PORTSMOUTH HARBOR AND PISCATAQUA RIVER
NEW HAMPSHIRE AND MAINE
NAVIGATION IMPROVEMENT STUDY
FEASIBILITY REPORT

APPENDIX N

NEARSHORE PLACEMENT SITE INVESTIGATIONS
WELLS BEACH AND
MERRIMACK RIVER AREA BEACHES

Field Survey in Support of
Nearshore Placement Site Characterization

Final

Portsmouth Harbor and Piscataqua River Navigation Improvement Project Nearshore Placement Site Characterization

US Army Corps of Engineers ®
New England District

August 2013

FIELD SURVEY

IN SUPPORT OF

PORTSMOUTH HARBOR AND PISCATAQUA RIVER

NAVIGATION IMPROVEMENT PROJECT

NEARSHORE PLACEMENT SITE CHARACTERIZATION

WELLS, MAINE
NEWBURY AND NEWBURYPORT, MASSACHUSETTS

August, 2013

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New England District
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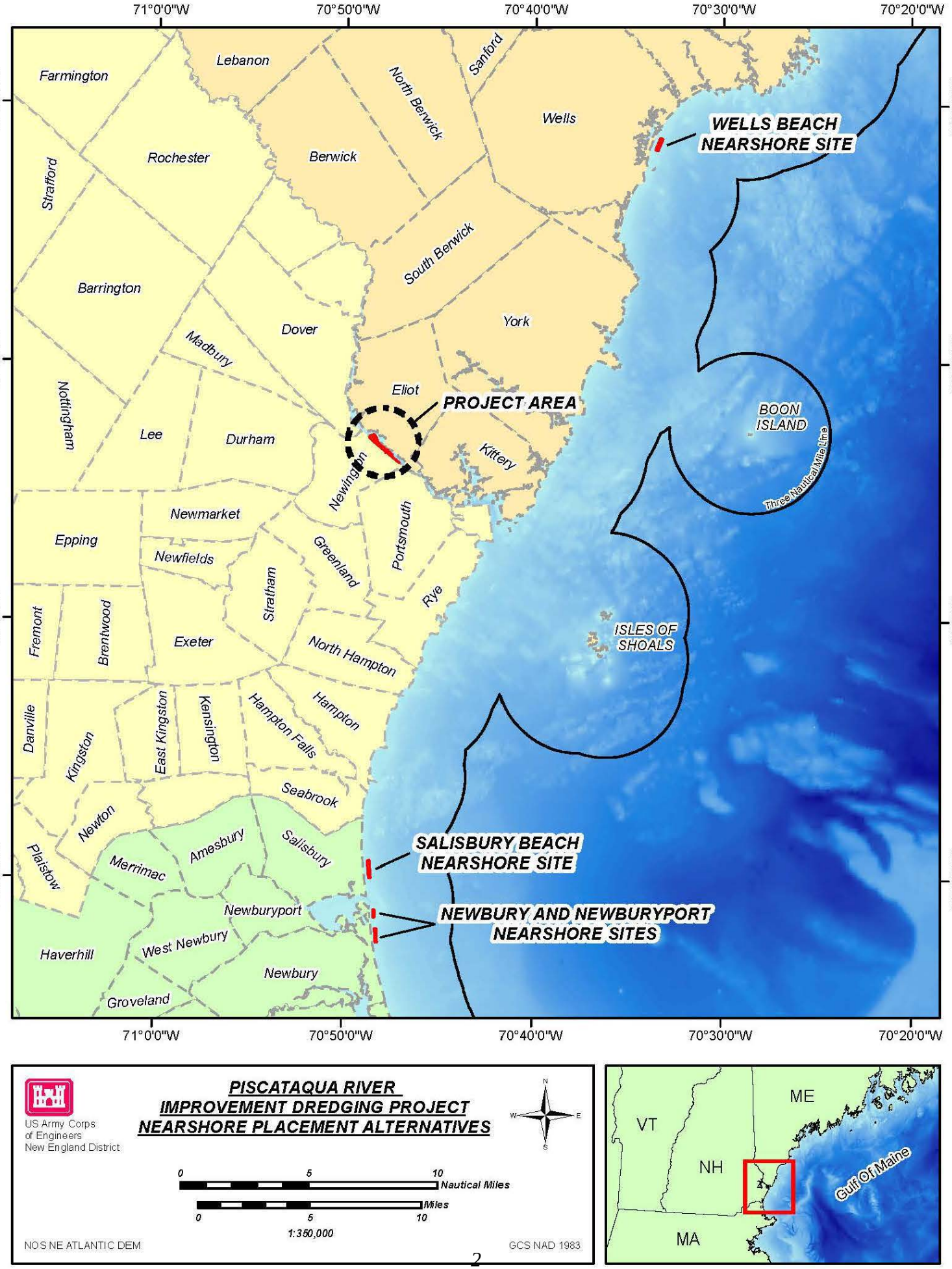
1.0 INTRODUCTION

The existing federal navigation project (FNP) in the Piscataqua River consists of a 400 foot wide, 35 foot deep (MLLW) channel extending 8.8 miles upstream from the entrance in Portsmouth Harbor; a 850 foot wide, 35 foot deep (MLLW) turning basin located just upstream of Boiling Rock; and a 950 foot wide, 35 foot deep (MLLW) turning basing at the upstream end of the federal channel. The current width of the uppermost turning basin poses safety concerns for liquid petroleum gas (LPG) cryo-tankers and other large bulk cargo vessels which rely on this area to access terminals in the upstream portions of the river.

The New England District (NAE) of the Army Corps of Engineers (USACE) is currently proposing to widen the upper turning basin to a width of 1,200 feet at the current 35-foot depth. This would involve mechanically dredging approximately 720,000 cubic yards of sand and gravel in addition to the blasting and removal of 16,000 cubic yards of bedrock. NAE coordinated with communities along the Maine, Massachusetts, and New Hampshire coastlines regarding beneficial use opportunities for the proposed dredged material and four towns have expressed an interest in placing the sandy material in nearshore areas for the purpose of beach nourishment. It is anticipated that 360,000 of the 720,000 cubic yards of dredged material will be placed off of Wells Beach in Wells, Maine, and the remaining 360,000 will be divided between beaches in Newbury, Newburyport, and Salisbury, Massachusetts. An overview of the proposed nearshore placement sites in relation to the project area is presented as Figure 1.

The objectives of the field effort described in this report were to collect data to characterize the proposed nearshore placement sites and to help identify any resources of concern that might be impacted by the proposed activity. In order to accomplish these objectives surficial sediment samples were collected at each site and analyzed for grain size and benthic infaunal community assemblage. In addition, towed video and hydroacoustic survey transects were completed at each site in order to document water depth, presence of submerged aquatic vegetation (SAV) (defined in this report as any rooted vascular plant or attached macroalgae), and general bottom conditions. This report describes the field methods employed, site conditions encountered, and the results of analysis.

FIGURE 1


71°0'0"W
70°50'0"W
70°40'0"W
70°30'0"W
70°20'0"W
43°20'0"N
43°10'0"N
43°0'0"N
42°50'0"N
Farmington
Lebanon
North Berwick
Sanford
Wells
Rochester
Berwick
Strafford
South Berwick
Barrington
Dover
York
Madbury
Eliot
Nottingham
Lee
Durham
Kittery
Newington
Newmarket
Portsmouth
Epping
Newfields
Greenland
Stratham
Rye
Fremont
Brentwood
Exeter
North Hampton
Danville
Kingston
East Kingston
Kensington
Hampton Falls
Hampton
Seabrook
Newton
Plaistow
Merrimac
Amesbury
Salisbury
Newburyport
Haverhill
West Newbury
Newbury
Groveland
WELLS BEACH NEARSHORE SITE
PROJECT AREA
BOON ISLAND
Three Nautical Mile Line
ISLES OF SHOALS
SALISBURY BEACH NEARSHORE SITE
NEWBURY AND NEWBURYPORT NEARSHORE SITES
US Army Corps of Engineers New England District
PISCATAQUA RIVER IMPROVEMENT DREDGING PROJECT NEARSHORE PLACEMENT ALTERNATIVES
N
W
E
S
0
5
10
Nautical Miles
Miles
1:350,000
NOS NE ATLANTIC DEM
GCS NAD 1983
VT
ME
NH
MA
Gulf Of Maine

2.0 MATERIALS AND METHODS

Video and acoustic surveys as well as sediment sampling efforts took place at the proposed Wells Beach nearshore placement site on July 30, 2013. Sediment sampling at the Newbury, Newburyport, and Salisbury sites took place on July 31. Video and acoustic surveys at these sites were scheduled to be carried out on August 1, but were postponed until August 15 due to rough sea state. Work was carried out onboard the R/V NOMAD, a 25 foot SBI defender. Positioning was achieved using a WAAS enabled Lowrance HDS-10 sonar/chart plotter with external LGC-4000 GPS receiver antenna, and verified with a Trimble GeoXM Differential Global Positioning System (DGPS) with an accuracy of 3 meters or less.

Video and hydroacoustic survey transects were pre-planned in ArcGIS 10 and transferred to the Lowrance chartplotter for navigation in the field. Video transects were laid out parallel to the shoreline for ease of towing the camera sled and to obtain the best picture quality by minimizing changes in bottom depth. Hydroacoustic transects were laid out perpendicular to the shoreline to better document changes in depth and the inshore/offshore edges of SAV beds. SAV species of concern were not identified in the vicinity of any of the proposed placement sites by state resource agencies, so a wider transect spacing of 500 feet was selected to provide a generalized overview of SAV coverage to supplement the video survey data. The planned survey transects for each site are presented are presented as Figures 2-5.

Video footage was collected using a Sea Viewer® Sea-Drop 950 Underwater Video Camera and recorded to a portable DVR system connected to a Sea-Trak™ GPS video overlay to provide date, time, position, speed, and heading data from the vessel's navigation system. The Camera was mounted in a custom made benthic sled which maintained the camera height and angle in relation to the bottom. The sled was towed along the seafloor approximately 50 feet off the stern of the vessel at a speed between 2 and 3 knots. Transects were run in opposite directions to minimize non-recording time. All video footage was viewed in real time on a dash mounted LCD monitor.

Hydroacoustic data was collected using a Lowrance LSS-1 Structure Scan System with an in-line 200/800 kHz transducer array. The transducer array was mounted to the stern of the boat along the centerline. Sonar data was viewed in real time and recorded to a memory card using the Lowrance HDS-10. The boat operator navigated all transects at a speed of approximately 5 knots while recording data. Transects were run in opposite directions to minimize non-recording time.

Sediment grabs for grain size and benthic community analysis were collected from five pre-planned locations at each site (Figures 2-5) using a $0.04m^2$ Van Veen grab which was deployed and retrieved with a davit mounted on the starboard side of the vessel. Sediment collected for grain size analysis was transferred to sample containers and stored at ambient temperature. Sediment collected for benthic community analysis was washed through a 0.5 mm sieve, treated with the biological stain rose bengal, and preserved in 10% buffered formalin. All samples were delivered to the NAE environmental laboratory

in Concord, MA at the conclusion of field activities. Sediment collection data is summarized in Table 1.

Table 1: Summary of Sediment Collection Data

Station ID	Lat (NAD 83)	Long (NAD 83)	Date	Time (EDT)	Measured Water Depth (FT)
Wells-A	43.305541	-70.559624	7/30/2013	16:30	-21
Wells-B	43.311916	-70.556157	7/30/2013	17:11	-23
Wells-C	43.308522	-70.557182	7/30/2013	16:44	-24
Wells-D	43.305135	-70.558227	7/30/2013	16:13	-23
Wells-E	43.311501	-70.554730	7/30/2013	17:37	-26
Salisbury-A	42.834346	-70.809975	7/31/2013	11:31	-13
Salisbury-B	42.843930	-70.810784	7/31/2013	11:54	-16
Salisbury-C	42.839165	-70.809785	7/31/2013	11:39	-18
Salisbury-D	42.834406	-70.808646	7/31/2013	11:22	-18
Salisbury-E	42.843990	-70.809476	7/31/2013	11:47	-22
Newburyport-A	42.808835	-70.805989	7/31/2013	12:37	-13
Newburyport -B	42.812375	-70.805966	7/31/2013	12:14	-14
Newburyport -C	42.810657	-70.805499	7/31/2013	12:20	-15
Newburyport -D	42.808842	-70.805155	7/31/2013	12:34	-14
Newburyport -E	42.812370	-70.805149	7/31/2013	12:08	-16
Newbury-A	42.792570	-70.803665	7/31/2013	13:14	-12
Newbury -B	42.800016	-70.804189	7/31/2013	12:50	-7
Newbury -C	42.796320	-70.803457	7/31/2013	12:57	-14
Newbury -D	42.792615	-70.802901	7/31/2013	13:09	-17
Newbury -E	42.800044	-70.803313	7/31/2013	12:46	-10

FIGURE 2

US Army Corps of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SURVEY OVERVIEW
WELLS, ME

0 1,000 2,000 3,000 Feet

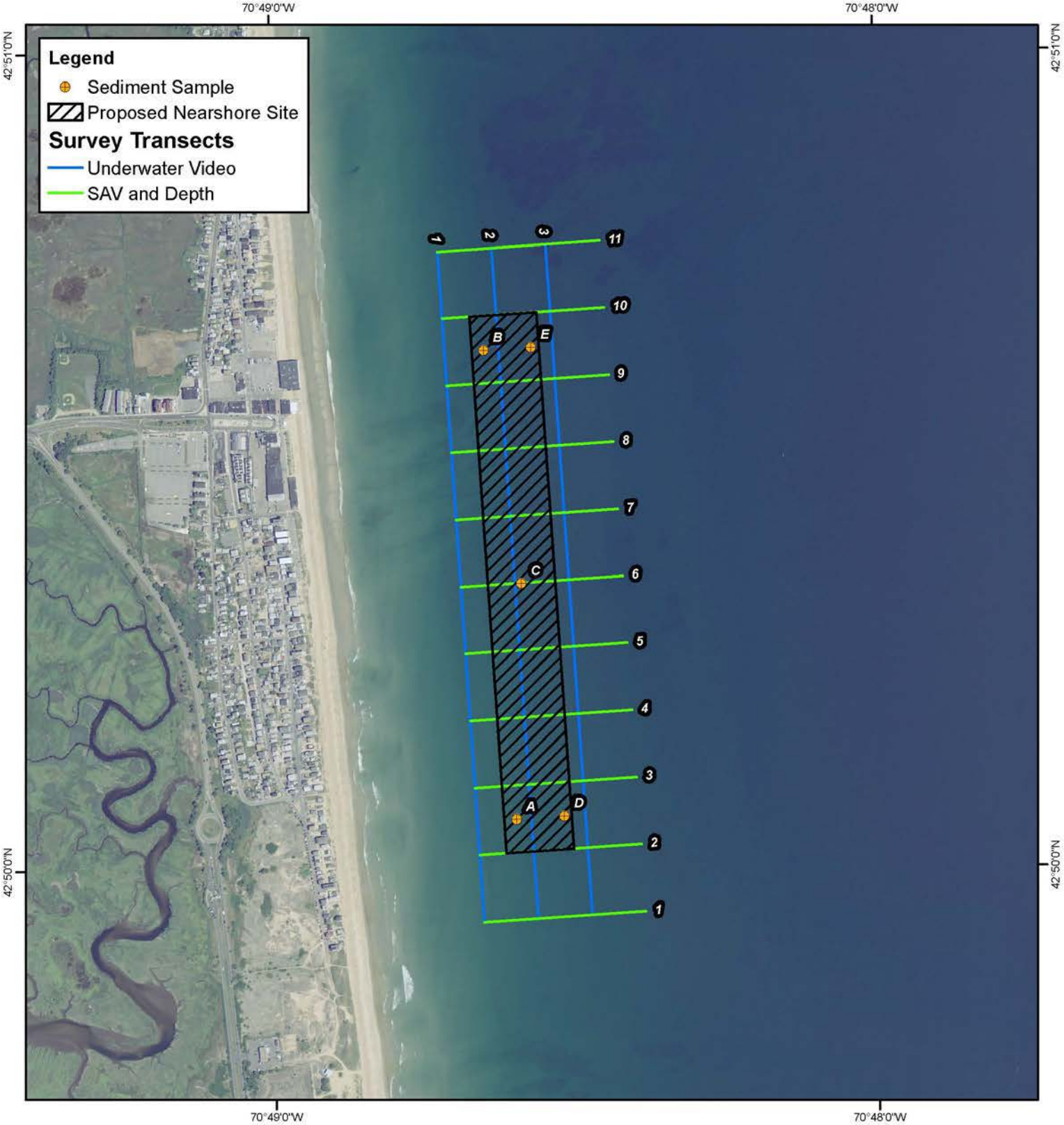
0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2011 NAIP AERIAL IMAGERY

GCS NAD 1983

FIGURE 3



US Army Corps
of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SURVEY OVERVIEW
SALISBURY, MA

N
W
E
S

0 1,000 2,000 3,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2012 NAIP Aerial Imagery

WGS NAD 1983

FIGURE 4

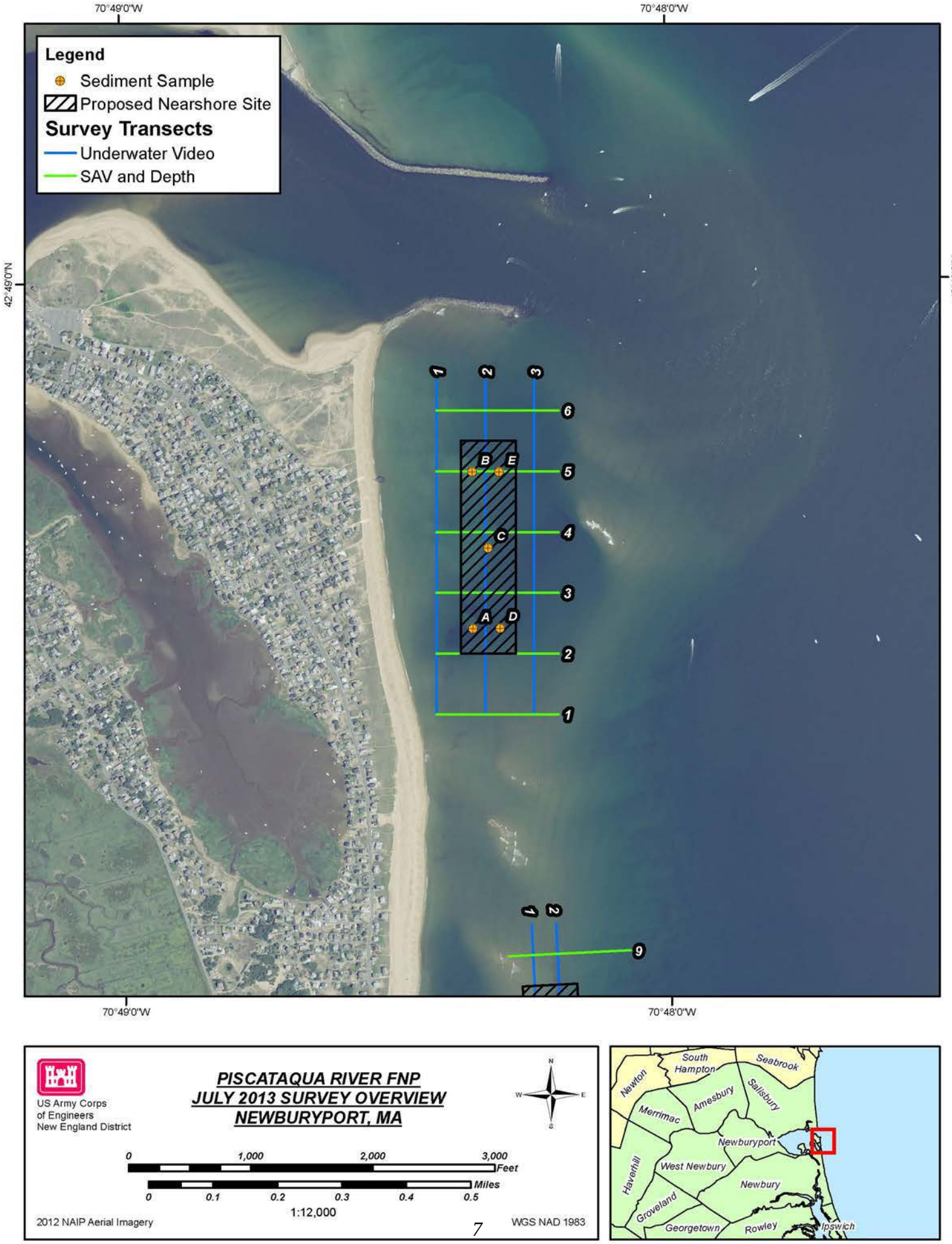

70°49'0"W
70°48'0"W
42°49'0"N
Legend
Sediment Sample
Proposed Nearshore Site
Survey Transects
Underwater Video
SAV and Depth
1
2
3
6
5
4
3
2
1
9
A
B
C
D
E
US Army Corps of Engineers New England District
PISCATAQUA RIVER FNP
JULY 2013 SURVEY OVERVIEW
NEWBURYPORT, MA
N
W
E
S
0
1,000
2,000
3,000
Feet
Miles
0
0.1
0.2
0.3
0.4
0.5
1:12,000
2012 NAIP Aerial Imagery
WGS NAD 1983
South Hampton
Seabrook
Newton
Salisbury
Amesbury
Merrimac
Newburyport
West Newbury
Haverhill
Newbury
Groveland
Georgetown
Rowley
Ipswich

FIGURE 5

US Army Corps of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SURVEY OVERVIEW
NEWBURY, MA

0 1,000 2,000 3,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2012 NAIP Aerial Imagery

WGS NAD 1983

3.0 DATA PROCESSING

Video files were reviewed using CyberLink PowerDirector video editing software. Representative screen captures were created at user selected intervals along each transect to show general bottom conditions. An image library containing all screen captures organized by time and transect along with a descriptive caption is presented as appendix A of this report.

The Navico .sl2 files containing the hydroacoustic survey transect data were processed using the SAVEWS Jr. (Submersed Aquatic Vegetation Early Warning System) software package developed by the US Army Engineer Research and Development Center (ERDC). This software uses an algorithm augmented by user defined parameters to track the bottom depth and the presence of SAV while providing an estimate of canopy height and vegetation percent coverage. Outputs include an ASCII file with output variables and position referenced data and a graphic consisting of the classified output (bottom depth and canopy top) superimposed on the colorized echogram along with aligned data plots of canopy height and percent coverage for each transect. The SAVEWS Jr. post-processing program FINALIZE was then used to combine transect data files, make depth corrections, and coordinate projection transformations. Tide correction data for FINALIZE was obtained from the nearby Wells and Merrimack River tide stations. The SAVEWS Jr. configuration file and the graphic output for each transect are presented in Appendix A.

The ASCII files containing the processed and compiled SAVEWS Jr. output for each survey area were imported into ArcGIS as point shapefiles and interpolated to raster files representing the SAV percent cover data along each transect. This data was compared with video transect footage to validate the SAVEWS Jr. output and delineate areas of SAV coverage. In addition, the tide corrected depth data contained in each point shapefile was interpolated as a raster file and used to generate depth contours for the extent of each survey area.

Grain size analysis was completed by the NAE environmental laboratory. Samples were prepared according to the guidance in ASTM D421-85 (Re-approved 2002), Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants, and analyzed according to ASTM D422-63 (Re-approved 2002), Standard Test Method for Particle-Size Analysis of Soils using sieve nos. 4, 10, 40, 100, 200. There were no deviations from the established laboratory testing protocols.

Benthic community analysis was also completed by the NAE environmental laboratory. All samples were re-washed through a 0.5 mm sieve, sorted into major taxonomic groups, and identified to lowest identifiable taxon by qualified marine benthic taxonomists. Samples were stored in 70% ethyl alcohol while awaiting sorting and for archiving after identification.

4.0 RESULTS AND DISCUSSION

4.1 Wells, ME Nearshore Area

Depths within the Wells, ME survey area ranged from -9 to -24 feet MLLW (Figure 6). Depths in the proposed nearshore placement site were between -12 and -21 feet MLLW. Water conditions and sea state during at the time of survey resulted in decreased visibility in shallower portions of the video survey, but sufficient footage was obtained to characterize the bottom conditions along all video survey transects. In general the bottom was very uniform, consisting of small scale sand waves with scattered macroalgae wrack. Multiple lobsters were observed along transects 2, 3, and 4 with increasing frequency in the offshore portion of the survey area.

Because sonar data was recorded during both the hydroacoustic and video survey transects, the coverage of hydroacoustic data collected from the Wells survey area was sufficient to create an interpolated grid representing SAVEWS vegetation percent cover for the entire survey area (Figure 7). Processed SAVEWS percent cover data correlated well with the video survey and aerial imagery of the area. Vegetation detected by SAVEWS was found to be either clumps of drift algae or *Codium fragile*. Eelgrass (*Zostera marina*) was not observed within any portion of the survey area.

Grain size analysis of sediments from the five stations within the proposed nearshore placement site indicates that the entire site is composed of poorly sorted fine sand. The results of grain size analysis are summarized in Table 2. Grain size curves and laboratory data sheets can be found in the analytical report presented as Appendix B.

The benthic community within the nearshore site off Wells was dominated by burrowing amphipods (*Haustorius canadensis*). A wide range of polychaete species were also present. Juvenile razor clams (*Ensis directus*) and juvenile surf clams (*Spisula solidissima*) were abundant throughout the site. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data are presented in Table 3.

Table 2: Wells, ME Grain Size Results

Sample ID	%Cobble	%Gravel		%Sand			%Fines
		Coarse	Fine	Coarse	Medium	Fine	
Wells-A	0.0	0.0	0.0	0.1	1.0	98.9	0.0
Wells-B	0.0	0.0	0.2	0.4	1.4	98.1	0.0
Wells-C	0.0	0.0	0.1	0.0	0.6	99.3	0.0
Wells-D	0.0	0.0	0.0	0.1	1.2	98.7	0.0
Wells-E	0.0	0.0	0.5	0.2	0.5	98.8	0.0

Table 3: Wells, ME Benthic Community Data
(Numbers of individuals per 0.04 m^2)

Species	Wells-A	Wells- B	Wells- C	Wells- D	Wells- E
ANNELIDA					
POLYCHAETA					
Capitella capitata	-	-	1	-	7
Drilonereis spp.	-	-	-	-	1
Exogone dispar	-	-	-	-	1
Nephtys picta	3	-	-	-	1
Sthenelais sp.	-	-	-	1	-
Paraonis fulgens	1	-	2	1	4
Sabaco elongatus	-	-	-	-	2
Spio setosa	-	-	-	-	1
Streblospio benedicti	30	1	12	11	18
ANNELIDA					
CLITELLATA					
Unidentifed Oligochaete	1	-	-	-	-
NEMATODA					
Unidentified Nematoda	3	-	-	-	-
MOLLUSCA					
BIVALVIA					
Ensis directus	24	4	5	9	17
Spisula solidissima	201	1	8	19	9
ARTHROPODA					
MALACOSTRACA					
Chiridotea spp.	3	1	6	5	11
Eudorella spp.	-	1	4	1	2
Gammaridae spp.	-	-	2	-	1
Haustorius canadensis	242	79	569	379	590
Idunella spp.	-	-	-	-	1
ECHINODERMATA					
ECHINOIDEA					
Echinarachnius parma	-	-	1	-	1
TOTALS					
# of Species	**9**	**6**	**10**	**8**	**16**
# of Individuals	**508**	**87**	**610**	**426**	**667**

FIGURE 6

US Army Corps
of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SAVEWS SURVEY DEPTHS
WELLS, ME

0 1,000 2,000 3,000 Feet

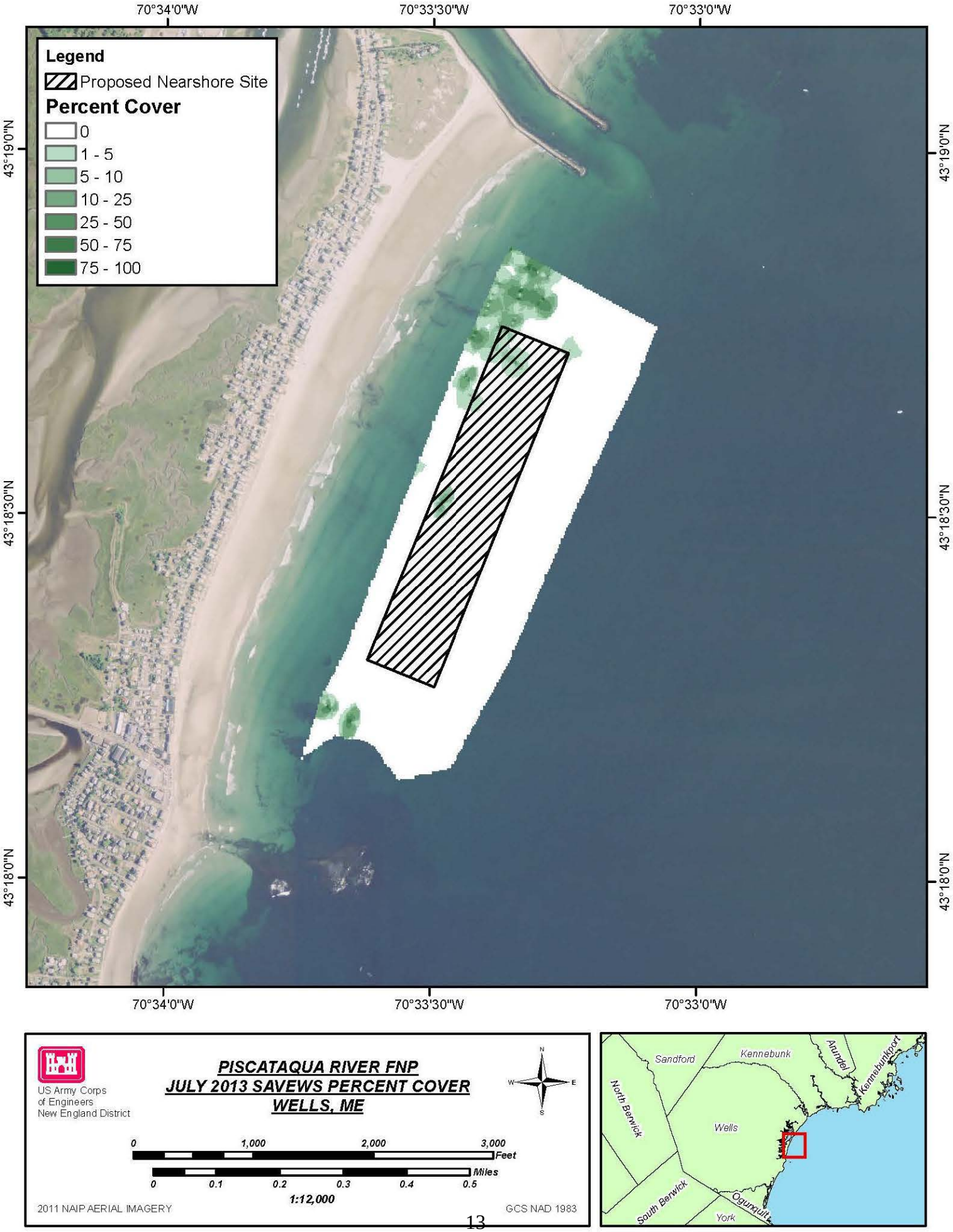
0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2011 NAIP AERIAL IMAGERY

GCS NAD 1983

FIGURE 7


70°34'0"W
70°33'30"W
70°33'0"W
43°19'0"N
43°18'30"N
43°18'0"N
Legend
Proposed Nearshore Site
Percent Cover
0
1 - 5
5 - 10
10 - 25
25 - 50
50 - 75
75 - 100
US Army Corps of Engineers New England District
PISCATAQUA RIVER FNP
JULY 2013 SAVEWS PERCENT COVER
WELLS, ME
0 1,000 2,000 3,000 Feet
0 0.1 0.2 0.3 0.4 0.5 Miles
1:12,000
2011 NAIP AERIAL IMAGERY
GCS NAD 1983
Sandford
Kennebunk
Arundel
Kennebunkport
North Berwick
Wells
South Berwick
Ogunquit
York

4.2 Salisbury, MA Nearshore Area

Depths within the Salisbury, MA survey area ranged from -9 to -27 feet MLLW (Figure 8). Depths in the proposed nearshore placement site were between -10 and -22 feet MLLW. Three video transects were successfully completed within the survey area, but a high concentration of lobster traps in the northern portion of the site resulted in the early termination of the outermost transect. Sufficient footage was obtained to characterize the bottom along all video survey transects. Bottom conditions were uniform, consisting of small scale sand waves with a high concentration of drift algae in the northern and outermost portions of the survey area. Several lobsters were observed along the central portion of transect 2.

The spacing of hydroacoustic survey transects was too wide to create a grid representing vegetation percent cover for the entire Salisbury survey area, but the processed SAVEWS data combined with the video survey data and interpretation of aerial photography enabled an adequate characterization of the site.

Grain size analysis of sediments from the five stations within the proposed nearshore placement site indicates that the entire site is composed of poorly sorted medium to fine sand. The results of grain size analysis are summarized in Table 4. Grain size curves and laboratory data sheets can be found in the analytical report presented as Appendix B.

The benthic community within the nearshore site off Salisbury was dominated by burrowing amphipods (*Haustorius canadensis*). A wide range of polychaete species (typically syllids and spionids) were also present. Razor clams (*Ensis directus*) were present in low numbers, while juvenile surf clams (*Spisula solidissima*) were abundant. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data are presented in Table 5.

