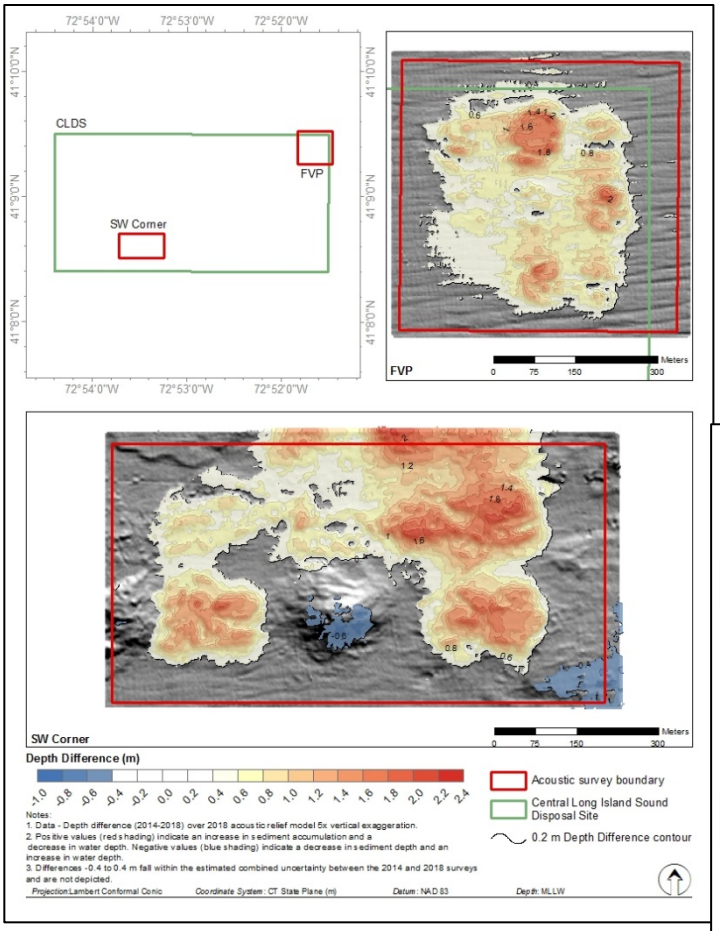
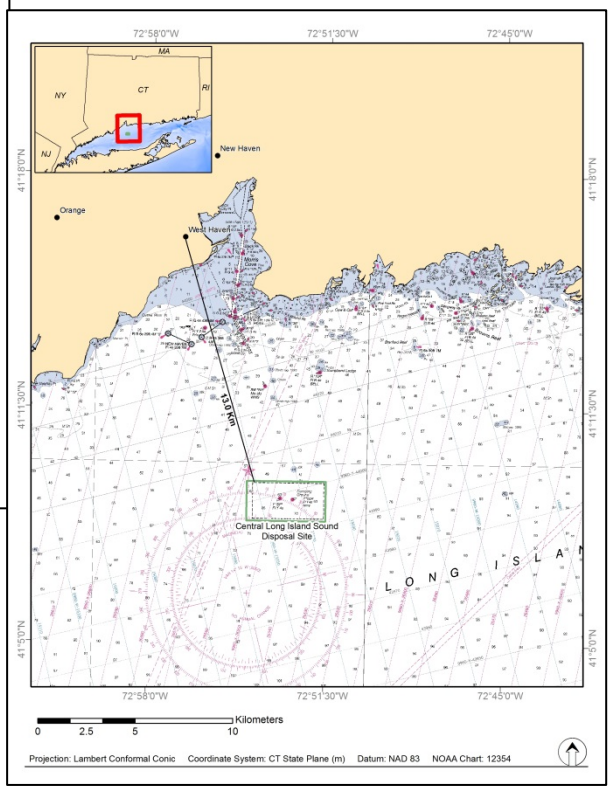
Data Summary Report for the Monitoring Survey at the Central Long Island Sound Disposal Site – October 2018

Disposal Area Monitoring System DAMOS





Data Summary Report
DR 2019-01
November 2019

DISPOSAL AREA MONITORING SYSTEM

US Army Corps of Engineers ®
New England District

DATA SUMMARY REPORT FOR THE MONITORING SURVEY AT THE CENTRAL LONG ISLAND DISPOSAL SITE OCTOBER 2018

DATA REPORT
November 2019

Contract No. W912WJ-17-D-0003

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13. ABSTRACT

A monitoring survey was conducted at the Central Long Island Sound Disposal Site (CLDS) in October 2018 as part of the United States (U.S.) Army Corps of Engineers (USACE) New England District (NAE) Disposal Area Monitoring System (DAMOS) Program. The 2018 CLDS survey was a confirmatory study, utilizing acoustic monitoring over areas that have recently received dredged materials. In this study, the use of acoustic monitoring was employed to track and characterize the placement of dredged materials at the site.

The Central Long Island Sound Disposal Site (CLDS) is located approximately 10.4 kilometers (km) (5.6 nautical miles [nmi]) south of South End Point, East Haven, Connecticut, just south of the mouth of New Haven harbor. This relatively large disposal area has a rectangular footprint approximately 4.1 x 2.0 km (2.2 x 1.1 nmi) in size, centered at 41° 08.95' N, 72° 52.95' W in the North American Datum of 1983 (NAD 83). CLDS was formally designated as a disposal site by the United States Environmental Protection Agency (USEPA) in 2005; however, the site and surrounding area have been receiving dredged sediments for more than 60 years.

Multiple maintenance dredging projects have resulted in the placement of approximately 300,000 m^3 (390,000 yd^3) of dredged material at CLDS since the 2016 bathymetric survey. The 2018 survey was designed as a confirmatory DAMOS survey to document the distribution of recently placed dredged material, and to characterize the seafloor topography at CLDS in support of ongoing site management. Specific objectives were tracking material height and spread in the active portion of the site and gauging the thickness of material added as cover over the FVP mound.

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Note on units of this report: As a scientific contribution, information and data are presented in the metric system. However, given the prevalence of English units in the dredging industry of the United States, conversions to English units are provided for the general information in Section 1. A table of common conversions can be found in Appendix A.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CI	confidence interval
CLDS	Central Long Island Sound Disposal Site
CLIS	Central Long Island Sound
cm	centimeters
DAMOS	Disposal Area Monitoring System
dB	decibel
DGPS	differential GPS
FVP	Field Verification Program
GIS	geographic information system
GPS	Global Positioning System
GRD	gridded file format
kHz	kilohertz
km	kilometer
MBES	multibeam echosounder
MLLW	Mean Lower Low Water
MRU	motion reference unit
m2	square meter
m3	cubic meter
msec	millisecond
NAD83	North American Datum of 1983
NAE	USACE, New England District
nmi	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NTRIP	Networked Transport of Radio Technical Commission for Maritime Services (RTCM) via Internet Protocol
PPS	pulse-per-second
PV	plan-view
QAPP	Quality Assurance Project Plan

ROV	remotely operated vehicle
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
SAIC	Science Applications International Corporation
SOPs	Standard Operating Procedures
SPI	sediment-profile imaging
SVP	sound velocity profile
SW	southwest
TIF	tagged image file
UNH/NOAA	
CCOM	University of New Hampshire's NOAA Center for Coastal and Ocean Mapping
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VDATUM	Vertical Datum Transformation
yd3	cubic yards

1.0 INTRODUCTION

A monitoring survey was conducted at the Central Long Island Sound Disposal Site (CLDS) in October 2018 as part of the United States (U.S.) Army Corps of Engineers (USACE) New England District (NAE) Disposal Area Monitoring System (DAMOS) Program. DAMOS is a comprehensive monitoring and management program designed and conducted to address environmental concerns surrounding the placement of dredged material at aquatic disposal sites throughout the New England region. This section includes an overview of the DAMOS Program and a description of CLDS, including a brief description of historic and recent dredged material disposal activities and study objectives for the October 2018 monitoring survey.

The remainder of the report includes an overview of the methods used to collect and analyze the survey data, a summary of the results, and a list of references cited in the document.

1.1 Overview of the DAMOS Program

The DAMOS Program features a tiered management protocol designed to ensure that any potential adverse environmental impacts associated with dredged material disposal are promptly identified and addressed (Germano et al., 1994). For over 40 years, under the DAMOS Program, dredged material disposal site data throughout New England have been collected and evaluated. Based on these data, patterns of physical, chemical, and biological responses of seafloor environments to dredged material placement activity have been documented along with evaluation of potential impacts to water quality (Fredette and French, 2004, Wolf et al,. 2012).

DAMOS monitoring surveys fall into two general categories: confirmatory studies and focused studies. The data collected and evaluated during these studies provide answers to strategic questions in determining next steps in the disposal site management process. DAMOS monitoring results guide the management of disposal activities at existing sites, support planning for use of future sites, and evaluate the long-term status of historical sites (Wolf et al., 2012).

Confirmatory studies are designed to test hypotheses related to expected physical and ecological response patterns following placement of dredged material on the seafloor at established, active disposal sites. Several survey techniques are employed in order to characterize dredged material placement. Sequential acoustic monitoring surveys (including bathymetric and acoustic backscatter measurements and side-scan sonar) are undertaken to characterize the height and spread of discrete dredged material deposits or mounds created at open water sites as well as the accumulation/consolidation of dredged material into confined aquatic disposal cells.

Focused studies are periodically undertaken within the DAMOS Program to evaluate candidate sites, to establish baseline surveys at new sites, to evaluate inactive/historical disposal sites, and to contribute to the development of dredged material placement and capping techniques. Focused DAMOS monitoring surveys often feature additional types of data collection activities as deemed appropriate to achieve specific survey objectives, such as grab sampling of sediment for physical and biological analysis, sub-bottom profiling, sediment coring, towed video, or video collection via a remotely operated vehicle (ROV).

The 2018 CLDS survey was a confirmatory study, utilizing acoustic monitoring over areas that have recently received dredged materials. In this study, the use of acoustic monitoring was employed to track and characterize the placement of dredged materials at the site.

1.2 Central Long Island Sound Disposal Site Background

The Central Long Island Sound Disposal Site (CLDS) is located approximately 10.4 kilometers (km) (5.6 nautical miles [nmi]) south of South End Point, East Haven, Connecticut, just south of the mouth of New Haven harbor. This relatively large disposal area has a rectangular footprint approximately 4.1 x 2.0 km (2.2 x 1.1 nmi) in size, centered at 41° 08.95' N, 72° 52.95' W in the North American Datum of 1983 (NAD 83) (Figure 1-1). CLDS was formally designated as a disposal site by the United States Environmental Protection Agency (USEPA) in 2005; however, the site and surrounding area have been receiving dredged sediments for more than 60 years.

1.3 Historic Disposal Activity at CLDS

The early management strategy (prior to 1990) at CLDS focused on the placement of relatively small volumes of sediment at targeted locations within the disposal area. A series of designated capping projects were also executed at this disposal site during its early use.

Since the 1990s, the disposal strategy was modified to focus on creating closely spaced, contiguous mounds on the seafloor in an effort to create ringed or circular berms to form containment cells. Containment cells can reduce the potential for the lateral spread of highly fluid dredged material as part of the long-term management of the CLDS (Site) (Fredette, 1994). The oldest containment cell within the Site was developed in 1993 and was used to contain New Haven harbor material (NHAV93 mound complex); in 1999, additional containment cells were constructed (Figure 1-2).

In the early 2000s the management strategy for CLDS shifted to place dredged material in a series of closely spaced mounds and target cells, contributing to the earlier approach of creating circular berms and individual mounds on the seafloor.

1.4 Previous Surveys at CLDS

A summary of monitoring activities from 2005 until present is included in Table 1-1. A bathymetric survey was conducted over the entire CLDS site in 2014, and most recently in 2016, a bathymetric survey of CLDS was conducted over the south central (active) portion of the Site (Figure 1-2). The DAMOS contribution for the 2016 monitoring survey is currently in progress; however bathymetric data from the 2016 survey are used for comparision within this data report. In addition, comparisons to the 2014 bathymetric data are included within this data report, due to the differences in survey coverage.

1.5 Recent Dredged Material Disposal Activity

Since the September/October 2016 bathymetry survey of CLDS, close to 300,000 cubic meters (m^3) (390,000 cubic yards [yd^3]) of dredged material have been deposited at CLDS (Table 1-2, Figures 1-3a and 1-3b, Appendix B). The Field Verification Program (FVP) survey area, located in the northeastern corner of CLDS, received approximately 180,000 m^3 (235,000 yd^3) of dredged material originating solely from the North Cove Federal Navigation Project. The FVP study area includes an experimental disposal mound formed from the unconfined open water placement of dredged materials from Black Rock Harbor in Bridgeport, CT. Materials placed from Black Rock Harbor had elevated levels of metals and organic contaminants, and demonstrated biological toxicity (Scott et al. 1987). The FVP mound was previously left uncapped to be used as a field comparison of capped mounds located within the CLDS. The dredged material recently placed within the FVP study area was intended to act as a broad cap over the previously uncapped FVP sediments.

The southwest (SW) corner, which is currently the active placement area for CLDS, received approximately 108,000 m^3 (141,000 yd^3) of material originating from various dredging projects within the region. Additional deposits were made to an area northeast of the SW corner survey boundary resulting in the placement of an estimated 11,000 m^3 (14,400 yd^3) of material that was not surveyed during this field effort; however this area will be prioritized during the next round of monitoring.

1.6 Study Objectives

Multiple maintenance dredging projects have resulted in the placement of approximately 300,000 m^3 (390,000 yd^3) of dredged material at CLDS since the 2016 bathymetric survey. The 2018 survey was designed as a confirmatory DAMOS survey to document the distribution of recently placed dredged material, and to characterize the seafloor topography at CLDS in support of ongoing site management. Specific objectives were tracking material height and spread in the active portion of the site and gauging the thickness of material added as cover over the FVP mound.

Table 1-1.

Previous Surveys at CLDS since 2005

Year	Survey Type	Bathymetric Survey (m x m)	No. SPI Stations	Other	Contribution #	Citation
July 2005	Acoustic Monitoring	2500 x 4500	-	-	177	ENSR, 2007
Sept/Oct 2009	Acoustic Monitoring	1000 x 1500 (active portion)	58		184	Valente et al., 2012
Sept/Oct 2011	Acoustic and Sediment-Profile Monitoring	Active Portion of CLDS 1000 x 1900 FVP Mound 1000 x 950	68		192	AECOM, 2013
December 2013	Acoustic Confirmatory	NHAV14-S and NHAV14-N Placement Areas	-	Sediment Grabs	Internal	
January 2014	Acoustic Confirmatory	NHAV14-S and NHAV14-N Placement Areas	-	Sediment Grabs	Internal	
August 2014	Acoustic and Sediment-Profile Monitoring	Entire Site 2500 x 4500	-	Sediment Grabs	197	Hopkins et al., 2017
October 2015	Acoustic Confirmatory	1000 x 1000	-	-	DR 2015-06	Beaver E.; Bellagamba Fucile, E. 2017
Sept/Oct 2016		1200 x 700 (active portion) and (3) 600 x 600 Ref Areas	60	Sediment Grabs	In progress	In progress

Table 1-2.

