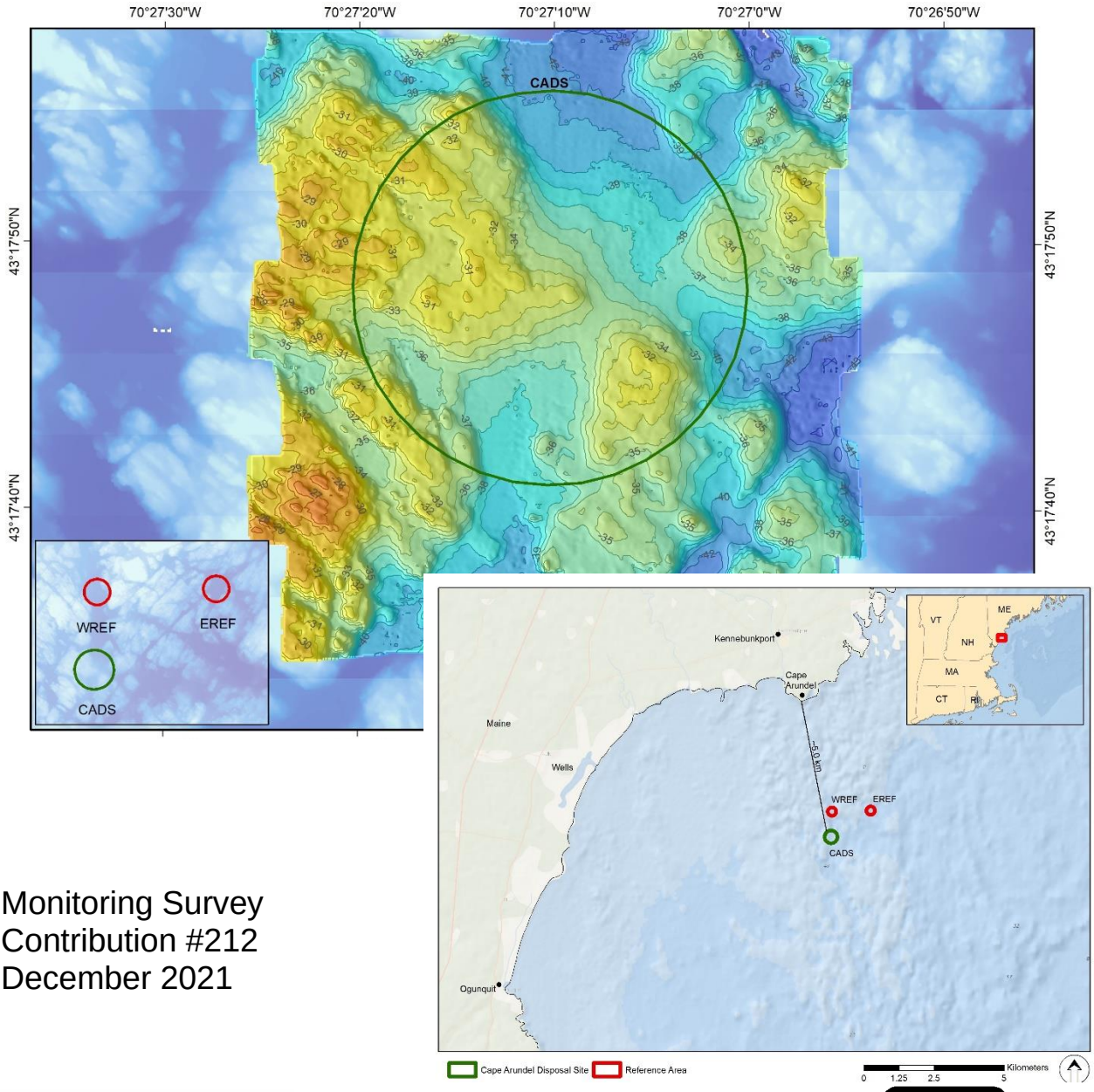
Monitoring Survey of the Cape Arundel Disposal Site
September 2020

Disposal Area Monitoring System DAMOS



Monitoring Survey
Contribution #212
December 2021

DISPOSAL AREA MONITORING SYSTEM

US Army Corps of Engineers ®
New England District

MONITORING SURVEY OF THE CAPE ARUNDEL DISPOSAL SITE SEPTEMBER 2020

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13. ABSTRACT

A monitoring survey was conducted in September 2020 at the Cape Arundel Disposal Site (CADS) (the site) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2020 survey consisted of a hydroacoustic (multibeam bathymetry, side scan sonar, and backscatter) survey, sediment grab sampling, and an underwater video survey at locations in CADS and in the associated reference areas.

After a period of temporary closure as an alternative dredged material disposal site, CADS was reopened by Congressional action in 2014 for a period of five years which was then extended until 31 December 2021 by America's Water Infrastructure Act of 2018. Since reopening in 2014, approximately 69,167 cubic meters (m3) (90,468 cubic yards [yd3]) of dredged material has been placed at the site.

The September 2020 monitoring survey provided an assessment of seafloor topography, sediment quality, and benthic recovery at CADS after the placement of approximately 70,000 m3 of dredged material since the last survey in 2013. Based on the results of the hydroacoustic survey and sediment grab sampling, recent dredged material deposits at CADS are limited to the northeast corner of the site, with sediment quality and benthic conditions that are comparable to the reference areas. These results, and the expected closure of the site in December 2021, indicate that the management strategy at CADS can shift to a long-term monitoring program to ensure that the site remains stable and continues to progress towards full benthic recovery after closure.

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EXECUTIVE SUMMARY

A monitoring survey was conducted in September 2020 at the Cape Arundel Disposal Site (CADS) (the site) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2020 survey consisted of a hydroacoustic (multibeam bathymetry, side scan sonar, and backscatter) survey, sediment grab sampling, and an underwater video survey at locations in CADS and in the associated reference areas.

After a period of temporary closure as an alternative dredged material disposal site, CADS was reopened by Congressional action in 2014 for a period of five years which was then extended until 31 December 2021 by America's Water Infrastructure Act of 2018. Since reopening in 2014, approximately 69,167 cubic meters (m^3) (90,468 cubic yards [yd^3]) of dredged material has been placed at the site.

The multibeam bathymetric survey was conducted over a 500-meter (m) x 500 m area that covered the entire site and over two 300 m x 300 m areas that covered each of the two reference areas. The results of the 2020 acoustic survey were used to characterize the seafloor topography and surficial features over the site and reference areas. The bathymetric data indicated that the seafloor within CADS displayed an irregular topography, with areas of rocky outcrops interspersed with uniform, soft sediment basins. Depth difference calculations performed between the previous survey in 2013 and the 2020 bathymetric data identified the formation of a 175 m wide dredged material disposal mound in the northeastern corner of the site which rises approximately 1.6 m above the ambient seafloor.

Results of the sediment grab sampling survey were used to assess benthic community recovery and to evaluate sediment quality at CADS by comparing the site concentrations to reference area concentrations and regional sediment quality guidelines (SQGs) (NOAA Effects Range Low [ER-L] and Effects Range Median [ER-M]). Sediment grabs were collected from six locations within the active portion of CADS and from six locations within the reference areas. The sediment grab samples were analyzed for grain size, total organic carbon (TOC), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, total metals, and benthic community structure. Surficial grain size results were consistent across the site and reference areas; samples were composed of a mix of silt and sand with trace gravel at some stations. Chemical analyses of the sediment showed generally low levels for all analytes at the site and reference areas with concentrations below or only slightly above the ER-L at all stations. The benthic community at CADS was dominated by species assigned to the subsurface deposit feeding trophic guild and showed resulting abundances which indicate a community trending toward a state of recovery. The underwater video survey results provided additional correlating information about the seafloor and epifauna within the site and the WREF reference area.

The September 2020 monitoring survey provided an assessment of seafloor topography, sediment quality, and benthic recovery at CADS after the placement of

approximately 70,000 m^3 of dredged material since the last survey in 2013. Based on the results of the hydroacoustic survey and sediment grab sampling, recent dredged material deposits at CADS are limited to the northeast corner of the site, with sediment quality and benthic conditions that are comparable to the reference areas. These results, and the expected closure of the site in December 2021, indicate that the management strategy at CADS can shift to a long-term monitoring program to ensure that the site remains stable and continues to progress towards full benthic recovery after closure.

LIST OF ACRONYMS AND ABBREVIATIONS

Alpha	Alpha Analytical Services
APP	Accident Prevention Plan
aRPD	apparent redox potential discontinuity
ASCII	American Standard Code for Information Interchange
As	arsenic
CADS	Cape Arundel Disposal Site (the site)
Cd	cadmium
cm	centimeters
Cr	chromium
CR	CR Environmental, Inc
Cu	copper
CVAA	Cold Vapor Atomic Absorption
DAMOS	Disposal Area Monitoring System
dB	decibel
DDD	4,4'-dichlorodiphenyldichloroethane
DDE	4,4'-dichlorodiphenyldichloroethylene
DDT	4,4'-dichlorodiphenyltrichloroethane
DGPS	differential global positioning system
ER-L	effects range low
ER-M	effects range median
FD	field duplicate
ft	foot/feet
Fisher's α	Fisher's *alpha*
FNP	Federal Navigation Project
GC/MS	Gas Chromatography/Mass Spectrometry
GPS	global positioning system
GIS	geographic information system
GRD	gridded file format
GTX	GeoTesting Express
H′	Shannon-Weiner diversity index

Hg	mercury
HMW	high molecular weight
ICP-MS	Inductively Coupled Plasma Mass Spectrometer
IOSN	Isle of Shoals North Site
J′	Pielou's evenness value
Katahdin	Katahdin Analytical Services
kHz	kilohertz
km	kilometer
LCS	laboratory control sample
LED	light-emitting diode
LMW	low molecular weight
LPTL	lowest practical taxonomic level
m	meter
m^2	square meter
m^3	cubic meters
MA	Massachusetts
ME	Maine
MB	method blank
MBES	multibeam echo sounder
MDL	method detection limit
mg/kg	milligrams per kilogram
MLLW	Mean Lower Low Water
mm	millimeter
MPRSA	Marine Protection, Research, and Sanctuaries Act
MRU	motion reference unit
msec	millisecond
MS/MSD	matrix spike/matrix spike duplicate
NAD 83	North American Datum of 1983
NAE	New England District
Ni	nickel
nmi	nautical mile
NOAA	National Oceanic and Atmospheric Administration

NTRIP	Networked Transport of Radio Technical Commission for Maritime Services (RTCM) via Internet Protocol
OTI	Outland Technologies'
PAHs	polycyclic aromatic hydrocarbons
Pb	lead
PCA	Principal Components Analysis
PCB	polychlorinated biphenyl
PDS	Portland Disposal Site
PPS	pulse per second
PV	plan-view
QAPP	Quality Assurance Project Plan
QC	quality control
RIM	Regional Implementation Manual
R/V	Research Vessel
ROV	remotely operated vehicle
RTCM	Radio Technical Commission for Maritime Services
RTK	Real-Time Kinematic
SOPs	Standard Operating Procedures
SPI	sediment profile imaging
SQGs	sediment quality guidelines
SVP	sound velocity profile
TIF	tagged image file
TOC	total organic carbon
UNH/NOAA CCOM	University of New Hampshire's NOAA Center for Coastal and Ocean
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
yd^3	cubic yards
Zn	zinc
µg/kg	micrograms per liter

1.0 INTRODUCTION

A monitoring survey was conducted at the Cape Arundel Disposal Site (CADS) (the site) in September 2020 as part of the United States 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. An introduction to the DAMOS Program and CADS, including a brief description of previous dredged material disposal and site monitoring activities, is provided below, along with a description of the study objectives for the 2020 monitoring survey.

The remainder of this report includes an overview of the methods used to collect and analyze the survey data, a summary of the results, a discussion of the 2020 survey results in comparison to previous findings, conclusions and recommendations for future site management and monitoring, 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, the DAMOS Program has collected and evaluated dredged material disposal site data throughout New England. Based on these data, patterns of physical, chemical, and biological responses of seafloor environments to dredged material placement activity have been documented (Fredette and French 2004).

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 made 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. Sediment-profile imaging (SPI) and plan-view (PV) imaging surveys

are often included in confirmatory surveys to provide further physical characterization of the material and to support evaluation of seafloor (benthic) habitat and recovery over time.

Focused studies are periodically undertaken within the DAMOS Program to evaluate candidate sites, for baseline surveys at new sites, to evaluate inactive/historical disposal sites, and to contribute to the development of dredged material placement, capping techniques, and management planning. 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 chemical, physical, and biological analysis, sub-bottom profiling, sediment coring, towed video, or video collection via a remotely operated vehicle (ROV).

The survey discussed herein included elements of both a confirmatory survey and a focused study. The confirmatory survey employed the use of hydroacoustic survey techniques to monitor the distribution of recently placed dredged material. A focused sediment grab sampling survey was conducted to gain information on the chemical composition and benthic community structure of newly placed dredged material at the site. In addition, a towed video survey was conducted to provide qualitative information about the seafloor habitat within the site and reference areas.

1.2 Introduction to the Cape Arundel Disposal Site

CADS is located approximately 5.0 kilometers (km) (2.7 nautical miles [nmi]) south-southeast of Cape Arundel, Maine and is defined as a 457-meter (m) (1,500-foot [ft]) diameter circle, centered at 43° 17.805' N, 70° 27.170' W in the North American Datum of 1983 (NAD 83) (Figure 1-1).

In 1985 CADS was first selected as an alternative dredged material disposal site by USACE under Section 103(b) of the Marine Protection, Research, and Sanctuaries Act (MPRSA); although some records indicate that the site may have received dredged material as early as the 1930s (USEPA, 2019). The site received periodic use during this selection period (1985 – 2010) when approximately 864,000 cubic meters (m^3) (1,130,000 cubic yards [yd^3]) of dredged material was placed primarily within the central portion of the site. Through Congressional legislation (Public Law 113-76) the site was reopened in 2014 for a period of five years which was then extended until 31 December 2021 by America's Water Infrastructure Act of 2018 (Public Law 115-270).

Water depths within CADS range from 30 m (98 ft) to 42 m (138 ft) and the topography is complex with areas of steep slope changes and rocky ledges. A defining 1,000 m (3,281 ft) long by 50 to 250 m (164 to 820 ft) wide trough runs through the central portion of the site, which increases in depth towards the northern and southern site boundaries and decreases in depth toward the western and southeastern site boundaries (USEPA, 2019). Results of previous acoustic surveys have described hard rock outcrops and ridges in the shallower areas

that border the trough and the presence of relatively soft sediment within the deeper basins of the trough (SAIC, 1991).

1.3 Previous Surveys at CADS

A summary of monitoring surveys at CADS is presented in Table 1-1. Most recently, in August of 2013, the DAMOS Program conducted a combined confirmatory and focused survey of the site. Although CADS was closed at the time of the survey, the site was active until 2010 and was being considered for potential reopening. The 2013 survey included a hydroacoustic survey to characterize the seafloor topography and a SPI/PV imaging survey to characterize the surficial features and to assess benthic recovery. In addition, a reconnaissance survey was conducted to characterize the seafloor conditions of an area to the east of CADS for potential disposal site consideration and to assess areas near the existing site with SPI/PV for use as potential reference areas.

Bathymetric survey data collected within CADS in 2013 yielded depths that ranged from 30 to 50 m (98 to 164 ft) within the site, with areas of steep slopes and rocky ledges (Figure 1-2). The expanded survey area to the east of CADS displayed similar depth ranges and topography as the site. A depth difference analysis was conducted using the 1997 and 2013 bathymetric surveys which revealed evidence of 0.5 to 1.5 m (1.6 to 5.0 ft) of dredged material accumulation primarily in the deeper, soft-bottom area surrounding the rocky outcrops near the center of the site (Hickey et al. 2014).

Acoustic backscatter data estimated the sediment texture throughout the site to be harder surfaces (rock) in the shallower areas and softer sediments in the deeper areas along the central trough. Evidence of dredged material placement in the acoustic backscatter data confirmed placement in the deeper, soft sediment areas of the site. Filtered backscatter and side-scan sonar mosaics confirmed the patterns of shallower/rocky and deeper/soft sediment surfaces throughout the site.

The 2013 SPI/PV survey was conducted to assess the physical features of the surficial sediment and the status of benthic recolonization within the disposal site. Two proposed reference areas, EREF and WREF (initially referred to as NREF), and the expanded hydroacoustic study area were also included in the 2013 SPI/PV effort. Due to the hard-bottom nature of much of the study area, camera penetration was variable and/or not achieved at some locations, resulting in many indeterminate results, though successful images indicated a recovered benthic community throughout the study area (Hickey et al. 2014).

1.4 Recent Dredged Material Disposal Activity

Since Congressional legislation reopened the site in 2014, CADS has received 69,167 m^3 (90,468 yd^3) of dredged material from the York Harbor Federal Navigation Project (FNP), Cape Porpoise FNP, and several non-federal dredging projects in southern Maine

(Table 1-2). Dredged material was placed in a directed manner on the seafloor, primarily in the deep trough in the northeastern quadrant of the site. A summary of recent disposal activity is presented in Table 1-2, depicted in Figure 1-3, and individual disposals are presented in Appendix B.

1.5 2020 Study Objectives

The 2020 survey was designed with both confirmatory and focused DAMOS survey elements to meet the following objectives:

- Objective 1: Characterize the seafloor topography and surficial features over the site and reference areas (WREF and EREF) by completing a hydroacoustic survey.
- Objective 2: Characterize the surficial sediment quality and benthic community status of the site and reference areas through the collection of video footage and sediment grab samples for chemical, physical, and biological analysis.

Table 1-1.

Previous Surveys at CADS

Year	Survey Type	Bathymetric Survey Area (m x m)	No. SPI Stations	Other	Citation	DAMOS Contribution No.
1985	Monitoring	-	-	-	SAIC, 1987	-
1987	Monitoring	600 x 1200	51	-	SAIC, 1990	67
1990	Monitoring	600 x 1400, 600 x 600	-	-	SAIC, 1991	82
1997	Monitoring	-	-	-	unpublished	-
2013	Monitoring, reference area investigation, and reconnaissance for potential site expansion	600 x 600, 600 x 1000	30	PV-imaging	Hickey et al., 2014	DR-2013-01

Table 1-2.

Summary of Recent Disposals at CADS

Project	Disposal Year	Volume (m^3)	Volume (yd^3)
Arundel Yacht Club	2016	3,879	5,074
Kennebunkport Marina	2016	1,537	2,010
Town of Kennebunkport	2016	841	1,100
Yachtsman Lodge and Marina	2016	3,670	4,800
York Harbor FNP	2017	12,349	16,152
Kennebunk, ME - Chester Homer	2018	274	359
Kennebunk, ME – John Rinaldi	2018	470	615
Kennebunk, ME – Melissa Winstanly	2018	675	883
York Harbor FNP	2018	13,233	17,308
Cape Porpoise Harbor FNP	2019	27,756	36,304
York Harbor Marine Service	2019	3,551	4,644
Kennebunk, ME – John Rinaldi	2019	932	1,219
Total		**69,167**	**90,468**

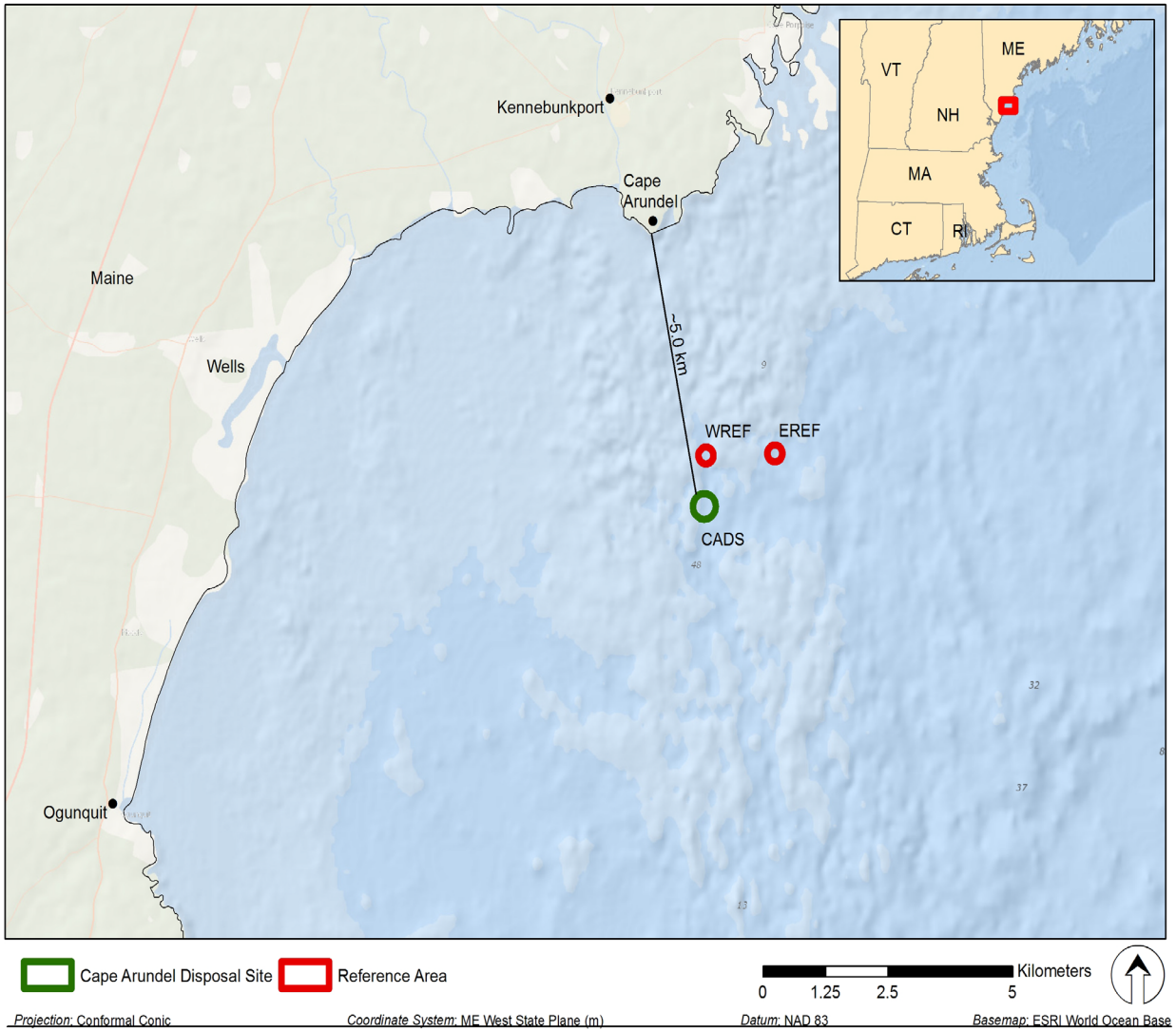


Figure 1-1. Location of the Cape Arundel Disposal Site (CADS) and associated reference areas.

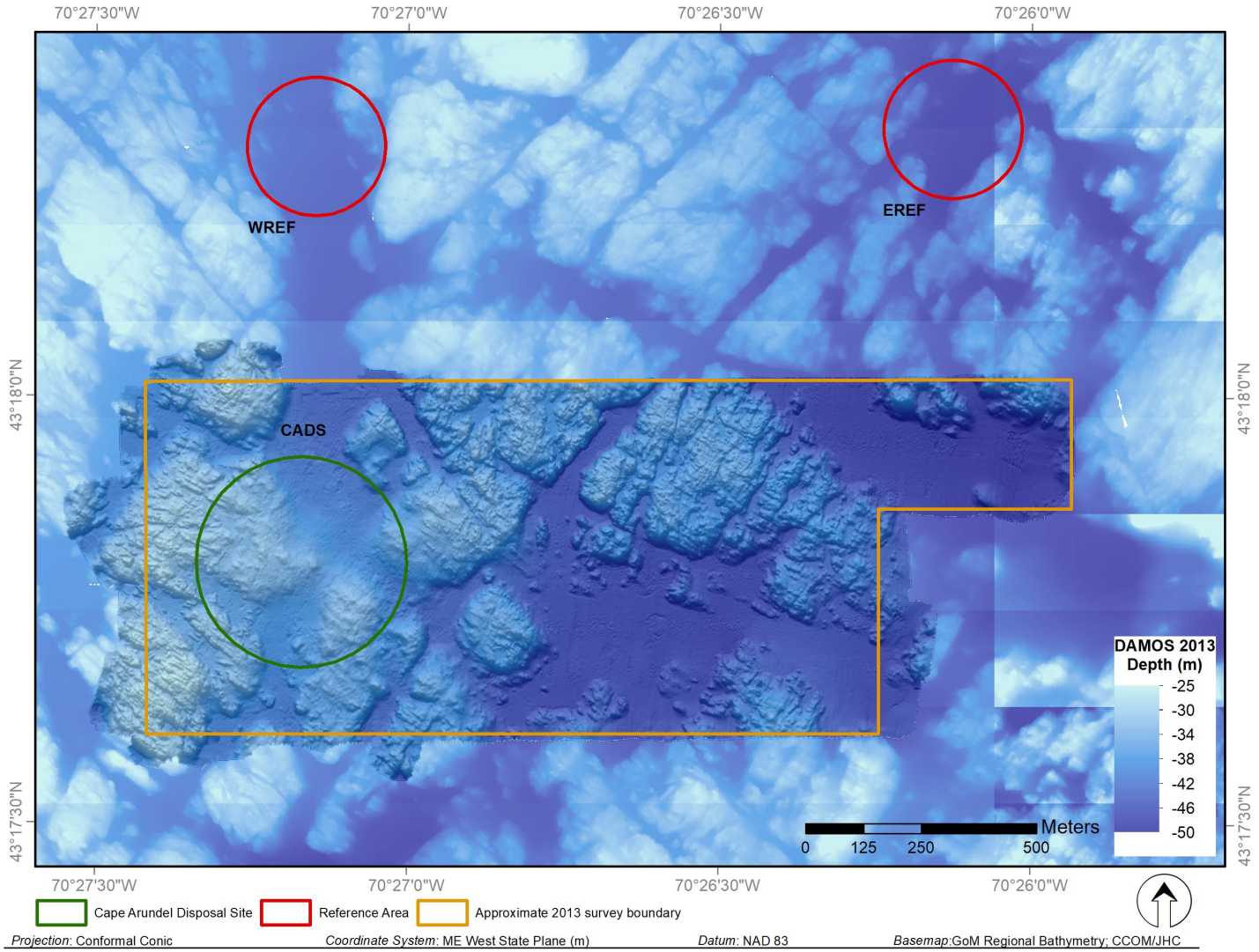


Figure 1-2. 2013 Bathymetric data over acoustic relief 5x vertical exaggeration of CADS and vicinity.

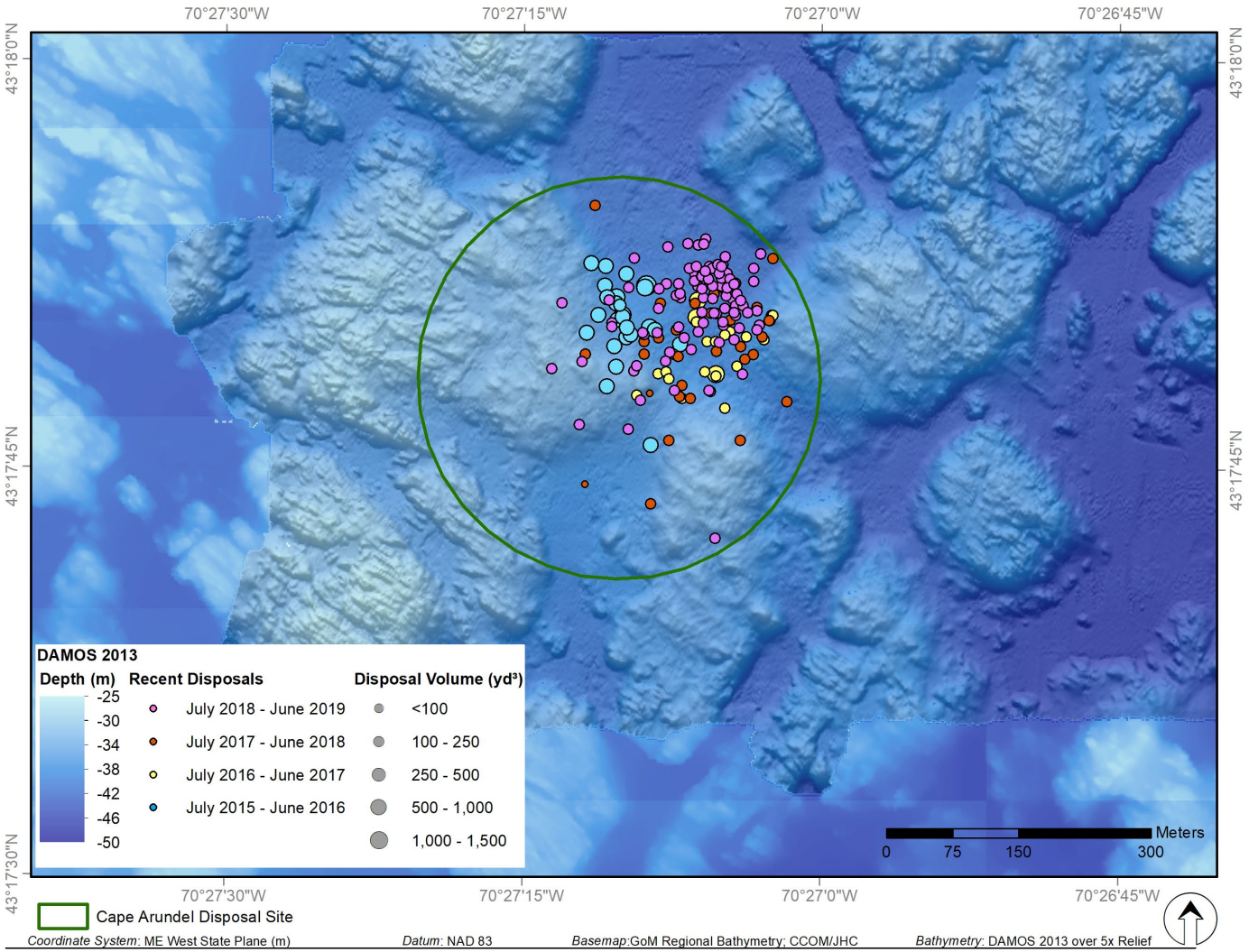


Figure 1-3. Recent disposal records at CADS (2016-2019) over 2013 bathymetric data and acoustic relief 5x vertical exaggeration.

2.0 METHODS

AECOM and CR Environmental, Inc (CR) conducted the September 2020 surveys at CADS. Alpha Analytical Services (Alpha) (Westborough, Massachusetts [MA]), Katahdin Analytical Services (Katahdin) (Scarborough, Maine [ME]), and GeoTesting Express (GTX) (Acton, MA) performed the sediment chemistry and grain size analyses. The AECOM Benthic Laboratory (Pocasset, MA) performed the sorting and identification of infaunal organisms from the sediment samples obtained during the survey. The acoustic survey was conducted on 13 September 2020 to document recent disposals within CADS and to collect updated acoustic datasets for the two reference areas (WREF and EREF). Sediment grab samples were collected on 13 and 14 September 2020 from a total of 12 locations: six locations within CADS and three locations from each reference area. To provide additional data to aid in the characterization of the surficial sediment quality and benthic community, a video survey was conducted after the completion of sediment grab activities.

The surveys were conducted aboard the 55-ft Research Vessel (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, 2020a). Additionally, marine operations were conducted in accordance with the Accident Prevention Plan (APP) for Marine Operations Associated with the DAMOS Program (AECOM, 2020b).

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 corrections 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, if necessary, as a backup. 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 and targets. 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. The processed data can also be compared with previous surveys to track changes in the size and location of seafloor features.

This technique is the primary tool in the DAMOS Program for mapping the distribution of dredged material at disposal sites. 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 2020 acoustic survey of CADS was conducted on 13 September 2020 aboard the R/V *Jamie Hannah*. The bathymetric survey was conducted within a 500 m x 500 m area over the entire footprint of CADS and two 300 m x 300 m squares covering the associated reference areas (Figure 2-1). 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 29 survey lines over the three surveyed areas, spaced approximately 50-70 m apart and oriented in a north-south direction. Cross-lines were spaced approximately 200 m and 150 m apart over CADS and the two reference areas, respectively. Over the WREF site, three cross-lines were run within the central portion of the site spaced at approximately 25 m apart as part of the QA process. Cross-lines were oriented in a west-east 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 230 kHz and pulse length of 0.075 millisecond (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 V motion reference unit (MRU) and heading sensor 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; and
- 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) Seavey Island Tide Station (#8419870). The mean difference between RTK and NOAA Tide Station data was 0.05 m. Correction of sounding depth and position (range and azimuth) for refraction due to water column stratification was conducted using a series of four sound-velocity profiles acquired by the survey team. Data artifacts associated with refraction remain 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 230 kHz. At this frequency, the system has a published beam width of 1.85°. Assuming an average survey area depth of 37.5 m (123 ft) and a maximum beam angle of 60°, the average dimensions of the beam footprint mid-swath was 1.7 m × 2.4 m resulting in an approximately 4.2 m^2 footprint. Data were reduced to a cell (grid) size of 3.0 m × 3.0 m, acknowledging finer resolution in shallow portions of the survey area and 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 2020 bathymetric data, as summarized on Table 2-2, displays negligible tide bias (-0.02 m) and a mean vertical uncertainty of 0.69 m, lower than the values recommended by USACE (2013) or NOAA Order 1A (2015). Uncertainty was driven by the steep slopes of ledge outcrops relative to the beam footprint rather than systematic errors or biases.

Reduced data were exported in American Standard Code for Information Interchange (ASCII) text format with fields for Easting, Northing, and Mean Lower Low Water (MLLW)

elevation in meters. All data were projected to the Maine West State Plane, NAD 83 (metric). A variety of data visualizations were generated using a combination of ESRI ArcMap and Golden Software Surfer programs. Visualizations and data products included:

- ASCII data files of all processed soundings including MLLW depths and elevations;
- Contours of seabed elevation (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;
- Three-Dimensional surface maps of the seabed created using 2× vertical exaggeration and artificial illumination to highlight fine-scale features not visible on contour layers delivered in grid and tagged image file (TIF) formats, and
- An acoustic relief map of the survey area created using 2× 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 2.0 m x 2.0 m pixel resolution. Backscatter data were also exported in ASCII format with fields for Easting, Northing, and backscatter decibel (dB). These data were converted to a grid format, a Gaussian filter was applied to the grid to minimize nadir artifacts, and the filtered data were used to map backscatter values on a 2 m x 2 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 0.14 m 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 were analyzed to document the distribution of dredged material at CADS and to evaluate changes in seafloor topography in comparison with previous surveys. The processed bathymetric grids were converted to rasters and bathymetric contour lines were generated and displayed using GIS.

GIS was also used to calculate depth difference grids between the previous 2013 survey and the 2020 bathymetric dataset. The depth difference grid was calculated by subtracting the 2013 survey depth estimates from the 2020 survey depth estimates at each point throughout the grid. The resulting depth differences were contoured and displayed using GIS. The mean difference on the depth difference grid was -15cm, which is likely associated with the use of RTK for tides vs. historic use of remote NOAA stations, and a more precise beam angle in the 2020 dataset. Based on this difference 0.15m was added to the processed depth difference grid to account for the bias.

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.

2.3 Sediment Sampling

Sediment grab samples were collected for grain size analysis, chemical analysis, and benthic infaunal community analysis on 13 and 14 September 2020 aboard the R/V *Jamie Hannah*. Target sampling locations were selected prior to the survey and pre-programmed into the on-board navigation system. The survey vessel navigated within a 10 m radius of the selected target sampling locations prior to deploying the sediment grab sampling equipment over the side of the vessel, in some instances, due to the rocky nature of the survey area and inability to find soft sediment, samples were collected outside of the proposed 10 m radius. Samples were collected from six stations within CADS and from six stations within the reference areas: three within EREF and three within WREF. Actual sediment grab sampling locations are depicted on Figure 2-2, and sample collection coordinates are presented in Table 2-3.

2.3.1 Sediment Sample Collection – Chemistry

Samples for sediment chemistry were collected using a 0.1 square meter (m^2) grab sampler. Upon collection, sediment was brought aboard the vessel to be visually inspected and generally described, including color, texture, general grain size observations, and additional items, such as odor and surface biota. Descriptions were recorded in the dedicated project field logbook.

After a general description of the grab was recorded and any overlaying water siphoned off, the entire contents of the grab was put into a decontaminated stainless-steel bowl and thoroughly homogenized. Sediment was then placed in pre-cleaned glassware appropriate for each required analysis. Prior to sealing the lids to the glass containers, they were wiped with clean paper towels and subsequently labeled. Sample container sizes, preservation requirements, and holding times are detailed in the program QAPP (AECOM, 2020a). Between samples, the grab samplers, spoons, and bowl were thoroughly

decontaminated with a non-phosphate detergent and then rinsed with de-ionized water prior to re-deployment.

Analytical chemistry samples were stored on ice and transferred under chain-of-custody via courier to their respective laboratories

2.3.2 Sediment Sample Collection – Benthic

Samples for benthic community structure and taxonomic analysis were collected using a 0.04 m^2 Ted Young grab sampler. After retrieving the samples from the seafloor, they were taken onboard and general notes were made regarding the penetration of the grab sampler, general sediment characteristics, and presence of odor. For each sample, the entire contents of the grab sampler were removed and washed into a clean 9.4 liter (2.5 gallon) plastic bucket and rinsed through a 0.5 millimeter (mm) (500-micron) mesh sieve. The material retained on the sieve was then placed into an appropriate sample container and preserved with 10% formalin buffered with sodium borate. Samples were transported by AECOM staff to the AECOM benthic laboratory in Pocasset, MA under chain-of-custody.

2.4 Underwater Video Survey

After the completion of grab sampling on 14 September 2020, underwater video footage was taken by the scientific crew aboard the R/V *Jamie Hannah*. Video data were collected along three transects using a video grab system consisting of a Ted Young 0.1 m^2 modified Van Veen grab sampler, stability fin, camera, and light brackets (Figure 2-3). The video system included an Outland Technologies' (OTI) high-definition color video camera and two wide-angle light-emitting diode (LED) video lights with variable output control. The OTI video camera was cabled to an OTI-1080 HD DVR recorder and high-resolution daylight monitor at the surface. The video system was deployed and towed close to the seafloor to capture footage of the substrate and epifauna. One transects was taken throughout the CADS area (crossing over grab sampling stations CADS 1, 2 and 3), running from the northwestern corner toward the center of the site. Two transects were taken at the WREF area – one along the southwestern-southern portion of the site (crossing through grab sampling station WREF-3) and the second in the northeastern corner, trailing outside the survey boundary. Video transects are displayed in Figure 2-4.

2.5 Laboratory Analysis

2.5.1 Sediment Chemistry Samples

The sediment samples were analyzed for grain size, total organic carbon (TOC), metals (arsenic [As], cadmium [Cd], chromium [Cr], copper [Cu], lead [Pb], mercury [Hg], nickel [Ni], and zinc [Zn]), pesticides, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Analytical samples were analyzed by Alpha for TOC, metals, pesticides, and PCBs, by Katahdin for PAHs, and by GeoTesting for grain size. Table

2-4 includes a summary of the laboratory analytical work and Appendix C presents all analytical results.

A routine set of quality control (QC) samples was collected, including one field duplicate (FD) and one matrix spike/matrix spike duplicate (MS/MSD) for the aforementioned analyses. A rinsate blank was collected from the sediment grab sampling and processing equipment and was analyzed to provide a quality check of decontamination procedures. All samples were extracted and analyzed within the holding times for the analytes mentioned above.

For the metals, pesticides, PAH, and PCB analyses, standard QC procedures included analysis of a method blank (MB) and a laboratory control sample (LCS) in order to evaluate the accuracy of the dataset. For TOC, all samples were analyzed in duplicate per the method requirements and the QC samples included a MB and LCS.

Analytical methods applied within this study are consistent with those prescribed in the Regional Implementation Manual (RIM) that provides guidance for testing dredged material (USEPA and USACE, 2004).

2.5.2 Benthic Biology Laboratory Processing

After 48 hours of collection, but within the holding time of 10 days, benthic samples were transferred out of the formalin, rinsed on a 500-micron sieve with freshwater, and preserved in an 80% ethanol solution. To facilitate the sorting process, the samples were stained in a solution of Rose Bengal, a biological stain that adds color to proteinaceous tissue. Benthic infaunal samples were sorted using a dissecting microscope to identify major taxonomic categories, such as Polychaeta to family level and Arthropoda, Mollusca, and Echinodermata to class level.

Following sorting, individual species were identified to the lowest practical taxonomic level (LPTL), typically species, and enumerated. The final dataset excluded taxa such as unidentifiable juveniles and indeterminate or damaged specimens that could not be identified to the species level, as well as epifauna, shellborers, and parasites. Organisms such as meiofauna (e.g., Nematoda, Harpacticoida, and Ostracoda), planktonic fauna, and colonial epifauna were neither identified nor included in the raw data files. Data were recorded on project-specific datasheets and entered into an Excel™ spreadsheet. The data were carefully inspected, and a final dataset was produced. For statistical community analysis, taxa such as juveniles and indeterminate specimens were excluded from the dataset, however, these individuals were included in total abundance data.

2.5.2.1 Benthic Laboratory QA/QC analysis

To ensure sample quality, a standard QA/QC procedure was followed. A “Batch Listing Sheet” was prepared for each sorter in which samples sorted by the individual were

identified in batches of ten. Once a batch was sorted, a sample was selected using a random number generator. The selected sample was then re-sorted by a senior lab member. Any organisms found in the sample residue during the re-sort were removed, enumerated, identified, and added to the sample vials. This process was completed for 10% of the samples. If the number of organisms found within the re-sorted sample was greater than 10% of the total abundance, corrective action would be taken – guidance would be provided to the sorter on how to improve and the sorter would be instructed to re-sort samples from the batch. Samples that were selected for the QA/QC process passed and no corrective action was necessary.

2.6 Data Analysis

2.6.1 Sediment Chemistry Analysis

Total PAHs (the sum of the 18 PAH compounds analyzed) and total DDx (the sum of 4,4'-dichlorodiphenyldichloroethane [DDD], 4,4'-dichlorodiphenyldichloroethylene [DDE], and 4,4'-dichlorodiphenyltrichloroethane [DDT]) were calculated using one-half the method detection limit (MDL) for individual analytes that were recorded as non-detect and then totals were summed. Total PCBs were calculated as the sum of the 18 NOAA congeners multiplied by two, with non-detects included as one-half of the MDL. Individual compounds that were recorded as non-detect are presented as one-half of the MDL, as specified within the QAPP (AECOM, 2020a).

Chemistry results from the survey are compared to national sediment quality guidelines (SQGs). These SQGs were derived using a database that compiles data from multiple studies and investigators and contains paired sediment chemistry and bioassay data (Long and Morgan, 1991; Long et al. 1995). From these data, the 10th and 50th percentile of the effect values was identified for each chemical of interest. The two guidance values used for comparative purposes herein (effects range low [ER-L] and effects range median [ER-M]) are intended to delineate three concentration ranges for a specific chemical. The concentrations below the ER-L (10th percentile) value represent a minimal effects range, rare to cause adverse effects. Concentrations above the ER-L but below the ER-M (between 10th and 50th percentile) represent a possible adverse effects range, and concentrations above the ER-M (>50th percentile) represent a probable effects range (Long et al., 1995). The screening values used within this report are intended to provide a general scale of sediment contamination levels and are a useful tool in providing a primary assessment of the nature of sediment contamination; combined with technical judgement, research, and the appropriate field and laboratory procedures, SQGs can provide important information to assist with sediment characterization and risk assessments (Kwok, et. al., 2014).

2.6.2 Benthic Infaunal Community Analysis

The PRIMER E (v.7) statistical package was used to calculate diversity indices, including Shannon-Weiner diversity index (H′), Pielou's evenness value (J′), and Log-series

Fisher's alpha (Clarke and Gorley, 2001). Shannon-Weiner's index (H′) is based on information theory and is the most widely used diversity index among benthic ecologists. Shannon's index assumes that individuals are randomly sampled from an infinitely large population and that the total number of species are present in the sample obtained (Wilhm and Dorris, 1968; Pielou, 1975; Magurran, 1988). Neither assumption correctly describes the environmental samples collected in most marine benthic programs; therefore, it is important to include additional metrics to assess for benthic community structure. Pielou's evenness index (J′) expresses H′ relative to the maximum value that H′ can obtain when the number of species in the sample is perfectly even (J′ is constrained between 0 and 1). The less evenly distributed species are in a community, the lower the value of J′. Log-series Fisher's *alpha* (Fisher's α) model of species abundance (Fisher et al., 1943) has also been widely used and is considered to be a better index for discriminating diversity among samples with subtly different characteristics in community structure (Taylor, 1978). Fisher's α is a measure of diversity that is calculated to be independent of sample size and does not assume, as H′ does, that the total number of species is present within the sample obtained.

A species-area curve was generated to evaluate the success of sampling the three areas (CADS and two reference sites) relative to the number of species identified per number of samples collected. The cumulative species count should increase with the number of samples collected until an asymptote (plateau) is reached indicating a low likelihood of finding additional species with increased sampling effort. PRIMER was also used to calculate the Bray-Curtis Similarity matrix and to perform a Principal Components Analysis (PCA) to discern patterns of community structure among the stations sampled. These multivariate and univariate metrics were used to test the hypothesis that CADS and the reference areas have similar infaunal community assemblages.

2.6.3 Benthic Infaunal Trophic Groupings

To further evaluate the species composition of CADS relative to the reference areas, the species identified were assigned to one of six trophic groupings (feeding modes): 1. omnivores/scavengers; 2. subsurface deposit feeders; 3. interface feeders; 4. suspension feeders; 5. surface deposit feeders; or 6. predators. Tropic grouping assignments were referenced to Pollock, 1998 and QA'd by a qualified benthic ecologist.

2.6.4 Underwater Video Survey Data Analysis

The underwater video footage was analyzed at the AECOM benthic lab. The video transects were viewed in slow motion so a comprehensive one-second interval analysis could be completed. Data recorded from the video analysis included: location coordinates, time of recording, substrate type, sample area associated with the recording, and any other relevant comments, such as camera quality or biota identified. Data were recorded in an Excel™ data sheet and screenshots were taken throughout the footage to display any biota of interest and to depict the general area substrate (Appendix E).

Table 2-1.

September 2020 CADS Field Activities Summary

Survey	Date	Summary
Bathymetry	13 September 2020	Bathymetric, Backscatter, and Side-Scan Sonar CADS: 500 x 500 m Reference Areas: 300 x 300 m Lines: 29 total Spacing: 50-70 m
Sediment Grab Sampling	13 and 14 September 2020	Total Stations: 12 CADS: 6 Reference Areas: 6 (3 per area)
Video Survey	14 September 2020	Three transects conducted across CADS (1) and WREF (2)

Table 2-2.

Acoustic Cross-Line Comparison Results

+/- Beam Angle Limit	Max Outlier	Mean Diff	Std Dev	95% Confidence
0	4.53	0.08	0.33	0.66
5	6.08	0.08	0.29	0.58
10	6.33	0.07	0.33	0.65
15	6.33	0.04	0.29	0.56
20	6.26	0.01	0.37	0.72
25	6.50	0.02	0.29	0.57
30	6.56	0.02	0.33	0.65
35	6.56	-0.03	0.34	0.68
40	6.56	-0.09	0.34	0.67
45	4.82	-0.07	0.42	0.82
50	4.82	-0.08	0.39	0.76
55	4.43	-0.11	0.38	0.75
60	4.43	-0.15	0.48	0.93
Mean	5.71	-0.02	0.35	0.69

Notes:
1. Data accepted to +/- 55-degrees from vertical based on field assessment of data quality.
2. Statistical summary based on average elevations within 3m x 3m cells.
3. Maximum outlier values representative of slopes on geological features.
4. Mean difference indicative of RTK GPS tidal uncertainty.

Table 2-3.