Table 4: Salisbury, MA Grain Size Results

Sample ID	%Cobble	%Gravel		%Sand			%Fines
		Coarse	Fine	Coarse	Medium	Fine	
Salisbury-A	0.0	0.0	0.0	0.1	73.2	26.7	0.0
Salisbury-B	0.0	0.0	0.0	0.0	2.7	97.3	0.0
Salisbury-C	0.0	0.0	0.0	0.0	74.9	25.0	0.0
Salisbury-D	0.0	0.0	0.0	0.1	83.1	16.8	0.0
Salisbury-E	0.0	0.0	0.0	0.0	1.4	98.5	0.0

Table 5: Salisbury, MA Benthic Community Data
(Numbers of individuals per 0.04 m^2)

Species	Salisbury A	Salisbury B	Salisbury C	Salisbury D	Salisbury E
ANNELIDA					
POLYCHAETA					
Arabella iricolor	-	-	4	2	-
Brania spp.	-	-	16	7	-
Capitella capitata	-	-	2	1	-
Nephtys caeca	-	6	-	-	-
Nephtys picta	-	4	6	2	5
Sabaco elongatus	-	-	-	-	2
Schistomeringos rudolphii	-	4	-	-	-
Scolelepis squamata	1	3	-	1	-
Streblospio benedicti	-	7	-	-	24
NEMATODA					
Unidentifed Nematoda	-	2	-	-	-
MOLLUSCA					
BIVALVIA					
Ensis directus	-	-	-	-	9
Spisula solidissima	1	17	7	9	188
GASTROPODA					
Ilyanassa trivittata	-	1	1	-	3
ARTHROPODA					
MALACOSTRACA					
Chiridotea spp.	-	4	-	-	15
Cyathura polita	-	-	1	-	-
Oxyurostylis spp.	-	-	-	-	4
Gammaridae spp.	-	2	-	-	2
Haustorius canadensis	15	235	314	102	557
Leptocheirus pinguis	-	-	-	-	4
ECHINODERMATA					
ECHINOIDEA					
Echinarachnius parma	-	-	1	-	1
Strongylocentrotus droebachiensis	-	-	1	-	-
TOTALS					
# of Species	**3**	**11**	**10**	**7**	**12**
# of Individuals	**17**	**285**	**353**	**124**	**814**

FIGURE 8

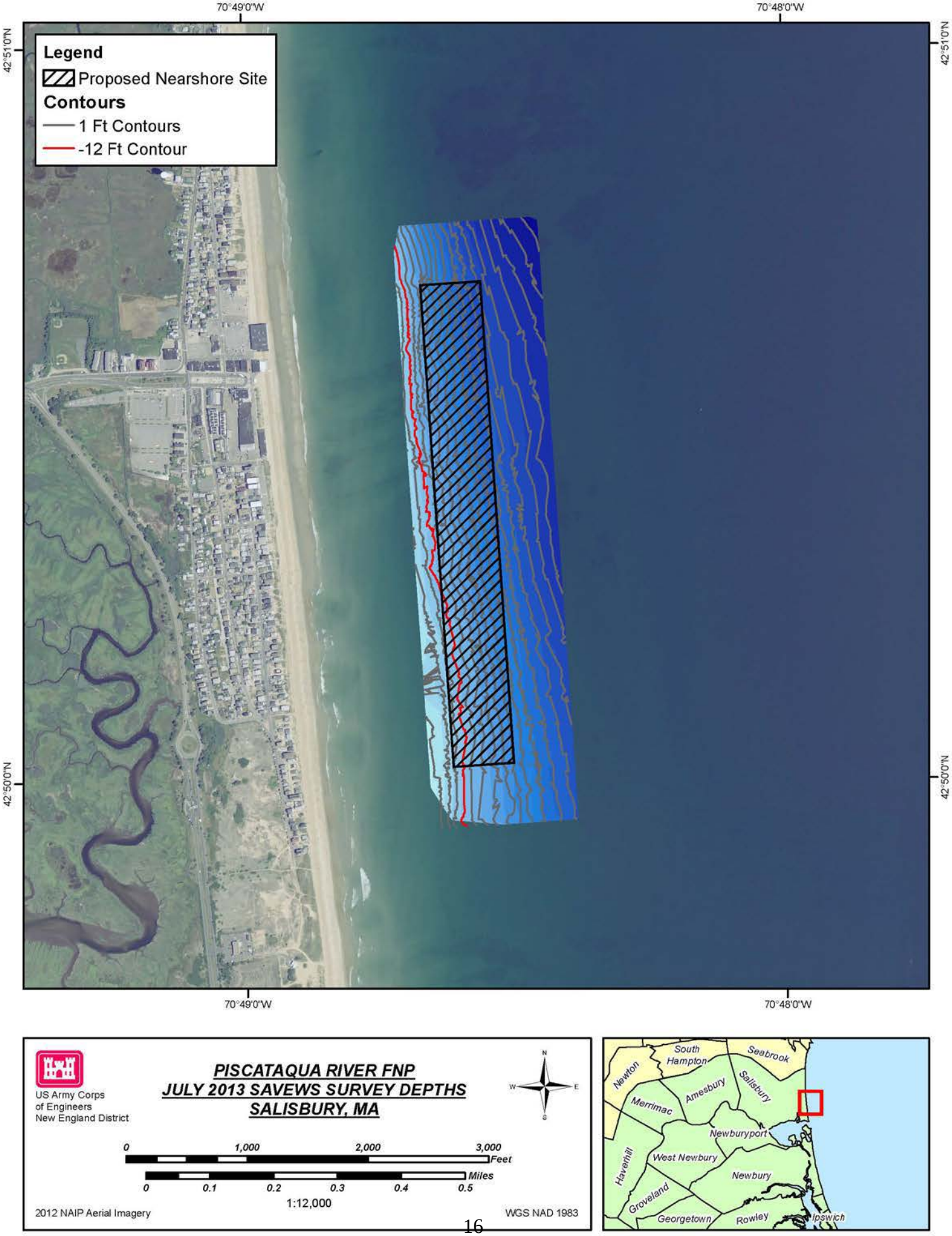

70°49'0"W
70°48'0"W
42°51'0"N
42°50'0"N
Legend
Proposed Nearshore Site
Contours
1 Ft Contours
-12 Ft Contour
US Army Corps of Engineers New England District
PISCATAQUA RIVER FNP
JULY 2013 SAVEWS SURVEY DEPTHS
SALISBURY, MA
0 1,000 2,000 3,000 Feet
0 0.1 0.2 0.3 0.4 0.5 Miles
1:12,000
2012 NAIP Aerial Imagery
WGS NAD 1983
South Hampton
Seabrook
Newton
Salisbury
Amesbury
Merrimac
Newburyport
West Newbury
Haverhill
Newbury
Groveland
Georgetown
Rowley
Ipswich

FIGURE 9

Legend
Proposed Nearshore Site
Percent Cover
0
1 - 5
5 - 10
10 - 25
25 - 50
50 - 75
75 - 100
US Army Corps
of Engineers
New England District
PISCATAQUA RIVER FNP
JULY 2013 SAVEWS PERCENT COVER
SALISBURY, MA
N
W
E
S
0
1,000
2,000
3,000
Feet
Miles
0
0.1
0.2
0.3
0.4
0.5
1:12,000
2012 NAIP Aerial Imagery
WGS NAD 1983
South Hampton
Seabrook
Newton
Salisbury
Amesbury
Merrimac
Newburyport
West Newbury
Haverhill
Newbury
Groveland
Georgetown
Rowley
Ipswich

4.3 Newburyport, MA Nearshore Area

Depths within the Newburyport, MA survey area ranged from -3 to -18 feet MLLW (Figure 10). The proposed nearshore placement site is situated over a longshore trough with depths between -10 and -27 feet MLLW. Three video transects were successfully completed within the survey area. The camera was towed in the water column independently of the camera sled because the sled repeatedly rolled over when crossing larger sand waves. Sufficient footage was obtained to characterize the bottom along all video survey transects. Bottom conditions were uniform, consisting of small to medium sand waves with scattered surf clam shell.

The spacing of hydroacoustic survey transects was too wide to create a grid representing vegetation percent cover for the entire Newburyport survey area, but the processed SAVEWS data combined with the video survey data and interpretation of aerial photography enabled an adequate characterization of the site. Processed SAVEWS percent cover data along each transect (Figure 11) correlated well with the video survey and aerial imagery of the area. Vegetation detected by SAVEWS was found to be clumps of drift algae in contact with the bottom. Eelgrass was not observed within any portion of the survey area.

Grain size analysis of sediments from the five stations within the proposed nearshore placement site indicates that the entire site is composed of poorly sorted medium to fine sand. The results of grain size analysis are summarized in Table 6. Grain size curves and laboratory data sheets can be found in the analytical report presented as Appendix B.

The benthic community within the nearshore site off Newburyport was dominated by syllid polychaetes (*Brania* sp. and *Exogone dispar*) and various species of burrowing amphipods (e.g. *Haustorius canadensis*). Razor clams (*Ensis directus*) and surf clams (*Spisula solidissima*) were also present in low numbers. All clams were juvenile. The individuals found at this site represent a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data are presented in Table 7.

Table 6: Newburyport, MA Grain Size Results

Sample ID	%Cobble	%Gravel		%Sand			%Fines
		Coarse	Fine	Coarse	Medium	Fine	
Newburyport-A	0.0	0.0	1.6	8.6	85.4	4.4	0.0
Newburyport -B	0.0	0.0	0.0	0.9	98.1	1.0	0.0
Newburyport -C	0.0	0.0	0.2	3.2	85.9	10.7	0.0
Newburyport -D	0.0	0.0	5.1	4.3	36.2	54.5	0.0
Newburyport -E	0.0	0.0	0.8	2.2	74.1	22.9	0.0

Table 7: Newburyport, MA Benthic Community Data
(Numbers of individuals per 0.04 m^2)

Species	Newburyport A	Newburyport B	Newburyport C	Newburyport D	Newburyport E
ANNELIDA					
POLYCHAETA					
Brania spp.	450	38	-	14	464
Capitella capitata	70	-	-	130	38
Exogone dispar	-	-	-	388	-
Nephtys picta	-	-	-	2	-
Polydora spp.	-	-	-	-	8
Sabaco elongatus	-	-	-	1	-
Scolelepis squamata	3	6	-	-	5
Streblospio benedicti	-	1	-	10	-
CLITELLATA					
Unidentified Tubificidae	-	-	-	-	12
NEMATODA					
Unidentified Nematoda	60	3	-	13	27
MOLLUSCA					
BIVALVIA					
Ensis directus	-	1	-	-	1
Mytilus edulis	-	-	-	-	1
Spisula solidissima	-	3	1	1	1
GASTROPODA					
Euspira triseriata	-	1	-	-	-
ARTHROPODA					
MALACOSTRACA					
Politolana sp.	-	-	-	1	-
Cancer borealis	-	-	-	1	-
Chiridotea spp.	1	4	-	7	14
Limnoria lignorum	-	-	-	-	1
Unidentified Lysianassidae	-	226	-	-	-
Haustorius canadensis	1	10	-	-	3
TOTALS					
# of Species	**6**	**10**	**1**	**11**	**12**
# of Individuals	**585**	**293**	**1**	**568**	**575**

FIGURE 10

US Army Corps
of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SAVEWS SURVEY DEPTHS
NEWBURYPORT, MA

0 1,000 2,000 3,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2012 NAIP Aerial Imagery

WGS NAD 1983

FIGURE 11

70°49'0"W
70°48'0"W
42°49'0"N
Legend
Proposed Nearshore Site
Percent Cover
0
1 - 5
5 - 10
10 - 25
25 - 50
50 - 75
75 - 100
US Army Corps
of Engineers
New England District
PISCATAQUA RIVER FNP
JULY 2013 SAVEWS PERCENT COVER
NEWBURYPORT, MA
0
1,000
2,000
3,000
Feet
Miles
0
0.1
0.2
0.3
0.4
0.5
1:12,000
2012 NAIP Aerial Imagery
WGS NAD 1983
South Hampton
Seabrook
Newton
Salisbury
Amesbury
Merrimac
Newburyport
West Newbury
Haverhill
Newbury
Groveland
Georgetown
Rowley
Ipswich

4.4 Newbury, MA Nearshore Area

Depths within the Newbury, MA survey area ranged from -5 to -26 feet MLLW (Figure 12). The proposed nearshore placement site is situated over a longshore trough with depths between -5 and -20 feet MLLW. Two video transects were successfully completed within the survey area. The camera was towed in the water column independently of the camera sled because the sled repeatedly rolled over when crossing larger sand waves. Visibility in the shallower portions of the survey area was decreased due to wave action and turbidity in the water column. Sufficient footage was obtained to characterize the bottom along all video survey transects. The majority of the site consisted of small to medium sand waves with scattered surf clam shell and macroalgae wrack. A small area in the south east portion of the proposed placement site was covered with dense macroalgae wrack. Several lobsters were observed in this area.

The spacing of hydroacoustic survey transects was too wide to create a grid representing vegetation percent cover for the entire Newbury survey area, but the processed SAVEWS data combined with the video survey data and interpretation of aerial photography enabled an adequate characterization of the site. Processed SAVEWS percent cover data along each transect (Figure 13) correlated well with the video survey and aerial imagery of the area. Vegetation detected by SAVEWS was found to be clumps of macroalgae wrack in contact with the bottom. Eelgrass was not observed within any portion of the survey area.

Grain size analysis of sediments from the six stations within the proposed nearshore placement site indicates that the entire site is composed of poorly sorted medium to fine sand. The results of grain size analysis are summarized in Table 8. Grain size curves and laboratory data sheets can be found in the analytical report presented as Appendix B.

The benthic community within the nearshore site off Newbury was dominated by a mix of syllid polychaetes (*Brania* sp. and *Exogone dispar*), capitellid polychaetes (*Capitella* sp.) and oligochaetes. Surf clams (*Spisula solidissima*) were present within the site in low numbers. All surf clams were juvenile. The community found at this site represents a sandy nearshore assemblage typical of New England intertidal and shallow subtidal environments (Croker, et al. 1974, Larsen and Doggett, 1990). A complete species list and abundance data are presented in Table 9.

Table 8: Newbury, MA Grain Size Results

Sample ID	%Cobble	%Gravel		%Sand			%Fines
		Coarse	Fine	Coarse	Medium	Fine	
Newbury-A	0.0	0.0	0.0	0.1	49.1	50.8	0.0
Newbury -B	0.0	0.0	0.3	0.7	87.2	11.9	0.0
Newbury -C	0.0	0.0	0.0	0.0	66.0	34.0	0.0
Newbury -D	0.0	0.0	0.1	0.2	57.2	42.6	0.0
Newbury -E	0.0	0.0	0.0	0.2	96.5	3.2	0.0

Table 9: Newbury, MA Benthic Community Data
(Numbers of individuals per 0.04 m^2)

Species	Newbury A	Newbury B	Newbury C	Newbury D	Newbury E
ANNELIDA					
POLYCHAETA					
Brania spp.	-	63	170	112	8
Capitella sp.	1	96	186	25	3
Drilonereis spp.	-	-	-	-	1
Exogone dispar	123	-	-	-	22
Polydora spp.	-	-	-	-	1
Sabaco elongatus	7	-	-	-	8
Scolelepis squamata	-	-	5	-	-
CLITELLATA					
Unidentified Tubificidae	6	33	-	42	-
NEMATODA					
Unidentifed Nematoda	-	58	29	10	30
MOLLUSCA					
BIVALVIA					
Spisula solidissima	-	5	-	-	3
ARTHROPODA					
MALACOSTRACA					
Chiridotea spp.	-	11	1	1	2
Unidentified Gammaridae	4	-	-	2	-
Haustorius canadensis	-	3	-	-	-
Politolana sp.	-	-	1	-	-
TOTALS					
# of Species	**5**	**7**	**6**	**6**	**9**
# of Individuals	**141**	**269**	**392**	**192**	**78**

FIGURE 12

US Army Corps
of Engineers
New England District

PISCATAQUA RIVER FNP
JULY 2013 SAVEWS SURVEY DEPTHS
NEWBURY, MA

0 1,000 2,000 3,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:12,000

2012 NAIP Aerial Imagery

WGS NAD 1983

FIGURE 13

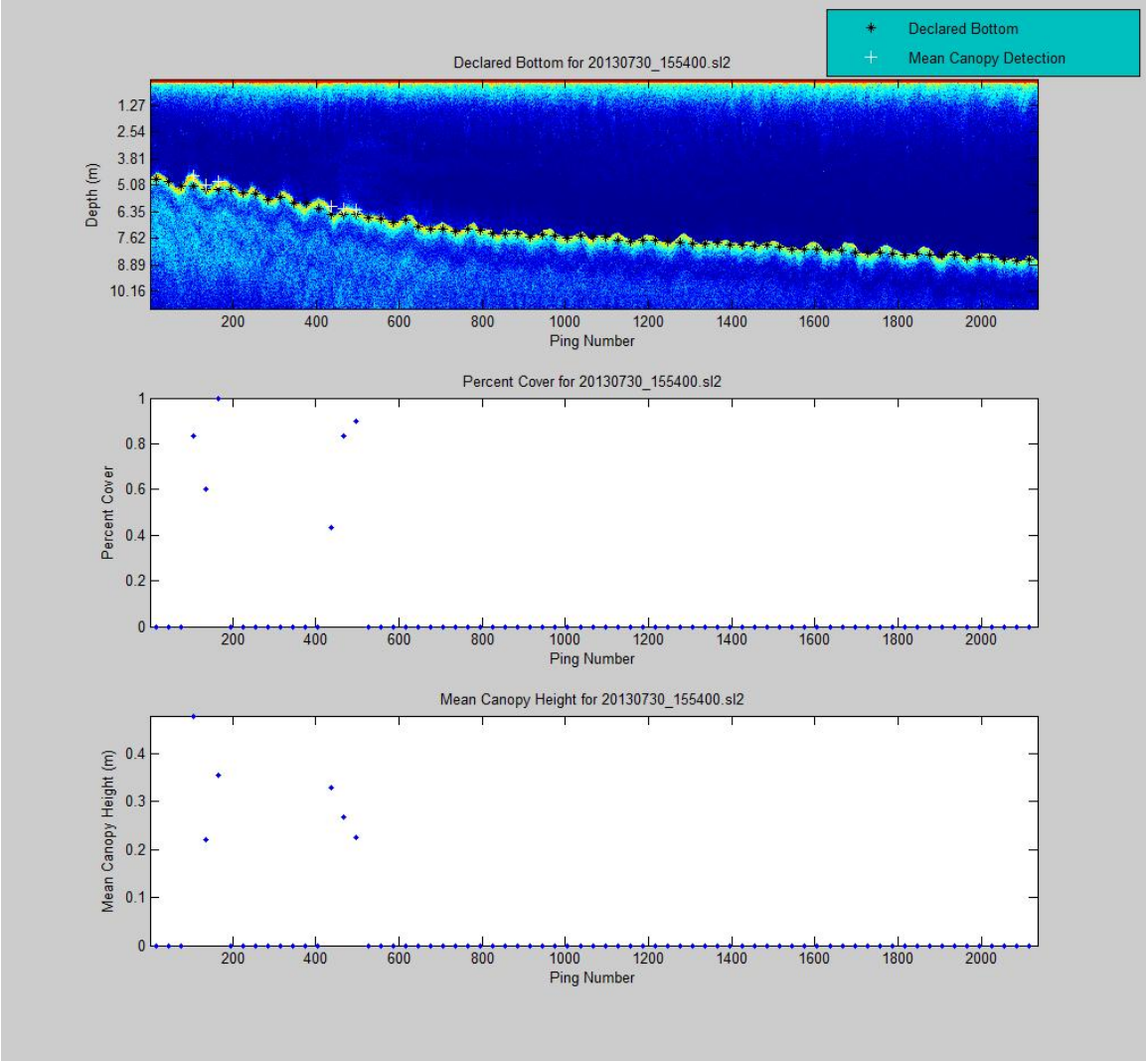
70°49'0"W
70°48'0"W
42°48'0"N
Legend
Proposed Nearshore Site
Percent Cover
0
1 - 5
5 - 10
10 - 25
25 - 50
50 - 75
75 - 100
US Army Corps of Engineers New England District
PISCATAQUA RIVER FNP
JULY 2013 SAVEWS PERCENT COVER
NEWBURY, MA
0 1,000 2,000 3,000 Feet
0 0.1 0.2 0.3 0.4 0.5 Miles
1:12,000
2012 NAIP Aerial Imagery
WGS NAD 1983
South Hampton
Seabrook
Newton
Amesbury
Salisbury
Merrimac
Newburyport
West Newbury
Haverhill
Newbury
Groveland
Georgetown
Rowley
Ipswich

APPENDIX A

SAVEWS JR DATA OUTPUT AND CONFIGURATION FILES

Appendix A: SAVEWS JR OUTPUT AND CONFIGURATION FILES

WELLS, ME - TRANSECT 1 (20130730_155400.SL2)



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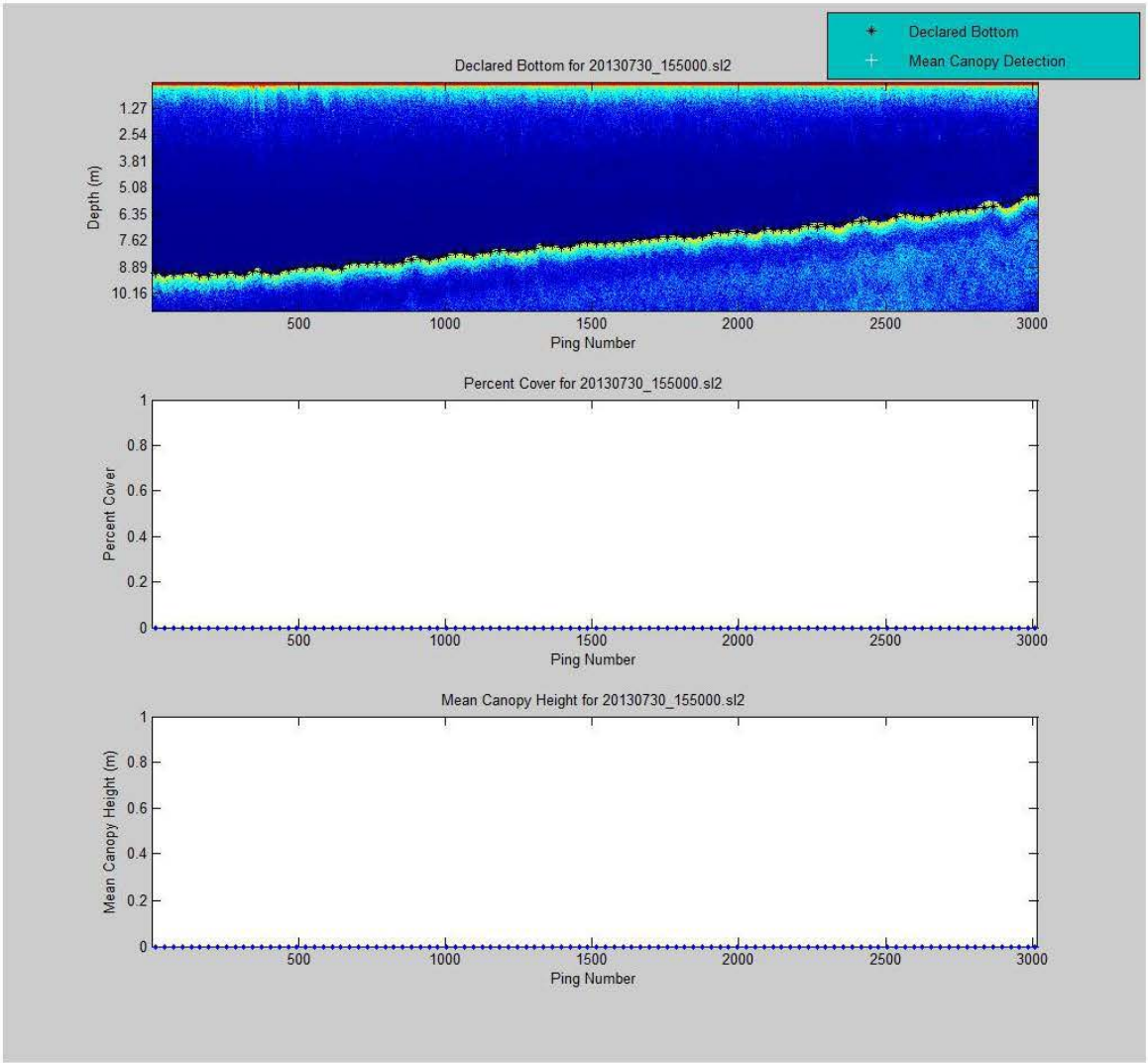

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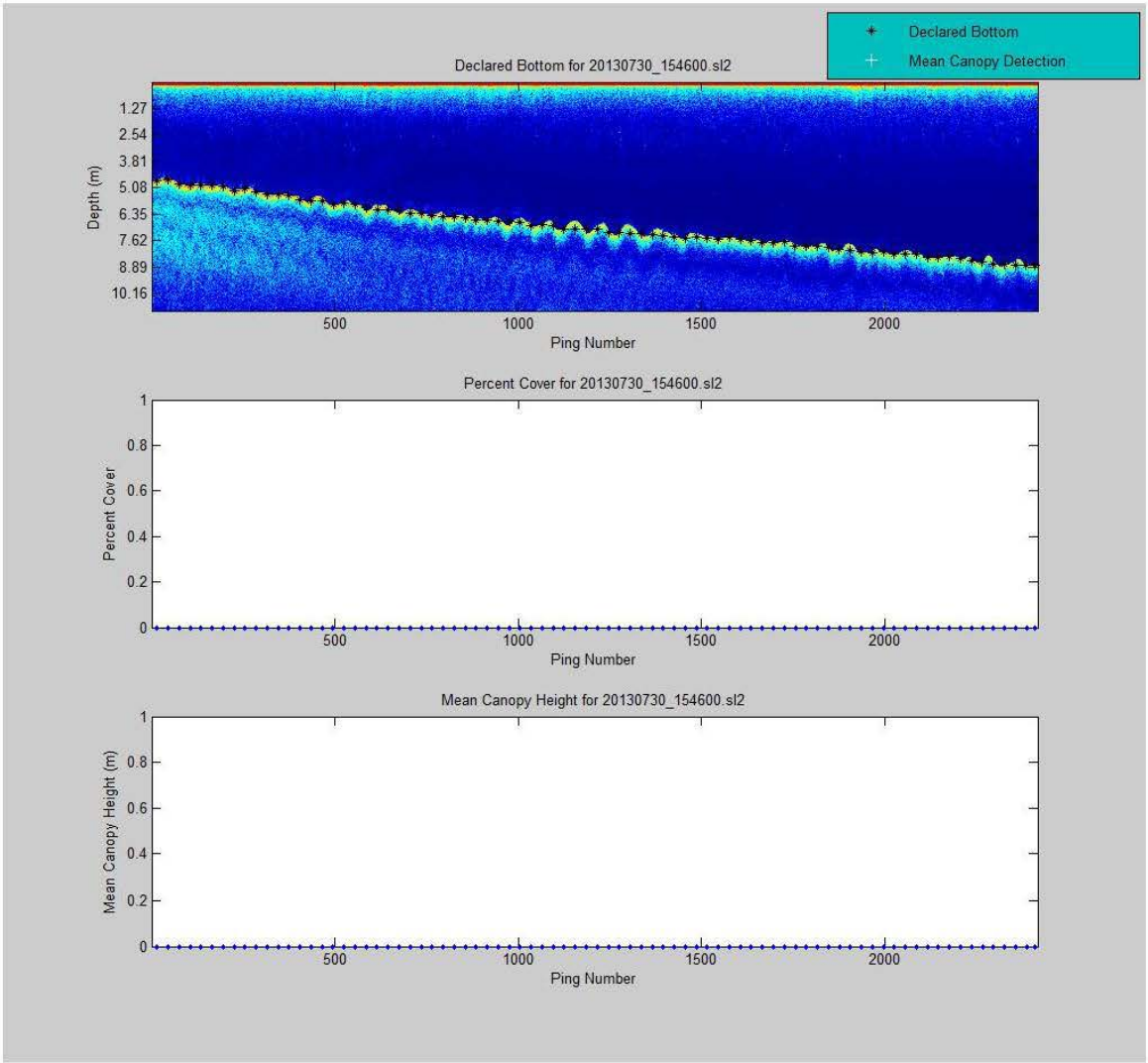

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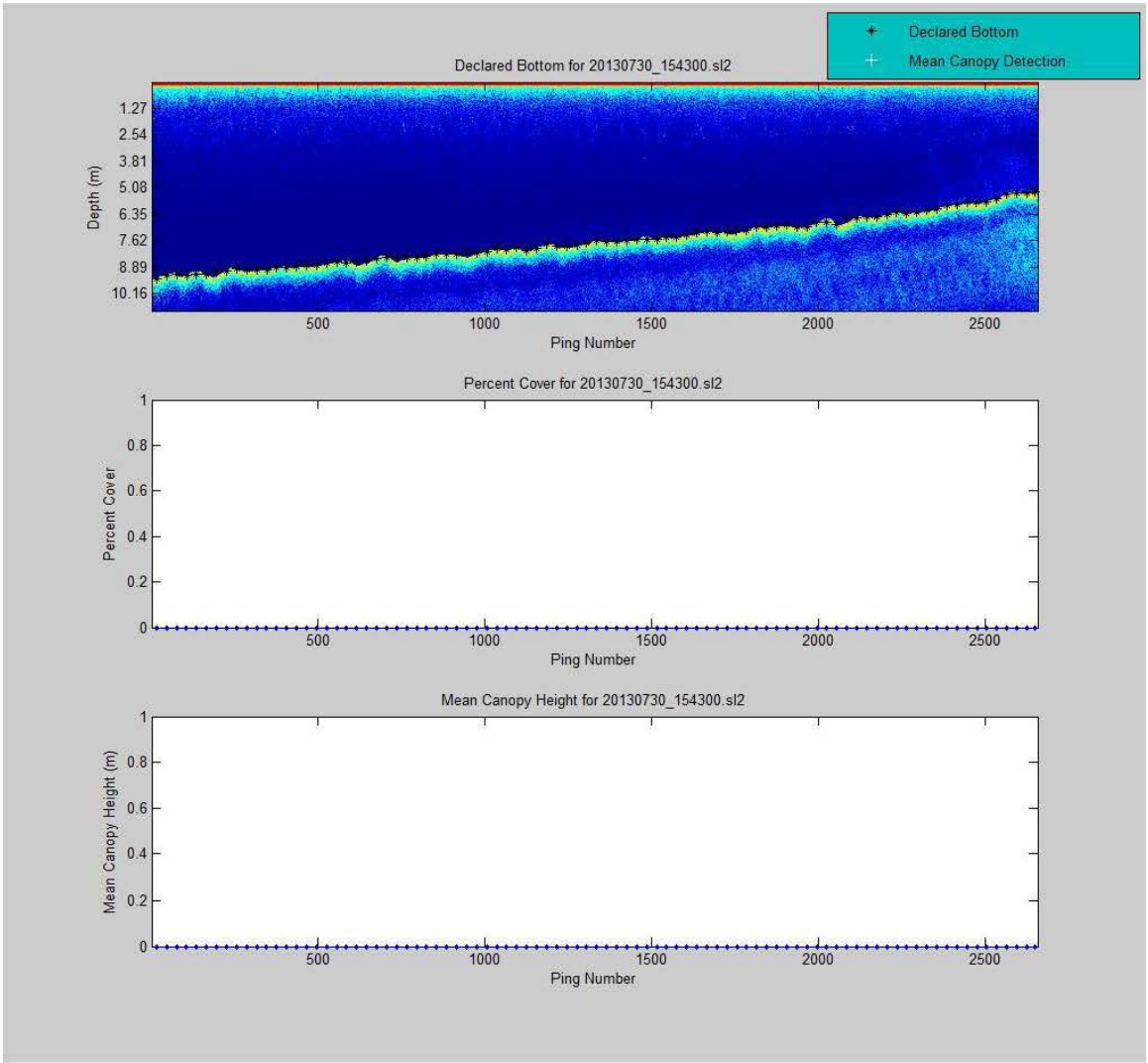

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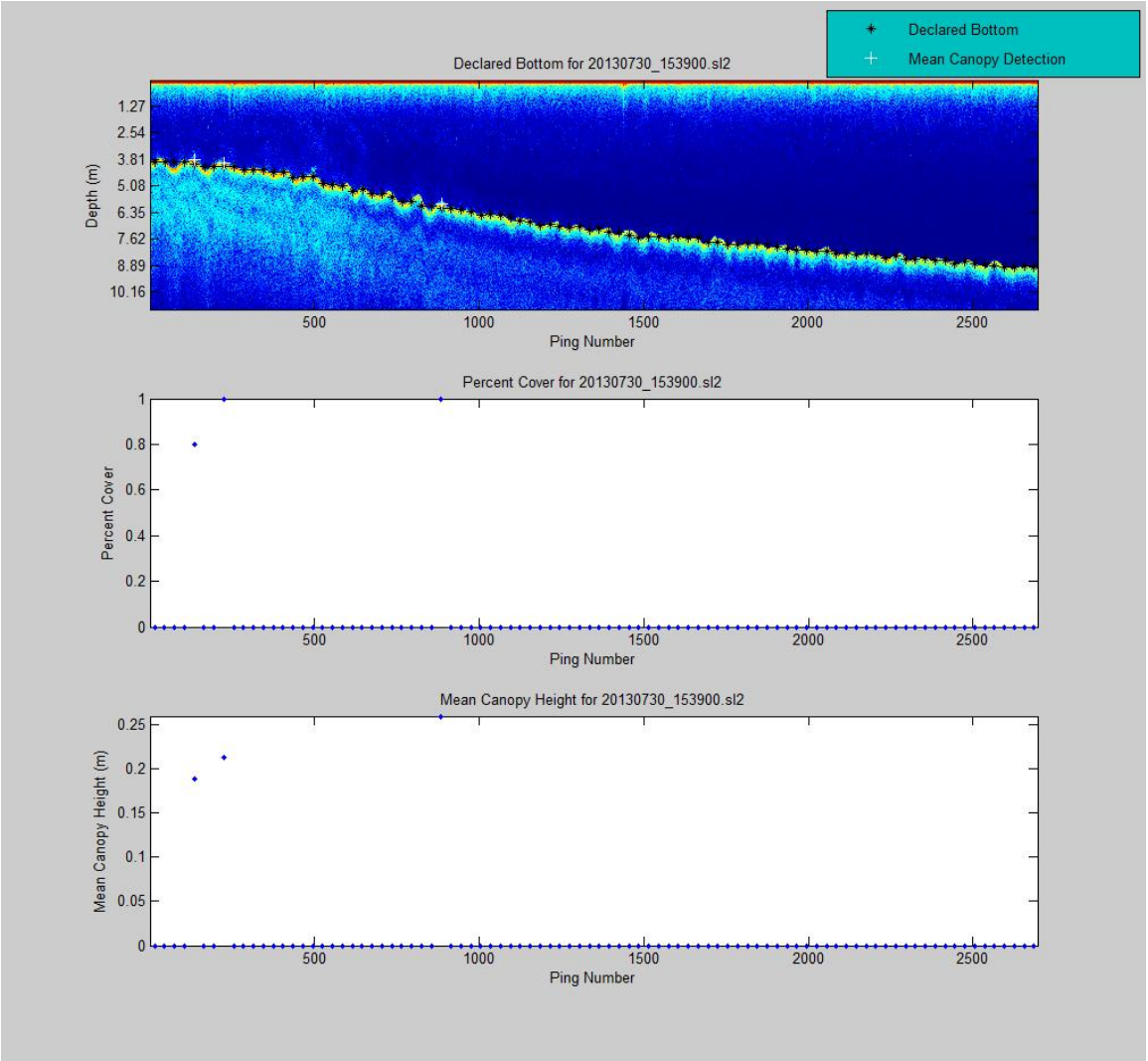

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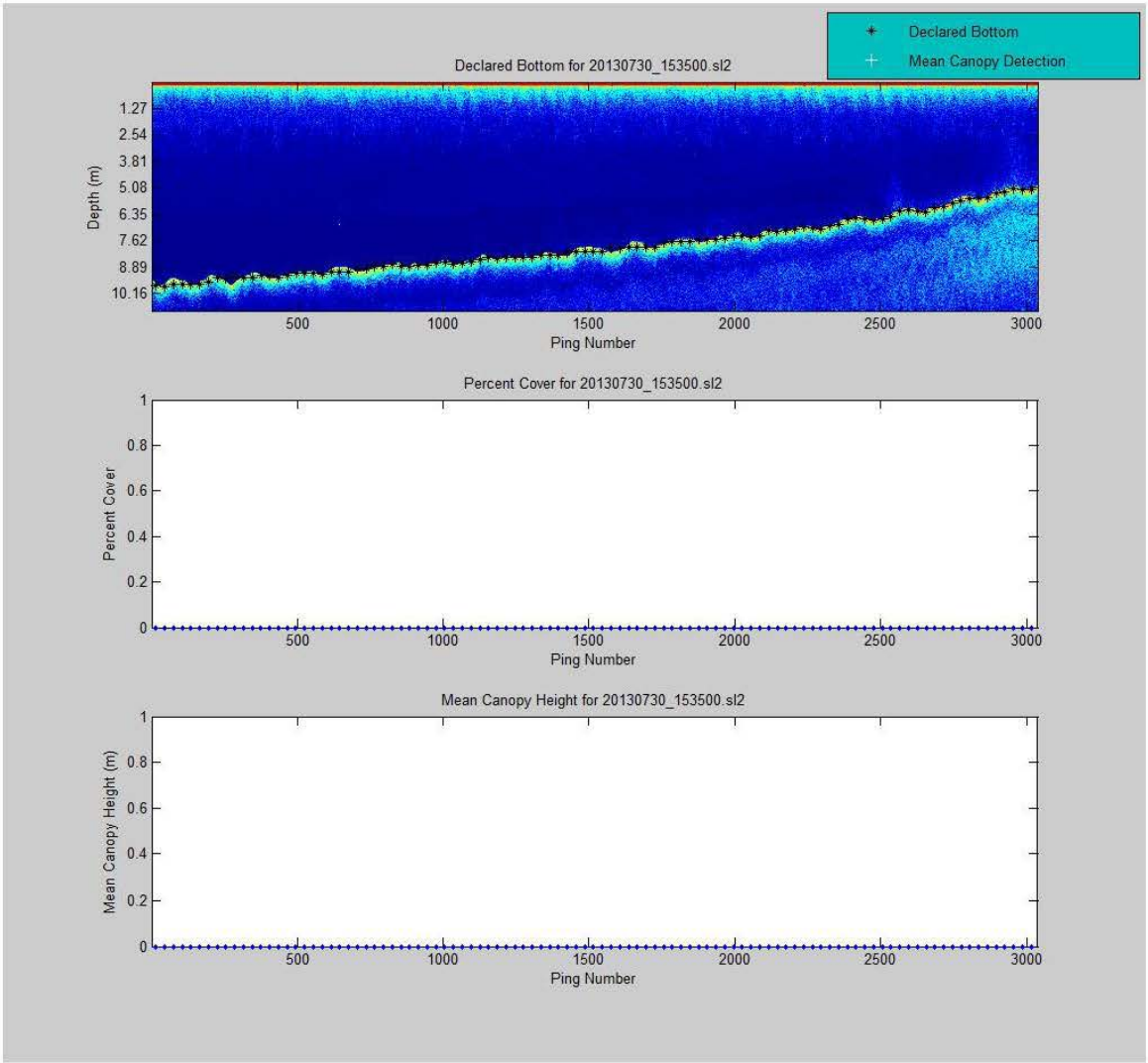

