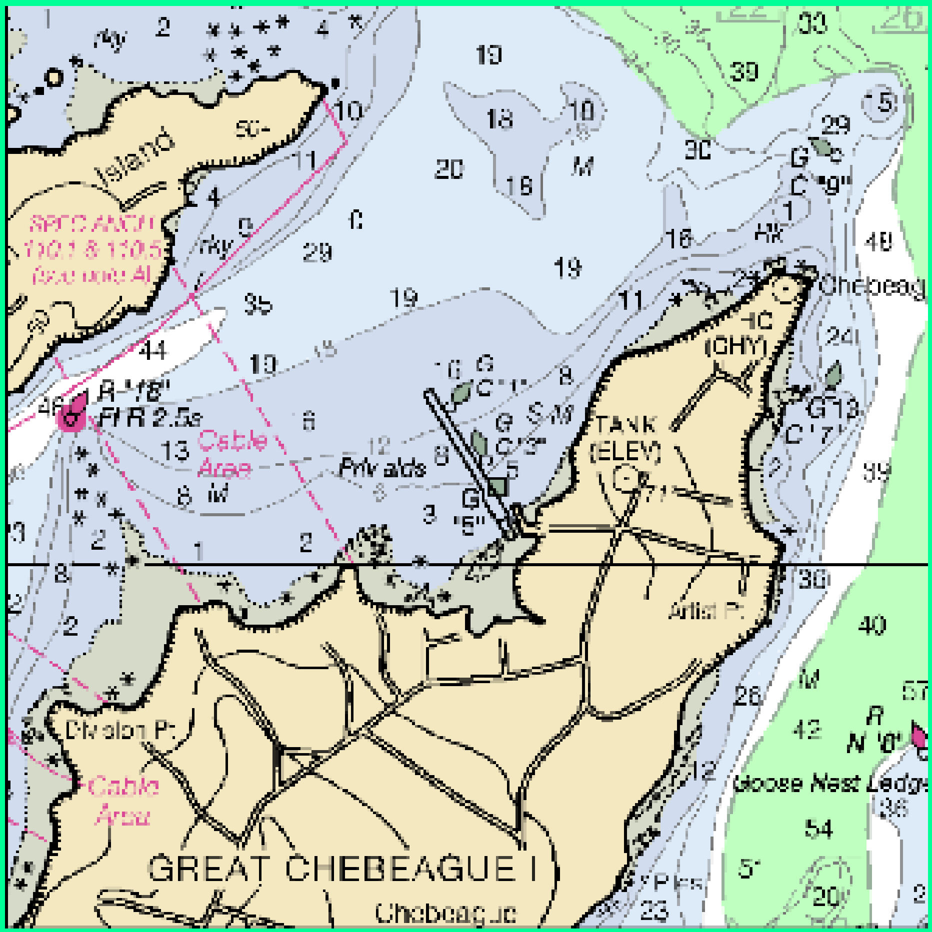
GREAT CHEBEAGUE ISLAND
MAINE
NAVIGATION IMPROVEMENT PROJECT

APPENDIX G
SUBMERGED AQUATIC VEGETATION SURVEY



Prepared by:

Planning Division
Environmental Resources Section
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

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JULY 2017

PREDREDGE SURVEY FOR

SUBMERGED AQUATIC VEGETATION

GREAT CHEBEAGUE ISLAND

NAVIGATION IMPROVEMENT PROJECT

CASCO BAY, MAINE

December, 2017

Prepared by:

Planning Division
Environmental Resources Section
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

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1.0 INTRODUCTION

The Town of Chebeague Island is comprised of several islands located in the upper portion of Casco Bay, in Cumberland County, Maine. Great Chebeague, the largest and most populated island, is the center for town commerce and features a landing and stone pier along the northwest shore which serves as the town's principal link to the mainland. Town officials report that shallow water depth hinders operation of the many activities that rely on the landing, including commercial fishing, barging, and ferry operations. As the Island's principal landing, public safety, the island economy, and island services all depend on adequate access to the mainland from this point.

The Town of Chebeague Island has requested that the New England District (NAE) of the U.S. Army Corps of Engineers (USACE) investigate the potential of establishing a federal channel to allow full time vessel traffic to the Great Chebeague Island landing. The results of this investigation determined that a 0.5 acre turning basin and a 100 to 150 feet wide channel extending approximately 1,600 feet from the stone pier northwest to deep water would be required to meet the project objectives. The dredged depths for the turning basin and channel would be 8 and 10 feet, respectively, at mean lower low water (MLLW) plus 1 foot of allowable overdepth. This would produce approximately 33,000 cubic yards of mixed gravel, sand, and silt. It is expected that this material would be mechanically dredged and placed at the Portland Disposal Site (PDS).