CADS Sediment/ Biology Grab Locations (Actual)

Station ID	Easting	Northing	Latitude (N)	Longitude (W)	Sediment Grab (Physical and Chemical)	Benthic Community Structure Analysis
CADS Site						
CADS-1a	876787.7	51543.0	43°17 817’	-70°27.164’	X	
CADS-1b	876781.0	51574.3	43°17.833’	-70°27.169’		X
CADS-2a	876771.4	51588.5	43°17.842’	-70°27.176’		X
CADS-2b	876770.4	51583.4	43°17.839’	-70°27.176’	X	
CADS-3a	876788.1	51636.3	43°17.834’	-70°27.164’	X	
CADS-3b	876770.4	51631.8	43°17.865’	-70°27.177’		X
CADS-4a	876871.6	51641.8	43°17.870’	-70°27.102’		X
CADS-4b	876877.1	51651.9	43°17.876’	-70°27.098’	X	
CADS-5a	876917.1	51592.6	43°17.844’	-70°27.068’		X
CADS-5b	876922.5	51601.7	43°17.849’	-70°27.064’	X	
CADS-6a	876922.3	51555.6	43°17.824’	-70°27.064’	X	
CADS-6b	876932.2	51550.9	43°17.821’	-70°27.057’		X
Reference Areas						
EREF-1a	878235.5	52549.1	43°18.363’	-70°26.096’		X
EREF-1b	878267.1	52556.9	43°18.367’	-70°26.072’	X	
EREF-2a	878147.1	52453.8	43°18.311’	-70°26.161’	X	
EREF-2b	878127.1	52455.6	43°18.312’	-70°26.176’		X
EREF-3a	878223.1	52379.8	43°18.271’	-70°26.104’		X
EREF-3b	878222.9	52413.7	43°18.290’	-70°26.105’	X	
WREF-1a	876761.8	52450.4	43°18.307’	-70°27.185’	X	
WREF-1b	876747.7	52454.9	43°18.309’	-70°27.196’		X
WREF-2a	876834.0	52407.2	43°18.283’	-70°27.131’		X
WREF-2b	876843.2	52411.3	43°18.286’	-70°27.125’	X	
WREF-3a	876785.4	52338.2	43°18.246’	-70°27.167’	X	
WREF-3b	876787.5	52334.2	43°18.244’	-70°27.166’		X

Notes
1. Grid coordinates are NAD_1983_StatePlane_Maine_West_FIPS_1802
2. Geographic coordinates are NAD83 decimal degrees

Table 2-4.

Summary of Laboratory Analytical Work

	Test Method EPA Test Method No.		
	Sample Prep	**Analytical**	**Instrumentation**
Arsenic (As)	3050B	6020B	ICP-MS
Cadmium (Cd)	3050B	6020B	ICP-MS
Chromium (Cr)	3050B	6020B	ICP-MS
Copper (Cu)	3050B	6020B	ICP-MS
Lead (Pb)	3050B	6020B	ICP-MS
Mercury (Hg)	7471B	7471B	CVAA
Nickel (Ni)	3050B	6020B	ICP-MS
Zinc (Zn)	3050B	6020B	ICP-MS
Polynuclear Aromatic Hydrocarbons (PAHs)	3540C	8270D SIM	GC/MS
Polychlorinated Biphenyls	3540C	8082A	GC/MS
Pesticides	3540C	8081B	GC/MS
Total Organic Carbon (TOC)	-	9060A	Carbonaceous analyzer
Grain Size	ASTM D422-63		

Notes:
ICP-MS - Inductively Coupled Plasma Mass Spectrometer
CVAA - Cold Vapor Atomic Absorption
GC/MS - Gas Chromatography/Mass Spectrometry

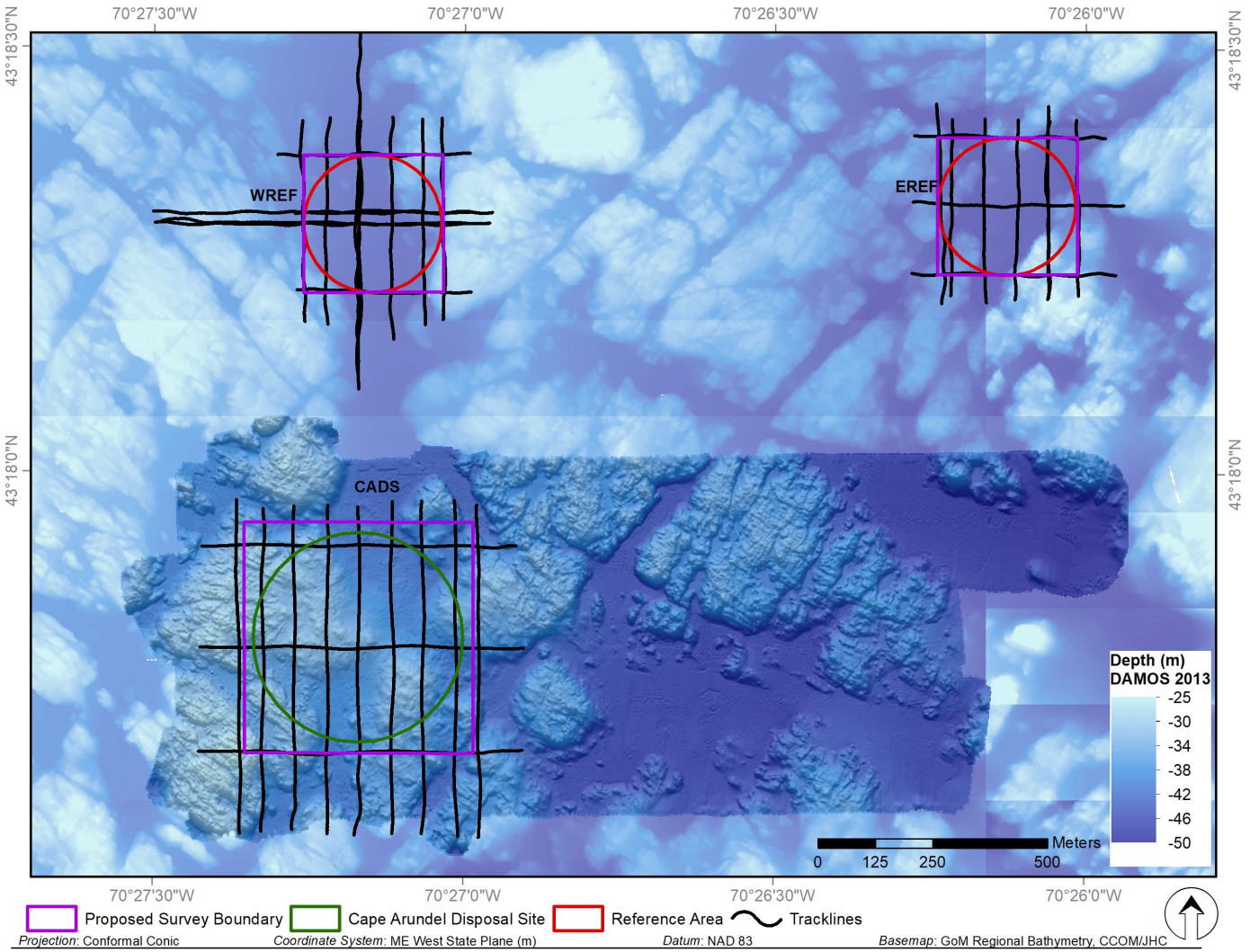


Figure 2-1. CADS and reference areas bathymetric survey boundaries and acoustic tracklines, September 2020.

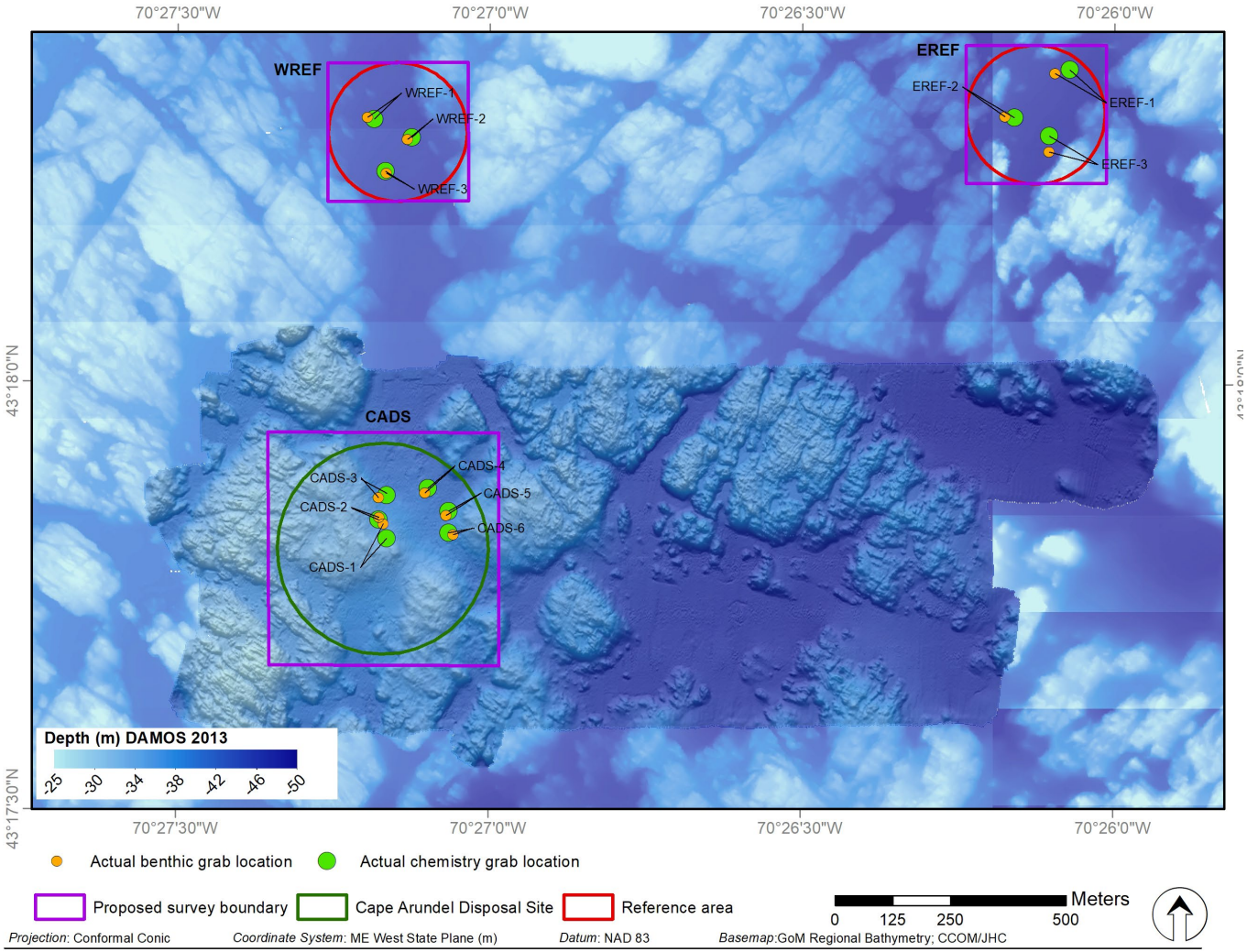


Figure 2-2. Sediment grab locations at CADS and reference areas, September 2020.

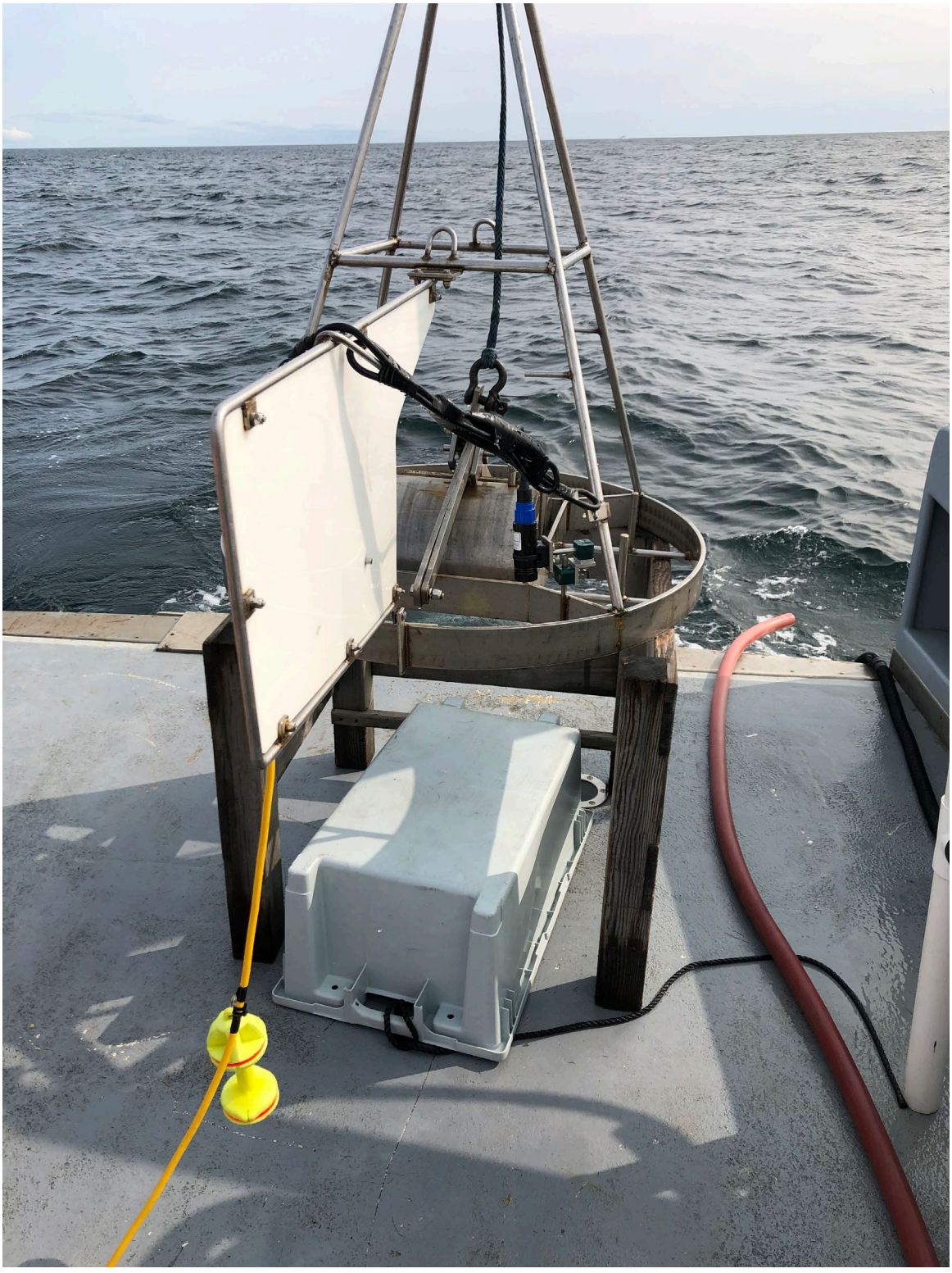


Figure 2-3. Ted Young 0.1 m^2 modified Van Veen grab sampler with video system.

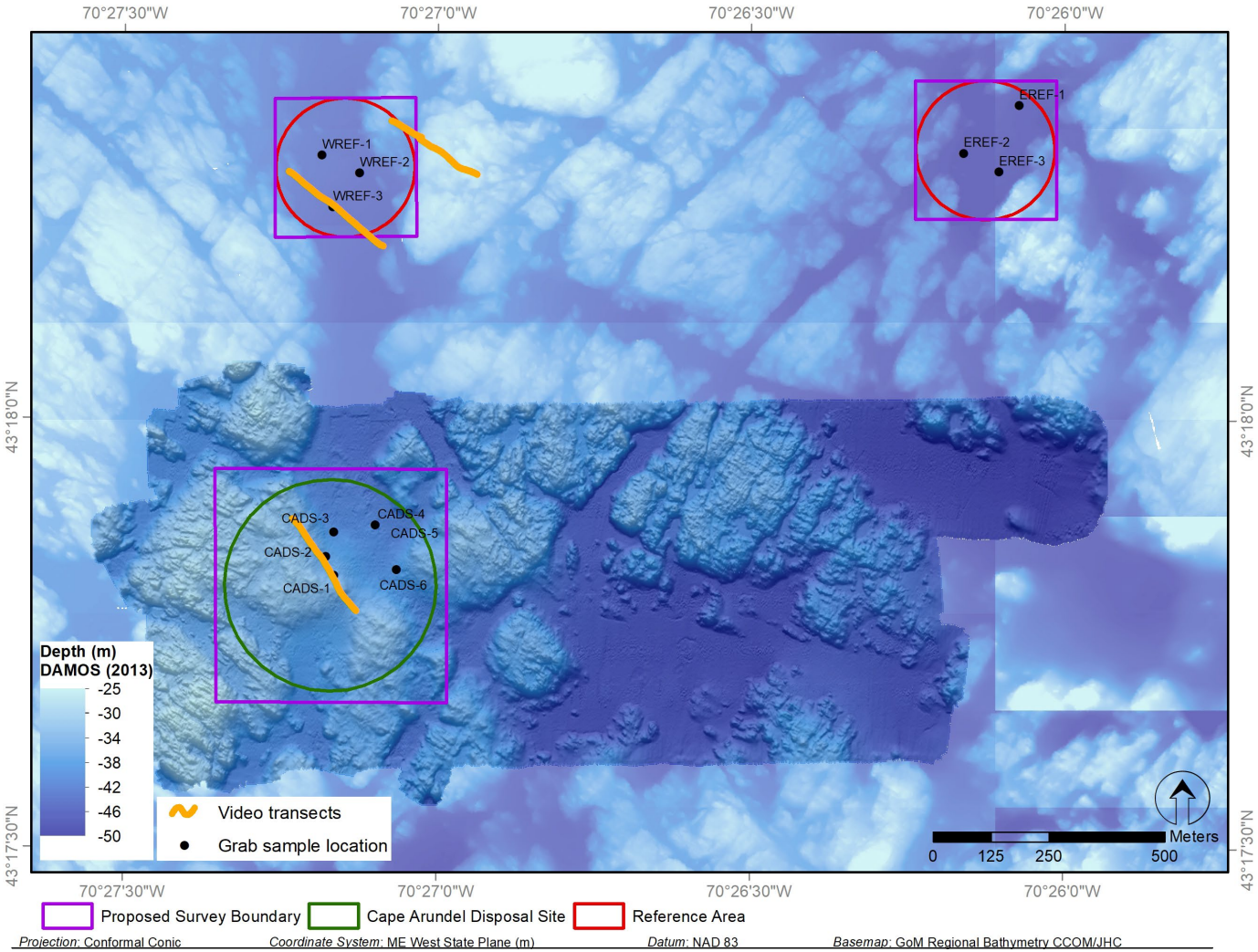


Figure 2-4. Video Survey Transects at CADS and reference area, WREF, September 2020.

3.0 RESULTS

The 2020 hydroacoustic surveys of CADS, completed on 13 September 2020, covered an area of 500 m x 500 m over the entire site and 300 m x 300 m over each of the two reference areas (WREF and EREF). On 13 and 14 of September 2020, sediment grab samples were collected for physical, chemical, and benthic infaunal community analysis at CADS and the two reference areas. On the final survey day, 14 September 2020, an underwater video survey was completed at CADS and within reference area WREF. Data from these investigations are presented below and in the subsequent tables and figures.

3.1 Bathymetry, Backscatter, and Side-Scan

3.1.1 Bathymetric Results

The resulting bathymetry revealed a widely variable topography across the site and reference areas (Figures 3-1 and 3-2). The survey area displayed irregular topography including rocky outcrops and steep slopes rising 30 to 35 m (98 to 115 ft) from the ambient seafloor, within the northwestern and southeastern sections of the site. Rocky outcrops were also noted along the far southwestern and eastern survey boundaries. Deeper, more uniform water depths (36 to 41 m [118 to 135 ft]) were depicted in the northeastern corner and southern area of the site, forming a trough between the higher promontories. Defined slopes were observed throughout the site where transition in topography was noted.

Hydroacoustic surveys were also conducted over both reference areas. As observed within the disposal site, both reference areas displayed regions of elevated topography sloping to areas of deeper waters (Figures 3-1 and 3-2). The central area of WREF displayed uniformly deeper waters, reaching a maximum depth of approximately 43 m (141 ft). The far northeastern and southern corners of WREF displayed areas that increased in elevation from the deeper central area to approximately 30 to 35 m (98 to 115 ft). The central portion of EREF also displayed uniformly deeper waters (approximately 45 to 46 m [148 to 151 ft] deep), while the northwestern and southern corners displayed areas of increased elevation, ranging from approximately 38 to 42 m (125 to 138 ft).

Depth difference calculations were performed using the 2013 and 2020 bathymetric datasets. A range of -0.5 to 0.5 m was assumed to capture the estimated uncertainty between the 2013 and 2020 surveys. Depth difference results identified the formation of a mound in the northeastern corner of the site which rises approximately 1.6 m (5.2 ft) above the ambient seafloor at its highest point. The results of the depth difference comparison show that the disposal mound has an area of 175 m x 175 m, which is approximately 25% of the total site area (Figure 3-3). The depth difference results also displayed a small area of potential sediment accumulation (0.5 m to 1.0 m) outside of the northeastern site boundary. Apparent sediment accumulation was visible on the depth difference model within the southern portion

of the site; however, this marker is most likely erroneous and due to bottom detection accuracy in an area with highly variable seafloor changes.

3.1.2 Backscatter and Side-Scan 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 a high-resolution image of seafloor texture and bottom features.

The CADS backscatter survey results (measured in dB) highlight the difference in bottom type across the highly variable site and confirm the presence of a soft sediment mound in the northeast area of the site (Figures 3-4 and 3-6). In general, backscatter signals over the disposal mound and soft sediment areas ranged from to -31 to -38 dB. The rocky outcrop areas of the site emitted backscatter signals ranging from -18 to -23 dB. Ambient sediments in the area surrounding the disposal mound, and between the harder features within the trough, ranged from -26 to -30 dB.

Backscatter signals over the two reference areas were similar to each other and the disposal site. Backscatter signals over both reference areas displayed areas of soft sediment surrounded by coarser, rocky material. Filtered backscatter signals within the central and southern areas of WREF ranged from -30 to -37 dB. In areas to the north, far west, and east of WREF, where rocky ledges and outcrops surround the soft sediment, filtered backscatter ranged from -18 to -24 dB. Filtered backscatter values within EREF ranged from -32 to -36 dB over the soft sediment central portion of the site, while the surrounding areas that are comprised of coarser material ranged from -20 to -27 dB (Figures 3-5 and 3-7).

Side-scan sonar mosaics of the CADS survey area and reference areas displayed similar results to those of the backscatter data, with areas of softer and coarser bottom types over the survey areas (Figures 3-8 and 3-9).

3.2 Sediment Grab Sampling

3.2.1 Sediment Biological, Physical, and Chemical Analyses

Sediment grab samples were collected from a total of 12 stations on 13 and 14 September 2020 and were analyzed for grain size, TOC, total PCBs, total PAHs, total metals, and infaunal benthic community structure. Data tables for chemical and biological data are presented in Appendices C and D, respectively.

3.2.2 Grain Size and Total Organic Carbon

Surficial grain size samples were consistent across CADS and the reference areas. Samples within CADS were predominantly composed of sand (51.9 – 79.2 %) with fines (silt and clay) (20.8 – 48.1%). Trace amounts of gravel, 2.6% and 0.2%, were present at CADS-1 and CADS-4, respectively. Similar to CADS, both reference areas were composed mostly of sand with fines, with the average composition of sand being 64.8% and fines, 34.7%. EREF was comprised of slightly more gravel than the CADS samples; all three stations had gravel present with a maximum of 6.6% gravel at EREF-2. WREF-2 and WREF-3 contained 2.9 and 0.3% gravel, respectively, which was more comparable to the CADS stations.

TOC values ranged from 0.33 – 1.44% within CADS, and from 0.65 – 1.29% within the reference areas. The highest TOC values were present at stations CADS-3, -4, and -5, which are located in the northeastern corner of the site and were composed of a relatively even mix of sand and silt/clay. This trend was evident within the reference areas as well where the highest TOC values were measured at stations with >40% silt/clay. Across the surveyed areas, stations that were composed of a higher percentage of sand resulted in lower TOC values.

A summary of the grain size and TOC data are displayed in Tables 3-1 and 3-2, respectively. Figure 3-10 depicts sediment grain size and Figure 3-11 depicts a comparison of fines (silt + clay) and TOC.

3.2.3 Total Metals

Surficial sediment within CADS and the reference areas were analyzed for the following metals: As, Cd, Cr, Cu, Pb, Hg, Ni and Zn; a summary of results is presented in Tables 3-3 and 3-4 and on Figures 3-12 through 3-18. Concentrations at locations within CADS were less than the ER-L for all analyzed metals. The only metal concentration that exceeded the associated ER-L value was arsenic at the reference areas where concentrations were slightly greater than the ER-L of 8.2 mg/kg at EREF-1 (8.8 mg/kg) and WREF-3 (8.25 mg/kg). The average arsenic concentration detected within the site was 3.1 mg/kg and the average concentration within the reference areas was 7.5 mg/kg. Other metals concentrations were less than the respective ER-L guidelines at the site and reference area stations. All metals concentrations were less than the associated ER-M values.

3.2.4 Total PAHS

The concentrations of total, low molecular weight (LMW), and high molecular weight (HMW) PAHs were also less than their respective ER-Ls within the site and the reference areas. Summary statistics for total, LMW, and HMW PAHs are presented on Tables 3-3 and 3-5, and Total PAHs compared to the ER-L and ER-M are displayed on Figure 3-19. Total PAH values within CADS ranged from 295 to 853 µg/kg. Reference area total PAH values ranged from 134 to 318 µg/kg. Concentrations of total LMW PAHs ranged from 46 to 114

µg/kg within CADS and from 21 to 43 µg/kg within the reference areas. Concentrations of total HMW PAHs ranged from 248 to 739 µg/kg within CADS and from 113 to 275 µg/kg within the reference areas.

3.2.5 PCBS

Total PCB concentrations within CADS ranged from 3.3 to 5.6 µg/kg and 3.6 to 4.7 µg/kg within the reference areas; well below the ER-L of 22.7 µg/kg (Tables 3-3 and 3-5, Figure 3-20).

3.2.6 Pesticides

Pesticides detected in sediments within CADS and the reference areas are presented in Tables 3-3 and 3-5 and summarized in Figure 3-21. Total DDx (the sum of DDD, DDE, and DDT) concentrations ranged from 0.39 to 1.72 µg/kg within CADS; the total DDx slightly exceeded the ER-L (1.58 µg/kg) at CADS-3 with a reported value of 1.72 µg/kg. DDD ranged from 0.36 to 1.69 µg/kg at CADS and was not detected at the reference stations. DDE and DDT were not detected at CADS or the reference areas.

All other analyzed pesticides, including total chlordane and dieldrin, were not detected at any sample location, however, given dieldrin's low ER-L of 0.02 µg/kg, all stations within CADS and the reference areas exceeded the ER-L due to the detection limit being more than twice the ER-L.

3.2.7 Benthic Community Statistics

Benthic biology samples for characterization of the benthic infaunal community were collected from a total of twelve locations: six within the CADS site and six from the reference areas (3 from WREF and 3 from EREF). A total species richness of 81 was calculated; 50 taxa were identified from the CADS samples and 67 taxa were identified from the two reference site locations. The mean species richness was 24 species at reference stations and 36 species from the disposal site stations. Average density was 5,467 individuals/m^2 for the CADS locations and 22,496 individuals/m^2 for the reference areas, with a similar mean Shannon-Weiner (Log_2) diversity (H') at the reference and disposal site locations (3.52 and 3.17, respectively). Pileou's Evenness (J′) averaged 0.77 for CADS stations and 0.61 for the reference areas. A mean of 7.14 and 7.62 Fisher's alpha were calculated at the CADS area and reference areas, respectively. The benthic community univariate metrics calculated are displayed for the CADS stations and reference areas in Table 3-6.

Bray-Curtis multivariate calculation (with 4^{th} root transformation) and graphic representation were used to compare the overall benthic infaunal community similarity of the reference and disposal site station locations. The results suggested that the reference areas and CADS benthic infaunal communities displayed some dissimilarities based on benthic

biodiversity (Figure 3-22). The reference stations were approximately 65% similar to each other, while the EREF stations exhibited the most similarity amongst each other, at approximately 80% or greater. All stations within the CADS area were nearly 50% similar, with CADS-3 and -6 being most comparable at approximately 70%. The results demonstrated an approximate 40% similarity between the CADS area stations and reference site stations. Statistical significance of these metrics in the cluster analysis of the reference and CADS stations are indicated by the lines in Figure 3-23. Non-metric, multidimensional scaling of 4th root transformed abundance of projected similarity data showed grouping results based on Bray-Curtis similarity with both the CADS and reference stations depicting similar likeness results. All CADS site stations are 40-60% similar, while all reference site stations are 60-80% similar. CADS stations are grouped with CADS-2, -3, and -6 displaying 60% or greater similarity among each other. CADS-4 and -5 are also approximately 60% similar. CADS-1 appears to be the most dissimilar to other stations within the disposal site, though is still correlated to the five other stations by about 40%. WREF-2 is shown as the most dissimilar when compared to the other reference area stations, though it is still approximately 60% similar. EREF-1 and 2 are the most similar, at an approximate 80%.

3.2.8 Trophic Groupings

Trophic guild analysis showed that the disposal site stations were dominated by subsurface deposit, followed by surface deposit and omnivores/scavenger feeding polychaetes. Reference area stations were also dominated by surface and subsurface deposit feeders, though interface feeding amphipods were the most abundant species identified among the stations analyzed. The subsurface deposit feeding polychaete, *Prionospio steenstrupi,* was the most dominant species identified within the six CADS stations, followed by polychaete *Nephtys picta*, which is classified as an omnivore/scavenger. Other dominant species identified within CADS included subsurface deposit feeding polychaetes *Spiophanes bombyx*, *Spio setosa,* and *Heteromastus filiformis*, and surface deposit feeding polychaetes *Tharyx acutus* and *Aricidea* spp. Aside from the abundant interface feeding amphipod, *Ampelisca* spp., other dominant species identified at the reference stations included multiple species of the surface deposit feeding polychaete family Cirratulidae, soft sediment burrowing polychaete *Cossura longicirrata* (subsurface deposit feeder), and tube building head-down deposit feeders (subsurface deposit feeders) polychaetes from the Maldanidae family (*Clymenella torquata* and unidentifiable juveniles). These data are summarized in Tables 3-7 and 3-8, Figures 3-24 and 3-25, and Appendix D. The aforementioned species were consistently within the respective top ten dominant taxa identified from stations sampled within both reference and disposal site areas. Though polychaetes were the dominant taxa identified, additional taxa from phyla Crustacea (amphipoda, cumacea) and Mollusca (bivalvia) were frequently identified throughout the sampled area.

3.3 Underwater Video Survey

The underwater video survey was composed of three transects – one video transect collected within CADS and two collected from reference area WREF. The transect taken at CADS ran through the northwestern sector of the site in the vicinity of stations CADS-1, -2 and -3. At WREF, two transects were taken – one in the southwestern corner and the second running through the northeastern corner, continuing outside of the reference area. The video footage was analyzed to classify substrate and note any benthic fauna. Footage of CADS confirmed the variable substrates of the area, including silt and sand and areas of gravel with cobble. Video of WREF also confirmed variable substrates, including silt, sand, cobble, and gravel as well as areas of bedrock outside the reference area. Figures 3-26 and 3-27 and Appendix E summarize the findings from the underwater video analysis.

Table 3-1.

Grain Size Data for CADS and Reference Area Sediment Samples

Sample ID	Cobble	Gravel	Sand	Silt+Clay
Site		**Percent (%)**		
CADS-1	--	2.6	68.6	28.8
CADS-2	--	0.0	79.2	20.8
CADS-3	--	0.0	58.7	41.3
CADS-4	--	0.2	53.5	46.3
CADS-5*	--	0.0	51.9	48.1
CADS-6	--	0.0	76.9	23.1
Reference Areas				
EREF-1	--	0.9	57.8	41.3
EREF-2	--	6.6	69.5	23.9
EREF-3	--	4.4	52.7	42.9
WREF-1	--	0.0	67.7	32.3
WREF-2	--	2.9	56.6	40.5
WREF-3	--	0.3	46.0	53.7

*Field Duplicate, average of two samples

Table 3-2.

Total Organic Carbon in CADS and Reference Area Sediment Samples

	Total Organic Carbon %				
Area	**n**	**MIN**	**MAX**	**Mean**	**StdDev**
Site	6	0.33	1.40	0.92	0.49
Reference	6	0.65	1.30	1.00	0.28

Notes:
1. Duplicates are averaged.

Table 3-3.

Sediment Chemistry Results Summary

Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury	Total PCBs	Total DDx	Total LMW PAHs	Total HMW PAHs	Total PAHs
	mg/kg								µg/kg				
Site													
CADS-1	2.41	0.139	11.8	4.63	6.30	5.99	19.4	0.0330	3.31 U	0.701	64.7	414	479
CADS-2	1.56	0.103	9.39	2.68	4.19	4.70	14.5	0.0220	3.33 U	0.388	46.4	248	295
CADS-3	4.05	0.397	25.8	8.32	15.2	11.2	40.9	0.0590	5.56 J	**1.72**	111	700	811
CADS-4	4.11	0.438	24.3	8.40	16.7	11.5	39.3	0.0610	4.64 U	1.36	100	591	691
CADS-5*	4.35	0.391	22.7	8.41	16.6	11.1	39.0	0.0815	4.98	1.15	114	739	853
CADS-6	2.18	0.222	11.5	3.78	6.17	5.52	20.5	0.0270	3.50 U	0.502	55.4	323	379
Reference													
EREF-1	**8.80**	0.0390	24.0	6.96	15.4	13.8	36.3	0.0340	4.35 U	0.0495	36.7	223	259
EREF-2	7.01	0.0240	18.6	4.38	9.95	10.2	25.1	0.0200	3.55 U	0.0410	21.1	113	134
EREF-3	7.91	0.0520	24.3	6.81	14.7	14.4	35.3	0.0300	4.29 U	0.0480	28.3	166	194
WREF-1	6.51	0.0360	17.1	4.68	10.6	10.1	25.8	0.0190	3.74 U	0.0430	25.6	141	167
WREF-2	6.64	0.0530	18.8	5.39	11.6	10.5	27.5	0.0240	3.84 U	0.0470	32.4	192	225
WREF-3	**8.25**	0.102	21.5	6.85	14.2	12.2	36.6	0.0350	4.70 J	0.0510	42.9	275	318
Sediment Screening Values (a)													
ER-L	**8.2**	**1.2**	**81**	**34**	**46.7**	**20.9**	**150**	**0.15**	**22.7**	**1.58**	**552**	**1,700**	**4,022**
ER-M	**70**	**9.6**	**370**	**270**	**218**	**51.6**	**410**	**0.71**	**180**	**46.1**	**3,160**	**9,600**	**44,792**

Notes:
ER-L - Effects Range Low
ER-M - Effects Range Median
HMW - High Molecular Weight
LMW - Low Molecular Weight
mg/kg – milligrams per kilogram
µg/kg – micrograms per kilogram

PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated biphenyls
J – Estimated
U - Not Detected (reported at 1/2 method detection limit)
Totals for non-detects were calculated using 1/2 the method detection limit for non-detects
Total PCBs calculated as the sum of the 18 NOAA congeners multiplied by 2
Total DDx is the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'DDT.

Concentration exceeds ERL screening value
Concentration exceeds the ERM screening value
(a) Marine sediment screening values obtained from Long, et al. (1995) and Buchman (2008)
*Field Duplicate, average of two samples

Table 3-4.

Metals in CADS and Reference Area Sediment Samples

	Arsenic mg/kg					Cadmium mg/kg					Chromium mg/kg					Copper mg/kg				
Area	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**
Site	6	1.6	4.4	3.1	1.2	6	0.10	0.44	0.28	0.15	6	9.4	26	18	7.4	6	2.7	8.4	6.0	2.6
Reference	6	6.5	8.8	7.5	0.90	6	0.020	0.10	0.050	0.030	6	17	24	21	3.0	6	4.4	7.0	5.8	1.2

	Lead mg/kg					Mercury mg/kg					Nickel mg/kg					Zinc mg/kg				
Area	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**
Site	6	4.2	17	11	5.9	6	0.022	0.082	0.047	0.020	6	4.7	12	8.3	3.2	6	15	41	29	12
Reference	6	10	15	13	2.3	6	0.019	0.035	0.027	0.010	6	10	14	12	1.9	6	25	37	31	5.5

Notes:
1. Duplicates are averaged.

Table 3-5.

Total PAHs and High and Low Molecular Weight PAHs, Total PCBs, and Total DDX in CADS and Reference Area Sediment

	Total PAHs[1] µg/kg					Total LMW PAHs[2] µg/kg					Total HMW PAHs[3] µg/kg				
Area	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**
Site	6	295	853	584	233	6	46.4	114	81.9	29.9	6	248	739	503	204
Reference	6	134	318	216	66.1	6	21.1	42.9	31.2	7.89	6	113	275	185	58.3

	Total PCBs[4] µg/kg					Total DDx[5] µg/kg				
Area	**n**	**MIN**	**MAX**	**Mean**	**StdDev**	**n**	**MIN**	**MAX**	**Mean**	**StdDev**
Site	6	3.31	5.56	4.22	0.968	6	0.387	1.72	0.971	0.527
Reference	6	3.55	4.70	4.07	0.437	6	0.0410	0.0510	0.0466	0.00385

Notes:

1. Total PAHs is the sum of the 18 PAH compounds analyzed (naphthalene, 2-methylnaphthalene, 1-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, anthracene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene). Non-detected compounds were summed using ½ the MDL.
2. Total LMW PAHs is the sum of the 8 PAH compounds analyzed (1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene). Non-detected compounds were summed using ½ the MDL.
3. Total HMW PAHs is the sum of the 10 PAH compounds analyzed (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene). Non-detected compounds were summed using ½ the MDL.
4. Total PCB is the sum of the NOAA 18 congeners multiplied by 2. Non-detected congeners were summed using ½ the method detection limit (MDL).
5. Total DDx is the sum of 4,4’-DDD, 4,4’-DDE, and 4,4’DDT. Non-detected compounds were summed using ½ the MDL.
6. Duplicates are averaged.

Table 3-6.

Summary of Benthic Biology Community Parameters for CADS and Reference Stations, September 2020

Sample	No. of Species	Abundance (0.04 m^2)	Individuals/ m^2	Shannon's H' (log2)	Pielou's J'	Fisher's alpha
Site						
CADS-1	30	256	6,400	3.36	0.685	8.90
CADS-2	23	160	4,000	3.63	0.802	7.72
CADS-3	23	333	8,325	3.18	0.702	5.61
CADS-4	20	150	3,750	3.65	0.844	6.39
CADS-5	21	168	4,200	3.69	0.840	7.22
CADS-6	25	245	6,125	3.59	0.773	7.00
Average	24	219	5,467	3.52	0.774	7.14
Minimum	20	150	3,750	3.18	0.685	5.61
Maximum	30	333	8,325	3.69	0.844	8.90
Reference						
EREF-1	41	1,147	28,675	3.31	0.619	8.42
EREF-2	36	812	20,300	3.41	0.659	7.89
EREF-3	36	729	18,225	3.49	0.675	8.07
WREF-1	33	798	19,950	2.81	0.557	7.02
WREF-2	30	935	23,375	2.98	0.607	5.94
WREF-3	40	978	24,450	3.05	0.573	8.40
Average	36	900	22,496	3.17	0.615	7.62
Minimum	30	729	18,225	2.81	0.557	5.94
Maximum	41	1,147	28,675	3.49	0.675	8.42

Table 3-7.

List of Major Species in Trophic Faunal Groupings

Trophic Group	Taxonomic Group	Species
Suspension feeders	Bivalvia	*Thyasira gouldii*
		Periploma papyratium
		Parvicardium pinnulatum
	Polychaeta	*Euchone elegans*
Interface feeders	Amphipoda	*Ampelisca* spp.
		Lysianassidae spp.
	Cumacea	*Diastylis sculpta*
Surface deposit feeders	Polychaeta	*Tharyx acutus*
		Cirratulus cirratus
		Apistobranchus tullbergi
		Aricidea spp.
Omnivores/Scavengers	Polychaeta	*Nephtys picta*
		Ninoe nigripes
		Nephtys caeca
		Exogone spp.
	Oligochaeta	*Oligochaeta* spp.
Predators	Nemertea	*Cerebratulus lacteus*
	Polychaeta	*Hypereteone heteropoda*
		Phyllodoce mucosa
Subsurface deposit feeders	Polychaeta	*Prionospio steenstrupi*
		Cossura longocirrata
		Heteromastus filiformis
		Clymenella zonalis
		Spio setosa
		Mediomastus ambiseta
		Spiophanes bombyx
		Levinsenia gracilis
	Bivalvia	*Nucula proxima*

Table 3-8.

Summary of Trophic Faunal Groupings at CADS and Reference Stations, September 2020

Sample	Total No. of Organisms	Suspension Feeders	Interface Feeders	Surface Deposit Feeders	Omnivore/ Scavengers	Predators	Subsurface Deposit Feeders
Site							
CADS-1	256	10	3	28	57	4	**154**
CADS-2	160	0	1	16	36	11	**96**
CADS-3	333	4	9	82	10	6	**222**
CADS-4	150	9	4	**87**	35	4	11
CADS-5	168	5	4	7	55	7	**90**
CADS-6	245	0	5	80	38	8	**114**
Reference							
EREF-1	1,147	24	361	**375**	64	13	310
EREF-2	812	28	259	**285**	29	14	197
EREF-3	729	23	41	**391**	36	8	228
WREF-1	798	43	**401**	164	27	9	154
WREF-2	935	7	272	**406**	57	14	179
WREF-3	978	34	**327**	251	34	8	324

Note:
Most abundant faunal group shown in bold.

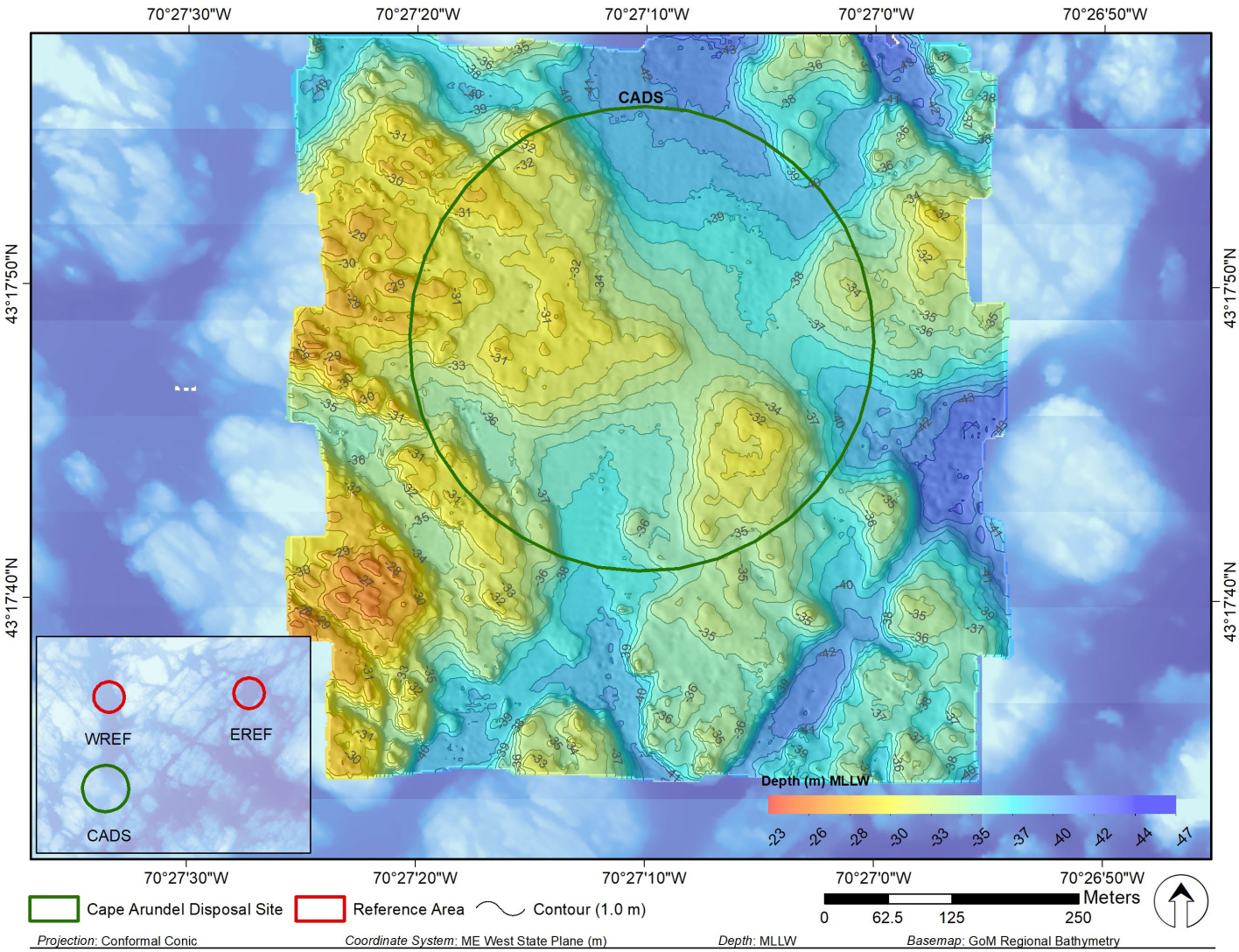


Figure 3-1. Bathymetry of CADS presented over 2x vertical relief model, September 2020.

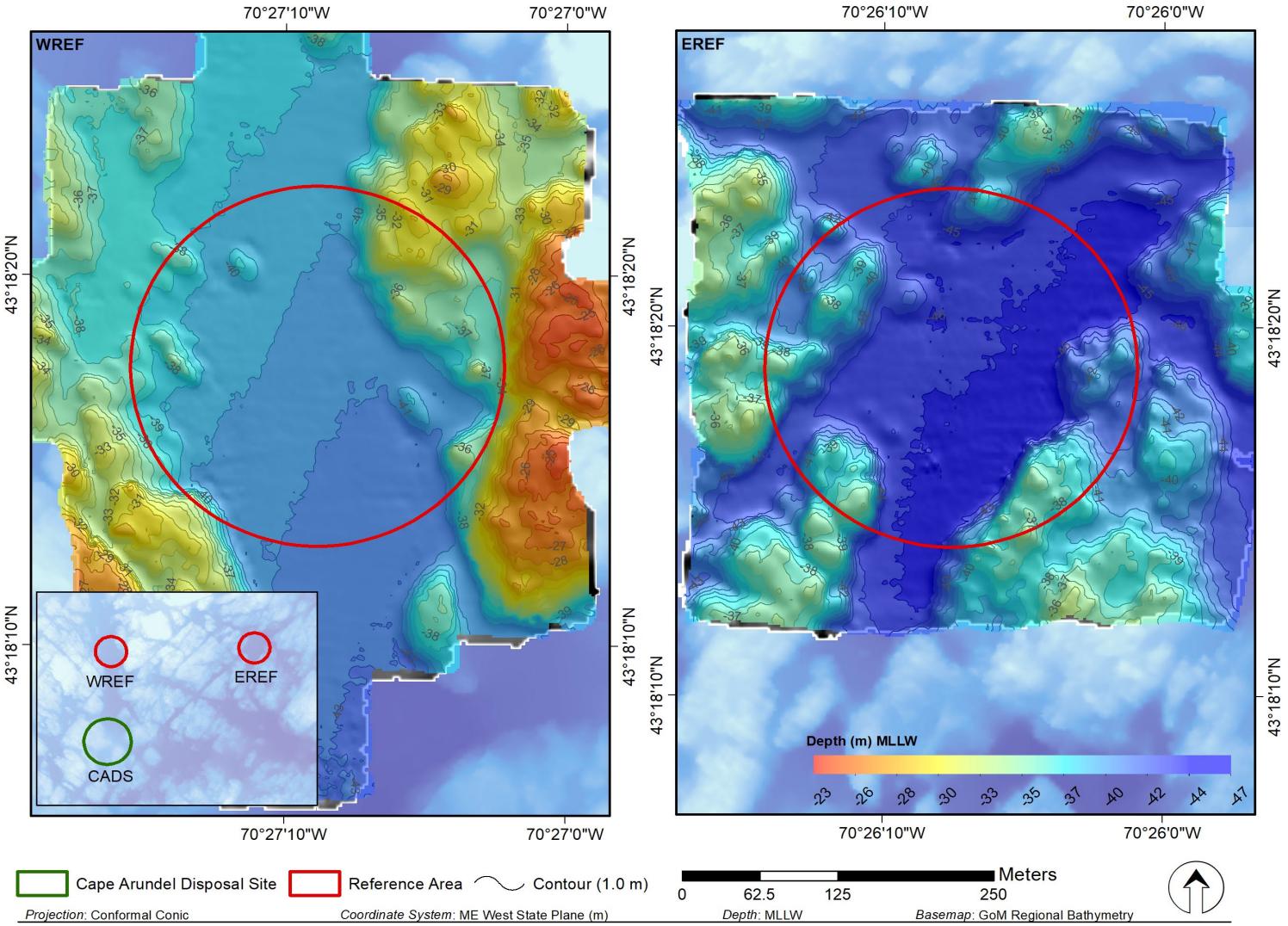


Figure 3-2. Bathymetry of reference areas presented over 2x vertical relief model, September 2020.