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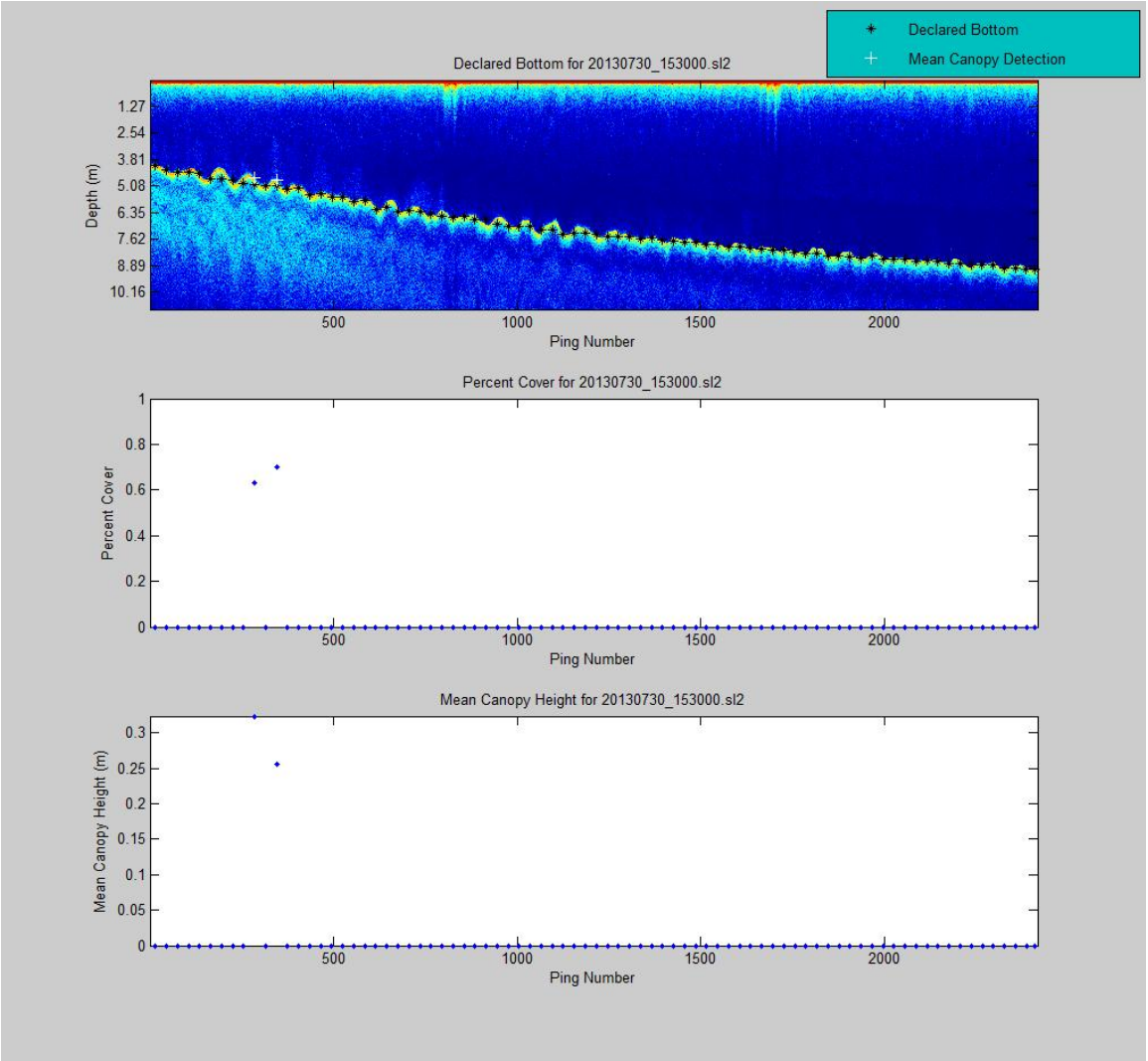

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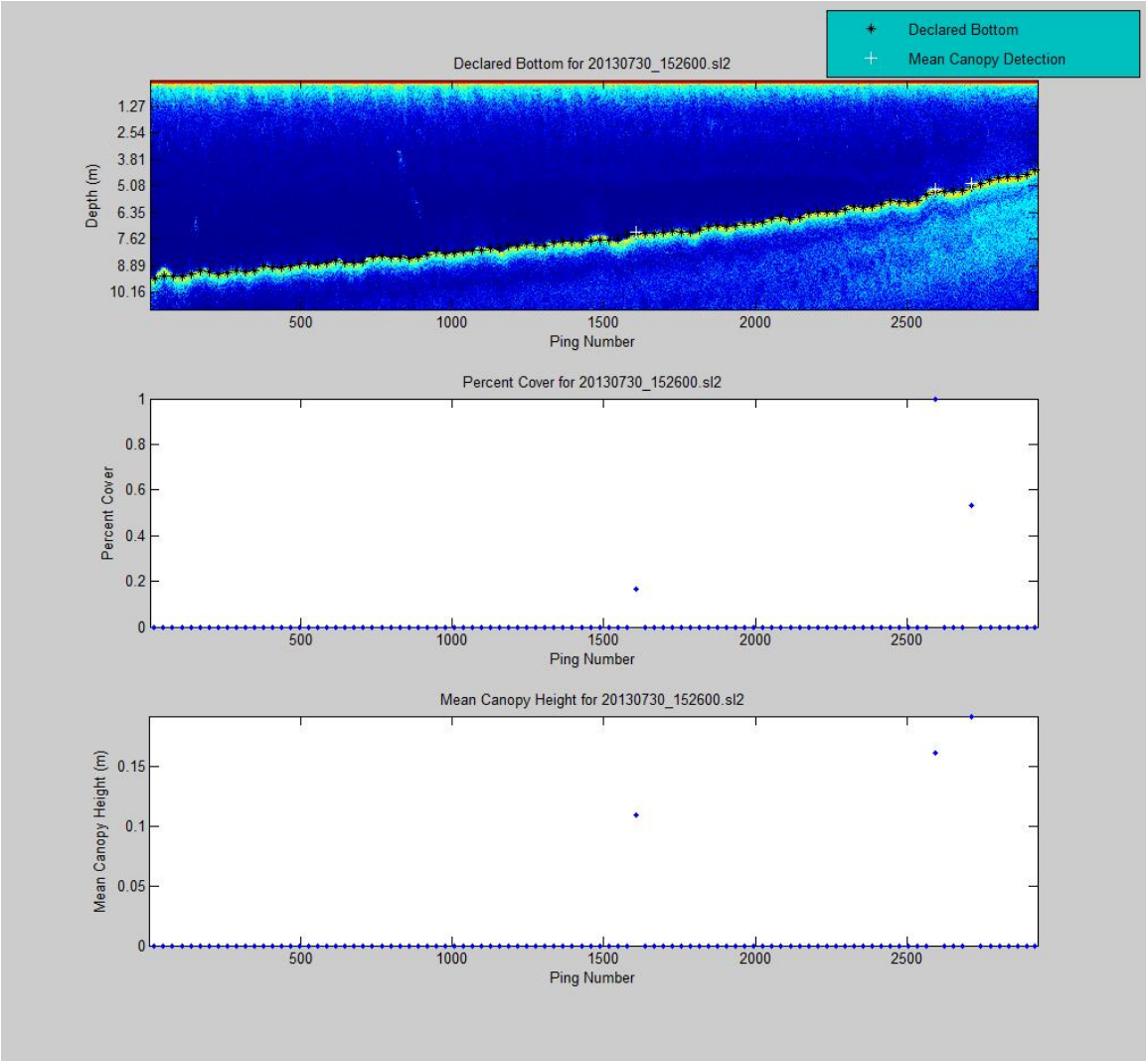

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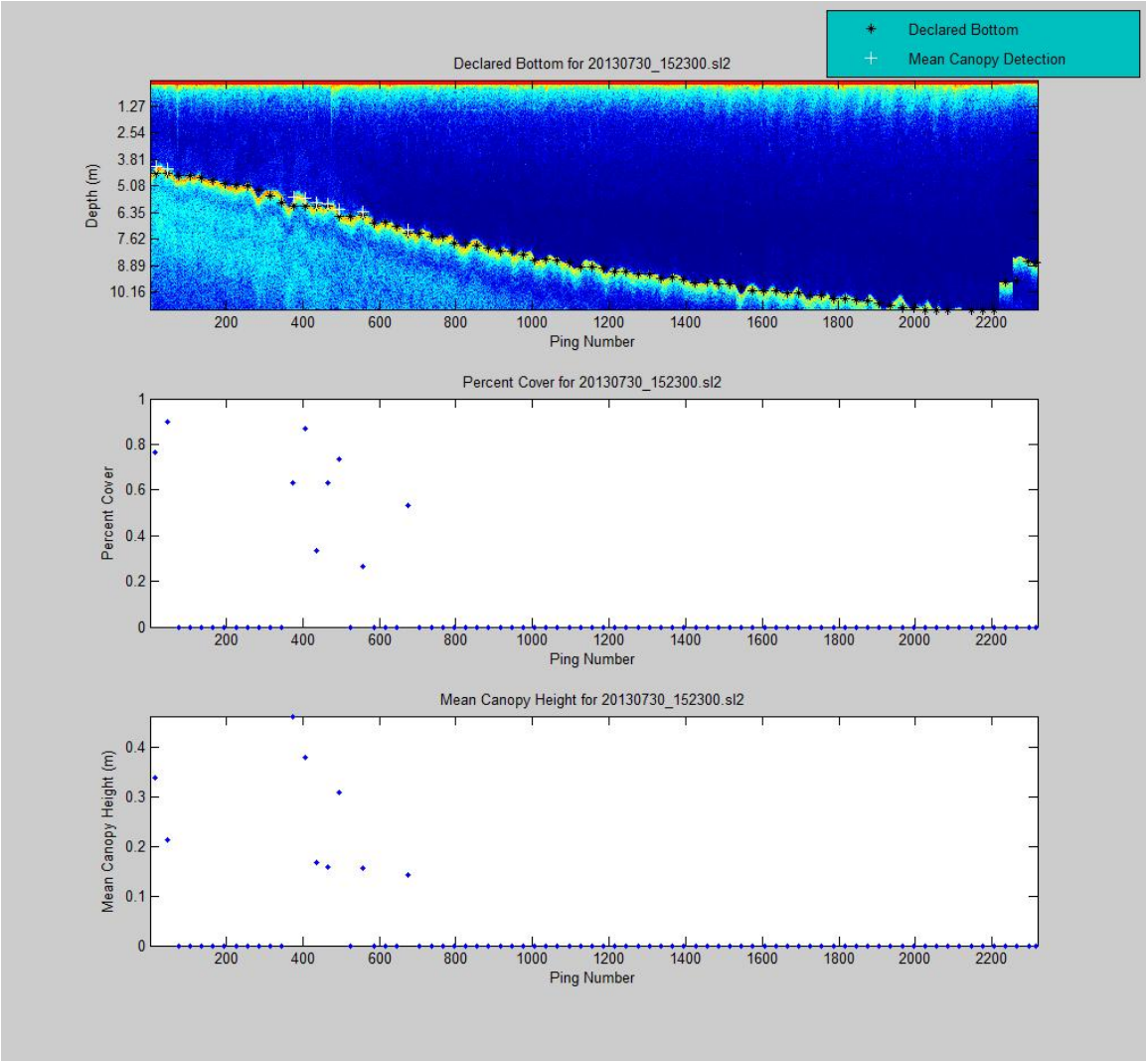

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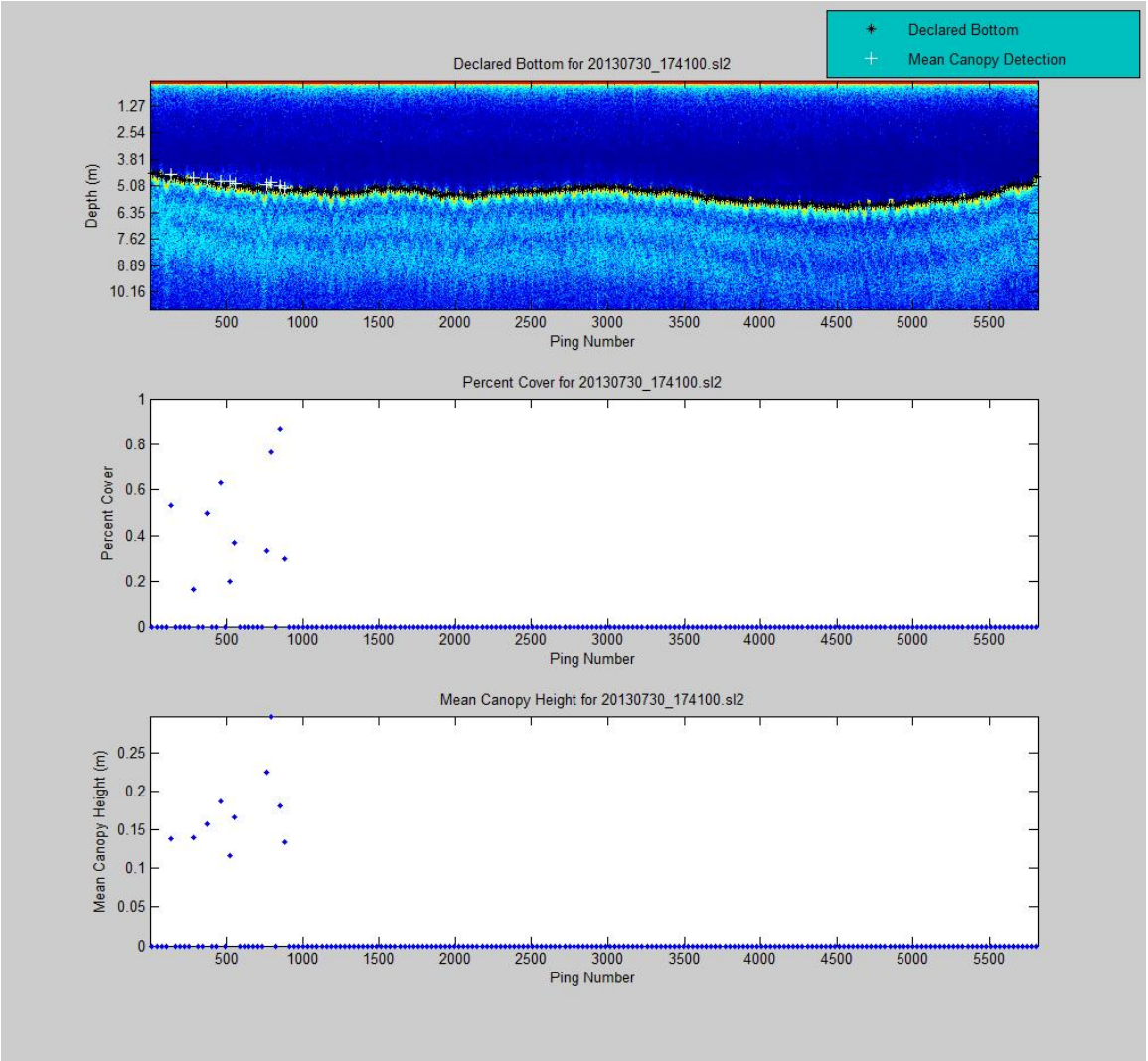

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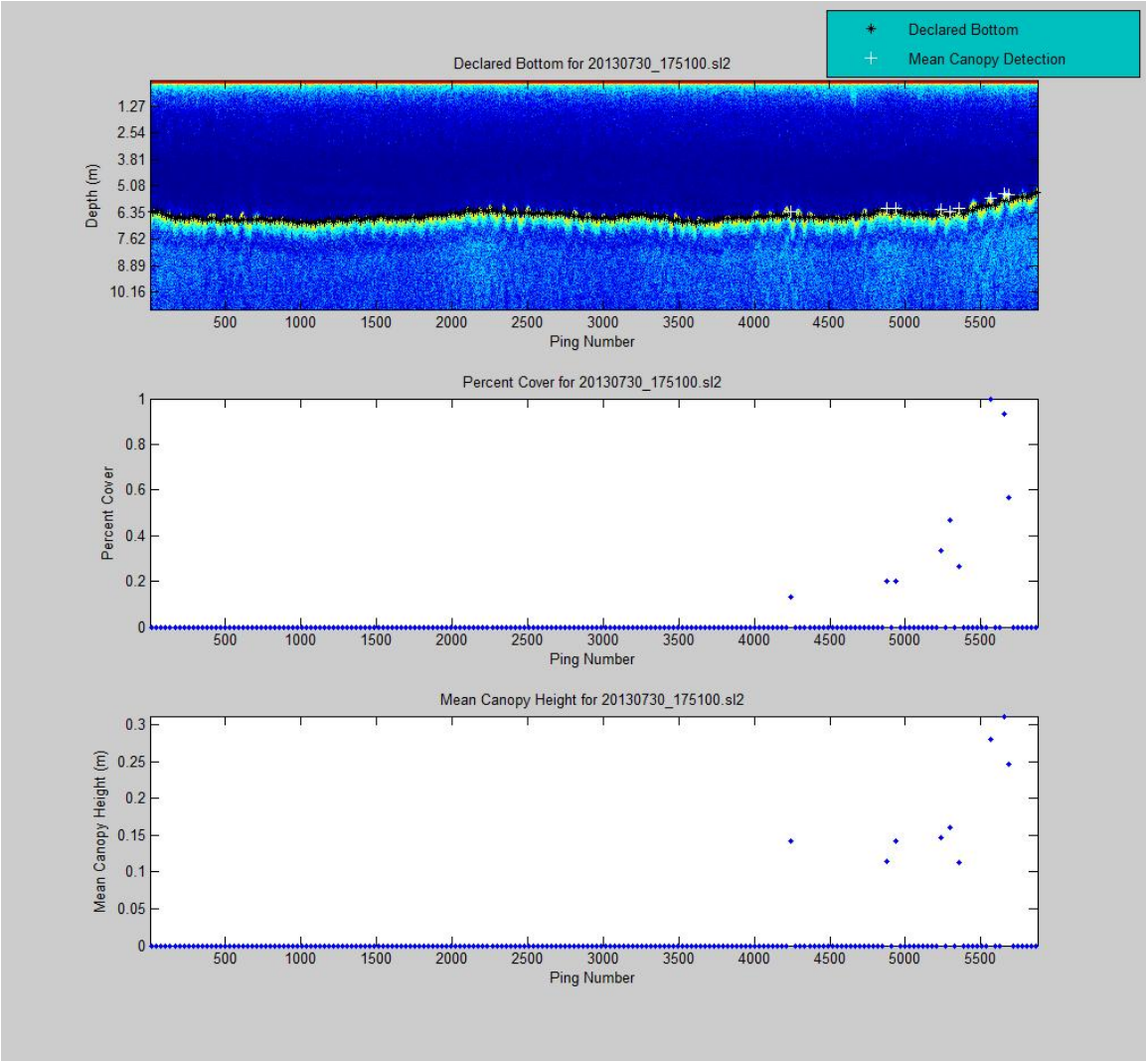

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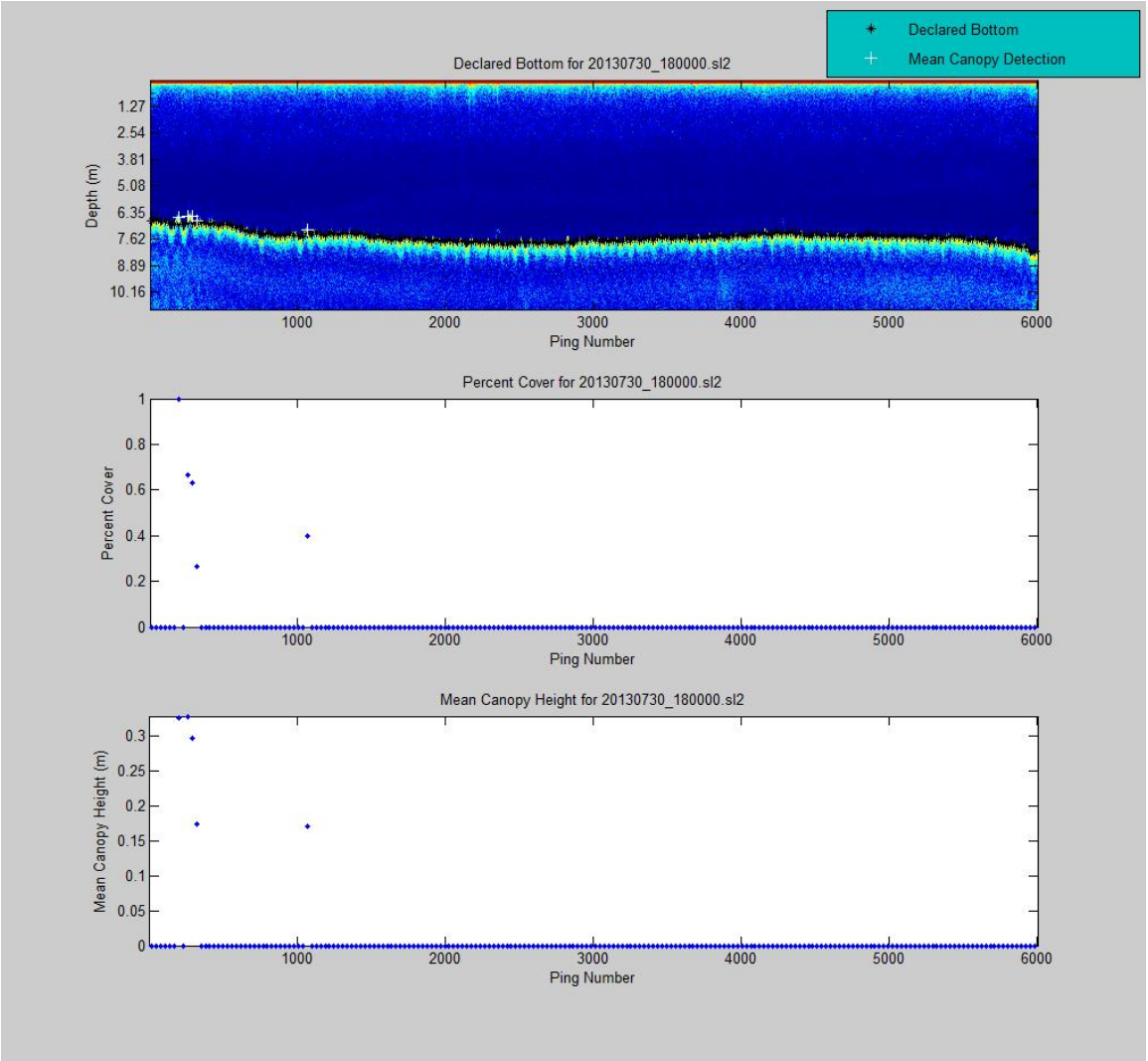

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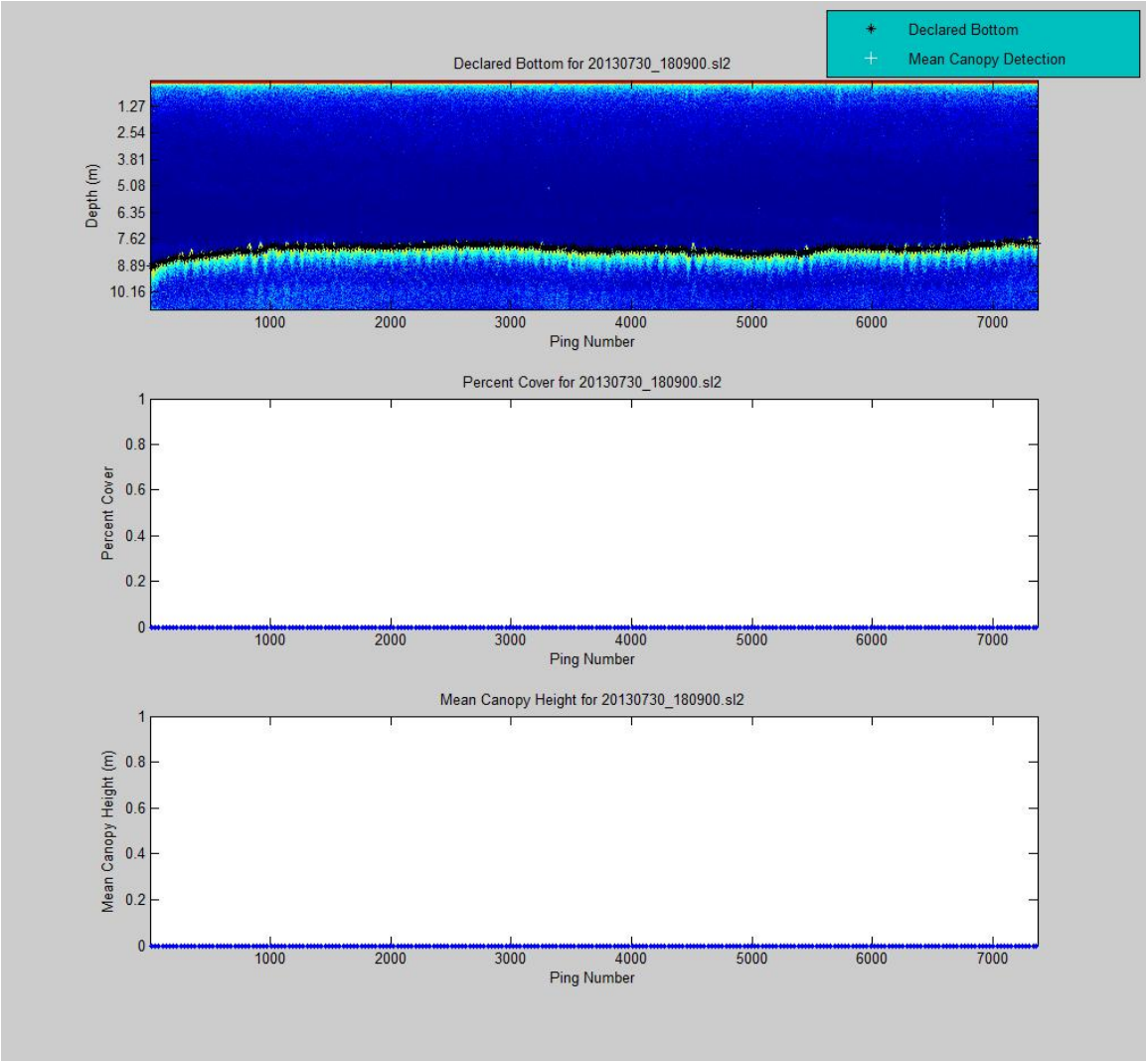

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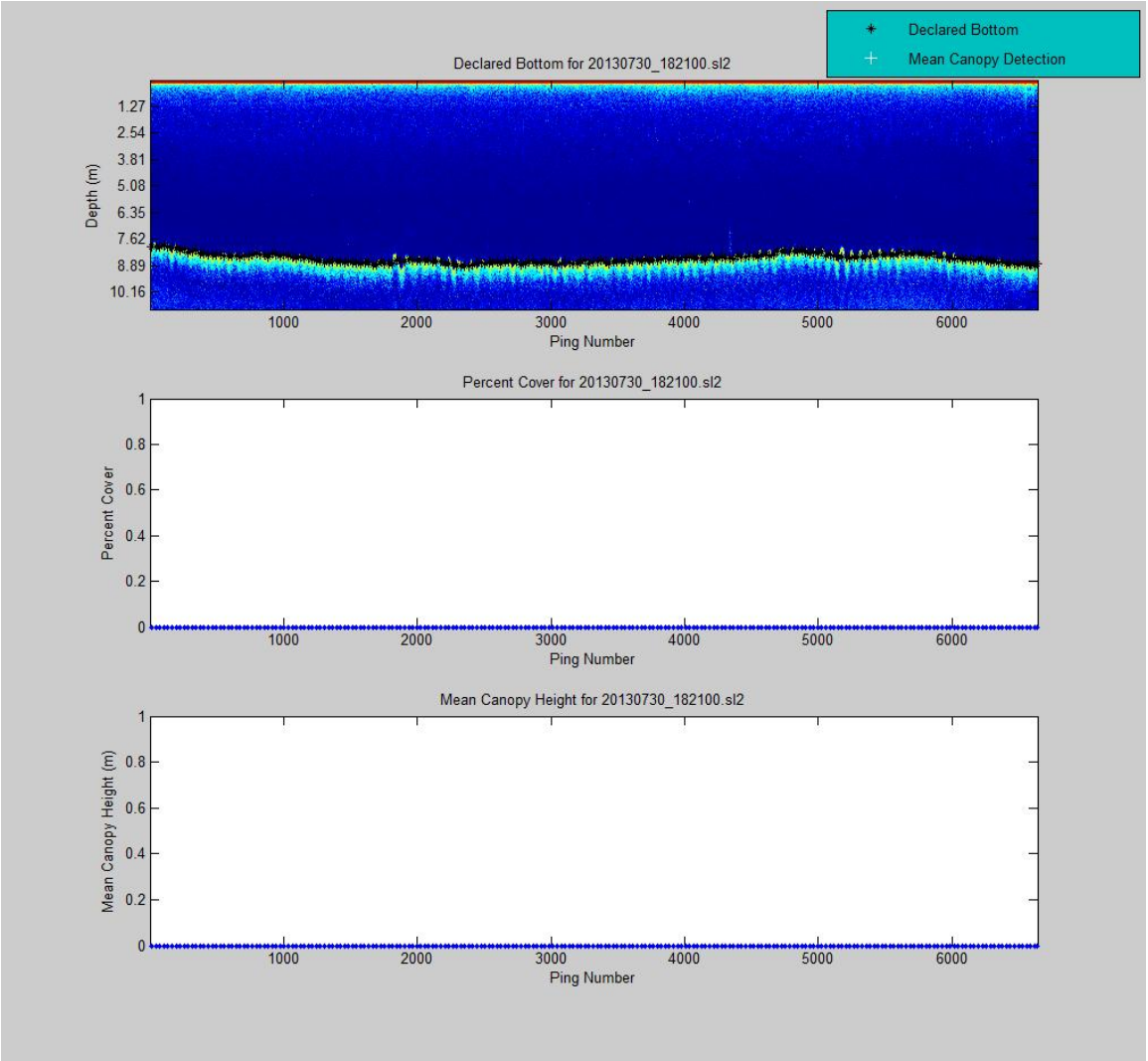

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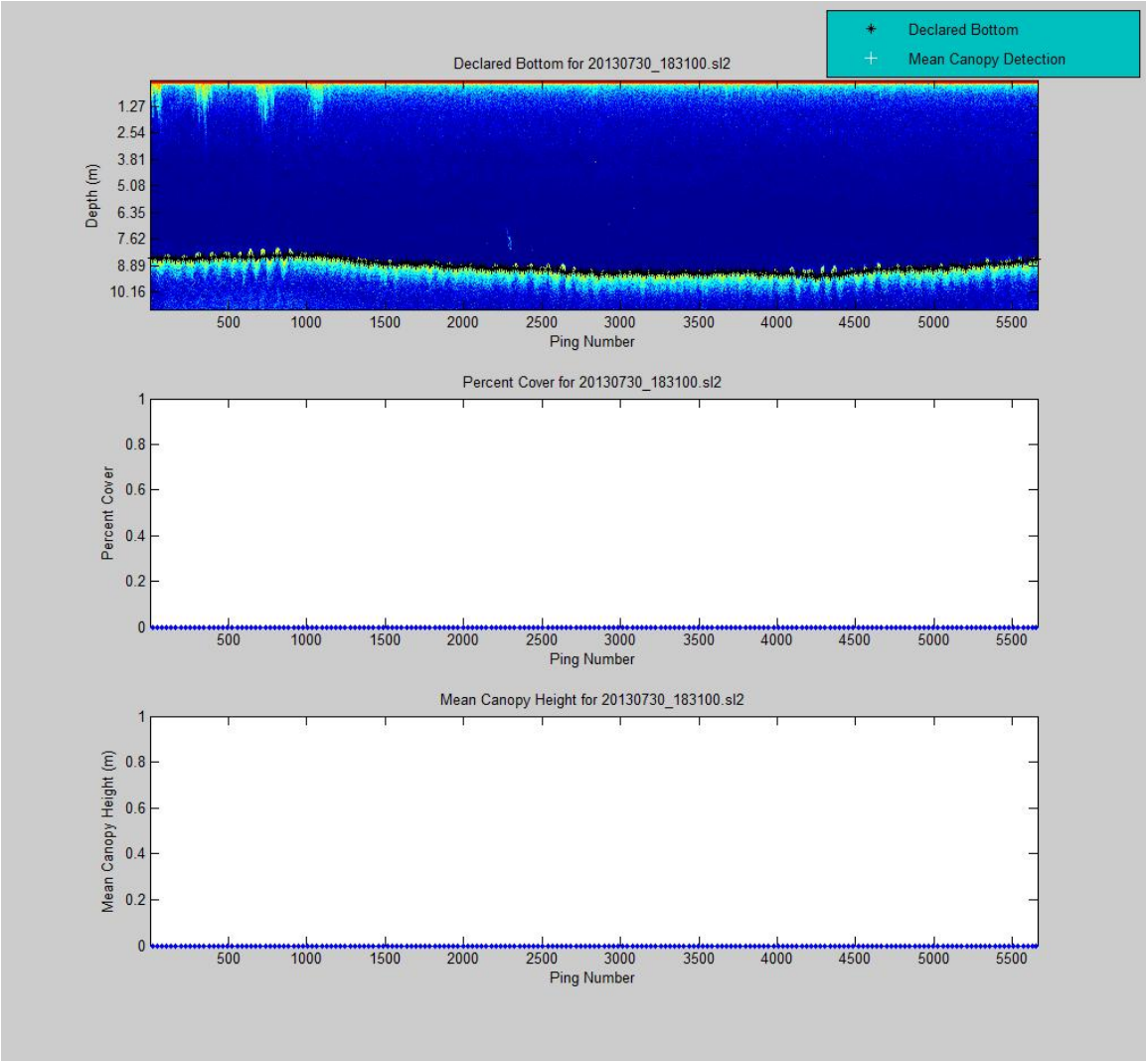

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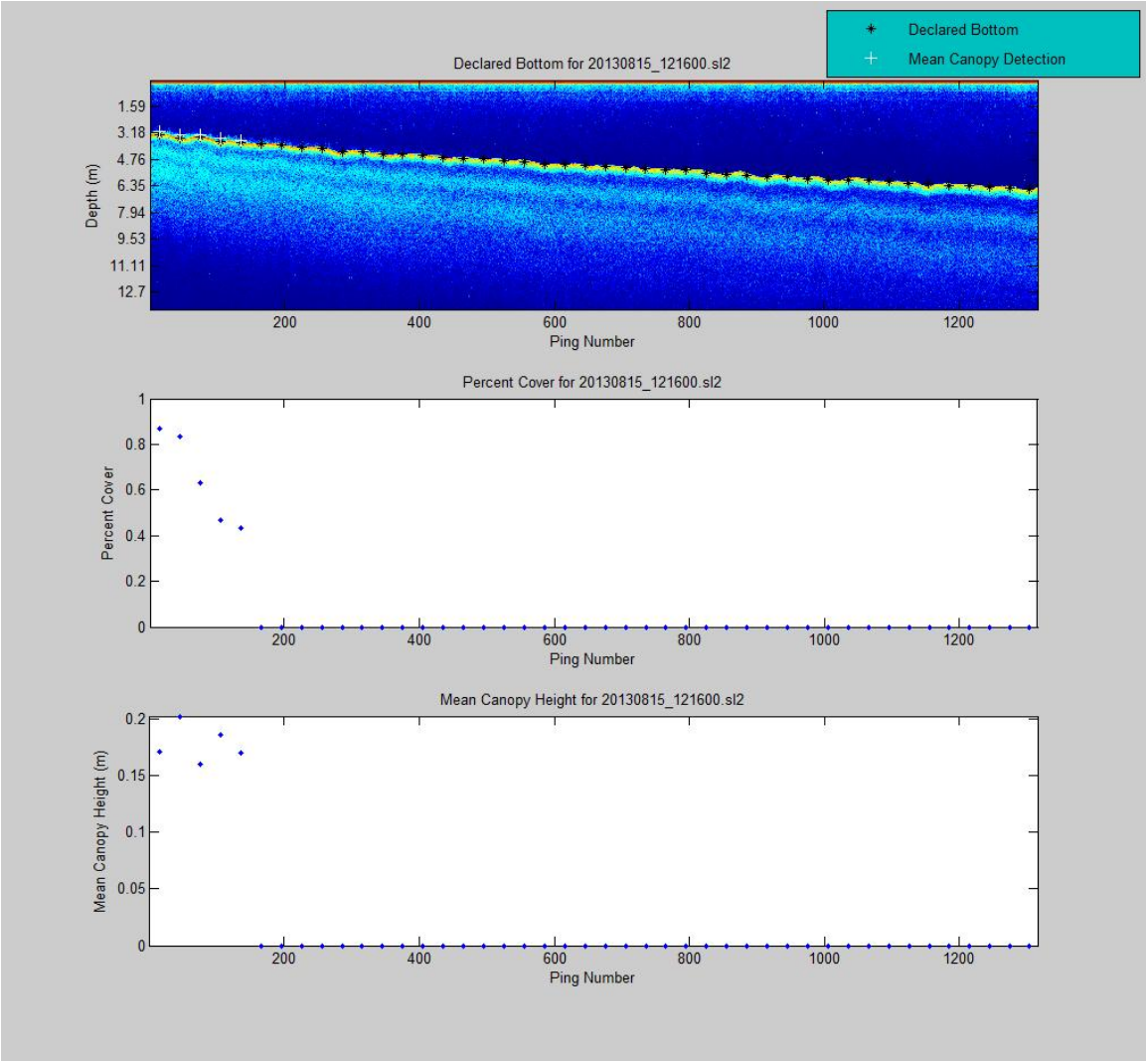

