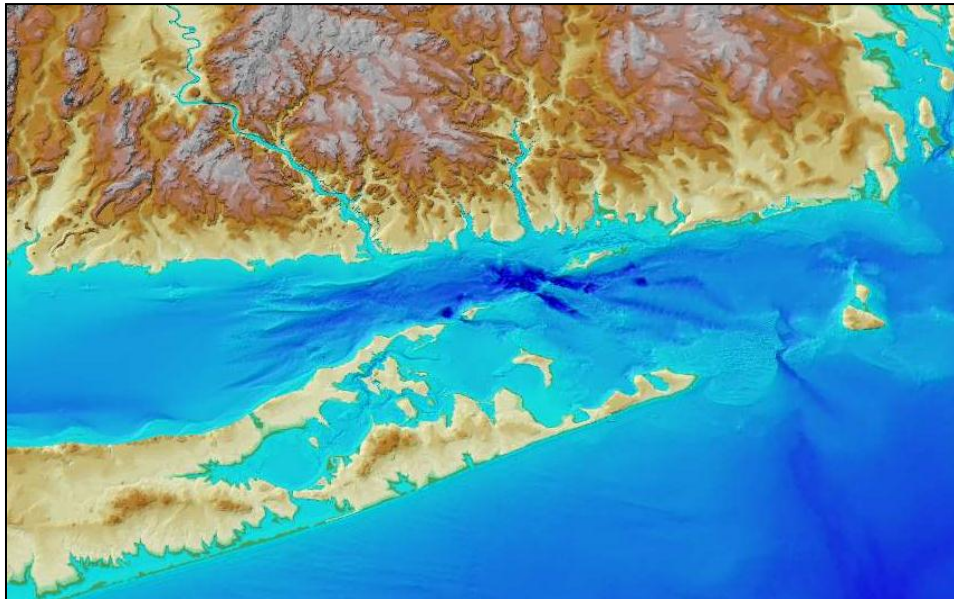


Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(s) in Eastern Long Island Sound, Connecticut and New York

APPENDIX D

Side-Scan Sonar Data Processing and Mosaicking: Eastern Long Island Sound



Prepared for: **United States Environmental Protection Agency**
and
Eastern Research Group, Inc.



Prepared by: **Woods Hole Group**



February 2014

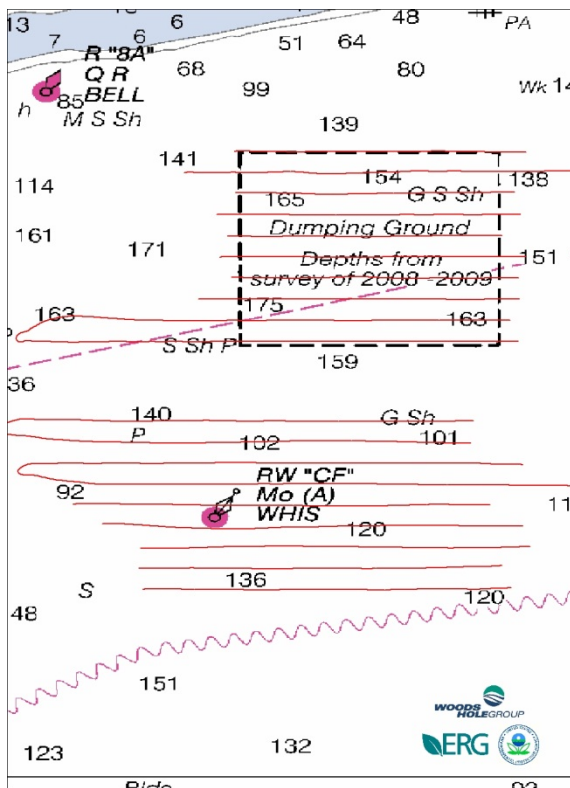
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FINAL

**SIDE-SCAN SONAR DATA PROCESSING AND
MOSAICKING:**

EASTERN LONG ISLAND SOUND

USEPA Contract no. EP-C-09-020
ERG Subcontract no. OCPD-020/7



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February 2014

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ACRONYMS

AGC	Automatic Gain Control
BAC	Beam Angle Correction
CTI	Chesapeake Technology, Inc.
DAMOS	Disposal Area Monitoring System
EGN	Empirical Gain Normalization
ELIS	Eastern Long Island Sound
ERG	Environmental Research Group
GEOTIFF	Georeferenced Tagged Image File Format
GIS	Geographic Information System
kHz	Kilohertz
LIS	Long Island Sound
NOAA	National Oceanic and Atmospheric Administration
SPI	Sediment Profile Image
USACE-NAE	United State Army Corps of Engineers New England District
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WHG	Woods Hole Group, Inc.
XTF	Extended Triton Format (a common side-scan sonar file extension)

1.0 INTRODUCTION

1.1 PURPOSE OF STUDY

Ocean disposal sites are designated by the United States Environmental Protection Agency (EPA). The EPA Region 1 (R1) monitors disposal sites with the assistance of the United States Army Corps of Engineers New England District (USACE) following guidance outlined in Site Management and Monitoring Plans (SMMPs) for EPA designated dredged material disposal sites. EPA has designated two dredged material disposal sites in Long Island Sound (LIS). EPA is conducting a Supplemental Impact Statement for eastern Long Island Sound (ELIS) and this data will support that effort. In ELIS, there are two sites currently being used (under the USACE's site selection authority) that have not been designated; these two sites are: 1) the Cornfield Shoals Disposal Site (CSDS), and 2) the New London Disposal Site (NLDS). EPA Region 1 is compiling information necessary to support the Supplemental Impact Statement for ELIS; this report will be used for that purpose. The EPA has a voluntary policy under the National Environmental Policy Act (NEPA) which describes the studies to be conducted.

This effort processes side-scan sonar data collected by the EPA R1. Side-scan data is a useful tool in evaluating seafloor properties. An acoustic pulse emitted by the sonar equipment reflects back to receivers, and that information is processed to produce an "image" of the seafloor, which may be used to characterize geology, morphology, shipwrecks or other structures.

1.2 WORK OBJECTIVES

Under contract number EP-C-09-020, subcontract OCPD-020/7, Woods Hole Group (WHG) provided analysis, interpretation, and reporting of side-scan sonar data to assess seafloor characteristics and classification at 28 sites in eastern Long Island Sound. Analysis included review of individual side-scan sonar files to create a mosaic for each of the 28 sites. The single mosaic created by grouping the side-scan sonar files from a particular site facilitated characterization of the entire survey area. Raw data were provided to WHG in XTF (Extended Triton Format) files, the industry standard, which is compatible with the Chesapeake Technology SonarWiz 5 processing software. Upon the completion of side-scan data processing, WHG was to provide a GIS-compatible mosaic image for each project location (e.g., GEOTIFF), along with supporting files (e.g., SHP) that identify seafloor characteristics and individual targets. This document serves as the summary report of this data processing task and complements the electronic data deliverables described above.

2.0 METHODS

This section provides the methodological context for which the work tasks were performed. Detail about the processing methods, data quality review and other project specific information is documented in the Quality Assurance Project Plan (QAPP) produced as part of this contract (Woods Hole Group, 2014).

2.1 METHODS: PROCESSING SIDE-SCAN SONAR DATA

The side-scan surveys were conducted by USEPA using the L3-Klein Model 3000 side-scan sonar system aboard the USEPA OSV *BOLD*. Digital data from the 100- and 500-kHz data channels of the side-scan were acquired, using a range setting of 100m and 75m resolution. Survey lanes were spaced at approximately 100 meter intervals running east-west, and some north-south across the width of the survey areas. Considering that the vessel may, at times, wander 20 to 30 m off the intended lane, 100% bottom coverage was achieved by the survey plans, and 100% overlap (but not for all sites). Bottom coverage is defined as the percentage of seafloor area that the side-scan sonar receives reflected acoustic energy, or “backscatter”. Overlap is defined as the percentage of area that is surveyed more than once, and from more than one direction, such that the seafloor does not contain shadows, or areas of acoustic energy loss. Vessel speed was maintained between 3 and 5 knots. The altitude of the tow fish was maintained between 5 and 15 meters from the seafloor. All project locations were surveyed in ELIS within the 100 meter (330-foot) isobaths.

Raw side-scan sonar data were provided to WHG in XTF file format. Data were processed on Windows PCs using the SonarWiz 5 software package by Chesapeake Technology Inc. (Chesapeake Technology, Inc., 2013). Technicians followed the standard operating procedure (SOP) for side-scan data processing and mosaic creation described in the QAPP (Woods Hole Group, 2014). The data collected from the 500-kHz channels (channels 3 and 4) on the L3-Klein towfish were used for data processing because it provides less backscatter and higher resolution imagery. Side-scan sonar backscatter intensity was displayed in mosaics using the L3-Klein proprietary copper color scale, where low-intensity backscatter is black and high-backscatter is a golden-yellow (Figure 2.1.1). High backscatter intensity is characteristic of an object that reflects the most acoustic energy originally transmitted by the side-scan sonar transducers. Dense objects, such as boulders or metals, are often indicated by high backscatter. From a geologic perspective, fine-grained sediments are characterized by lower backscatter than coarser sediments such as sand and gravel.

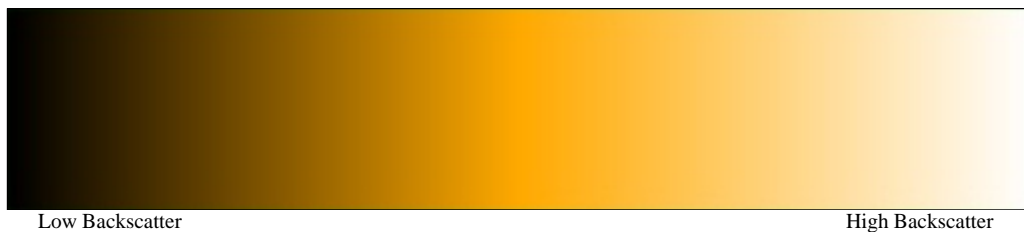


Figure 2.1.1. L3-Klein backscatter intensity color scale

As part of processing, raw data were trimmed and removed to provide a consistent mosaic edge (survey area) and data quality. All data files used for the mosaics met quality acceptance categories. In cases where data files were trimmed, it was because they were either: 1) data from turning; 2) poor signal return; 3) striping. Raw data was recorded during transect turns for some but not all files; these data were removed because it was not required for this project.

When processing the data using CTI SonarWiz 5, processes called “nadir blanking”, “offset altitude adjustment”, and “adjusted display range”, along with several filters, were applied to produce a final data product that could be used for interpretation. The nadir is area of ensonified data directly beneath the side-scan towfish, including the water column. The nadir blanking distance is the distance away from nadir center where seafloor bottom track is set to begin. The altitude offset adjustment sets the distance added to each pixel to translate the bottom track further from the nadir, which is used to hide visual artifacts that can occur at the nadir/bottom track boundary. Adjusted display range sets the total range of each line that is visible, with reductions occurring at the far starboard and port edges of the trackline. For example, an adjusted display range of 98 of 100 means that 1 meter is hidden from both the starboard and port edges of the sonar swath. The display range was adjusted along with trimming to provide a consistent edge of the survey area and to hide visual artifacts on the far edges of tracklines.

Mosaics were developed using three primary filters to normalize the acoustic backscatter signal: Beam Angle Correction (BAC), Automatic Gain Control (AGC), and empirical gain normalization (EGN). The BAC and AGC filters were used to provide a “smooth” image, while the EGN filter was used to assist with the interpretation of the survey area and evaluate more subtle difference in backscatter.

Following creation of the mosaic, the SonarWiz 5 Classification function was used to quantitatively define three (3) seafloor classifications based on the relative differences of side-scan backscatter intensity (e.g., low, moderate or high return) in a single mosaic. The results of the classification function are unique to each mosaic. This task was performed to ultimately assist with the interpretation of the seafloor geology represented in the side-scan mosaic by providing an objective classification of bottom backscatter, which is used as a proxy for sediment texture. Use of the Classification function results with supplemental ground-truthing data sources, such as sediment grain size samples, can increase the confidence level of the seafloor interpretation over the mosaic area.

Classification could be done in one step, however, due to the functionality of the SonarWiz5 software, projects with a large number of side-scan files (>80 XTF files) were split into several steps. The classification process works by using a single side-scan sonar file as a reference and applying the criteria to other files. Whenever a split was necessary, the same sonar file was used as a reference between all successive steps for one project location so that all files were being classified in the same way. For example, project location Eastern_LIS_Niantic_Master contained 825 side-scan sonar files and required twelve (12) steps to classify all files.

2.2 METHODS: TARGET IDENTIFICATION

Target identification was based solely on side-scan sonar backscatter intensity in the data provided. An assessment of multiple data types, such as surficial sediment samples or magnetic anomaly data, could reduce the uncertainty of interpretation of this side-scan sonar data, but this level of assessment was beyond the scope of this work. Without additional information to ground-truth the survey area, WHG cannot characterize the seafloor or a particular target with 100% accuracy. However, EPA sediment grain size data, EPA sediment profile images, and USGS sediment classifications have been reviewed to increase the confidence level of accuracy. The EPA provided ground-truthing data for select survey sites. Data included grain-size characterization from sediment grabs and sediment profile images (SPI). A summary of the data sets that correspond to specific survey areas is presented in Table 2.3.1.

Woods Hole Group (WHG) has classified targets according to categories approved by EPA. These categories are based on a general knowledge of Long Island Sound marine geology and site specific history. Targets are classified according to the categories listed in Table 2.3.2. Some targets have a lower percentage of confidence and are therefore classified as “Unidentified/Other” until additional data are collected.

Targets are identified and recorded as a point in the sonar image that has a corresponding position (e.g., latitude and longitude) and supporting metadata, all which are stored in the SonarWiz 5 Target Catalog. In some mosaics with dense target items, instead of a single point for every item, a polygon was used to delineate an area of targets. Using the SonarWiz 5 terminology, a “target” is defined as a single point, and a “feature” is defined as a polygon. Both targets and features were exported as GIS-compatible shapefiles.

2.3 METHODS: MOSAIC INTERPRETATION

An interpretation of the seafloor geology in each mosaic was primarily based on the results of the SonarWiz5 Classification function, which evaluated the relative differences in side-scan backscatter intensity within a mosaicked area.

All mosaic images were processed with the BAC, AGC, and EGN filters. Evaluation of the mosaics revealed that the BAC and AGC filters tended to “wash out” subtle differences in backscatter that may be related to seafloor geology (e.g., sediment grain size). Therefore, mosaics were created and evaluated using different combinations of filters, but interpretation for 24 of 28 sites was completed using the EGN mosaics

Upon review of the classification results and EPA ground-truthing data, the Woods Hole Group evaluated supplemental data sets from existing publications to help reduce the uncertainty of the seafloor interpretation for each mosaic. In particular, Woods Hole Group evaluated the features from:

- NOAA Electronic Navigation Charts (ENCs);
- NOAA hydrographic surveys h11250, h11252, h11997;
- U.S. Geological Survey Open-File Reports 00-304, 2005-1001, and USGS (2011);

Table 2.3.1. EPA ground-truthing data used for target identification and mosaic interpretation.

Site ID	Data Type (# of samples)
ELIS14	SPI (2)
6MILE10	SPI (3)
MTK9	SPI (1)
FALKNER8	SPI (2)
CLINTON7	SPI (3)
FISEHOLE1	SPI (3)
FISEHOLE6	SPI (3)
Eastern_LIS_Niantic_Master	SPI (1), Sediment (3)
Eastern_LIS_EastHole_Master	Sediment (4)
Eastern_LIS_Fishers_Master	Sediment (4)
FISE_NEW	Sediment (4)
FISE_OLD_2009	Sediment (3)
NLDN_REF	Sediment (8)
CSDS_ACT	Sediment (4)
NTDS_NEW	Sediment (2)
NTDS_HIST	Sediment (3)
NLDN_ACT	Sediment (7)

Table 2.3.2. Target classifications

Classification Category	Definition
Debris Pile	Isolated reflector area with backscatter intensity in contrast with surrounding area; often round or ellipse shaped. Anthropogenic origin, occurring in a designated disposal area.
Field of Debris Piles	Larger area with multiple targets as described above. Anthropogenic origin, occurring in a designated disposal area.
Trawl/Anchor mark	Linear reflectors on the seafloor caused by fishing gear or anchors. Trawl marks often occur in parallel over large expanses of seafloor. Anchor marks are definitive if singular and confined within a federal anchorage area.
Fishing Gear - trap/buoy	Rectangular, box-like contact, often in series. Occasionally a line may be observed connecting the reflector series.
Wreck	Defined as plotted on NOAA navigation charts; observed as an irregular reflector on the seafloor, often oblong with high backscatter
Navigation aid/buoy	Defined as plotted on NOAA navigation charts; observed as a box or block shaped contact on the seafloor, with a linear connector
Bedform(s)	Any reflectors that resemble naturally occurring seafloor morphology, this could be erosional (e.g., scour and sorting “comet trails”), depositional, or active transport (e.g., sand waves).
Rock outcrop/geological	Reflector that is angular, with block-like structure, often with linear reflectors of high backscatter relative to surrounding area.
Boulder	Rounded or angular contact of high backscatter relative to surrounding seafloor, greater than 1 meter in size (large boulder).
Boulder Field	Area of rounded or angular, high backscatter contacts, as defined above.
Bathy slope reflection	Linear reflector of high backscatter relative to surrounding seafloor that corresponds with a steeply sloping change in bathymetry.
Unidentified/Other	Any other contact or reflector of interest that cannot be positively identified according to the definitions above.

3.0 RESULTS

3.1 SURVEY SITES

The 28 sites selected for data processing and interpretation are listed in Table 3.1.1, and mapped with their respective mosaic areas in Figure 3.1.1. Note that some mosaics overlap (e.g., ELIS14 and FISEHOLE6). All survey sites are located in eastern Long Island Sound, between Sachem Head, Guilford, CT and Watch Hill Point, Westerly, RI.

In general, the 28 survey sites were located at or in close proximity to the two active dredged material disposal sites in ELIS: Cornfield Shoals Disposal Site (CSDS) and New London Disposal Site (NLDS). Figures 3.1.2 through 3.1.4 provide larger-scale maps of the survey sites and resulting mosaic areas. These figures also map the boundaries of CSDS, NLDS, and historical disposal sites, provided by the USACE-NAE DAMOS Program. There are seven (7) historical disposal sites, which are documented as having had a disposal event; these include Falkner Island, Mattituck, Clinton Harbor, Six Mile Reef, Niantic Bay, North Dumpling, and Stonington.

The mosaics for all survey sites are presented in Appendix M. The targets and features identified for each survey site are presented in Appendix T. The SonarWiz5 Classification function output for each survey site is provided in Appendix Z. These appendices have been provided electronically.

Table 3.1.1. Identification for each mosaic site

Site ID	Data Acquisition Date	Number of XTF Files Collected	Survey Line Spacing /Resolution
ELIS16	7/22/12	41	100m/75m
ELIS15	7/20/12	16	100m/75m
ELIS14	7/18/12	194	100m/75m
ELIS13	7/16/12	52	100m/75m
ELIS12	7/14/12	43	100m/75m
6MILE10	7/26/11	73	100m/100 res
MTK9	7/25/11	97	100m/75m up to line 3, then 100 m resolution
FALKNER8	7/24/11	74	100m/75m
CLINTON7	7/23/11	86	100m/75m
FISEHOLE1	7/19/11	221	100m/75m
FISEHOLE2	7/18/11	20	100m/75m
FISEHOLE3	7/18/11	24	100m/75m
FISEHOLE4	7/18/11	26	100m/75m
FISEHOLE5	7/17/11	100	100m/75m
FISEHOLE6	7/16/11	145	100m/75m
Eastern_LIS_Niantic_Master	6/9/10	825	100m/100 res
Eastern_LIS_EastHole_Master	6/8/10	640	100m/100 res
Eastern_LIS_Fishers_Master	6/7/10	431	100m/100 res
FISE_SW_ADD2	7/23/07	17	100m/100 res
FISE_NEW	7/18/07	40	100m/100 res
FISE_OLD_2009	7/17/07	55	100m/100 res
NLDN_REF_ADD	7/17/07	60	100m/100 res
NLDN_REF	7/16/07	92	100m/100 res
CSDS_ACT	7/16/07	63	100m/100 res
CSDS_ADD	7/16/07	61	100m/100 res
NTDS_NEW	7/15/07	110	100m/100 res
NTDS_HIST	7/15/07	89	100m/100 res
NLDN_ACT	7/14/07	64	100m/100 res

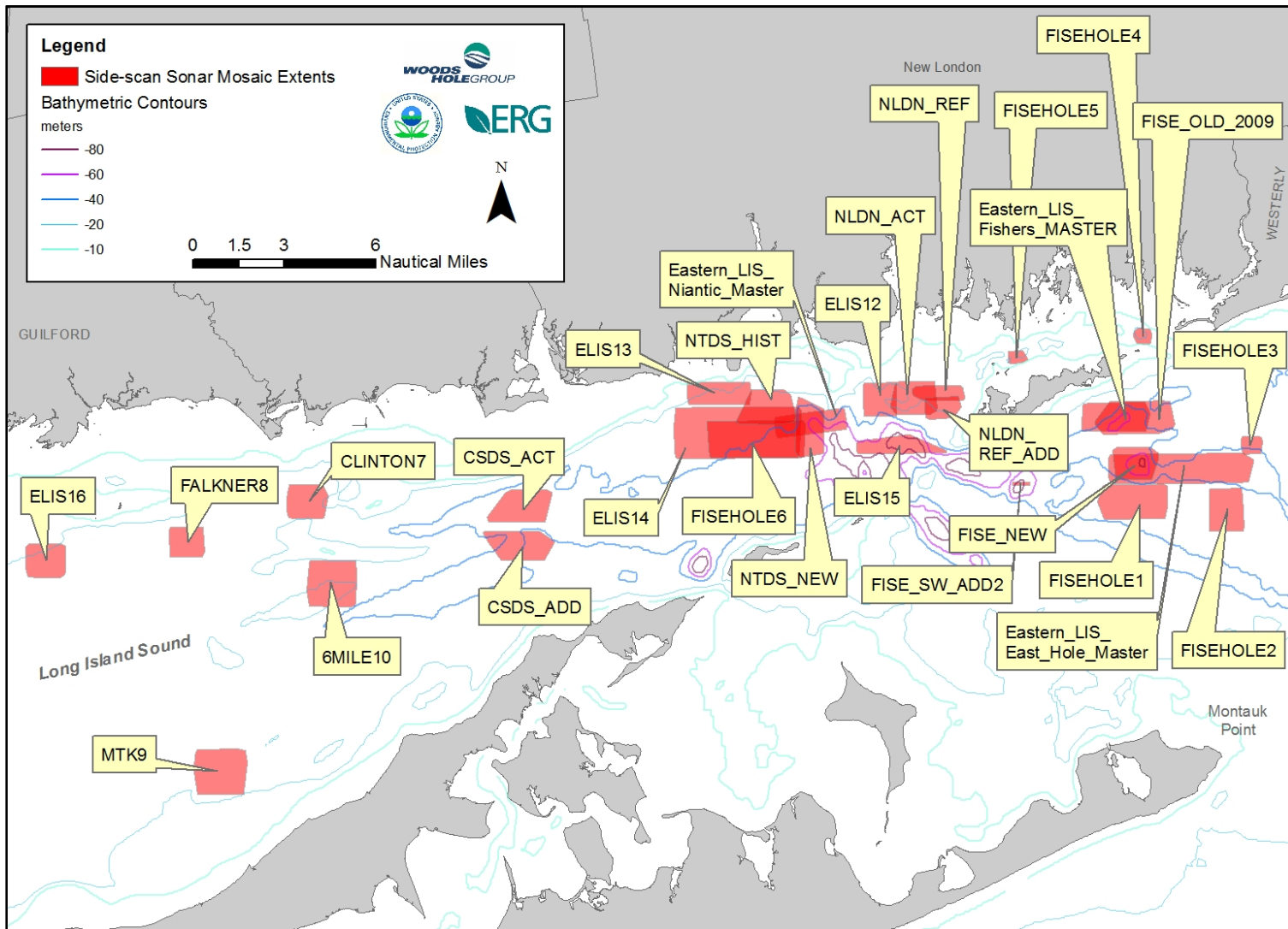


Figure 3.1.1. Basemap of the 28 side-scan sonar survey sites selected for data processing and interpretation.

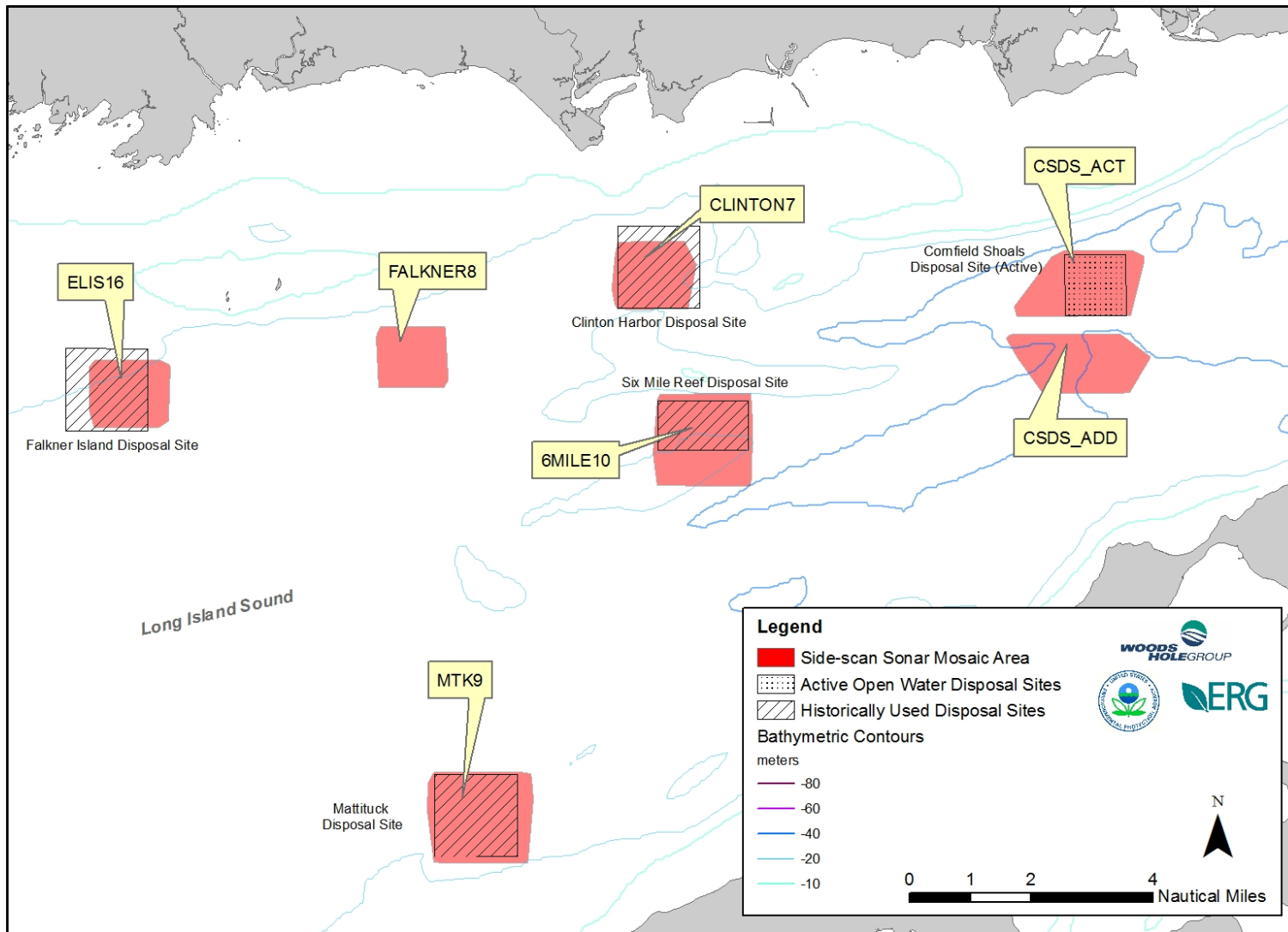


Figure 3.1.2. Basemap of western survey areas along with active and historical disposal sites.

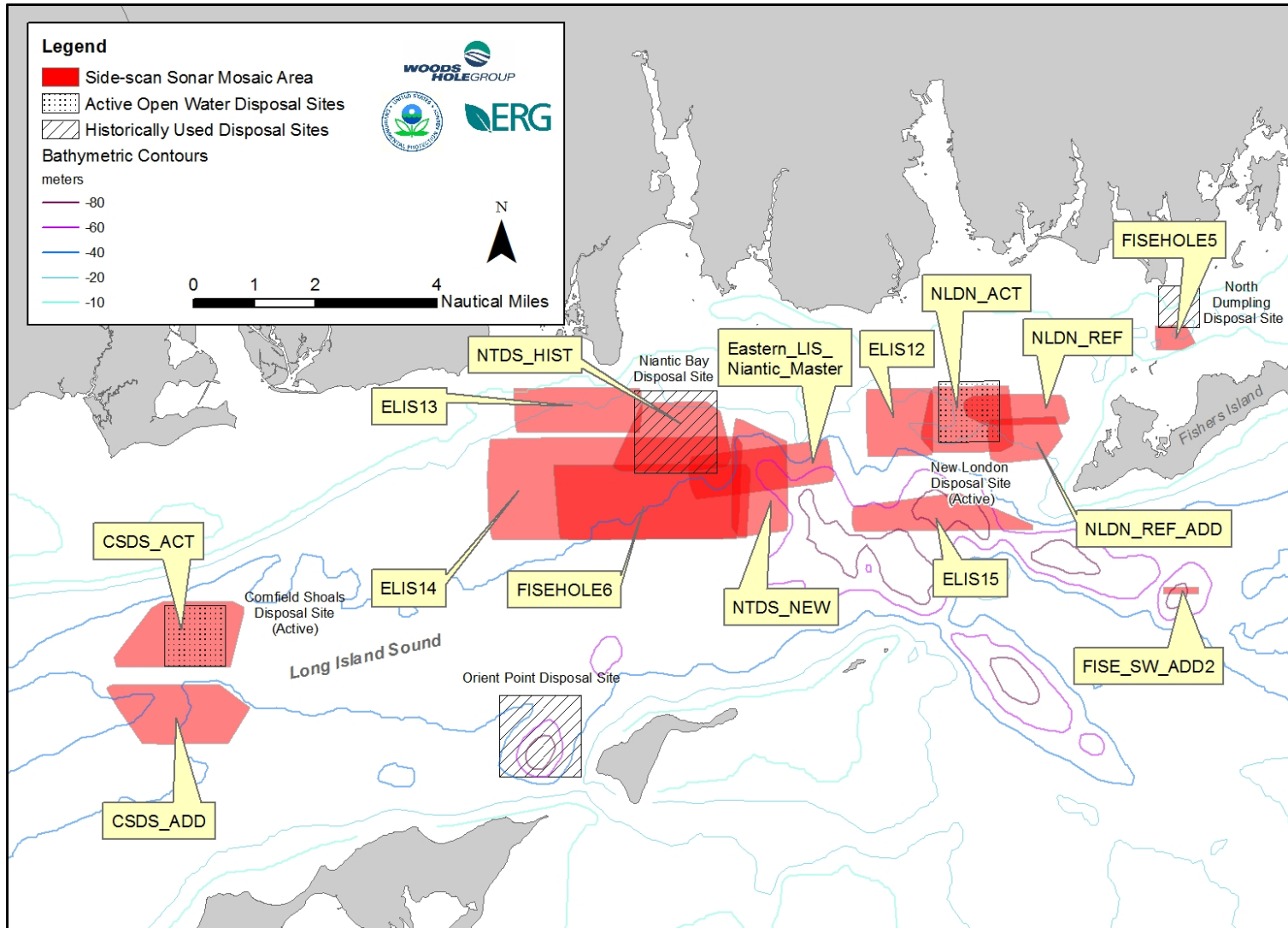


Figure 3.1.3. Basemap of central survey areas along with active and historical disposal sites.

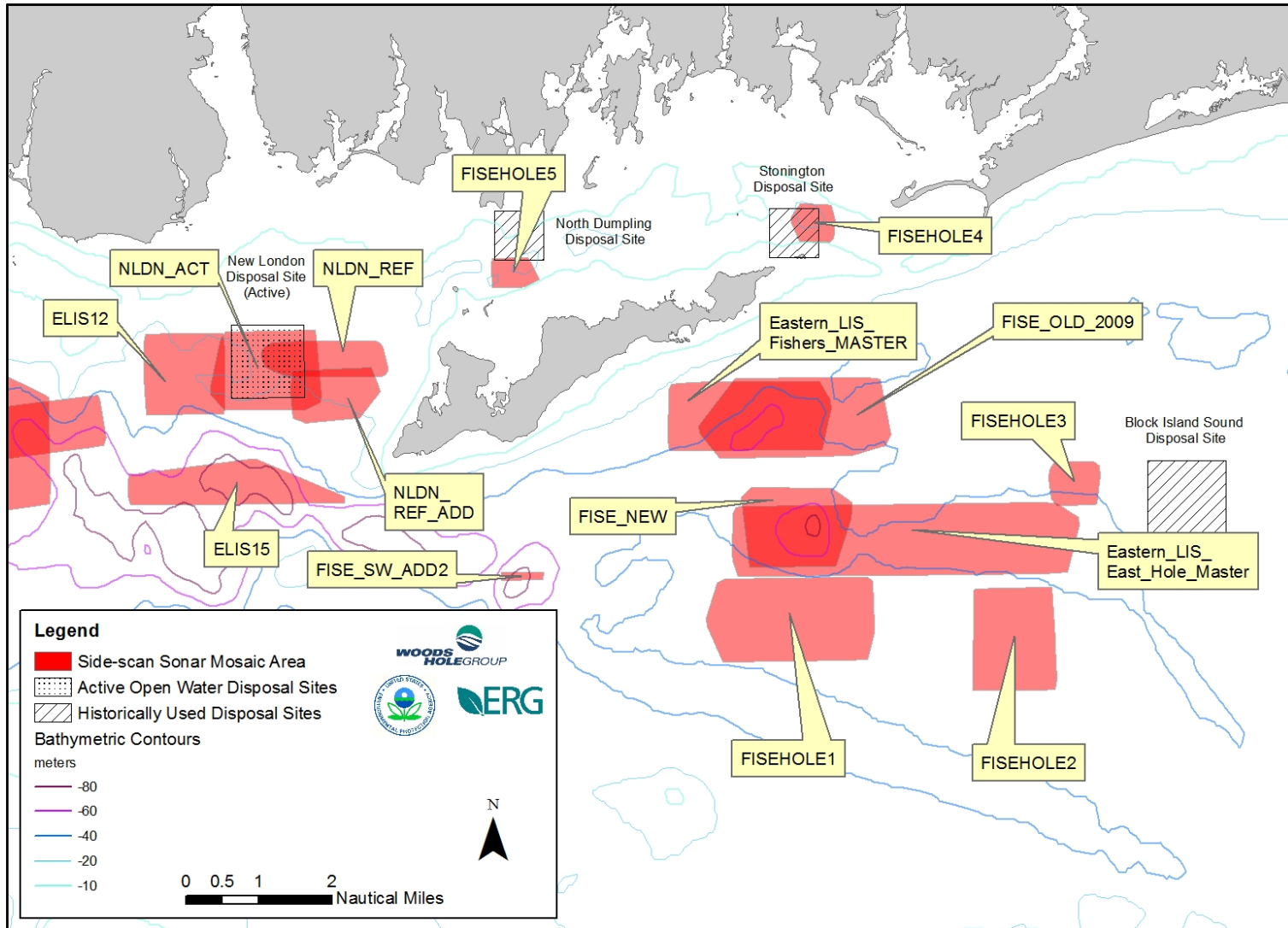


Figure 3.1.4. Basemap of eastern survey areas along with active and historical disposal sites.

3.2 ELIS16

3.2.1 Mosaic Overview

Project location ELIS16 is located approximately 10 km south of Branford, CT and 6 km southwest of Falkner Island (Figure 3.1.2). Depths vary between 18 to 30 meters at this location. The Falkner Island disposal site (historical) covers approximately 80% of the survey area, extending from the west to the east.

Processing summary statistics are listed in Table 3.2.1. Forty-one (41) side-scan sonar XTF files were imported for this project location. A quality control assessment was conducted and zero (0) files were rejected. Two (2) files were trimmed of data. Data coverage is presented in Figure 3.2.1. The green shade indicates survey area with 100% coverage (0% overlap); the blue shade represents area with 200% coverage (100% overlap). In total, the project area was surveyed at approximately 30–50% overlap in data coverage. Navigation/layback information was imbedded in the sonar data files. Side-scan data covered 4.24 million sq. meters. The mosaic and navigation lines are presented in Figure 3.2.2.

Table 3.2.1. ELIS16 processing statistics used in SonarWiz 5.

ELIS16	
# XTF files	41
Navigation/layback imbedded in sonar data?	Yes
Nadir Blanking dist. (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	ELIS16_06_05_120721205600
	ELIS16_38_37_120722000800
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.2.2 Target Summary

Seventy-five (75) unique targets and one (1) feature were identified at ELIS16 using specific descriptions. Targets were assigned to four classifications, with the number of targets assigned to each classification given in parentheses: boulder (3), debris pile (1), trawl/anchor mark (28), or unidentified/other (42). The one feature outlined an area of trawl/anchor marks in the center of the project location, extending roughly east-west. Trawl marks were observed mostly in the center of the project location and would often continue on several adjacent survey lines. Approximately half of the targets were

isolated, meaning there were no other adjacent targets. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.2.2 and example target images are indicated in Figure 3.2.3.

3.2.3 Seafloor Classification & Geological Interpretation

The seafloor at ELIS16 consists of material with medium intensity acoustic backscatter, which is homogeneously distributed in the project area. No bottom samples or SPI images were provided within the survey area. Sediment texture interpretation performed by the USGS describes the entire project area as a mix of sand-silt-clay (USGS, 2000). Figure 3.2.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned a single class to the entire study area, which is consistent with the USGS data, and further supports the interpretations of a seafloor composed of one sediment type. SonarWiz 5 bottom classifications are located in Appendix Z.

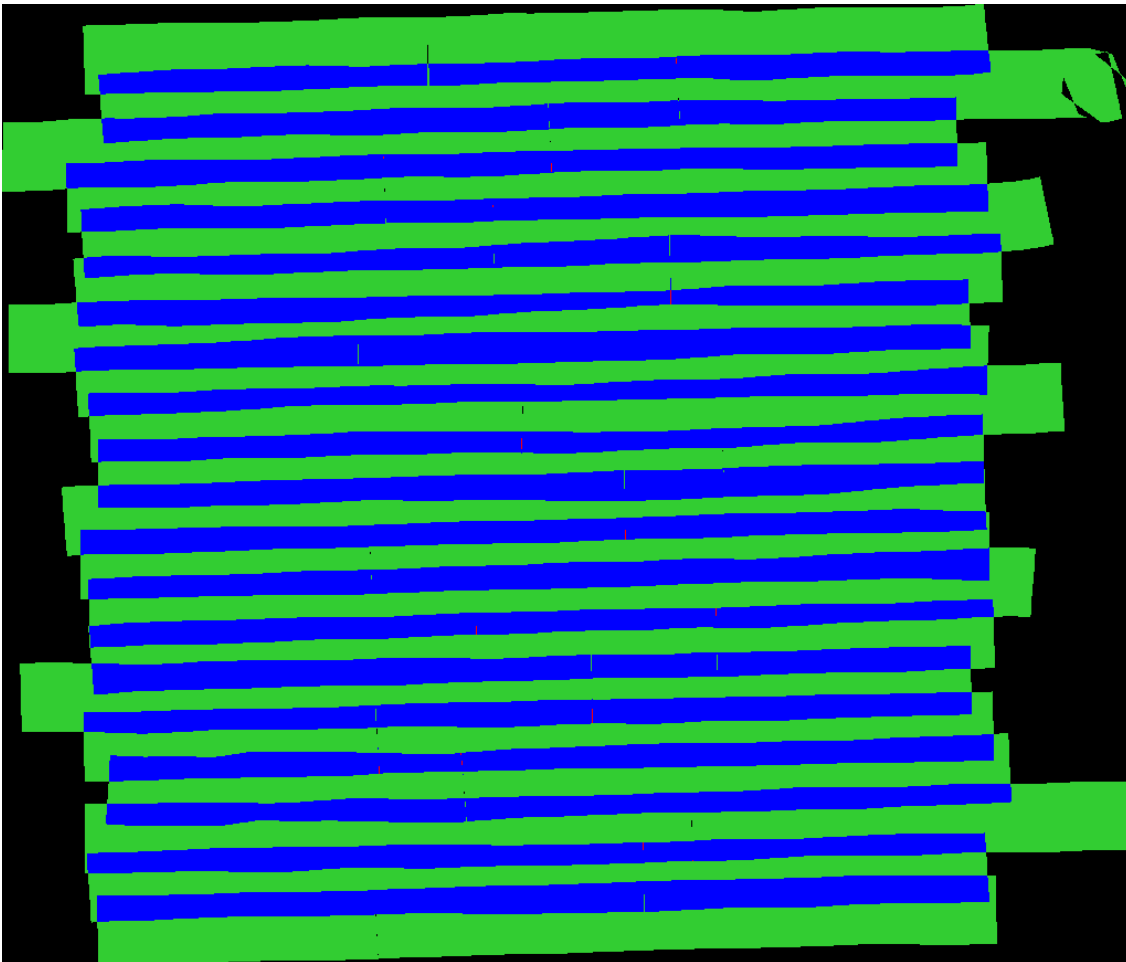


Figure 3.2.1. ELIS16 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

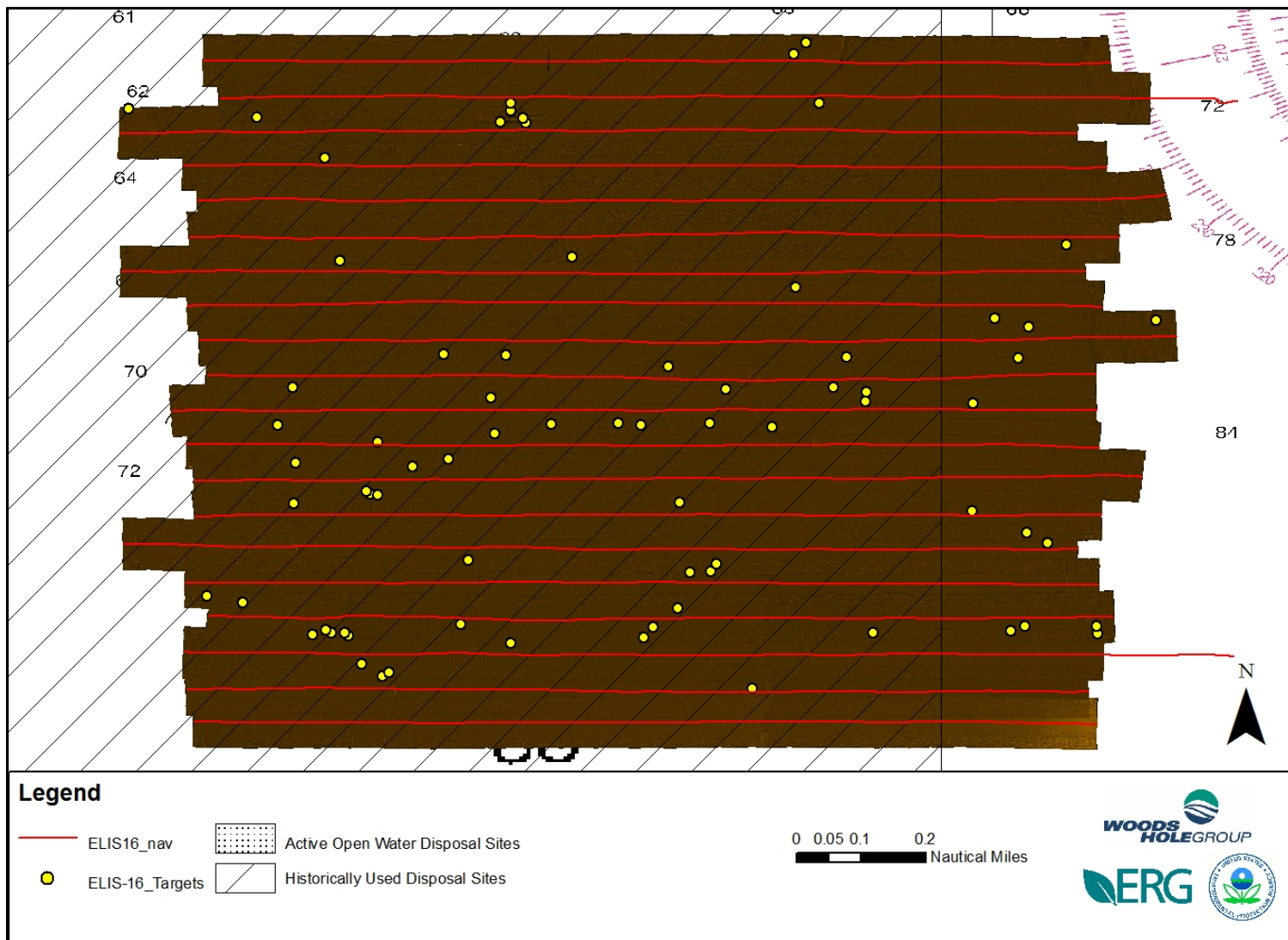


Figure 3.2.2. ELIS16 mosaic with navigation lines and targets.

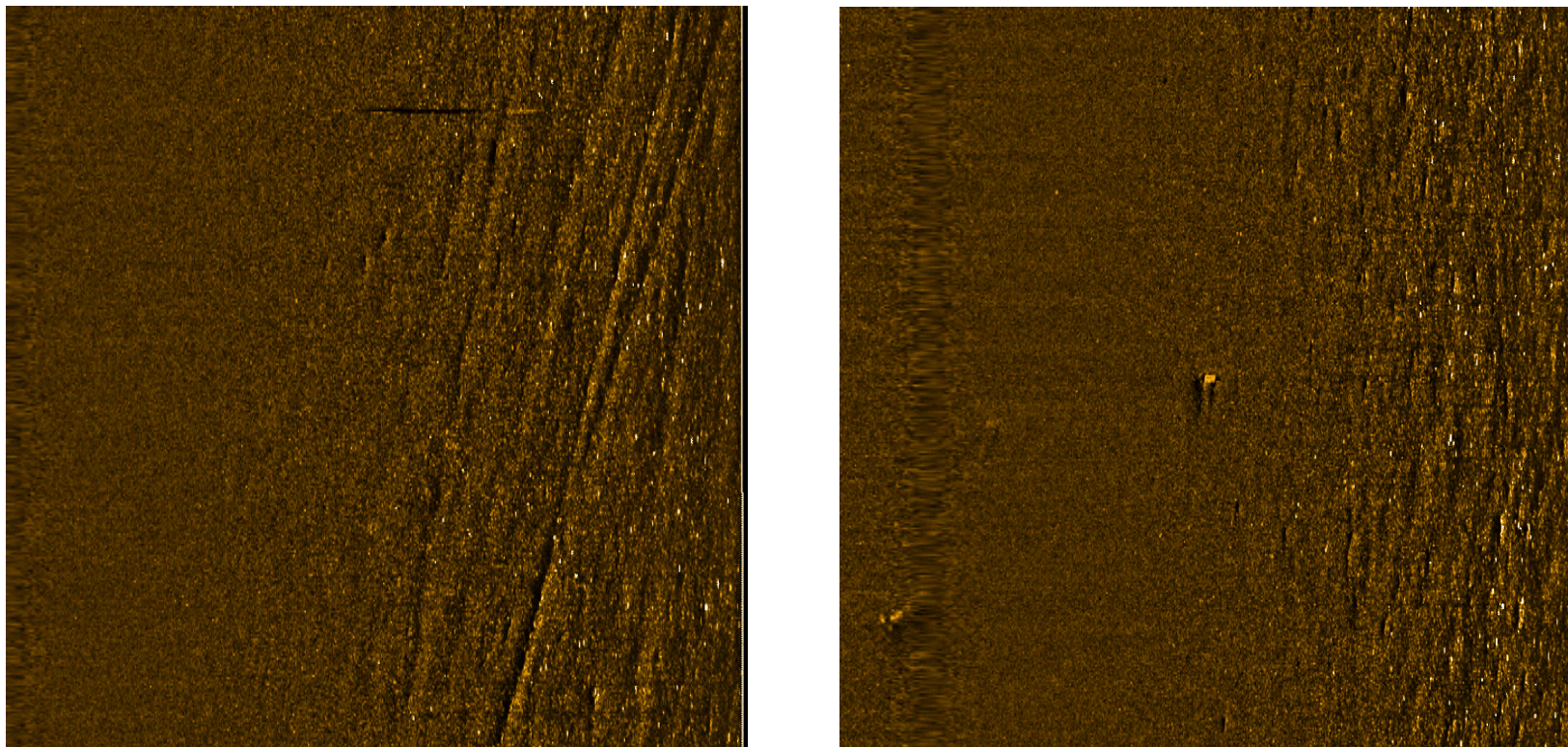


Figure 3.2.3. ELIS16 target examples: trawl/anchor marks (L), unidentified/other (R).



Figure 3.2.4. ELIS16 mosaic with supplemental data to assist with interpretation.

3.3 ELIS15

3.3.1 Mosaic Overview

Project location ELIS15 is located near Race Rock Reef approximately 10 km south of New London Harbor, CT and 5 km west of Fishers Island (Figure 3.1.3). The site is 1.3 km south of the New London Disposal Site (active). Depth ranges from 15 to 91 meters in this area.

Sixteen (16) side-scan sonar XTF files were imported for this project location, and one (1) file was rejected for QA reasons. Three (3) files were trimmed of data (Table 3.3.1). Data coverage is presented in Figure 3.3.1. The project area was surveyed at approximately 0% overlap in data coverage. Side-scan data covered 2.45 million sq. meters at this location. The navigation and mosaic lines are presented in Figure 3.3.2.

Table 3.3.1. ELIS15 processing statistics used in SonarWiz 5.

ELIS15	
# XTF files	16
Navigation/layback imbedded in sonar data?	Yes
Nadir Blanking dist. (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	3
Tracklines trimmed	ELIS15_2_1120720080100
	ELIS15_2_1120720081100
	ELIS15_14_13_120721152100
# Tracklines removed/hidden	1
Tracklines removed/hidden	ELIS15_2_1120720082100

3.3.2 Target Summary

Forty (40) unique targets and zero (0) features were identified at ELIS15 using specific descriptions. Targets were assigned to four classifications, with the number of targets assigned to each classification given in parentheses: boulder area/field (35), debris (1), rock outcrop/geological (1), or unidentified (3). Very few targets were isolated since they were surrounded by other similar bottom features. Targets and features are compiled in Appendix T. Targets are indicated in Figure 3.3.2 and example target images are indicated in Figure 3.3.3.

3.3.3 Seafloor Classification & Geological Interpretation

The seafloor at ELIS15 consists of material with medium intensity backscatter that is interrupted by small, intermittent areas of higher intensity backscatter. Numerous piles of boulders and rock outcrops were interpreted from survey data. There were no grab samples of bottom material at this location. The USGS model of bottom sediment is a complex mix of mostly gravel and sand, with areas of san-silt-clay, where grain size increases as depth decreases (USGS, 2000). The proximity to the swift currents of The Race suggests the bottom in shallower areas is composed of coarse sediment and exposed bedrock, and deeper areas are composed of finer sediments. Figure 3.3.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned three classes to the study area: two dominant classes which correspond to the seafloor sediment and the larger debris fields, and a third class which corresponds mainly to outcrop shadows and is not considered an actual change in the seafloor. However, since the survey lines do not provide data overlap this classification should be used with caution. SonarWiz 5 bottom classifications are located in Appendix Z.

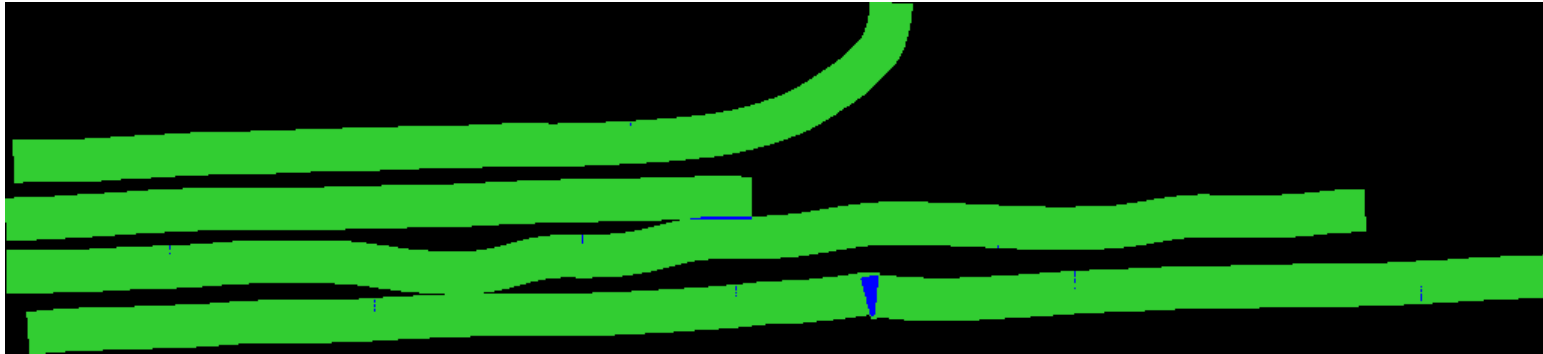


Figure 3.3.1. ELIS15 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

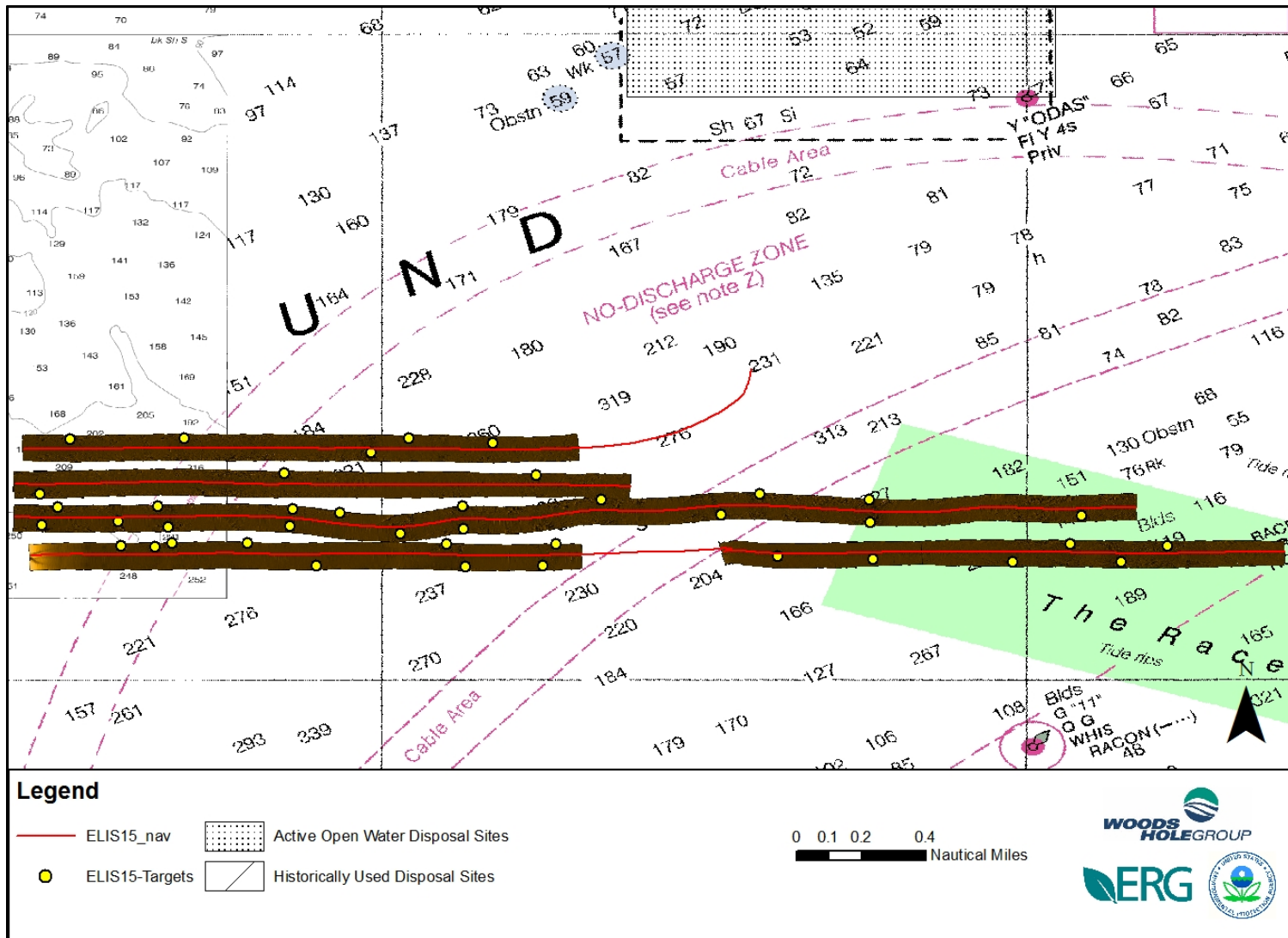


Figure 3.3.2. ELIS15 mosaic with navigation lines and targets.

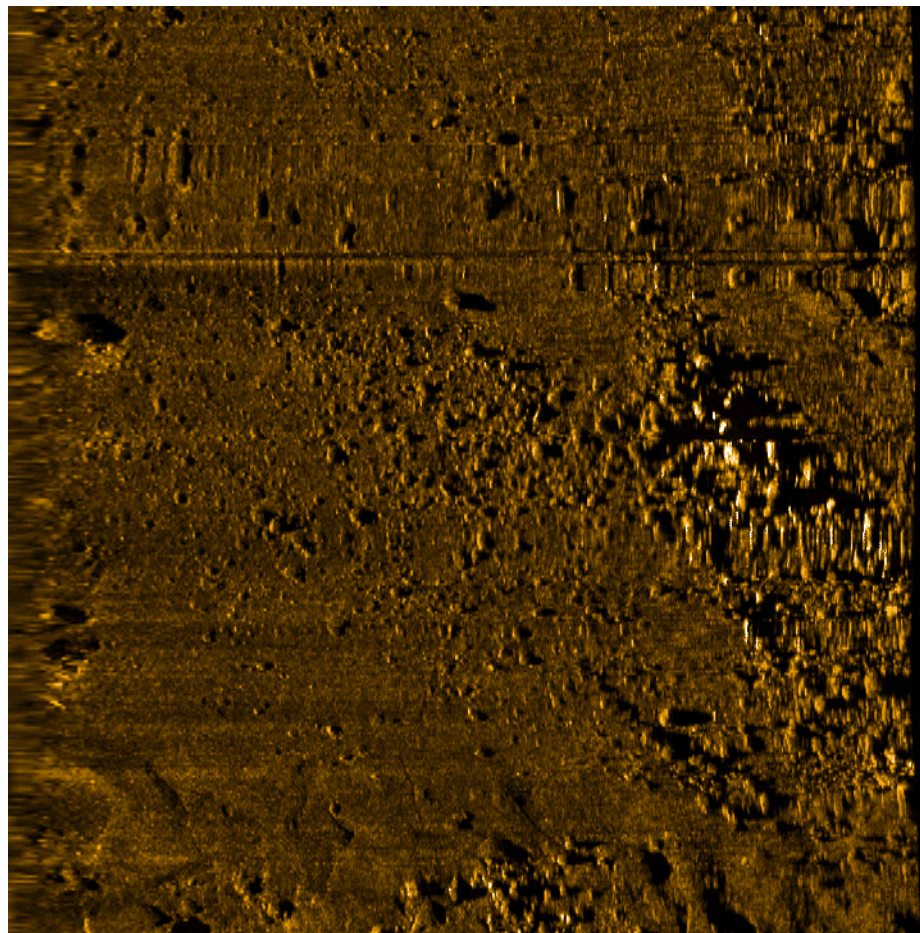


Figure 3.3.3. ELIS15 target example: boulder area/field.

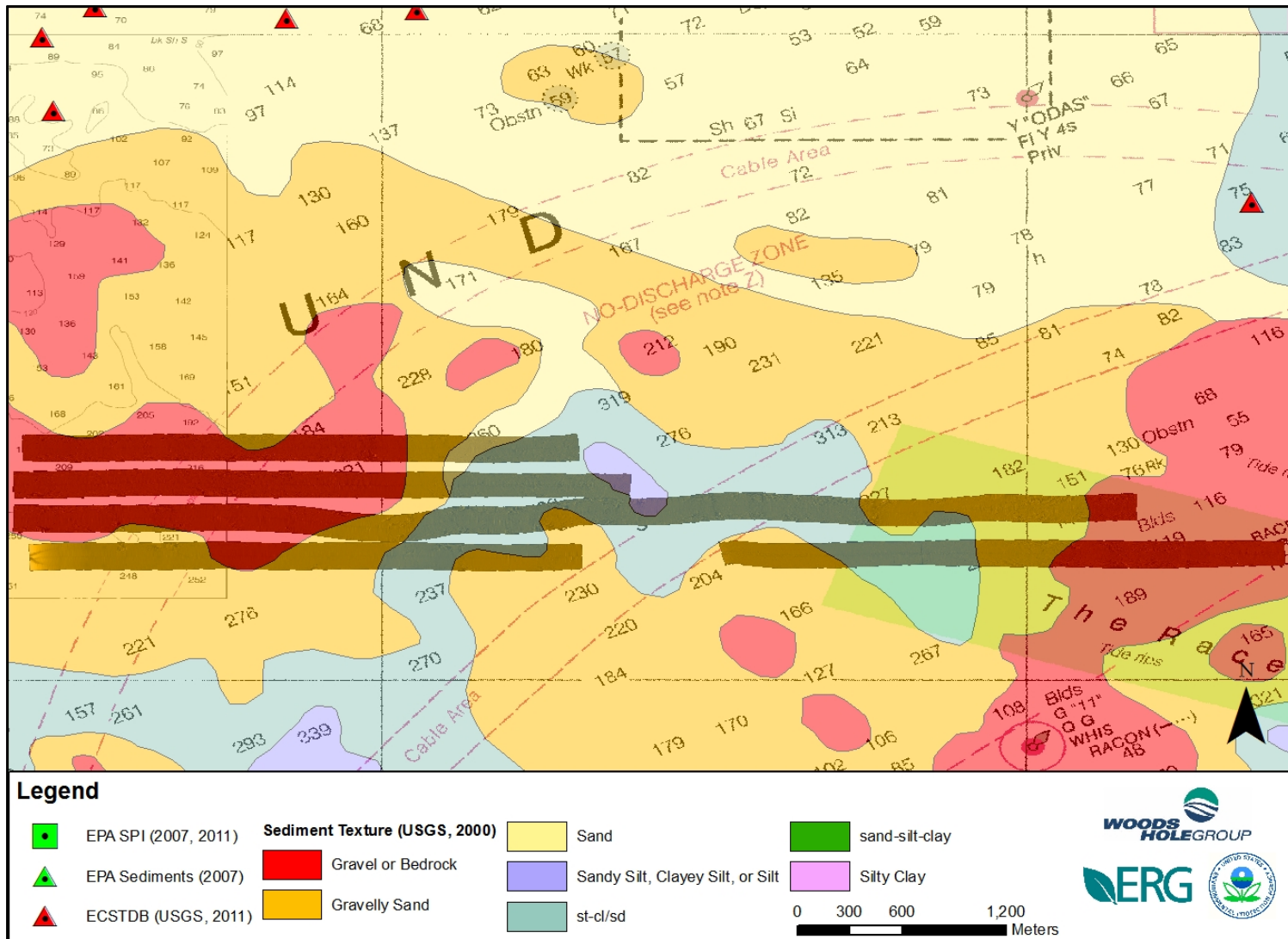


Figure 3.3.4. ELIS15 mosaic with supplemental data to assist with interpretation.

3.4 ELIS14

3.4.1 Mosaic Overview

Project location ELIS14 is located approximately 8 km south of Niantic Bay, CT (Figure 3.1.3). Depth varies between 12 and 61 meters in this area. This site overlaps with project locations FISEHOLE6, NTDS_HIST, NTDS_NEW, and Eastern_LIS_Niantic_Master. The Niantic Bay disposal site (historical) overlaps the site in the northeast corner.

One hundred ninety-four (194) side-scan sonar XTF files were imported for this project location, and zero (0) files were rejected for QA reasons. Two (2) files were trimmed of data (Table 3.4.1). Data coverage is presented in Figure 3.4.1. The project area was surveyed at approximately 100% overlap in data coverage. Navigation/layback information was imbedded in the sonar data files. Side-scan data covered 8.13 million sq. meters at this location.

Table 3.4.1. ELIS14 processing statistics used in SonarWiz 5.

ELIS14	
# XTF files	194
Navigation/layback imbedded in sonar data?	Yes
Nadir Blanking dist. (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	ELIS14_47_48_120717142200
	ELIS14_44_43_120717144300
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.4.2 Target Summary

Ninety-five (95) unique targets and four (4) features were identified at ELIS14 using specific descriptions. Targets were assigned to nine classifications, with the number of targets assigned to each classification given in parentheses: bedforms (1), boulder (5), boulder area/field (39), debris pile (9), fishing gear – trap/buoy (4), rock outcrop/geological (3), trawl/anchor mark (8), unidentified/other (24), and wreck (2). The features outlined boulder area/fields in the center and east edge of the project location. The wrecks were located in the center and southeast areas of the site: target ELIS14-T0044 is identified on NOAA charts, but target ELIS-T0089 is not. Targets and

features are compiled in Appendix T. Targets are indicated on Figure 3.4.2 and example target images are indicated in Figure 3.4.3.