This report describes a video and hydroacoustic survey effort conducted by NAE in July of 2017 to characterize submerged aquatic vegetation (SAV) in the vicinity of the proposed dredge area. Areas in and adjacent to the proposed channel alignment have been identified as eelgrass (*Zostera marina*) habitat by the Maine Department of Marine Resources through the interpretation of 2013 aerial photography. The objective of the NAE survey effort was to document the location and relative density of eelgrass beds in or adjacent to the proposed dredge footprint in order to minimize any detrimental effects to the beds from the proposed action.

2.0 MATERIALS AND METHODS

Video and hydroacoustic survey efforts were conducted on 18 July of 2017 by staff from the NAE Environmental Resources Section. Work was carried out on a 17 foot Boston Whaler outfitted for shallow water survey operations. Positioning was achieved using a Hemisphere R330 Global Positioning System (GPS) receiving real time differential corrections. The system was interfaced with a computer running Hypack® for navigation and Biosonics Visual Acquisition software for real time visualization and recording of sonar data.

Forty-three survey transects were pre-planned in ESRI ArcGIS using a spacing of 50 feet in an orientation perpendicular to the proposed channel alignment. These transects were laid out to provide adequate coverage of the proposed dredge area in the vicinity of SAV beds identified by the Maine Department of Marine Resources (MEDMR) through interpretation of 2013 orthophotography (available through the MEDMR website:

http://www.maine.gov/dmr/rm/eelgrass/). The planned survey transects for the project area are presented as Figure 1.

Hydroacoustic data was collected using a BioSonics MX echosounder with a 204.8 kHz, 8.7° calibrated transducer operating at a 5Hz ping rate. The transducer was fixed to an adjustable boom mounted along the starboard side of the vessel. The face of the transducer was adjusted to be 16 inches below the water surface. The boat operator navigated all transects at a speed of approximately 3.5 knots (4.0 mph) while recording data. Adjacent transects were run in opposite directions to minimize non-recording time. Transect information including the number, filename, start and stop time, direction, and observations of bottom type and SAV were recorded in a field log during the survey. Sonar data was viewed in real time and recorded using Biosonics Visual Acquisition software. Waypoints were created throughout the survey to mark changes in bottom type and features of interest identified in real time to be later investigated during the video survey.

Video footage was collected at 25 stations corresponding to waypoints created during the acoustic survey. Video was collected using a Sea Viewer Sea-Drop 650 Underwater Video Camera and recorded to a portable DVR system outfitted with an LCD monitor for real time viewing. The camera was weighted with a 5lb downrigger weight and deployed off the starboard side of the vessel. The camera was allowed to remain on the bottom for approximately 5 to 10 seconds at each station, observing 5 to 10 linear feet of bottom with typical vessel drift. Depth and directional adjustments of the camera were made manually by USACE personnel positioned on deck. Real time observations of bottom type, macro algae, or eelgrass beds were recorded in the field notebook.

3.0 DATA PROCESSING

The .DT4 files containing the hydroacoustic data from each transect were processed using Biosonics Visual Habitat software. This software uses multiple algorithms augmented by user defined parameters to determine bottom depth, plant canopy height, and plant density for each sonar ping (defined as one transmit and receive cycle of the ecosounder). The bottom depth and canopy height outputs for each transect were superimposed on a colorized echogram along with aligned data plots of plant density and reviewed for accuracy. Any erroneous data points (i.e. inaccurate bottom depth or canopy height outputs resulting from acoustic artifacts or noise in the water column) were manually corrected by the reviewer. The finalized outputs were combined into data points representing average percent cover and canopy height for every five sonar pings and exported as geo-referenced CSV files.

Video files were reviewed using CyberLink PowerDirector video editing software. Representative screen captures were created from the footage collected at each video station. In addition, the name of each station, waypoint GPS coordinates, and a brief description of the video content (bottom type, macro algae, and eelgrass present) were recorded in a Microsoft Excel spreadsheet and compared to the field notes collected during the video survey. The screen capture database and library are presented as appendix A of this report.