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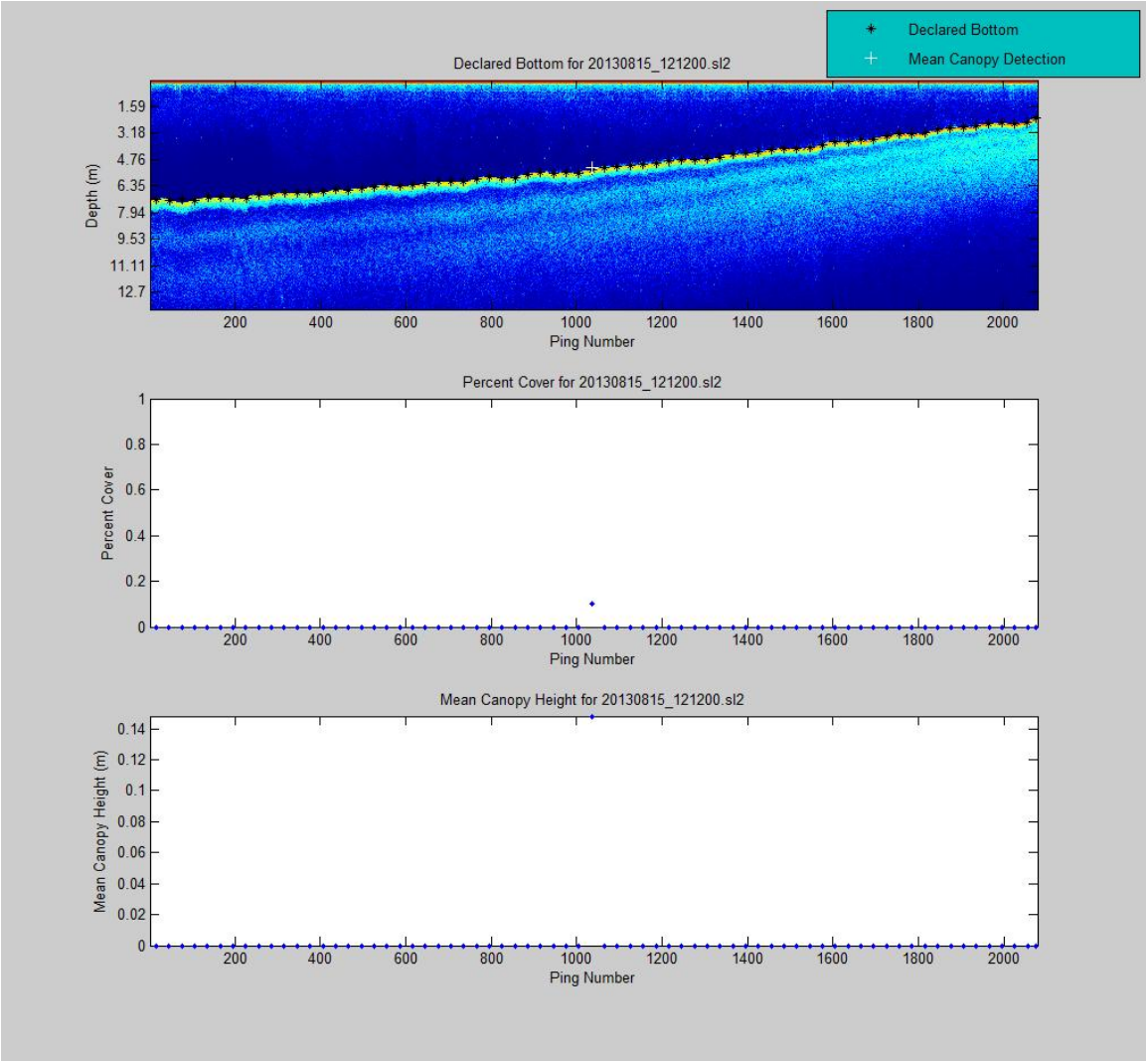

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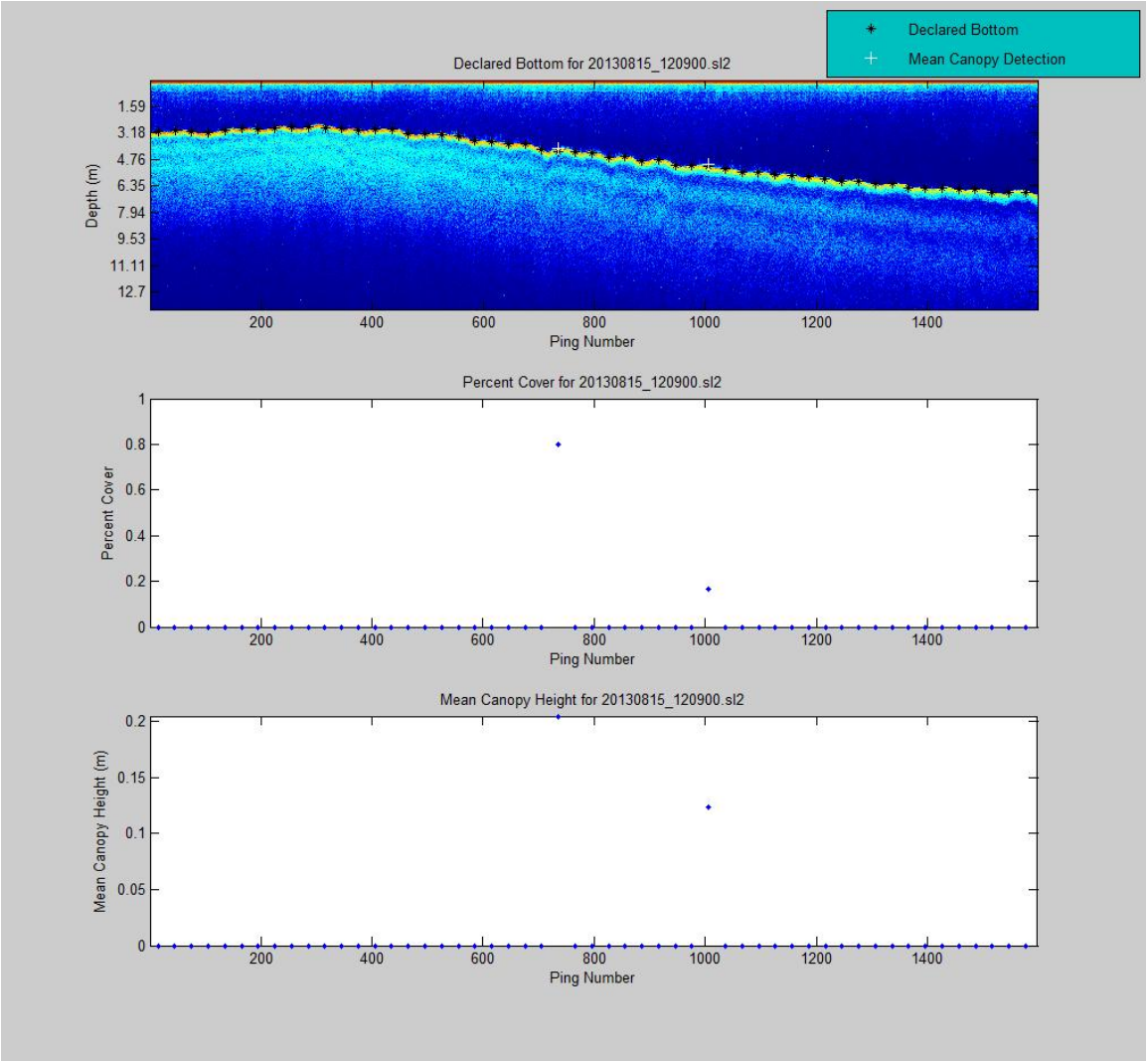

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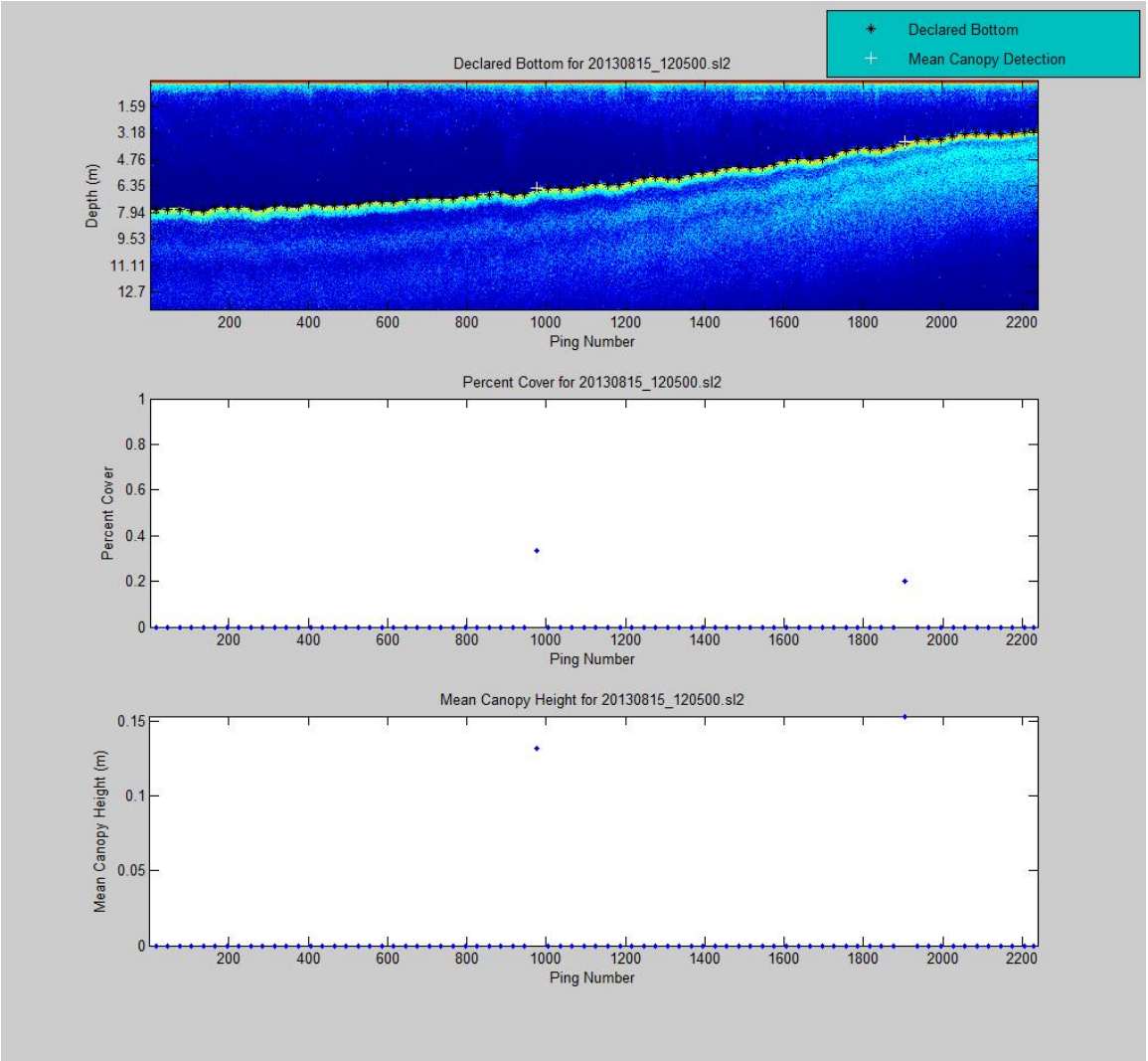

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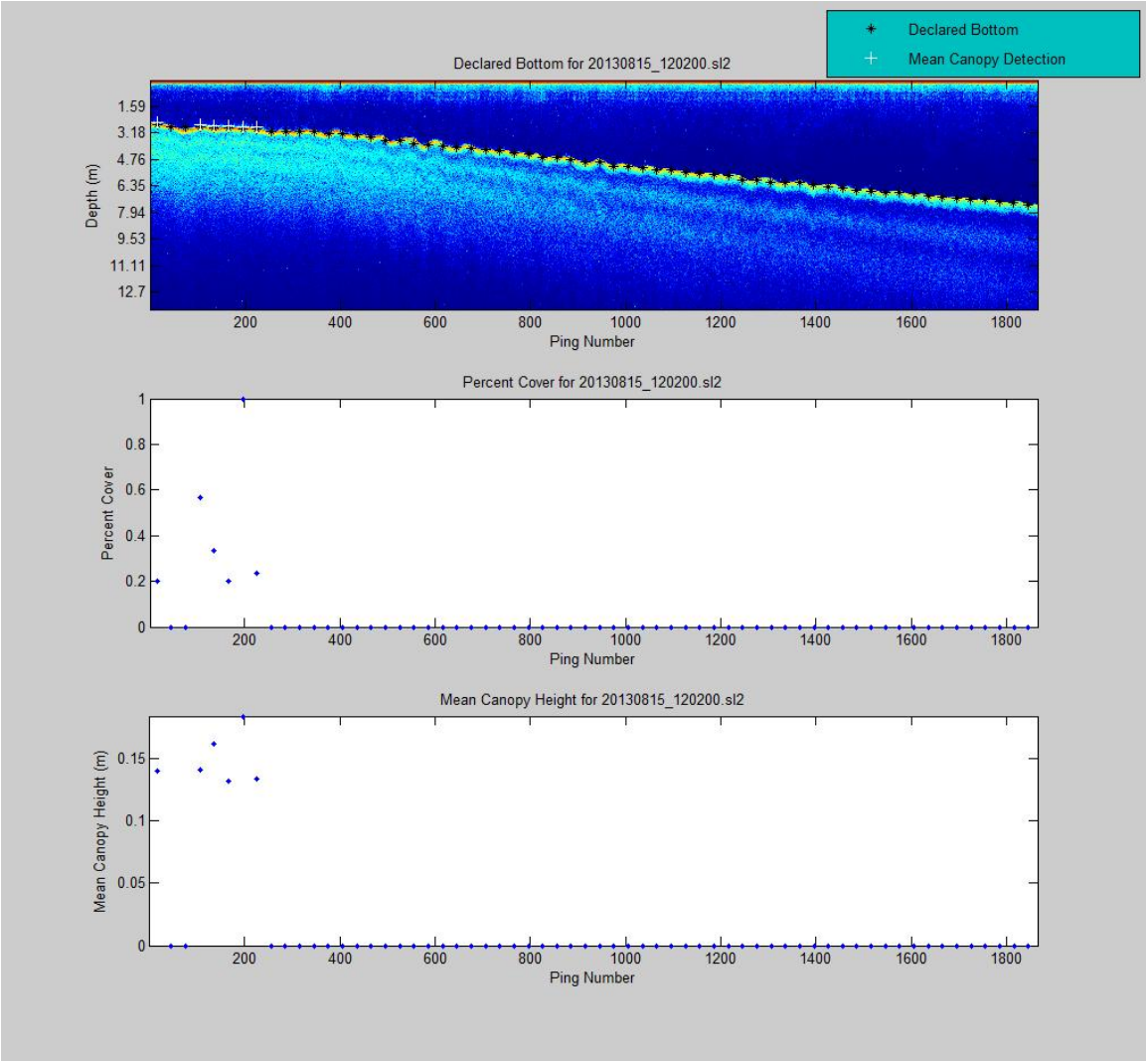

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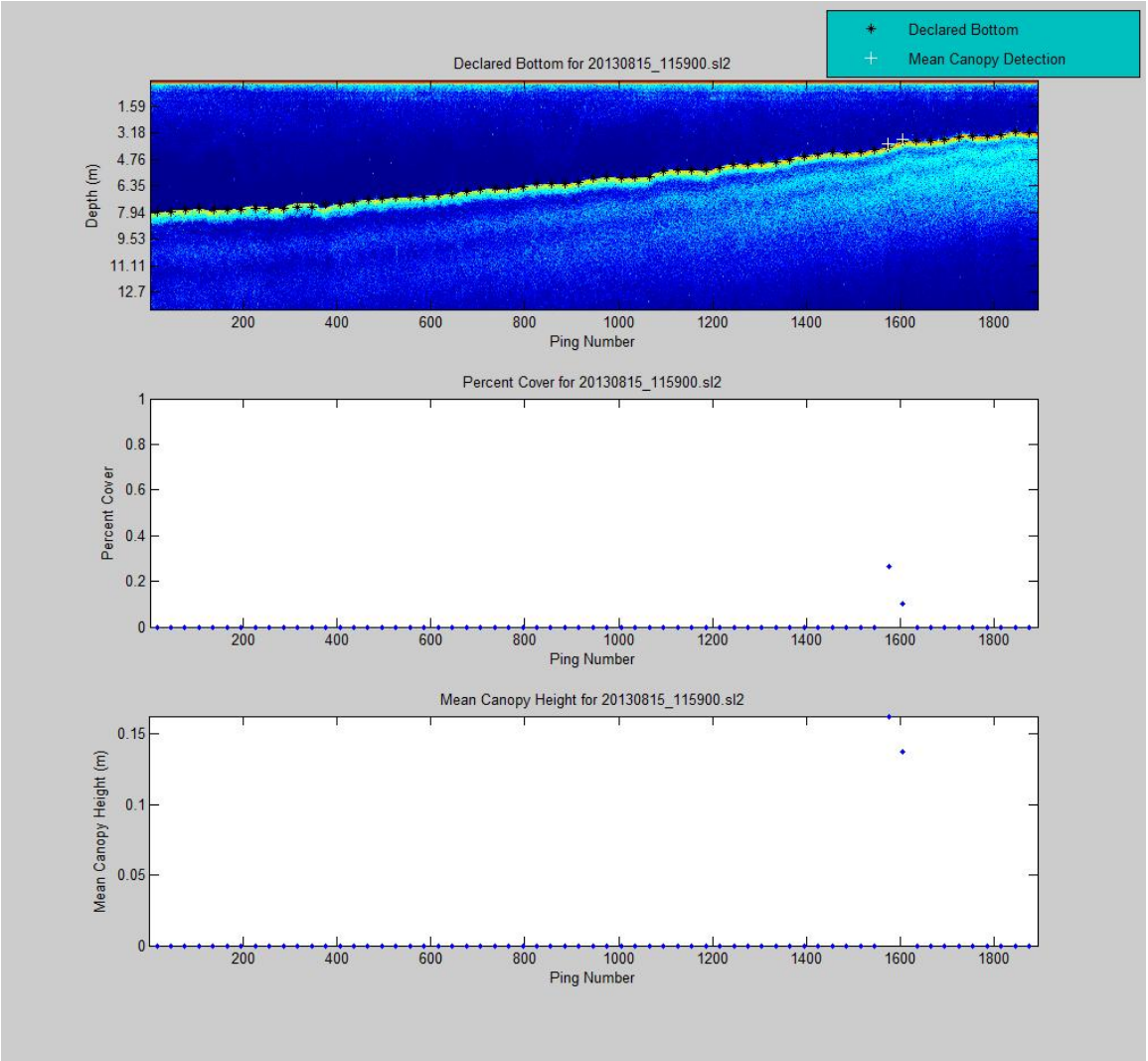

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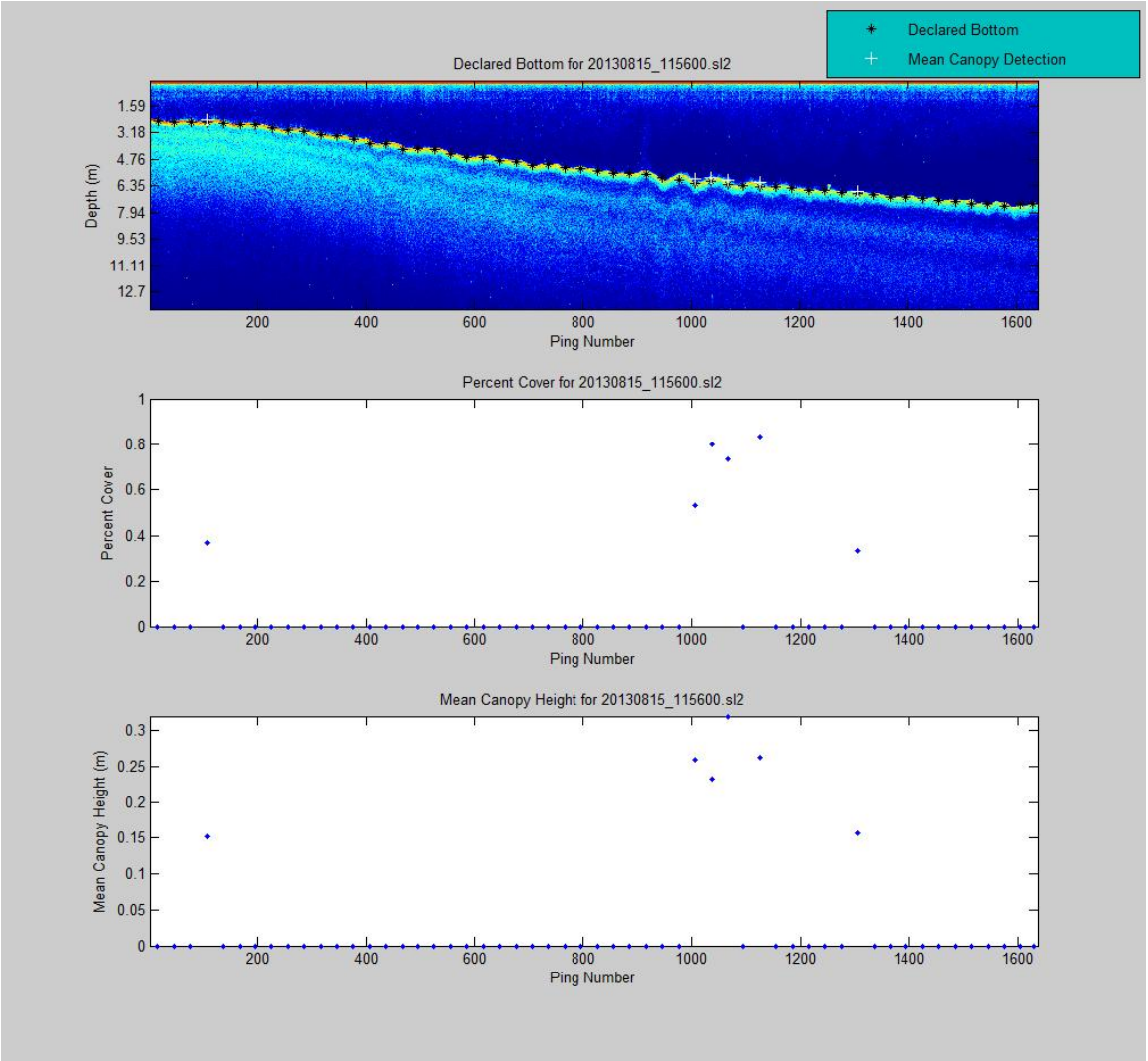
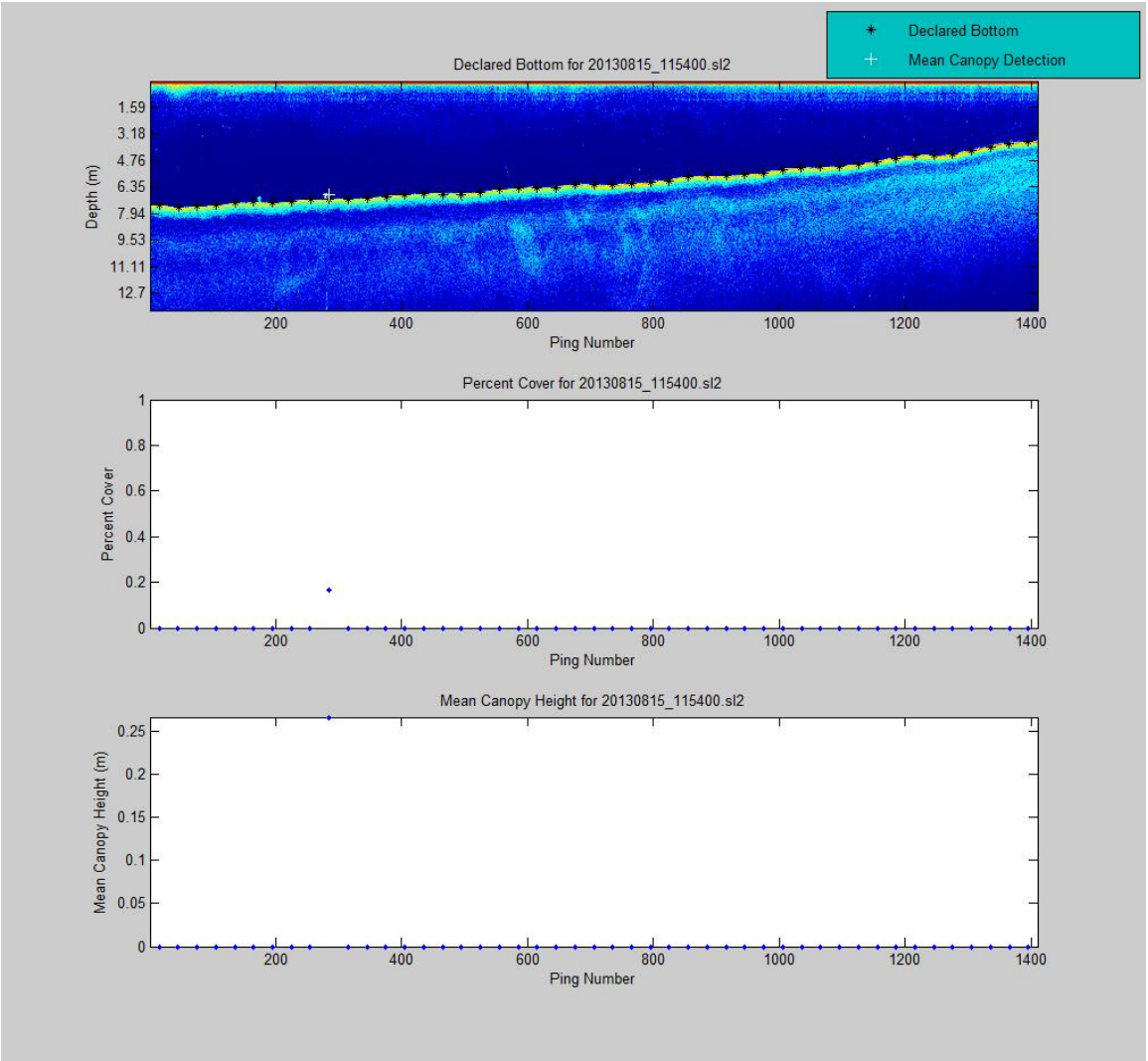


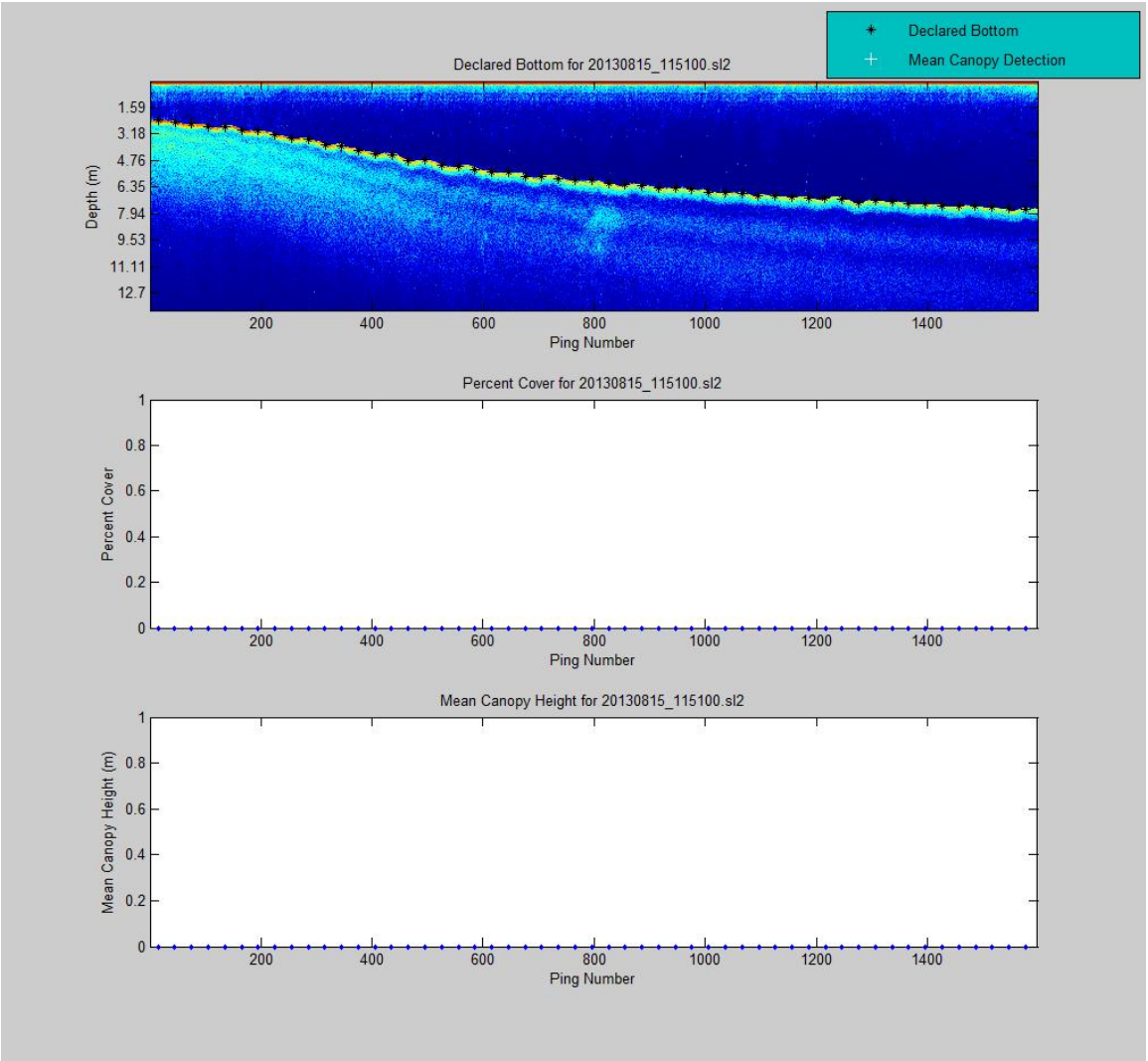
Appendix A: SAVEWS JR OUTPUT AND CONFIGURATION FILES

SALISBURY, MA - TRANSECT 8 (20130815_115400.SL2)



Appendix A: SAVEWS JR OUTPUT AND CONFIGURATION FILES

SALISBURY, MA - TRANSECT 9 (20130815_115100.SL2)



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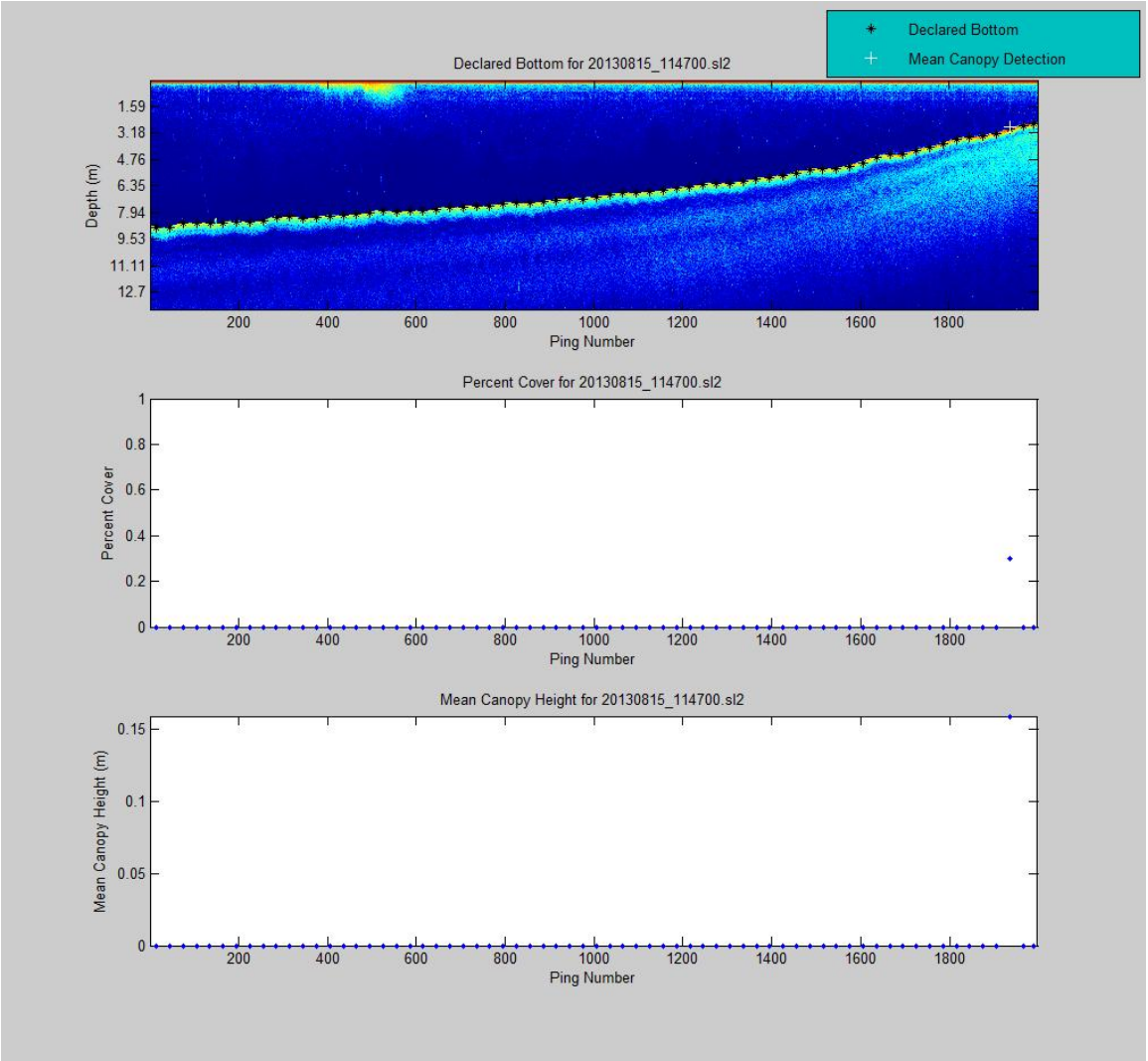

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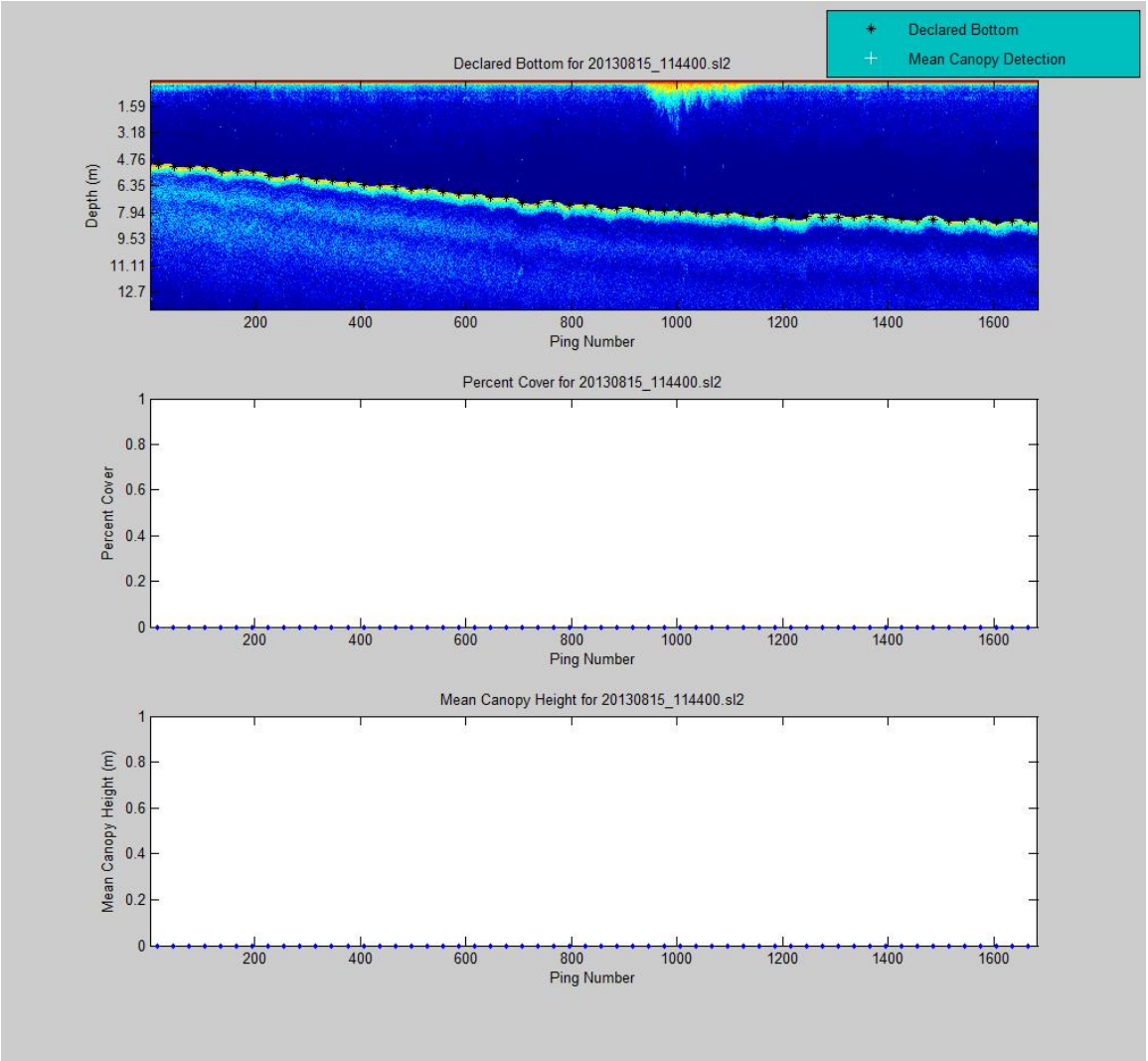