3.4.3 Seafloor Classification & Geological Interpretation

The seafloor at ELIS14 consists of homogeneously distributed medium backscatter material, with infrequent and isolated patches of higher backscatter. Closer examination of the seafloor reveals bedforms that may be sand waves in the west. Sediment grabs by the USGS consisted of gravel with varying percentages of sand (USGS, 2011). SPI images provided by the EPA show the bottom to be coarse sand with shells and shell hash. The USGS modeled seafloor classification described the survey area as dominantly gravelly sand with patches of gravel in the east, fining to the west to sand and silty sand (USGS, 2000). The large number of targets identified as boulder fields in the project area supports this interpretation of a hard bottom. Figure 3.4.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area, despite there being clear visual differences in backscatter between bottom sediment and exposed bedrock and boulders. Possibly this is because the total area of boulders and bedrock was not great enough to be considered a unique class when compared to the surrounding survey area. SonarWiz 5 bottom classifications are located in Appendix Z.

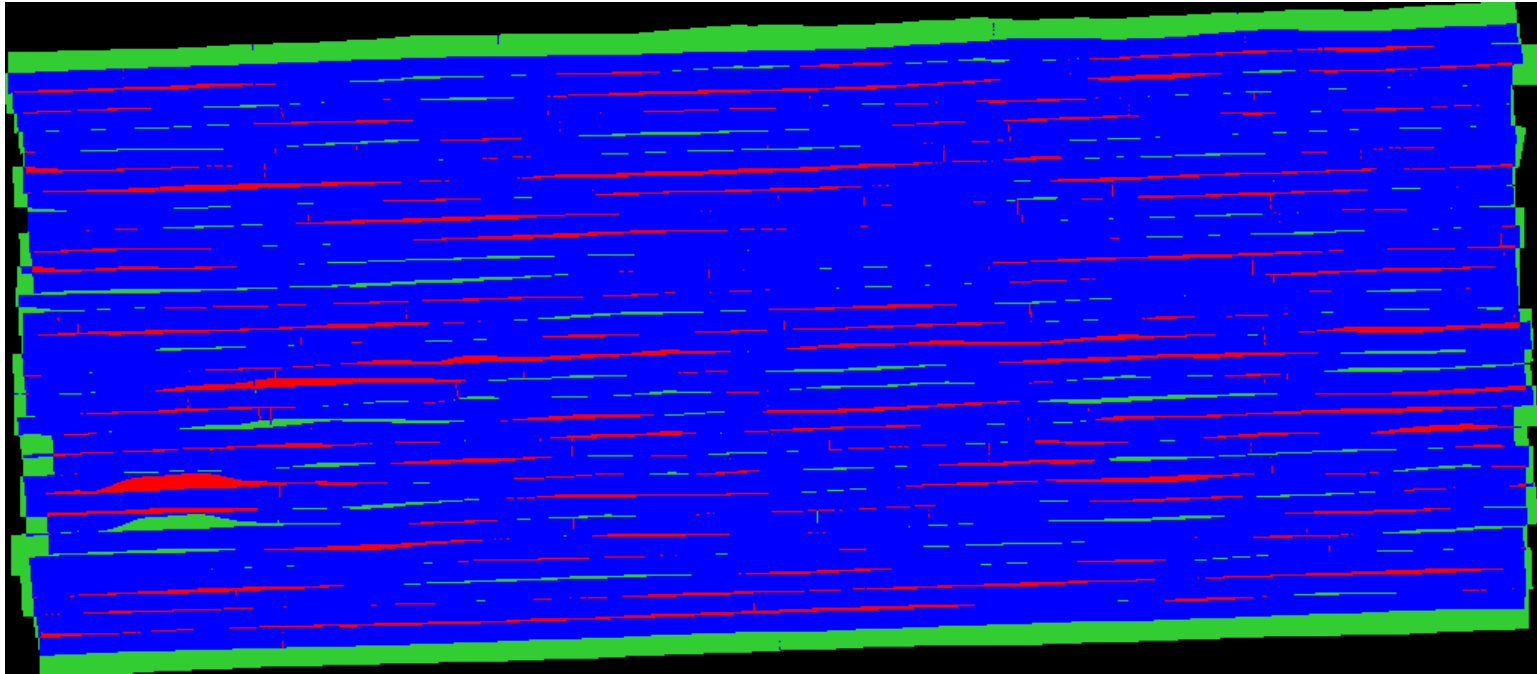


Figure 3.4.1. ELIS14 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

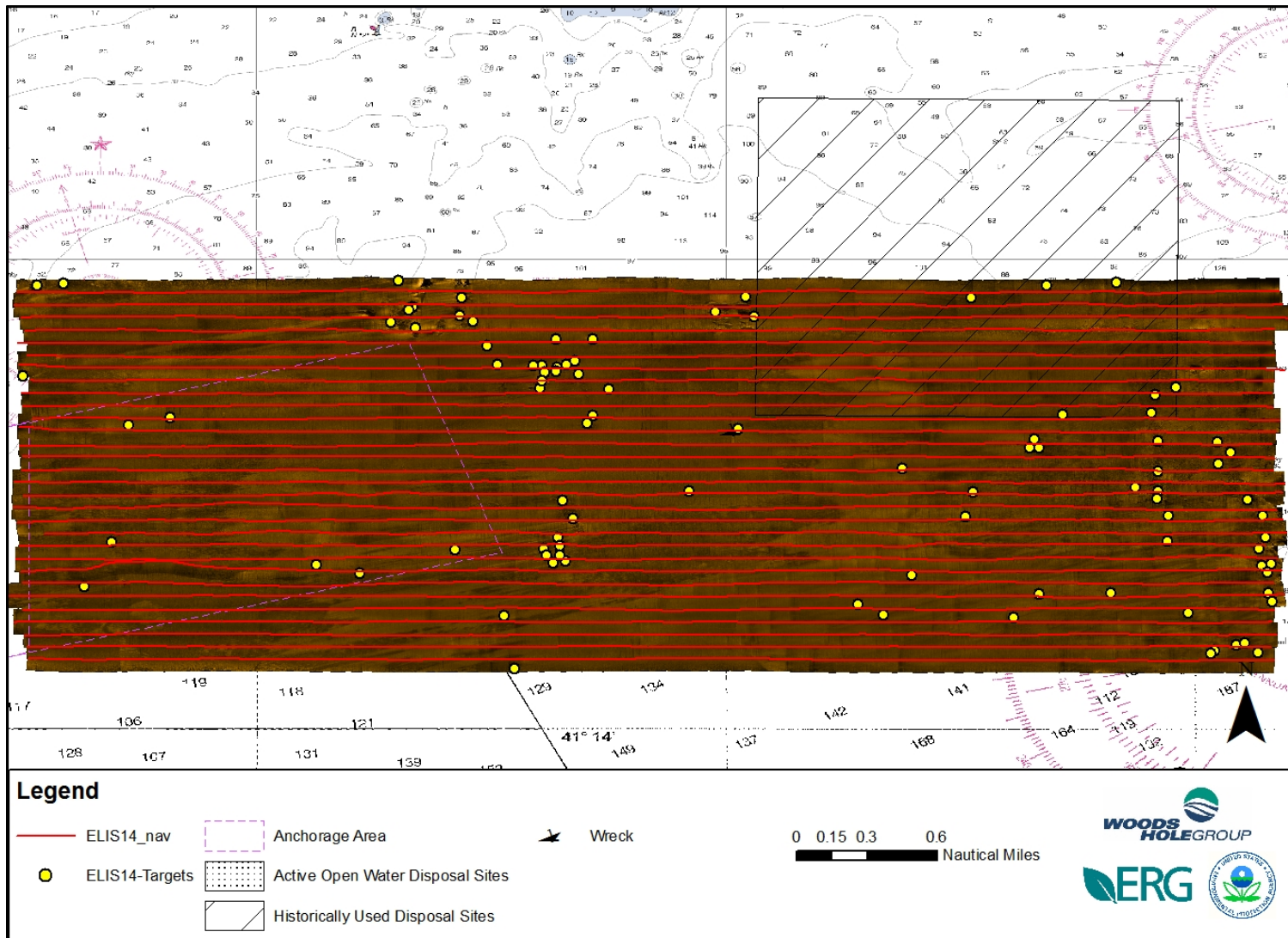


Figure 3.4.2. ELIS14 mosaic with navigation lines and targets.

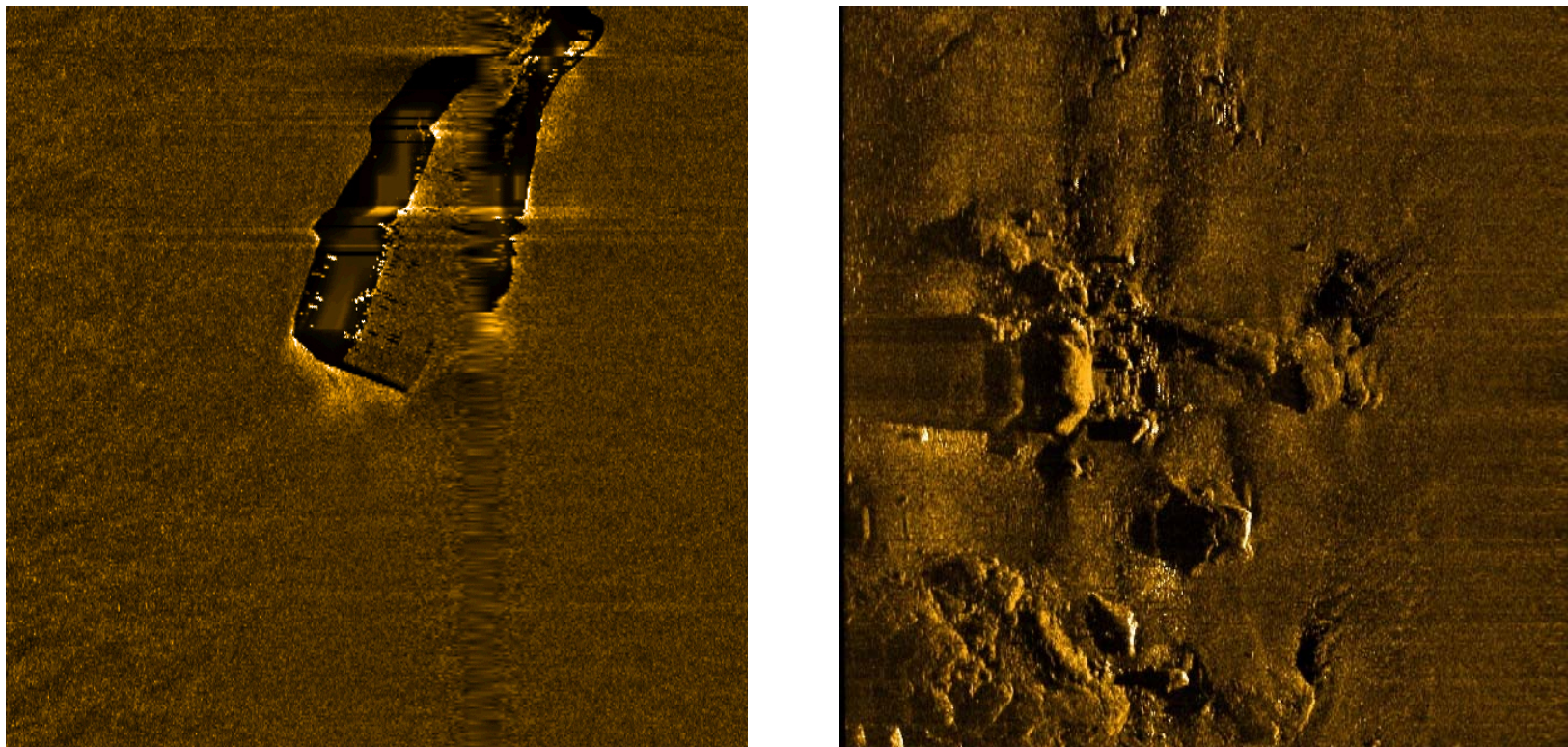


Figure 3.4.3. ELIS14 target examples: wreck (L), boulder area/field (R).

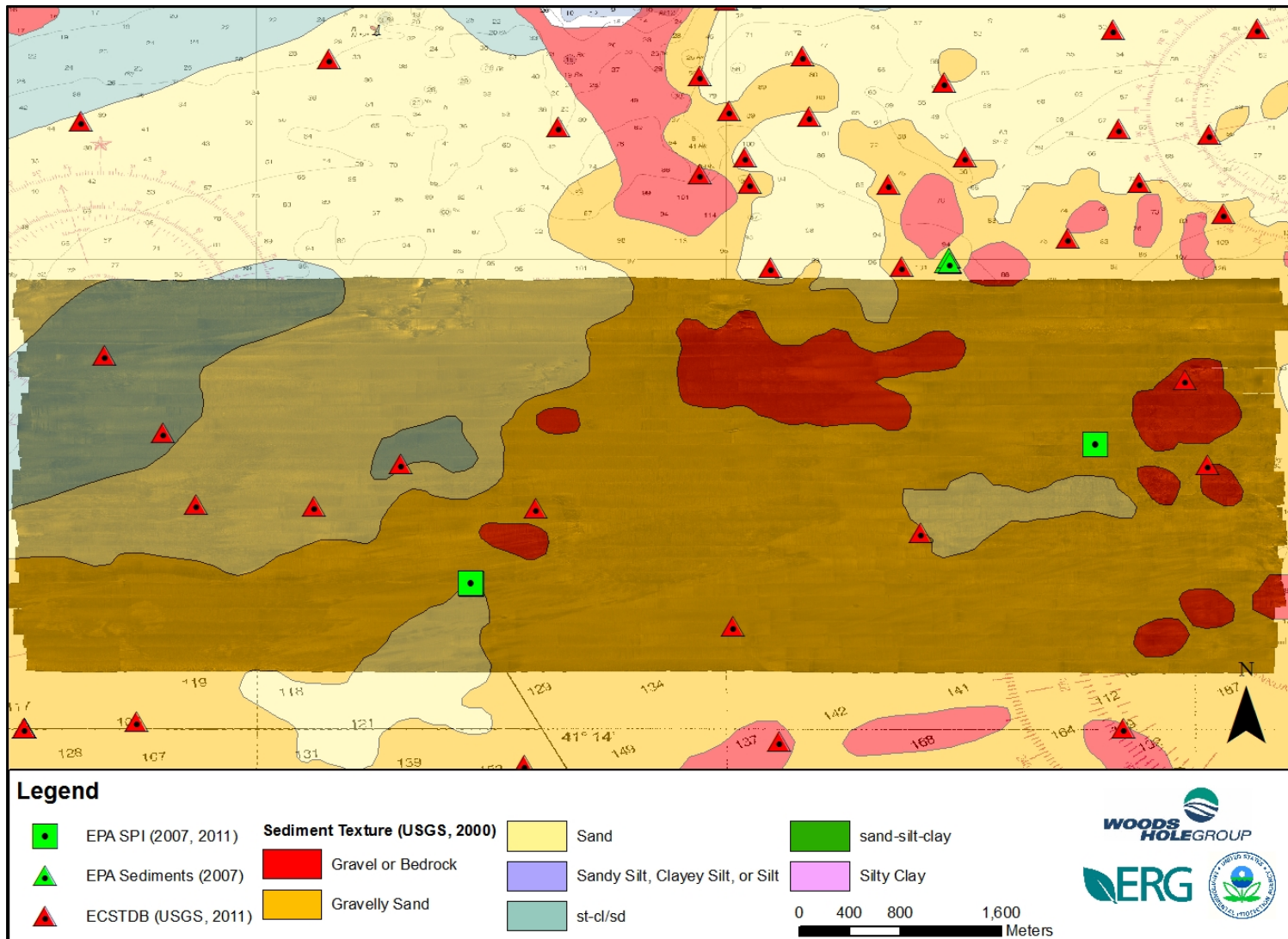


Figure 3.4.4. ELIS14 mosaic with supplemental data to assist with interpretation.

3.5 ELIS13

3.5.1 Mosaic Overview

Project location ELIS13 is located approximately 4 km southwest of Niantic Bay, CT (Figure 3.1.3). Project location NTDS_NEW and the Niantic Bay disposal site (historical) overlap to a small degree in the eastern edge of ELIS13. Depth varies between 6 and 30 meters in this area.

Fifty-two (52) side-scan sonar XTF files were imported for this project location, and zero (0) files were rejected for QA reasons. Four (4) files were trimmed of data (Table 3.5.1). Data coverage is presented in Figure 3.5.1. The project area was surveyed at approximately 50–60% overlap in data coverage. Navigation/layback information was imbedded in the sonar data files. Side-scan data covered 5.75 million sq. meters at this location.

Table 3.5.1. ELIS13 processing statistics used in SonarWiz 5.

ELIS13	
# XTF files	52
Navigation/layback imbedded in sonar data?	Yes
Nadir Blanking dist. (m)	4
Nadir Threshold	10
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	73 of 75
# Tracklines trimmed	4
Tracklines trimmed	ELIS13_24_23_120717081800
	ELIS13_20_19_120716183500
	ELIS13_6_5_120716121300
	ELIS13_20_19_120716181500
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.5.2 Target Summary

Eighty-eight (88) unique targets and four (4) features were identified at ELIS13 using specific descriptions. Targets were assigned to seven classifications, with the number of targets assigned to each classification given in parentheses: bedforms (12), boulder (5), boulder area/field (36), debris pile (2), rock outcrop/geological (20), unidentified/other (12), and wreck (1). The features outlined three boulder area/fields in distinct sections running north-south in the center and eastern areas of the project location, with the fourth being much smaller and lacking directional orientation. The wreck (target identification

ELIS13-T0072) is located in the south-center of the site and is not identified on NOAA charts. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.5.2 and example target images are indicated in Figure 3.5.3.

3.5.3 Seafloor Classification & Geological Interpretation

The seafloor at ELIS13 consists of evenly distributed material with medium intensity backscatter with areas of either exposed bedrock or boulder fields in the east and central areas of the project. This is supported by USGS bottom samples in the area which range from sand in the west to gravel and bedrock in the east (USGS, 2011). A large area of rock outcrops/boulder fields in the center of the project area identified in the sonar data was not present in the USGS model of bottom classification (USGS, 2000). This discrepancy could be due to the difference in survey coverage, the frequency acquired survey data (100-kHz vs. 500-kHz), or morphological changes to the seafloor. In this case, the USGS side-scan sonar coverage ends at the outcropping bedrock off Black Point, and there were no samples that indicated bedrock at this location, therefore the model of bottom classification was inaccurate. The presence of bedforms (sand waves) in the east-central section of the study area is evidence that ocean currents play a role in shaping the seafloor at this location, either by producing bedforms or exposing bedrock. Figure 3.5.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area, with a dominant class and a secondary class. The primary class was assigned to the vast majority of the seafloor, which according to the USGS (2000, 2011) is comprised of sand. The secondary class partially covers the higher backscatter features in the center and eastern part of the study area (likely outcropping bedrock or rocks, but also was assigned to areas of possible bedforms (e.g. sand waves). SonarWiz 5 bottom classifications are located in Appendix Z.

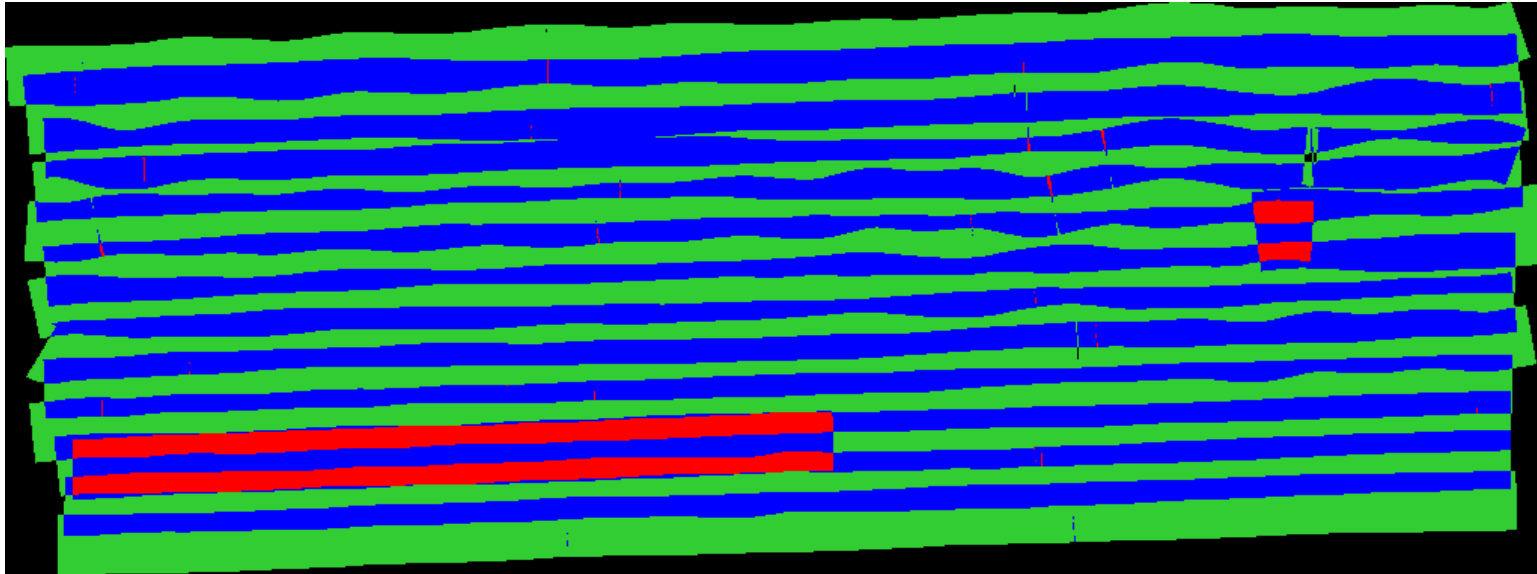


Figure 3.5.1. ELIS13 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

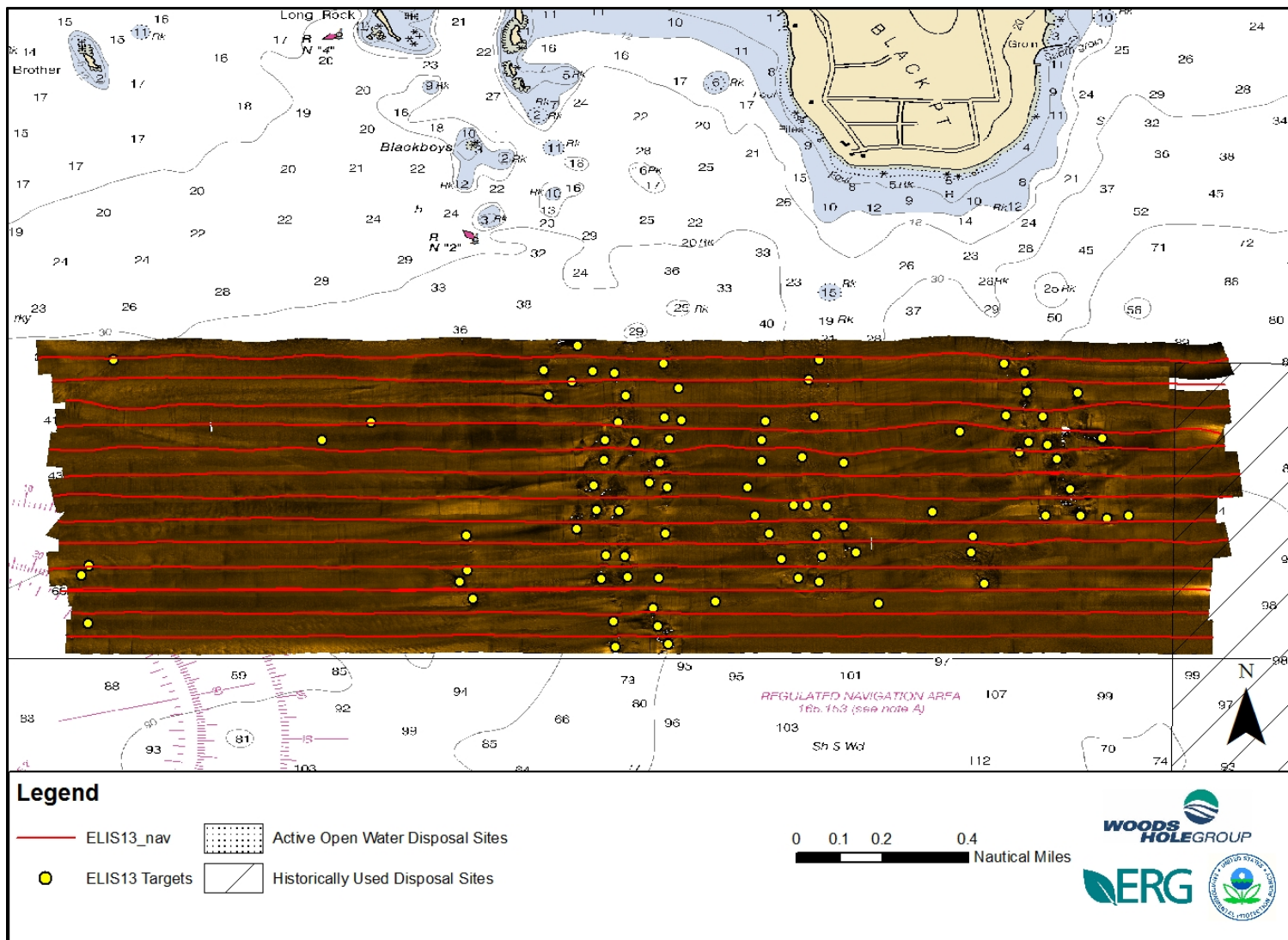


Figure 3.5.2. ELIS13 mosaic with navigation lines and targets.

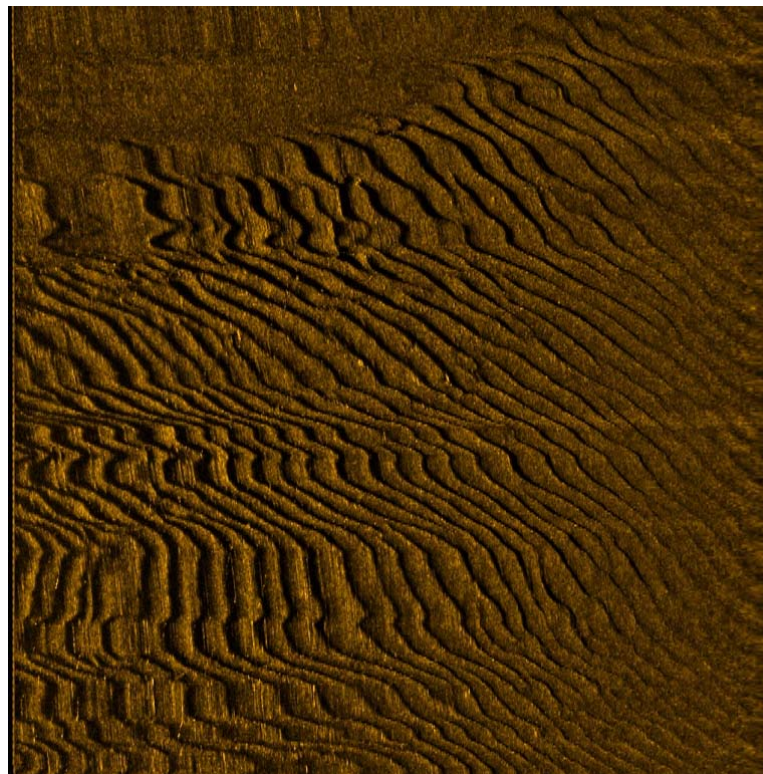
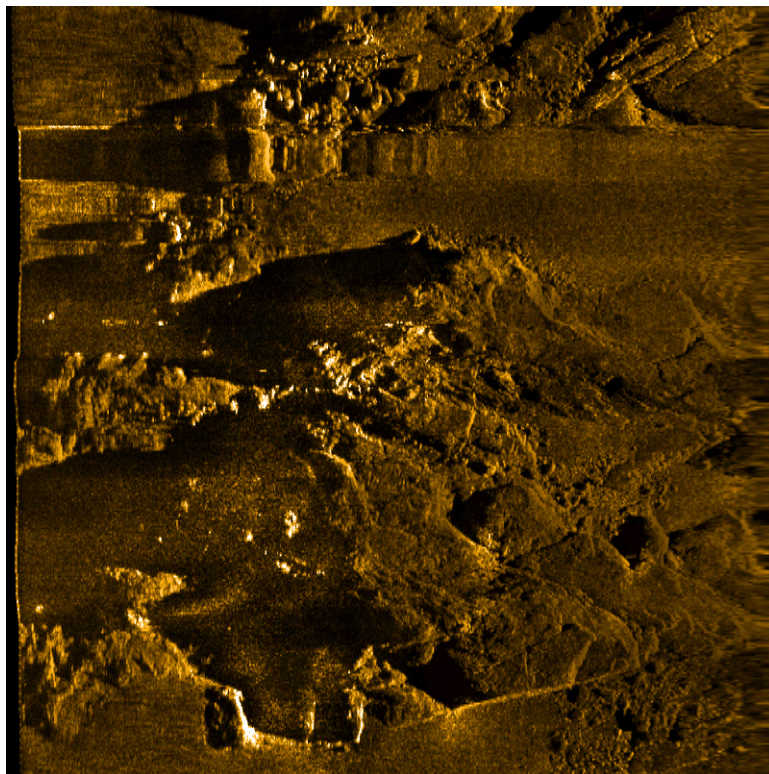


Figure 3.5.3. ELIS13 target examples: rock outcrop/geological (L), bedforms (R).

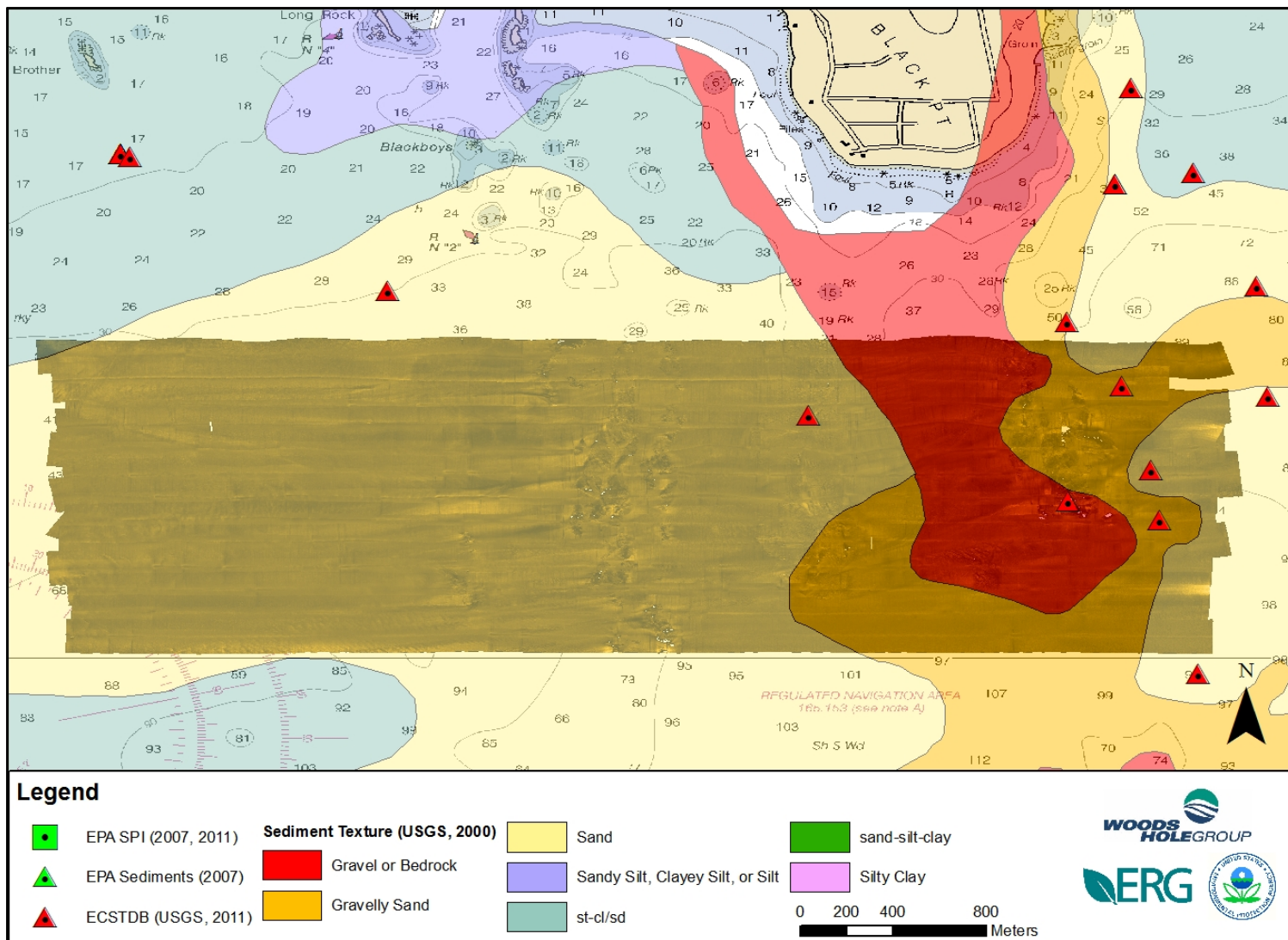


Figure 3.5.4. ELIS13 mosaic with supplemental data to assist with interpretation.

3.6 ELIS12

3.6.1 Mosaic Overview

Project location ELIS12 is located approximately 2 km east of Bartlett Reef and 5 km southwest of New London Harbor, CT (Figure 3.1.3). Project location NLDN_ACT overlaps this site briefly to the east. Depth varies between 15 and 43 meters in this area. Figure 3.6.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Forty-three (43) side-scan sonar XTF files were imported for this project location. Zero (0) files were rejected for QA reasons, and zero (0) files were trimmed of data (Table 3.6.1). Data coverage is presented in Figure 3.6.1. The project area was surveyed at approximately 50% overlap in data coverage. Navigation/layback information was imbedded in the sonar data files. Side-scan data covered 4.43 million sq. meters.

Table 3.6.1. ELIS12 processing statistics used in SonarWiz 5.

ELIS12	
# XTF files	43
Navigation/layback imbedded in sonar data?	Yes
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	0
Tracklines trimmed	N/A
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.6.2 Target Summary

Sixty-nine (69) unique targets and three (3) features were identified at ELIS12 using specific descriptions. Targets were assigned to nine classifications, with the number of targets assigned to each classification given in parentheses: bedforms (6), boulder (5), boulder area/field (36), debris pile (12), field of debris pile (1), fishing gear – trap/buoy (1), rock outcrop/geological (4), trawl/anchor mark (1), unidentified/other (3). Nearly all targets were identified in the north-central or southwest areas of the project location. Two features outlining boulder area/fields were located in the north-center and southwest corner of the project location and the feature describing bedforms was in the southwest of the site. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.6.2 and example target images are indicated in Figure 3.6.3.

3.6.3 Seafloor Classification & Geological Interpretation

The seafloor at ELIS12 is composed of material with medium backscatter along with intermittent features of higher backscatter in the north-center and southwest. Higher backscatter returns were nearly continuous in the north-central and were described as boulder areas/fields. Bedforms in the southwest imply currents are strong enough to shape the bottom, which could explain how boulders and bedrock may be exposed. Several USGS samples in the project area describe bottom type as sand with some gravel, especially in the east and southwest (USGS, 2011). USGS modeled bottom type describes the area as almost entirely sand, with few areas of gravelly sand (USGS, 2000). Figure 3.6.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class (blue) covers nearly 100% of the project area. The secondary class occupies such an extremely small area within the sections of high backscatter that it is negligible. The Classification function was run through several iterations (using different settings) in an attempt to better delineate the areas of higher backscatter in the southwest and north-central; unfortunately the Classification function could not resolve these features from the rest of the seafloor; the result is located in Appendix Z.

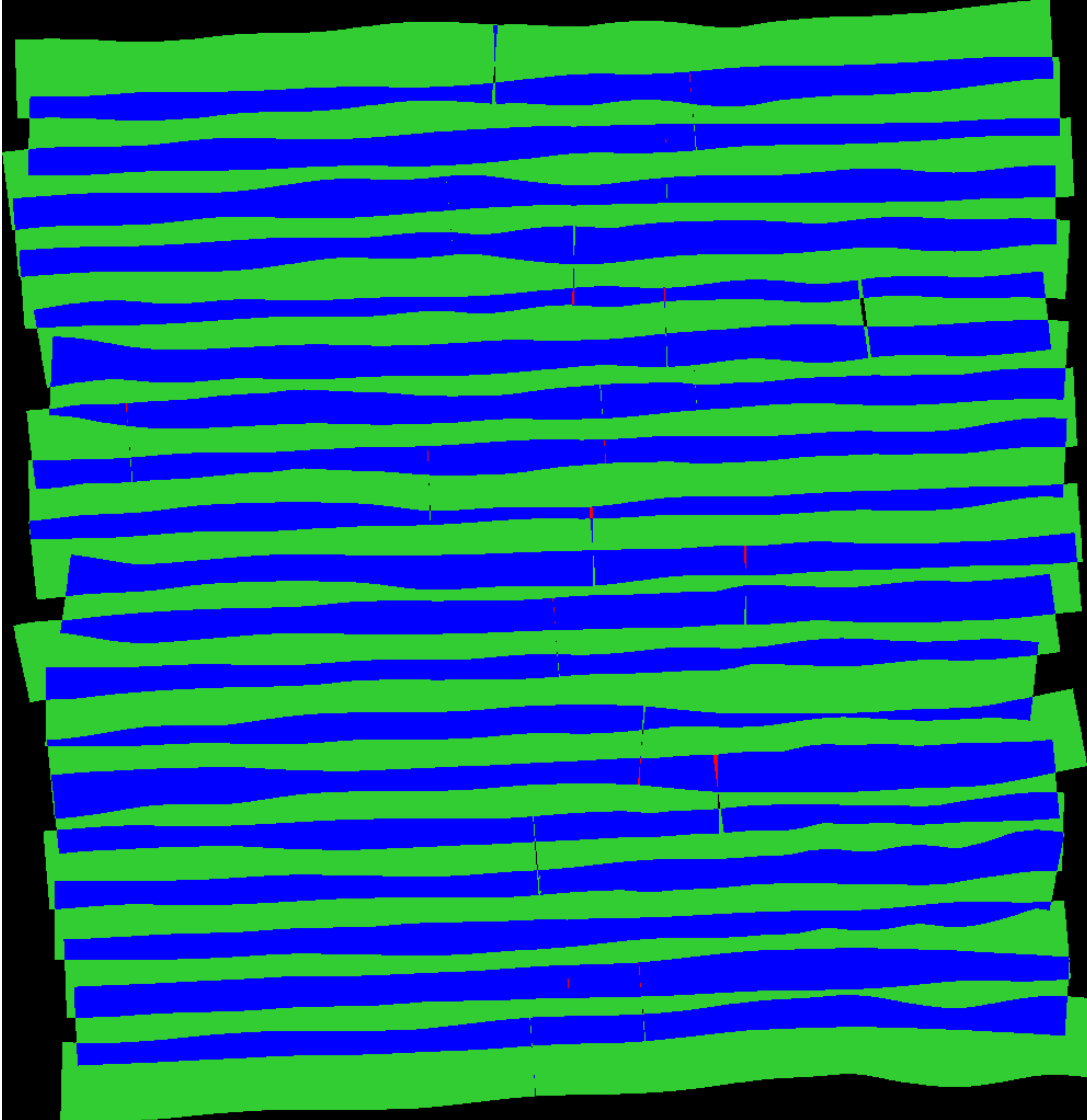


Figure 3.6.1. ELIS12 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

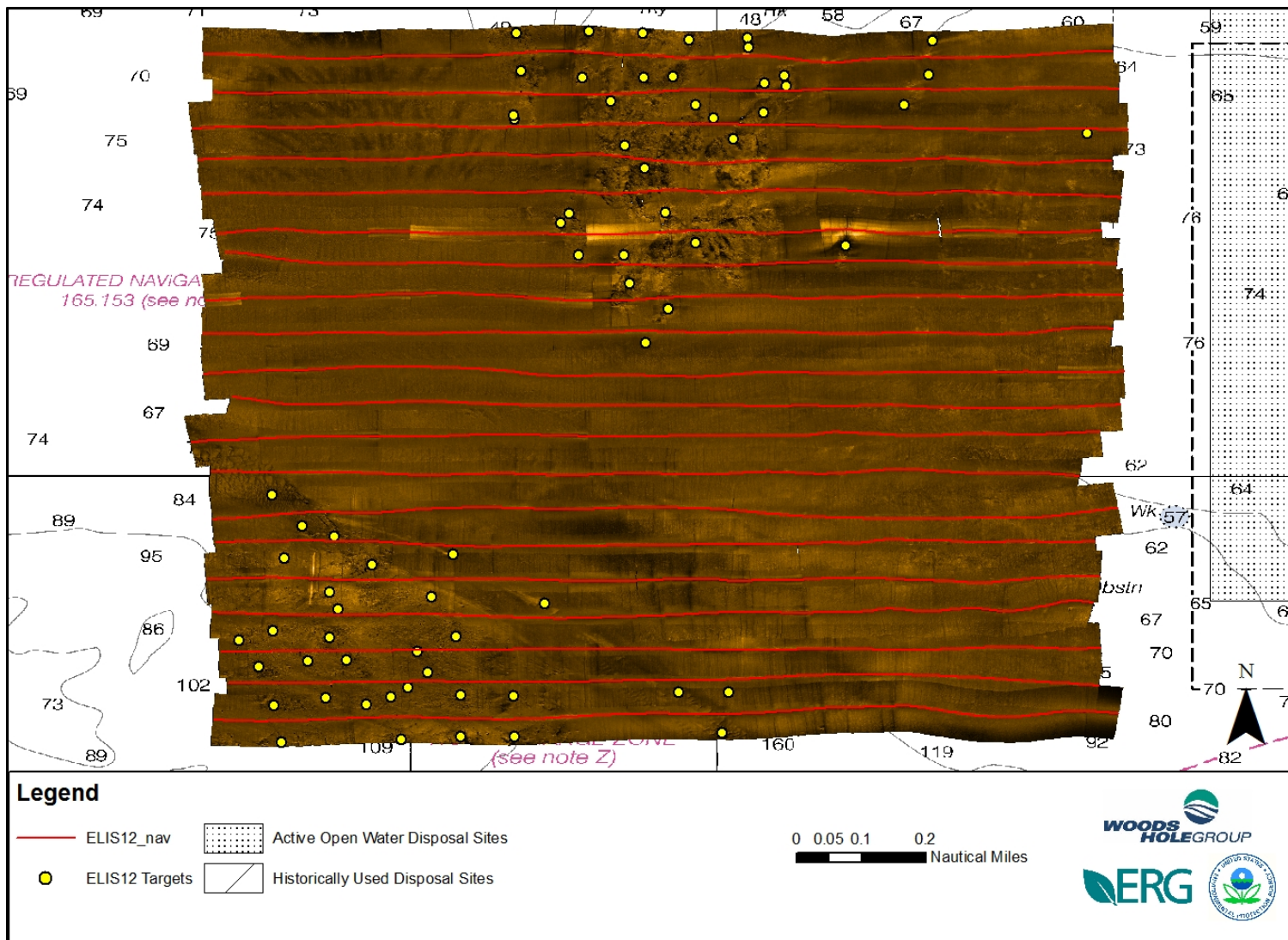


Figure 3.6.2. ELIS12 mosaic with navigation lines and targets.

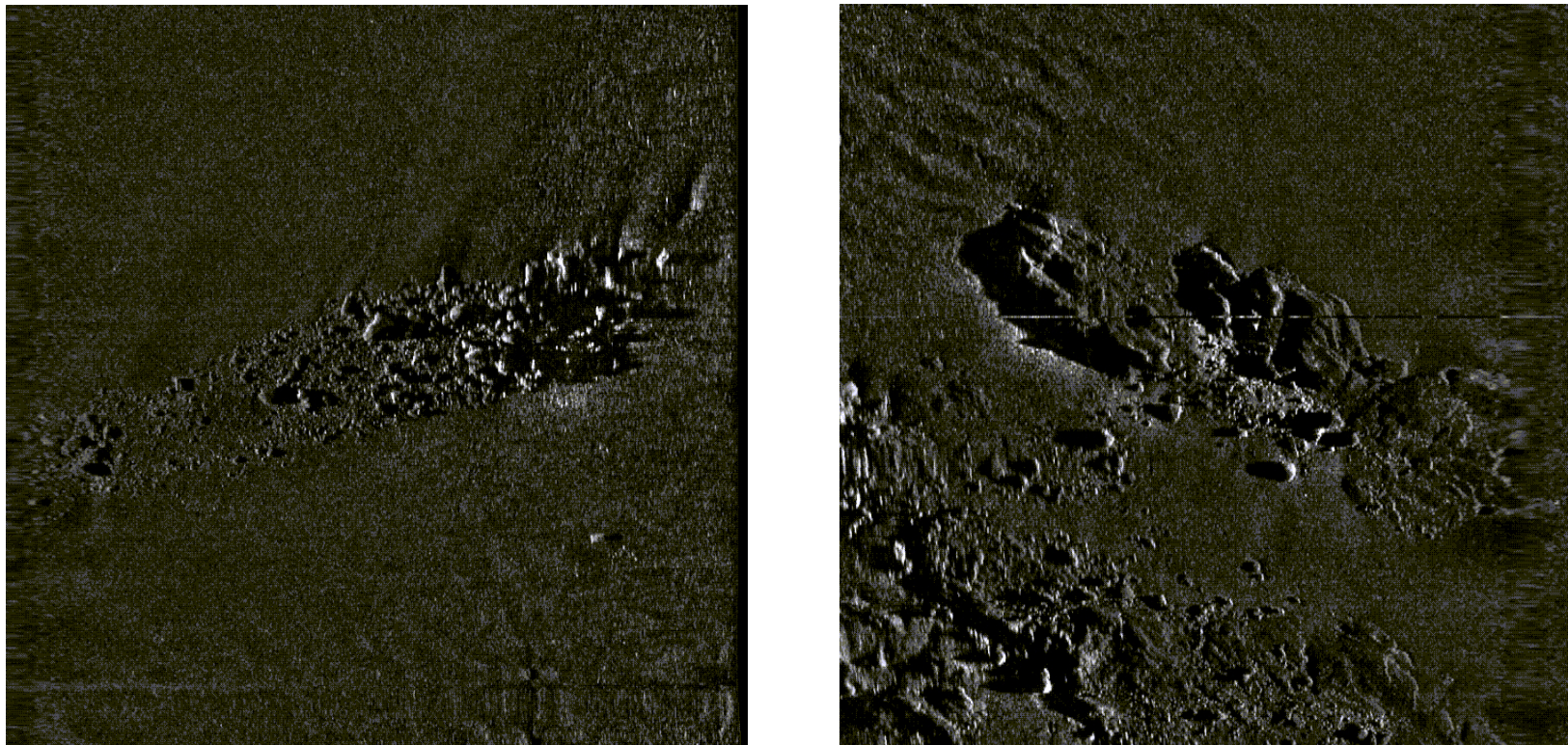


Figure 3.6.3. ELIS12 target examples: debris pile (L), boulder area/field (R).

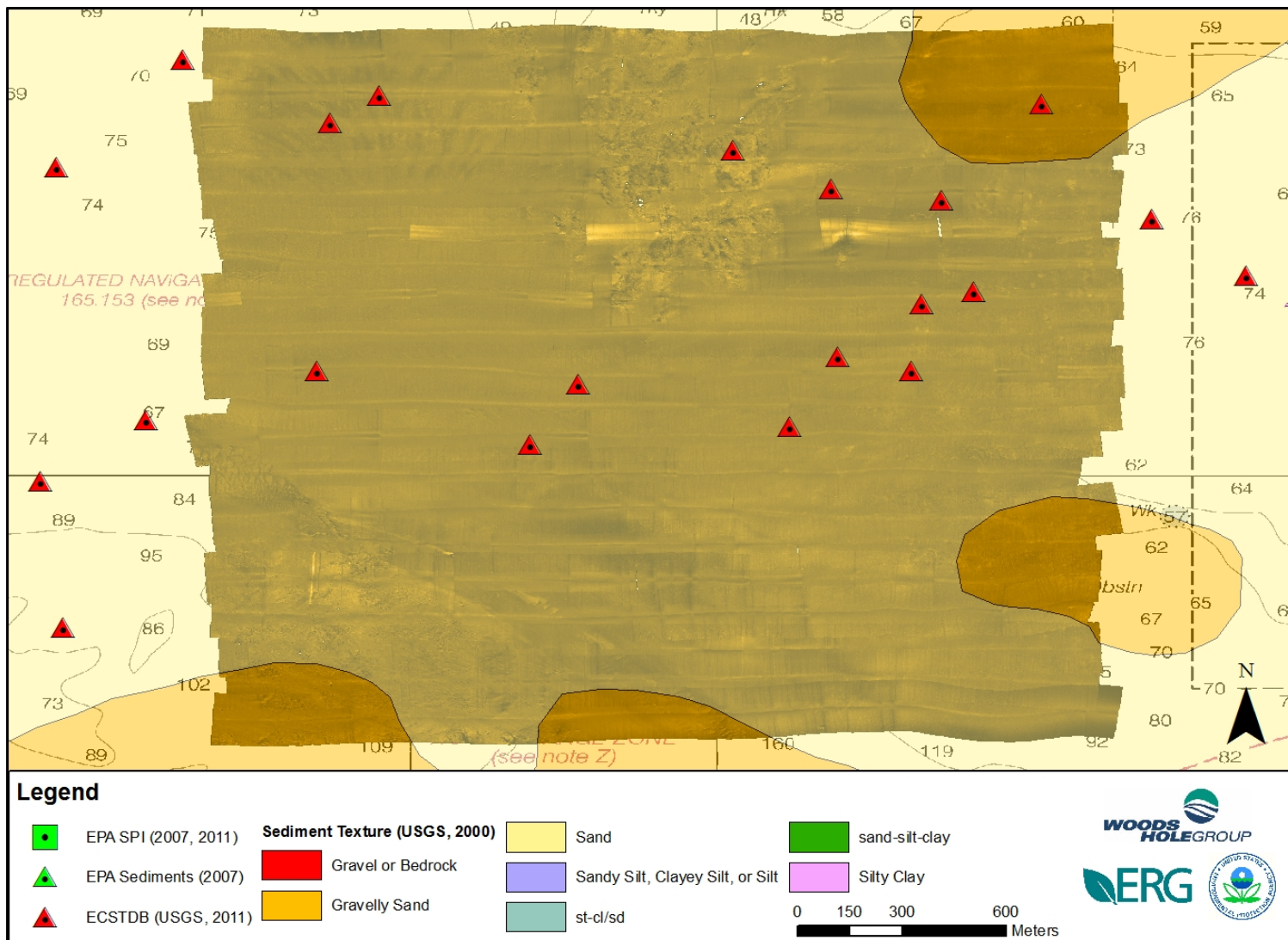


Figure 3.6.4. ELIS12 mosaic with supplemental data to assist with interpretation.

3.7 6MILE10

3.7.1 Mosaic Overview

Project location 6MILE10 is located approximately 0.5 km southeast of Sixmile Reef and 9 km south of Clinton Harbor, CT (Figure 3.1.2). The Six Mile Reef disposal site (historical) is entirely located in the northern half of this project location. Depth varies between 9 and 43 meters in this area. Figure 3.7.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Seventy-three (73) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and two (2) files were trimmed of data (Table 3.7.1). Data coverage is presented in Figure 3.7.1. The project area was surveyed at approximately 0% overlap in data coverage. Side-scan data covered 7.82 million sq. meters.

Table 3.7.1. 6MILE10 processing statistics used in SonarWiz 5.

6MILE10	
# XTF files	73
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	6MILE10_6_5_110726091200
	6MILE10_54_53_110726154300
# Tracklines removed/hidden	1
Tracklines removed/hidden	6MILE10_6_5_110726090700

3.7.2 Target Summary

Zero (0) unique targets and one (1) feature was identified at 6MILE10. The feature identifies bedforms and encompasses the entire project location. This feature is compiled in Appendix T. An example of bedforms is presented in Figure 3.7.3.

3.7.3 Seafloor Classification & Geological Interpretation

The seafloor at 6MILE10 is composed of material with medium backscatter defined by bedforms of both large and small-scale. Adjacent USGS bottom samples were described as sand (USGS, 2011). The USGS modeled seafloor sediment type was sand with a very small patch of gravelly sand in the north-central (USGS, 2000). Based on the extent and

size of bedforms in this project area, it is apparent that a large amount of sediment transport is occurring. SPI images provided by the EPA show the bottom to be sandy silt with shells. 6MILE10 is identified as a historical disposal site yet there are no significant targets or evidence of disposal in the side-scan sonar data. Due to the abundance of sand waves and evidence of sediment transport, debris piles may have been covered/dispersed. Figure 3.7.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area, with the primary class occupying nearly 100% of the project area. The secondary class occupies only the parts of tracklines most distant from the nadir, and may represent either data shadows from bedforms or slope reflections. SonarWiz 5 bottom classifications are located in Appendix Z.

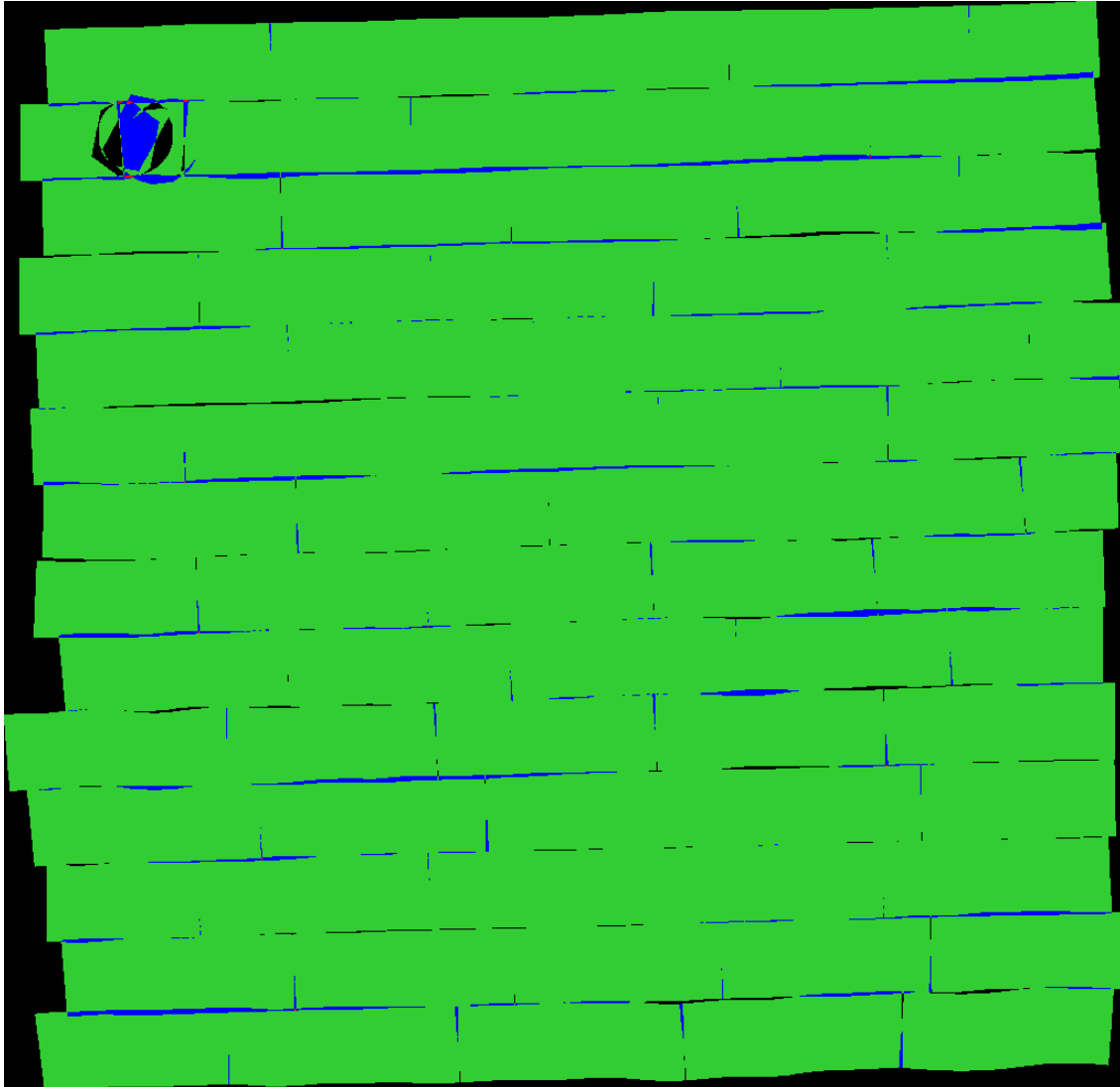


Figure 3.7.1. 6MILE10 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

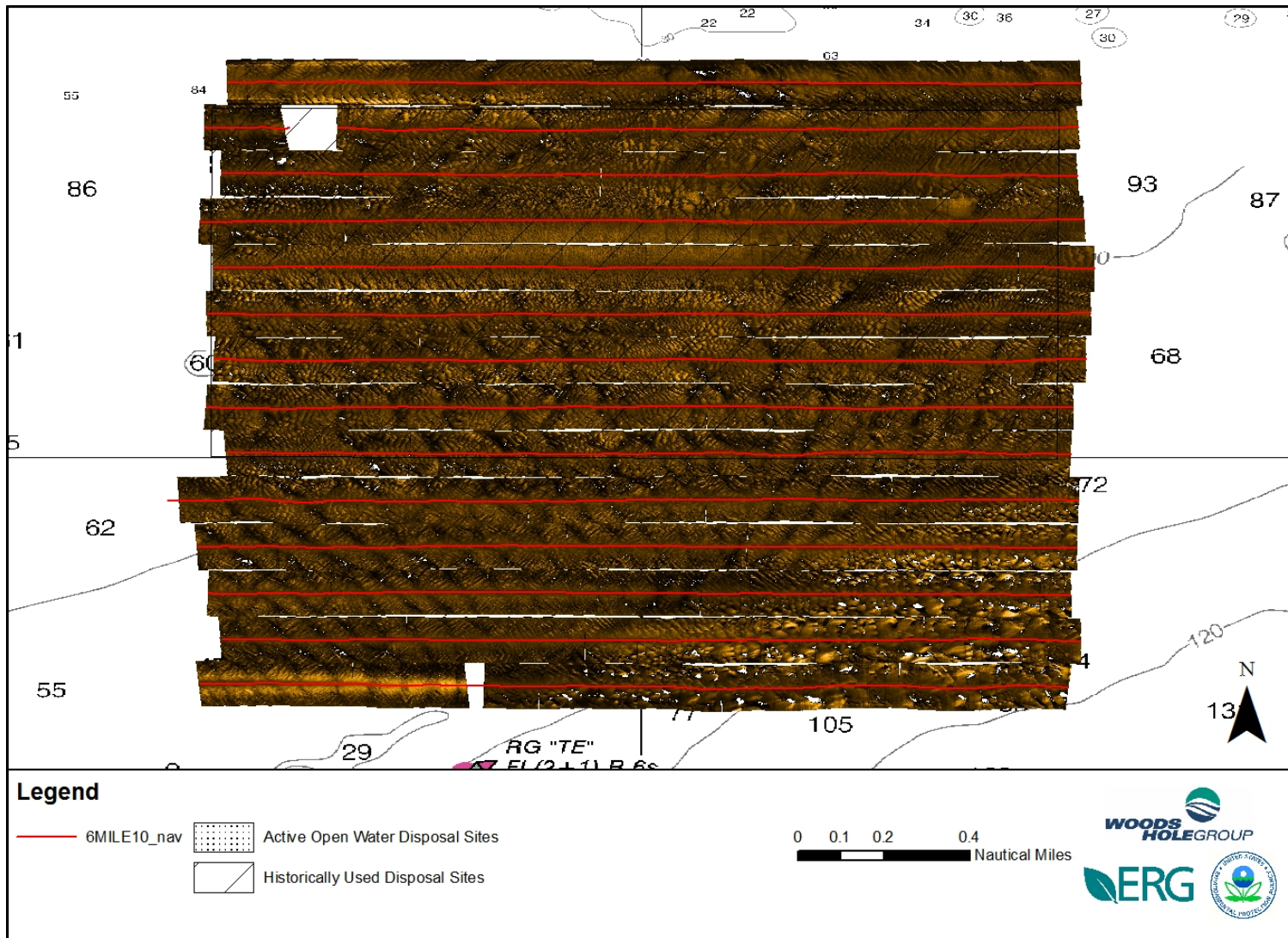


Figure 3.7.2. 6MILE10 mosaic with navigation lines and targets.

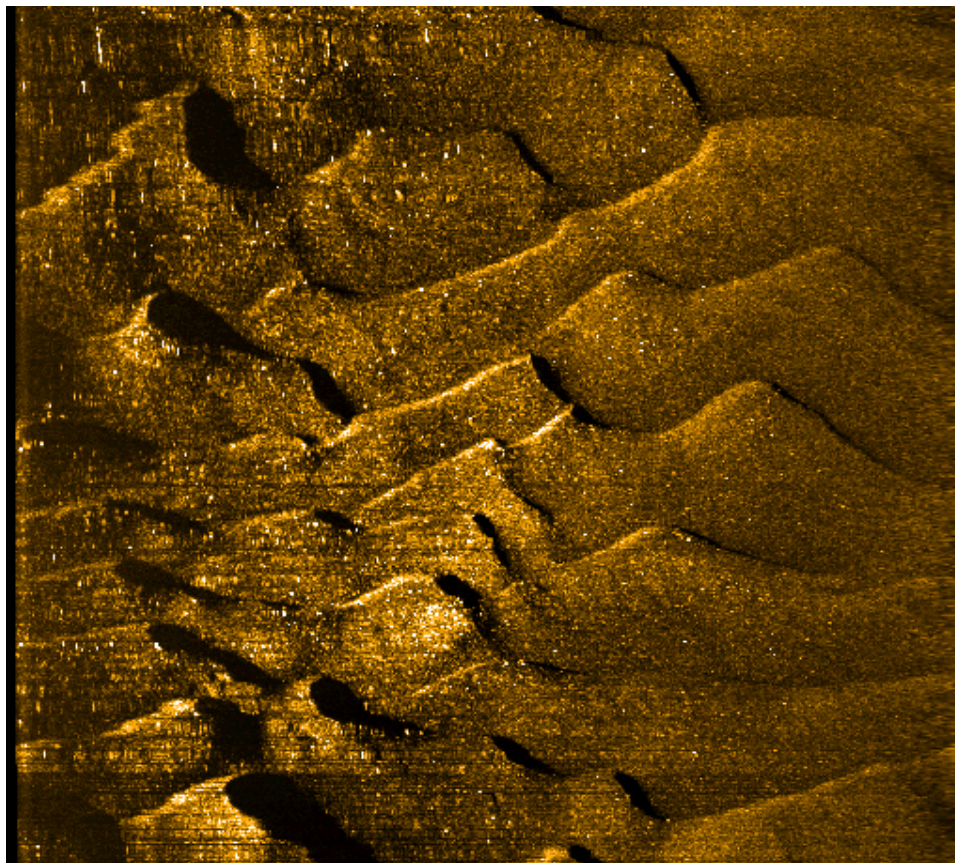


Figure 3.7.3. 6MILE10 feature example: bedforms.

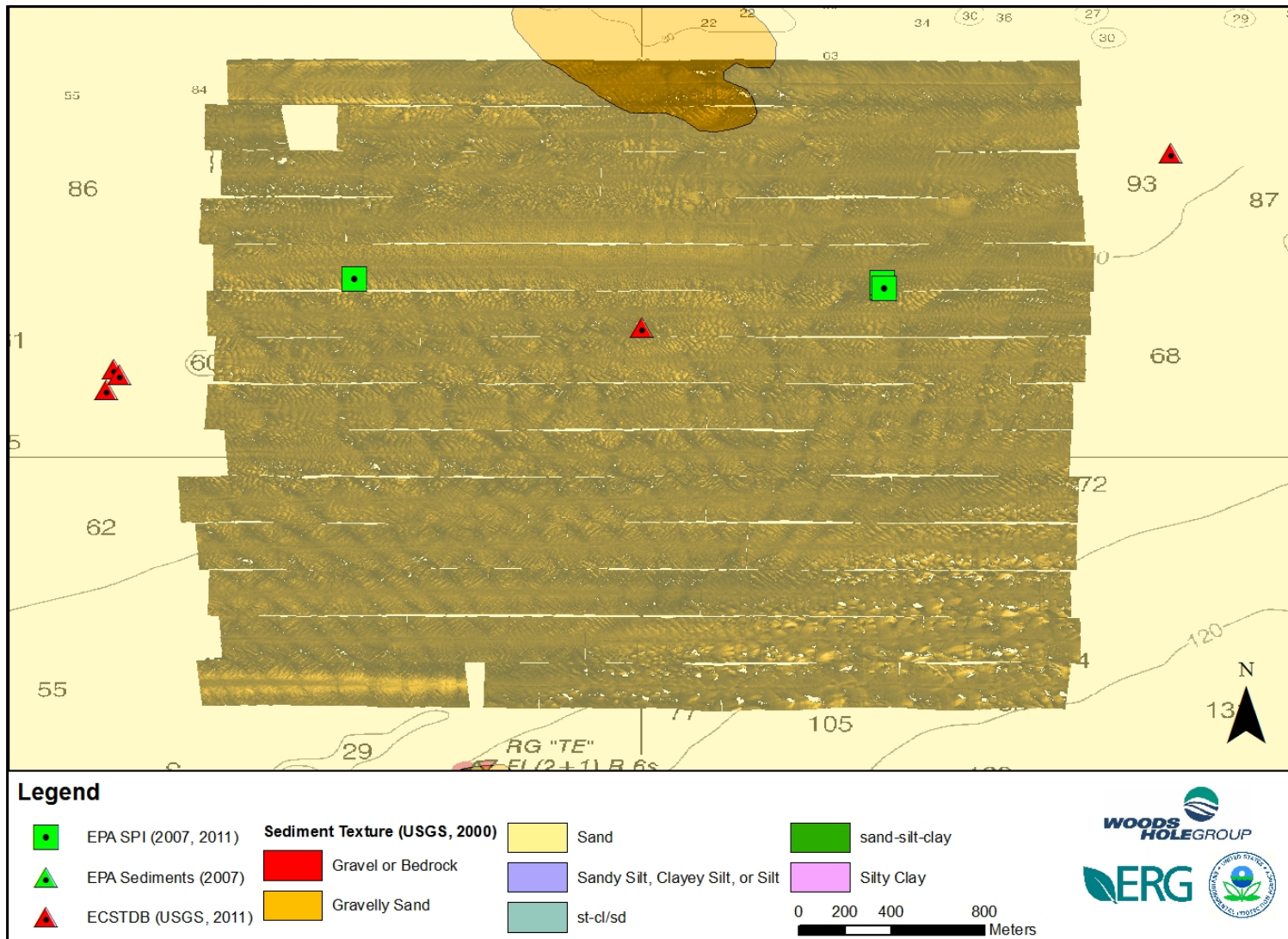


Figure 3.7.4. 6MILE10 mosaic with supplemental data to assist with interpretation.