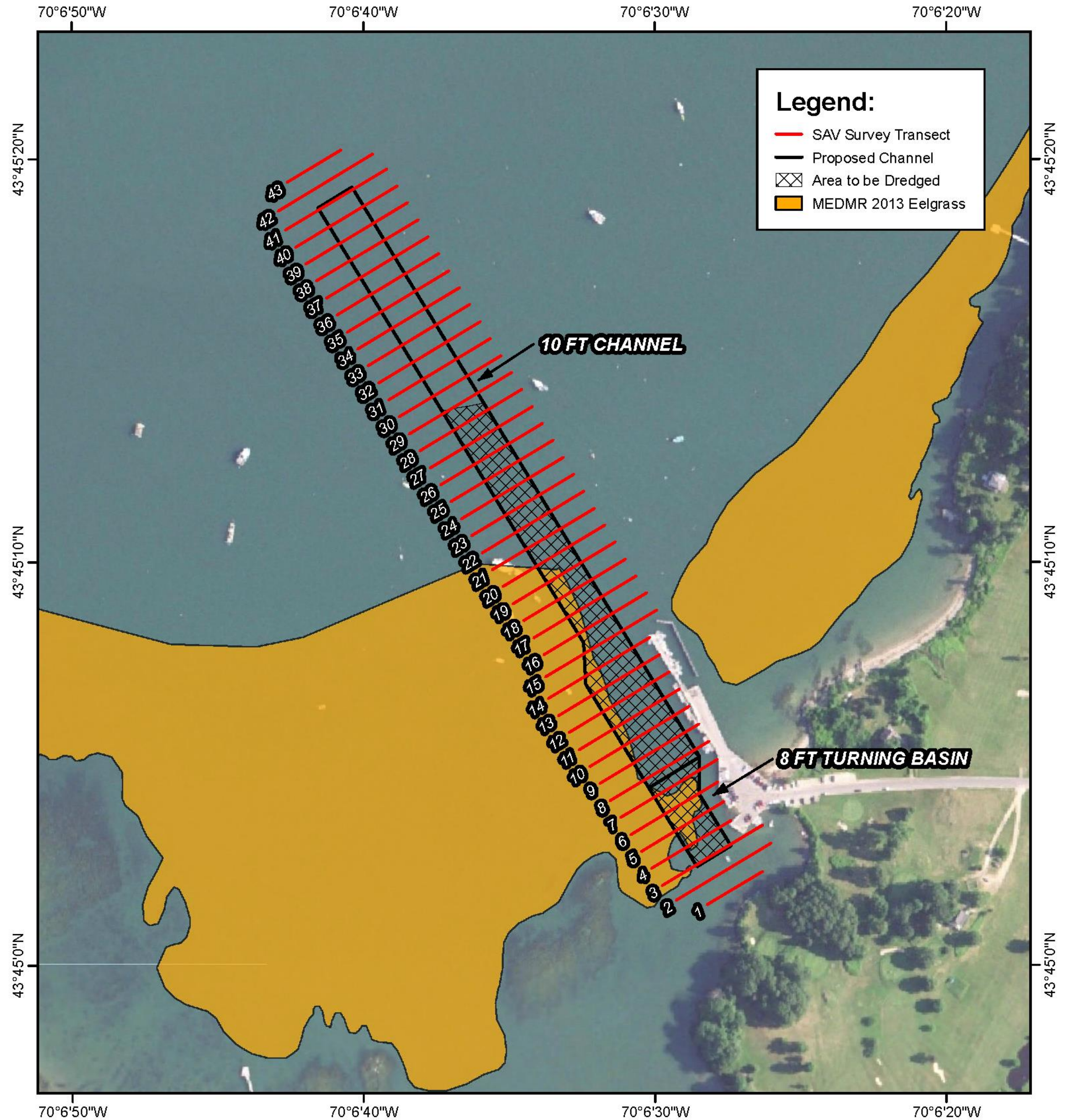
The CSV file containing the processed and compiled Visual Habitat output was imported into ArcGIS as a point shapefile and then interpolated using inverse distance weighting methodology to produce a gridded raster representing SAV percent cover for each survey area. This data was compared with the video footage from each station to validate the Visual Habitat output and delineate areas of SAV coverage corresponding to eelgrass beds. This data was also compared in ArcGIS with the MEDMR eelgrass coverage for the project area. A map depicting SAV percent cover for the survey area and video survey stations separated into two classes based on the presence or absence of eelgrass is presented as Figure 2. Interpolated SAV canopy height within the survey area is presented as Figure 3. Areas delineated as eelgrass (either beds or interspersed with other SAV) are presented as Figure 4.