Summary of Recent Disposals at CLDS

Project	Survey Area	Disposal Year	Volume (yd^3)	Volume (m^3)
Clinton Yacht Haven	SW corner	2016	2,840	2,171
Gwenmor Marina	SW corner	2016	243	186
Oyster Landing Beach Club	SW corner	2016	2,694	2,060
Tilcon Pine Orchard Dock	SW corner	2016	34,957	26,725
American Styrenics Facility	SW corner	2017	59,721	45,657
Brewer Pilot Point Marina	SW corner	2017	1,577	1,206
Brewers Pilot Point Marina	*	2017	3,618	2,766
Clinton Town Marina	SW corner	2017	5,036	3,850
Davenport Landing	*	2017	5,193	3,970
Guilford Yacht Club	SW corner	2017	7,220	5,520
Indian Town Associates	SW corner	2017	6,949	5,313
Noank Village Boat Club	SW corner	2017	559	427
Noroton Yacht Club	SW corner	2017	687	525
Pine Island Real Estate LLC	SW corner	2017	820	627
Pine Orchard Yacht Club	SW corner	2017	12,814	9,796
Saybrook Point Marina	SW corner	2017	2,244	1,716
Spicers Marina	SW corner	2017	2,089	1,597
North Cove	FVP	2018	234,694	179,423
Town of Branford	*	2018	5,266	4,026
Total			**389,220**	**297,559**

*Placement area outside of 2019 survey boundaries

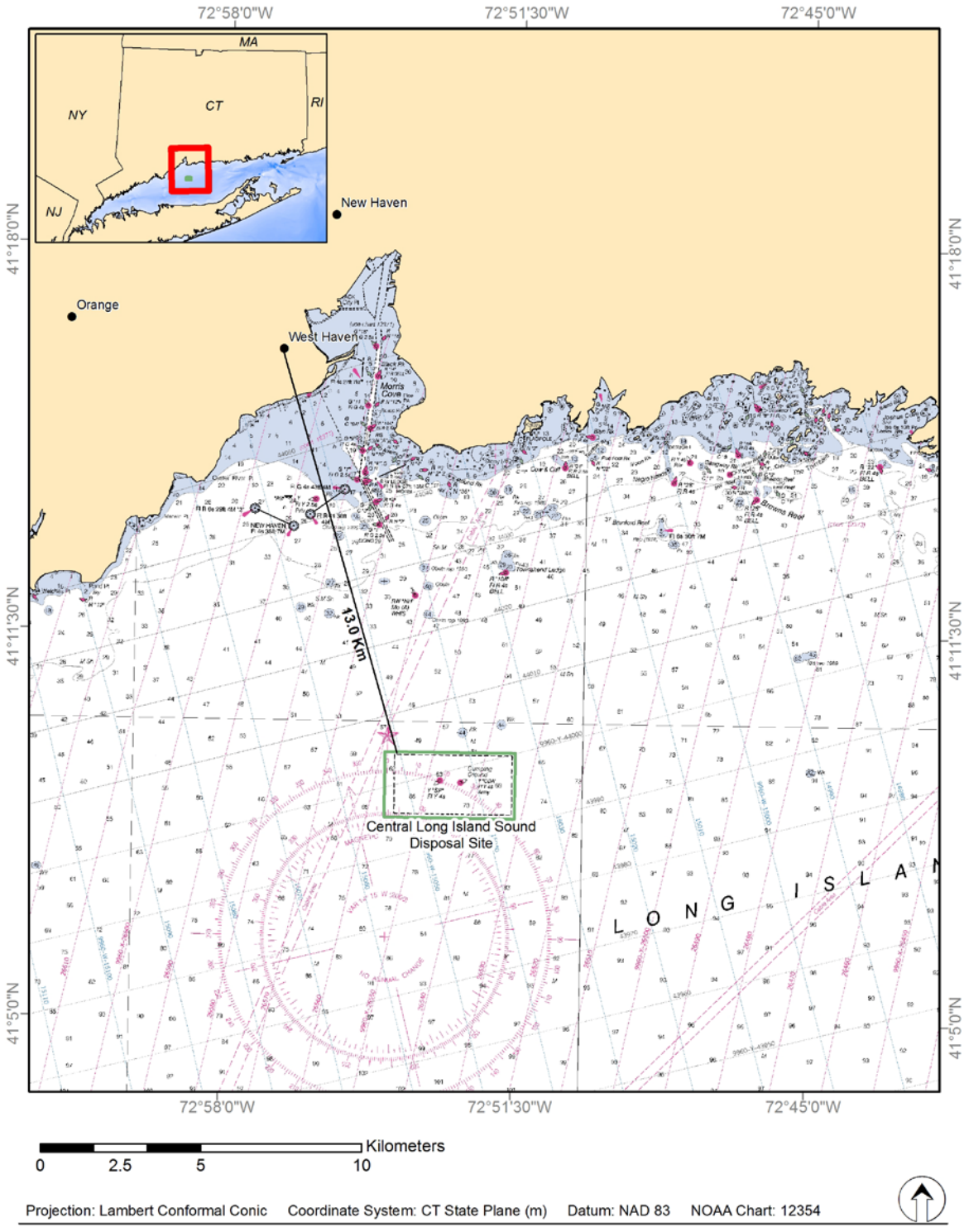

Figure 1-1. Location of CLDS in Long Island Sound

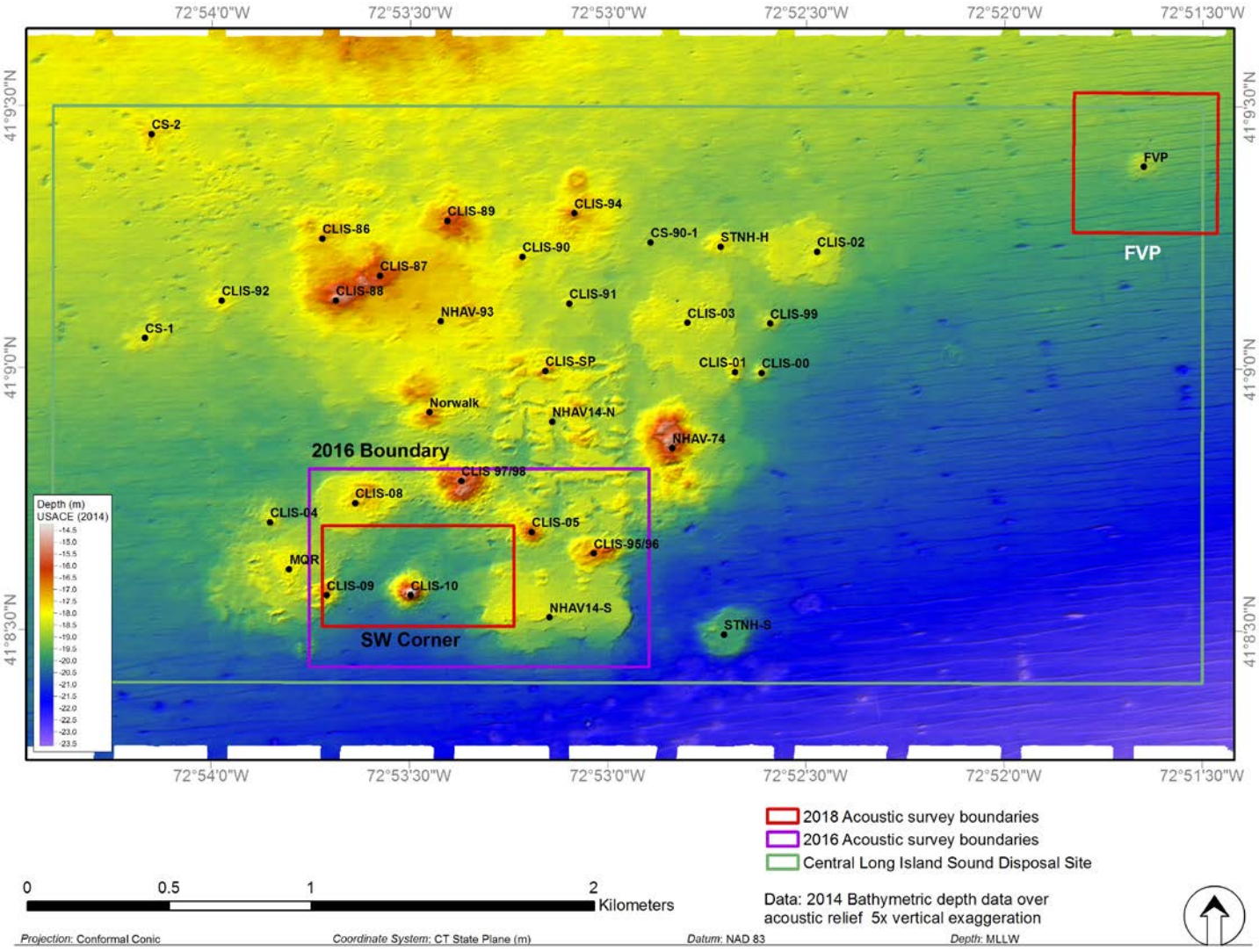

Figure 1-2. Bathymetric survey data of CLDS, August 2014 along with 2016 and 2018 survey boundaries

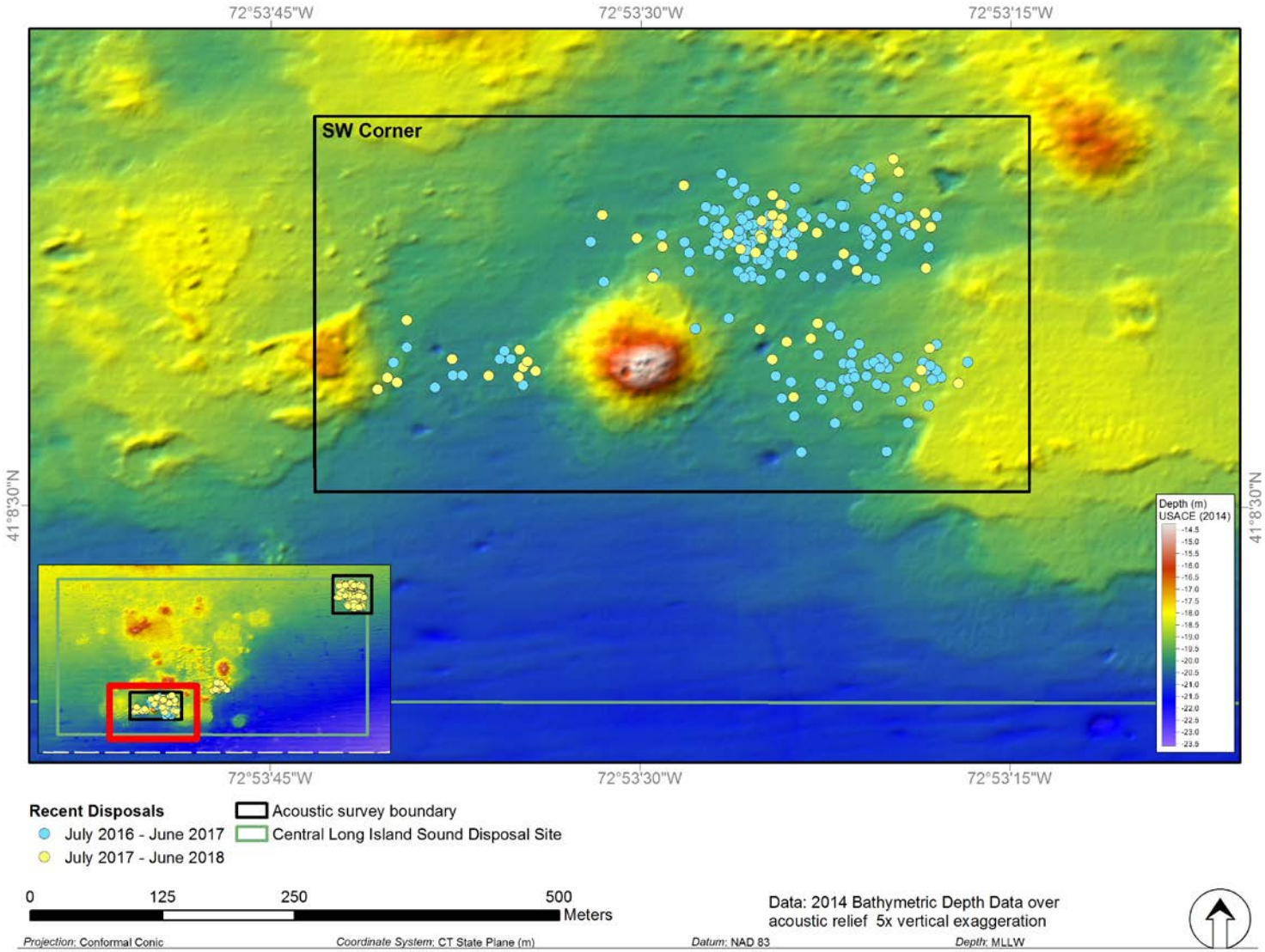

Figure 1-3a. Bathymetric survey data of CLDS, SW Survey Area, August 2014, with recent disposals (2016 – 2018)

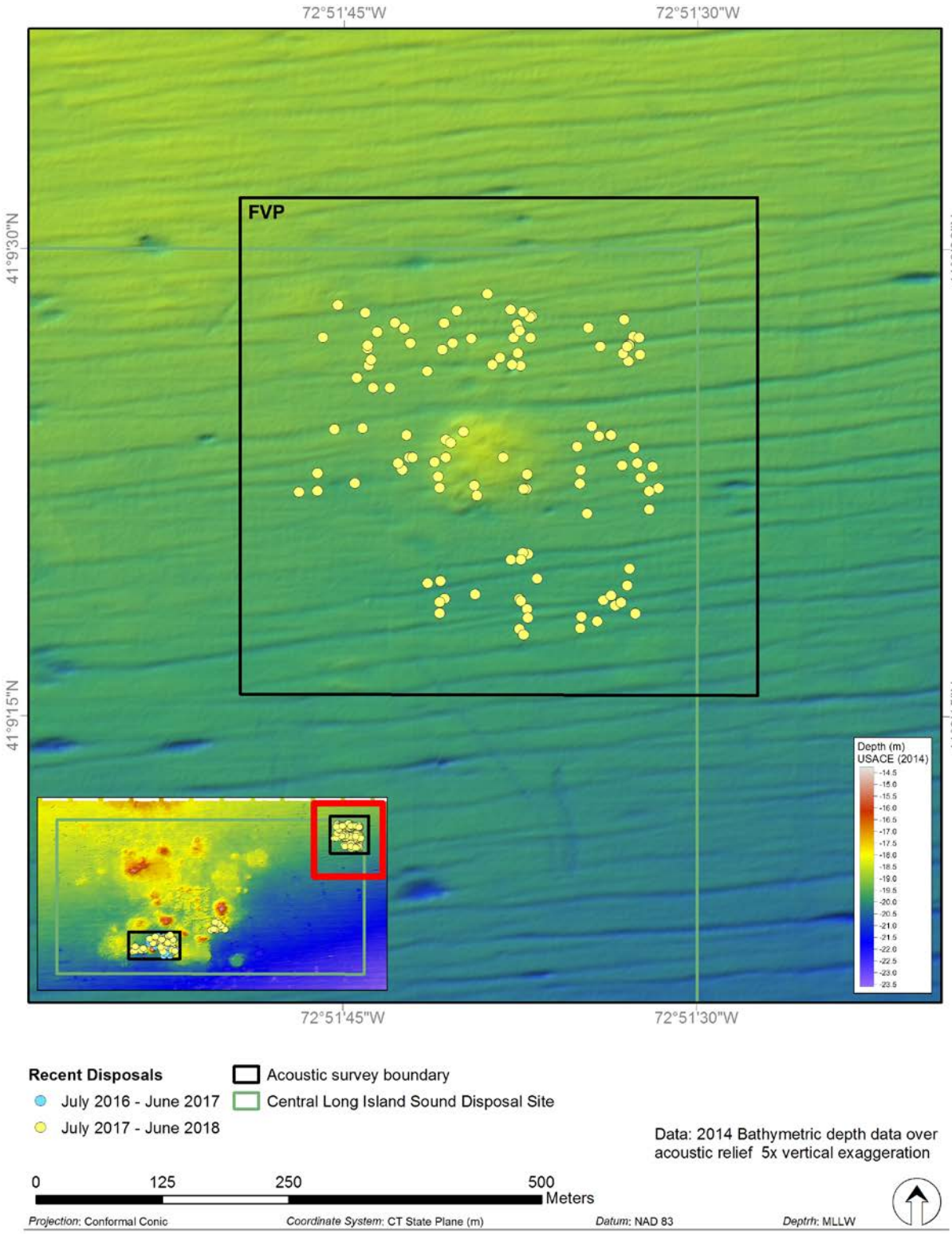

Figure 1-3b. Bathymetric survey data of CLDS, FVP Survey Area, August 2014, with recent disposals (2016 – 2018

2.0 METHODS

The October 2018 survey conducted at CLDS was performed by a scientific team comprised of members from AECOM and CR Environmental, Inc. The acoustic survey was conducted on 19 October 2018 to characterize the seafloor topography and document recent disposals in the SW corner and FVP portions of CLDS. The survey was conducted aboard the 55-foot R/V *Jamie Hannah*. Field activities are summarized in Table 2-1, and an overview of the methods used to collect and analyze the survey data is provided below. Detailed Standard Operating Procedures (SOPs) for data collection and processing are presented in the program Quality Assurance Project Plan (QAPP) (AECOM, 2018).

2.1 Navigation and On-Board Data Acquisition

Navigation for the acoustic survey was accomplished using a Hemisphere VS-330 Real Time Kinematic (RTK) Global Positioning System (GPS) which received base station correction through the Keynet Networked Transport of Radio Technical Commission for Maritime Services (RTCM) via Internet Protocol (NTRIP) broadcast. Horizontal position accuracy in fixed RTK mode was approximately 2 centimeters (cm). A dual-antennae Hemisphere VS110 differential GPS (DGPS) was available as a backup, if necessary. The GPS system was interfaced to a desktop computer running HYPACK hydrographic survey software. HYPACK continually recorded vessel position and GPS satellite quality and provided a steering display for the vessel captain to accurately maintain the position of the vessel along pre-established survey transects. Vessel heading measurements were provided by an IxBlue Octans III fiber optic gyrocompass.

2.2 Acoustic Surveys

The multibeam survey included bathymetric, backscatter, and side-scan sonar data collection. The bathymetric data provided measurements of water depth that, when processed, were used to map the seafloor topography. Backscatter and side-scan sonar data provided images that supported characterization of surface sediment texture and roughness. Each of these acoustic data types is useful for assessing dredged material placement and surface sediment features.

