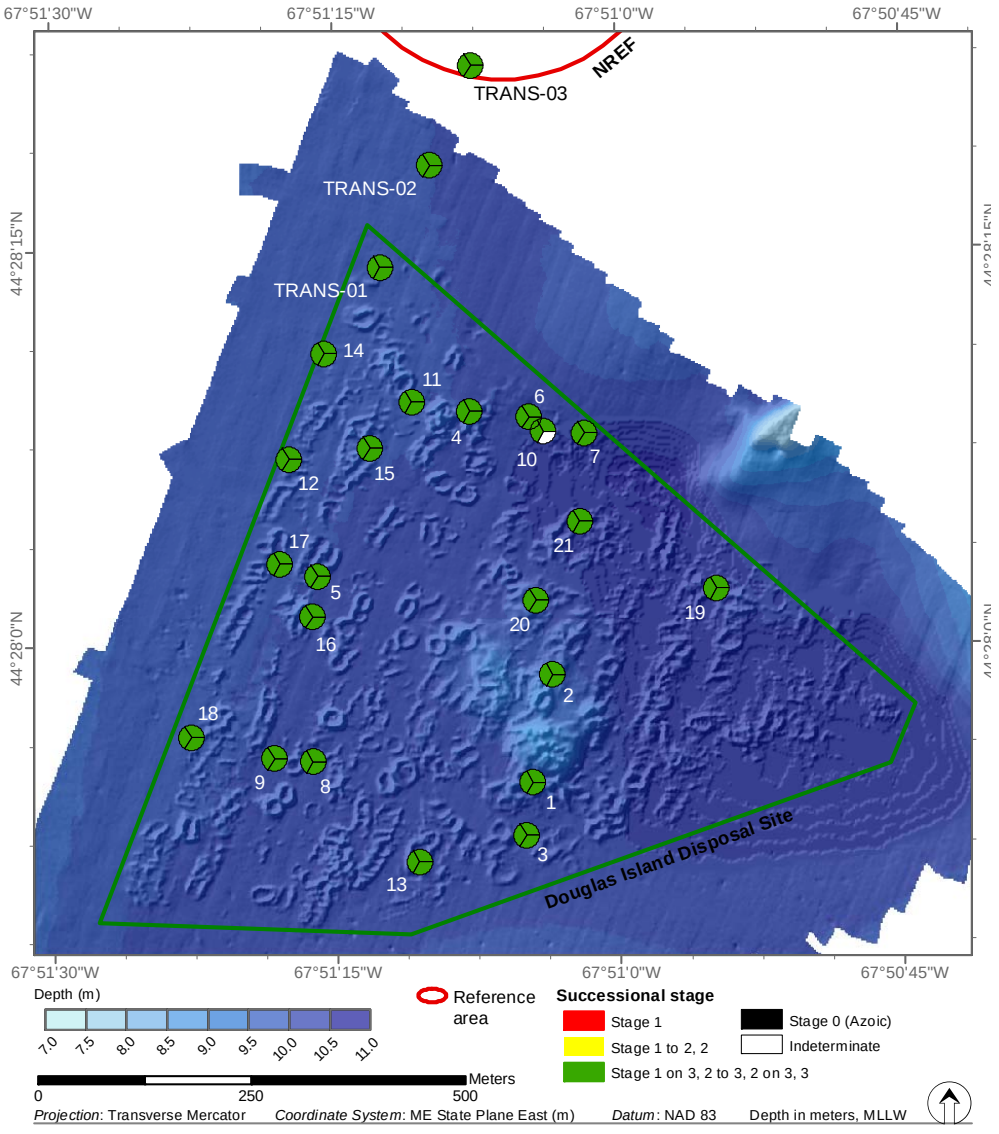
Monitoring Survey of the Douglas Island Disposal Site
October 2011

Disposal Area Monitoring System DAMOS



DISPOSAL AREA MONITORING SYSTEM

Contribution 191
October 2012

US Army Corps of Engineers ®
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13. ABSTRACT

A monitoring survey was conducted in October 2011 at the Douglas Island Disposal Site (DIDS) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2011 survey effort consisted of a multibeam bathymetric survey to characterize seafloor topography and dredged material distribution and sediment profile imaging (SPI) and plan-view imaging surveys to provide additional physical characterization and to assess benthic recolonization. The results of the 2011 surveys were used to document changes at DIDS since the previous surveys in 2004/2005 and the subsequent placement of approximately 195,000 m^3 of dredged material at the site. These results were also used to evaluate the response of DIDS to a change in disposal strategy; prior to the 2004/2005 surveys, placements were targeted at a single location and after the 2004/2005 surveys dredged material was broadly distributed over the entire site.

The multibeam bathymetric survey was conducted over an irregular polygon covering the extent of DIDS and documented broad, but relatively thin, areas of sediment accumulation over much of the site. There was little change to the height of the historical disposal mound near the center of DIDS.

SPI and plan-view images were collected from DIDS, three reference areas, and along a transect between the site and the northern reference area. Evidence of Stage 3 successional status was present in all but one replicate image from all survey stations, suggesting that the benthic community at the disposal site had recovered and was equivalent to reference area benthic communities. Deep apparent redox potential discontinuity (aRPD) depths at all stations indicated intense biological reworking of sediments, and mean aRPDs had increased since the previous SPI survey in 2005.

In summary, the distributed disposal of approximately 195,000 m^3 of material affected the seafloor topography as expected with little change to the height of the existing mound and a varied, thin layer of accumulation over the majority of the site. In addition, DIDS experienced full recovery of the benthic community in the year and a half since cessation of dredged material disposal. Continuation of the distributed placement strategy is recommended to maintain adequate water depth and to limit the potential for mobilization of sediment at this relatively shallow site. Future confirmatory survey work at DIDS is conditional on additional placement of a significant amount of dredged material.

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

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EXECUTIVE SUMMARY

A monitoring survey was conducted in October 2011 at the Douglas Island Disposal Site (DIDS) as part of the Disposal Area Monitoring System (DAMOS) Program. The 2011 survey effort consisted of a multibeam bathymetric survey to characterize seafloor topography and dredged material distribution and sediment profile imaging (SPI) and plan-view imaging surveys to provide additional physical characterization and to assess benthic recolonization. The results of the 2011 surveys were used to document changes at DIDS since the previous surveys in 2004/2005 and the subsequent placement of approximately 195,000 m^3 of dredged material at the site. These results were also used to evaluate the response of DIDS to a change in disposal strategy; prior to the 2004/2005 surveys, placements were targeted at a single location and after the 2004/2005 surveys dredged material was broadly distributed over the entire site.

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In summary, the distributed disposal of approximately 195,000 m^3 of material affected the seafloor topography as expected with little change to the height of the existing mound and a varied, thin layer of accumulation over the majority of the site. In addition, DIDS experienced full recovery of the benthic community in the year and a half since cessation of dredged material disposal. Continuation of the distributed placement strategy is recommended to maintain adequate water depth and to limit the potential for mobilization of sediment at this relatively shallow site. Future confirmatory survey work at DIDS is conditional on additional placement of a significant amount of dredged material.

1.0 INTRODUCTION

A monitoring survey was conducted at the Douglas Island Disposal Site (DIDS) as part of the U.S. Army Corps of Engineers (USACE) New England District (NAE) Disposal Area Monitoring System (DAMOS) Program. DAMOS is a comprehensive monitoring and management program designed and conducted to address environmental concerns associated with use of aquatic disposal sites throughout the New England region. An introduction to the DAMOS Program and DIDS, including a brief description of previous dredged material disposal activities and previous monitoring surveys, is provided below.

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 35 years, the DAMOS Program has collected and evaluated 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. 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. The data collected and evaluated during these studies provide answers to strategic management questions in determining the next step in the disposal site environmental management process. Focused studies are periodically undertaken within the DAMOS Program to evaluate inactive/historical disposal sites and contribute to the development of dredged material placement and capping techniques. The 2011 DIDS survey is considered a confirmatory study of an active disposal site.

Two primary goals of DAMOS confirmatory surveys are to document the physical location and stability of dredged material placed into the aquatic environment and to evaluate the biological recovery of the benthic community following placement of the dredged material. Several survey techniques are employed in order to characterize these responses to dredged material placement. Sequential bathymetric measurements 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) surveys are

performed to support evaluation of seafloor (benthic) habitat conditions and recovery over time. Each type of data collection activity is conducted periodically at disposal sites, and data are evaluated to determine the next step in the disposal site management process. The conditions found after a defined period of disposal activity are compared with the long-term data set at a specific site (Germano et al. 1994). DAMOS monitoring surveys may also feature additional types of data collection activities, such as plan-view underwater camera (PUC) photography, side-scan sonar, towed video, sediment coring, or grab sampling, as deemed appropriate to achieve specific survey objectives.

1.2 DIDS Background

DIDS is located in the waters of eastern Maine 1 km (0.6 mi) from the town of Millbridge. The site is situated in outer Narraguagus Bay and lies in a sheltered area between a peninsula to the northwest and islands to the southeast, south, and southwest (Figure 1-1). Water depths at the site range from approximately 7 to 11 m MLLW (23 to 36 ft), and the site is centered at 44°27.95' N, 67°51.07' W, (NAD 83) (ENSR 2007). DIDS covers an area of approximately 0.42 km^2 (104 acres) and is roughly triangular in shape. The site boundary is somewhat irregular and was set to avoid the adjacent Class SA waters, designated as an outstanding natural resource area (Maine Department of Environmental Protection 2012).

DIDS was identified as a potential placement site in 2002 during the environmental assessment for maintenance dredging of the Narraguagus River, a Federal navigation project to restore the navigable channel from Narraguagus Bay upriver to the landing in Millbridge, Maine (Figure 1-1). Several established disposal sites were considered for the project including the more distant Rockland Disposal Site and Mark Island Disposal Site, and the Narraguagus Bay Disposal Site located just north of DIDS further into Narraguagus Bay (Figure 1-1). The Narraguagus Bay Disposal Site (NBDS) was last used for Narraguagus River dredging in the spring of 1900 (USACE 2002). The river was dredged again in the 1968, and the material was placed at the Narraguagus Ocean Disposal Site (Figure 1-1). The Narraguagus Ocean Disposal Site was not considered during the 2002 disposal site selection process because the extensive designation process required for ocean sites was not justified given the expected limited dredged material disposal needs of the area. The Narraguagus Bay Disposal Site was initially selected to receive the dredged material from the project because of its history of prior use and its proximity to the dredging area. However, during the 2002 environmental assessment, several State and Federal agencies raised concerns about renewed placement activity at NBDS because of the potential impact on fisheries resources supported by the nearshore marine habitats within the site. Based on these concerns the USACE, in consultation

with other State and Federal agencies, agreed in 2002 to investigate an alternative open water disposal site in outer Narraguagus Bay.

In 2002, Federal, State, and local agencies met with the local fishing community and identified a seldom fished area in southwestern Narraguagus Bay, north of Douglas Island. After conducting benthic surveys and classifying grain size at both NBDS and the newly proposed DIDS, Federal and State agencies determined that DIDS was a preferable alternative disposal site to NBDS and that placement of dredged material would have less impact on benthic organisms (USACE 2002). Although tidal currents within the bay had been reported sufficient to resuspend fine-grained sediment, they were not considered an issue for DIDS (USACE 2002).

1.3 Previous Disposal Activity at DIDS

DIDS has only been used on three occasions, each time with dredged material originating from maintenance dredging of the Narraguagus River channel (Table 1-1). In 2004, approximately 77,000 m^3 (101,000 yd^3) of dredged material was placed at the center of DIDS, forming a single mound at the site (Figure 1-2). After 2004, the placement strategy was revised and subsequent dredged material was distributed over the entire site (instead of targeted at a single location) in an effort to maintain sufficient water depth and limit the potential for resuspension of fine-grained material over this relatively shallow site. Employing this new strategy, an additional 77,000 m^3 (101,000 yd^3) of material was placed at the site from October 2006 to January 2007. The most recent activity was during the 2009–2010 disposal season, in which approximately 118,000 m^3 (154,000 yd^3) of dredged material was placed at the site. The recorded position of the disposal scows during release of material highlights the broad distribution of material for these last two events (Figure 1-3).

1.4 Previous Surveys at DIDS

A pre-disposal bathymetric survey was conducted at DIDS in 2003 and documented water depths at the site ranging from approximately 9.8 to 11.3 m MLLW (32–36 ft) with the deepest area of the site located along the northern boundary. A post-disposal bathymetric survey was conducted after placement of dredged material in 2004 to document distribution of dredged material and disposal mound morphology. Results of the post-disposal bathymetric survey found water depths at the site that ranged from approximately 7.5 to 11.3 m MLLW (25 to 36 ft) (Figure 1-2). A depth difference comparison of the pre- and post-disposal bathymetric survey results identified the formation of a 200–250 m (660–820 ft) diameter mound near the center of the site. The

mound was, on average, approximately 2 m (6.6 ft) high with a peak height of 3 m (10 ft) (ENSR 2007).

A confirmatory SPI survey was conducted in 2005 to assess the benthic recolonization status of DIDS after the placement of material in 2004. The 2005 SPI results indicated that benthic recovery at the disposal site was advanced with Stage 3 successional stage organisms present at the majority of the stations within the disposal site (ENSR 2007). Although the benthic community was not functionally equivalent to the community found in the reference areas, the site was recovering within the expected time-frame for soft bottom benthic community succession following dredged material disposal (Rhoads et al. 1978; Germano et al. 1994; Bolam and Rees 2003) and was expected to progress to full function within 6 to 12 months if no additional material was placed at the site (ENSR 2007). Results from the 2005 SPI survey also showed signs of periodic sediment transport and deposition at the reference areas that limited apparent redox potential discontinuity (aRPD) depths at these stations.

1.5 Study Objectives

Two rounds of maintenance dredging of the Narraguagus River channel have resulted in the placement of approximately 195,000 m^3 (255,000 yd^3) of dredged material at DIDS since the surveys in 2004 and 2005. The 2011 survey was designed to document the distribution of recently placed dredged material and seafloor topography at DIDS and to evaluate the benthic recolonization status of the site compared to nearby references areas and previous surveys.

Specific objectives of the October 2011 survey were to:

- Use multibeam bathymetry to document the current seafloor topography of DIDS and recent dredged material distribution and to evaluate changes since previous survey; and

- Assess the benthic recolonization status of DIDS compared to the previous survey and three reference areas using SPI.

Collection of these data also allowed for an evaluation of how the change in disposal strategy employed at DIDS, from point placement to distributed placement of material, has affected the site.

Table 1-1.

Summary of Disposals at DIDS

Project	Permittee	Disposal Date	Volume (m^3)	Volume (yd^3)
Narraguagus River Federal Navigation Project	USACE - Narraguagus River	2/2004 - 4/2004	77,000	101,000
		11/2006 - 1/2007	77,000	101,000
		11/2009 - 1/2010	118,000	154,000
Total			272,000	356,000

Table 1-2.

Previous Surveys at DIDS

Year	Survey Type	Bathymetric Survey Area (mxm)	No. SPI Stations	Other	Citation
2002	Site characterization			Sediment samples (benthic community, grain size)	USACE 2002
2003	Pre-disposal	975 x 840 (Irregularly Shaped)			ENSR 2007
2004	Post-disposal	1000 x 900			ENSR 2007
2005	Confirmatory monitoring		Site: 21 Ref: 21		ENSR 2007

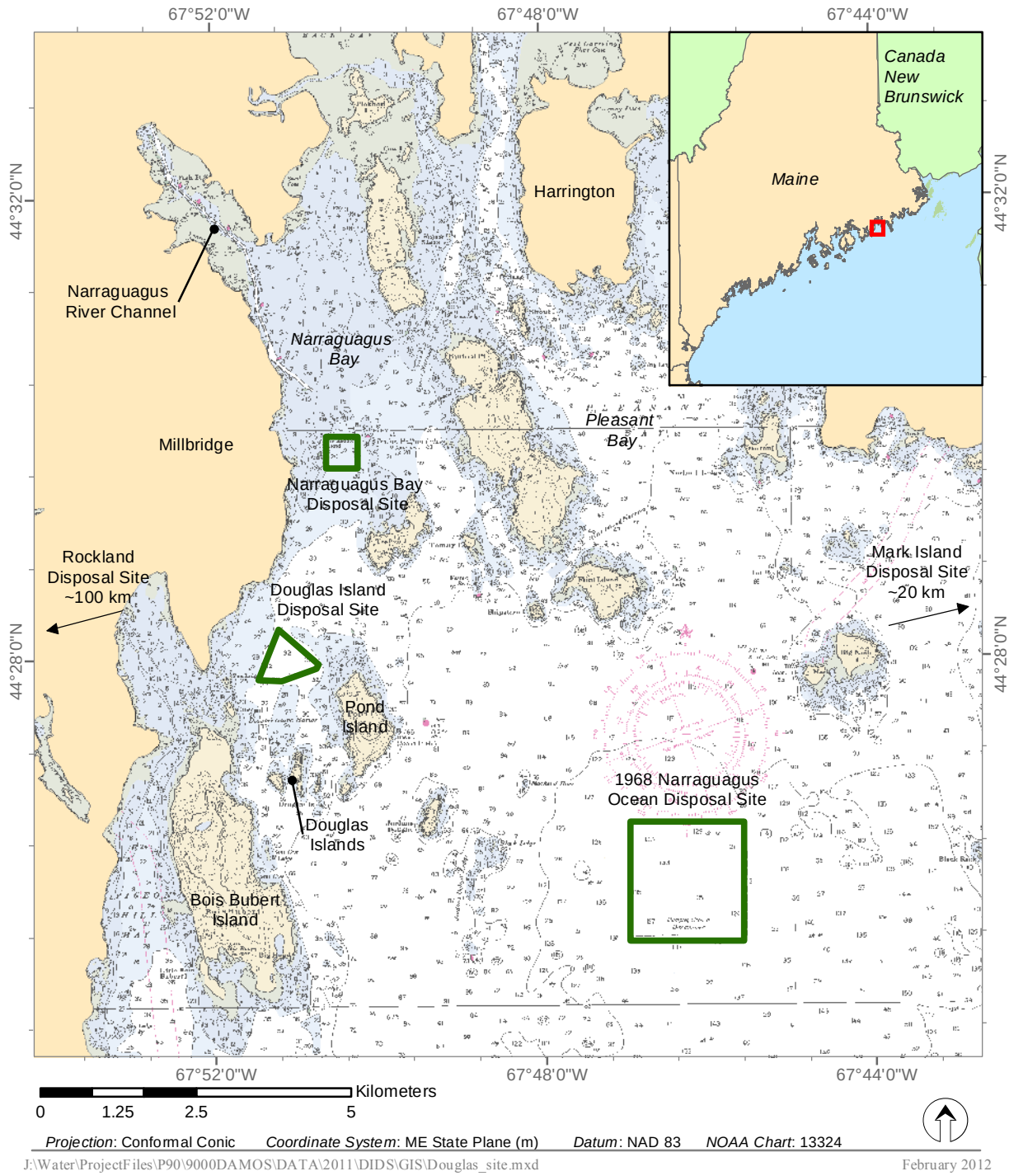


Figure 1-1. Location of DIDS in Outer Narraguagus Bay, Maine

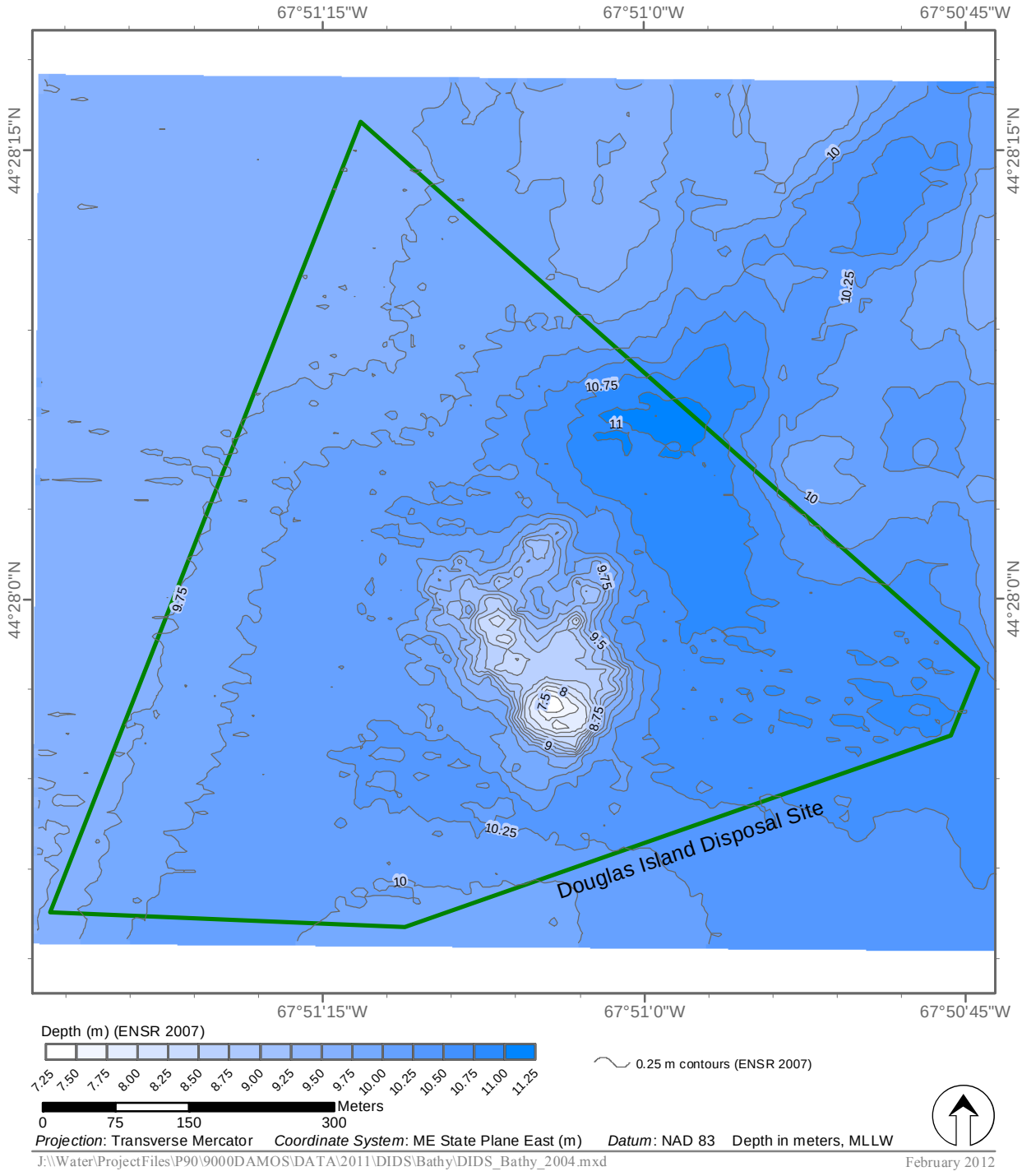


Figure 1-2. Bathymetric contour map of DIDS, April 2004 post-disposal

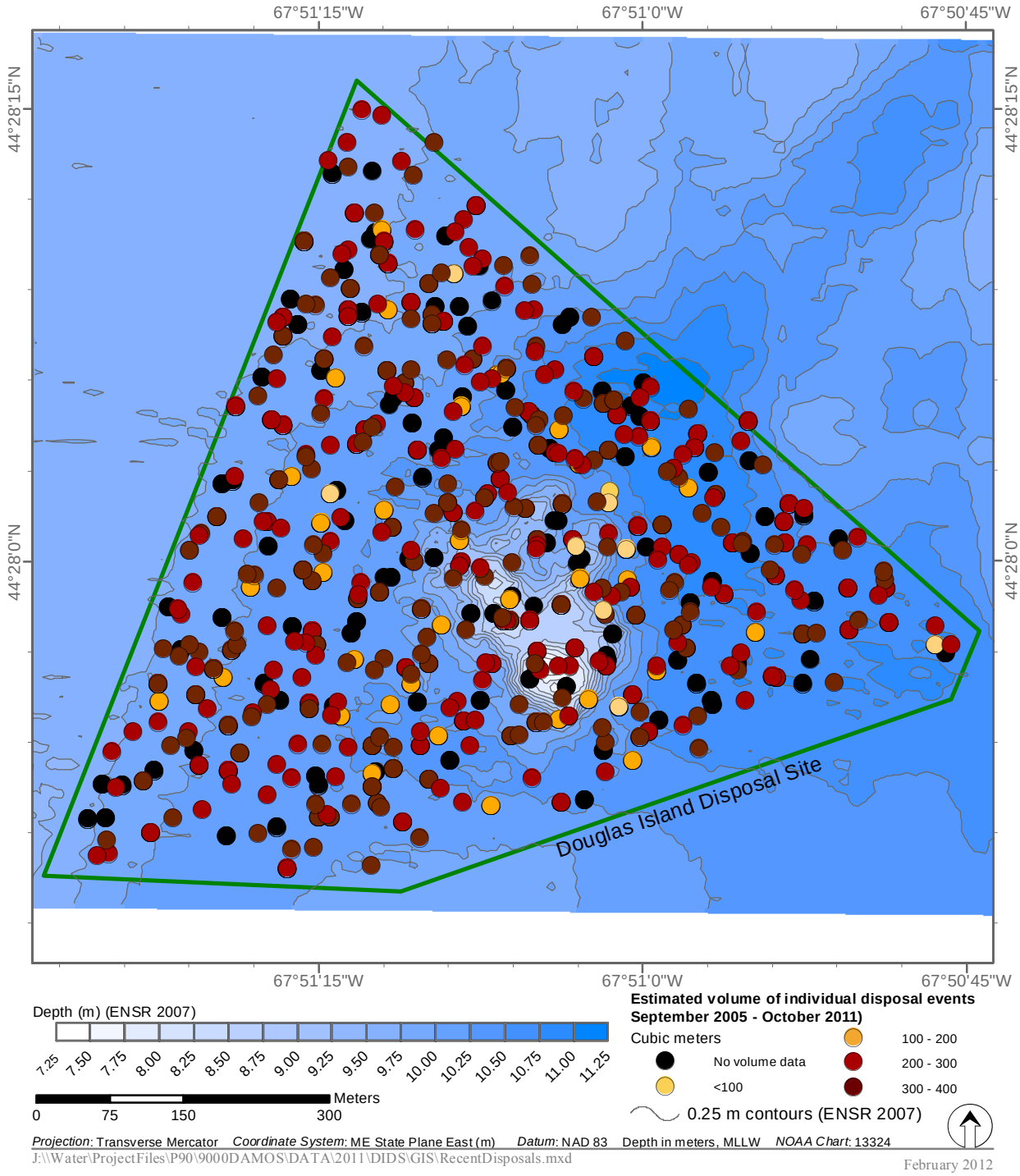


Figure 1-3. Recent disposal history at DIDS (September 2005 – October 2011)

2.0 METHODS

The October 2011 surveys conducted at DIDS were performed by AECOM, CR Environmental, Inc., and Germano & Associates. The bathymetric survey was conducted 11 October 2011 to document depths in and around the disposal site. The SPI survey was conducted 12–13 October 2011 to provide additional data on the physical characteristics of the site and to assess benthic recolonization within the disposal site compared to reference areas. All surveys were conducted aboard the F/V *First Light*. 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.