3.8 MTK9

3.8.1 Mosaic Overview

Project location MTK9 is located approximately 4.6 km northeast of Mattituck Inlet, NY and 9.6 km west of Horton Point, NY (Figure 3.1.2). The Mattituck disposal site (historical) is entirely located within the site area. Depth varies between 17 and 34 meters in this area. Figure 3.8.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Ninety-seven (97) side-scan sonar XTF files were imported for this project location. Five (5) files were rejected for QA reasons, and nine (9) files were trimmed of data (Table 3.8.1). Data coverage is presented in Figure 3.8.1. The project area was surveyed at approximately 0-50% overlap in data coverage depending on location. Side-scan data covered 7.63 million sq. meters.

Table 3.8.1. MTK9 processing statistics used in SonarWiz 5.

MTK9	
# XTF files	97
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	2
Nadir Blanking Duration	6
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	9
Tracklines trimmed	MTK9_6_5_110725084700
	MTK9_14_13_110725101800
	MTK9_14_13_110725101300
	MTK9_17_18_110725103900
	MTK9_17_18_110725104400
	MTK9_25_26_110725132000
	MTK9_38_37_110725151200
	MTK9_49_50_110725172400
	MTK9_49_50_110725173900
# Tracklines removed/hidden	5
Tracklines removed/hidden	MTK9_38_37_110725151700
	MTK9_30_29_110725140900
	MTK9_33_34_110725144600
	MTK9_41_42_110725155600
	MTK9_4_3_110725183400

3.8.2 Target Summary

Thirty-seven (37) unique targets and three (3) features were identified at MTK9 using specific descriptions. Targets were assigned to three classifications, with the number of targets assigned to each classification given in parentheses: bedforms (11), trawl/anchor mark (24), unidentified/other (2). Targets were widely distributed throughout the project location. One feature outlining bedforms extended from the northwest corner to the northeast corner, then arching down towards to southwest. The feature describing trawl/anchor marks occupied much of the central and southwest portions of the project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.8.2 and example target images are indicated in Figure 3.8.3

3.8.3 Seafloor Classification & Geological Interpretation

The seafloor at MTK9 is composed of medium backscatter material defined by bedforms, mainly sand waves in the northeast, and a bathymetry slope reflection in the southeast. Bedforms extend from the north/northeast to the southwest along the ridge that is the peak of the bathymetry slope. The slope is defined by long, linear, parallel reflectors of slightly higher intensity backscatter oriented perpendicular to the direction of increasing depth, like rings in a bathtub. Several USGS bottom samples in the proximity to the project area were described as sand (USGS, 2011). The modeled seafloor sediment type lists sand as the bottom type, but as depth increases down the slope, the bottom type changes to silt/silty sand (USGS, 2000). SPI images provided by the EPA show the bottom to be sandy silt with shells. MTK9 is identified as a historical disposal site yet there is no evidence of dumping in the side-scan sonar data. Due to the abundance of sand waves and evidence of sediment transport, perhaps any debris piles have been covered. Figure 3.8.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned a single class to the study area, showing there is virtually no difference in sonar backscatter between sand and silty sand. SonarWiz 5 bottom classifications are located in Appendix Z.

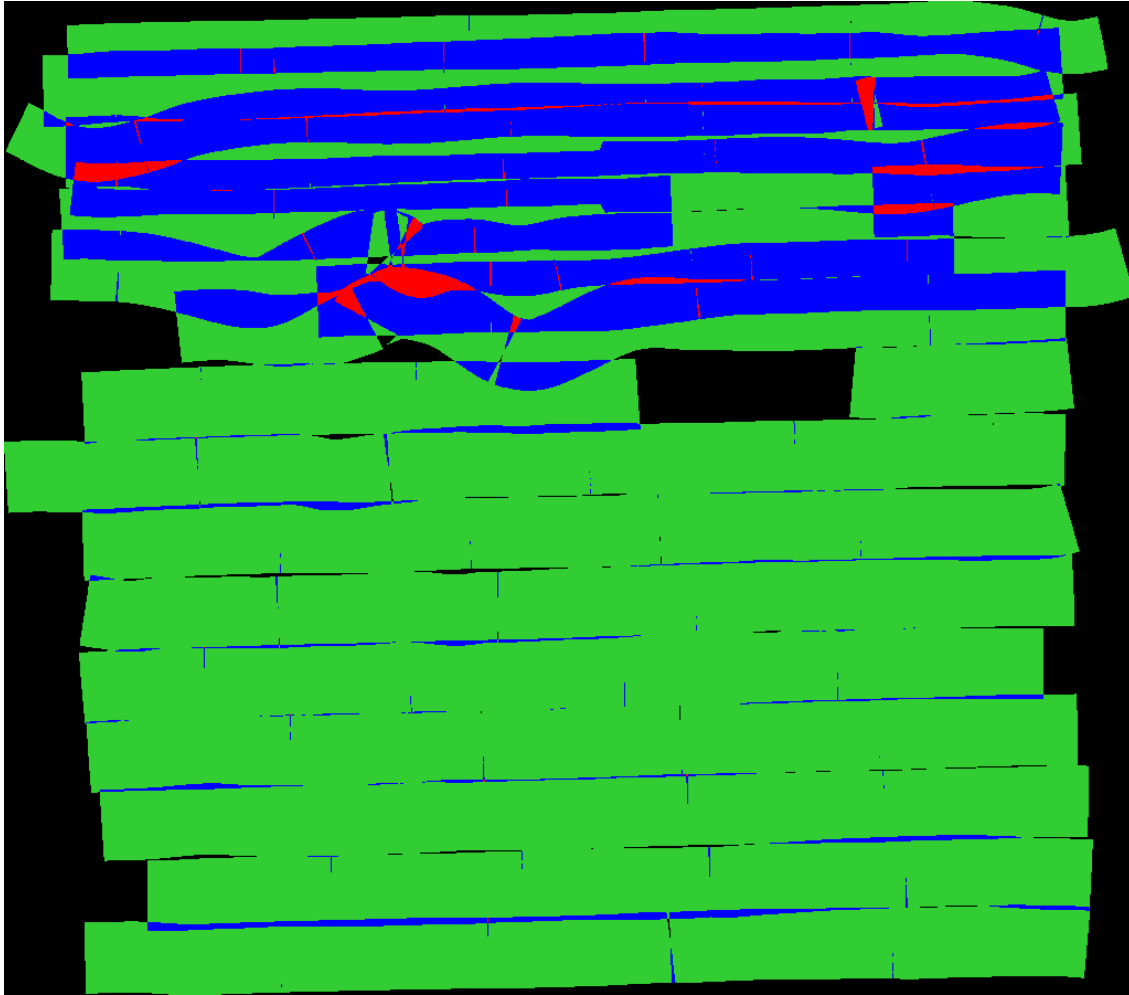


Figure 3.8.1. MTK9 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

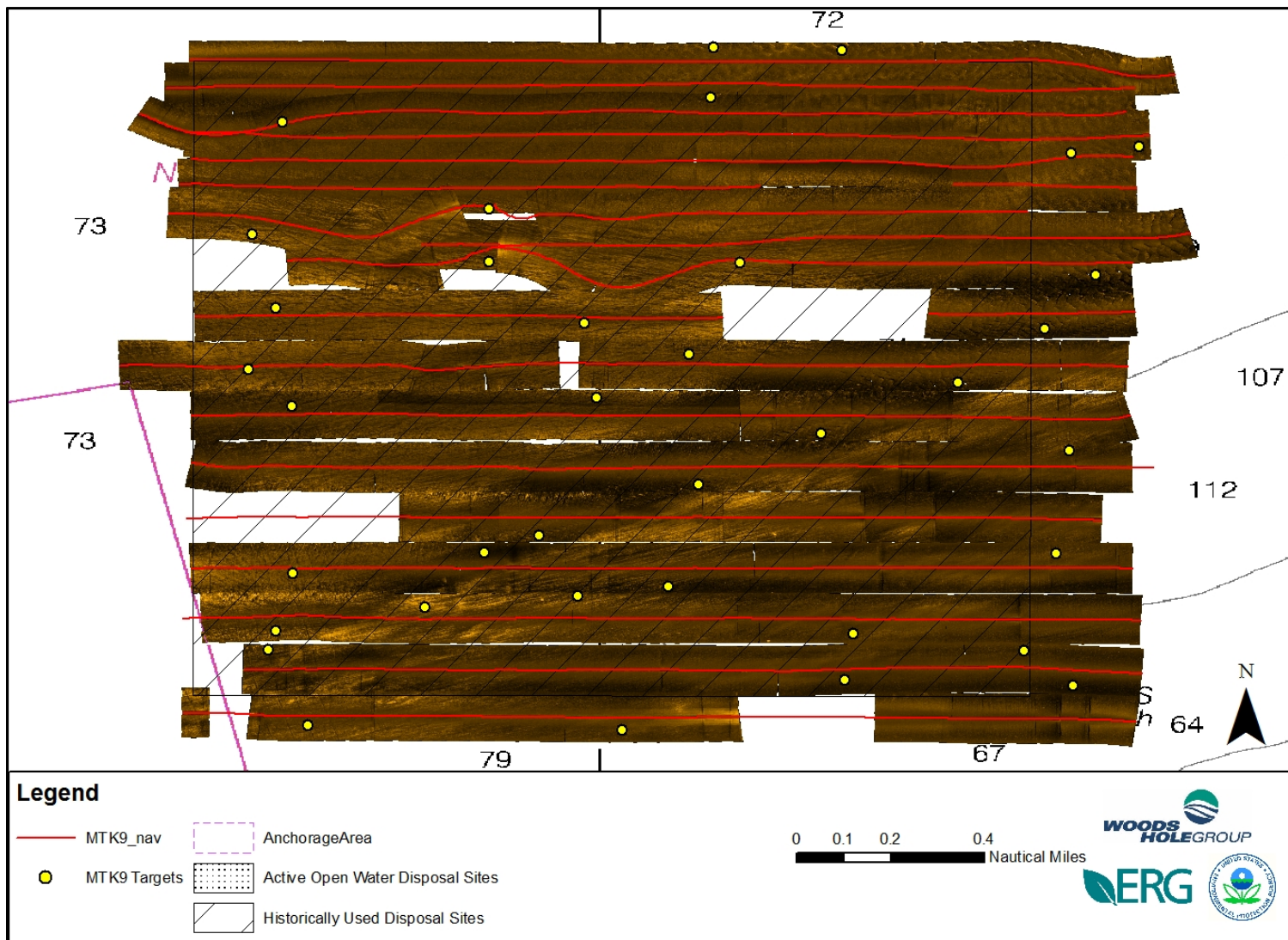


Figure 3.8.2. MTK9 mosaic with navigation lines and targets.

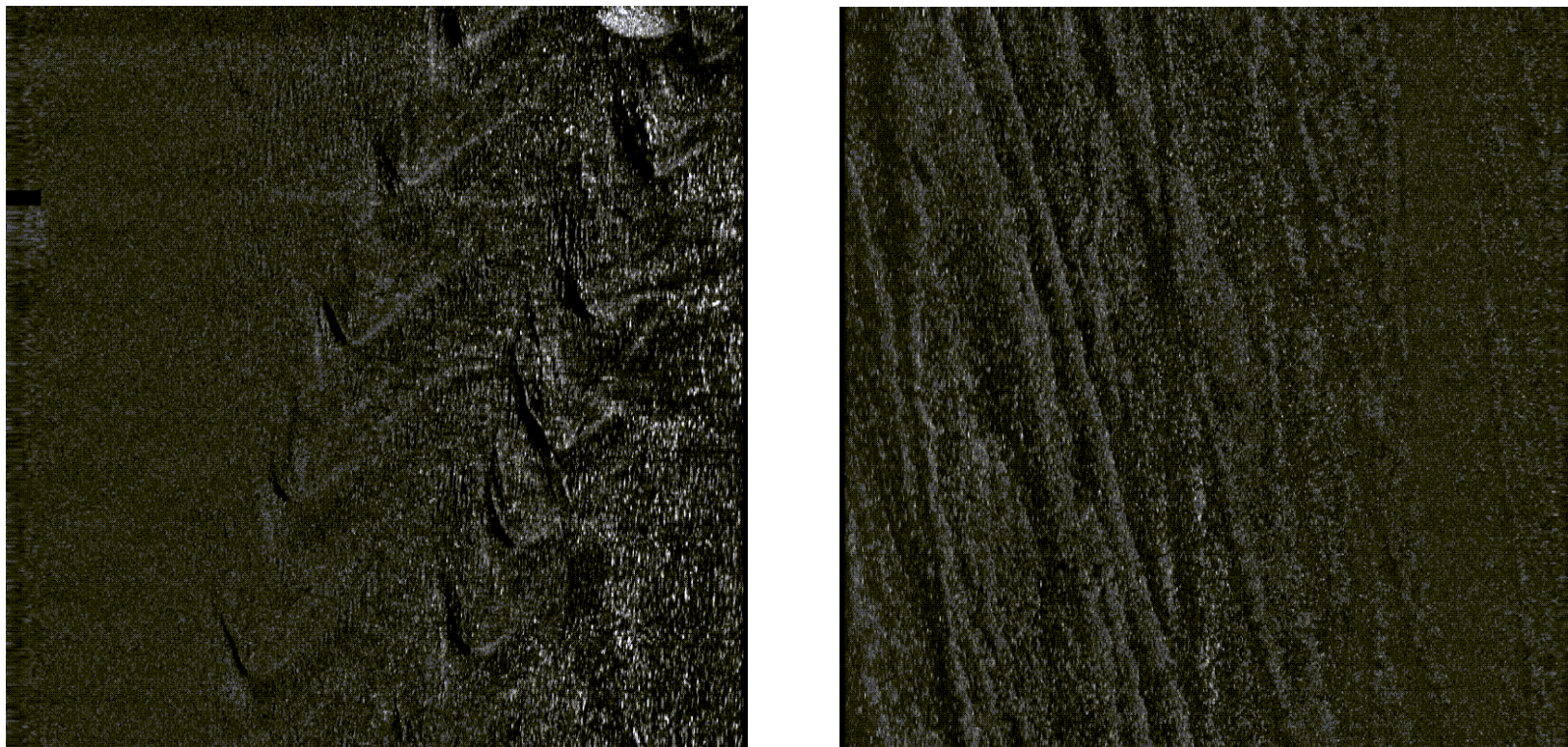


Figure 3.8.3. MTK9 target examples: bedforms (L), trawl/anchor marks (R).

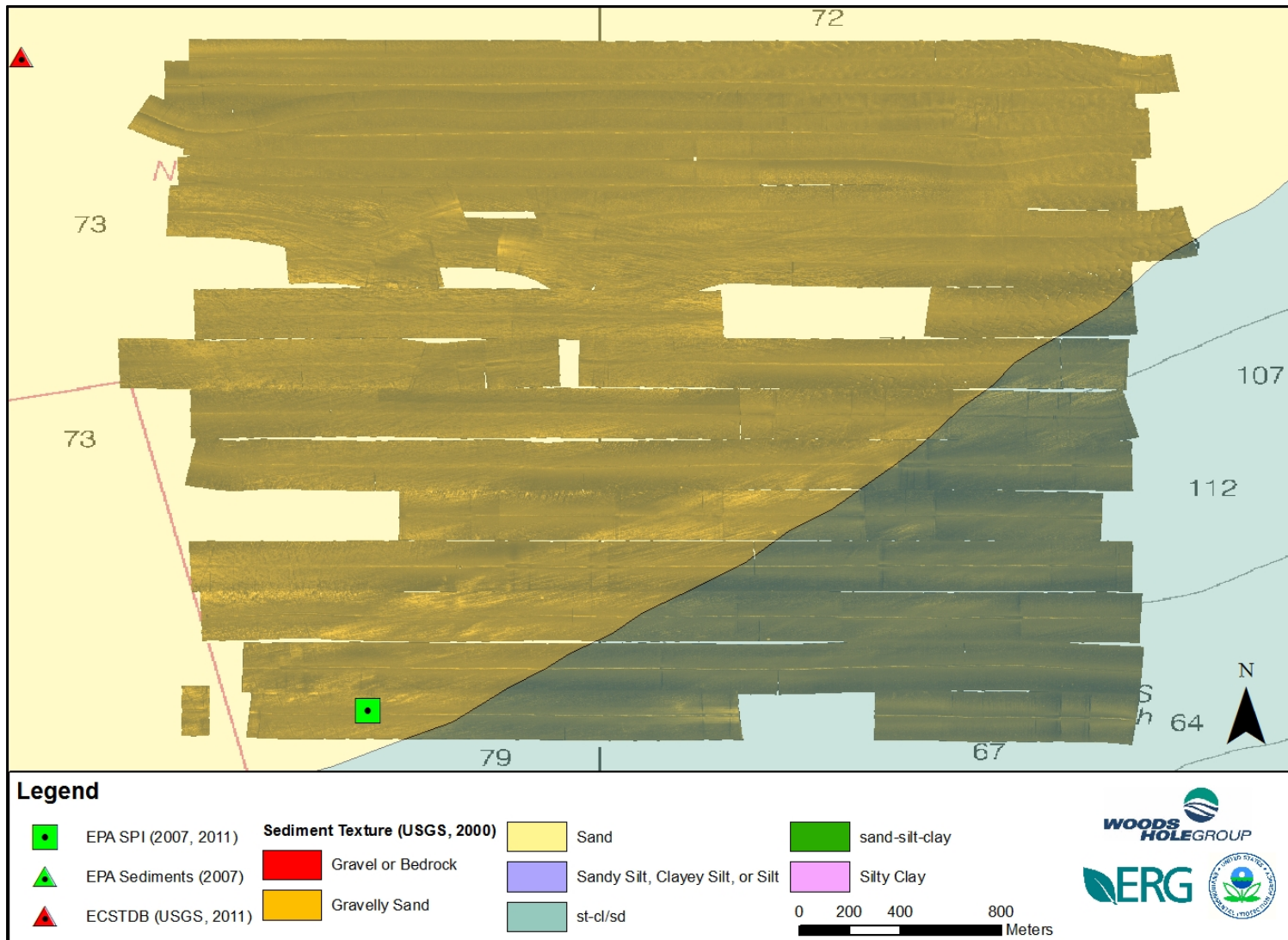


Figure 3.8.4. MTK9 mosaic with supplemental data to assist with interpretation.

3.9 FALKNERS

3.9.1 Mosaic Overview

Project location FALKNER8 is located approximately 3.3 km east of Falkner Island and 8 km southwest of Clinton Harbor, CT (Figure 3.1.2). Depth varies between 19 and 30 meters in this area. Figure 3.9.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Seventy-four (74) side-scan sonar XTF files were imported for this project location. Three (3) files were rejected for QA reasons, and seven (7) files were trimmed of data (Table 3.9.1). Data coverage is presented in Figure 3.9.1. The project area was surveyed at approximately 50% overlap in data coverage. Side-scan data covered 3.63 million sq. meters.

Table 3.9.1. FALKNER8 processing statistics used in SonarWiz 5.

FALKNER8	
# XTF files	74
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	73 of 75
# Tracklines trimmed	7
Tracklines trimmed	FALKNER8_2_1_110724130200
	FALKNER8_7_8_110724201500
	FALKNER8_7_8_110724202000
	FALKNER8_20_19_110724185500
	FALKNER8_20_19_110724190000
	FALKNER8_20_19_110724190500
	FALKNER8_26_25_110724154400
# Tracklines removed/hidden	3
Tracklines removed/hidden	FALKNER8_28_27_110724175900
	FALKNER8_28_27_110724180400
	FALKNER8_10_9_110724135900

3.9.2 Target Summary

Zero (0) unique targets and features were identified at FALKNER8. The seafloor at this site is featureless.

3.9.3 Seafloor Classification & Geological Interpretation

The seafloor at MTK9 is a homogenous expanse of medium backscatter material. There are no USGS grab samples in the project area, but the modeled seafloor describes the area as a mix between sand and silty sand (USGS, 2000). SPI images provided by the EPA show the bottom to be silty sand. These two sediment types are indistinguishable in side-scan sonar data. Figure 3.9.3 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. However, this classification is considered poor because the demarcation between classes parallels the nadir, which is obviously an error of the classification function. Settings were adjusted many times to create a classification that did not have this artifact, but all attempts were unsuccessful. This may have occurred because the bottom is devoid of features and any irregularities in the sonar data, no matter how small, were interpreted as secondary classes. SonarWiz 5 bottom classifications are located in Appendix Z.

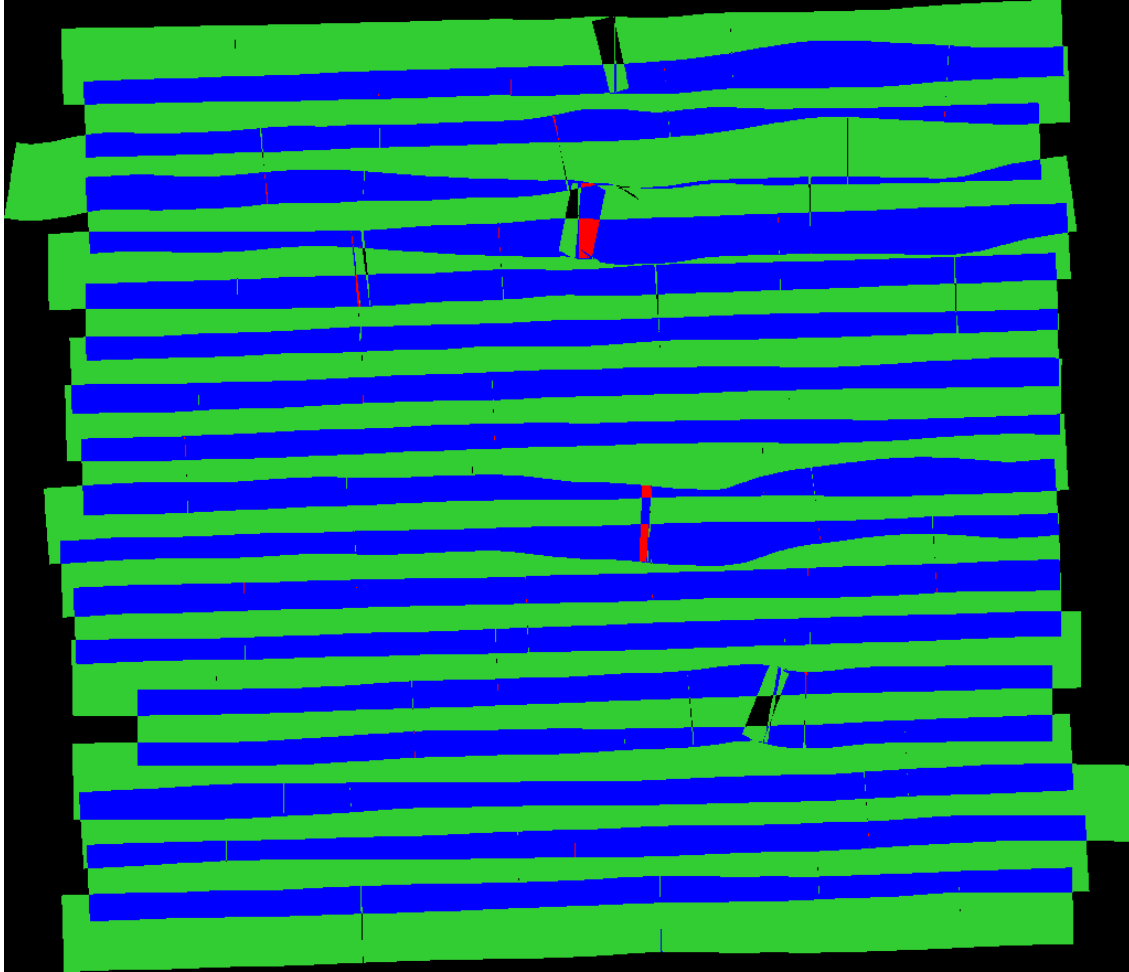


Figure 3.9.1. FALKNER8 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

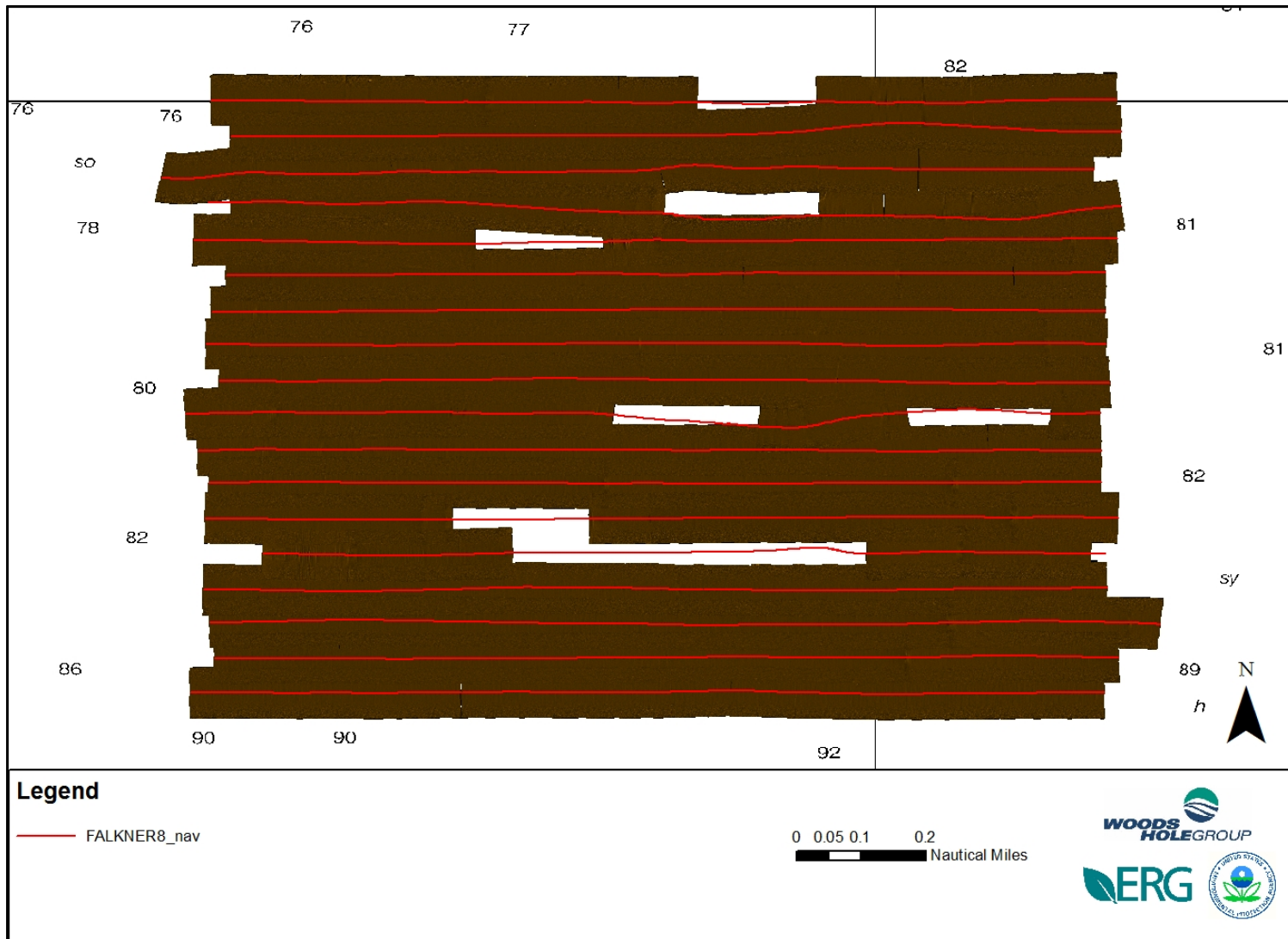


Figure 3.9.2. FALKNER8 mosaic with navigation lines and targets.

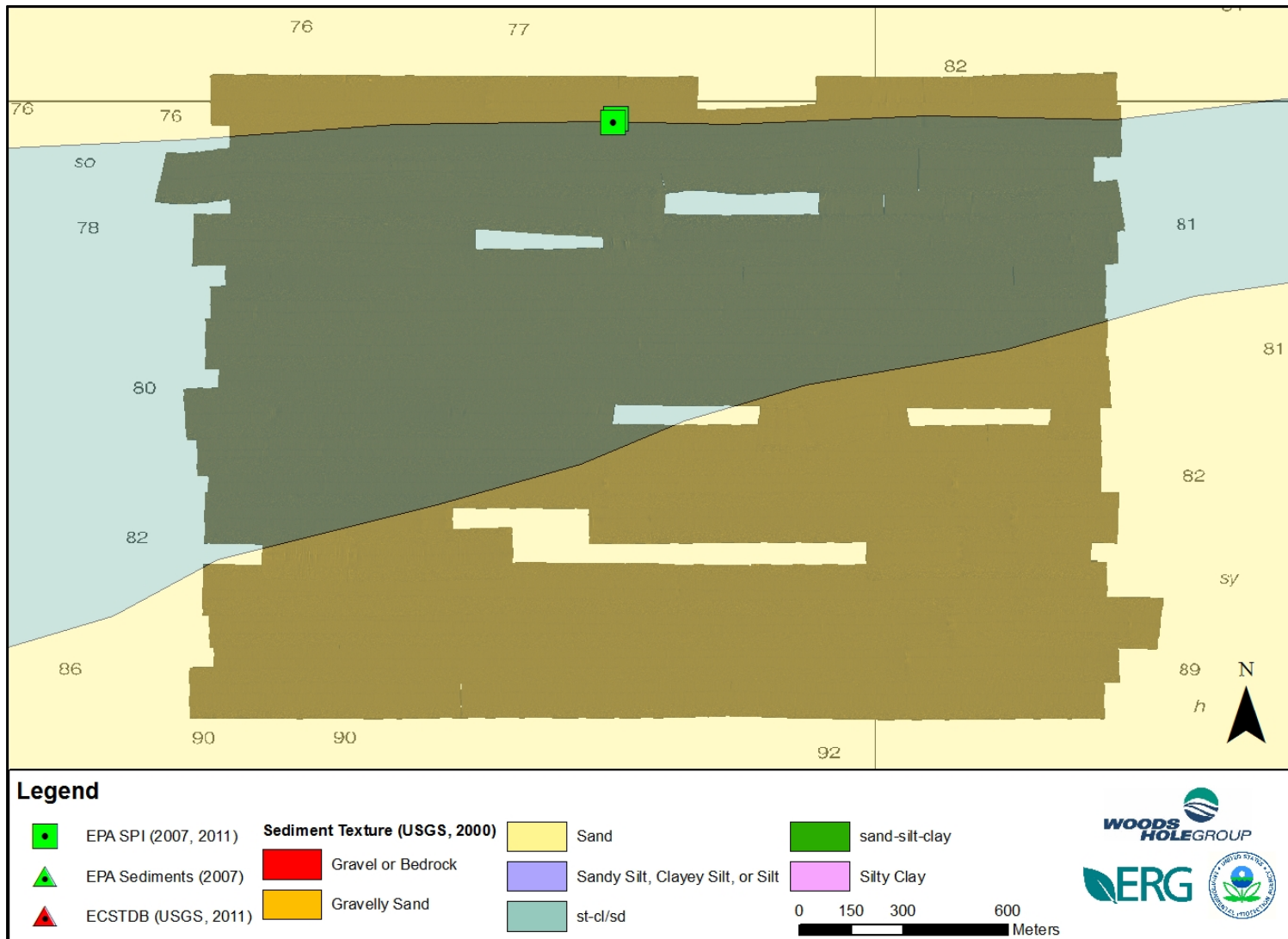


Figure 3.9.3. FALKNER8 mosaic with supplemental data to assist with interpretation.

3.10 CLINTON7

3.10.1 Mosaic Overview

Project location CLINTON7 is located approximately 4 km south of Clinton Harbor, CT and 2 km north of Sixmile Reef (Figure 3.1.2). The project location is within the boundaries of the Clinton Harbor disposal site (historical). Depth varies between 14 and 34 meters in this area. Figure 3.10.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Eighty-six (86) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and one (1) file was trimmed of data (Table 3.10.1). Data coverage is presented in Figure 3.10.1. The project area was surveyed at approximately 50% overlap in data coverage. Side-scan data covered 4.40 million sq. meters.

Table 3.10.1. CLINTON7 processing statistics used in SonarWiz 5.

CLINTON7	
# XTF files	86
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	1
Tracklines trimmed	CLINTON7_13_14_110723170500
# Tracklines removed/hidden	1
Tracklines removed/hidden	CLINTON7_13_14_110723171000

3.10.2 Target Summary

Twenty-eight (28) unique targets and one (1) feature were identified at CLINTON7. Targets were assigned to six classifications, with the number of targets assigned to each classification given in parentheses: boulder (5), boulder area/field (4), debris pile (4), rock outcrop/geological (5), unidentified/other (5), or wreck (1). Nearly all targets were identified in the central to northeast areas of the project location, with some identified in the southeast. The wreck is identified on NOAA charts. The feature of bedforms occupied the entire project area except the northeast corner. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.10.1 and example target images are indicated in Figure 3.10.3.

3.10.3 Seafloor Classification & Geological Interpretation

The seafloor at CLINTON7 is composed of a medium intensity backscatter material defined by large expanses of bedforms. Bedforms cover approximately 75% of the project area, indicating that ocean currents acting on the seafloor cause a significant amount of sediment transport at this site. The northeast corner had several targets described as boulders, rock outcrop or debris pile, which shows agreement with the USGS bottom samples and modeled seafloor classification. Bottom samples adjacent to the majority of the project area were described as sand, and as bedrock for the northeast corner (USGS, 2011). SPI images provided by the EPA within the survey area show the bottom to be silty sand with shells and shell hash. Seafloor classification shows sand for the entire project area except for the northeast corner, which was gravel/bedrock (USGS, 2000). Figure 3.10.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers nearly 100% of the project area and the secondary class is so minimal that the total area it occupies is negligible. The classification feature was run several times with different settings to try to emphasize the difference between soft bottom and rock outcrops, but attempts were unsuccessful. For the purposes of this report, site CLINTON7 has only one class. SonarWiz 5 bottom classifications are located in Appendix Z.

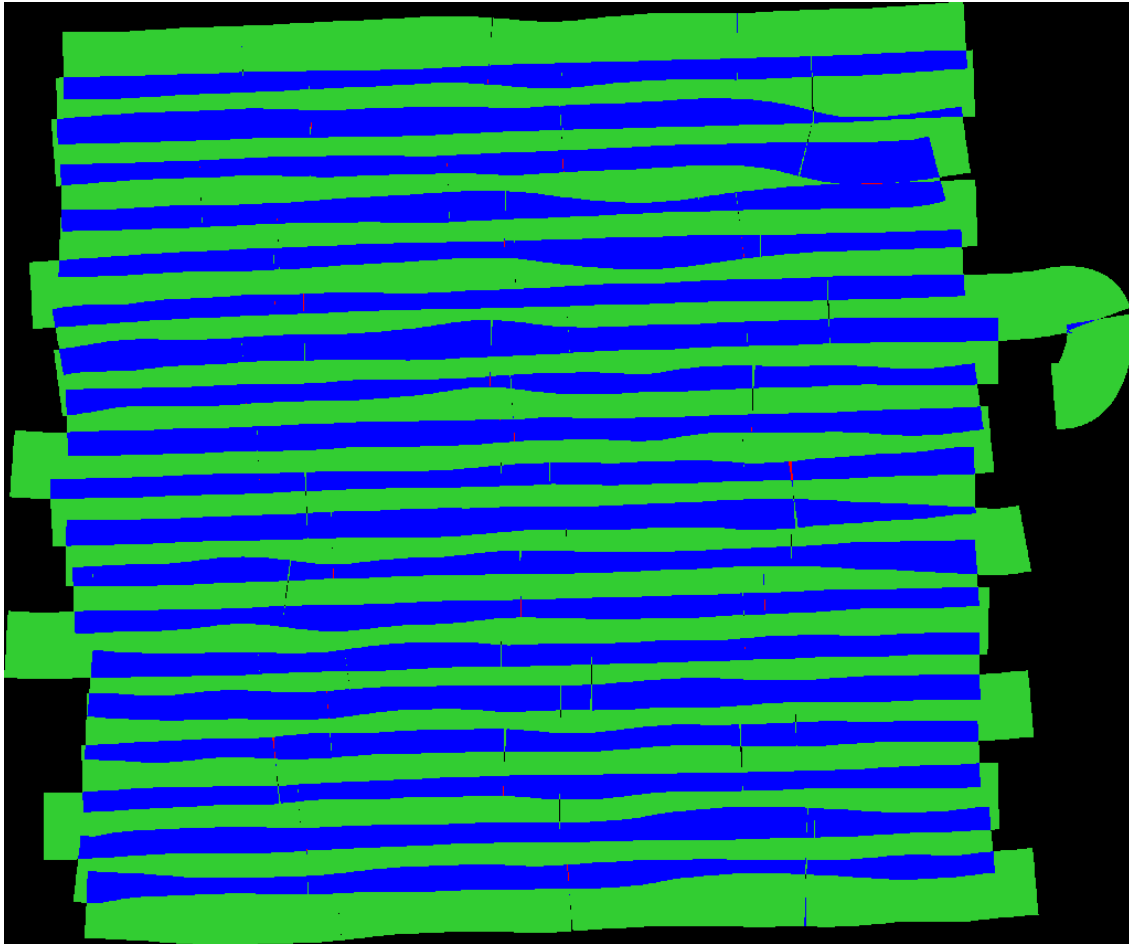


Figure 3.10.1. CLINTON7 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

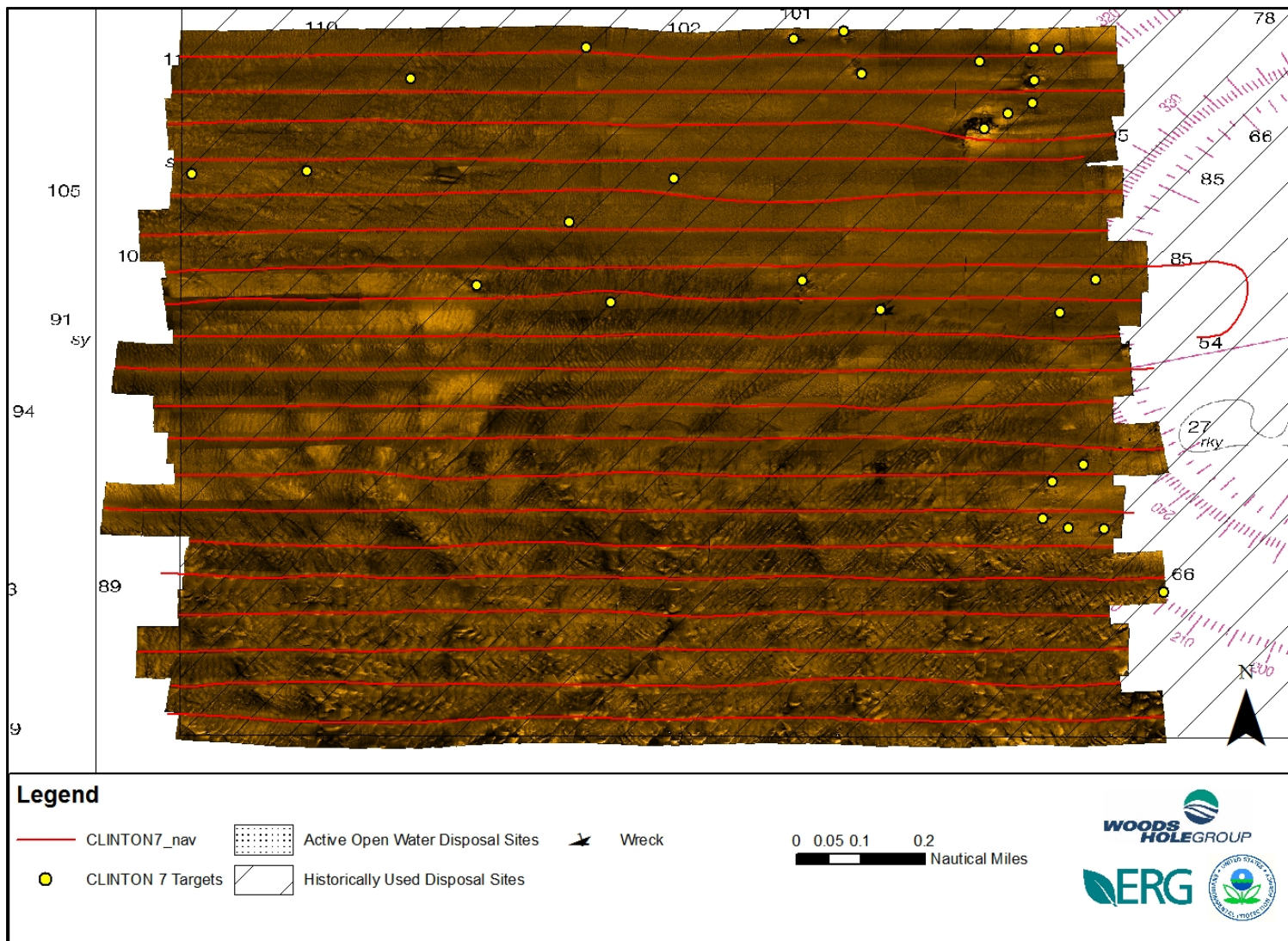


Figure 3.10.2. CLINTON7 mosaic with navigation lines and targets.

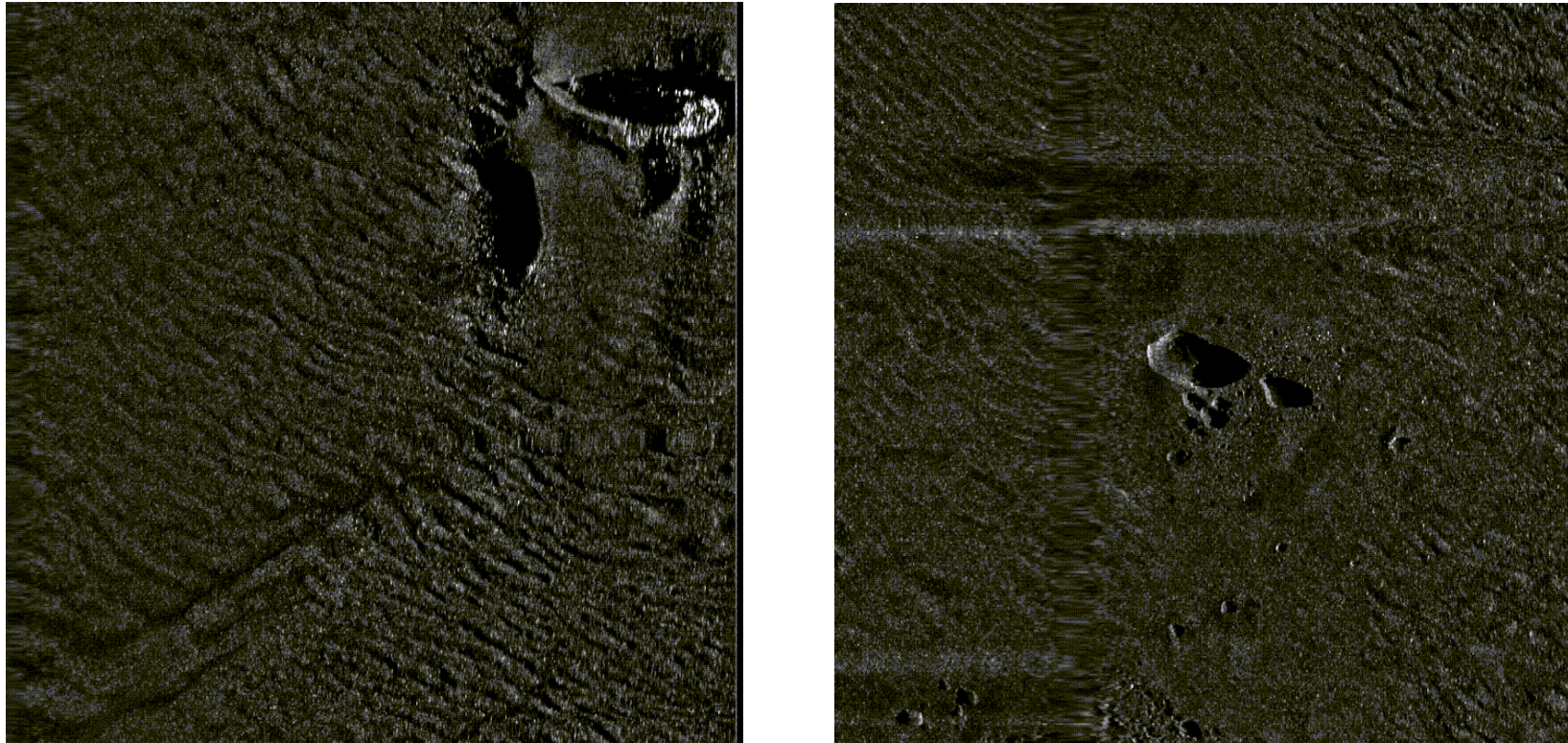


Figure 3.10.3. CLINTON7 target examples: wreck (L), boulder (R).

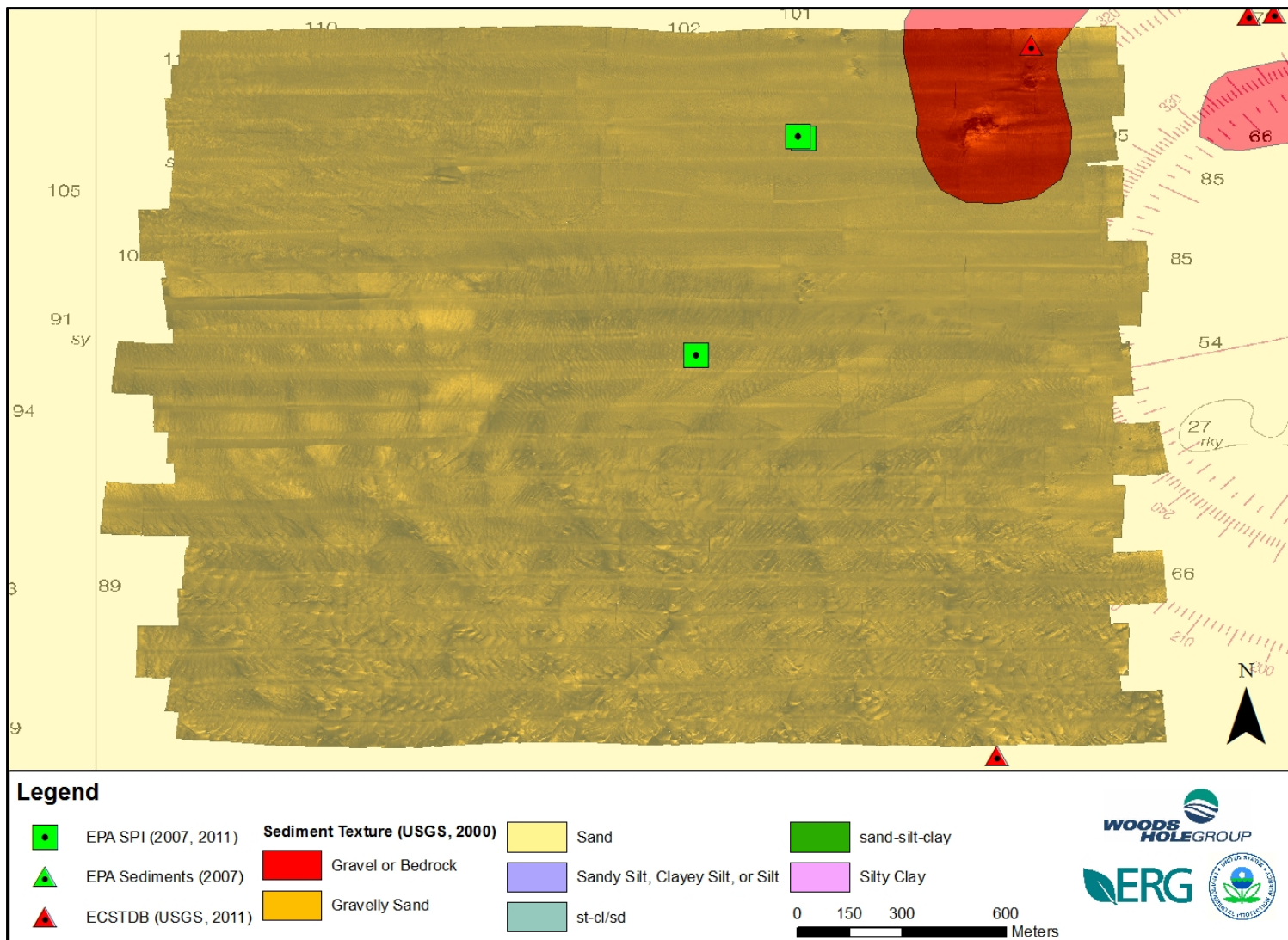


Figure 3.10.4. CLINTON7 mosaic with supplemental data to assist with interpretation.

3.11 FISEHOLE1

3.11.1 Mosaic Overview

Project location FISEHOLE1 is located approximately 14.8 km northwest of Montauk Point, NY and 6.3 km southeast of Fishers Island, NY (Figure 3.1.4). Depth varies between 27 and 99 meters in this area. Figure 3.11.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

One hundred forty-five (145) side-scan sonar XTF files were imported for this project location. Thirteen (13) files were rejected for QA reasons, and two (2) files were trimmed of data (Table 3.11.1). Data coverage is presented in Figure 3.11.1. The project area was surveyed at approximately 100% overlap in data coverage with one line having 200% overlap. Side-scan data covered 6.66 million sq. meters.

Table 3.11.1. FISEHOLE1 processing statistics used in SonarWiz 5.

FISEHOLE1	
# XTF files	145
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	FISEHOLE_38_37_110717002400
	FISEHOLE_22_21_110716214700
# Tracklines removed/hidden	13
Tracklines removed/hidden	FISEHOLE_22_21110716212400
	FISEHOLE_22_21_110716212700
	FISEHOLE_22_21110716212900
	FISEHOLE_22_21_110716213200
	FISEHOLE_22_21110716213400
	FISEHOLE_22_21_110716213700
	FISEHOLE_22_21110716213900
	FISEHOLE_22_21_110716214200
	FISEHOLE_22_21110716214400
	FISEHOLE_22_21_110716214700
	FISEHOLE_22_21_110716215200
	FISEHOLE_22_21110716214900
	FISEHOLE_40_39_110717032400

3.11.2 Target Summary

Six (6) unique targets and three (3) features were identified at FISEHOLE1 using specific descriptions. All six targets were assigned the same classification, unidentified/other. Targets were spread evenly across the northern edge of the project area. The first feature outlines trawl/anchor marks and extended from the north-central to northeast corner. The other feature describes bedforms and covers nearly the entire area of the triangle formed from the northwest to the southeast to the southwest corners. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.11.2 and example target images are indicated in Figure 3.11.3.

3.11.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE1 is composed of a medium intensity backscatter material defined by large expanses of bedforms and trawl marks. Bedforms cover an area between from west side to the southeast corner and trawl marks are apparent in the north-central to northeast corners of the survey area. No USGS bottom samples were collected in this area, but SPI images provided by the EPA show an apparent bottom type of silty sand. A USGS modeled seafloor classification described the entire survey area as sand (USGS, 2000). Figure 3.11.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one classes to the study area. Given the homogeneity observed in side-scan data and SPI images, this classification is believed to be accurate. SonarWiz 5 bottom classifications are located in Appendix Z.

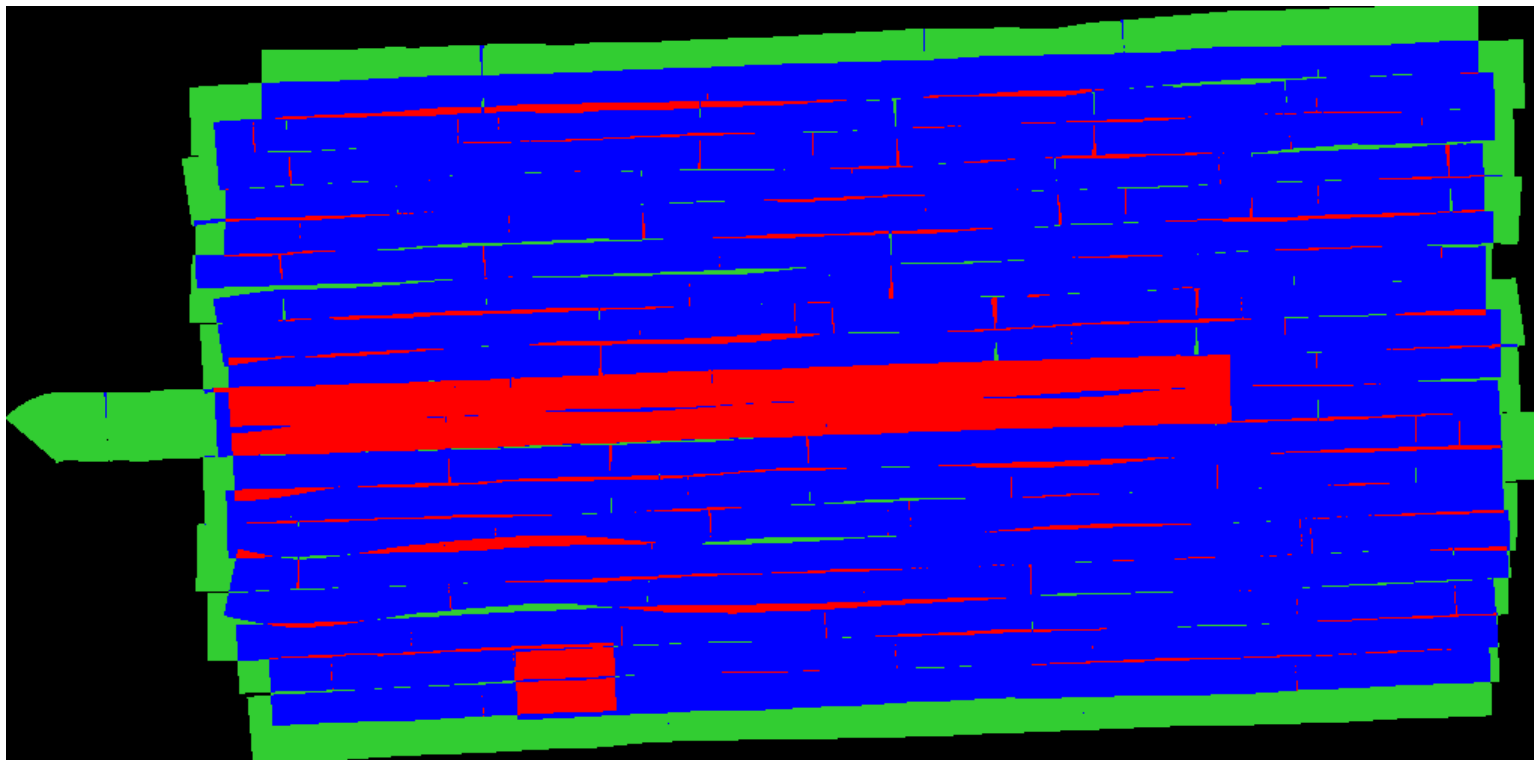


Figure 3.11.1. FISEHOLE1 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

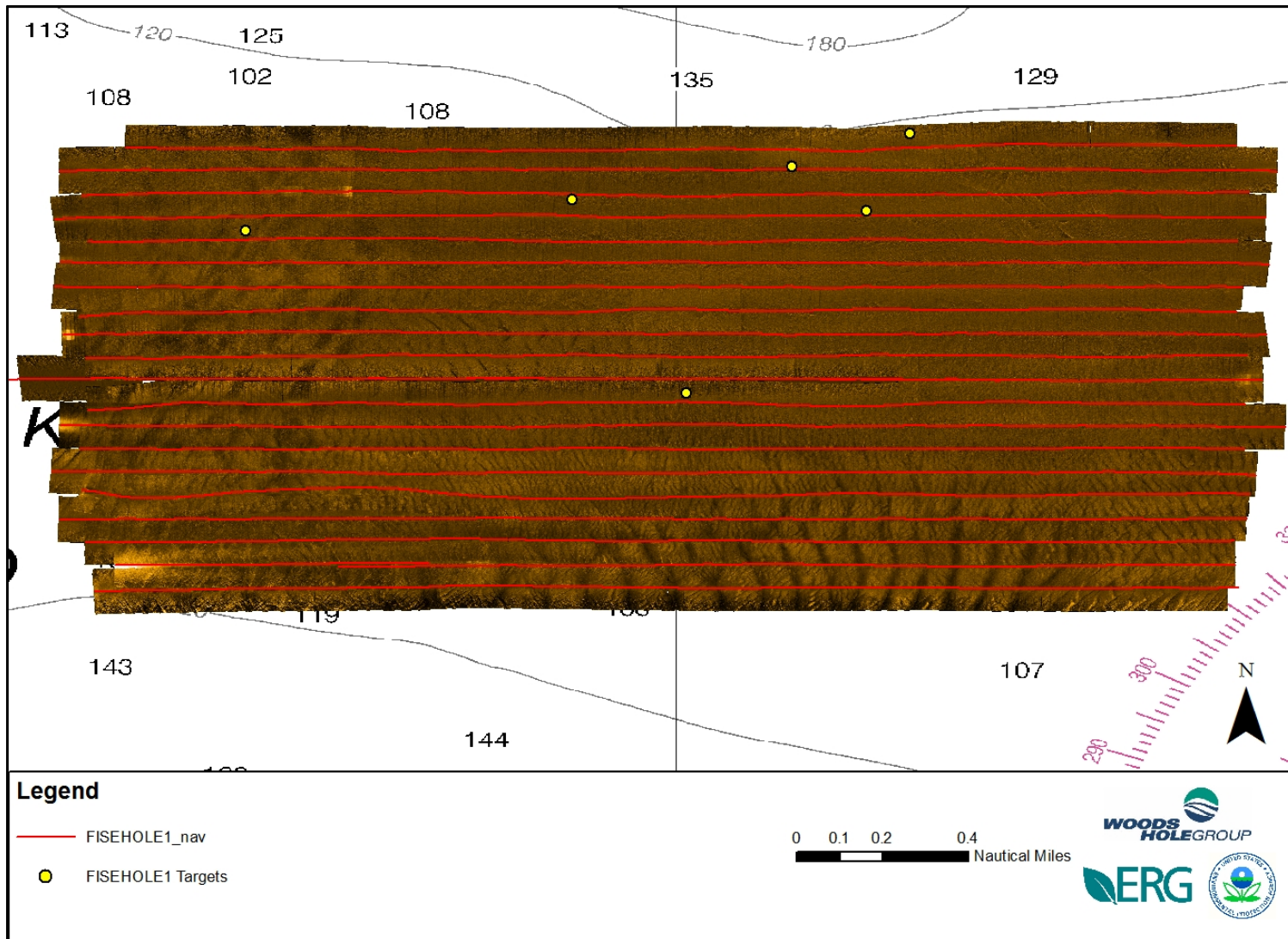


Figure 3.11.2. FISEHOLE1 mosaic with navigation lines and targets.

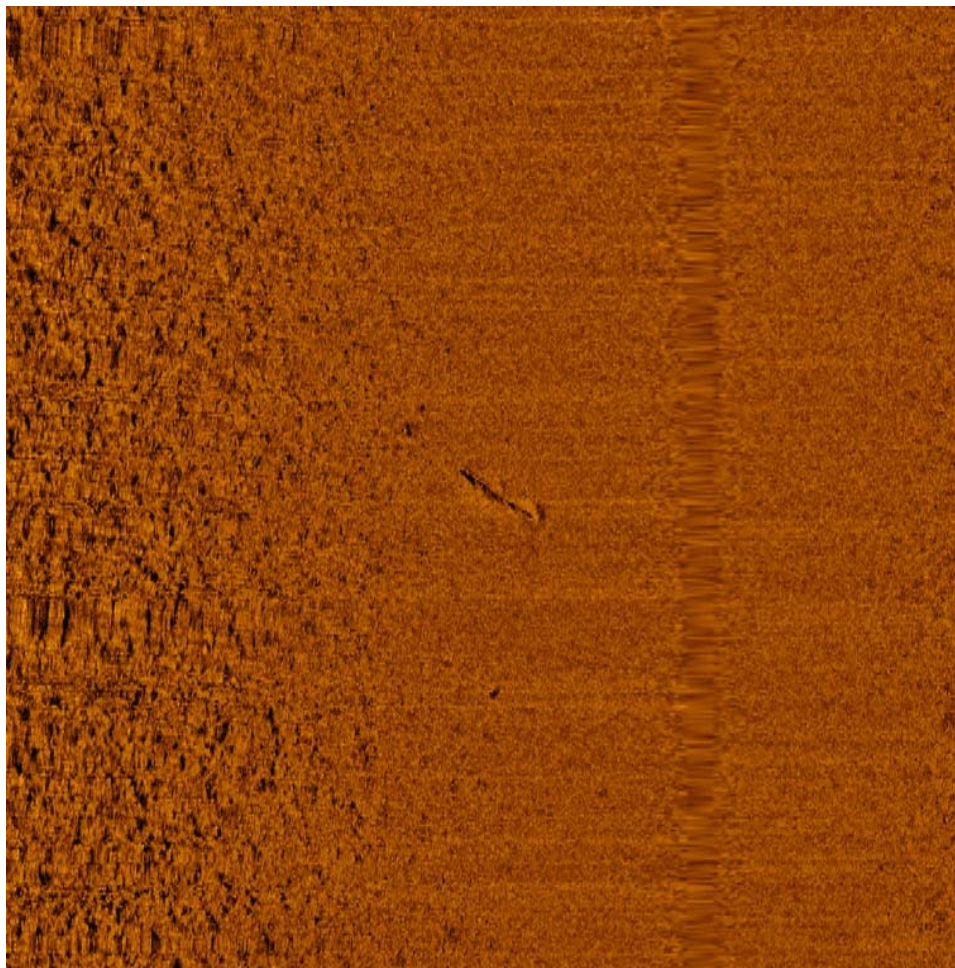


Figure 3.11.3. FISEHOLE1 target example: unidentified/other.

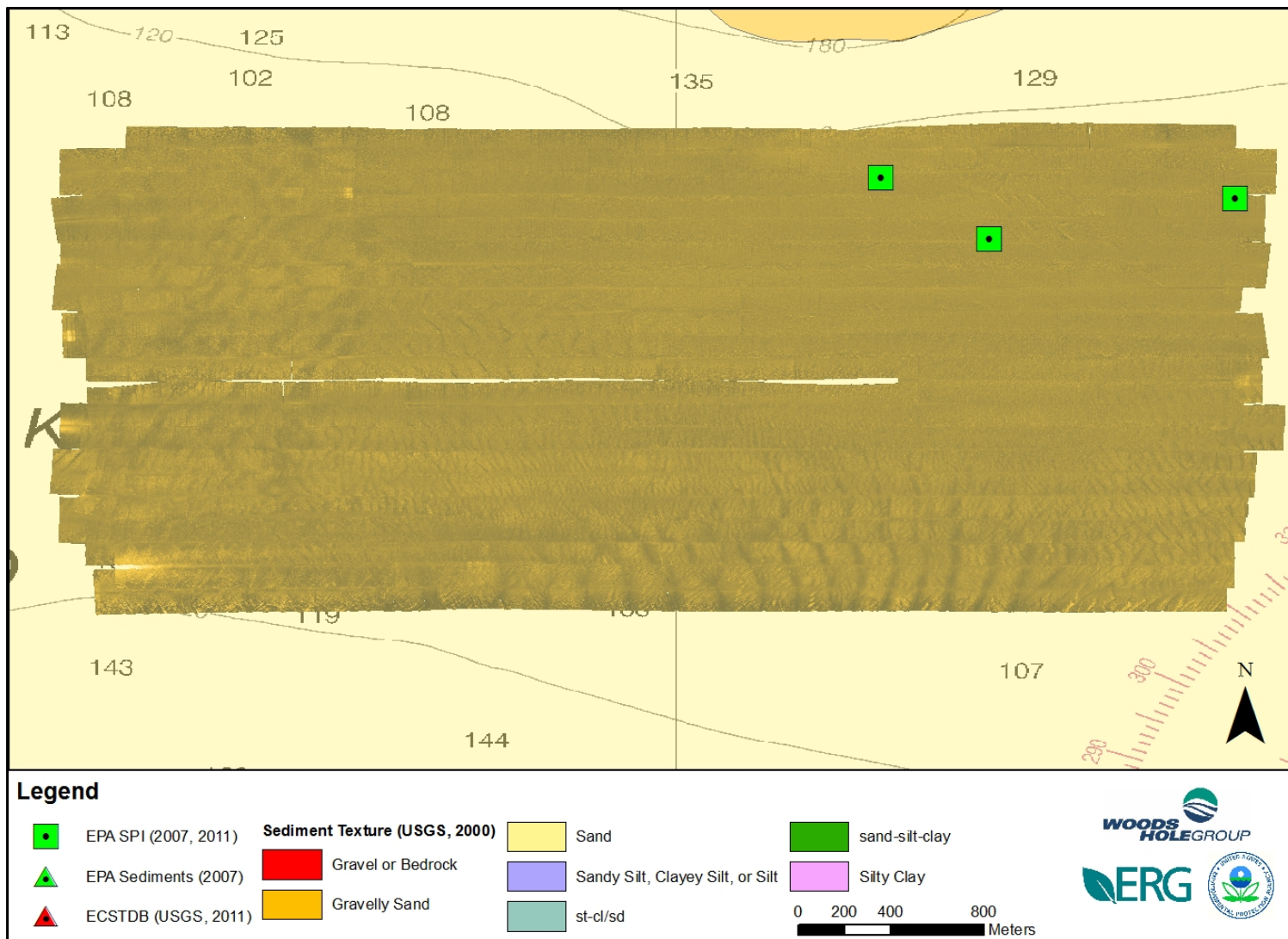


Figure 3.11.4. FISEHOLE1 mosaic with supplemental data to assist with interpretation.