4.0 RESULTS AND DISCUSSION

A total of 39 transects covering 2.2 linear miles were successfully run with a cumulative 12,730 processed output points. Direct comparison between the Visual Habitat output and video survey observations demonstrated excellent agreement. Transects one through four could not be run do to shallow water depths. This area was visually inspected and determined to be unvegetated. It should be noted that shallow depths and water clarity enabled the field crew to make visual observations of the surrounding bottom conditions from the surface in much of the project area.

Analysis of the MEDMR eelgrass coverage for the project area from 1997-2013 suggests that a contiguous and fairly stable eelgrass bed has persisted in and along the western side of the proposed channel during that time period. Examination of the 2017 NAE survey data confirms that the spatial extent of the existing SAV beds are consistent with historic coverage and that the primary species of SAV growing in the survey area is *Zostera marina*.

The eelgrass bed along the western side of the proposed project footprint was observed to begin at the top of the slope associated with the existing town channel and extend beyond the western survey boundary. Bottom conditions in the outer portion of the proposed project area consisted of unvegetated fine sand and silt with numerous burrows. The eastern portion of the channel adjacent to the town landing was documented as unvegetated fine sand and silt with a layer of leafy organic debris and eelgrass wrack at the surface. The area in the vicinity of the to the boat ramp along the southernmost portion of the town landing was found to be coarse substrate consisting of cobble, gravel, and shell. During the course of the survey a landing craft style ferry was observed to line up with the boat ramp and use its thrusters to maintain position during loading and unloading operations. It is assumed that this is the reason for the rapid change in sediment type between the inner and outer portions of the project area.



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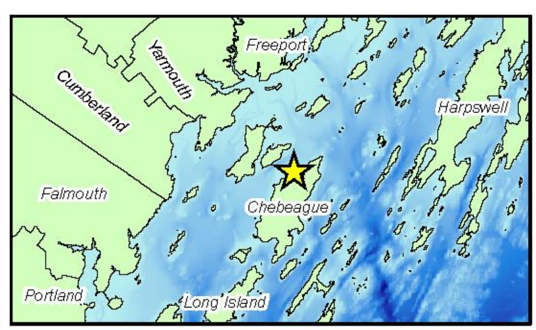
New England District