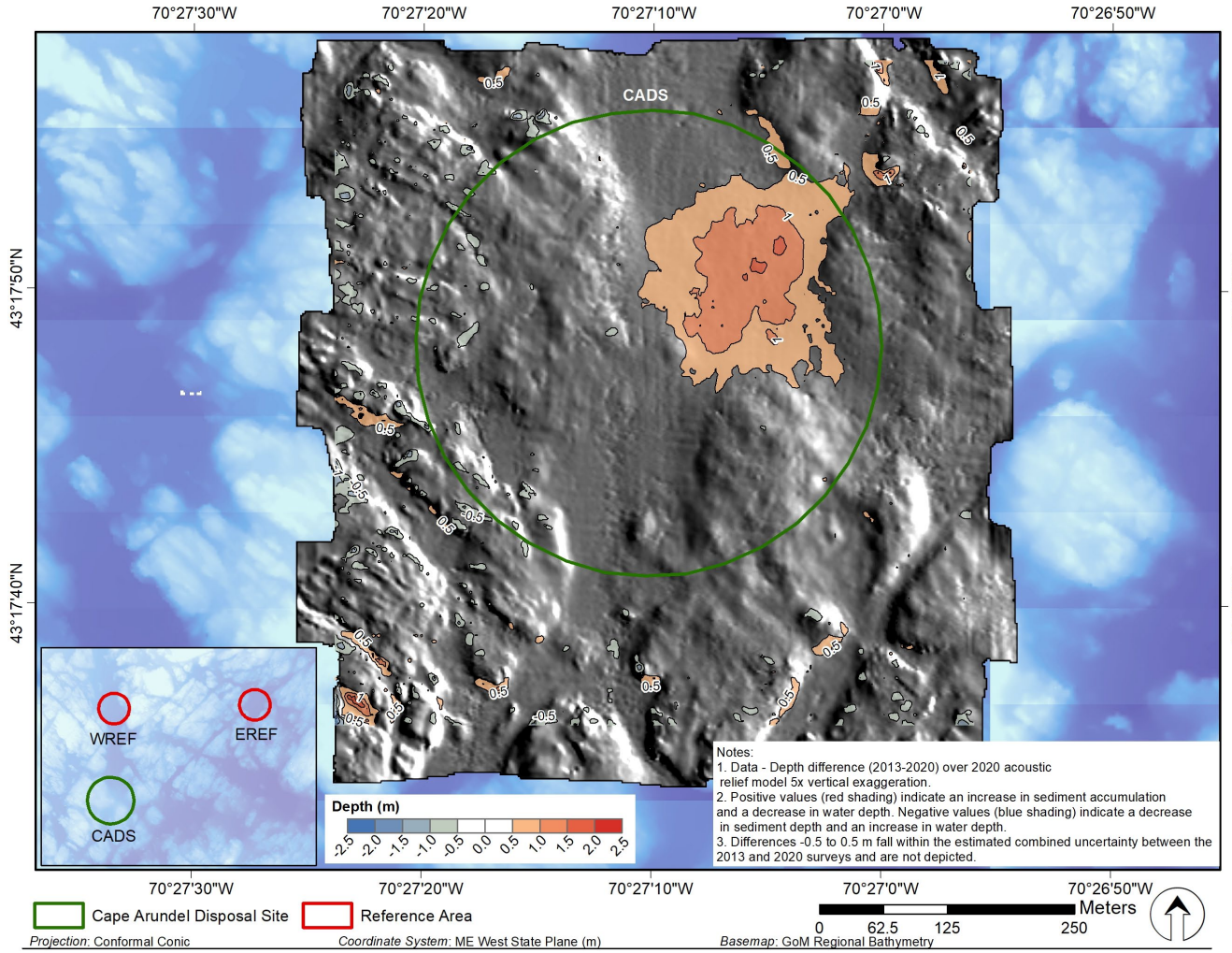


Figure 3-3. Depth Difference (2013 – 2020) of CADS over 2020 acoustic relief model 2x vertical exaggeration, September 2020.

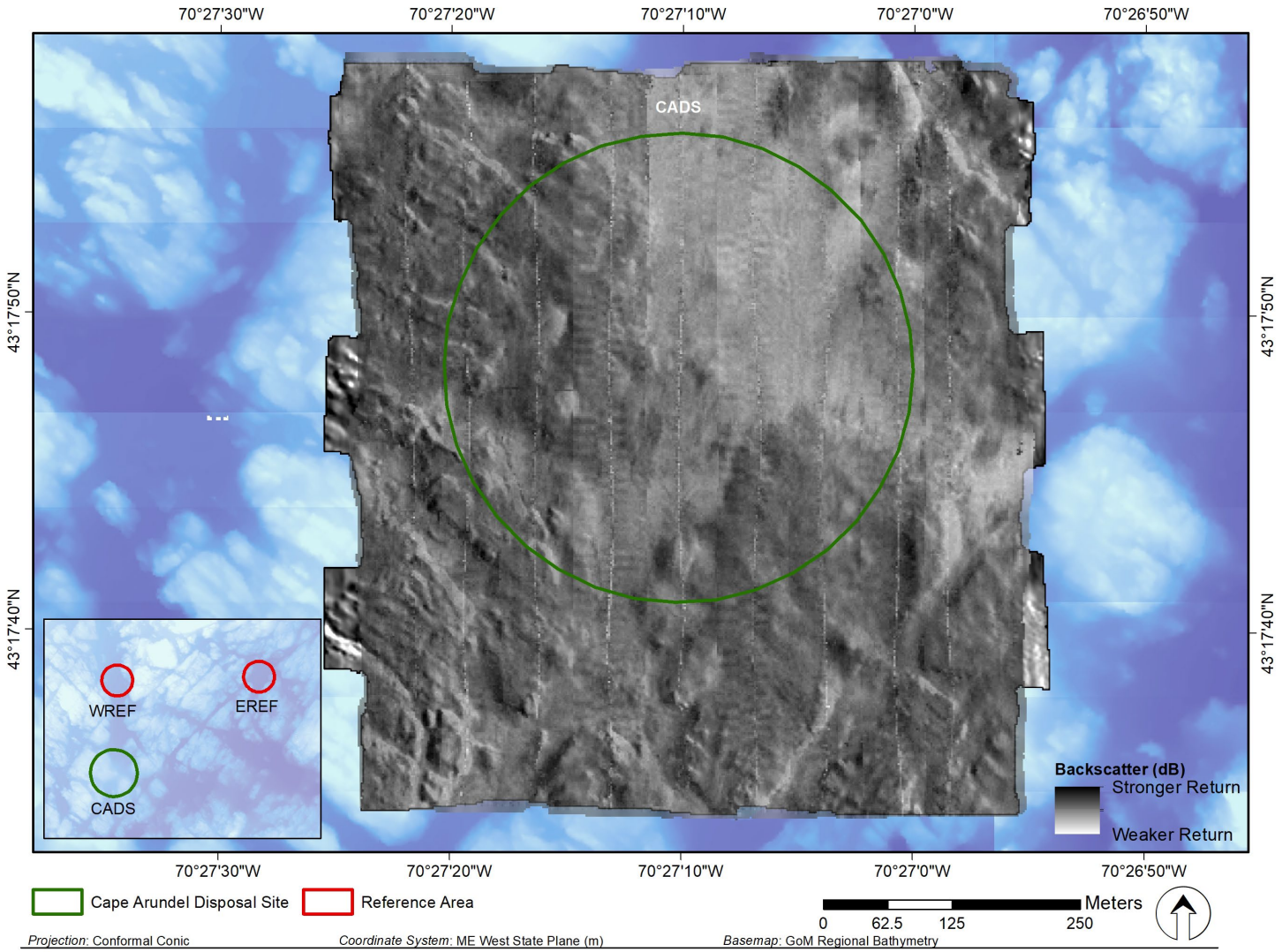


Figure 3-4. Backscatter intensity (dB) at CADS over 2x vertical relief model, 2020.

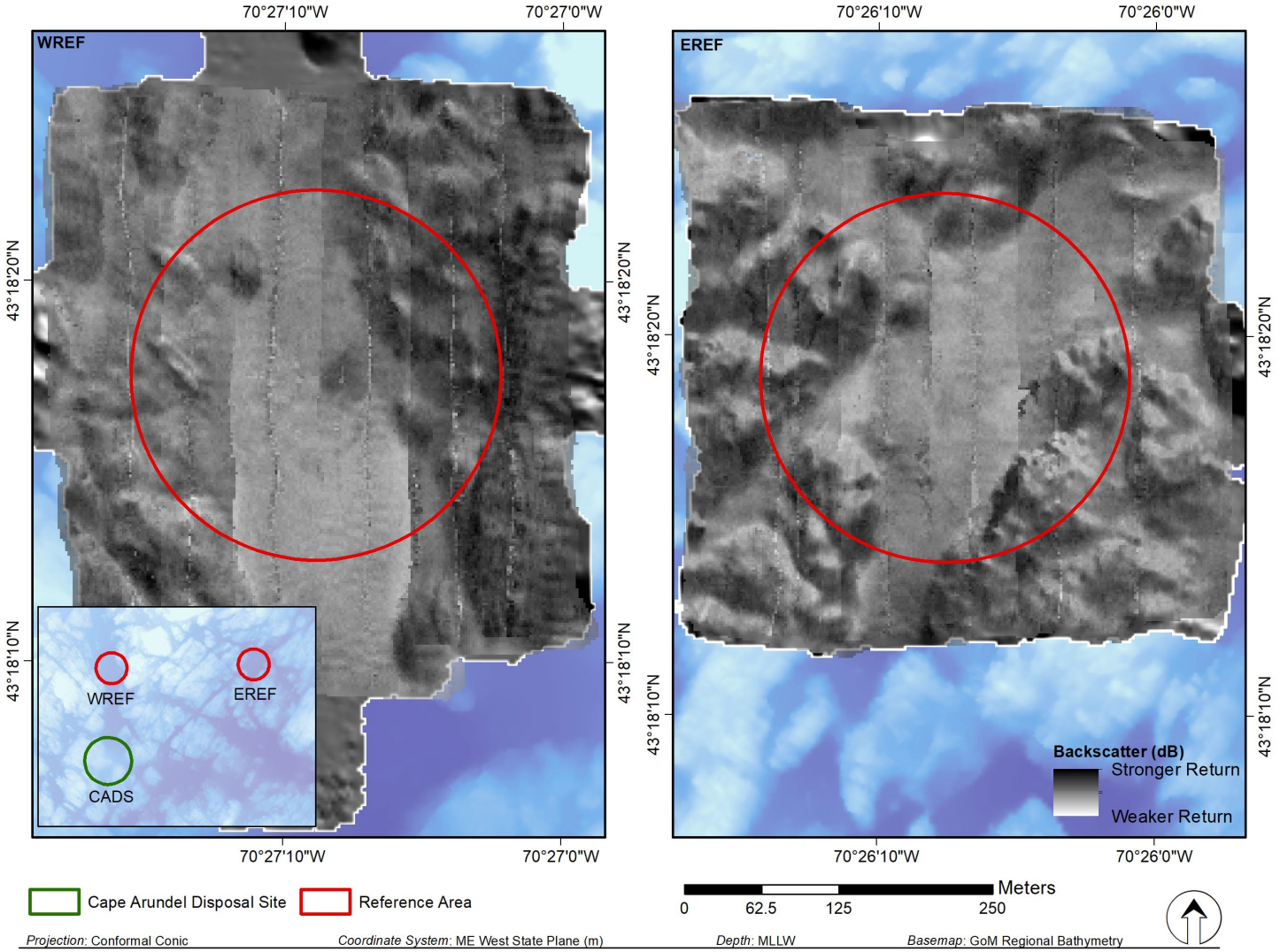


Figure 3-5. Backscatter intensity (dB) at reference areas over 2x vertical relief model, 2020.

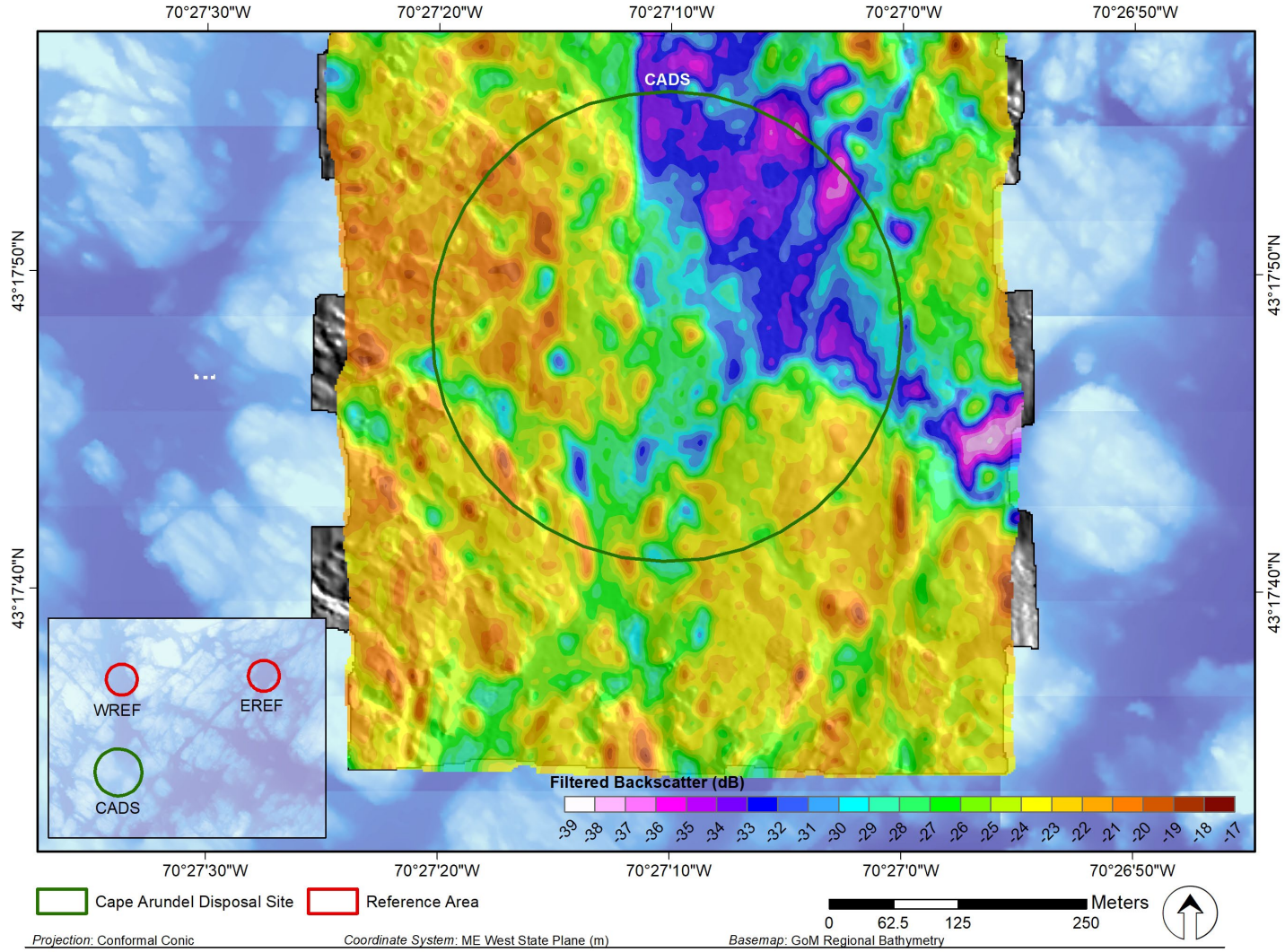


Figure 3-6. Filtered backscatter intensity (dB) at CADS over 2x vertical relief model, 2020.

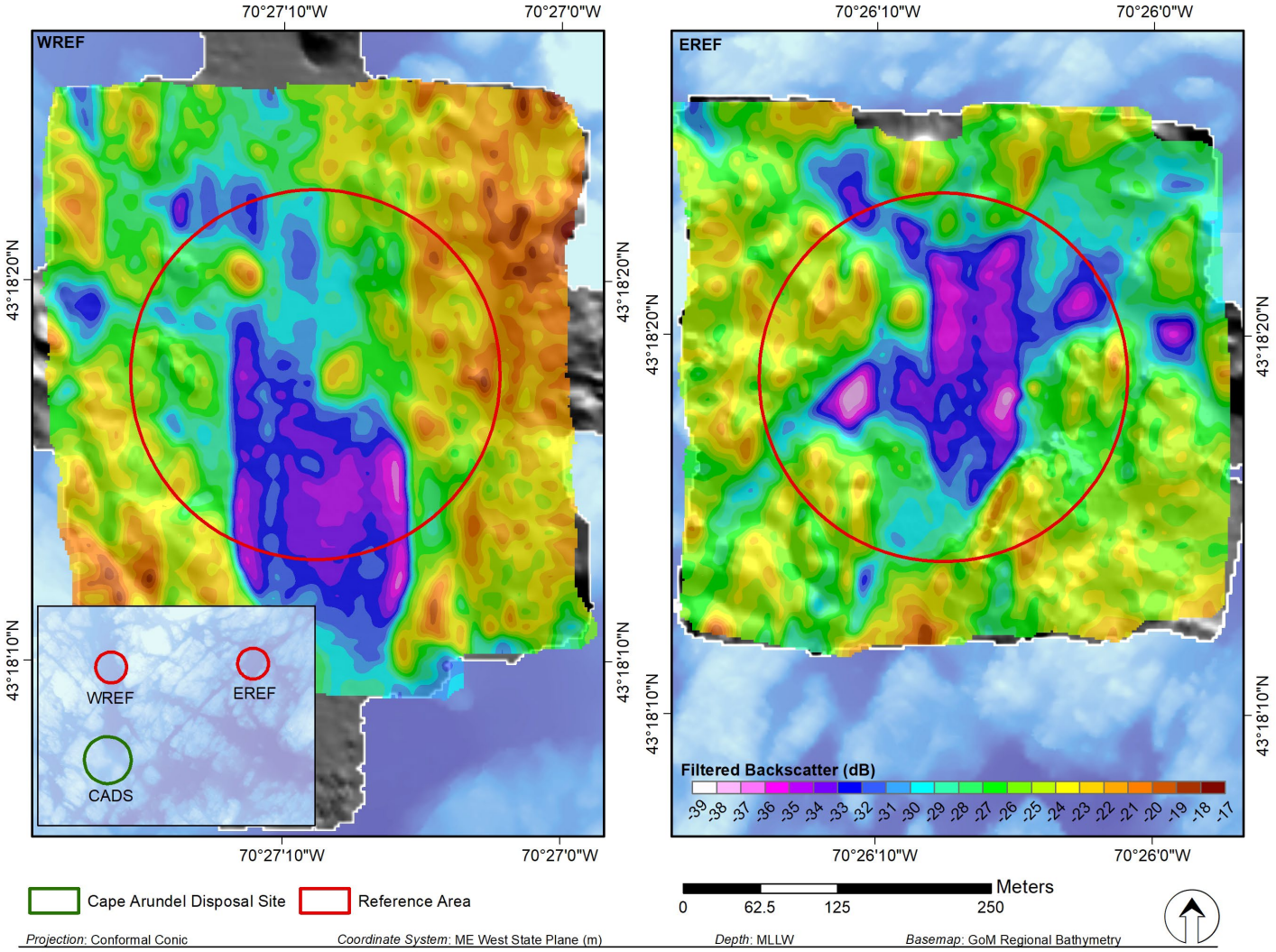


Figure 3-7. Filtered backscatter intensity (dB) at reference areas over 2x vertical relief model, 2020.

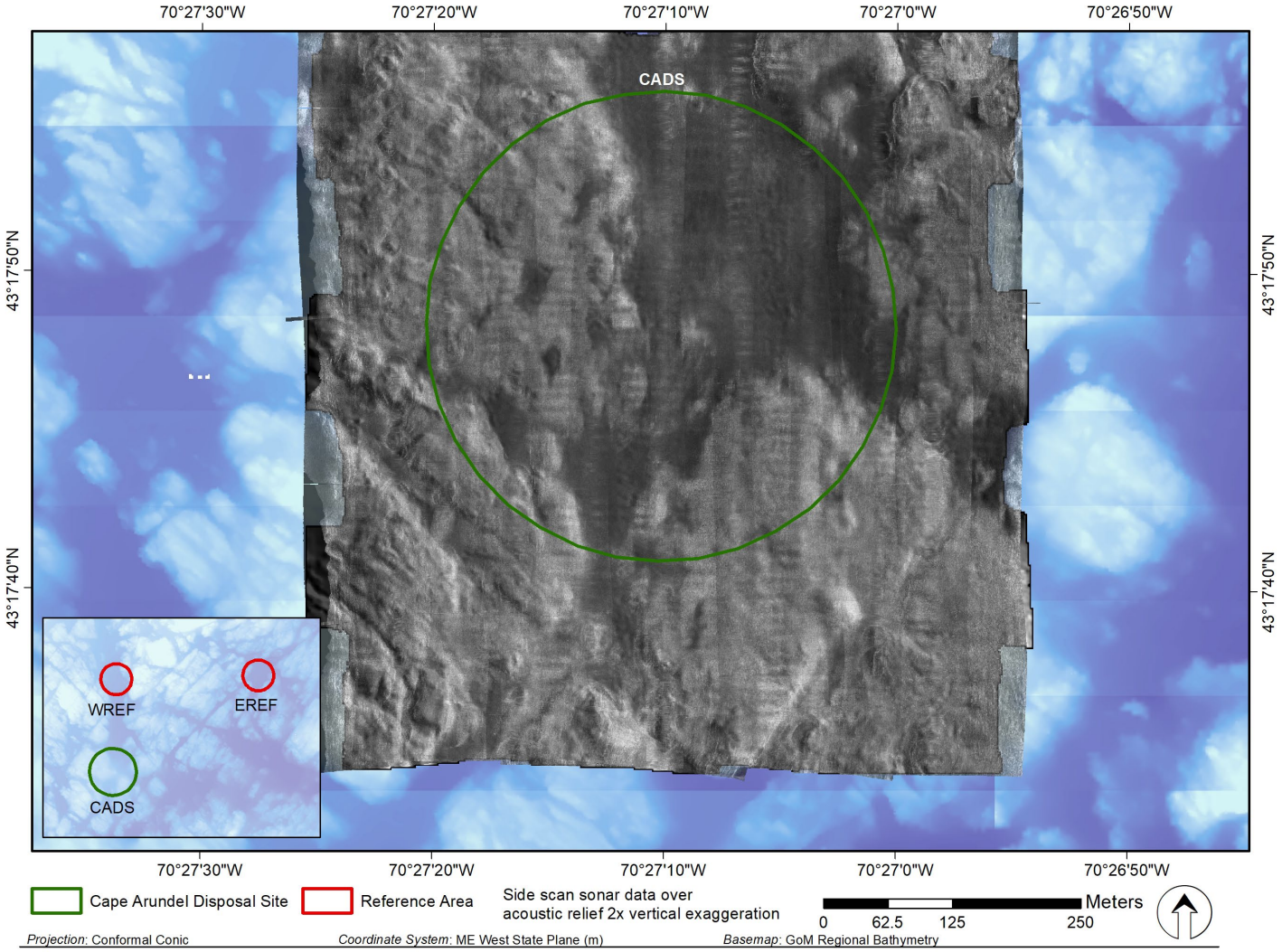


Figure 3-8. Side scan sonar data at CADS over 2x vertical relief model, 2020.

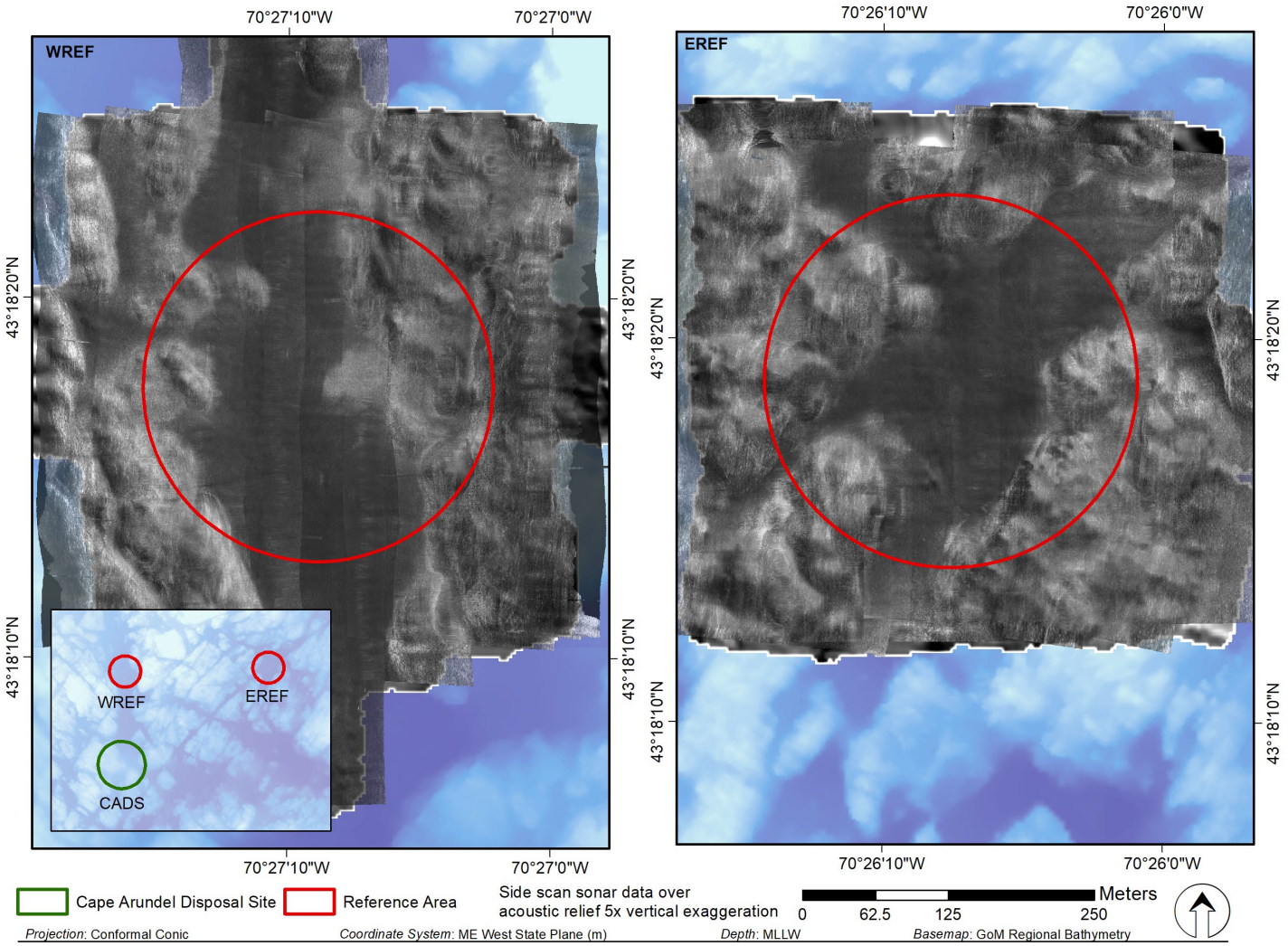


Figure 3-9. Side scan sonar data at reference areas over 2x vertical relief model, 2020.

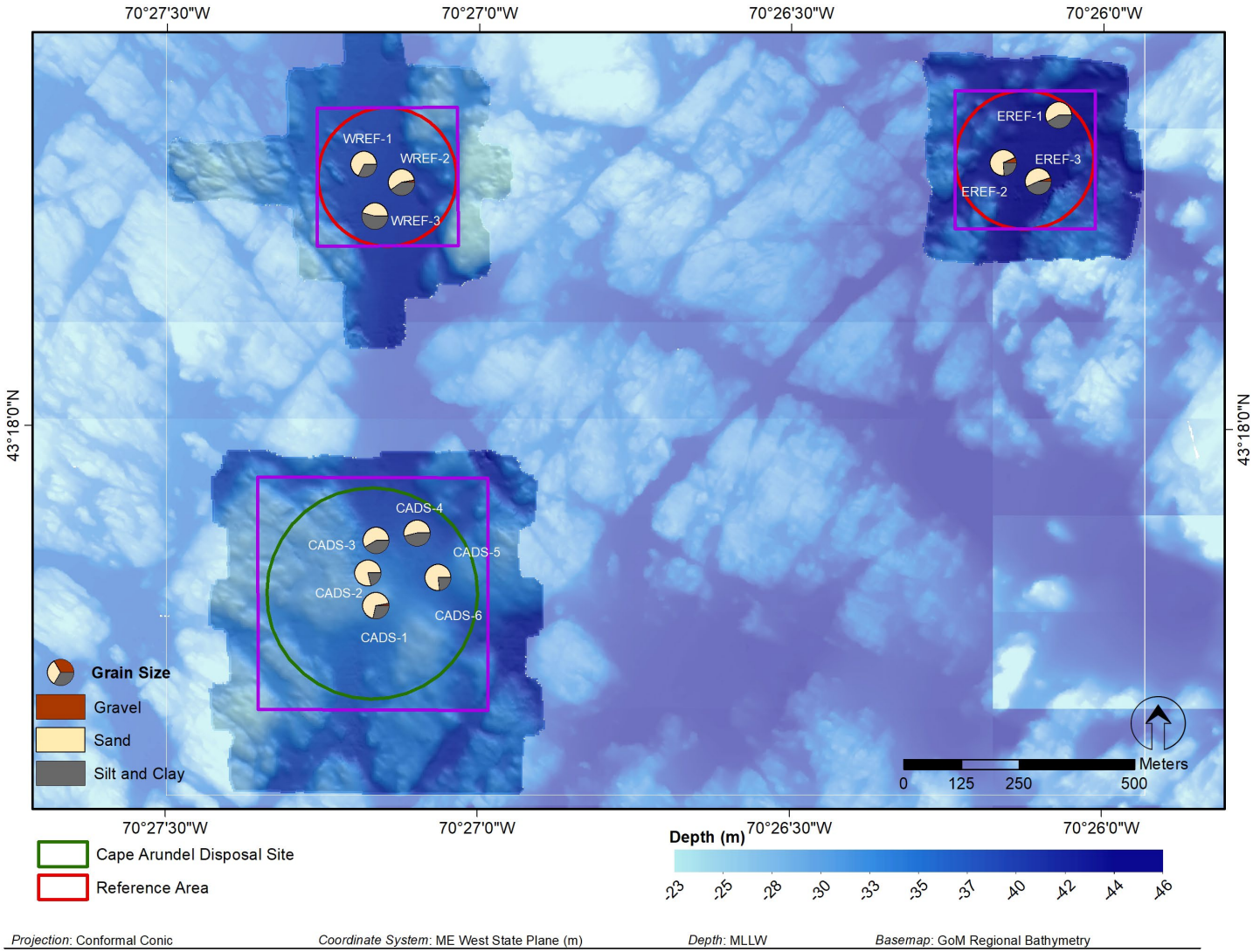
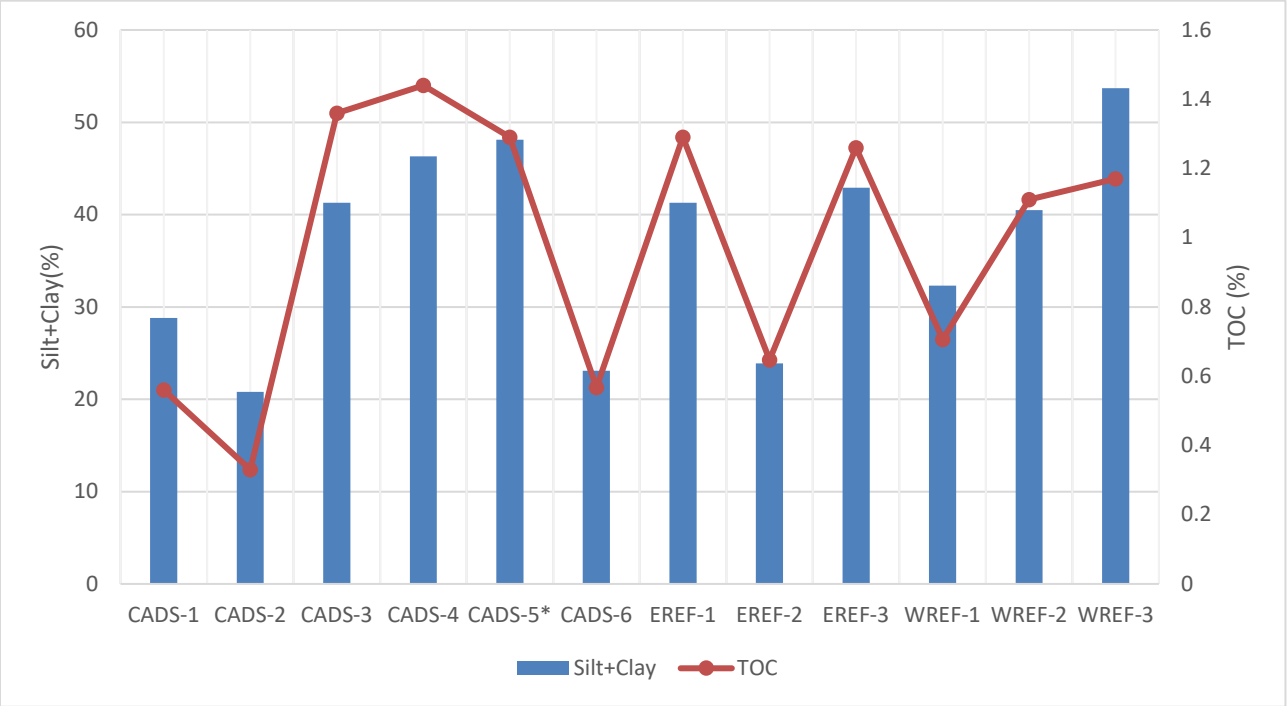


Figure 3-10. Sediment grain size, CADS and reference areas, September 2020.



*Field Duplicate, average of two samples

Figure 3-11. Fines (silt+clay) and TOC relationship, CADS and reference areas, September 2020.