3.12 FISEHOLE2

3.12.1 Mosaic Overview

Project location FISEHOLE2 is located approximately 13.4 km south of Montauk Point, NY and 9.3 km southeast of Fishers Island, NY (Figure 3.1.4). Depth varies between 27 and 58 meters in this area. Figure 3.12.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

One hundred (100) side-scan sonar XTF files were imported for this project location. Zero (0) files were rejected for QA reasons, and one (1) file was trimmed of data (Table 3.12.1). Data coverage is presented in Figure 3.12.1. The project area was surveyed at approximately 100% overlap in data coverage. Side-scan data covered 5.14 million sq. meters.

Table 3.12.1. FISEHOLE2 processing statistics used in SonarWiz 5.

FISEHOLE2	
# XTF files	100
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	1
Tracklines trimmed	FISEHOLE2_1_2_110717140300
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.12.2 Target Summary

Zero (0) targets and one (1) feature were identified at FISEHOLE2 using specific descriptions. The feature describes trawl/anchor marks and encompasses the entire project area. Features are compiled in Appendix T. An example of trawl/anchor marks is presented in Figure 3.12.3.

3.12.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE2 is composed of a medium intensity backscatter material that is covered in trawl/anchor marks. No bottom samples were provided in this area by USGS or EPA. Two SPI images provided by the EPA approximately 2 km to the west of the survey area show a coarse sand bottom with possible shells and bedforms. The USGS modeled seafloor classification only partially covers the survey area, but describes the

bottom as sand, with a small area of silty/clayey sand in the northeast (USGS, 2000). Figure 3.12.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area, but the classification was very poor. Despite modifying settings and re-running several times, the Classification function delineated two classes parallel to the direction of the nadir in a repeated pattern across the survey area. Considering the side-scan sonar data, nearby SPI images and USGS modeled seafloor, this classification is not believed to be accurate. SonarWiz 5 bottom classifications are located in Appendix Z.

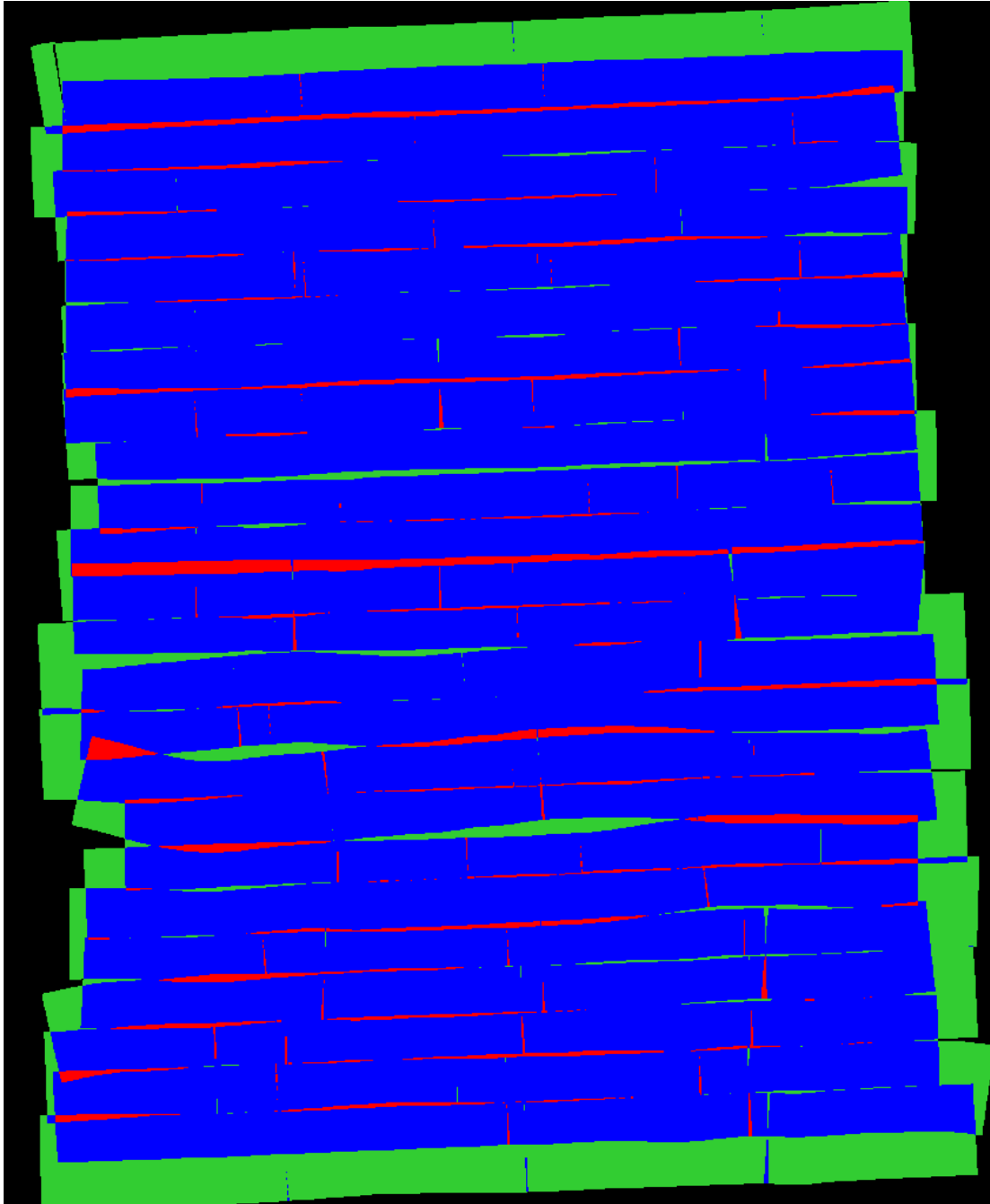


Figure 3.12.1. FISEHOLE2 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

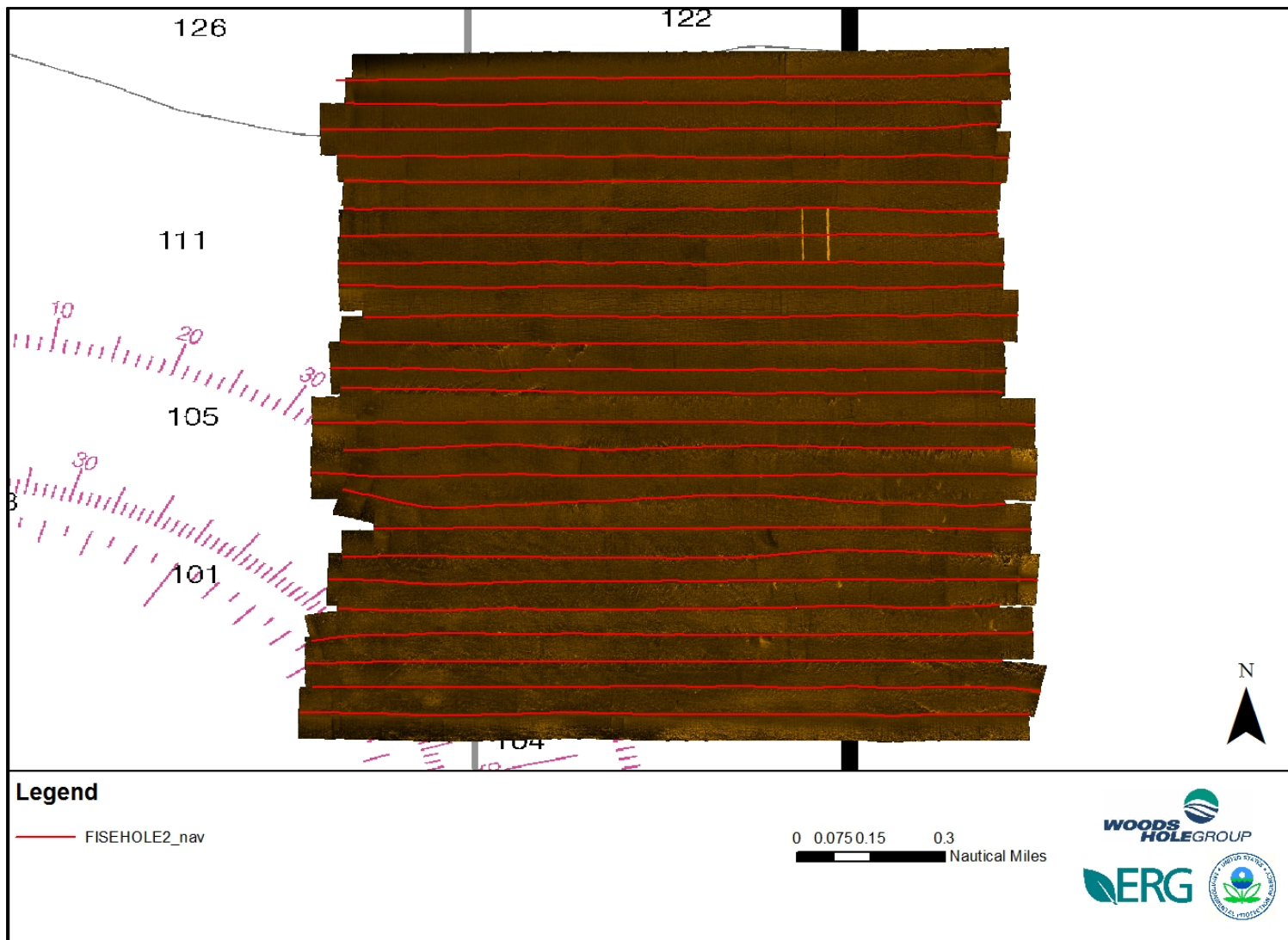


Figure 3.12.2. FISEHOLE2 mosaic with navigation lines and targets.

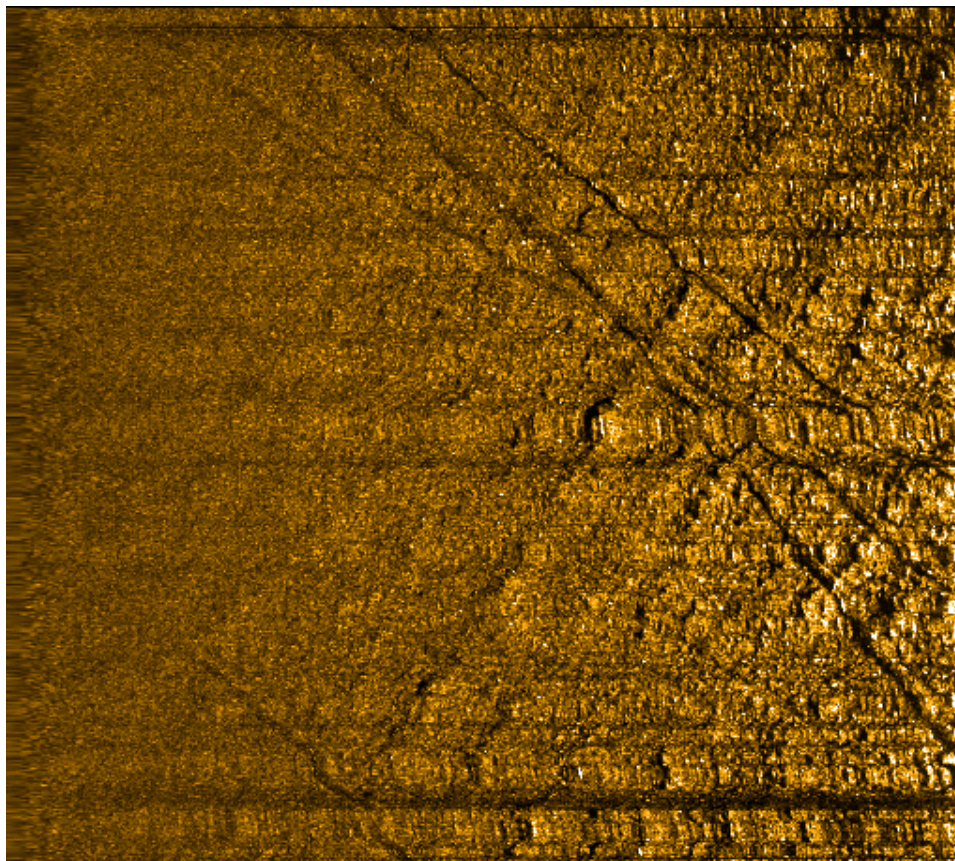


Figure 3.12.3. FISEHOLE2 feature example: trawl/anchor marks.

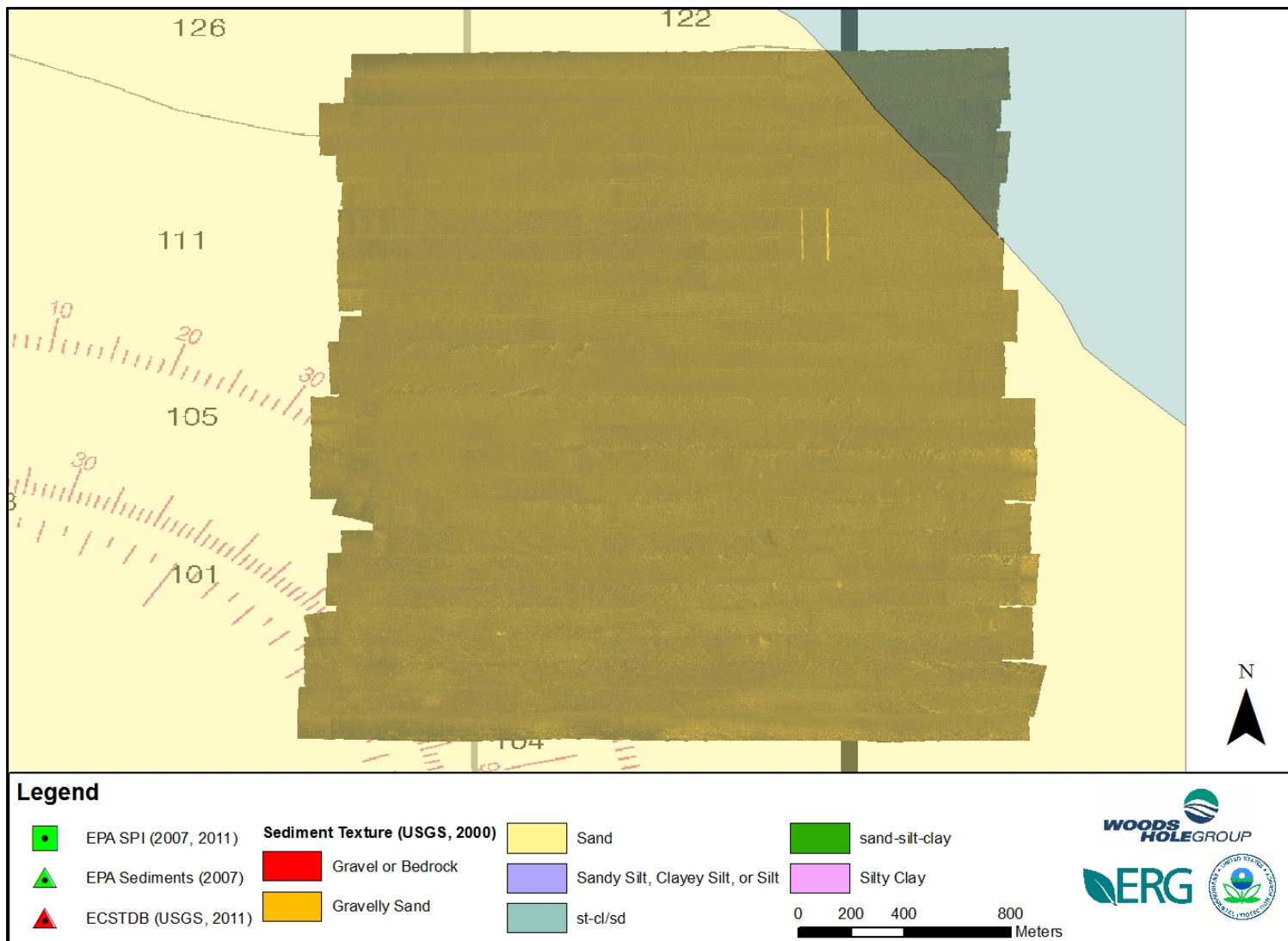


Figure 3.12.4. FISEHOLE2 mosaic with supplemental data to assist with interpretation.

3.13 FISEHOLE3

3.13.1 Mosaic Overview

Project location FISEHOLE3 is located approximately 6.6 km southeast of Watch Hill Point, RI and 8.7 km east of Fishers Island, NY (Figure 3.1.4). Depth is approximately 35 meters in this area. Figure 3.13.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Twenty-six (26) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and one (1) file was trimmed of data (Table 3.13.1). Data coverage is presented in Figure 3.13.1. The project area was surveyed at approximately 100% overlap in data coverage. Side-scan data covered 1.23 million sq. meters.

Table 3.13.1. FISEHOLE3 processing statistics used in SonarWiz 5.

FISEHOLE3	
# XTF files	26
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6 to 8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	1
Tracklines trimmed	FISEHOLE3_1_2110718074000
# Tracklines removed/hidden	1
Tracklines removed/hidden	FISEHOLE3_9_10_110718082800

3.13.2 Target Summary

Ten (10) unique targets and one (1) feature were identified at FISEHOLE3 using specific descriptions. Targets were assigned to three classifications, with the number of targets assigned to each classification given in parentheses: rock outcrop/geological (1), trawl/anchor mark (7), unidentified/other (2). Targets were evenly distributed in the project area. The feature outlining trawl/anchor marks covers the entire project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.13.2 and an example target image is indicated in Figure 3.13.3.

3.13.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE3 is composed of a medium intensity backscatter material covered with trawl/anchor marks. No bottom samples were provided by USGS or EPA in the survey area. No SPI images were provided within the survey area. The modeled USGS seafloor classification partially covers the survey area in the west and describes the bottom as silty/clayey sand with adjacent areas of sand (USGS, 2000). A bathy slope reflection is evident in the south-center of the survey area that is also apparent on NOAA charts. Figure 3.13.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area, but the classification is considered poor. Similar to FISEHOLE2, the Classification function assigned classes parallel to the direction of the nadir. This was encountered even when settings were changed and the function was re-run. Due to the homogeneity in the side-scan sonar data, this classification is considered to be inaccurate. SonarWiz 5 bottom classifications are located in Appendix Z.

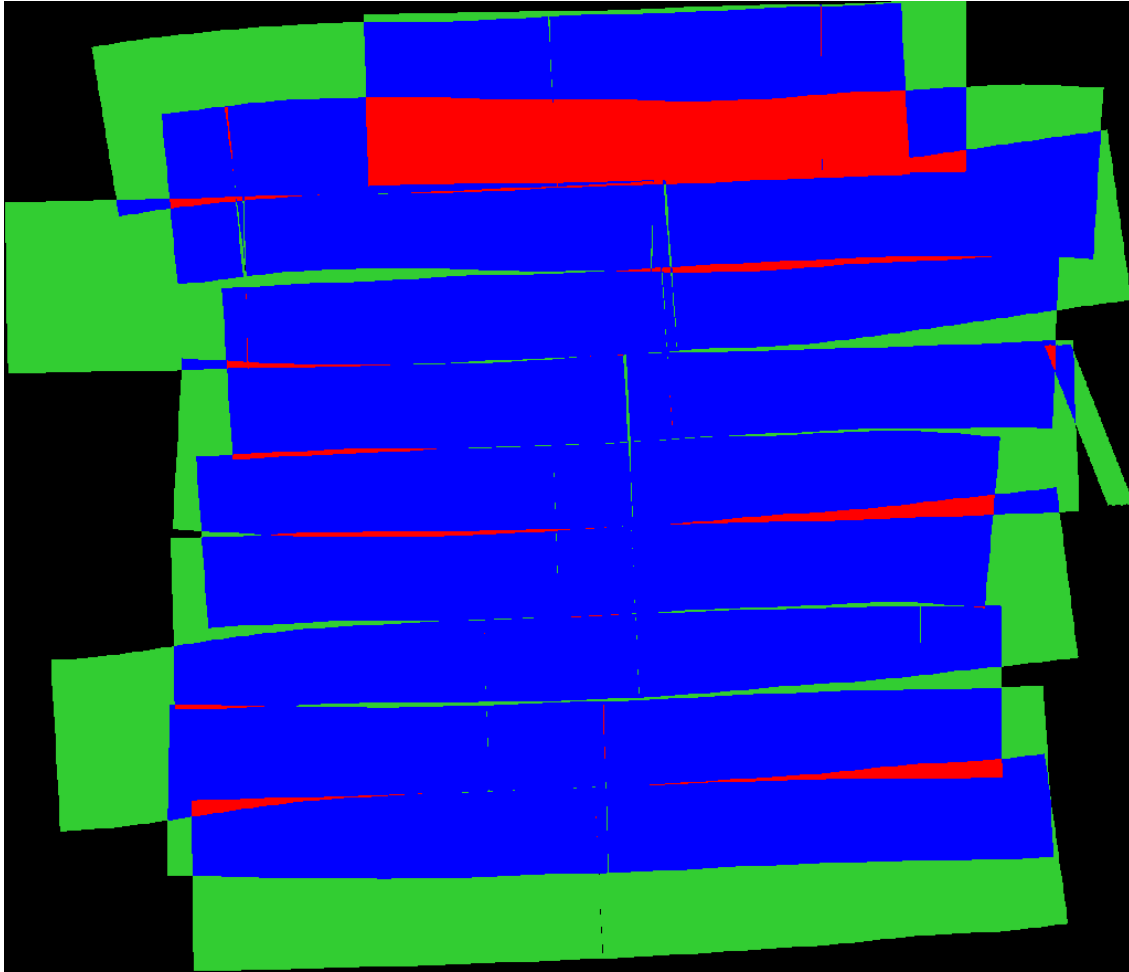


Figure 3.13.1. FISEHOLE3 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

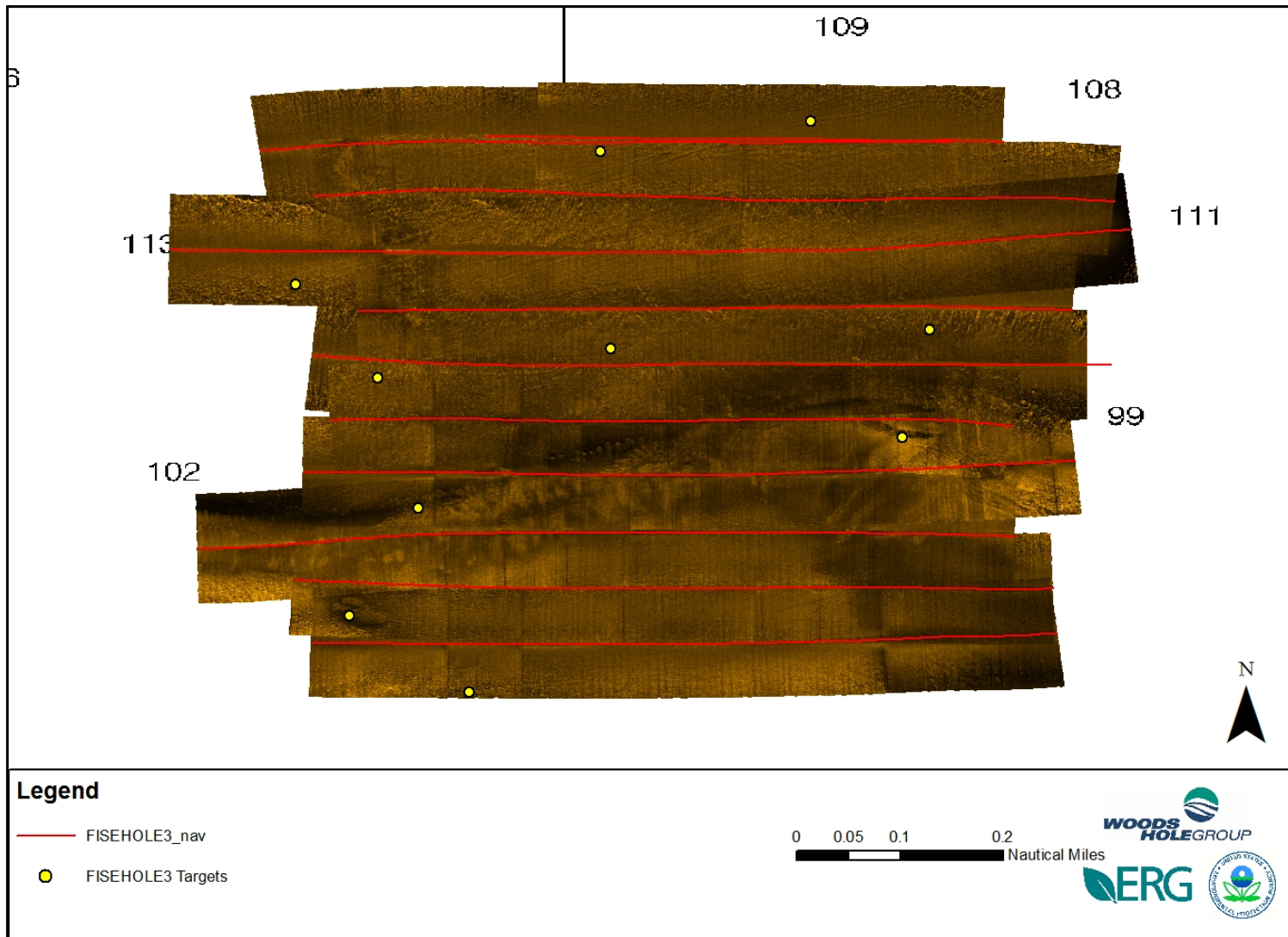


Figure 3.13.2. FISEHOLE3 mosaic with navigation lines and targets.

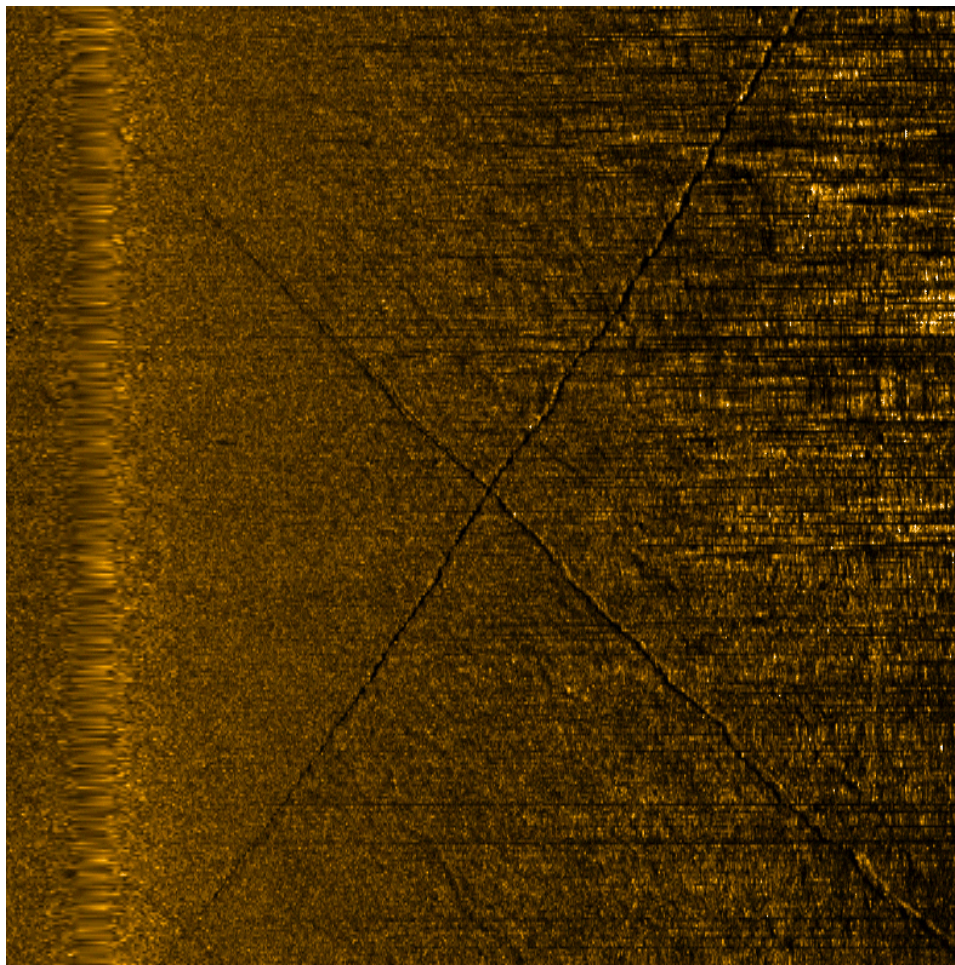


Figure 3.13.3. FISEHOLE3 target example: trawl/anchor marks.

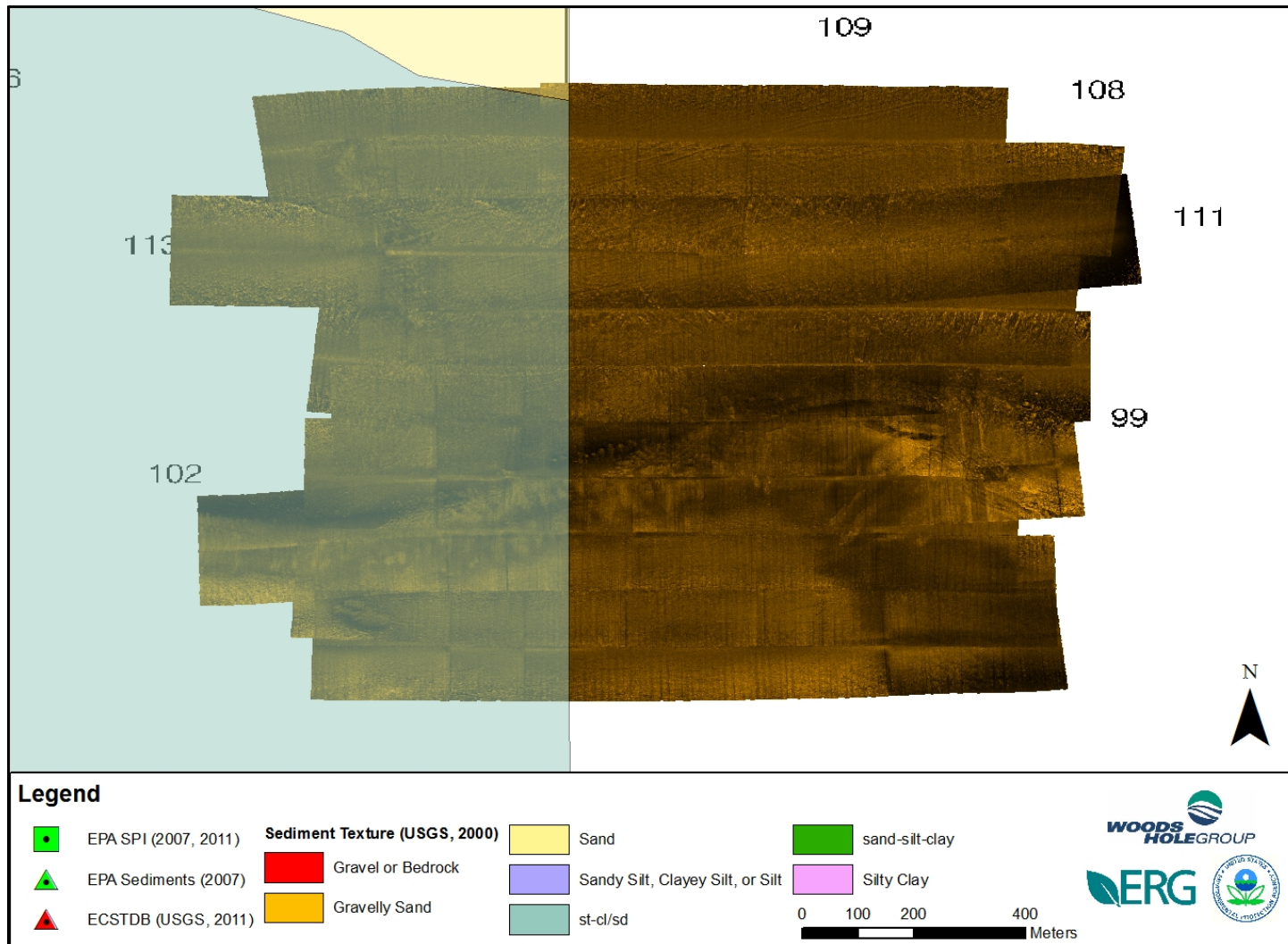


Figure 3.13.4. FISEHOLE3 mosaic with supplemental data to assist with interpretation. Note, the USGS (2000) seafloor classification coverage ends in this location.

3.14 FISEHOLE4

3.14.1 Mosaic Overview

Project location FISEHOLE4 is located approximately 0.9 km northeast of East Point (Fishers Island, NY) and 3.5 km south of Stonington Harbor, CT (Figure 3.1.4). The project location lies partially within the Stonington disposal site (historical). Depth varies between 3.6 and 31 meters in this area. Figure 3.14.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Twenty-four (24) side-scan sonar XTF files were imported for this project location. Two (2) files were rejected for QA reasons, and two (2) files were trimmed of data (Table 3.14.1). Data coverage is presented in Figure 3.14.1. The project area was surveyed at approximately 50% overlap in data coverage. Side-scan data covered 0.82 million sq. meters.

Table 3.14.1. FISEHOLE4 processing statistics used in SonarWiz 5.

FISEHOLE4	
# XTF files	24
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6 to 8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	2
Tracklines trimmed	FISEHOLE4_1_2_110718141100
	FISEHOLE4_7_8_110718161800
# Tracklines removed/hidden	2
Tracklines removed/hidden	FISEHOLE4_9_10_110718145700
	FISEHOLE4_14_13_110718151800

3.14.2 Target Summary

Sixteen (16) unique targets and one (1) feature were identified at FISEHOLE4 using specific descriptions. Targets were assigned to three classifications, with the number of targets assigned to each classification given in parentheses: boulder (3), debris pile (8), unidentified/other (5). All targets were identified in the western edge of the project location. Targets identified as debris piles fall within the area of overlap between the project location and the Stonington disposal site. The feature outlines a field of debris pile which occupies the entire eastern half of the project area. Targets and features are

compiled in Appendix T. Targets are indicated on Figure 3.14.2 and example target images are indicated in Figure 3.14.3.

3.14.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE4 is composed of a medium and higher intensity backscatter material with many bottom features. A large field of debris pile extends from the eastern edge to the center of the survey area. This area is defined by many high intensity reflectors of significant enough height to cause data shadows. The presence of debris is not surprising, since disposal events have occurred here in the past. Several bottom samples collected by the USGS were described as gravelly or boulder (USGS, 2011), which verifies the classification of targets identified for this site. The EPA did not provide SPI images for this site. The USGS modeled seafloor classification described the survey area as a complex mix of gravelly sand interspersed with areas of gravel, including one that extends from the eastern sides to the survey area to the center, just like the bottom feature described in this study. Figure 3.14.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned three classes to the study area. The primary class (blue) covers approximately 60% of the project area, with most coverage occurring in the west and central portions of the survey area. The secondary class (red) approximately mirrors the shape of the field of debris piles defined in the eastern side of the survey area. The tertiary class (yellow) is not likely to be an accurate representation of the bottom, since it mostly occurs in lines parallel to the nadir. SonarWiz 5 bottom classifications are located in Appendix Z.

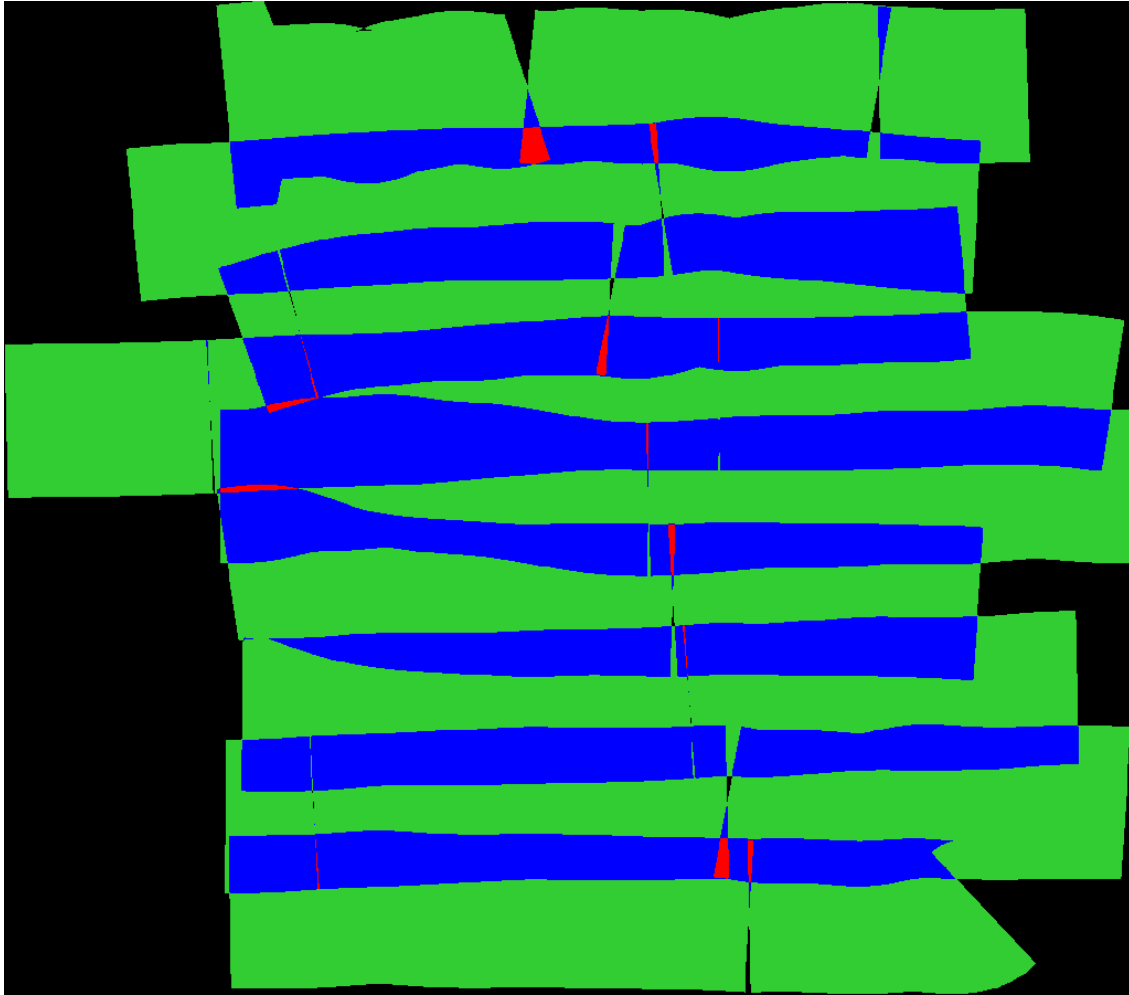


Figure 3.14.1. FISEHOLE4 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

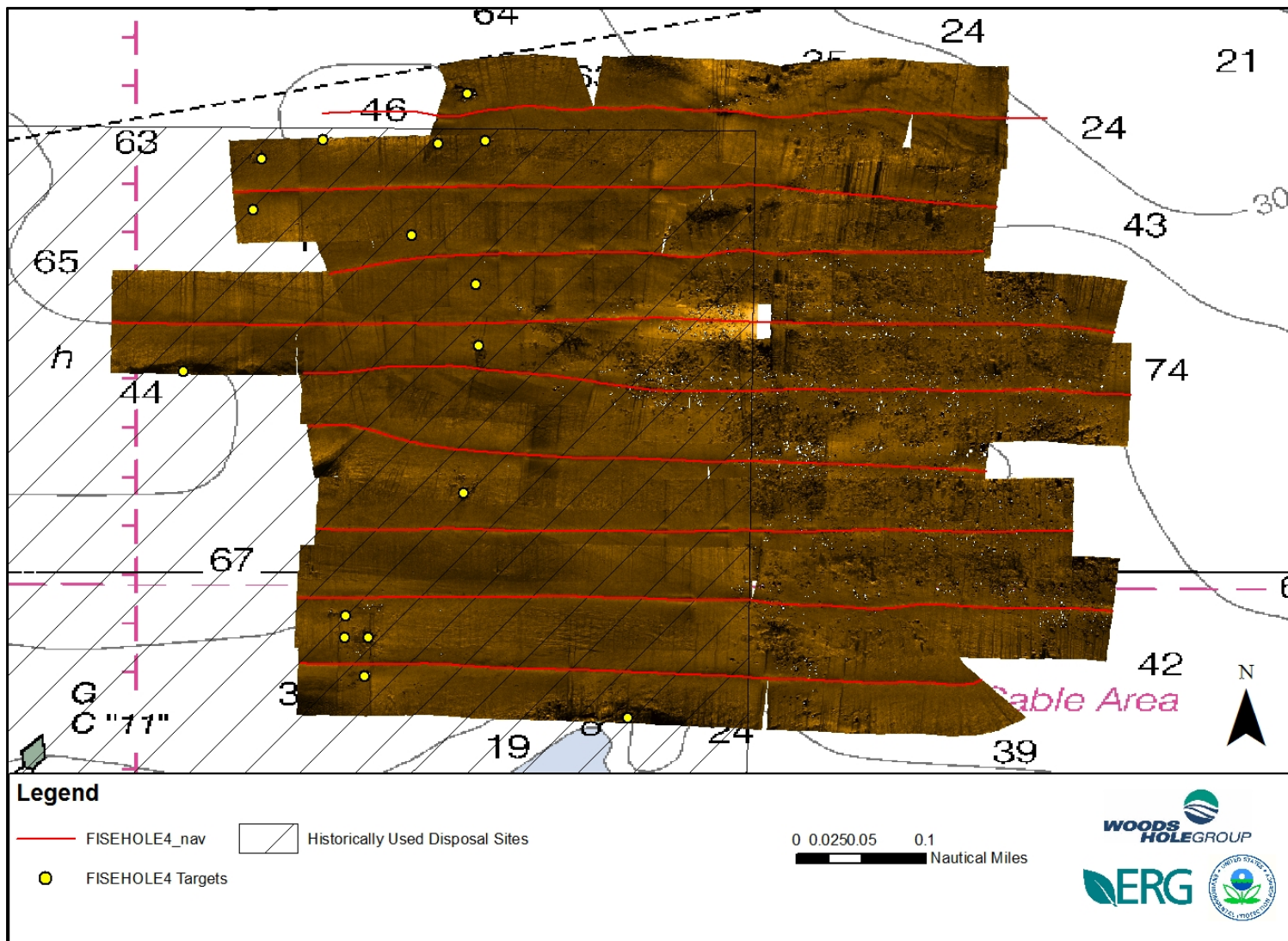


Figure 3.14.2. FISEHOLE4 mosaic with navigation lines and targets.

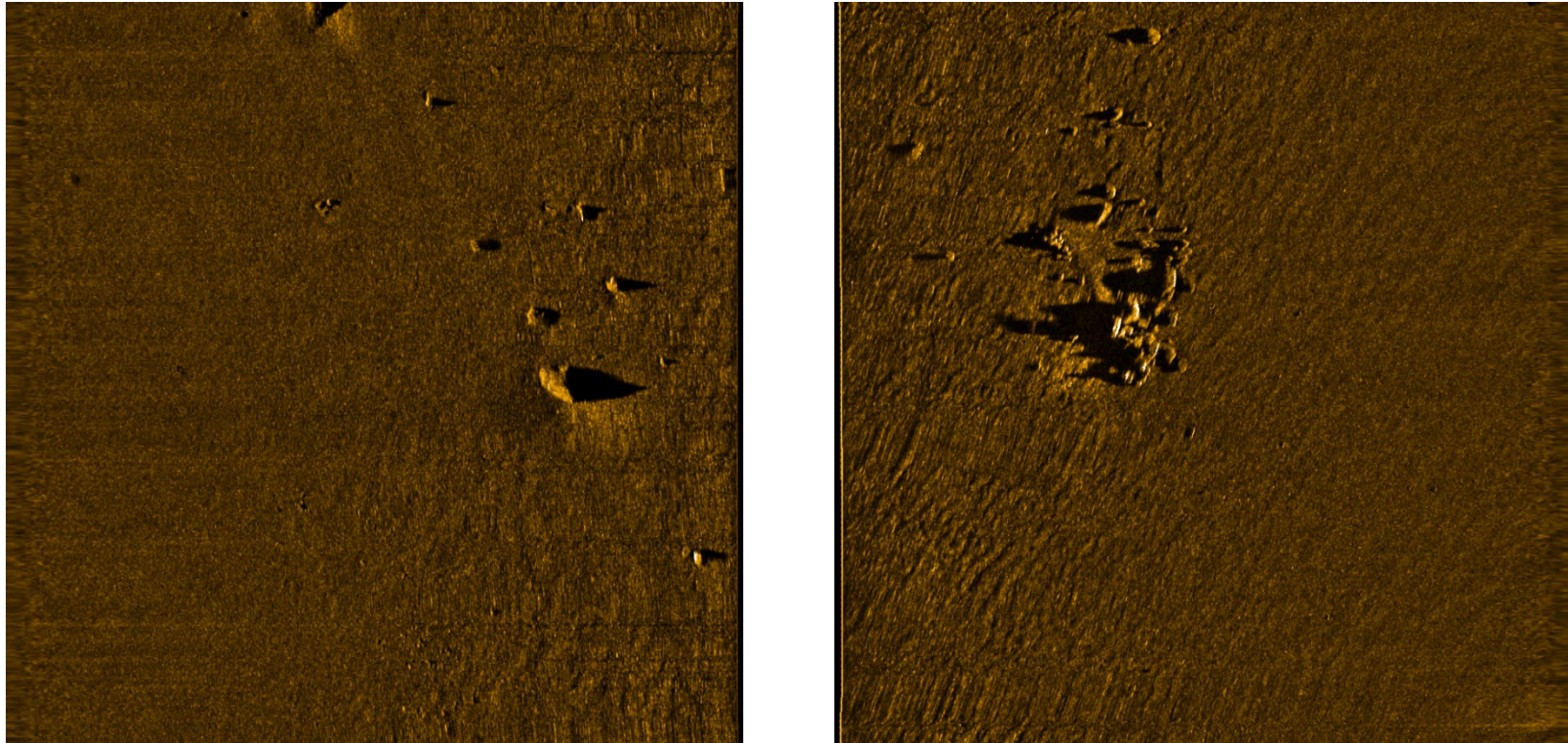


Figure 3.14.3. FISEHOLE4 target examples: boulder (L), debris pile (R).

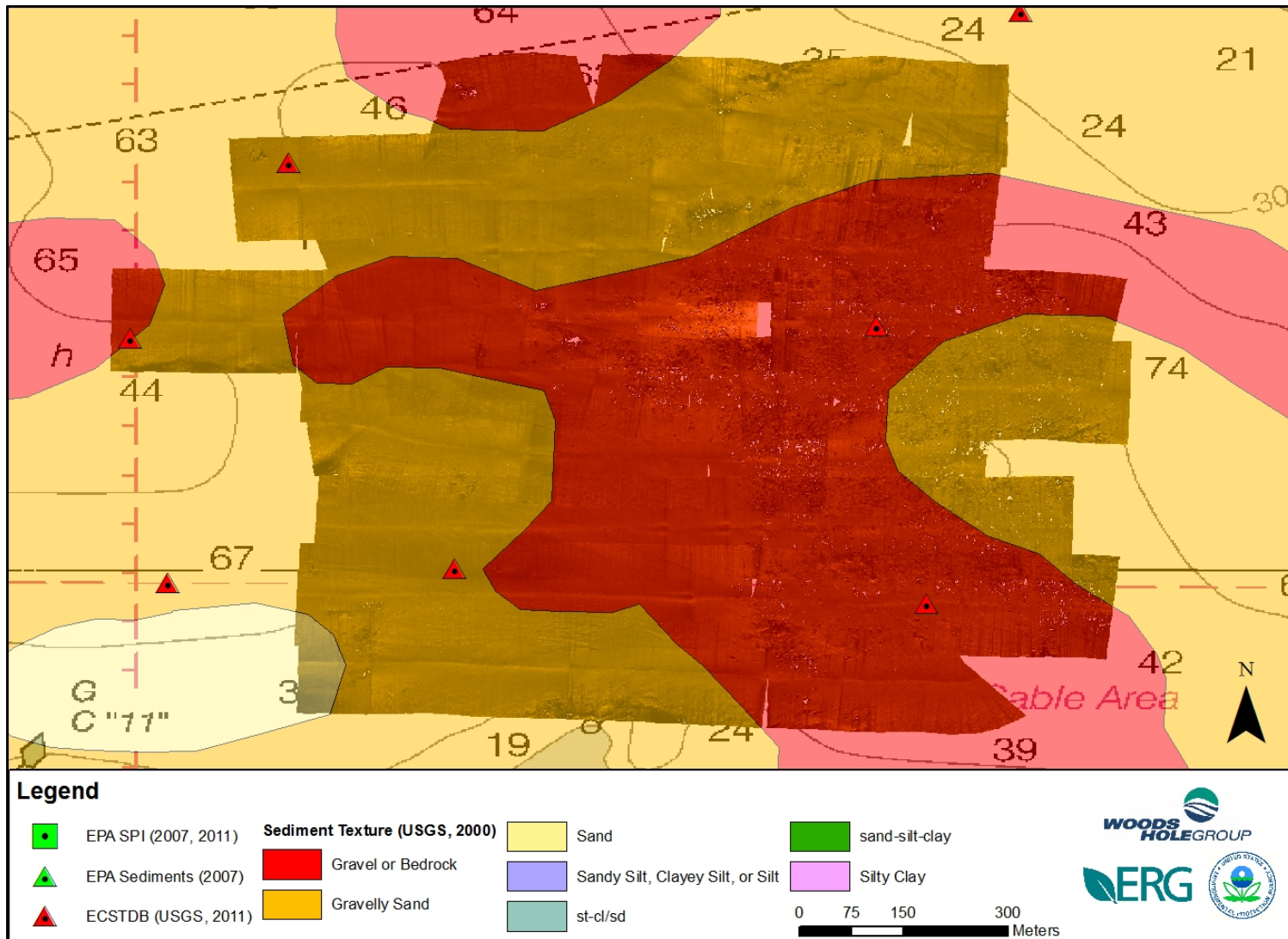


Figure 3.14.4. FISEHOLE4 mosaic with supplemental data to assist with interpretation.

3.15 FISEHOLE5

3.15.1 Mosaic Overview

Project location FISEHOLE5 is located approximately 1 km northwest of Fishers Island, NY and 1.3 km south of Groton Long Point, CT (Figure 3.1.4). The North Dumpling disposal site (historical) is directly north of the project area but does not overlap. Depth varies between 6 and 27 meters in this area. Figure 3.15.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Twenty (20) side-scan sonar XTF files were imported for this project location. Zero (0) files were rejected for QA reasons, and one (1) file was trimmed of data (Table 3.15.1). Data coverage is presented in Figure 3.15.1. The project area was surveyed at approximately 50% overlap in data coverage. Side-scan data covered 0.72 million sq. meters.

Table 3.15.1. FISEHOLE5 processing statistics used in SonarWiz 5.

FISEHOLE5	
# XTF files	20
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6 to 9
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	74 of 75
# Tracklines trimmed	1
Tracklines trimmed	FISEHOLE5_2_1_110718190500
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.15.2 Target Summary

Twelve (12) unique targets and four (4) features were identified at FISEHOLE5 using specific descriptions. Targets were assigned to nine classifications, with the number of targets assigned to each classification given in parentheses: boulder (2), debris pile (8), unidentified/other (1), or wreck (1). Most targets were identified near the northwest corner of the project area, and most targets identified as debris piles were located proximal to the North Dumpling disposal area. The wreck is identified on NOAA charts. Three features were identified as fields of debris pile, located in the northern half of the project area. The other feature was identified as bedforms, and was located in the southwest corner of the project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.15.2 and example target images are indicated in Figure 3.15.3.

3.15.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE5 is composed of a medium intensity backscatter material with intermittent areas of higher backscatter. The seafloor is homogenous in most of the survey area, with exceptions in the northeast and northwest corners where higher backscatter objects dominate the seafloor. Most of the higher backscatter areas were identified as debris piles due to the proximity to the North Dumpling disposal site (historical). USGS bottom samples in the survey area were identified as gravelly sediment and boulders, the latter of which is located within the feature delineated as a field of debris piles in this study (USGS, 2011). EPA did not provide SPI images for this survey area. USGS modeled seafloor classification describes the general area as predominantly sand with approximately equal areas gravelly sand and gravel arranged in a complex pattern where most gravel is located in the northern half of the survey area (USGS, 2000). The organization of sediment types and sorting in the survey area is likely influenced by currents due to relatively shallow depth. Figure 3.15.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area, but the result is poor. Despite re-running the function with different settings several times, classes are organized in a manner roughly parallel to the nadir. The classification function was not able to effectively distinguish between the rockier northern areas from the sandier southern areas. SonarWiz 5 bottom classifications are located in Appendix Z.

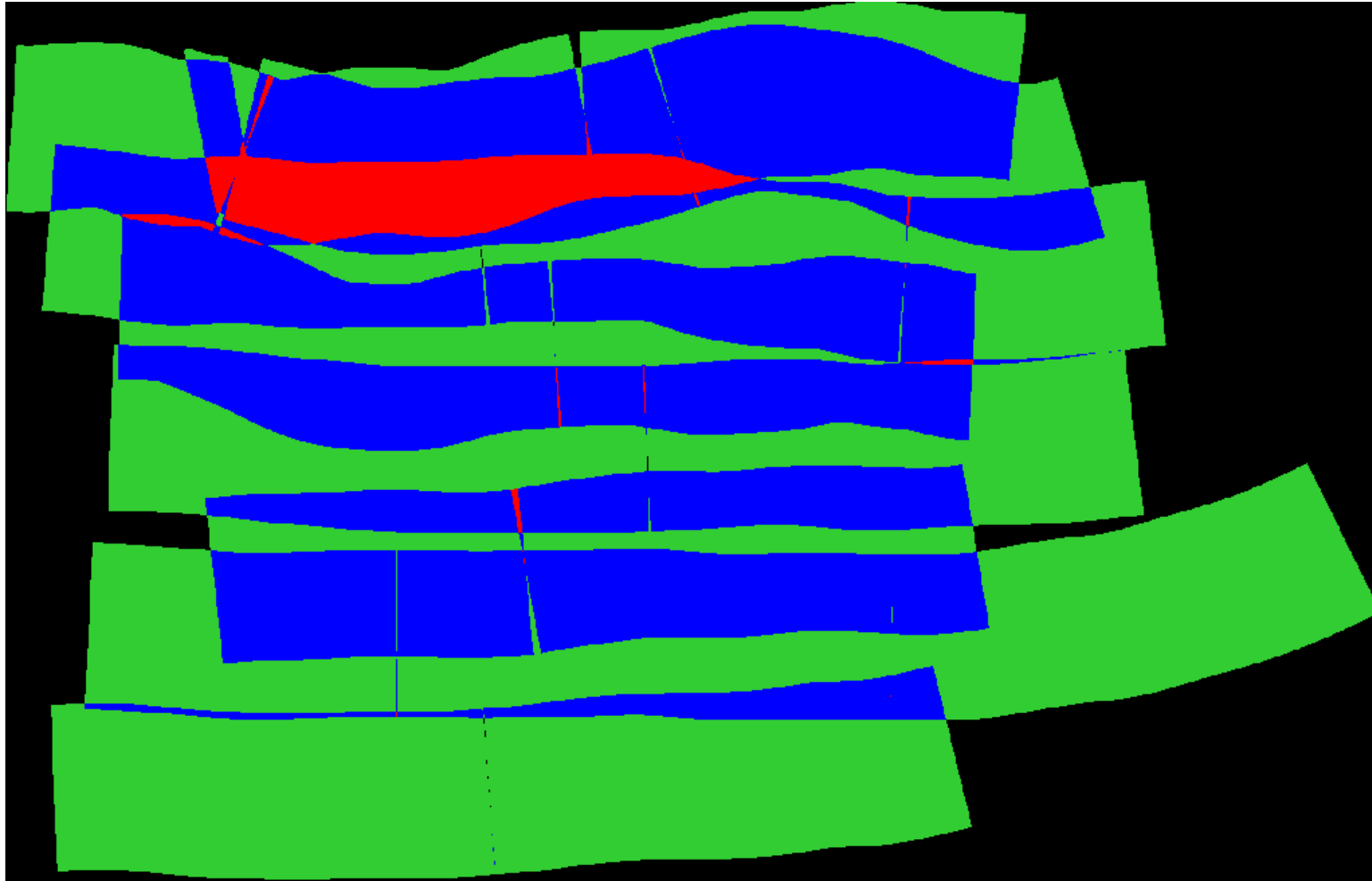


Figure 3.15.1. FISEHOLE5 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

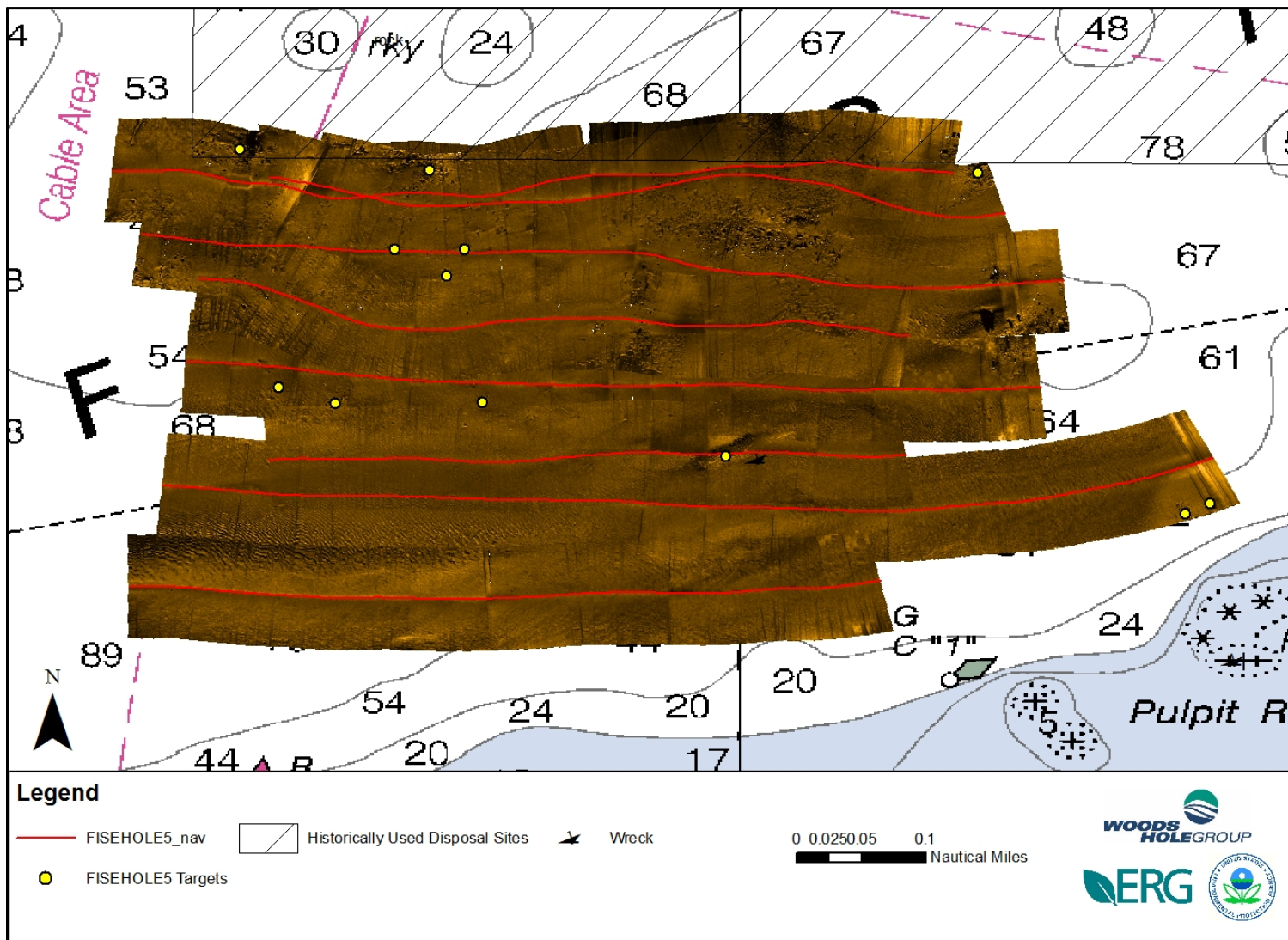


Figure 3.15.2. FISEHOLE5 mosaic with navigation lines and targets.

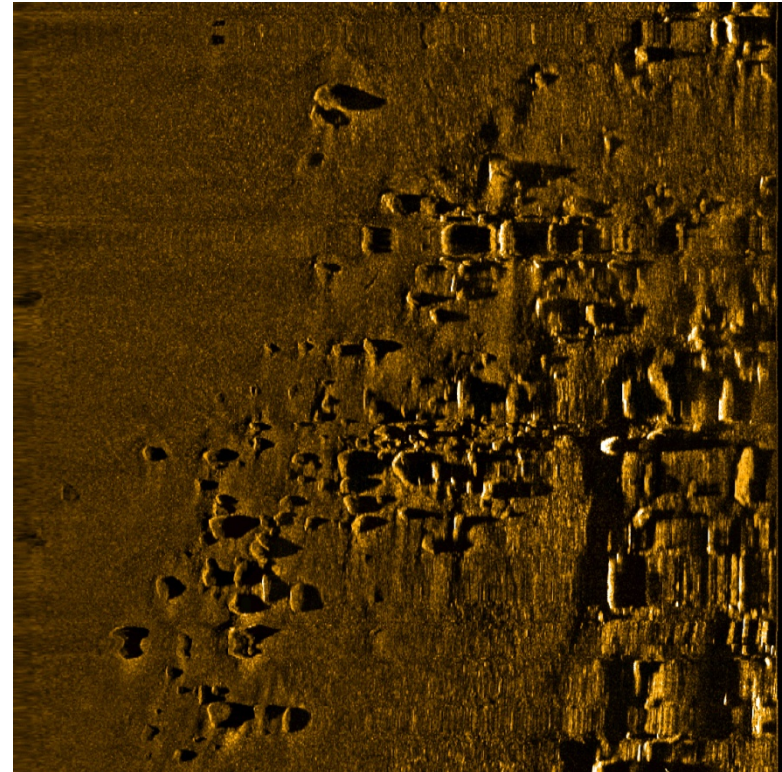
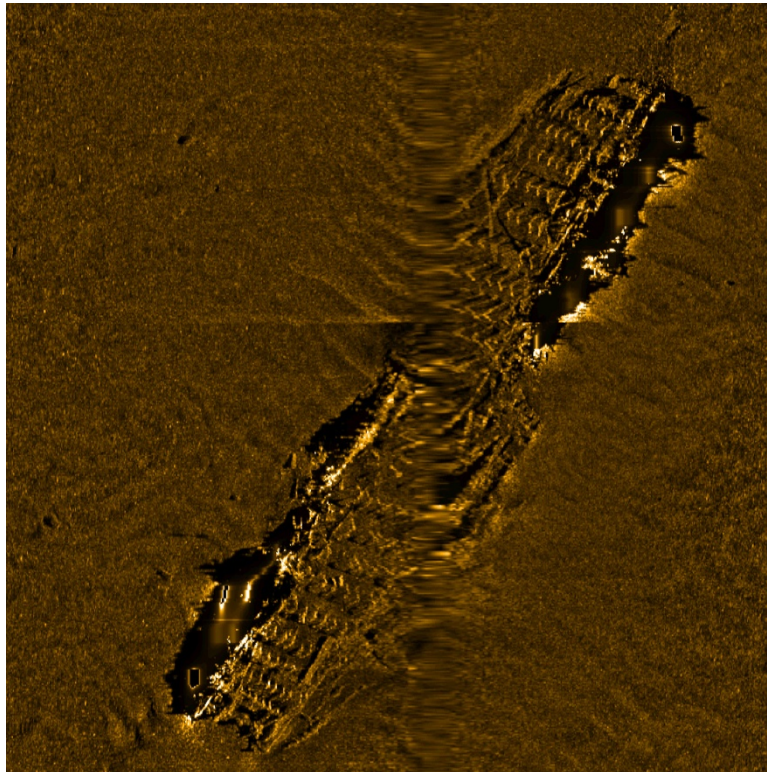


Figure 3.15.3. FISEHOLE5 target examples: wreck (L), debris pile (R).