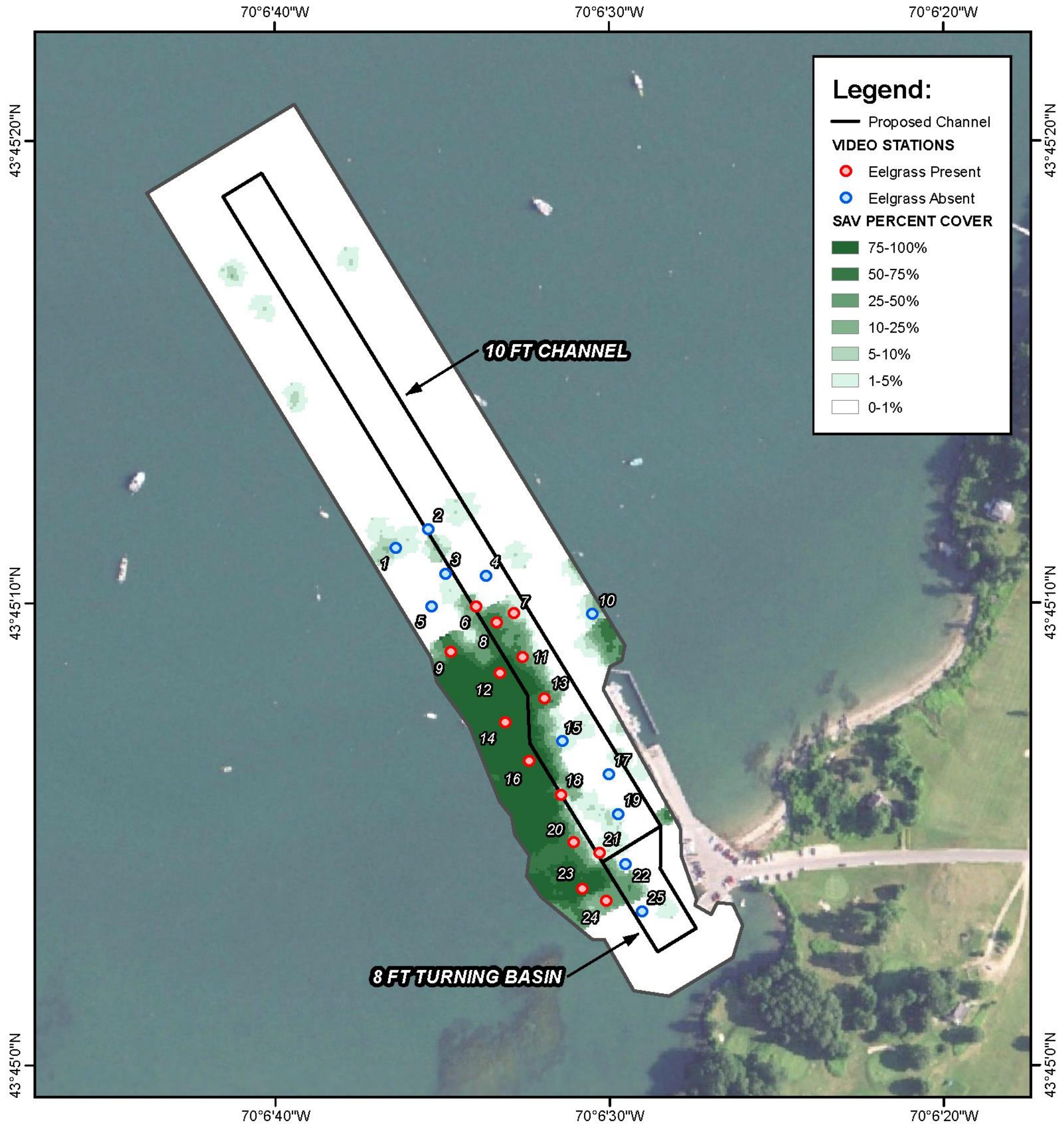
FIGURE 1:
GREAT CHEBEAGUE ISLAND
2017 SAV SURVEY PLAN

0 250 500 750 Feet
0 50 100 150 200 Meters
1:4,000

2015 NAIP AERIAL IMAGERY

GCS NAD 1983





US Army Corps
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New England District