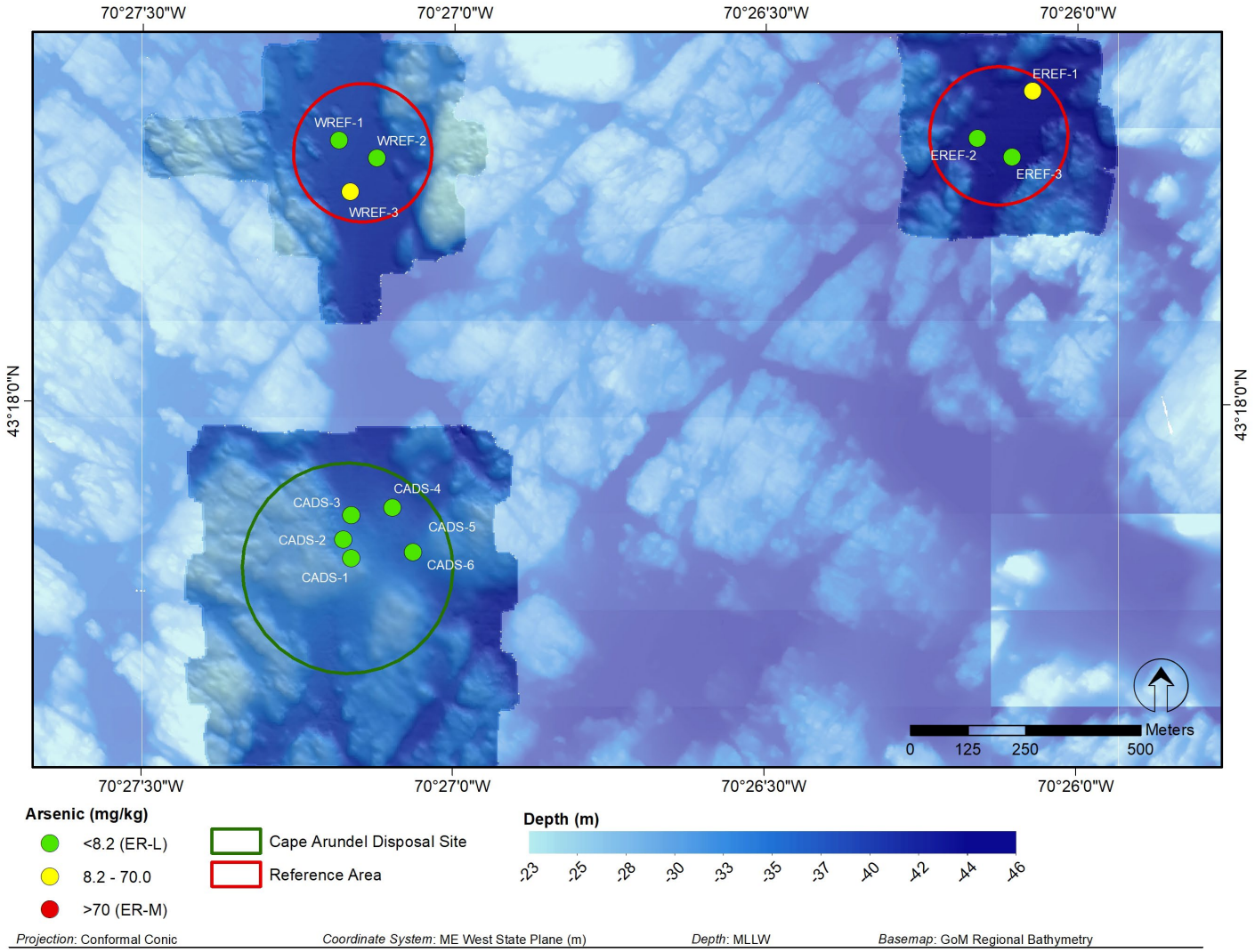


Figure 3-12. Arsenic concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

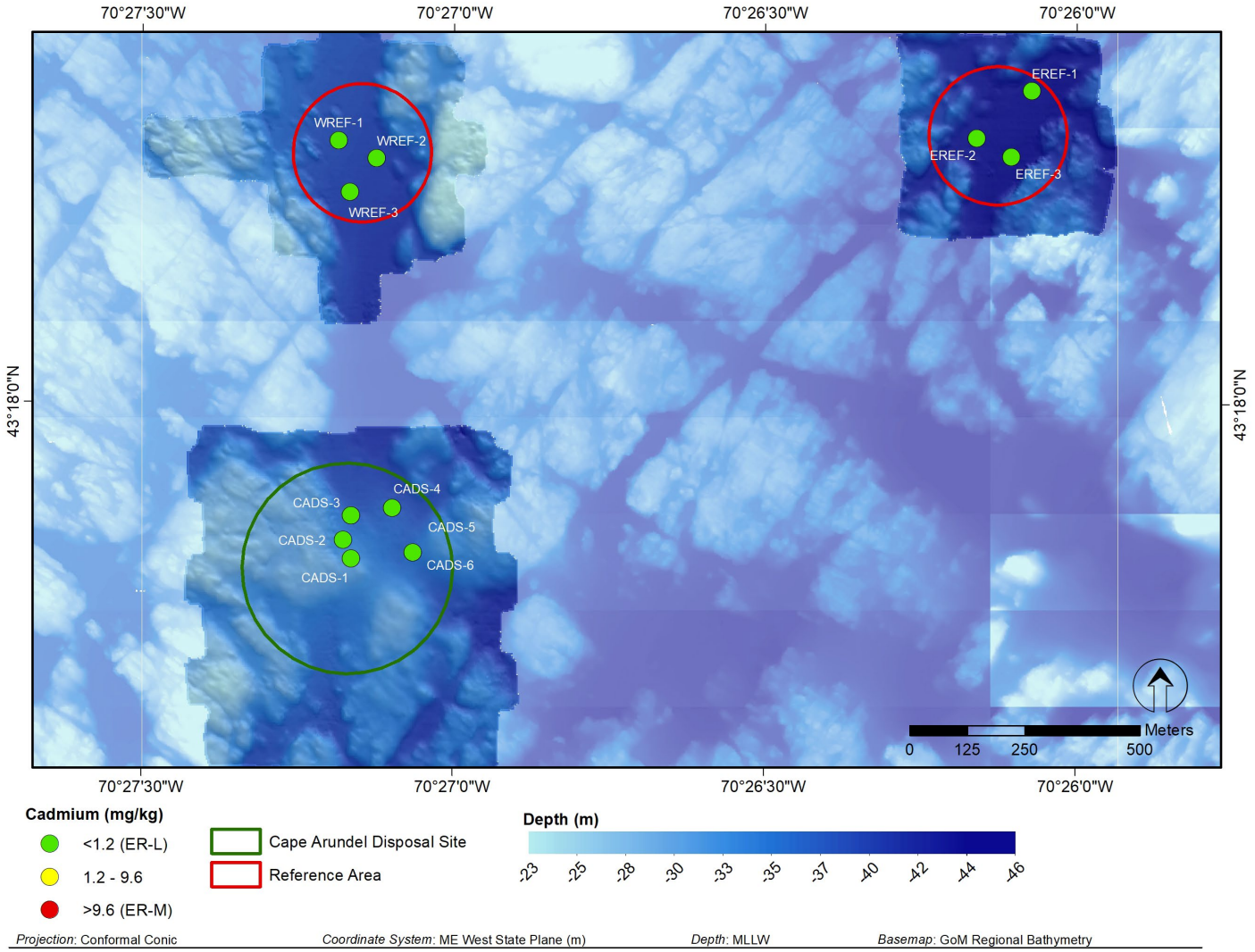


Figure 3-13. Cadmium concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

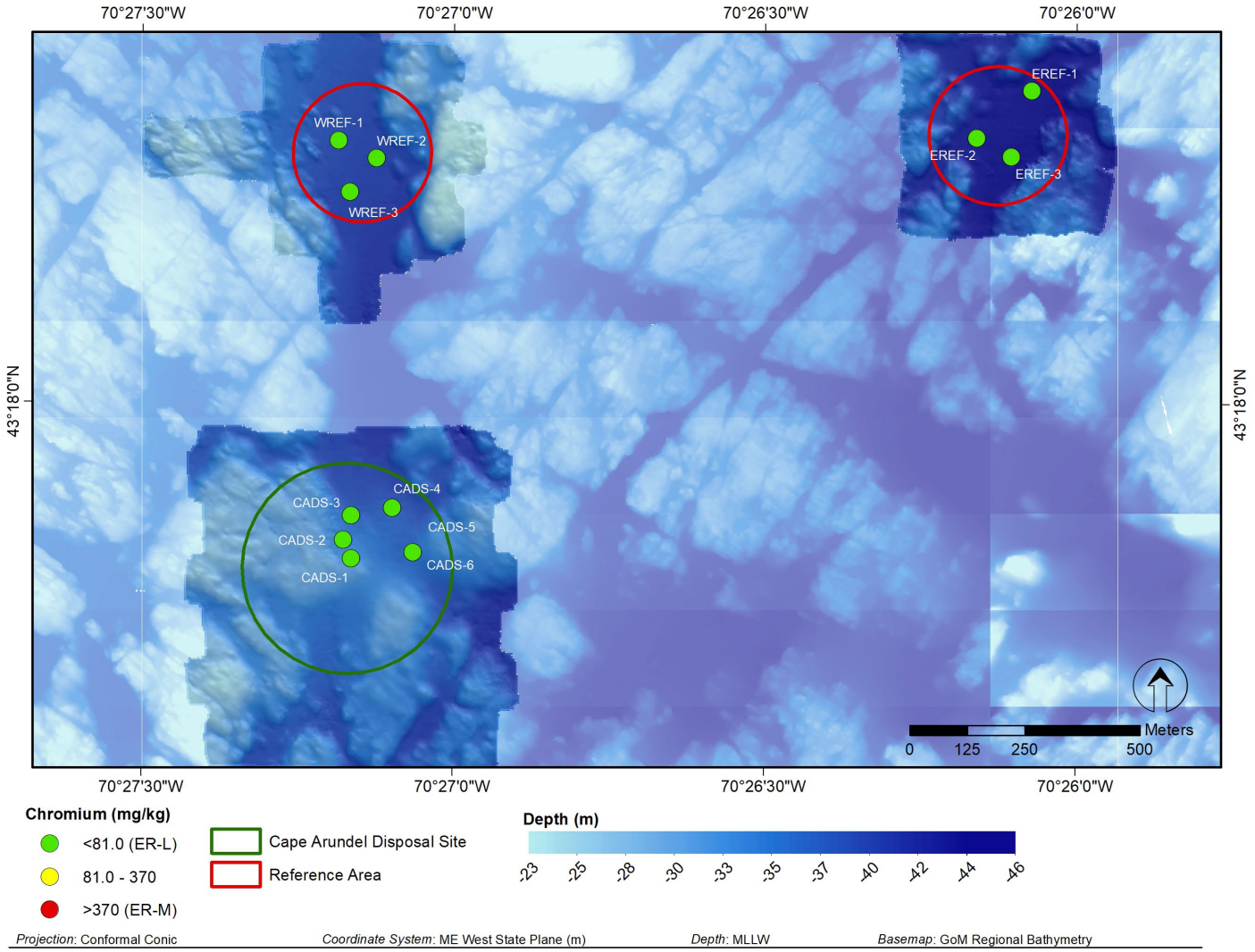


Figure 3-14. Chromium concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

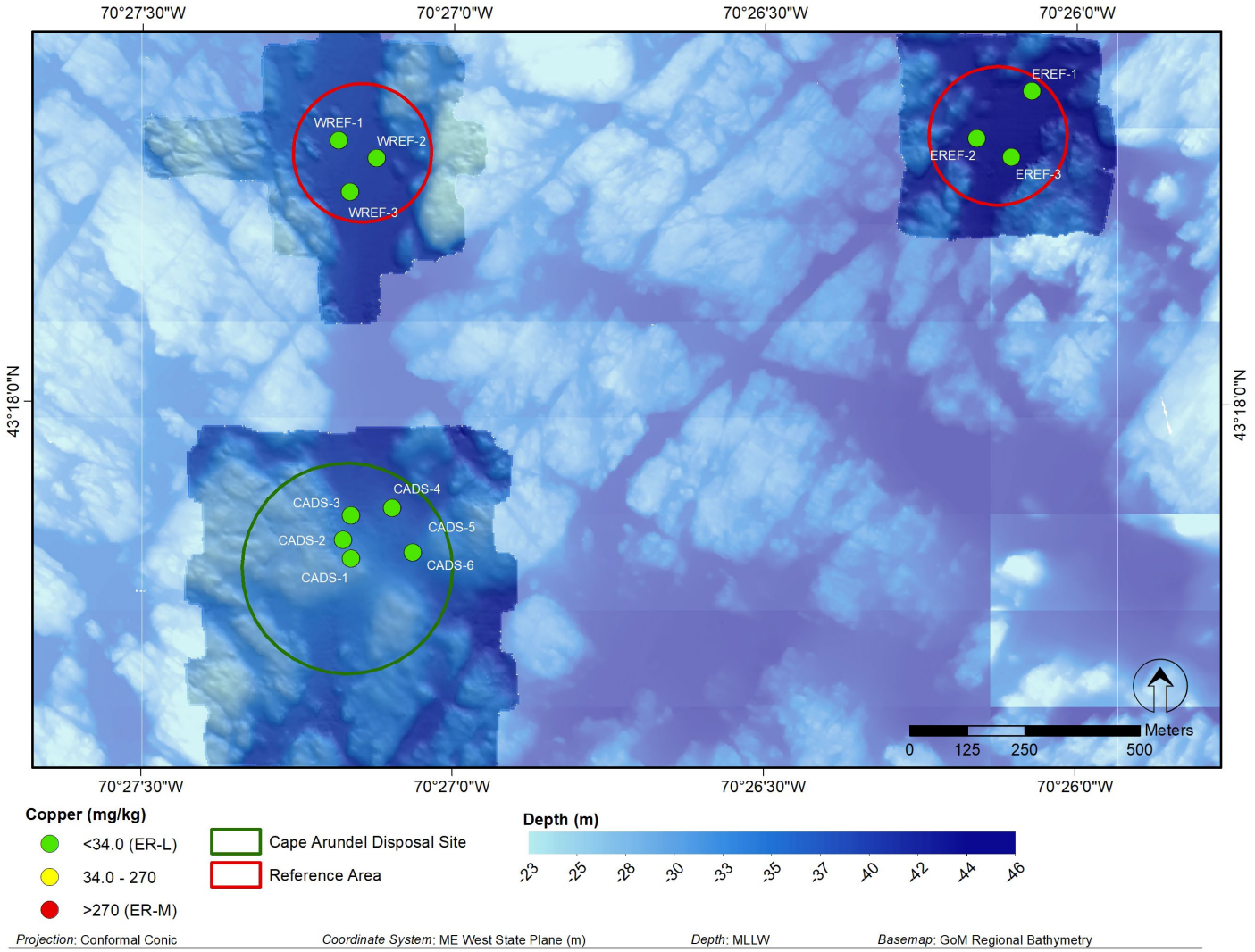


Figure 3-15. Copper concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

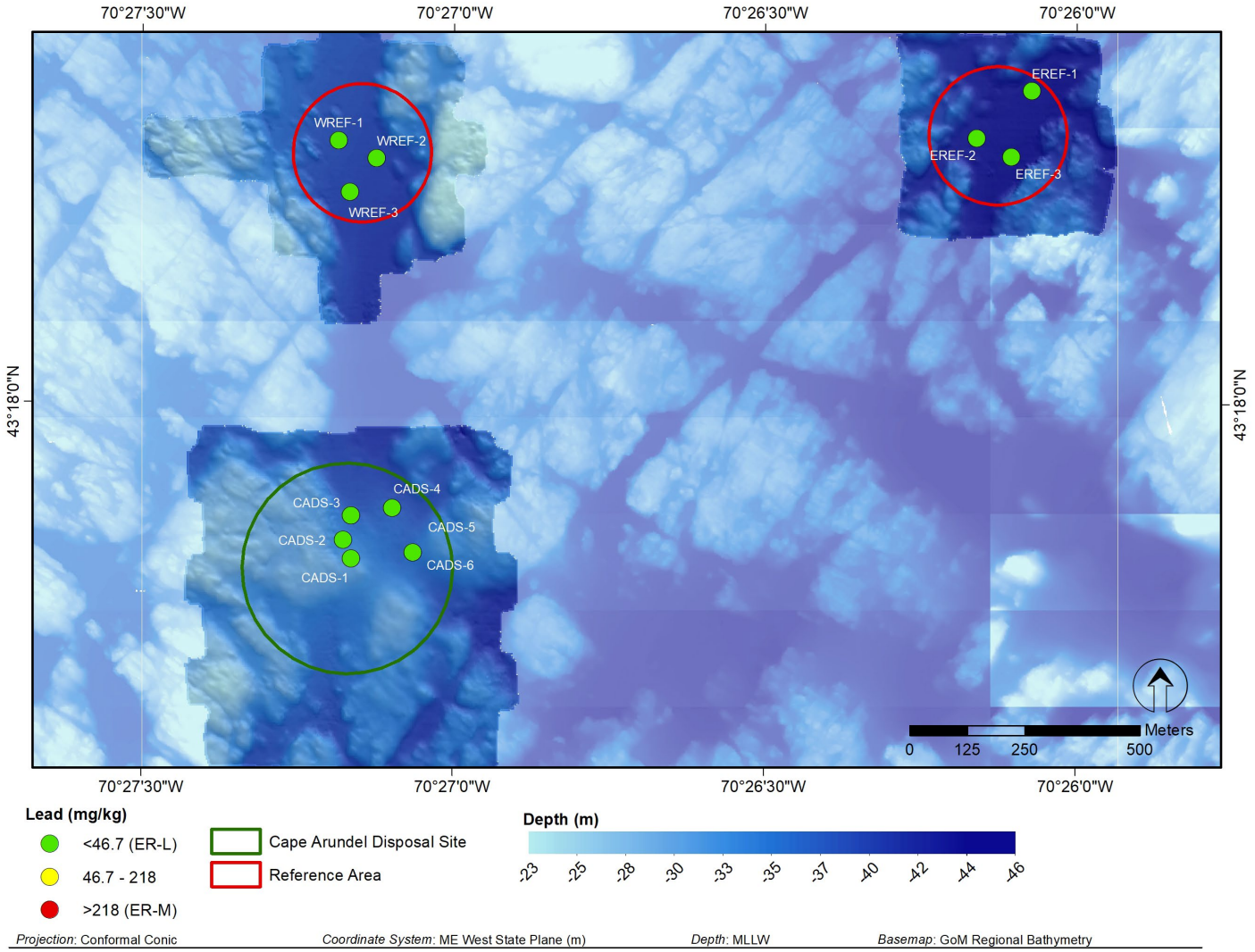


Figure 3-16. Lead concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

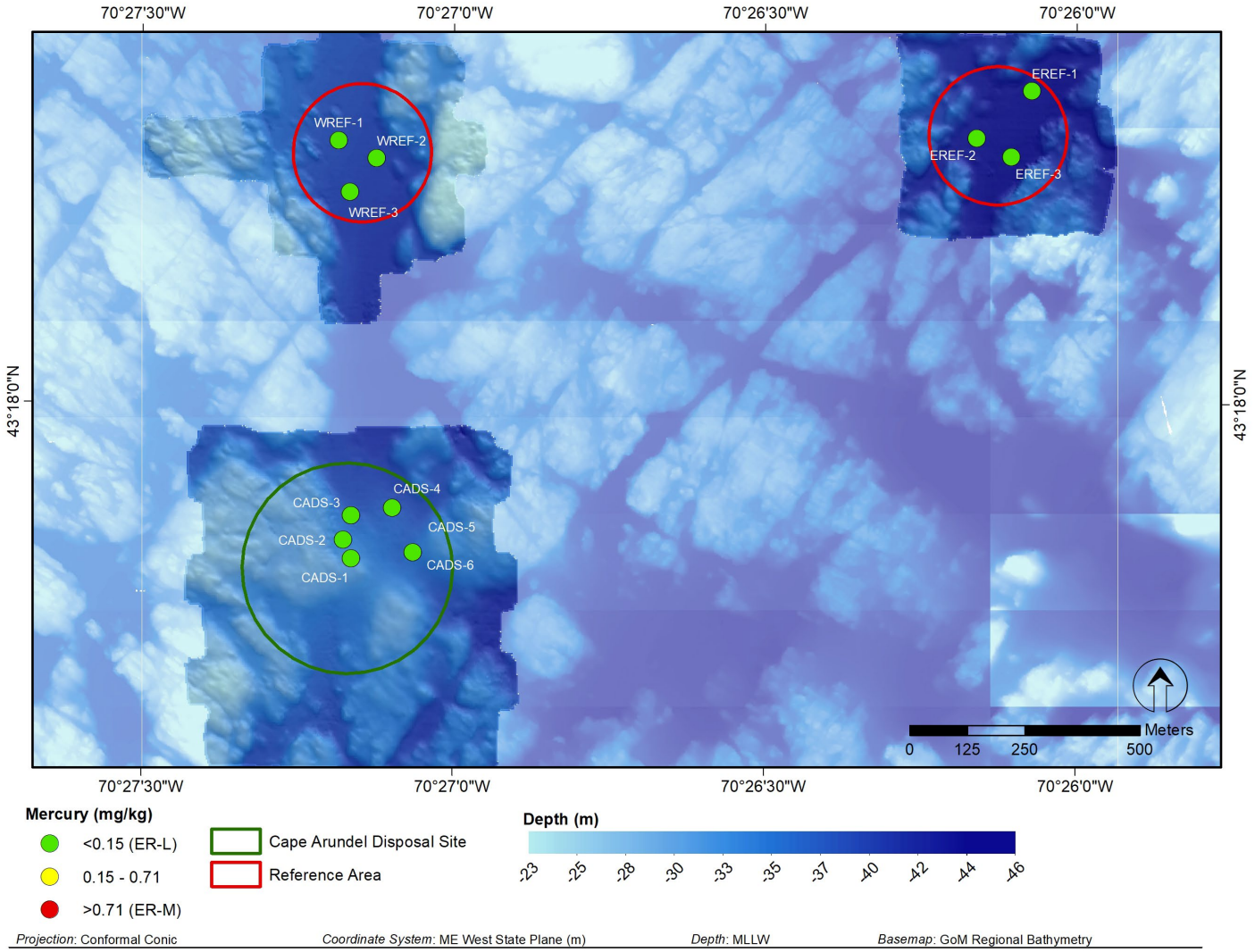


Figure 3-17. Mercury concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

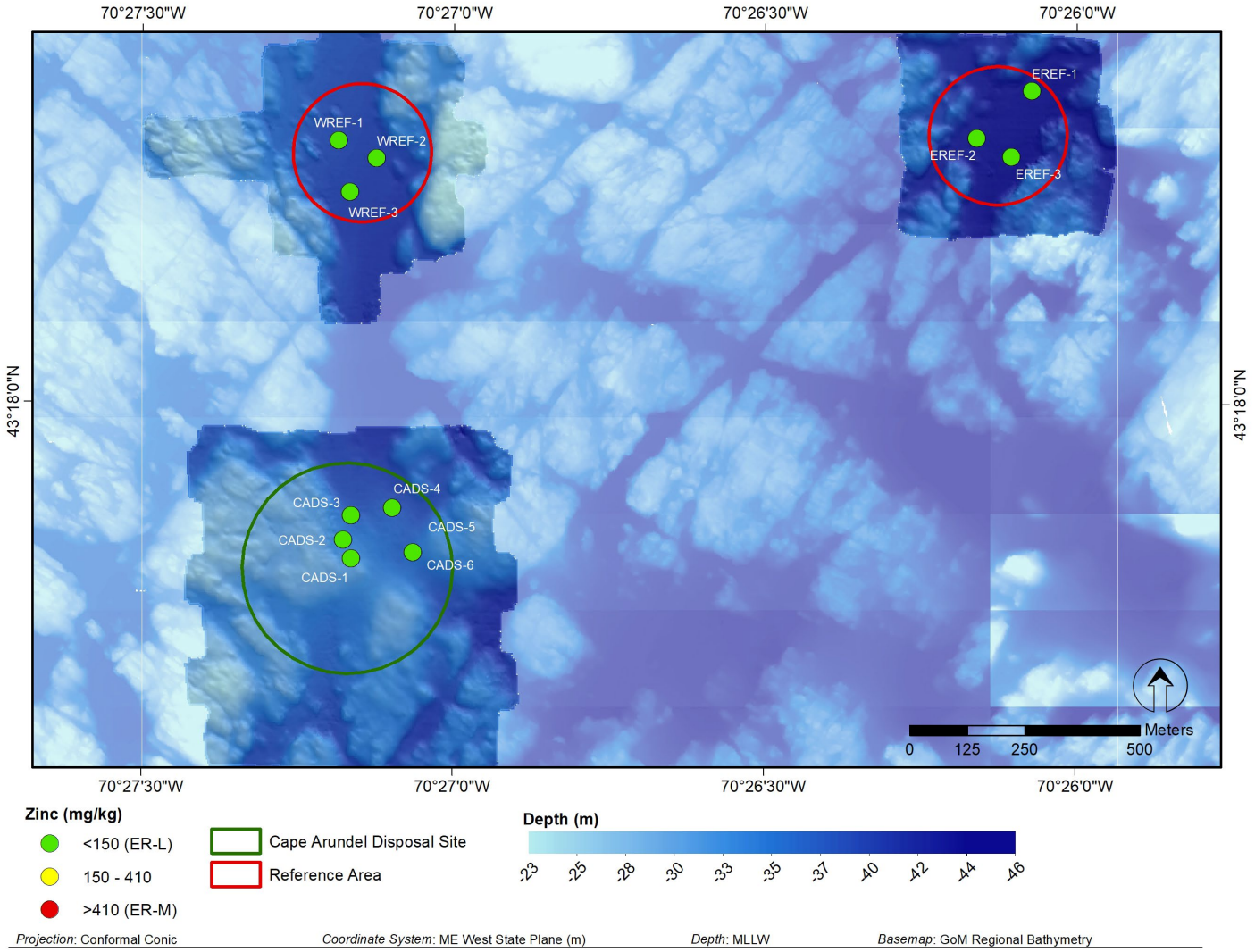


Figure 3-18. Zinc concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

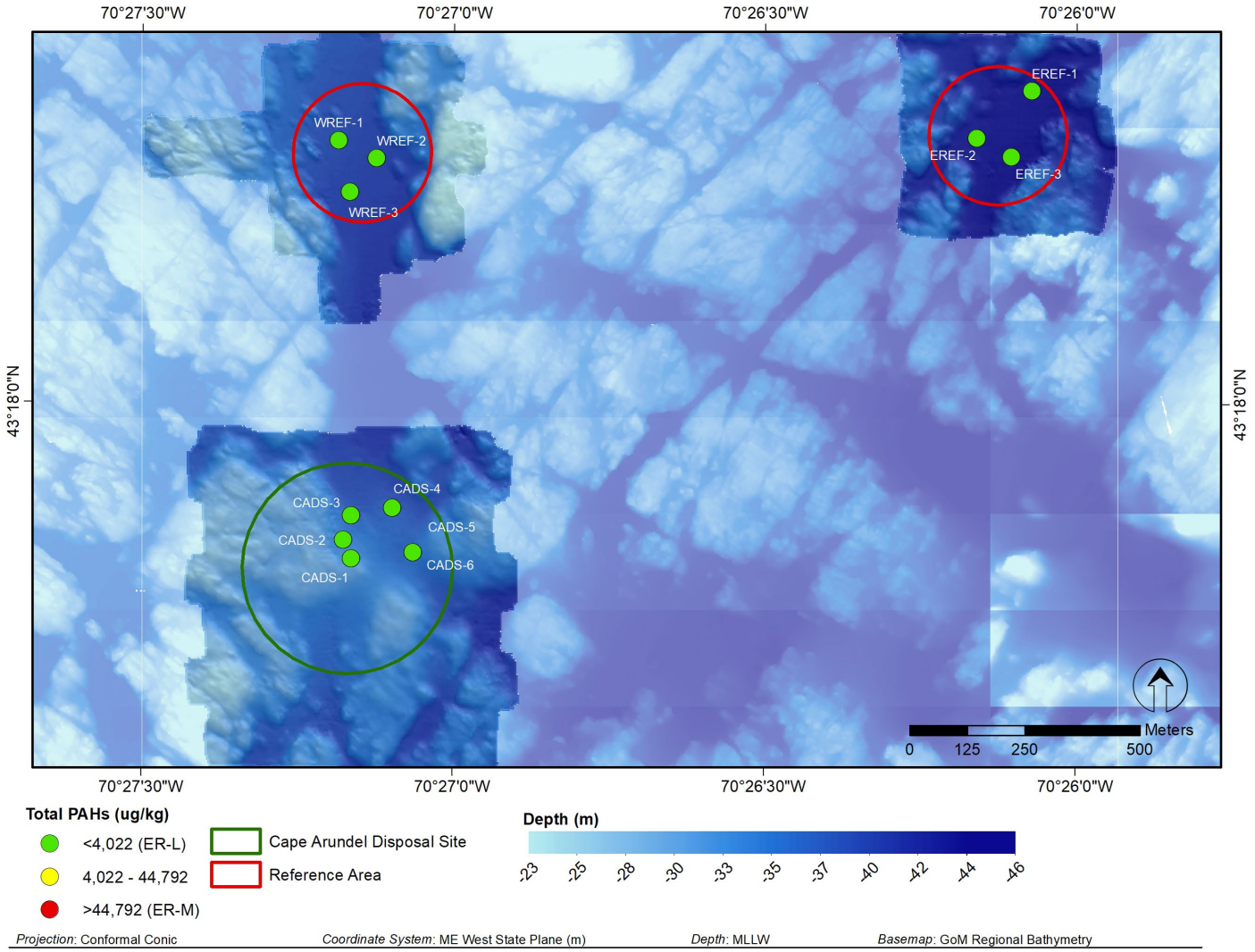


Figure 3-19. Total PAHs concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

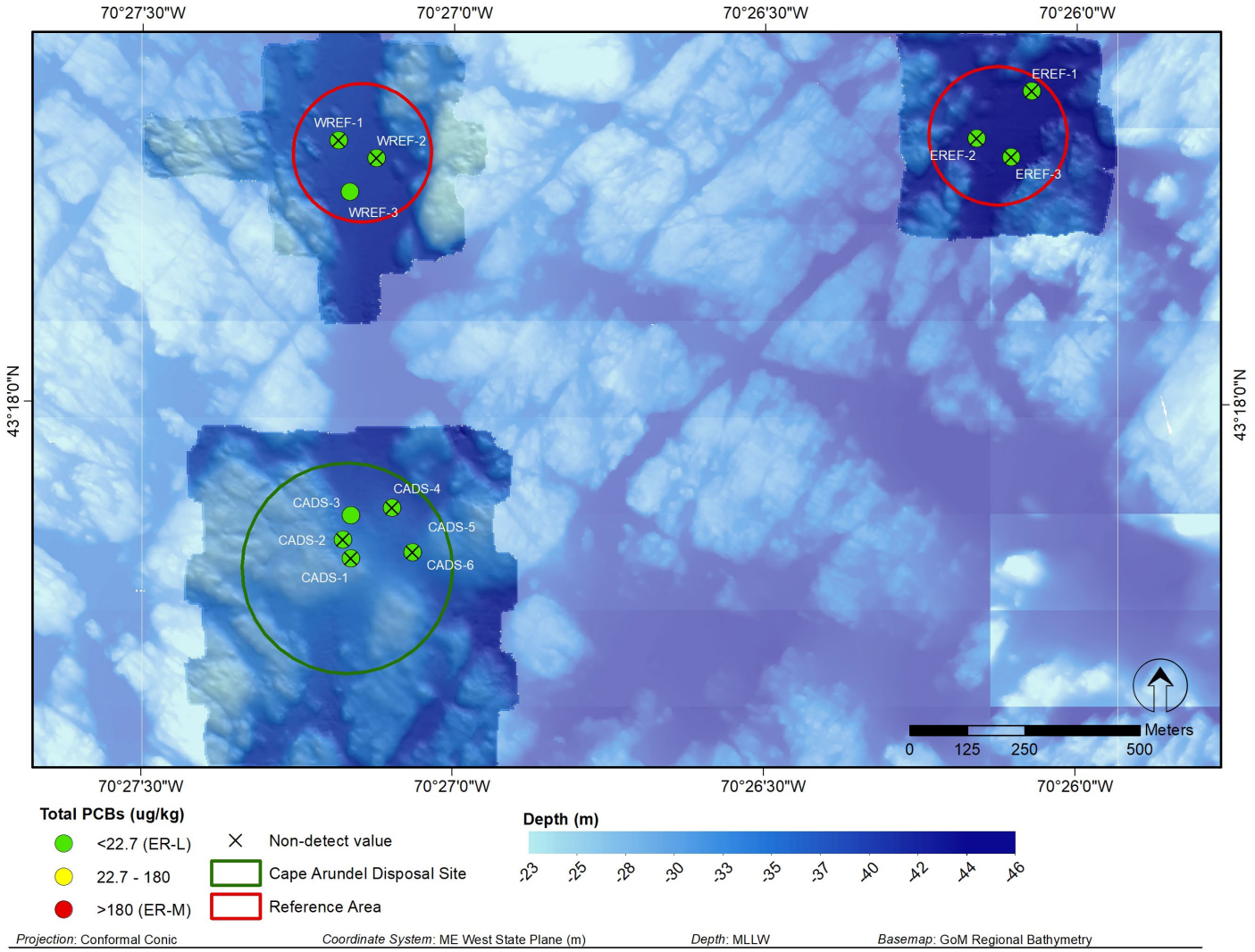


Figure 3-20. Total PCBs concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

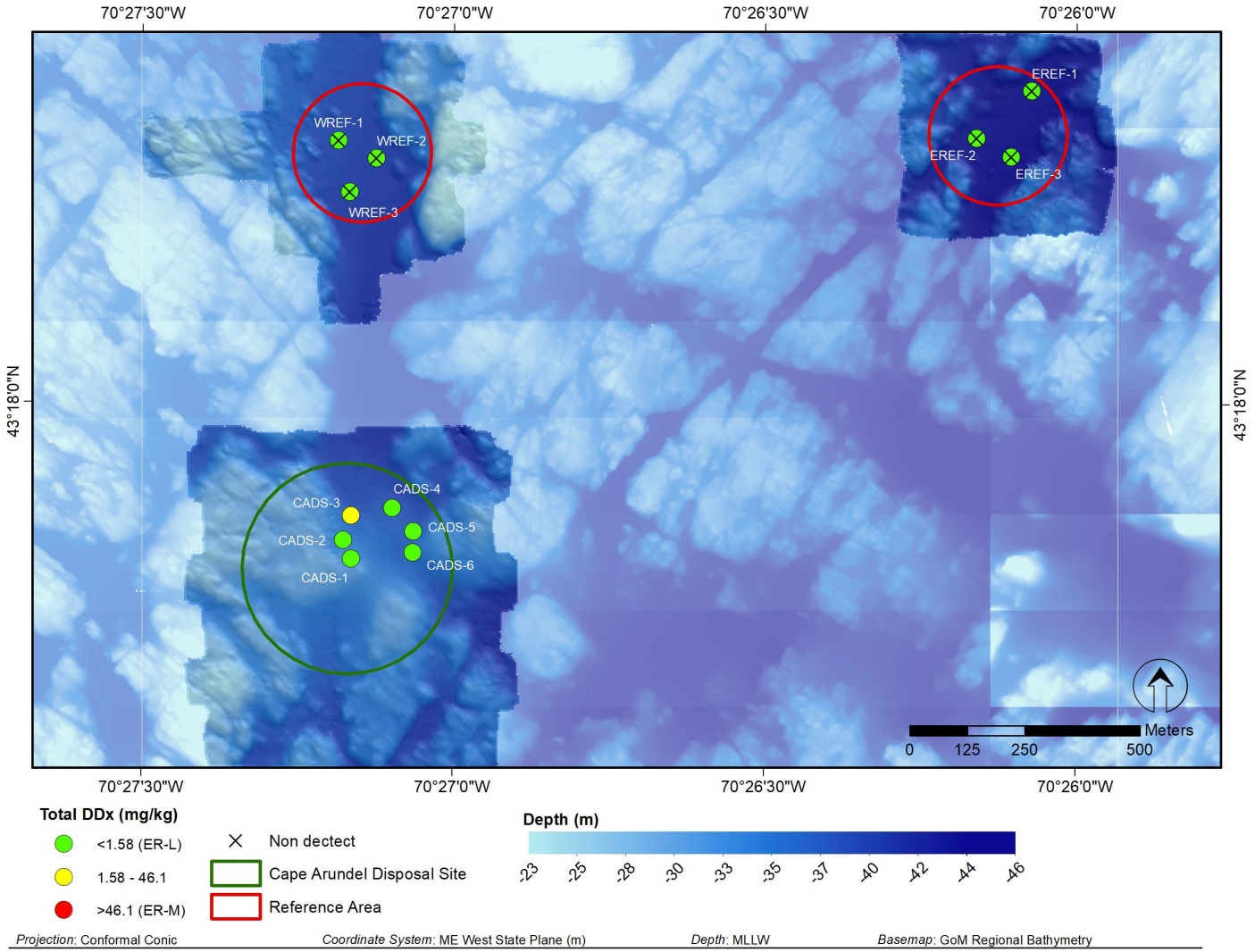


Figure 3-21. Total DDx concentrations compared to ER-L and ER-M values, CADS and reference areas, September 2020.

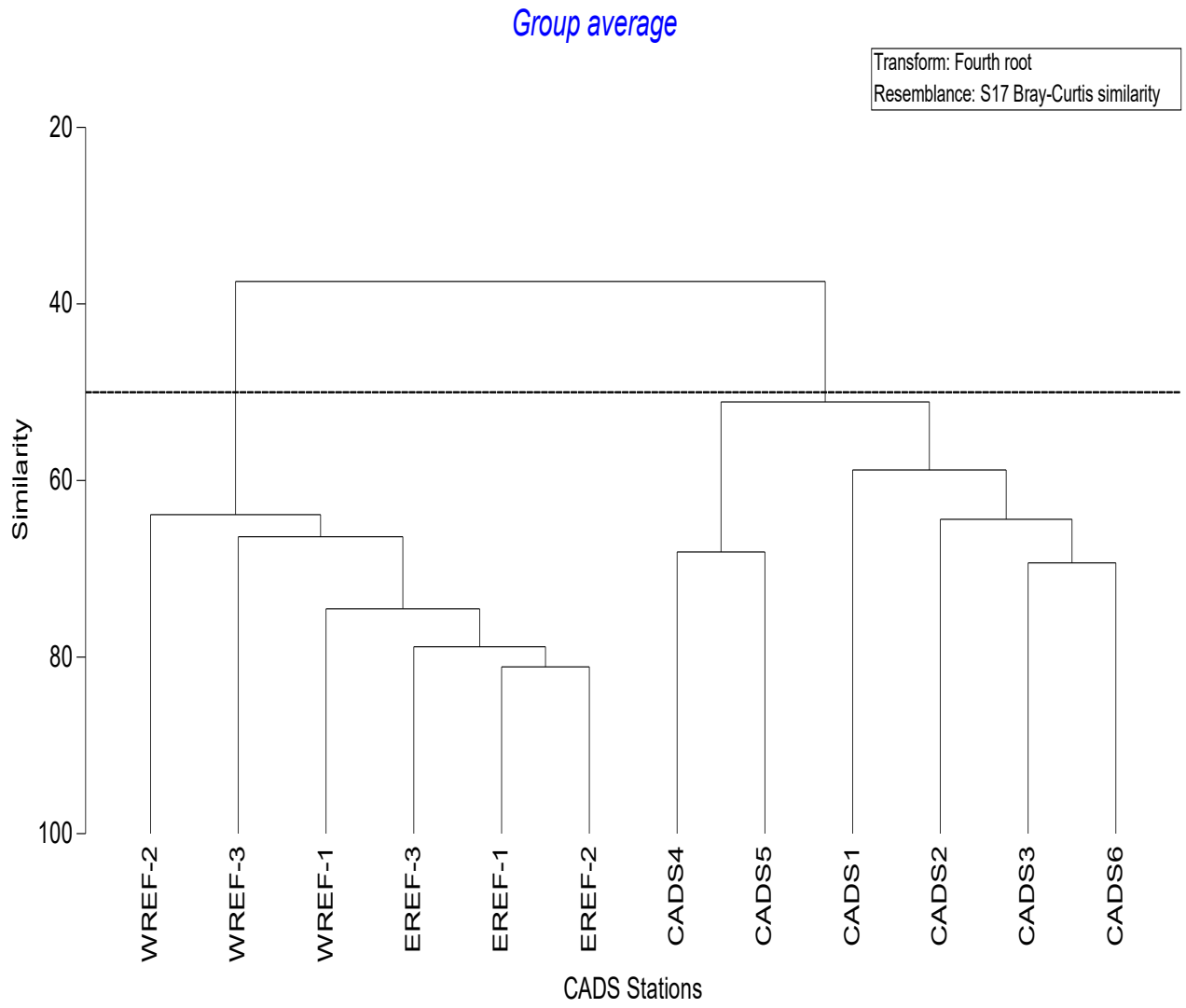


Figure 3-22. Cluster analysis of CADS and reference areas, September 2020.

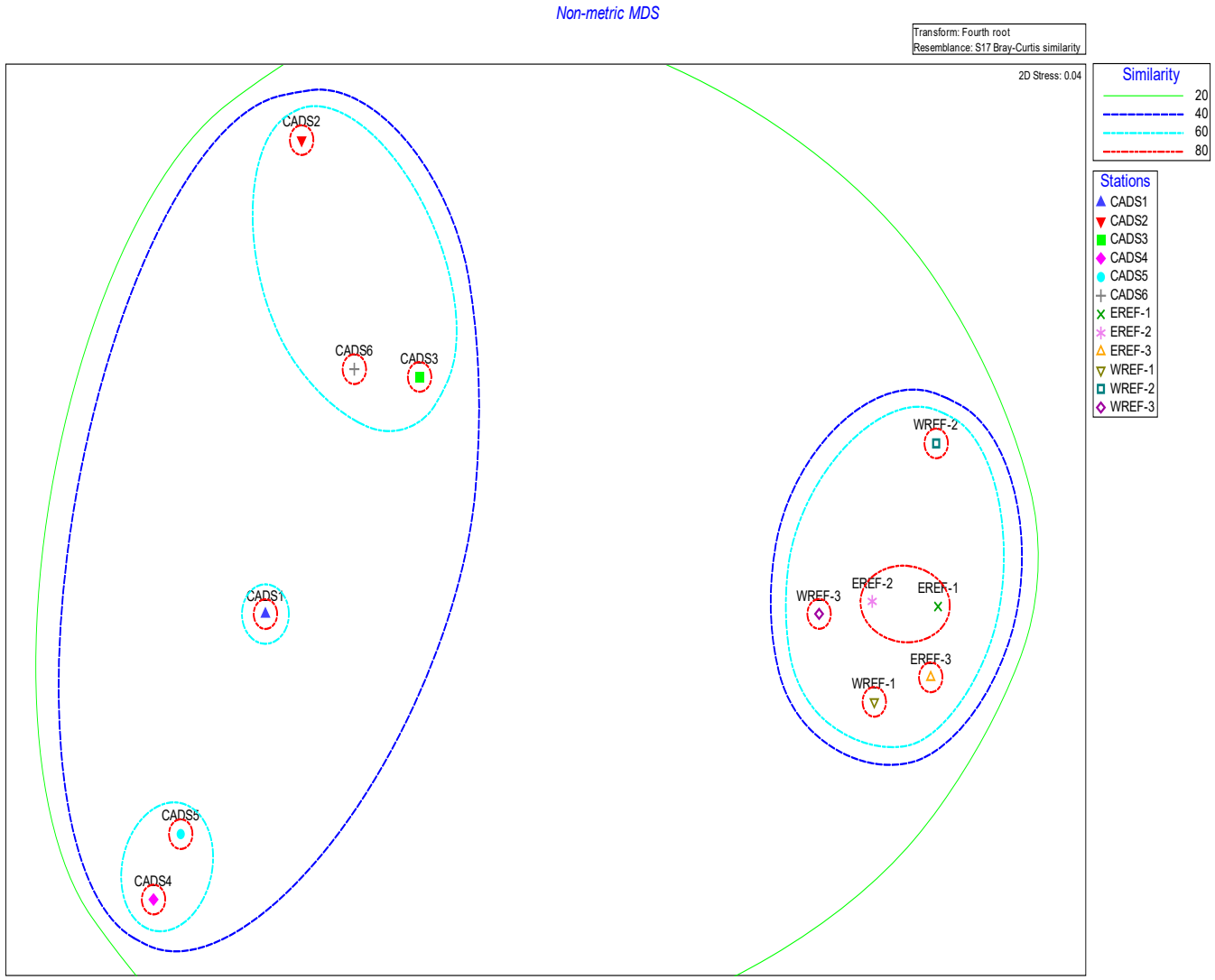


Figure 3-23. Cluster analysis of CADS and reference areas, September 2020.

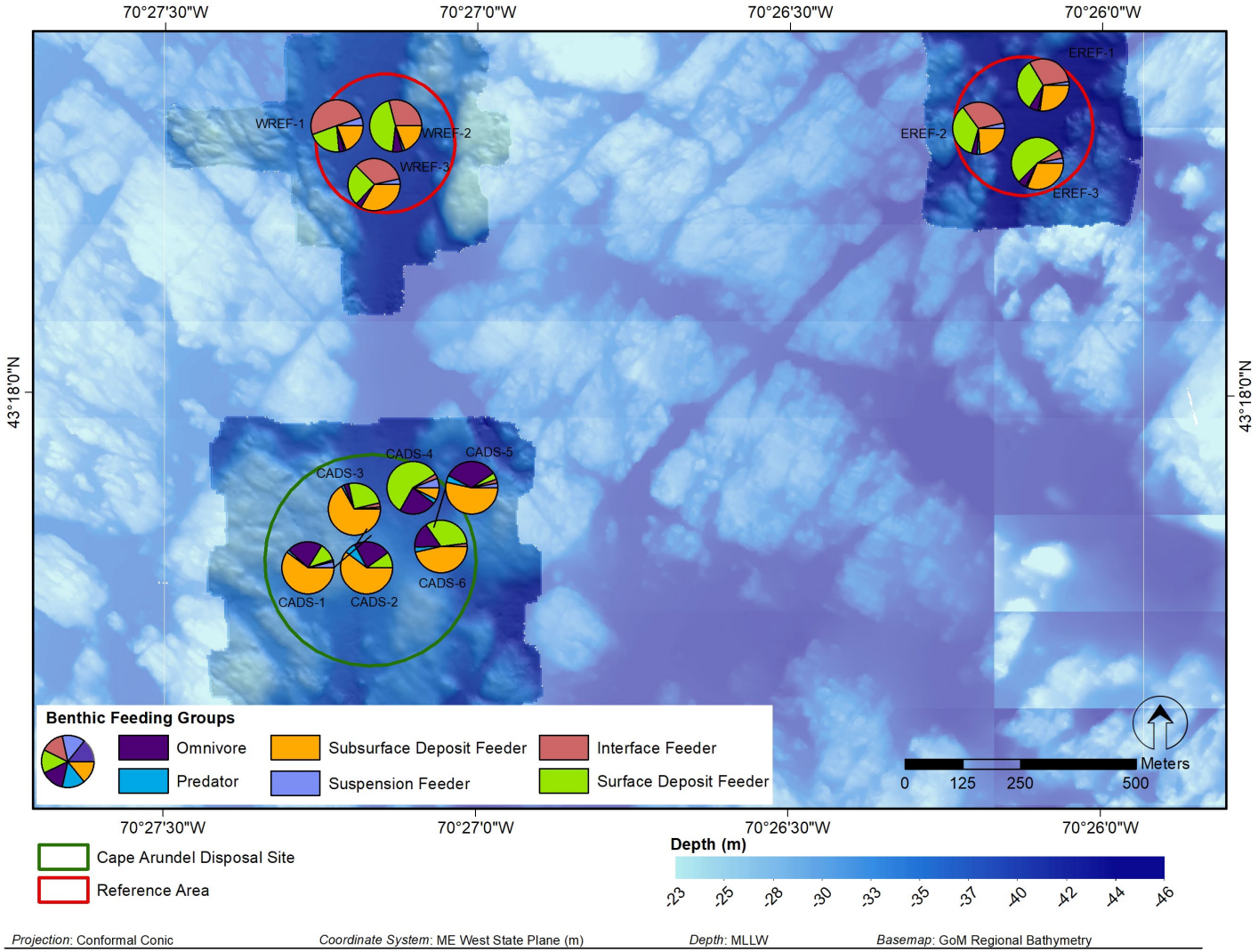


Figure 3-24. Percentage of individuals belonging to each trophic guild, CADS and reference areas, September 2020.

Figure 3-25. Percentage of individuals belonging to each trophic guild at CADS and reference areas, September 2020.

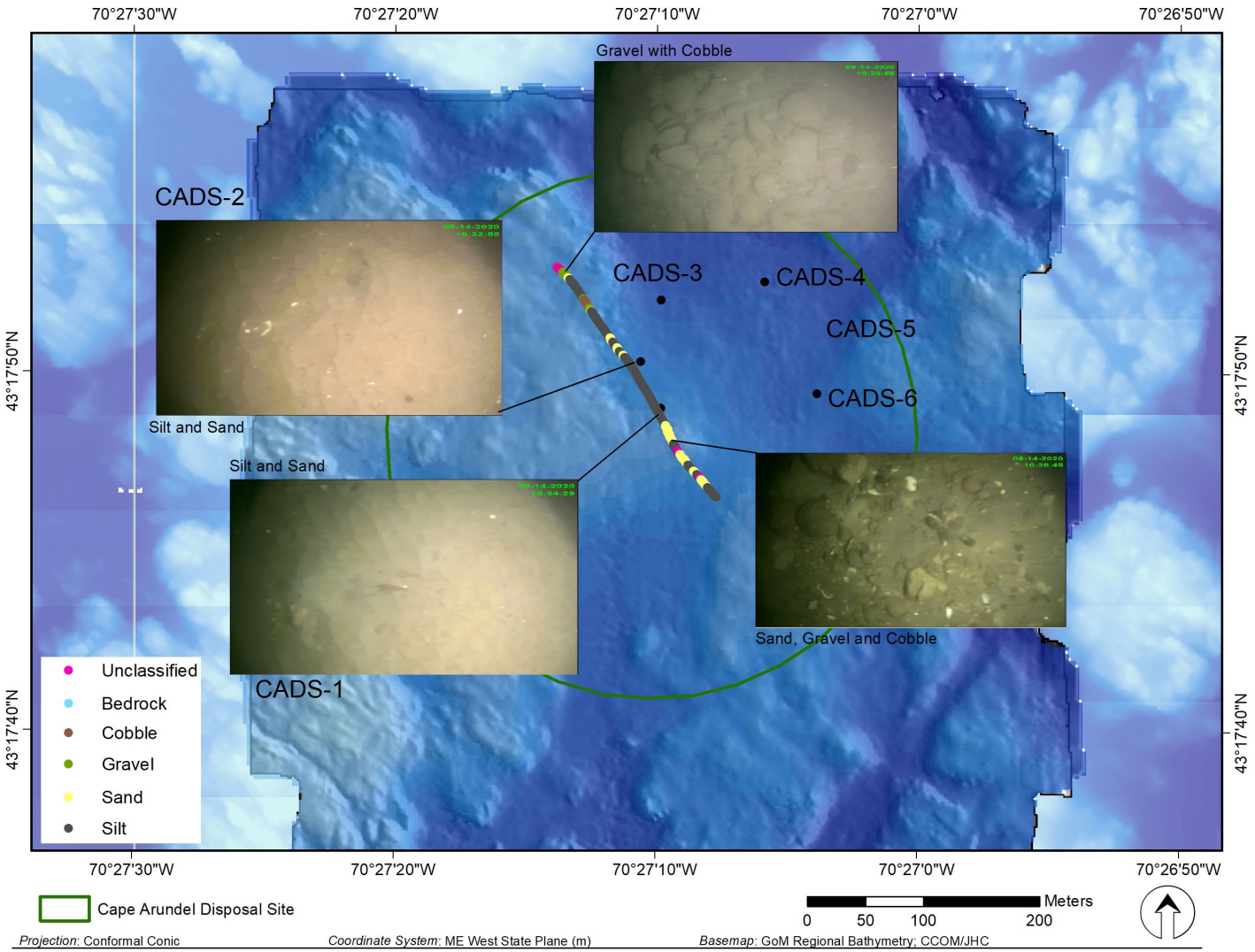


Figure 3-26. Video survey substrate observations at CADS, September 2020.

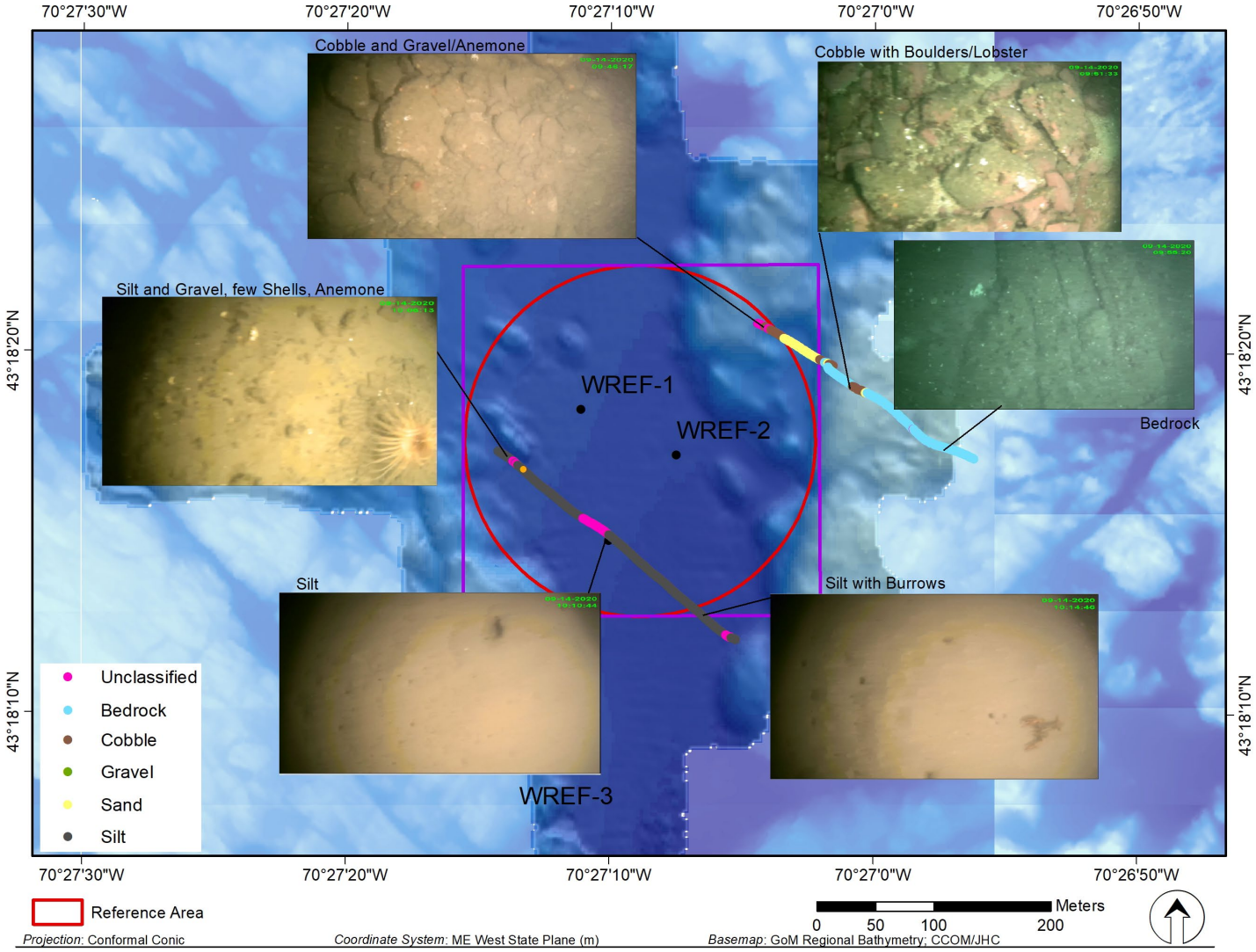


Figure 3-27. Video survey substrate observations at WREF, September 2020.

4.0 DISCUSSION

The objectives of the September 2020 survey of CADS were to document the distribution of dredged material and to assess the benthic recovery of the site after placement of approximately 69,167 m^3 (82,723 yd^3) of dredged material since 2014. The monitoring activities performed in 2020 represented a combination of a confirmatory survey with elements of a more comprehensive, focused survey. A hydroacoustic survey was performed over the entirety of the CADS site and both reference areas, EREF and WREF, to map the topography of the site and assess the stability of the dredged material disposal mound. Sediment grab samples were collected to characterize surficial sediment within the northeastern quadrant of the site, where recent disposals were focused, and across the two reference areas. Underwater video footage was also collected over the northeastern portion of the site and over the WREF reference area.

4.1 Dredged Material Distribution and Seafloor Topography

The hydroacoustic survey identified a dredged material disposal mound within the northeastern portion of the site. During the previous 2013 hydroacoustic survey, the formation of a mound was evident, although it was stated that due to the complex nature of the site, it was difficult to detect the exact sediment accumulation throughout the area (Hickey, et.al., 2014). Depth differencing results of the 2013 - 2020 hydroacoustic surveys identified that dredged material accumulation over the past six years has created a mound, ranging from approximately 0.5 to 1.6 m (1.6 to 5.2 ft) above the ambient seafloor in the northeastern portion of the site. The buildup of dredged material over the northeastern portion of the site is consistent with the recent disposal records, as shown on Figure 4-1. It is assumed that the disposal mound is a discrete feature within CADS, based on the location of recent disposals and the acoustic markers resulting from the latest survey.

Both reference areas were surveyed for the first time under the DAMOS Program during the 2020 hydroacoustic survey. Based on the acoustic data, the reference areas and CADS exhibited similar bathymetric profiles, both featuring areas of hard bottom and sloping ridges surrounding deeper, soft sediment basins. This first high-resolution hydroacoustic dataset supports the continued use of the EREF and WREF areas as appropriate reference areas for future CADS monitoring efforts.

4.2 Surficial Sediment Characterization

Results of the physical and chemical sediment analysis are discussed in Section 3.2. Sediment grain size was comparable between the disposal site stations and reference area stations; on average, the reference stations contained more trace amounts of gravel and CADS stations were composed of slightly greater amounts of sand, which is likely a result of disposal activities within the site. A comparison of the data with those discussed in the 1990 Summary Report (SAIC, 1996) (sediment chemistry results from the 1985 site selection

study) indicated that the 2020 concentrations (As, Cd, Cr, Cu, Hg, Pb, Zn, TOC, and PCBs) were comparable to or less than the historical chemistry datasets for the site. Additionally, the 2020 CADS sediment chemistry results were similar to those within the reference areas for all analyzed contaminants. Chemical concentrations across the site and reference areas were also below the SQGs, with the exception of arsenic within the reference areas which highlights elevated arsenic background levels of native sediment in the region. For comparison, sediment was recently collected prior to any dredged material disposal at the newly designated Isles of Shoals North (IOSN) disposal site (approximately 25 km south of CADS), and the resulting mean arsenic background value was also slightly above the ERL at 9.4 mg/kg at IOSN (USACE, 2021). Based on these lines of evidence, dredged material disposal activities are unlikely to cause adverse effects at CADS due to sediment chemical composition.

4.3 Benthic Status and Recovery

Due to the variable SPI camera penetration encountered during the 2013 survey at CADS, benthic status of the site was assessed in the 2020 survey through the collection of sediment grabs analyzed for benthic community structure. Making a direct comparison between results from the two surveys is difficult because the resulting data (i.e., SPI/PV images versus benthic biological data) are not directly comparable, but comprehensive conclusions can be drawn such as similarities in benthic community recovery.

SPI/PV interpretation from 2013 indicated a recovered and healthy benthic community on par with the reference areas within the CADS survey area, featuring mature biological successional stages and relatively deep apparent redox potential discontinuity (aRPD). The 2020 benthic results included infauna which support these results, including the presence of subsurface deposit feeders, though abundance numbers were higher within the reference areas than the site.

CADS was temporarily closed from 2010 through 2014; therefore, when the 2013 SPI/PV survey was conducted the site had been inactive for 3 years, allowing the site to recover in an undisturbed state during that timeframe. CADS was reopened in 2014 and received dredged material as recently as 9 months before the 2020 survey; providing less opportunity for recovery in 2020 than in 2013. Despite the disturbance of the sediments by placement of dredged material at the CADS site <1 year prior to the 2020 survey, results suggest that the deposited sediment is being quickly recolonized, and benthic community observations are similarly noted between the 2013 and 2020 surveys. The most abundant trophic feeders identified at CADS from the 2020 survey were subsurface deposit feeders (also known as head down deposit feeders), which actively redevelop the sediment and are indicators of a recovering environment. This abundance of subsurface deposit feeders noted in the 2020 survey correlates with the Stage 3 Successional Stage community described in the 2013 CADS SPI survey, which reported a “mature, equilibrium community of deep dwelling head down deposit feeders” throughout the study area (Hickey, et. al., 2014). The

Stage 3 Successional Stage is represented by organisms that are defined as established tube builders and deep burrowing, head down deposit feeders (Rhoads and Germano 1986). The abundance of head-down deposit feeders as noted in both the 2013 and the 2020 CADS surveys is indicative of a benthic community trending toward a state of recovery.

Though the CADS stations featured lower abundance numbers when compared to the reference areas, abundances were consistent with other studies conducted within the region which featured similar recovering benthic habitats. A comparison was made between the 2020 survey and the 2016 monitoring survey at the Portland Disposal Site (PDS) (McKelvey, et. al., 2021) off the coast of Cape Elizabeth, Maine, which included both SPI/PV and benthic grab sampling. PDS features similar topography to CADS and the two surveys were conducted at the same time of year and within a comparable post-disposal timeframe; both studies revealed equivalent abundances and benthic community structures, indicative of recovering benthic communities. PDS was surveyed approximately two years post-disposal, and organism abundance was 267 enumerated individuals (6,675 individuals/m^2), while CADS was surveyed approximately one-year post-disposal, with an average of 219 enumerated individuals (5,467 individuals/m^2). Both sites featured the same dominant species, including polychaetes from Capitellids, Spionids, Cirratulids, and Nephtyids. Higher abundances noted at the CADS reference areas were solely due to large numbers of two organisms: amphipod *Ampelisca* spp. (n = 1,638) and polychaete *Tharyx acutus* (n = 1,365).