2.2.1 Bathymetry, Backscatter, and Side-Scan Data Collection

The 2018 acoustic survey covered two portions of the disposal site, an approximately 700 m x 350 m area in the southwestern portion of the site and a 500 m x 500 m portion in the northeastern corner of the site. Sediment acoustic backscatter data (beam time-series) and side-scan sonar imagery were collected in conjunction with the bathymetric survey. The acoustic survey included a total of 30 survey lines over the two survey areas, spaced approximately 30 m apart and oriented in an east-west direction. Cross-lines were spaced 200 m apart and oriented in a north-west direction (Figure 2-1).

Data layers generated by the survey included bathymetric, acoustic backscatter, and side-scan sonar and were collected using an R2Sonic 2022 broadband multibeam echo sounder (MBES). This 200-400 kilohertz (kHz) system forms up to 256 1- to 2-degree beams (frequency dependent) distributed equiangularly or equidistantly across a 10- to 160-degree swath. For this survey, a frequency of 200 kHz and pulse length of 0.079 milliseconds (msec) were selected to maximize the resolution of bathymetric data without compromising the quality of acoustic backscatter data. The MBES transducer was mounted amidships to the port rail of the survey vessel using a high-strength adjustable boom. The primary GPS antenna was mounted atop the transducer boom. The transducer depth below the water surface (draft) and antenna height were checked and recorded at the beginning and end of data acquisition, and draft was confirmed using the "bar check" method.

An IxBlue Octans III motion reference unit (MRU) was interfaced to the MBES topside processor and to the acquisition computer. Precise linear offsets between the MRU and MBES were recorded and applied during acquisition. Depth and backscatter data were synchronized using pulse–per-second (PPS) timing and transmitted to the HYPACK MAX® acquisition computer via Ethernet communications. Patch calibration tests were conducted before and during the survey to allow computation of angular offsets between the MBES system components.

The system was calibrated for local water mass speed of sound by performing sound velocity profile (SVP) casts at frequent intervals throughout the survey day using an AML, Inc. MinosX sound velocity profiler.

2.2.2 Bathymetric Data Processing

Bathymetric data were processed using HYPACK HYSWEEP® software. Processing components are described below and included:

- Adjustment of data for tidal elevation fluctuations
- Correction of ray bending (refraction) due to density variations in the water column
- Removal of spurious points associated with water column interference or system errors
- Development of a grid surface representing depth solutions
- Statistical estimation of sounding solution uncertainty
- Generation of data visualization products

Tidal adjustments were accomplished using RTK GPS verified against tide data using records obtained from the National Oceanic and Atmospheric Association's (NOAA) New Haven Tide Station (#8465705) after application of a site-specific Tide Zoning Model provided by NOAA. The mean difference between the RTK and NOAA Tide Station data was 0.03 m. Water surface elevations derived using RTK were adjusted to Mean Lower Low

Water (MLLW) elevations using NOAA's Vertical Datum Transformation (VDATUM) Model. Correction of sounding depth and position (range and azimuth) for refraction due to water column stratification was conducted using a series of five sound-velocity profiles acquired by the survey team. Data artifacts associated with refraction remained in the bathymetric surface model at a relatively fine scale (generally less than 5 to 10 cm) relative to the survey depth.

Bathymetric data were filtered to accept only beams falling within an angular limit of 60° to minimize refraction artifacts. Spurious sounding solutions were rejected based on the careful examination of data on a sweep-specific basis.

The R2Sonics 2022 MBES system was operated at 200 kHz. At this frequency, the system has a published beam width of 2.0°. Assuming an average survey area depth of 19 m and a maximum beam angle of 60°, the average dimensions of the beam footprint mid-swath was 1.3 m × 0.9 m resulting in an approximately 1.2 square meter (m^2) footprint. Data were reduced to a cell (grid) size of 2.0 m × 2.0 m, acknowledging the system's fine range resolution while accommodating beam position uncertainty. This data reduction was accomplished by calculating and exporting the average elevation for each cell in accordance with USACE recommendations (USACE, 2013).

Statistical analysis of bathymetric data, as summarized in Table 2-2, showed negligible tide bias (<0.01 m) and a mean vertical uncertainty of 0.18 m, substantially lower than values recommended by USACE (2013) or NOAA (2015). Note that the most stringent National Ocean Service (NOS) standard for this project depth (Special Order 1A) would call for a 95th percentile confidence interval (95% CI) uncertainty of 0.29 m at the maximum and mean survey depths (20.7 m and 19.1 m, respectively).

Processed data were exported in American Standard Code for Information Interchange (ASCII) text format with fields for Easting, Northing, and MLLW elevation (meters). All data were projected to the Connecticut Mainland State Plane, North American Datum of 1983 (NAD83) (metric). A variety of data visualizations were generated using a combination of ESRI ArcMap and Golden Software Surfer programs. Visualizations and data products include:

- ASCII data files of all processed soundings including MLLW depths and elevations.
- Contours of seabed elevation (20-cm, 50-cm and 1.0-m intervals) in a geospatial data file format suitable for plotting using geographic information system (GIS) and computer-aided design software.
- 3-Dimensional surface maps of the seabed created using 5× vertical exaggeration and artificial illumination to highlight fine-scale features not visible on contour layers delivered in grid and tagged image file (TIF) formats.
- An acoustic relief map of the survey area created using 5× vertical exaggeration, delivered in georeferenced TIF format.

2.2.3 Backscatter Data Processing

Backscatter data were extracted from cleaned MBES TruePix formatted files and then used to provide an estimation of surface sediment texture based on seabed surface roughness. Mosaics of backscatter data were created using HYPACK's implementation of GeoCoder software developed by scientists at the University of New Hampshire's NOAA Center for Coastal and Ocean Mapping (UNH/NOAA CCOM). A seamless mosaic of unfiltered backscatter data was developed and exported in grayscale TIF format using a 0.5 m x 0.5 m pixel resolution. Backscatter data were also exported in ASCII format with fields for Easting, Northing, and backscatter in decibels (dB). These data were converted to grid format and a Gaussian filter was applied to the grid to minimize nadir artifacts; the filtered data were used to map backscatter values on a 1 m x 1 m grid. The grid was exported in ESRI binary gridded file format (GRD) to facilitate comparison with other data layers.

2.2.4 Side-Scan Sonar Data Processing

Side-scan sonar data were processed using Chesapeake Technology, Inc. Sonar Wiz software to generate a database of images that maximized both textural information and structural detail. Data were processed using gain adjustment methods to minimize nadir artifacts and facilitate visualization of fine seabed structures. Seamless mosaics of side-scan sonar data were developed using SonarWiz and exported in grayscale TIF format using a resolution of 0.20m per pixel. Data for each sonar file were exported as individual TIF images to allow detailed inspection using GIS software.

2.2.5 Acoustic Data Analysis

Bathymetric data for the FVP survey area were compared to data collected for DAMOS in 2014, and bathymetric data collected in the SW corner survey area were compared to data collected for DAMOS in 2016. Surfaces were developed from these comparisons representing elevation changes (depth differences) between survey dates. Elevation differences were considered to be significant if they were equal to or greater than 0.4 m (estimated average survey vertical uncertainty for the combined 2018 and 2014 or 2018 and 2016 survey data sets).

The backscatter mosaics and filtered backscatter grids were combined with acoustic relief models in GIS to facilitate visualization of the relationships between acoustic datasets. This was done by rendering images and color-coded grids with sufficient transparency to allow the three-dimensional acoustic relief model to be visible underneath.

Table 2-1.

2018 Field Activities at CLDS

Survey	Date	Summary
Bathymetry	19 October 2018	Two areas with sides measuring: 700 m x 350 m and 500 m x 500 m Lines: 37 Spacing: 30 m

Table 2-2.

Acoustic Cross-Line Comparison Results

+/- Beam Angle Limit	Max Outlier	Mean Diff	Std Dev	95% Confidence
0 (vertical)	0.41	0.0	0.07	0.13
5	0.54	-0.01	0.07	0.13
10	0.54	-0.01	0.07	0.14
15	0.54	-0.01	0.09	0.17
20	0.54	-0.05	0.1	0.19
25	0.54	-0.02	0.09	0.17
30	0.48	-0.01	0.08	0.17
35	0.5	0	0.08	0.16
40	0.5	0.01	0.09	0.17
45	0.52	0.03	0.09	0.18
50	0.52	0.02	0.1	0.19
55	0.52	0.01	0.1	0.2
60	0.52	-0.01	0.12	0.23
65	0.51	-0.02	0.12	0.23
Mean	0.503	-0.006	0.091	0.176

Notes:

1. Data from October 19, 2018 survey represented in meters.
2. Comparisons were made between cross-line swaths and a reference surface created using mainstay data to +/- 65 degrees from nadir using 2m x 2m cell average elevations.
3. 95th percentile uncertainty calculated as 2x root mean square per Army Corps of Engineers recommendations.

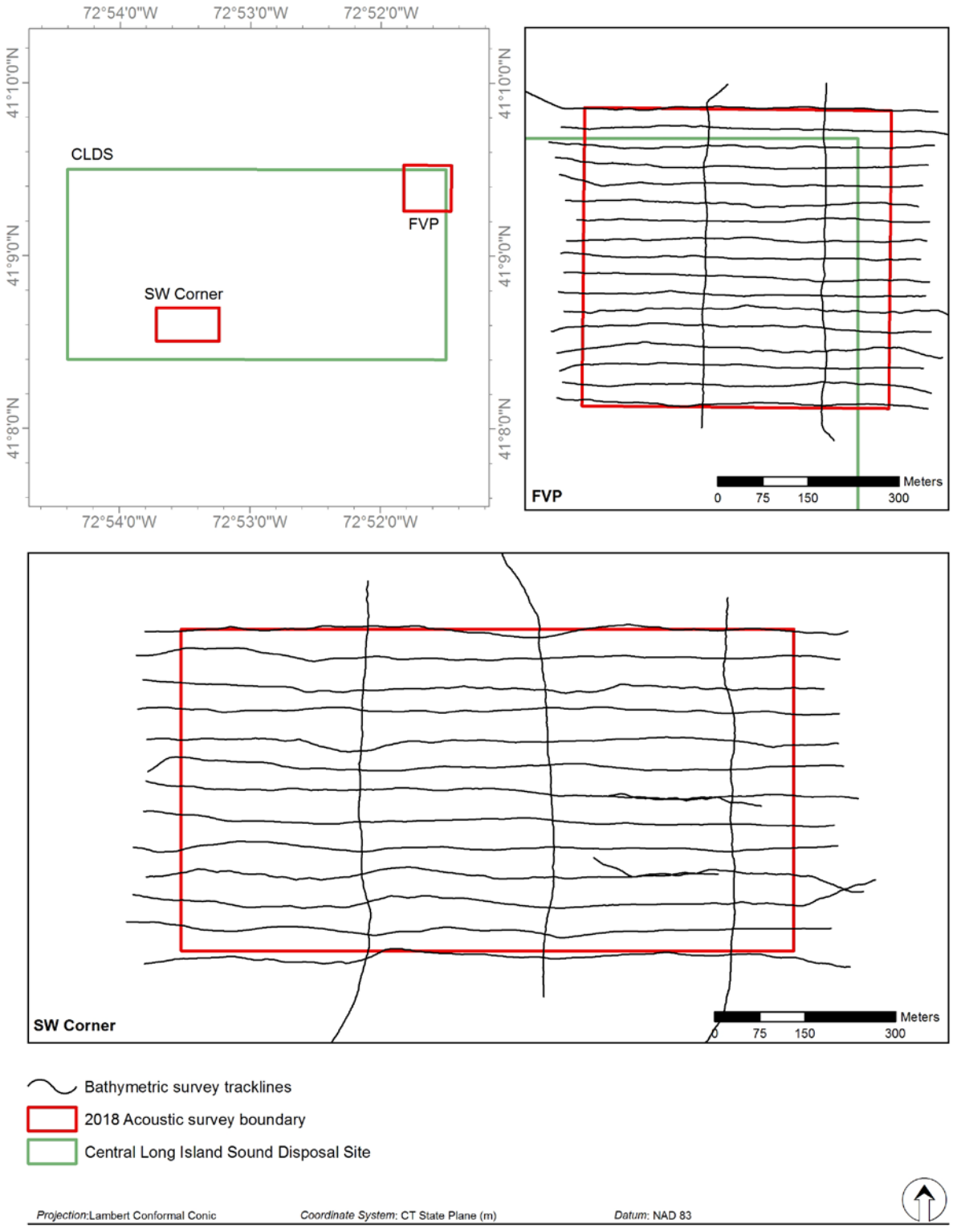

Figure 2-1. Bathymetric survey boundaries and tracklines, October 2018

3.0 RESULTS

The 2018 acoustic surveys of CLDS covered two areas which measured 500 m x 500 m over the FVP area of the Site, and 350 m x 700 m over the SW corner of the Site. During the acoustic survey, a fishing gear assessment was also conducted; however no fishing gear was observed. Data from these investigations are summarized below and presented in the subsequent tables and figures.

3.1 Bathymetry, Backscatter, and Side-Scan

3.1.1 Bathymetric Results

The FVP portion of CLDS is relatively flat with depths ranging from 17 - 20 m MLLW. The historic disposal mound was visible in the central portion of the FVP survey area where depths were slightly shallower than the surrounding seafloor (Figures 3-1a and 3-1b). The area of theFVP that rises above the ambient seafloor measures approximately 350 m from east to west, and 420 m from north to south. An area of densly accumulated dredged material is located in the north central portion of the FVP spanning approximately 100 m in diameter.

Depths in the SW corner survey area of CLDS ranged from 14.5 – 20.5m MLLW. The ambient seafloor in this area was relatively flat, ranging from 18 – 20.5 m MLLW. The previously formed CLIS-10 disposal mound was visible in the central portion of the SW corner survey area (Figures 3-1a and 3-1b). The visible mound spanned approximately 130 m in diameter at its widest points, and rose approximately five meters above the surrounding seafloor. Portions of the NHAV14-S disposal area were visible to the east of the CLIS-10 mound, where the depth reached approximately 16 m MLLW at the shallowest point. Along the eastern boundary of the SW corner survey area, the previously formed CLIS-09 mound was visible with depths measuring approximately 16.5 m at the peak of the mound (Figures 3-1a and 3-1b).

Depth difference calculations were performed using the 2014 - 2018 bathymetric datasets for the FVP portion of the Site and the 2016 - 2018 bathymetric datasets for the SW corner survey area (Figures 3-2a and 3-2b). An estimated uncertainty of -0.4 to 0.4 m was assumed to capture the range of uncertainty between the 2014, 2016, and 2018 surveys. Depth difference results depict the addition of sediments within each of the survey areas since the 2014 and 2016 surveys. Depth difference results with an overlay of logged disposal points are presented in Figures 3-3a and 3-3b.

The depth difference analysis within the FVP portion of CLDS displayed a depth increase within the central portion of the survey area. The most thickly accumulated area of dredged material was in the north central portion of the survey area where a small mound rose approximately 2 m above the seafloor. Two smaller areas of accumulated dredged

material that also rose 2 m above the seafloor were visible in the central and south central portion of the FVP area. Thinner deposits of accumulated dredged material were visible across the majority of the survey area, creating the base for a cap layer over the FVP mound.

Within the SW corner survey area, depth difference results displayed two defined sediment accumulation areas, each rising aporoximately 2 m from the ambient seafloor. The mounds present within the eastern portion of the survey area measured approximately 300 m in diameter at the widest points. A smaller dredge material placement area was present in the southwestern corner of the survey area, rising approximately 1.4 m from the seafloor. This smaller mound measured approximately 175 m in diameter at its widest points.

3.1.2 Backscatter and Side-Scan Sonar Results

Backscatter and side-scan sonar data provide images that display changes in seafloor sediment texture and roughness. These tools also aid in the analysis of topographic changes between the ambient seafloor and areas that have received dredged material. Typically, high backscatter intensity is related to the presence of rock or coarse-grained sediment (e.g., gravel, coarse sand), and low backscatter intensity is indicative of fine-grained sediments (e.g., silt, clay). Side-scan sonar also provides an image of seafloor texture and bottom features.

The CLDS backscatter survey results (measured in dB) displayed little variation in sediment type within the FVP portion of CLDS. In general, backscatter signals ranged from -41 to -47 dB (Figures 3-4a, 3-4b, 3-5a and 3-5b). Within the SW corner survey area, backscatter signals ranged from -32 to -47 dB, reflecting coarser sediments present over the CLIS-9 and CLIS-10 disposal mounds and softer sediments in areas where recent (2016 – 2018) placements occurred (Figures 3-4a, 3-4b, 3-5a and 3-5b).

A side-scan sonar mosaic of the survey area allowed for interpretation of surficial features of the Site. Similar to the backscatter results, the side scan sonar results displayed little variation in sediment texture within the FVP portion of CLDS. Side scan sonar results in the SW corner of the CLDS also displayed coarser sediments over the CLIS- 9 and CLIS-10 mounds with sediment texture showing more variation in the western portion of the survey area and less variation in the eastern portion (Figures 3-6a and 3-6b).