FIGURE 2:
GREAT CHEBEAGUE ISLAND
JULY 2017 SAV PERCENT COVER
AND VIDEO SURVEY STATIONS

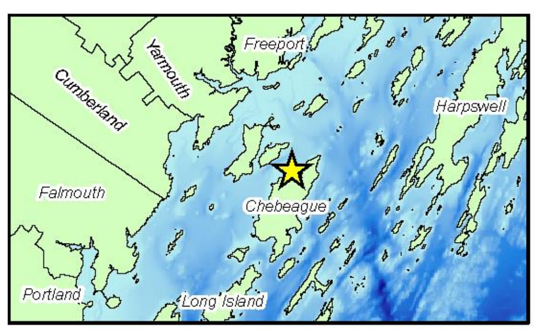
0 250 500 750 Feet

0 50 100 150 200 Meters

1:3,500

2015 NAIP AERIAL IMAGERY

GCS NAD 1983



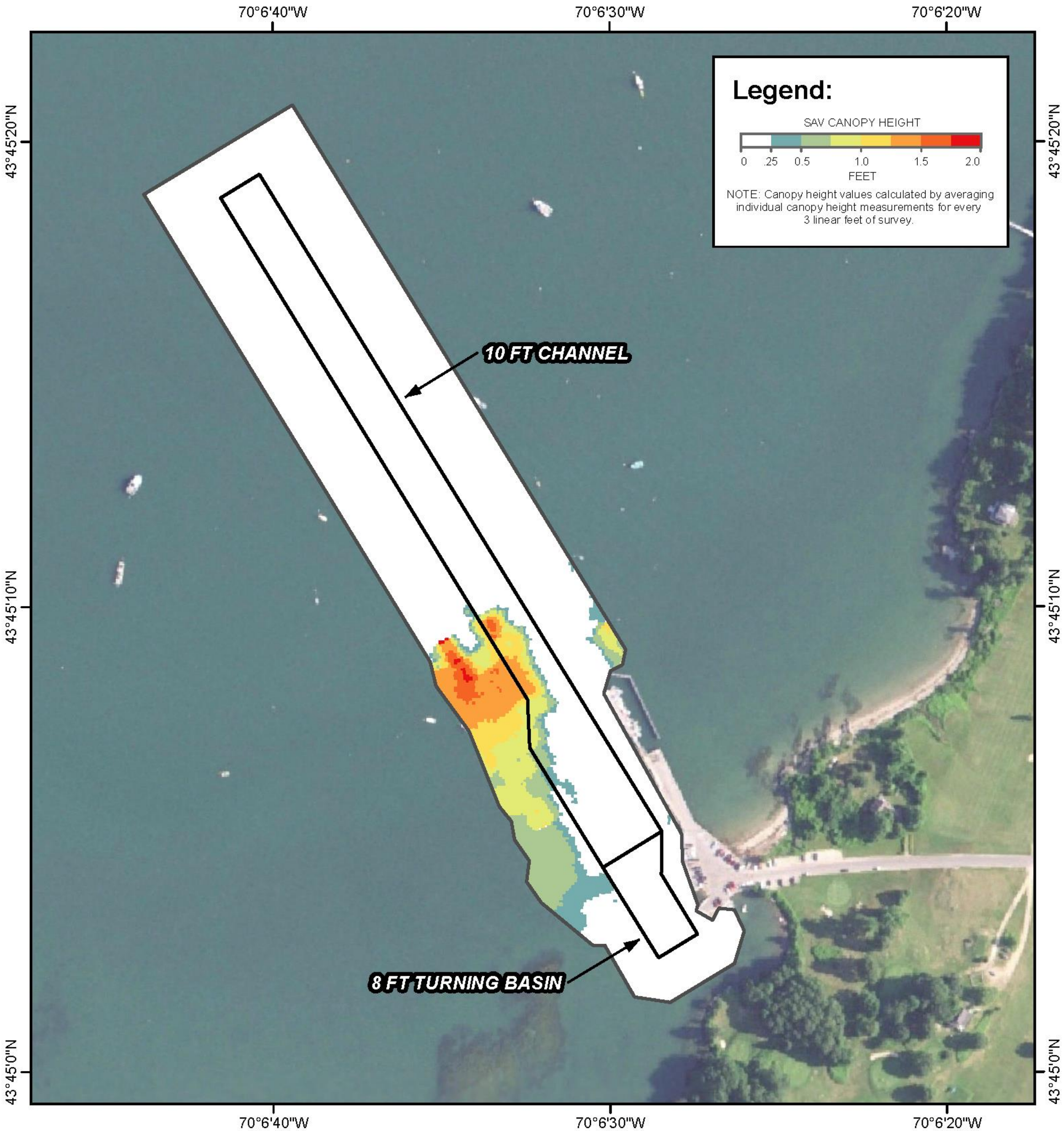


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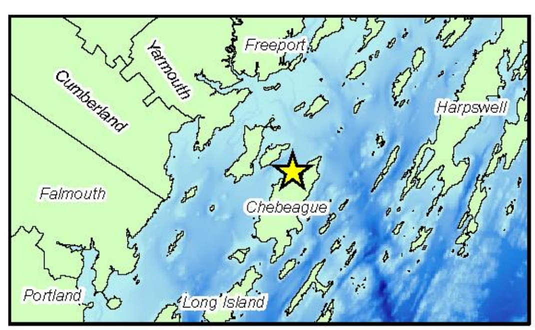
