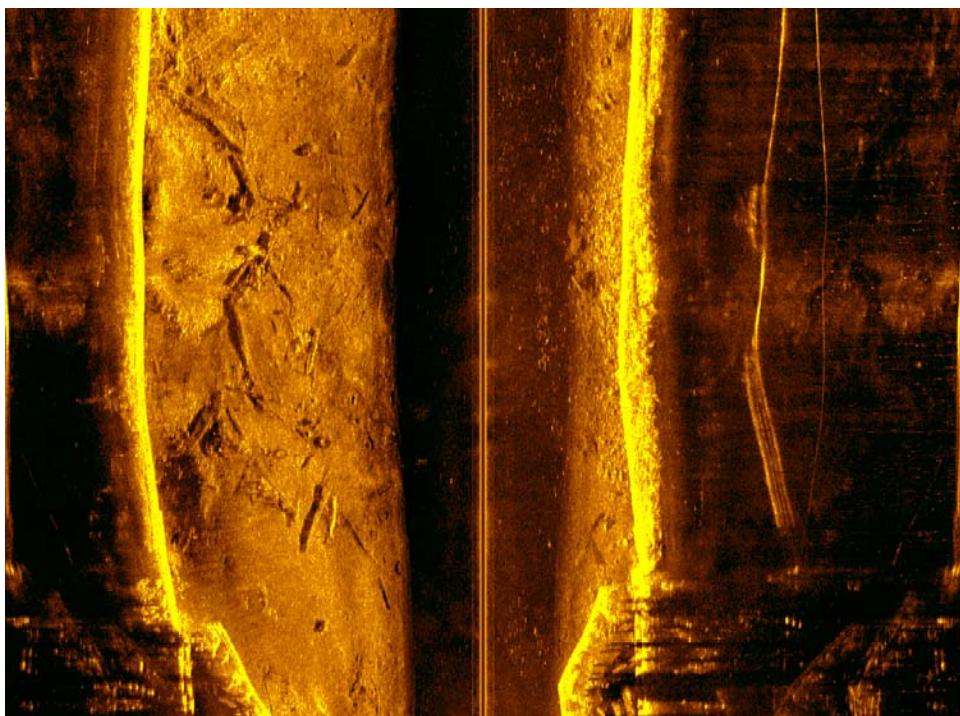


Figure 18. Typical Debris at Target 48 – Between Hamilton Ave. Bridge and 9th St. Bridge