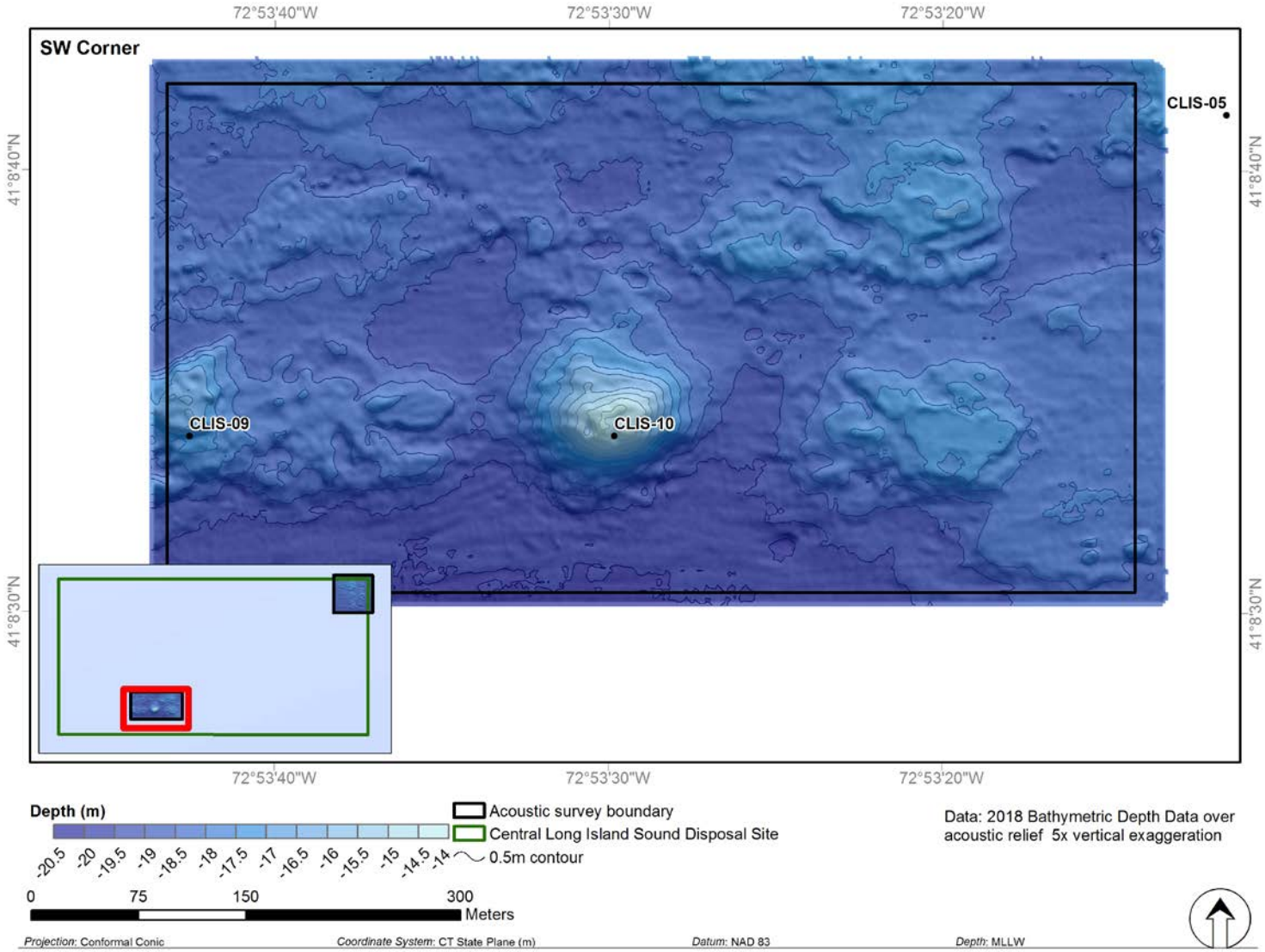

Figure 3-1a. Bathymetry of SW survey area over 5x vertical relief model, October 2018

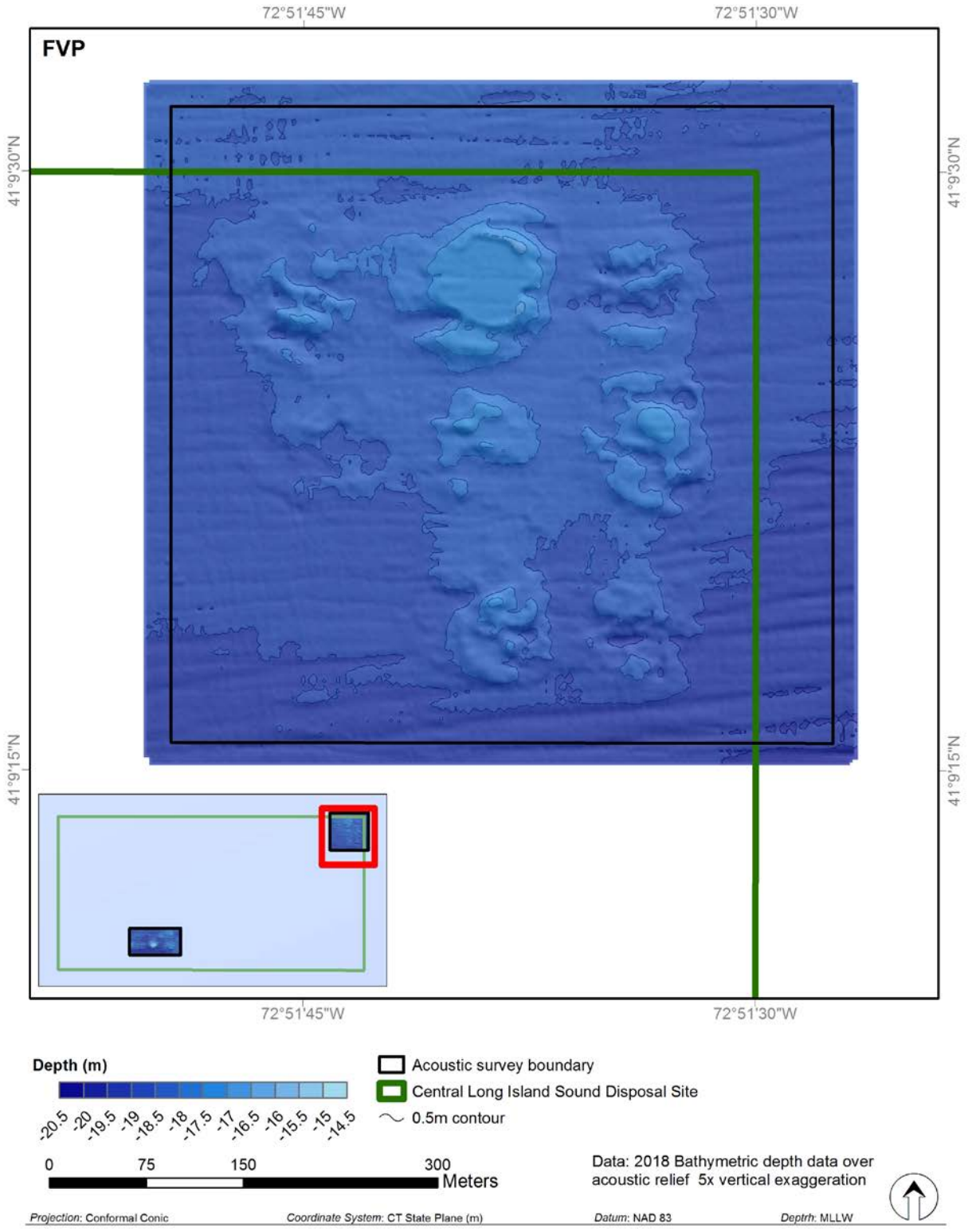

Figure 3-1b. Bathymetry of FVP Survey Area over 5x vertical relief model, October 2018

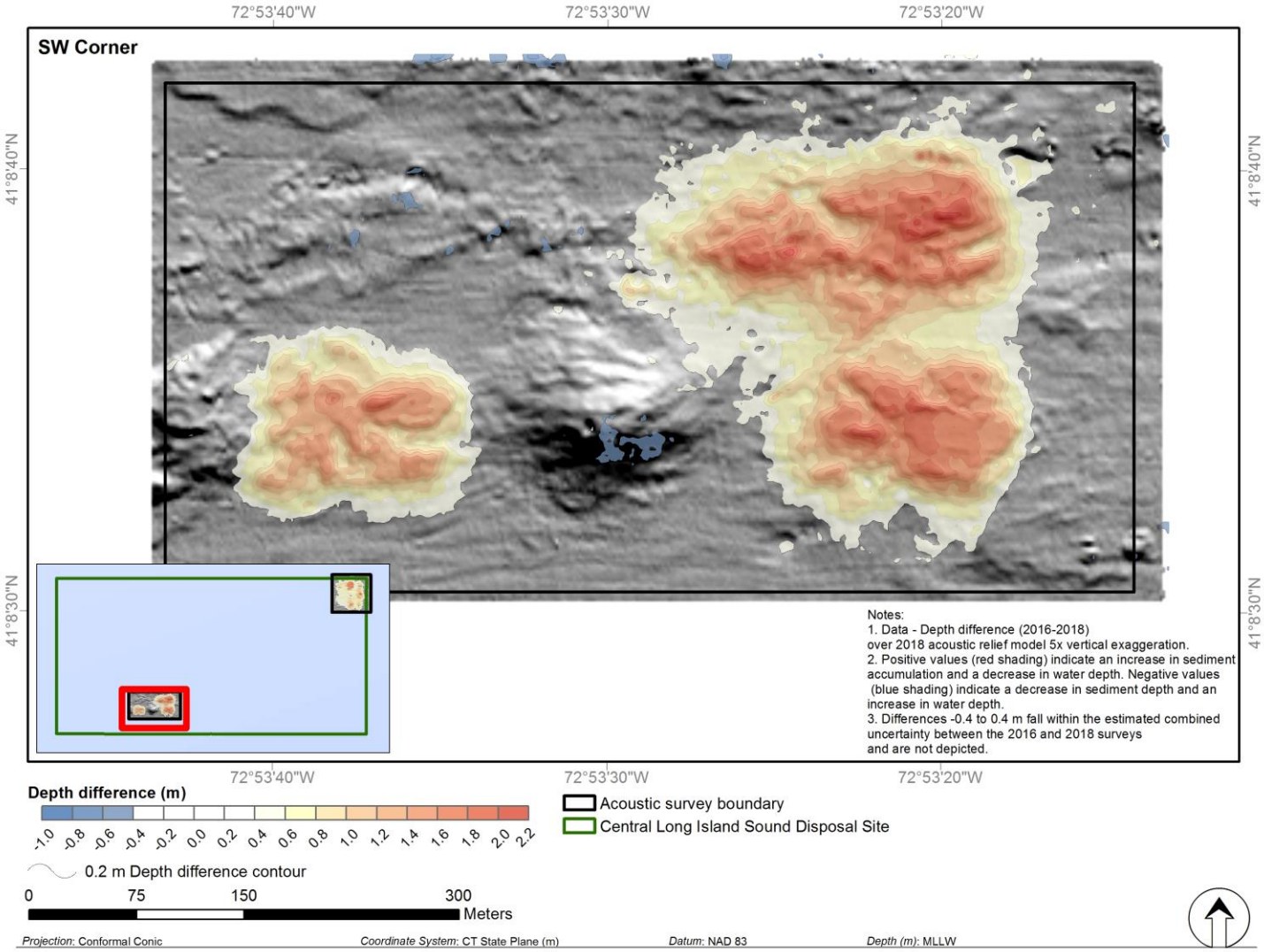

Figure 3-2a. Depth differencing (2016 - 2018) of SW Survey Area over 5x vertical relief model, 2018

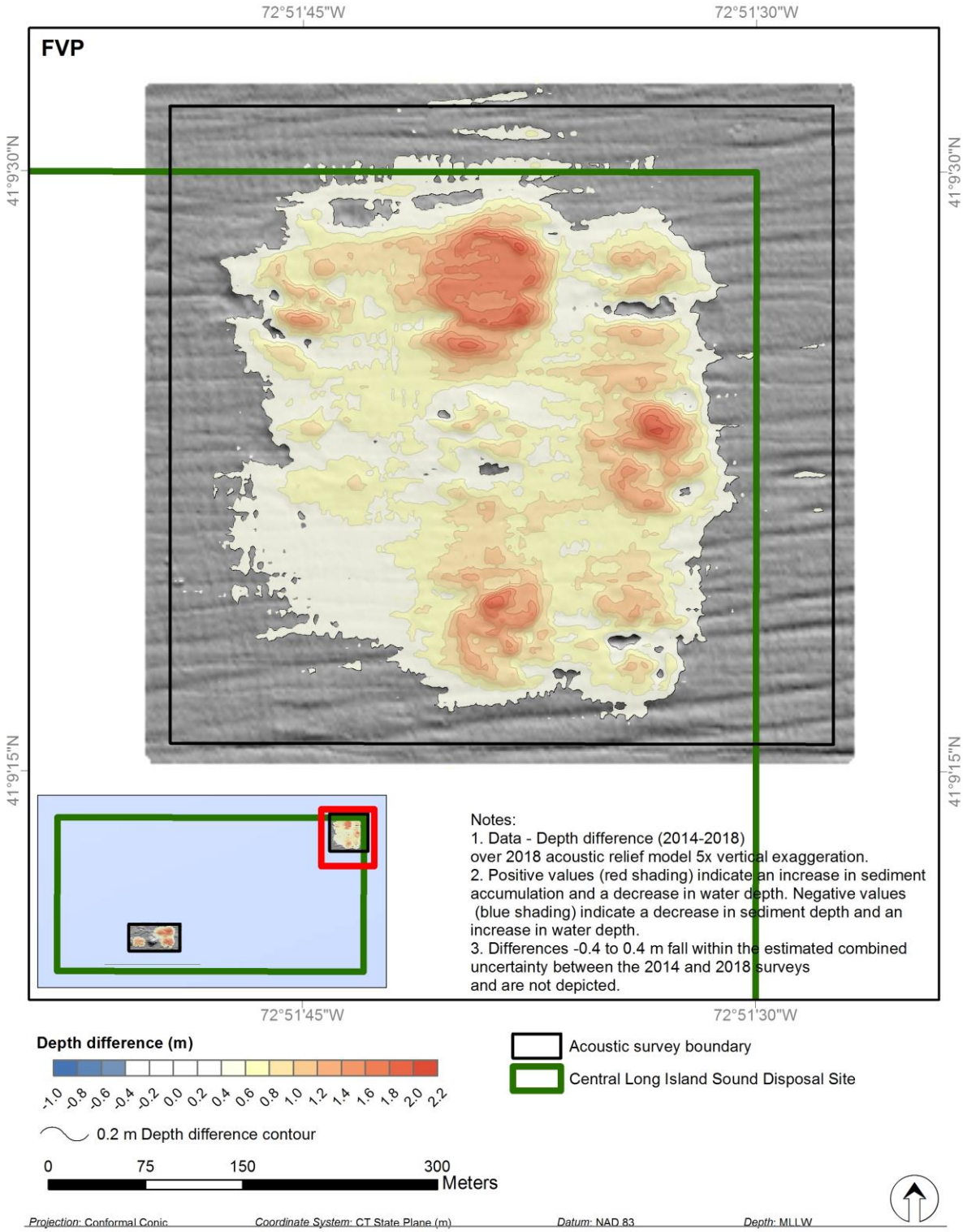

Figure 3-2b. Depth differencing (2014 – 2018) of FVP Survey Area over 5x vertical relief model, 2018