2.1 Navigation and On-Board Data Acquisition

Navigation for the surveys was accomplished using a Trimble AgGPS 132 12-channel Differential Global Positioning System (DGPS) system capable of receiving U.S. Coast Guard (USCG) Beacon corrections as well as OmniStar subscription-based satellite differential corrections. The system is capable of sub-meter horizontal position accuracy. The DGPS system was interfaced to a laptop computer running HYPACK MAX® hydrographic survey software. HYPACK MAX® continually recorded vessel position, DGPS 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 acquired using a primary system and backup system capable of producing vessel heading measurements accurate to within 0.05° up to 20 times per second. The primary device, an SG Brown Meridian Gyrocompass, and the secondary device, a dual-antenna Hemisphere VS-100 Crescent Digital compass and DGPS system, were both interfaced to HYPACK® acquisition software.

2.2 Bathymetry

Bathymetric surveys provide measurements of water depth that, when processed, can be 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.

2.2.1 Bathymetric Data Collection

The 2011 multibeam bathymetric survey of DIDS was conducted 11 October 2011 aboard the F/V *First Light.* The bathymetric survey was conducted within an irregular polygon covering that covered the entire site (Figure 2-1). Sediment acoustic backscatter data (beam time-series) and side-scan sonar imagery were also collected. The bathymetric survey included a total of 47 survey lines, spaced approximately 25 m apart and oriented in an approximately northeast-southwest direction. Six cross-tie lines were completed to assess data quality and the accuracy of tidal corrections (Figure 2-1).

Bathymetric and acoustic backscatter data and side-scan sonar imagery were collected using a Reson 8101 Multibeam Echo Sounder (MBES). This 240-kHz system forms 101 1.5° beams distributed equiangularly across a 150° swath. The MBES transducer was mounted amidships to the port rail of the survey vessel using a high strength adjustable boom and the DGPS antenna was attached to the top of the transducer boom. The transducer depth below the water surface (draft) was recorded at the beginning and end of data acquisition.

The MBES topside processor was equipped with components necessary to export depth solutions, backscatter, and side-scan sonar signals to the HYPACK MAX® acquisition computer via Ethernet communications. HYPACK MAX® also received and recorded navigation data from the DGPS, motion data from a serially interfaced TSS DMS 3-05 motion reference unit (MRU), and heading data from the Meridian and Hemisphere compass systems. Several patch tests were conducted 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 conductivity-temperature-depth (CTD) casts at frequent intervals throughout the survey day with a Seabird SBE-19 Seacat CTD profiler. Additional confirmation of proper calibration was obtained using the "bar check" method, in which a metal plate was lowered beneath the MBES transducer to known distances (e.g., 2.0 and 5.0 m) below the water surface. "Bar-check" calibrations were accurate to within 0.01 m in tests conducted at the beginning and end of the survey.

Water depths over the survey area were recorded in meters and referenced to mean lower low water (MLLW) based on water levels recorded at the National Oceanic and Atmospheric Administration (NOAA) Bar Harbor Tide Station # 8413320, located approximately 30 km southwest of the survey area. A tide range multiplier of 1.05 was developed for the DIDS survey area in consultation with the Hydrographic Planning Team at NOAA's National Ocean Service (NOS) Center for Operational Oceanographic Products and Services. HYPACK MAX® software was used to manage data acquisition

and storage of data from the echosounder and the navigation system. HYPACK MAX® also recorded depth, vessel heave, heading, position, and time along each survey transect line.

2.2.2 Bathymetric Data Processing

MBES bathymetric data were processed using HYSWEEP® software. Data for outer beams greater than 60° offset from nadir (vertical) were excluded from processing to minimize the impact of refraction and vessel motion on data quality. Preliminary components of data processing included: application of tide corrections, adjustment of beam orientation using the results of patch test calibrations, correction of soundings for minor variations in water column sound velocity, and removal of outlying sounding solutions associated with water column interference (marine mammals, fish, or suspended debris).

The cleaned and adjusted data were further processed to calculate seafloor elevations based on evaluation of overlapping swath data. Based on the combined estimated average acoustic footprint of the MBES system ($\sim$0.1 – 0.3 m diameter), the accuracy of the DGPS ($<$1.0 m) and anticipated beam steering errors, the average sounding solutions present within 2 x 2 m grid cells were accepted as seafloor elevations and exported in delimited ASCII text format for mapping in ArcGIS®10.1 (GIS). The vertical uncertainty of soundings within each of these cells was calculated and exported in ASCII format to aid statistical assessment of data quality.

MBES backscatter data were processed using HYPACK®'s implementation of GeoCoder software developed by NOAA's Center for Coastal and Ocean Mapping Joint Hydrographic Center (CCOM/JHC). GeoCoder was used to create a mosaic best suited for substrate characterization through the use of innovative beam-angle correction algorithms.

Snippets backscatter data (beam-specific ping time-series records) were extracted from cleaned files and were converted to Generic Sensor Format (GSF) files. Mosaics of beam time-series (BTS) backscatter data were created from GSF data using GeoCoder, and were exported in grey-scale TIF raster format. BTS data were also exported in ASCII format with fields for Easting, Northing, and backscatter (dB). These data were gridded using Kriging algorithms and filtered with a mild low-pass Gaussian filter to minimize nadir artifacts. The filtered grids were used to develop maps of backscatter values using 2.0 m (horizontal resolution) node intervals. Side-scan imagery was not processed, and will therefore not be discussed further.

2.2.3 Bathymetric Data Analysis

Bathymetric data were analyzed to document the distribution of dredged material at DIDS 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 2004 survey and the 2011 bathymetric dataset. The depth difference grids were calculated by subtracting the 2004 survey depth estimates from the 2011 survey depth estimates at each point throughout the grid. The resulting depth differences were contoured and displayed using GIS. However, there were several factors associated with the 2004 dataset that limited the resolution of the depth difference model. For example, the 2004 bathymetry was collected using a single beam system while the 2011 survey utilized a multibeam system. Other quality control parameters, such as cross-tie data, bar check results, the tide range correction, and an average error within bathymetric grid cells were also unavailable for the 2004 dataset. Therefore, the resulting depth difference calculations were limited to an estimated uncertainty between the 2011 and 2004 surveys.

2.3 Sediment-Profile and Plan-View Imaging

2.3.1 Sediment-Profile Imaging

SPI is a monitoring technique used to provide data on the physical characteristics of the seafloor as well as the status of the benthic biological community. This technique involves deploying an underwater camera system to photograph a cross section of the sediment-water interface. Acquisition of high-resolution sediment-profile images was accomplished using a Nikon D7000 digital single-lens reflex camera mounted inside an Ocean Imaging Model 3731 pressure housing system. The pressure housing sat atop a wedge-shaped prism with a front faceplate and back mirror. The mirror was mounted at a 45° angle to reflect the profile of the sediment-water interface. As the prism penetrated the seafloor, a trigger activated a time-delay circuit that fired an internal strobe to obtain a cross-sectional image of the upper 15–20 cm of the sediment column (Figure 2-2). The camera remained on the seafloor for approximately 20 seconds to ensure that a successful image had been obtained. Details of the camera settings for each digital image are available in the associated parameters file embedded in each electronic image file. For this survey, the ISO-equivalent was set at 640, shutter speed was 1/250, f8, and storage in compressed raw Nikon Electronic Format (NEF) files (approximately 9 MB each). Electronic files were converted to high-resolution jpeg (8-bit) format files (3300 x 4900 pixels) using Nikon Capture® NX2 software (Version 2.2.7).

Test exposures of the Kodak® Color Separation Guide (Publication No. Q-13) were made on deck at the beginning and end of each survey to verify that all internal electronic systems were working to design specifications and to provide a color standard against which final images could be checked for proper color balance. After deployment of the camera at each station, the frame counter was checked to ensure that the requisite number of replicate images had been obtained. In addition, a prism-penetration depth indicator on the camera frame was checked to verify that the optical prism had actually penetrated the bottom to a sufficient depth. If images were missed or the penetration depth was insufficient, the camera frame stop collars were adjusted and/or weights were added or removed, and additional replicate images were taken. Changes in prism weight amounts, the presence or absence of mud doors (to limit over-penetration in soft sediments), and frame stop collar positions were recorded for each replicate image.

Each image was assigned a unique time stamp in the digital file attributes by the camera's data logger and cross-checked with the time stamp in the navigational system's computer data file. In addition, the field crew kept redundant written sample logs. Images were downloaded periodically to verify successful sample acquisition and/or to assess what type of sediment/depositional layer was present at a particular station. Digital image files were re-named with the appropriate station name immediately after downloading as a further quality assurance step.

2.3.2 Plan-View Imaging

Plan-view underwater images were also collected at each station sampled with the sediment-profile camera. An Ocean Imaging Model DSC6000 plan-view underwater camera system with two Ocean Imaging Model 400-37 Deep Sea Scaling lasers was attached to the Model 3731 camera frame and used to collect plan-view photographs on the seafloor surface (Figure 2-2). The PUC system consisted of a Nikon D7000 camera encased in titanium housing, a 24 VDC autonomous power pack, a 500W strobe, and a bounce trigger. A weight was attached to the bounce trigger with a stainless steel cable so that the weight hung below the camera frame. The length of the stainless steel trigger cable was adjusted for changing conditions in water clarity within the site. Scaling lasers projected two red dots that were separated by a constant distance (26 cm) regardless of the field of view of the PUC, which was varied by increasing or decreasing the length of the trigger wire. The field of view for the plan view images ranged from approximately 0.36 m^2 to 0.65 m^2 (Appendix D).

As the camera frame was lowered to the seafloor, the weight attached to the bounce trigger contacted the seafloor prior to the camera frame hitting the bottom and triggered the PUC. Details of the camera settings for each digital image are available in

the associated parameters file embedded in each electronic image file. For this survey, the ISO-equivalent was set at 400, shutter speed was 1/30, f13, white balance set to flash, color mode to Adobe RGB, sharpening to none, noise reduction off, and storage in compressed raw Nikon Electronic Format (NEF) files (approximately 7 MB each). Electronic files were converted to high-resolution jpeg (8-bit) format files (3000 x 4900 pixels) using Nikon Capture® NX2 software (Version 2.2.7).

Prior to field operations, the internal clock in the digital PUC was synchronized with the GPS navigation system and the SPI camera. Each PUC image acquired was assigned a time stamp in the digital file, and redundant notations were made in the field and navigation logs. Throughout the survey, PUC images were downloaded at the same time as the sediment-profile images and evaluated for successful image acquisition and image clarity.

2.3.3 SPI and PUC Data Collection

The sediment-profile and plan-view imaging survey at DIDS was initiated 12 October 2011 and completed 13 October aboard the F/V *First Light.* At each station, the vessel was positioned at the target coordinates and the camera was deployed within a defined station tolerance of 10 m. Three replicate SPI and plan-view images were collected at each of the stations.

The 2011 imaging survey design included the collection of sediment-profile and plan-view images at 42 stations (Table 2-3, Figure 2-3). Twenty-one stations were randomly distributed throughout the disposal site and 18 stations were distributed equally among the three reference areas. Three additional stations were located along a transect between DIDS and the NREF area. The reference areas were surveyed to provide a basis of comparison between DIDS sediment conditions and ambient sediment conditions. Transect stations were placed to evaluate whether the distributed disposal strategy at DIDS affected the northern reference area (NREF).

2.3.4 SPI and PUC Data Analysis

Computer-aided analysis of the resulting images provided a set of standard measurements that enabled comparison between different locations and different surveys. The DAMOS Program has successfully used this technique for over 30 years to map the distribution of disposed dredged material and to monitor benthic recolonization at disposal sites.

Following completion of data collection, the digital images were analyzed using Bersoft Image Measurement© software version 3.13 (Bersoft, Inc.). Images were first adjusted in Adobe Photoshop® to expand the available pixels to their maximum light and dark threshold range. Linear and areal measurements were recorded as number of pixels and converted to scientific units using the Kodak® Color Separation Guide for measurement calibration. Detailed records of all SPI and PUC results are included in Appendices C and D.

2.3.4.1 SPI Data Analysis

Analysis of each SPI image was performed to provide measurement of the following standard set of parameters:

Sediment Type—The sediment grain size major mode and range were estimated visually from the images using a grain-size comparator at a similar scale. Results were reported using the phi scale. Conversion to other grain-size scales is provided in Appendix B. The presence and thickness of disposed dredged material were also assessed by inspection of the images.

Penetration Depth—The depth to which the camera penetrated into the seafloor was measured to provide an indication of the sediment density or bearing capacity. The penetration depth can range from a minimum of 0 cm (i.e., no penetration on hard substrates) to a maximum of 20 cm (full penetration on very soft substrates).

Surface Boundary Roughness—Surface boundary roughness is a measure of the vertical relief of features at the sediment-water interface in the sediment-profile image. Surface boundary roughness was determined by measuring the vertical distance between the highest and lowest points of the sediment-water interface. The surface boundary roughness (sediment surface relief) measured over the width of sediment-profile images typically ranges from 0 to 4 cm, and may be related to physical structures (e.g., ripples, rip-up structures, mudclasts) or biogenic features (e.g., burrow openings, fecal mounds, foraging depressions). Biogenic roughness typically changes seasonally and is related to the interaction of bottom turbulence and bioturbational activities.

Apparent Redox Potential Discontinuity (aRPD) Depth— aRPD provides a measure of the integrated time history of the balance between near-surface oxygen conditions and biological reworking of sediments. Sediment particles exposed to oxygenated waters oxidize and lighten in color to brown or light grey. As the particles are buried or moved down by biological activity, they are exposed to reduced oxygen

concentrations in subsurface pore waters and their oxic coating slowly reduces, changing color to dark grey or black. When biological activity is high, the aRPD depth increases; when it is low or absent, the aRPD depth decreases. The aRPD depth was measured by assessing color and reflectance boundaries within the images.

Infaunal Successional Stage—Infaunal successional stage is a measure of the biological community inhabiting the seafloor. Current theory holds that organism-sediment interactions in fine-grained sediments follow a predictable sequence of development after a major disturbance (such as dredged material disposal), and this sequence has been divided subjectively into four stages (Germano et al. 2011). Successional stage was assigned by assessing which types of species or organism-related activities were apparent in the images.

Additional components of the SPI analysis included calculation of means and ranges for the parameters listed above and mapping of mean values of station replicates.

2.3.4.2 PUC Image Data Analysis

Analysis of each PUC image was performed to provide additional information about large-scale sedimentary features, density and patch size of surface fauna, density of infaunal burrowers, and occurrences and density of epifaunal foraging patterns on the seafloor of the disposal site and reference areas.

2.3.5 Statistical Methods

One of the objectives of the 2011 SPI survey at DIDS was to assess the benthic recolonization status of the site relative to reference conditions. The two SPI parameters which are most indicative of recolonization status, and which also lend themselves to quantitative analysis, are the depth of the aRPD (an indirect measure of the degree of biological reworking of surface sediments) and the infaunal successional stage. For the statistical analysis, the mean value for aRPD (based on n=3 replicate images) was utilized, while the maximum value among the three replicates was used as the successional stage rank for each station. The successional stage ranks had possible values between 0 (no fauna present) and 3 (Stage 3); half ranks were also possible for the "in-between" stages (e.g., Stage 1 going to 2 had a value of 1.5).

Traditionally, the study objective has been addressed using point null hypotheses of the form "There is no difference in benthic conditions between the reference area and the disposal mound." An approach using bioequivalence or interval testing is considered

to be more informative than the point null hypothesis test of "no difference". In the real world, there is always some small difference, and the statistical significance of this difference may or may not be ecologically meaningful. Without an associated power analysis, this type of point null hypothesis testing provides an incomplete picture of the results.

In this application of bioequivalence (interval) testing, the null hypothesis presumes the difference is great, i.e., an inequivalence hypothesis (e.g., McBride 1999). This is recognized as a 'proof of safety' approach because rejection of the inequivalence null hypothesis requires sufficient proof that the difference is actually small. The null and alternative hypotheses to be tested were:

H_0: $d \leq -\delta$ or $d \geq \delta$ (presumes the difference is great)

H_A: $-\delta < d < \delta$ (requires proof that the difference is small)

where d is the difference between the reference site and disposal mound means.

If the null hypothesis is rejected, then it is concluded that the two means are equivalent to one another within $\pm\delta$ units. The size of δ should be determined from historical data and/or best professional judgment to identify a maximum difference that is within background variability/noise and is therefore not ecologically meaningful. Based on historical DAMOS data, δ values of 1 for RPD and 0.5 for successional stage rank (on the 0–3 scale) have been established.

The test of the interval hypothesis can be broken down into two one-sided tests (TOST) (McBride 1999 after Schuirmann 1987) which are based on the normal distribution, or, more typically, on Student's *t*-distribution when sample sizes are small and variances must be estimated from the data. The statistics used to test the interval hypotheses shown here are based on such statistical foundations as the Central Limit Theorem (CLT) and basic statistical properties of random variables. A simplification of the CLT says that the mean of any random variable is normally distributed. Linear combinations of normal random variables are also normal, so a linear function of means is also normally distributed. When a linear function of means is divided by its standard error the ratio follows a t-distribution with degrees of freedom associated with the variance estimate. Hence, the t-distribution can be used to construct a confidence interval around any linear function of means.

In the sampling design utilized in the 2011 SPI survey at DIDS, there were four distinct areas (the disposal site and three reference areas; transect stations were not included in the statistical analysis), and the difference equations of interest are the linear contrasts of the disposal site mean minus the average of the three reference means, or

$[1/3(\text{Mean}_{\text{NREF}} + \text{Mean}_{\text{SERef}} + \text{Mean}_{\text{SWRef}}) - (\text{Mean}_{\text{DIDS}})]$

where $\text{Mean}_{\text{DIDS}}$ was the mean for the disposal site.

The three reference areas collectively represented ambient conditions, but if there were mean differences among these three areas then pooling them into a single reference group would increase the variance beyond true background variability. The effect of keeping the three reference areas separate has little effect on the grand reference mean (when n is equal among these areas), but it maintains the variance as a true background variance for each individual population with a constant mean.

The difference equation, $\hat{d}$, for the comparison of interest was:

$[1/3(\text{Mean}_{\text{NRef}} + \text{Mean}_{\text{SERef}} + \text{Mean}_{\text{SWRef}}) - (\text{Mean}_{\text{DIDS}})]$ [Eq.1]

and the standard error of each difference equation was calculated assuming that the variance of a sum is the sum of the variances for independent variables, or:

$$se(\hat{d}) = \sqrt{\sum_j \left(S_j^2 c_j^2 / n_j\right)} \qquad \text{[Eq.2]}$$

where:

c_j = coefficients for the j means in the difference equation, $\hat{d}$ [Eq. 1] (i.e., for equation 1 shown above, the coefficients were 1/3 for each of the 3 reference areas, and -1 for the site).

S_j^2 = variance for the j^{th} area. If equal variances are assumed, a single pooled residual variance estimate can be substituted for each group, equal to the mean square error from an ANOVA based on all four groups.

n_j = number of replicate observations for the j^{th} area.

The inequivalence null hypothesis was rejected (and equivalence is concluded) if the confidence interval on the difference of means, $\hat{d}$, was fully contained within the interval [–δ , + δ]. Thus the decision rule was to reject H_0 if:

$$D_L = \hat{d} - t_{\alpha,\upsilon} se(\hat{d}) > -\delta \quad \text{and} \quad D_U = \hat{d} + t_{\alpha,\upsilon} se(\hat{d}) < \delta \qquad \text{[Eq. 3]}$$

where:

$\hat{d}$ = observed difference in means between the Reference and Site

$t_{\alpha,\upsilon}$ = upper $100th$ percentile of a Student's t-distribution with υ degrees of freedom

$se(\hat{d})$ = standard error of the difference.

υ = degrees of freedom for the standard error. If a pooled residual variance estimate was used, it was the residual degrees of freedom from an ANOVA on all groups (total number of stations minus the number of groups); if separate variance estimates were used, degrees of freedom were calculated based on the Brown and Forsythe estimation (Zar 1996).

Validity of the normality and equal variance assumptions were tested using Shapiro-Wilk's test for normality on the area residuals ($\alpha = 0.05$) and Levene's test for equality of variances among the seven areas ($\alpha = 0.05$). If normality was not rejected but equality of variances was, then the variance for the difference equation was based on separate variances for each group. If systematic deviations from normality were identified, then a non-parametric bootstrapped interval was used.

Table 2-1.

2011 Field Activities at DIDS

Survey	Date	Summary
Bathymetry	11 October 2011	Pentagonal area with sides of: 1170 x 1070 x 190 x 660 x 530 m (Irregular shape) Lines: 47 Spacing: 25 m
SPI and PUC	12 October 2011	Stations: 42 DIDS: 21 Transect: 3 Reference Areas: 18

Table 2-2.