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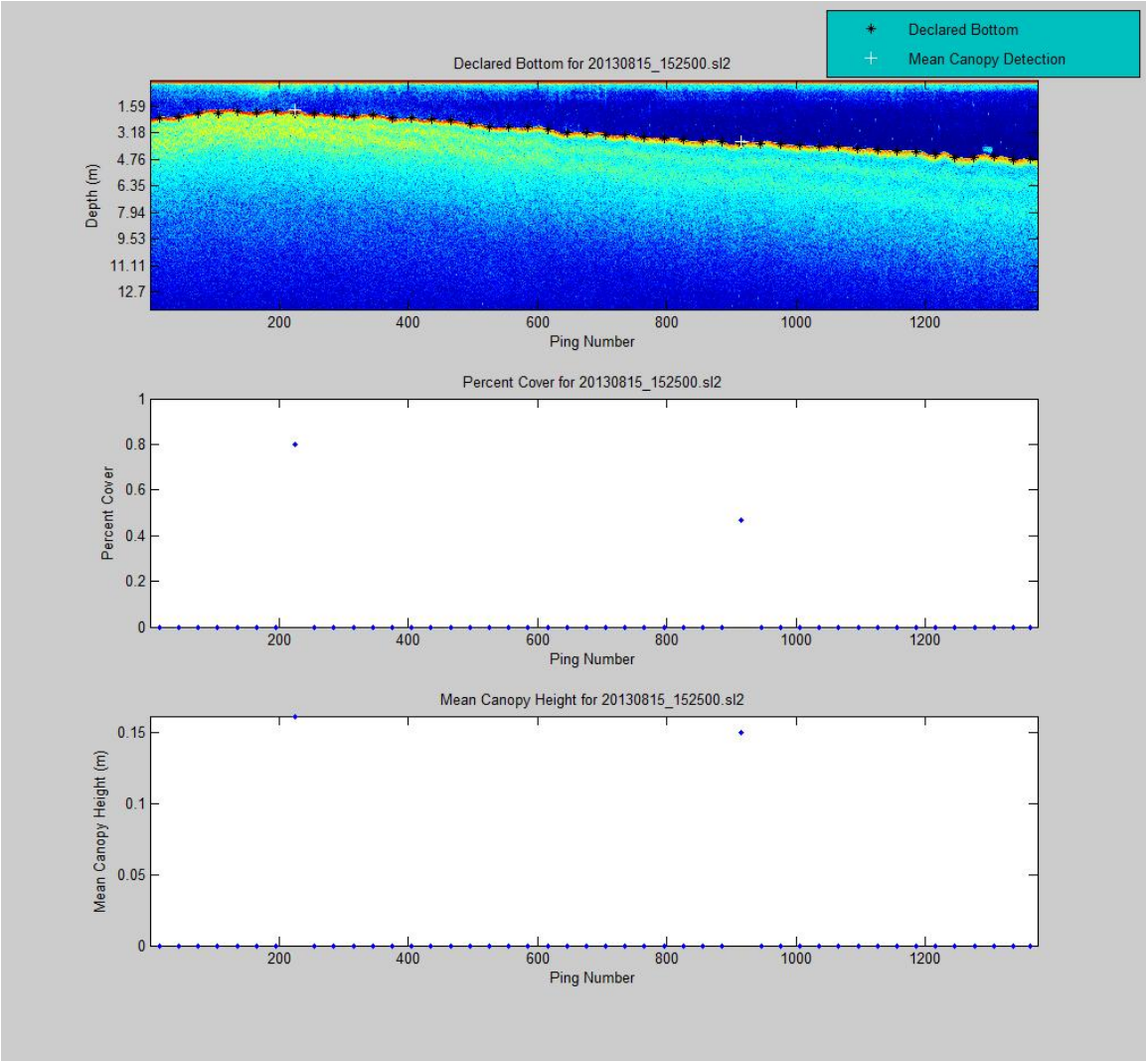

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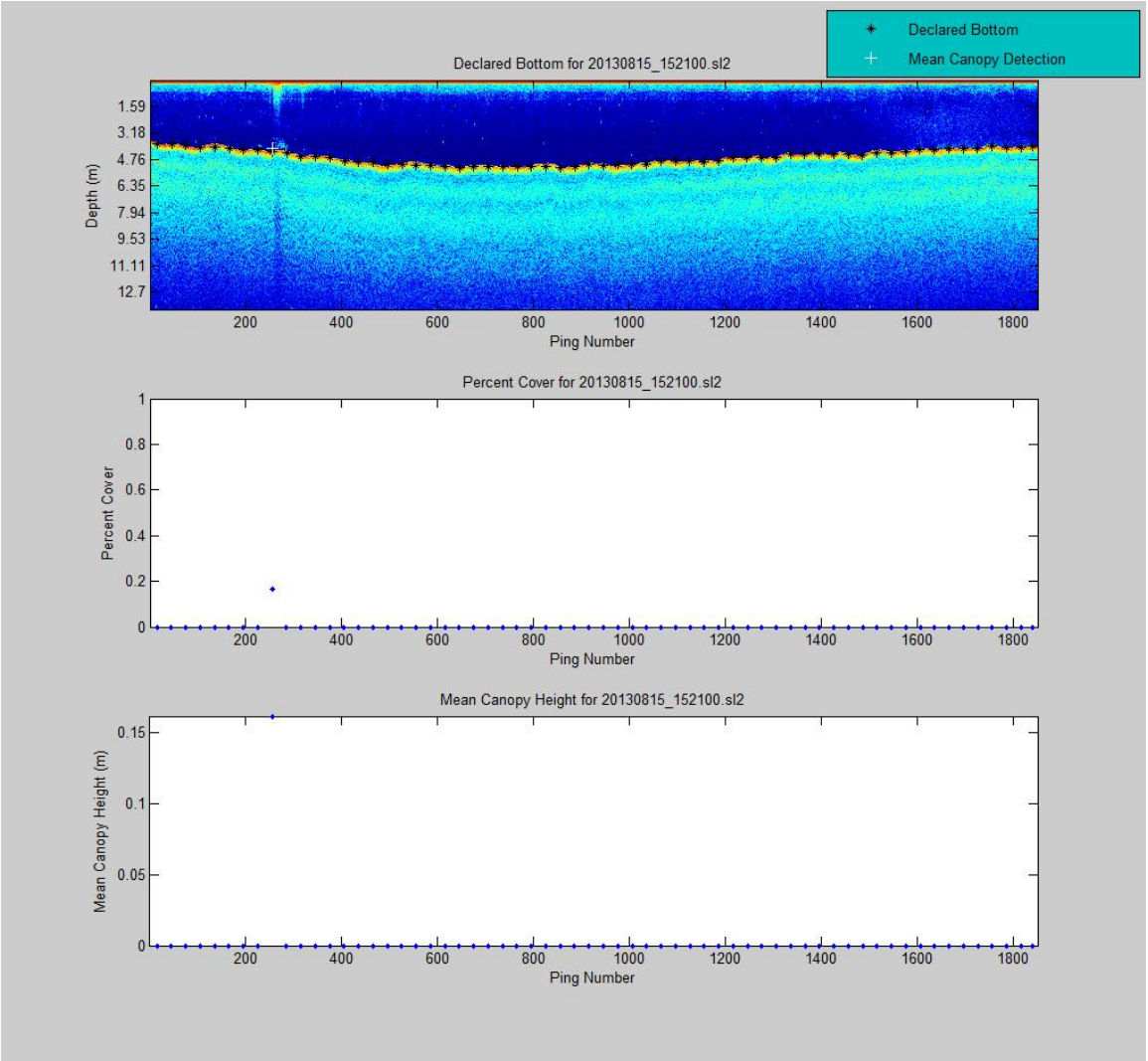

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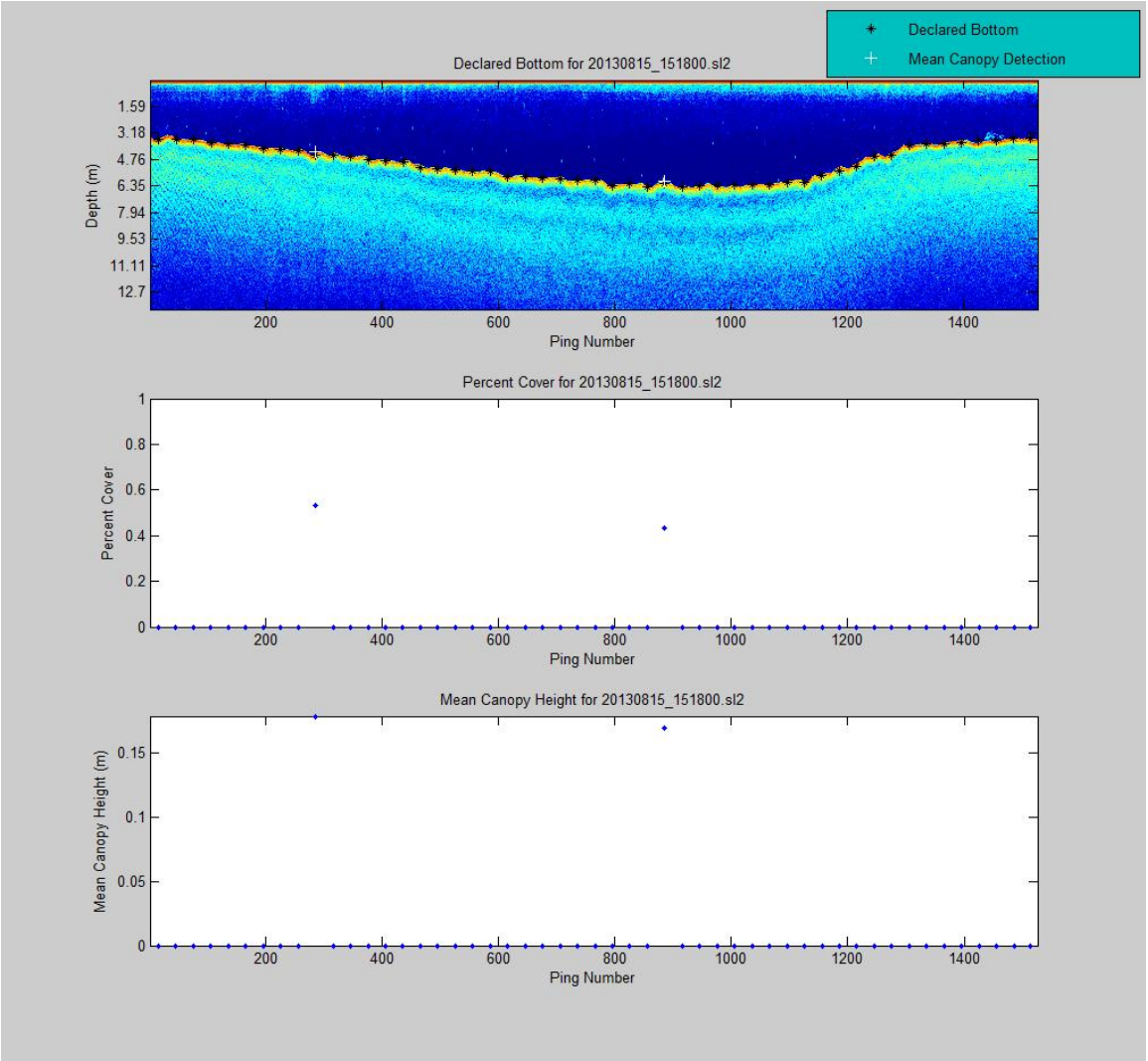

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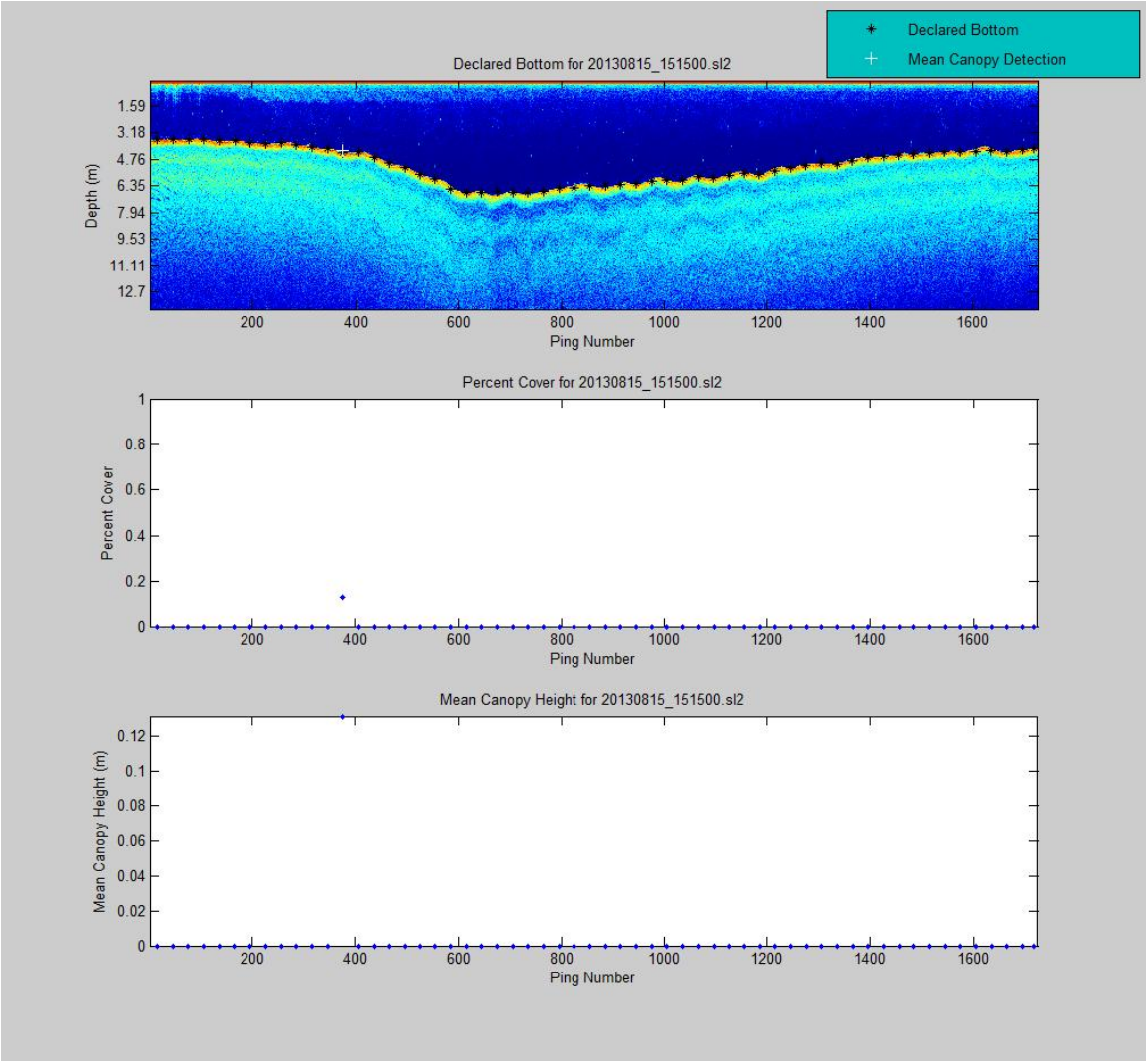

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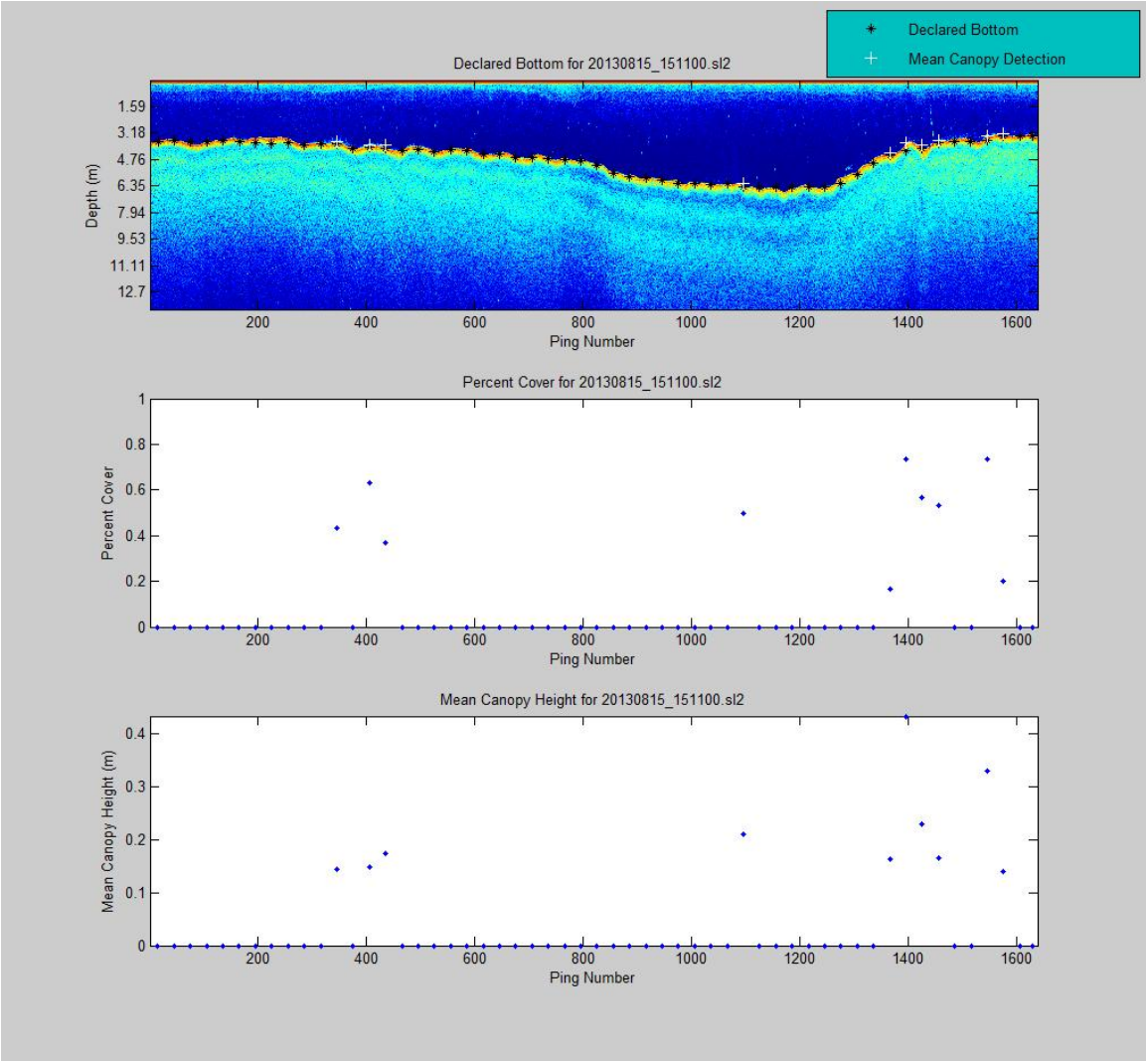
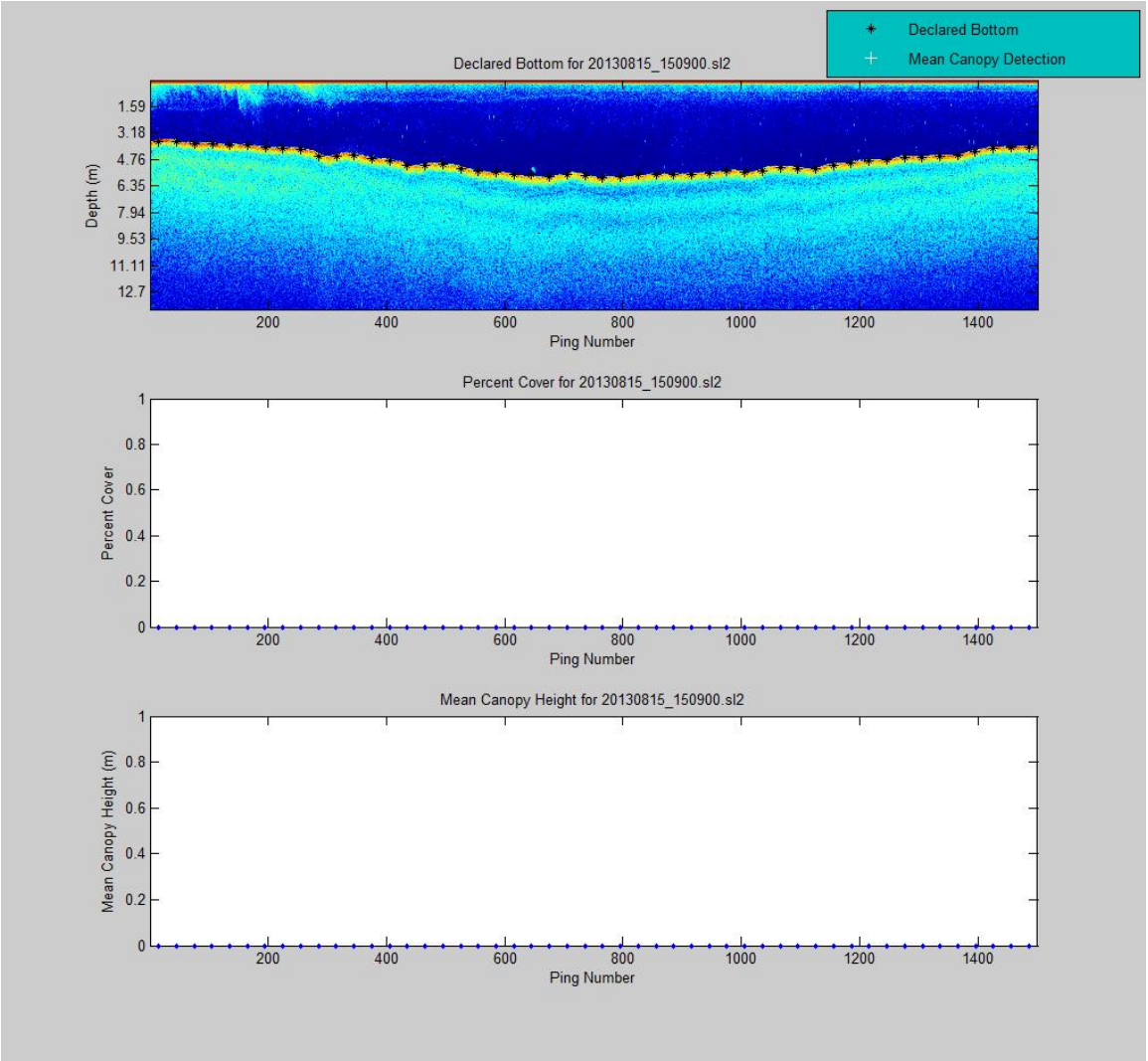
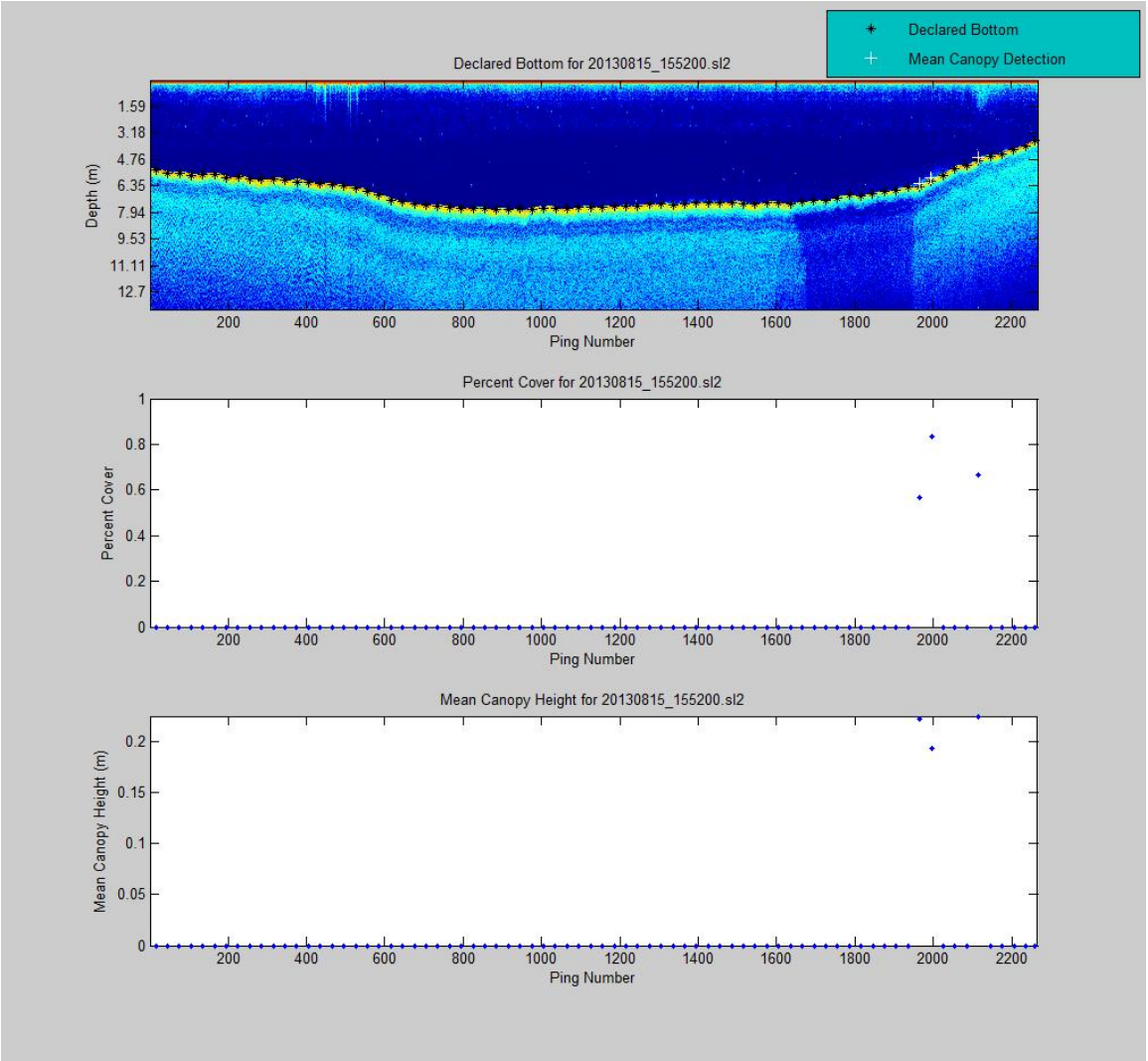


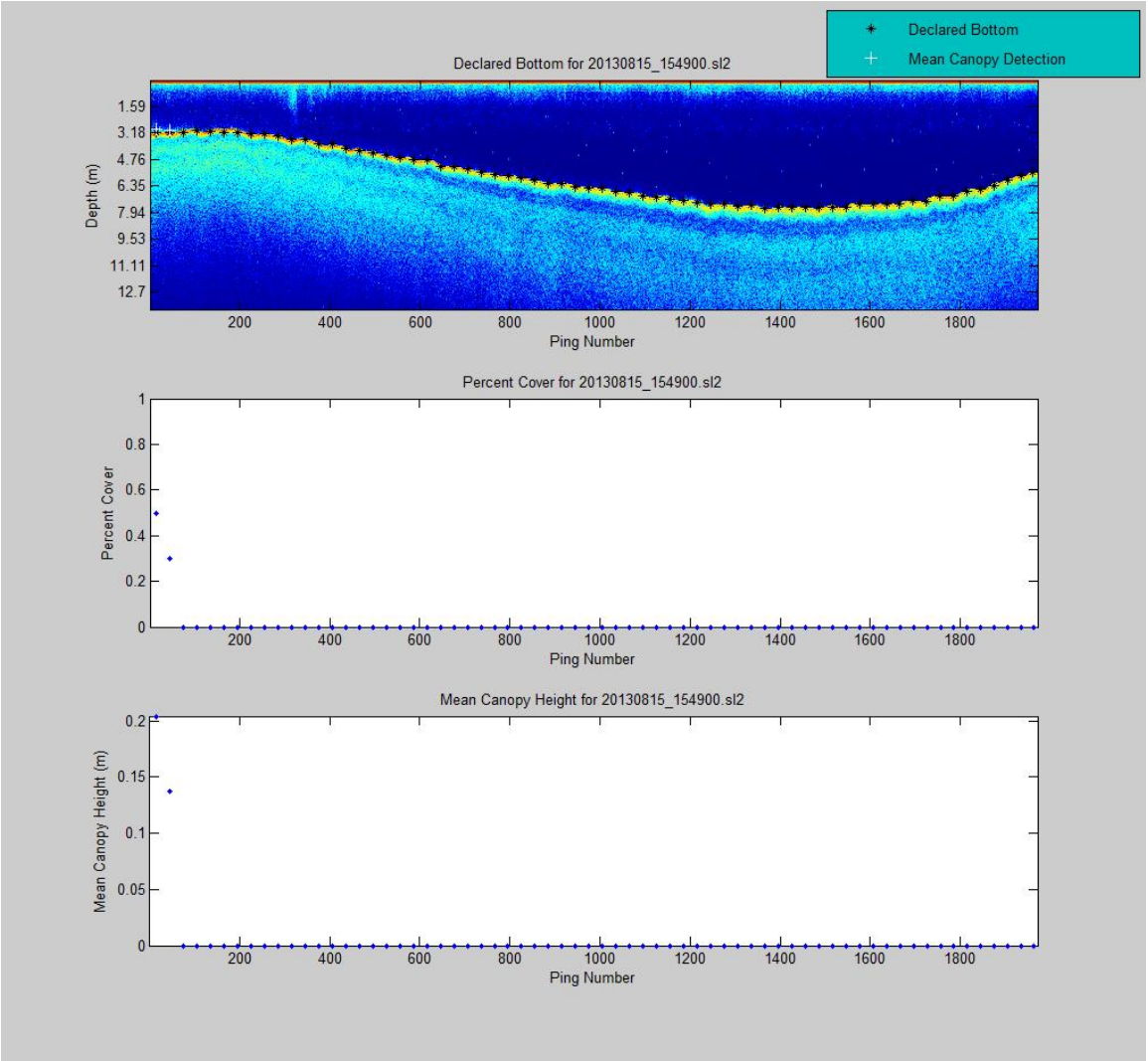
NEWBURYPORT, MA - TRANSECT 6 (20130815_150900.SL2)



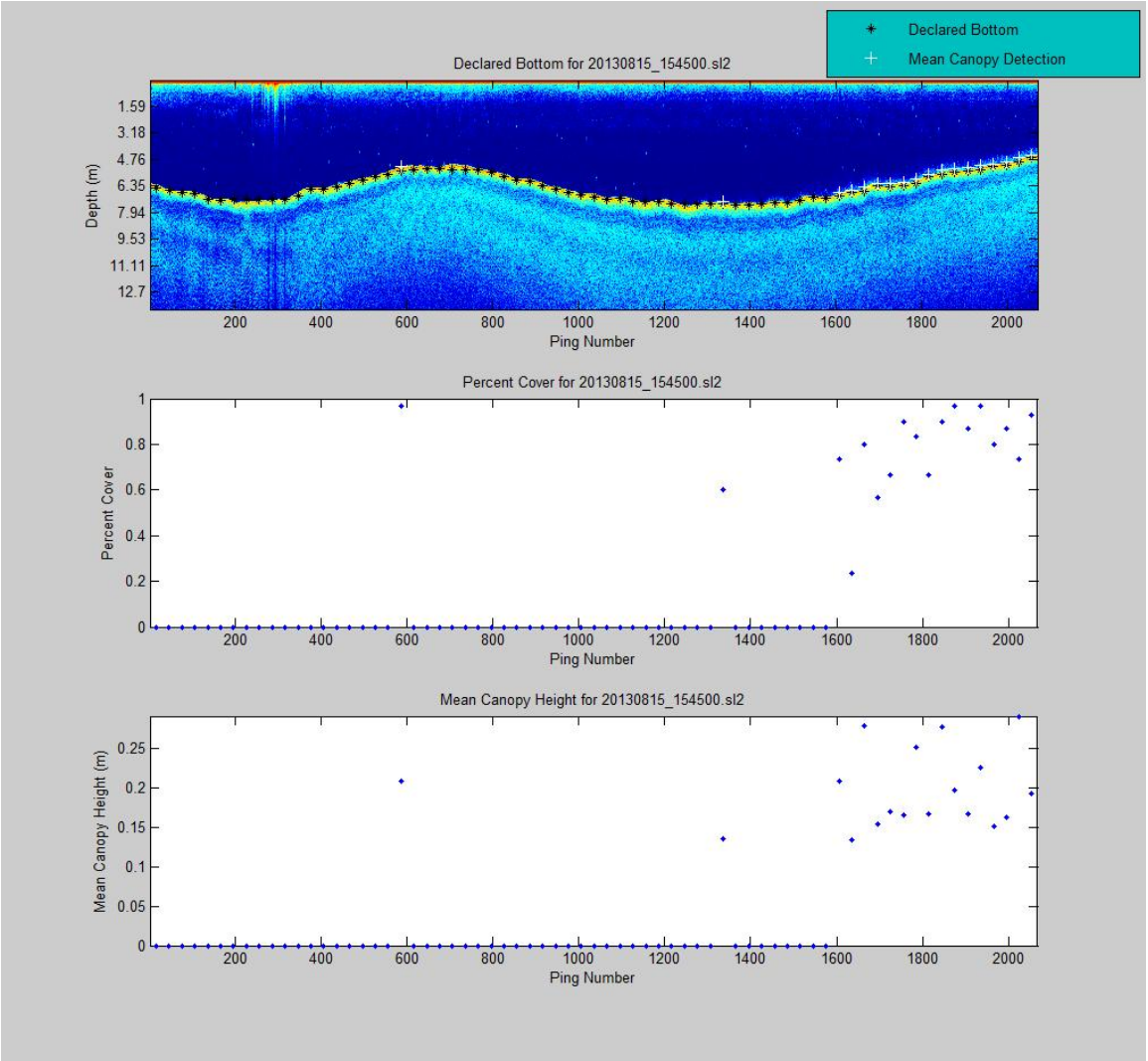
NEWBURY, MA - TRANSECT 1 (20130815_155200.SL2)



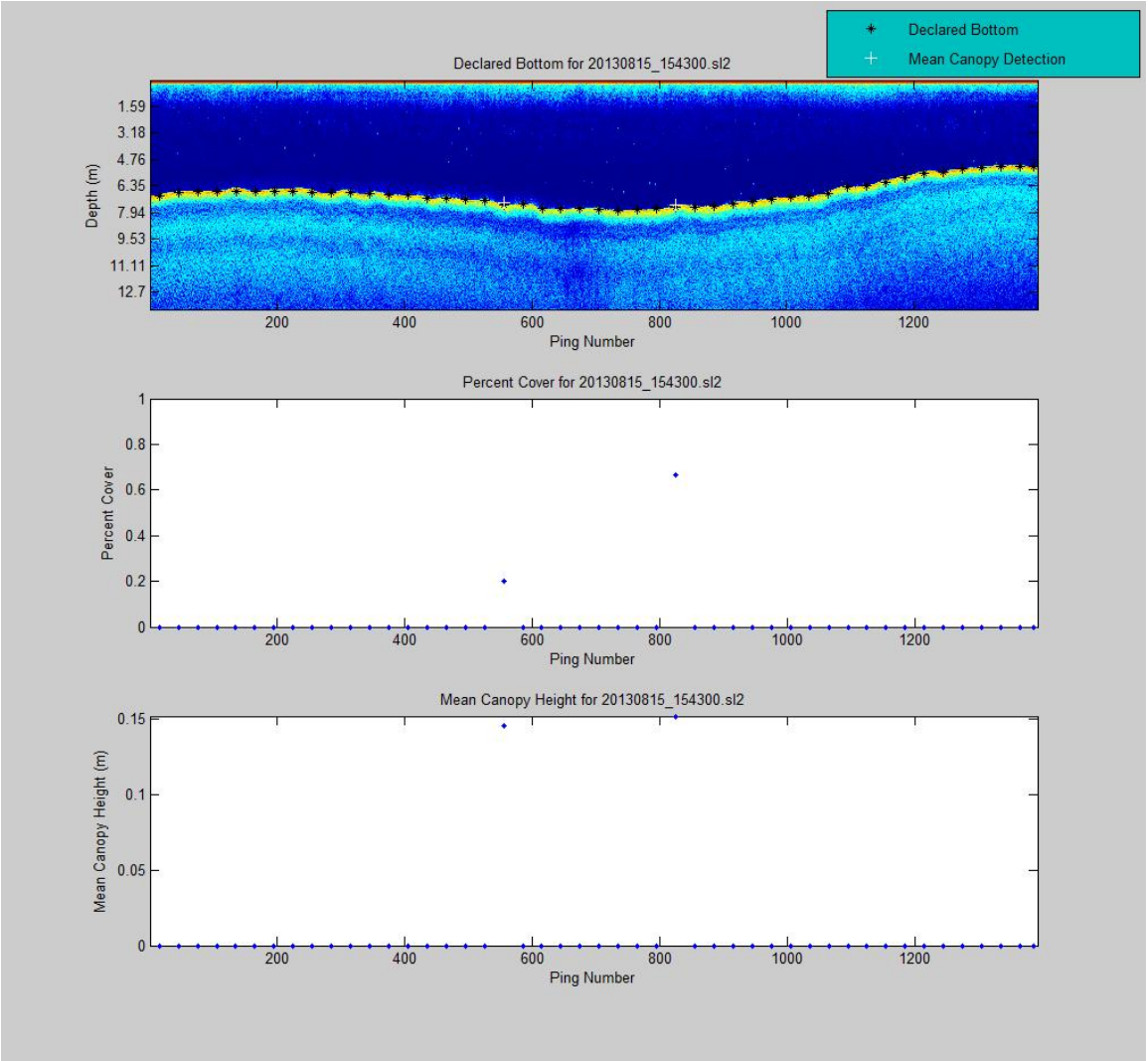
NEWBURY, MA - TRANSECT 2 (20130815_154900.SL2)