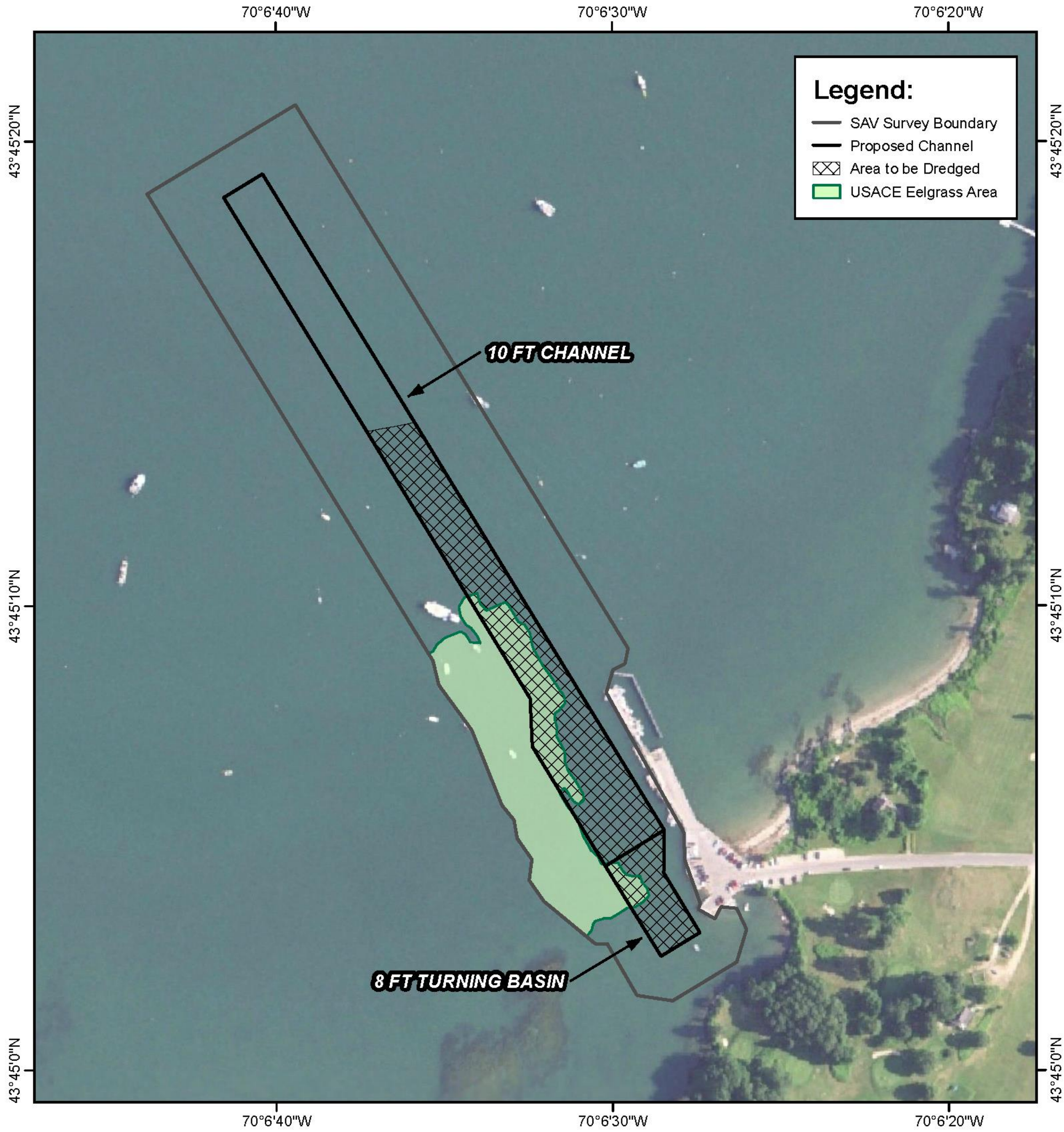
FIGURE 3:
GREAT CHEBEAGUE ISLAND
JULY 2017 SAV CANOPY HEIGHT

0 250 500 750 Feet
0 50 100 150 200 Meters
1:3,500

2015 NAIP AERIAL IMAGERY

GCS NAD 1983





US Army Corps
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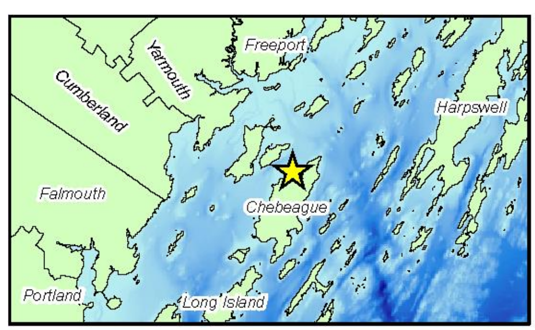
New England District