SPI and PUC Stations

Station	Latitude (N)	Longitude (W)	Station	Latitude (N)	Longitude (W)
Douglas Island Disposal Site			Reference Areas and Transect Stations		
DIDS-1	44° 27.913'	67° 51.078'	NEREF-1	44° 28.417'	67° 51.080'
DIDS-2	44° 27.981'	67° 51.060'	NEREF-2	44° 28.527'	67° 51.145'
DIDS-3	44° 27.880'	67° 51.084'	NEREF-3	44° 28.553'	67° 51.150'
DIDS-4	44° 28.148'	67° 51.132'	NEREF-4	44° 28.541'	67° 51.091'
DIDS-5	44° 28.044'	67° 51.267'	NEREF-5	44° 28.460'	67° 50.993'
DIDS-6	44° 28.144'	67° 51.079'	NEREF-6	44° 28.423'	67° 51.178'
DIDS-7	44° 28.133'	67° 51.031'	SWREF-1	44° 27.509'	67° 51.462'
DIDS-8	44° 27.927'	67° 51.272'	SWREF-2	44° 27.390'	67° 51.303'
DIDS-9	44° 27.929'	67° 51.306'	SWREF-3	44° 27.356'	67° 51.327'
DIDS-10	44° 28.134'	67° 51.067'	SWREF-4	44° 27.465'	67° 51.327'
DIDS-11	44° 28.154'	67° 51.183'	SWREF-5	44° 27.463'	67° 51.404'
DIDS-12	44° 28.118'	67° 51.292'	SWREF-6	44° 27.376'	67° 51.463'
DIDS-13	44° 27.863'	67° 51.179'	SEREF-1	44° 27.391'	67° 50.901'
DIDS-14	44° 28.185'	67° 51.260'	SEREF-2	44° 27.521'	67° 50.858'
DIDS-15	44° 28.125'	67° 51.220'	SEREF-3	44° 27.388'	67° 50.950'
DIDS-16	44° 28.019'	67° 51.272'	SEREF-4	44° 27.363'	67° 50.897'
DIDS-17	44° 28.052'	67° 51.300'	SEREF-5	44° 27.370'	67° 50.784'
DIDS-18	44° 27.943'	67° 51.380'	SEREF-6	44° 27.483'	67° 50.790'
DIDS-19	44° 28.035'	67° 50.915'	TRANS-01	44° 28.239'	67° 51.210'
DIDS-20	44° 28.028'	67° 51.074'	TRANS-02	44° 28.303'	67° 51.166'
DIDS-21	44° 28.078'	67° 51.035'	TRANS-03	44° 28.366'	67° 51.129'

Coordinate system NAD 83

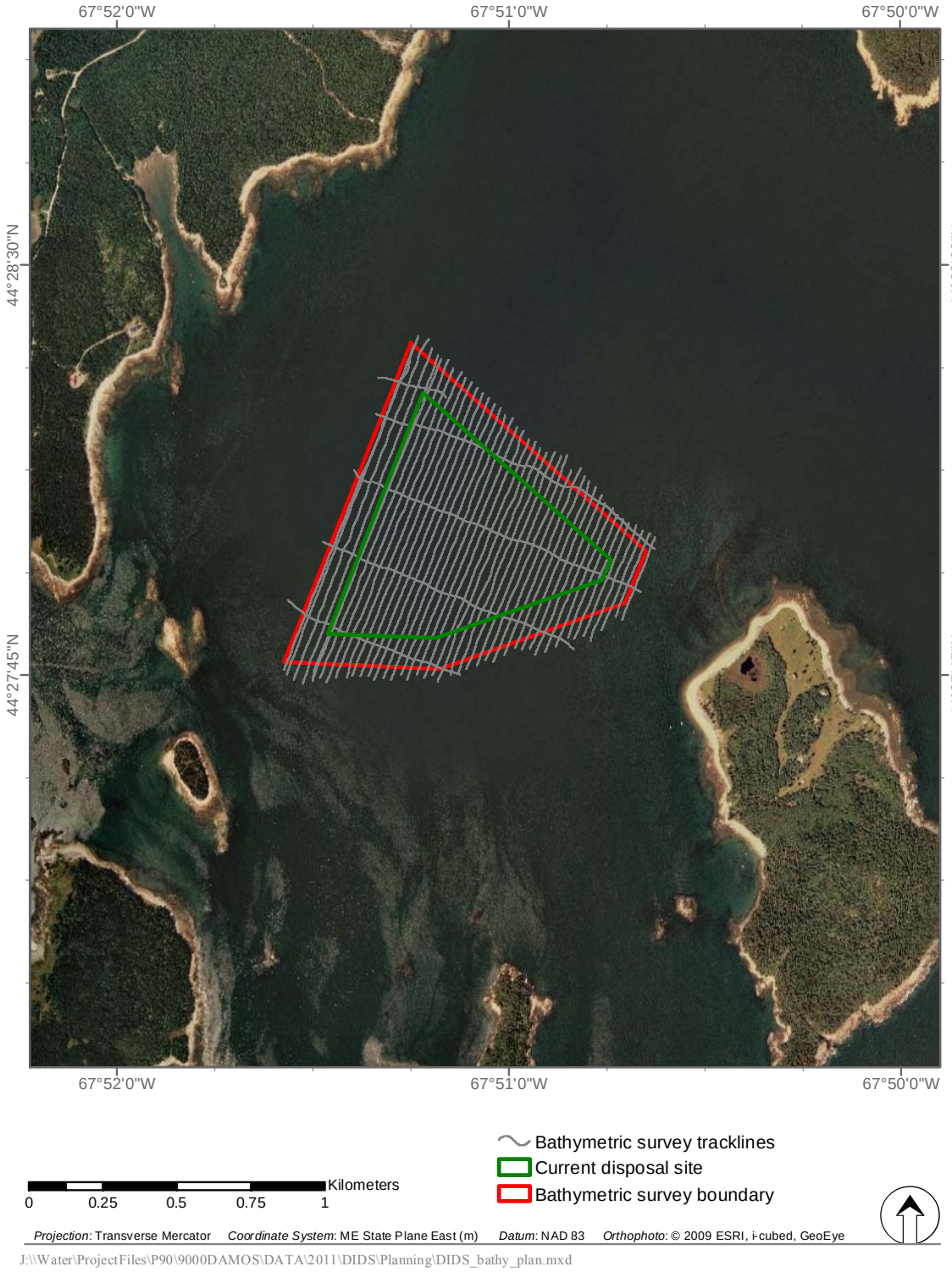


Figure 2-1. DIDS bathymetric survey boundary and tracklines, October 2011

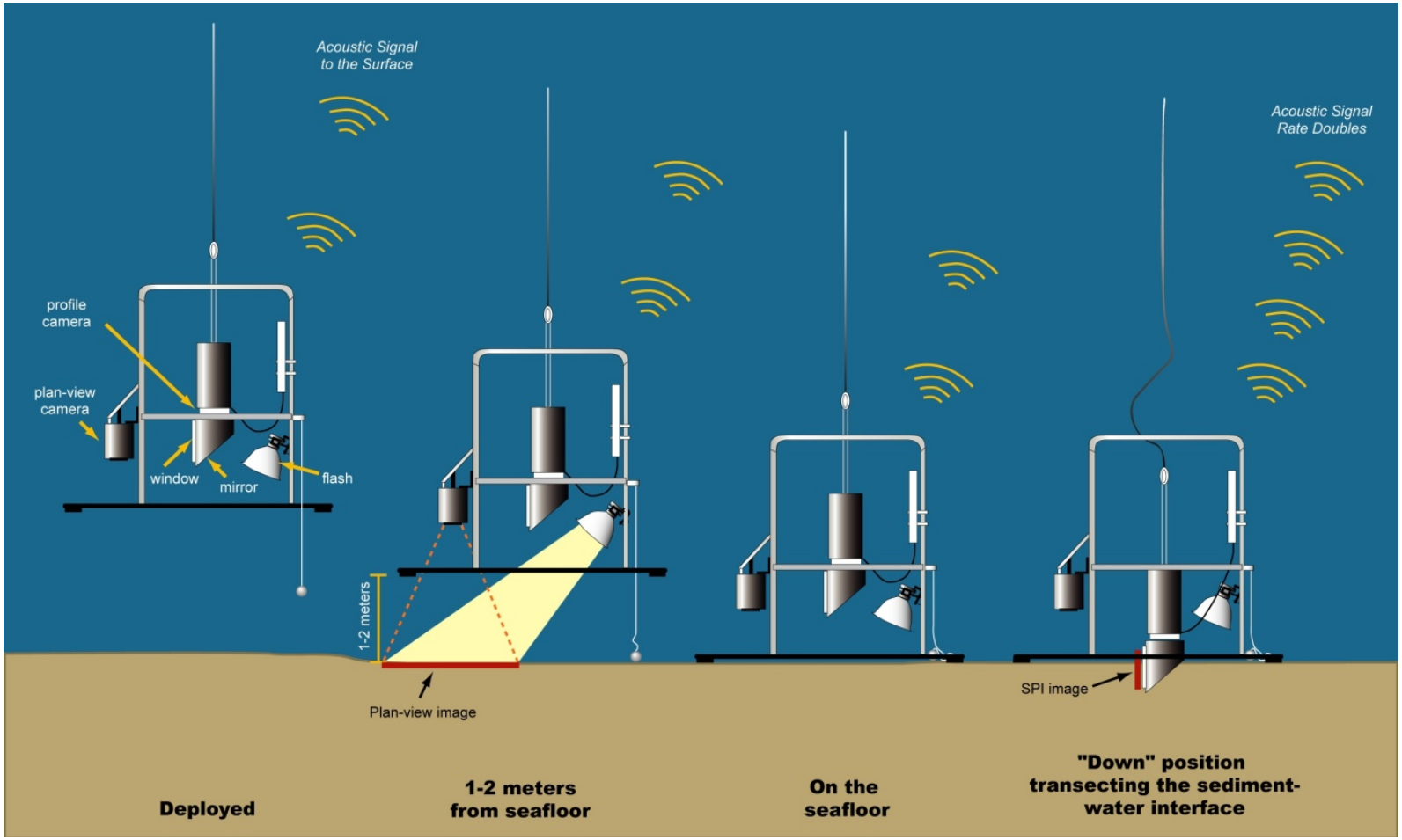


Figure 2-2. Schematic diagram of the SPI and plan-view camera deployment

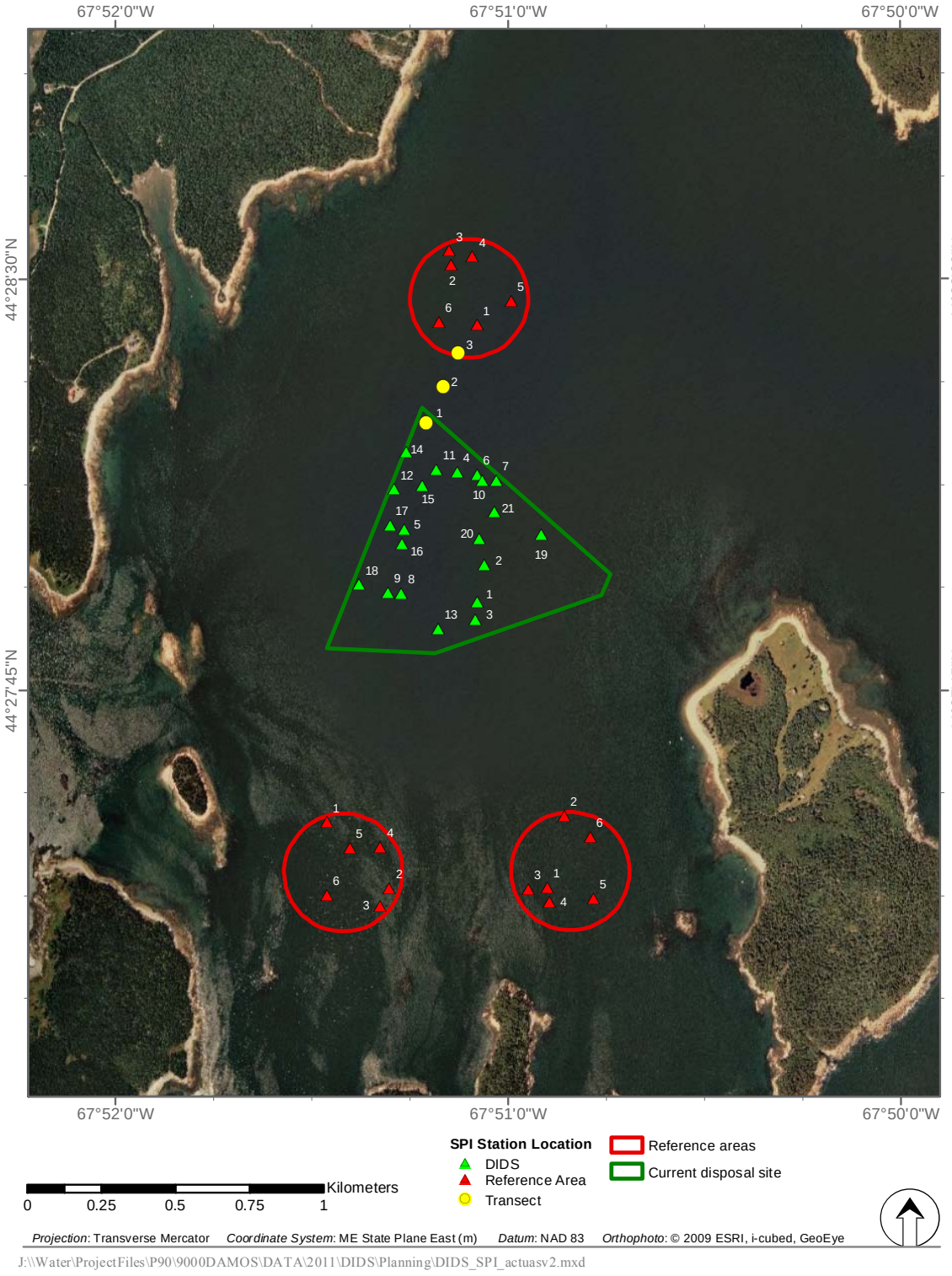


Figure 2-3. DIDS SPI locations, October 2011

3.0 RESULTS

The 2011 bathymetric survey of DIDS was completed on 11 October under fair conditions. SPI and plan view images were collected at DIDS, three reference areas, and one transect on 12 and 13 October 2011. Data from these investigations are presented below and in the subsequent tables and figures.

3.1 Bathymetry and Backscatter

3.1.1 Bathymetric Data Quality

To assess data quality across the MBES swath, cell depth variations were mapped and statistically evaluated. The average error within bathymetric grid cells for the DIDS survey was 0.04 m (0.18 m at 95th % C.I. [confidence interval]). USACE Guidance for Hydrographic Surveying (EM 1110-2-1003) provides performance standards for data acquired in depths up to 80 feet (24.4 meters). The performance standard for data accuracy in this depth range was 0.30 m at the 95th % C.I.. The majority of the data from the 2011 survey at DIDS conform to this Performance Standard. Non-compliant outliers were universally confined to the slopes of seabed features (disposal craters/mounds) where the sounding range within 2.0 m cells was constrained by morphology rather than accuracy.

3.1.2 Bathymetric Results

Overall, the seafloor within DIDS sloped gently from the western boundary, with depths of 9.0 to 9.5 m MLLW, to the eastern portion of the site, with depths of 10.0 to 10.8 m MLLW. Water depth was shallowest, approximately 7.3 m MLLW, over the historical disposal mound (Figure 3-1). The disposal mound was evident as an irregularly shaped feature in the central portion of the site. The mound spanned approximately 270 m in diameter at its widest point and rose approximately 2 meters above the surrounding seafloor. The bathymetric survey results also revealed multiple, individual dredged material placement features within the site boundaries.

There was a mix of single and overlapping placement features evident across the site in roughly linear patterns from north to south (Figure 3-1). Many of the placement features were in the form of classic impact craters formed by dredged material impact with the seafloor. These individual craters typically rose approximately 0.5 m above the surrounding seafloor, and most were approximately 30 m across with no individual feature greater than 45 m in diameter (Figure 3-1). There was also at least one new impact crater clearly visible on the historical disposal mound (Figure 3-2).

Depth difference calculations between the 2004 and 2011 bathymetric datasets were limited to within the estimated uncertainty of the 2004 and 2011 surveys. The average error of the 2011 survey was 0.2 m at the 95th % C.I.; however, the average error of the 2004 survey was unavailable. In its absence, an average error of 0.2 m, equal to the error of the 2011 survey, was assumed and assigned to the 2004 dataset. An estimated uncertainty of -0.4 to 0.4 m was assumed to capture the range of uncertainty between the 2004 and 2011 surveys. Results from the depth difference comparison showed broad areas, covering approximately 60% of the site, with sediment accumulation of 0.4 to 0.6 m. Placement events observed in the bathymetric data were also evident as isolated features of depth decrease in the depth difference data (Figure 3-2). There were also small areas (most less than 15 m across) of depth increase (0.4–0.9 m) over isolated portions of the historical disposal mound.

3.1.3 Backscatter Results

Sonar imagery and modeled backscatter (in dB) can be used to make inferences about the relative surface characteristics within the site. The backscatter signal ranged from -43.8 to -22.0 dB and averaged -36.9 dB across DIDS (Figure 3-3). Backscatter signals were stronger along the eastern boundary of the site (-24 to -22 dB), indicating rougher or larger-grained surface material compared to the southern boundary of the site, which produced the weakest backscatter signals (approximately -42 to -44 dB) indicating a smoother surface produced by finer-grained sediment surfaces. Backscatter signals across the disposal mound were higher, compared to the surrounding seafloor, and ranged as high as -27.3 dB. There was not a consistent correlation between the dredged material distribution (based on depth difference results) and backscatter signal. The multiple, individual disposal events described earlier were not as evident in the backscatter signal as they were in the bathymetric results.

3.2 Sediment-Profile and Plan-View Imaging

Detailed image analysis results are provided in Appendices C (SPI) and D (PUC). The following sections summarize the results for the reference areas, transect stations, and the disposal site. Statistical comparisons between the reference area and disposal site SPI results are also presented.

3.2.1 Reference Areas

Physical Sediment Characteristics

Sediments at the reference area stations were classified as primarily sandy silts. Most of the reference stations exhibited subtle layering of silty, very fine sand over silt clay, resulting in a grain size major mode designation of 4 to 3 phi over >4 phi (Table 3-1; Figure 3-4). There was no evidence of dredged material at any of the reference area stations. Camera prism penetration ranged from 10.6 to 20.3 cm, with an overall reference area mean penetration of 15.9 cm (Table 3-1; Figure 3-5). Small scale surface boundary roughness values ranged from 0.5 to 1.6 cm, with an overall reference area mean of 0.9 cm (Table 3-1); the majority of the small-scale topographic roughness elements were due to biogenic feeding pits and mounds (Appendix C; Figure 3-6). None of the reference area stations exhibited any evidence of low dissolved oxygen in the overlying water or signs of methane in the subsurface sediments (Table 3-1).

Biological Conditions

Mean aRPD depths at the reference stations ranged from 2.1 to 4.8 cm, with an overall reference area mean of 3.3 cm (Table 3-1; Figure 3-7). Evidence of mature, deposit-feeding fauna (Stage 3 communities) was found in every replicate image from all 18 reference area stations (Table 3-1; Figures 3-8 to 3-10). The mean maximum depth of subsurface infaunal structures (feeding voids/burrows) was 13.5 cm (Table 3-1), indicating a high degree of sediment working at depth by resident infauna. There were also extensive organism tracks, pits, and burrow openings visible in the plan-view images from the reference area stations (Figure 3-10).

3.2.2 Transect Stations

Three transect stations were located between DIDS and the northern reference area (NREF) to evaluate whether the distributed disposal technique employed at DIDS had affected the condition of the northern reference area. Silty dredged material was present in SPI images at Stations TRANS-01 and TRANS-02, but the relatively firm, sandy silt visible at Station TRANS-03 appeared to be ambient sediment (Table 3-2; Figure 3-11). All three of the transect stations were characterized by relatively deep aRPD depths and a mature benthic community (Stage 3 successional assemblages; Table 3-2).

3.2.3 Disposal Site

Dredged Material Distribution and Physical Sediment Characteristics

Surface sediments at the disposal site stations were primarily sandy silts (i.e., poorly-sorted muds with varying degrees of fine sand). Most of these stations exhibited subtle layering of silty, very fine sand over silt clay, resulting in a grain-size major mode of 4 to 3 phi overlying >4 phi (Table 3-2). Dredged material was present at all of the stations sampled (Figure 3-12), and many of the stations showed evidence of wood chips or debris in the disposed sediments (Figure 3-13).

Most of the disposal site stations (81%) had mean prism penetration values greater than 15 cm, reflecting the relatively soft, unconsolidated nature of the silty dredged material (Table 3-2; Figure 3-14). Small scale surface boundary roughness values ranged from 0.4 to 2.3 cm, with an overall site mean of 1.0 cm (Table 3-2). The majority (86%) of the small-scale topographic roughness elements were due to biogenic feeding pits and mounds (Appendix C). No stations exhibited any evidence of low dissolved oxygen in the overlying water or signs of methane in the subsurface sediments (Table 3-2).

Biological Conditions

The mean aRPD values at the disposal site stations ranged from 0.8 to 4.7 cm, with an overall site mean aRPD of 2.8 cm (Table 3-2; Figure 3-15). With the exception of one image at station DIDS-10, all of the replicate images obtained at the disposal site stations showed evidence of mature, deposit-feeding benthic taxa (Figure 3-16). The evidence of a well-developed community of Stage 3 taxa (head-down, deposit-feeding invertebrates) included extensive feeding voids, burrows, and/or larger-bodied subsurface organisms observed in the profile images (Figures 3-17 to 3-19).

The mean maximum depth of subsurface infaunal structures (feeding voids/burrows) was 11.7 cm at the disposal site stations (Table 3-2), indicating that the resident infauna were reworking the sediment extensively at depth. The plan-view images from the disposal site stations showed extensive organism tracks, pits, and burrow openings at the sediment surface similar to the reference area, reflecting the activity of both infaunal and epifaunal organisms (Figure 3-20).

3.2.4 Statistical Comparisons of Disposal Site and Reference Stations

A summary of the mean aRPD and successional stage rank values by sampling location are shown in Table 3-3 and Figure 3-21. The statistical comparisons results for each variable follow.

Mean aRPD Variable

The data from all four groups were combined to assess normality and estimate pooled variance. Results for the normality test indicated that the area residuals (i.e., each observation minus the area mean) were not significantly different from normal (Shapiro-Wilk's test p-value = 0.42). Group standard deviations ranged from 0.5 to 1.3, with the smallest standard deviation occurring at the reference stations (Table 3-3). The variances were found to be significantly different among the four groups ($p=0.002$ for Levene's test), so a normal *t*-interval using separate variance estimates was constructed to determine results of the inequivalence test (Table 3-4, see Section 2.3.5 for description of inequivalence test).

If the difference between the mean of the reference areas and the disposal site was fully contained within the interval [-1, +1], it was concluded that the two means were significantly equivalent. The mean aRPD value for the DIDS stations was significantly equivalent to that at the reference stations, with a difference in means of approximately 0.51 cm.

Successional Stage Rank Variable

All stations across both the disposal site and the reference areas were characterized by successional stages of Stage 3 or equivalent. With identical means and zero variance, no statistics were needed for comparisons between reference areas and the disposal site to conclude statistical equivalence.

Table 3-1.