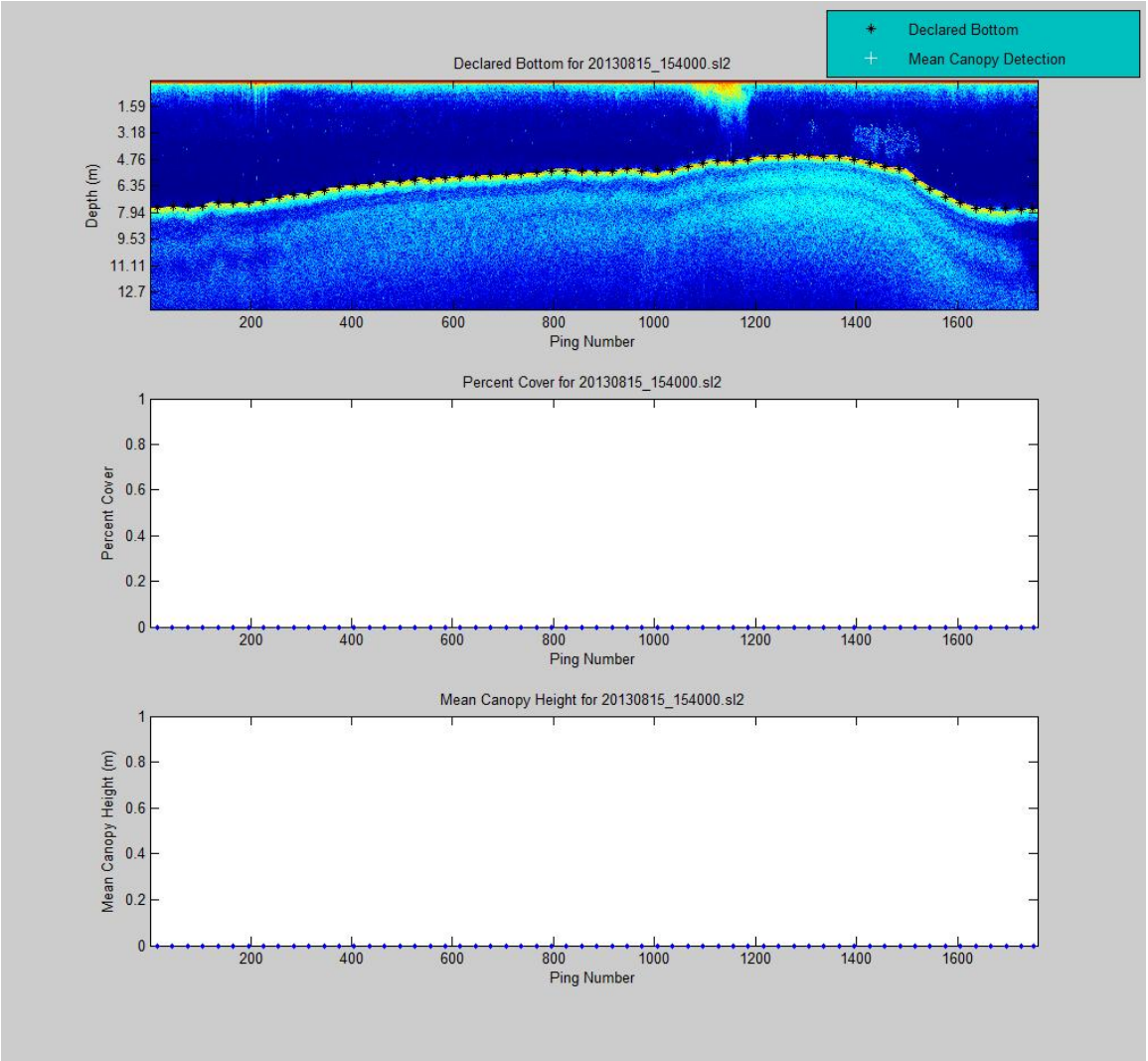
NEWBURY, MA - TRANSECT 3 (20130815_154500.SL2)



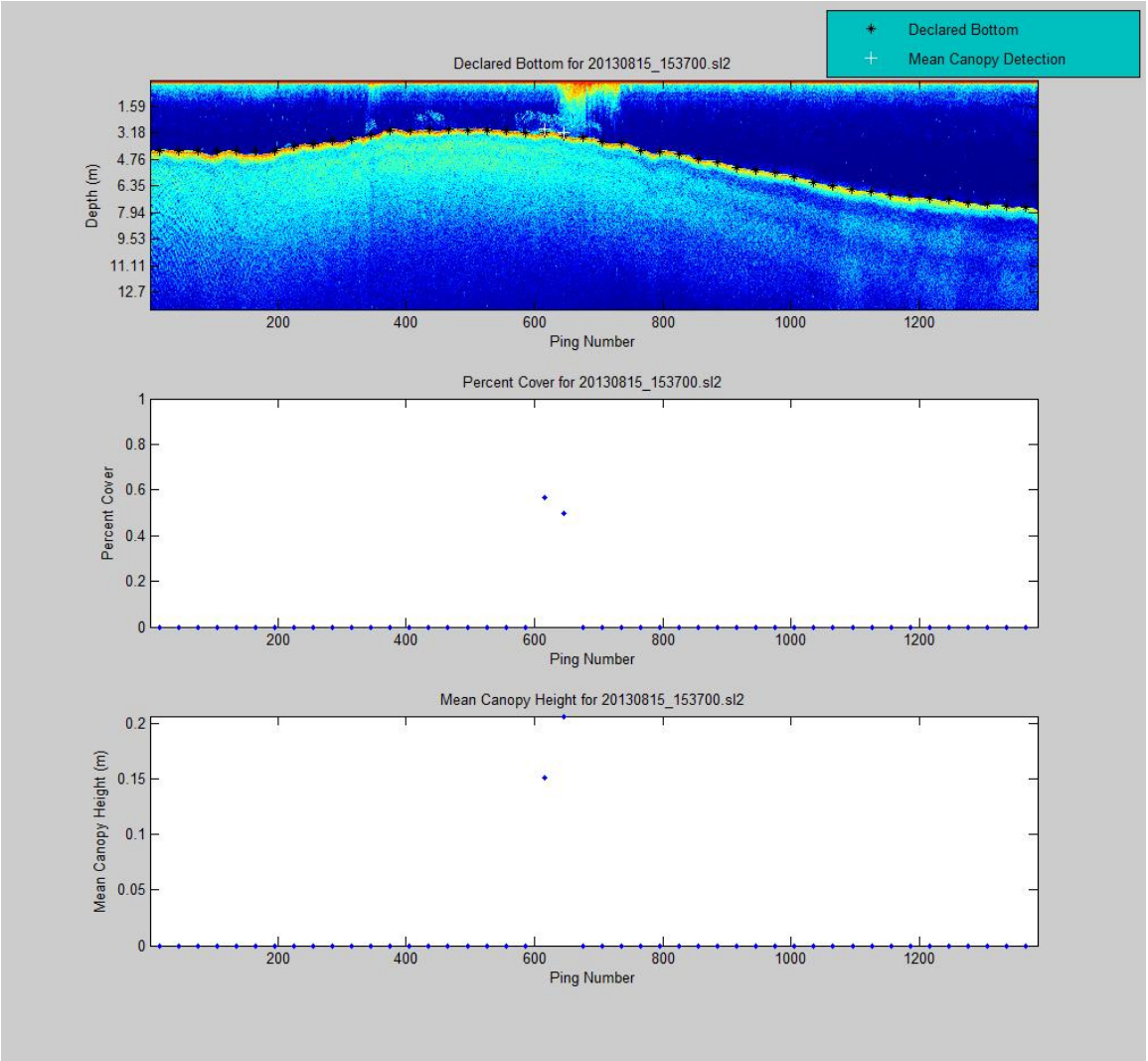
NEWBURY, MA - TRANSECT 4 (20130815_154300.SL2)



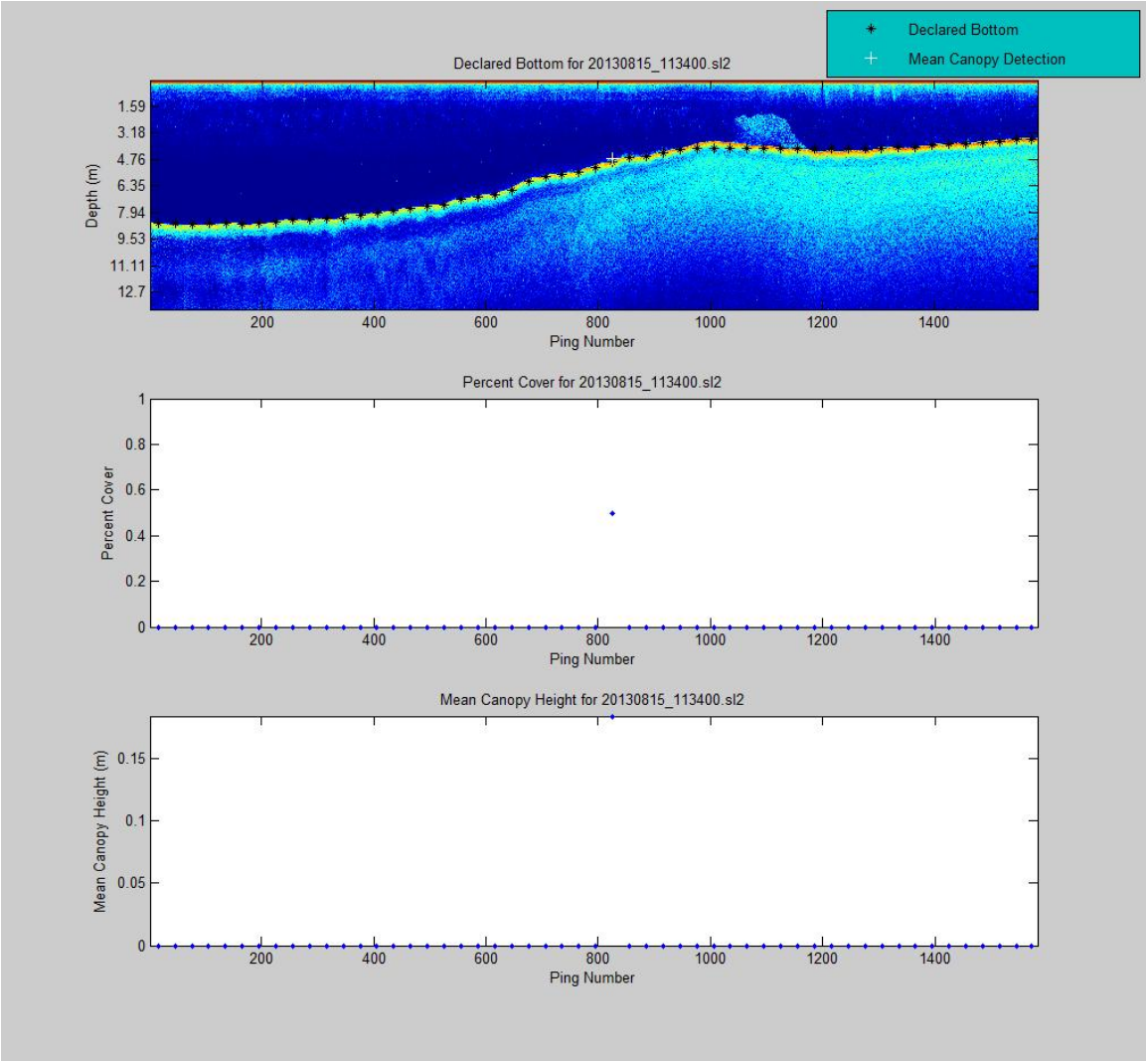
NEWBURY, MA - TRANSECT 5 (20130815_154000.SL2)



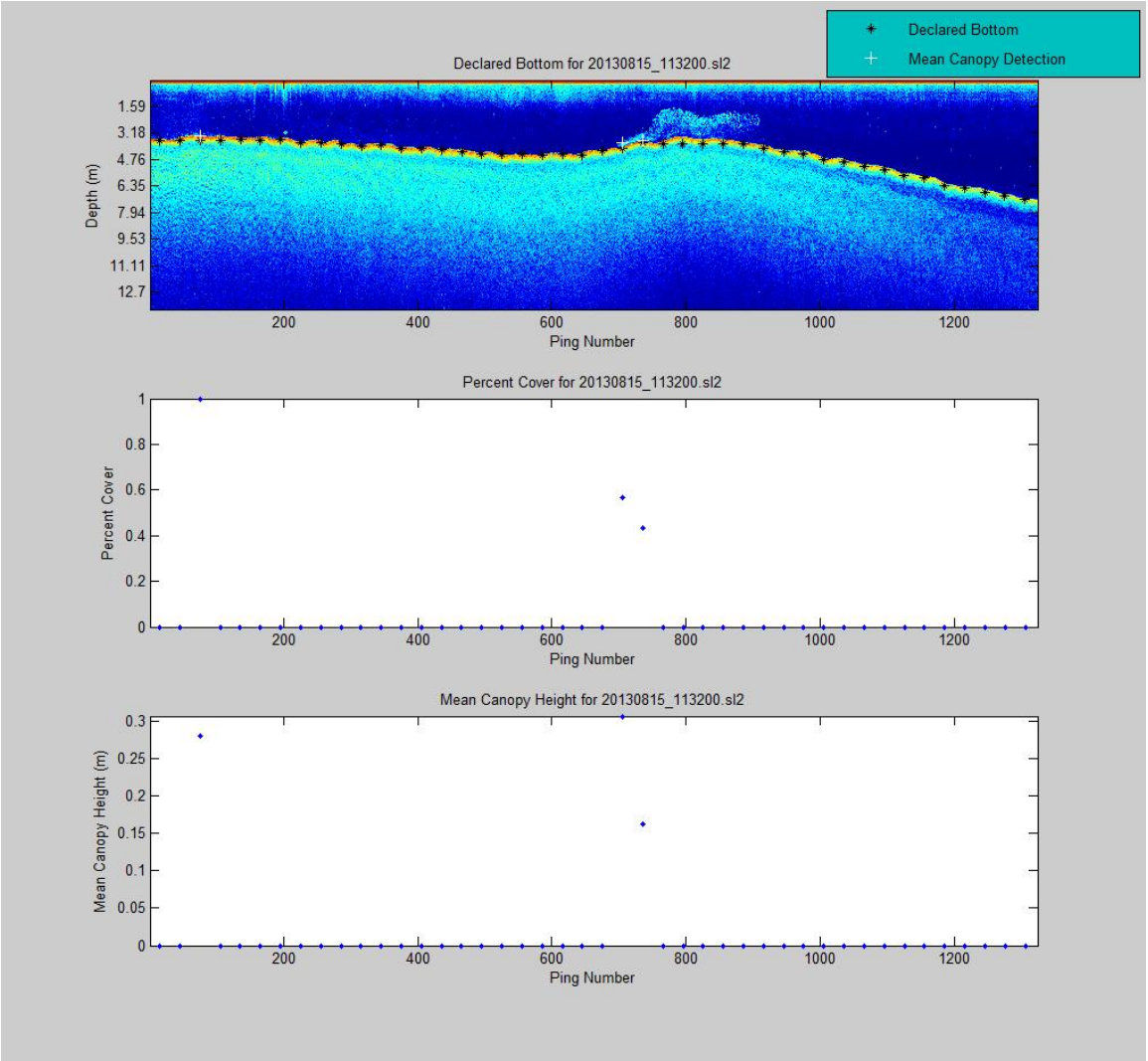
NEWBURY, MA - TRANSECT 6 (20130815_153700.SL2)



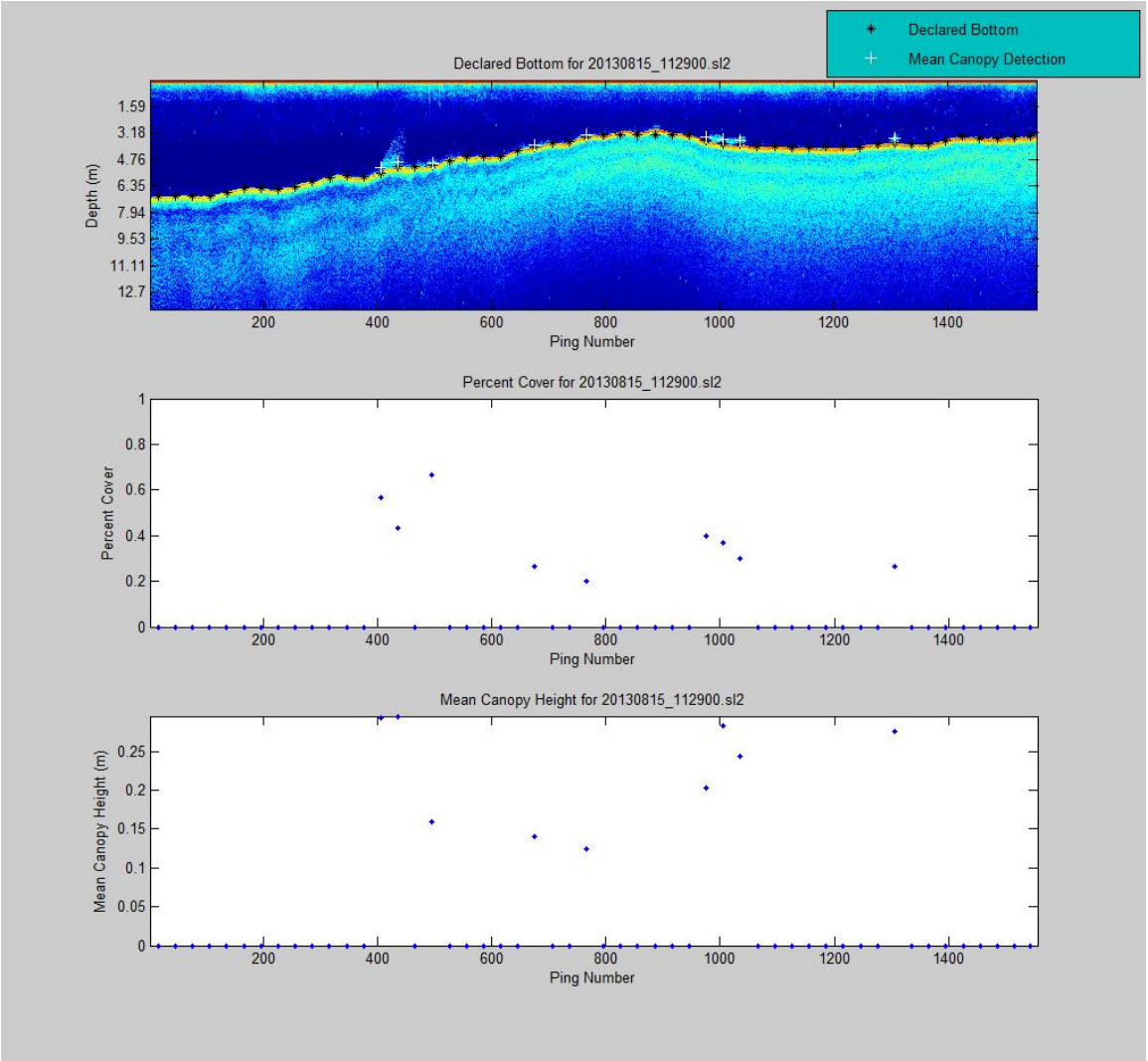
NEWBURY, MA - TRANSECT 7 (20130815_153400.SL2)



NEWBURY, MA - TRANSECT 8 (20130815_153200.SL2)



NEWBURY, MA - TRANSECT 9 (20130815_112900.SL2)



Appendix A: SAVEWS JR OUTPUT AND CONFIGURATION FILES

Configuration file PISCATAQUA_NSDS.sjrcfg
File created 8/26/13

****
Basic Parameters
****

n	30	The number of StructureScan pings used per report cycle. Structure-Scan operated as a fixed rate of 30 Hz.
heightmin	0.10	Minimum plant height (m) (distance between declared bottom and shallowest above-threshold signal) required for a candidate plant detection declaration.
stdmin	0.03	Standard deviation (m) of difference between plant height of adjoining pings. Both STDMIN and HEIGHTMIN must exceed this minimum for a declared plant detection (AND function). To use only one feature set the other to zero.
maxplantdepth	8	The maximum bottom depth (m), uncorrected for transducer depth or tides, at which plants are found. This eliminates any candidate detection below this depth, and output is declared unvegetated.

****
Intermediate Parameters
****

startdepth	1.0	The depth (m) below transducer (zero depth) to start processing. This value can be set to higher value if it is necessary to read past an interference such as reflection from the motor lower unit. All data prior to this depth is ignored.
usernoise	90	Setting this value to zero will activate automated determination of noise threshold using Percentile value below. If set to a non-zero value, that number will be used as the noise threshold value.
percentile	75	The percentile of program-generated noise threshold data to be represented by the programatically-determined overall noise threshold. Higher percentile values result in higher stresholds, with less sensitivity to noise and to plant detection.
mingap	0.05	The minimum quiet zone distance (m) that must be below noise threshold in order to detect vegetation. If this quiet zone minimum is not met the ping is rejected as bad data. Only decrease this value from 0.10 m if working in extremely shallow water or inherently "noisy" water. In this situation, an alternate approach would be to increase the usernoise value.
bot_med_filt_size	11	Parameter for smoothing bottom declarations. Size of median filter (number of elements) used in median filter. Current value is the center element of this filter. Use only odd numbers between 5 and 13.

bot_change_tol	0.10	Parameter for smoothing bottom declarations. If deviation (m) between current value and the median determined by median filter of size bot_med_filt_size exceeds this value, then the current value will be replaced by the median. Deactivate this feature by setting it to a very large value, such as 10 m.
cand_veg_amt	5	The minimum percentage of pings in a report cycle that must be candidate vegetation before output is declared to be vegetation. If this percentage is not met, the report is declared unvegetated.
required_good	30	Minimum percentage of pings in report cycle (set as n above) that must be valid data before that report cycle is output. 30 is considered the minimum recommended value.

****
Advanced Parameters
****

swin	9	The width of the median filter to be used in smoothing the pings. If changing this parameter, refer to filterflag in the "Intermediate Parameters" section to complete parameter setup.
th_limit	230	The maximum allowable noise threshold for a ping.
use_all	1	Set this value to 1 for all data to be used, or 0 for only half of the data (depth-wise) to be used. This is a data reduction option that achieves processing time cost savings if depth recording is > 2x bottom depth.
hist_width	0.02	The width (m) of the bins to use in the histogram analysis that is used to make bottom declarations. This represents the bin widths into which bottom candidates are placed in order to make accurate bottom declarations.
bot_wid_percent	1	The percentage of bottom widths that can have a width of 0. This is used to set the threshold value to calculate the width of the bottom. The threshold value is increased until (bot_wid_percent) percent of pings have no bottom width.
filterflag	0	Set this value to 1 if median filtering of the original ping data is desired, or 0 is median filtering is NOT desired. For 200khz input data, this filtering must always be used. If using median filtering, refer to "swin" in the "Advanced Parameters" section to complete parameter setup.

****

APPENDIX B

VIDEO SCREEN CAPTURE LIBRARY

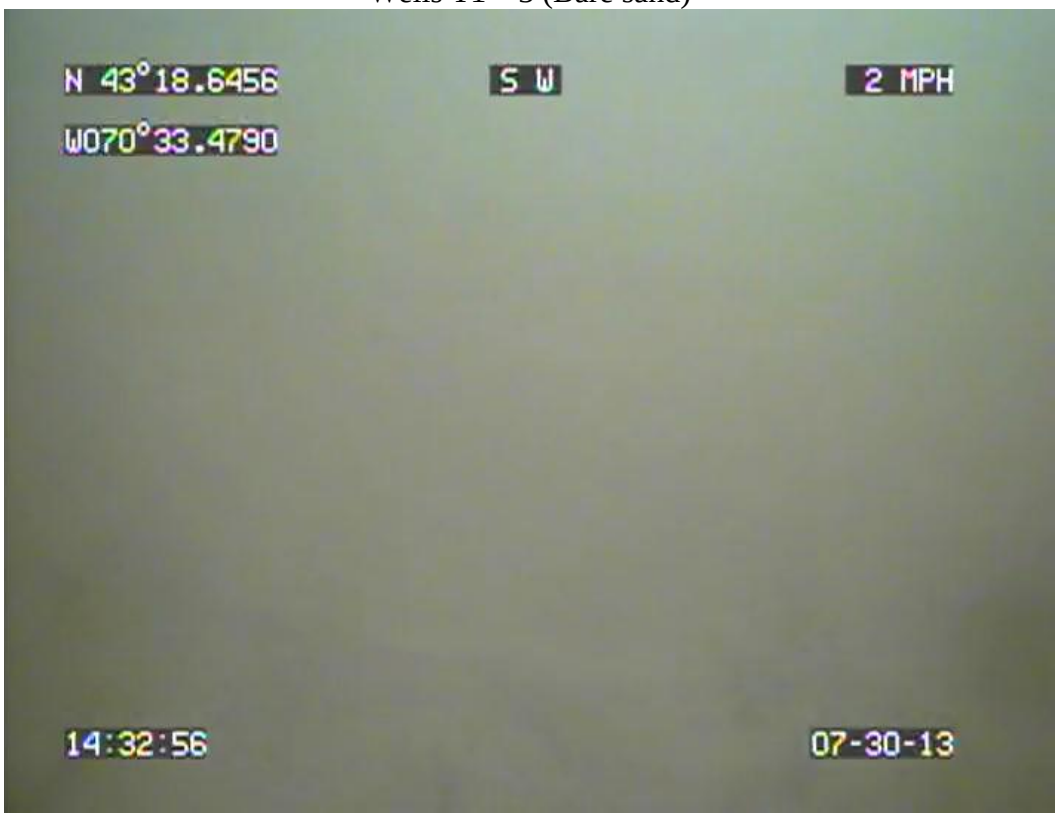
Appendix B: Video Screen Capture Library

Wells T1 – 1 (Bare sand)

Wells T1 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

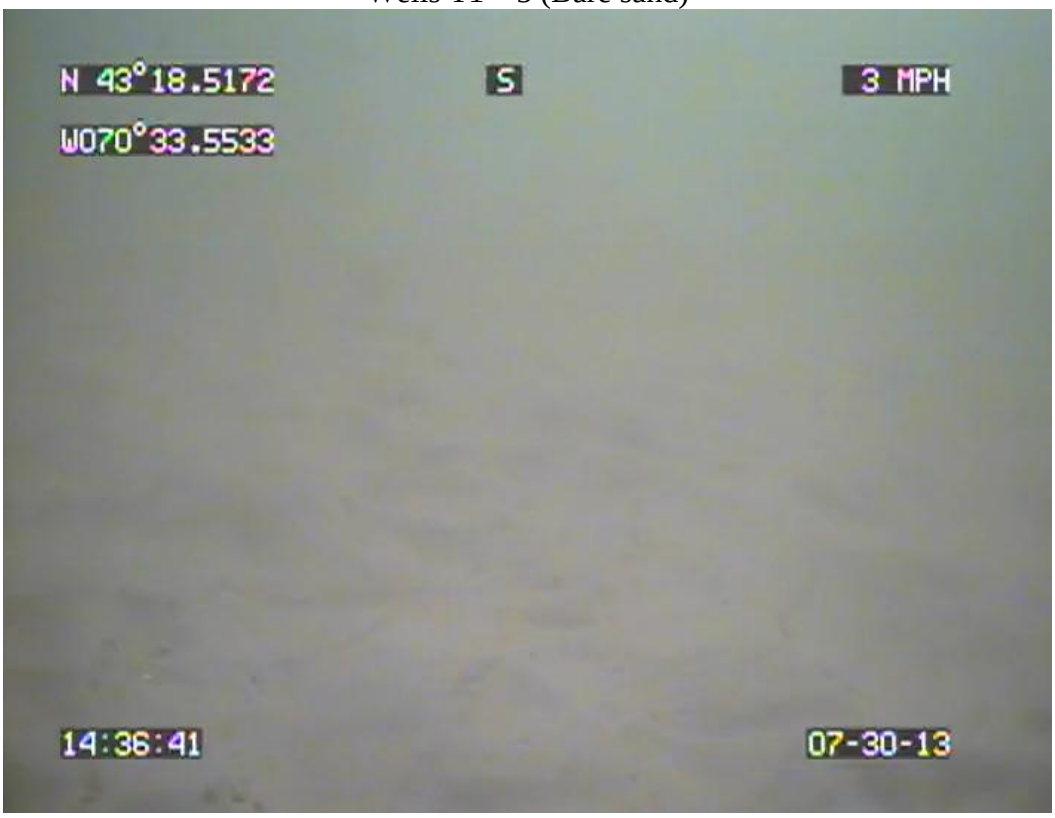
Wells T1 – 3 (Bare sand)



Wells T1 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T1 – 5 (Bare sand)



Wells T1 – 6 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T1 – 7 (Bare sand)

Wells T1 – 8 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T1 – 9 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T2 – 1 (Bare sand)

Wells T2 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T2 – 3 (Bare sand)

Wells T2 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T2 – 5 (Bare sand)

Wells T2 – 6 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T2 – 7 (Bare sand)

Wells T2 – 8 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T2 – 9 (Bare sand)

Wells T2 – 10 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T3 – 1 (Bare sand with algal debris)

Wells T3 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T3 – 3 (Bare sand)

Wells T3 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T3 – 5 (Bare sand and lobster)

Wells T3 – 6 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T3 – 7 (Bare sand)

Wells T3 – 8 (Bare sand and lobster)

Appendix B: Video Screen Capture Library

Wells T3 – 9 (Bare sand)

Wells T3 – 10 (Bare sand and lobster)

Appendix B: Video Screen Capture Library

Wells T4 – 1 (Bare sand)

Wells T4 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T4 – 3 (Bare sand with individual clump of unidentified macroalgae)

Wells T4 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Wells T4 – 5 (Bare sand and lobsters)

Wells T4 – 6 (Bare sand and lobster)

Appendix B: Video Screen Capture Library

Wells T4 – 7 (Bare sand)

Wells T4 – 8 (Bare sand)

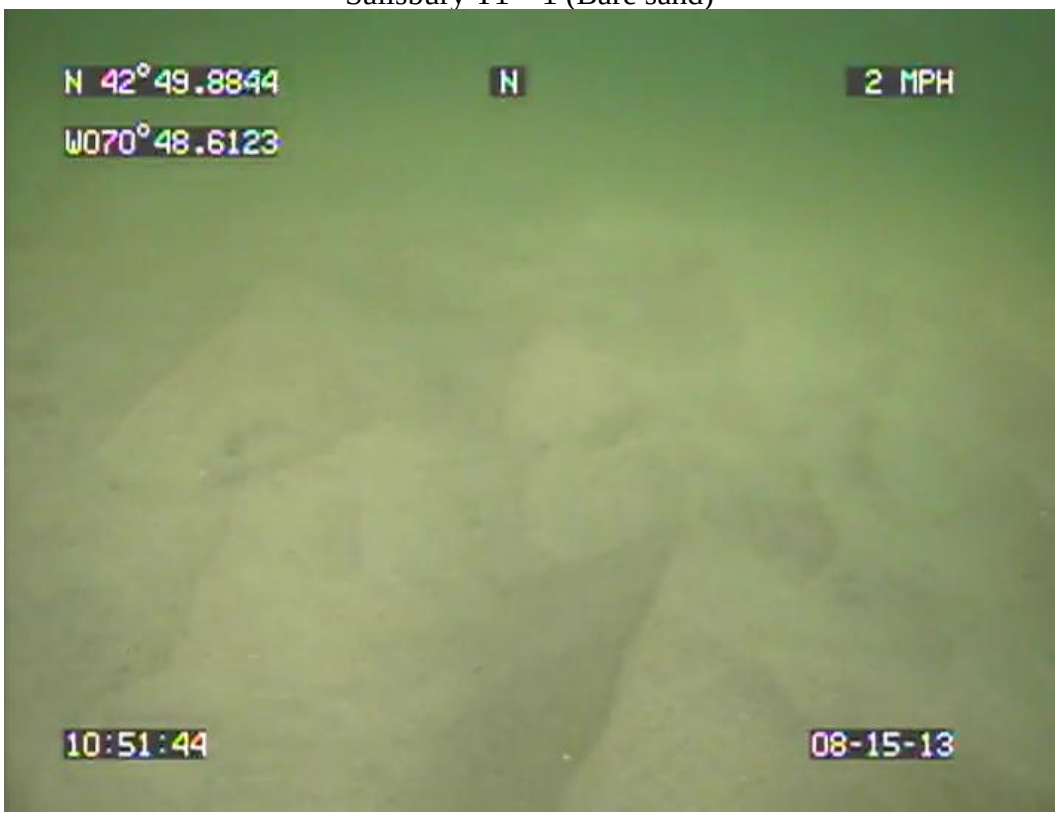
Appendix B: Video Screen Capture Library

Wells T4 – 9 (Bare sand and lobster)

Wells T4 – 10 (Bare sand and algal debris)

Appendix B: Video Screen Capture Library

Salisbury T1 – 1 (Bare sand)



Salisbury T1 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Salisbury T1 – 3 (Bare sand)

Salisbury T1 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Salisbury T1 – 5 (Bare sand)

Salisbury T1 – 6 (Bare sand)

Appendix B: Video Screen Capture Library

Salisbury T1 – 7 (Bare sand)

Salisbury T1 – 8 (Bare sand)

Appendix B: Video Screen Capture Library

Salisbury T1 – 9 (Bare sand)

Salisbury T1 – 10 (Bare sand)

Appendix B: Video Screen Capture Library

Salisbury T2 – 1 (Sand and drift algae)

Salisbury T2 – 2 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Salisbury T2 – 3 (Sand and drift algae)

Salisbury T2 – 4 (Sand, drift algae, and lobster)

Appendix B: Video Screen Capture Library

Salisbury T2 – 5 (Sand, drift algae, and lobster)

Salisbury T2 – 6 (Bare Sand)

Appendix B: Video Screen Capture Library

Salisbury T2 – 7 (Bare Sand)

Salisbury T2 – 8 (Bare Sand)

Appendix B: Video Screen Capture Library

Salisbury T2 – 9 (Bare Sand)

Salisbury T2 – 10 (Bare Sand)

Appendix B: Video Screen Capture Library

Salisbury T3 – 1 (Sand and drift algae)

Salisbury T3 – 2 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Salisbury T3 – 3 (Sand and drift algae)

Salisbury T3 – 4 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Salisbury T3 – 5 (Sand and drift algae)

Salisbury T3 – 6 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Salisbury T3 – 7 (Sand and drift algae)

Salisbury T3 – 8 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Salisbury T3 – 9 (Sand and drift algae)

Salisbury T3 – 10 (Sand and drift algae)

Appendix B: Video Screen Capture Library

Newburyport T1 – 1 (Bare sand and shell fragments)

Newburyport T1 – 2 (Bare sand and shell fragments)

Appendix B: Video Screen Capture Library

Newburyport T1 – 3 (Bare sand)

Newburyport T1 – 4 (Bare sand)

Newburyport T1 – 5 (Bare sand)

Newburyport T1 – 6 (Bare sand)

Appendix B: Video Screen Capture Library

Newburyport T1 – 7 (Bare sand)

Newburyport T1 – 8 (Bare sand and moon snail)

Appendix B: Video Screen Capture Library

Newburyport T1 – 9 (Bare sand)

Newburyport T1 – 10 (Bare sand)

Appendix B: Video Screen Capture Library

Newburyport T2 – 1 (Bare sand)

Newburyport T2 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Newburyport T2 – 3 (Bare sand)

Newburyport T2 – 4 (Bare sand and surf clam shell)

Appendix B: Video Screen Capture Library

Newburyport T2 – 5 (Bare sand)

Newburyport T2 – 6 (Bare sand and surf clam shells)

Newburyport T2 – 7 (Bare sand)

Newburyport T2 – 8 (Bare sand)

Newburyport T2 – 9 (Bare sand)

Newburyport T2 – 10 (Bare sand and surf clam shell with crab)

Appendix B: Video Screen Capture Library

Newburyport T3 – 1 (Bare sand)

Newburyport T3 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Newburyport T3 – 3 (Bare sand and shell fragments)

Newburyport T3 – 4 (Bare sand and surf clam shell)

Appendix B: Video Screen Capture Library

Newburyport T3 – 5 (Bare sand)

Newburyport T3 – 6 (Bare sand and surf clam shells)

Appendix B: Video Screen Capture Library

Newburyport T3 – 7 (Bare sand and surf clam shells)

Newburyport T3 – 8 (Bare sand)

Appendix B: Video Screen Capture Library

Newburyport T3 – 9 (Bare sand)

Newburyport T3 – 10 (Bare sand)

Appendix B: Video Screen Capture Library

Newbury T1 – 1 (Bare sand)

Newbury T1 – 2 (Bare sand)

Appendix B: Video Screen Capture Library

Newbury T1 – 3 (Bare sand)

Newbury T1 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Newbury T1 – 5 (Bare sand)

Newbury T1 – 6 (Bare sand and drift algae)

Newbury T1 – 7 (Bare sand and drift algae)

Newbury T1 – 8 (Bare sand and drift algae)

Appendix B: Video Screen Capture Library

Newbury T1 – 9 (Bare sand)

Newbury T1 – 10 (Bare sand)

Appendix B: Video Screen Capture Library

Newbury T2 – 1 (Bare sand)

Newbury T2 – 2 (Macroalgae wrack and lobster)

Appendix B: Video Screen Capture Library

Newbury T2 – 3 (Bare sand)

Newbury T2 – 4 (Bare sand)

Appendix B: Video Screen Capture Library

Newbury T2 – 5 (Bare sand)

Newbury T2 – 6 (Bare sand and surf clam shell)

Newbury T2 – 7 (Bare sand, shell fragment, and drift algae)

Newbury T2 – 8 (Bare sand)

Newbury T2 – 9 (Bare sand)

Newbury T2 – 10 (Bare sand)

APPENDIX C

ANALYTICAL REPORT

US Army Corps of Engineers
New England District

NAE ENVIRONMENTAL LABORATORY
Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME

Date Collected: 07/30/13
Date Recieved: 08/01/13
Date Analyzed: 08/05/13

Preparation Method: ASTM D421-85 (reapproved 2002)

Analysis Method: ASTM D 422-63 (reapproved 2002) - Sieve Nos. 4, 10, 40, 100, 200

Lab SOP: Particle Size Analysis of Sediments - Without Hydrometer (October 2011)

Received By: RBL **Analyzed By:** CGB **Checked By:** RBL

Discussion: Five samples for each location (a total of twenty samples) were received by the lab upon completion of field activities. There were no deviations from the established laboratory testing protocols during preparation or analysis.