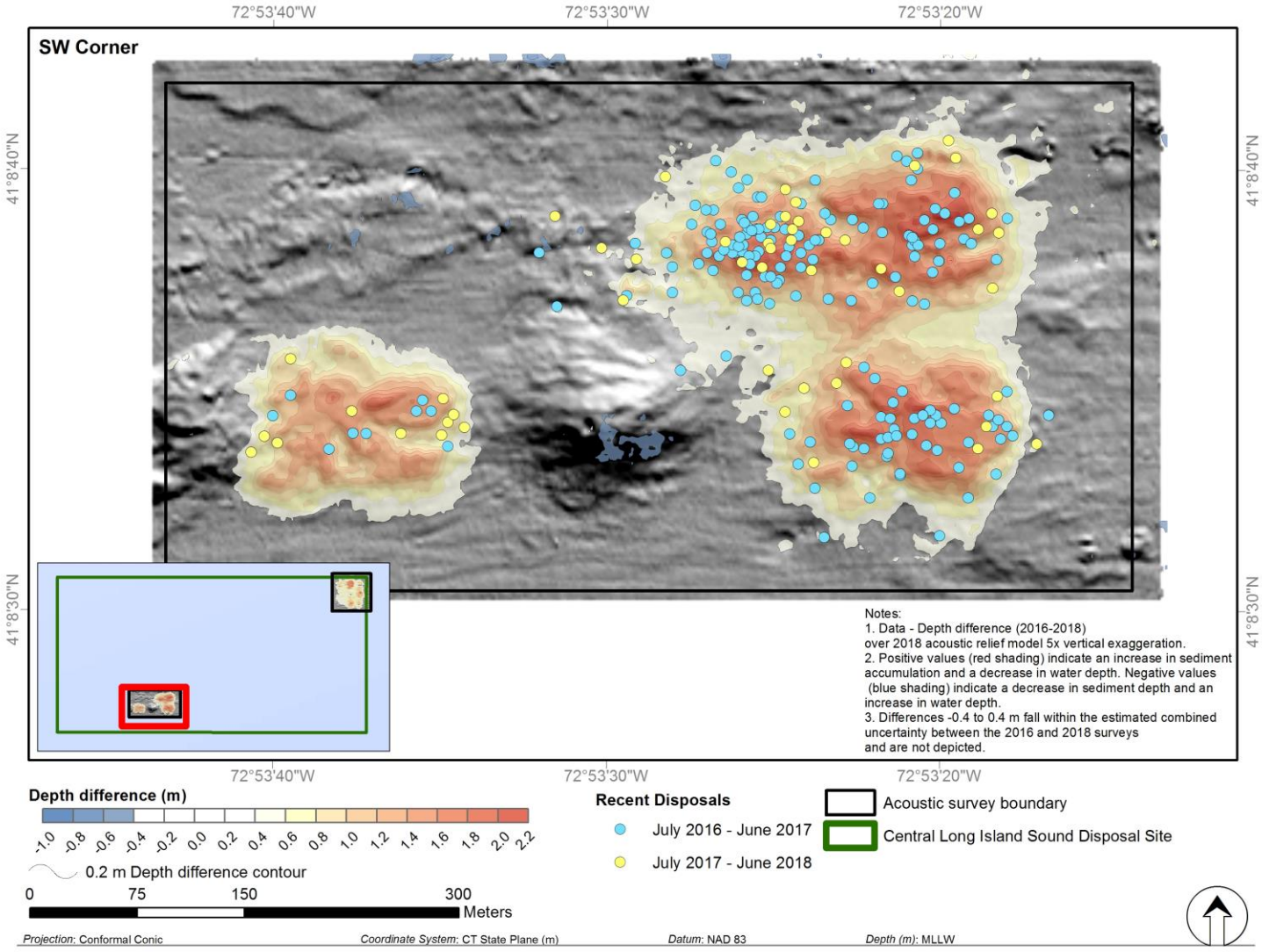

Figure 3-3a. Recent Disposals over Depth Differencing Model (2016 - 2018), SW Survey Area

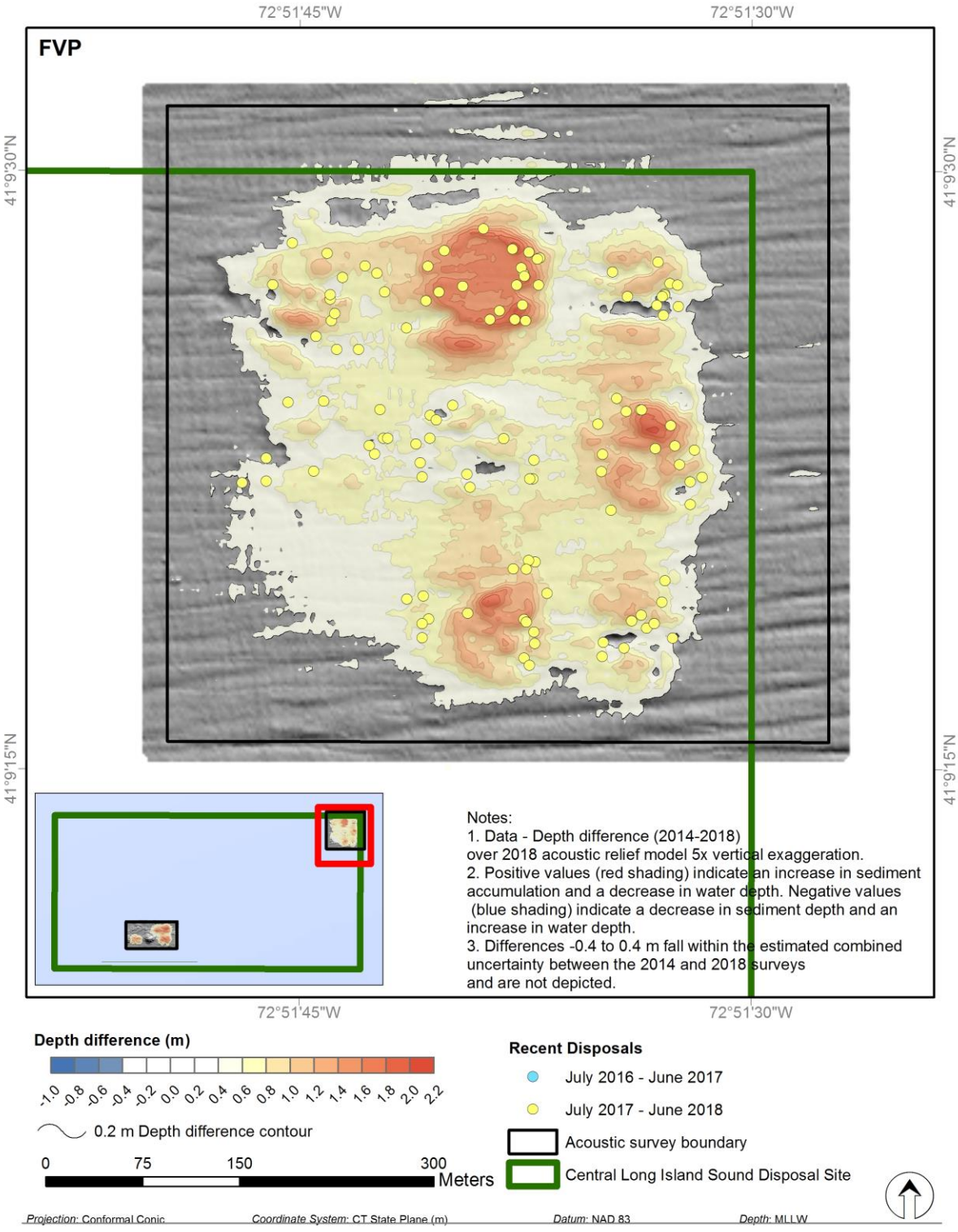

Figure 3-3b. Recent Disposals over Depth Differencing Model (2014 – 2018), FVP Survey Area

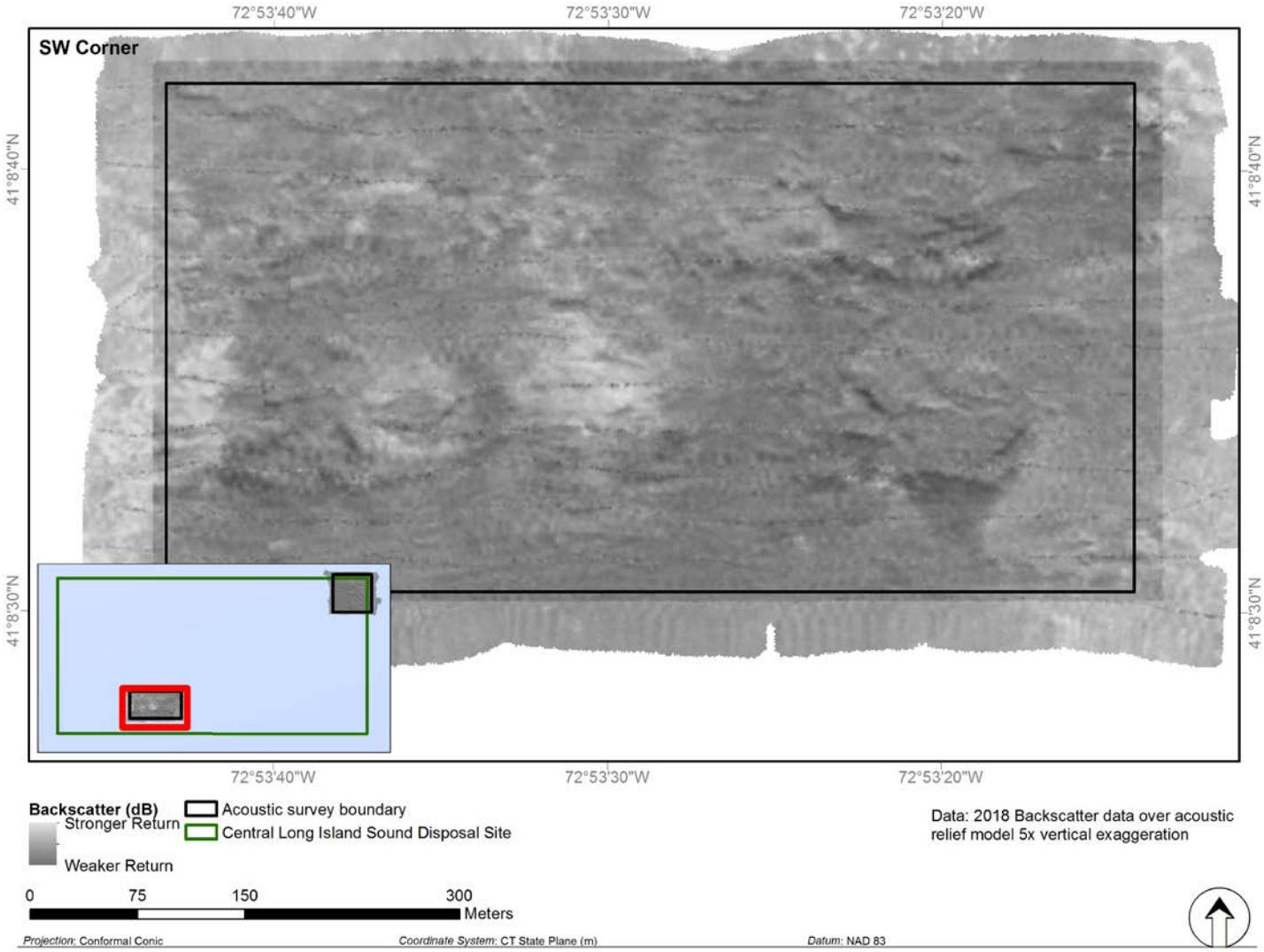

Figure 3-4a. Backscatter intensity (dB) of the SW Survey Area, over 5x vertical relief model, 2018

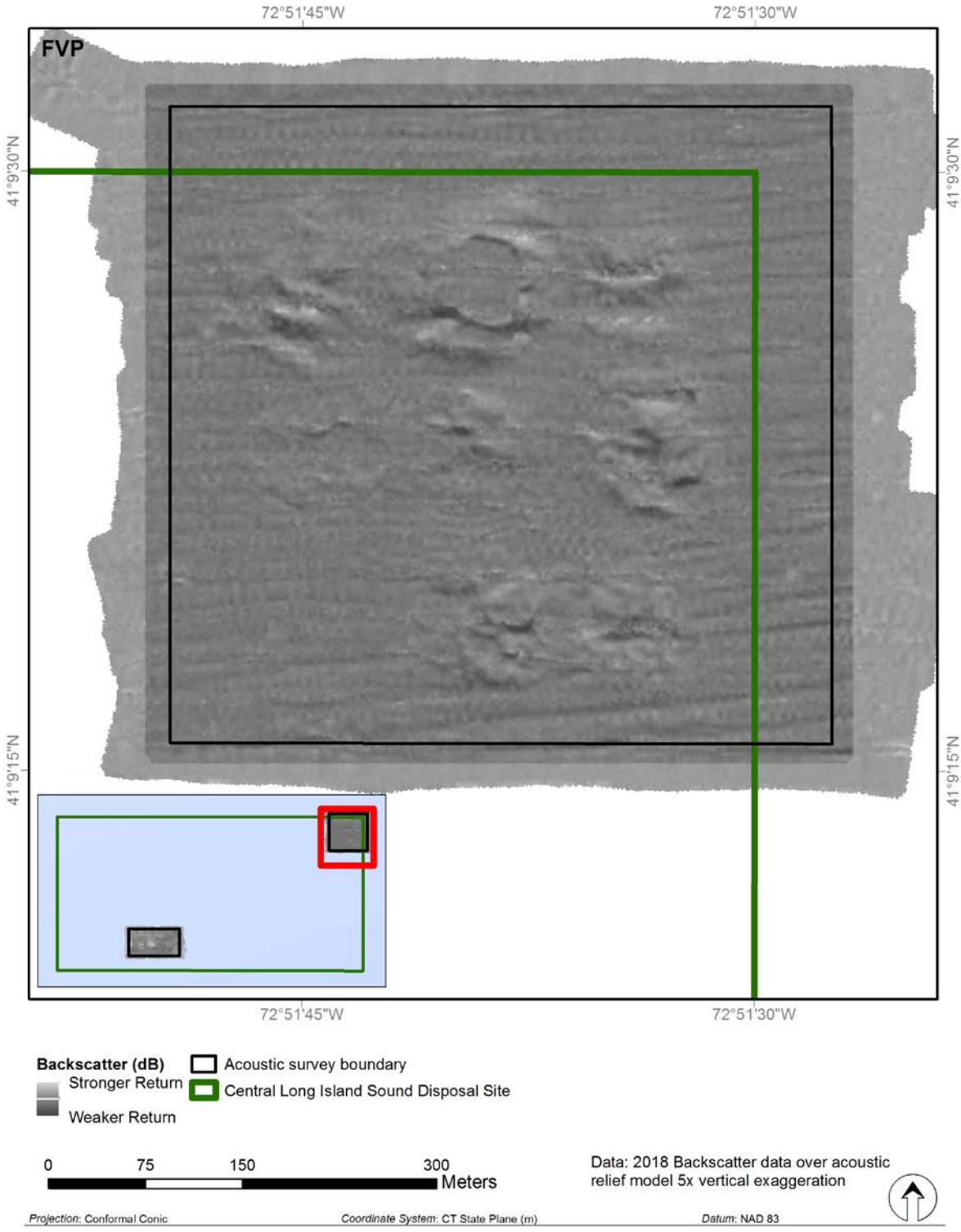

Figure 3-4b. Backscatter intensity (dB) of the FVP Survey Area, over 5x vertical relief model, 2018

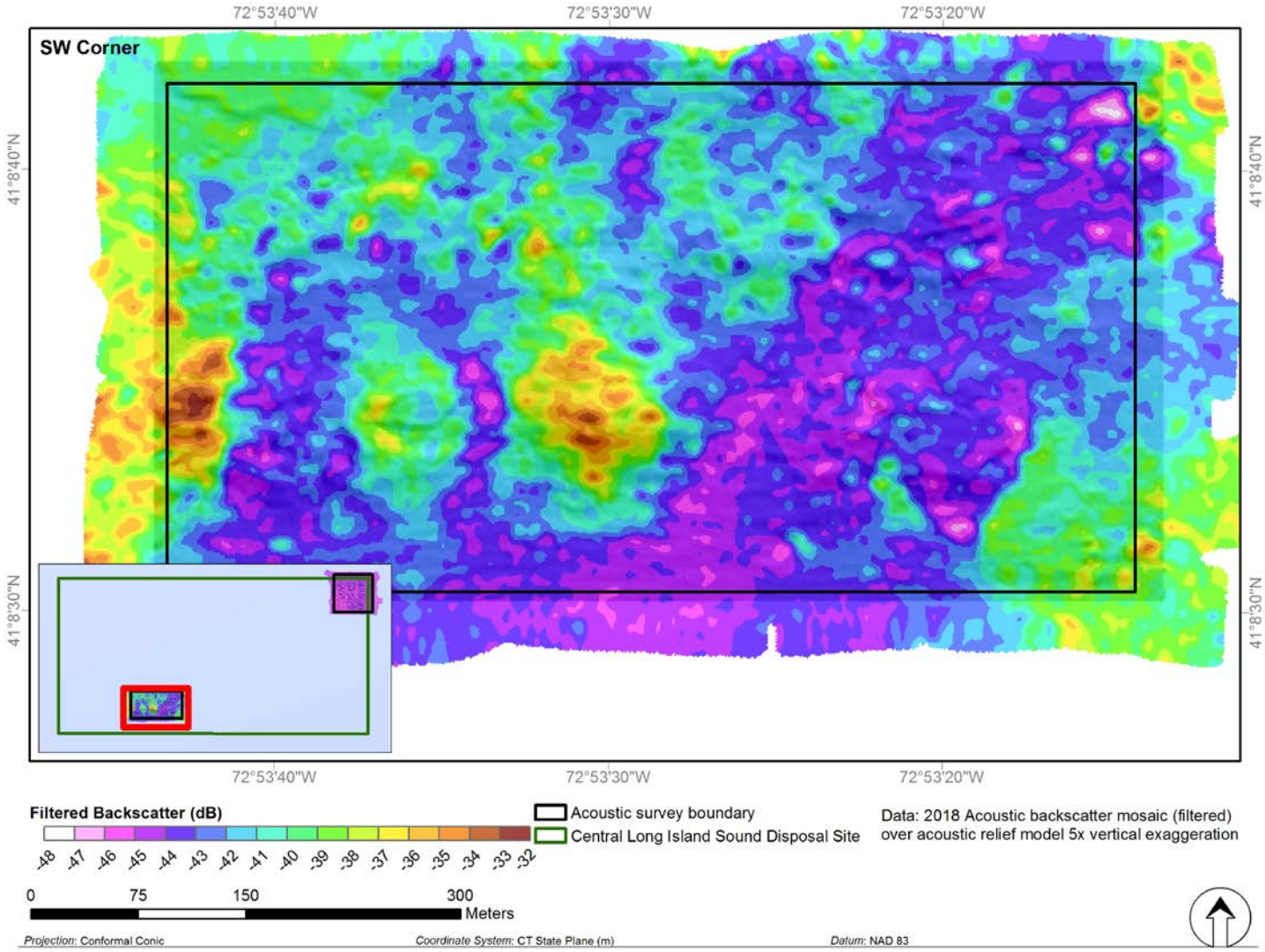

Figure 3-5a. Filtered backscatter intensity (dB) of the SW Survey Area, over 5x vertical relief model, 2018