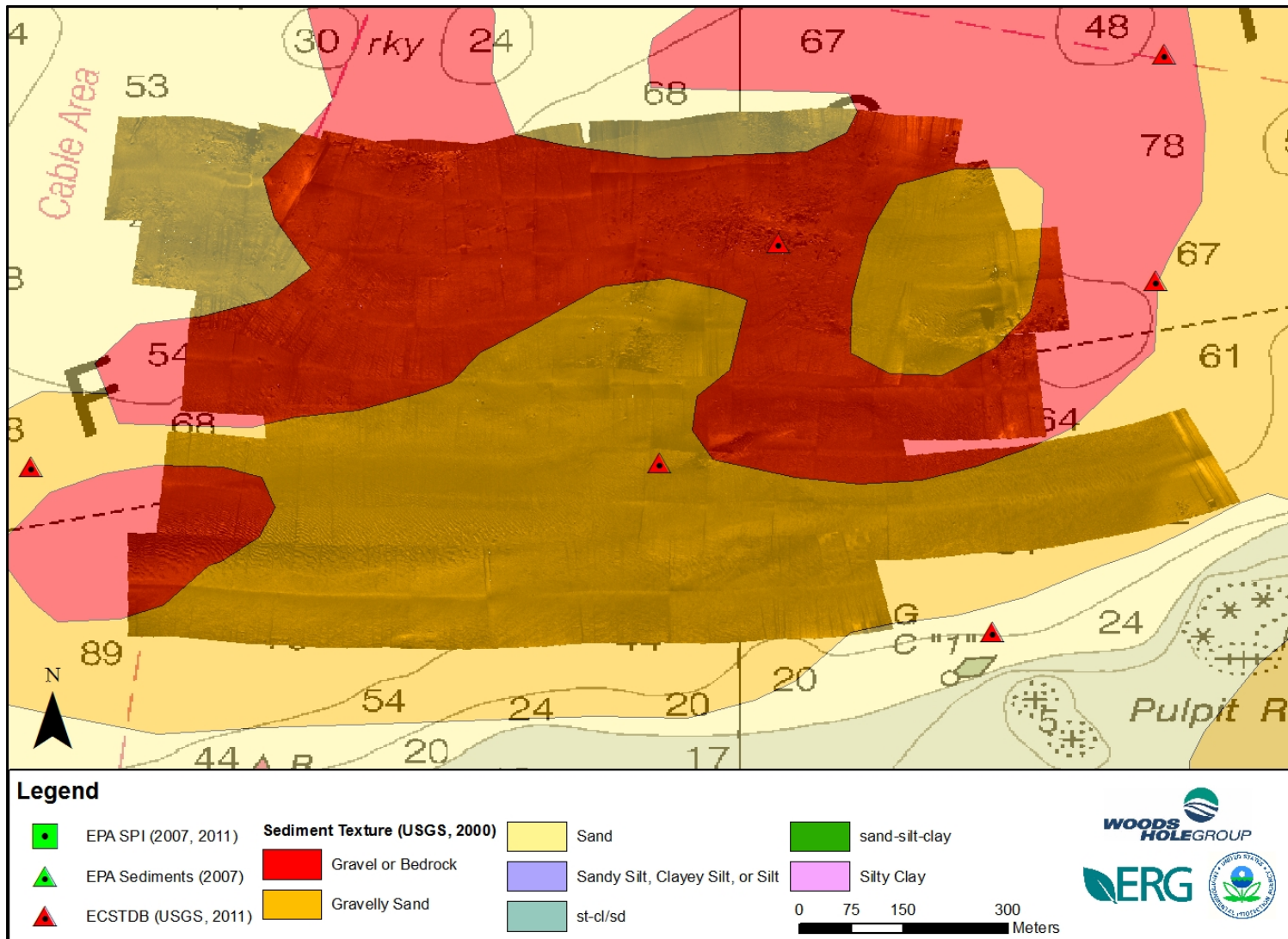


Figure 3.15.4. FISEHOLE5 mosaic with supplemental data to assist with interpretation.

3.16 FISEHOLE6

3.16.1 Mosaic Overview

Project location FISEHOLE6 is located approximately 3.2 km south of Black Point, CT and 5.4 km north of Plum Island, NY (Figure 3.1.3). Project locations ELIS14, Eastern_LIS_Niantic_Master, NTDS_HIST, and NTDS_NEW overlap with FISEHOLE6. The Niantic Bay disposal site (historical) has a small area of overlap in the north central area of FISEHOLE6. Depth varies between 19 and 61 meters in this area. Figure 3.16.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Two hundred twenty-one (221) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and two (2) files were trimmed of data (Table 3.16.1). Data coverage is presented in Figure 3.16.1. The project area was surveyed at approximately 50% overlap in data coverage. Side-scan data covered 8.40 million sq. meters.

Table 3.16.1. FISEHOLE6 processing statistics used in SonarWiz 5.

FISEHOLE6	
# XTF files	221
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	FISEHOLE6_11_12_110720042100
	FISEHOLE6_11_12_110720043100
# Tracklines removed/hidden	1
Tracklines removed/hidden	FISEHOLE6_11_12_110720042600

3.16.2 Target Summary

Thirty-two (32) unique targets and four (4) features were identified at FISEHOLE6 using specific descriptions. Targets were assigned to seven classifications, with the number of targets assigned to each classification given in parentheses: boulder (2), boulder area/field (2), debris pile (1), fishing gear – trap/buoy (11), rock outcrop/geological (3), unidentified/other (12), or wreck (1). Most targets were identified in the northwest and southeast corners. The majority of targets identified as fishing gear – trap/buoys were located in the southeast corner. All four features outline fields of debris pile, and were located along the central to east-central sections of the project location. Targets and

features are compiled in Appendix T. Targets are indicated on Figure 3.16.2 and example target images are indicated in Figure 3.16.3.

3.16.3 Seafloor Classification & Geological Interpretation

The seafloor at FISEHOLE6 is composed of a medium intensity backscatter material evenly distributed around the survey area with an area of debris piles in the east. Bottom samples collected by USGS were described as gravelly sediment or gravel and are equally distributed around the survey area (USGS, 2011). SPI images provided by EPA show a bottom consisting of coarse sand overlain with shells, in agreement with the bottom samples collected by USGS. The USGS modeled seafloor classification shows gravelly sand as the dominant sediment type, with intermittent smaller areas of gravel mainly in the north and east, as well as a small area of sand in the central area. These changes in bottom types are not evident in the side-scan sonar data, likely because the only varying factor is the gravel percentage, which is not resolvable at the scale used in this study. Figure 3.16.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers nearly 100% of the project area and the secondary class is minimal to the point that that the total area it occupies is negligible. The field of debris piles in the east was not distinguishable using the Classification function. SonarWiz 5 bottom classifications are located in Appendix Z.

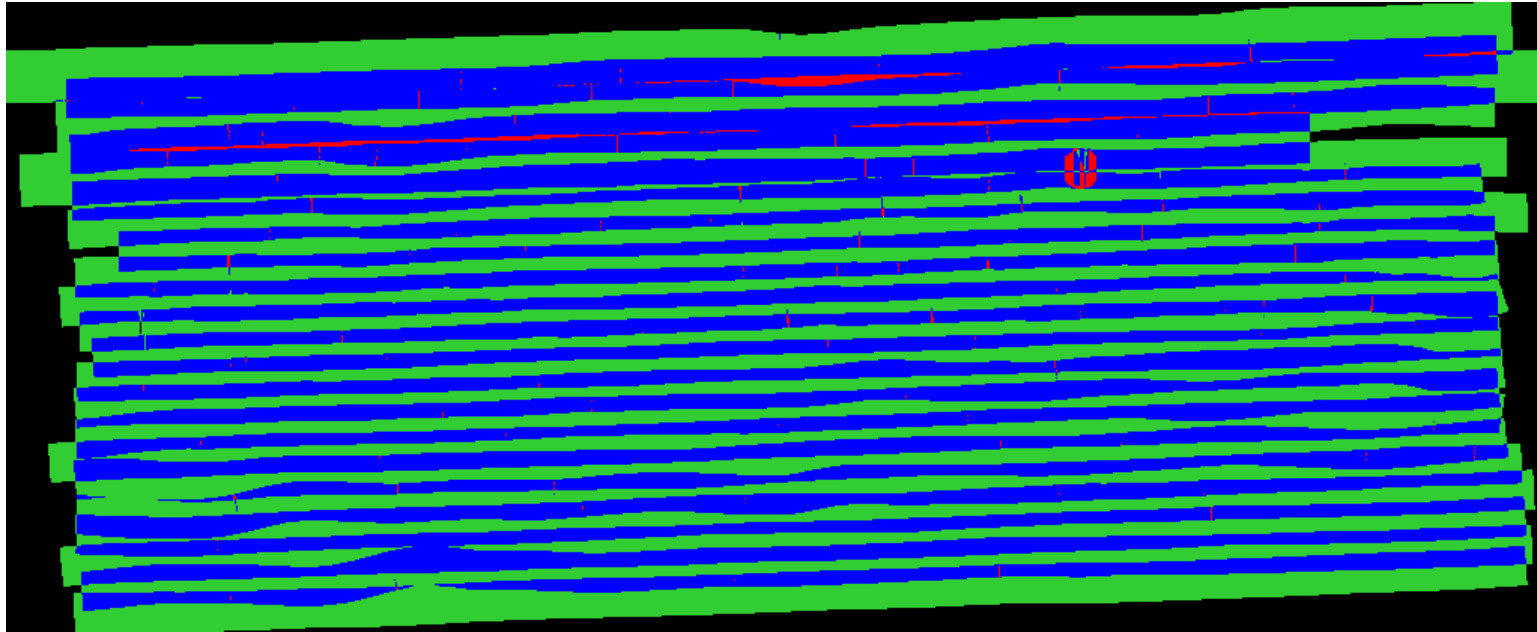


Figure 3.16.1. FISEHOLE6 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

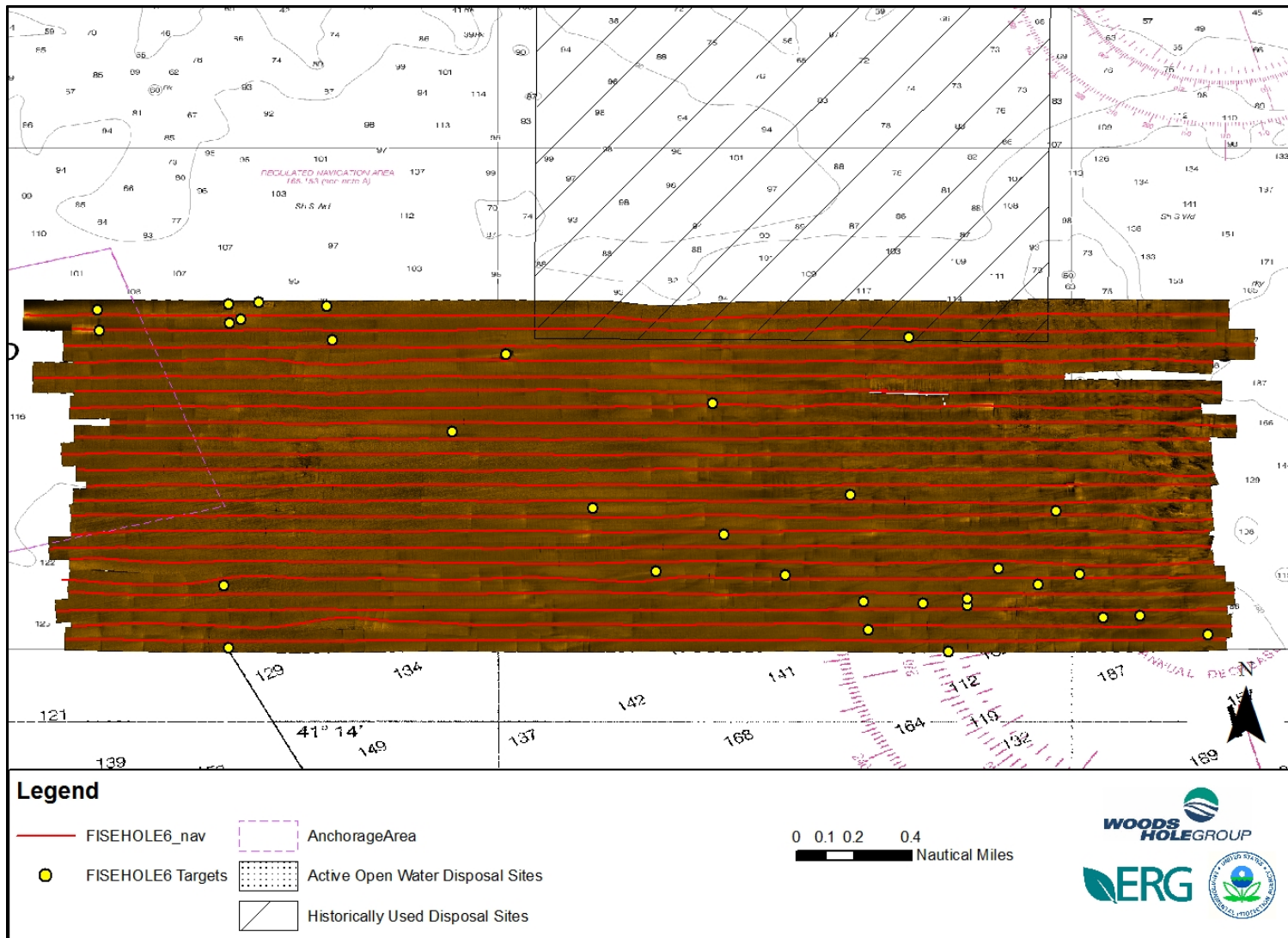


Figure 3.16.2. FISEHOLE6 mosaic with navigation lines and targets.

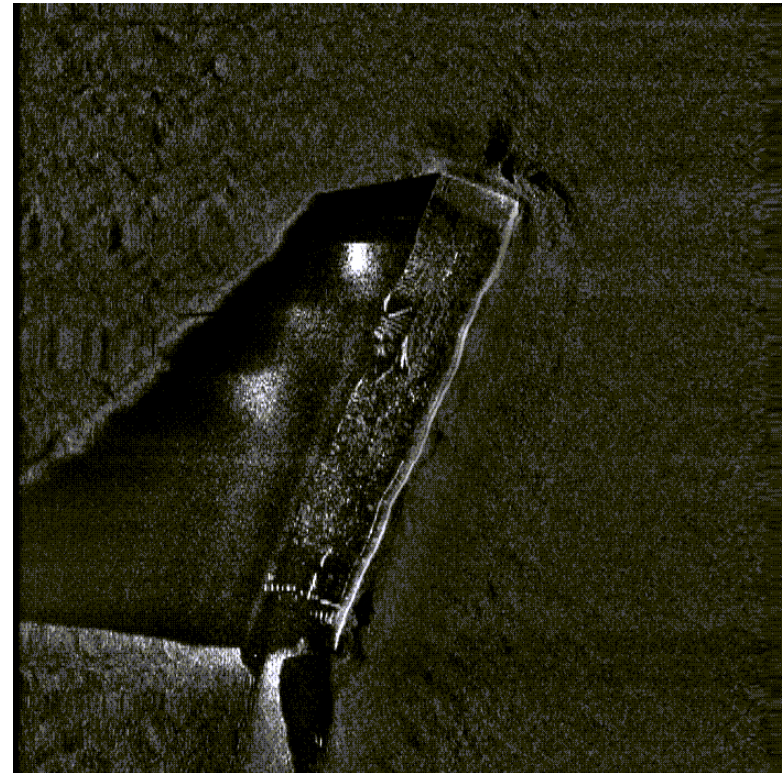
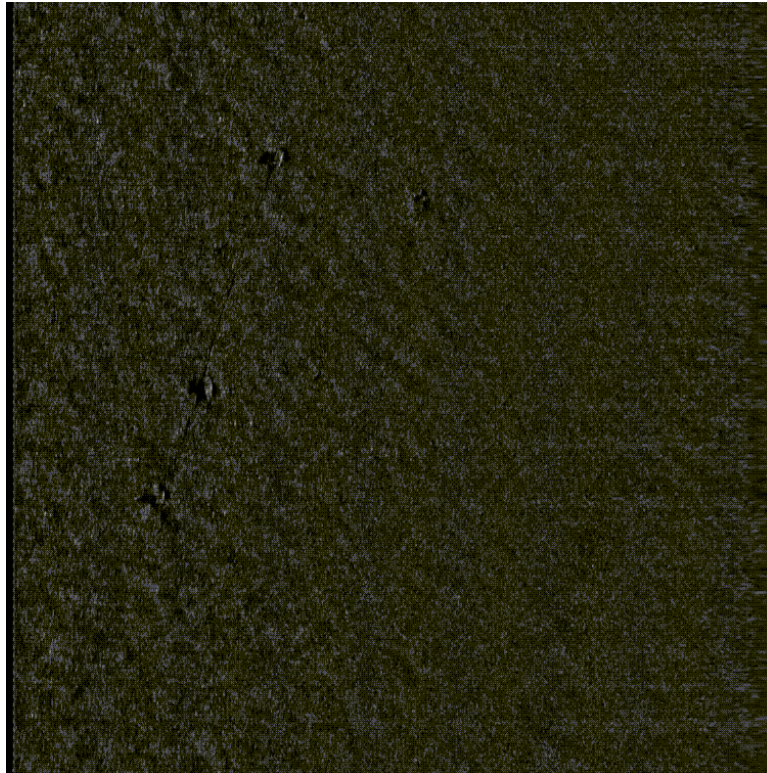


Figure 3.16.3. FISEHOLE6 target examples: fishing gear – trap/buoy (L), wreck (R).

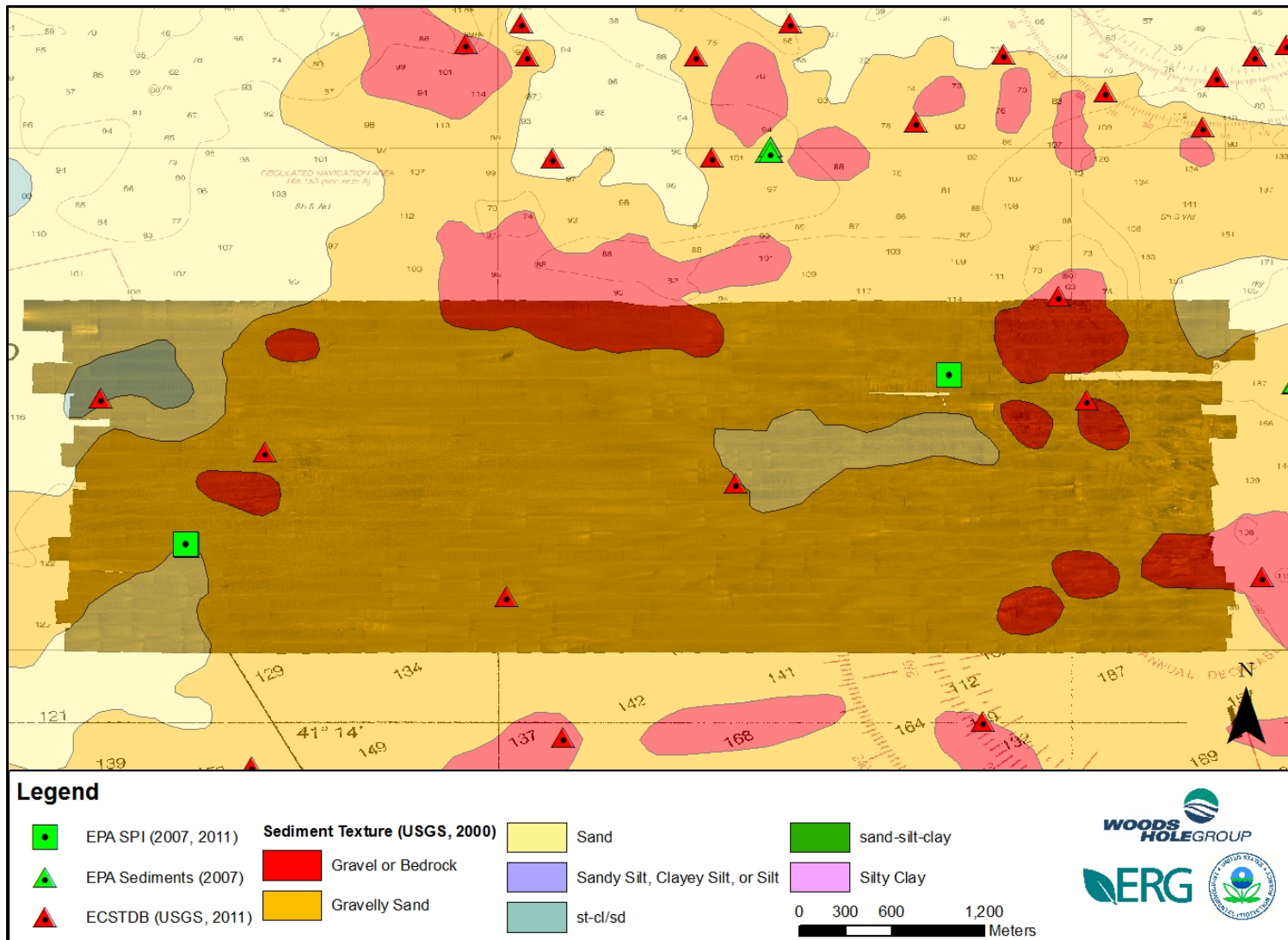


Figure 3.16.4. FISEHOLE6 mosaic with supplemental data to assist with interpretation.

3.17 EASTERN_LIS_NIANTIC_MASTER

3.17.1 Mosaic Overview

Project location Eastern_LIS_Niantic_Master is located approximately 6.5 km north of Plum Island, NY and 6.5 km south of Niantic Harbor, CT (Figure 3.1.3). Depth varies between 25 and 91 meters in this area. Project locations NTDS_NEW, NTDS_HIST, FISEHOLE6, and ELIS14 overlap this project location. The Niantic Bay disposal site (historical) overlaps very briefly in the northwest corner of the project area. Figure 3.17.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Eight hundred twenty-five (825) side-scan sonar XTF files were imported for this project location. Thirty (30) files were rejected for QA reasons, and nine (9) files were trimmed of data (Table 3.17.1). Data coverage is presented in Figure 3.17.1. The project area was surveyed at approximately 0% overlap in data coverage in some areas and 100% in others. Side-scan data covered 5.37 million sq. meters.

Table 3.17.1. Eastern_LIS_Niantic_Master processing statistics used in SonarWiz 5.

Eastern_LIS_Niantic_Master	
# XTF files	825
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	48 of 50
# Tracklines trimmed	9
Tracklines trimmed	N_02-01100609080100
	N_03_04_redo100610071500
	N_03_04_redo100610071600
	N_08_07_redo100610081500
	N_21_22100609121500
	N_26_25100609130300
	N_29_30100609140800
	N_29_30100609140900
N_39_40_redo100610120500	
# Tracklines removed/hidden	30
Tracklines removed/hidden	N_05_06100609092000
	N_08_07_redo100610082700
	N_13_14100609105800

Table 3.17.1. (cont.) Eastern_LIS_Niantic_Master processing statistics.

Tracklines removed/hidden (cont.)	N_16_15_redo100610095900
	N_18_17100609113900
	N_18_17100609113800
	N_26_25100609130800
	N_26_25100609130900
	N_26_25100609131000
	N_26_25100609131100
	N_26_25100609131200
	N_26_25100609131300
	N_26_25100609131400
	N_26_25100609131500
	N_26_25100609131600
	N_26_25100609134000
	N_29_30100609142300
	N_31_32_redo100610105100
	N_39_40_redo100610123000
	N_44_43_redo100610131900
	N_45_46100609181200
	N_26_25100609130400
	N_26_25100609130500
	N_26_25100609130600
	N_26_25100609130700
	N_44REDO_100609195300
	N_44REDO_100609195400
	N_3940_100609200600
	N_3940_100609200700
N_3940_100609200800	

3.17.2 Target Summary

Forty-three (43) unique targets and two (2) features were identified at Eastern_LIS_Niantic_Master using specific descriptions. Targets were assigned to five classifications, with the number of targets assigned to each classification given in parentheses: boulder (9), debris pile (17), fishing gear – trap/buoy (6), rock outcrop/geological (2), or unidentified/other (9). Most targets were identified in the north and north-central areas of the project location. Targets identified as debris piles were predominantly located in the north-central and east areas of the project location. Two

features outline fields of debris pile, and occupy the majority of the project area with only sections in the west, north-central and east remaining outside their coverage. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.17.2 and example target images are indicated in Figure 3.17.3.

3.17.3 Seafloor Classification & Geological Interpretation

The seafloor at Eastern_LIS_Niantic_Master is composed of evenly-distributed, medium intensity backscatter material with fields of debris pile occupying the majority of the central area. Bottom samples collected by USGS were described as gravel and were only collected in the western half of the survey area (USGS, 2011). SPI images provided by EPA show a bottom consisting of coarse sand overlain with shells, consistent with the bottom samples collected by USGS and the seafloor interpretation. The USGS modeled seafloor classification shows gravelly sand as the dominant sediment type, with intermittent smaller areas of gravel in the west and northeast, as well as a small area of sand in the center and west. These changes in bottom types are not evident in the side-scan sonar data, likely because the only varying factor is the gravel percentage, which is not resolvable at the scale used in this study. Figure 3.17.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area. The primary class covers 100% of the project. This is in agreement with the side-scan sonar data interpretation as well as the supplemental data from USGS and EPA. SonarWiz 5 bottom classifications are located in Appendix Z.

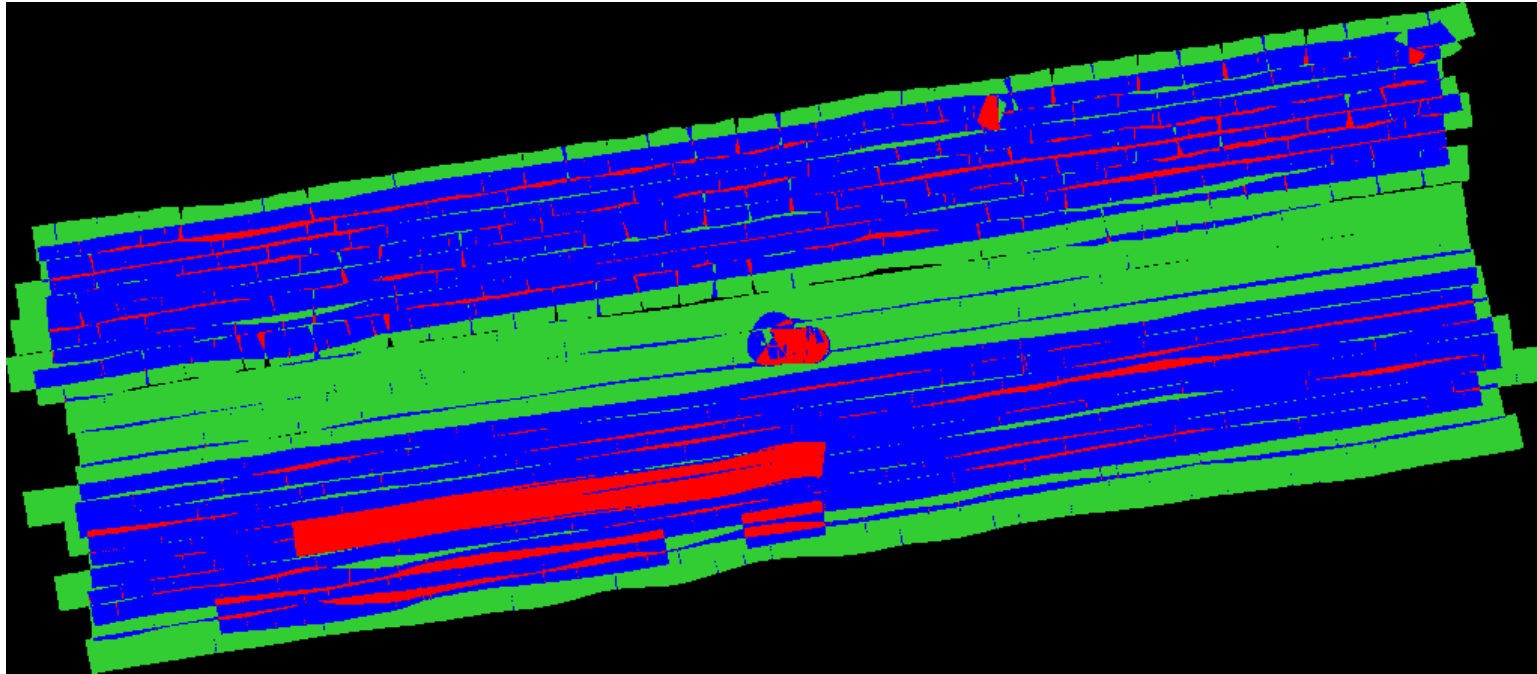


Figure 3.17.1. Eastern_LIS_Niantic_Master survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

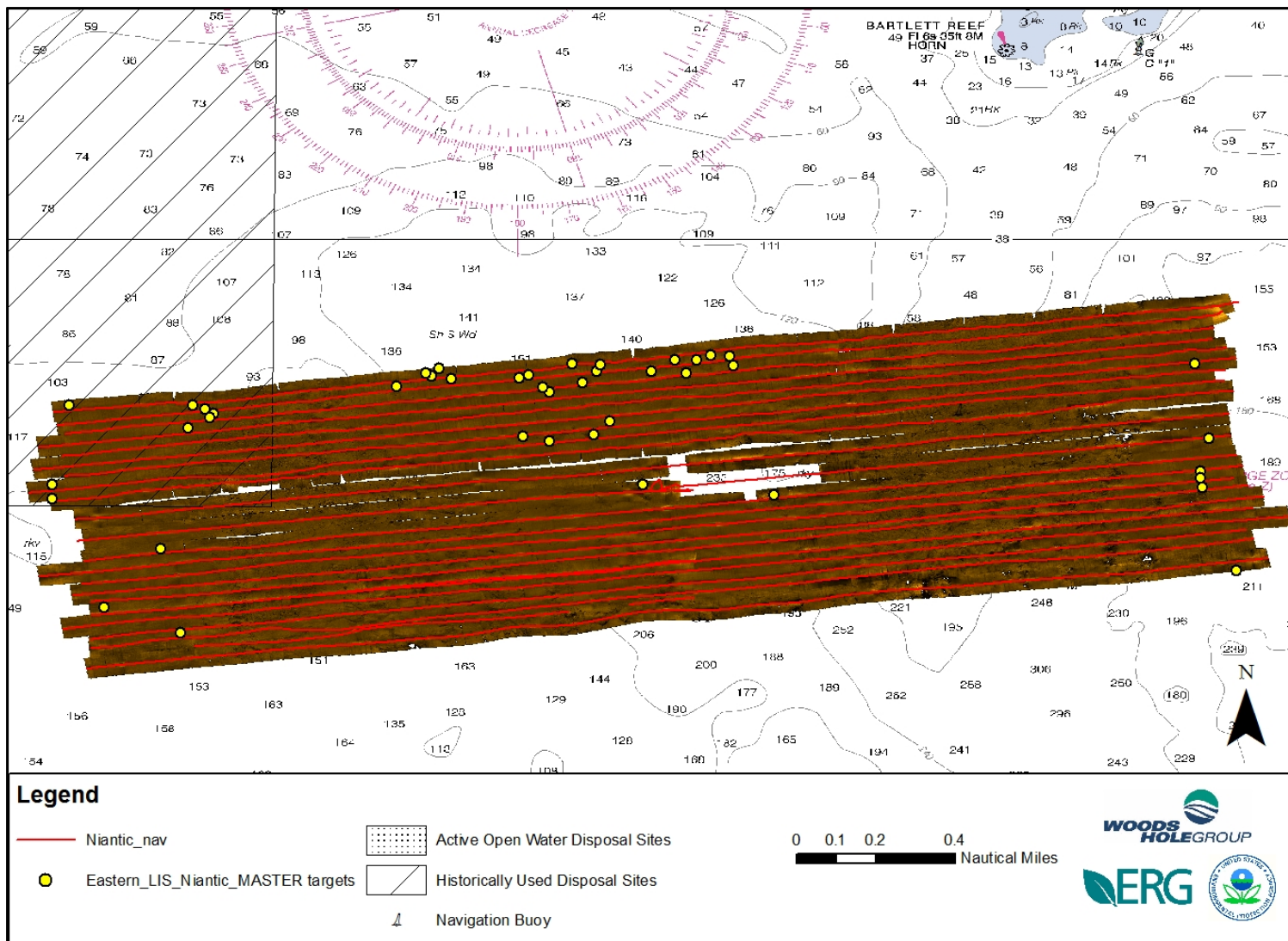


Figure 3.17.2. Eastern_LIS_Niantic_Master mosaic with navigation lines and targets.

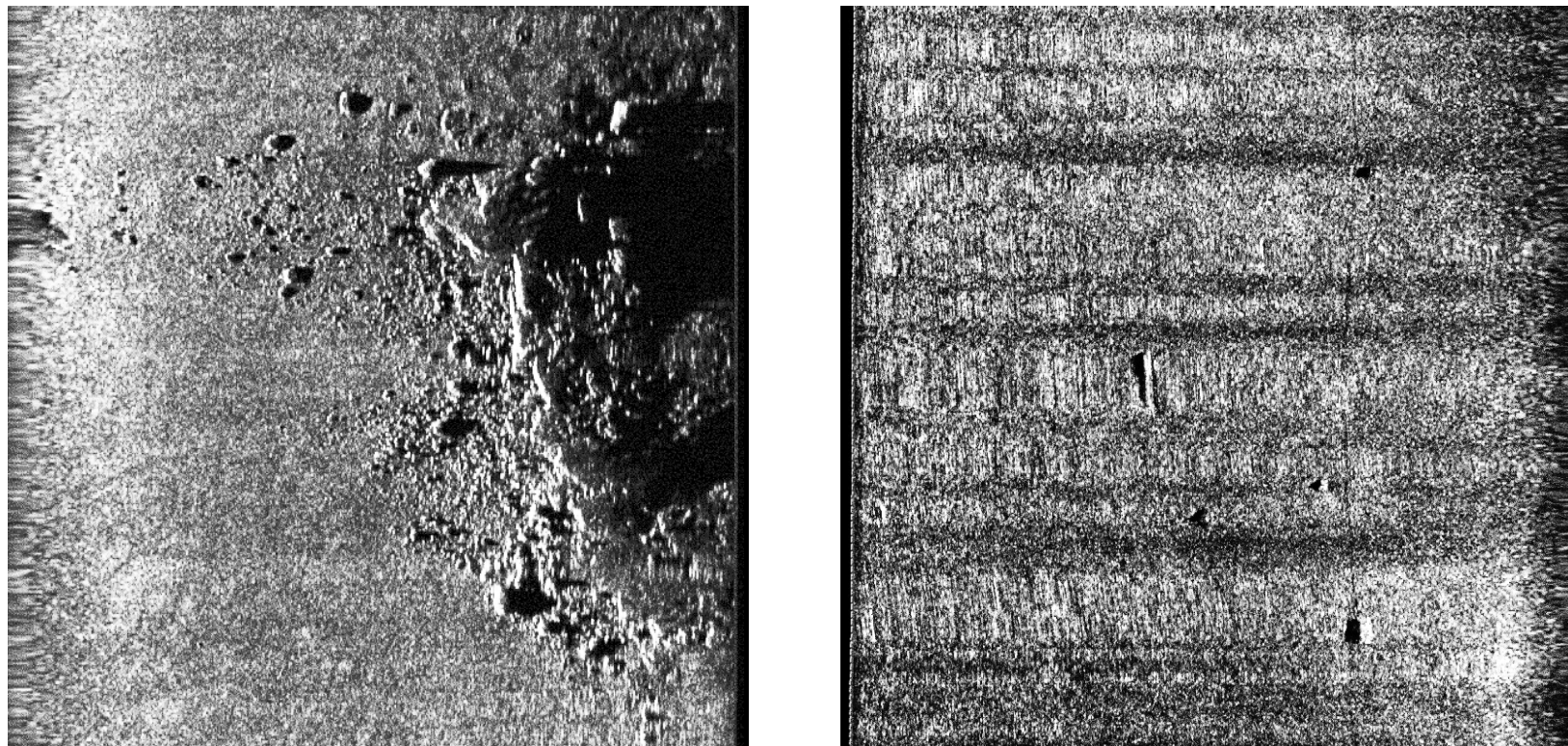


Figure 3.17.3. Eastern_LIS_Niantic_Master target examples: debris pile (L), fishing gear – trap/buoy (R).

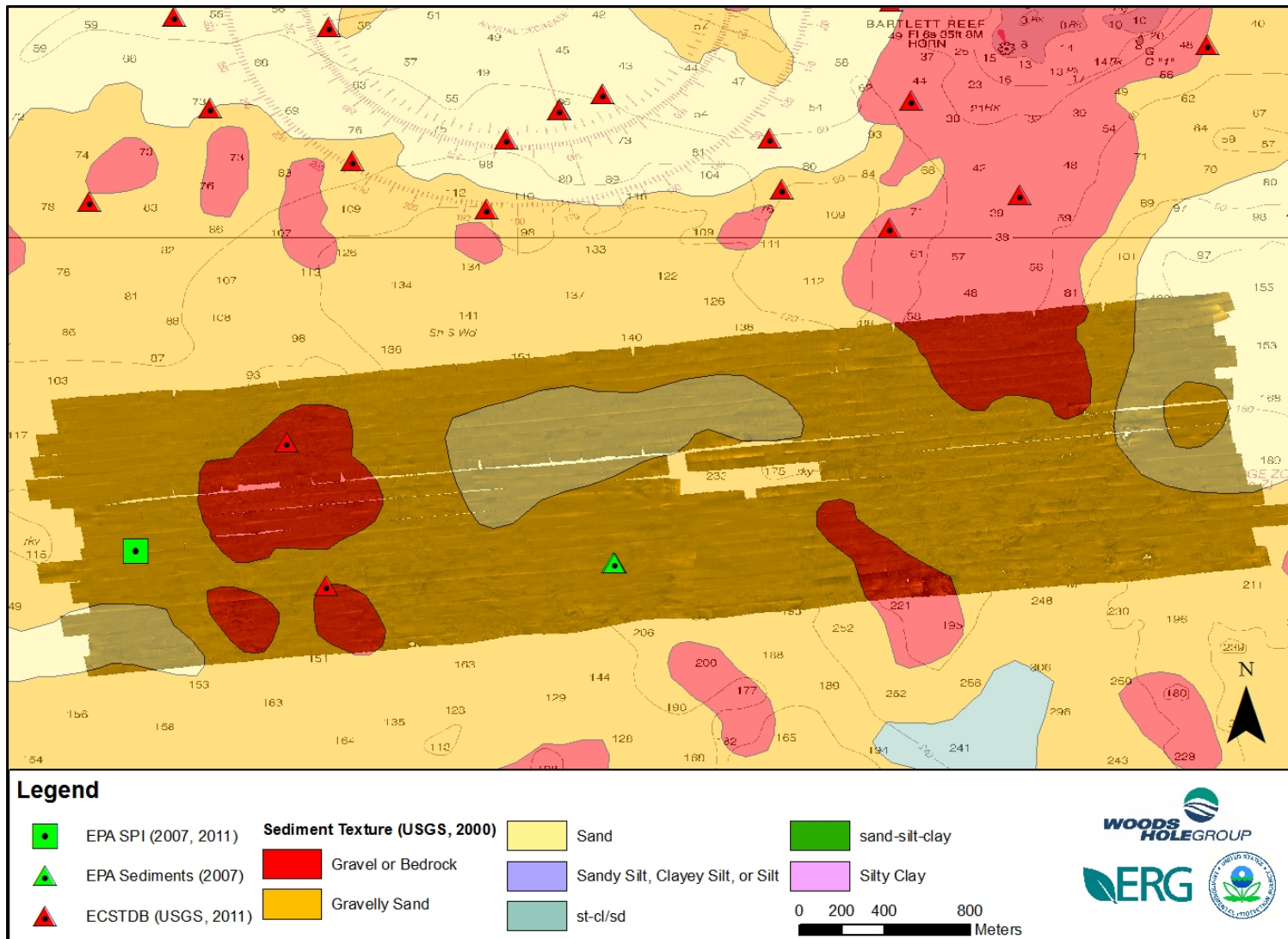


Figure 3.17.4. Eastern_LIS_Niantic_Master mosaic with supplemental data to assist with interpretation.

3.18 EASTERN_LIS_EASTHOLE_MASTER

3.18.1 Mosaic Overview

Project location Eastern_LIS_EastHole_Master is located approximately 16.9 km north of Montauk Point, NY and 4.6 km southeast of Fishers Island, NY (Figure 3.1.4). Project location FISE_NEW overlaps this site in the west. Depth varies between 27 and 99 meters in this area. Figure 3.18.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Six hundred forty (640) side-scan sonar XTF files were imported for this project location. Seven (7) files were rejected for QA reasons, and two (2) files were trimmed of data (Table 3.18.1). Data coverage is presented in Figure 3.18.1. The project area was surveyed at approximately 0% overlap in data coverage. Side-scan data covered 7.58 million sq. meters.

Table 3.18.1. Eastern_LIS_EastHole_Master processing statistics used in SonarWiz 5.

Eastern_LIS_EastHole_Master	
# XTF files	640
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	4
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	48 of 50
# Tracklines trimmed	2
Tracklines trimmed	East_Hole100608072900
	East_Hole_34_33100608191700
# Tracklines removed/hidden	7
Tracklines removed/hidden	East_Hole100608071900
	East_Hole2526red100608193400
	East_Hole2526red100608194800
	East_Hole_13_14100608122500
	East_Hole_18_17100608134900
	East_Hole_21_22100608151000
	East_Hole_34_33100608191900

3.18.2 Target Summary

Thirty-three (33) unique targets and four (4) features were identified at Eastern_LIS_EastHole_Master using specific descriptions. Targets were assigned to seven classifications, with the number of targets assigned to each classification given in parentheses: bedforms (4), boulder (2), debris pile (1), field of debris pile (9), rock outcrop/geological (2), trawl/anchor mark (2), unidentified/other (13). The majority of targets were identified in the western half of the project location. Three small features outlining fields of debris pile were located in the west-central, center and the east of the project. The entire project area was covered by a feature describing trawl/anchor marks, which were observed throughout. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.18.2 and example target images are indicated in Figure 3.18.3.

3.18.3 Seafloor Classification & Geological Interpretation

The seafloor at Eastern_LIS_EastHole_Master is composed of a medium intensity backscatter material with trawl/anchor marks throughout. Three small fields of debris piles are located in the east, center and west-center. A bathymetry slope reflection is visible in the west-central of the survey area, where depth increases from approximately 130 feet to 320 feet. Four bottom samples provided by the EPA in the west-center of the survey area were described as organic silty clay with fine sand. These bottom samples are in agreement with the USGS bottom samples collected in the center of the survey area, described as silty sand or clayey silt (USGS, 2011). Three SPI images were provided by the EPA outside the survey area to the south, and showed a bottom of silty sand. The USGS modeled seafloor classification describes the survey area as predominantly sand, with areas of gravelly sand in the center and silty sand in the west and east (USGS, 2000). Figure 3.18.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area. The primary class covers 100% of the project area, since the survey area is dominantly sand with varying percentages of fines, which cannot be resolved in the side-scan sonar data. Side-scan sonar and supplemental data support the conclusion that the bottom at Eastern_LIS_EastHole_Master is mostly homogeneous. SonarWiz 5 bottom classifications are located in Appendix Z.

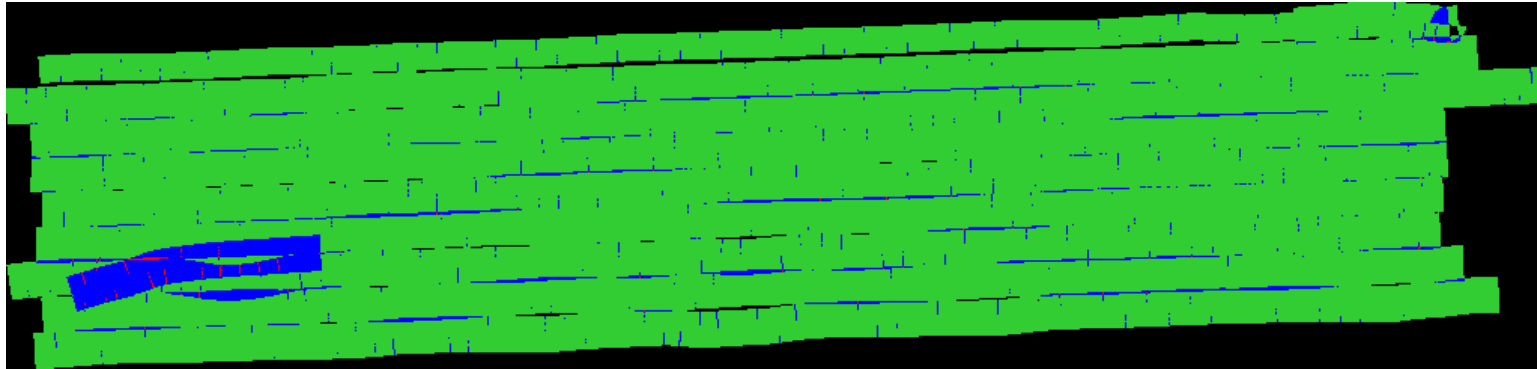


Figure 3.18.1. Eastern LIS EastHole Master survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

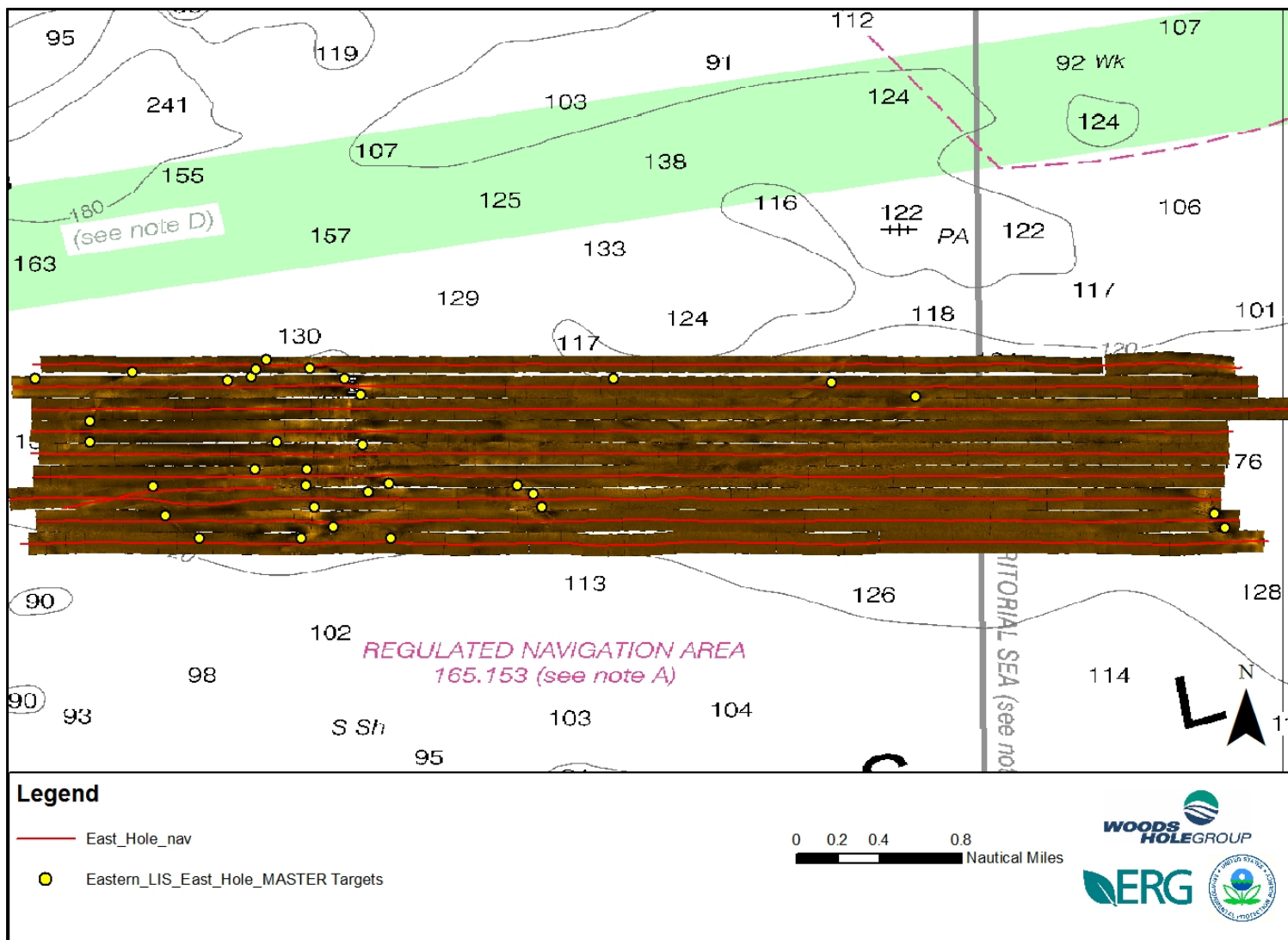


Figure 3.18.2. Eastern_LIS_EastHole_Master mosaic with navigation lines and targets.

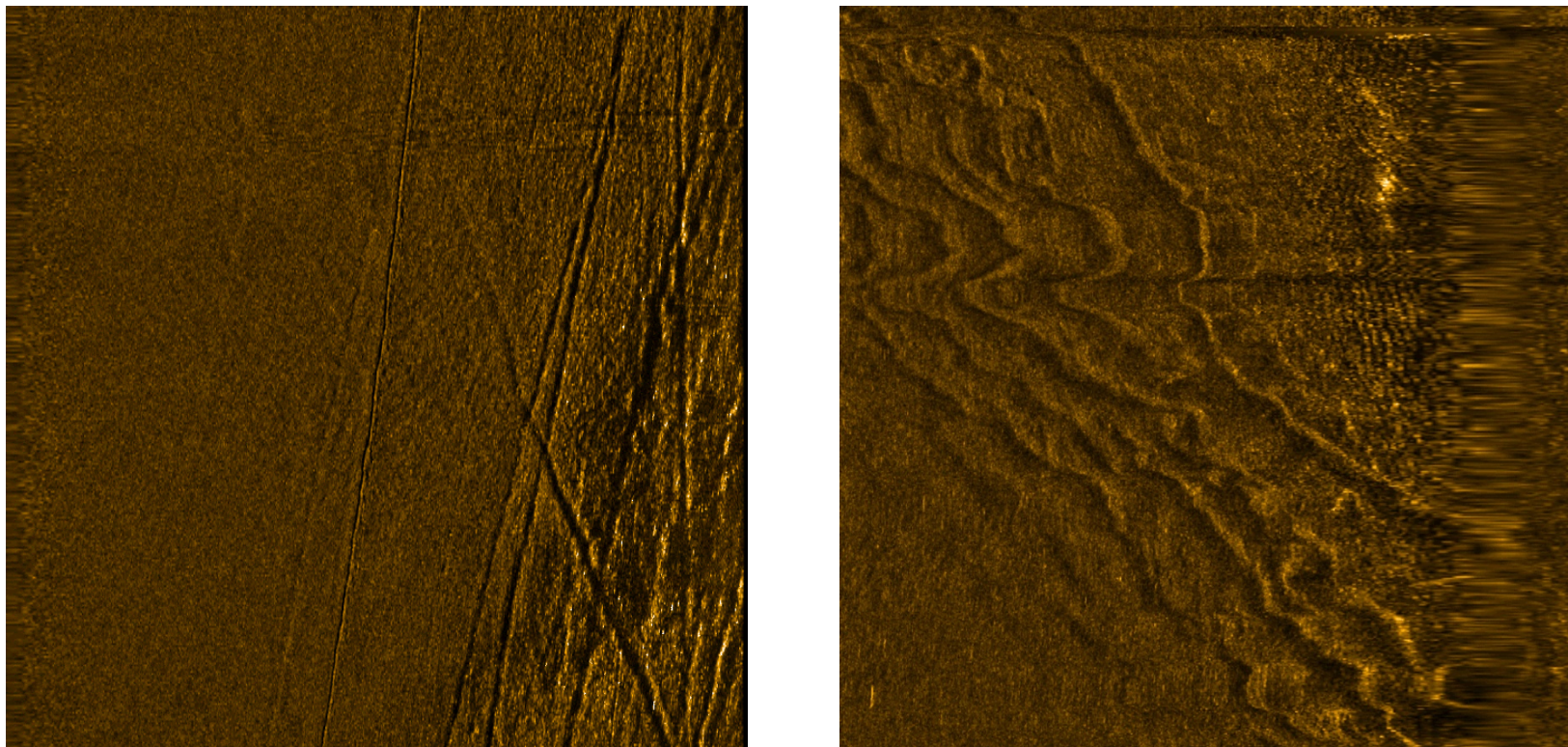


Figure 3.18.3. Eastern_LIS_EastHole_Master target examples: trawl/anchor marks (L), bedforms (R).

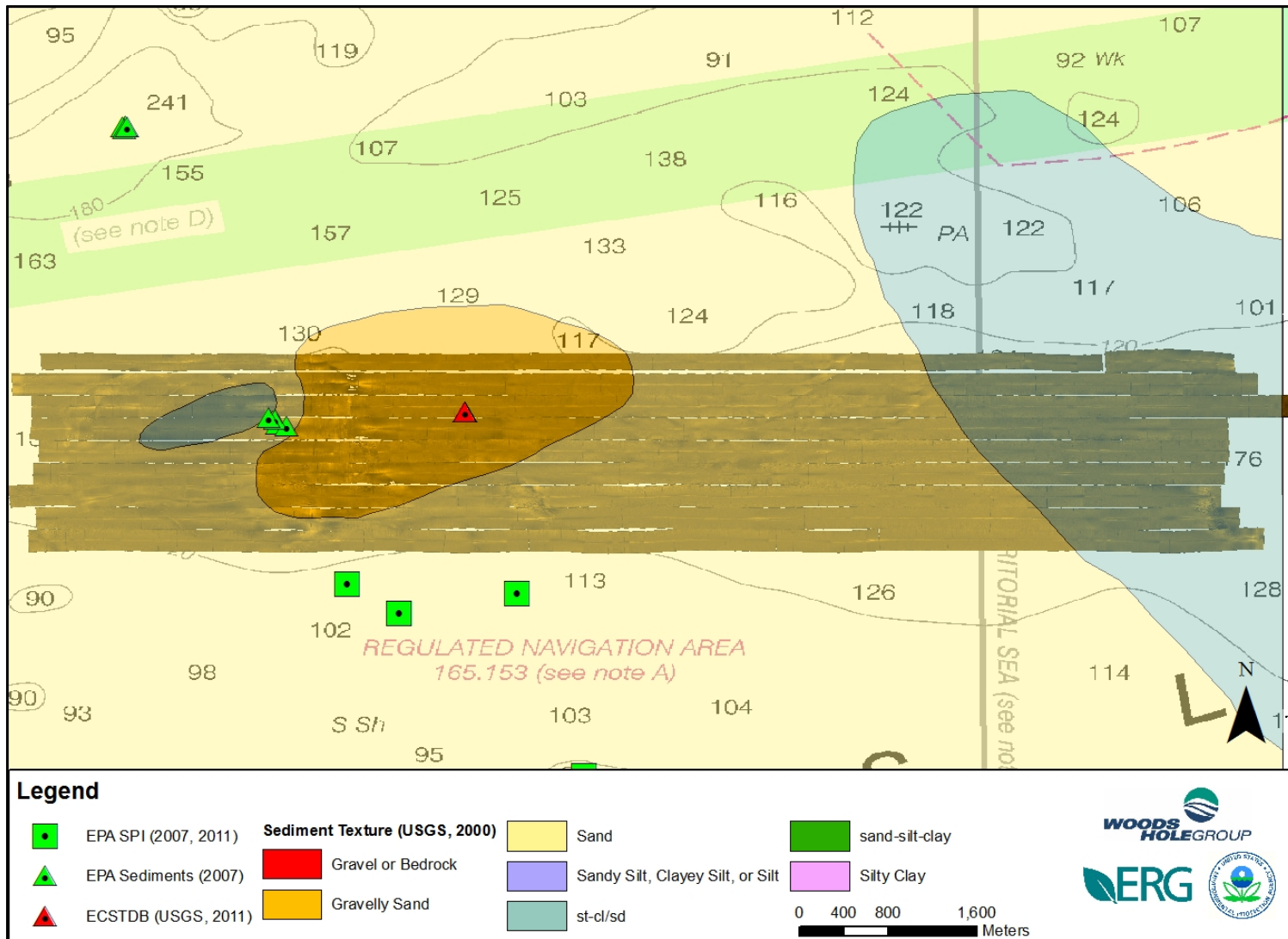


Figure 3.18.4. Eastern_LIS_EastHole_Master mosaic with supplemental data to assist with interpretation.

3.19 EASTERN_LIS_FISHERS_MASTER

3.19.1 Mosaic Overview

Project location Eastern_LIS_Fishers_Master is located approximately 1 km southeast of Fishers Island, NY and 6 km southwest of Watch Hill Point, RI (Figure 3.1.4). Project location FISE_OLD_2009 overlaps with the majority of the site, mainly in the east. Depth varies between 17 and 76 meters in this area. Figure 3.19.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Four hundred thirty-one (431) side-scan sonar XTF files were imported for this project location. Forty-four (44) files were rejected for QA reasons, and five (5) files were trimmed of data (Table 3.19.1). Data coverage is presented in Figure 3.19.1. The project area was surveyed at approximately 25% overlap in data coverage, with certain area having 100% overlap. Side-scan data covered 6.60 million sq. meters.

Table 3.19.1. Eastern_LIS_Fishers_Master processing statistics used in SonarWiz 5.

Eastern_LIS_Fishers_Master	
# XTF files	431
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4 to 25
Nadir Threshold	6 to 10
Nadir Blanking Duration	0 to 2
Offset Alt (m)	2
Adjusted display range (m)	98 of 100
# Tracklines trimmed	5
Tracklines trimmed	sonar_data_1817_100607122400
	sonar_data_1817_100607122500
	sonar_data_1817_100607123000
	sonar_data_2122_100607133600
	sonar_data_2425_100607135900
# Tracklines removed/hidden	44
Tracklines removed/hidden	10276710_F100607092600
	10276710_F100607093100
	10276710_F100607093600
	10276710_F100607094100
	sonar_data100607104200
	sonar_data_1009_100607112800
	sonar_data_1314_100607121200

Table 3.19.1. (cont.) Eastern_LIS_Fishers_Master processing statistics.

Tracklines removed/hidden (cont.)	sonar_data_1817_100607123100
	sonar_data_1817_100607123200
	sonar_data_1817_100607123300
	sonar_data_1817_100607123400
	sonar_data_1817_100607123500
	sonar_data_1817_100607123600
	sonar_data_1817_100607123700
	sonar_data_1817_100607123800
	sonar_data_1817_100607130100
	sonar_data_2122_100607134100
	sonar_data_2122_100607134200
	sonar_data_2122_100607134300
	sonar_data_2122_100607134400
	sonar_data_2122_100607134500
	sonar_data_2122_100607134600
	sonar_data_2122_100607134700
	sonar_data_2122_100607134800
	sonar_data_2425_100607135500
	sonar_data_2425_100607140100
	sonar_data_2425_100607140600
	sonar_data_2425_100607140800
	sonar_data_2425_100607140900
	sonar_data_2425_100607141000
	sonar_data_2425_100607141100
	sonar_data_2425_100607141200
	sonar_data_2425_100607143400
	sonar_data_3231_100607152000
	sonar_data_3334_100607160600
	sonar_data_3738_100607163900
	sonar_data_3738_100607164000
	sonar_data_3738_100607165300
	sonar_data_0102_100607181000
	sonar_data_0102_100607184100
	sonar_data15redo100607191800
sonar_data25redo100607192500	
sonar_data25redo100607192600	
sonar_data25redo100607193400	

3.19.2 Target Summary

Thirteen (13) unique targets and one (1) feature were identified at Eastern_LIS_Fishers_Master using specific descriptions. Targets were assigned to five classifications, with the number of targets assigned to each classification given in parentheses: bedforms (6), debris pile (12), fishing gear – trap/buoy (1), unidentified/other (3), or wreck (1). Targets were evenly distributed in the project area with no pattern of distribution. The wreck (target identification ELISFishM-T0001) is not present on NOAA charts and was located in the northwest corner of the project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.19.2 and example target images are indicated in Figure 3.19.3.

3.19.3 Seafloor Classification & Geological Interpretation

The seafloor at Eastern_LIS_Fishers_Master is composed of a homogeneous medium intensity backscatter material. Bottom samples collected in the east-center by the EPA were described as sandy silt with varying percentages of clay. There were no SPI images provided in the survey area. The USGS modeled seafloor classification shows sand as the dominant bottom sediment, with an area of gravelly sand in the southwest corner (USGS, 2000). The Figure 3.19.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area. The primary class covers 100% of the project area. The side-scan data combined with supplemental data suggest the seafloor of Eastern_LIS_Fishers_Master is dominated by sand, and that slight changes in gravel and silt content are not resolvable at the scale used in this survey. SonarWiz 5 bottom classifications are located in Appendix Z.

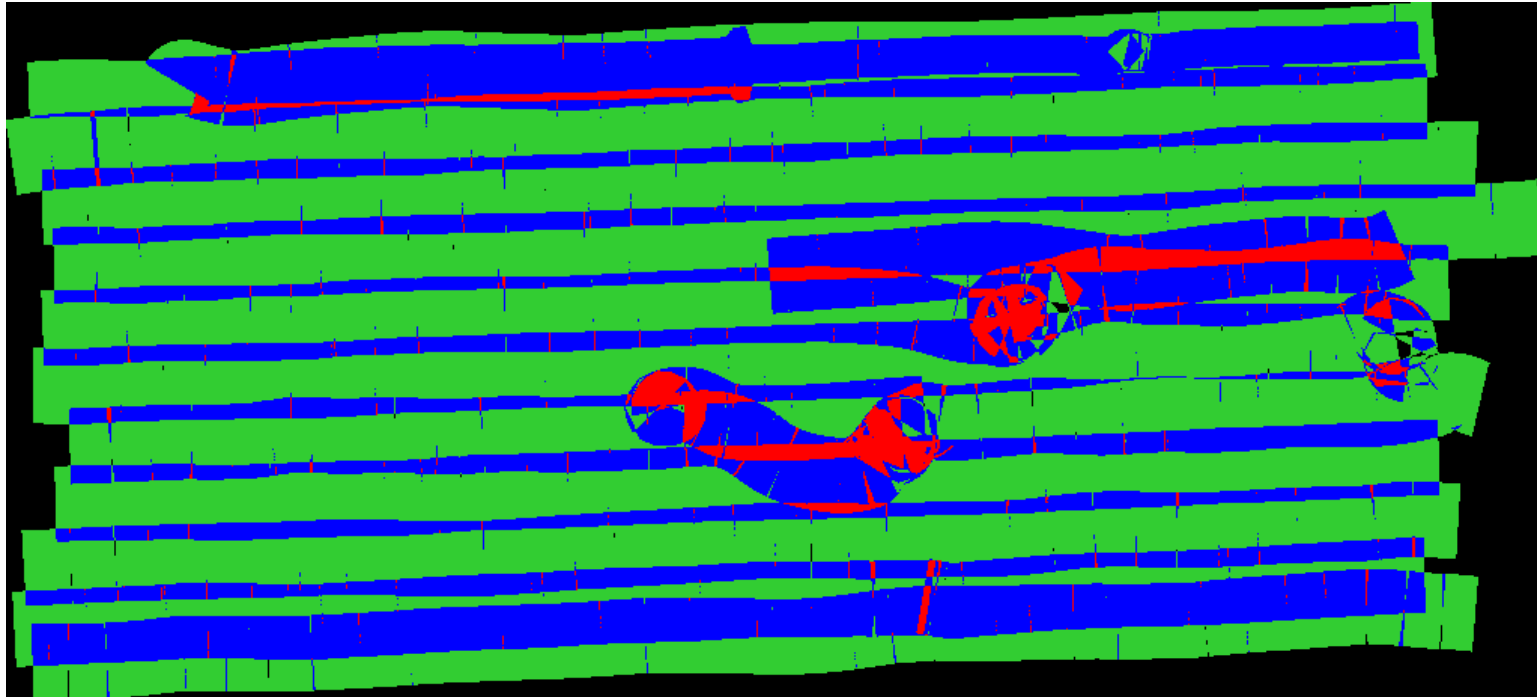


Figure 3.19.1. Eastern_LIS_Fishers_Master survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

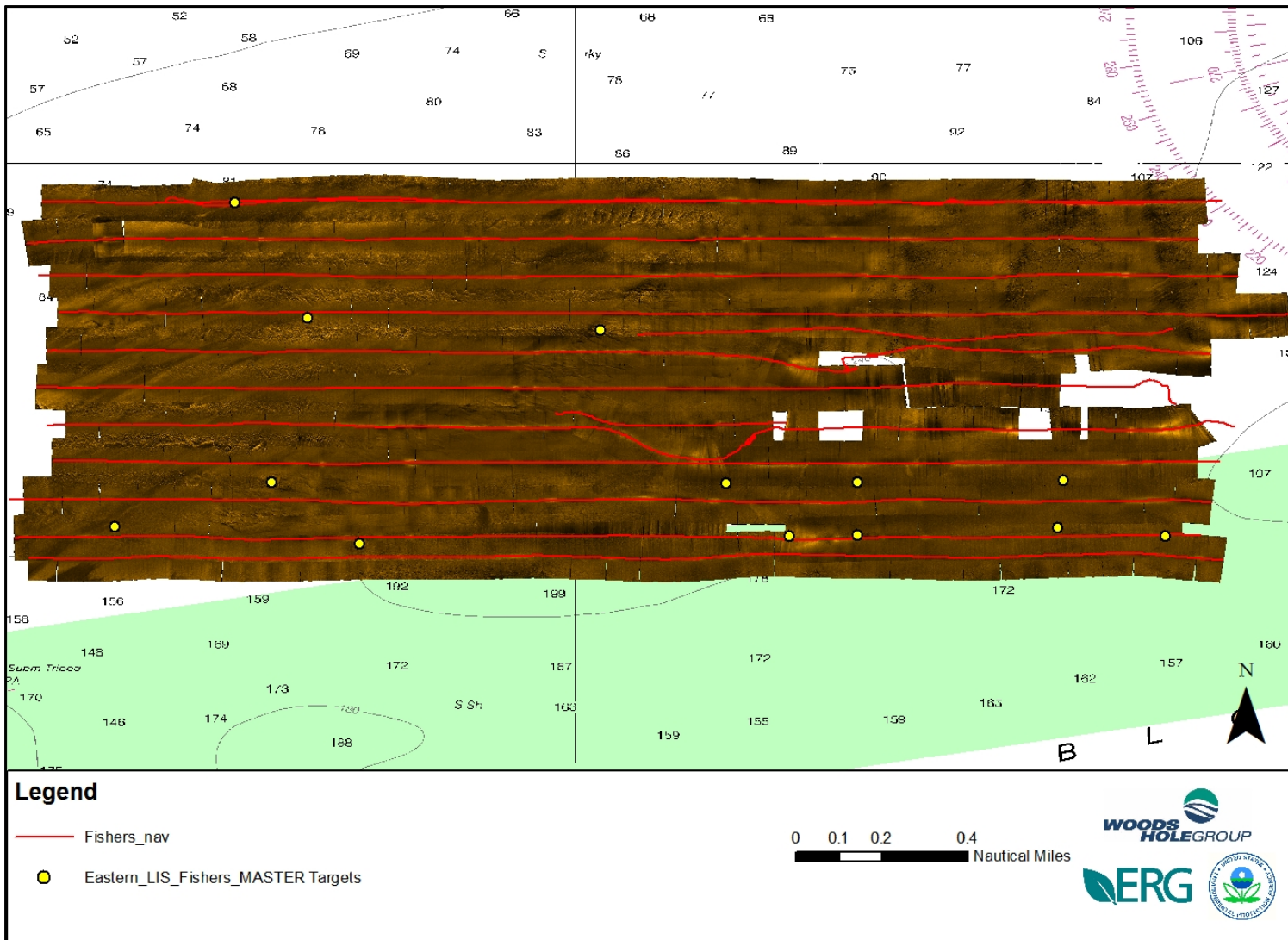


Figure 3.19.2. Eastern_LIS_Fishers_Master mosaic with navigation lines and targets.