Summary SPI Results (station means) at DIDS Reference Stations

Area	Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean aRPD Depth (cm)	Methane Present?	Maximum Void Depth (cm)	Mean Dredged Material Thickness (cm)	Successional Stages Present (3 replicates)		
NREF	NREF-01	4-3/>4	10.6	1.1	2.9	No	8.8	0	1 on 3	1 on 3	2 on 3
	NREF-02	4-3/>4	18.3	0.8	3.4	No	18.2	0	1 on 3	1 on 3	2 on 3
	NREF-03	4-3/>4	16.7	0.5	2.7	No	13.0	0	2 on 3	2 on 3	2 on 3
	NREF-04	>4	14.6	0.9	3.2	No	0.0	0	1 on 3	1 on 3	2 on 3
	NREF-05	4-3/>4	10.9	0.6	2.1	No	9.8	0	1 on 3	1 on 3	1 on 3
	NREF-06	4-3/>4	11.6	0.6	3.1	No	10.1	0	1 on 3	1 on 3	1 on 3
SEREF	SEREF-01	4-3/>4	16.7	0.7	3.8	No	17.3	0	2 on 3	2 on 3	1 on 3
	SEREF-02	4-3/>4	17.8	1.5	3.6	No	15.9	0	1 on 3	1 on 3	2 on 3
	SEREF-03	4-3/>4	14.2	1.1	3.9	No	10.1	0	1 on 3	2 on 3	3
	SEREF-04	4-3/>4	17.8	1.2	3.2	No	13.8	0	2 on 3	2 on 3	2 on 3
	SEREF-05	4-3/>4	14.1	0.6	2.1	No	12.4	0	1 on 3	1 on 3	1 on 3
	SEREF-06	4-3/>4	17.5	0.9	3.3	No	16.6	0	1 on 3	1 on 3	1 on 3
SWREF	SWREF-01	4-3/>4	17.3	0.7	3.3	No	15.9	0	1 on 3	1 on 3	1 on 3
	SWREF-02	4-3/>4	17.7	1.6	3.7	No	14.1	0	1 on 3	1 on 3	2 on 3
	SWREF-03	4-3/>4	20.3	0.7	4.8	No	16.7	0	1 on 3	1 on 3	3
	SWREF-04	>4	13.8	1.0	3.6	No	14.5	0	1 on 3	1 on 3	1 on 3
	SWREF-05	4-3/>4	17.8	0.9	2.9	No	19.3	0	1 on 3	1 on 3	1 on 3
	SWREF-06	4-3/>4	18.2	0.9	3.7	No	16.4	0	2 on 3	2 on 3	2 on 3
	Mean	NA	15.9	0.9	3.3	NA	13.5	0	NA		

Table 3-2.

Summary SPI Results (station means) at DIDS and Transect Stations

Area	Station	Grain Size Major Mode (phi)	Mean Prism Penetration Depth (cm)	Mean Boundary Roughness (cm)	Mean aRPD Depth (cm)	Methane Present?	Maximum Void Depth (cm)	Mean Dredged Material Thickness (cm)	Successional Stages Present (3 replicates)		
DIDS	DIDS-01	4-3/>4	17.5	0.4	2.9	No	9.1	>17.5	1 on 3	1 on 3	1 on 3
	DIDS-02	4-3/>4	16.8	2.0	1.7	No	9.7	>16.8	1 on 3	1 on 3	1 on 3
	DIDS-03	4-3/>4	18.9	0.9	4.3	No	0.0	>18.9	2 on 3	2 on 3	1 on 3
	DIDS-04	>4	15.8	1.3	1.6	No	9.8	>15.8	1 on 3	1 on 3	1 on 3
	DIDS-05	4-3/>4	17.3	0.8	4.3	No	11.5	>17.3	1 on 3	1 on 3	1 on 3
	DIDS-06	4-3/>4	6.6	0.9	1.5	No	5.7	>6.6	1 on 3	1 on 3	2 on 3
	DIDS-07	4-3/>4	8.5	0.8	1.8	No	7.7	>8.5	2 on 3	2 on 3	1 on 3
	DIDS-08	4-3/>4	17.2	0.6	3.0	No	16.5	>17.2	2 on 3	2 on 3	1 on 3
	DIDS-09	4-3/>4	17.0	1.0	4.7	No	11.6	>17	2 on 3	2 on 3	3
	DIDS-10	4-3/>4	6.8	1.0	2.1	No	6.6	>6.8	2 on 3	1 on 3	Indeterminate
	DIDS-11	4-3/>4	14.3	1.0	3.0	No	16.9	>14.3	1 on 3	1 on 3	2 on 3
	DIDS-12	>4	17.2	0.7	1.4	No	5.4	>17.2	1 on 3	1 on 3	2 on 3
	DIDS-13	4-3/>4	19.7	0.8	4.4	No	20.2	>19.7	2 on 3	2 on 3	2 on 3
	DIDS-14	4-3/>4	18.3	0.9	4.1	No	18.3	>18.3	1 on 3	1 on 3	1 on 3
	DIDS-15	4-3/>4	16.3	0.4	3.3	No	14.8	>16.3	2 on 3	2 on 3	1 on 3
	DIDS-16	4-3/>4	17.3	0.6	3.9	No	15.4	>17.3	1 on 3	1 on 3	2 on 3
	DIDS-17	4-3/>4	16.7	0.6	4.3	No	7.5	>16.7	2 on 3	2 on 3	1 on 3
	DIDS-18	4-3/>4	16.0	1.2	2.6	No	12.9	>16	1 on 3	1 on 3	2 on 3
	DIDS-19	4-3/>4	16.3	2.3	0.8	No	18.6	>16.3	1 on 3	1 on 3	1 on 3
	DIDS-20	4-3/>4	15.5	1.4	0.8	No	10.2	>15.5	1 on 3	1 on 3	1 on 3
	DIDS-21	4-3/>4	17.7	0.8	2.0	No	17.1	>17.7	1 on 3	1 on 3	1 on 3
	Mean	NA	15.6	1.0	2.8	NA	11.7	NA		NA	
Transect	TRANS-01	>4	16.8	0.8	4.3	No	16.1	>16.8	2 on 3	2 on 3	1 on 3
	TRANS-02	>4	18.1	0.9	4.0	No	14.2	>18.1	2 on 3	2 on 3	1 on 3
	TRANS-03	4-3/>4	9.5	1.0	2.2	No	7.0	0	2 on 3	2 on 3	1 on 3
	Mean	NA	14.8	0.9	3.5	NA	12.4	NA		NA	

Table 3-3.

Summary of Station Means by Sampling Location

		Mean aRPD (cm)		Successional Stage Rank	
Area	N	Mean	Standard Deviation	Mean	Standard Deviation
Reference Locations					
NREF	6	2.9	0.46	3	0
SEREF	6	3.3	0.66	3	0
SWREF	6	3.7	0.63	3	0
Mean		3.3		3	
Disposal Site					
DIDS	21	2.8	1.3	3	0

Table 3-4.

Summary of Statistics and Results of Inequivalence Hypothesis Testing for aRPD Values

Difference Equation	Observed Difference ($\hat{d}$)	SE ($\hat{d}$)	df for SE ($\hat{d}$)	95% Confidence Bounds (lower–upper)	Results
$Mean_{REF} - Mean_{DIDS}$	0.51	0.31	31	-0.02–1.00	s

d = Fail to reject the inequivalence hypothesis: the two group means are significantly different

s = Reject the inequivalence hypothesis: the two group means are significantly similar

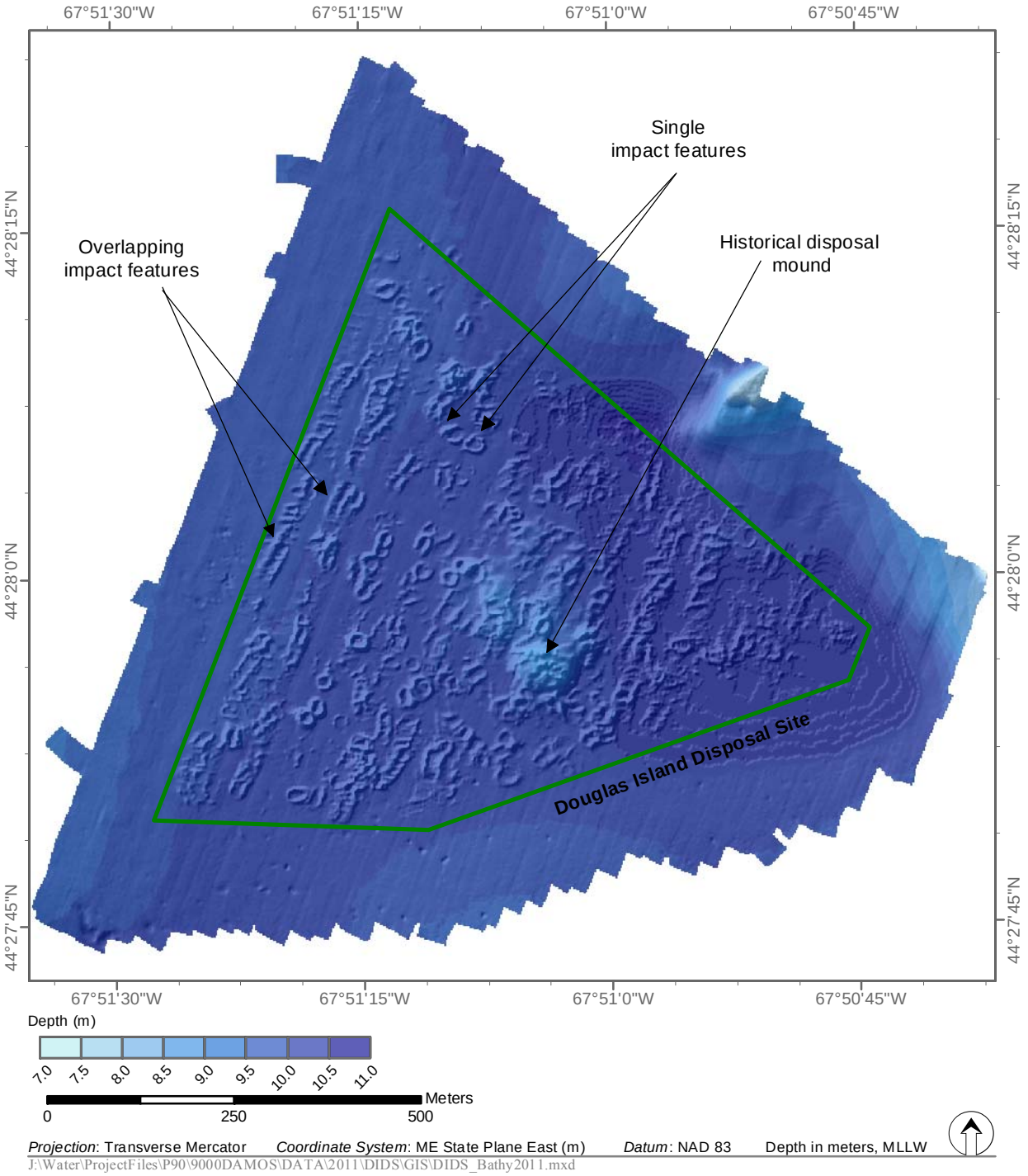


Figure 3-1. Bathymetry of DIDS with hillshading (no vertical exaggeration), October 2011

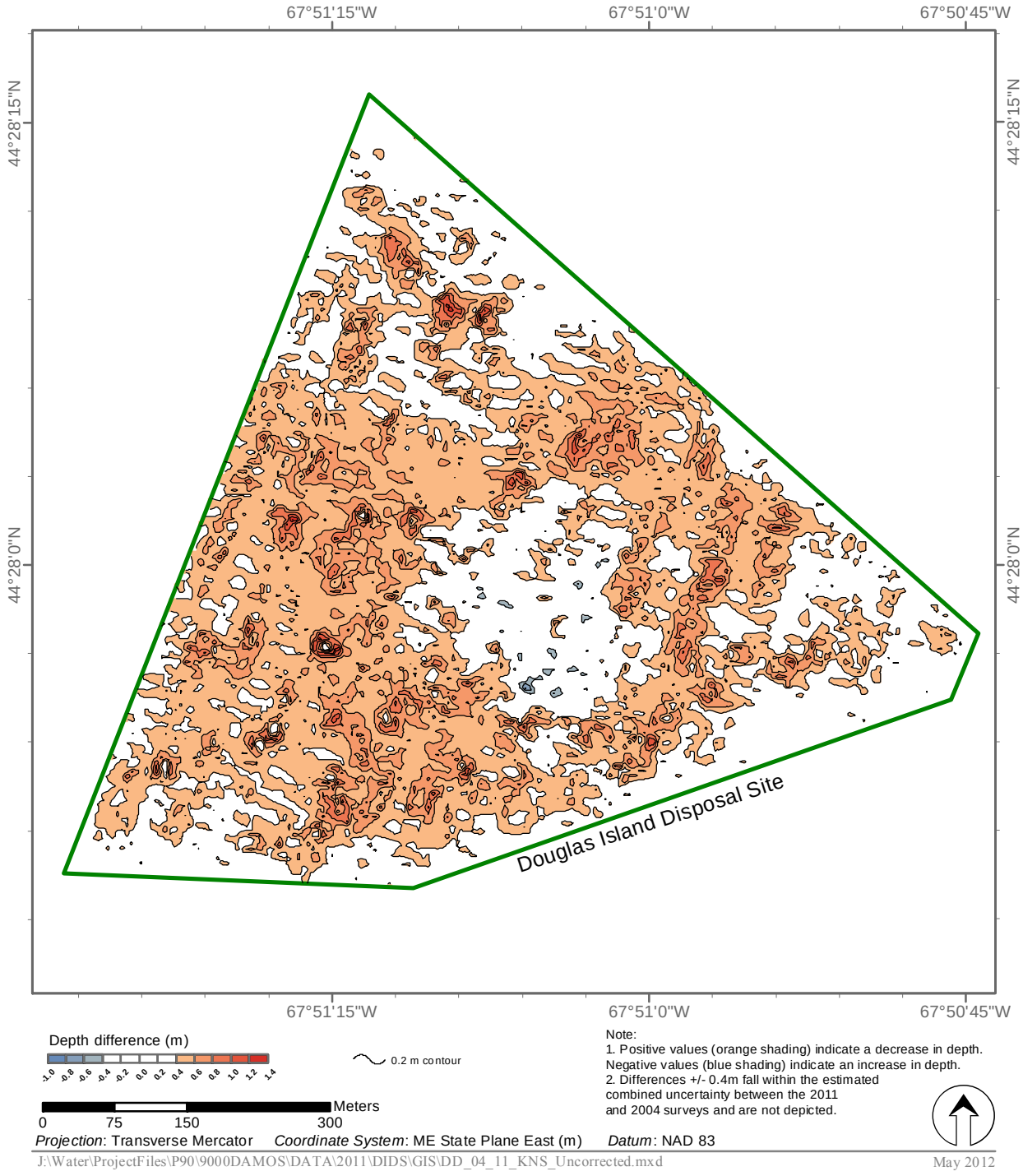


Figure 3-2. Depth differencing of DIDS (between 2011–2004)

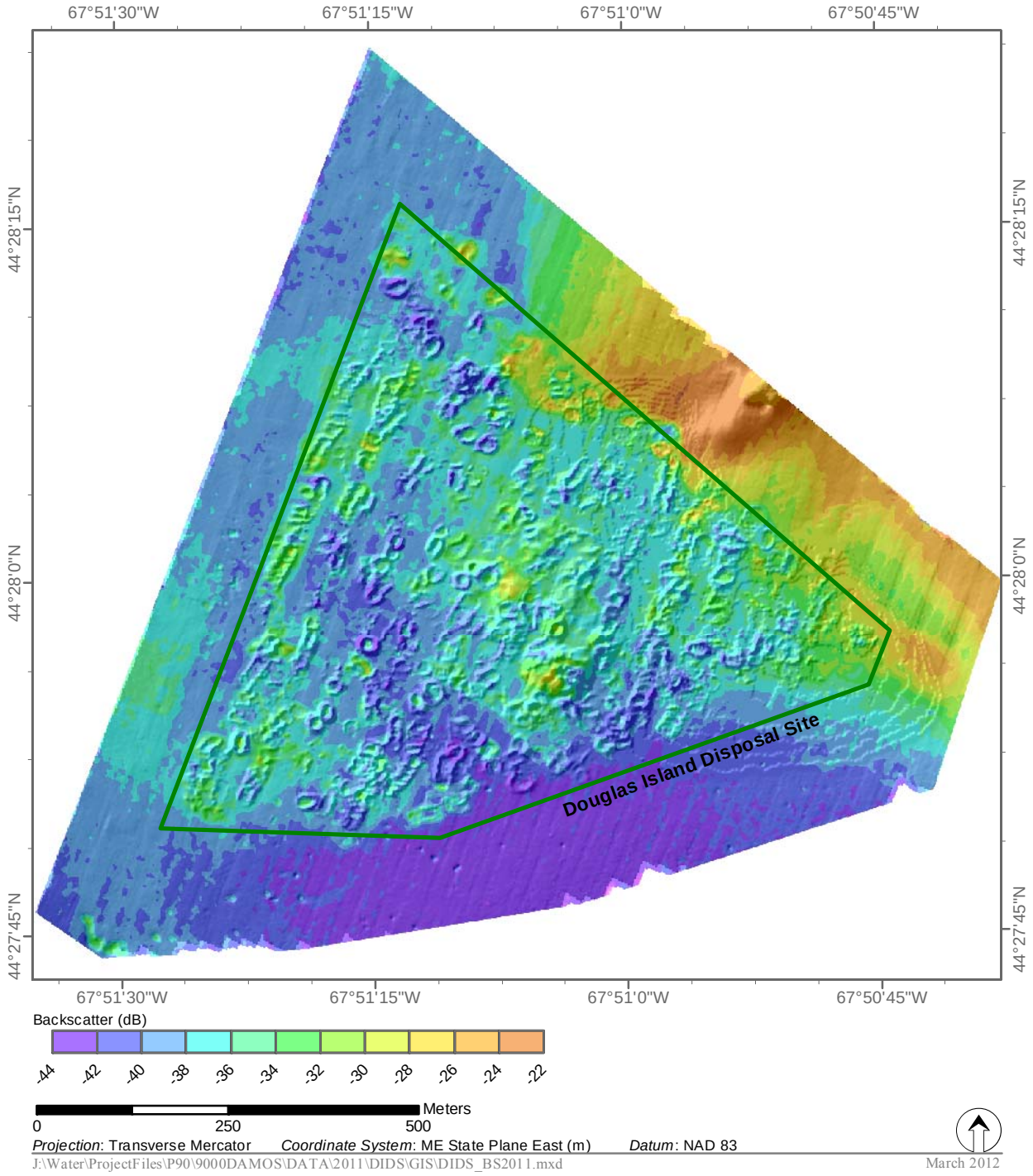


Figure 3-3. Backscatter intensity (dB) at DIDS, over hillshaded bathymetry (no vertical exaggeration), October 2011

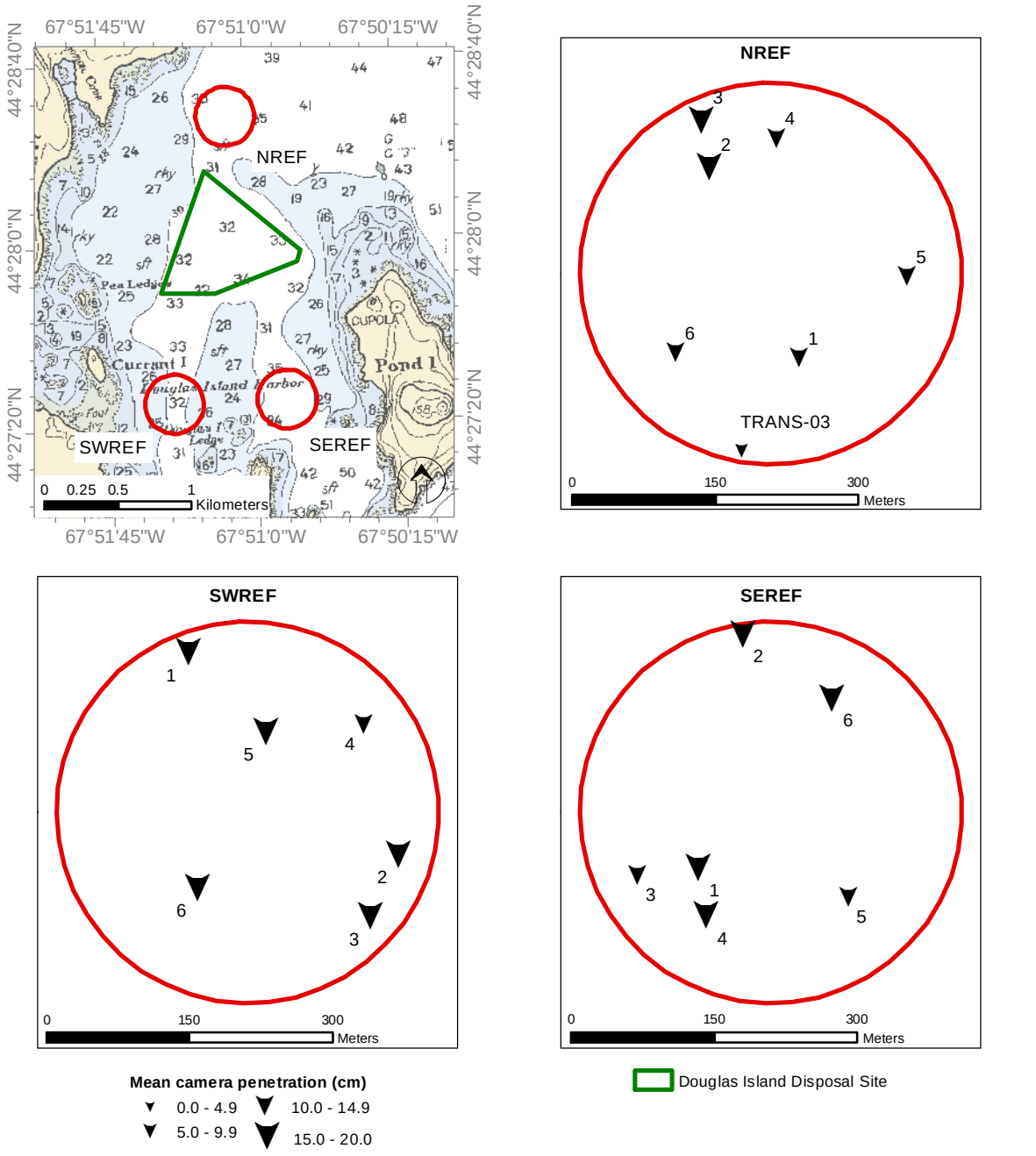


Figure 3-4. Map of mean replicate camera penetration depth (cm) at the DIDS reference areas; Numbers next to symbols indicate station ID