QA/QC Narrative: Not requested

Summary of Results:

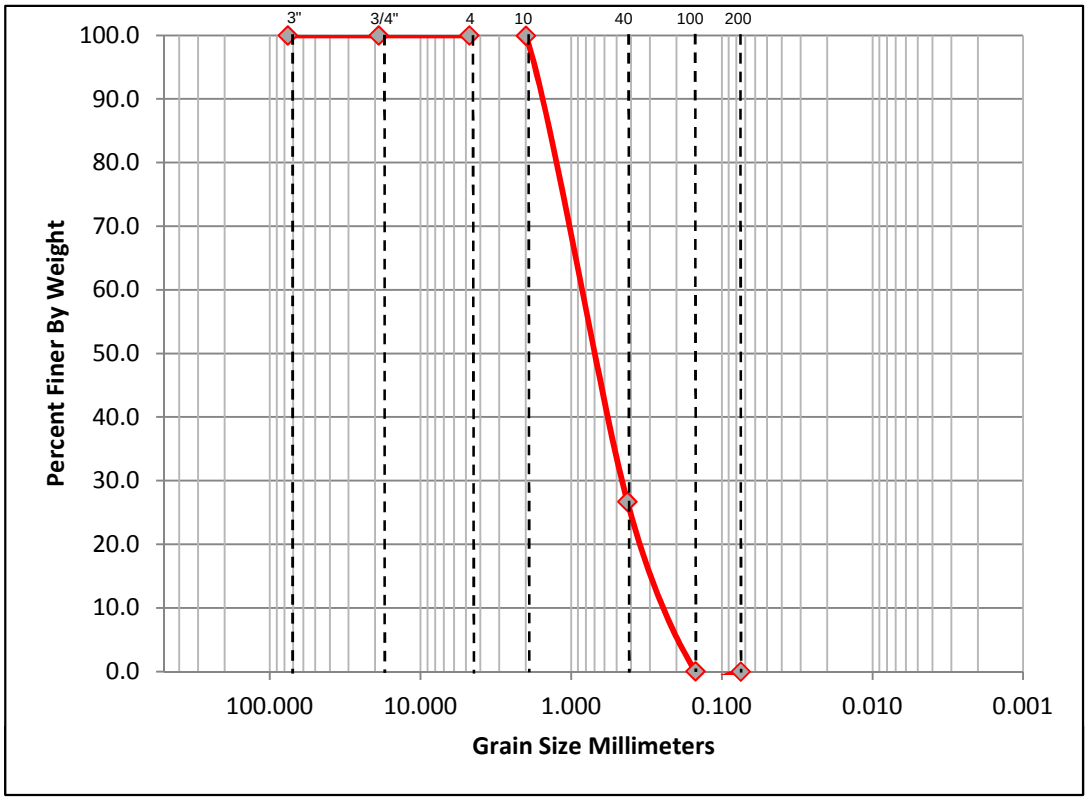
Sample ID	%Cobble	%Gravel		%Sand			%Fines
		Coarse	Fine	Coarse	Medium	Fine	
Salis-A	0.0	0.0	0.0	0.1	73.2	26.7	0.0
Salis-B	0.0	0.0	0.0	0.0	2.7	97.3	0.0
Salis-C	0.0	0.0	0.0	0.0	74.9	25.0	0.0
Salis-D	0.0	0.0	0.0	0.1	83.1	16.8	0.0
Salis-E	0.0	0.0	0.0	0.0	1.4	98.5	0.0
Newb-A	0.0	0.0	1.6	8.6	85.4	4.4	0.0
Newb-B	0.0	0.0	0.0	0.9	98.1	1.0	0.0
Newb-C	0.0	0.0	0.2	3.2	85.9	10.7	0.0
Newb-D	0.0	0.0	5.1	4.3	36.2	54.5	0.0
Newb-E	0.0	0.0	0.8	2.2	74.1	22.9	0.0
PI-A	0.0	0.0	0.0	0.1	49.1	50.8	0.0
PI-B	0.0	0.0	0.3	0.7	87.2	11.9	0.0
PI-C	0.0	0.0	0.0	0.0	66.0	34.0	0.0
PI-D	0.0	0.0	0.1	0.2	57.2	42.6	0.0
PI-E	0.0	0.0	0.0	0.2	96.5	3.2	0.0
Wells-A	0.0	0.0	0.0	0.1	1.0	98.9	0.0
Wells-B	0.0	0.0	0.2	0.4	1.4	98.1	0.0
Wells-C	0.0	0.0	0.1	0.0	0.6	99.3	0.0
Wells-D	0.0	0.0	0.0	0.1	1.2	98.7	0.0
Wells-E	0.0	0.0	0.5	0.2	0.5	98.8	0.0

US Army Corps of Engineers®
New England District

Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME
Sample ID: Salis-A

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	73.2	26.7	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.2526	0.3041	0.4956	0.9257	1.1408	1.6785	3.44	4.52

Original Sample Weight (g)			571.5	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	494.0	494.0	0.0	0.0	0.0	100.0
#10	2.000	470.5	470.8	0.3	0.1	0.1	99.9
#40	0.425	353.1	771.6	418.5	73.2	73.3	26.7
#100	0.150	328.9	481.3	152.4	26.7	99.9	0.1
#200	0.075	313.6	313.9	0.3	0.1	100.0	0.0

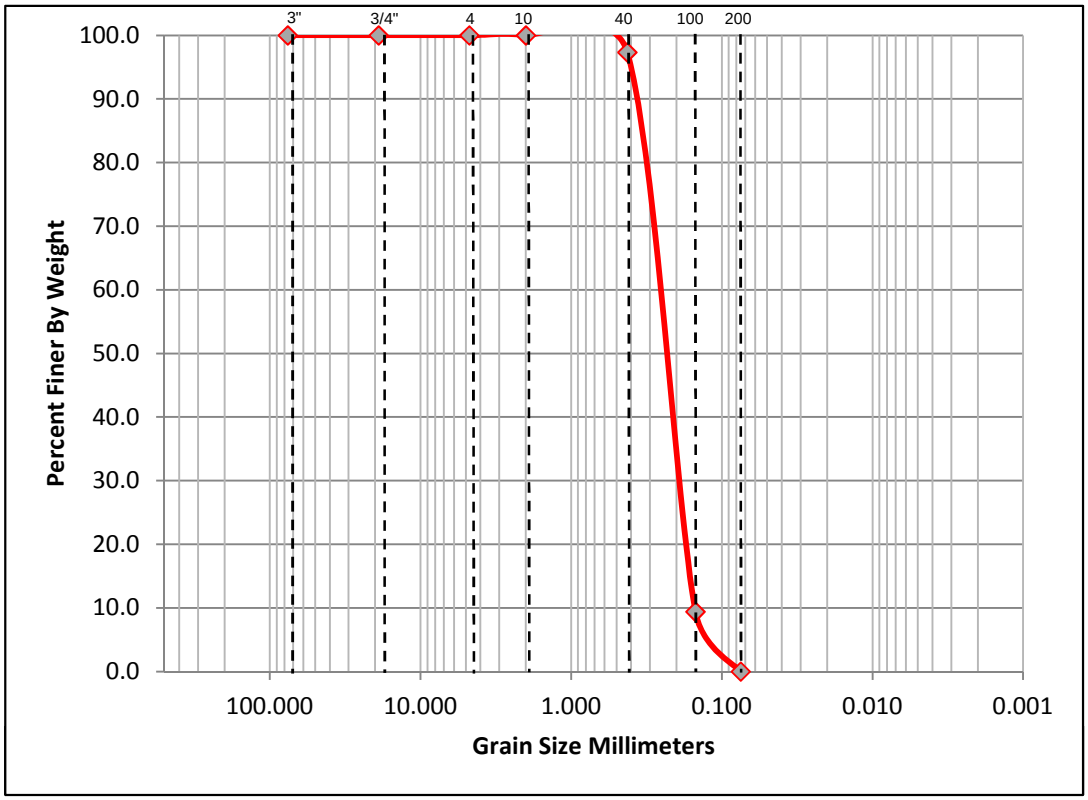
Sample Notes: SP- Grey and tan, subangular, medium to fine sand.

US Army Corps of Engineers®
New England District

Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME
Sample ID: Salis-B

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.7	97.3	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1519	0.1675	0.2144	0.2770	0.3083	0.3864	9.16	2.03

Original Sample Weight (g)			472.7	Post Wash Weight (g)			
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.4	489.4	0.0	0.0	0.0	100.0
#10	2.000	463.6	463.6	0.0	0.0	0.0	100.0
#40	0.425	355.0	367.6	12.6	2.7	2.7	97.3
#100	0.150	325.7	741.4	415.7	87.9	90.6	9.4
#200	0.075	316.8	361.2	44.4	9.4	100.0	0.0

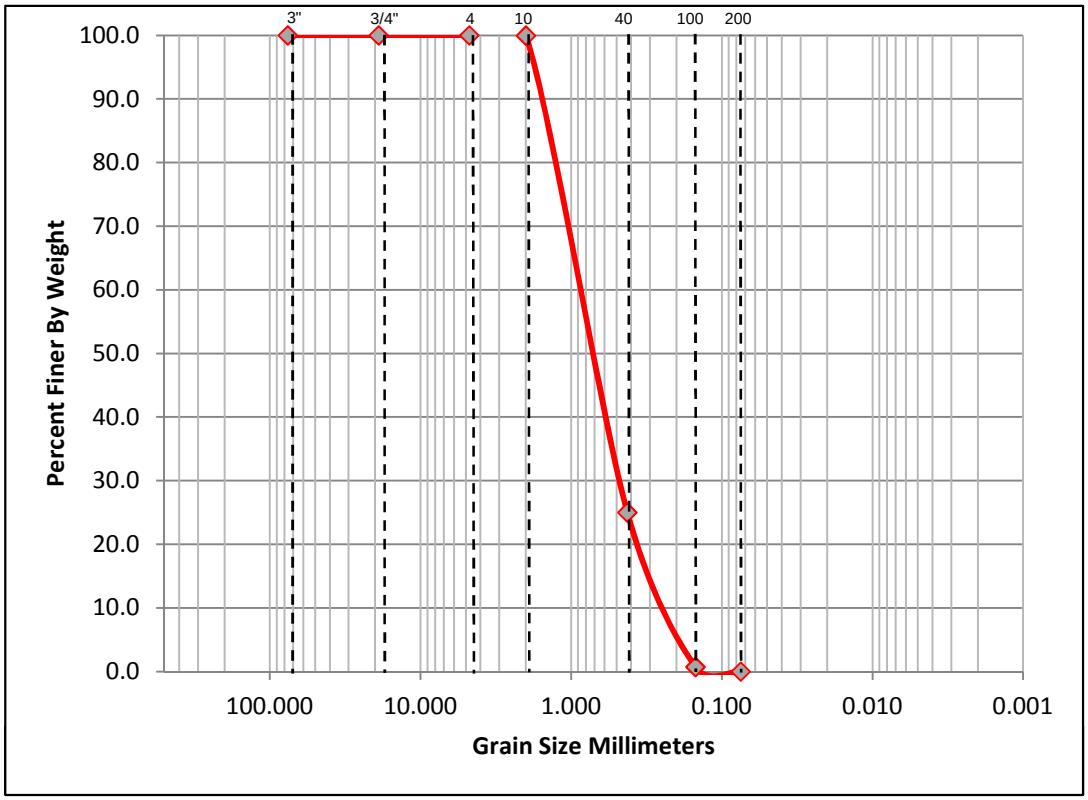
Sample Notes: SP- Medium to fine, grey and tan, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME
Sample ID: Salis-C

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	74.9	25.0	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.2551	0.3117	0.5299	0.9501	1.1603	1.6856	3.58	4.55

Original Sample Weight (g)			485.0	Post Wash Weight (g)			
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	494.0	494.0	0.0	0.0	0.0	100.0
#10	2.000	470.5	470.7	0.2	0.0	0.0	100.0
#40	0.425	352.9	716.4	363.5	74.9	75.0	25.0
#100	0.150	328.9	446.7	117.8	24.3	99.3	0.7
#200	0.075	313.6	317.1	3.5	0.7	100.0	0.0

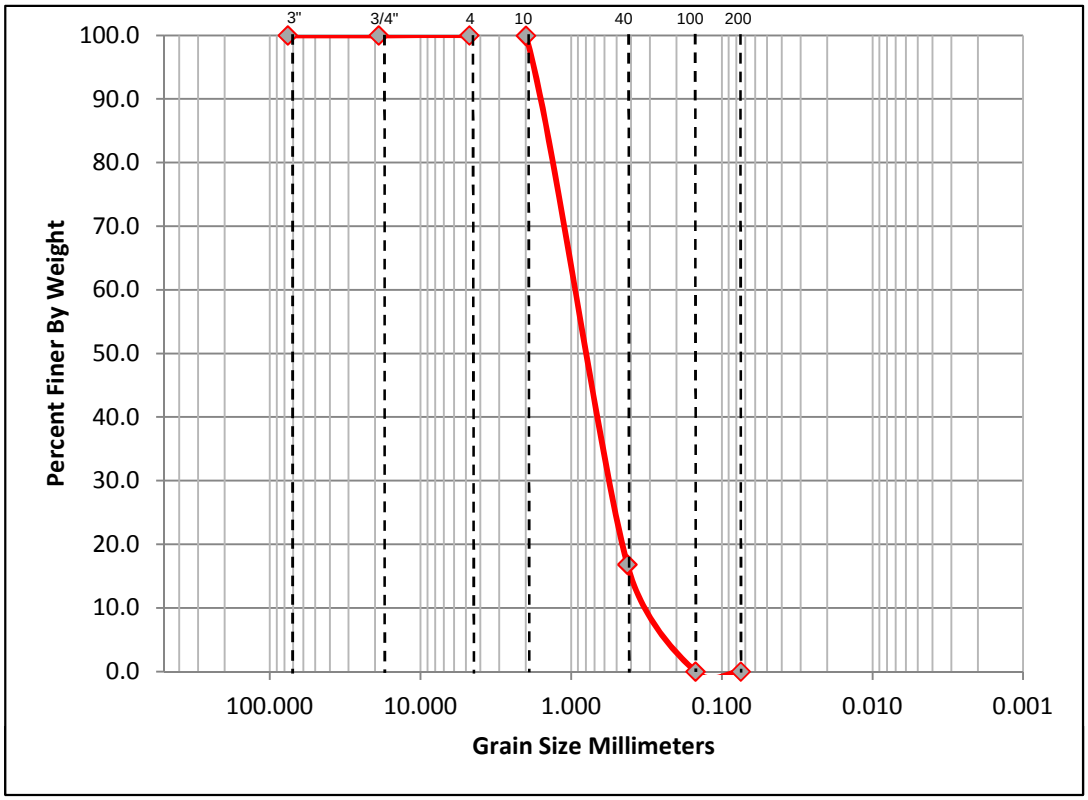
Sample Notes: SP- Medium to fine, grey, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME
Sample ID: Salis-D

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	83.1	16.8	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.3133	0.3950	0.6745	1.0535	1.2430	1.7168	3.46	3.97

Original Sample Weight (g)			507.8	Post Wash Weight (g)			
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.4	489.4	0.0	0.0	0.0	100.0
#10	2.000	463.6	463.9	0.3	0.1	0.1	99.9
#40	0.425	354.8	776.8	422.0	83.1	83.2	16.8
#100	0.150	325.6	411.1	85.5	16.8	100.0	0.0
#200	0.075	316.8	316.8	0.0	0.0	100.0	0.0

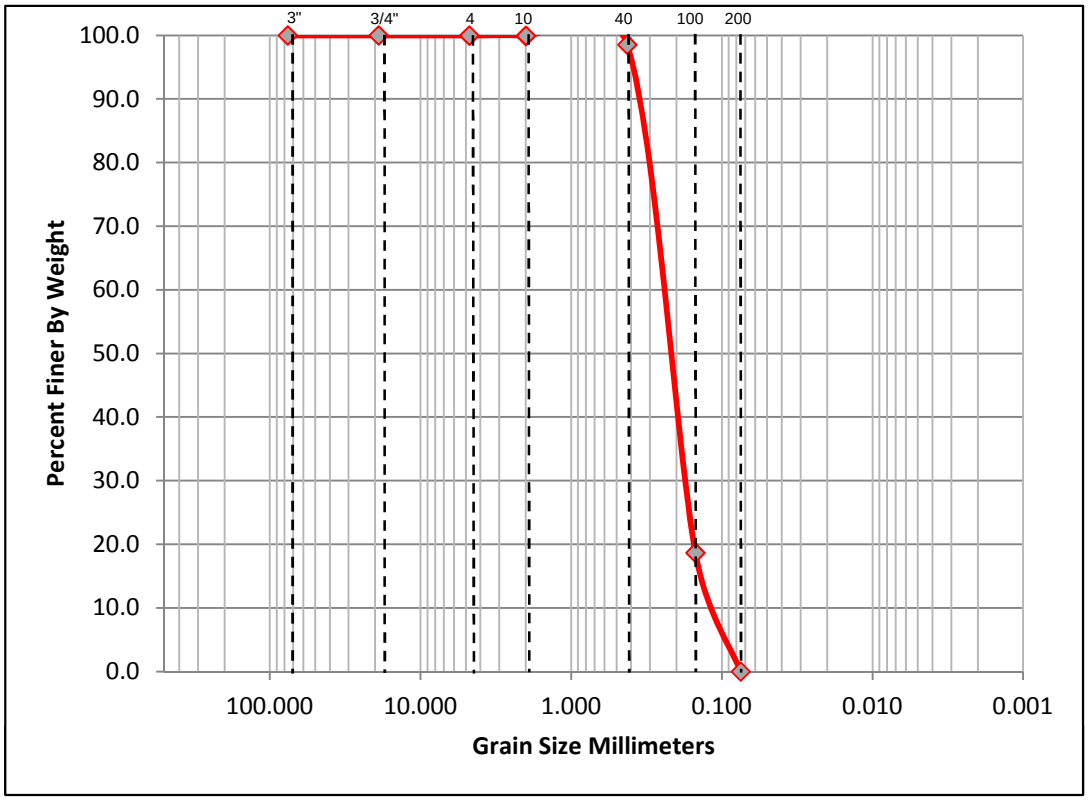
Sample Notes: SP- Medium to fine, sub-angular, tan sand.

US Army Corps of Engineers®
New England District

Project Name: Nearshore Disposal Sites
Project Location: Salisbury/Newburyport, MA; Wells, ME
Sample ID: Salis-E

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.4	98.5	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1152	0.1352	0.1890	0.2579	0.2923	0.3784	11.23	2.54

Original Sample Weight (g)			452.0	Post Wash Weight (g)			
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	494.0	494.1	0.1	0.0	0.0	100.0
#10	2.000	470.6	470.8	0.2	0.0	0.1	99.9
#40	0.425	353.1	359.4	6.3	1.4	1.5	98.5
#100	0.150	328.9	689.9	361.0	79.9	81.3	18.7
#200	0.075	313.7	398.1	84.4	18.7	100.0	0.0

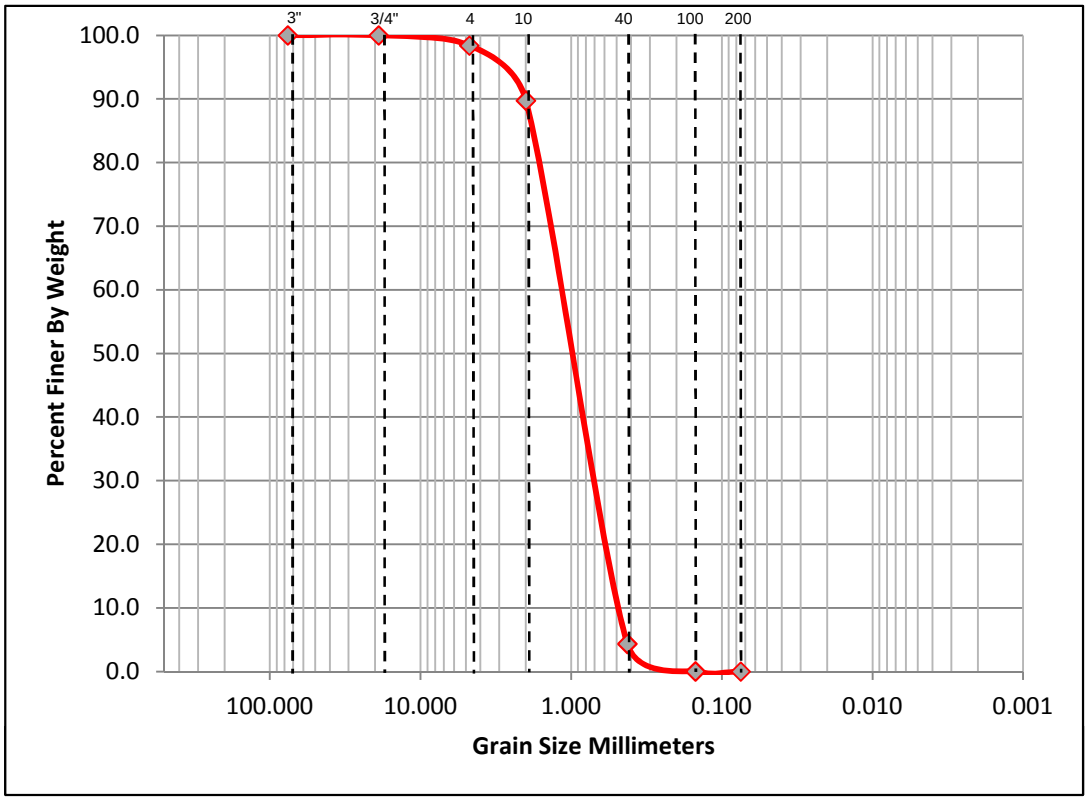
Sample Notes: SP- Mostly fine, grey and tan, sub-angular sand.

US Army Corps of Engineers®
New England District

Project Name: Newburyport
Project Location: Newburyport, MA
Sample ID: Newb-A

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	8.6	85.4	4.4	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.5290	0.6212	0.8979	1.2668	1.4512	1.9123	2.34	2.74

Original Sample Weight (g)			603.1	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.3	499.0	9.7	1.6	1.6	98.4
#10	2.000	463.6	515.7	52.1	8.6	10.2	89.8
#40	0.425	354.8	869.8	515.0	85.4	95.6	4.4
#100	0.150	325.7	351.9	26.2	4.3	100.0	0.0
#200	0.075	316.6	316.7	0.1	0.0	100.0	0.0

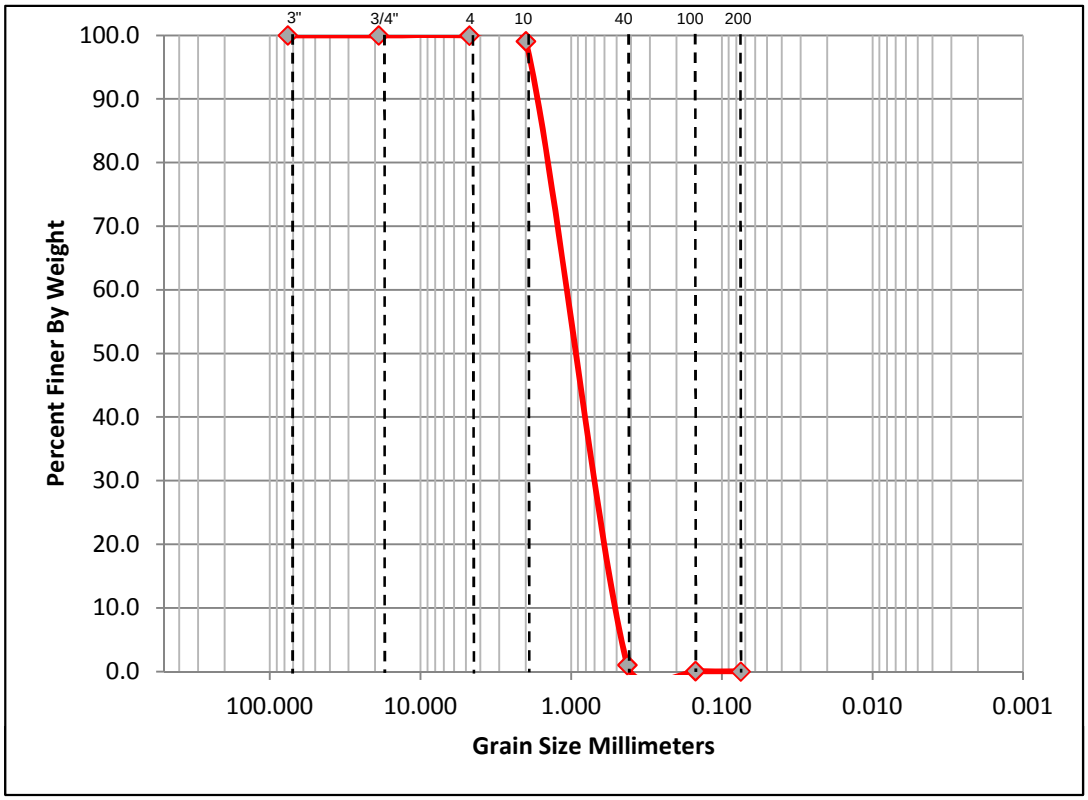
Sample Notes: SP- Coarse to medium, subangular, brown and tan sand with small pea-sized gravel.

US Army Corps of Engineers®
New England District

Project Name: Newburyport
Project Location: Newburyport, MA
Sample ID: Newb-B

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	98.1	1.0	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.5692	0.6495	0.8904	1.2117	1.3723	1.7739	2.28	2.41

Original Sample Weight (g)			595.4	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.4	489.6	0.2	0.0	0.0	100.0
#10	2.000	470.3	475.6	5.3	0.9	0.9	99.1
#40	0.425	352.9	936.7	583.8	98.1	99.0	1.0
#100	0.150	328.9	334.5	5.6	0.9	99.9	0.1
#200	0.075	316.6	317.1	0.5	0.1	100.0	0.0

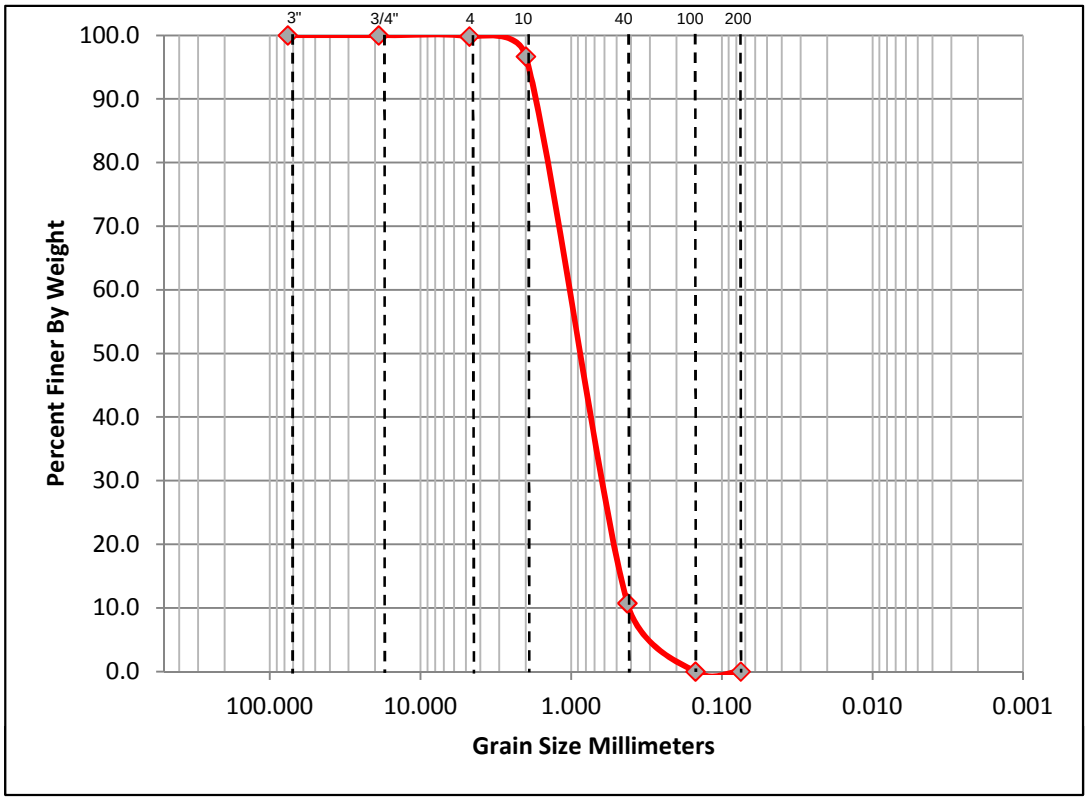
Sample Notes: SP- Coarse to medium, subangular, tan sand with small pea-sized gravel.

US Army Corps of Engineers®
New England District

Project Name: Newburyport
Project Location: Newburyport, MA
Sample ID: Newb-C

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	3.2	85.9	10.7	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.4059	0.5030	0.7779	1.1444	1.3277	1.7859	2.89	3.27

Original Sample Weight (g)			627.2	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.3	490.3	1.0	0.2	0.2	99.8
#10	2.000	463.5	483.3	19.8	3.2	3.3	96.7
#40	0.425	354.7	893.7	539.0	85.9	89.3	10.7
#100	0.150	325.6	393.0	67.4	10.7	100.0	0.0
#200	0.075	316.8	316.8	0.0	0.0	100.0	0.0

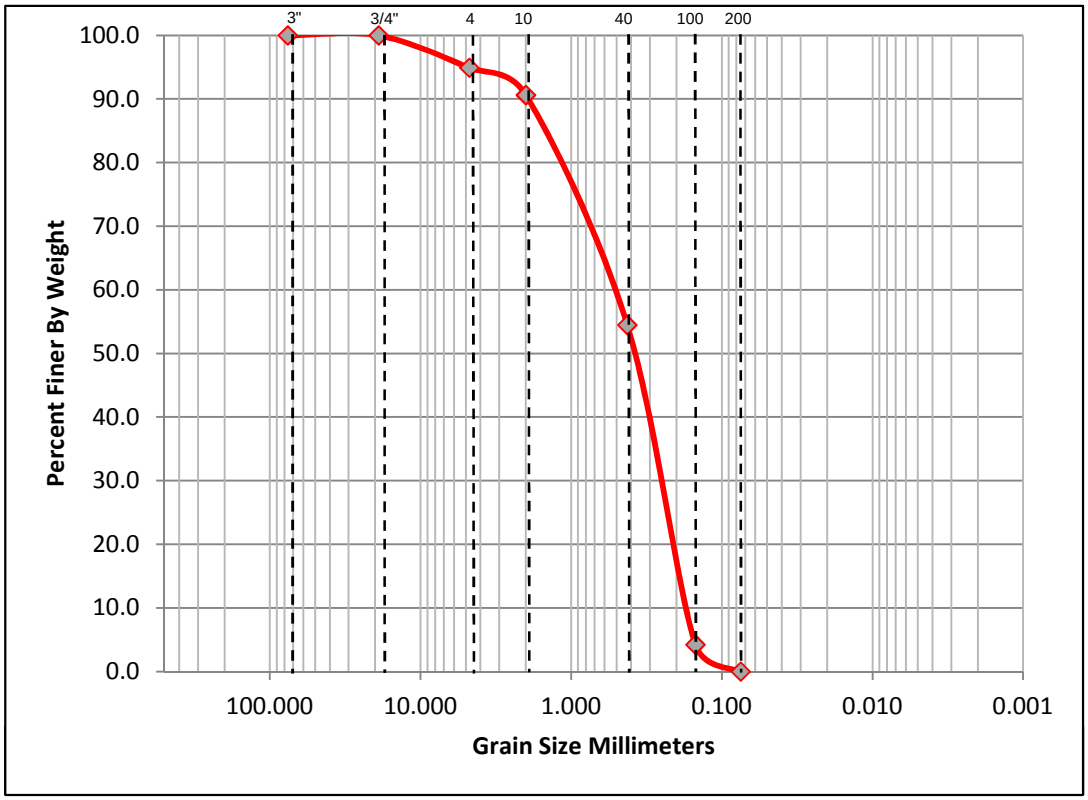
Sample Notes: SP- Very coarse to medium, subangular, tan and brown sand with multi-colored small pea-sized gravel.

US Army Corps of Engineers®
New England District

Project Name: Newburyport
Project Location: Newburyport, MA
Sample ID: Newb-D

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.1	4.3	36.2	54.5	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1815	0.2089	0.2910	0.4005	0.6658	1.7549	4.82	3.67

Original Sample Weight (g)			603.8	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.2	519.9	30.7	5.1	5.1	94.9
#10	2.000	463.4	489.3	25.9	4.3	9.4	90.6
#40	0.425	354.6	572.9	218.3	36.2	45.5	54.5
#100	0.150	325.5	628.8	303.3	50.2	95.8	4.2
#200	0.075	316.6	342.2	25.6	4.2	100.0	0.0

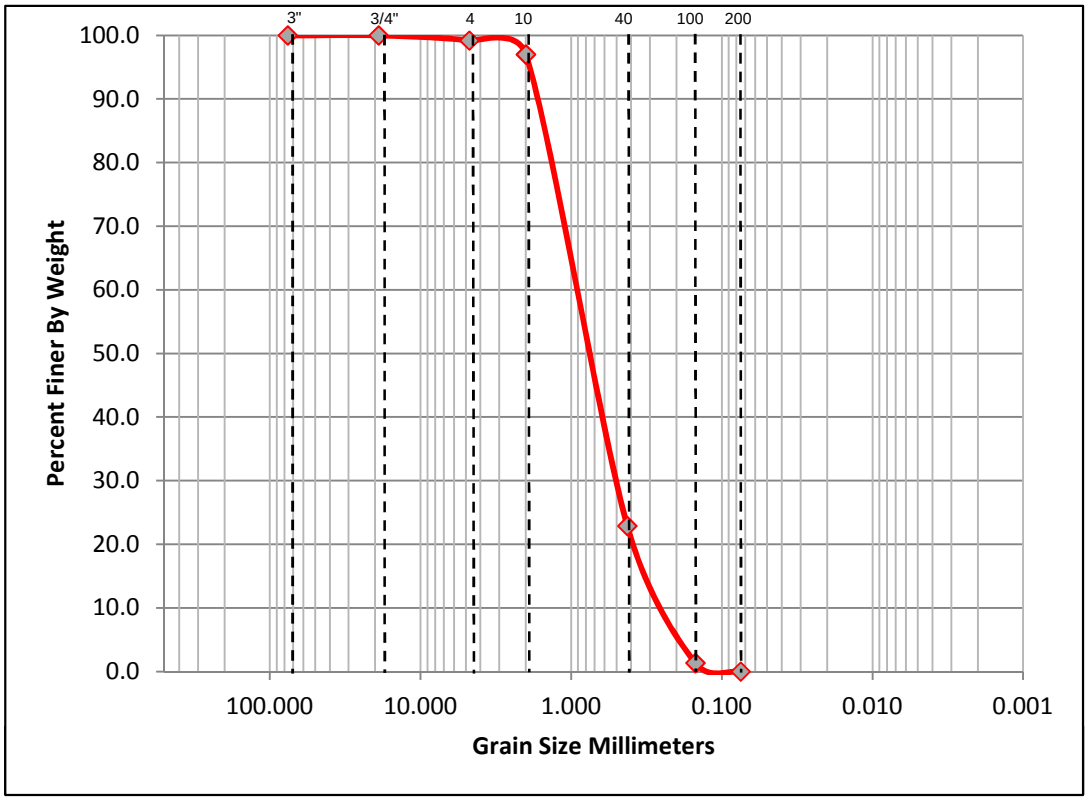
Sample Notes: SP- Very coarse to fine, subangular, multi-colored sand.