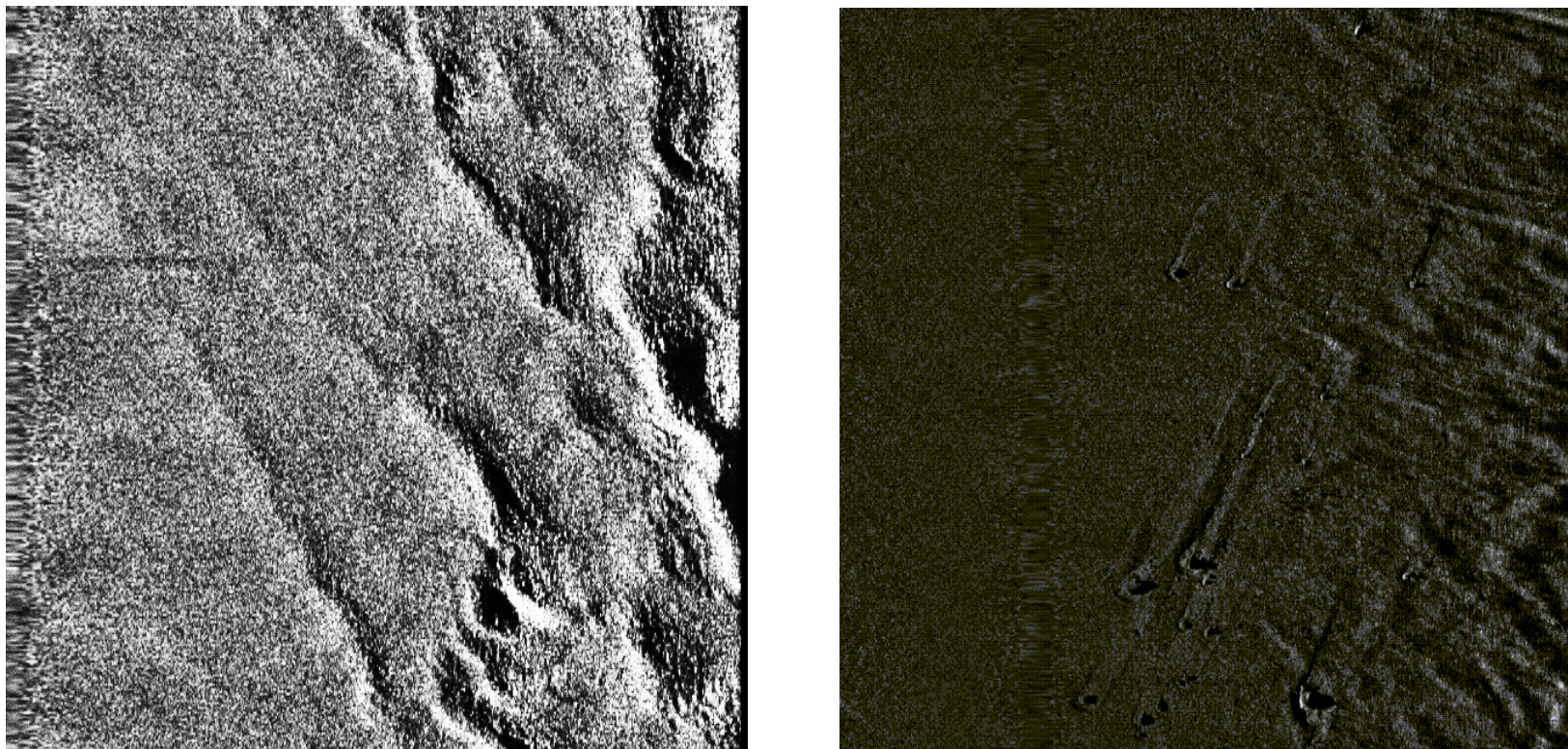


Figure 3.19.3. Eastern_LIS_Fishers_Master target examples: bedforms (L), debris pile (R).

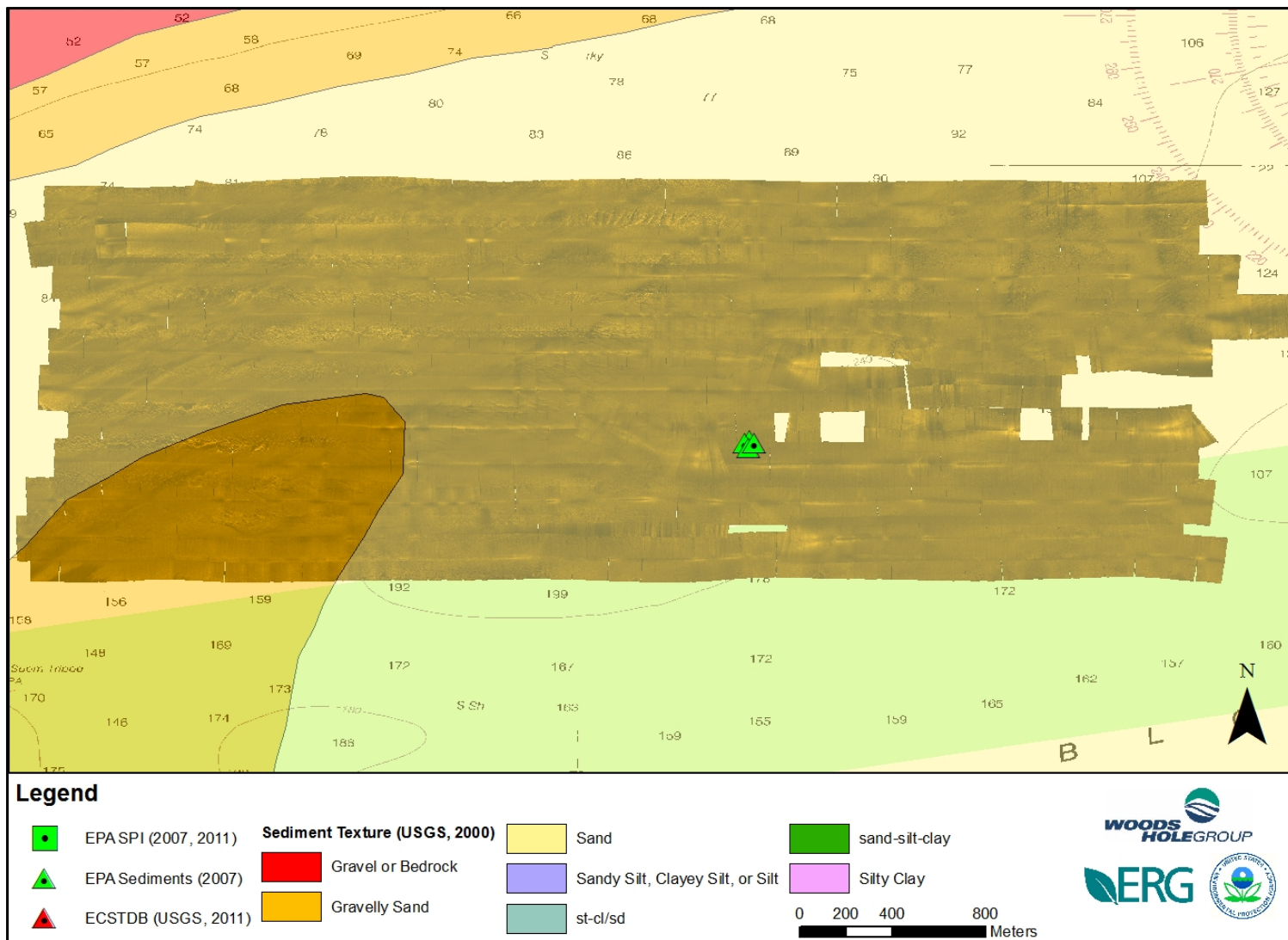


Figure 3.19.4. Eastern_LIS_Fishers_Master mosaic with supplemental data to assist with interpretation.

3.20 FISE_SW_ADD2

3.20.1 Mosaic Overview

Project location FISE_SW_ADD2 is located approximately 3.5 km south of Fishers Island, NY and 15.3 km northeast of Gardiners Island, NY (Figure 3.1.4). Depth varies between 30 and 95 meters in this area. Figure 3.20.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Seventeen (17) side-scan sonar XTF files were imported for this project location. Four (4) files were rejected for QA reasons, and zero (0) files were trimmed of data (Table 3.20.1). Data coverage is presented in Figure 3.20.1. The project area was surveyed at 0% overlap in data coverage, because there is only one trackline of data. Side-scan data covered 0.26 million sq. meters.

Table 3.20.1. FISE_SW_ADD2 processing statistics used in SonarWiz 5.

FISE_SW_ADD2	
# XTF files	17
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6 to 20
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	0
Tracklines trimmed	N/A
# Tracklines removed/hidden	4
Tracklines removed/hidden	FISE_SW_ADD070723121300
	FISE_SW_ADD070723121400
	FISE_SW_ADD070723121500
	FISE_SW_ADD070723121600

3.20.2 Target Summary

Seven (7) unique targets and zero (0) features were identified at FISE_SW_ADD2 using specific descriptions. Targets were assigned to four classifications, with the number of targets assigned to each classification given in parentheses: boulder area/field (1), fishing gear – trap/buoy (1), rock outcrop/geological (1), or unidentified/other (4). Six of seven targets were located in the eastern half of the project area. Targets are compiled in Appendix T. Targets are indicated on Figure 3.20.2 and example target images are indicated in Figure 3.20.3.

3.20.3 Seafloor Classification & Geological Interpretation

The seafloor at FISE_SW_ADD2 is composed of a medium intensity backscatter material. No bottom samples were provided in the survey area by USGS or EPA. No SPI images were provided by EPA in the survey area. The USGS modeled seafloor classification describes the bottom as gravelly sand in the west, grading to sand then silty/clayey sand as depth increases in the east of the survey area (USGS, 2000). A more detailed description of the survey area could be produced if the survey area were larger or consisted of more than a single trackline. Figure 3.20.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers nearly 100% of the project area and the secondary class is so minimal that the total area it occupies is negligible. SonarWiz 5 bottom classifications are located in Appendix Z.



Figure 3.20.1. FISE_SW_ADD2 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

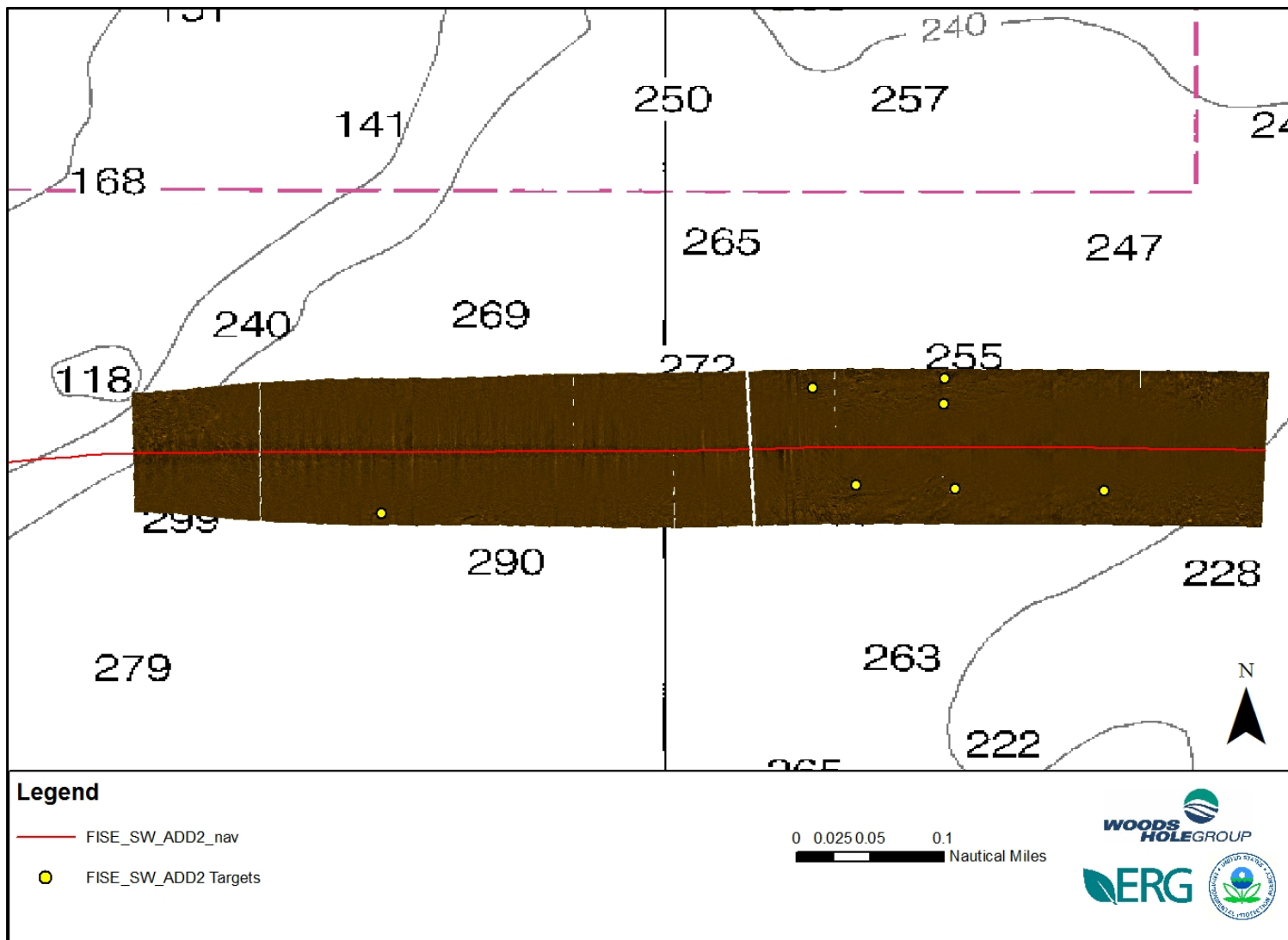


Figure 3.20.2. FISE_SW_ADD2 mosaic with navigation lines and targets.

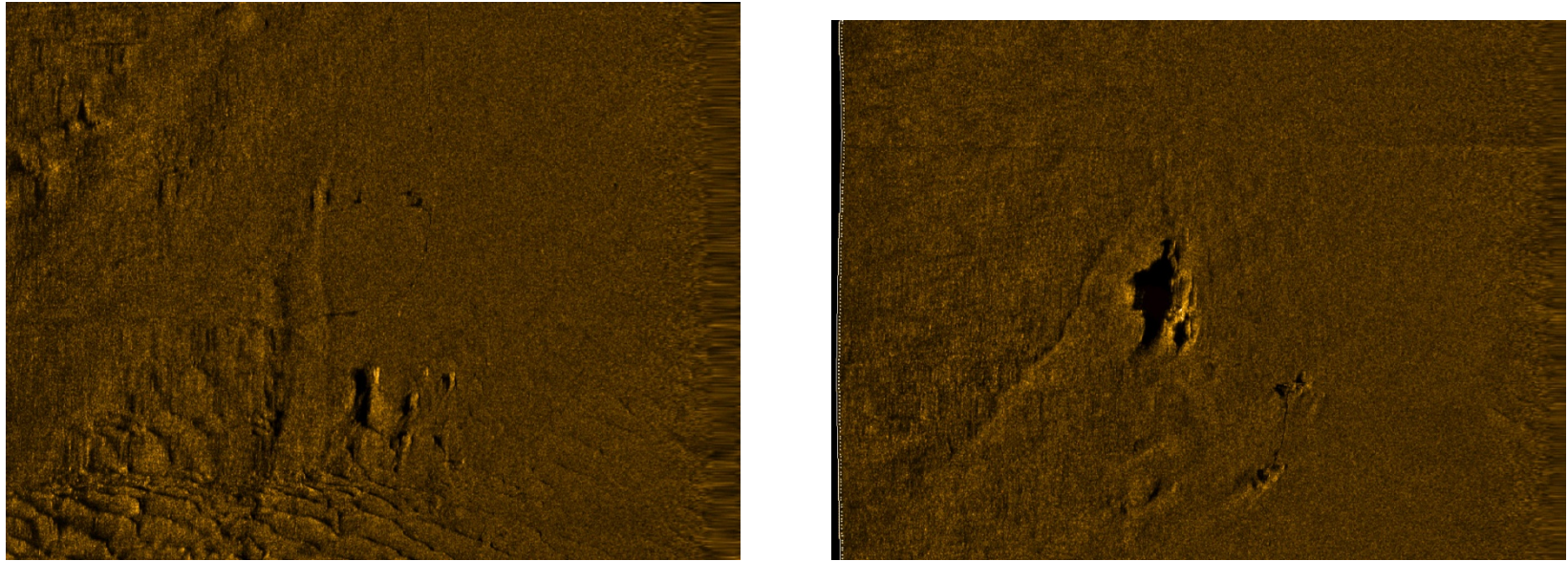


Figure 3.20.3. FISE_SW_ADD2 target examples: boulder (L), rock outcrop/geological (R).

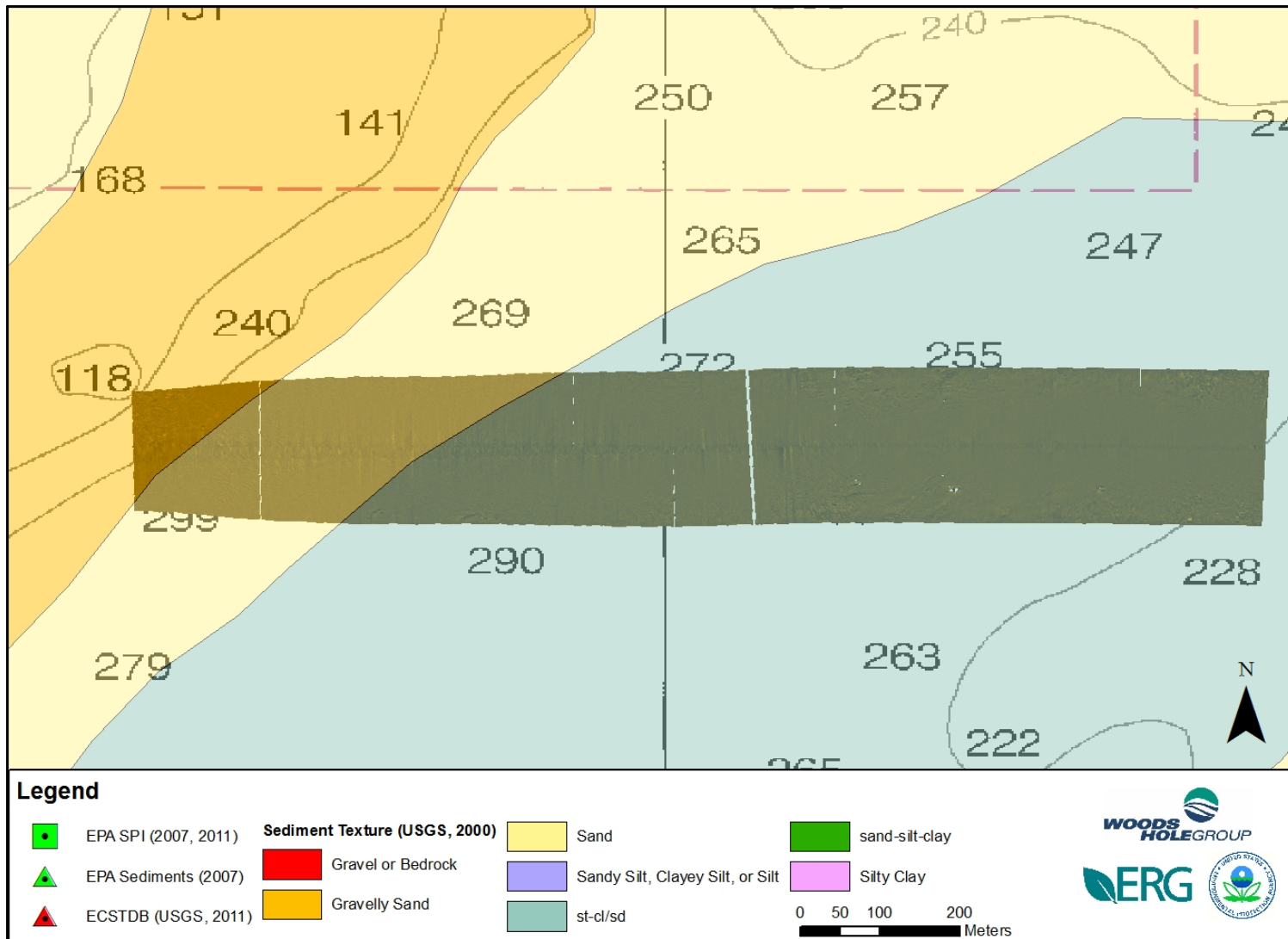


Figure 3.20.4. FISE_SW_ADD2 mosaic with supplemental data to assist with interpretation.

3.21 FISE_NEW

3.21.1 Mosaic Overview

Project location FISE_NEW is located approximately 4.5 km southeast of Fishers Island, NY and 17.8 km northwest of Montauk Point, NY (Figure 3.1.4). Approximately ¾ of the total area of FISE_NEW overlaps with project location Eastern_LIS_EastHole_Master beginning in the south. Depth varies between 27 and 99 meters in this area. Figure 3.21.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Sixty (60) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and one (1) file was trimmed of data (Table 3.21.1). Data coverage is presented in Figure 3.21.1. The project area was surveyed at approximately 0% overlap in data coverage but one line has 100% overlap. Side-scan data covered 4.45 million sq. meters.

Table 3.21.1. FISE_NEW processing statistics used in SonarWiz 5.

FISE_NEW	
# XTF files	60
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	1
Tracklines trimmed	FISE_NEW070717095800
# Tracklines removed/hidden	1
Tracklines removed/hidden	FISE_NEW070717083100

3.21.2 Target Summary

Twelve (12) unique targets and three (3) features were identified at FISE_NEW using specific descriptions. Targets were assigned to six classifications, with the number of targets assigned to each classification given in parentheses: bathy slope reflection (1), boulder (1), boulder area/field (2), debris pile (4), trawl/anchor mark (2), or unidentified/other (2). Targets were evenly distributed in the project area. Trawl/anchor marks were outlined as a feature along the entire northern border of FISE_NEW, and a large curvilinear bathy slope reflection was highlighted as a feature in the center of the project area. A third feature outlining a field of debris pile was located in the southeast. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.21.2 and example target images are indicated in Figure 3.21.3.

3.21.3 Seafloor Classification & Geological Interpretation

The seafloor at FISE_NEW is composed of a medium intensity backscatter material. A curved bathymetry slope reflection is defined by varying higher and lower intensity backscatter where depth increases rapidly in the center of the survey area. Trawl marks cover the northern portion of the survey area. EPA bottom samples located within the central, deepest part of the survey area were described as organic silty clay with varying percentages of sand. USGS bottom samples collected to the east outside of the survey area were described as a range from silty sand to clayey silt (USGS, 2011). No SPI images were provided within the survey area. USGS modeled seafloor classification describes the bottom dominated by sand, with silty/clayey sand in the deepest, central area and gravelly sand in the east half where depth is shallowest (USGS, 2000). Figure 3.21.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. However, the primary class covers nearly 100% of the project area and the secondary class, which is only evident along the edges of survey tracklines, is so minimal that the total area it occupies is negligible. The survey resolution was not able to resolve the increase in the percentage of fine-grain sediment that would go along with the increase in depth at the center of the survey area. Side-scan sonar and supplemental data suggest the seafloor at FISE_NEW is composed of sand with varying degrees of finer and coarser material as depth varies. SonarWiz 5 bottom classifications are located in Appendix Z.

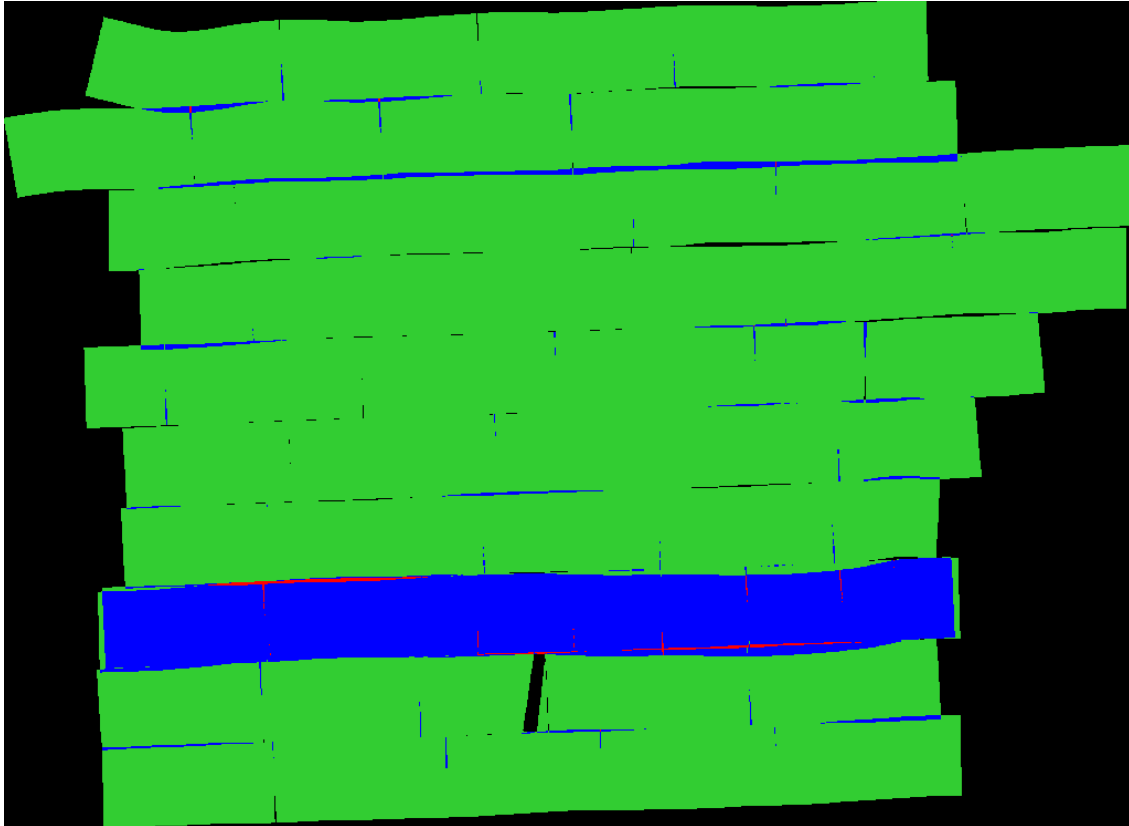


Figure 3.21.1. FISE_NEW survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

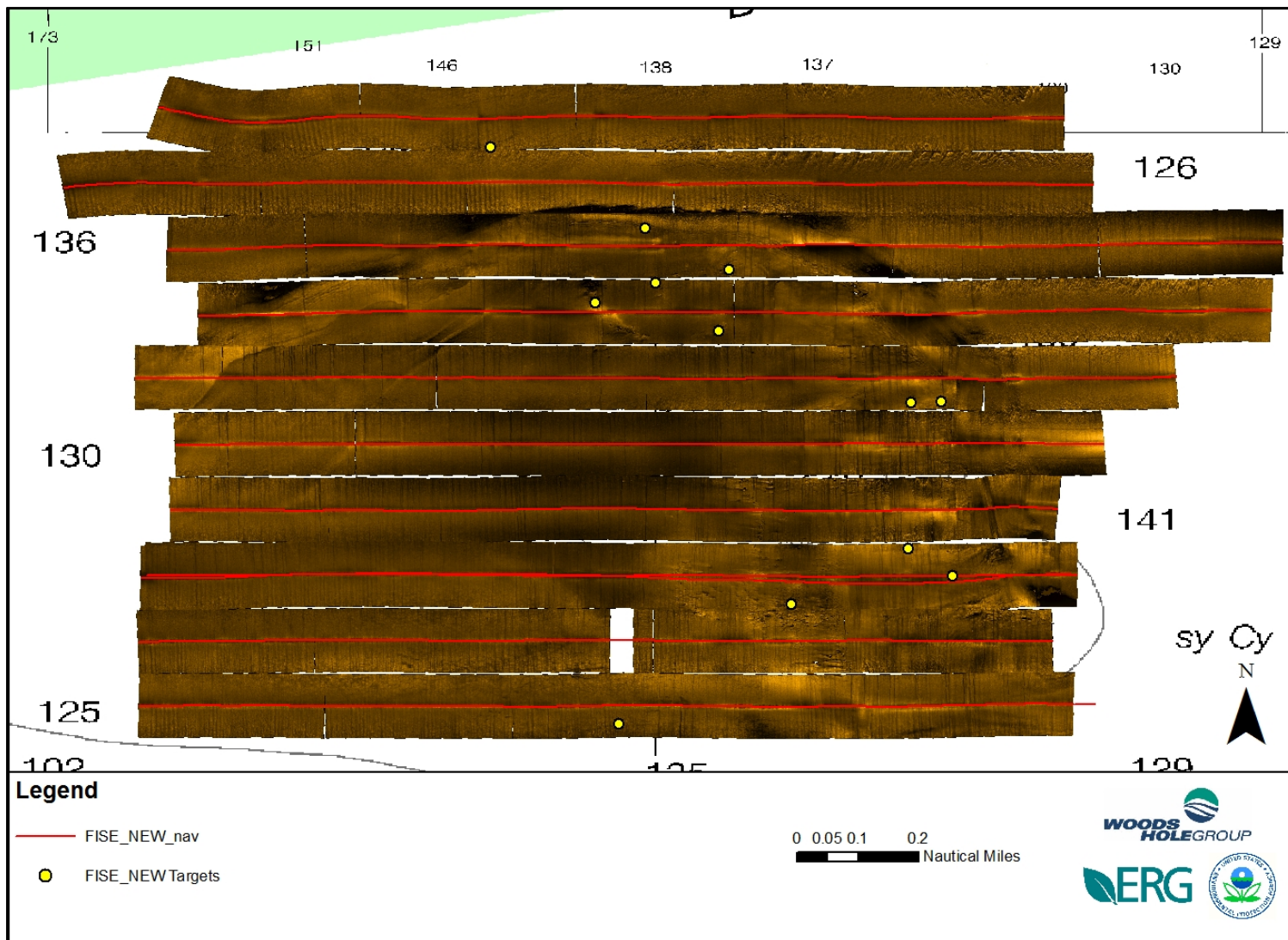


Figure 3.21.2. FISE_NEW mosaic with navigation lines and targets.

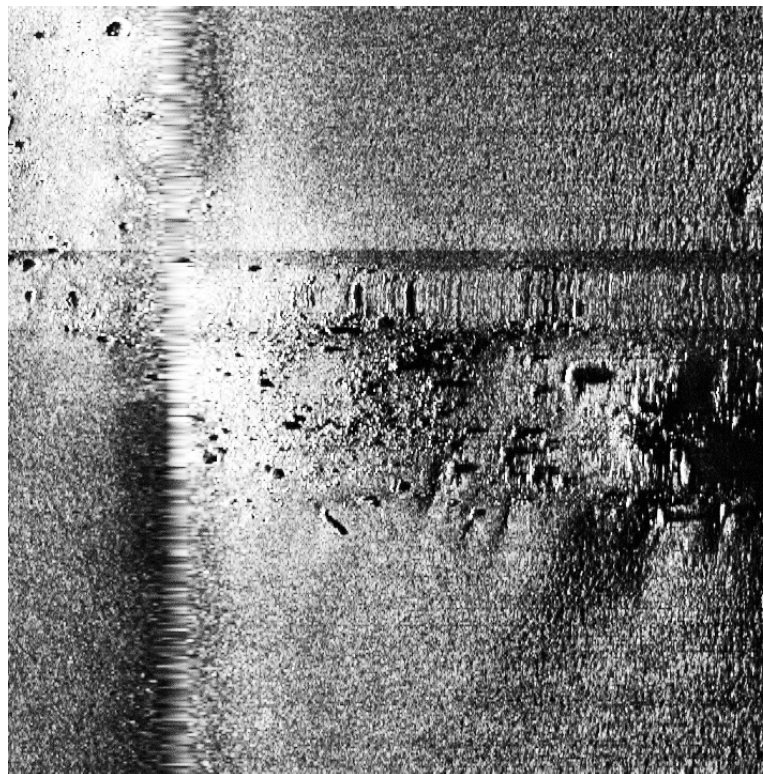
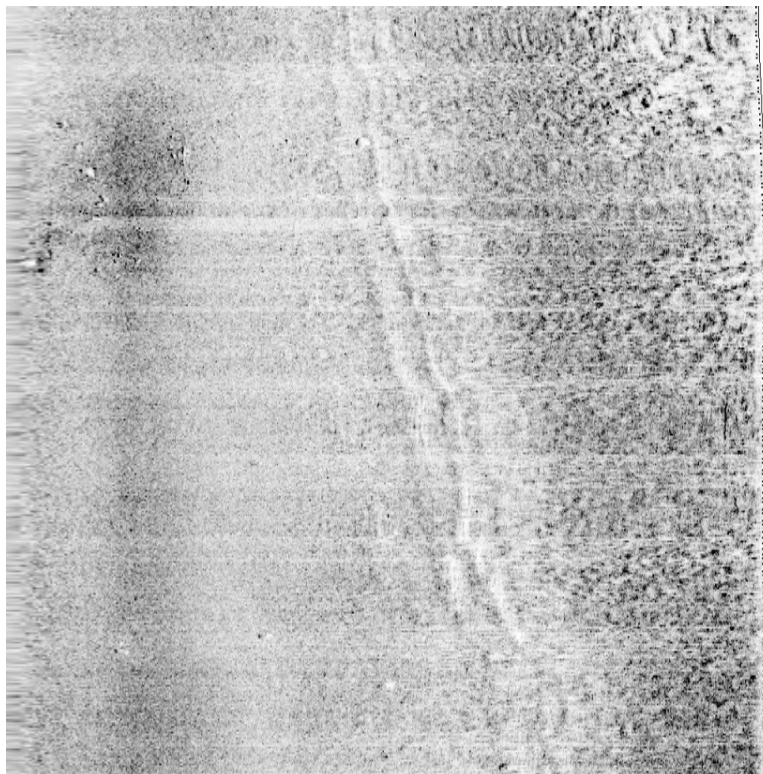


Figure 3.21.3. FISE_NEW target examples: bathy slope reflection (L), debris pile (R).

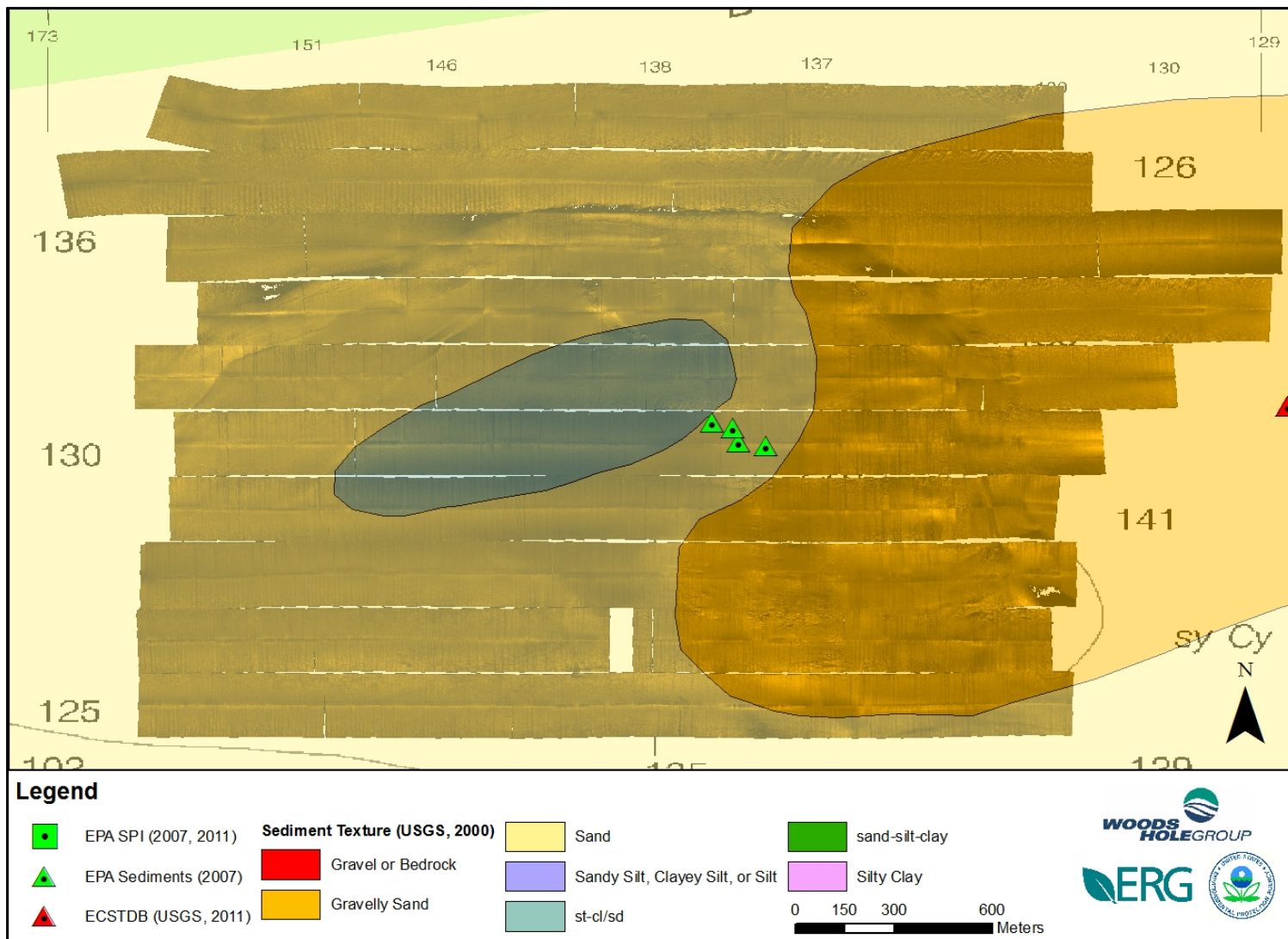


Figure 3.21.4. FISE_NEW mosaic with supplemental data to assist with interpretation.

3.22 FISE_OLD_2009

3.22.1 Mosaic Overview

Project location FISE_OLD_2009 is located approximately 1.5 km east of Fisher’s Island, NY and 5 km southwest of Watch Hill Point, RI (Figure 3.1.4). Project location Eastern_LIS_Fishers_Master overlaps with the western half of FISE_OLD_2009. Depth varies between 23 and 73 meters in this area. Figure 3.22.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Ninety-two (92) side-scan sonar XTF files were imported for this project location. Two (2) files were rejected for QA reasons, and three (3) files were trimmed of data (Table 3.22.1). Data coverage is presented in Figure 3.22.1. The project area was surveyed at approximately 0% overlap in data coverage but certain lines have 100% overlap. Side-scan data covered 5.23 million sq. meters.

Table 3.22.1. FISE_OLD_2009 processing statistics used in SonarWiz 5.

FISE_OLD_2009	
# XTF files	92
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	6 to 8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	3
Tracklines trimmed	FISE_OLD070717000200
	FISE_OLD070716232600
	FISE_OLD070717031700
# Tracklines removed/hidden	2
Tracklines removed/hidden	FISE_OLD070717032100
	FISE_OLD070717023800

3.22.2 Target Summary

Thirteen (13) unique targets and three (3) features were identified at FISE_OLD_2009 using specific descriptions. Targets were assigned to six classifications, with the number of targets assigned to each classification given in parentheses: bedforms (1), boulder (3), boulder area/field (1), fishing gear – trap/buoy (2), trawl/anchor mark (3), unidentified/other (3). There were three features outlined: a small feature of bedforms in the west-central; a small feature of trawl/anchor marks in the east; and a large field of debris piles from the center to the northeast corner. Targets and features are compiled in

Appendix T. Targets are indicated on Figure 3.22.2 and an example target image is indicated in Figure 3.22.3.

3.22.3 Seafloor Classification & Geological Interpretation

The seafloor at FISE_OLD_2009 is composed of a medium intensity backscatter material defined by fields of debris piles. A field of debris piles occupies the central to northeast corner of the survey area, with bedforms in the west of the survey area as evidence that sediment transport occurs at this site. Several EPA bottom samples in the west were described as sandy silt with varying percentages of clay. No SPI images were provided in the survey area. USGS modeled seafloor classification describes the entire survey area as sand (USGS, 2000). Figure 3.22.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area. The Classification function was unable to separately classify the field of debris piles from the surrounding sandy bottom. SonarWiz 5 bottom classifications are located in Appendix Z.

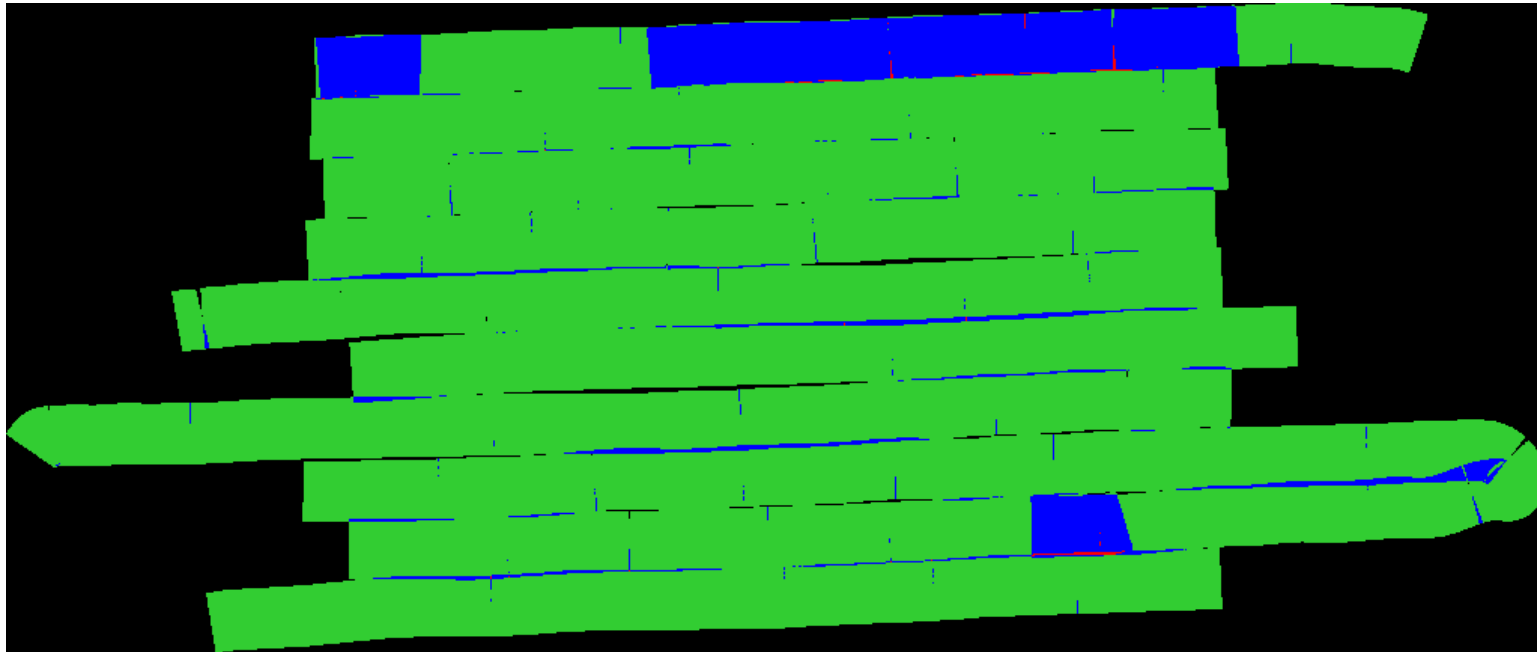


Figure 3.22.1. FISE_OLD_2009 survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

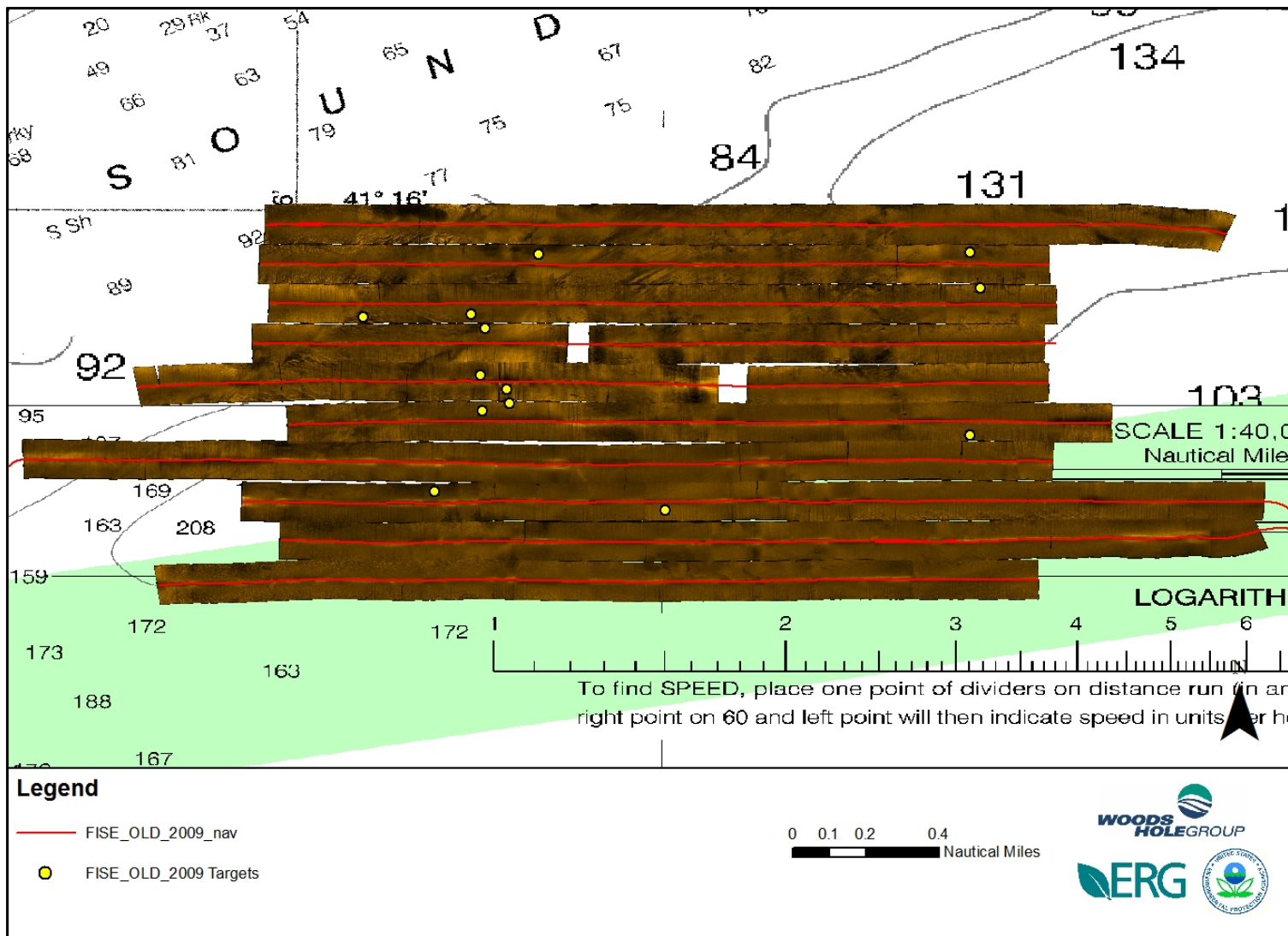


Figure 3.22.2. FISE_OLD_2009 mosaic with navigation lines and targets.

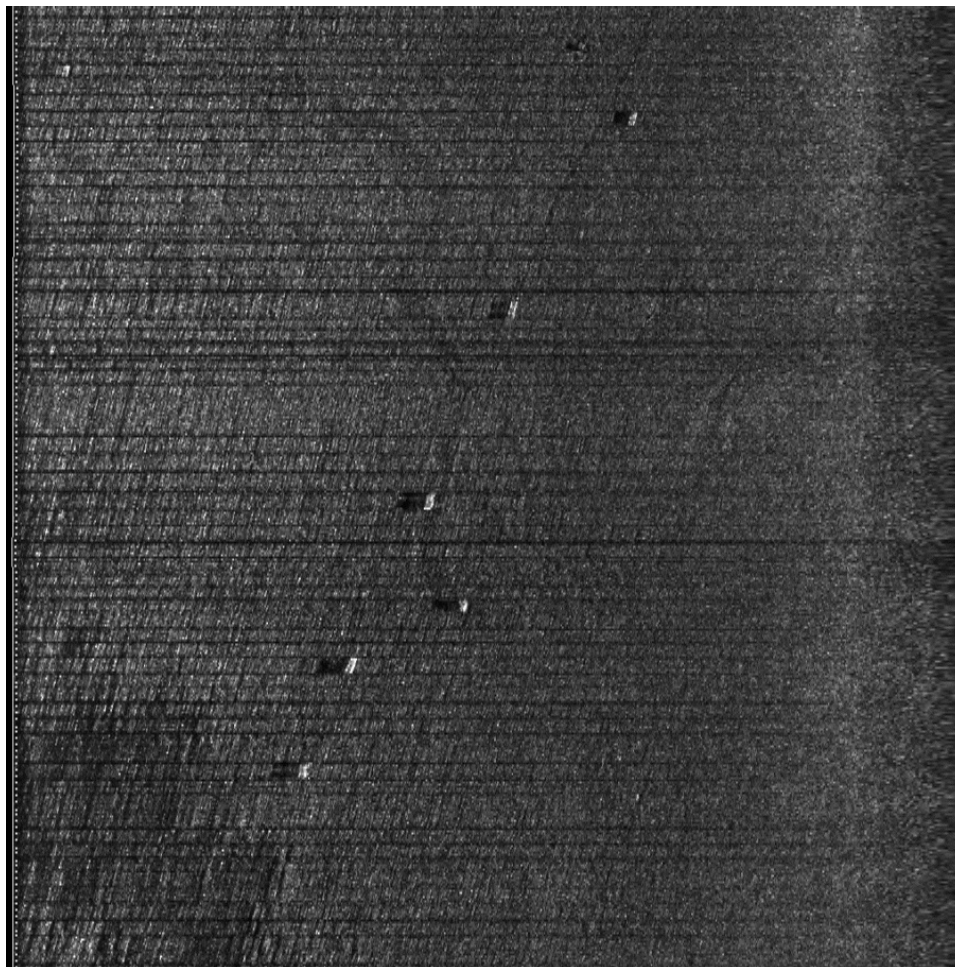


Figure 3.22.3. FISE_OLD_2009 target example: fishing gear – trap/buoy.

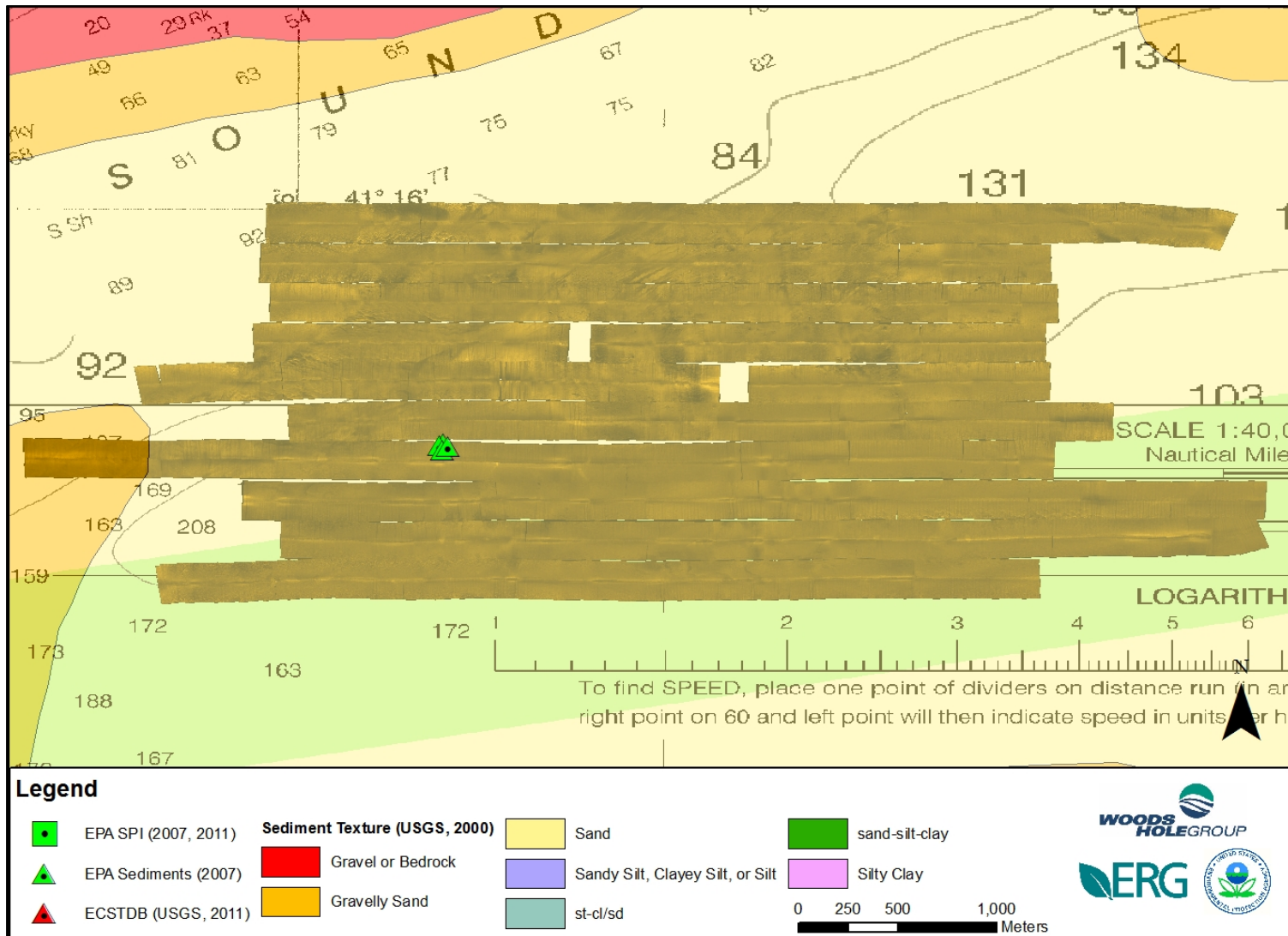


Figure 3.22.4. FISE_OLD_2009 mosaic with supplemental data to assist with interpretation.

3.23 NLDN_REF_ADD

3.23.1 Mosaic Overview

Project location NLDN_REF_ADD is located approximately 6 km south of New London Harbor, CT and 1.5 km west of Fishers Island (Figure 3.1.3). Project locations NLDN_REF and NLDN_ACT overlap with this site. The New London disposal site (active) overlaps the site slightly in the west. Depth varies between 12 and 27 meters in this area. Figure 3.23.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Forty (40) side-scan sonar XTF files were imported for this project location. Two (2) files were rejected for QA reasons, and three (3) files were trimmed of data (Table 3.23.1). Data coverage is presented in Figure 3.23.1. The project area was surveyed at approximately 0-100% overlap in data coverage, depending in location. Side-scan data covered 2.09 million sq. meters.

Table 3.23.1. NLDN_REF_ADD processing statistics used in SonarWiz 5.

NLDN_REF_ADD	
# XTF files	40
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8 to 10
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	3
Tracklines trimmed	NLDN_REF_ADD070718042000
	NLDN_REF_ADD070718050200
	NLDN_REF_ADD070718055300
# Tracklines removed/hidden	2
Tracklines removed/hidden	NLDN_REF_ADD070718042400
	NLDN_REF_ADD070718042800

3.23.2 Target Summary

Thirty-nine (39) unique targets and one (1) feature were identified at NLDN_REF_ADD using specific descriptions. Targets were assigned to six classifications, with the number of targets assigned to each classification given in parentheses: bathy slope reflection (1), boulder (1), boulder area/field (5), debris pile (5), fishing gear – trap/buoy (11), or unidentified/other (16). Targets are evenly distributed in the project area, with most identified as fishing gear – trap/buoy located in the central area. A feature identifying a

field of debris piles extends from the southeast corner to the center of the project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.23.2 and example target images are indicated in Figure 3.23.3.

3.23.3 Seafloor Classification & Geological Interpretation

The seafloor at NLDN_REF_ADD is composed of a medium intensity backscatter material with a dispersed field of debris piles in the center to southeast corner. No bottom samples were provided within the survey area, but several bottom samples were collected 0.2 km to the north of the survey area by the EPA. These bottom samples were described as silty clay and clayey silt. No SPI images were provided in the survey area. USGS modeled seafloor classification has two sediment types bisecting the survey area: sand in the western half and silty/clayey sand in the eastern half. Backscatter intensity increases slightly towards the western edge of the survey area and darkens towards the east (USGS, 2000). Figure 3.23.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned one class to the study area. This is in agreement with the sonar data and supplemental data which show that the seafloor is dominated by sand with varying percentages of silt/clay. SonarWiz 5 bottom classifications are located in Appendix Z.

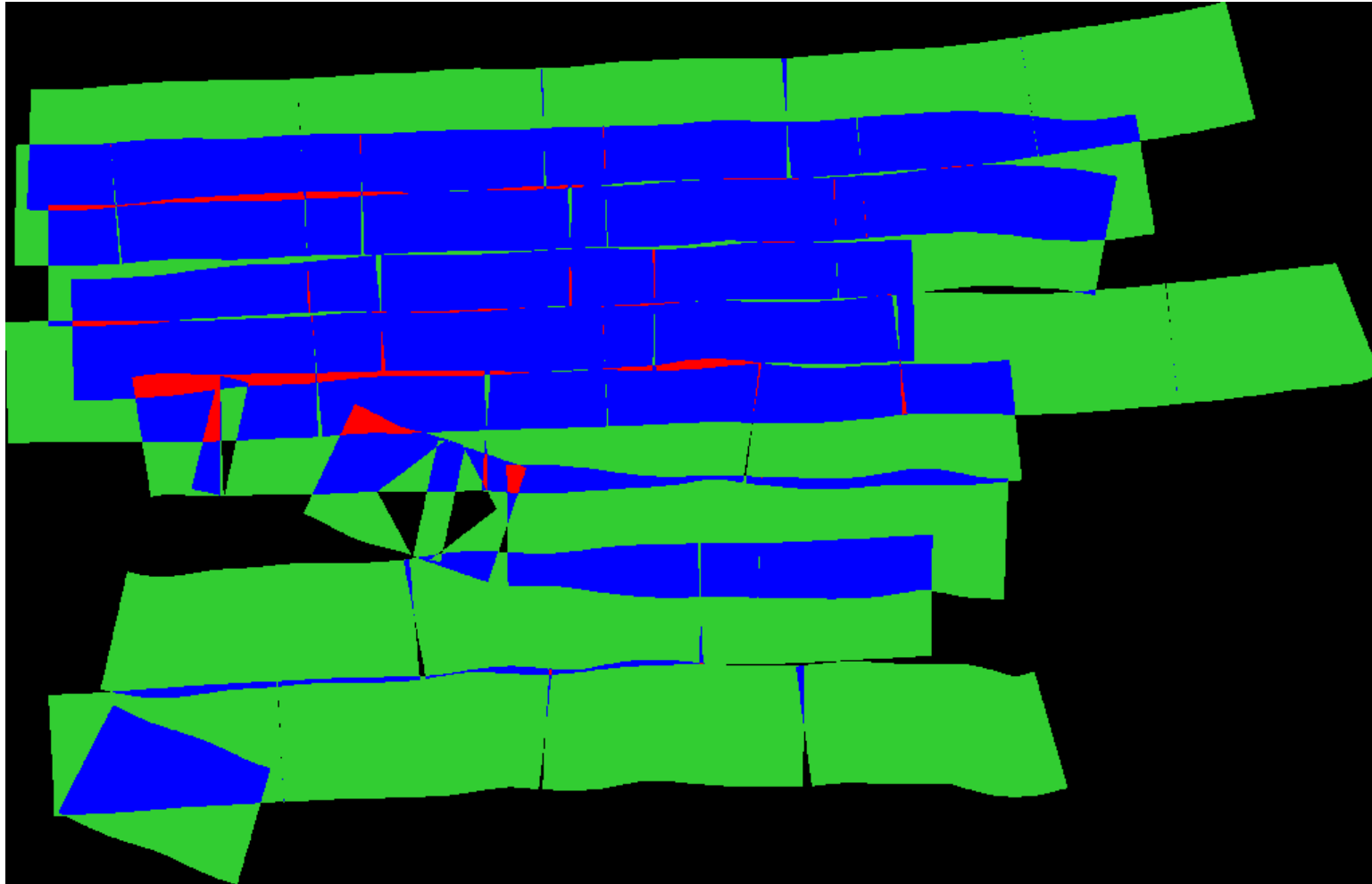


Figure 3.23.1. NLDN_REF_ADD survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

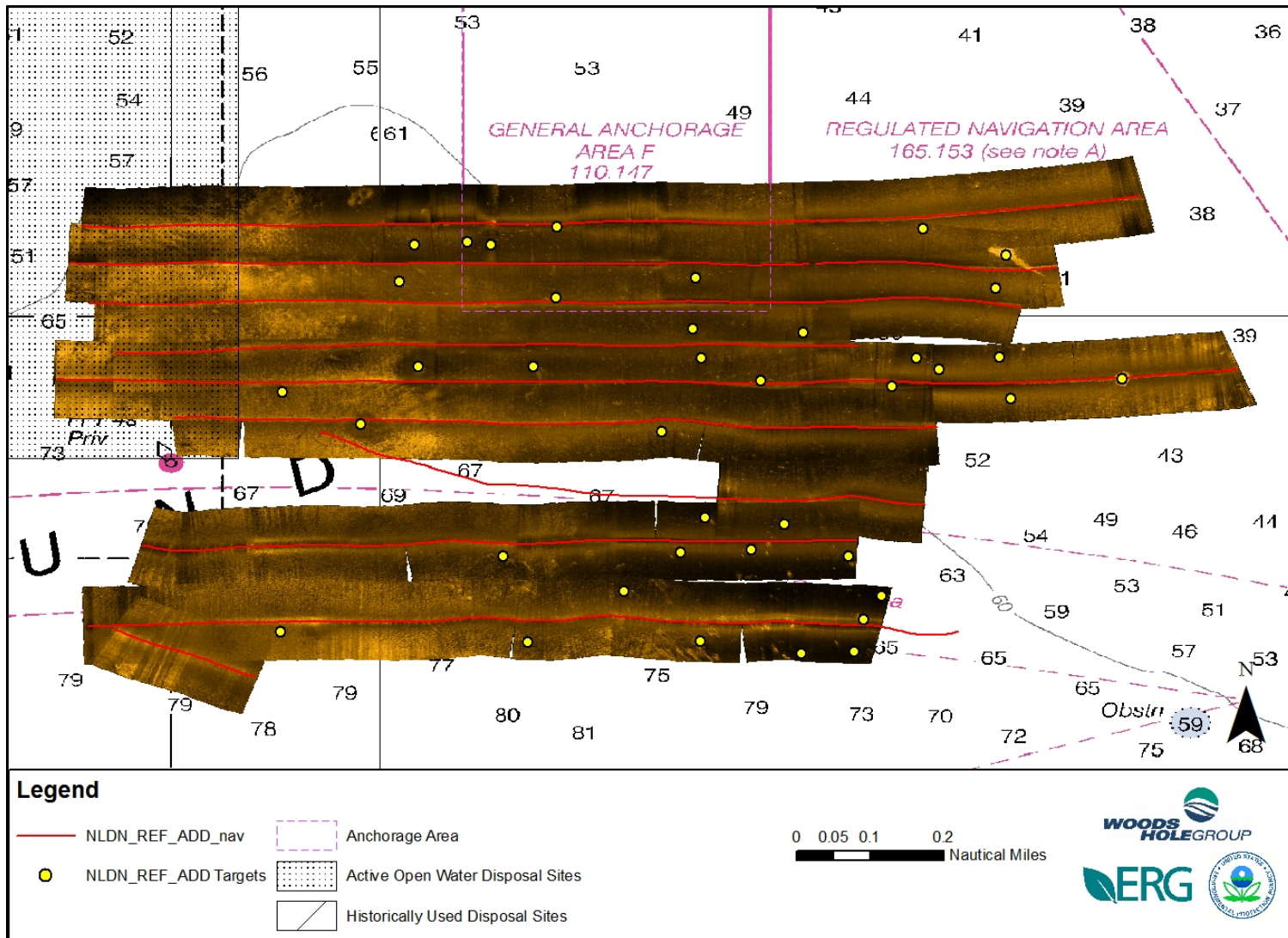


Figure 3.23.2. NLDN_REF_ADD mosaic with navigation lines and targets.