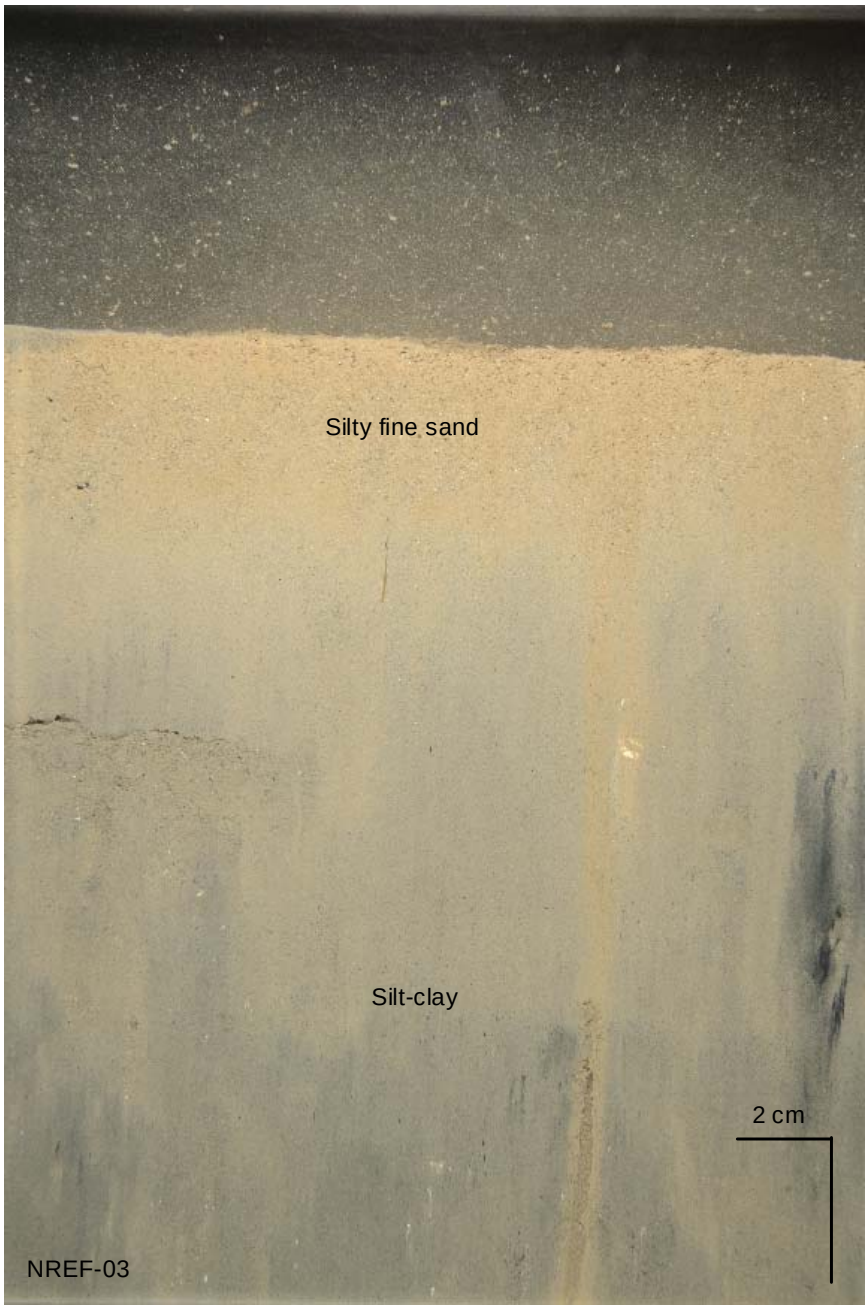
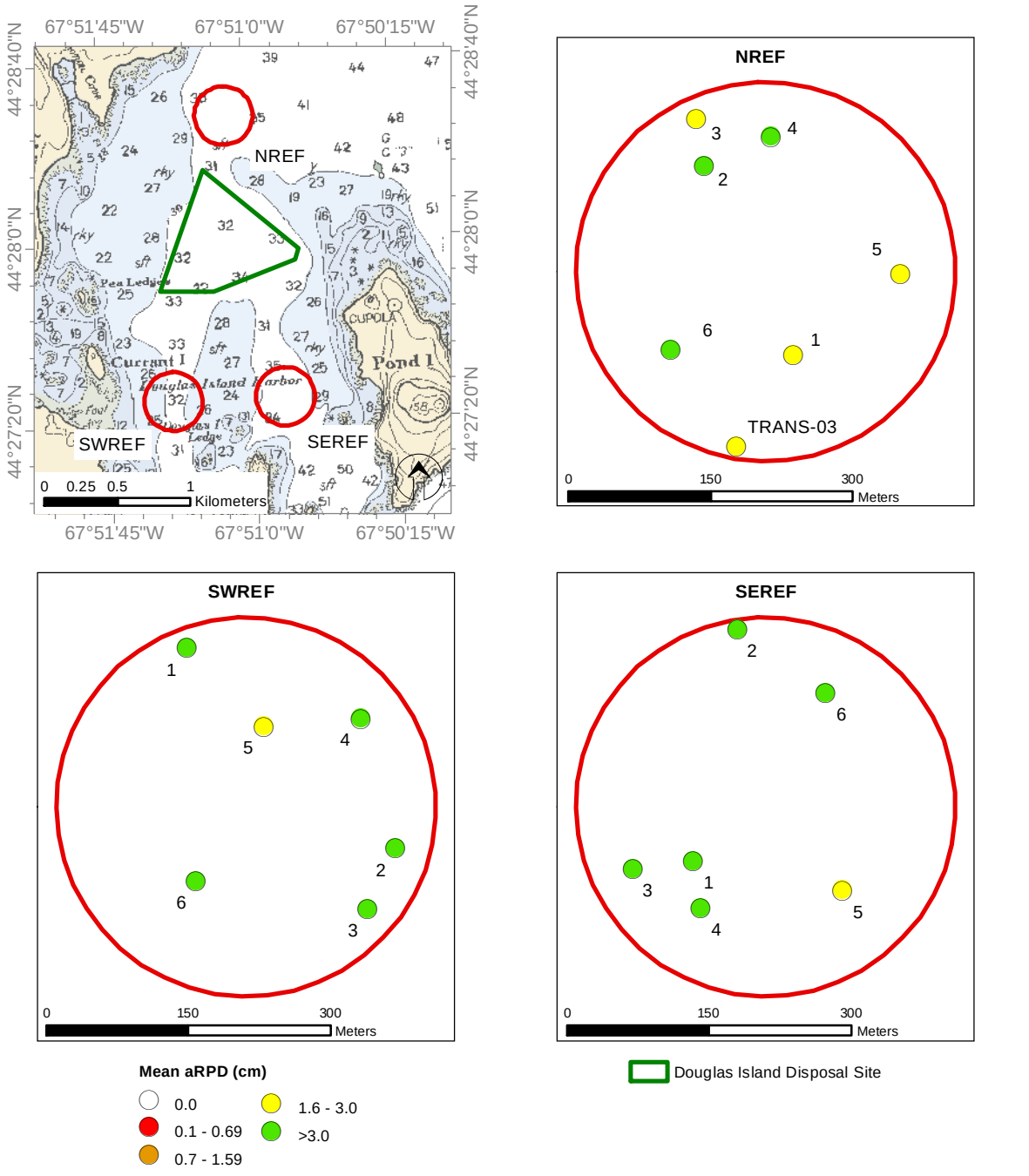


Figure 3-5. A surface layer of silty, very fine sand overlying silt-clay sediment at depth was present in this profile image from station NREF-03

Figure 3-6. The small-scale surface topography (i.e., boundary roughness) in this profile image from station NREF-06 was due to the presence of biogenic mounds created by the burrowing and feeding activities of subsurface organisms



Projection: Transverse Mercator *Coordinate System*: ME State Plane East (m) *Datum*: NAD 83

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Figure 3-7. Map of mean replicate aRPD depths (cm) at the DIDS reference areas; Numbers next to symbols indicate station ID

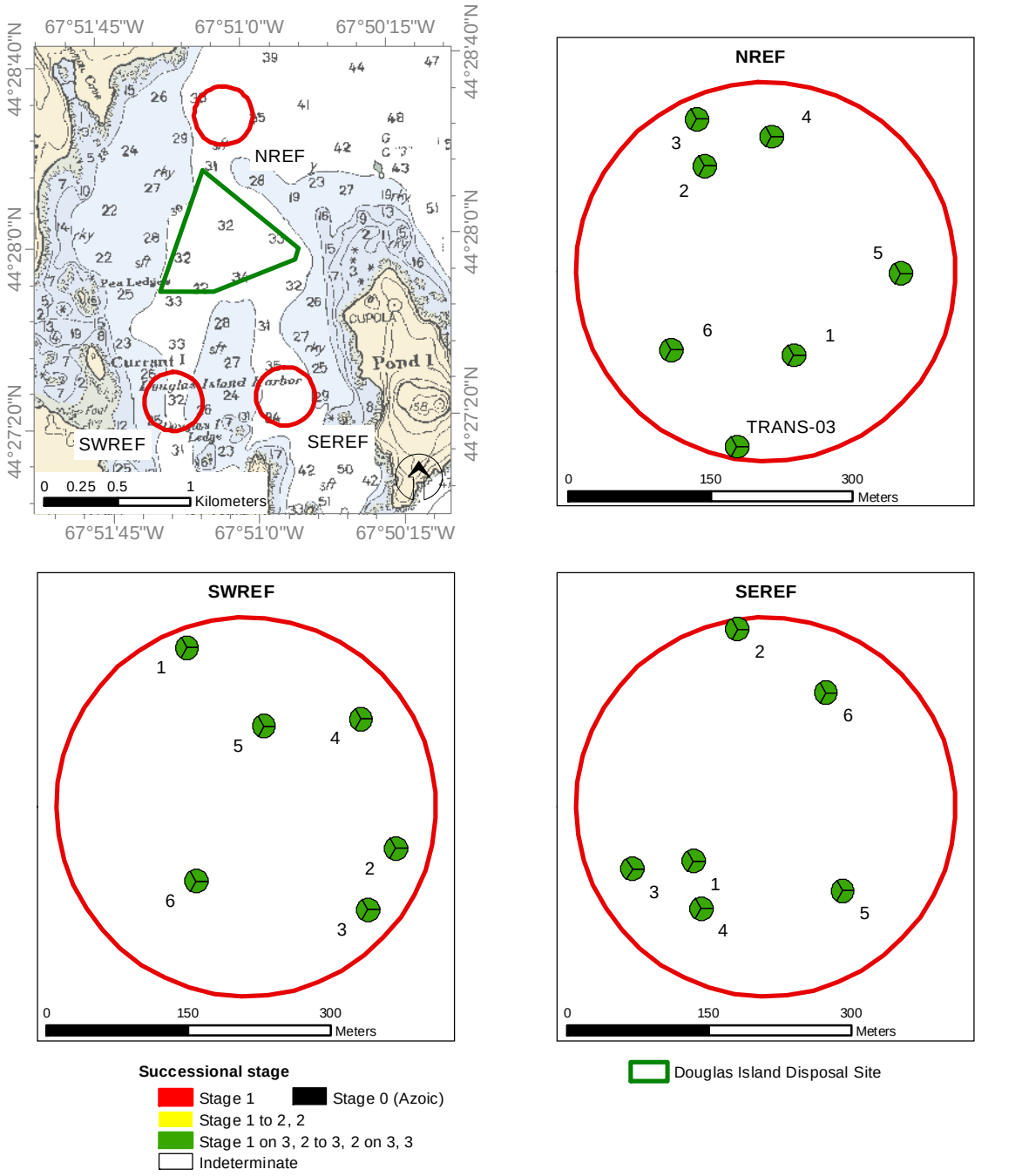

Figure 3-8. Map of infaunal successional stage observed in each replicate profile image at reference stations; Numbers next to symbols indicate station ID

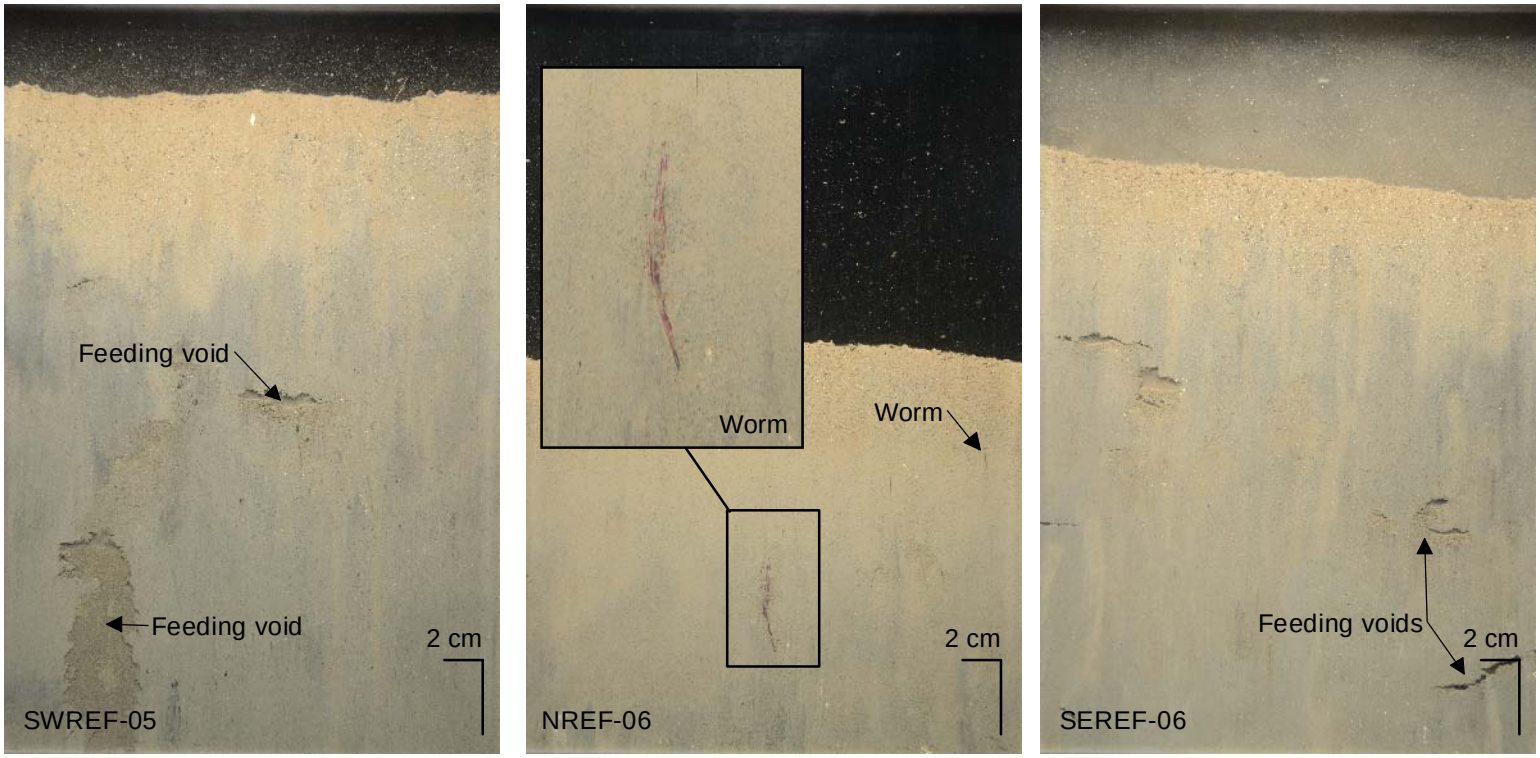

Figure 3-9. Profile images illustrating the extensive Stage 3 activity observed at the reference area stations: a subsurface burrow and several feeding voids at station SWREF-05 (left), several subsurface polychaetes at station NREF-06 (center), and multiple feeding voids at station SEREF-06 (right)

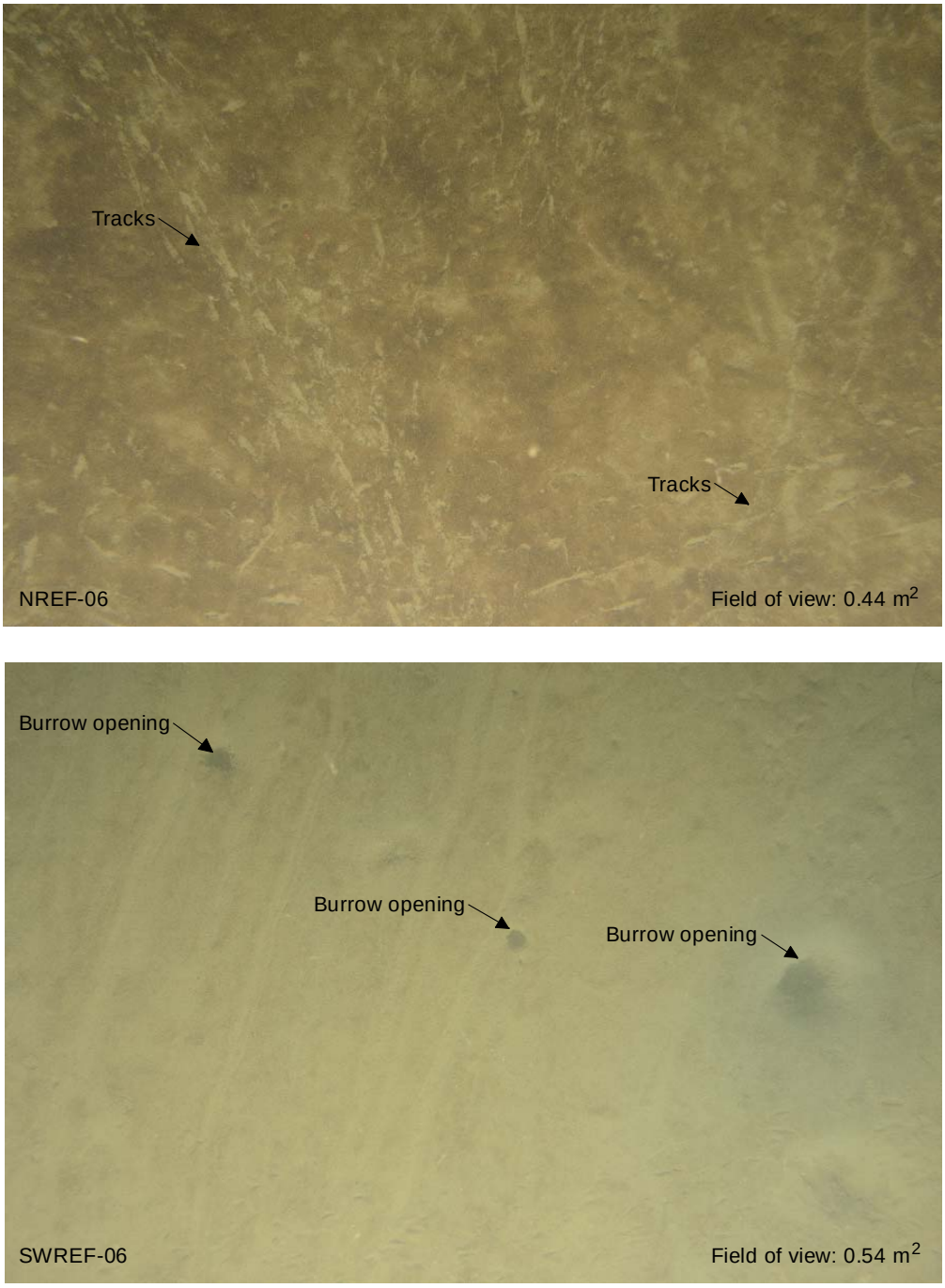

Figure 3-10. Plan-view images showing extensive organism foraging tracks and pits at station NREF-06 (top) and several burrow openings (arrows) at station SWREF-06 (bottom)

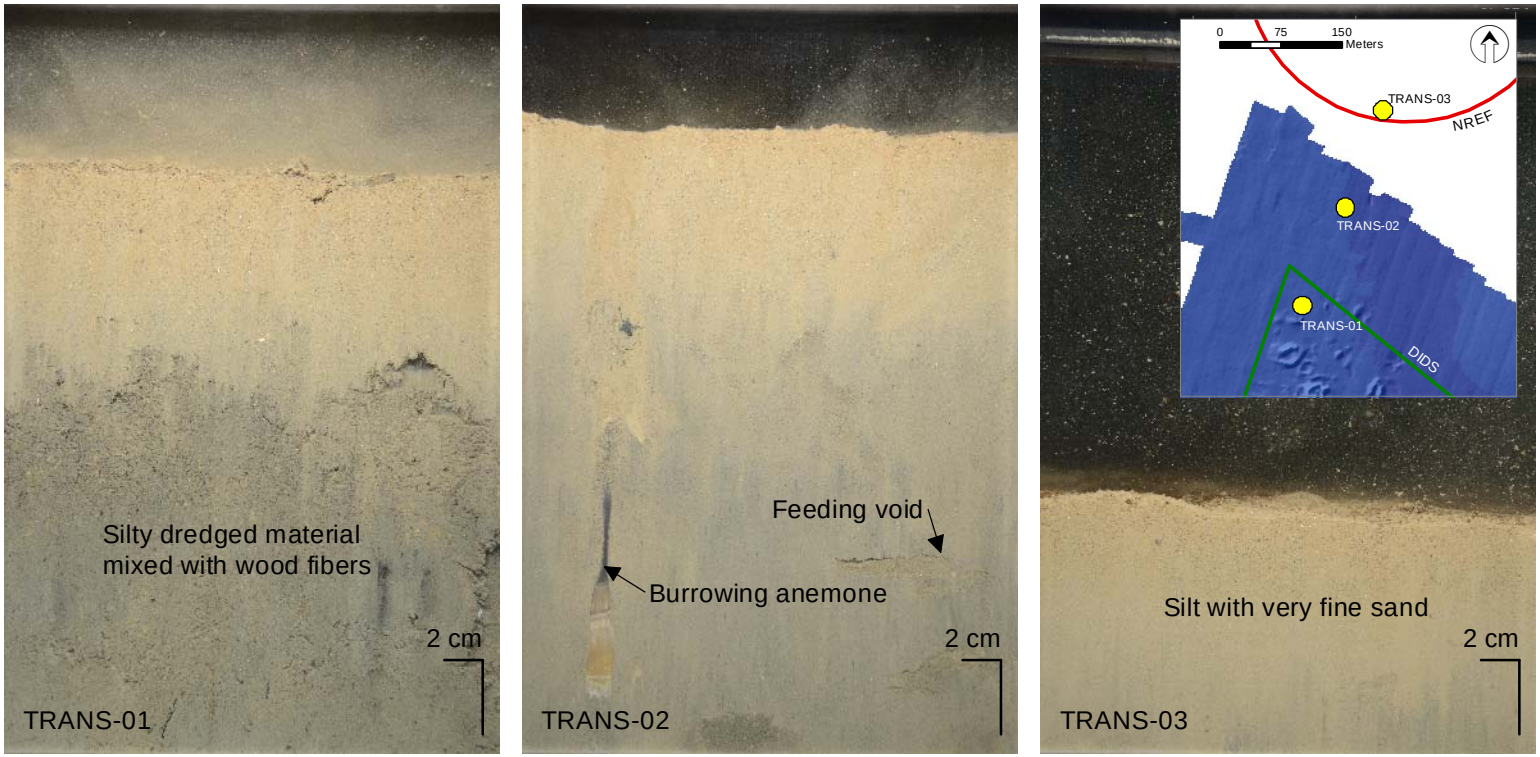

Figure 3-11. Representative SPI images from the transect stations between DIDS and NREF. The left image from Station TRANS-01 shows silty dredged material with wood chips, the center image shows silty dredged material with feeding voids and a burrowing anemone at Station TRANS-02, and the right image shows ambient sediment consisting of silt with very fine sand at Station TRANS-03

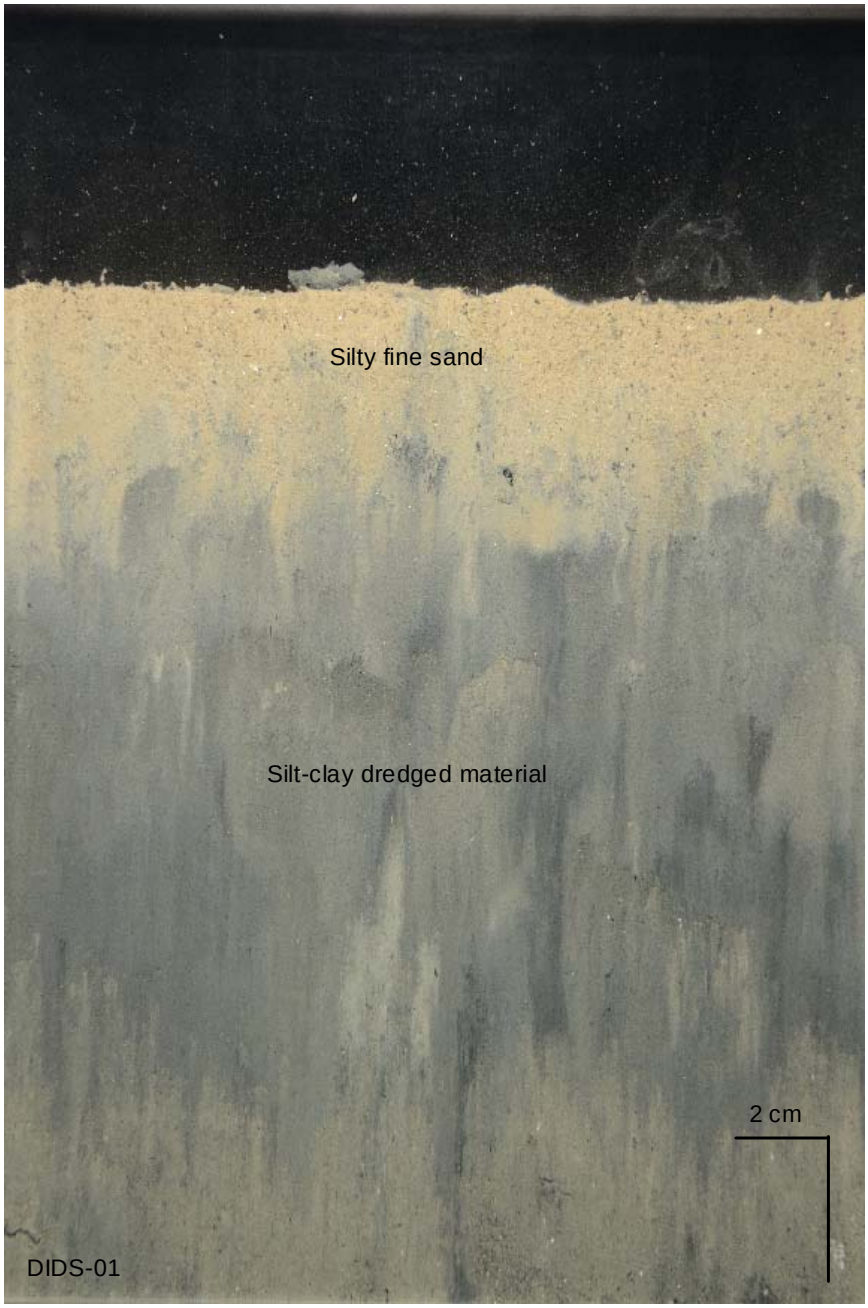

Figure 3-12. Profile image from station DIDS-01 with layered dredged material consisting of a surface layer of silty, very fine sand (4 to 3 phi) overlying silt-clay (>4 phi)