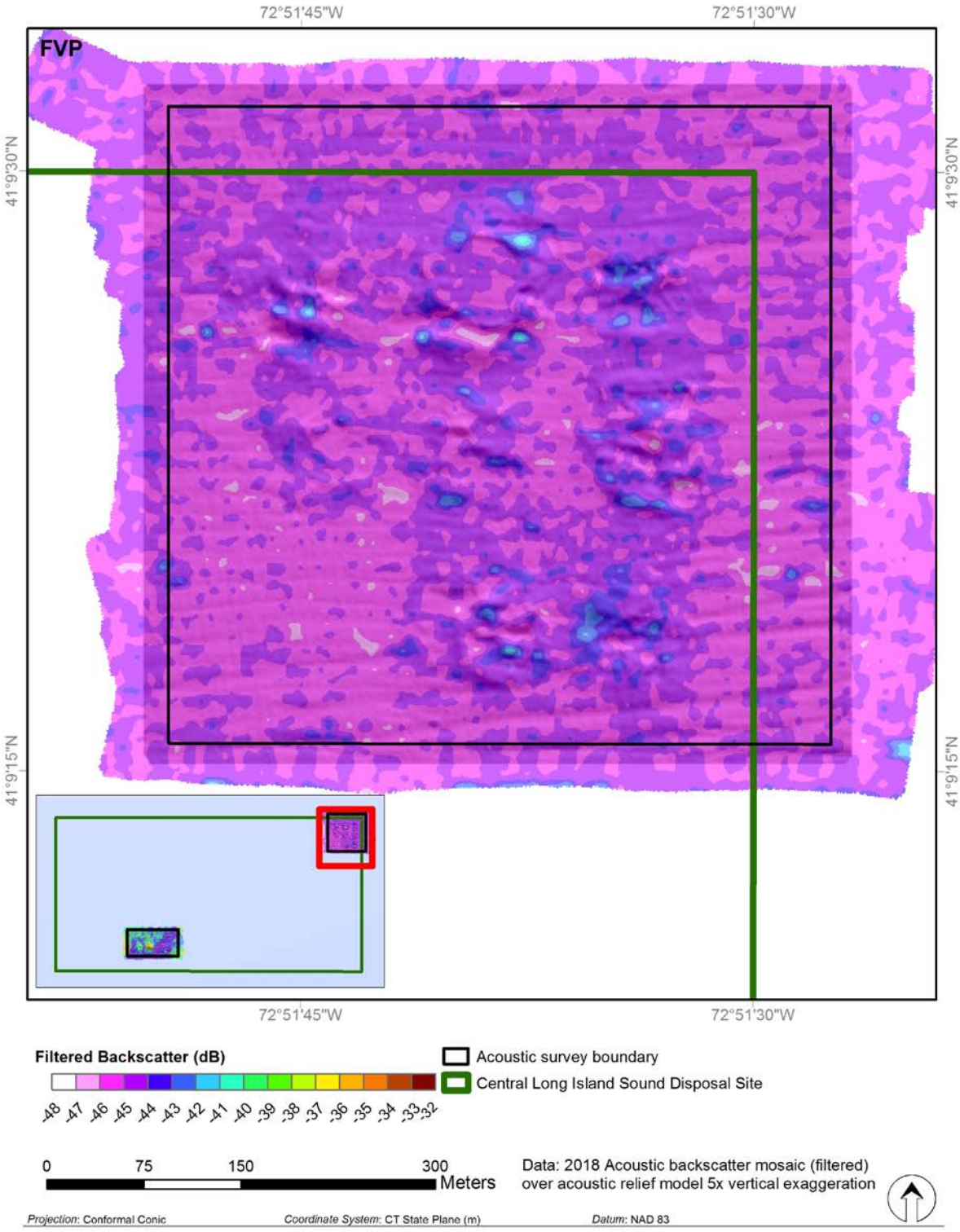

Figure 3-5b. Filtered backscatter intensity (dB) of the FVP Survey Area, over 5x vertical relief model, 2018

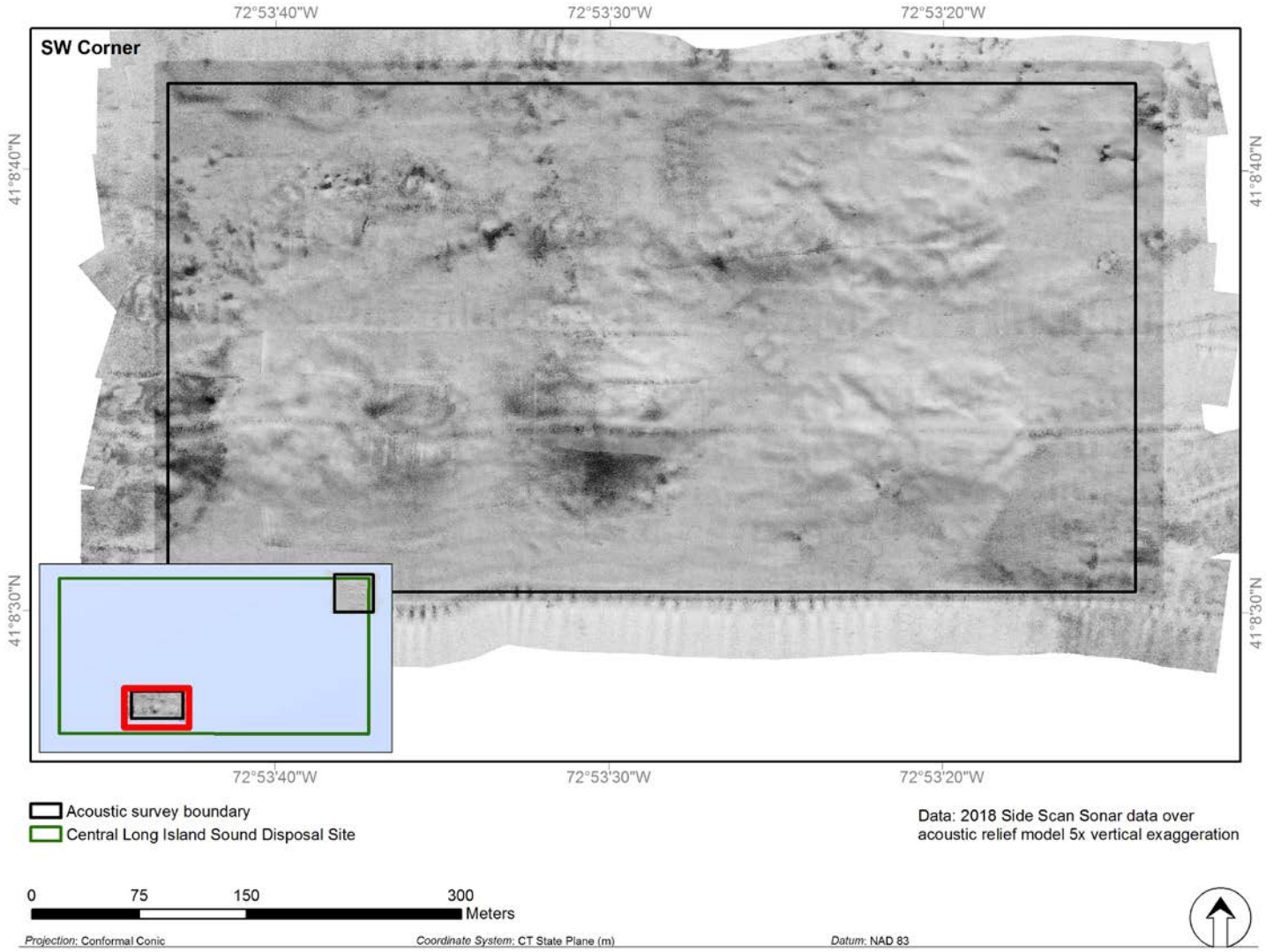

Figure 3-6a. Side-scan sonar of the SW Survey Area, over 5x vertical relief model, 2018

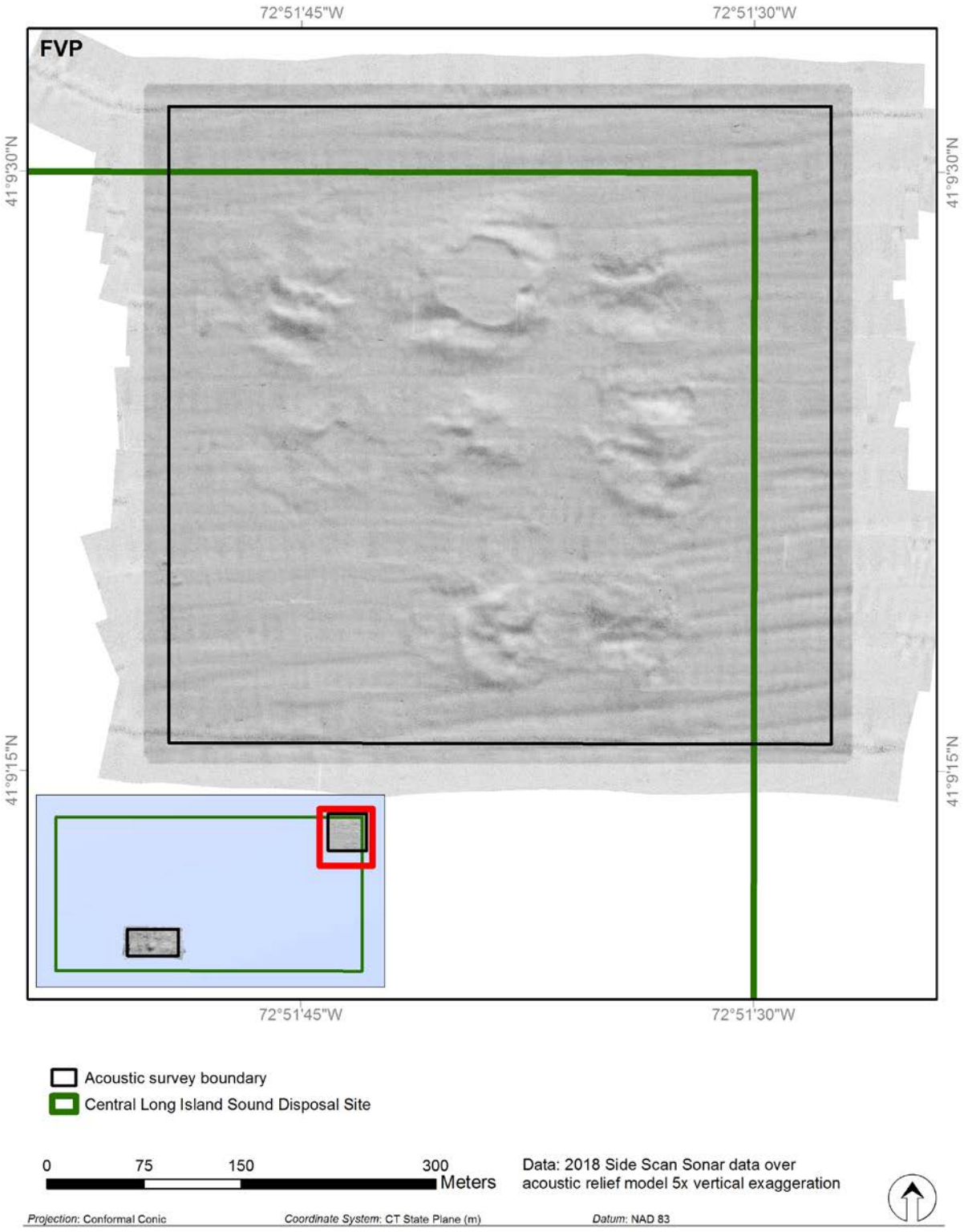

Figure 3-6b. Side-scan sonar of the FVP Survey Area, over 5x vertical relief model, 2018

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Appendix A

Common Conversions

APPENDIX A.

Common Conversions

Metric	English
Area	
1 Square Kilometer (km^2)	247.12 Acres
Length	
1 Kilometer (km)	0.62 Miles (mi)
1 Kilometer (km)	0.54 Nautical Miles (nmi)
1 Meter (m)	3.28 Feet (ft)
1 Centimeter (cm)	0.39 Inches (in)
Volume	
1 Cubic Meter (m^3)	35.31 Cubic Feet (ft^3)
1 Cubic Meter (m^3)	1.31 Cubic Yards (yd^3)

Appendix B

CLDS Disposal Log Data (2016 – 2018)

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
American Styrenics Facility	CLDS	2011	1539	10/11/2017	41.1441	-72.8902
American Styrenics Facility	CLDS	1821	1393	10/11/2017	41.1440	-72.8917
American Styrenics Facility	CLDS	1972	1509	10/12/2017	41.1440	-72.8903
American Styrenics Facility	CLDS	1814	1388	10/12/2017	41.1440	-72.8907
American Styrenics Facility	CLDS	1559	1193	10/12/2017	41.1440	-72.8901
American Styrenics Facility	CLDS	1995	1526	10/13/2017	41.1428	-72.8945
American Styrenics Facility	CLDS	2167	1658	10/13/2017	41.1429	-72.8938
American Styrenics Facility	CLDS	1592	1218	10/13/2017	41.1429	-72.8902
American Styrenics Facility	CLDS	2015	1542	10/14/2017	41.1426	-72.8899
American Styrenics Facility	CLDS	1956	1496	10/14/2017	41.1440	-72.8898
American Styrenics Facility	CLDS	1573	1204	10/14/2017	41.1442	-72.8901
American Styrenics Facility	CLDS	1991	1523	10/15/2017	41.1428	-72.8930
American Styrenics Facility	CLDS	1830	1400	10/15/2017	41.1428	-72.8930
American Styrenics Facility	CLDS	1498	1146	10/16/2017	41.1432	-72.8897
American Styrenics Facility	CLDS	1925	1473	10/16/2017	41.1427	-72.8946
American Styrenics Facility	CLDS	1879	1437	10/16/2017	41.1437	-72.8884
American Styrenics Facility	CLDS	1492	1141	10/17/2017	41.1431	-72.8897
American Styrenics Facility	CLDS	1952	1493	10/17/2017	41.1427	-72.8944
American Styrenics Facility	CLDS	1899	1453	10/17/2017	41.1441	-72.8886
American Styrenics Facility	CLDS	1600	1224	10/18/2017	41.1431	-72.8900
American Styrenics Facility	CLDS	1991	1523	10/18/2017	41.1429	-72.8929
American Styrenics Facility	CLDS	1976	1512	10/18/2017	41.1442	-72.8885
American Styrenics Facility	CLDS	1586	1213	10/19/2017	41.1430	-72.8884
American Styrenics Facility	CLDS	2027	1550	10/19/2017	41.1433	-72.8943
American Styrenics Facility	CLDS	1839	1406	10/20/2017	41.1445	-72.8888
American Styrenics Facility	CLDS	1498	1146	10/20/2017	41.1427	-72.8886
American Styrenics Facility	CLDS	1945	1488	10/20/2017	41.1428	-72.8929
American Styrenics Facility	CLDS	1898	1452	10/21/2017	41.1438	-72.8900
American Styrenics Facility	CLDS	2084	1594	10/21/2017	41.1428	-72.8934
American Styrenics Facility	CLDS	6	5	10/21/2017	41.4418	-72.0864
American Styrenics Facility	CLDS	1975	1511	10/22/2017	41.1440	-72.8884
American Styrenics Facility	CLDS	1653	1265	10/22/2017	41.1428	-72.8885
American Styrenics Facility	CLDS	898	687	10/23/2017	41.1430	-72.8930
Brewer Pilot Point Marina	CLDS 15/16 1C	232	177	2/12/2017	41.1440	-72.8905
Brewer Pilot Point Marina	CLDS 15/16 1C	186	142	2/14/2017	41.1439	-72.8906
Brewer Pilot Point Marina	CLDS 15/16 1C	251	192	2/18/2017	41.1443	-72.8906
Brewer Pilot Point Marina	CLDS 15/16 1C	224	171	2/19/2017	41.1440	-72.8906
Brewer Pilot Point Marina	CLDS 15/16 1C	260	199	2/20/2017	41.1439	-72.8904
Brewer Pilot Point Marina	CLDS 15/16 1C	209	160	2/21/2017	41.1440	-72.8908
Brewer Pilot Point Marina	CLDS 15/16 1C	215	164	2/22/2017	41.1441	-72.8904
Brewers Pilot Point Marina	CLDS	168	129	11/3/2017	41.1456	-72.8807
Brewers Pilot Point Marina	CLDS	253	193	11/4/2017	41.1455	-72.8817
Brewers Pilot Point Marina	CLDS	233	178	11/7/2017	41.1455	-72.8814
Brewers Pilot Point Marina	CLDS	239	183	11/9/2017	41.1460	-72.8813
Brewers Pilot Point Marina	CLDS	234	179	11/12/2017	41.1456	-72.8816
Brewers Pilot Point Marina	CLDS	282	216	11/13/2017	41.1462	-72.8815
Brewers Pilot Point Marina	CLDS	275	210	11/14/2017	41.1454	-72.8813
Brewers Pilot Point Marina	CLDS	227	173	11/16/2017	41.1455	-72.8814