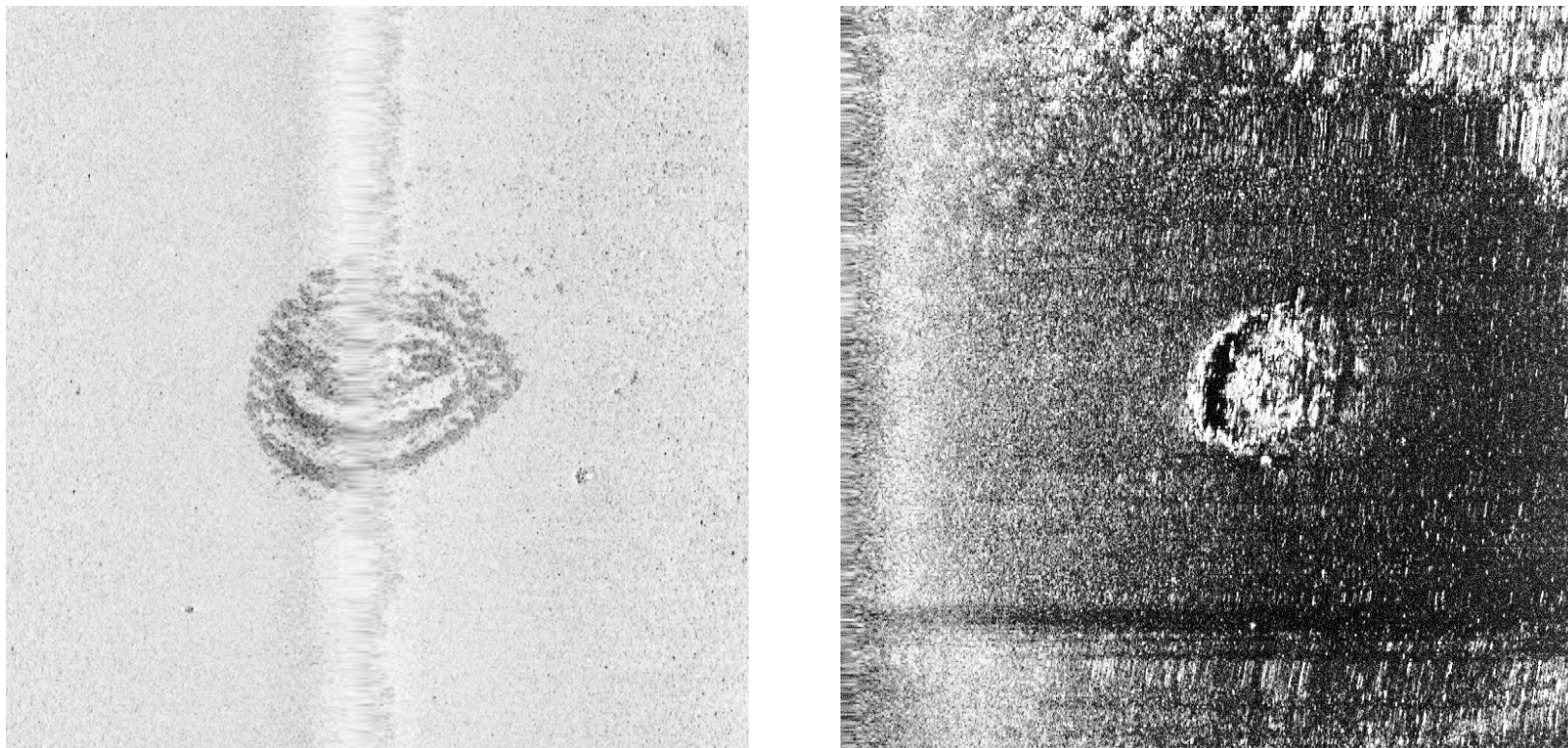


Figure 3.23.3. NLDN_REF_ADD target examples: unidentified/other (L), debris pile (R).

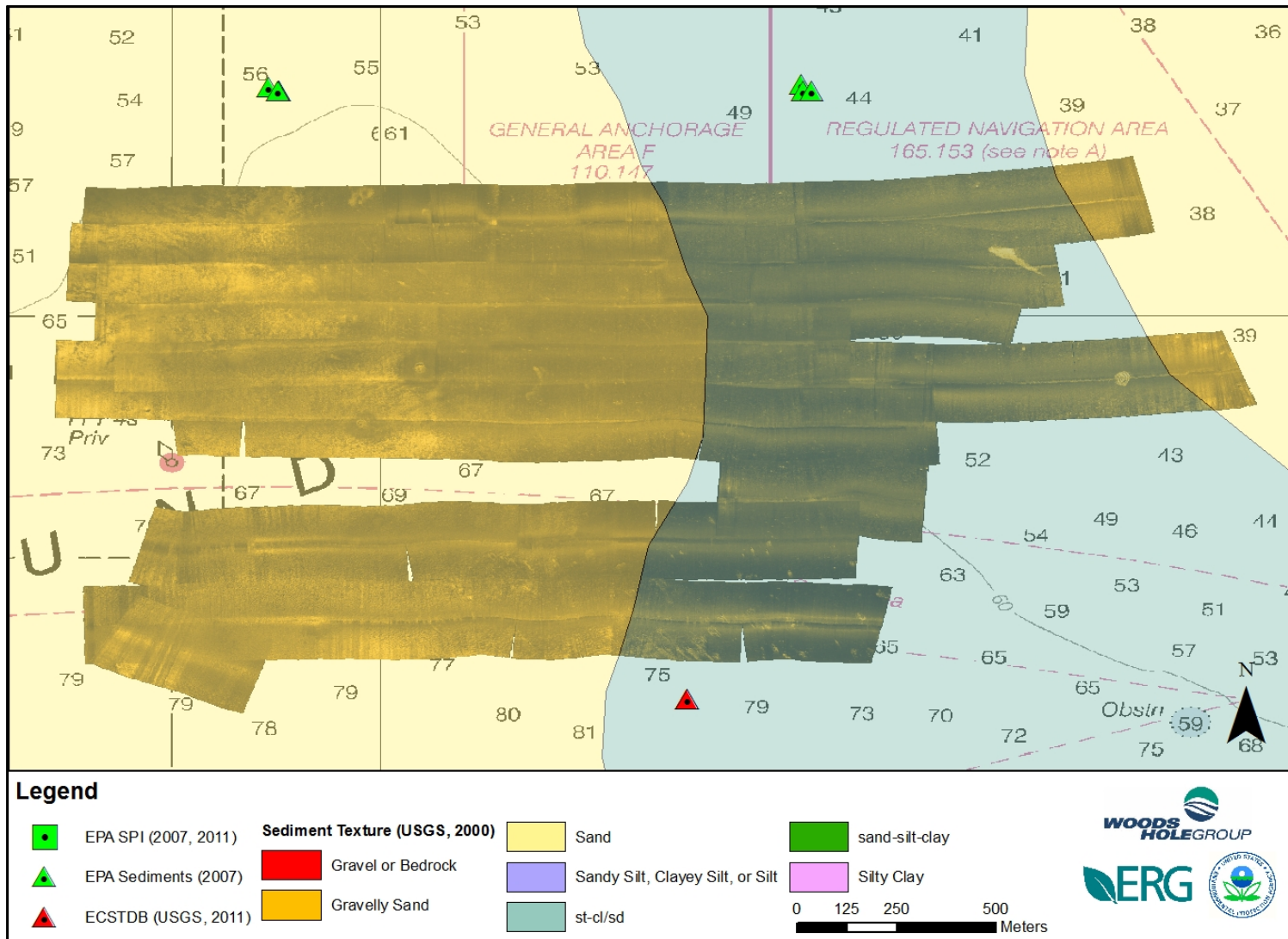


Figure 3.23.4. NLDN_REF_ADD mosaic with supplemental data to assist with interpretation.

3.24 NLDN_REF

3.24.1 Mosaic Overview

Project location NLDN_REF is located approximately 6.5 km west of Fishers Island, NY and 6.5 km south of New London Harbor, CT (Figure 3.1.3). Project locations NLDN_REF_ADD and NLDN_ACT overlap with this site. The New London disposal site (active) overlaps this site in the west. Depth varies between 11 and 21 meters in this area. Figure 3.24.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Fifty-five (55) side-scan sonar XTF files were imported for this project location. Five (5) files were rejected for QA reasons, and nine (9) files were trimmed of data (Table 3.24.1). Data coverage is presented in Figure 3.24.1. The project area was surveyed at approximately 100% overlap in data coverage. Side-scan data covered 2.64 million sq. meters.

Table 3.24.1. NLDN_REF processing statistics used in SonarWiz 5.

NLDN_REF	
# XTF files	55
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4 to 8
Nadir Threshold	6 to 12
Nadir Blanking Duration	2
Offset Alt (m)	1 to 2
Adjusted display range (m)	98 of 100
# Tracklines trimmed	9
Tracklines trimmed	NLDN_REF070717220200
	NLDN_REF070717232200
	NLDN_REF070717232600
	NLDN_REF070717233000
	NLDN_REF070717235400
	NLDN_REF070717235800
	NLDN_REF070718002600
	NLDN_REF070718003000
	NLDN_REF070718005400
# Tracklines removed/hidden	5
Tracklines removed/hidden	NLDN_REF070717223000
	NLDN_REF070717225800
	NLDN_REF070718001400
	NLDN_REF070718001800
	NLDN_REF070718002200

3.24.2 Target Summary

Twenty-four (24) unique targets and one (1) feature were identified at NLDN_REF using specific descriptions. Targets were assigned to five classifications, with the number of targets assigned to each classification given in parentheses: boulder (2), boulder area/field (1), debris pile (2), fishing gear – trap/buoy (13), or unidentified/other (6). Most targets are within the center of the project area, the majority of which were identified as fishing gear – trap/buoy. A feature outlining the fishing gear – traps/buoys covers an area from the north-center to south-center. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.24.2 and example target images are indicated in Figure 3.24.3.

3.24.3 Seafloor Classification & Geological Interpretation

The seafloor at NLDN_REF is composed of a medium intensity backscatter material with gradation from slightly higher backscatter in the west to less backscatter in the east. The areas with the highest backscatter fall within the boundary of the New London Disposal Site (active). Depth does not vary greatly in the survey area, suggesting that the change in backscatter is not a natural phenomenon. Three clusters of 2-4 bottom samples were collected by EPA in the west and center of the survey area, and were described as silty clay with varying percentages of sand. There were no SPI images provided in the survey area. USGS modeled seafloor classification has two sediment types in the survey area: sand in the western half and the eastern edge, with silty/clayey sand in the east-central half (USGS, 2000). Figure 3.24.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers nearly 100% of the project area and the secondary class is so minimal that the total area it occupies is negligible. This is in agreement with the sonar data and supplemental data, particularly the bottom samples. Classification did not distinguish between the slightly higher and lower backscatter material in the western half of the study area. SonarWiz 5 bottom classifications are located in Appendix Z.

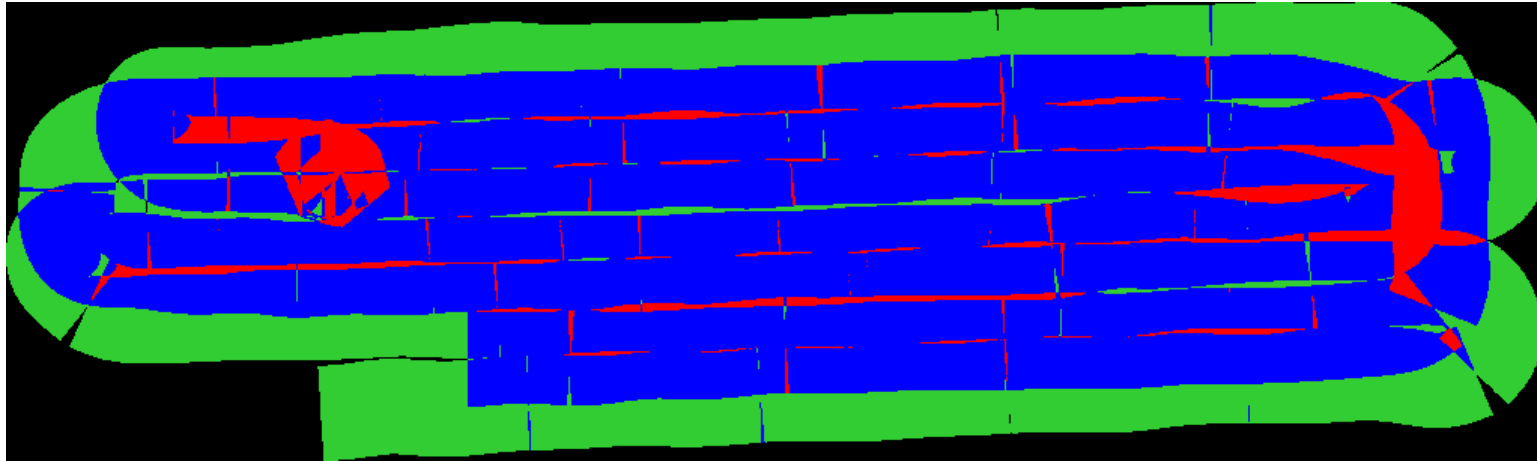


Figure 3.24.1. NLDN_REF survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

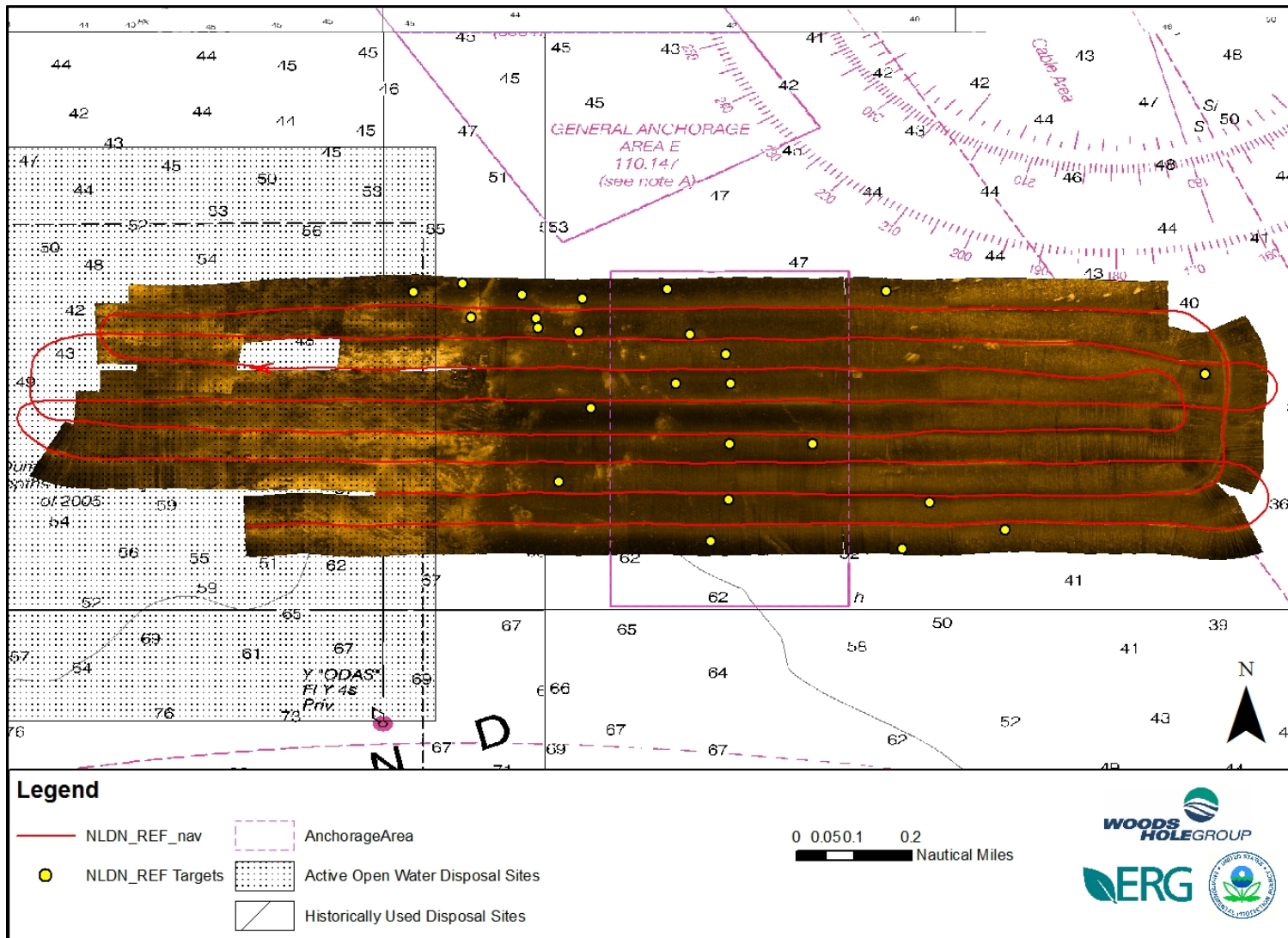


Figure 3.24.2. NLDN_REF mosaic with navigation lines and targets.

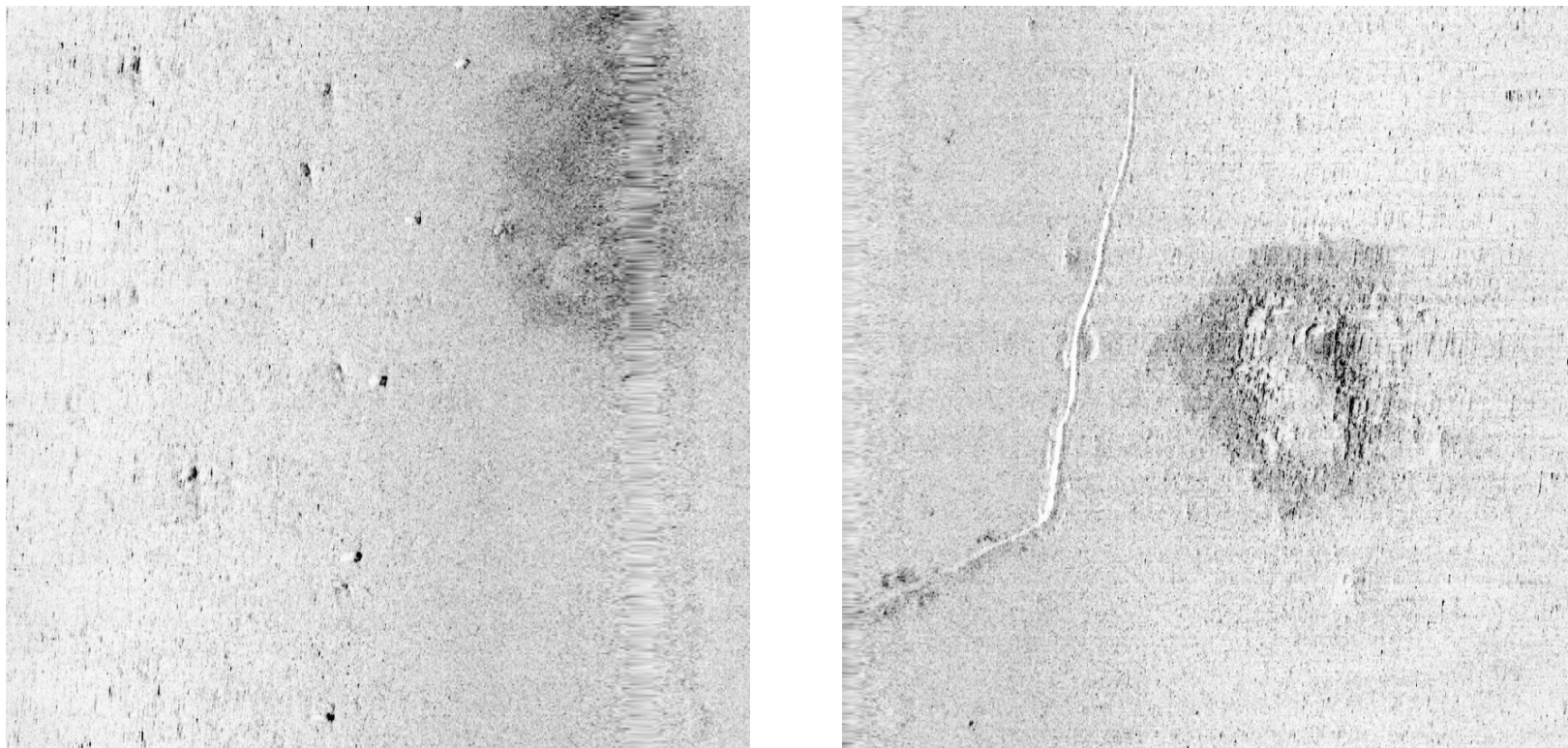


Figure 3.24.3. NLDN_REF target examples: fishing gear – trap/buoy (L), debris pile with adjacent trawl/anchor mark (R).

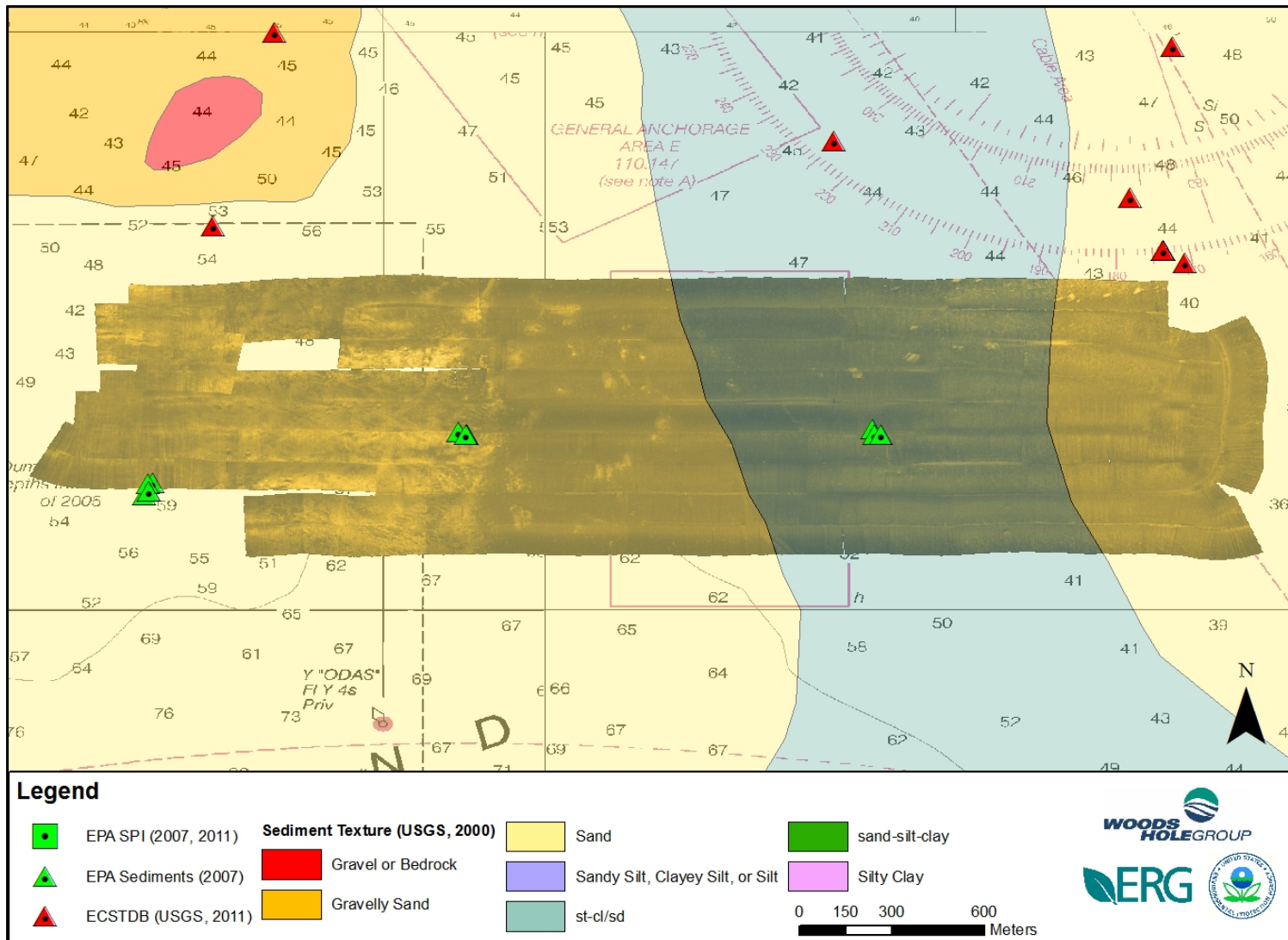


Figure 3.24.4. NLDN_REF mosaic with supplemental data to assist with interpretation.

3.25 CSDS_ACT

3.25.1 Mosaic Overview

Project location CSDS_ACT is located approximately 7.2 km north of Rocky Point, NY and 4.7 km southeast of Cornfield Point, CT. The Cornfield Shoals disposal site (active) is located entirely within the project area. Depth varies between 27 and 58 meters in this area. Figure 3.25.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Sixty-one (61) side-scan sonar XTF files were imported for this project location. One (1) file was rejected for QA reasons, and four (4) files were trimmed of data (Table 3.25.1). Data coverage is presented in Figure 3.25.1. The project area was surveyed at approximately 0% overlap in data coverage. Side-scan data covered 4.87 million sq. meters.

Table 3.25.1. CSDS_ACT processing statistics used in SonarWiz 5.

CSDS_ACT	
# XTF files	61
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4 to 25
Nadir Threshold	6 to 14
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	4
Tracklines trimmed	CSDS_ACT070716060300
	CSDS_ACT070716063000
	CSDS_ACT070716090000
	CSDS_ACT070716104900
# Tracklines removed/hidden	1
Tracklines removed/hidden	CSDS_ACT070716103700

3.25.2 Target Summary

Sixteen (16) unique targets and four (4) features were identified at CSDS_ACT using specific descriptions. Targets were assigned to two classifications, with the number of targets assigned to each classification given in parentheses: bedforms (3) or debris pile (13). Nearly all targets were identified in the center area of the project area. A feature outlining bedforms was located in the north and extended the width of the project area, and two other features outlining bedforms were in center and west-center of the project area. A feature describing a field of debris piles was located in the south-center of the

project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.25.2 and an example target image is indicated in Figure 3.25.3.

3.25.3 Seafloor Classification & Geological Interpretation

The seafloor at CSDS_ACT is composed of a medium intensity backscatter material defined by large expanses of bedforms, which cover most of the north and western parts of the survey area. A field of debris piles is located in the south-center of the survey area, and is defined by a distribution of objects with higher backscatter intensity and data shadow. The presence of debris is expected, since the survey areas falls within the Cornfield Shoals disposal site (active). Five bottom samples were provided by the EPA within the survey area, located in the north-center, and were described as sand with silt and shell hash, with one including gravel. There were no SPI images provided in the survey area. The USGS modeled seafloor classification shows a general trend of sediment fining towards the northwest: areas of gravel in the southeast grade to sand, then again to silty/clayey sand and finally sandy clay/silt in the northeast (USGS, 2000). The majority of the site was characterized as gravelly sand. Figure 3.25.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers nearly 100% of the project area and the secondary class, which is only evident near the edges of tracklines, is so minimal that the total area it occupies is negligible. The Classification function did not distinguish the field of debris piles from the surrounding seafloor. SonarWiz 5 bottom classifications are located in Appendix Z.

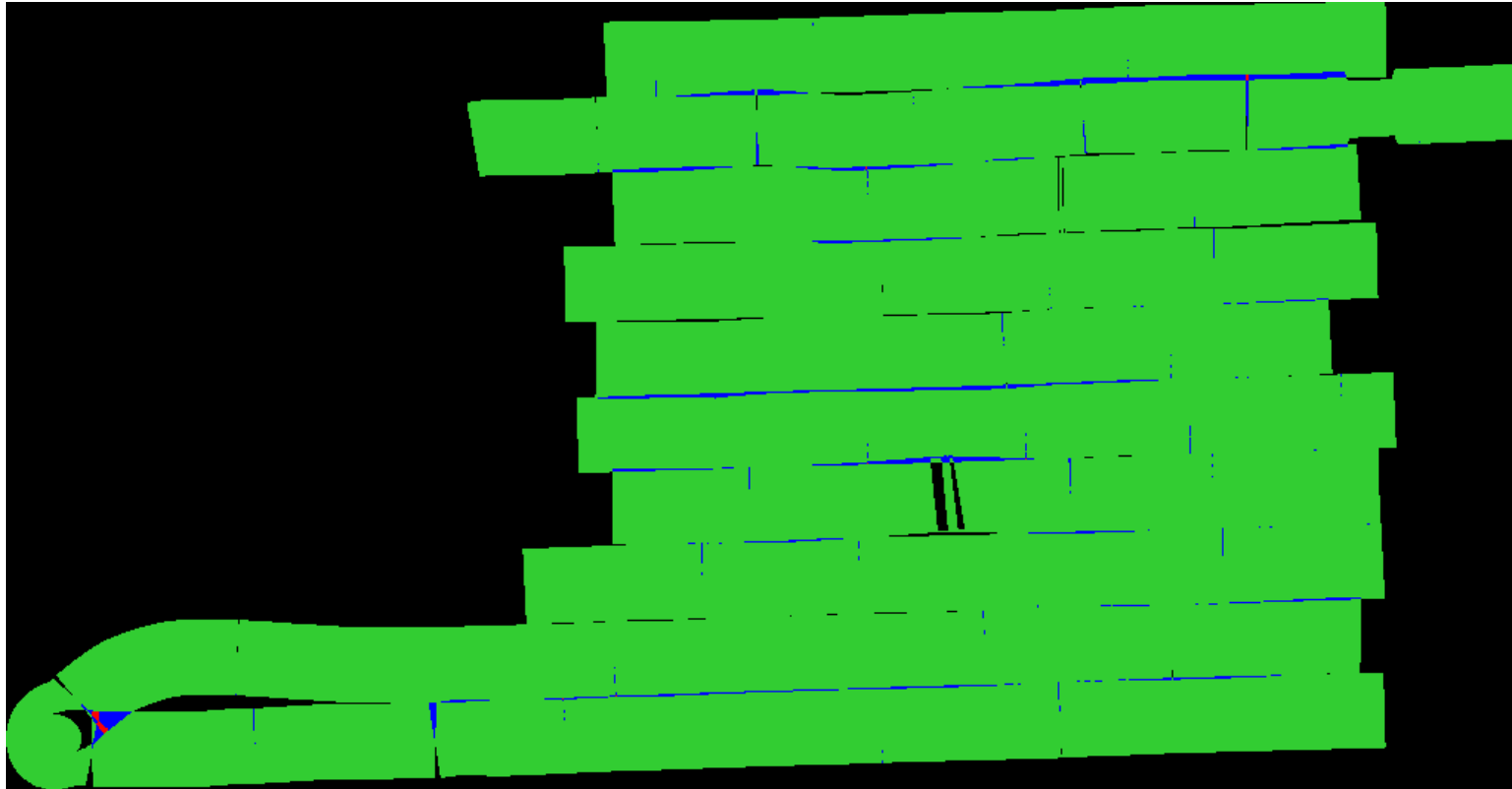


Figure 3.25.1. CSDS_ACT survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

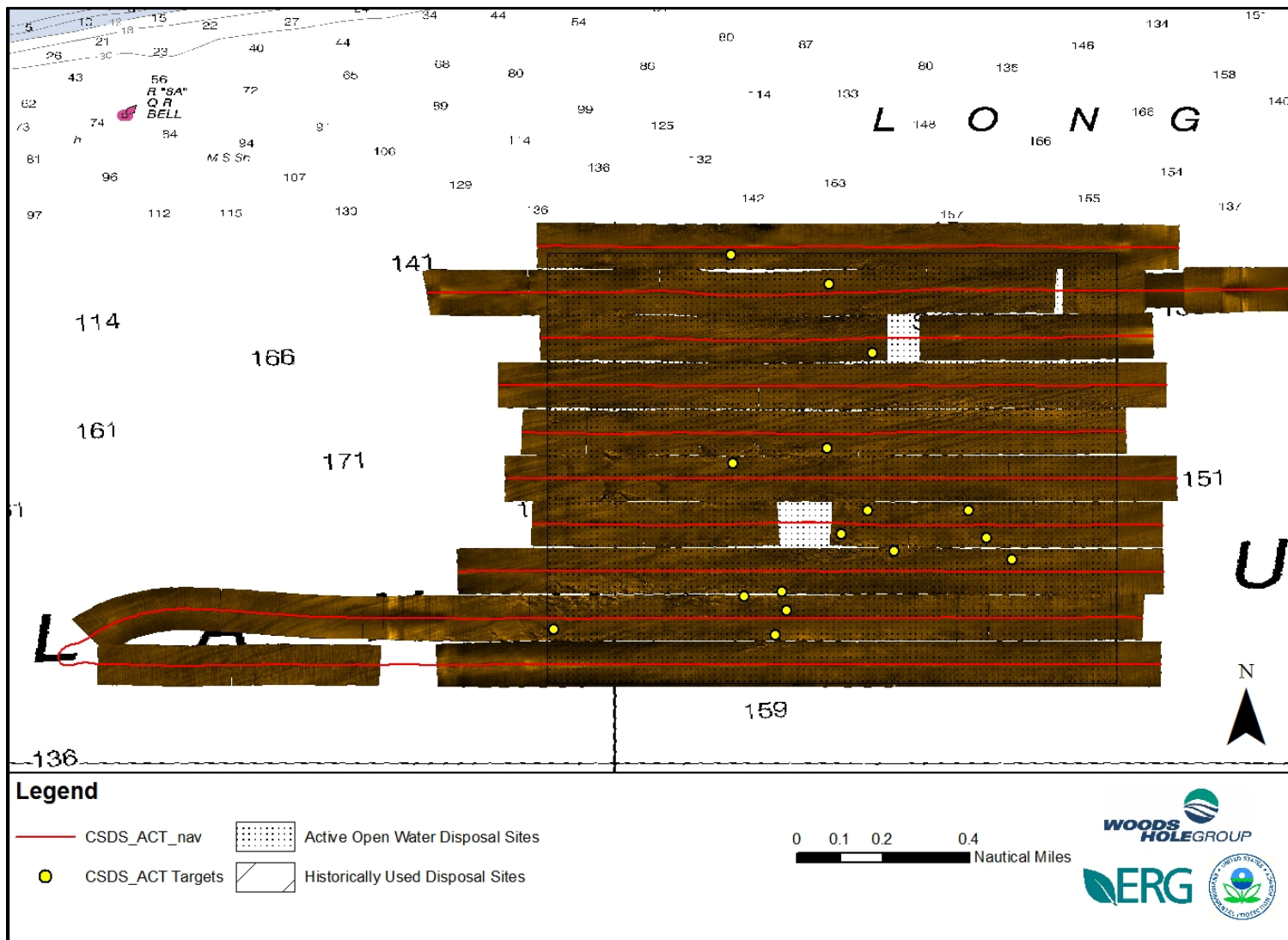


Figure 3.25.2. CSDDS_ACT mosaic with navigation lines and targets.

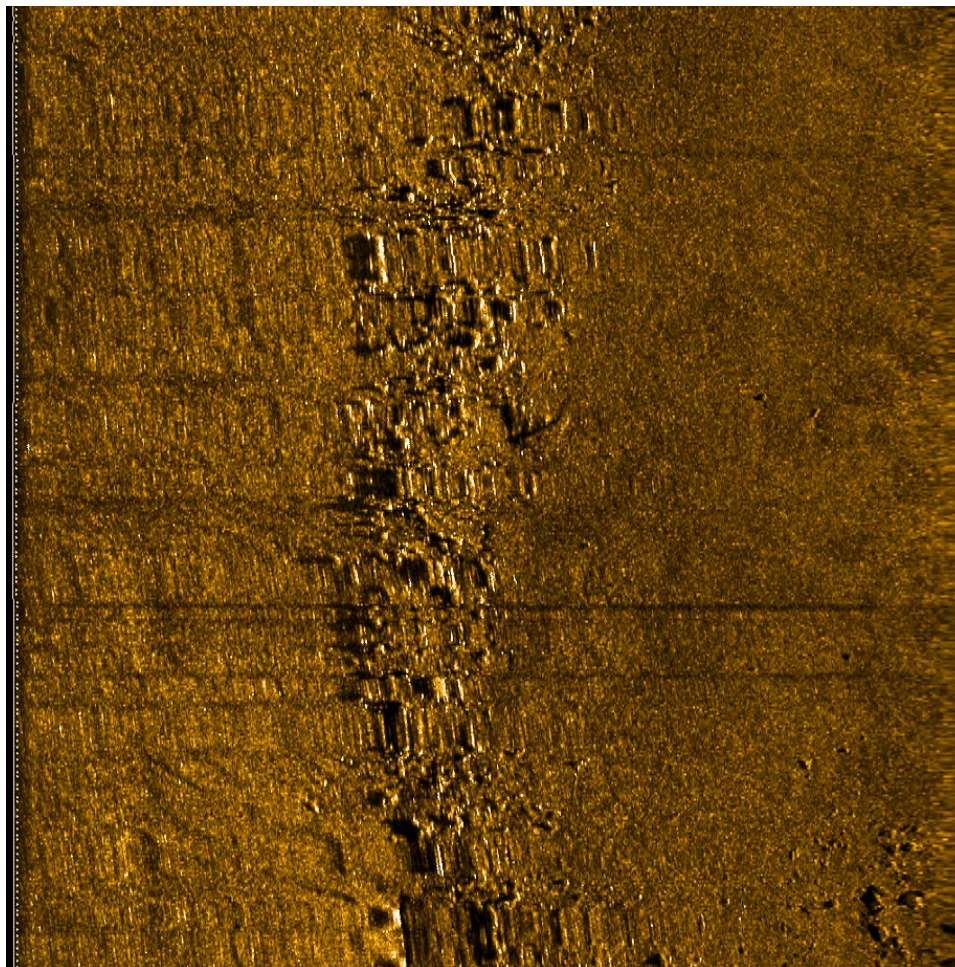


Figure 3.25.3. CSDS_ACT target example: debris pile.

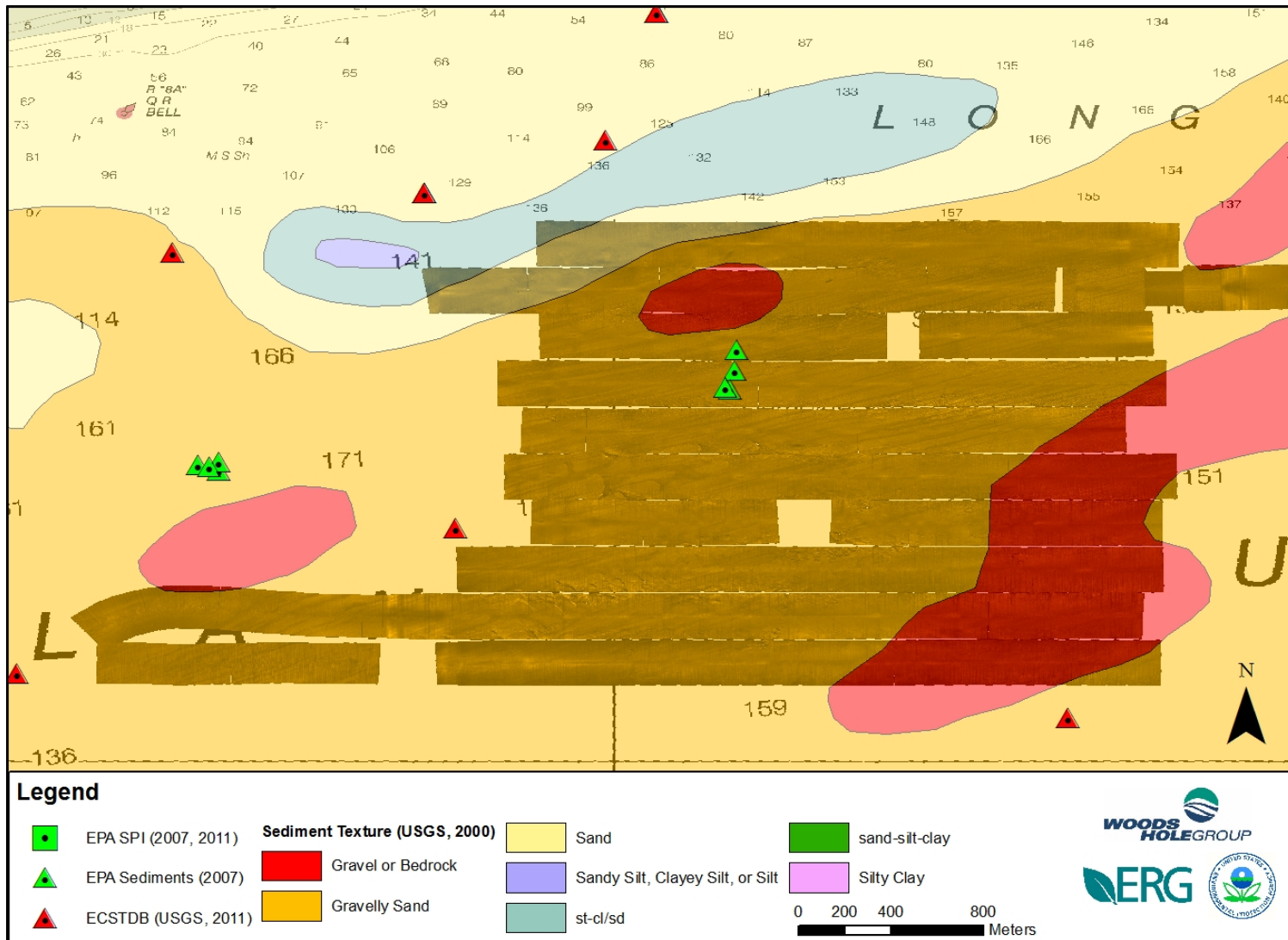


Figure 3.25.4. CSDS_ACT mosaic with supplemental data to assist with interpretation.

3.26 CSDS_ADD

3.26.1 Mosaic Overview

Project location CSDS_ADD is located approximately 4.7 km north of Rocky Point, NY and 7 km southeast of Cornfield Point, CT (Figure 3.1.3). Depth varies between 30 and 43 meters in this area. Figure 3.26.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Sixty-three (63) side-scan sonar XTF files were imported for this project location. Three (3) files were rejected for QA reasons, and two (2) files were trimmed of data (Table 3.26.1). Data coverage is presented in Figure 3.26.1. The project area was surveyed at approximately 0% overlap in data coverage. Side-scan data covered 5.57 million sq. meters.

Table 3.26.1. CSDS_ADD processing statistics used in SonarWiz 5.

CSDS_ADD	
# XTF files	63
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	3 to 8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	2
Tracklines trimmed	CSDS_ADD070716121400
	CSDS_ADD070716140200
# Tracklines removed/hidden	3
Tracklines removed/hidden	CSDS_ADD070716121800
	CSDS_ADD070716133000
	CSDS_ADD070716143800

3.26.2 Target Summary

Three (3) unique targets and one (1) feature were identified at CSDS_ADD using specific descriptions. Targets were assigned to two classifications, with the number of targets assigned to each classification given in parentheses: bathy slope reflection (1) or unidentified/other (2). The target identifying bathy slope reflections shows a series of linear features that cast no shadow and run perpendicular to the inclination of the majority of bedforms. The feature identifying bedforms encompasses the entire project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.26.2 and an example target image is indicated in Figure 3.26.3.

3.26.3 Seafloor Classification & Geological Interpretation

The seafloor at CSDS_ADD is composed of a medium intensity backscatter material defined by large expanses of bedforms. Bedforms are sand waves and trough distance between successive waves ranges from approximately 2 to 50 m, indicating significant sediment transport occurs at this site. Two bottom samples were collected in the center and southeast corners of the survey area by USGS, described as gravelly sediment and gravel, respectively. Several other bottom samples outside the survey area were described as sand or gravelly sediment. There were no SPI images provided within the survey area. The USGS modeled seafloor classification describes the general area as dominantly gravelly sand with small areas of sand and gravel apart from one another. Figure 3.26.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned two classes to the study area. The primary class covers 100% of the project area, since the secondary class, which responds to data shadows caused by bedforms, does not represent an actual change in seafloor reflectivity. Based on the side-scan sonar and supplemental data, CSDS_ADD is composed of one bottom type. SonarWiz 5 bottom classifications are located in Appendix Z.

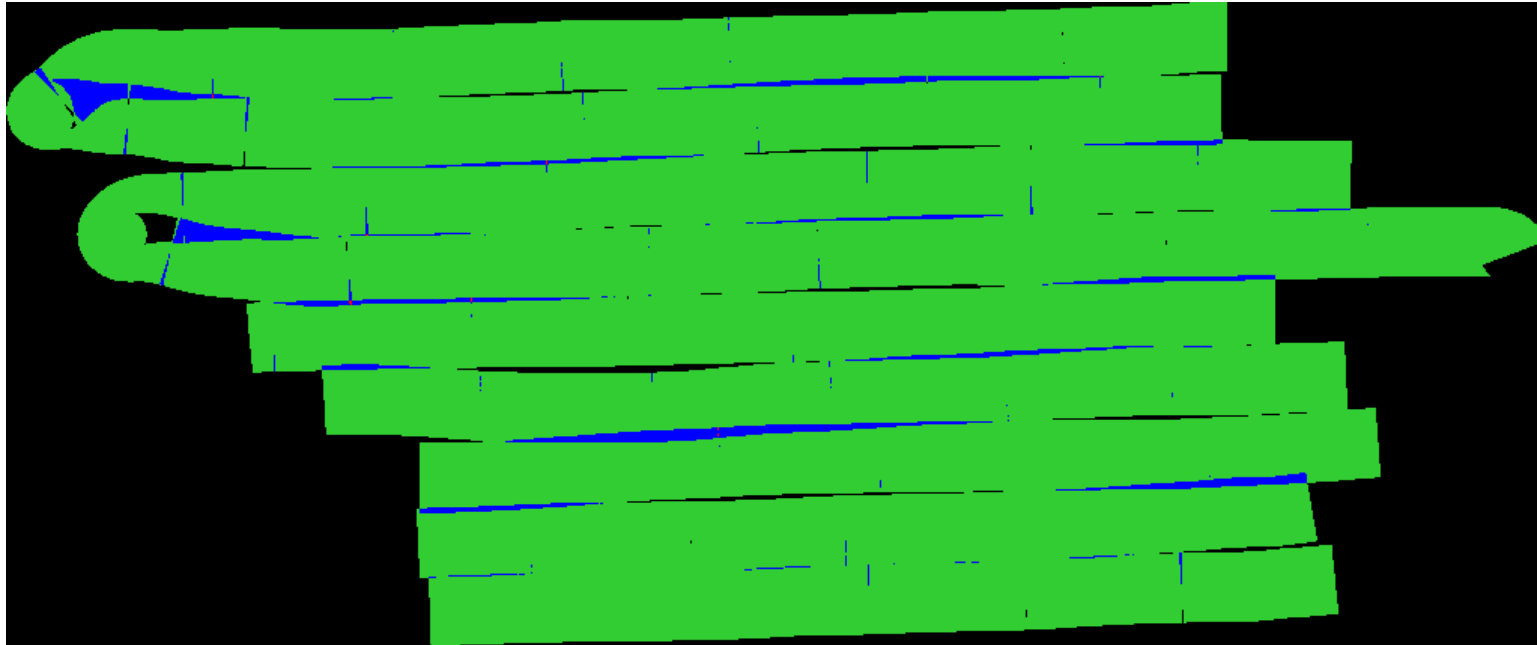
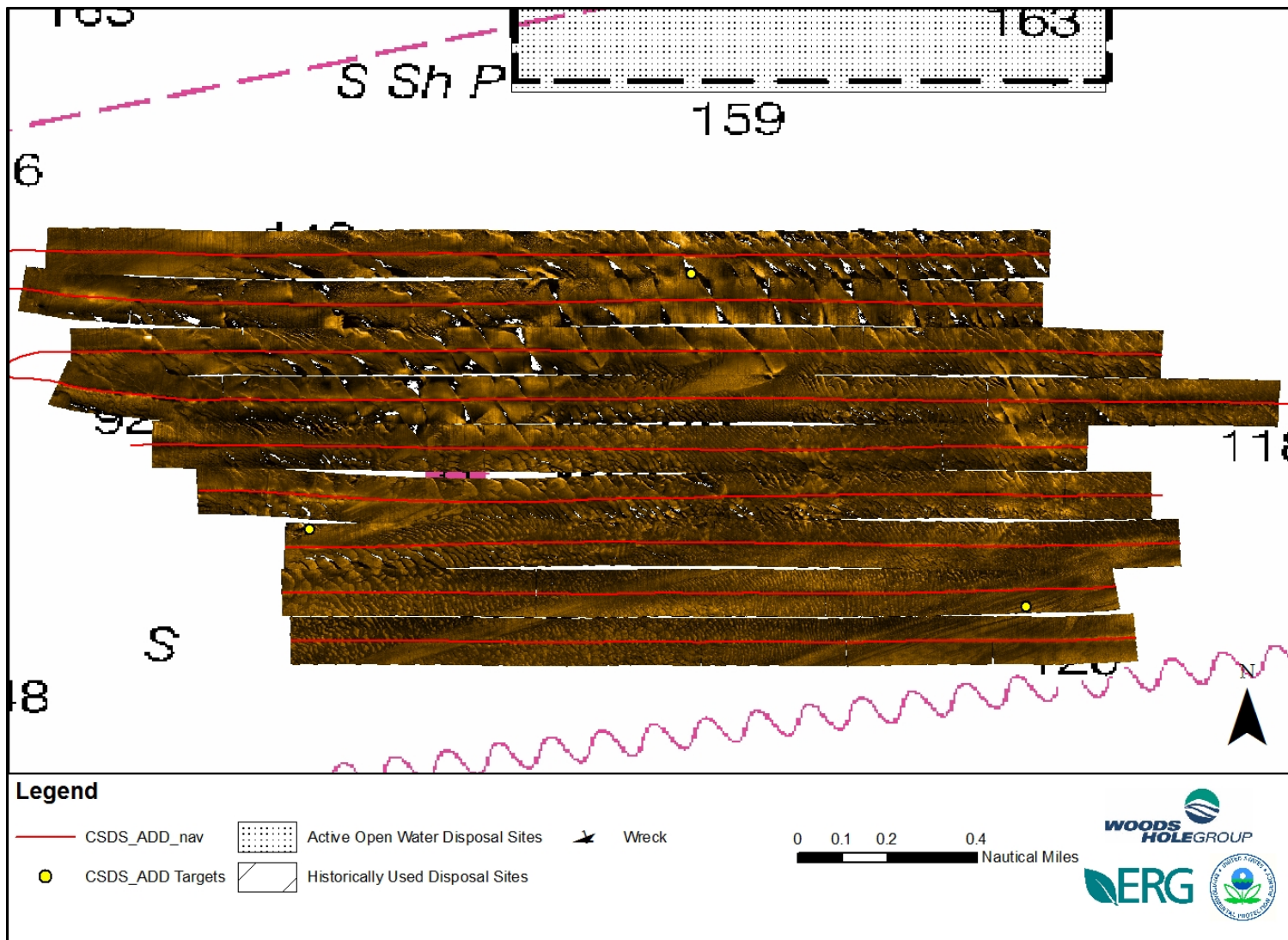


Figure 3.26.1. CSDS_ADD survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.



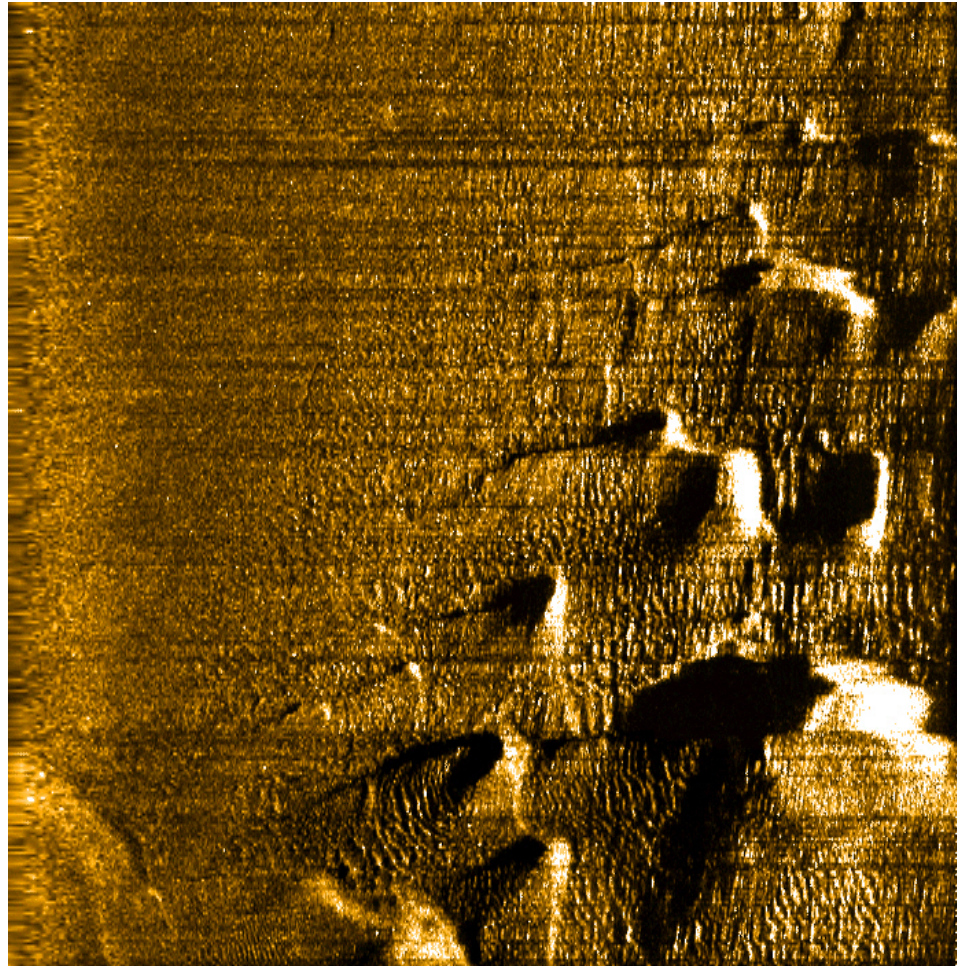


Figure 3.26.3. CSDS_ADD target example: bedforms.

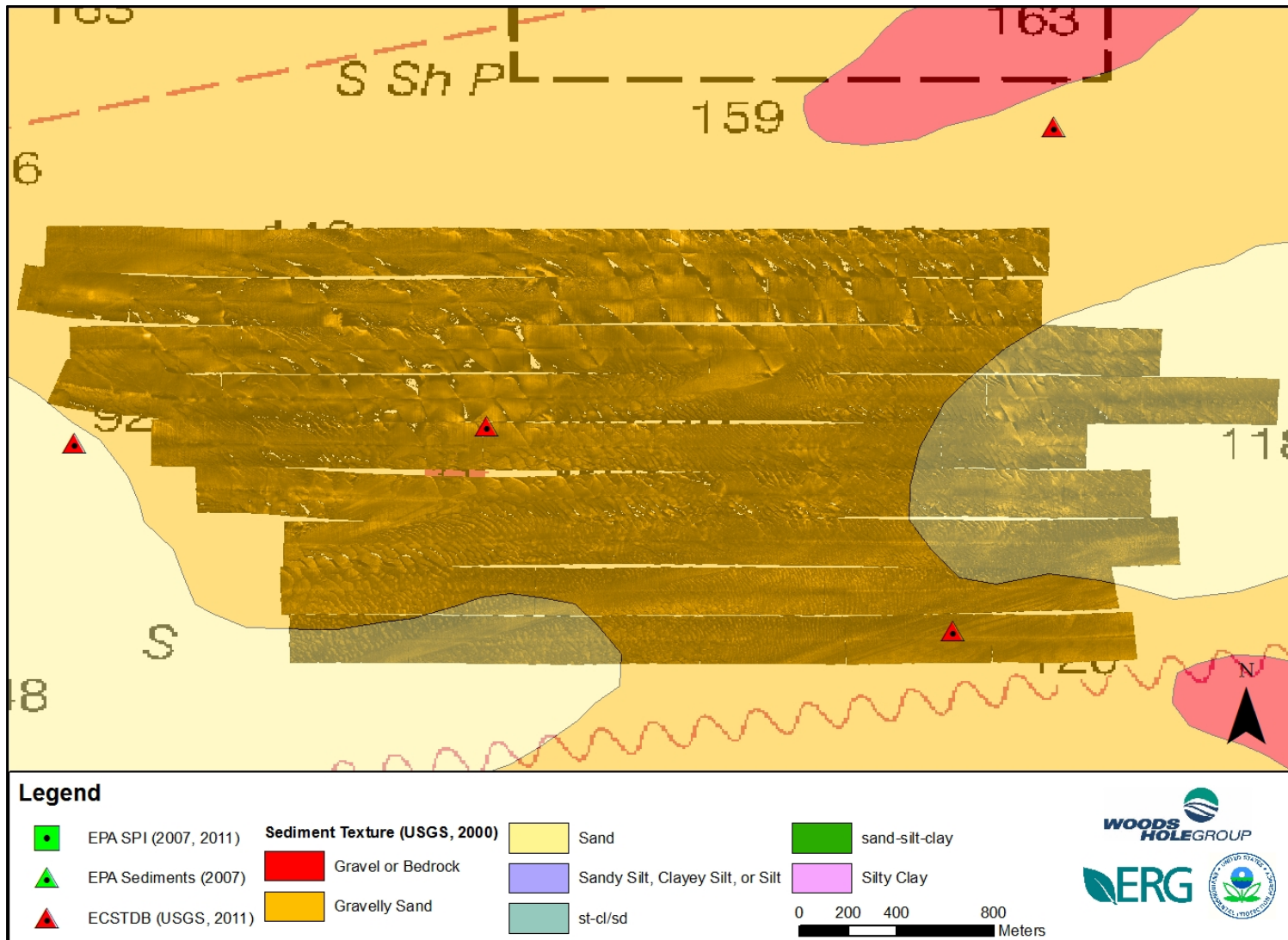


Figure 3.26.4. CSDS_ADD mosaic with supplemental data to assist with interpretation.

3.27 NTDS_NEW

3.27.1 Mosaic Overview

Project location NTDS_NEW is located approximately 6 km southeast of Niantic Harbor, CT and 5.9 km northeast of Plum Island, NY (Figure 3.1.3). Project locations Eastern_LIS_Niantic_Master, FISEHOLE6, NTDS_HIST and ELIS14 overlap with this site. The Niantic Bay disposal site (historical) lies to the west of this site. Depth varies between 18 and 72 meters in this area. Figure 3.27.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

One hundred ten (110) side-scan sonar XTF files were imported for this project location. Zero (0) files were rejected for QA reasons, and eight (8) files were trimmed of data (Table 3.27.1). Data coverage is presented in Figure 3.27.1. The project area was surveyed at approximately 0-200% overlap in data coverage, depending on location. Side-scan data covered 4.65 million sq. meters.

Table 3.27.1. NTDS_NEW processing statistics used in SonarWiz 5.

NTDS_NEW	
# XTF files	110
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4 to 10
Nadir Threshold	4 to 8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	8
Tracklines trimmed	NTDS_NEW070716010100
	NTDS_NEW070716020300
	NTDS_NEW070717152900
	NTDS_NEW070717161000
	NTDS_NEW070717170300
	NTDS_NEW070717195700
	NTDS_NEW070717171100
	NTDS_NEW070717192700
NTDS_NEW070716000200	
# Tracklines removed/hidden	0
Tracklines removed/hidden	N/A

3.27.2 Target Summary

Fourteen (14) unique targets and one (1) feature were identified at NTDS_NEW using specific descriptions. Targets were assigned to four classifications, with the number of targets assigned to each classification given in parentheses: boulder (1), debris pile (9), rock outcrop/geological (2), or unidentified/other (2). All targets were identified in the northwest corner of the project area. One feature describing a field of debris piles occupies the southern half of the project area. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.27.2 and example target images are indicated in Figure 3.27.3.

3.27.3 Seafloor Classification & Geological Interpretation

The seafloor at NTDS_NEW is composed of a medium intensity backscatter material with large areas of higher intensity backscatter and shadows, particularly in the southern half of the survey area. The field of higher backscatter material fall within an area described as a field of debris piles, but rock outcrops/geological features could be present within the area as well. The seafloor on the northern half of the survey area is more homogeneous, with fewer variations in backscatter intensity. Two USGS bottom samples were collected in the far north and south, described as gravelly sediment and gravel, respectively (USGS, 2011). Adjacent USGS bottom samples outside the survey area were described as gravelly sediment, gravel and boulders (USGS, 2011). EPA bottom samples from the center of the survey area were described as silty sand and medium sand with stones. One SPI image provided by EPA, located 1 km to the west of the survey area, showed the bottom as coarse sand overlain with shells and shell hash. The USGS modeled seafloor classification is majority gravelly sand, with small areas of gravel in the south, with an area of sand in the north-center (USGS, 2000). Figure 3.27.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned three classes to the study area. The primary class (blue) covers nearly 100% of the project area and the secondary class (red) is occurs mostly where data shadows occur, making it a false classification of bottom type. The tertiary class (yellow) covers a negligible area and corresponds to areas near a data shadow only. The Classification function was not able to effectively separate the more rocky southern half and the more homogenous northern half. SonarWiz 5 bottom classifications are located in Appendix Z.

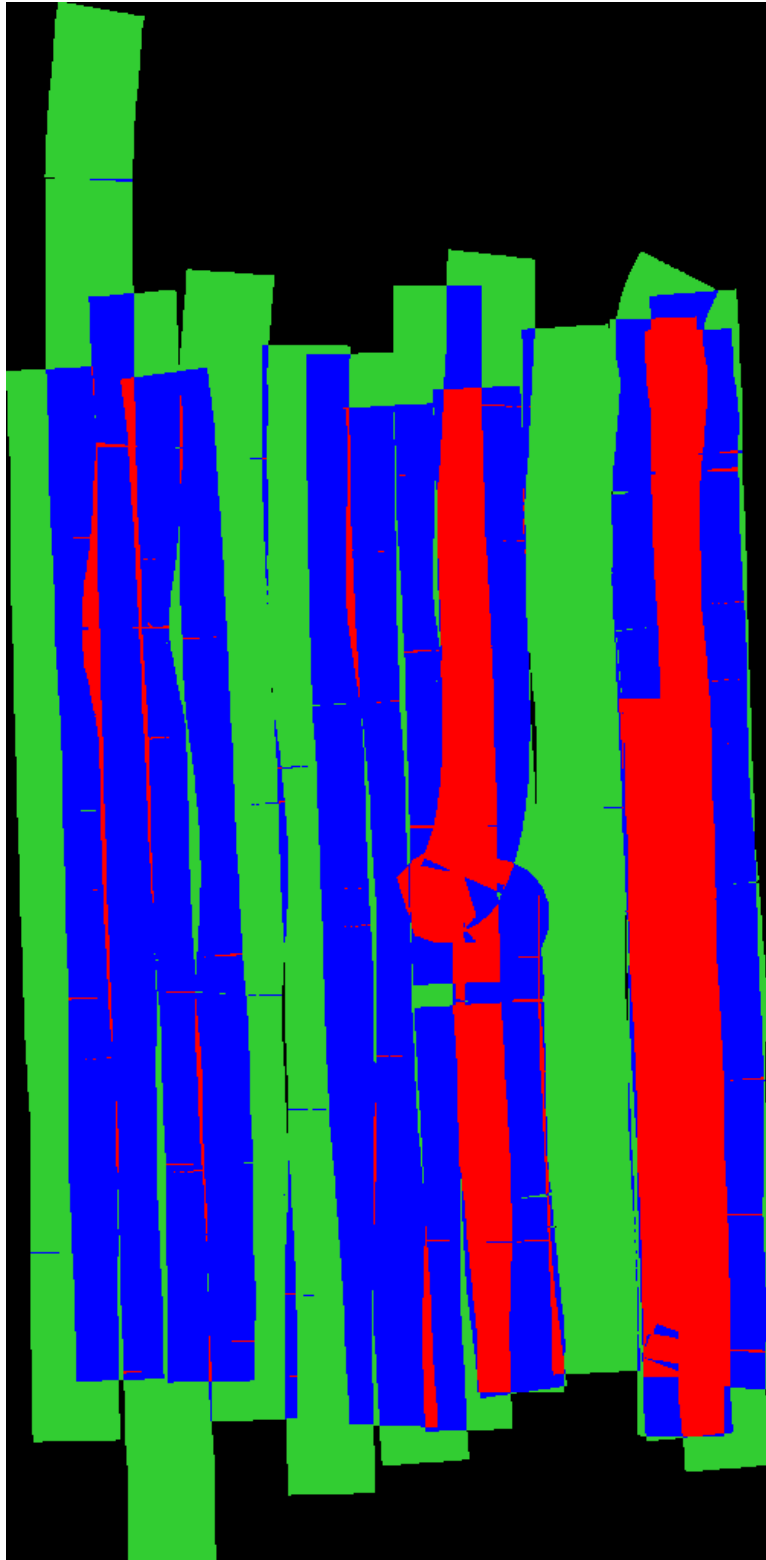


Figure 3.27.1. NTDS_NEW survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively. The color red represents area with 300% coverage.