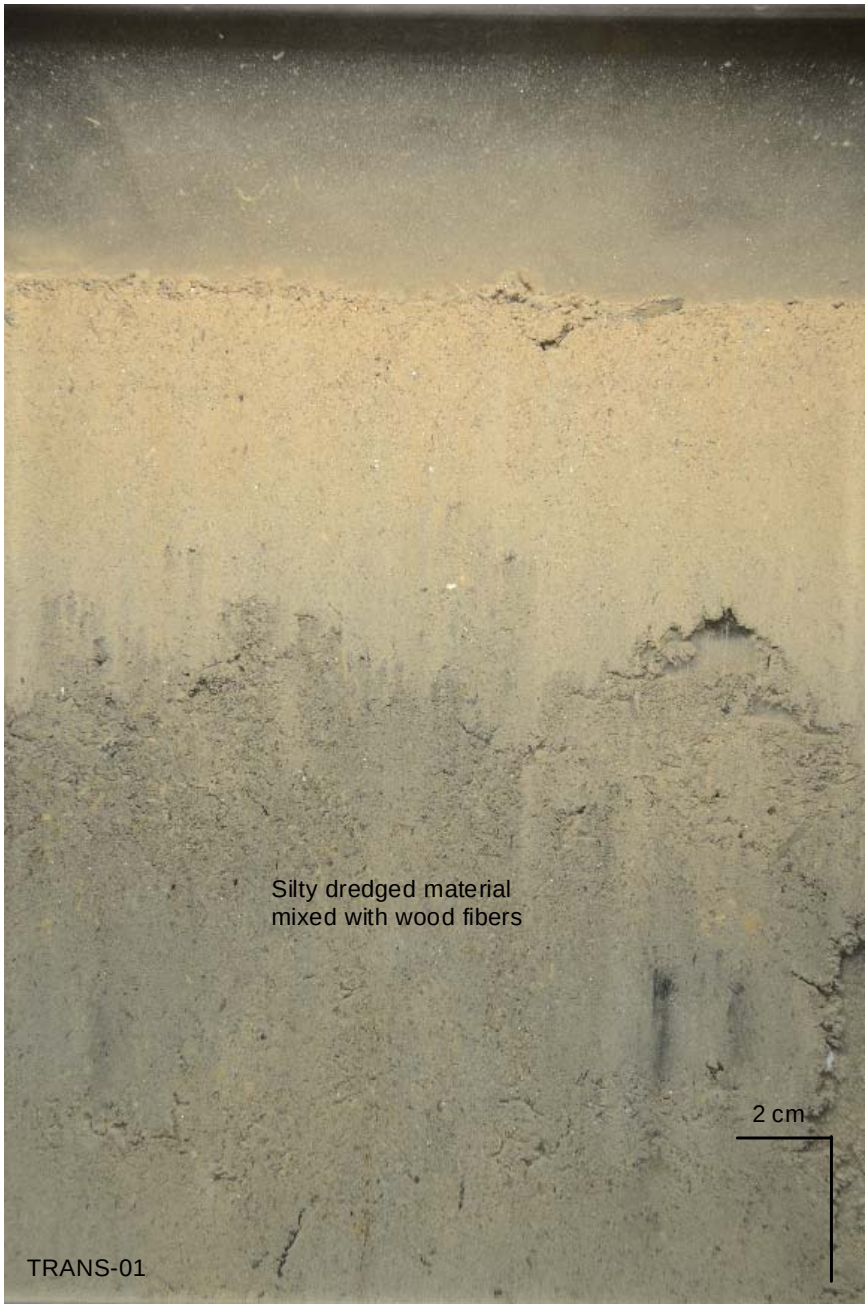

Figure 3-13. Silty dredged material containing wood chips and particles comprises the bottom half of this profile image from transect station (TRANS-01) located within the disposal site boundary

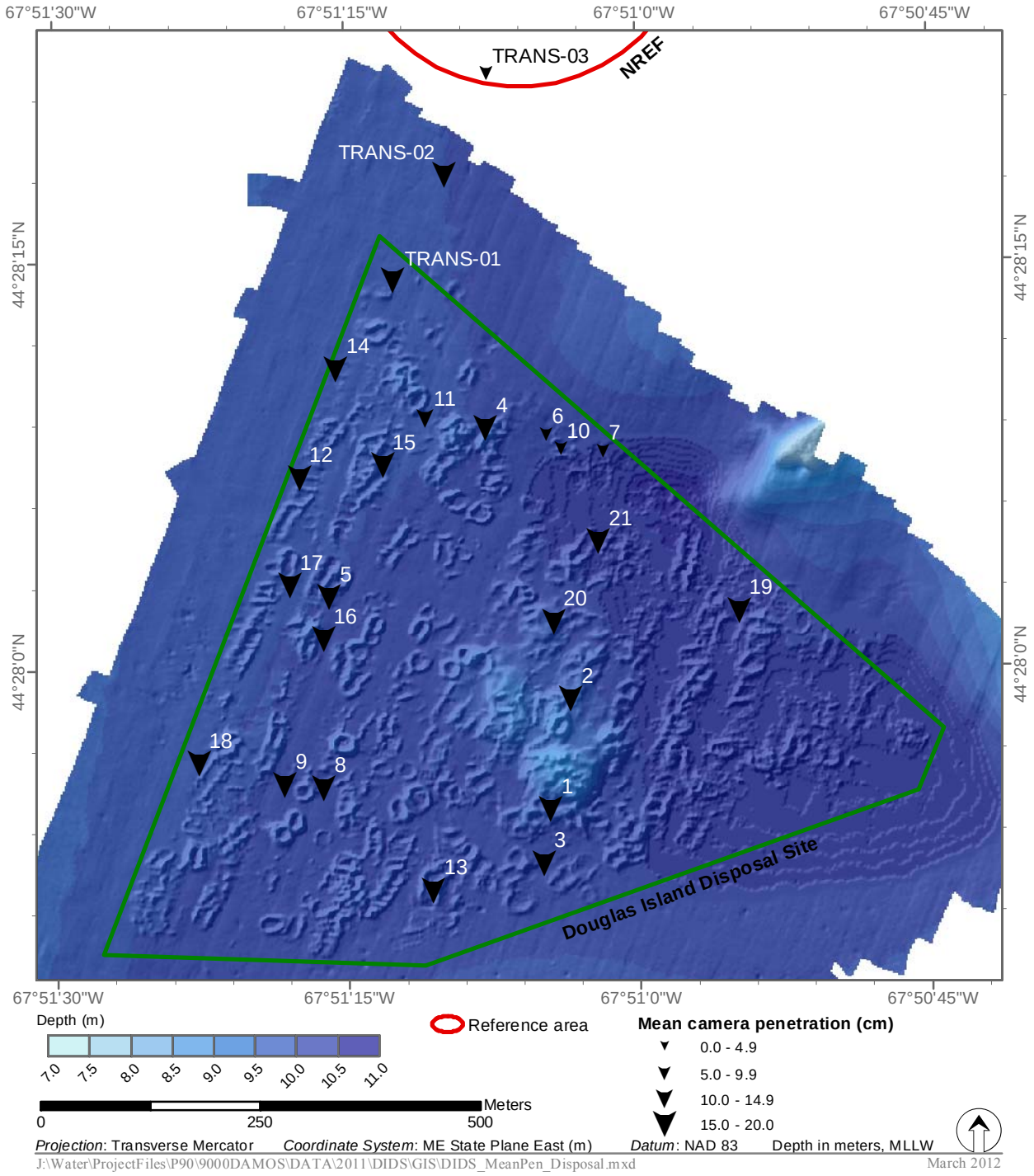

Figure 3-14. Map of mean replicate camera penetration depth (cm) at DIDS over hillshaded 2011 bathymetry

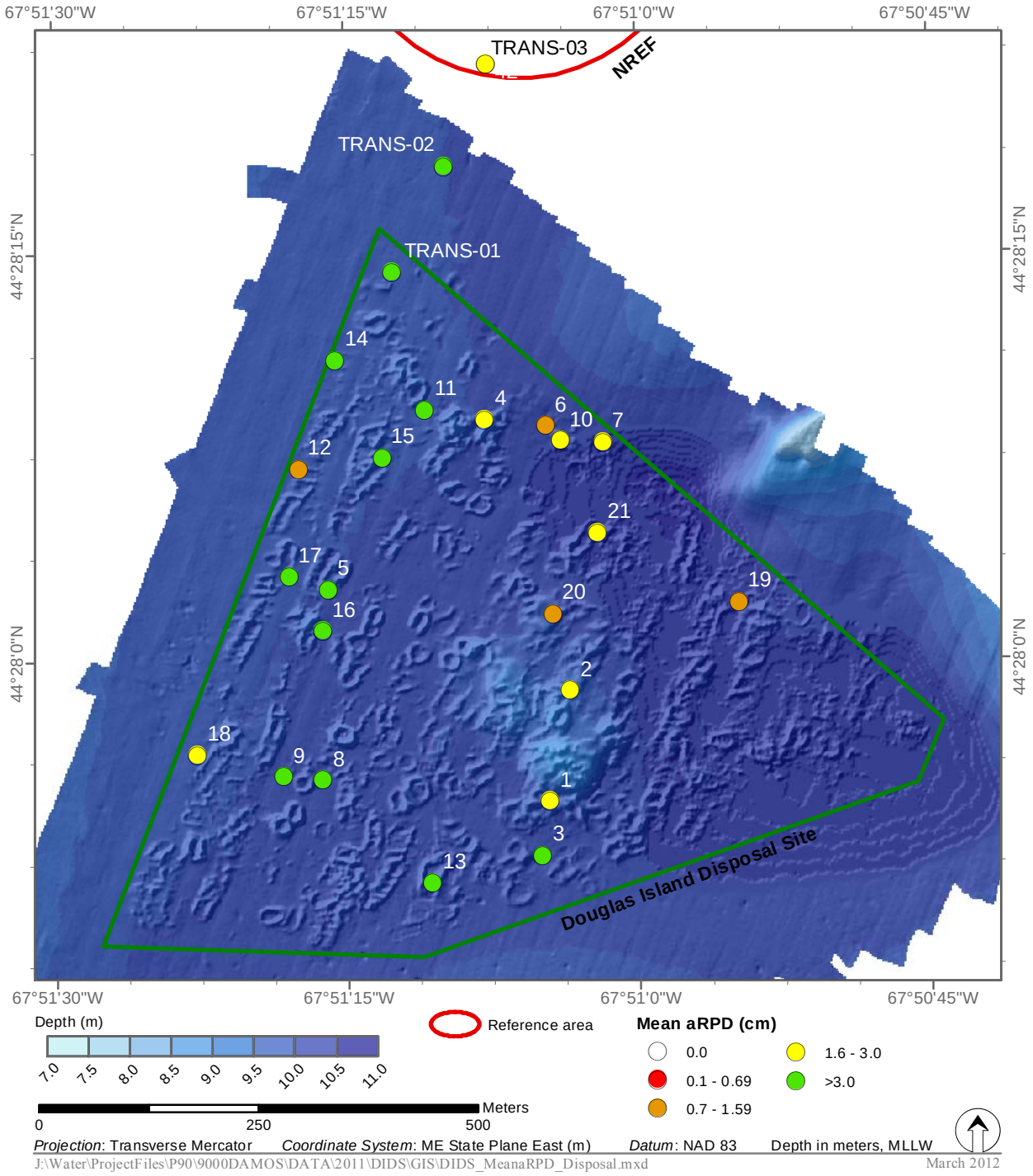

Figure 3-15. Map of mean replicate aRPD depths (cm) at DIDS over hillshaded 2011 bathymetry

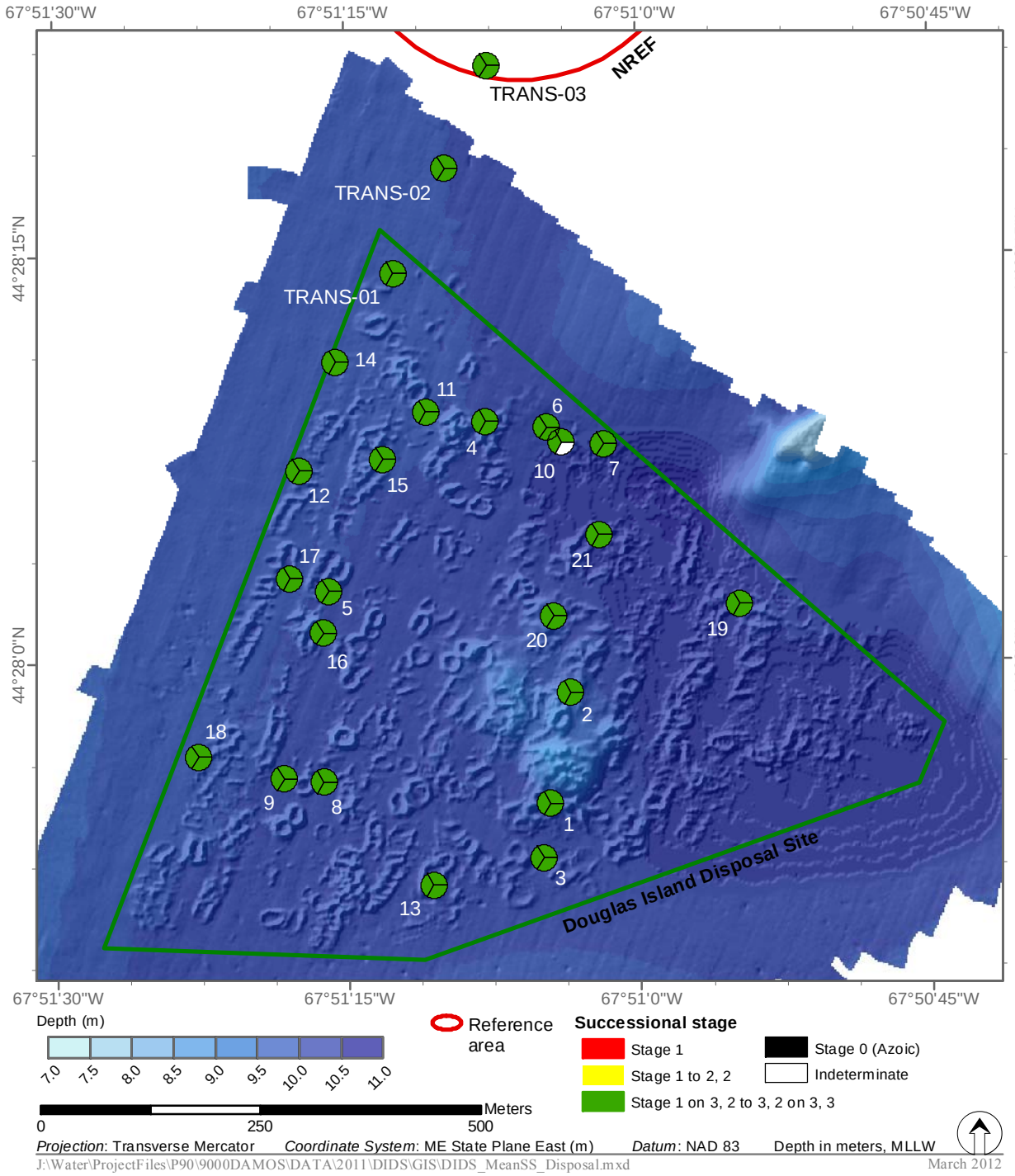

Figure 3-16. Map showing the infaunal successional stage observed in each replicate profile image at DIDS SPI stations over hillshaded 2011 bathymetry

Figure 3-17. Profile images from station DIDS-19 (left) and DIDS-04 (right) with extensive subsurface feeding voids

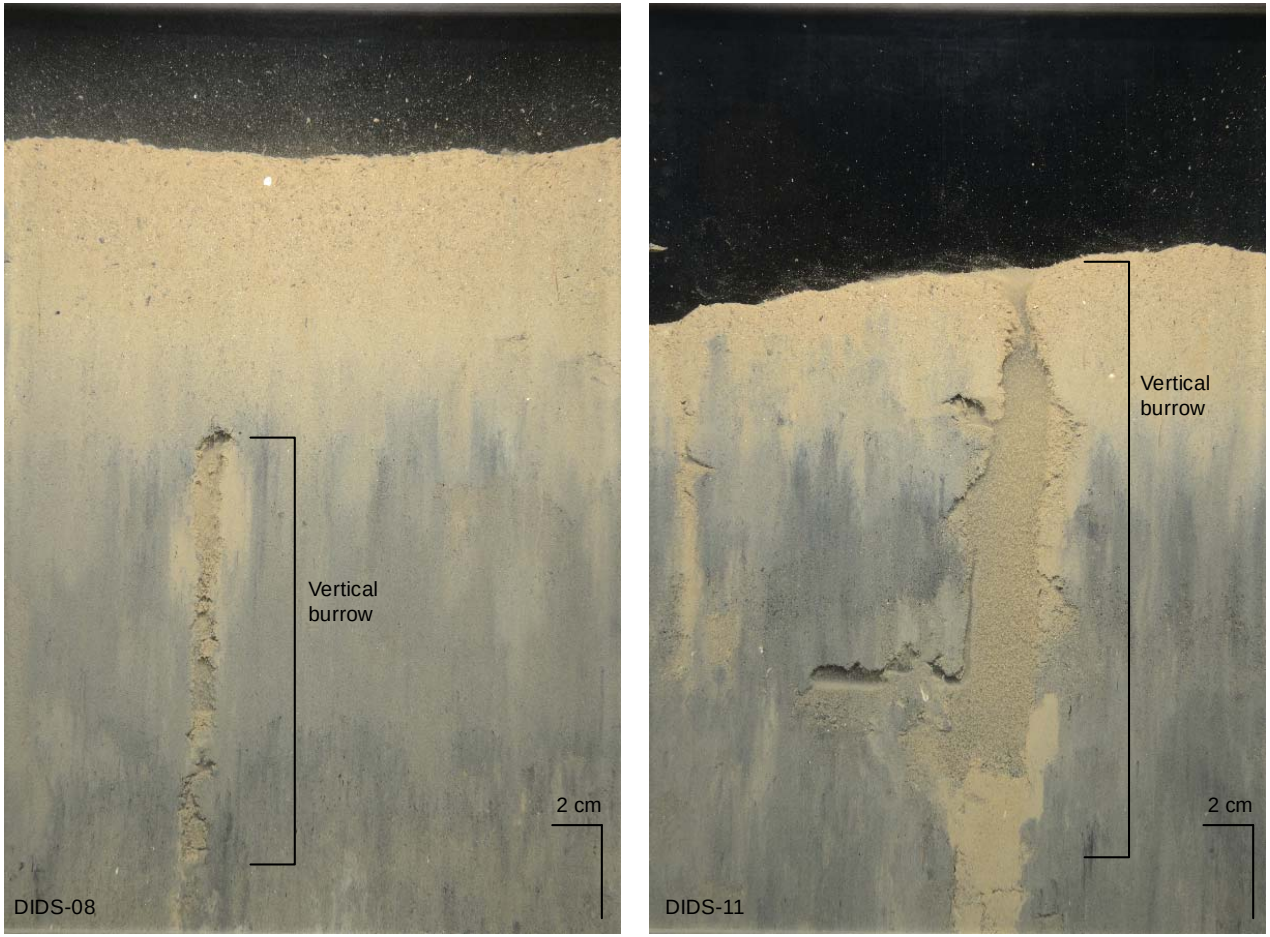

Figure 3-18. Vertical burrows were visible in profile images from stations DIDS-08 (left) and DIDS-11 (right). Irrigation of the burrows by oxygenated water caused the sediment surrounding these structures to have a lighter color, similar to the sediment above the aRPD

Figure 3-19. Profile image from station DIDS-17 with a large-bodied polychaete in silty dredged material containing wood particles

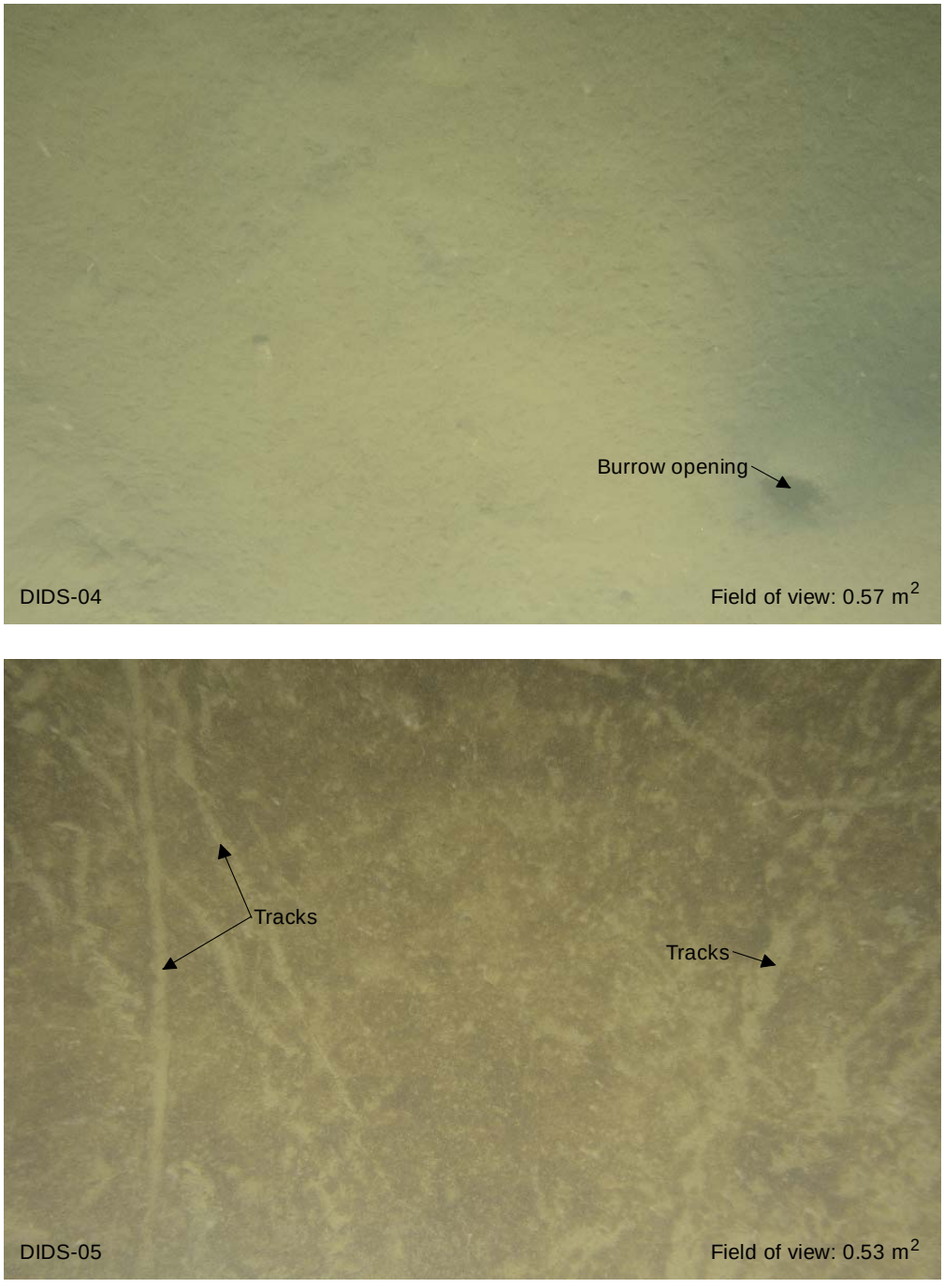

Figure 3-20. Plan-view images with a burrow opening at station DIDS-04 (top) and extensive organism tracks at station DIDS-05 (bottom)