US Army Corps of Engineers®
New England District

Project Name: Newburyport
Project Location: Newburyport, MA
Sample ID: Newb-E

Date: 08/05/13

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	2.2	74.1	22.9	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.2605	0.3243	0.5760	1.0011	1.2136	1.7449	3.64	4.66

Original Sample Weight (g)			617.2	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	494.0	499.0	5.0	0.8	0.8	99.2
#10	2.000	470.7	484.2	13.5	2.2	3.0	97.0
#40	0.425	353.0	810.4	457.4	74.1	77.1	22.9
#100	0.150	329.1	462.1	133.0	21.5	98.7	1.3
#200	0.075	313.7	322.0	8.3	1.3	100.0	0.0

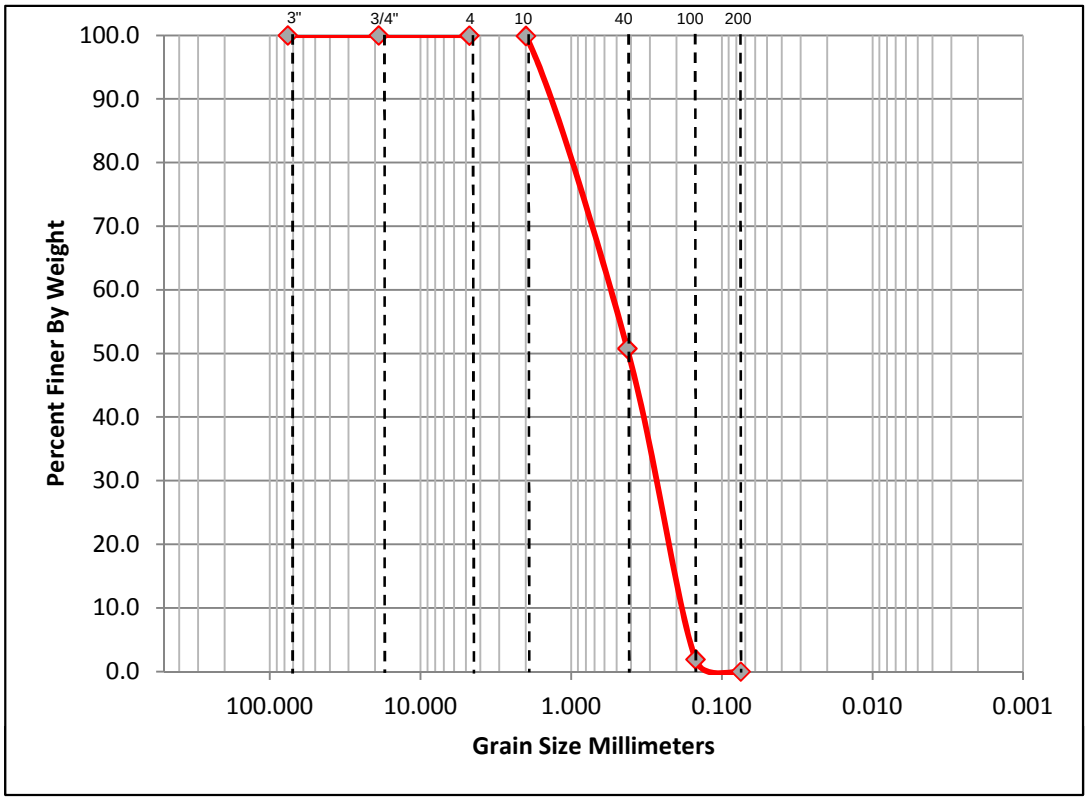
Sample Notes: SP- Very coarse to medium, subangular, orange, tan and brown sand with pea sized gravel.

US Army Corps of Engineers®
New England District

Project Name: Plum Island
Project Location: Plum Island, MA
Sample ID: PI-A

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	49.1	50.8	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1955	0.2236	0.3080	0.4206	0.7205	1.5220	4.37	3.69

Original Sample Weight (g)			561.2	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.3	489.4	0.1	0.0	0.0	100.0
#10	2.000	463.5	463.9	0.4	0.1	0.1	99.9
#40	0.425	354.8	630.5	275.7	49.1	49.2	50.8
#100	0.150	325.6	599.8	274.2	48.9	98.1	1.9
#200	0.075	316.7	327.5	10.8	1.9	100.0	0.0

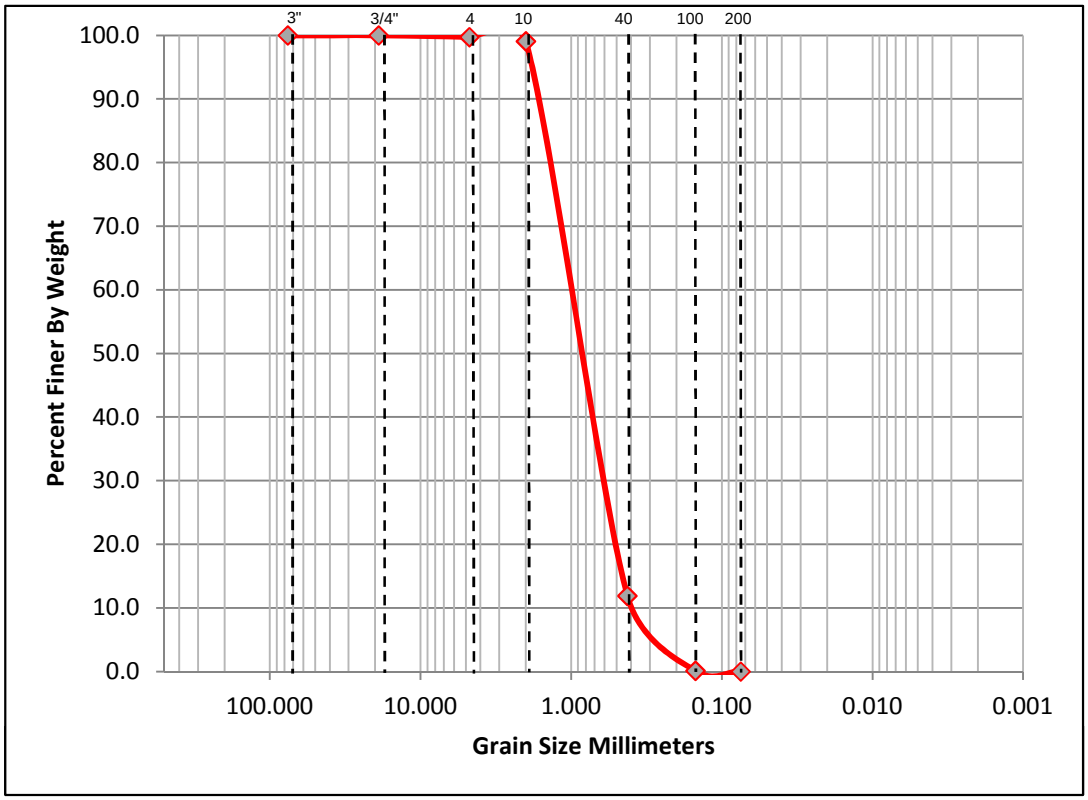
Sample Notes: SP- Medium to fine, tan and grey, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Plum Island
Project Location: Plum Island, MA
Sample ID: PI-B

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.7	87.2	11.9	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.3807	0.4811	0.7521	1.1134	1.2941	1.7458	3.05	3.40

Original Sample Weight (g)			484.2	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	493.8	495.1	1.3	0.3	0.3	99.7
#10	2.000	470.4	473.6	3.2	0.7	0.9	99.1
#40	0.425	352.9	775.0	422.1	87.2	88.1	11.9
#100	0.150	329.0	386.0	57.0	11.8	99.9	0.1
#200	0.075	313.6	314.2	0.6	0.1	100.0	0.0

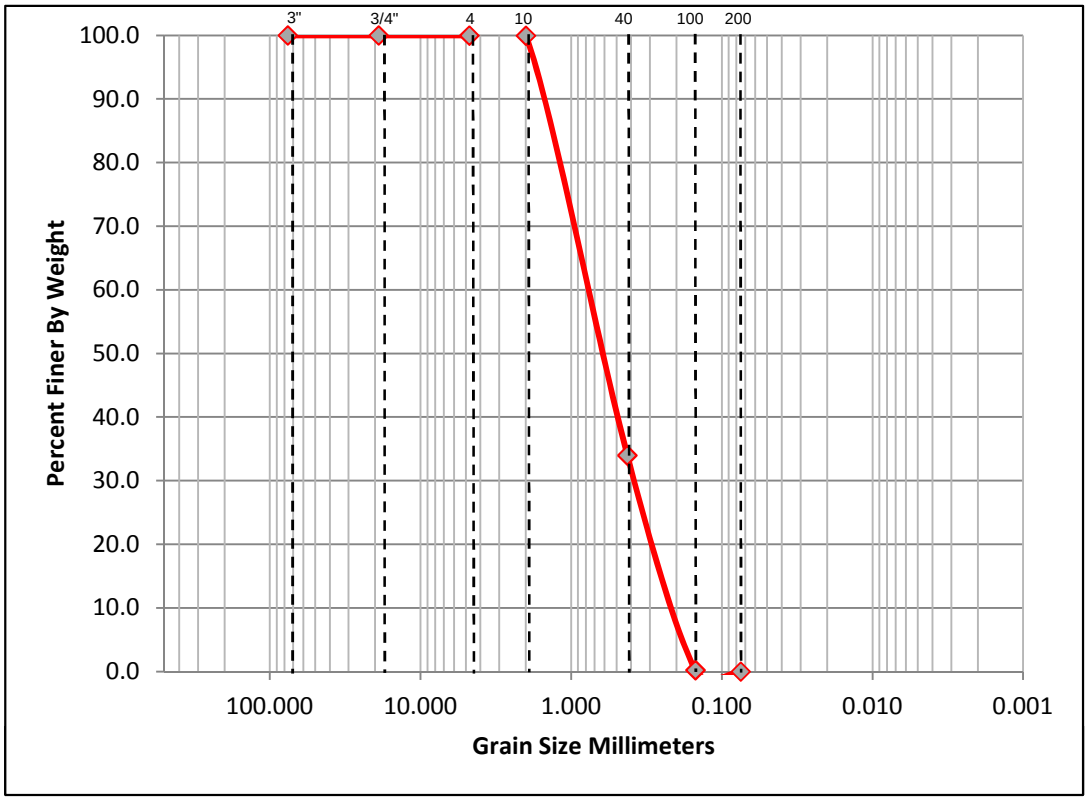
Sample Notes: SP- Medium to fine, orange and tan, subangular sand with a few small subrounded rocks.

US Army Corps of Engineers®
New England District

Project Name: Plum Island
Project Location: Plum Island, MA
Sample ID: PI-C

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	66.0	34.0	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.2296	0.2703	0.3925	0.8074	1.0462	1.6431	3.27	4.56

Original Sample Weight (g)			568.8	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	493.9	494.0	0.1	0.0	0.0	100.0
#10	2.000	470.4	470.6	0.2	0.0	0.1	99.9
#40	0.425	353.0	728.2	375.2	66.0	66.0	34.0
#100	0.150	328.9	520.9	192.0	33.8	99.8	0.2
#200	0.075	313.6	314.9	1.3	0.2	100.0	0.0

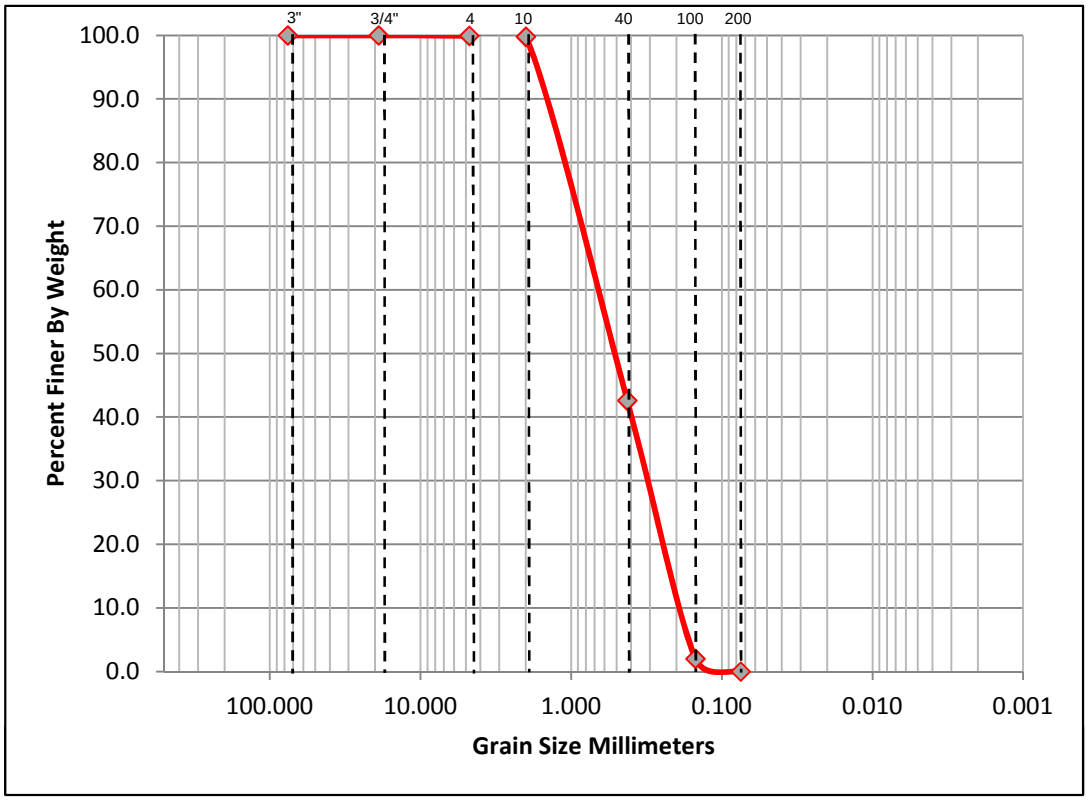
Sample Notes: SP- Tan and orange, medium to fine, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Plum Island
Project Location: Plum Island, MA
Sample ID: PI-D

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	57.2	42.6	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.2041	0.2380	0.3397	0.6289	0.9043	1.5927	3.68	4.43

Original Sample Weight (g)			522.6	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.4	489.7	0.3	0.1	0.1	99.9
#10	2.000	463.6	464.4	0.8	0.2	0.2	99.8
#40	0.425	354.7	653.6	298.9	57.2	57.4	42.6
#100	0.150	325.7	537.8	212.1	40.6	98.0	2.0
#200	0.075	316.6	327.1	10.5	2.0	100.0	0.0

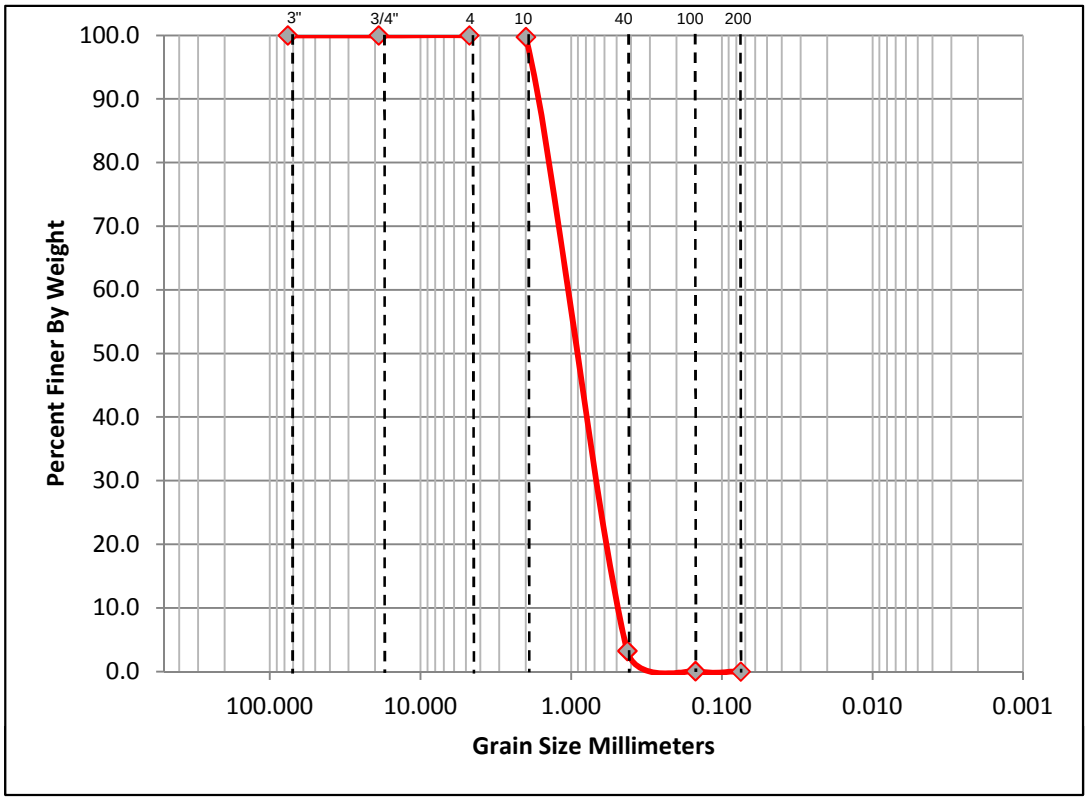
Sample Notes: SP- Tan and brown, medium to fine, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Plum Island
Project Location: Plum Island, MA
Sample ID: PI-E

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	96.5	3.2	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.5352	0.6168	0.8616	1.1880	1.3512	1.7592	2.38	2.52

Original Sample Weight (g)			612.4	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.3	489.3	0.0	0.0	0.0	100.0
#10	2.000	463.4	464.9	1.5	0.2	0.2	99.8
#40	0.425	354.7	945.7	591.0	96.5	96.8	3.2
#100	0.150	325.7	345.2	19.5	3.2	99.9	0.1
#200	0.075	316.6	317.0	0.4	0.1	100.0	0.0

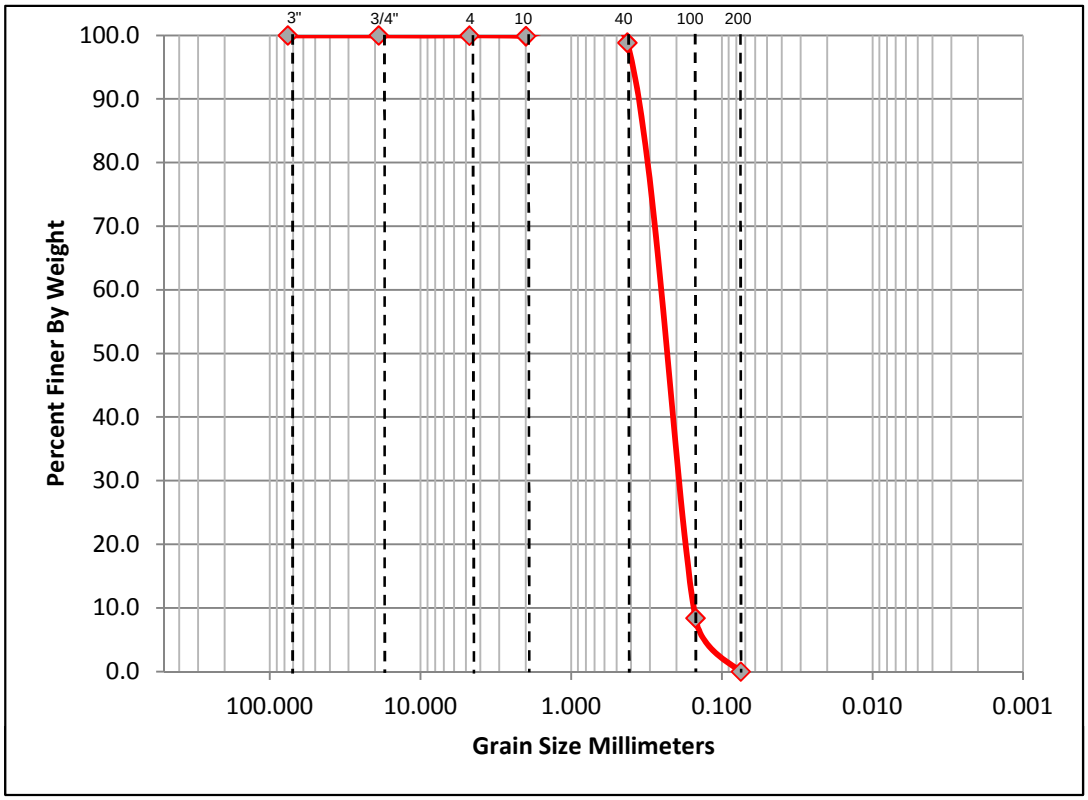
Sample Notes: SP- Tan and brown, coarse to medium, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Wells
Project Location: Wells, ME
Sample ID: Wells-A

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.0	98.9	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1548	0.1700	0.2156	0.2765	0.3069	0.3829	9.08	1.98

Original Sample Weight (g)			540.9	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	493.9	494.1	0.2	0.0	0.0	100.0
#10	2.000	470.4	470.8	0.4	0.1	0.1	99.9
#40	0.425	353.1	358.7	5.6	1.0	1.1	98.9
#100	0.150	328.9	818.1	489.2	90.4	91.6	8.4
#200	0.075	313.6	359.1	45.5	8.4	100.0	0.0

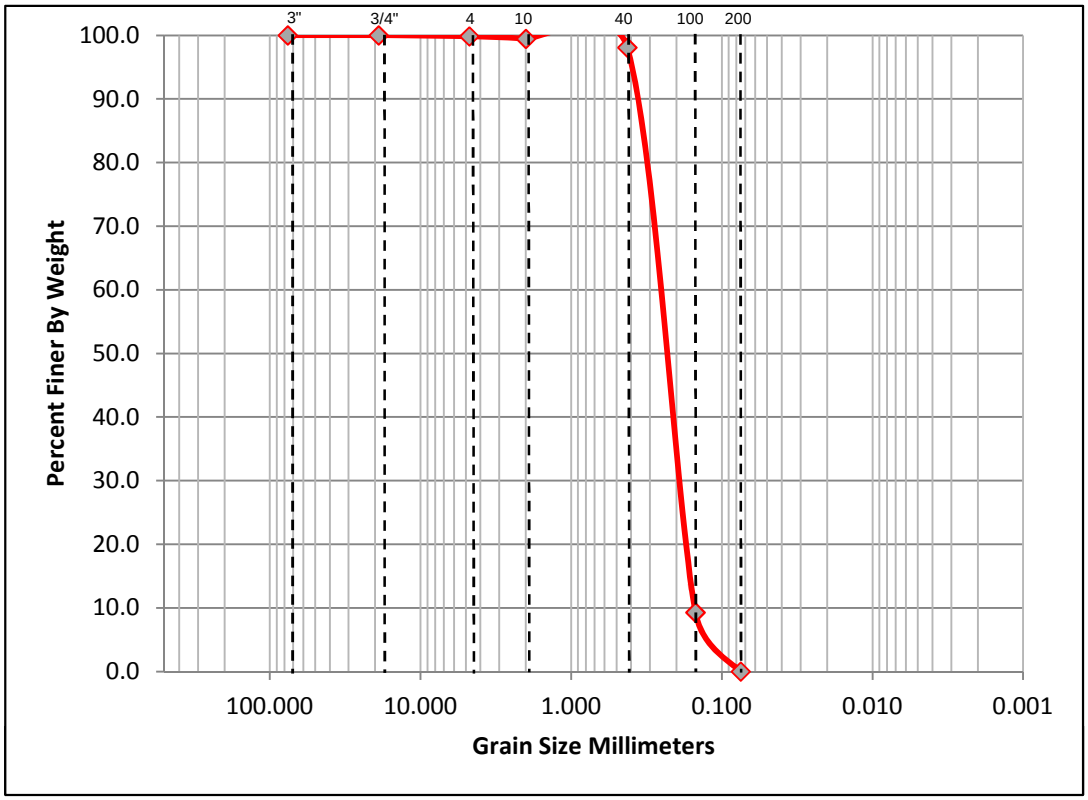
Sample Notes: SP- Tan and grey, subangular, fine sand.

US Army Corps of Engineers®
New England District

Project Name: Wells
Project Location: Wells, ME
Sample ID: Wells-B

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.4	1.4	98.1	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1522	0.1677	0.2141	0.2761	0.3071	0.3845	9.16	2.02

Original Sample Weight (g)			511.4	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	493.9	494.7	0.8	0.2	0.2	99.8
#10	2.000	470.4	472.4	2.0	0.4	0.5	99.5
#40	0.425	352.9	359.9	7.0	1.4	1.9	98.1
#100	0.150	328.9	783.0	454.1	88.8	90.7	9.3
#200	0.075	313.6	361.1	47.5	9.3	100.0	0.0

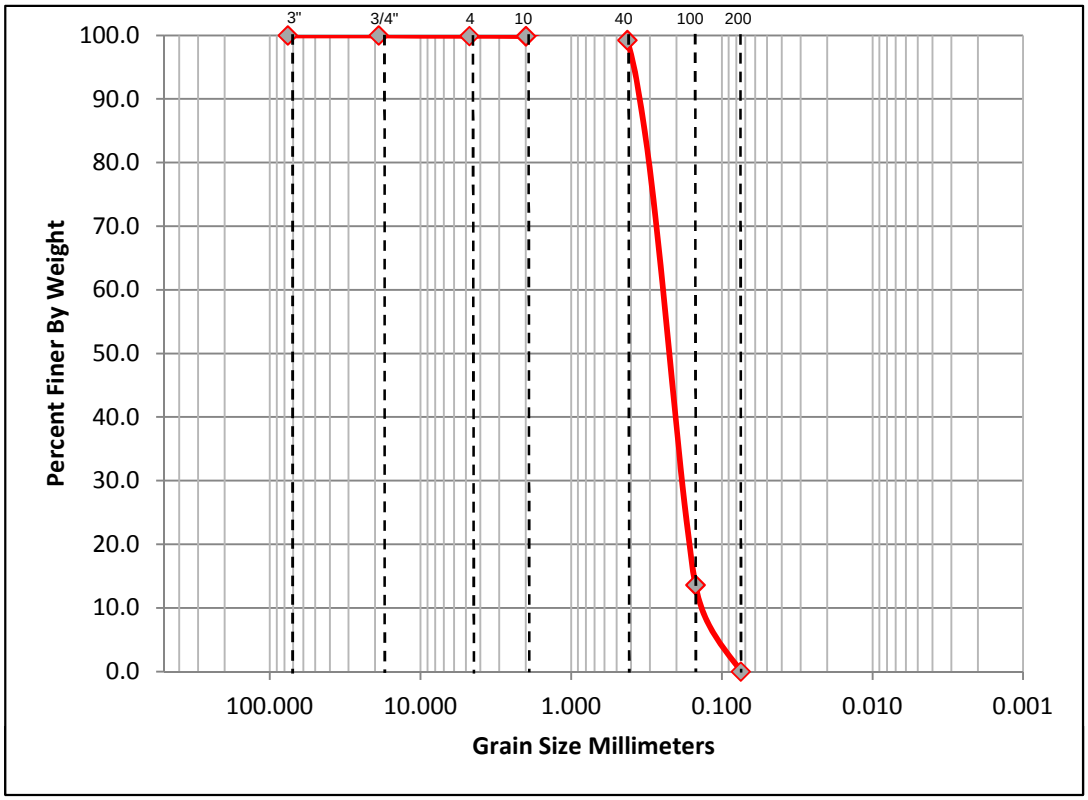
Sample Notes: SP- Tan, fine, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Wells
Project Location: Wells, ME
Sample ID: Wells-C

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	0.6	99.3	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1301	0.1544	0.2026	0.2668	0.2989	0.3792	10.42	2.30

Original Sample Weight (g)			523.6	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.4	489.9	0.5	0.1	0.1	99.9
#10	2.000	463.7	463.8	0.1	0.0	0.1	99.9
#40	0.425	354.7	358.0	3.3	0.6	0.7	99.3
#100	0.150	325.7	774.1	448.4	85.6	86.4	13.6
#200	0.075	316.7	388.0	71.3	13.6	100.0	0.0

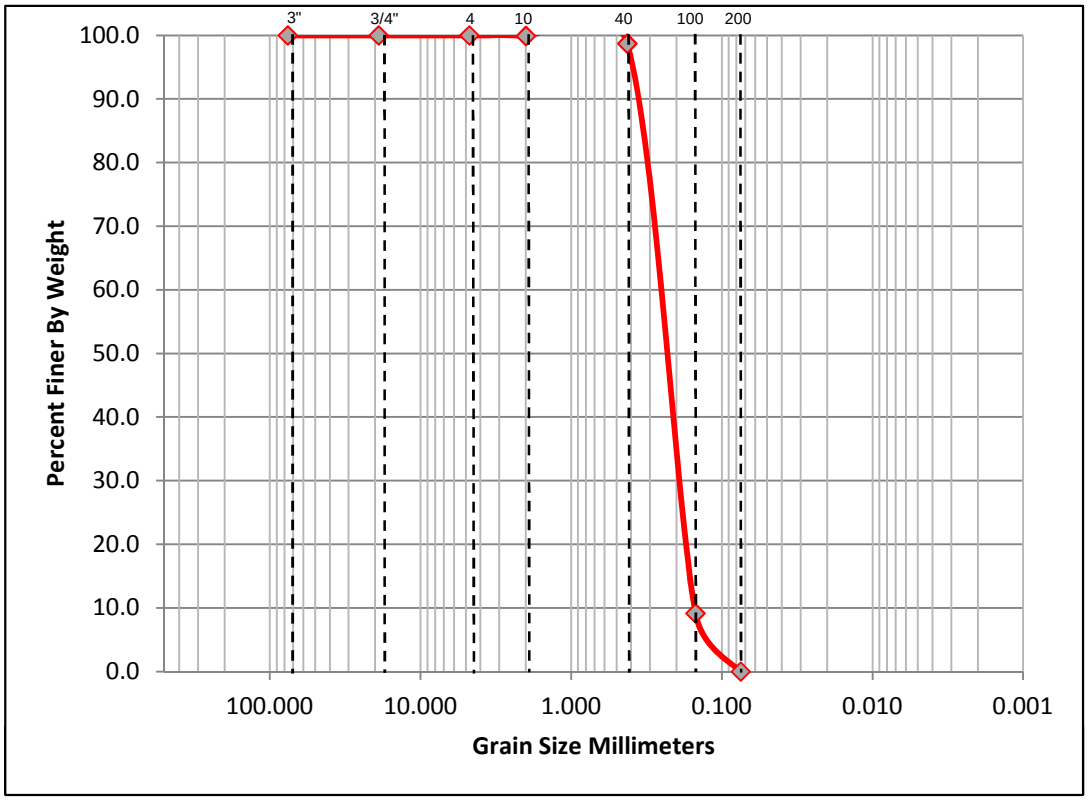
Sample Notes: SP- Grey and tan, fine, subangular sand.

US Army Corps of Engineers®
New England District

Project Name: Wells
Project Location: Wells, ME
Sample ID: Wells-D

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.2	98.7	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1526	0.1679	0.2140	0.2754	0.3061	0.3829	9.16	2.01

Original Sample Weight (g)			435.8	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	489.3	489.3	0.0	0.0	0.0	100.0
#10	2.000	463.5	463.9	0.4	0.1	0.1	99.9
#40	0.425	354.7	359.9	5.2	1.2	1.3	98.7
#100	0.150	325.7	716.0	390.3	89.6	90.8	9.2
#200	0.075	316.7	356.6	39.9	9.2	100.0	0.0

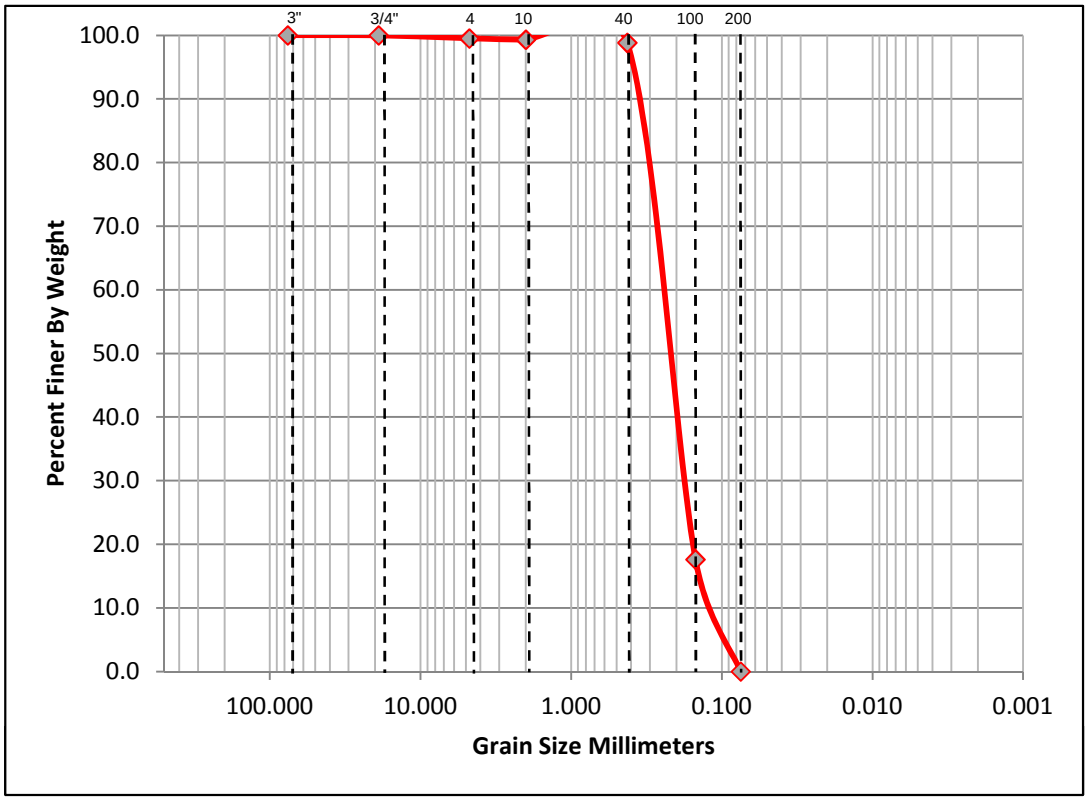
Sample Notes: SP- Tan, subangular, fine sand.

US Army Corps of Engineers®
New England District

Project Name: Wells
Project Location: Wells, ME
Sample ID: Wells-E

Date: 8/6/2013

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel		%Sand			%Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.2	0.5	98.8	0.0	

D10	D15	D30	D50	D60	D85	Cc	Cu
0.1176	0.1389	0.1919	0.2597	0.2935	0.3782	11.12	2.50

Original Sample Weight (g)			394.0	Post Wash Weight (g)			-
Sieve	Sieve Size (mm)	Sieve Weight (g)	Shaken Weight (g)	Weight Retained (g)	Percent Retained	Cum. Percent Retained	Percent Finer
3"	76.200	-	-	0.0	0.0	0.0	100.0
3/4"	19.000	-	-	0.0	0.0	0.0	100.0
#4	4.750	494.0	495.9	1.9	0.5	0.5	99.5
#10	2.000	470.5	471.3	0.8	0.2	0.7	99.3
#40	0.425	352.9	354.8	1.9	0.5	1.2	98.8
#100	0.150	329.0	649.0	320.0	81.2	82.4	17.6
#200	0.075	313.6	383.0	69.4	17.6	100.0	0.0

Sample Notes: SP- Tan and grey, subangular, fine sand with a few small pieces of gravel.