FIGURE 4:
GREAT CHEBEAGUE ISLAND
JULY 2017 EELGRASS AREA

0 250 500 750 Feet
0 50 100 150 200 Meters
1:3,500

2015 NAIP AERIAL IMAGERY

GCS NAD 1983



APPENDIX A

VIDEO SCREEN CAPTURE LIBRARY

Appendix A: Video Screen Capture Library

TABLE 1: SCREEN CAPTURE INDEX

STATION	LAT	LONG	COMMENT
1	43.753109	-70.110115	Fine sand and silt with scattered macroalgae
2	43.753220	-70.109845	Fine sand and silt with burrows and scattered macroalgae
3	43.752953	-70.109701	Fine sand and silt with scattered macroalgae
4	43.752940	-70.109367	Fine sand and silt with burrows
5	43.752757	-70.109818	Fine sand and silt with burrows
6	43.752757	-70.109448	Sparse eelgrass on sand and silt
7	43.752718	-70.109133	Sparse eelgrass on sand and silt
8	43.752660	-70.109277	Dense eelgrass
9	43.752484	-70.109655	Dense eelgrass
10	43.752712	-70.108484	Macroalgae on coarse substrate
11	43.752451	-70.109061	Sparse to moderate eelgrass on sand and silt
12	43.752354	-70.109250	Dense eelgrass
13	43.752204	-70.108880	Moderate eelgrass cover on sand and shell
14	43.752061	-70.109205	Dense eelgrass
15	43.751945	-70.108729	Kelp, rockweed, and leafy debris
16	43.751826	-70.109007	Dense eelgrass
17	43.751748	-70.108349	Sand, silt, shell, and scattered wrack
18	43.751625	-70.108745	Moderate eelgrass cover and leafy debris on sand and silt
19	43.751507	-70.108267	Leafy debris and eelgrass wrack on silt
20	43.751338	-70.108637	Moderate eelgrass cover on sand and shell
21	43.751273	-70.108421	Sand, gravel, and shell transitioning to eelgrass
22	43.751207	-70.108207	Sand, gravel, and shell substrate
23	43.751058	-70.108565	Dense eelgrass
24	43.750986	-70.108367	Moderate eelgrass cover on sand and shell
25	43.750921	-70.108069	Cobble, gravel, and shell substrate

Appendix A: Video Screen Capture Library

Station 1

Station 2

Appendix A: Video Screen Capture Library

Station 3

Station 4

Station 5

Station 6

Station 7

Station 8

Station 9

Station 10

No image. Station visually inspected from surface.

Station 11

Station 12

Appendix A: Video Screen Capture Library

Station 13

Station 14

Station 15

Station 16

Station 17

Station 18

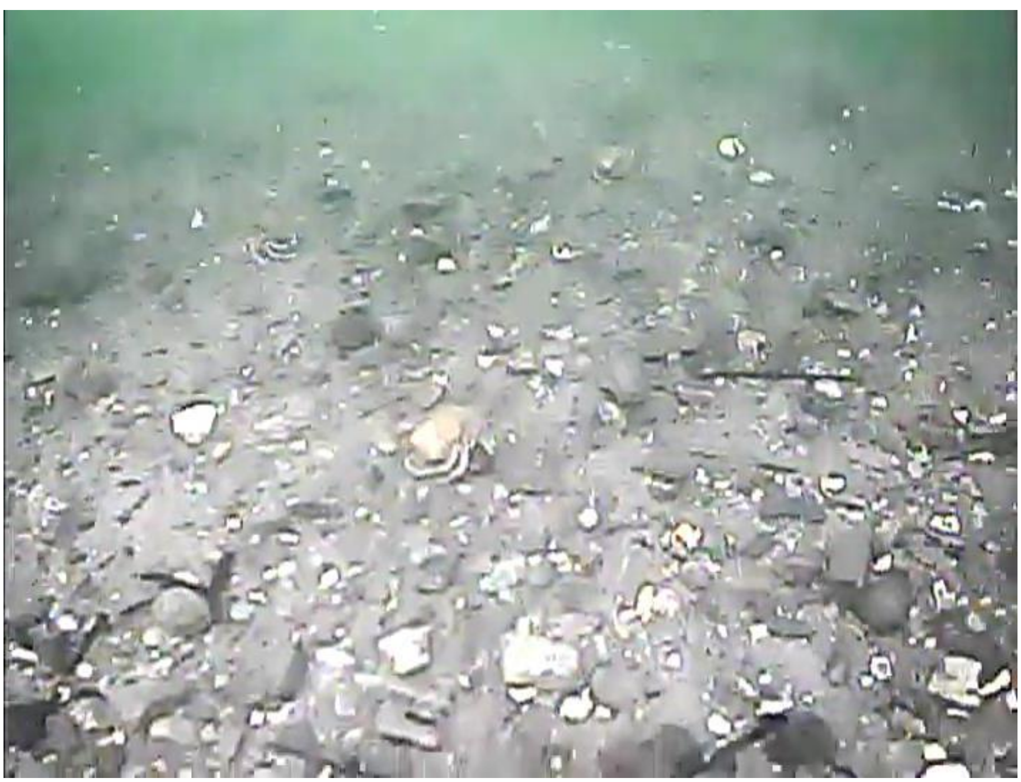
Station 19

Station 20

Appendix A: Video Screen Capture Library

Station 21

Station 22



Station 23

Station 24

Station 25