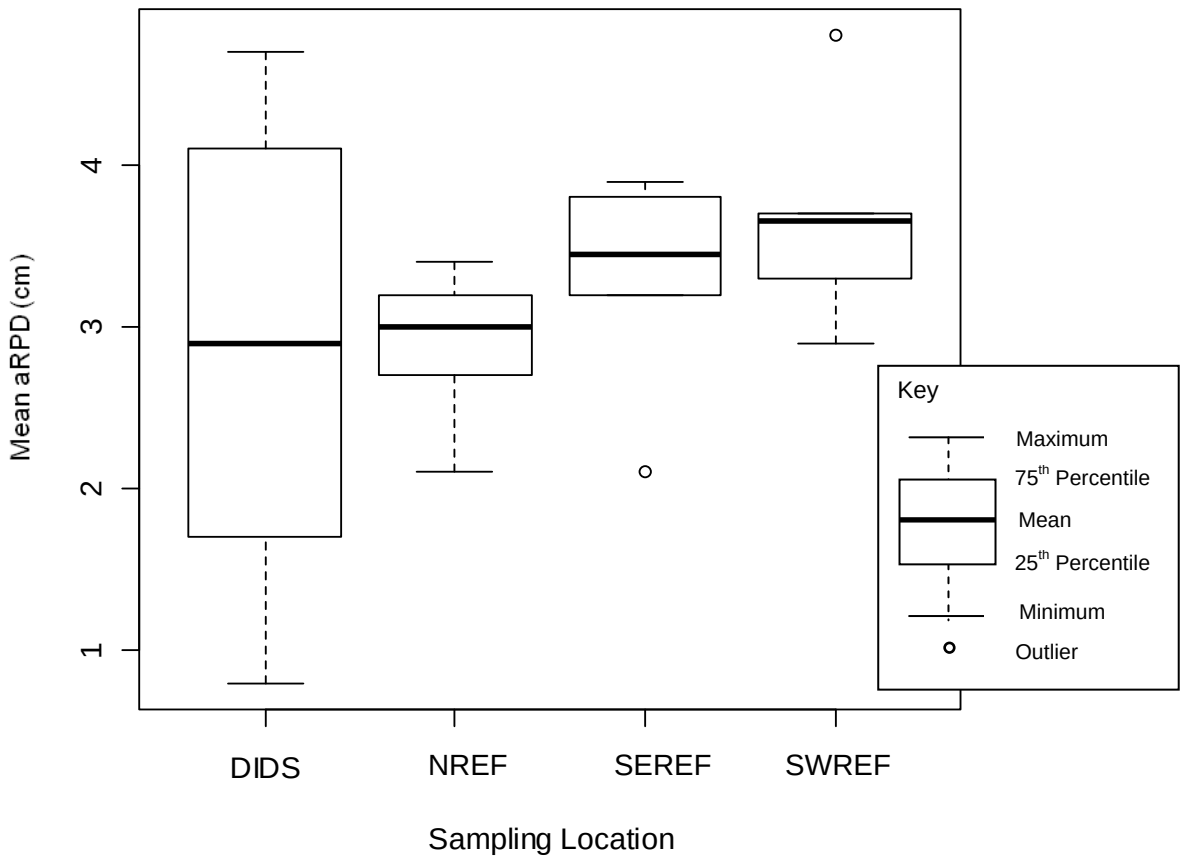

Figure 3-21. Boxplots with distribution of station mean aRPD values for DIDS and reference stations, October 2011

4.0 DISCUSSION

The objectives of the September 2011 survey of the Douglas Island Disposal Site (DIDS) were to document the distribution of dredged material and benthic recovery at the site after placement of approximately 195,000 m^3 of dredged material since 2006. The disposals during this period marked a change in disposal strategy at the site from point placement prior to 2004 to distributed placement since 2006. Survey tools included multibeam bathymetry, sediment-profile imaging (SPI), and plan-view imaging.

4.1 Dredged Material Distribution

The current strategy of distributed dredged material placement at DIDS affected the seafloor topography at the site as expected and did not create a defined disposal mound. The previous targeted disposal of approximately 77,000 m^3 of material from 2003 to 2004 formed a 2 m high mound at the site. Since 2006, more than twice as much material (195,000 m^3) was placed at the site, but instead of targeting the placement at a single location, scow releases were deliberately distributed throughout the site footprint. Because of this strategy, the distributed placement of 195,000 m^3 of material resulted in a more uniform accumulation across the site of approximately 0.5 m.

Despite continued disposal activity over the historical mound, the net change over the majority of the mound was within the estimated combined error of the bathymetric surveys (± 0.4 m). This absence of detectable change is likely the result of the continued disposal activity being offset by the consolidation of the previously placed dredged material, the majority of this consolidation likely occurred within the first year after mound formation. Although the site is in an area of the bay with currents that were noted to have the potential for sediment transport (ENSR 2007), there was no evidence of scour within the 2011 bathymetry. Rather, the bathymetry revealed distinct individual disposal features (Figure 3-1) and preservation of these features indicates limited mobilization of sediments over the site.

The dredged material identified at SPI station TRAN-02, just north of the site boundary, was not unexpected given the multiple placement events that occurred across the site with many near or at the site boundary. However, no dredged material was detected at station TRANS-03, which was located on the boundary of the northern reference area at the closest point to the disposal site, or at any of the stations within the reference area. Hence, this reference area was still considered valid for comparison with site conditions.

4.2 Benthic Recovery

The results of the 2011 SPI survey indicate a relatively high degree of benthic recolonization at the disposal site at the time of the survey. Recovery of the benthic community at DIDS was evident in both aRPD depths and successional stage status observations from SPI and plan-view underwater camera (PUC) images.

Almost all of the replicate images from across the disposal site showed abundant evidence of mature, deposit-feeding benthic taxa. The PUC images reinforced the SPI results in showing numerous burrow openings, tubes, and tracks on the sediment surface at almost all of the stations. Stage 3 taxa were equally abundant at each of the three reference areas, with evidence of mature, deposit-feeding fauna observed in every replicate image. Similar to the disposal site stations, there were extensive organism tracks, pits, and burrow openings visible in the plan-view images from the reference area stations.

Mean aRPD depths were relatively well-developed at both the disposal site and reference stations, with no statistical difference between the two. These results reflect the relatively high degree of aeration resulting from deep sediment reworking by resident infauna. Overall, the results support the conclusion that surface sediments at DIDS have been extensively colonized by a mature benthic community that is comparable to that in nearby reference areas.

When compared to SPI results from the 2005 survey, the 2011 aRPD values at the disposal site and all three reference areas were uniformly deeper. However, the deeper aRPD depths measured in 2011 may have been a result of seasonal differences (the 2005 survey was conducted in September and the 2011 survey was conducted in October) or related to periodic sediment mobilization and deposition. Despite these different aRPD depths, both the 2005 and 2011 SPI surveys indicated that dredged material deposited at the site was rapidly recolonized to a mature, Stage 3 infaunal community.

5.0 CONCLUSIONS

The October 2011 survey at DIDS was conducted to collect bathymetric data over the entire site and to collect SPI and plan-view imaging at the site, three reference areas, and along a transect between the site and the northern reference area. The survey was designed to assess changes at the site after placement of 195,000 m^3 of dredged material since the previous surveys and to evaluate the effect of a different placement strategy at the site. Prior to the 2004/2005 bathymetric and SPI surveys at DIDS, dredged material placement was targeted at a single location within the site, but subsequent disposals were distributed across the entire site. The 2011 SPI and bathymetric surveys successfully captured the effect of the new disposal strategy at the site with the following results:

- The distributed disposal strategy has affected the seafloor topography at the site as expected and resulted in a more uniform dredged material layer over the site. The lack of a formation of a new mound, or of an increase in the existing mound height, is expected to limit the potential for sediment transport at this relatively shallow site.

- The benthic community at the site has fully recovered according to the expected recovery paradigm.

Additional monitoring of DIDS is only recommended if significant additional dredged material placement occurs at the site.

6.0 REFERENCES

Bolam, S. G.; Rees, H. L. 2003. Minimizing the impacts of maintenance dredged material disposal in the coastal environment: A habitat approach, Environmental Management. 32:171-188.

ENSR; Coastal Vision; CR Environmental; Germano & Associates; USACE. 2007. Monitoring Survey at the Douglas Island Disposal Site, Outer Narraguagus Bay, ME, April 2003/April 2004/September 2005. DAMOS Contribution No. 173. USACE, New England District, Concord, MA 41 pp.

Fredette, T. J.; French, G.T. 2004. Understanding the physical and environmental consequences of dredged material disposal: history in New England and current perspectives. Marine Pollution Bulletin 49: 93-102.

Germano, J. D.; Rhoads, D. C.; Lunz, J. D. 1994. An integrated, tiered approach to monitoring and management of dredged material sites in the New England region. DAMOS Contribution No. 87 (SAIC Report No. 90/7575&234). US Army Corps of Engineers, New England Division, Waltham, MA.

Germano, J. D.; Rhoads, D. C.; Valente, R. M.; Carey, D. A.; Solan, M. 2011. The use of sediment profile imaging (SPI) for environmental impact assessments and monitoring Studies: Lessons learned from the past four decades. Oceanography and Marine Biology: An Annual Review 49:235-298.

Maine Department of Environmental Protection. "Class SA Waters" accessed at http://www.maine.gov/dep/water/wd/vessel/SA/index.htm on May 10, 2012

McBride, G. B. 1999. Equivalence tests can enhance environmental science and management. Australian & New Zealand Journal of Statistics 41(1): 19–29.

Rhoads, D. C.; McCall, P. L.; Yingst, J. Y. 1978. Disturbance and production on the estuarine seafloor. American Scientist 66:577–586.

SAIC 1995. Sediment capping of subaqueous dredged material disposal mounds: An overview of the New England experience 1979-1993. DAMOS Contribution No. 95. US Army Corps of Engineers, New England Division, Waltham, MA.

Schuirmann, D. J. 1987. A comparison of the two one-sided tests procedure and the power approach for assessing the equivalence of average bioavailability. Journal of Pharmacokinetics and Biopharmaceutics 15:657–680.

Silva, A.J., H.G. Brandes, C.J. Uchytil, T.J. Fredette and D. Carey. 1994. Geotechnical analysis of capped dredged material mounds. Proceedings of the Conference Dredging '94, Orlando, Florida, pp. 410-419.

USACE. 2002. Narraguagus River, Millbridge, ME Environmental Assessment and Finding of No Significant Impact. USACE New England District, Concord, MA.

USGS. 1998. Predicting the long-term fate of sediments and contaminants in Massachusetts Bay. U.S. Geological Society Fact Sheet FS 172-97.

Zar, J. H. 1996. Biostatistical Analysis, Third Edition. Prentice Hall, New Jersey.

Appendix A

Disposal Barge Logs for DIDS
February 2004 to January 2010

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/25/2004	550	420.53	44.4654	-67.851033	15 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/25/2004	312	238.555	44.46545	-67.851167	10 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/25/2004	560	428.176	44.4659667	-67.851017	20 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/25/2004	155	118.513	44.4655333	-67.851267	15 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/25/2004	155	118.513	44.4650833	-67.85075	35 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	435	332.601	44.4652667	-67.8511	20 ft	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	320	244.672	44.4652833	-67.851233	40 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	540	412.884	44.46535	-67.850983	25 ft	SW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	320	244.672	44.4653833	-67.851117	35	SW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	500	382.3	44.4662333	-67.850833	15 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/26/2004	300	229.38	44.4663667	-67.8514	30 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	500	382.3	44.4653667	-67.8513	30	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	300	229.38	44.46645	-67.851083	40	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	500	382.3	44.4653667	-67.8515	45	SW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	300	229.38	44.4655	-67.850983	15	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	500	382.3	44.4666	-67.850733	40 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	300	229.38	44.46685	-67.850767	60 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/27/2004	450	344.07	44.4665333	-67.851267	25 ft	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/28/2004	300	229.38	44.46635	-67.850667	100 ft	NW

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/28/2004	550	420.53	44.4659833	-67.851017	100 ft	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/28/2004	300	229.38	44.4662167	-67.850233	150 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/28/2004	500	382.3	44.4700667	-67.855517	40 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/28/2004	300	229.38	44.466	-67.850933	5 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	500	382.3	44.4657167	-67.851033	60 ft	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	300	229.38	44.4504333	-67.85105	150 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	500	382.3	44.4679667	-67.8516	1000 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	300	229.38	44.46715	-67.850683	700 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	500	382.3	44.4661	-67.849983	600 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	2/29/2004	300	229.38	44.4663333	-67.850483	200 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	500	382.3	44.4666	-67.851533	100	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	300	229.38	44.4503833	-67.85095	100	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	500	382.3	44.4664333	-67.851133	10 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	300	229.38	44.46625	-67.8511	15 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	500	382.3	44.4662333	-67.851317	15 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/1/2004	300	229.38	44.4662667	-67.850983	5 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	500	382.3	44.4659833	-67.8507	100 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	300	229.38	44.4658333	-67.8508	150 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	315	240.849	44.4655	-67.85185	150 ft	SW

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	300	229.38	44.4652833	-67.850133	250 ft	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	500	382.3	44.4665167	-67.8512	45 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	300	229.38	44.46635	-67.851133	25 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	500	382.3	44.4661833	-67.850517	40 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/2/2004	300	229.38	44.4655667	-67.850667	35 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	500	382.3	44.4507	-67.850883	150 ft	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	300	229.38	44.4661667	-67.851783	150	SW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	500	382.3	44.46555	-67.851817	150 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	300	229.38	44.4666	-67.85195	200 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	500	382.3	44.4664833	-67.850917	25 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	300	229.38	44.4662167	-67.850683	30 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/3/2004	500	382.3	44.4662333	-67.851333	50 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	300	229.38	44.4681333	-67.850083	900	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	500	382.3	44.4685	-67.85105	500	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	300	229.38	44.46805	-67.866467	800 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	450	344.07	44.4661833	-67.851217	25 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	300	229.38	44.4663	-67.851017	10 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	500	382.3	44.4662667	-67.850733	15 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/4/2004	300	229.38	44.4661667	-67.85125	15 ft	W

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	500	382.3	44.4663	-67.850983	50 ft	NE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	300	229.38	44.4660667	-67.851567	50 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	500	382.3	44.4658833	-67.850167	75 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	300	229.38	44.4665833	-67.8508	50 ft	NNE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	500	382.3	44.4662667	-67.851733	40 ft	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	300	229.38	44.4661333	-67.851317	15 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	500	382.3	44.4664667	-67.85125	40	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/5/2004	300	229.38	44.4662667	-67.850867	40 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	500	382.3	44.4652833	-67.850617	100 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	300	229.38	44.4661833	-67.850683	75 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	500	382.3	44.46645	-67.8511	30 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	300	229.38	44.4665333	-67.8512	100 ft	N
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	400	305.84	44.4663667	-67.851483	30 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/6/2004	300	229.38	44.4663	-67.8508	10 ft	E
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/7/2004	500	382.3	44.4656833	-67.85	50 ft	SE
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/7/2004	300	229.38	44.4655333	-67.85055	75 ft	S
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/7/2004	450	344.07	44.4666167	-67.8513	50 ft	W
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/7/2004	300	229.38	44.4663333	-67.851133	20 ft	NW
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/7/2004	500	382.3	44.4666167	-67.851017	50 ft	NE

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/8/2004	300	229.38	44.4660167	-67.851233	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/8/2004	500	382.3	44.4655833	-67.851167	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/8/2004	300	229.38	44.4655167	-67.8515	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/8/2004	500	382.3	44.46435	-67.85055	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	300	229.38	44.46565	-67.8508	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	500	382.3	44.4661667	-67.850867	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	300	229.38	44.4661833	-67.85035		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	500	382.3	44.46715	-67.85035		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	300	229.38	44.4669833	-67.849967		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/9/2004	500	382.3	44.4673667	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	300	229.38	44.466	-67.85115	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	500	382.3	44.46575	-67.8516	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	300	229.38	44.4659	-67.851167	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	500	382.3	44.4664	-67.850933		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	300	229.38	44.4665	-67.850417		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/10/2004	500	382.3	44.4667667	-67.851683		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	300	229.38	44.4658167	-67.85025	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	500	382.3	44.4655667	-67.851283	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	300	229.38	44.46625	-67.851083	N/A nobuoy	

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	500	382.3	44.46595	-67.851017	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	300	229.38	44.4661333	-67.850517		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	500	382.3	44.4666	-67.85055		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	300	229.38	44.4669667	-67.850267	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/11/2004	500	382.3	44.4674333	-67.851067	N/A	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	300	229.38	44.4664333	-67.850633	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	500	382.3	44.4657833	-67.850433	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	300	229.38	44.4660333	-67.85095	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	360	275.256	44.4662	-67.85085	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	300	229.38	44.4660333	-67.851117		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	500	382.3	44.4658833	-67.851		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/12/2004	300	229.38	44.46605	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/13/2004	500	382.3	44.4668	-67.850333	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/13/2004	300	229.38	44.4665	-67.8503	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/13/2004	300	229.38	44.4657833	-67.850967	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/13/2004	300	229.38	44.4659667	-67.85115		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/13/2004	500	382.3	44.4658833	-67.850867		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	300	229.38	44.4666833	-67.851067	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	340	259.964	44.4663667	-67.851183	N/A nobuoy	

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	300	229.38	44.4662333	-67.851233	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	495	378.477	44.4659667	-67.8511		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	300	229.38	44.4658833	-67.8511		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/14/2004	500	382.3	44.4659833	-67.851233		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	300	229.38	44.4672167	-67.851283	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	500	382.3	44.4670833	-67.850567	N/A nobuoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	300	229.38	44.4648833	-67.8504	N/A gone	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	450	344.07	44.4647	-67.851467	N/A gone	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	300	229.38	44.4664167	-67.850333		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	500	382.3	44.46585	-67.850667		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/15/2004	300	229.38	44.4657167	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	500	382.3	44.4661667	-67.850833		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	300	229.38	44.4658333	-67.850583		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	500	382.3	44.4652167	-67.851733		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	300	229.38	44.4656	-67.852567		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	500	382.3	44.4652667	-67.8514		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	300	229.38	44.4659167	-67.8513		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	500	382.3	44.4662833	-67.85075		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/16/2004	300	229.38	44.4658	-67.850917		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/17/2004	350	267.61	44.4659667	-67.8511		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/17/2004	500	382.3	44.4662167	-67.850483		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/17/2004	300	229.38	44.4662833	-67.8504		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	500	382.3	44.4662167	-67.850933		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	300	229.38	44.4658333	-67.850967		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	500	382.3	44.4659833	-67.8512		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	300	229.38	44.4659333	-67.851067		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	500	382.3	44.46595	-67.8502		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/18/2004	300	229.38	44.4659667	-67.850733		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	500	382.3	44.46585	-67.851133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	300	229.38	44.4658667	-67.851117		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	500	382.3	44.4659333	-67.8511		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	300	229.38	44.4659667	-67.851		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	500	382.3	44.4654833	-67.850967		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	300	229.38	44.4655833	-67.850883		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	500	382.3	44.46625	-67.850683		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/19/2004	300	229.38	44.4658167	-67.85085		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	500	382.3	44.4656167	-67.850567		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	300	229.38	44.46595	-67.850283		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	320	244.672	44.4656333	-67.85085		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	300	229.38	44.4655667	-67.851		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	500	382.3	44.4658833	-67.8505		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	300	229.38	44.4665333	-67.851667		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	400	305.84	44.4669167	-67.850383		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/20/2004	300	229.38	44.4666	-67.851967		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	500	382.3	44.46655	-67.850733		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	300	229.38	44.4665667	-67.8511		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	350	267.61	44.4665833	-67.850933		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	300	229.38	44.4670333	-67.850767		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	500	382.3	44.4667	-67.852133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	300	229.38	44.4667167	-67.852033		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	500	382.3	44.4667167	-67.851817		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/21/2004	300	229.38	44.4669167	-67.851833		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/22/2004	500	382.3	44.4665333	-67.85105		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/22/2004	300	229.38	44.4665	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/22/2004	500	382.3	44.46665	-67.851933		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/22/2004	300	229.38	44.46655	-67.8515		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	500	382.3	44.4664667	-67.851583		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	300	229.38	44.46645	-67.851467		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	250	191.15	44.467	-67.851133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	300	229.38	44.4665333	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	500	382.3	44.4664167	-67.851483		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	300	229.38	44.4666833	-67.851967		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	420	321.132	44.46625	-67.85165		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/23/2004	300	229.38	44.46655	-67.852		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	500	382.3	44.4578	-67.850567		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	300	229.38	44.4665	-67.85145		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	360	275.256	44.4665	-67.851783		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	300	229.38	44.4666333	-67.851767		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	500	382.3	44.466	-67.8666		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	300	229.38	44.4659333	-67.851283		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	365	279.079	44.4665333	-67.850917		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	300	229.38	44.4664167	-67.85075		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/24/2004	460	351.716	44.4671	-67.8507		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	300	229.38	44.466	-67.8501		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	500	382.3	44.4664167	-67.851783		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	300	229.38	44.4665167	-67.8522		

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	365	279.079	44.4666333	-67.8522		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	300	229.38	44.4667833	-67.851417		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	500	382.3	44.46645	-67.851133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	300	229.38	44.4664333	-67.851083		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	325	248.495	44.4665167	-67.85165		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/25/2004	300	229.38	44.4660167	-67.850917		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	550	420.53	44.4660167	-67.851883	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	300	229.38	44.4665	-67.851933	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	550	420.53	44.4666167	-67.8515	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	300	229.38	44.4683333	-67.851867	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	500	382.3	44.46645	-67.850883		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	300	229.38	44.4663167	-67.850917		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	500	382.3	44.4662333	-67.851117		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/26/2004	300	229.38	44.4665833	-67.850867		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	550	420.53	44.46665	-67.850467	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	300	229.38	44.46665	-67.851933	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	550	420.53	44.46635	-67.851933	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	300	229.38	44.4674667	-67.851433	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	500	382.3	44.4664167	-67.852717		

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	300	229.38	44.46595	-67.852033		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	425	324.955	44.4658167	-67.8529		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/27/2004	300	229.38	44.46665	-67.852017		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	550	420.53	44.4669167	-67.852	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	300	229.38	44.4663167	-67.852617	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	500	382.3	44.46665	-67.85125		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	300	229.38	44.4671167	-67.85115		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	425	324.955	44.4664333	-67.851333		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	300	229.38	44.4662667	-67.8521		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/28/2004	500	382.3	44.4671167	-67.851167		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	300	229.38	44.4659333	-67.8513	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	550	420.53	44.46665	-67.850033	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	300	229.38	44.4661167	-67.850767	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	550	420.53	44.4666167	-67.851483	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	300	229.38	44.4668	-67.8519		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	425	324.955	44.4668667	-67.85225		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	300	229.38	44.4668167	-67.85155		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	425	324.955	44.4664333	-67.852267		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/29/2004	300	229.38	44.4662333	-67.852083		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	550	420.53	44.46605	-67.8509	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	300	229.38	44.4657167	-67.851817	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	550	420.53	44.4660333	-67.8499	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	300	229.38	44.4665333	-67.8517	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	500	382.3	44.4665333	-67.852033		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	300	229.38	44.4666	-67.851783		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	500	382.3	44.4666333	-67.852117		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/30/2004	300	229.38	44.4666667	-67.8522		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	550	420.53	44.4663	-67.8515	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	300	229.38	44.4654833	-67.851783	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	450	344.07	44.46625	-67.851683	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	300	229.38	44.4669833	-67.850983	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	500	382.3	44.458	-67.852133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	300	229.38	44.4667667	-67.851667		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	500	382.3	44.4664667	-67.851817		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	3/31/2004	300	229.38	44.4665833	-67.851617		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	400	305.84	44.4662833	-67.851733	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	300	229.38	44.4658833	-67.8521	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	450	344.07	44.4663	-67.85245	No buoy	