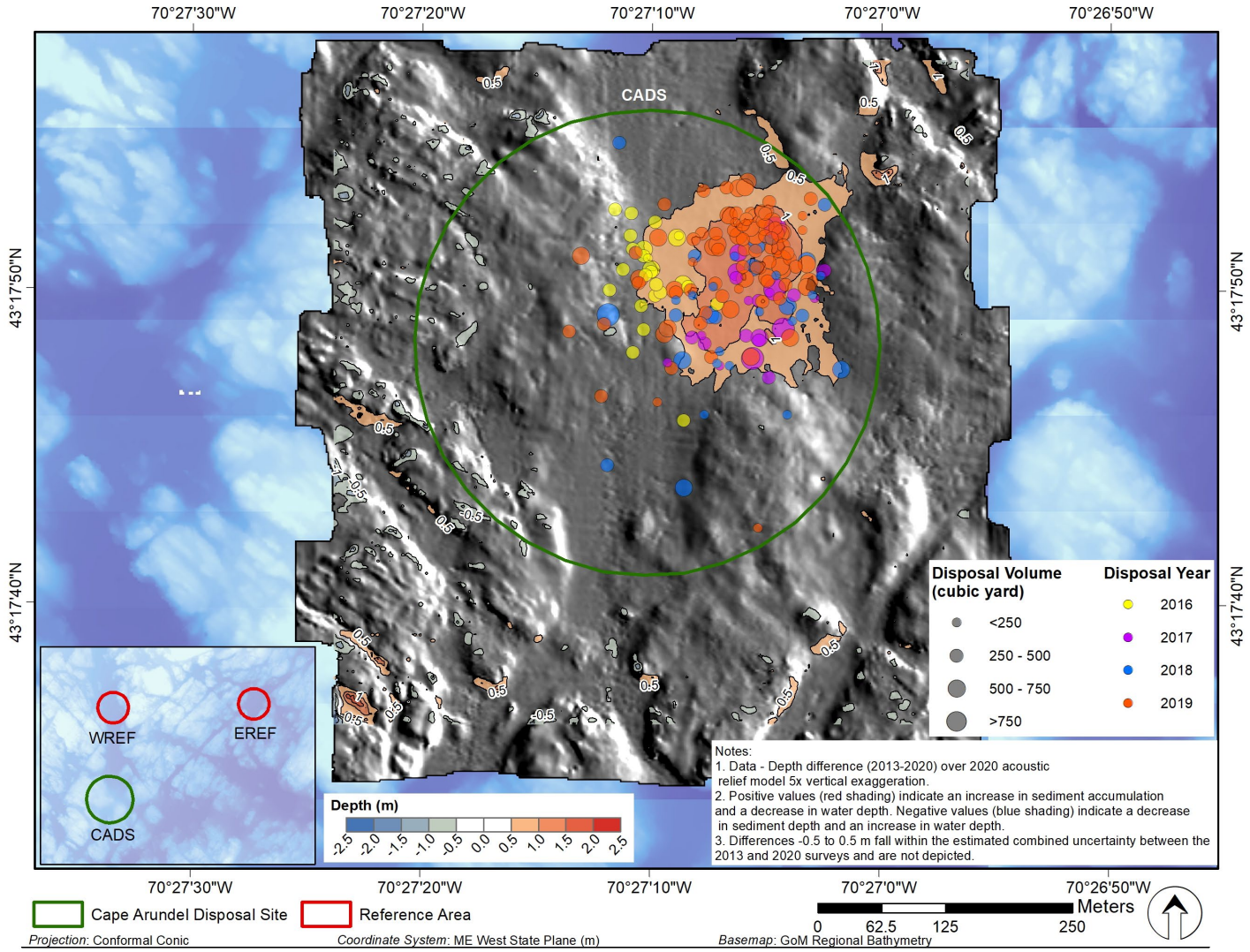


Figure 4-1. CADS depth differencing model with recent disposals (2013 – 2020).

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The September 2020 survey at CADS was designed to assess site conditions after the placement of approximately 69,167 m^3 (90,467 yd^3) of dredged material since the previous survey and to perform a comprehensive assessment of the site prior to its expected closure on 31 December 2021. The 2020 survey included the collection of hydroacoustic data (bathymetry, backscatter, side-scan) over the site and both reference areas (EREF and WREF); collection of surficial sediment samples for physical, chemical, and benthic community analysis; and an underwater video survey at CADS and WREF. All components of the survey were successfully performed, and results are summarized below:

- A newly formed dredged material disposal mound is present in the northeastern corner of the site, with the highest point approximately 1.6 m (5.2 ft) above the ambient seafloor. Disposals appear to be mostly contained to this portion of the site.
- Chemical analyses of the sediment samples showed generally low concentrations, only isolated ER-L exceedances of arsenic at the reference areas, at all CADS and reference area stations and comparable concentrations between the site and reference areas for all analytes.
- The benthic community at CADS is in a state of recovery with resulting abundances and most commonly occurring trophic feeding groups aligning with those identified at recovering or recently recovered sites within the region.
- Underwater video footage confirmed the hydroacoustic survey findings and benthic habitat observations and provided a qualitative assessment of the varying seafloor conditions at CADS and the reference areas.

5.2 Recommendations

Based on the hydroacoustic survey results, features of the dredged material disposal mound, low sediment chemistry concentrations, and benthic community observations, it is expected that the site will fully recover to reference area conditions. Based on these conclusions, the following is recommended:

- After permanent closure, revisit the site for a comprehensive focused study to determine if the CADS biological conditions more closely resemble the biological conditions within the reference areas.
- Future monitoring efforts at CADS should include paired benthic analysis and SPI/PV surveys where possible in the soft sediment areas of the site.

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Appendix A

Table of Common Conversions

US Army Corps
of Engineers®
New England District

APPENDIX A

TABLE OF COMMON CONVERSIONS

Metric	English
Area	
1 Square Kilometer (km2)	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)

English	Metric
Area	
1 Acre	0.004 Square Kilometers (km^2)
Length	
1 Mile (mi)	1.61 Kilometers (km)
1 Nautical Mile (nmi)	1.85 Kilometers (km)
1 Foot (ft)	0.30 Meters (m)
1 Inch (in)	0.03 Centimeters (cm)

Appendix B

Disposal Summary Logs

Appendix B
Disposal Barge Logs

Project Name	Disposal Site	Load Volume (yd^3)	Load Volume (m^3)	Placement Date	Longitude	Latitude
Arundel Yacht Club	CADS	461	352	1/6/16	-70.4529	43.2975
Arundel Yacht Club	CADS	461	352	1/7/16	-70.4530	43.2977
Arundel Yacht Club	CADS	461	352	1/7/16	-70.4530	43.2979
Arundel Yacht Club	CADS	461	352	1/8/16	-70.4530	43.2976
Arundel Yacht Club	CADS	461	352	1/8/16	-70.4527	43.2978
Arundel Yacht Club	CADS	461	352	1/14/16	-70.4527	43.2972
Arundel Yacht Club	CADS	461	352	1/15/16	-70.4527	43.2972
Arundel Yacht Club	CADS	461	352	1/15/16	-70.4529	43.2969
Arundel Yacht Club	CADS	461	352	1/20/16	-70.4528	43.2974
Arundel Yacht Club	CADS	461	352	1/21/16	-70.4527	43.2973
Arundel Yacht Club	CADS	464	355	1/21/16	-70.4529	43.2974
Kennebunkport Marina	CADS	670	512	1/22/16	-70.4525	43.2977
Kennebunkport Marina	CADS	670	512	1/22/16	-70.4528	43.2974
Kennebunkport Marina	CADS	670	512	1/27/16	-70.4529	43.2976
Town of Kennebunkport	CADS	1100	841	1/28/16	-70.4525	43.2977
Yachtsman Lodge and Marina	CADS	500	382	2/11/16	-70.4531	43.2974
Yachtsman Lodge and Marina	CADS	500	382	2/22/16	-70.4530	43.2967
Yachtsman Lodge and Marina	CADS	500	382	2/22/16	-70.4532	43.2979
Yachtsman Lodge and Marina	CADS	500	382	2/23/16	-70.4533	43.2972
Yachtsman Lodge and Marina	CADS	500	382	3/1/16	-70.4524	43.2961
Yachtsman Lodge and Marina	CADS	500	382	3/1/16	-70.4523	43.2973
Yachtsman Lodge and Marina	CADS	500	382	3/3/16	-70.4529	43.2971
Yachtsman Lodge and Marina	CADS	500	382	3/4/16	-70.4520	43.2971
Yachtsman Lodge and Marina	CADS	550	421	3/8/16	-70.4524	43.2973
Yachtsman Lodge and Marina	CADS	250	191	3/8/16	-70.4528	43.2975
York Harbor	CADS	545	416	12/1/17	-70.4517	43.2976
York Harbor	CADS	694	531	12/2/17	-70.4518	43.2974
York Harbor	CADS	640	490	12/3/17	-70.4515	43.2968
York Harbor	CADS	347	266	12/3/17	-70.4516	43.2968
York Harbor	CADS	792	606	12/4/17	-70.4513	43.2972
York Harbor	CADS	810	619	12/7/17	-70.4513	43.2978
York Harbor	CADS	251	192	12/8/17	-70.4511	43.2972
York Harbor	CADS	1015	776	12/8/17	-70.4514	43.2972
York Harbor	CADS	395	302	12/9/17	-70.4523	43.2968
York Harbor	CADS	1239	947	12/9/17	-70.4520	43.2966
York Harbor	CADS	1037	793	12/11/17	-70.4508	43.2972
York Harbor	CADS	356	272	12/12/17	-70.4518	43.2973
York Harbor	CADS	1075	822	12/14/17	-70.4522	43.2968
York Harbor	CADS	360	275	12/15/17	-70.4507	43.2974
York Harbor	CADS	1214	928	12/15/17	-70.4516	43.2971
York Harbor	CADS	288	220	12/16/17	-70.4514	43.2965
York Harbor	CADS	333	255	12/17/17	-70.4515	43.2971
York Harbor	CADS	1090	834	12/18/17	-70.4507	43.2974
York Harbor	CADS	878	671	12/21/17	-70.4516	43.2966
York Harbor	CADS	335	256	12/21/17	-70.4521	43.2968
York Harbor	CADS	1143	874	12/22/17	-70.4526	43.2966
York Harbor	CADS	981	750	12/28/17	-70.4512	43.2969
York Harbor	CADS	306	234	12/28/17	-70.4507	43.2974
York Harbor	CADS	0	0	12/29/17	-70.6464	43.1303
York Harbor	CADS	29	23	12/31/17	-70.4515	43.2968
York Harbor	CADS	1195	914	1/3/18	-70.4513	43.2974
York Harbor	CADS	300	230	1/3/18	-70.4523	43.2975
York Harbor	CADS	1018	778	1/7/18	-70.4520	43.2966
York Harbor	CADS	1092	835	1/10/18	-70.4508	43.2972
York Harbor	CADS	490	375	1/10/18	-70.4507	43.2980
York Harbor	CADS	1246	953	1/18/18	-70.4515	43.2970
York Harbor	CADS	105	80	1/19/18	-70.4511	43.2961
York Harbor	CADS	1112	850	1/20/18	-70.4507	43.2974
York Harbor	CADS	349	267	1/21/18	-70.4510	43.2970
York Harbor	CADS	1175	898	1/21/18	-70.4520	43.2973
York Harbor	CADS	356	272	1/22/18	-70.4573	43.2851
York Harbor	CADS	1236	945	1/25/18	-70.4511	43.2970
York Harbor	CADS	130	100	1/26/18	-70.4518	43.2966
York Harbor	CADS	1211	926	2/1/18	-70.4520	43.2967
York Harbor	CADS	155	119	2/3/18	-70.6464	43.1307
York Harbor	CADS	610	467	2/6/18	-70.4516	43.2974
York Harbor	CADS	703	538	2/9/18	-70.4511	43.2971
York Harbor	CADS	183	140	2/10/18	-70.4518	43.2975
York Harbor	CADS	671	513	2/12/18	-70.4524	43.2955

Appendix B
Disposal Barge Logs

Project Name	Disposal Site	Load Volume (yd^3)	Load Volume (m^3)	Placement Date	Longitude	Latitude
York Harbor	CADS	543	415	2/13/18	-70.4505	43.2965
York Harbor	CADS	629	481	2/14/18	-70.4515	43.2976
York Harbor	CADS	649	497	2/15/18	-70.4514	43.2977
York Harbor	CADS	686	524	2/16/18	-70.4509	43.2975
York Harbor	CADS	647	495	2/21/18	-70.4521	43.2970
York Harbor	CADS	226	173	2/22/18	-70.4521	43.2961
York Harbor	CADS	93	71	2/23/18	-70.4533	43.2970
York Harbor	CADS	495	378	2/28/18	-70.4532	43.2985
Kennebunk, ME - Chester Homer	CADS	249	190	12/5/18	-70.4523	43.2972
Kennebunk, ME - Chester Homer	CADS	110	84	12/6/18	-70.4525	43.2971
Kennebunk, ME - Melissa Winstanly	CADS	545	417	12/9/18	-70.4524	43.2966
Kennebunk, ME - Melissa Winstanly	CADS	338	258	12/11/18	-70.4533	43.2957
Kennebunk, ME - John Rinaldi	CADS	270	206	12/19/18	-70.4520	43.2970
Kennebunk, ME - John Rinaldi	CADS	345	264	12/20/18	-70.4525	43.2970
Kennebunk, ME - John Rinaldi	CADS	455	348	1/4/19	-70.4525	43.2965
Kennebunk, ME - John Rinaldi	CADS	420	321	1/4/19	-70.4520	43.2973
Kennebunk, ME - John Rinaldi	CADS	344	263	1/8/19	-70.4534	43.2963
York Harbor	CADS	610	466	1/22/19	-70.4516	43.2966
York Harbor	CADS	425	325	1/27/19	-70.4538	43.2969
York Harbor	CADS	655	501	2/2/19	-70.4536	43.2975
York Harbor	CADS	546	417	2/4/19	-70.4525	43.2972
York Harbor	CADS	611	467	2/6/19	-70.4526	43.2968
York Harbor	CADS	600	459	2/11/19	-70.4526	43.2969
York Harbor	CADS	491	376	2/18/19	-70.4534	43.2969
York Harbor	CADS	485	371	2/20/19	-70.4529	43.2973
York Harbor	CADS	221	169	2/22/19	-70.4527	43.2962
Cape Porpoise Harbor	CADS	532	407	11/4/19	-70.4512	43.2974
Cape Porpoise Harbor	CADS	150	115	11/5/19	-70.4517	43.2972
Cape Porpoise Harbor	CADS	281	215	11/6/19	-70.4515	43.2974
Cape Porpoise Harbor	CADS	474	363	11/6/19	-70.4514	43.2973
Cape Porpoise Harbor	CADS	356	272	11/6/19	-70.4514	43.2971
Cape Porpoise Harbor	CADS	536	410	11/6/19	-70.4516	43.2978
Cape Porpoise Harbor	CADS	417	319	11/6/19	-70.4513	43.2977
Cape Porpoise Harbor	CADS	210	161	11/7/19	-70.4518	43.2978
Cape Porpoise Harbor	CADS	531	406	11/7/19	-70.4513	43.2978
Cape Porpoise Harbor	CADS	128	98	11/7/19	-70.4515	43.2951
Cape Porpoise Harbor	CADS	439	336	11/8/19	-70.4513	43.2976
Cape Porpoise Harbor	CADS	519	397	11/9/19	-70.4512	43.2974
Cape Porpoise Harbor	CADS	435	333	11/9/19	-70.4520	43.2976
Cape Porpoise Harbor	CADS	663	507	11/9/19	-70.4520	43.2976
Cape Porpoise Harbor	CADS	351	269	11/9/19	-70.4514	43.2977
Cape Porpoise Harbor	CADS	649	497	11/10/19	-70.4520	43.2976
Cape Porpoise Harbor	CADS	341	261	11/10/19	-70.4519	43.2981
Cape Porpoise Harbor	CADS	391	299	11/11/19	-70.4526	43.2980
Cape Porpoise Harbor	CADS	528	404	11/11/19	-70.4529	43.2973
Cape Porpoise Harbor	CADS	391	299	11/11/19	-70.4521	43.2970
Cape Porpoise Harbor	CADS	557	426	11/12/19	-70.4527	43.2977
Cape Porpoise Harbor	CADS	361	276	11/12/19	-70.4514	43.2977
Cape Porpoise Harbor	CADS	397	304	11/13/19	-70.4515	43.2974
Cape Porpoise Harbor	CADS	391	299	11/13/19	-70.4514	43.2975
Cape Porpoise Harbor	CADS	495	379	11/14/19	-70.4512	43.2976
Cape Porpoise Harbor	CADS	406	311	11/14/19	-70.4519	43.2972
Cape Porpoise Harbor	CADS	383	293	11/14/19	-70.4509	43.2980
Cape Porpoise Harbor	CADS	317	242	11/14/19	-70.4522	43.2969
Cape Porpoise Harbor	CADS	588	450	11/14/19	-70.4512	43.2975
Cape Porpoise Harbor	CADS	419	321	11/15/19	-70.4517	43.2976
Cape Porpoise Harbor	CADS	665	509	11/15/19	-70.4512	43.2974
Cape Porpoise Harbor	CADS	370	283	11/15/19	-70.4516	43.2979
Cape Porpoise Harbor	CADS	708	541	11/15/19	-70.4515	43.2977
Cape Porpoise Harbor	CADS	373	285	11/15/19	-70.4514	43.2979
Cape Porpoise Harbor	CADS	412	315	11/16/19	-70.4522	43.2981
Cape Porpoise Harbor	CADS	327	250	11/16/19	-70.4515	43.2979
Cape Porpoise Harbor	CADS	730	558	11/17/19	-70.4517	43.2973
Cape Porpoise Harbor	CADS	430	329	11/17/19	-70.4515	43.2979
Cape Porpoise Harbor	CADS	568	435	11/17/19	-70.4509	43.2975
Cape Porpoise Harbor	CADS	550	420	11/20/19	-70.4517	43.2977
Cape Porpoise Harbor	CADS	346	265	11/20/19	-70.4522	43.2977
Cape Porpoise Harbor	CADS	513	392	11/20/19	-70.4514	43.2978
Cape Porpoise Harbor	CADS	402	307	11/21/19	-70.4517	43.2977

Appendix B
Disposal Barge Logs

Project Name	Disposal Site	Load Volume (yd^3)	Load Volume (m^3)	Placement Date	Longitude	Latitude
Cape Porpoise Harbor	CADS	469	359	11/21/19	-70.4523	43.2972
Cape Porpoise Harbor	CADS	410	313	11/21/19	-70.4513	43.2976
Cape Porpoise Harbor	CADS	549	420	11/23/19	-70.4519	43.2979
Cape Porpoise Harbor	CADS	334	255	11/23/19	-70.4518	43.2978
Cape Porpoise Harbor	CADS	700	535	11/23/19	-70.4512	43.2977
Cape Porpoise Harbor	CADS	375	287	11/24/19	-70.4514	43.2980
Cape Porpoise Harbor	CADS	593	453	11/24/19	-70.4516	43.2982
Cape Porpoise Harbor	CADS	610	467	11/25/19	-70.4517	43.2981
Cape Porpoise Harbor	CADS	441	337	11/26/19	-70.4515	43.2976
Cape Porpoise Harbor	CADS	509	389	11/26/19	-70.4509	43.2973
Cape Porpoise Harbor	CADS	329	252	11/26/19	-70.4512	43.2972
Cape Porpoise Harbor	CADS	608	465	11/27/19	-70.4509	43.2973
Cape Porpoise Harbor	CADS	320	245	11/27/19	-70.4511	43.2975
Cape Porpoise Harbor	CADS	181	138	11/27/19	-70.4523	43.2975
Cape Porpoise Harbor	CADS	413	316	11/30/19	-70.4525	43.2972
Cape Porpoise Harbor	CADS	249	190	11/30/19	-70.4510	43.2979
Cape Porpoise Harbor	CADS	363	278	12/1/19	-70.4513	43.2978
Cape Porpoise Harbor	CADS	381	291	12/6/19	-70.4517	43.2978
Cape Porpoise Harbor	CADS	378	289	12/7/19	-70.4513	43.2977
Cape Porpoise Harbor	CADS	406	310	12/7/19	-70.4521	43.2966
Cape Porpoise Harbor	CADS	389	297	12/7/19	-70.4517	43.2978
Cape Porpoise Harbor	CADS	481	368	12/7/19	-70.4510	43.2974
Cape Porpoise Harbor	CADS	443	338	12/8/19	-70.4514	43.2978
Cape Porpoise Harbor	CADS	354	270	12/8/19	-70.4520	43.2977
Cape Porpoise Harbor	CADS	406	310	12/11/19	-70.4517	43.2974
Cape Porpoise Harbor	CADS	382	292	12/11/19	-70.4512	43.2973
Cape Porpoise Harbor	CADS	434	332	12/11/19	-70.4530	43.2976
Cape Porpoise Harbor	CADS	483	369	12/12/19	-70.4518	43.2979
Cape Porpoise Harbor	CADS	515	394	12/12/19	-70.4514	43.2973
Cape Porpoise Harbor	CADS	527	403	12/12/19	-70.4516	43.2978
Cape Porpoise Harbor	CADS	523	400	12/12/19	-70.4512	43.2977
Cape Porpoise Harbor	CADS	379	290	12/13/19	-70.4511	43.2976
Cape Porpoise Harbor	CADS	178	136	12/13/19	-70.4510	43.2978
Cape Porpoise Harbor	CADS	667	510	12/16/19	-70.4511	43.2968
Cape Porpoise Harbor	CADS	462	354	12/17/19	-70.4514	43.2979
Cape Porpoise Harbor	CADS	425	325	12/18/19	-70.4516	43.2979
Cape Porpoise Harbor	CADS	628	480	12/18/19	-70.4517	43.2981
Cape Porpoise Harbor	CADS	388	296	12/20/19	-70.4523	43.2977
Cape Porpoise Harbor	CADS	589	451	12/21/19	-70.4518	43.2971

Appendix C

Summary of Chemistry Results

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Sediment Results

Analyte	CAS Number	SITE											
		CADS-1		CADS-2		CADS-3		CADS-4		CADS-5		CADS-5-DUP	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GRAIN SIZE AND SOLIDS (%)													
Gravel (>4.75mm) %Retained	28	2.6		0		0		0.2		0		0	
Sand (0.075-.425mm) %Retained	26	68.6		79.2		58.7		53.5		53.8		50	
Silt+Clay (<0.075mm) %Retained	29	28.8		20.8		41.3		46.3		46.2		50	
% Solids	17	65.3		70.8		51.0		50.7		54.4		53.4	
TOTAL ORGANIC CARBON (%)													
TOC In Soil (Avg)	14762744	0.56		0.33		1.36		1.44		1.36		1.22	

Analyte	CAS Number	SITE		REFERENCE									
		CADS-6		EREF-1		EREF-2		EREF-3		WREF-1		WREF-2		WREF-3	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
GRAIN SIZE AND SOLIDS (%)															
Gravel (>4.75mm) %Retained	28	0		0.9		6.6		4.4		0		2.9		0.3	
Sand (0.075-.425mm) %Retained	26	76.9		57.8		69.5		52.7		67.7		56.6		46	
Silt+Clay (<0.075mm) %Retained	29	23.1		41.3		23.9		42.9		32.3		40.5		53.7	
% Solids	17	65.4		53.2		64.8		54.6		60.4		57.5		51.6	
TOTAL ORGANIC CARBON (%)															
TOC In Soil (Avg)	14762744	0.57		1.29		0.65		1.26		0.71		1.11		1.17	

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Analyte	CAS Number	SITE											
		CADS-1		CADS-2		CADS-3		CADS-4		CADS-5		CADS-5-DUP	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
METALS (MG/KG)													
Arsenic	7440382	2.41		1.56		4.05		4.11		4.50		4.20	
Cadmium	7440439	0.139		0.103		0.397		0.438		0.387		0.394	
Chromium	7440473	11.8		9.4		25.8		24.3		23.3		22.1	
Copper	7440508	4.6		2.7		8.3		8.4		8.5		8.3	
Lead	7439921	6.3		4.2		15.2		16.7		16.5		16.7	
Nickel	7440020	6.0		4.7		11.2		11.5		11.3		10.9	
Zinc	7440666	19.4		14.5		40.9		39.3		39.3		38.7	
Mercury	7439976	0.033		0.022		0.059		0.061		0.087		0.076	

Analyte	CAS Number	SITE		REFERENCE									
		CADS-6		EREF-1		EREF-2		EREF-3		WREF-1		WREF-2		WREF-3	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
METALS (MG/KG)															
Arsenic	7440382	2.18		8.80		7.01		7.91		6.51		6.64		8.25	
Cadmium	7440439	0.222		0.039	J	0.024	J	0.052	J	0.036	J	0.053	J	0.102	
Chromium	7440473	11.5		24.0		18.6		24.3		17.1		18.8		21.5	
Copper	7440508	3.8		7.0		4.4		6.8		4.7		5.4		6.9	
Lead	7439921	6.2		15.4		10.0		14.7		10.6		11.6		14.2	
Nickel	7440020	5.5		13.8		10.2		14.4		10.1		10.5		12.2	
Zinc	7440666	20.5		36.3		25.1		35.3		25.8		27.5		36.6	
Mercury	7439976	0.027		0.034		0.020		0.030		0.019		0.024		0.035	

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Analyte	CAS Number	SITE											
		CADS-1		CADS-2		CADS-3		CADS-4		CADS-5		CADS-5-DUP	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PESTICIDES (UG/KG)													
4,4`-DDD	72548	0.674		0.364		1.690		1.330		1.100		1.130	
4,4`-DDE	72559	0.009	U	0.008	U	0.011	U	0.011	U	0.010	U	0.010	U
4,4`-DDT	50293	0.019	U	0.016	U	0.024	U	0.023	U	0.021	U	0.022	U
Total DDx		*0.701*		*0.388*		*1.725*		*1.364*		*1.131*		*1.162*	
Aldrin	309002	0.047	U	0.040	U	0.060	U	0.058	U	0.054	U	0.055	U
Alpha-BHC	319846	0.028	U	0.025	U	0.036	U	0.036	U	0.033	U	0.033	U
cis-Chlordane (alpha-Chlordane)	5103719	0.100	U	0.087	U	0.129	U	0.126	U	0.116	U	0.118	U
Beta-BHC	319857	0.020	U	0.017	U	0.025	U	0.024	U	0.023	U	0.023	U
Delta-BHC	319868	0.022	U	0.019	U	0.029	U	0.028	U	0.026	U	0.026	U
Dieldrin	60571	*0.028*	*U*	*0.024*	*U*	*0.036*	*U*	*0.035*	*U*	*0.033*	*U*	*0.033*	*U*
Endosulfan I	959988	0.026	U	0.022	U	0.033	U	0.032	U	0.030	U	0.030	U
Endosulfan II	33213659	0.013	U	0.012	U	0.017	U	0.017	U	0.015	U	0.016	U
Endosulfan sulfate	1031078	0.008	U	0.007	U	0.010	U	0.010	U	0.009	U	0.009	U
Endrin	72208	0.015	U	0.013	U	0.020	U	0.019	U	0.018	U	0.018	U
gamma-BHC (Lindane)	58899	0.042	U	0.037	U	0.054	U	0.053	U	0.049	U	0.049	U
trans-Chlordane (gamma-Chlordane)	5103742	0.028	U	0.025	U	0.036	U	0.036	U	0.033	U	0.033	U
Total Chlordane		*0.212*	*U*	*0.183*	*U*	*0.272*	*U*	*0.266*	*U*	*0.245*	*U*	*0.249*	*U*
Heptachlor	76448	0.029	U	0.025	U	0.038	U	0.037	U	0.034	U	0.034	U
Heptachlor epoxide	1024573	0.060	U	0.052	U	0.077	U	0.075	U	0.069	U	0.070	U
Methoxychlor	72435	0.066	U	0.057	U	0.085	U	0.083	U	0.076	U	0.078	U
cis-Nonachlor	5103731	0.014	U	0.012	U	0.018	U	0.017	U	0.016	U	0.016	U
trans-Nonachlor	39765805	0.013	U	0.011	U	0.016	U	0.016	U	0.015	U	0.015	U
Oxychlordane	27304138	0.058	U	0.050	U	0.074	U	0.072	U	0.067	U	0.068	U
Toxaphene	8001352	1.20	U	1.05	U	1.55	U	1.51	U	1.39	U	1.41	U

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Analyte	CAS Number	SITE		REFERENCE											
		CADS-6		EREF-1		EREF-2		EREF-3		WREF-1		WREF-2		WREF-3	
		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PESTICIDES (UG/KG)															
4,4`-DDD	72548	0.476		0.017	U	0.014	U	0.017	U	0.015	U	0.016	U	0.018	U
4,4`-DDE	72559	0.008	U	0.011	U	0.009	U	0.010	U	0.009	U	0.010	U	0.011	U
4,4`-DDT	50293	0.018	U	0.022	U	0.019	U	0.022	U	0.020	U	0.021	U	0.023	U
Total DDx		*0.502*		*0.050*	*U*	*0.041*	*U*	*0.048*	*U*	*0.043*	*U*	*0.047*	*U*	*0.051*	*U*
Aldrin	309002	0.045	U	0.057	U	0.047	U	0.054	U	0.049	U	0.054	U	0.059	U
Alpha-BHC	319846	0.027	U	0.035	U	0.029	U	0.033	U	0.030	U	0.033	U	0.036	U
cis-Chlordane (alpha-Chlordane)	5103719	0.097	U	0.122	U	0.102	U	0.117	U	0.106	U	0.116	U	0.126	U
Beta-BHC	319857	0.019	U	0.024	U	0.020	U	0.023	U	0.021	U	0.023	U	0.025	U
Delta-BHC	319868	0.022	U	0.027	U	0.023	U	0.026	U	0.024	U	0.026	U	0.028	U
Dieldrin	60571	*0.027*	*U*	*0.034*	*U*	*0.029*	*U*	*0.033*	*U*	*0.030*	*U*	*0.032*	*U*	*0.035*	*U*
Endosulfan I	959988	0.025	U	0.031	U	0.026	U	0.030	U	0.027	U	0.030	U	0.032	U
Endosulfan II	33213659	0.013	U	0.016	U	0.014	U	0.016	U	0.014	U	0.015	U	0.017	U
Endosulfan sulfate	1031078	0.008	U	0.010	U	0.008	U	0.009	U	0.008	U	0.009	U	0.010	U
Endrin	72208	0.015	U	0.019	U	0.016	U	0.018	U	0.016	U	0.018	U	0.019	U
gamma-BHC (Lindane)	58899	0.041	U	0.051	U	0.043	U	0.049	U	0.044	U	0.049	U	0.053	U
trans-Chlordane (gamma-Chlordane)	5103742	0.027	U	0.035	U	0.029	U	0.033	U	0.030	U	0.033	U	0.036	U
Total Chlordane		*0.204*	*U*	*0.258*	*U*	*0.215*	*U*	*0.248*	*U*	*0.223*	*U*	*0.245*	*U*	*0.267*	*U*
Heptachlor	76448	0.028	U	0.036	U	0.030	U	0.034	U	0.031	U	0.034	U	0.037	U
Heptachlor epoxide	1024573	0.058	U	0.073	U	0.061	U	0.070	U	0.063	U	0.069	U	0.075	U
Methoxychlor	72435	0.064	U	0.080	U	0.067	U	0.077	U	0.070	U	0.076	U	0.083	U
cis-Nonachlor	5103731	0.013	U	0.017	U	0.014	U	0.016	U	0.014	U	0.016	U	0.017	U
trans-Nonachlor	39765805	0.012	U	0.015	U	0.013	U	0.015	U	0.013	U	0.015	U	0.016	U
Oxychlordane	27304138	0.056	U	0.070	U	0.059	U	0.067	U	0.061	U	0.067	U	0.073	U
Toxaphene	8001352	1.16	U	1.47	U	1.23	U	1.41	U	1.27	U	1.39	U	1.52	U

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Analyte		CAS Number	SITE											
			CADS-1		CADS-2		CADS-3		CADS-4		CADS-5		CADS-5-DUP	
			Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PCBs (UG/KG) (a)														
PCB 8		34883437	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 18		37680652	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 28		7012375	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 44		41464395	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 49	x	41464408	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 52		35693993	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 66		32598100	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 77	x	32598133	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 87 / 111	x	38380028/ 39635320	0.175	U	0.176	U	0.240	U	0.244	U	0.224	U	0.223	U
PCB 101 / 90		37680732/ 68194070	0.175	U	0.176	U	0.240	U	0.244	U	0.224	U	0.223	U
PCB 105		32598144	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 118		31508006	0.087	U	0.088	U	0.120	U	0.122	U	0.270	J	0.112	U
PCB 126	x	57465288	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 128		38380073	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 138		35065282	0.087	U	0.088	U	0.354	J	0.122	U	0.112	U	0.321	J
PCB 153		35065271	0.087	U	0.088	U	0.385	J	0.122	U	0.298	J	0.294	J
PCB 156	x	38380084	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 169	x	32774166	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 170		35065306	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 180		35065293	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 183	x	52663691	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 184	x	74472483	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 187		52663680	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 195		52663782	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 206		40186729	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
PCB 209		2051243	0.087	U	0.088	U	0.120	U	0.122	U	0.112	U	0.112	U
Total PCBs			3.31	U	3.33	U	5.56	J	4.64	U	4.94	J	5.02	J

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Analyte		CAS Number	SITE CADS-6 Result	Qual	REFERENCE EREF-1 Result	Qual	EREF-2 Result	Qual	EREF-3 Result	Qual	WREF-1 Result	Qual	WREF-2 Result	Qual	WREF-3 Result	Qual
PCBs (UG/KG) (a)																
PCB 8		34883437	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 18		37680652	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 28		7012375	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 44		41464395	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 49	x	41464408	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 52		35693993	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 66		32598100	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 77	x	32598133	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 87 / 111	x	38380028/ 39635320	0.184	U	0.229	U	0.187	U	0.226	U	0.197	U	0.203	U	0.234	U
PCB 101 / 90		37680732/ 68194070	0.184	U	0.229	U	0.187	U	0.226	U	0.197	U	0.203	U	0.234	U
PCB 105		32598144	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 118		31508006	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 126	x	57465288	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 128		38380073	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 138		35065282	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 153		35065271	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.244	J
PCB 156	x	38380084	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 169	x	32774166	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 170		35065306	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 180		35065293	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 183	x	52663691	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 184	x	74472483	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 187		52663680	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 195		52663782	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 206		40186729	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
PCB 209		2051243	0.092	U	0.115	U	0.094	U	0.113	U	0.099	U	0.101	U	0.117	U
Total PCBs			3.50	U	4.35	U	3.55	U	4.29	U	3.74	U	3.84	U	4.70	J

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Analyte		CAS Number	SITE											
			CADS-1		CADS-2		CADS-3		CADS-4		CADS-5		CADS-5-DUP	
			Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PAHs (UG/KG)														
1-Methylnaphthalene	L	90120	1.3	U	1.2	U	1.6	U	3.8	J	1.6	U	1.5	U
2-Methylnaphthalene	L	91576	1.7	U	1.5	U	2.1	U	4.3	J	2.0	U	2.0	U
Acenaphthene	L	83329	1.1	U	1.0	U	1.4	U	1.4	U	1.4	U	1.4	U
Acenaphthylene	L	208968	0.90	U	0.80	U	1.2	U	1.1	U	1.1	U	1.1	U
Anthracene	L	120127	7.4	J	4.0	J	16		11	J	15		13	J
Benzo(a)anthracene	H	56553	40		23		78		60		78		72	
Benzo(a)pyrene	H	50328	43		25		74		63		80		71	
Benzo(b)fluoranthene	H	205992	40		26		75		59		100		96	
Benzo(g,h,i)perylene	H	191242	20		11		34		32		49		42	
Benzo(k)fluoranthene	H	207089	31		16		46		42		33		34	
Chrysene	H	218019	47		30		72		60		70		62	
Dibenz(a,h)anthracene	H	53703	1.4	U	1.2	U	7.1	J	1.7	U	14		12	U
Fluoranthene	H	206440	79		51		140		120		160		160	
Fluorene	L	86737	2.4	U	2.2	U	3.1	U	6.3	J	7.8	J	6.9	U
Indeno(1,2,3-cd)pyrene	H	193395	21		12		34		33		47		37	
Naphthalene	L	91203	2.0	U	1.8	U	2.5	U	2.4	U	2.4	U	2.3	U
Phenanthrene	L	85018	48		34		83		70		87		82	
Pyrene	H	129000	92		53		140		120		130		130	
Total LMW PAHs	L		65		46		111		100		118		110	
Total HMW PAHs	H		414		248		700		591		761		716	
Total PAHs			479		295		811		691		879		826	

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Analyte		CAS Number	SITE CADS-6 Result	Qual	REFERENCE EREF-1 Result	Qual	EREF-2 Result	Qual	EREF-3 Result	Qual	WREF-1 Result	Qual	WREF-2 Result	Qual	WREF-3 Result	Qual
PAHs (UG/KG)																
1-Methylnaphthalene	L	90120	1.2	U	1.4	U	1.3	U	1.5	U	1.3	U	1.3	U	1.6	U
2-Methylnaphthalene	L	91576	1.6	U	1.9	U	1.7	U	2.0	U	1.7	U	1.7	U	2.1	U
Acenaphthene	L	83329	1.1	U	1.3	U	1.1	U	1.4	U	1.2	U	1.2	U	1.4	U
Acenaphthylene	L	208968	0.85	U	1.0	U	0.9	U	1.1	U	1.0	U	1.0	U	1.1	U
Anthracene	L	120127	7.6	J	4.4	J	0.9	U	1.1	U	1.0	U	2.8	J	3.4	J
Benzo(a)anthracene	H	56553	32		17		8.6	J	12		12		17		25	
Benzo(a)pyrene	H	50328	32		25		11		18		14		20		29	
Benzo(b)fluoranthene	H	205992	43		23		12		20		22		28		41	
Benzo(g,h,i)perylene	H	191242	20		13		8.2	J	11	J	9.8	J	15		19	
Benzo(k)fluoranthene	H	207089	14		17		9.3	J	13		6.3	J	8.8	J	14	
Chrysene	H	218019	29		24		13		17		14		19		25	
Dibenz(a,h)anthracene	H	53703	5.3	J	1.5	U	1.4	U	1.6	U	1.4	U	1.4	U	4.9	J
Fluoranthene	H	206440	72		42		21.0		31		29		38		54	
Fluorene	L	86737	2.3	U	2.7	U	2.4	U	2.9	U	2.5	U	2.5	U	3.0	U
Indeno(1,2,3-cd)pyrene	H	193395	18		12.0		5.8	J	8.5	J	9.6	J	12		18	
Naphthalene	L	91203	1.9	U	2.2	U	1.9	U	2.4	U	2.1	U	2.0	U	2.4	U
Phenanthrene	L	85018	39		22		11		16		15		20		28	
Pyrene	H	129000	58		48		23		34		23		33		45	
Total LMW PAHs	L		55		37		21		28		26		32		43	
Total HMW PAHs	H		323		223		113		166		141		192		275	
Total PAHs			379		259		134		194		167		225		318	

Notes:

x - Not a NOAA18 congener.
H/HMW - High Molecular Weight.
J - Estimated.
L/LMW - Low Molecular Weight.
MG/KG - Milligram per kilogram.
NA - Not Analyzed.
PAHs - Polycyclic Aromatic Hydrocarbons.
PCBs - Polychlorinated Biphenyls.
TOC - Total Organic Carbon.
U - Not Detected (reported at 1/2 method detection limit).
UG/KG - Microgram per kilogram.
Totals calculated using 1/2 the method detection limit for non-detects.

Total PCBs calculated as the sum of the 18 NOAA congeners multiplied by 2.
(a) Laboratory results report the following PCB congeners together: PCB 87 / 111 and PCB 101 / 90.

Appendix D

Benthic Biology Results for CADS Survey

Table D-1. Species Abundance at the CADS Site and Reference Area

Station	Rank	Species	Total Abundance	% Total
CADS stations	1	*Prionospio steenstrupi* (SSDF)	322	25%
	2	*Nephtys picta* (OS)	120	9%
	3	*Tharyx acutus* (SDF)	108	8%
	4	*Spiophanes bombyx* (SSDF)	100	8%
	5	*Spio setosa* (SSDF)	94	7%
	6	*Aricidea* spp.(SDF)	75	6%
	7	*Heteromastus filiformis* (SSDF)	74	6%
	8	Oligochaeta spp. (OS)	72	5%
	9	*Capitella capitata* (SSDF)	37	3%
	10	*Polycirrus medusa* (SSDF)	35	3%
	-	Remaining Species	275	21%
Species Richness	50	**Station Abundance**	1312	
Reference Stations	1	*Ampelisca* spp. (IF)	1638	30%
	2	*Tharyx acutus* (SDF)	1365	25%
	3	*Cirratulus cirratus* (SDF)	238	4%
	4	*Cossura longocirrata* (SSDF)	220	4%
	5	*Apistobranchus tullbergi* (SDF)	185	3%
	6	*Clymenella zonalis* (SSDF)	158	3%
	7	*Maldanidae spp.* (SSDF)	147	3%
	8	*Mediomastus ambiseta* (SSDF)	132	2%
	9	*Exogone spp.* (P)	126	2%
	10	*Heteromastus filiformis* (SSDF)	123	2%
	-	Remaining Species	1067	20%
Species Richness	64	**Station Abundance**	5399	

Notes- Trophic Faunal Grouping :

IF – Interface Feeder

OS – Omnivore/Scavenger

P - Predator

SSDF – Subsurface Deposit Feeder

SDF – Surface Deposit Feeder

SFF – Suspension/Filter Feeder

Table D-2. Species Abundance by Station at the CADS Site and Reference Area

Site

Station	Rank	Species	Total Abundance	% Total
CADS-1	1	*Prionospio steenstrupi* (SSDF)	86	34%
	2	*Nephtys picta* (OS)	43	17%
	3	*Spiophanes bombyx* (SSDF)	24	9%
	4	*Heteromastus filiformis* (SSDF)	20	8%
	5	*Tharyx acutus* (SDF)	13	5%
	6	*Aricidea* spp. (SDF)	10	4%
	7	*Leitoscoloplos fragilis* (SSDF)	9	4%
	8	*Parvicardium pinnulatum* (SFF)	7	3%
	9	*Oligochaeta* spp. (OS)	6	2%
	9	*Spio setosa* (SSDF)	6	2%
	-	Remaining Species	32	13%
Species Richness	30	**Station Abundance**	256	
CADS-2	1	*Prionospio steenstrupi* (SSDF)	42	26%
	2	*Nephtys picta* (OS)	19	12%
	3	*Heteromastus filiformis* (SSDF)	15	9%
	4	*Oligochaeta* spp. (OS)	12	8%
	5	*Aricidea* spp. (SDF)	10	6%
	6	*Ophelina acuminata* (SSDF)	7	4%
	6	*Polydora* spp. (SSDF)	7	4%
	6	*Spio setosa* (SSDF)	7	4%
	7	*Lepidonotus squamatus* (P)	5	3%
	8	*Capitella capitata* (SSDF)	4	3%
	8	*Scalibregma inflatum* (SSDF)	4	3%
	8	*Spiophanes bombyx* (SSDF)	4	3%
	-	Remaining Species	24	15%
Species Richness	23	**Station Abundance**	160	

Notes -Trophic Faunal Grouping:

IF – Interface Feeder

OS – Omnivore/Scavenger

P – Predator

SSDF – Subsurface Deposit Feeder

SDF – Surface Deposit Feeder

SFF – Suspension/Filter Feeder

Station	Rank	Species	Total Abundance	% Total
CADS-3	1	*Prionospio steenstrupi* (SSDF)	118	35%
	2	*Tharyx acutus* (SDF)	61	18%
	3	*Spiophanes bombyx* (SSDF)	27	8%
	4	*Heteromastus filiformis* (SSDF)	25	8%
	5	*Spio setosa* (SSDF)	18	5%
	6	*Aricidea* spp. (SDF)	16	5%
	7	*Leitoscoloplos fragilis* (SSDF)	14	4%
	8	*Levinsenia gracilis* (SSDF)	12	4%
	9	*Ampelisca* spp. (IF)	9	3%
	10	*Nephtys picta* (OS)	6	2%
	-	Remaining Species	27	8%
Species Richness	23	**Station Abundance**	333	
CADS-4	1	*Prionospio steenstrupi* (SSDF)	27	18%
	2	*Polycirrus medusa* (SSDF)	18	12%
	3	*Nephtys caeca* (OS)	16	11%
	3	*Spio setosa* (SSDF)	16	11%
	4	*Nephtys picta* (OS)	11	7%
	5	*Spiophanes bombyx* (SSDF)	10	7%
	6	*Parvicardium pinnulatum* (SFF)	9	6%
	7	*Oligochaeta* spp. (OS)	8	5%
	8	*Capitella capitata* (SSDF)	7	5%
	9	*Pherusa affinis* (SDF)	6	4%
	10	*Scalibregma inflatum* (SSDF)	4	3%
	-	Remaining Species	18	12%
Species Richness	20	**Station Abundance**	150	

Notes - Trophic Faunal Grouping:

IF – Interface Feeder

OS – Omnivore/Scavenger

P - Predator

SSDF – Subsurface Deposit Feeder

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SFF – Suspension/Filter Feeder

Station	Rank	Species	Total Abundance	% Total
CADS-5	1	*Oligochaeta* spp. (OS)	43	26%
	2	*Spio setosa* (SSDF)	21	13%
	3	*Prionospio steenstrupi* (SSDF)	19	11%
	4	*Capitella capitata (SSDF)*	16	10%
	5	*Polycirrus medusa* (SSDF)	14	8%
	6	*Nephtys picta* (OS)	10	6%
	7	*Ophelina acuminata* (SSDF)	10	6%
	7	*Spiophanes bombyx* (SSDF)	6	4%
	8	*Euchone elegans* (SFF)	5	3%
	9	*Parougia caeca* (SDF)	4	2%
	-	Remaining Species	20	12%
Species Richness	21	**Station Abundance**	168	
CADS-6	1	*Aricidea* spp. (SDF)	39	16%
	2	*Tharyx acutus* (SDF)	32	13%
	3	*Nephtys picta* (OS)	31	13%
	4	*Prionospio steenstrupi* (SSDF)	30	12%
	5	*Spiophanes bombyx* (SSDF)	29	12%
	6	*Spio setosa* (SSDF)	26	11%
	7	*Heteromastus filiformis* (SSDF)	14	6%
	8	*Capitella capitata* (SSDF)	9	4%
	9	*Ampelisca* spp. (IF)	4	2%
	9	*Phyllodoce mucosa* (P)	4	2%
	-	Remaining Species	27	11%
Species Richness	25	**Station Abundance**	245	

Notes - Trophic Faunal Grouping:

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Reference Area

Station	Rank	Species	Total Abundance	% Total
EREF-1	1	*Ampelisca* spp. (IF)	361	31%
	2	*Tharyx acutus* (SDF)	265	23%
	3	*Mediomastus ambiseta* (SSDF)	81	7%
	4	*Cirratulus cirratus* (SDF)	60	5%
	5	*Maldanidae* spp. (SSDF)	55	5%
	6	*Cossura longocirrata* (SSDF)	42	4%
	7	*Exogone* spp. (P)	41	4%
	8	*Apistobranchus tullbergi* (SDF)	32	3%
	9	*Prionospio steenstrupi* (SSDF)	29	3%
	10	*Clymenella torquata* (SSDF)	27	2%
	-	Remaining Species	154	13%
Species Richness	41	**Station Abundance**	1147	
EREF-2	1	*Ampelisca* spp. (IF)	248	31%
	2	*Tharyx acutus* (SDF)	183	23%
	3	*Maldanidae* spp. (SSDF)	50	6%
	4	*Apistobranchus tullbergi* (SDF)	49	6%
	5	*Cirratulus cirratus* (SDF)	40	5%
	6	*Cossura longocirrata* (SSDF)	22	3%
	6	*Mediomastus ambiseta* (SSDF)	22	3%
	7	*Clymenella torquata* (SSDF)	18	2%
	7	*Nucula proxima* (SSDF)	18	2%
	8	*Exogone* spp. (P)	16	2%
	8	*Prionospio steenstrupi* (SSDF)	16	2%
	9	*Lysianassidae* spp. (IF)	10	1%
	9	*Thyasira gouldii* (SFF)	10	1%
	-	Remaining Species	110	14%
Species Richness	36	**Station Abundance**	812	

Notes - Trophic Faunal Grouping:

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Station	Rank	Species	Total Abundance	% Total
EREF-3	1	*Tharyx acutus* (SDF)	262	36%
	2	*Cossura longocirrata* (SSDF)	76	10%
	3	*Apistobranchus tullbergi* (SDF)	69	9%
	4	*Ampelisca* spp. (IF)	40	5%
	5	*Cirratulus cirratus* (SDF)	34	5%
	6	*Prionospio steenstrupi* (SSDF)	27	4%
	7	*Mediomastus ambiseta* (SSDF)	26	4%
	8	*Oligochaeta* spp. (OS)	20	3%
	9	*Aricidea* spp. (SDF)	17	2%
	9	*Nucula proxima* (SSDF)	17	2%
	10	*Sternaspis scutata* (SSDF)	16	2%
	-	Remaining Species	125	17%
Species Richness	36	**Station Abundance**	729	
WREF-1	1	*Ampelisca* spp. (IF)	401	50%
	2	*Tharyx acutus* (SDF)	125	16%
	3	*Levinsenia gracilis (SSDF)*	30	4%
	4	*Maldanidae* spp. (SSDF)	27	3%
	5	*Prionospio steenstrupi* (SSDF)	20	3%
	6	*Cirratulus cirratus* (SDF)	18	2%
	7	*Apistobranchus tullbergi* (SDF)	17	2%
	7	*Yoldia sapotilla* (SSDF)	17	2%
	8	*Spio setosa* (SSDF)	16	2%
	9	*Nucula proxima* (SSDF)	15	2%
	10	*Periploma papyratium* (SFF)	13	2%
	-	Remaining Species	99	12%
Species Richness	33	**Station Abundance**	798	