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Brewers Pilot Point Marina	CLDS	257	197	11/25/2017	41.1458	-72.8817
Brewers Pilot Point Marina	CLDS	221	169	11/28/2017	41.1453	-72.8817
Brewers Pilot Point Marina	CLDS	255	195	11/30/2017	41.1455	-72.8820
Brewers Pilot Point Marina	CLDS	235	180	12/1/2017	41.1455	-72.8816
Brewers Pilot Point Marina	CLDS	236	180	12/2/2017	41.1457	-72.8810
Brewers Pilot Point Marina	CLDS	262	200	12/3/2017	41.1457	-72.8812
Brewers Pilot Point Marina	CLDS	241	185	12/4/2017	41.1456	-72.8813
Clinton Town Marina	CLDS	304	233	10/10/2017	41.1438	-72.8904
Clinton Town Marina	CLDS	298	228	10/11/2017	41.1440	-72.8897
Clinton Town Marina	CLDS	192	147	10/12/2017	41.1445	-72.8891
Clinton Town Marina	CLDS	343	263	10/14/2017	41.1443	-72.8902
Clinton Town Marina	CLDS	305	234	10/16/2017	41.1432	-72.8903
Clinton Town Marina	CLDS	307	235	10/17/2017	41.1438	-72.8894
Clinton Town Marina	CLDS	301	230	10/19/2017	41.1446	-72.8888
Clinton Town Marina	CLDS	310	237	10/20/2017	41.1437	-72.8892
Clinton Town Marina	CLDS	334	255	10/21/2017	41.1441	-72.8901
Clinton Town Marina	CLDS	323	247	10/22/2017	41.1440	-72.8903
Clinton Town Marina	CLDS	339	259	10/22/2017	41.1441	-72.8903
Clinton Town Marina	CLDS	338	259	10/23/2017	41.1441	-72.8901
Clinton Town Marina	CLDS	338	258	10/25/2017	41.1439	-72.8914
Clinton Town Marina	CLDS	333	255	11/4/2017	41.1436	-72.8915
Clinton Town Marina	CLDS	335	256	11/5/2017	41.1442	-72.8921
Clinton Town Marina	CLDS	336	257	11/9/2017	41.1444	-72.8912
Clinton Yacht Haven	CLDS 15/16 1C	293	224	10/9/2016	41.1438	-72.8901
Clinton Yacht Haven	CLDS 15/16 1C	328	251	10/11/2016	41.1437	-72.8904
Clinton Yacht Haven	CLDS 15/16 1C	286	219	10/11/2016	41.1438	-72.8904
Clinton Yacht Haven	CLDS 15/16 1C	290	222	10/12/2016	41.1440	-72.8901
Clinton Yacht Haven	CLDS 15/16 1C	370	283	10/15/2016	41.1438	-72.8902
Clinton Yacht Haven	CLDS 15/16 1C	229	175	10/16/2016	41.1441	-72.8902
Clinton Yacht Haven	CLDS 15/16 1C	322	246	10/17/2016	41.1439	-72.8906
Clinton Yacht Haven	CLDS 15/16 1C	356	272	10/18/2016	41.1438	-72.8902
Clinton Yacht Haven	CLDS 15/16 1C	366	280	10/19/2016	41.1441	-72.8903
Davenport Landing	CLDS	1021	781	11/11/2017	41.1452	-72.8815
Davenport Landing	CLDS	1021	781	11/15/2017	41.1454	-72.8819
Davenport Landing	CLDS	871	666	11/18/2017	41.1456	-72.8820
Davenport Landing	CLDS	989	757	12/15/2017	41.1457	-72.8817
Davenport Landing	CLDS	956	732	12/21/2017	41.1456	-72.8819
Davenport Landing	CLDS	335	256	12/29/2017	41.1452	-72.8825
Guilford Yacht Club	CLDS 15/16 1C	367	281	1/29/2017	41.1440	-72.8904
Guilford Yacht Club	CLDS 15/16 1C	249	190	1/30/2017	41.1442	-72.8902
Guilford Yacht Club	CLDS 15/16 1C	319	244	1/31/2017	41.1439	-72.8900
Guilford Yacht Club	CLDS 15/16 1C	336	257	2/2/2017	41.1437	-72.8903
Guilford Yacht Club	CLDS 15/16 1C	349	267	2/2/2017	41.1440	-72.8899
Guilford Yacht Club	CLDS 15/16 1C	238	182	2/11/2017	41.1443	-72.8904
Guilford Yacht Club	CLDS 15/16 1C	226	173	2/11/2017	41.1438	-72.8905
Guilford Yacht Club	CLDS 15/16 1C	312	239	2/12/2017	41.1440	-72.8900
Guilford Yacht Club	CLDS 15/16 1C	222	170	2/12/2017	41.1439	-72.8907
Guilford Yacht Club	CLDS 15/16 1C	318	243	2/14/2017	41.1438	-72.8903

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Guilford Yacht Club	CLDS 15/16 1C	313	239	2/15/2017	41.1429	-72.8880
Guilford Yacht Club	CLDS 15/16 1C	281	215	2/18/2017	41.1439	-72.8922
Guilford Yacht Club	CLDS 15/16 1C	309	236	2/18/2017	41.1432	-72.8911
Guilford Yacht Club	CLDS 15/16 1C	308	236	2/19/2017	41.1444	-72.8905
Guilford Yacht Club	CLDS 15/16 1C	300	230	2/19/2017	41.1438	-72.8911
Guilford Yacht Club	CLDS 15/16 1C	319	244	2/20/2017	41.1440	-72.8903
Guilford Yacht Club	CLDS 15/16 1C	279	213	2/21/2017	41.1433	-72.8907
Guilford Yacht Club	CLDS 15/16 1C	234	179	2/22/2017	41.1440	-72.8906
Guilford Yacht Club	CLDS 15/16 1C	215	164	2/23/2017	41.1437	-72.8906
Guilford Yacht Club	CLDS 15/16 1C	212	162	2/23/2017	41.1439	-72.8904
Guilford Yacht Club	CLDS 15/16 1C	301	230	2/24/2017	41.1439	-72.8905
Guilford Yacht Club	CLDS 15/16 1C	314	240	2/25/2017	41.1441	-72.8903
Guilford Yacht Club	CLDS 15/16 1C	215	164	2/27/2017	41.1441	-72.8904
Guilford Yacht Club	CLDS 15/16 1C	330	252	2/28/2017	41.1436	-72.8905
Guilford Yacht Club	CLDS 15/16 1C	354	271	2/28/2017	41.1439	-72.8889
Gwenmor Marina	CLDS 15/16 1C	134	103	10/12/2016	41.1440	-72.8905
Gwenmor Marina	CLDS 15/16 1C	109	83	11/8/2016	41.1442	-72.8908
Indian Town Associates	CLDS 16/17 1B	178	136	4/5/2017	41.1441	-72.8887
Indian Town Associates	CLDS 16/17 1B	339	259	4/27/2017	41.1426	-72.8887
Indian Town Associates	CLDS 16/17 1B	335	256	4/27/2017	41.1429	-72.8885
Indian Town Associates	CLDS 16/17 1B	324	248	4/28/2017	41.1425	-72.8892
Indian Town Associates	CLDS 16/17 1B	319	244	4/28/2017	41.1429	-72.8889
Indian Town Associates	CLDS 16/17 1B	204	156	4/29/2017	41.1429	-72.8891
Indian Town Associates	CLDS 16/17 1B	303	232	4/29/2017	41.1428	-72.8885
Indian Town Associates	CLDS 16/17 1B	297	227	4/30/2017	41.1424	-72.8887
Indian Town Associates	CLDS 16/17 1B	305	233	4/30/2017	41.1425	-72.8884
Indian Town Associates	CLDS 16/17 1B	329	252	5/1/2017	41.1432	-72.8895
Indian Town Associates	CLDS 16/17 1B	323	247	5/4/2017	41.1427	-72.8887
Indian Town Associates	CLDS 16/17 1B	345	264	5/7/2017	41.1429	-72.8890
Indian Town Associates	CLDS 16/17 1B	340	260	5/7/2017	41.1429	-72.8884
Indian Town Associates	CLDS 16/17 1B	290	222	5/8/2017	41.1428	-72.8884
Indian Town Associates	CLDS 16/17 1B	335	256	5/9/2017	41.1428	-72.8893
Indian Town Associates	CLDS 16/17 1B	317	243	5/9/2017	41.1428	-72.8891
Indian Town Associates	CLDS 16/17 1B	270	207	5/10/2017	41.1429	-72.8890
Indian Town Associates	CLDS 16/17 1B	319	244	5/10/2017	41.1429	-72.8890
Indian Town Associates	CLDS 16/17 1B	307	235	5/11/2017	41.1429	-72.8890
Indian Town Associates	CLDS 16/17 1B	302	231	5/11/2017	41.1431	-72.8894
Indian Town Associates	CLDS 16/17 1B	195	149	5/12/2017	41.1431	-72.8892
Indian Town Associates	CLDS 16/17 1B	268	205	5/12/2017	41.1430	-72.8893
Indian Town Associates	CLDS 16/17 1B	335	256	5/14/2017	41.1421	-72.8899
Indian Town Associates	CLDS 16/17 1B	70	54	5/16/2017	41.1424	-72.8895
Noank Village Boat Club	CLDS 15/16 1C	169	129	5/9/2017	41.1439	-72.8907
Noank Village Boat Club	CLDS 15/16 1C	204	156	5/10/2017	41.1437	-72.8911
Noank Village Boat Club	CLDS 15/16 1C	186	142	5/11/2017	41.1438	-72.8908
Noroton Yacht Club	CLDS 15/16 1C	105	80	12/20/2016	41.1441	-72.8907
Noroton Yacht Club	CLDS 15/16 1C	118	90	12/21/2016	41.1439	-72.8912
Noroton Yacht Club	CLDS 15/16 1C	132	101	12/22/2016	41.1442	-72.8909
Noroton Yacht Club	CLDS 15/16 1C	123	94	12/24/2016	41.1439	-72.8909

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Noroton Yacht Club	CLDS 15/16 1C	97	74	1/2/2017	41.1440	-72.8914
Noroton Yacht Club	CLDS 15/16 1C	112	86	1/7/2017	41.1442	-72.8905
North Cove	CLDS	2154	1648	11/15/2017	41.1565	-72.8606
North Cove	CLDS	1627	1244	11/16/2017	41.1567	-72.8611
North Cove	CLDS	601	460	11/16/2017	41.1561	-72.8609
North Cove	CLDS	2320	1775	11/23/2017	41.1566	-72.8613
North Cove	CLDS	2285	1748	11/23/2017	41.1562	-72.8610
North Cove	CLDS	2193	1677	11/24/2017	41.1562	-72.8604
North Cove	CLDS	2516	1925	11/24/2017	41.1563	-72.8614
North Cove	CLDS	2270	1737	11/25/2017	41.1566	-72.8612
North Cove	CLDS	2172	1662	11/26/2017	41.1564	-72.8614
North Cove	CLDS	2424	1854	11/26/2017	41.1562	-72.8604
North Cove	CLDS	2265	1732	11/28/2017	41.1563	-72.8603
North Cove	CLDS	2325	1779	11/28/2017	41.1565	-72.8613
North Cove	CLDS	2427	1857	11/29/2017	41.1562	-72.8614
North Cove	CLDS	2322	1776	11/30/2017	41.1567	-72.8618
North Cove	CLDS	2217	1696	11/30/2017	41.1562	-72.8630
North Cove	CLDS	2414	1847	12/2/2017	41.1562	-72.8628
North Cove	CLDS	2239	1713	12/2/2017	41.1565	-72.8617
North Cove	CLDS	2352	1800	12/3/2017	41.1564	-72.8618
North Cove	CLDS	2180	1668	12/3/2017	41.1562	-72.8624
North Cove	CLDS	2272	1738	12/4/2017	41.1567	-72.8623
North Cove	CLDS	2144	1640	12/4/2017	41.1563	-72.8628
North Cove	CLDS	2289	1751	12/4/2017	41.1564	-72.8619
North Cove	CLDS	2178	1666	12/5/2017	41.1565	-72.8617
North Cove	CLDS	2193	1678	12/5/2017	41.1567	-72.8626
North Cove	CLDS	2248	1720	12/8/2017	41.1556	-72.8603
North Cove	CLDS	2234	1709	12/9/2017	41.1554	-72.8614
North Cove	CLDS	2252	1723	12/9/2017	41.1551	-72.8614
North Cove	CLDS	2097	1604	12/10/2017	41.1552	-72.8614
North Cove	CLDS	2109	1613	12/10/2017	41.1551	-72.8603
North Cove	CLDS	1989	1522	12/12/2017	41.1550	-72.8603
North Cove	CLDS	1211	927	12/16/2017	41.1552	-72.8604
North Cove	CLDS	1919	1468	1/9/2018	41.1554	-72.8602
North Cove	CLDS	1901	1454	1/10/2018	41.1552	-72.8609
North Cove	CLDS	1980	1514	1/10/2018	41.1556	-72.8605
North Cove	CLDS	1941	1485	1/11/2018	41.1554	-72.8615
North Cove	CLDS	2043	1563	1/11/2018	41.1549	-72.8604
North Cove	CLDS	2180	1667	1/12/2018	41.1549	-72.8604
North Cove	CLDS	1945	1488	1/12/2018	41.1556	-72.8604
North Cove	CLDS	2122	1624	1/14/2018	41.1556	-72.8604
North Cove	CLDS	2249	1720	1/14/2018	41.1552	-72.8604
North Cove	CLDS	1942	1486	1/15/2018	41.1552	-72.8613
North Cove	CLDS	2104	1610	1/15/2018	41.1564	-72.8592
North Cove	CLDS	2093	1601	1/16/2018	41.1567	-72.8594
North Cove	CLDS	2119	1621	1/16/2018	41.1562	-72.8597
North Cove	CLDS	2150	1645	1/17/2018	41.1567	-72.8594
North Cove	CLDS	2039	1559	1/17/2018	41.1566	-72.8591