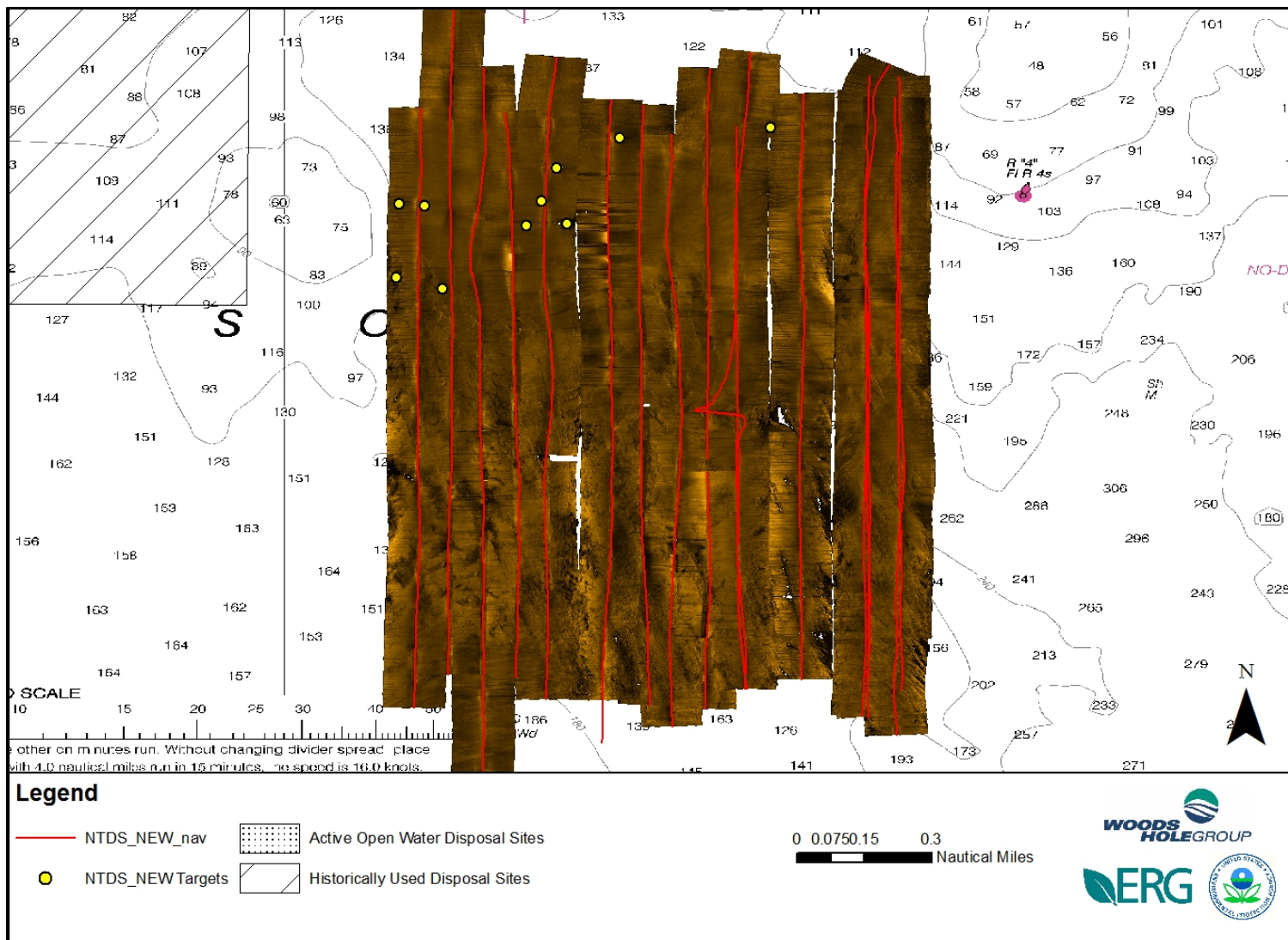


Figure 3.27.2. NTDS_NEW mosaic with navigation lines and targets.

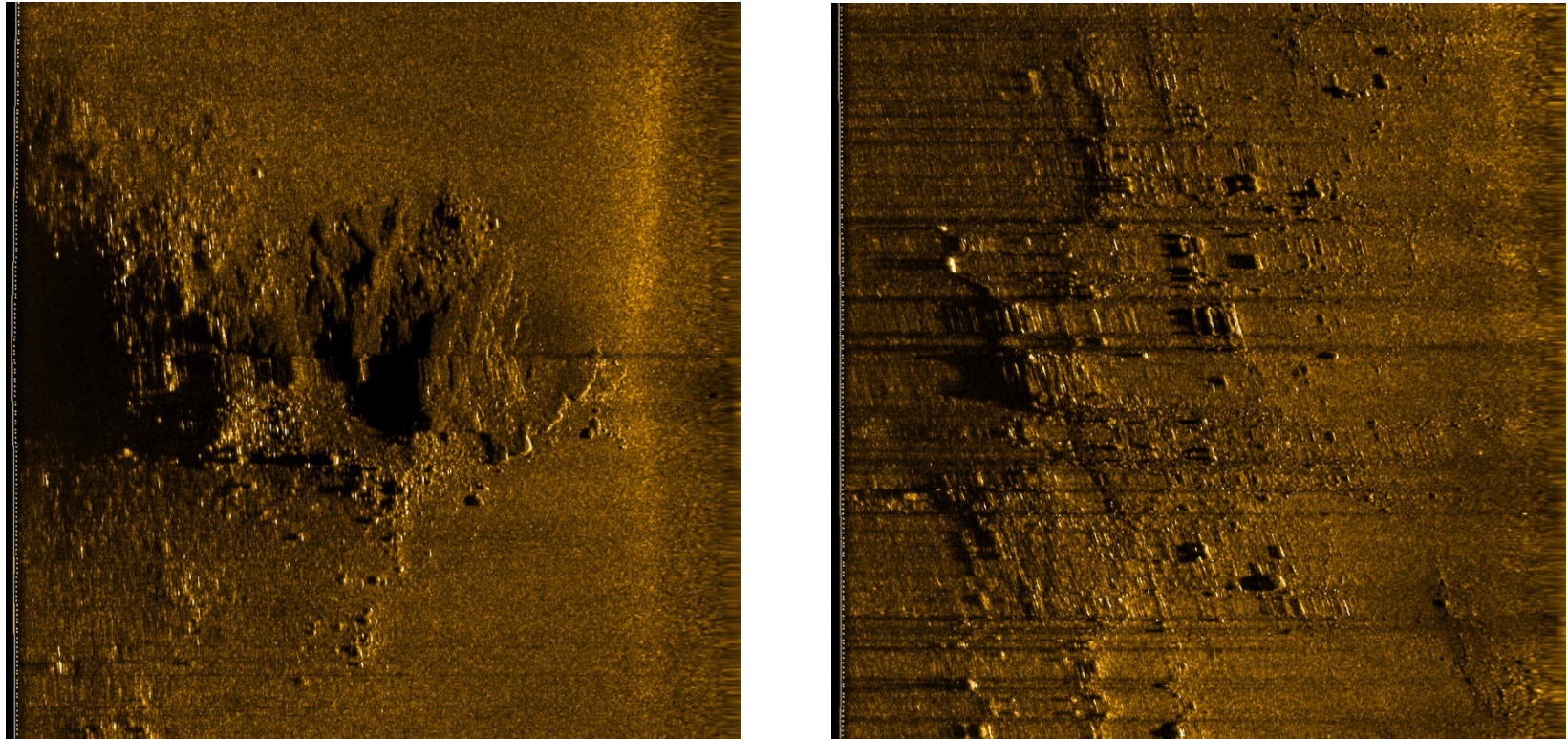


Figure 3.27.3. NTDS_NEW target examples: rock outcrop/geological (L), debris pile (R).

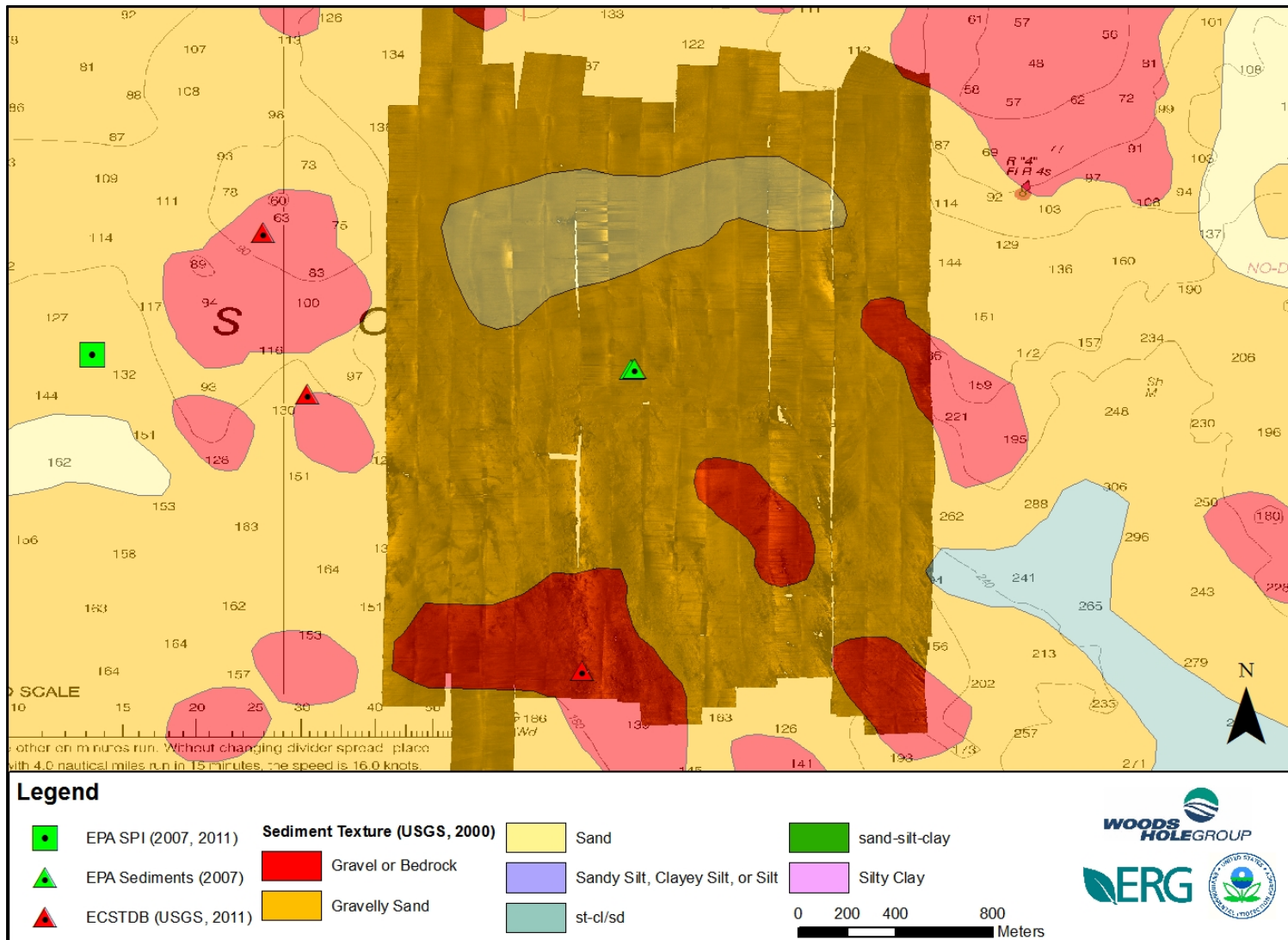


Figure 3.27.4. NTDS_NEW mosaic with supplemental data to assist with interpretation.

3.28 NTDS_HIST

3.28.1 Mosaic Overview

Project location NTDS_HIST is located approximately 5 km south of Niantic Harbor, CT and 7.4 km north of Plum Island, NY (Figure 3.1.3). Project locations ELIS13, ELIS14, FISEHOLE6, NTDS_NEW and Eastern_LIS_Niantic_Master overlap with this site. The majority of the Niantic Bay disposal site (historical) lies within the project area. Depth varies between 15 and 49 meters in this area. Figure 3.28.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Eighty-nine (89) side-scan sonar XTF files were imported for this project location. Three (3) files were rejected for QA reasons, and five (5) files were trimmed of data (Table 3.28.1). Data coverage is presented in Figure 3.28.1. The project area was surveyed at approximately 0% overlap in data coverage, though a few lines have 50-100% overlap. Side-scan data covered 5.45 million sq. meters.

Table 3.28.1. NTDS_HIST processing statistics used in SonarWiz 5.

NTDS_HIST	
# XTF files	89
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	5
Tracklines trimmed	NTDS_HIST070715130100
	NTDS_HIST070715135700
	NTDS_HIST070715130900
	NTDS_HIST070715132900
	NTDS_HIST070715140500
# Tracklines removed/hidden	3
Tracklines removed/hidden	NTDS_HIST070715131300
	NTDS_HIST070715132500
	NTDS_HIST070715140100

3.28.2 Target Summary

Forty-four (44) unique targets and three (3) features were identified at NTDS_HIST using specific descriptions. Targets were assigned to seven classifications, with the number of targets assigned to each classification given in parentheses: bedforms (6), boulder (1),

boulder area/field (2), debris pile (22), field of debris pile (5), rock outcrop/geological (2), or unidentified/other (6). Targets identified as debris piles were located throughout the project area, mainly clustered in the central and north-central. Three features outlining fields of debris piles are located in the central, north-central and east. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.28.2 and example target images are indicated in Figure 3.28.3.

3.28.3 Seafloor Classification & Geological Interpretation

The seafloor at NTDS_HIST is composed of a medium intensity backscatter material with intermittent fields of debris piles. Fields of debris piles were located in the north, center and southeast corner of the survey area. Seven bottom samples were collected by USGS within the survey area, with descriptions ranging from sand to gravelly sediment to boulders (USGS, 2011). USGS bottom samples were evenly distributed around the northern half of the survey area. Five bottom samples provided by the EPA in the center of the survey area were described with varying percentages of sand and silt with shell hash. One SPI image provided by EPA, located 0.3 km to the south of the survey area, showed the bottom as coarse sand overlain with shells and shell hash. The USGS modeled seafloor classification is a complex mix of gravel, gravelly sand and sand, with gravelly sand being the dominant member (USGS, 2000). The bottom sediment shows a general trend of fining towards the north. Figure 3.28.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned three classes to the study area. However, the primary class covers nearly 100% of the project area and the secondary and tertiary classes occupy negligible area and are only observed near the edges of tracklines, most likely making them artifacts. Based on the side-scan sonar and supplemental data, it is believed the seafloor at NTDS_HIST is composed of sand with varying percentages of coarse material (shells, gravel, boulders etc.). SonarWiz 5 bottom classifications are located in Appendix Z.

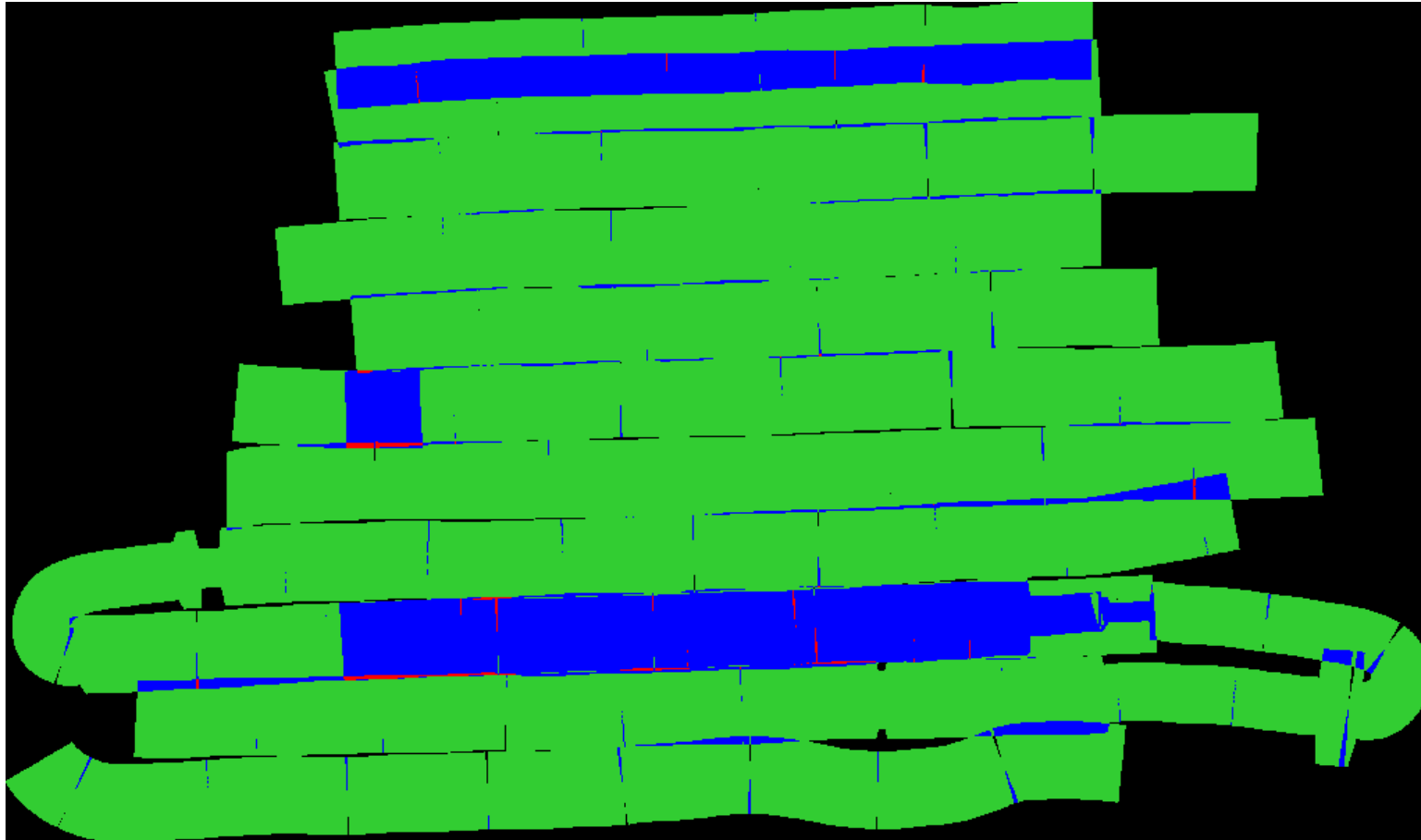


Figure 3.28.1. NTDS_HIST survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

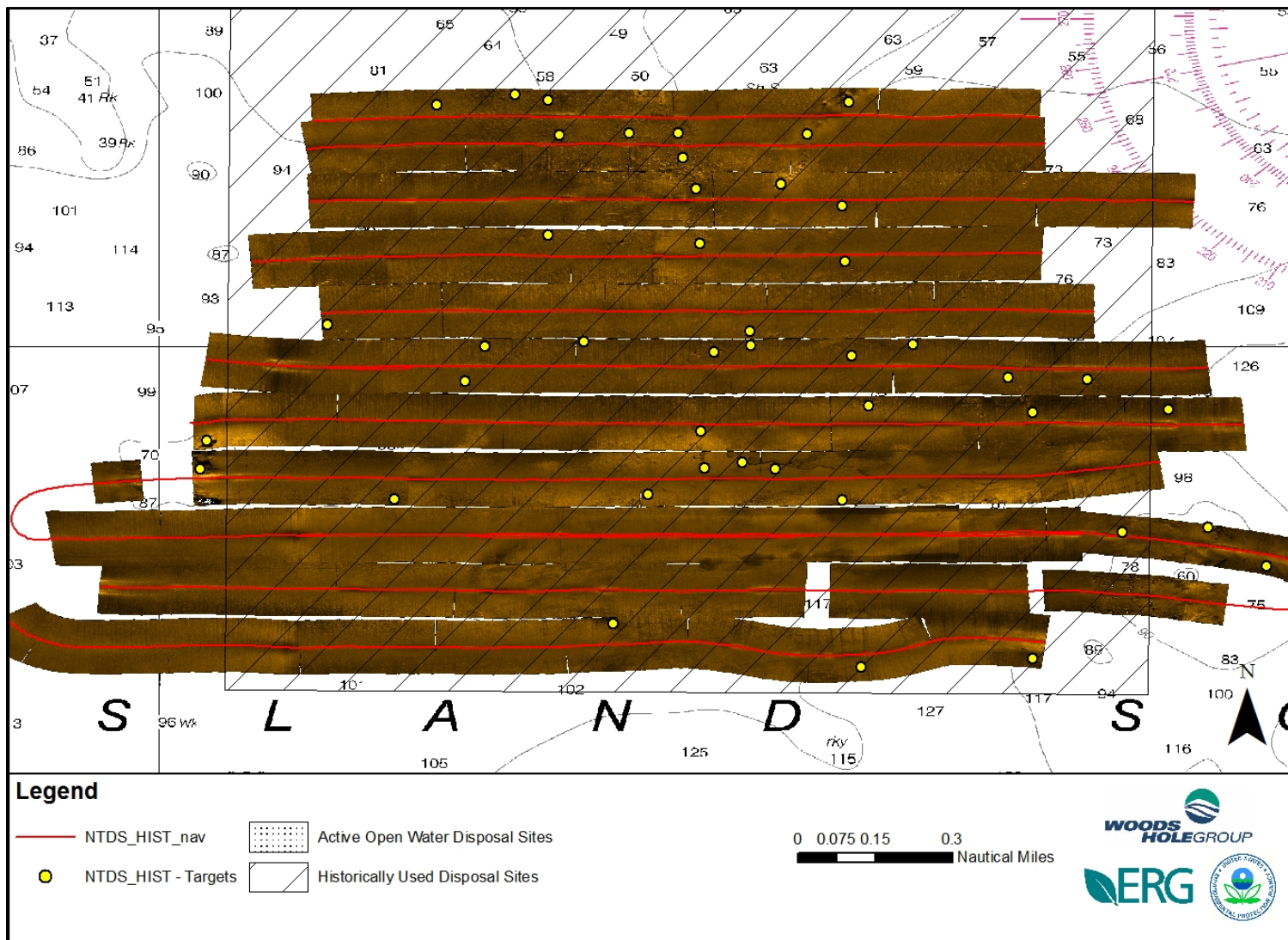


Figure 3.28.2. NTDS_HIST mosaic with navigation lines and targets.

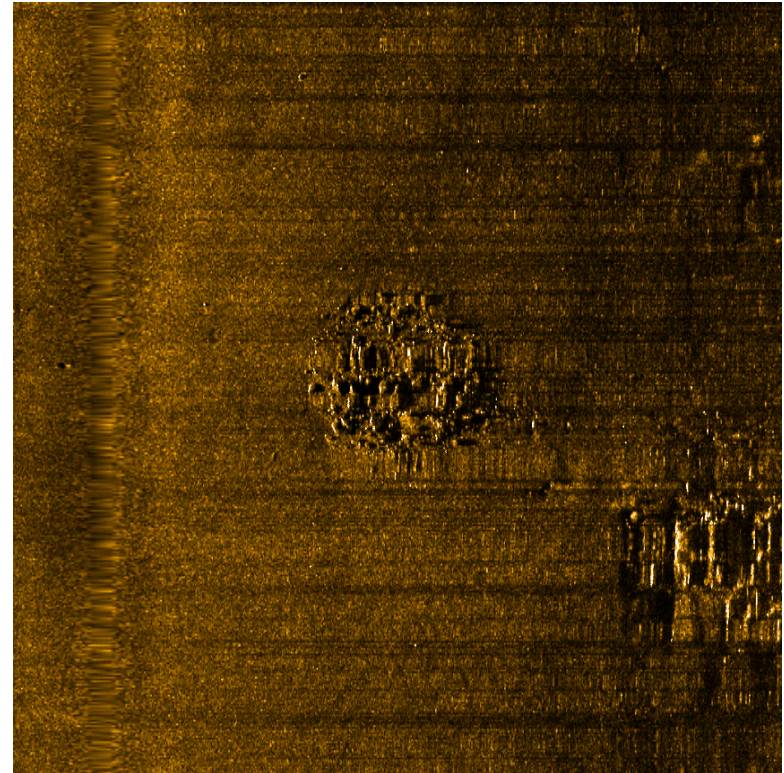
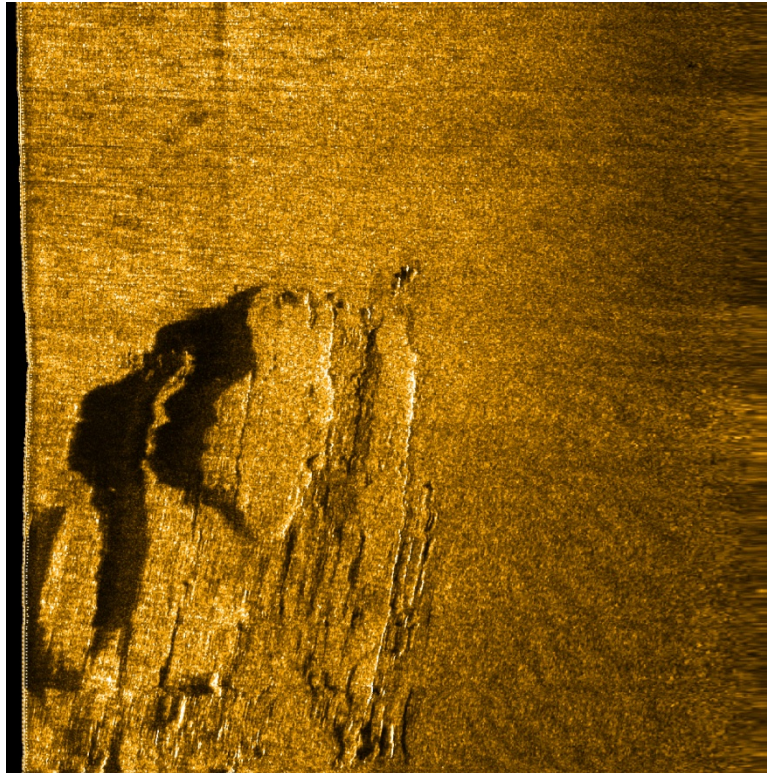


Figure 3.28.3. ELIS16 target examples: rock outcrop/geological (L), debris pile (R).

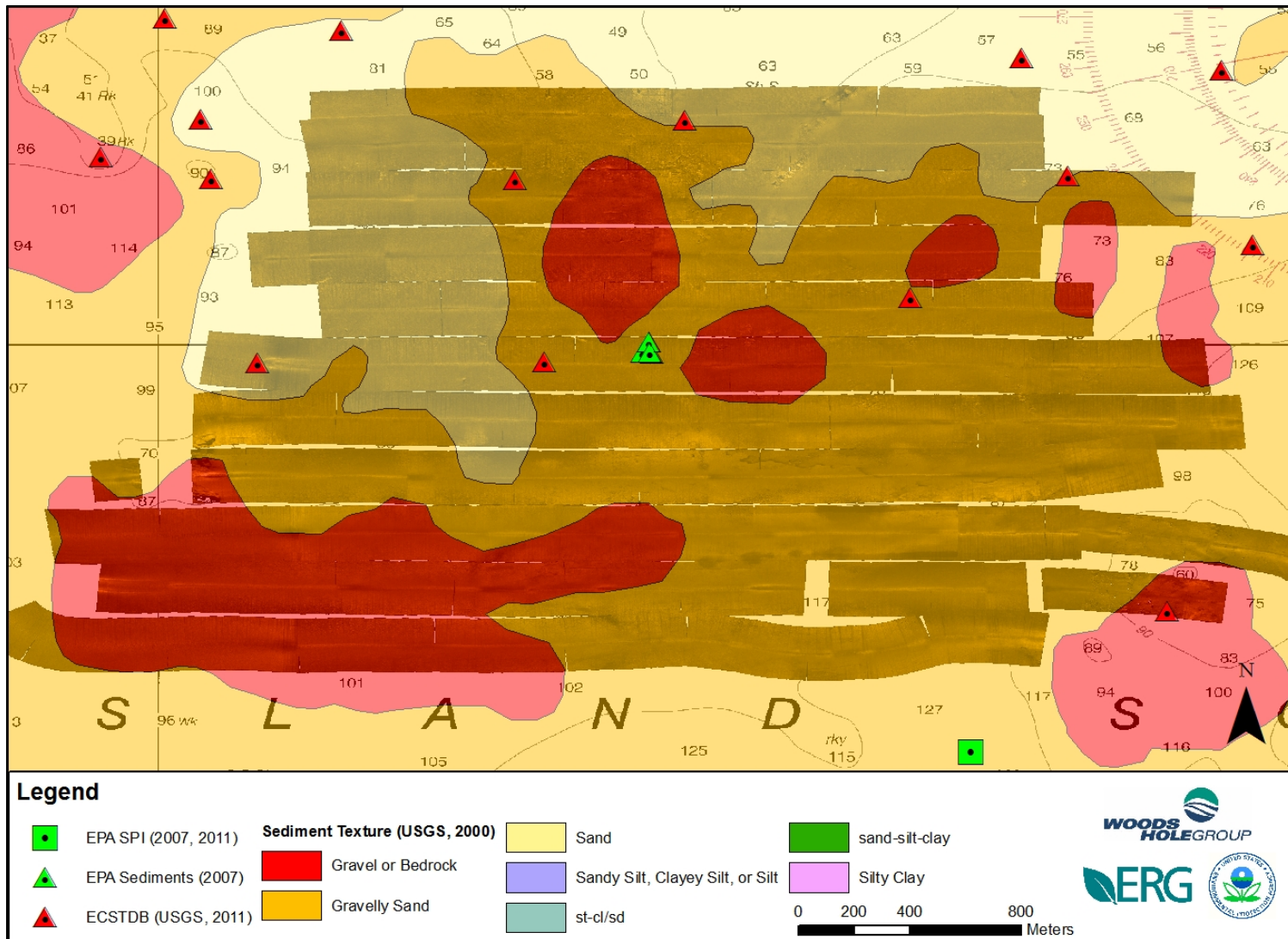


Figure 3.28.4. NTDS_HIST mosaic with supplemental data to assist with interpretation.

3.29 NLDN_ACT

3.29.1 Mosaic Overview

Project location NLDN_ACT is located approximately 2.9 km west of Fishers Island, NY and 5 km south of New London Harbor, CT (Figure 3.1.3). Project locations NLDN_REF, NLDN_REF_ADD and ELIS12 overlap with this site. The entirety of the New London Disposal Site (active) is within the project area. Depth varies between 12 and 52 meters in this area. Figure 3.29.2 plots the survey lines navigated to collect the side-scan sonar data at this specific location.

Sixty-four (64) side-scan sonar XTF files were imported for this project location. Two (2) files were rejected for QA reasons, and three (3) files were trimmed of data (Table 3.29.1). Data coverage is presented in Figure 3.29.1. The project area was surveyed at approximately 0% overlap in data coverage but two tracklines have 100% overlap. Side-scan data covered 4.20 million sq. meters.

Table 3.29.1. NLDN_ACT processing statistics used in SonarWiz 5.

NLDN_ACT	
# XTF files	64
Navigation/layback imbedded in sonar data?	No
Nadir Blanking dist (m)	4
Nadir Threshold	8
Nadir Blanking Duration	2
Offset Alt (m)	1
Adjusted display range (m)	98 of 100
# Tracklines trimmed	3
Tracklines trimmed	NLDN_ACT070714192300
	NLDN_ACT070715072600
	NLDN_ACT070715080100
# Tracklines removed/hidden	2
Tracklines removed/hidden	NLDN_ACT070714100900
	NLDN_ACT070714183900

3.29.2 Target Summary

Thirty (30) unique targets and one (1) feature were identified at NLDN_ACT using specific descriptions. Targets were assigned to eight classifications, with the number of targets assigned to each classification given in parentheses: bedforms (3), boulder (1), boulder area/field (1), debris pile (9), fishing gear - trap/buoy (5), rock outcrop/geological (1), unidentified/other (9), or wreck (1). Targets are evenly distributed around the project area and targets of similar type are not clustered together. The wreck is located in the

southwest of the project area and is identified on NOAA charts. The feature is located in the southwest and outlines an area identified as unknown/other, due to its distinct difference in sonar backscatter compared to adjacent bottom and its lack of shadow. This feature is only visible when beam angle correction filters are not enabled and may be fine-grain sediment from dredging that absorbs more sonar energy than the adjacent, harder bottom. Targets and features are compiled in Appendix T. Targets are indicated on Figure 3.29.2 and example target images are indicated in Figure 3.29.3.

3.29.3 Seafloor Classification & Geological Interpretation

The seafloor at NLDN_ACT is composed of a medium intensity backscatter material that contains patches of variable backscatter intensity. The variable backscatter does not appear to be related to objects on the seafloor or topography because there are no shadows associated with the change, which would be expected. A feature of much lower intensity backscatter is located in the southwest corner, which appears as a noticeably darker area on the seafloor (see section 3.29.2 for identification). Three bottom samples collected by the USGS were described as gravelly sediment (in the west) and silty sand (in the north) (USGS, 2011). There were no SPI images provided within in the survey area. The USGS modeled seafloor classification shows sand as the dominant sediment type, with small areas of gravelly sand in the southwest corner and northern edge (USGS, 2000). Grain size appears to increase to the north towards shore. Figure 3.29.4 shows the mosaic with supplemental interpretative data.

The Classification function in SonarWiz 5 assigned three classes to the study area. The primary class covers approximately 75% of the total area, and is prevalent throughout the survey area. The secondary class covers the remaining 25% and was assigned to areas with slightly higher intensity backscatter. The tertiary class is negligible in size and frequency. The lower intensity backscatter feature was not identified as a unique class by the Classification function. According to the side-scan sonar and supplemental data, the seafloor at NLDN_ACT appears to be predominantly sand. SonarWiz 5 bottom classifications are located in Appendix Z.



Figure 3.29.1. NLDN_ACT survey data coverage. The green and blue colors indicate survey area with 100% coverage (0% overlap) and 200% coverage (100% overlap), respectively.

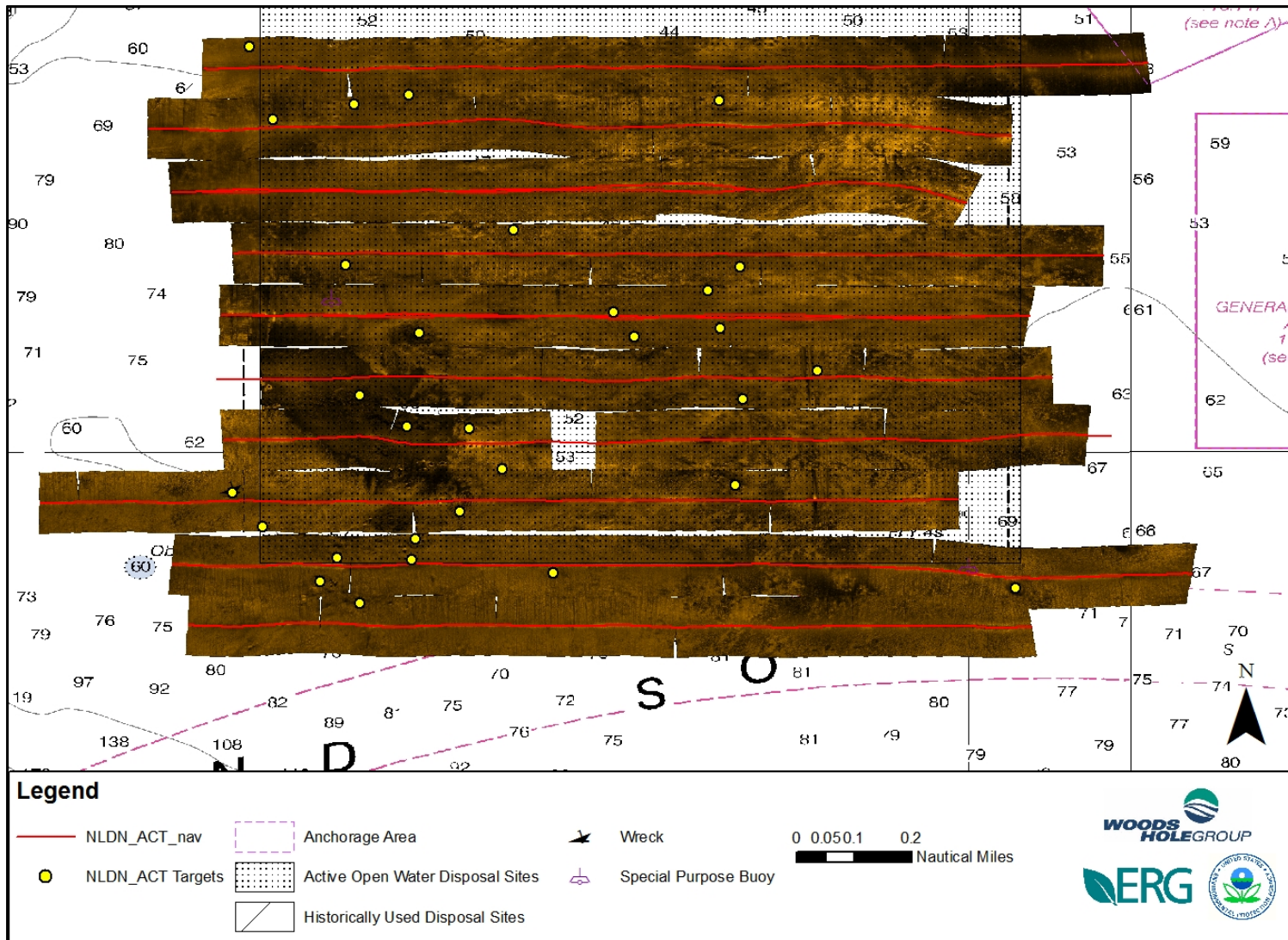


Figure 3.29.2. NLDN_ACT mosaic with navigation lines and targets.

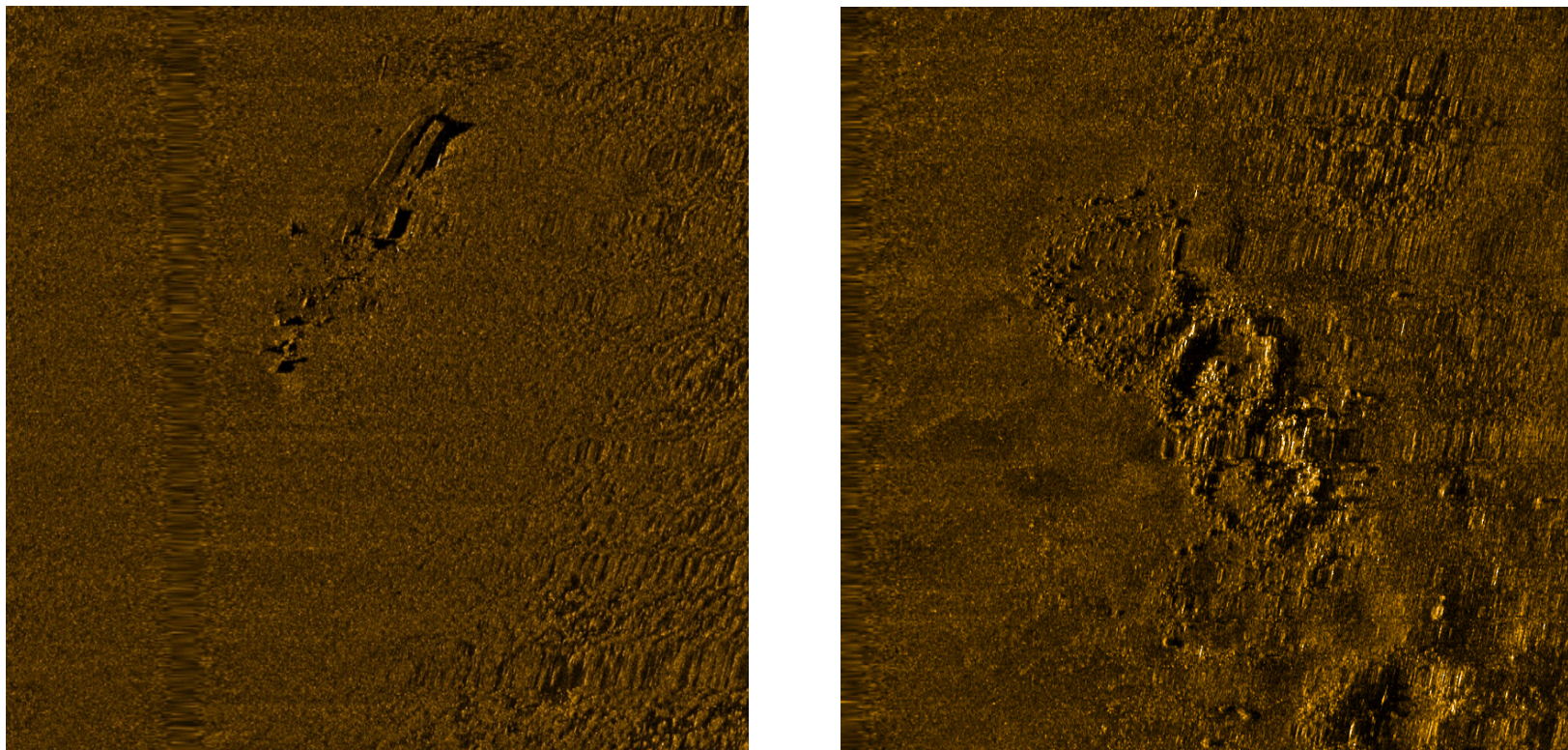


Figure 3.29.3. NLDN_ACT target examples: wreck (L), debris pile (R).

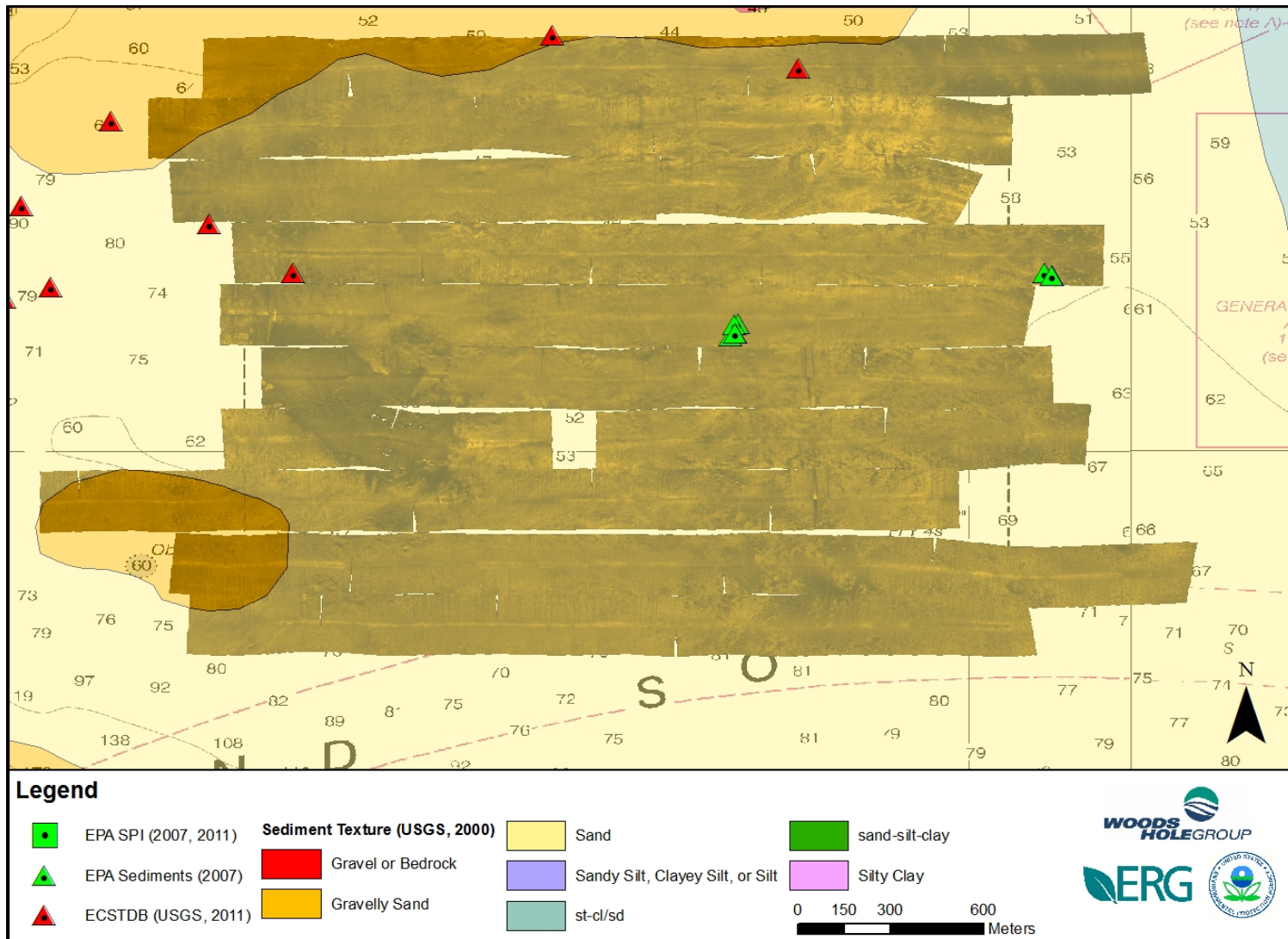


Figure 3.29.4. NLDN_ACT mosaic with supplemental data to assist with interpretation.

4.0 QA/QC DISCUSSION

4.1 DATA COVERAGE

In some survey areas there are gaps in quality data coverage that are manifested as holes or “holidays” in the mosaic image. There are many reasons for a data gap, but we have listed the potential leading causes below:

- In some circumstances, the vessel had to navigate off a survey transect/line to avoid an object, such as a navigation buoy in the path of the survey vessel, which resulted in a gap in data coverage. Examples of these data gaps are exhibited by the linear holidays in the mosaic for NLDN_REF_ADD2 and Eastern_LIS_EastHole_Master (Figures 3.23.2 and 3.18.2).
- At some sites, data was collected as a cursory overview, focused on covering a larger area with less coverage or overlap. This was due to an EPA plan to collect overlap coverage during multiple data collection events. In cases where overlap was not planned, small navigational movements resulted in data gaps. Since the data collection occurred over a multi-year effort, some mosaics were planned without overlap. This is not true for all mosaics, but it is the cause for most of the linear data gaps. An example of these data gaps is exhibited by the 6MILE10 mosaic (Figure 3.7.2).
- As indicated by EPA field notes, occasional equipment malfunctions by the side-scan sonar or support equipment caused areas of data loss, which is represented in mosaics as a spatial gap in coverage. The mosaic FALKNER8 exhibits this occurrence (Figure 3.9.2). In addition, excessive equipment movement during ascent, descent, or turns may cause poor quality in data. All data recorded for turns were removed from the mosaics. The mosaic for NLDN_REF exhibits this occurrence (Figure 3.24.2).

4.2 NAVIGATION

All side-scan sonar data files used to create the mosaics and identify targets for this report have not been corrected for navigation offsets and towfish layback. The identified targets provided in Appendix T contain a minimum geographic position offset of 50 meters. Revised geographic positions of targets, for a select number of sites, have been provided to the EPA as separate files. The geographic offset of targets has no impact on the side-scan sonar backscatter intensity and general characterization of the mosaics provided herein, especially in consideration of the large scale of these areas with respect to the error estimate.

4.3 TARGET COLOR SCALES

While all mosaics were created using the Klein color scale referenced in Figure 2.1.1, identification of targets was performed using both the Klein scale and a monochrome grey scale. The color scale variation was dependent on the professional preference of the technician who identified the targets. The grey scale is similar to the Klein scale, but

with the color white on one end of the spectrum, and black on the other. In this case, the color scale was inverted and low backscatter was represented by white, and high backscatter represented by black.

5.0 SUMMARY

The Woods Hole Group was contracted by ERG to process side-scan sonar data collected by the EPA R1 in eastern Long Island Sound. In total, data from 28 side-scan sonar survey sites were processed, mosaicked, cataloged for targets, and geomorphologically characterized. This work was performed to support EPA Region 1 in the process of conducting the studies necessary for part of an Environmental Impact Statement (EIS) for eastern Long Island Sound.

6.0 REFERENCES

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Processing and Mosaicking, Long Island Sound. USEPA Contract No. EP-C-09-
020. ERG Subcontract No. OCPD-020/7. January 15, 2014.

APPENDIX M

M.1 DESCRIPTION

Appendix M is a compilation of the electronic data deliverables associated with the georeferenced side-scan mosaic images for the 28 sites in ELIS. The mosaic images are provided in GEOTIFF format; these files and their supporting data files are organized by survey site and provided in self-titled file folder directories. The supporting data files for each mosaic contain the spatial metadata for each site, or are used for display purposes by ESRI ArcGIS software.

Each site directory contains a mosaic image (.tif extension) with “-M” appended to the filename, which is the final mosaic image with Beam Angle Correction (BAC) and Automatic Gain Correction (AGC) filters enabled. Most project locations also include a mosaic image with “-EGN” appended to the filename, these are mosaic images with the Empirical Gain Normalization (EGN) filter enabled. All directories, except four (ELIS16, ELIS15, FALKNER8, and FISE_SW_ADD2), contain EGN mosaics; EGN mosaics images were not created for these sites because it did not improve the ability to interpret the seafloor.

The file folder structure for Appendix M and the subdirectories is depicted in Figure M1. The files structure of each site folder is depicted in Figure M2. All data files are included with the report summary report on the EPA R1 portable hard drive.

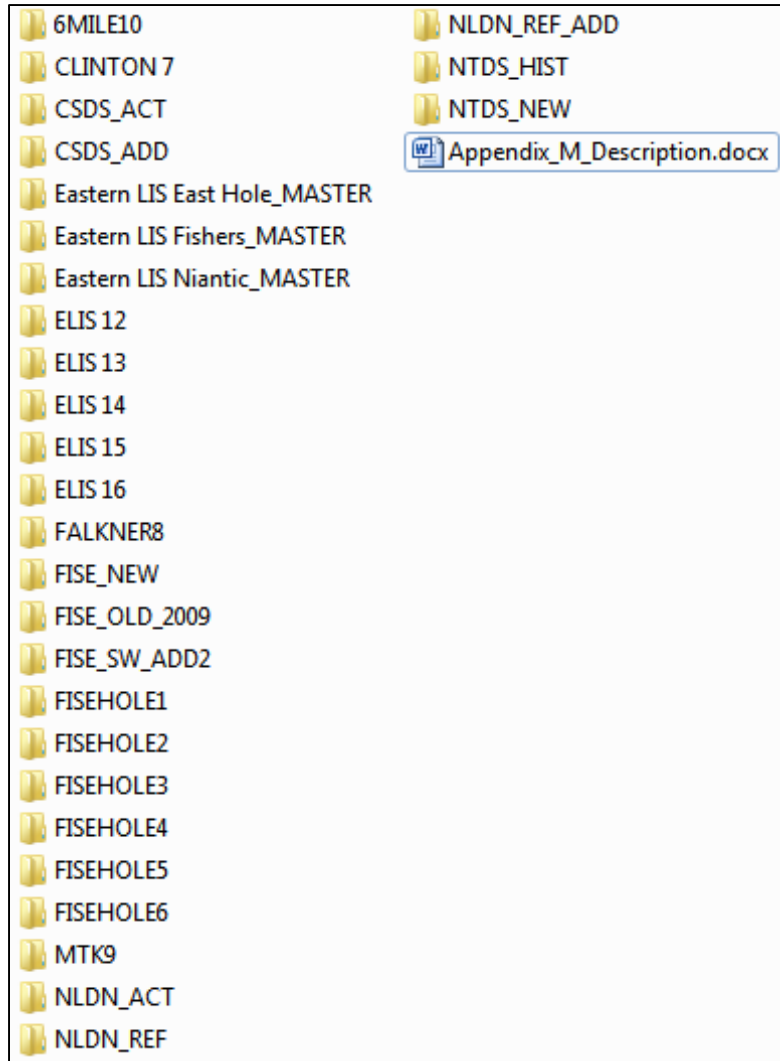


Figure M1. Directory structure of Appendix M

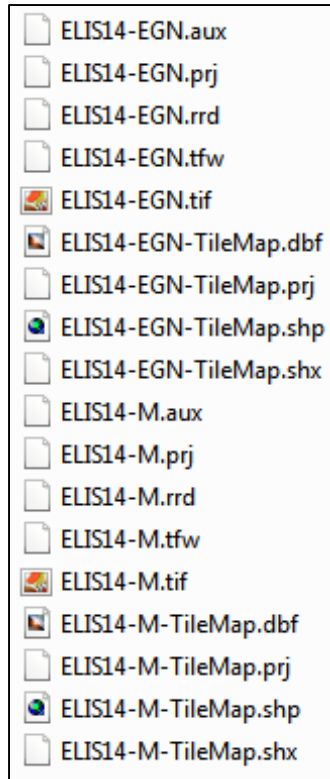


Figure M2 Example of the file structure for each site.

APPENDIX T

T.1 DESCRIPTION

Appendix T is a compilation of the electronic data deliverables associated with the seafloor target and feature identification for the 28 sites in ELIS. These files and their supporting data files are organized by survey site and provided in self-titled file folder directories. The supporting data files are used for display purposes by ESRI ArcGIS software.

All targets for each project location are summarized in a GIS-compatible shapefile (.shp file extension), but each feature polygon is present as a separate shapefile. A comma-delimited text file (.csv file extension) summarizes all the target metadata. Two images with .jpg extension are included for each target identified on the seafloor: 1) the target as it appears on the sonar line without any modification, and 2) an image with visual settings adjusted to assist with identification (“_adj” appended to file name). The adjusted images show the final visual settings that the data technician used to identify the target, and do not reflect how the target appears on the sonar line in the mosaic images. While all mosaics were created using the Klein color scale, identification of targets was performed using both the Klein scale and a monochrome grey scale. The color scale variation was dependent on the professional preference of the technician who identified the targets. None of the images in Appendix T are geo-referenced. For some project locations there is a folder named “Deleted” that contains jpeg images of targets that were removed from the project for QA reasons. Project locations that have no targets or features identified (e.g. FALKNER8) still have a subdirectory in Appendix T, but the folder contains a text file explaining that either no targets or features were identified.

The file folder structure for Appendix T and the subdirectories is depicted in Figure T1. The file structure of each site folder is depicted in Figure T2. All data files are included with the report summary report on the EPA R1 portable hard drive.

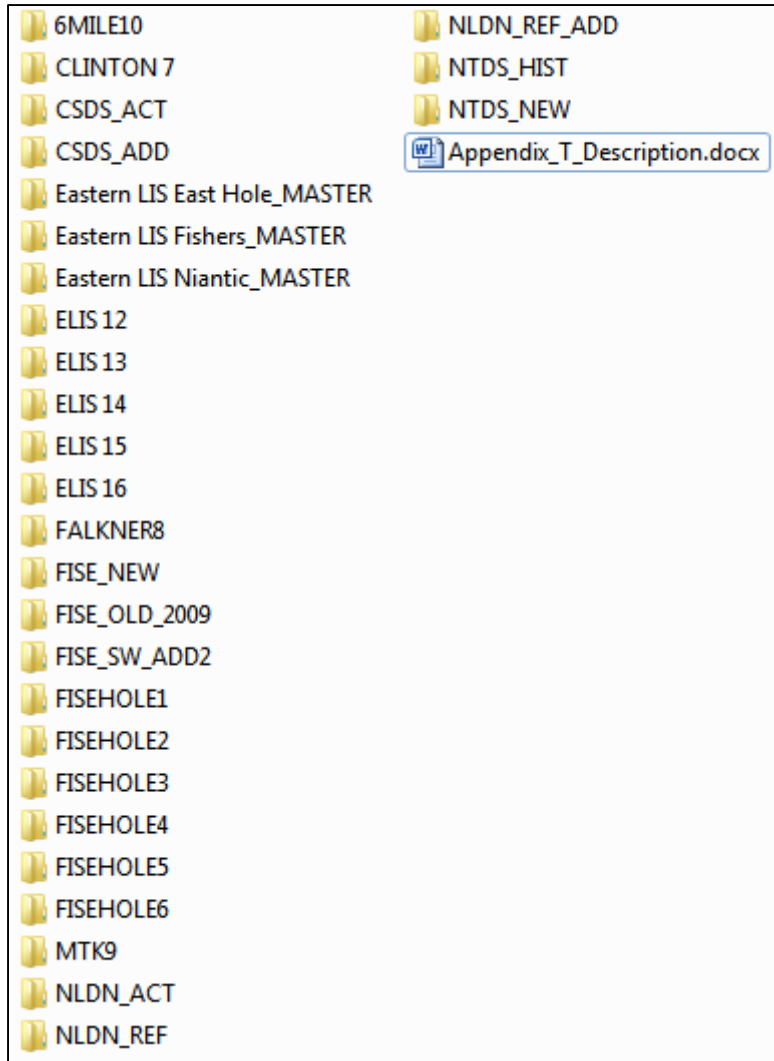


Figure T1. Directory structure of Appendix T.

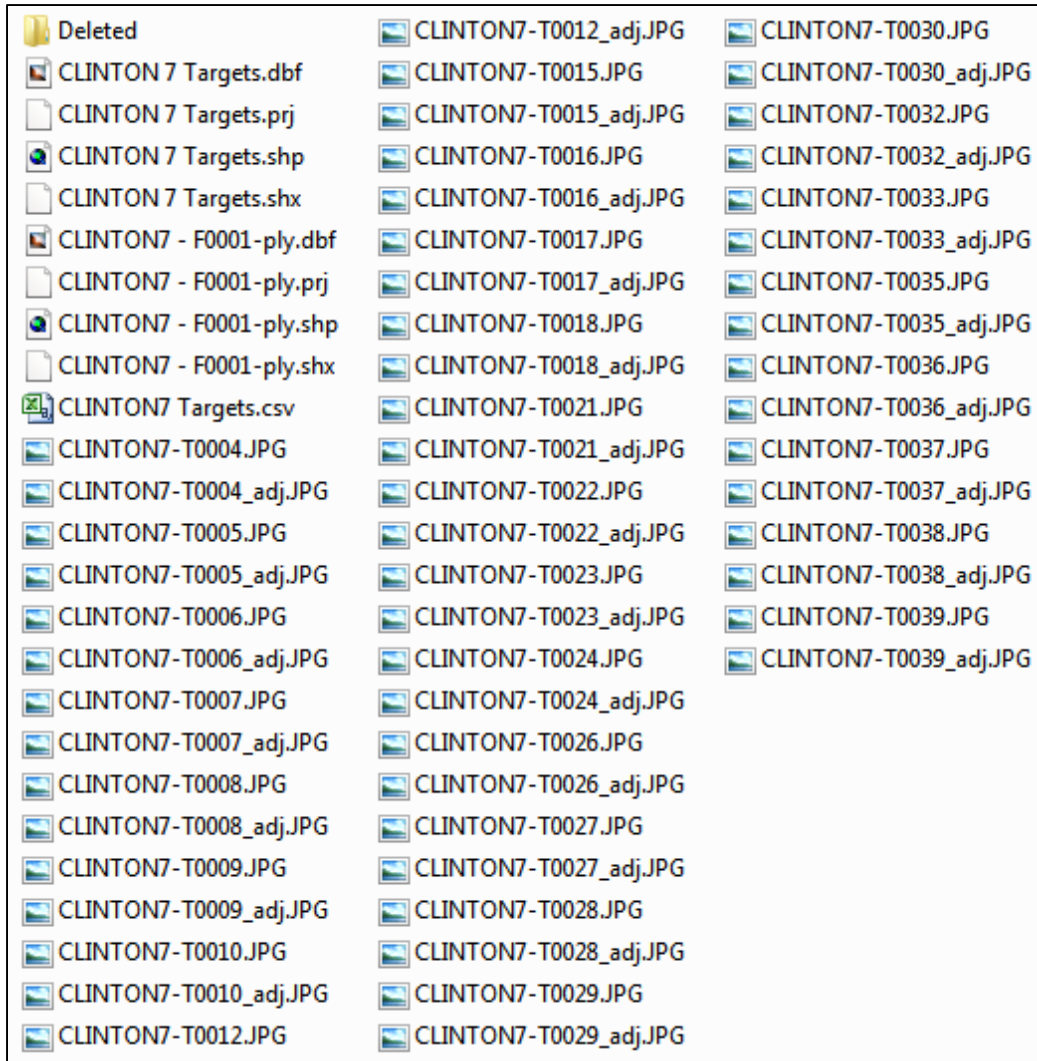


Figure T2. Example of the file structure for each site.

APPENDIX Z

Z.1 DESCRIPTION

Appendix Z is a compilation of the electronic data deliverables associated with the georeferenced seafloor classification images for the 28 sites in ELIS. The classification images are provided in GEOTIFF format; these files and their supporting data files are organized by survey site and provided in self-titled file folder directories. The supporting data files are used for display purposes by ESRI ArcGIS software.

GEOTIFF images (.tif extension) are included for each project location. For most sites there is a single GEOTIFF image and the associated supporting files. However, some project locations had their classification split into several images due to SonarWiz 5 functionality. For example, project location Eastern_LIS_Niantic_Master contained 825 side-scan sonar files and required twelve (12) images to classify the entire survey area. For project locations that required more than one GEOTIFF image, the text “_XofY” was appended to filenames, where Y is the total number of images required and X is between 1 and Y.

The file folder structure for Appendix Z and the subdirectories is depicted in Figure Z1. The file structure of each site folder is depicted in Figure Z2. All data files are included with the report summary report on the EPA R1 portable hard drive.

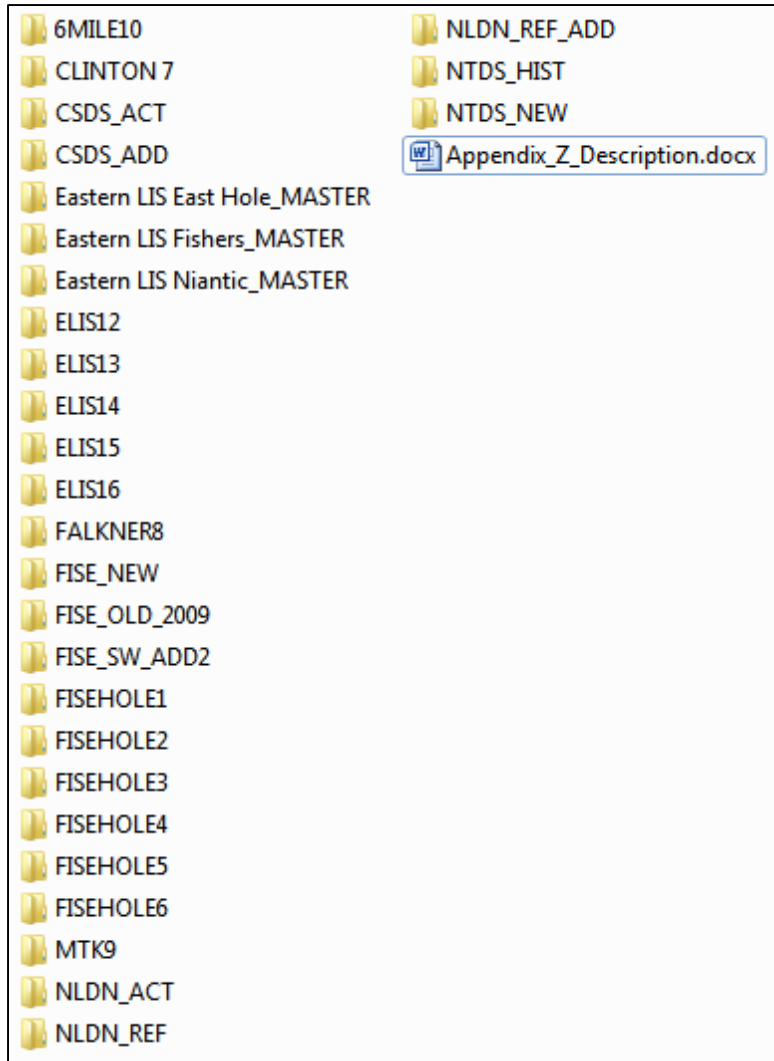


Figure Z1. Directory structure of Appendix Z.

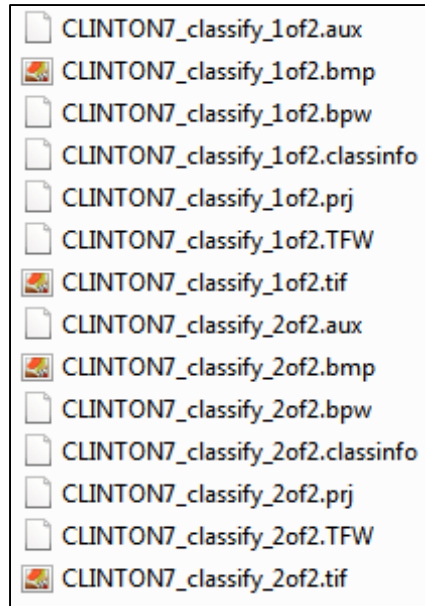


Figure Z2. Example of the file structure for each site.