Notes - Trophic Faunal Grouping:

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Station	Rank	Species	Total Abundance	% Total
WREF-2	1	*Tharyx acutus* (SDF)	297	32%
	2	*Ampelisca* spp. (IF)	265	28%
	3	*Cirratulus cirratus* (SDF)	86	9%
	4	*Heteromastus filiformis* (SSDF)	77	8%
	5	*Exogone* spp. (P)	36	4%
	6	*Cossura longocirrata* (SSDF)	35	4%
	7	*Apistobranchus tullbergi* (SDF)	15	2%
	8	*Prionospio steenstrupi* (SSDF)	13	1%
	9	*Maldane sarsi* (SSDF)	11	1%
	10	*Cerebratulus lacteus* (P)	10	1%
	10	*Leitoscoloplos fragilis* (SSDF)	10	1%
	10	*Levinsenia gracilis* (SSDF)	10	1%
	-	Remaining Species	70	7%
Species Richness	30	**Station Abundance**	935	
WREF-3	1	*Ampelisca* spp. (IF)	323	33%
	2	*Tharyx acutus* (SDF)	233	24%
	3	*Clymenella zonalis* (SSDF)	158	16%
	4	*Heteromastus filiformis* (SSDF)	46	5%
	5	*Cossura longocirrata* (SSDF)	41	4%
	6	*Exogone* spp. (P)	25	3%
	6	*Levinsenia gracilis* (SSDF)	25	3%
	7	*Nucula proxima* (SSDF)	17	2%
	8	*Thyasira gouldii* (SFF)	15	2%
	9	*Euchone elegans* (SFF)	9	1%
	10	*Terebellides stroemii* (SSDF)	8	1%
	-	Remaining Species	78	8%
Species Richness	40	**Station Abundance**	978	

Notes - Trophic Faunal Grouping:

IF – Interface Feeder

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Appendix E

Underwater Video Data

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876912.8	52523.87	9:45:53		camera too high - poor resolution	WREF-1
876913.4	52523.67	9:45:55		camera too high - poor resolution	WREF-1
876913.7	52523.47	9:45:56		camera too high - poor resolution	WREF-1
876914.6	52522.95	9:45:58		camera too high - poor resolution	WREF-1
876914.9	52522.81	9:45:59		camera too high - poor resolution	WREF-1
876915.1	52523.01	9:46:01		camera too high - poor resolution	WREF-1
876915.4	52522.93	9:46:02		camera too high - poor resolution	WREF-1
876916.1	52522.52	9:46:04		camera too high - poor resolution	WREF-1
876916.8	52521.93	9:46:06		camera too high - poor resolution	WREF-1
876917.1	52521.79	9:46:07		camera too high - poor resolution	WREF-1
876917.6	52521.58	9:46:09		camera too high - poor resolution	WREF-1
876918	52521.46	9:46:10		camera too high - poor resolution	WREF-1
876918.3	52521.3	9:46:11		camera too high - poor resolution	WREF-1
876918.4	52521.28	9:46:12		camera too high - poor resolution	WREF-1
876918.7	52521.24	9:46:13		camera too high - poor resolution	WREF-1
876918.7	52521.3	9:46:14		camera too high - poor resolution	WREF-1
876918.9	52521.2	9:46:15		camera too high - poor resolution	WREF-1
876919.3	52520.95	9:46:16	Cobble and gravel	lightly encrusted	WREF-1
876919.6	52520.68	9:46:17	Cobble and gravel	Screen shot Anemone	WREF-1
876920	52520.43	9:46:18	Cobble and gravel	lightly encrusted	WREF-1
876920.3	52520.38	9:46:19	Cobble and gravel	lightly encrusted	WREF-1
876920.4	52520.34	9:46:20	Cobble and gravel	lightly encrusted	WREF-1
876920.8	52520.17	9:46:21	Cobble and gravel	lightly encrusted	WREF-1
876921.1	52519.98	9:46:22	Cobble and gravel	lightly encrusted	WREF-1
876921.4	52519.77	9:46:23	Cobble and gravel	lightly encrusted	WREF-1
876921.7	52519.54	9:46:24	Cobble and gravel	lightly encrusted	WREF-1
876921.8	52519.33	9:46:25		camera too high - poor resolution	WREF-1
876922.1	52519.11	9:46:26		camera too high - poor resolution	WREF-1
876922.3	52518.96	9:46:27		camera too high - poor resolution	WREF-1
876922.6	52518.99	9:46:28		camera too high - poor resolution	WREF-1
876922.9	52518.98	9:46:29		camera too high - poor resolution	WREF-1
876923	52519.05	9:46:30		camera too high - poor resolution	WREF-1
876923.5	52518.88	9:46:31		camera too high - poor resolution	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876923.8	52518.64	9:46:32		camera too high - poor resolution	WREF-1
876924.1	52518.35	9:46:33	Cobble and gravel	lightly encrusted	WREF-1
876924.4	52518.08	9:46:34	Cobble and gravel	lightly encrusted	WREF-1
876924.6	52517.9	9:46:35	Cobble and gravel	lightly encrusted	WREF-1
876924.9	52517.73	9:46:36	Cobble and gravel	lightly encrusted	WREF-1
876925.4	52517.56	9:46:37	Cobble and gravel	lightly encrusted	WREF-1
876925.7	52517.4	9:46:38	Cobble and gravel	lightly encrusted	WREF-1
876926.1	52517.2	9:46:39	Cobble and gravel	lightly encrusted	WREF-1
876926.3	52516.99	9:46:40	Cobble and gravel	lightly encrusted	WREF-1
876926.5	52516.89	9:46:41	Cobble and gravel	lightly encrusted	WREF-1
876926.8	52516.76	9:46:42	Cobble and gravel	lightly encrusted	WREF-1
876926.9	52516.66	9:46:43	Cobble and gravel	lightly encrusted	WREF-1
876927.2	52516.42	9:46:44	Cobble and gravel	lightly encrusted	WREF-1
876927.6	52516.07	9:46:45	Cobble and gravel	lightly encrusted	WREF-1
876928.1	52515.89	9:46:46	Cobble and gravel	lightly encrusted	WREF-1
876928.5	52515.8	9:46:47	Cobble and gravel	lightly encrusted	WREF-1
876928.5	52515.92	9:46:48	Cobble and gravel	lightly encrusted	WREF-1
876928.8	52515.88	9:46:49	Cobble and gravel	lightly encrusted	WREF-1
876929	52515.64	9:46:50	Cobble and gravel	lightly encrusted	WREF-1
876929.5	52515.18	9:46:51	Cobble and gravel	lightly encrusted	WREF-1
876930	52514.79	9:46:52	Cobble and gravel	lightly encrusted	WREF-1
876930.3	52514.6	9:46:53	Cobble and gravel	lightly encrusted	WREF-1
876930.4	52514.55	9:46:54	Cobble and gravel	lightly encrusted	WREF-1
876930.5	52514.45	9:46:55	Cobble and gravel	lightly encrusted	WREF-1
876930.7	52514.24	9:46:56	Cobble and gravel	lightly encrusted	WREF-1
876931	52514.03	9:46:57	Cobble and gravel	lightly encrusted	WREF-1
876931.4	52513.94	9:46:58	Cobble and gravel	lightly encrusted	WREF-1
876931.7	52513.97	9:46:59	Cobble and gravel	lightly encrusted	WREF-1
876931.9	52513.9	9:47:00	Cobble and gravel	lightly encrusted	WREF-1
876932.2	52513.6	9:47:01	Cobble and gravel	lightly encrusted and anemone	WREF-1
876932.5	52513.22	9:47:02	Cobble and gravel	lightly encrusted	WREF-1
876933	52512.89	9:47:03	Cobble and gravel	lightly encrusted	WREF-1
876933	52512.8	9:47:04	Cobble and gravel	lightly encrusted	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876933.3	52512.7	9:47:05	Cobble and gravel	lightly encrusted	WREF-1
876933.6	52512.53	9:47:06	Cobble and gravel	lightly encrusted	WREF-1
876933.9	52512.32	9:47:07	Cobble and gravel	lightly encrusted	WREF-1
876934.2	52512.06	9:47:08	Cobble and gravel	lightly encrusted	WREF-1
876934.4	52511.87	9:47:09	Cobble and gravel	lightly encrusted	WREF-1
876934.5	52511.76	9:47:10	Cobble and gravel	lightly encrusted	WREF-1
876934.7	52511.72	9:47:11	Cobble and gravel	lightly encrusted	WREF-1
876934.9	52511.61	9:47:12	Cobble and gravel	lightly encrusted	WREF-1
876935.1	52511.45	9:47:13	Cobble and gravel	lightly encrusted	WREF-1
876935.5	52511.11	9:47:14	Sand with gravel		WREF-1
876935.8	52510.82	9:47:15	Sand with gravel		WREF-1
876936.3	52510.55	9:47:16	Sand with gravel		WREF-1
876936.7	52510.3	9:47:17	Sand with gravel		WREF-1
876937	52510.13	9:47:18	Sand with gravel		WREF-1
876937.2	52510.07	9:47:19	Sand with gravel		WREF-1
876937.2	52510.17	9:47:20	Sand with gravel		WREF-1
876937.2	52510.27	9:47:21	Sand with gravel		WREF-1
876937.4	52510.21	9:47:22	Sand with gravel	Screen shot	WREF-1
876937.7	52509.95	9:47:23	Sand with gravel		WREF-1
876938.3	52509.57	9:47:24	Sand with gravel		WREF-1
876938.5	52509.32	9:47:25	Sand with gravel		WREF-1
876939	52508.96	9:47:26	Sand with gravel		WREF-1
876939.2	52508.71	9:47:27	Sand with gravel		WREF-1
876939.6	52508.47	9:47:28	Sand with gravel		WREF-1
876939.8	52508.36	9:47:29	Sand with gravel		WREF-1
876940	52508.38	9:47:30	Sand with gravel		WREF-1
876940.2	52508.46	9:47:31	Sand with gravel		WREF-1
876940.5	52508.41	9:47:32	Sand with gravel		WREF-1
876940.7	52508.35	9:47:33	Sand with gravel		WREF-1
876941	52508.19	9:47:34	Sand with gravel		WREF-1
876941.3	52507.93	9:47:35	Sand with gravel		WREF-1
876941.7	52507.65	9:47:36	Sand with gravel		WREF-1
876942.2	52507.35	9:47:37	Sand with gravel		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876942.5	52507.08	9:47:38	Sand with gravel		WREF-1
876942.8	52506.8	9:47:39	Sand with gravel		WREF-1
876942.8	52506.64	9:47:40	Sand with gravel		WREF-1
876943.1	52506.45	9:47:41	Sand with gravel		WREF-1
876943.1	52506.42	9:47:42	Sand with gravel		WREF-1
876943.4	52506.39	9:47:43	Sand with gravel		WREF-1
876943.8	52506.26	9:47:44	Sand with gravel		WREF-1
876944.1	52506.17	9:47:45	Sand with gravel		WREF-1
876944.5	52506.05	9:47:46	Sand with gravel		WREF-1
876944.9	52505.79	9:47:47	Sand with gravel		WREF-1
876945.4	52505.38	9:47:48	Sand with gravel		WREF-1
876945.8	52505.04	9:47:49	Sand with gravel		WREF-1
876946	52504.84	9:47:50	Sand with gravel		WREF-1
876946	52504.87	9:47:51	Sand with gravel		WREF-1
876946	52504.94	9:47:52	Sand with gravel		WREF-1
876946.2	52504.91	9:47:53	Sand with gravel		WREF-1
876946.4	52504.78	9:47:54	Sand with gravel		WREF-1
876946.7	52504.38	9:47:55	Sand with gravel		WREF-1
876947.3	52503.84	9:47:56	Sand with gravel		WREF-1
876947.6	52503.52	9:47:57	Sand with gravel		WREF-1
876948.2	52503.31	9:47:58	Sand with gravel		WREF-1
876948.4	52503.32	9:47:59	Sand with gravel		WREF-1
876948.7	52503.25	9:48:00	Sand with gravel		WREF-1
876948.9	52503.12	9:48:01	Sand with gravel		WREF-1
876949	52503.01	9:48:02	Sand with gravel		WREF-1
876949.2	52502.93	9:48:03	Sand with gravel		WREF-1
876949.3	52502.94	9:48:04	Sand with gravel		WREF-1
876949.5	52502.75	9:48:05	Sand with gravel		WREF-1
876949.7	52502.46	9:48:06	Sand with gravel		WREF-1
876950.2	52501.99	9:48:07	Sand with gravel		WREF-1
876950.7	52501.59	9:48:08	Sand with gravel		WREF-1
876951.1	52501.27	9:48:09	Sand with gravel		WREF-1
876951.6	52501.01	9:48:10	Sand with gravel		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876951.7	52500.87	9:48:11	Sand with gravel		WREF-1
876951.8	52500.9	9:48:12	Sand with gravel		WREF-1
876952	52500.88	9:48:13	Sand with gravel		WREF-1
876952.1	52500.97	9:48:14	Sand with gravel		WREF-1
876952.4	52500.94	9:48:15	Sand with gravel		WREF-1
876952.7	52500.7	9:48:16	Sand with gravel		WREF-1
876953.2	52500.31	9:48:17	Sand with gravel		WREF-1
876953.6	52499.88	9:48:18	Sand with gravel		WREF-1
876954.2	52499.47	9:48:19	Sand with gravel		WREF-1
876954.5	52499.19	9:48:20	Sand with gravel		WREF-1
876954.8	52498.92	9:48:21	Sand with gravel		WREF-1
876955	52498.82	9:48:22	Sand with gravel		WREF-1
876955.2	52498.71	9:48:23	Sand with gravel		WREF-1
876955.3	52498.77	9:48:24	Sand with gravel		WREF-1
876955.4	52498.9	9:48:25	Sand with gravel		WREF-1
876955.6	52498.87	9:48:26	Sand with gravel		WREF-1
876955.8	52498.71	9:48:27	Sand with gravel		WREF-1
876956.3	52498.23	9:48:28	Sand with gravel		WREF-1
876956.8	52497.71	9:48:29	Sand with gravel		WREF-1
876957.3	52497.34	9:48:30	Sand with gravel		WREF-1
876957.7	52497.14	9:48:31	Sand with gravel		WREF-1
876957.9	52497.17	9:48:32	Sand with gravel		WREF-1
876958.1	52497.21	9:48:33	Sand with gravel		WREF-1
876958.2	52497.18	9:48:34	Sand with gravel		WREF-1
876958.4	52497.07	9:48:35	Sand with gravel		WREF-1
876958.6	52496.85	9:48:36	Sand with gravel		WREF-1
876958.8	52496.66	9:48:37	Sand with gravel		WREF-1
876959.1	52496.53	9:48:38	Sand with gravel		WREF-1
876959.4	52496.34	9:48:39	Sand with gravel		WREF-1
876959.8	52496.13	9:48:40	Sand with gravel		WREF-1
876960.4	52495.79	9:48:41	Sand with gravel		WREF-1
876960.8	52495.58	9:48:42	Sand with gravel		WREF-1
876961.1	52495.36	9:48:43	Sand with gravel		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876961.2	52495.3	9:48:44	Sand with gravel		WREF-1
876961.3	52495.24	9:48:45	Sand with gravel		WREF-1
876961.5	52495.07	9:48:46	Sand with gravel		WREF-1
876961.6	52495.01	9:48:47	Sand with gravel		WREF-1
876962	52494.7	9:48:48	Sand	Screen shot: Burrowing anemone	WREF-1
876962.3	52494.53	9:48:49	Sand		WREF-1
876962.5	52494.45	9:48:50	Sand		WREF-1
876962.9	52494.28	9:48:51	Sand		WREF-1
876963.3	52494.11	9:48:52	Sand		WREF-1
876963.9	52493.9	9:48:53	Sand		WREF-1
876964.1	52493.82	9:48:54	Sand		WREF-1
876964.2	52493.68	9:48:55	Sand		WREF-1
876964.2	52493.47	9:48:56	Sand		WREF-1
876964.5	52493.23	9:48:57	Sand with gravel and cobble	Fish and anemone	WREF-1
876964.8	52493.01	9:48:58	Sand with gravel and cobble		WREF-1
876965.2	52492.93	9:48:59	Sand with gravel and cobble		WREF-1
876965.7	52492.81	9:49:00	Cobble		WREF-1
876966.1	52492.67	9:49:01	Cobble		WREF-1
876966.4	52492.56	9:49:02	Cobble		WREF-1
876966.5	52492.48	9:49:03	Cobble	Screen shot	WREF-1
876966.8	52492.28	9:49:04	Cobble		WREF-1
876967	52492.06	9:49:05	Cobble		WREF-1
876967.4	52491.84	9:49:06	Cobble		WREF-1
876967.8	52491.69	9:49:07	Cobble		WREF-1
876968.1	52491.61	9:49:08	Cobble	Camera hits rock outcrop	WREF-1
876968.5	52491.51	9:49:09	Cobble		WREF-1
876968.7	52491.36	9:49:10	Cobble		WREF-1
876969.1	52491.17	9:49:11	Cobble		WREF-1
876969.5	52491.01	9:49:12	Cobble and rock	several tunicates on boulder?	WREF-1
876969.6	52490.87	9:49:13	Cobble and rock		WREF-1
876970.1	52490.61	9:49:14	Bedrock		WREF-1
876970.1	52490.44	9:49:15	Bedrock		WREF-1
876970.2	52490.24	9:49:16	Bedrock		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876970.7	52490.09	9:49:17	Bedrock		WREF-1
876970.9	52490.09	9:49:18	Bedrock		WREF-1
876971.4	52490.04	9:49:19	Bedrock		WREF-1
876971.9	52489.95	9:49:20	Bedrock		WREF-1
876972.3	52489.9	9:49:21	Bedrock		WREF-1
876972.6	52489.74	9:49:22	Sand with cobble and rock		WREF-1
876972.8	52489.61	9:49:23	Sand with cobble and rock		WREF-1
876973.1	52489.45	9:49:24	Sand with cobble and rock		WREF-1
876973.4	52489.15	9:49:25	Sand with cobble and rock		WREF-1
876973.7	52488.92	9:49:26	Cobble and rock		WREF-1
876974.1	52488.76	9:49:27	Cobble and rock	Camera hits rock outcrop, anemone, tu	WREF-1
876974.2	52488.61	9:49:28	Cobble and rock	Camera stuck	WREF-1
876974.6	52488.57	9:49:29	Cobble and rock	Camera stuck	WREF-1
876974.8	52488.55	9:49:30	Cobble and rock	Camera stuck	WREF-1
876975	52488.64	9:49:31	Cobble and rock	Camera stuck	WREF-1
876975.4	52488.61	9:49:32	Cobble and rock	Camera stuck	WREF-1
876975.6	52488.55	9:49:33	Cobble and rock	Camera stuck	WREF-1
876975.8	52488.4	9:49:34	Cobble and rock	Camera stuck	WREF-1
876976.2	52488.17	9:49:35	Cobble and rock	Camera stuck	WREF-1
876976.5	52487.97	9:49:36	Cobble and rock	Camera stuck	WREF-1
876977	52487.74	9:49:37	Cobble and rock	Camera stuck	WREF-1
876977.3	52487.56	9:49:38	Cobble and rock	Camera stuck	WREF-1
876977.3	52487.53	9:49:39	Cobble and rock	Camera stuck	WREF-1
876977.3	52487.47	9:49:40	Cobble and rock	Camera stuck	WREF-1
876976.9	52487.59	9:49:41	Cobble and rock	Camera stuck	WREF-1
876976.3	52487.82	9:49:42	Cobble and rock	Camera stuck	WREF-1
876975.6	52488	9:49:43	Cobble and rock	Camera stuck	WREF-1
876974.9	52488.01	9:49:44	Cobble and rock	Camera stuck	WREF-1
876974.6	52487.91	9:49:45	Cobble and rock	Camera stuck	WREF-1
876974.3	52487.84	9:49:46	Cobble and rock	Camera stuck	WREF-1
876974	52487.77	9:49:47	Cobble and rock	Camera stuck	WREF-1
876973.7	52487.58	9:49:48	Cobble and rock	Camera stuck	WREF-1
876973.6	52487.35	9:49:49	Cobble and rock	Camera stuck	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876973.4	52487.06	9:49:50	Cobble and rock	Camera stuck	WREF-1
876973.4	52486.79	9:49:51	Cobble and rock	Camera stuck	WREF-1
876973.5	52486.64	9:49:52	Cobble and rock	Camera stuck	WREF-1
876973.5	52486.54	9:49:53	Cobble and rock	Camera stuck	WREF-1
876973.3	52486.42	9:49:54	Cobble and rock	Camera stuck	WREF-1
876973.1	52486.41	9:49:55	Bedrock	Camera stuck	WREF-1
876972.9	52486.36	9:49:56	Bedrock		WREF-1
876972.8	52486.27	9:49:57	Bedrock		WREF-1
876972.9	52486.14	9:49:58	Bedrock		WREF-1
876972.9	52485.96	9:49:59	Bedrock		WREF-1
876973.2	52485.82	9:50:00	Bedrock		WREF-1
876973.4	52485.56	9:50:01	Bedrock		WREF-1
876973.5	52485.26	9:50:02	Bedrock		WREF-1
876973.6	52484.98	9:50:03	Bedrock		WREF-1
876973.9	52484.8	9:50:04	Bedrock		WREF-1
876974	52484.59	9:50:05	Bedrock		WREF-1
876974.1	52484.5	9:50:06	Bedrock		WREF-1
876974.1	52484.43	9:50:07	Bedrock		WREF-1
876974.1	52484.34	9:50:08	Bedrock		WREF-1
876974.2	52484.27	9:50:09	Bedrock		WREF-1
876974.5	52484.13	9:50:10	Bedrock		WREF-1
876974.9	52483.98	9:50:11	Bedrock		WREF-1
876975.1	52483.77	9:50:12	Bedrock		WREF-1
876975.3	52483.51	9:50:13	Bedrock		WREF-1
876975.5	52483.35	9:50:14	Bedrock		WREF-1
876975.7	52483.14	9:50:15	Bedrock		WREF-1
876975.9	52482.88	9:50:16	Bedrock		WREF-1
876976.1	52482.7	9:50:17	Bedrock		WREF-1
876976.5	52482.52	9:50:18	Bedrock		WREF-1
876976.8	52482.34	9:50:19	Bedrock		WREF-1
876977.1	52482.2	9:50:20	Bedrock		WREF-1
876977.3	52482.04	9:50:21	Bedrock		WREF-1
876977.4	52482.02	9:50:22	Bedrock		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876977.5	52481.97	9:50:23	Bedrock		WREF-1
876977.7	52481.82	9:50:24	Bedrock		WREF-1
876977.9	52481.41	9:50:25	Bedrock		WREF-1
876978.5	52481.11	9:50:26	Bedrock		WREF-1
876978.9	52480.6	9:50:27	Bedrock		WREF-1
876979.4	52480.32	9:50:28	Bedrock		WREF-1
876979.6	52480.07	9:50:29	Bedrock		WREF-1
876979.7	52479.92	9:50:30	Bedrock		WREF-1
876980	52479.89	9:50:31	Bedrock		WREF-1
876980.1	52479.79	9:50:32	Bedrock		WREF-1
876980.3	52479.64	9:50:33	Bedrock		WREF-1
876980.7	52479.57	9:50:34	Bedrock		WREF-1
876981.2	52479.23	9:50:35	Bedrock		WREF-1
876981.7	52478.96	9:50:36	Bedrock		WREF-1
876982.1	52478.53	9:50:37	Bedrock		WREF-1
876982.4	52478.2	9:50:38	Bedrock		WREF-1
876982.9	52478	9:50:39	Bedrock		WREF-1
876983.2	52477.6	9:50:40	Bedrock		WREF-1
876983.4	52477.44	9:50:41	Bedrock		WREF-1
876983.5	52477.25	9:50:42	Bedrock		WREF-1
876983.7	52477.13	9:50:43	Bedrock		WREF-1
876984.2	52477.07	9:50:44	Bedrock		WREF-1
876984.6	52476.77	9:50:45	Bedrock		WREF-1
876985	52476.4	9:50:46	Bedrock		WREF-1
876985.4	52476.15	9:50:47	Bedrock		WREF-1
876985.7	52475.9	9:50:48	Bedrock		WREF-1
876986.1	52475.56	9:50:49	Bedrock		WREF-1
876986.6	52475.36	9:50:50	Bedrock		WREF-1
876987	52475.14	9:50:51	Bedrock		WREF-1
876987.3	52474.9	9:50:52	Bedrock		WREF-1
876987.6	52474.78	9:50:53	Bedrock		WREF-1
876987.9	52474.59	9:50:54	Bedrock		WREF-1
876988.3	52474.44	9:50:55	Bedrock with sand and cobble		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876988.6	52474.18	9:50:56	Bedrock with sand and cobble		WREF-1
876989	52474.06	9:50:57	Bedrock with sand and cobble		WREF-1
876989.3	52473.72	9:50:58	Bedrock with sand and cobble		WREF-1
876989.8	52473.31	9:50:59	Bedrock with sand and cobble		WREF-1
876990.3	52473.03	9:51:00	Bedrock with sand and cobble		WREF-1
876990.5	52472.67	9:51:01	Bedrock with sand and cobble		WREF-1
876990.9	52472.56	9:51:02	Bedrock with sand and cobble		WREF-1
876991.2	52472.4	9:51:03	Bedrock with sand and cobble		WREF-1
876991.5	52472.23	9:51:04	Bedrock with sand and cobble		WREF-1
876992	52472.06	9:51:05	Bedrock with sand and cobble		WREF-1
876992.4	52471.78	9:51:06	Bedrock with sand and cobble		WREF-1
876992.8	52471.54	9:51:07	Bedrock with sand and cobble		WREF-1
876993.2	52471.2	9:51:08	Bedrock with sand and cobble		WREF-1
876993.4	52470.77	9:51:09	Bedrock with sand and cobble		WREF-1
876993.6	52470.42	9:51:10	Bedrock with sand and cobble		WREF-1
876993.8	52470.09	9:51:11	Cobbles		WREF-1
876994.2	52469.79	9:51:12	Cobbles		WREF-1
876994.7	52469.52	9:51:13	Cobbles		WREF-1
876995.3	52469.3	9:51:14	Cobbles		WREF-1
876995.8	52469.2	9:51:15	Cobbles		WREF-1
876996.1	52469.02	9:51:16	Cobbles		WREF-1
876996.4	52468.91	9:51:17	Cobbles with boulders		WREF-1
876996.7	52468.78	9:51:18	Cobbles with boulders		WREF-1
876997.1	52468.46	9:51:19	Cobbles with boulders		WREF-1
876997.4	52468.04	9:51:20	Cobbles with boulders		WREF-1
876997.8	52467.7	9:51:21	Cobbles with boulders		WREF-1
876998.3	52467.24	9:51:22	Cobbles with boulders		WREF-1
876999	52467.01	9:51:23	Cobbles with boulders		WREF-1
876999.5	52466.78	9:51:24	Cobbles with boulders		WREF-1
876999.9	52466.65	9:51:25	Cobbles with boulders		WREF-1
877000.3	52466.62	9:51:26	Cobbles with boulders		WREF-1
877000.7	52466.5	9:51:27	Cobbles with boulders		WREF-1
877001.1	52466.59	9:51:28	Cobbles with boulders		WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877001.4	52466.48	9:51:29	Cobbles with boulders		WREF-1
877001.7	52466.4	9:51:30	Cobbles with boulders		WREF-1
877002.2	52466.27	9:51:31	Cobbles with boulders		WREF-1
877002.8	52465.72	9:51:32	Cobbles with boulders		WREF-1
877003.5	52465.15	9:51:33	Cobbles with boulders	Screen shot: Lobster	WREF-1
877004	52464.73	9:51:34	Cobbles with boulders		WREF-1
877004.3	52464.41	9:51:35	Cobbles with boulders		WREF-1
877004.6	52464.4	9:51:36	Sand with cobbles and boulders		WREF-1
877005	52464.59	9:51:37	Sand with cobbles and boulders		WREF-1
877005.5	52464.6	9:51:38	Sand with cobbles and boulders		WREF-1
877006	52464.53	9:51:39	Sand with cobbles and boulders		WREF-1
877006.5	52464.43	9:51:40	Bedrock	Encrusting organisms cover surface	WREF-1
877006.8	52464.13	9:51:41	Bedrock	Encrusting organisms cover surface	WREF-1
877007.2	52463.84	9:51:42	Bedrock	Encrusting organisms cover surface	WREF-1
877007.8	52463.53	9:51:43	Bedrock	Encrusting organisms cover surface and	WREF-1
877008.2	52463.03	9:51:44	Bedrock	Encrusting organisms cover surface and	WREF-1
877008.8	52462.77	9:51:45	Bedrock	Encrusting organisms cover surface	WREF-1
877009.2	52462.63	9:51:46	Bedrock	Encrusting organisms cover surface	WREF-1
877009.5	52462.55	9:51:47	Bedrock	Encrusting organisms cover surface	WREF-1
877009.9	52462.51	9:51:48	Bedrock	Encrusting organisms cover surface	WREF-1
877010.2	52462.36	9:51:49	Bedrock	Encrusting organisms cover surface	WREF-1
877010.6	52462.13	9:51:50	Bedrock	Encrusting organisms cover surface	WREF-1
877011.1	52461.89	9:51:51	Bedrock	Encrusting organisms cover surface	WREF-1
877011.6	52461.4	9:51:52	Bedrock	Encrusting organisms cover surface	WREF-1
877012.1	52460.99	9:51:53	Bedrock	Encrusting organisms cover surface	WREF-1
877012.6	52460.6	9:51:54	Bedrock	Encrusting organisms cover surface	WREF-1
877013	52460.4	9:51:55	Bedrock	Encrusting organisms cover surface	WREF-1
877013.5	52460.38	9:51:56	Bedrock	Encrusting organisms cover surface	WREF-1
877013.9	52460.3	9:51:57	Bedrock	Encrusting organisms cover surface	WREF-1
877014.2	52460.08	9:51:58	Bedrock	Encrusting organisms cover surface	WREF-1
877014.7	52459.96	9:51:59	Bedrock	Encrusting organisms cover surface	WREF-1
877015	52459.77	9:52:00	Bedrock	Encrusting organisms cover surface	WREF-1
877015.4	52459.63	9:52:01	Bedrock	Encrusting organisms cover surface	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877015.9	52459.38	9:52:02	Bedrock	Encrusting organisms cover surface	WREF-1
877016.3	52458.83	9:52:03	Bedrock	Encrusting organisms cover surface	WREF-1
877017	52458.27	9:52:04	Bedrock	Encrusting organisms cover surface	WREF-1
877017.5	52457.74	9:52:05	Bedrock	Encrusting organisms cover surface	WREF-1
877018.1	52457.47	9:52:06	Bedrock	Encrusting organisms cover surface	WREF-1
877018.5	52457.35	9:52:07	Bedrock	Encrusting organisms cover surface	WREF-1
877018.6	52457.29	9:52:08	Bedrock	Encrusting organisms cover surface	WREF-1
877018.9	52457.35	9:52:09	Bedrock	Encrusting organisms cover surface	WREF-1
877019.2	52457.23	9:52:10	Bedrock	Encrusting organisms cover surface	WREF-1
877019.6	52456.98	9:52:11	Bedrock	Encrusting organisms cover surface	WREF-1
877020.3	52456.71	9:52:12	Bedrock	Encrusting organisms cover surface	WREF-1
877020.8	52456.21	9:52:13	Bedrock	Encrusting organisms cover surface	WREF-1
877021.4	52455.71	9:52:14	Bedrock	Encrusting organisms cover surface	WREF-1
877022	52455.15	9:52:15	Bedrock	Encrusting organisms cover surface	WREF-1
877022.3	52454.63	9:52:16	Bedrock	Encrusting organisms cover surface	WREF-1
877022.6	52454.37	9:52:17	Bedrock	Encrusting organisms cover surface	WREF-1
877022.8	52454.2	9:52:18	Bedrock	Encrusting organisms cover surface	WREF-1
877023	52454.02	9:52:19	Bedrock	Encrusting organisms cover surface	WREF-1
877023.3	52453.83	9:52:20	Bedrock	Encrusting organisms cover surface	WREF-1
877023.7	52453.51	9:52:21	Bedrock	Encrusting organisms cover surface	WREF-1
877024.3	52453.27	9:52:22	Bedrock	Encrusting organisms cover surface	WREF-1
877024.8	52452.96	9:52:23	Bedrock	Encrusting organisms cover surface	WREF-1
877025.4	52452.6	9:52:24	Bedrock	Encrusting organisms cover surface	WREF-1
877025.7	52452.24	9:52:25	Bedrock	Encrusting organisms cover surface	WREF-1
877026.1	52451.82	9:52:26	Bedrock	Encrusting organisms cover surface	WREF-1
877026.6	52451.32	9:52:27	Bedrock	Encrusting organisms cover surface	WREF-1
877026.9	52450.9	9:52:28	Bedrock	Encrusting organisms cover surface	WREF-1
877027.4	52450.75	9:52:29	Bedrock	Encrusting organisms cover surface	WREF-1
877027.6	52450.54	9:52:30	Bedrock	Encrusting organisms cover surface	WREF-1
877027.8	52450.39	9:52:31	Bedrock	Encrusting organisms cover surface	WREF-1
877028.2	52450.23	9:52:32	Bedrock	Encrusting organisms cover surface	WREF-1
877028.5	52449.88	9:52:33	Bedrock	Encrusting organisms cover surface	WREF-1
877029.1	52449.64	9:52:34	Bedrock	Encrusting organisms cover surface	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877029.6	52449.25	9:52:35	Bedrock	Encrusting organisms cover surface	WREF-1
877030	52448.75	9:52:36	Bedrock	Encrusting organisms cover surface	WREF-1
877030.6	52448.25	9:52:37	Bedrock	Encrusting organisms cover surface	WREF-1
877030.9	52447.85	9:52:38	Bedrock	Encrusting organisms cover surface	WREF-1
877031.2	52447.53	9:52:39	Bedrock	Encrusting organisms cover surface	WREF-1
877031.4	52447.22	9:52:40	Bedrock	Encrusting organisms cover surface	WREF-1
877031.6	52446.94	9:52:41	Bedrock	Encrusting organisms cover surface	WREF-1
877032	52446.62	9:52:42	Bedrock	Encrusting organisms cover surface	WREF-1
877032.3	52446.3	9:52:43	Bedrock	Encrusting organisms cover surface and	WREF-1
877032.8	52445.97	9:52:44	Bedrock	Encrusting organisms cover surface	WREF-1
877033.3	52445.59	9:52:45	Bedrock	Encrusting organisms cover surface	WREF-1
877033.6	52445.21	9:52:46	Bedrock	Encrusting organisms cover surface	WREF-1
877034	52444.95	9:52:47	Bedrock	Encrusting organisms cover surface and	WREF-1
877034.3	52444.63	9:52:48	Bedrock	Encrusting organisms cover surface	WREF-1
877034.5	52444.2	9:52:49	Bedrock	Encrusting organisms cover surface	WREF-1
877035	52443.8	9:52:50	Bedrock	Encrusting organisms cover surface	WREF-1
877035	52443.32	9:52:51	Bedrock	Encrusting organisms cover surface	WREF-1
877035.4	52442.99	9:52:52	Bedrock	Encrusting organisms cover surface	WREF-1
877035.7	52442.76	9:52:53	Bedrock	Encrusting organisms cover surface	WREF-1
877036	52442.42	9:52:54	Bedrock	Encrusting organisms cover surface	WREF-1
877036.8	52442.09	9:52:55	Bedrock	Encrusting organisms cover surface	WREF-1
877037.2	52441.63	9:52:56	Bedrock	Encrusting organisms cover surface	WREF-1
877037.8	52441.24	9:52:57	Bedrock	Encrusting organisms cover surface	WREF-1
877038.2	52440.87	9:52:58	Bedrock	Encrusting organisms cover surface	WREF-1
877038.3	52440.52	9:52:59	Bedrock	Encrusting organisms cover surface	WREF-1
877038.8	52440.13	9:53:00	Bedrock	Encrusting organisms cover surface	WREF-1
877039	52439.7	9:53:01	Bedrock	Encrusting organisms cover surface	WREF-1
877039.6	52439.31	9:53:02	Bedrock and cobbles	Encrusting organisms cover surface	WREF-1
877040.2	52438.92	9:53:03	Bedrock	Encrusting organisms cover surface	WREF-1
877040.5	52438.51	9:53:04	Bedrock	Encrusting organisms cover surface	WREF-1
877041.1	52438.11	9:53:05	Bedrock	Encrusting organisms cover surface	WREF-1
877041.5	52437.69	9:53:06	Bedrock	Encrusting organisms cover surface	WREF-1
877042	52437.34	9:53:07	Bedrock	Encrusting organisms cover surface	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877042.4	52437.03	9:53:08	Bedrock	Encrusting organisms cover surface	WREF-1
877042.7	52436.6	9:53:09	Bedrock	Encrusting organisms cover surface	WREF-1
877043	52436.17	9:53:10	Bedrock	Encrusting organisms cover surface	WREF-1
877043.5	52435.69	9:53:11	Bedrock	Encrusting organisms cover surface	WREF-1
877043.7	52435.25	9:53:12	Bedrock	Encrusting organisms cover surface	WREF-1
877044.3	52434.79	9:53:13	Bedrock	Encrusting organisms cover surface	WREF-1
877044.5	52434.34	9:53:14	Bedrock	Encrusting organisms cover surface	WREF-1
877045	52433.97	9:53:15	Bedrock	Encrusting organisms cover surface	WREF-1
877045.5	52433.67	9:53:16	Bedrock	End of video file (09142020_094318_1.	WREF-1
877045.6	52433.53	9:53:17			WREF-1
877046.2	52433.26	9:53:18	Bedrock	Start of video (09142020_095318_1.avi	WREF-1
877046.4	52432.99	9:53:19	Bedrock	camera too high - poor resolution	WREF-1
877046.6	52432.67	9:53:20	Bedrock	camera too high - poor resolution	WREF-1
877047	52432.19	9:53:21	Bedrock	camera too high - poor resolution	WREF-1
877047.2	52431.78	9:53:22	Bedrock	camera too high - poor resolution	WREF-1
877047.7	52431.36	9:53:23	Bedrock	camera too high - poor resolution	WREF-1
877048.1	52430.93	9:53:24	Bedrock	camera too high - poor resolution	WREF-1
877048.6	52430.57	9:53:25	Bedrock	camera too high - poor resolution	WREF-1
877049.1	52430.31	9:53:26	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877049.3	52430.11	9:53:27	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877049.4	52430.02	9:53:28	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877049.7	52429.85	9:53:29	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877049.8	52429.66	9:53:30	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877050	52429.43	9:53:31	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877050.3	52429.17	9:53:32	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877050.4	52428.84	9:53:33	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877050.9	52428.44	9:53:34	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877051.3	52428.1	9:53:35	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877051.6	52427.92	9:53:36	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877051.9	52427.72	9:53:37	Bedrock with sand in the crevasse	Screen shot	WREF-1
877052.2	52427.52	9:53:38	Bedrock with sand in the crevasse	camera too high - poor resolution	WREF-1
877052.4	52427.25	9:53:39	Bedrock	camera too high - poor resolution	WREF-1
877052.8	52426.87	9:53:40	Bedrock	camera too high - poor resolution	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877052.9	52426.64	9:53:41	Bedrock	camera too high - poor resolution	WREF-1
877053.2	52426.4	9:53:42	Bedrock	camera too high - poor resolution	WREF-1
877053.4	52426.17	9:53:43	Bedrock	camera too high - poor resolution	WREF-1
877053.8	52425.89	9:53:44	Bedrock	camera too high - poor resolution	WREF-1
877054.2	52425.59	9:53:45	Bedrock	camera too high - poor resolution	WREF-1
877054.5	52425.47	9:53:46	Bedrock	camera too high - poor resolution	WREF-1
877054.8	52425.34	9:53:47	Bedrock	camera too high - poor resolution	WREF-1
877055	52425.22	9:53:48	Bedrock	camera too high - poor resolution	WREF-1
877055.2	52424.96	9:53:49	Bedrock		WREF-1
877055.7	52424.58	9:53:50	Bedrock		WREF-1
877056	52424.2	9:53:51	Bedrock		WREF-1
877056.5	52423.88	9:53:52	Bedrock	anemone, heavily encrusted bottom	WREF-1
877056.8	52423.6	9:53:53	Bedrock	heavily encrusted bottom	WREF-1
877056.9	52423.51	9:53:54	Bedrock	heavily encrusted bottom	WREF-1
877057.1	52423.38	9:53:55	Bedrock	heavily encrusted bottom	WREF-1
877057.4	52423.19	9:53:56	Bedrock	heavily encrusted bottom	WREF-1
877057.6	52423.26	9:53:57	Bedrock	heavily encrusted bottom	WREF-1
877057.9	52423.2	9:53:58	Bedrock	heavily encrusted bottom	WREF-1
877058.1	52423.22	9:53:59	Bedrock	heavily encrusted bottom	WREF-1
877058.3	52423.08	9:54:00	Bedrock	heavily encrusted bottom	WREF-1
877058.7	52422.79	9:54:01	Bedrock	heavily encrusted bottom	WREF-1
877059.1	52422.53	9:54:02	Bedrock	heavily encrusted bottom	WREF-1
877059.6	52422.28	9:54:03	Bedrock	heavily encrusted bottom	WREF-1
877060	52422.03	9:54:04	Bedrock	heavily encrusted bottom	WREF-1
877060.3	52421.66	9:54:05	Bedrock	heavily encrusted bottom	WREF-1
877060.6	52421.48	9:54:06	Bedrock	heavily encrusted bottom	WREF-1
877060.8	52421.43	9:54:07	Bedrock	heavily encrusted bottom	WREF-1
877060.7	52421.67	9:54:08	Bedrock	heavily encrusted bottom	WREF-1
877060.7	52421.81	9:54:09	Bedrock	heavily encrusted bottom	WREF-1
877060.9	52421.8	9:54:10	Bedrock	heavily encrusted bottom	WREF-1
877061.2	52421.66	9:54:11	Bedrock	heavily encrusted bottom	WREF-1
877061.8	52421.42	9:54:12	Bedrock	Screen shot: Sponge	WREF-1
877062.2	52421.29	9:54:13	Bedrock	heavily encrusted bottom	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877062.9	52420.93	9:54:14	Bedrock	heavily encrusted bottom	WREF-1
877063.3	52420.71	9:54:15	Bedrock	heavily encrusted bottom	WREF-1
877063.7	52420.47	9:54:16	Bedrock	heavily encrusted bottom	WREF-1
877064	52420.31	9:54:17	Bedrock	heavily encrusted bottom	WREF-1
877064.3	52420.11	9:54:18	Bedrock	heavily encrusted bottom	WREF-1
877064.6	52419.96	9:54:19	Bedrock	heavily encrusted bottom	WREF-1
877064.8	52419.87	9:54:20	Bedrock	heavily encrusted bottom	WREF-1
877065.1	52419.82	9:54:21	Bedrock	heavily encrusted bottom	WREF-1
877065.3	52419.87	9:54:22	Bedrock	moderate encrusting	WREF-1
877065.5	52419.84	9:54:23	Bedrock	moderate encrusting	WREF-1
877065.9	52419.79	9:54:24	Bedrock	Screen shot	WREF-1
877066.4	52419.55	9:54:25	Bedrock	moderate encrusting	WREF-1
877066.9	52419.29	9:54:26	Bedrock	moderate encrusting	WREF-1
877067.3	52419.14	9:54:27	Bedrock	moderate encrusting	WREF-1
877067.6	52419.07	9:54:28	Bedrock	heavily encrusted bottom	WREF-1
877067.8	52419.14	9:54:29	Bedrock	heavily encrusted bottom	WREF-1
877067.8	52419.17	9:54:30	Bedrock	heavily encrusted bottom	WREF-1
877068.1	52419.08	9:54:31	Bedrock	heavily encrusted bottom	WREF-1
877068.5	52418.94	9:54:32	Bedrock	heavily encrusted bottom	WREF-1
877068.8	52418.79	9:54:33	Bedrock	heavily encrusted bottom	WREF-1
877069	52418.74	9:54:34	Bedrock	Sponge	WREF-1
877069.2	52418.59	9:54:35	Bedrock	heavily encrusted bottom	WREF-1
877069.4	52418.55	9:54:36	Bedrock	heavily encrusted bottom	WREF-1
877069.7	52418.54	9:54:37	Bedrock	heavily encrusted bottom	WREF-1
877070.1	52418.48	9:54:38	Bedrock	heavily encrusted bottom	WREF-1
877070.3	52418.57	9:54:39	Bedrock	heavily encrusted bottom	WREF-1
877070.7	52418.5	9:54:40	Bedrock	heavily encrusted bottom	WREF-1
877070.8	52418.51	9:54:41	Bedrock	Screen shot: Sponge + lobster	WREF-1
877071.1	52418.34	9:54:42	Bedrock	heavily encrusted bottom	WREF-1
877071.5	52418.05	9:54:43	Bedrock	heavily encrusted bottom	WREF-1
877071.9	52417.81	9:54:44	Bedrock	heavily encrusted bottom	WREF-1
877072.2	52417.69	9:54:45	Bedrock	Fish	WREF-1
877072.5	52417.66	9:54:46	Bedrock	heavily encrusted bottom	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877072.8	52417.65	9:54:47	Bedrock	heavily encrusted bottom	WREF-1
877073.1	52417.59	9:54:48	Bedrock	heavily encrusted bottom	WREF-1
877073.7	52417.41	9:54:49	Bedrock	heavily encrusted bottom	WREF-1
877073.8	52417.34	9:54:50	Bedrock	heavily encrusted bottom	WREF-1
877074.1	52417.16	9:54:51	Bedrock	Crab	WREF-1
877074.3	52417.12	9:54:52	Bedrock	heavily encrusted bottom	WREF-1
877074.3	52417.18	9:54:53	Bedrock	heavily encrusted bottom	WREF-1
877074.6	52417.16	9:54:54	Bedrock	heavily encrusted bottom	WREF-1
877075.1	52417.03	9:54:55	Bedrock	heavily encrusted bottom	WREF-1
877075.6	52416.78	9:54:56	Bedrock	heavily encrusted bottom	WREF-1
877076.1	52416.58	9:54:57	Bedrock	heavily encrusted bottom	WREF-1
877076.6	52416.39	9:54:58	Bedrock	heavily encrusted bottom	WREF-1
877076.8	52416.39	9:54:59	Bedrock	heavily encrusted bottom	WREF-1
877077	52416.37	9:55:00	Bedrock	heavily encrusted bottom	WREF-1
877077.3	52416.21	9:55:01	Bedrock	heavily encrusted bottom	WREF-1
877077.5	52416.08	9:55:02	Bedrock	heavily encrusted bottom	WREF-1
877078.1	52415.92	9:55:03	Bedrock	heavily encrusted bottom	WREF-1
877078	52415.97	9:55:04	Bedrock	heavily encrusted bottom	WREF-1
877078.2	52415.99	9:55:05	Bedrock	heavily encrusted bottom	WREF-1
877078.4	52415.97	9:55:06	Bedrock	heavily encrusted bottom	WREF-1
877078.8	52415.84	9:55:07	Bedrock	heavily encrusted bottom	WREF-1
877079.4	52415.62	9:55:08	Bedrock	moderately encrusted bottom	WREF-1
877079.9	52415.52	9:55:09	Bedrock	moderately encrusted bottom	WREF-1
877080.3	52415.41	9:55:10	Bedrock	moderately encrusted bottom	WREF-1
877080.6	52415.33	9:55:11	Bedrock	moderately encrusted bottom	WREF-1
877080.9	52415.16	9:55:12	Bedrock	moderately encrusted bottom	WREF-1
877081.3	52414.88	9:55:13	Bedrock	moderately encrusted bottom	WREF-1
877081.7	52414.69	9:55:14	Bedrock	moderately encrusted bottom	WREF-1
877081.9	52414.68	9:55:15	Bedrock	moderately encrusted bottom	WREF-1
877081.9	52414.76	9:55:16	Bedrock	moderately encrusted bottom	WREF-1
877082	52414.86	9:55:17	Bedrock	moderately encrusted bottom	WREF-1
877082.2	52414.75	9:55:18	Bedrock	moderately encrusted bottom	WREF-1
877082.6	52414.6	9:55:19	Bedrock	moderately encrusted bottom	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877083.1	52414.43	9:55:20	Bedrock	Screen shot	WREF-1
877083.5	52414.41	9:55:21	Bedrock	moderately encrusted bottom	WREF-1
877083.9	52414.33	9:55:22	Bedrock	moderately encrusted bottom	WREF-1
877084.2	52414.19	9:55:23	Bedrock	heavily encrusted bottom	WREF-1
877084.4	52413.93	9:55:24	Bedrock	heavily encrusted bottom	WREF-1
877084.9	52413.62	9:55:25	Bedrock	fish	WREF-1
877085.1	52413.45	9:55:26	Bedrock	heavily encrusted bottom	WREF-1
877085.3	52413.38	9:55:27	Bedrock	heavily encrusted bottom	WREF-1
877085.7	52413.17	9:55:28	Bedrock	heavily encrusted bottom	WREF-1
877085.9	52413.09	9:55:29	Bedrock	heavily encrusted bottom	WREF-1
877086.3	52413.04	9:55:30	Bedrock	heavily encrusted bottom	WREF-1
877086.5	52413.08	9:55:31	Bedrock	heavily encrusted bottom	WREF-1
877086.7	52413.06	9:55:32	Bedrock	heavily encrusted bottom	WREF-1
877087	52412.95	9:55:33	Bedrock	heavily encrusted bottom	WREF-1
877087.3	52412.83	9:55:34	Bedrock	heavily encrusted bottom	WREF-1
877087.7	52412.68	9:55:35	Bedrock	heavily encrusted bottom	WREF-1
877087.8	52412.54	9:55:36	Bedrock	heavily encrusted bottom	WREF-1
877088.4	52412.18	9:55:37	Bedrock	heavily encrusted bottom	WREF-1
877088.8	52411.84	9:55:38	Bedrock	heavily encrusted bottom	WREF-1
877089.4	52411.63	9:55:39	Bedrock	heavily encrusted bottom	WREF-1
877089.7	52411.57	9:55:40	Bedrock	heavily encrusted bottom	WREF-1
877089.8	52411.56	9:55:41	Bedrock	heavily encrusted bottom	WREF-1
877090.2	52411.39	9:55:42	Bedrock	heavily encrusted bottom	WREF-1
877090.4	52411.34	9:55:43	Bedrock	heavily encrusted bottom	WREF-1
877090.7	52411.3	9:55:44	Bedrock	heavily encrusted bottom	WREF-1
877090.9	52411.3	9:55:45	Bedrock	heavily encrusted bottom	WREF-1
877091.2	52411.17	9:55:46	Bedrock	heavily encrusted bottom	WREF-1
877091.6	52410.9	9:55:47	Bedrock	heavily encrusted bottom	WREF-1
877092	52410.64	9:55:48	Bedrock	heavily encrusted bottom	WREF-1
877092.6	52410.36	9:55:49	Bedrock	heavily encrusted bottom	WREF-1
877093	52410.18	9:55:50	Bedrock	heavily encrusted bottom	WREF-1
877093.3	52409.96	9:55:51	Bedrock	heavily encrusted bottom	WREF-1
877093.6	52409.8	9:55:52	Bedrock	heavily encrusted bottom	WREF-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
877093.8	52409.63	9:55:53	Bedrock	heavily encrusted bottom	WREF-1
877094.1	52409.5	9:55:54	Bedrock	heavily encrusted bottom	WREF-1
877094.3	52409.45	9:55:55	Bedrock	heavily encrusted bottom	WREF-1
877094.6	52409.26	9:55:56	Bedrock	heavily encrusted bottom	WREF-1
877095.1	52408.99	9:55:57	Bedrock	heavily encrusted bottom	WREF-1
877095.6	52408.72	9:55:58	Bedrock	heavily encrusted bottom	WREF-1
877096.1	52408.64	9:55:59	Bedrock	heavily encrusted bottom	WREF-1
877096.3	52408.64	9:56:00	Bedrock	heavily encrusted bottom	WREF-1
877096.4	52408.62	9:56:01	Bedrock	heavily encrusted bottom	WREF-1
877096.7	52408.41	9:56:02	Bedrock	heavily encrusted bottom	WREF-1
877097.1	52408.2	9:56:03	Bedrock	heavily encrusted bottom	WREF-1
877097.4	52407.96	9:56:04	Bedrock	heavily encrusted bottom	WREF-1
877097.8	52407.72	9:56:05	Bedrock	End of video file (09142020_095318_1.	WREF-1
876690.9	52414.36	10:04:51	Silt and gravel with some shells	Screen shot: Burrowing anemone	WREF-2
876690.9	52414.41	10:04:52	Silt and gravel with some shells		WREF-2
876690.9	52414.49	10:04:53	Silt and gravel with some shells		WREF-2
876691.3	52414.41	10:04:54	Silt and gravel with some shells		WREF-2
876691.5	52414.32	10:04:55	Silt and gravel with some shells	Burrowing anemone	WREF-2
876691.9	52414.09	10:04:56	Silt and gravel with some shells		WREF-2
876692.1	52413.9	10:04:57	Silt and gravel with some shells		WREF-2
876692.3	52413.78	10:04:58	Silt and gravel with some shells		WREF-2
876692.6	52413.62	10:04:59	Silt and gravel with some shells		WREF-2
876692.8	52413.52	10:05:00	Silt and gravel with some shells	Burrowing anemone	WREF-2
876692.8	52413.56	10:05:01	Silt and gravel with some shells		WREF-2
876693.1	52413.48	10:05:02	Silt and gravel with some shells		WREF-2
876693.2	52413.44	10:05:03	Silt and gravel with some shells		WREF-2
876693.4	52413.25	10:05:04	Silt and gravel with some shells		WREF-2
876693.7	52413.05	10:05:05	Silt and gravel with some shells		WREF-2
876693.8	52412.85	10:05:06	Silt and gravel with some shells		WREF-2
876694.2	52412.65	10:05:07	Silt and gravel with some shells		WREF-2
876694.4	52412.54	10:05:08	Silt and gravel with some shells		WREF-2
876694.7	52412.37	10:05:09	Silt and gravel with some shells		WREF-2
876694.9	52412.32	10:05:10	Silt and gravel with some shells		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876695.1	52412.23	10:05:11	Silt and gravel with some shells	Burrowing anemone	WREF-2
876695.3	52412.12	10:05:12	Silt and gravel with some shells		WREF-2
876695.5	52411.97	10:05:13	Silt and gravel with some shells		WREF-2
876695.7	52411.81	10:05:14	Silt and gravel with some shells		WREF-2
876695.9	52411.65	10:05:15	Silt and gravel with some shells	Burrowing anemone	WREF-2
876696.2	52411.52	10:05:16	Silt and gravel with some shells		WREF-2
876696.5	52411.4	10:05:17	Silt and gravel with some shells		WREF-2
876696.7	52411.22	10:05:18	Silt and gravel with some shells	Burrowing anemones	WREF-2
876697	52410.96	10:05:19	Silt and gravel with some shells		WREF-2
876697	52410.86	10:05:20	Silt and gravel with some shells		WREF-2
876697.2	52410.76	10:05:21	Silt and gravel with some shells		WREF-2
876697.4	52410.64	10:05:22	Silt and gravel with some shells		WREF-2
876697.7	52410.49	10:05:23	Silt and gravel with some shells		WREF-2
876698.3	52410.1	10:05:24	Silt and gravel with some shells		WREF-2
876698.7	52409.84	10:05:25	Silt and gravel with some shells		WREF-2
876698.9	52409.64	10:05:26	Silt and gravel with some shells	Screen shot: Burrowing anemones	WREF-2
876699	52409.49	10:05:27	Silt and gravel with some shells		WREF-2
876699.1	52409.42	10:05:28	Silt and gravel with some shells		WREF-2
876699.4	52409.3	10:05:29	Silt and gravel with some shells		WREF-2
876700	52408.94	10:05:30	Silt and gravel with some shells		WREF-2
876700.4	52408.64	10:05:31	Silt and gravel with some shells		WREF-2
876700.6	52408.41	10:05:32	Silt and gravel with some shells		WREF-2
876700.8	52408.24	10:05:33	Silt and gravel with some shells		WREF-2
876700.9	52408.16	10:05:34	Silt and gravel with some shells		WREF-2
876701.2	52408.03	10:05:35	Silt and gravel with some shells	Anemone	WREF-2
876701.5	52407.86	10:05:36	Silt and gravel with some shells		WREF-2
876701.9	52407.5	10:05:37	Silt and gravel with some shells	Anemone	WREF-2
876702.3	52407.08	10:05:38	Silt and gravel with some shells		WREF-2
876702.7	52406.72	10:05:39	Silt and gravel with some shells		WREF-2
876702.9	52406.48	10:05:40	Silt and gravel with some shells		WREF-2
876703	52406.36	10:05:41	Silt and gravel with some shells		WREF-2
876703.4	52406.12	10:05:42		camera too high - poor resolution	WREF-2
876703.6	52406.06	10:05:43		camera too high - poor resolution	WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876703.9	52405.87	10:05:44		camera too high - poor resolution	WREF-2
876704.2	52405.67	10:05:45		camera too high - poor resolution	WREF-2
876704.3	52405.53	10:05:46		camera too high - poor resolution	WREF-2
876704.7	52405.16	10:05:47		camera too high - poor resolution	WREF-2
876705.1	52404.83	10:05:48		camera too high - poor resolution	WREF-2
876705.6	52404.44	10:05:49	Silt and gravel with some shells		WREF-2
876705.8	52404.24	10:05:50	Silt and gravel with some shells		WREF-2
876706.1	52403.97	10:05:51		camera too high - poor resolution	WREF-2
876706.5	52403.69	10:05:52		camera too high - poor resolution	WREF-2
876706.6	52403.45	10:05:53		camera too high - poor resolution	WREF-2
876707.1	52403.06	10:05:54		camera too high - poor resolution	WREF-2
876707.4	52402.8	10:05:55		camera too high - poor resolution	WREF-2
876707.5	52402.66	10:05:56	Silt and gravel with some shells		WREF-2
876707.9	52402.33	10:05:57	Silt and gravel with some shells		WREF-2
876708	52402.36	10:05:58	Silt and gravel with some shells		WREF-2
876708.4	52402.05	10:05:59	Silt and gravel with some shells		WREF-2
876708.9	52401.68	10:06:00	Silt and gravel with some shells	Fish - sculpin type	WREF-2
876709.2	52401.42	10:06:01	Silt and gravel with some shells		WREF-2
876709.5	52401.17	10:06:02	Silt and gravel with some shells	Screen Shot	WREF-2
876709.7	52401.12	10:06:03	Silt and gravel with some shells		WREF-2
876709.9	52400.95	10:06:04	Silt with some gravel and few shells		WREF-2
876710	52400.8	10:06:05	Silt with some gravel and few shells		WREF-2
876710.3	52400.42	10:06:06	Silt with some gravel and few shells		WREF-2
876710.6	52400.09	10:06:07	Silt with some gravel and few shells		WREF-2
876711.2	52399.69	10:06:08	Silt with some gravel and few shells		WREF-2
876711.5	52399.39	10:06:09	Silt with some gravel and few shells		WREF-2
876711.9	52399.17	10:06:10	Silt with some gravel and few shells		WREF-2
876711.9	52399.23	10:06:11	Silt with some gravel and few shells	Burrowing anemone	WREF-2
876712.3	52399.04	10:06:12	Silt with some gravel and few shells		WREF-2
876712.5	52398.83	10:06:13	Silt with some gravel and few shells	Screen shot	WREF-2
876712.7	52398.59	10:06:14	Silt with some gravel and few shells	Burrowing anemone	WREF-2
876713	52398.17	10:06:15	Silt with some gravel and few shells		WREF-2
876713.3	52397.78	10:06:16	Silt with some gravel and few shells		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876713.5	52397.44	10:06:17	Silt with some gravel and few shells		WREF-2
876713.8	52397.22	10:06:18	Silt with some gravel and few shells		WREF-2
876714.2	52396.98	10:06:19	Silt with some gravel and few shells		WREF-2
876714.4	52396.89	10:06:20	Silt with few burrows	Fish	WREF-2
876714.9	52396.52	10:06:21	Silt with few burrows		WREF-2
876715.2	52396.23	10:06:22	Silt with few burrows	Screen shot	WREF-2
876715.5	52395.97	10:06:23	Silt with few burrows		WREF-2
876715.7	52395.75	10:06:24	Silt with few burrows		WREF-2
876715.8	52395.59	10:06:25	Silt with few burrows		WREF-2
876715.8	52395.51	10:06:26	Silt with few burrows		WREF-2
876716.2	52395.22	10:06:27	Silt with few burrows		WREF-2
876716.6	52394.81	10:06:28	Silt with few burrows		WREF-2
876717.1	52394.35	10:06:29	Silt with few burrows		WREF-2
876717.4	52393.94	10:06:30	Silt with few burrows		WREF-2
876717.5	52393.82	10:06:31	Silt with few burrows		WREF-2
876717.6	52393.75	10:06:32	Silt with few burrows		WREF-2
876717.7	52393.63	10:06:33	Silt with few burrows		WREF-2
876718.3	52393.17	10:06:34	Silt with few burrows		WREF-2
876718.7	52392.86	10:06:35	Silt with few burrows		WREF-2
876719.1	52392.53	10:06:36	Silt with few burrows		WREF-2
876719.2	52392.34	10:06:37	Silt with few burrows		WREF-2
876719.2	52392.32	10:06:38	Silt with few burrows		WREF-2
876719.2	52392.3	10:06:39	Silt with few burrows		WREF-2
876719.2	52392.36	10:06:40	Silt with few burrows		WREF-2
876719.7	52392.01	10:06:41	Silt with few burrows		WREF-2
876720.2	52391.51	10:06:42	Silt with few burrows		WREF-2
876720.6	52390.92	10:06:43	Silt with few burrows		WREF-2
876720.9	52390.6	10:06:44	Silt with few burrows		WREF-2
876721	52390.47	10:06:45	Silt with few burrows	Burrowing anemone	WREF-2
876721.2	52390.44	10:06:46	Silt with few burrows		WREF-2
876721.5	52390.22	10:06:47	Silt with few burrows		WREF-2
876721.7	52390.05	10:06:48	Silt with few burrows		WREF-2
876721.9	52389.88	10:06:49	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876722.3	52389.61	10:06:50	Silt with few burrows		WREF-2
876722.4	52389.55	10:06:51	Silt with few burrows		WREF-2
876722.6	52389.36	10:06:52	Silt with few burrows		WREF-2
876722.6	52389.18	10:06:53	Silt with few burrows		WREF-2
876722.7	52388.91	10:06:54	Silt with few burrows		WREF-2
876723.1	52388.58	10:06:55	Silt with few burrows		WREF-2
876723.5	52388.3	10:06:56	Silt with few burrows		WREF-2
876723.9	52388.07	10:06:57	Silt with few burrows		WREF-2
876724.4	52387.7	10:06:58	Silt with few burrows		WREF-2
876724.4	52387.71	10:06:59	Silt with few burrows		WREF-2
876724.6	52387.49	10:07:00	Silt with few burrows		WREF-2
876724.8	52387.24	10:07:01	Silt with few burrows		WREF-2
876724.8	52387.28	10:07:02	Silt with few burrows		WREF-2
876725.2	52386.95	10:07:03	Silt with few burrows		WREF-2
876725.4	52386.76	10:07:04	Silt with few burrows		WREF-2
876725.7	52386.5	10:07:05	Silt with few burrows		WREF-2
876726.1	52386.12	10:07:06	Silt with few burrows		WREF-2
876726.4	52385.87	10:07:07	Silt with few burrows		WREF-2
876726.7	52385.61	10:07:08	Silt with few burrows		WREF-2
876727	52385.5	10:07:09	Silt with few burrows		WREF-2
876727.2	52385.4	10:07:10	Silt with few burrows		WREF-2
876727.4	52385.21	10:07:11	Silt with few burrows		WREF-2
876727.6	52385.08	10:07:12	Silt with few burrows		WREF-2
876727.7	52384.93	10:07:13	Silt with few burrows		WREF-2
876728.2	52384.44	10:07:14	Silt with few burrows		WREF-2
876728.5	52384.31	10:07:15	Silt with few burrows		WREF-2
876728.9	52384.1	10:07:16	Silt with few burrows		WREF-2
876729.2	52383.95	10:07:17	Silt with few burrows		WREF-2
876729.2	52383.99	10:07:18	Silt with few burrows		WREF-2
876729.3	52383.71	10:07:19	Silt with few burrows		WREF-2
876729.6	52383.47	10:07:20	Silt with few burrows		WREF-2
876730	52383.21	10:07:21	Silt with few burrows		WREF-2
876730.4	52382.87	10:07:22	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876730.8	52382.65	10:07:23	Silt with few burrows		WREF-2
876731	52382.52	10:07:24	Silt with few burrows		WREF-2
876731.3	52382.28	10:07:25	Silt with few burrows		WREF-2
876731.6	52382.19	10:07:26	Silt with few burrows		WREF-2
876731.9	52382.03	10:07:27	Silt with few burrows		WREF-2
876732.1	52381.89	10:07:28	Silt with few burrows		WREF-2
876732.2	52381.84	10:07:29	Silt with few burrows		WREF-2
876732.5	52381.62	10:07:30	Silt with few burrows		WREF-2
876732.8	52381.32	10:07:31	Silt with few burrows		WREF-2
876733.3	52380.87	10:07:32	Silt with few burrows		WREF-2
876733.5	52380.53	10:07:33	Silt with few burrows		WREF-2
876733.7	52380.35	10:07:34	Silt with few burrows		WREF-2
876734.1	52380.01	10:07:35	Silt with few burrows		WREF-2
876734.4	52379.84	10:07:36	Silt with few burrows		WREF-2
876734.9	52379.57	10:07:37	Silt with few burrows		WREF-2
876735.4	52379.29	10:07:38	Silt with few burrows		WREF-2
876735.6	52379.27	10:07:39	Silt with few burrows	Screen shot: Invertebrate burrows (prol	WREF-2
876735.7	52379.19	10:07:40	Silt with few burrows		WREF-2
876735.9	52378.95	10:07:41	Silt with few burrows		WREF-2
876736.1	52378.69	10:07:42	Silt with few burrows		WREF-2
876736.4	52378.38	10:07:43	Silt with few burrows		WREF-2
876736.6	52378.11	10:07:44	Silt with few burrows		WREF-2
876737.2	52377.61	10:07:45	Silt with few burrows		WREF-2
876737.5	52377.32	10:07:46	Silt with few burrows		WREF-2
876737.9	52376.94	10:07:47	Silt with few burrows		WREF-2
876738.2	52376.67	10:07:48	Silt with few burrows		WREF-2
876738.6	52376.53	10:07:49	Silt with few burrows		WREF-2
876738.9	52376.31	10:07:50	Silt with few burrows		WREF-2
876739.1	52376.18	10:07:51	Silt with few burrows		WREF-2
876739.4	52375.99	10:07:52	Silt with few burrows		WREF-2
876739.5	52375.78	10:07:53	Silt with few burrows		WREF-2
876739.8	52375.5	10:07:54	Silt with few burrows		WREF-2
876740.2	52375.18	10:07:55	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876740.5	52374.78	10:07:56	Silt with few burrows		WREF-2
876741	52374.3	10:07:57	Silt with few burrows		WREF-2
876741.4	52374.09	10:07:58	Silt with few burrows		WREF-2
876741.7	52373.91	10:07:59	Silt with few burrows		WREF-2
876742	52373.76	10:08:00	Silt with few burrows		WREF-2
876742.4	52373.51	10:08:01	Silt with few burrows		WREF-2
876742.8	52373.04	10:08:02	Silt with few burrows		WREF-2
876743.2	52372.67	10:08:03	Silt with few burrows		WREF-2
876743.3	52372.62	10:08:04	Silt with few burrows		WREF-2
876743.5	52372.51	10:08:05	Silt with few burrows		WREF-2
876743.8	52372.25	10:08:06	Silt with few burrows		WREF-2
876744	52371.99	10:08:07	Silt with few burrows		WREF-2
876744.5	52371.52	10:08:08	Silt with few burrows		WREF-2
876745	52371.08	10:08:09	Silt with few burrows		WREF-2
876745.4	52370.74	10:08:10	Silt with few burrows		WREF-2
876745.9	52370.35	10:08:11	Silt with few burrows		WREF-2
876746.1	52370.12	10:08:12	Silt with few burrows		WREF-2
876746.5	52369.87	10:08:13	Silt with few burrows		WREF-2
876746.7	52369.63	10:08:14	Silt with few burrows		WREF-2
876746.9	52369.56	10:08:15	Silt with few burrows		WREF-2
876747.2	52369.25	10:08:16	Silt with few burrows		WREF-2
876747.3	52369.2	10:08:17	Silt with few burrows		WREF-2
876747.6	52368.86	10:08:18	Silt with few burrows		WREF-2
876748	52368.45	10:08:19	Silt with few burrows		WREF-2
876748.4	52368.15	10:08:20	Silt with few burrows		WREF-2
876749	52367.71	10:08:21	Silt with few burrows		WREF-2
876749.4	52367.35	10:08:22	Silt with few burrows		WREF-2
876749.8	52366.95	10:08:23	Silt with few burrows		WREF-2
876749.9	52366.78	10:08:24	Silt with few burrows		WREF-2
876750.1	52366.52	10:08:25	Silt with few burrows		WREF-2
876750.5	52366.29	10:08:26	Silt with few burrows		WREF-2
876750.8	52366.14	10:08:27	Silt with few burrows		WREF-2
876751.2	52365.87	10:08:28	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876751.7	52365.48	10:08:29	Silt with few burrows		WREF-2
876752.1	52365.14	10:08:30	Silt with few burrows		WREF-2
876752.6	52364.68	10:08:31	Silt with few burrows		WREF-2
876752.9	52364.49	10:08:32	Silt with few burrows		WREF-2
876753.1	52364.31	10:08:33	Silt with few burrows		WREF-2
876753.5	52364.05	10:08:34	Silt with few burrows		WREF-2
876753.7	52363.96	10:08:35	Silt with few burrows	Fish	WREF-2
876754.2	52363.56	10:08:36	Silt with few burrows		WREF-2
876754.6	52363.12	10:08:37	Silt with few burrows		WREF-2
876755	52362.78	10:08:38	Silt with few burrows		WREF-2
876755.4	52362.44	10:08:39	Silt with few burrows		WREF-2
876755.7	52362.26	10:08:40	Silt with few burrows		WREF-2
876756.2	52362.1	10:08:41	Silt with few burrows		WREF-2
876756.6	52362.02	10:08:42	Silt with few burrows		WREF-2
876757.1	52361.65	10:08:43	Silt with few burrows		WREF-2
876757.6	52361.26	10:08:44	Silt with few burrows		WREF-2
876757.8	52361.06	10:08:45	Silt with few burrows		WREF-2
876758.2	52360.59	10:08:46	Silt with few burrows		WREF-2
876758.3	52360.55	10:08:47	Silt with few burrows		WREF-2
876758.7	52360.3	10:08:48	Silt with few burrows	Screen shot: Crab and small fish	WREF-2
876759.4	52359.75	10:08:49	Silt with few burrows		WREF-2
876759.7	52359.68	10:08:50	Silt with few burrows		WREF-2
876760.2	52359.32	10:08:51	Silt with few burrows		WREF-2
876760.6	52359.11	10:08:52	Silt with few burrows		WREF-2
876761.2	52358.75	10:08:53	Silt with few burrows		WREF-2
876761.6	52358.4	10:08:54	Silt with few burrows		WREF-2
876761.9	52358.2	10:08:55	Silt with few burrows		WREF-2
876762.4	52357.93	10:08:56	Silt with few burrows		WREF-2
876762.5	52357.83	10:08:57	Silt with few burrows		WREF-2
876762.8	52357.62	10:08:58	Silt with few burrows		WREF-2
876763.2	52357.23	10:08:59	Silt with few burrows		WREF-2
876763.5	52357.1	10:09:00		Poor resolution - camera too high or	WREF-2
876764	52356.87	10:09:01		hits bottom and creates plume - looks	WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876764.3	52356.69	10:09:02		silty when bottom is visible	WREF-2
876764.6	52356.52	10:09:03			WREF-2
876765.2	52356.16	10:09:04			WREF-2
876765.6	52355.9	10:09:05			WREF-2
876765.9	52355.77	10:09:06			WREF-2
876766.3	52355.53	10:09:07			WREF-2
876766.3	52355.54	10:09:08			WREF-2
876766.5	52355.49	10:09:09			WREF-2
876767	52355.19	10:09:10			WREF-2
876767.1	52355.15	10:09:11			WREF-2
876767.5	52354.93	10:09:12			WREF-2
876767.8	52354.7	10:09:13			WREF-2
876768.3	52354.38	10:09:14			WREF-2
876768.7	52354.08	10:09:15			WREF-2
876769	52353.9	10:09:16			WREF-2
876769.6	52353.51	10:09:17			WREF-2
876769.9	52353.37	10:09:18			WREF-2
876770.1	52353.31	10:09:19			WREF-2
876770.3	52353.27	10:09:20			WREF-2
876770.5	52353.27	10:09:21			WREF-2
876771	52352.97	10:09:22			WREF-2
876771.4	52352.69	10:09:23			WREF-2
876771.7	52352.49	10:09:24			WREF-2
876772.2	52352.14	10:09:25			WREF-2
876772.5	52351.84	10:09:26			WREF-2
876772.7	52351.75	10:09:27			WREF-2
876772.7	52351.77	10:09:28			WREF-2
876772.9	52351.82	10:09:29			WREF-2
876773.1	52351.74	10:09:30			WREF-2
876773.5	52351.48	10:09:31			WREF-2
876774	52350.99	10:09:32			WREF-2
876774.4	52350.74	10:09:33			WREF-2
876774.7	52350.64	10:09:34			WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876775	52350.5	10:09:35			WREF-2
876775.3	52350.42	10:09:36			WREF-2
876775.4	52350.33	10:09:37			WREF-2
876775.5	52350.3	10:09:38			WREF-2
876775.6	52350.32	10:09:39			WREF-2
876775.7	52350.21	10:09:40			WREF-2
876776.1	52349.79	10:09:41			WREF-2
876776.4	52349.55	10:09:42			WREF-2
876776.9	52349.25	10:09:43			WREF-2
876777.3	52348.96	10:09:44			WREF-2
876777.8	52348.72	10:09:45			WREF-2
876778.1	52348.47	10:09:46			WREF-2
876778.4	52348.32	10:09:47			WREF-2
876778.7	52348.25	10:09:48			WREF-2
876778.9	52348.17	10:09:49			WREF-2
876779.3	52347.82	10:09:50			WREF-2
876779.5	52347.54	10:09:51			WREF-2
876779.7	52347.4	10:09:52			WREF-2
876780	52347.2	10:09:53			WREF-2
876780.3	52347.04	10:09:54			WREF-2
876780.6	52346.88	10:09:55			WREF-2
876780.9	52346.78	10:09:56			WREF-2
876781.3	52346.47	10:09:57			WREF-2
876781.7	52346.19	10:09:58			WREF-2
876781.8	52345.96	10:09:59			WREF-2
876782.2	52345.6	10:10:00			WREF-2
876782.4	52345.46	10:10:01			WREF-2
876782.7	52345.33	10:10:02			WREF-2
876783.2	52345.03	10:10:03			WREF-2
876783.4	52344.82	10:10:04		Screen shot: sample location (WREF)	WREF-2
876783.7	52344.61	10:10:05		Poor resolution - camera too high or	WREF-2
876783.7	52344.49	10:10:06		hits bottom and creates plume - looks	WREF-2
876784.1	52344.09	10:10:07		silty when bottom is visible	WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876784.4	52343.78	10:10:08			WREF-2
876784.9	52343.39	10:10:09			WREF-2
876785.4	52343.04	10:10:10	Silt	Crab? Out of focus	WREF-2
876785.5	52343.01	10:10:11	Silt		WREF-2
876785.6	52342.88	10:10:12	Silt		WREF-2
876785.7	52342.89	10:10:13	Silt		WREF-2
876786	52342.8	10:10:14	Silt		WREF-2
876786.6	52342.33	10:10:15	Silt		WREF-2
876787	52342.16	10:10:16	Silt		WREF-2
876787.4	52341.74	10:10:17	Silt		WREF-2
876787.5	52341.59	10:10:18	Silt		WREF-2
876787.7	52341.38	10:10:19	Silt		WREF-2
876788	52341.08	10:10:20	Silt		WREF-2
876788.3	52340.81	10:10:21	Silt		WREF-2
876788.7	52340.52	10:10:22	Silt		WREF-2
876788.9	52340.32	10:10:23	Silt		WREF-2
876789	52340.24	10:10:24	Silt		WREF-2
876789.1	52340.26	10:10:25	Silt		WREF-2
876789.3	52340.19	10:10:26	Silt		WREF-2
876789.8	52339.77	10:10:27	Silt		WREF-2
876790.4	52339.34	10:10:28	Silt		WREF-2
876790.8	52338.95	10:10:29	Silt		WREF-2
876791.3	52338.49	10:10:30	Silt		WREF-2
876791.3	52338.34	10:10:31	Silt		WREF-2
876791.3	52338.33	10:10:32	Silt		WREF-2
876791.4	52338.17	10:10:33	Silt		WREF-2
876791.7	52338.08	10:10:34	Silt		WREF-2
876792.1	52337.79	10:10:35	Silt		WREF-2
876792.4	52337.65	10:10:36	Silt		WREF-2
876792.8	52337.24	10:10:37	Silt		WREF-2
876793	52337.07	10:10:38	Silt		WREF-2
876793.2	52336.74	10:10:39	Silt		WREF-2
876793.6	52336.43	10:10:40	Silt		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876793.9	52336.26	10:10:41	Silt		WREF-2
876794.2	52336.05	10:10:42	Silt		WREF-2
876794.4	52335.93	10:10:43	Silt		WREF-2
876794.8	52335.49	10:10:44	Silt	Screen shot: sample location (WREF)	WREF-2
876795.1	52335.2	10:10:45	Silt with few burrows		WREF-2
876795.5	52335	10:10:46	Silt with few burrows		WREF-2
876795.9	52334.64	10:10:47	Silt with few burrows		WREF-2
876796.2	52334.43	10:10:48	Silt with few burrows		WREF-2
876796.4	52334.12	10:10:49	Silt with few burrows		WREF-2
876796.5	52333.97	10:10:50	Silt with few burrows		WREF-2
876796.6	52333.82	10:10:51	Silt with few burrows		WREF-2
876797	52333.45	10:10:52	Silt with few burrows		WREF-2
876797.2	52333.29	10:10:53	Silt with few burrows		WREF-2
876797.7	52333.07	10:10:54	Silt with few burrows		WREF-2
876798.2	52332.67	10:10:55	Silt with few burrows	Screen Shot: Lobster	WREF-2
876798.6	52332.41	10:10:56	Silt with few burrows		WREF-2
876798.9	52332.11	10:10:57	Silt with few burrows		WREF-2
876799.1	52332.02	10:10:58	Silt with few burrows		WREF-2
876799.4	52331.78	10:10:59	Silt with few burrows		WREF-2
876799.5	52331.71	10:11:00	Silt with few burrows		WREF-2
876799.8	52331.42	10:11:01	Silt with few burrows		WREF-2
876800	52331.09	10:11:02	Silt with few burrows		WREF-2
876800.4	52330.73	10:11:03	Silt with few burrows		WREF-2
876800.7	52330.34	10:11:04	Silt with few burrows		WREF-2
876801	52330.1	10:11:05	Silt with few burrows		WREF-2
876801.3	52329.8	10:11:06	Silt with few burrows	Small fish	WREF-2
876801.7	52329.48	10:11:07	Silt with few burrows		WREF-2
876802	52329.24	10:11:08	Silt with few burrows		WREF-2
876802.3	52329.05	10:11:09	Silt with few burrows	Small fish	WREF-2
876802.5	52328.95	10:11:10	Silt with few burrows		WREF-2
876802.7	52328.71	10:11:11	Silt with few burrows		WREF-2
876802.8	52328.6	10:11:12	Silt with few burrows		WREF-2
876803	52328.33	10:11:13	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876803.4	52327.94	10:11:14	Silt with few burrows		WREF-2
876803.7	52327.63	10:11:15	Silt with few burrows		WREF-2
876804	52327.3	10:11:16	Silt with few burrows		WREF-2
876804.3	52327.01	10:11:17	Silt with few burrows		WREF-2
876804.5	52326.8	10:11:18	Silt with few burrows		WREF-2
876805	52326.38	10:11:19	Silt with few burrows		WREF-2
876805.2	52326.14	10:11:20	Silt with few burrows		WREF-2
876805.4	52326.01	10:11:21	Silt with few burrows		WREF-2
876805.4	52326	10:11:22	Silt with few burrows		WREF-2
876805.6	52325.76	10:11:23	Silt with few burrows		WREF-2
876805.9	52325.5	10:11:24	Silt with few burrows		WREF-2
876806.2	52325.13	10:11:25	Silt with few burrows		WREF-2
876806.8	52324.62	10:11:26	Silt with few burrows		WREF-2
876807	52324.61	10:11:27	Silt with few burrows		WREF-2
876807.3	52324.36	10:11:28	Silt with few burrows		WREF-2
876807.6	52324.08	10:11:29	Silt with few burrows		WREF-2
876807.7	52323.96	10:11:30	Silt with few burrows		WREF-2
876808	52323.61	10:11:31	Silt with few burrows	Fish	WREF-2
876808.2	52323.46	10:11:32	Silt with few burrows		WREF-2
876808.4	52323.27	10:11:33	Silt with few burrows		WREF-2
876808.7	52322.99	10:11:34	Silt with few burrows		WREF-2
876808.9	52322.72	10:11:35	Silt with few burrows		WREF-2
876809.5	52322.19	10:11:36	Silt with few burrows		WREF-2
876809.9	52321.73	10:11:37	Silt with few burrows		WREF-2
876810.2	52321.48	10:11:38	Silt with few burrows		WREF-2
876810.5	52321.22	10:11:39	Silt with few burrows		WREF-2
876810.5	52321.18	10:11:40	Silt with few burrows		WREF-2
876810.8	52320.93	10:11:41	Silt with few burrows		WREF-2
876811.1	52320.66	10:11:42	Silt with few burrows		WREF-2
876811.6	52320.35	10:11:43	Silt with few burrows		WREF-2
876812.1	52319.87	10:11:44	Silt with few burrows		WREF-2
876812.5	52319.5	10:11:45	Silt with few burrows		WREF-2
876812.9	52319.16	10:11:46	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876813.2	52318.81	10:11:47	Silt with few burrows	Crab	WREF-2
876813.4	52318.55	10:11:48	Silt with few burrows		WREF-2
876813.8	52318.24	10:11:49	Silt with few burrows		WREF-2
876814.1	52318	10:11:50	Silt with few burrows		WREF-2
876814.3	52317.91	10:11:51	Silt with few burrows		WREF-2
876814.7	52317.59	10:11:52	Silt with few burrows		WREF-2
876815	52317.42	10:11:53	Silt with few burrows		WREF-2
876815.5	52316.89	10:11:54	Silt with few burrows		WREF-2
876815.8	52316.6	10:11:55	Silt with few burrows		WREF-2
876816	52316.51	10:11:56	Silt with few burrows		WREF-2
876816.1	52316.43	10:11:57	Silt with few burrows		WREF-2
876816.3	52316.43	10:11:58	Silt with few burrows		WREF-2
876816.6	52316.06	10:11:59	Silt with few burrows		WREF-2
876817.1	52315.58	10:12:00	Silt with few burrows		WREF-2
876817.3	52315.27	10:12:01	Silt with few burrows		WREF-2
876817.7	52314.81	10:12:02	Silt with few burrows		WREF-2
876818	52314.54	10:12:03	Silt with few burrows		WREF-2
876818.3	52314.22	10:12:04	Silt with few burrows		WREF-2
876818.8	52313.85	10:12:05	Silt with few burrows		WREF-2
876818.9	52313.78	10:12:06	Silt with few burrows		WREF-2
876819.3	52313.54	10:12:07	Silt with few burrows		WREF-2
876819.6	52313.23	10:12:08	Silt with few burrows		WREF-2
876819.8	52313.14	10:12:09	Silt with few burrows		WREF-2
876820.2	52312.75	10:12:10	Silt with few burrows		WREF-2
876820.5	52312.51	10:12:11	Silt with few burrows		WREF-2
876820.8	52312.25	10:12:12	Silt with few burrows		WREF-2
876821.3	52311.71	10:12:13	Silt with few burrows		WREF-2
876821.7	52311.36	10:12:14	Silt with few burrows		WREF-2
876822.1	52310.88	10:12:15	Silt with few burrows		WREF-2
876822.5	52310.56	10:12:16	Silt with few burrows		WREF-2
876823	52310.23	10:12:17	Silt with few burrows		WREF-2
876823.4	52310.01	10:12:18	Silt with few burrows		WREF-2
876823.9	52309.71	10:12:19	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876824	52309.64	10:12:20	Silt with few burrows		WREF-2
876824.4	52309.44	10:12:21	Silt with few burrows		WREF-2
876824.4	52309.4	10:12:22	Silt with few burrows		WREF-2
876824.5	52309.24	10:12:23	Silt with few burrows		WREF-2
876825.1	52308.8	10:12:24	Silt with few burrows		WREF-2
876825.4	52308.47	10:12:25	Silt with few burrows		WREF-2
876825.9	52308.08	10:12:26	Silt with few burrows		WREF-2
876826.2	52307.8	10:12:27	Silt with few burrows		WREF-2
876826.5	52307.47	10:12:28	Silt with few burrows		WREF-2
876826.8	52307.07	10:12:29	Silt with few burrows		WREF-2
876827.1	52306.76	10:12:30	Silt with few burrows		WREF-2
876827.3	52306.51	10:12:31	Silt with few burrows		WREF-2
876827.5	52306.6	10:12:32	Silt with few burrows		WREF-2
876827.6	52306.74	10:12:33	Silt with few burrows		WREF-2
876828	52306.52	10:12:34	Silt with few burrows		WREF-2
876828.2	52306.35	10:12:35	Silt with few burrows		WREF-2
876828.4	52306.09	10:12:36	Silt with few burrows		WREF-2
876829	52305.55	10:12:37	Silt with few burrows		WREF-2
876829.2	52305.28	10:12:38	Silt with few burrows		WREF-2
876829.5	52305.1	10:12:39	Silt with few burrows		WREF-2
876829.7	52304.95	10:12:40	Silt with few burrows		WREF-2
876829.9	52304.82	10:12:41	Silt with few burrows		WREF-2
876830.2	52304.54	10:12:42	Silt with few burrows		WREF-2
876830.5	52304.28	10:12:43	Silt with few burrows		WREF-2
876830.8	52304.08	10:12:44	Silt with few burrows		WREF-2
876831	52303.96	10:12:45	Silt with few burrows		WREF-2
876831.4	52303.59	10:12:46	Silt with few burrows		WREF-2
876831.7	52303.39	10:12:47	Silt with few burrows		WREF-2
876832	52302.94	10:12:48	Silt with few burrows		WREF-2
876832.4	52302.69	10:12:49	Silt with few burrows		WREF-2
876832.5	52302.73	10:12:50	Silt with few burrows		WREF-2
876832.9	52302.41	10:12:51	Silt with few burrows		WREF-2
876833.2	52302.18	10:12:52	Silt with few burrows	Screen shot	WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876833.5	52301.93	10:12:53	Silt with few burrows		WREF-2
876833.7	52301.76	10:12:54	Silt with few burrows		WREF-2
876833.9	52301.59	10:12:55	Silt with few burrows		WREF-2
876834.1	52301.36	10:12:56	Silt with few burrows		WREF-2
876834.4	52301.02	10:12:57	Silt with few burrows	End of video file (09142020_100257_1.	WREF-2
876834.7	52300.53	10:12:58	Silt with few burrows	Start of video (09142020_101258_1.avi	WREF-2
876835.1	52300.15	10:12:59	Silt with few burrows		WREF-2
876835.5	52299.75	10:13:00	Silt with few burrows		WREF-2
876835.9	52299.43	10:13:01	Silt with few burrows		WREF-2
876836	52299.35	10:13:02	Silt with few burrows		WREF-2
876836.3	52299.11	10:13:03	Silt with few burrows		WREF-2
876836.6	52298.99	10:13:04	Silt with few burrows		WREF-2
876836.8	52298.85	10:13:05	Silt with few burrows		WREF-2
876837.2	52298.58	10:13:06	Silt with few burrows		WREF-2
876837.3	52298.48	10:13:07	Silt with few burrows		WREF-2
876837.5	52298.17	10:13:08	Silt with few burrows		WREF-2
876837.9	52297.52	10:13:09	Silt with few burrows		WREF-2
876838.3	52297.03	10:13:10	Silt with few burrows		WREF-2
876838.8	52296.49	10:13:11	Silt with few burrows		WREF-2
876839.1	52296.22	10:13:12	Silt with few burrows		WREF-2
876839.2	52296.34	10:13:13	Silt with few burrows		WREF-2
876839.3	52296.39	10:13:14	Silt with few burrows		WREF-2
876839.6	52296.05	10:13:15	Silt with few burrows		WREF-2
876839.9	52295.8	10:13:16	Silt with few burrows		WREF-2
876840.2	52295.46	10:13:17	Silt with few burrows		WREF-2
876840.4	52295.34	10:13:18	Silt with few burrows		WREF-2
876840.8	52295.03	10:13:19	Silt with few burrows	Screen shot	WREF-2
876841.2	52294.73	10:13:20	Silt with few burrows		WREF-2
876841.5	52294.56	10:13:21	Silt with few burrows		WREF-2
876841.8	52294.17	10:13:22	Silt with few burrows		WREF-2
876842.1	52293.89	10:13:23	Silt with few burrows		WREF-2
876842.3	52293.55	10:13:24	Silt with few burrows		WREF-2
876842.5	52293.27	10:13:25	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876842.7	52292.95	10:13:26	Silt with few burrows		WREF-2
876843	52292.83	10:13:27	Silt with few burrows		WREF-2
876843.4	52292.59	10:13:28	Silt with few burrows		WREF-2
876843.9	52292.27	10:13:29	Silt with few burrows		WREF-2
876844.1	52292.13	10:13:30	Silt with few burrows		WREF-2
876844.3	52291.81	10:13:31	Silt with few burrows		WREF-2
876844.8	52291.42	10:13:32	Silt with few burrows		WREF-2
876845	52291.34	10:13:33	Silt with few burrows		WREF-2
876845.5	52290.91	10:13:34	Silt with few burrows		WREF-2
876845.7	52290.62	10:13:35	Silt with few burrows		WREF-2
876845.9	52290.6	10:13:36	Silt with few burrows		WREF-2
876846.2	52290.32	10:13:37	Silt with few burrows		WREF-2
876846.4	52290.15	10:13:38	Silt with few burrows		WREF-2
876846.7	52290.02	10:13:39	Silt with few burrows		WREF-2
876847.1	52289.61	10:13:40	Silt with few burrows		WREF-2
876847.5	52289.31	10:13:41	Silt with few burrows		WREF-2
876847.7	52289.19	10:13:42	Silt with few burrows		WREF-2
876848	52288.94	10:13:43	Silt with few burrows		WREF-2
876848.2	52288.88	10:13:44	Silt with few burrows		WREF-2
876848.6	52288.53	10:13:45	Silt with few burrows		WREF-2
876849	52288.15	10:13:46	Silt with few burrows		WREF-2
876849.3	52287.95	10:13:47	Silt with few burrows		WREF-2
876849.5	52287.8	10:13:48	Silt with few burrows		WREF-2
876849.9	52287.43	10:13:49	Silt with few burrows		WREF-2
876850.2	52287.07	10:13:50	Silt with few burrows		WREF-2
876850.4	52286.78	10:13:51	Silt with few burrows		WREF-2
876850.8	52286.43	10:13:52	Silt with few burrows		WREF-2
876851	52286.25	10:13:53	Silt with few burrows		WREF-2
876851.2	52286.24	10:13:54	Silt with few burrows		WREF-2
876851.5	52286.03	10:13:55	Silt with few burrows		WREF-2
876851.9	52285.67	10:13:56	Silt with few burrows		WREF-2
876852.3	52285.33	10:13:57	Silt with few burrows		WREF-2
876852.6	52284.99	10:13:58	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876853	52284.58	10:13:59	Silt with few burrows		WREF-2
876853.2	52284.5	10:14:00	Silt with few burrows		WREF-2
876853.5	52284.16	10:14:01	Silt with few burrows		WREF-2
876853.8	52283.93	10:14:02	Silt with few burrows		WREF-2
876853.9	52283.88	10:14:03	Silt with few burrows		WREF-2
876854.2	52283.6	10:14:04	Silt with few burrows		WREF-2
876854.5	52283.5	10:14:05	Silt with few burrows		WREF-2
876854.9	52283.21	10:14:06	Silt with few burrows	Screen shot	WREF-2
876855.4	52282.74	10:14:07	Silt with few burrows		WREF-2
876855.7	52282.47	10:14:08	Silt with few burrows		WREF-2
876856	52282.16	10:14:09	Silt with few burrows		WREF-2
876856.2	52281.9	10:14:10	Silt with few burrows		WREF-2
876856.3	52281.79	10:14:11	Silt with few burrows		WREF-2
876856.7	52281.44	10:14:12	Silt with few burrows		WREF-2
876857	52281.16	10:14:13	Silt with few burrows		WREF-2
876857.3	52281.05	10:14:14	Silt with few burrows	Screen shot: Small fish	WREF-2
876857.7	52280.61	10:14:15	Silt with few burrows		WREF-2
876858	52280.4	10:14:16	Silt with few burrows		WREF-2
876858.2	52280.32	10:14:17	Silt with few burrows		WREF-2
876858.6	52279.92	10:14:18	Silt with few burrows		WREF-2
876858.7	52279.91	10:14:19	Silt with few burrows		WREF-2
876858.9	52279.73	10:14:20	Silt with few burrows		WREF-2
876859	52279.55	10:14:21	Silt with few burrows		WREF-2
876859.2	52279.33	10:14:22	Silt with few burrows		WREF-2
876859.7	52278.82	10:14:23	Silt with few burrows		WREF-2
876860	52278.64	10:14:24	Silt with few burrows		WREF-2
876860.3	52278.46	10:14:25	Silt with few burrows		WREF-2
876860.6	52278.19	10:14:26	Silt with few burrows		WREF-2
876860.9	52278.19	10:14:27	Silt with few burrows		WREF-2
876861.2	52278	10:14:28	Silt with few burrows		WREF-2
876861.6	52277.59	10:14:29	Silt with few burrows		WREF-2
876861.7	52277.72	10:14:30	Silt with few burrows		WREF-2
876861.8	52277.6	10:14:31	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876862	52277.26	10:14:32	Silt with few burrows		WREF-2
876862.2	52277.04	10:14:33	Silt with few burrows		WREF-2
876862.5	52276.69	10:14:34	Silt with few burrows		WREF-2
876863.1	52276.25	10:14:35	Silt with few burrows		WREF-2
876863.5	52276.09	10:14:36	Silt with few burrows		WREF-2
876863.8	52275.79	10:14:37	Silt with few burrows		WREF-2
876864	52275.65	10:14:38	Silt with few burrows		WREF-2
876864.2	52275.46	10:14:39	Silt with few burrows		WREF-2
876864.4	52275.32	10:14:40	Silt with few burrows		WREF-2
876864.8	52275.07	10:14:41	Silt with few burrows		WREF-2
876865.1	52274.66	10:14:42	Silt with few burrows		WREF-2
876865.4	52274.3	10:14:43	Silt with few burrows		WREF-2
876865.6	52274.08	10:14:44	Silt with few burrows		WREF-2
876865.8	52273.88	10:14:45	Silt with few burrows		WREF-2
876866.1	52273.7	10:14:46	Silt with few burrows		WREF-2
876866.5	52273.33	10:14:47	Silt with few burrows	Screen shot: Lobster	WREF-2
876866.7	52273.01	10:14:48	Silt with few burrows		WREF-2
876866.9	52272.72	10:14:49	Silt with few burrows		WREF-2
876867.3	52272.37	10:14:50	Silt with few burrows		WREF-2
876867.6	52271.98	10:14:51	Silt with few burrows		WREF-2
876868	52271.7	10:14:52	Silt with few burrows		WREF-2
876868.3	52271.36	10:14:53	Silt with few burrows		WREF-2
876868.6	52271	10:14:54	Silt with few burrows		WREF-2
876868.8	52271.01	10:14:55	Silt with few burrows		WREF-2
876869	52270.9	10:14:56	Silt with few burrows		WREF-2
876869.4	52270.63	10:14:57	Silt with few burrows		WREF-2
876869.5	52270.49	10:14:58	Silt with few burrows		WREF-2
876869.8	52270.24	10:14:59	Silt with few burrows		WREF-2
876870.1	52269.86	10:15:00	Silt with few burrows		WREF-2
876870.3	52269.6	10:15:01	Silt with few burrows		WREF-2
876870.6	52269.14	10:15:02	Silt with few burrows		WREF-2
876870.8	52268.94	10:15:03	Silt with few burrows		WREF-2
876871.1	52268.73	10:15:04	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876871.6	52268.36	10:15:05	Silt with few burrows		WREF-2
876871.9	52268.22	10:15:06	Silt with few burrows		WREF-2
876872.3	52267.88	10:15:07	Silt with few burrows		WREF-2
876872.6	52267.71	10:15:08	Silt with few burrows		WREF-2
876872.9	52267.61	10:15:09	Silt with few burrows		WREF-2
876873.2	52267.42	10:15:10	Silt with few burrows		WREF-2
876873.4	52267.15	10:15:11	Silt with few burrows		WREF-2
876873.7	52266.69	10:15:12	Silt with few burrows		WREF-2
876873.7	52266.55	10:15:13	Silt with few burrows		WREF-2
876874.1	52266.11	10:15:14	Silt with few burrows		WREF-2
876874.6	52265.71	10:15:15	Silt with few burrows		WREF-2
876875.1	52265.3	10:15:16	Silt with few burrows		WREF-2
876875.5	52265.05	10:15:17	Silt with few burrows		WREF-2
876875.7	52265.06	10:15:18	Silt with few burrows		WREF-2
876875.8	52265.07	10:15:19	Silt with few burrows		WREF-2
876876.1	52264.82	10:15:20	Silt with few burrows		WREF-2
876876.4	52264.5	10:15:21	Silt with few burrows		WREF-2
876876.7	52264.11	10:15:22	Silt with few burrows		WREF-2
876876.9	52263.87	10:15:23	Silt with few burrows		WREF-2
876877.2	52263.68	10:15:24	Silt with few burrows		WREF-2
876877.7	52263.35	10:15:25	Silt with few burrows		WREF-2
876878.1	52263.08	10:15:26	Silt with few burrows		WREF-2
876878.4	52262.83	10:15:27	Silt with few burrows		WREF-2
876878.6	52262.67	10:15:28	Silt with few burrows		WREF-2
876878.8	52262.62	10:15:29	Silt with few burrows		WREF-2
876879.1	52262.48	10:15:30	Silt with few burrows		WREF-2
876879.4	52262.05	10:15:31	Silt with few burrows		WREF-2
876879.6	52261.84	10:15:32	Silt with few burrows		WREF-2
876879.8	52261.46	10:15:33	Silt with few burrows		WREF-2
876880.2	52261.2	10:15:34	Silt with few burrows		WREF-2
876880.5	52261.08	10:15:35	Silt with few burrows		WREF-2
876881.1	52260.7	10:15:36	Silt with few burrows		WREF-2
876881.5	52260.49	10:15:37	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876881.7	52260.35	10:15:38	Silt with few burrows	Screen shot	WREF-2
876882	52260.18	10:15:39	Silt with few burrows		WREF-2
876882.2	52259.97	10:15:40	Silt with few burrows		WREF-2
876882.5	52259.68	10:15:41	Silt with few burrows		WREF-2
876882.7	52259.5	10:15:42	Silt with few burrows		WREF-2
876883	52259.22	10:15:43	Silt with few burrows		WREF-2
876883.2	52259.07	10:15:44	Silt with few burrows		WREF-2
876883.5	52258.94	10:15:45	Silt with few burrows		WREF-2
876883.8	52258.73	10:15:46	Silt with few burrows		WREF-2
876884.3	52258.41	10:15:47	Silt with few burrows		WREF-2
876884.7	52258.19	10:15:48	Silt with few burrows		WREF-2
876885.2	52257.67	10:15:49	Silt with few burrows		WREF-2
876885.4	52257.52	10:15:50		camera too high	WREF-2
876885.6	52257.41	10:15:51		camera too high	WREF-2
876885.8	52257.19	10:15:52		camera too high	WREF-2
876885.9	52257.2	10:15:53		camera too high	WREF-2
876886.3	52256.88	10:15:54		camera too high	WREF-2
876886.5	52256.8	10:15:55		camera too high	WREF-2
876886.9	52256.65	10:15:56		camera too high	WREF-2
876887.5	52256.23	10:15:57		camera too high	WREF-2
876887.9	52256.04	10:15:58		camera too high	WREF-2
876888.2	52255.89	10:15:59		camera too high	WREF-2
876888.5	52255.65	10:16:00		camera too high	WREF-2
876888.7	52255.59	10:16:01		camera too high	WREF-2
876888.7	52255.79	10:16:02		camera too high	WREF-2
876889	52255.74	10:16:03		camera too high	WREF-2
876889.3	52255.67	10:16:04		camera too high	WREF-2
876889.7	52255.45	10:16:05		camera too high	WREF-2
876890	52255.25	10:16:06	Silt with few burrows		WREF-2
876890.5	52255.01	10:16:07	Silt with few burrows		WREF-2
876891	52254.85	10:16:08	Silt with few burrows		WREF-2
876891.4	52254.78	10:16:09	Silt with few burrows		WREF-2
876891.6	52254.66	10:16:10	Silt with few burrows		WREF-2