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
North Cove	CLDS	2084	1594	1/18/2018	41.1560	-72.8596
North Cove	CLDS	2058	1575	1/18/2018	41.1567	-72.8595
North Cove	CLDS	1954	1494	1/18/2018	41.1560	-72.8589
North Cove	CLDS	2034	1556	1/19/2018	41.1564	-72.8590
North Cove	CLDS	2022	1547	1/19/2018	41.1563	-72.8590
North Cove	CLDS	2048	1567	1/20/2018	41.1562	-72.8588
North Cove	CLDS	1966	1504	1/20/2018	41.1564	-72.8589
North Cove	CLDS	2075	1588	1/21/2018	41.1562	-72.8589
North Cove	CLDS	2015	1541	1/21/2018	41.1566	-72.8598
North Cove	CLDS	2067	1581	1/22/2018	41.1564	-72.8597
North Cove	CLDS	2059	1575	1/22/2018	41.1568	-72.8596
North Cove	CLDS	2003	1533	1/25/2018	41.1574	-72.8604
North Cove	CLDS	2125	1625	1/25/2018	41.1574	-72.8613
North Cove	CLDS	2274	1740	1/26/2018	41.1578	-72.8612
North Cove	CLDS	2294	1755	1/26/2018	41.1578	-72.8605
North Cove	CLDS	2266	1734	1/27/2018	41.1578	-72.8604
North Cove	CLDS	2147	1642	1/27/2018	41.1575	-72.8612
North Cove	CLDS	2321	1775	1/27/2018	41.1577	-72.8605
North Cove	CLDS	2216	1695	1/28/2018	41.1577	-72.8603
North Cove	CLDS	2303	1762	1/29/2018	41.1575	-72.8610
North Cove	CLDS	2133	1632	1/29/2018	41.1576	-72.8604
North Cove	CLDS	2238	1712	1/29/2018	41.1577	-72.8613
North Cove	CLDS	2234	1709	1/30/2018	41.1573	-72.8604
North Cove	CLDS	2282	1746	1/31/2018	41.1573	-72.8605
North Cove	CLDS	2216	1696	1/31/2018	41.1573	-72.8608
North Cove	CLDS	2067	1581	2/1/2018	41.1574	-72.8607
North Cove	CLDS	2068	1582	2/1/2018	41.1577	-72.8603
North Cove	CLDS	2161	1653	2/2/2018	41.1579	-72.8608
North Cove	CLDS	2067	1582	2/2/2018	41.1572	-72.8615
North Cove	CLDS	1963	1502	2/2/2018	41.1575	-72.8605
North Cove	CLDS	2548	1949	2/4/2018	41.1575	-72.8603
North Cove	CLDS	2034	1556	2/5/2018	41.1576	-72.8604
North Cove	CLDS	1998	1529	2/5/2018	41.1575	-72.8617
North Cove	CLDS	2425	1855	2/6/2018	41.1571	-72.8622
North Cove	CLDS	2293	1754	2/7/2018	41.1578	-72.8626
North Cove	CLDS	1974	1510	2/7/2018	41.1573	-72.8622
North Cove	CLDS	2134	1633	2/8/2018	41.1571	-72.8620
North Cove	CLDS	1874	1434	2/9/2018	41.1573	-72.8622
North Cove	CLDS	2199	1682	2/10/2018	41.1578	-72.8622
North Cove	CLDS	2479	1896	2/10/2018	41.1575	-72.8622
North Cove	CLDS	2223	1701	2/11/2018	41.1576	-72.8621
North Cove	CLDS	2028	1551	2/12/2018	41.1572	-72.8623
North Cove	CLDS	1886	1442	2/13/2018	41.1574	-72.8622
North Cove	CLDS	2007	1536	2/13/2018	41.1575	-72.8628
North Cove	CLDS	2162	1654	2/14/2018	41.1577	-72.8619
North Cove	CLDS	1903	1456	2/14/2018	41.1576	-72.8618
North Cove	CLDS	2168	1658	2/15/2018	41.1575	-72.8595
North Cove	CLDS	1861	1423	2/16/2018	41.1574	-72.8592

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
North Cove	CLDS	2242	1715	2/17/2018	41.1574	-72.8590
North Cove	CLDS	1946	1489	2/17/2018	41.1576	-72.8596
North Cove	CLDS	1768	1352	2/19/2018	41.1575	-72.8591
North Cove	CLDS	1912	1462	2/19/2018	41.1575	-72.8591
North Cove	CLDS	1831	1400	2/20/2018	41.1575	-72.8590
North Cove	CLDS	1861	1424	2/21/2018	41.1575	-72.8591
North Cove	CLDS	2007	1535	2/22/2018	41.1573	-72.8592
North Cove	CLDS	2262	1730	2/22/2018	41.1575	-72.8592
North Cove	CLDS	2233	1708	2/23/2018	41.1577	-72.8592
North Cove	CLDS	2138	1635	2/23/2018	41.1552	-72.8593
North Cove	CLDS	2241	1714	2/24/2018	41.1551	-72.8591
North Cove	CLDS	1969	1506	2/24/2018	41.1552	-72.8592
North Cove	CLDS	1904	1456	2/25/2018	41.1555	-72.8591
North Cove	CLDS	1887	1443	2/26/2018	41.1550	-72.8595
North Cove	CLDS	2089	1598	2/26/2018	41.1549	-72.8597
North Cove	CLDS	1883	1441	2/27/2018	41.1551	-72.8597
North Cove	CLDS	434	332	2/27/2018	41.1552	-72.8594
North Cove	CLDS	1833	1402	3/9/2018	41.1553	-72.8592
North Cove	CLDS	1054	806	3/11/2018	41.1552	-72.8593
Oyster Landing Beach Club	CLDS 15/16 1C	251	192	10/13/2016	41.1442	-72.8908
Oyster Landing Beach Club	CLDS 15/16 1C	285	218	10/15/2016	41.1440	-72.8902
Oyster Landing Beach Club	CLDS 15/16 1C	255	195	10/16/2016	41.1444	-72.8906
Oyster Landing Beach Club	CLDS 15/16 1C	255	195	10/17/2016	41.1437	-72.8901
Oyster Landing Beach Club	CLDS 15/16 1C	201	154	10/18/2016	41.1443	-72.8904
Oyster Landing Beach Club	CLDS 15/16 1C	210	161	10/20/2016	41.1436	-72.8904
Oyster Landing Beach Club	CLDS 15/16 1C	213	163	10/27/2016	41.1441	-72.8905
Oyster Landing Beach Club	CLDS 15/16 1C	220	168	11/1/2016	41.1441	-72.8904
Oyster Landing Beach Club	CLDS 15/16 1C	235	180	11/2/2016	41.1436	-72.8903
Oyster Landing Beach Club	CLDS 15/16 1C	228	174	11/3/2016	41.1442	-72.8901
Oyster Landing Beach Club	CLDS 15/16 1C	268	205	11/5/2016	41.1439	-72.8905
Oyster Landing Beach Club	CLDS 15/16 1C	73	56	11/9/2016	41.1441	-72.8905
Pine Island Real Estate LLC	CLDS 16/17 1B	158	121	4/23/2017	41.1428	-72.8894
Pine Island Real Estate LLC	CLDS 16/17 1B	165	126	4/24/2017	41.1427	-72.8893
Pine Island Real Estate LLC	CLDS 16/17 1B	130	99	4/27/2017	41.1427	-72.8890
Pine Island Real Estate LLC	CLDS 16/17 1B	141	108	4/28/2017	41.1428	-72.8893
Pine Island Real Estate LLC	CLDS 16/17 1B	134	103	5/1/2017	41.1425	-72.8892
Pine Island Real Estate LLC	CLDS 16/17 1B	92	70	5/4/2017	41.1428	-72.8893
Pine Orchard Yacht Club	CLDS 15/16 1C	347	265	2/14/2017	41.1436	-72.8921
Pine Orchard Yacht Club	CLDS 16/17 1A	381	291	2/15/2017	41.1431	-72.8883
Pine Orchard Yacht Club	CLDS 16/17 1A	397	304	2/18/2017	41.1428	-72.8938
Pine Orchard Yacht Club	CLDS 16/17 1A	332	254	2/19/2017	41.1437	-72.8895
Pine Orchard Yacht Club	CLDS 16/17 1A	423	324	2/19/2017	41.1441	-72.8895
Pine Orchard Yacht Club	CLDS 16/17 1A	402	308	2/20/2017	41.1438	-72.8890
Pine Orchard Yacht Club	CLDS 16/17 1A	335	256	2/20/2017	41.1427	-72.8940
Pine Orchard Yacht Club	CLDS 16/17 1A	384	294	2/21/2017	41.1436	-72.8890
Pine Orchard Yacht Club	CLDS 16/17 1A	425	325	2/22/2017	41.1442	-72.8894
Pine Orchard Yacht Club	CLDS 16/17 1A	385	295	2/22/2017	41.1428	-72.8937
Pine Orchard Yacht Club	CLDS 15/16 1D	356	272	2/28/2017	41.1439	-72.8889

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Pine Orchard Yacht Club	CLDS 15/16 1D	307	235	3/1/2017	41.1441	-72.8894
Pine Orchard Yacht Club	CLDS 15/16 1D	263	201	3/6/2017	41.1439	-72.8884
Pine Orchard Yacht Club	CLDS 16/17 1A	331	253	3/6/2017	41.1439	-72.8901
Pine Orchard Yacht Club	CLDS 15/16 1D	331	253	3/6/2017	41.1445	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	328	251	3/7/2017	41.1443	-72.8888
Pine Orchard Yacht Club	CLDS 15/16 1D	339	259	3/8/2017	41.1441	-72.8896
Pine Orchard Yacht Club	CLDS 15/16 1D	264	202	3/8/2017	41.1440	-72.8891
Pine Orchard Yacht Club	CLDS 16/17 1A	256	196	3/10/2017	41.1445	-72.8893
Pine Orchard Yacht Club	CLDS 15/16 1D	334	256	3/13/2017	41.1436	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	338	259	3/13/2017	41.1445	-72.8892
Pine Orchard Yacht Club	CLDS 15/16 1D	313	239	3/18/2017	41.1441	-72.8898
Pine Orchard Yacht Club	CLDS 16/17 1A	249	190	3/18/2017	41.1439	-72.8902
Pine Orchard Yacht Club	CLDS 15/16 1D	260	199	3/18/2017	41.1436	-72.8898
Pine Orchard Yacht Club	CLDS 15/16 1D	326	249	3/20/2017	41.1440	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	371	284	3/20/2017	41.1436	-72.8896
Pine Orchard Yacht Club	CLDS 15/16 1D	284	217	3/21/2017	41.1440	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	231	177	3/24/2017	41.1446	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	355	272	3/24/2017	41.1440	-72.8899
Pine Orchard Yacht Club	CLDS 15/16 1D	338	259	3/25/2017	41.1440	-72.8886
Pine Orchard Yacht Club	CLDS 15/16 1D	353	270	3/25/2017	41.1439	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	349	267	3/26/2017	41.1442	-72.8899
Pine Orchard Yacht Club	CLDS 15/16 1D	349	267	3/26/2017	41.1440	-72.8892
Pine Orchard Yacht Club	CLDS 16/17 1A	322	246	3/28/2017	41.1444	-72.8899
Pine Orchard Yacht Club	CLDS 15/16 1D	326	249	3/28/2017	41.1442	-72.8894
Pine Orchard Yacht Club	CLDS 15/16 1D	345	264	3/29/2017	41.1442	-72.8889
Pine Orchard Yacht Club	CLDS 15/16 1D	334	256	3/29/2017	41.1442	-72.8889
Pine Orchard Yacht Club	CLDS 15/16 1D	348	266	3/30/2017	41.1440	-72.8891
Pine Orchard Yacht Club	CLDS 15/16 1D	103	79	3/31/2017	41.1441	-72.8890
Saybrook Point Marina	CLDS 15/16 1C	172	132	2/23/2017	41.1439	-72.8905
Saybrook Point Marina	CLDS 15/16 1C	172	132	2/25/2017	41.1440	-72.8906
Saybrook Point Marina	CLDS 15/16 1C	198	151	2/28/2017	41.1441	-72.8905
Saybrook Point Marina	CLDS 15/16 1C	233	178	3/6/2017	41.1440	-72.8908
Saybrook Point Marina	CLDS 15/16 1C	190	145	3/10/2017	41.1437	-72.8915
Saybrook Point Marina	CLDS 15/16 1C	156	119	3/18/2017	41.1440	-72.8908
Saybrook Point Marina	CLDS 15/16 1C	288	220	3/21/2017	41.1445	-72.8908
Saybrook Point Marina	CLDS 15/16 1C	187	143	3/24/2017	41.1440	-72.8906
Saybrook Point Marina	CLDS 15/16 1C	261	200	3/25/2017	41.1439	-72.8908
Saybrook Point Marina	CLDS 15/16 1C	223	171	3/28/2017	41.1441	-72.8910
Saybrook Point Marina	CLDS 15/16 1C	164	125	3/29/2017	41.1441	-72.8905
Spicers Marina	CLDS 16/17 1B	211	161	4/3/2017	41.1421	-72.8889
Spicers Marina	CLDS 16/17 1B	204	156	4/5/2017	41.1426	-72.8893
Spicers Marina	CLDS 16/17 1B	194	148	4/9/2017	41.1429	-72.8894
Spicers Marina	CLDS 16/17 1B	232	177	4/10/2017	41.1427	-72.8896
Spicers Marina	CLDS 16/17 1B	216	165	4/11/2017	41.1427	-72.8896
Spicers Marina	CLDS 16/17 1B	232	177	4/12/2017	41.1426	-72.8901
Spicers Marina	CLDS 16/17 1B	200	153	4/13/2017	41.1426	-72.8896
Spicers Marina	CLDS 16/17 1B	179	137	4/14/2017	41.1427	-72.8895
Spicers Marina	CLDS 16/17 1B	191	146	4/15/2017	41.1429	-72.8893

Project Name	Target Site	Load	Load	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Spicers Marina	CLDS 16/17 1B	230	176	4/18/2017	41.1427	-72.8900
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1361	1041	11/2/2016	41.1441	-72.8890
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1153	882	11/3/2016	41.1430	-72.8897
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1204	921	11/3/2016	41.1430	-72.8943
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1201	919	11/4/2016	41.1440	-72.8889
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1350	1033	11/5/2016	41.1427	-72.8889
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1324	1013	11/5/2016	41.1429	-72.8932
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1945	1488	11/6/2016	41.1441	-72.8887
Tilcon Pine Orchard Dock	CLDS 15/16 1D	2022	1547	11/7/2016	41.1428	-72.8889
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1901	1454	11/8/2016	41.1429	-72.8931
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1943	1486	11/8/2016	41.1444	-72.8891
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1881	1439	11/9/2016	41.1429	-72.8888
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1802	1379	11/9/2016	41.1440	-72.8887
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1682	1287	11/10/2016	41.1424	-72.8899
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1463	1119	11/10/2016	41.1430	-72.8932
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1593	1219	11/12/2016	41.1428	-72.8901
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1771	1355	11/13/2016	41.1429	-72.8945
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1841	1408	11/14/2016	41.1438	-72.8893
Tilcon Pine Orchard Dock	CLDS 15/16 1D	2047	1566	11/14/2016	41.1428	-72.8883
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1848	1414	11/15/2016	41.1427	-72.8930
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1900	1454	11/16/2016	41.1441	-72.8883
Tilcon Pine Orchard Dock	CLDS 15/16 1D	1725	1320	11/17/2016	41.1428	-72.8883
Town of Branford	CLDS	293	224	1/15/2018	41.1456	-72.8806
Town of Branford	CLDS	300	230	1/15/2018	41.1457	-72.8810
Town of Branford	CLDS	381	291	1/16/2018	41.1454	-72.8816
Town of Branford	CLDS	330	252	1/17/2018	41.1455	-72.8817
Town of Branford	CLDS	357	273	1/17/2018	41.1458	-72.8810
Town of Branford	CLDS	307	235	1/18/2018	41.1452	-72.8817
Town of Branford	CLDS	309	237	1/19/2018	41.1454	-72.8810
Town of Branford	CLDS	276	211	1/20/2018	41.1458	-72.8809
Town of Branford	CLDS	321	245	1/21/2018	41.1463	-72.8814
Town of Branford	CLDS	308	235	1/21/2018	41.1456	-72.8812
Town of Branford	CLDS	325	249	1/22/2018	41.1458	-72.8817
Town of Branford	CLDS	306	234	1/22/2018	41.1453	-72.8818
Town of Branford	CLDS	298	228	1/25/2018	41.1453	-72.8802
Town of Branford	CLDS	283	217	1/26/2018	41.1453	-72.8820
Town of Branford	CLDS	284	217	1/26/2018	41.1457	-72.8808
Town of Branford	CLDS	232	178	1/28/2018	41.1460	-72.8812
Town of Branford	CLDS	186	142	1/28/2018	41.1427	-72.8881
Town of Branford	CLDS	170	130	1/29/2018	41.1461	-72.8818

Project Name	Target Site	Load volume (yd^3)	Load Volume (m^3)	Placement Date	Latitude	Longitude
American Styrenics Facility	CLDS	1804	1380	10/11/2017	41.1439	-72.8905
Tilcon Pine Orchard Dock	CLDS 15/16-1D	1771	1355	11/13/2016	41.1429	-72.8945
Tilcon Pine Orchard Dock	CLDS 15/16-1D	1841	1408	11/14/2016	41.1438	-72.8893
Tilcon Pine Orchard Dock	CLDS 15/16-1D	2047	1566	11/14/2016	41.1428	-72.8883
Tilcon Pine Orchard Dock	CLDS 15/16-1D	1848	1414	11/15/2016	41.1427	-72.8930
Tilcon Pine Orchard Dock	CLDS 15/16-1D	1900	1454	11/16/2016	41.1441	-72.8883
Tilcon Pine Orchard Dock	CLDS 15/16-1D	1725	1320	11/17/2016	41.1428	-72.8883
Town of Branford	CLDS	293	224	1/15/2018	41.1456	-72.8806
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