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876891.7	52254.67	10:16:11	Silt with few burrows		WREF-2
876891.7	52254.73	10:16:12	Silt with few burrows		WREF-2
876891.9	52254.68	10:16:13	Silt with few burrows		WREF-2
876892.2	52254.58	10:16:14	Silt with few burrows		WREF-2
876892.7	52254.42	10:16:15	Silt with few burrows		WREF-2
876893.3	52254.14	10:16:16	Silt with few burrows		WREF-2
876893.6	52254.01	10:16:17	Silt with few burrows		WREF-2
876893.9	52253.77	10:16:18	Silt with few burrows		WREF-2
876894	52253.42	10:16:19	Silt with few burrows		WREF-2
876894.1	52253.45	10:16:20	Silt with few burrows	End of video file (09142020_101258_1.	WREF-2
876697.9	51665.27	10:28:33		camera too high	CADS-1
876698.1	51665.12	10:28:34		camera too high	CADS-1
876698.4	51664.88	10:28:35		camera too high	CADS-1
876698.5	51664.72	10:28:36	Gravel with cobble	Screen shot	CADS-1
876698.8	51664.32	10:28:37		camera too high	CADS-1
876698.9	51664.13	10:28:38		camera too high	CADS-1
876699.1	51664.09	10:28:39		camera too high	CADS-1
876699.8	51663.55	10:28:40		camera too high	CADS-1
876700.1	51663.42	10:28:41		camera too high	CADS-1
876700.8	51662.82	10:28:42		camera too high	CADS-1
876701.2	51662.37	10:28:43		camera too high	CADS-1
876701.3	51662.22	10:28:44		camera too high	CADS-1
876701.6	51661.88	10:28:45		camera too high	CADS-1
876701.5	51661.83	10:28:46		camera too high	CADS-1
876701.5	51661.72	10:28:47		camera too high	CADS-1
876701.9	51661.32	10:28:48		camera too high	CADS-1
876702.1	51661.17	10:28:49		camera too high	CADS-1
876702.7	51660.65	10:28:50		camera too high	CADS-1
876703.1	51660.27	10:28:51	Gravel with cobble		CADS-1
876703.2	51660.18	10:28:52	Gravel with cobble		CADS-1
876703.7	51659.83	10:28:53	Gravel with cobble		CADS-1
876703.9	51659.68	10:28:54	Gravel with cobble		CADS-1
876704.3	51659.29	10:28:55	Gravel with cobble		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876704.6	51658.87	10:28:56	Gravel with cobble		CADS-1
876704.8	51658.45	10:28:57	Gravel with cobble		CADS-1
876705.1	51658	10:28:58	Gravel with cobble		CADS-1
876705.2	51657.83	10:28:59	Gravel with cobble		CADS-1
876705.6	51657.37	10:29:00	Gravel with cobble		CADS-1
876706	51657.26	10:29:01	Gravel with cobble		CADS-1
876706.3	51657.02	10:29:02	Gravel with cobble		CADS-1
876706.5	51656.83	10:29:03	Gravel with cobble		CADS-1
876706.4	51657	10:29:04	Gravel with cobble		CADS-1
876706.6	51656.8	10:29:05	Gravel with cobble		CADS-1
876707	51656.41	10:29:06	Gravel with cobble		CADS-1
876707.4	51655.9	10:29:07	Gravel with cobble		CADS-1
876707.7	51655.44	10:29:08	Sand and gravel		CADS-1
876708	51655.09	10:29:09	Sand and gravel		CADS-1
876708.4	51654.7	10:29:10	Sand and gravel		CADS-1
876708.5	51654.55	10:29:11	Sand and gravel		CADS-1
876708.9	51654.14	10:29:12	Sand and gravel		CADS-1
876709.1	51653.89	10:29:13	Silt sand and gravel		CADS-1
876709.2	51653.85	10:29:14	Silt sand and gravel		CADS-1
876709.4	51653.74	10:29:15	Silt sand and gravel		CADS-1
876709.5	51653.67	10:29:16	Silt sand and gravel		CADS-1
876709.9	51653.26	10:29:17	Silt sand and gravel	Screen shot: possible scallops	CADS-1
876710	51653.11	10:29:18	Silt sand and gravel		CADS-1
876710.4	51652.45	10:29:19	Silt sand and gravel		CADS-1
876710.8	51651.93	10:29:20	Silt sand and gravel	Possible scallop	CADS-1
876711	51651.6	10:29:21	Silt sand and gravel		CADS-1
876711.5	51650.93	10:29:22	Silt sand and gravel		CADS-1
876711.6	51650.78	10:29:23	Silt sand and gravel		CADS-1
876711.7	51650.73	10:29:24	Silt sand and gravel		CADS-1
876712.1	51650.45	10:29:25	Silt sand and gravel		CADS-1
876712.4	51650.38	10:29:26	Silt and sand w/small ripples		CADS-1
876712.8	51649.93	10:29:27	Silt and sand		CADS-1
876713.2	51649.41	10:29:28	Silt and sand	Screen shot	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876713.2	51649.09	10:29:29	Silt and sand		CADS-1
876713.4	51648.72	10:29:30	Silt and sand		CADS-1
876713.5	51648.42	10:29:31	Silt and sand		CADS-1
876713.7	51648.11	10:29:32	Silt and sand		CADS-1
876714.1	51647.58	10:29:33	Silt and sand	Screen shot	CADS-1
876714.2	51647.36	10:29:34	Silt and sand		CADS-1
876714.6	51646.91	10:29:35	Silt and sand		CADS-1
876714.9	51646.58	10:29:36	Silt and sand		CADS-1
876715.2	51646.23	10:29:37	Silt and sand		CADS-1
876715.8	51645.64	10:29:38	Silt and sand		CADS-1
876716.2	51645.17	10:29:39	Silt and sand		CADS-1
876716.4	51644.72	10:29:40	Silt and sand		CADS-1
876716.6	51644.37	10:29:41	Silt and sand		CADS-1
876716.5	51644.2	10:29:42	Silt and sand		CADS-1
876716.5	51644.09	10:29:43	Silt and sand		CADS-1
876716.8	51643.64	10:29:44	Silt and sand		CADS-1
876717	51643.38	10:29:45	Silt and sand		CADS-1
876717.3	51643.03	10:29:46	Silt and sand		CADS-1
876717.7	51642.52	10:29:47	Silt and sand		CADS-1
876717.8	51642.21	10:29:48	Silt and sand		CADS-1
876718.4	51641.46	10:29:49	Silt and sand		CADS-1
876718.7	51640.98	10:29:50	Silt and sand		CADS-1
876719	51640.55	10:29:51	Silt and sand		CADS-1
876719.3	51640.11	10:29:52	Silt and sand		CADS-1
876719.4	51640.01	10:29:53	Silt and sand		CADS-1
876719.7	51639.81	10:29:54	Silt and sand		CADS-1
876719.9	51639.54	10:29:55	Silt and sand		CADS-1
876720	51639.27	10:29:56	Silt and sand		CADS-1
876719.9	51639.07	10:29:57	Silt and sand		CADS-1
876719.9	51638.82	10:29:58	Silt and sand		CADS-1
876720.1	51638.53	10:29:59	Silt and sand w few cobbles		CADS-1
876720.5	51638.17	10:30:00	Silt and sand w few cobbles		CADS-1
876721	51637.59	10:30:01	Gravel with cobble		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876721.2	51637.25	10:30:02	Gravel with cobble	Screen shot	CADS-1
876721.5	51636.78	10:30:03	Gravel with cobble		CADS-1
876721.6	51636.63	10:30:04	Cobble and boulder		CADS-1
876721.8	51636.47	10:30:05	Cobble and boulder		CADS-1
876722	51636.2	10:30:06	Cobble and boulder		CADS-1
876722.3	51635.86	10:30:07	Cobble and boulder		CADS-1
876722.4	51635.56	10:30:08	Cobble and boulder		CADS-1
876722.3	51635.38	10:30:09	Cobble and boulder		CADS-1
876722.4	51635.17	10:30:10	Cobble and boulder		CADS-1
876722.6	51634.83	10:30:11	Cobble and boulder		CADS-1
876722.8	51634.57	10:30:12	Cobble and boulder		CADS-1
876723	51634.14	10:30:13	Cobble and boulder		CADS-1
876723.3	51633.71	10:30:14	Cobble and boulder		CADS-1
876723.6	51633.51	10:30:15	Cobble and boulder		CADS-1
876723.9	51633.09	10:30:16	Cobble and boulder		CADS-1
876724.1	51632.9	10:30:17	Cobble and boulder		CADS-1
876724.2	51632.75	10:30:18	Cobble and boulder		CADS-1
876724.3	51632.43	10:30:19	Cobble and boulder		CADS-1
876724.3	51632.25	10:30:20	Cobble and boulder		CADS-1
876724.5	51631.9	10:30:21	Cobble and boulder	Fish	CADS-1
876724.5	51631.6	10:30:22	Cobble and boulder		CADS-1
876724.7	51631.29	10:30:23	Cobble and boulder		CADS-1
876724.8	51630.91	10:30:24	Cobble and boulder		CADS-1
876725.1	51630.62	10:30:25	Cobble and boulder		CADS-1
876725.5	51630.31	10:30:26	Cobble and boulder		CADS-1
876725.8	51630.1	10:30:27	Cobble and boulder		CADS-1
876726.1	51629.59	10:30:28	Gravel, cobble and bolder		CADS-1
876726.2	51629.36	10:30:29	Gravel, cobble and bolder		CADS-1
876726.3	51629.07	10:30:30	Gravel, cobble and bolder		CADS-1
876726.4	51628.59	10:30:31	Gravel, cobble and bolder		CADS-1
876726.4	51628.62	10:30:32	Gravel, cobble and bolder		CADS-1
876726.7	51628.01	10:30:33	Gravel, cobble and bolder		CADS-1
876726.9	51627.71	10:30:34	Gravel, cobble and bolder		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876727.2	51627.49	10:30:35	Gravel, cobble and bolder		CADS-1
876727.5	51626.98	10:30:36	Sand and gravel		CADS-1
876727.6	51627.01	10:30:37	Sand and gravel		CADS-1
876727.9	51626.62	10:30:38	Silt and sand		CADS-1
876728.1	51626.35	10:30:39	Silt and sand		CADS-1
876728.3	51626.12	10:30:40	Silt and sand		CADS-1
876728.6	51625.67	10:30:41	Silt and sand		CADS-1
876728.9	51625.37	10:30:42	Silt and sand		CADS-1
876729.2	51624.94	10:30:43	Silt and sand w/small ripples		CADS-1
876729.4	51624.67	10:30:44	Silt and sand		CADS-1
876729.5	51624.36	10:30:45	Silt and sand		CADS-1
876729.5	51623.98	10:30:46	Silt and sand		CADS-1
876729.6	51623.67	10:30:47	Silt and sand		CADS-1
876729.9	51623.36	10:30:48	Silt and sand		CADS-1
876730.2	51623.01	10:30:49	Silt and sand		CADS-1
876730.6	51622.55	10:30:50	Silt and sand		CADS-1
876730.8	51622.14	10:30:51	Silt and sand		CADS-1
876731.1	51621.8	10:30:52	Silt and sand		CADS-1
876731.3	51621.49	10:30:53	Silt and sand		CADS-1
876731.6	51621.22	10:30:54	Silt and sand		CADS-1
876731.9	51620.7	10:30:55	Silt and sand		CADS-1
876732	51620.53	10:30:56	Silt and sand		CADS-1
876732.1	51620.06	10:30:57	Silt and sand		CADS-1
876732.2	51619.75	10:30:58	Silt and sand		CADS-1
876732.3	51619.77	10:30:59	Silt and sand		CADS-1
876732.8	51619.19	10:31:00	Silt and sand		CADS-1
876733.1	51618.85	10:31:01	Silt and sand		CADS-1
876733.6	51618.28	10:31:02	Silt and sand		CADS-1
876733.7	51618.05	10:31:03	Silt and sand		CADS-1
876733.9	51617.56	10:31:04	Silt and sand		CADS-1
876734.2	51617.09	10:31:05	Silt and sand		CADS-1
876734.5	51616.56	10:31:06	Silt and sand		CADS-1
876735	51615.81	10:31:07	Silt and sand	Screen shot: Crab	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876735.1	51615.63	10:31:08	Silt and sand		CADS-1
876735.4	51615.27	10:31:09	Silt and sand		CADS-1
876735.6	51615.07	10:31:10	Silt and sand		CADS-1
876735.6	51615.06	10:31:11	Silt and sand		CADS-1
876736.1	51614.42	10:31:12	Silt and sand		CADS-1
876736.5	51613.89	10:31:13	Silt and sand	burrows	CADS-1
876736.7	51613.63	10:31:14	Silt and sand		CADS-1
876737.1	51613.08	10:31:15	Silt and sand		CADS-1
876737.3	51612.75	10:31:16	Silt and sand		CADS-1
876737.5	51612.58	10:31:17	Silt and sand	anemone	CADS-1
876737.8	51612.24	10:31:18	Silt and sand		CADS-1
876738	51611.9	10:31:19	Silt and sand		CADS-1
876738.2	51611.62	10:31:20	Silt and sand		CADS-1
876738.4	51611.41	10:31:21	Silt and sand		CADS-1
876738.6	51611.16	10:31:22	Silt and sand		CADS-1
876738.8	51610.8	10:31:23	Silt and sand		CADS-1
876739	51610.47	10:31:24	Silt and sand		CADS-1
876739.2	51610.18	10:31:25	Silt and sand		CADS-1
876739.4	51610	10:31:26	Silt and sand		CADS-1
876739.7	51609.54	10:31:27	Silt and sand		CADS-1
876739.9	51609.19	10:31:28	Silt and sand		CADS-1
876740.3	51608.65	10:31:29	Silt and sand		CADS-1
876740.6	51608.24	10:31:30	Silt and sand		CADS-1
876740.8	51608.01	10:31:31	Silt and sand		CADS-1
876741	51607.83	10:31:32	Silt and sand		CADS-1
876741.1	51607.56	10:31:33	Silt and sand		CADS-1
876741.3	51607.07	10:31:34	Silt and sand		CADS-1
876741.4	51606.75	10:31:35	Silt and sand		CADS-1
876741.7	51606.35	10:31:36	Silt and sand		CADS-1
876741.9	51605.96	10:31:37	Silt and sand		CADS-1
876742.1	51605.75	10:31:38	Silt and sand		CADS-1
876742.5	51605.39	10:31:39	Silt and sand		CADS-1
876742.6	51605.1	10:31:40	Silt and sand		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876742.8	51604.74	10:31:41	Silt and sand		CADS-1
876743	51604.35	10:31:42	Silt and sand		CADS-1
876743.2	51604.13	10:31:43	Silt and sand		CADS-1
876743.6	51603.69	10:31:44	Sand, gravel and cobble		CADS-1
876744.1	51603.23	10:31:45	Sand, gravel and cobble		CADS-1
876744.5	51602.76	10:31:46	Sand, gravel and cobble		CADS-1
876744.7	51602.52	10:31:47	Sand, gravel and cobble		CADS-1
876744.8	51602.09	10:31:48	Sand, gravel and cobble		CADS-1
876744.8	51601.85	10:31:49	Sand, gravel and cobble		CADS-1
876744.8	51601.66	10:31:50	Sand, gravel and cobble		CADS-1
876745	51601.2	10:31:51	Sand, gravel and cobble		CADS-1
876745.2	51601.03	10:31:52	Sand, gravel and cobble		CADS-1
876745.4	51600.77	10:31:53	Sand, gravel and cobble		CADS-1
876745.8	51600.4	10:31:54	Sand, gravel and cobble		CADS-1
876746.2	51599.91	10:31:55	Silt and sand		CADS-1
876746.5	51599.62	10:31:56	Silt and sand		CADS-1
876746.7	51599.42	10:31:57	Silt and sand		CADS-1
876747.1	51598.88	10:31:58	Silt and sand		CADS-1
876747.1	51598.87	10:31:59	Silt and sand		CADS-1
876747.3	51598.49	10:32:00	Silt and sand		CADS-1
876747.5	51598.07	10:32:01	Silt and sand		CADS-1
876747.5	51597.88	10:32:02	Silt and sand		CADS-1
876747.7	51597.44	10:32:03	Silt and sand		CADS-1
876747.9	51597.19	10:32:04	Silt and sand		CADS-1
876748.3	51596.73	10:32:05	Silt and sand		CADS-1
876748.8	51596.4	10:32:06	Silt and sand		CADS-1
876748.9	51596.33	10:32:07	Silt and sand		CADS-1
876749.3	51595.78	10:32:08	Silt and sand		CADS-1
876749.4	51595.58	10:32:09	Silt and sand		CADS-1
876749.7	51595.27	10:32:10	Sand, gravel and cobble		CADS-1
876750.1	51594.67	10:32:11	Sand, gravel and cobble		CADS-1
876750.3	51594.33	10:32:12	Sand, gravel and cobble		CADS-1
876750.4	51593.97	10:32:13	Sand, gravel and cobble		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876750.4	51593.84	10:32:14	Sand, gravel and cobble		CADS-1
876750.5	51593.77	10:32:15	Sand, gravel and cobble		CADS-1
876750.8	51593.57	10:32:16	Sand, gravel and cobble		CADS-1
876751	51593.37	10:32:17	Sand, gravel and cobble		CADS-1
876751.4	51592.87	10:32:18	Sand, gravel and cobble		CADS-1
876751.4	51592.75	10:32:19	Sand, gravel and cobble		CADS-1
876752	51592	10:32:20	Silt and sand		CADS-1
876752.4	51591.4	10:32:21	Silt and sand		CADS-1
876752.5	51591.33	10:32:22	Silt and sand		CADS-1
876753.1	51590.42	10:32:23	Silt and sand		CADS-1
876753.2	51590.35	10:32:24	Silt and sand		CADS-1
876753.5	51590.19	10:32:25	Silt and sand		CADS-1
876753.9	51589.59	10:32:26	Silt and sand		CADS-1
876754	51589.66	10:32:27	Silt and sand		CADS-1
876754.5	51589.22	10:32:28	Silt and sand		CADS-1
876754.9	51588.7	10:32:29	Sand, gravel and cobble		CADS-1
876755.1	51588.48	10:32:30	Sand, gravel and cobble	Screen shot: Fish	CADS-1
876755.4	51587.89	10:32:31	Sand, gravel and cobble		CADS-1
876755.6	51587.59	10:32:32	Sand, gravel and cobble		CADS-1
876755.9	51587.42	10:32:33	Sand, gravel and cobble		CADS-1
876756.2	51587.06	10:32:34	Sand, gravel and cobble		CADS-1
876756.4	51587.02	10:32:35	Silt and sand		CADS-1
876756.7	51586.67	10:32:36	Silt and sand		CADS-1
876756.9	51586.38	10:32:37	Silt and sand		CADS-1
876757.1	51586.3	10:32:38	Silt and sand		CADS-1
876757.5	51585.87	10:32:39	Silt and sand		CADS-1
876757.7	51585.57	10:32:40	Silt and sand		CADS-1
876757.9	51585.26	10:32:41	Silt and sand		CADS-1
876758.1	51584.86	10:32:42	Silt and sand		CADS-1
876758.2	51584.63	10:32:43	Silt and sand		CADS-1
876758.5	51584.26	10:32:44	Silt and sand		CADS-1
876758.8	51584	10:32:45	Silt and sand		CADS-1
876759.1	51583.8	10:32:46	Silt and sand		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876759.3	51583.64	10:32:47	Silt and sand		CADS-1
876759.5	51583.45	10:32:48	Silt and sand		CADS-1
876759.7	51583.14	10:32:49	Silt and sand		CADS-1
876759.9	51582.85	10:32:50	Silt and sand		CADS-1
876760.2	51582.54	10:32:51	Silt and sand		CADS-1
876760.6	51581.95	10:32:52	Silt and sand		CADS-1
876760.8	51581.49	10:32:53	Silt and sand		CADS-1
876761	51581.12	10:32:54	Silt and sand		CADS-1
876761.3	51580.72	10:32:55	Silt and sand		CADS-1
876761.5	51580.39	10:32:56	Silt and sand		CADS-1
876761.8	51580.1	10:32:57	Silt and sand		CADS-1
876762.1	51579.82	10:32:58	Silt and sand	Screen shot: sample location (CADS 2)	CADS-1
876762.3	51579.53	10:32:59	Silt and sand		CADS-1
876762.5	51579.14	10:33:00	Silt and sand		CADS-1
876762.6	51578.85	10:33:01	Silt and sand		CADS-1
876762.8	51578.4	10:33:02	Silt and sand		CADS-1
876763.2	51577.93	10:33:03	Silt and sand		CADS-1
876763.7	51577.38	10:33:04	Silt and sand		CADS-1
876764.1	51576.8	10:33:05	Silt and sand		CADS-1
876764.2	51576.47	10:33:06	Silt and sand		CADS-1
876764.3	51576.3	10:33:07	Silt and sand		CADS-1
876764.6	51575.9	10:33:08	Silt and sand		CADS-1
876764.8	51575.6	10:33:09	Silt and sand	Screen shot	CADS-1
876764.9	51575.37	10:33:10	Silt and sand		CADS-1
876765.1	51575.04	10:33:11	Silt and sand		CADS-1
876765.2	51574.66	10:33:12	Silt and sand		CADS-1
876765.4	51574.27	10:33:13	Silt and sand		CADS-1
876765.7	51573.95	10:33:14	Silt and sand		CADS-1
876766	51573.61	10:33:15	Silt and sand		CADS-1
876766.3	51573.23	10:33:16	Silt and sand		CADS-1
876766.4	51573.04	10:33:17	Silt and sand		CADS-1
876766.5	51572.85	10:33:18	Silt and sand		CADS-1
876766.6	51572.51	10:33:19	Silt and sand	Possible Scallop	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876766.8	51572.26	10:33:20	Silt and sand		CADS-1
876767	51571.86	10:33:21	Silt and sand		CADS-1
876767.2	51571.36	10:33:22	Silt and sand		CADS-1
876767.3	51571.16	10:33:23	Silt and sand		CADS-1
876767.4	51570.95	10:33:24	Silt and sand		CADS-1
876767.6	51570.61	10:33:25	Silt and sand		CADS-1
876767.7	51570.35	10:33:26	Silt and sand		CADS-1
876767.8	51570	10:33:27	Silt and sand		CADS-1
876767.9	51569.69	10:33:28	Silt and sand		CADS-1
876768.1	51569.44	10:33:29	Silt and sand		CADS-1
876768.3	51569.05	10:33:30	Silt and sand		CADS-1
876768.8	51568.44	10:33:31	Silt and sand		CADS-1
876769	51568.15	10:33:32	Silt and sand		CADS-1
876769.2	51567.75	10:33:33	Silt and sand		CADS-1
876769.5	51567.13	10:33:34	Silt and sand		CADS-1
876769.5	51566.99	10:33:35	Silt and sand		CADS-1
876769.8	51566.46	10:33:36	Silt and sand		CADS-1
876770	51565.94	10:33:37	Silt and sand		CADS-1
876770.3	51565.56	10:33:38	Silt and sand		CADS-1
876770.6	51565.07	10:33:39	Silt and sand		CADS-1
876770.8	51564.83	10:33:40	Silt and sand		CADS-1
876771.3	51564.11	10:33:41	Silt and sand		CADS-1
876771.6	51563.69	10:33:42	Silt and sand		CADS-1
876771.8	51563.29	10:33:43	Silt and sand		CADS-1
876772.4	51562.41	10:33:44	Silt and sand		CADS-1
876772.5	51562.24	10:33:45	Silt and sand	Lobster trap	CADS-1
876772.9	51561.61	10:33:46	Silt and sand		CADS-1
876773.4	51560.75	10:33:47	Silt and sand		CADS-1
876773.5	51560.62	10:33:48	Silt and sand	Fish	CADS-1
876773.9	51559.91	10:33:49	Silt and sand		CADS-1
876774.1	51559.56	10:33:50	Silt and sand		CADS-1
876774.3	51559.3	10:33:51	Silt and sand		CADS-1
876774.7	51558.75	10:33:52	Silt and sand		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876774.8	51558.61	10:33:53	Silt and sand		CADS-1
876775	51558.36	10:33:54	Silt and sand		CADS-1
876775.2	51558.02	10:33:55	Silt and sand		CADS-1
876775.4	51557.7	10:33:56	Silt and sand		CADS-1
876775.6	51557.29	10:33:57	Silt and sand		CADS-1
876775.9	51556.74	10:33:58	Silt and sand		CADS-1
876776.1	51556.41	10:33:59	Silt and sand		CADS-1
876776.3	51556.03	10:34:00	Silt and sand	burrow	CADS-1
876776.6	51555.63	10:34:01	Silt and sand		CADS-1
876777	51555.2	10:34:02	Silt and sand	burrow	CADS-1
876777	51555.07	10:34:03	Silt and sand		CADS-1
876777.3	51554.65	10:34:04	Silt and sand	burrow	CADS-1
876777.2	51554.53	10:34:05	Silt and sand		CADS-1
876777.2	51554.31	10:34:06	Silt and sand		CADS-1
876777.5	51553.76	10:34:07	Silt and sand		CADS-1
876777.5	51553.62	10:34:08	Silt and sand		CADS-1
876778.1	51552.87	10:34:09	Silt and sand		CADS-1
876778.6	51552.27	10:34:10	Silt and sand		CADS-1
876779.1	51551.62	10:34:11	Silt and sand		CADS-1
876779.4	51551.1	10:34:12	Silt and sand		CADS-1
876779.4	51550.83	10:34:13	Silt and sand		CADS-1
876779.5	51550.55	10:34:14	Silt and sand		CADS-1
876779.6	51550.28	10:34:15	Silt and sand		CADS-1
876779.7	51549.98	10:34:16	Silt and sand		CADS-1
876779.8	51549.74	10:34:17	Silt and sand	burrow	CADS-1
876779.9	51549.39	10:34:18	Silt and sand		CADS-1
876780.2	51548.93	10:34:19	Silt and sand		CADS-1
876780.5	51548.36	10:34:20	Silt and sand		CADS-1
876780.8	51547.84	10:34:21	Silt and sand	camera creates plume - no visability	CADS-1
876781	51547.65	10:34:22	Silt and sand	camera creates plume - no visability	CADS-1
876781.3	51547.31	10:34:23	Silt and sand	camera creates plume - no visability	CADS-1
876781.5	51546.93	10:34:24	Silt and sand	camera creates plume - no visability	CADS-1
876781.5	51546.53	10:34:25	Silt and sand	camera creates plume - no visability	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876781.5	51546.09	10:34:26	Silt and sand	camera creates plume - no visability	CADS-1
876781.5	51545.94	10:34:27	Silt and sand	camera creates plume - no visability	CADS-1
876781.8	51545.39	10:34:28	Silt and sand	camera creates plume - no visability	CADS-1
876782.1	51544.86	10:34:29	Silt and sand	Screen shot: sample location (CADS 1)	CADS-1
876782.4	51544.54	10:34:30	Silt and sand		CADS-1
876782.8	51544.04	10:34:31	Silt and sand		CADS-1
876783	51543.77	10:34:32	Silt and sand	camera too high	CADS-1
876783.1	51543.69	10:34:33	Silt and sand	camera too high	CADS-1
876783.2	51543.43	10:34:34	Silt and sand	camera too high	CADS-1
876783.3	51543.13	10:34:35	Silt and sand	camera too high	CADS-1
876783.5	51542.68	10:34:36	Silt and sand	camera too high	CADS-1
876783.8	51542.1	10:34:37	Silt and sand	camera too high	CADS-1
876784	51541.62	10:34:38	Silt and sand	camera too high	CADS-1
876784.3	51541.08	10:34:39	Silt and sand	camera too high	CADS-1
876784.5	51540.72	10:34:40	Silt and sand	camera too high	CADS-1
876784.7	51540.39	10:34:41	Silt and sand	camera too high	CADS-1
876785	51539.88	10:34:42	Silt and sand	camera too high	CADS-1
876785.2	51539.69	10:34:43	Silt and sand	camera too high	CADS-1
876785.6	51539.2	10:34:44	Silt and sand	camera too high	CADS-1
876785.8	51538.93	10:34:45	Silt and sand	camera too high	CADS-1
876786.1	51538.5	10:34:46	Silt and sand	camera too high	CADS-1
876786.4	51537.91	10:34:47	Silt and sand	camera too high	CADS-1
876786.5	51537.55	10:34:48	Silt and sand	camera too high	CADS-1
876787	51536.68	10:34:49	Silt and sand	camera too high	CADS-1
876787.1	51536.31	10:34:50	Silt and sand	camera too high	CADS-1
876787.5	51535.56	10:34:51	Silt and sand	camera too high	CADS-1
876787.9	51534.85	10:34:52	Silt and sand	camera too high	CADS-1
876788.1	51534.52	10:34:53	Silt and sand	camera too high	CADS-1
876788.5	51533.86	10:34:54	Silt and sand	camera too high	CADS-1
876788.6	51533.58	10:34:55	Silt and sand	camera too high	CADS-1
876788.7	51533.45	10:34:56	Silt and sand	camera too high	CADS-1
876789.1	51532.87	10:34:57	Silt and sand	camera too high	CADS-1
876789.2	51532.58	10:34:58	Silt and sand	camera too high	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876789.5	51532.09	10:34:59	Silt and sand	camera too high	CADS-1
876789.9	51531.31	10:35:00	Silt and sand		CADS-1
876790.1	51530.85	10:35:01	Silt and sand		CADS-1
876790.4	51530.24	10:35:02	Silt and sand	shells	CADS-1
876790.6	51529.79	10:35:03	Silt and sand		CADS-1
876790.9	51529.42	10:35:04	Silt and sand		CADS-1
876791	51529.01	10:35:05	Silt and sand	burrow	CADS-1
876791.1	51528.86	10:35:06	Silt and sand		CADS-1
876791.1	51528.83	10:35:07	Silt and sand		CADS-1
876791.4	51528.34	10:35:08	Silt and sand	burrow	CADS-1
876791.5	51528.06	10:35:09	Sand and gravel	Screen shot	CADS-1
876791.7	51527.48	10:35:10	Sand and gravel		CADS-1
876792	51526.89	10:35:11	Sand and gravel		CADS-1
876792.1	51526.57	10:35:12	Sand and gravel	camera creates plume - no visability	CADS-1
876792.6	51526.01	10:35:13	Sand and gravel	camera creates plume - no visability	CADS-1
876793	51525.56	10:35:14	Sand and gravel	camera creates plume - no visability	CADS-1
876793.2	51525.18	10:35:15	Sand and gravel	camera creates plume - no visability	CADS-1
876793.4	51524.82	10:35:16	Sand and gravel	camera creates plume - no visability	CADS-1
876793.6	51524.49	10:35:17	Sand and gravel	camera creates plume - no visability	CADS-1
876793.8	51523.96	10:35:18	Sand and gravel	camera creates plume - no visability	CADS-1
876793.7	51523.7	10:35:19	Sand and gravel	camera creates plume - no visability	CADS-1
876793.6	51523.33	10:35:20	Sand and gravel	camera too high	CADS-1
876793.4	51523.04	10:35:21	Sand and gravel	camera too high	CADS-1
876793.4	51522.84	10:35:22	Sand and gravel	camera too high	CADS-1
876793.7	51522.36	10:35:23	Sand and gravel		CADS-1
876794.1	51521.91	10:35:24	Sand and gravel		CADS-1
876794.5	51521.49	10:35:25	Sand and gravel	burrow	CADS-1
876794.9	51520.99	10:35:26	Sand and gravel		CADS-1
876795.2	51520.51	10:35:27	Sand and gravel		CADS-1
876795.2	51520.13	10:35:28	Sand and gravel		CADS-1
876795.2	51519.67	10:35:29	Sand, gravel and cobble	Screen shot	CADS-1
876795.1	51519.47	10:35:30	Sand, gravel and cobble		CADS-1
876795	51519.23	10:35:31	Sand, gravel and cobble		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876795	51518.96	10:35:32	Sand, gravel and cobble		CADS-1
876795.2	51518.75	10:35:33	Sand, gravel and cobble		CADS-1
876795.7	51518.08	10:35:34	Sand, gravel and cobble		CADS-1
876795.8	51517.94	10:35:35	Sand, gravel and cobble		CADS-1
876796.1	51517.51	10:35:36	Sand, gravel and cobble		CADS-1
876796.3	51517.09	10:35:37	Sand, gravel and cobble		CADS-1
876796.4	51516.78	10:35:38	Sand, gravel and cobble	Rope	CADS-1
876796.8	51516.01	10:35:39	Sand, gravel and cobble		CADS-1
876796.9	51515.68	10:35:40	Sand, gravel and cobble		CADS-1
876797.2	51515.17	10:35:41	Sand, gravel and cobble		CADS-1
876797.5	51514.77	10:35:42	Sand, gravel and cobble		CADS-1
876797.6	51514.43	10:35:43	Sand, gravel and cobble		CADS-1
876797.7	51514.16	10:35:44	Sand, gravel and cobble		CADS-1
876797.8	51513.97	10:35:45	Sand, gravel and cobble	Screen shot. End of video file (0914202(	CADS-1
876797.9	51513.86	10:35:46	Sand, gravel and cobble		CADS-1
876798	51513.59	10:35:47	Sand, gravel and cobble		CADS-1
876798.2	51513.22	10:35:48	Sand, gravel and cobble		CADS-1
876798.3	51512.76	10:35:49	Sand, gravel and cobble		CADS-1
876798.4	51512.39	10:35:50	Sand, gravel and cobble		CADS-1
876798.6	51512.04	10:35:51	Silt and sand		CADS-1
876799	51511.47	10:35:52	Silt and sand		CADS-1
876799.5	51510.64	10:35:53	Silt and sand		CADS-1
876799.9	51510.14	10:35:54	Silt and sand	camera creates plume - no visability	CADS-1
876800.1	51509.71	10:35:55	Silt and sand	camera creates plume - no visability	CADS-1
876800.1	51509.59	10:35:56	Silt and sand	camera creates plume - no visability	CADS-1
876799.9	51509.72	10:35:57	Silt and sand	camera creates plume - no visability	CADS-1
876799.9	51509.56	10:35:58	Silt and sand	camera creates plume - no visability	CADS-1
876800	51509.23	10:35:59	Silt and sand	camera creates plume - no visability	CADS-1
876800.2	51508.91	10:36:00	Silt and sand	camera creates plume - no visability	CADS-1
876800.3	51508.71	10:36:01	Silt and sand	camera creates plume - no visability	CADS-1
876800.5	51508.13	10:36:02	Silt and sand	camera creates plume - no visability	CADS-1
876800.7	51507.96	10:36:03	Silt and sand	camera creates plume - no visability	CADS-1
876801.2	51507.41	10:36:04	Silt and sand	camera creates plume - no visability	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876801.8	51506.54	10:36:05	Silt and sand	camera creates plume - no visability	CADS-1
876802	51506.4	10:36:06		camera too high	CADS-1
876802.4	51505.57	10:36:07		camera too high	CADS-1
876802.4	51505.22	10:36:08		camera too high	CADS-1
876802.4	51505.16	10:36:09		camera too high	CADS-1
876802.7	51504.55	10:36:10		camera too high	CADS-1
876802.8	51504.46	10:36:11		camera too high	CADS-1
876803.2	51503.88	10:36:12		camera too high	CADS-1
876803.6	51503.36	10:36:13		camera too high	CADS-1
876803.9	51503.18	10:36:14	Sand, gravel and cobble		CADS-1
876804.4	51502.43	10:36:15	Sand, gravel and cobble		CADS-1
876804.7	51502.27	10:36:16	Sand, gravel and cobble		CADS-1
876804.9	51502.1	10:36:17	Sand, gravel and cobble		CADS-1
876805.3	51501.32	10:36:18	Sand, gravel and cobble		CADS-1
876805.3	51501.33	10:36:19	Sand, gravel and cobble		CADS-1
876805.5	51500.96	10:36:20	Sand, gravel and cobble		CADS-1
876805.7	51500.55	10:36:21	Sand, gravel and cobble		CADS-1
876805.8	51500.63	10:36:22	Sand, gravel and cobble		CADS-1
876806.2	51500.1	10:36:23	Sand, gravel and cobble		CADS-1
876806.6	51499.79	10:36:24	Sand, gravel and cobble		CADS-1
876807.1	51499.41	10:36:25	Sand, gravel and cobble		CADS-1
876807.6	51498.91	10:36:26	Sand, gravel and cobble		CADS-1
876807.9	51498.68	10:36:27	Sand, gravel and cobble		CADS-1
876808.2	51498.19	10:36:28	Sand, gravel and cobble		CADS-1
876808.3	51497.98	10:36:29	Sand, gravel and cobble		CADS-1
876808.5	51497.53	10:36:30	Sand, gravel and cobble		CADS-1
876808.6	51497.32	10:36:31	Sand, gravel and cobble		CADS-1
876808.8	51496.9	10:36:32	Sand, gravel and cobble		CADS-1
876809.1	51496.5	10:36:33	Sand, gravel and cobble		CADS-1
876809.5	51495.92	10:36:34	Sand, gravel and cobble		CADS-1
876809.9	51495.37	10:36:35	Sand, gravel and cobble		CADS-1
876810.2	51495.08	10:36:36	Sand, gravel and cobble		CADS-1
876810.9	51494.12	10:36:37	Silt and sand		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876811.1	51493.96	10:36:38	Silt and sand		CADS-1
876811.5	51493.59	10:36:39	Silt and sand		CADS-1
876812.2	51492.56	10:36:40	Silt and sand		CADS-1
876812.2	51492.8	10:36:41	Silt and sand		CADS-1
876812.6	51492.22	10:36:42	Silt and sand		CADS-1
876813.2	51491.44	10:36:43	Silt and sand		CADS-1
876813.3	51491.41	10:36:44	Silt and sand		CADS-1
876814.1	51490.54	10:36:45	Silt and sand		CADS-1
876814.6	51489.87	10:36:46	Silt and sand		CADS-1
876815	51489.62	10:36:47	Silt and sand		CADS-1
876815.5	51489	10:36:48	Sand, gravel and cobble		CADS-1
876815.9	51488.68	10:36:49	Sand, gravel and cobble		CADS-1
876816.2	51488.4	10:36:50	Sand, gravel and cobble		CADS-1
876816.6	51487.94	10:36:51	Sand, gravel and cobble		CADS-1
876816.8	51487.79	10:36:52	Sand, gravel and cobble		CADS-1
876817.1	51487.59	10:36:53	Sand, gravel and cobble		CADS-1
876817.5	51487.18	10:36:54	Sand, gravel and cobble	Fish	CADS-1
876817.8	51486.98	10:36:55	Sand, gravel and cobble		CADS-1
876818.1	51486.59	10:36:56	Sand, gravel and cobble		CADS-1
876818.5	51486.15	10:36:57	Sand, gravel and cobble		CADS-1
876818.7	51485.83	10:36:58	Silt and sand		CADS-1
876819	51485.31	10:36:59	Silt and sand		CADS-1
876819.2	51485.08	10:37:00	Silt and sand		CADS-1
876819.2	51485.03	10:37:01	Silt and sand		CADS-1
876819.5	51484.75	10:37:02	Silt and sand		CADS-1
876819.5	51484.79	10:37:03	Silt and sand		CADS-1
876819.8	51484.58	10:37:04	Silt and sand		CADS-1
876820.1	51484.34	10:37:05	Silt and sand	burrow	CADS-1
876820.5	51484.07	10:37:06	Silt and sand		CADS-1
876820.9	51483.67	10:37:07		camera creates plume - no visability	CADS-1
876821.2	51483.27	10:37:08		camera creates plume - no visability	CADS-1
876821.4	51483.09	10:37:09		camera creates plume - no visability	CADS-1
876821.8	51482.48	10:37:10		camera creates plume - no visability	CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876822	51482.13	10:37:11		camera creates plume - no visability	CADS-1
876821.8	51482.26	10:37:12		camera creates plume - no visability	CADS-1
876822	51481.86	10:37:13		camera creates plume - no visability	CADS-1
876822	51481.8	10:37:14		camera creates plume - no visability	CADS-1
876822.1	51481.7	10:37:15	Sand, gravel and cobble	Screen shot	CADS-1
876822.7	51480.98	10:37:16	Sand, gravel and cobble		CADS-1
876823.1	51480.78	10:37:17	Sand, gravel and cobble		CADS-1
876823.6	51480.14	10:37:18	Sand, gravel and cobble		CADS-1
876824.1	51479.51	10:37:19	Sand, gravel and cobble		CADS-1
876824.2	51479.21	10:37:20	Sand, gravel and cobble		CADS-1
876824.5	51478.67	10:37:21	Sand, gravel and cobble		CADS-1
876824.6	51478.39	10:37:22	Sand, gravel and cobble		CADS-1
876824.6	51478.43	10:37:23	Sand, gravel and cobble		CADS-1
876825.1	51477.82	10:37:24	Sand, gravel and cobble		CADS-1
876825.4	51477.59	10:37:25	Sand, gravel and cobble		CADS-1
876825.7	51477.31	10:37:26	Sand, gravel and cobble		CADS-1
876826.2	51476.62	10:37:27	Sand, gravel and cobble		CADS-1
876826.3	51476.46	10:37:28	Sand, gravel and cobble		CADS-1
876826.9	51475.79	10:37:29	Sand, gravel and cobble		CADS-1
876827.4	51475.15	10:37:30	Sand, gravel and cobble		CADS-1
876827.7	51474.83	10:37:31	Sand, gravel and cobble		CADS-1
876827.9	51474.46	10:37:32	Sand, gravel and cobble		CADS-1
876827.8	51474.54	10:37:33	Silt and sand		CADS-1
876827.8	51474.61	10:37:34	Silt and sand		CADS-1
876828.2	51474.16	10:37:35	Silt and sand		CADS-1
876828.3	51474.14	10:37:36	Silt and sand		CADS-1
876828.8	51473.61	10:37:37	Silt and sand		CADS-1
876829.2	51473.2	10:37:38	Silt and sand		CADS-1
876829.4	51473.07	10:37:39	Silt and sand		CADS-1
876829.8	51472.42	10:37:40	Silt and sand		CADS-1
876830	51472.12	10:37:41	Silt and sand		CADS-1
876830.3	51471.89	10:37:42	Silt and sand		CADS-1
876830.7	51471.53	10:37:43	Silt and sand		CADS-1

Appendix E
Underwater Video Logs (1 Second Interval)

X	Y	Time	Substrate	Comment	Area
876830.9	51471.42	10:37:44	Silt and sand		CADS-1
876831	51471.15	10:37:45	Silt and sand		CADS-1
876831.2	51470.83	10:37:46	Silt and sand		CADS-1
876831.3	51470.62	10:37:47	Silt and sand		CADS-1
876831.5	51470.45	10:37:48	Silt and sand		CADS-1
876831.8	51470.13	10:37:49	Silt and sand		CADS-1
876832.2	51469.87	10:37:50	Silt and sand		CADS-1
876832.5	51469.6	10:37:51	Silt and sand		CADS-1
876832.8	51469.31	10:37:52	Silt and sand		CADS-1
876833.1	51468.87	10:37:53	Silt and sand		CADS-1
876833.2	51468.68	10:37:54	Silt and sand		CADS-1
876833.3	51468.47	10:37:55	Silt and sand		CADS-1
876833.5	51468.14	10:37:56	Silt and sand		CADS-1
876833.7	51467.98	10:37:57	Silt and sand		CADS-1
876833.9	51467.82	10:37:58	Silt and sand		CADS-1
876834.2	51467.73	10:37:59	Silt and sand		CADS-1
876834.6	51467.52	10:38:00	Silt and sand		CADS-1
876835	51466.97	10:38:01	Silt and sand		CADS-1
876835	51466.86	10:38:02	Silt and sand		CADS-1
876835.2	51466.35	10:38:03	Silt and sand	End of video (09142020_103545_1.avi)	CADS-1