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	300	229.38	44.4658167	-67.8523	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	500	382.3	44.4660167	-67.852333		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	300	229.38	44.45	-67.851533		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/1/2004	300	229.38	44.4668333	-67.851133		
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/2/2004	300	229.38	44.4665833	-67.852433	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/2/2004	300	229.38	44.4658167	-67.852817	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/5/2004	300	229.38	44.4655333	-67.852667	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/5/2004	300	229.38	44.4668	-67.852567	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/6/2004	300	229.38	44.4668333	-67.852517	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/6/2004	300	229.38	44.46625	-67.852783	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/6/2004	300	229.38	44.46675	-67.852083	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/7/2004	300	229.38	44.4668667	-67.852133	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/7/2004	300	229.38	44.4667167	-67.85165	No buoy	
NARRAGAUGUS RIVER	COE-NARRAGAUGUS RIVER	2004C0002	4/12/2004	300	229.38	44.4663333	-67.850767	No buoy	
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/1/2006	300	229.38	44.46618	-67.85048	40 ft	E
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/2/2006	300	229.38	44.46682	-67.85135	400 ft	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/3/2006	500	382.3	44.46653	-67.85203		W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/4/2006	500	382.3	44.46695	-67.85232	500 ft	S
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/5/2006	300	229.38	44.46678	-67.85137		E

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/6/2006	500	382.3	44.46758	-67.85182	N/A	N/A
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/7/2006	300	229.38	44.46805	-67.85243	N/A	N/A
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/8/2006	500	382.3	44.46667	-67.85293	N/A	N/A
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/9/2006	300	229.38	44.46677	-67.85297	N/A	N/A
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/10/2006	500	382.3	44.46563	-67.85297	N/A	N/A
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/11/2006	300	229.38	44.46567	-67.85132		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/12/2006	500	382.3	44.46572	-67.85138		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/13/2006	500	382.3	44.46507	-67.85158	400 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/14/2006	300	229.38	44.46532	-67.85247	500 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/15/2006	500	382.3	44.4668	-67.85045	100 ft	NE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/16/2006	300	229.38	44.46638	-67.85062	50 ft	E
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/17/2006	300	229.38	44.46755	-67.85077	600 ft	N
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/18/2006	500	382.3	44.46797	-67.85133		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/19/2006	300	229.38	44.46832	-67.85208	600 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/20/2006	500	382.3	44.46843	-67.85297	500 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/21/2006	300	229.38	44.46793	-67.85342		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/22/2006	500	382.3	44.46735	-67.85318		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/23/2006	300	229.38	44.46647	-67.85363		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/24/2006	300	229.38	44.46685	-67.85402		

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/25/2006	500	382.3	44.46682	-67.85423	400 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/26/2006	500	382.3	44.46618	-67.85048		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/27/2006	300	229.38	44.4652	-67.85215		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/28/2006	300	229.38	44.46497	-67.85222	600 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/29/2006	500	382.3	44.46577	-67.85332		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	11/30/2006	500	382.3	44.465	-67.85048		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/1/2006	300	229.38	44.4692	-67.85177		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/2/2006	300	229.38	44.46765	-67.84947		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/3/2006	500	382.3	44.46647	-67.84958	200 ft	E
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/4/2006	300	229.38	44.46752	-67.8496		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/5/2006	500	382.3	44.4676	-67.85063		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/6/2006	300	229.38	44.46823	-67.85088		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/7/2006	500	382.3	44.46865	-67.85137		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/8/2006	300	229.38	44.46865	-67.85205		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/9/2006	500	382.3	44.46932	-67.85258		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/10/2006	300	229.38	44.46972	-67.85292		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/11/2006	500	382.3	44.46903	-67.85432		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/12/2006	300	229.38	44.46873	-67.85399		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/13/2006	500	382.3	44.46803	-67.85413		

Note: Distance=distance from buoy; Direction=direction from buoy

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Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/14/2006	300	229.38	44.46765	-67.85432	500 ft	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/15/2006	500	382.3	44.4672	-67.85493		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/16/2006	420	321.132	44.46642	-67.8547		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/17/2006	300	229.38	44.46607	-67.85483		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/18/2006	400	305.84	44.46498	-67.85413		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/19/2006	300	229.38	44.4658	-67.8542	100 yds	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/20/2006	500	382.3	44.46528	-67.85003		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/21/2006	300	229.38	44.46473	-67.85048		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/22/2006	500	382.3	44.46412	-67.85287	800	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/23/2006	300	229.38	44.46495	-67.85378		SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/24/2006	300	229.38	44.46665	-67.84937		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/25/2006	300	229.38	44.46592	-67.84955	400 ft	E
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/26/2006	500	382.3	44.46683	-67.84872	250 ft	NE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/27/2006	300	229.38	44.46777	-67.84873		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/28/2006	500	382.3	44.46767	-67.84907	800 ft	NE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/29/2006	300	229.38	44.46817	-67.85003	450 ft	N
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/30/2006	500	382.3	44.46892	-67.85065	400 ft	NE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	12/31/2006	300	229.38	44.46898	-67.8514		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/1/2007	300	229.38	44.46945	-67.85205		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/2/2007	300	229.38	44.46982	-67.8523	800 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/3/2007	300	229.38	44.47035	-67.85309	600 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/4/2007	300	229.38	44.47052	-67.8538		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/5/2007	300	229.38	44.4695	-67.85387	1000 ft	SE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/6/2007	350	267.61	44.47036	-67.85404		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/7/2007	500	382.3	44.46902	-67.8542		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/8/2007	300	229.38	44.46835	-67.8547		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/9/2007	450	344.07	44.46857	-67.85474		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/10/2007	300	229.38	44.46548	-67.85478		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/11/2007	300	229.38	44.46745	-67.85524		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/12/2007	400	305.84	44.46583	-67.8557		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/13/2007	350	267.61	44.4669	-67.85571		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/14/2007	300	229.38	44.46647	-67.85578	1000	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/15/2007	300	229.38	44.46467	-67.85452		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/16/2007	350	267.61	44.46527	-67.85502		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/17/2007	300	229.38	44.46531	-67.85559		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/18/2007	500	382.3	44.46579	-67.85596		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/19/2007	400	305.84	44.46387	-67.85349		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/20/2007	300	229.38	44.46433	-67.85406		

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/21/2007	300	229.38	44.4648	-67.8547		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/22/2007	500	382.3	44.46497	-67.85607	750 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/23/2007	300	229.38	44.46682	-67.84788		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/24/2007	500	382.3	44.46755	-67.84845		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/25/2007	500	382.3	44.46401	-67.85452		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/26/2007	450	344.07	44.4643	-67.85604		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/27/2007	300	229.38	44.46458	-67.85677		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/28/2007	300	229.38	44.46397	-67.85687	1/4 mile	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/29/2007	300	229.38	44.46607	-67.84623		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/30/2007	500	382.3	44.46657	-67.8469		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	1/31/2007	500	382.3	44.46555	-67.84753		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/1/2007	300	229.38	44.4664	-67.84805		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/2/2007	500	382.3	44.46658	-67.84835		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/3/2007	300	229.38	44.46582	-67.84873		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/4/2007	300	229.38	44.46538	-67.84868		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/5/2007	500	382.3	44.46567	-67.84877		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/6/2007	500	382.3	44.46494	-67.84928		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/7/2007	500	382.3	44.46717	-67.85165		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/8/2007	500	382.3	44.46665	-67.85168		

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/9/2007	300	229.38	44.4673	-67.85173		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/10/2007	300	229.38	44.46573	-67.85202		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/11/2007	300	229.38	44.4666	-67.85208		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/12/2007	500	382.3	44.46603	-67.85227		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/13/2007	500	382.3	44.4664	-67.84965		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/14/2007	300	229.38	44.46692	-67.85043		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/15/2007	300	229.38	44.4657	-67.85108		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/16/2007	500	382.3	44.46535	-67.85158	100 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/17/2007	300	229.38	44.46538	-67.85238		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/18/2007	300	229.38	44.46761	-67.85258		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/19/2007	500	382.3	44.46711	-67.85268		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/20/2007	500	382.3	44.46581	-67.85284		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/21/2007	300	229.38	44.46693	-67.85335		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/22/2007	500	382.3	44.46721	-67.85059		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/23/2007	300	229.38	44.46766	-67.85108		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/24/2007	500	382.3	44.46792	-67.85137		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/25/2007	300	229.38	44.46835	-67.85193	200 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/26/2007	500	382.3	44.46852	-67.85252		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/27/2007	300	229.38	44.46828	-67.8532		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	2/28/2007	500	382.3	44.4679	-67.85347		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/1/2007	350	267.61	44.46445	-67.85232		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/2/2007	300	229.38	44.4651	-67.85285	250 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/3/2007	500	382.3	44.4644	-67.85337		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/4/2007	300	229.38	44.46636	-67.85365		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/5/2007	300	229.38	44.46707	-67.85388		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/6/2007	500	382.3	44.46674	-67.85411		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/7/2007	500	382.3	44.46642	-67.85052	50 ft	E
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/8/2007	300	229.38	44.4657	-67.85093	75 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/9/2007	500	382.3	44.46518	-67.85127		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/10/2007	300	229.38	44.46467	-67.85142		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/11/2007	500	382.3	44.46749	-67.84968		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/12/2007	300	229.38	44.46668	-67.8498		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/13/2007	300	229.38	44.46783	-67.85023		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/14/2007	500	382.3	44.46801	-67.85101		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/15/2007	300	229.38	44.46838	-67.85126		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/16/2007	500	382.3	44.46922	-67.85142	1000 ft	NW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/17/2007	300	229.38	44.46938	-67.85218		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/18/2007	300	229.38	44.46903	-67.8534		

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/19/2007	500	382.3	44.46987	-67.85345		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/20/2007	500	382.3	44.46865	-67.85358		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/21/2007	300	229.38	44.46515	-67.84948		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/22/2007	500	382.3	44.46513	-67.85052		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/23/2007	300	229.38	44.46457	-67.8526		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/24/2007	500	382.3	44.46495	-67.8532	500 ft	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/25/2007	500	382.3	44.46567	-67.85345	200 ft	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/26/2007	300	229.38	44.46525	-67.854	400 ft	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/27/2007	300	229.38	44.46774	-67.85401		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/28/2007	500	382.3	44.46751	-67.85426		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/29/2007	300	229.38	44.46592	-67.85432		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/30/2007	300	229.38	44.46697	-67.85465		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	3/31/2007	500	382.3	44.46654	-67.85499		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/1/2007	500	382.3	44.46685	-67.8487		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/2/2007	500	382.3	44.46711	-67.84923		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/3/2007	500	382.3	44.4662	-67.84938		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/4/2007	300	229.38	44.46663	-67.84941		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/5/2007	300	229.38	44.46815	-67.85037		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/6/2007	500	382.3	44.46815	-67.85037		

Note: Distance=distance from buoy; Direction=direction from buoy

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Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/7/2007	300	229.38	44.46634	-67.8504		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/8/2007	300	229.38	44.46843	-67.85113		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/9/2007	500	382.3	44.46939	-67.85178		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/10/2007	300	229.38	44.4697	-67.85241		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/11/2007	500	382.3	44.47022	-67.85295		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/12/2007	300	229.38	44.47077	-67.85335		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/13/2007	500	382.3	44.4703	-67.85379		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/14/2007	300	229.38	44.46954	-67.85379		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/15/2007	500	382.3	44.46927	-67.85402		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/16/2007	300	229.38	44.46887	-67.8547		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/17/2007	500	382.3	44.46819	-67.85495		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/18/2007	500	382.3	44.46443	-67.85375		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/19/2007	300	229.38	44.46468	-67.85395		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/20/2007	300	229.38	44.46567	-67.85475	400	SW
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/21/2007	500	382.3	44.46523	-67.85503		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/22/2007	300	229.38	44.46688	-67.85513		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/23/2007	500	382.3	44.46602	-67.85525		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/24/2007	500	382.3	44.46692	-67.85567		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/25/2007	300	229.38	44.4657	-67.85575		

Note: Distance=distance from buoy; Direction=direction from buoy

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February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/26/2007	500	382.3	44.4659	-67.85583		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/27/2007	300	229.38	44.46623	-67.85598		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/28/2007	300	229.38	44.46688	-67.84723	500 ft	NE
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/29/2007	500	382.3	44.46673	-67.84795		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	4/30/2007	500	382.3	44.46416	-67.85495		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/1/2007	300	229.38	44.46461	-67.85529		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/2/2007	500	382.3	44.46504	-67.85586		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/3/2007	300	229.38	44.4651	-67.85655		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/4/2007	300	229.38	44.46395	-67.85702		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/5/2007	300	229.38	44.4659	-67.84603		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/6/2007	500	382.3	44.4665	-67.84688		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/7/2007	500	382.3	44.46612	-67.84722		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/8/2007	300	229.38	44.4663	-67.84797		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/9/2007	500	382.3	44.46682	-67.8483		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/10/2007	300	229.38	44.4662	-67.84853		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/11/2007	500	382.3	44.466	-67.84776		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/12/2007	300	229.38	44.4657	-67.84887		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/13/2007	500	382.3	44.46524	-67.84929		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/14/2007	300	229.38	44.46713	-67.85215		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/15/2007	500	382.3	44.46651	-67.85244		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/16/2007	300	229.38	44.46612	-67.85175		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/17/2007	500	382.3	44.46615	-67.8518		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/18/2007	300	229.38	44.46557	-67.85206		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/19/2007	300	229.38	44.4677	-67.85241		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/20/2007	500	382.3	44.46738	-67.8525		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/21/2007	500	382.3	44.46597	-67.85277		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/22/2007	300	229.38	44.46666	-67.85293		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/23/2007	300	229.38	44.46761	-67.85087		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/24/2007	500	382.3	44.46808	-67.85164		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/25/2007	300	229.38	44.46847	-67.85229		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/26/2007	500	382.3	44.4689	-67.85297		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/27/2007	300	229.38	44.46822	-67.85306		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/28/2007	500	382.3	44.46777	-67.85359		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/29/2007	500	382.3	44.4654	-67.85103	100	W
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/30/2007	500	382.3	44.46744	-67.84953		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	5/31/2007	300	229.38	44.4668	-67.84974		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/1/2007	300	229.38	44.46781	-67.85004		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/2/2007	500	382.3	44.46638	-67.85028		

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APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/3/2007	300	229.38	44.46574	-67.85056		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/4/2007	500	382.3	44.46816	-67.85076		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/5/2007	300	229.38	44.4686	-67.85138		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/6/2007	500	382.3	44.46603	-67.8496		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/7/2007	300	229.38	44.4657	-67.84982		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/8/2007	500	382.3	44.46505	-67.85338		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/9/2007	500	382.3	44.46573	-67.8538		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/10/2007	300	229.38	44.46537	-67.85392		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/11/2007	300	229.38	44.46816	-67.85409		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/12/2007	500	382.3	44.46763	-67.85433		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/13/2007	300	229.38	44.46593	-67.85448		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/14/2007	300	229.38	44.46703	-67.85488		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/15/2007	450	344.07	44.46655	-67.85508		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/16/2007	500	382.3	44.46698	-67.84899		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/17/2007	300	229.38	44.46725	-67.84909		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/18/2007	300	229.38	44.46643	-67.84911		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/19/2007	500	382.3	44.46806	-67.84941		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/20/2007	300	229.38	44.46827	-67.8499		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/21/2007	500	382.3	44.46869	-67.85022		

Note: Distance=distance from buoy; Direction=direction from buoy

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Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/22/2007	500	382.3	44.46948	-67.85145		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/23/2007	300	229.38	44.46897	-67.85152		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/24/2007	300	229.38	44.46955	-67.85223		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/25/2007	500	382.3	44.47052	-67.85267		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/26/2007	300	229.38	44.47082	-67.85361		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/27/2007	500	382.3	44.51389	-67.85554		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/28/2007	500	382.3	44.46443	-67.8542		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/29/2007	500	382.3	44.46403	-67.85423		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	6/30/2007	300	229.38	44.4656	-67.85438		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/1/2007	300	229.38	44.46498	-67.85443		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/2/2007	300	229.38	44.46452	-67.85482		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/3/2007	500	382.3	44.46535	-67.85483		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/4/2007	500	382.3	44.4659	-67.85522		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/5/2007	350	267.61	44.46438	-67.85567		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/6/2007	300	229.38	44.4651	-67.85584		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/7/2007	300	229.38	44.46618	-67.85593		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/8/2007	500	382.3	44.46586	-67.85617		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/9/2007	300	229.38	44.46518	-67.85623		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/10/2007	300	229.38	44.46635	-67.84696		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/11/2007	500	382.3	44.46677	-67.84742		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/12/2007	300	229.38	44.46715	-67.84792		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/13/2007	75	57.345	44.46622	-67.8505		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/14/2007	300	229.38	44.46491	-67.85683		
MAINTENANCE DREDGING	COE-NARRAGUAGUS RIVER	2006C0010	7/15/2007	500	382.3	44.4641	-67.85689		
Narraguagas River			11/9/2009	240.5	183.874	-67.85258	44.46608		
Narraguagus River			11/10/2009	284.194	217.28	-67.85244	44.46712		
Narraguagus River			11/11/2009	245.663	187.821	-67.85258	44.46608		
Narraguagus River			11/12/2009	284.194	217.28	-67.85244	44.46712		
Narraguagus River			11/13/2009	245.663	187.821	-67.85258	44.46608		
Narraguagus River			11/14/2009	284.194	217.28	-67.85244	44.46712		
Narraguagas River			11/15/2009	226.858	173.443	-67.85171	44.46631		
Narraguagas River			11/16/2009	252.576	193.106	-67.85235	44.46686		
Narraguagas River			11/17/2009	233.679	178.659	-67.85332	44.46714		
Narraguagus River			11/18/2009	104.349	79.7798	-67.85193	44.46572		
Narraguagus River			11/19/2009	320.882	245.33	-67.85178	44.46612		
Narraguagus River			11/20/2009	340.056	259.989	-67.8529	44.46769		
Narraguagus River			11/21/2009	239.394	183.028	-67.85171	44.46631		
Narraguagus River			11/22/2009	241.054	184.297	-67.85235	44.46686		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
Narraguagus River			11/23/2009	221.695	169.497	-67.85332	44.46714		
Narraguagus River			11/24/2009	280.691	214.602	-67.85193	44.46572		
Narraguagus River			11/25/2009	320.882	245.33	-67.85178	44.46612		
Narraguagus River			11/26/2009	340.056	259.989	-67.8529	44.46769		
Narraguagus River			11/27/2009	239.394	183.028	-67.85171	44.46631		
Narraguagus River			11/28/2009	241.054	184.297	-67.85235	44.46686		
Narraguagus River			11/29/2009	221.695	169.497	-67.85332	44.46714		
Narraguagus River			11/30/2009	280.691	214.602	-67.85193	44.46572		
Narraguagus River			12/1/2009	320.882	245.33	-67.85178	44.46612		
Narraguagus River			12/2/2009	340.056	259.989	-67.8529	44.46769		
Narraguagas River			12/3/2009	141.129	107.9	-67.85298	44.46554		
Narraguagas River			12/4/2009	221.142	169.074	-67.85107	44.46521		
Narraguagus River			12/5/2009	394.258	301.429	-67.85338	44.46638		
Narraguagus River			12/6/2009	293.689	224.539	-67.8523	44.46519		
Narraguagus River			12/7/2009	141.129	107.9	-67.85298	44.46554		
Narraguagus River			12/8/2009	197.636	151.102	-67.85107	44.46521		
Narraguagus River			12/9/2009	394.258	301.429	-67.85338	44.46638		
Narraguagus River			12/10/2009	293.689	224.539	-67.8523	44.46519		
Narraguagus River			12/11/2009	141.129	107.9	-67.85298	44.46554		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
Narraguagus River			12/12/2009	197.636	151.102	-67.85107	44.46521		
Narraguagus River			12/13/2009	394.258	301.429	-67.85338	44.46638		
Narraguagus River			12/14/2009	293.689	224.539	-67.8523	44.46519		
Narraguagas River			12/15/2009	235.891	180.35	-67.8508	44.46651		
Narraguagas River			12/16/2009	228.978	175.064	-67.85081	44.46756		
Narraguagus River			12/17/2009	293.689	224.539	-67.86484	44.52945		
Narraguagus River			12/18/2009	303.091	231.728	-67.85089	44.46687		
Narraguagus River			12/19/2009	329.64	252.025	-67.85183	44.46743		
Narraguagus River			12/20/2009	258.291	197.476	-67.8508	44.46651		
Narraguagus River			12/21/2009	234.232	179.082	-67.85081	44.46756		
Narraguagus River			12/22/2009	293.689	224.539	-67.85087	44.46587		
Narraguagus River			12/23/2009	303.091	231.728	-67.85089	44.46687		
Narraguagus River			12/24/2009	329.64	252.025	-67.85183	44.46743		
Narraguagus River			12/25/2009	258.291	197.476	-67.8508	44.46651		
Narraguagus River			12/26/2009	234.232	179.082	-67.85081	44.46756		
Narraguagus River			12/27/2009	293.689	224.539	-67.85087	44.46587		
Narraguagus River			12/28/2009	303.091	231.728	-67.85089	44.46687		
Narraguagus River			12/29/2009	329.64	252.025	-67.85183	44.46743		
Narraguagas River			12/30/2009	218.008	166.678	-67.85233	44.46809		

Note: Distance=distance from buoy; Direction=direction from buoy

APPENDIX A
Disposal Barge Logs for DIDS
February 2004 to January 2010

Project Name	Permittee	Permit Number	Disposal Date	Volume (yd^3)	Volume (m^3)	Latitude (degrees)	Longitude (degrees)	Distance From Buoy (ft)	Direction From Buoy
Narraguagus River			12/31/2009	394.258	301.429	-67.85328	44.46842		
Narraguagus River			1/1/2010	199.572	152.582	-67.85233	44.46809		
Narraguagus River			1/2/2010	394.258	301.429	-67.85328	44.46842		
Narraguagus River			1/3/2010	199.572	152.582	-67.85233	44.46809		
Narraguagus River			1/4/2010	394.258	301.429	-67.85328	44.46842		
Narraguagas River			1/5/2010	81.6724	62.4425	-67.85402	44.46729		
Narraguagus River			1/6/2010	75.4963	57.7205	-67.85402	44.46729		
Narraguagus River			1/7/2010	75.4963	57.7205	-67.85402	44.46729		
Narraguagas River			1/8/2010	240.5	183.874	-67.85413	44.46702		

Note: Distance=distance from buoy; Direction=direction from buoy

Appendix B

Grain Size Scale Conversions

APPENDIX B
Grain Size Scale Conversions

Phi (Φ) size	Size range (mm)	Size class (Wentworth class)
< -1	> 2	Gravel
0 to –1	1 to 2	Very coarse sand
1 to 0	0.5 to 1	Coarse sand
2 to 1	0.25 to 0.5	Medium sand
3 to 2	0.125 to 0.25	Fine sand
4 to 3	0.0625 to 0.125	Very fine sand
> 4	< 0.0625	Silt/clay

Appendix C

Sediment-Profile Imaging Results

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
DIDS-01	B	14	3	10/13/2011	9:03:29	35	14.6	4-3/>4	0	>4	259.0	17.8	17.6	18.0	0.3	B	54.7	3.8	0	-	none	No	>17.8	0	-	-		1 on 3	Silty very fine sand over silt clay, somewhat coarser near surface with bits of debris incorporated. Few thin tubes at surface. Few sand-lined burrows. Thin polychaete near base of aRPD on left. Multiple burrows & voids with DM layer visible on top of former SWI horizon (approximately 15.75 cm below current SWI)
DIDS-01	C	14	3	10/13/2011	9:04:20	35	14.6	4-3/>4	0	>4	249.3	17.1	16.8	17.3	0.5	B	28.6	2.0	1	r	none	No	>17.1	0	-	-		1 on 3	Silty very fine sand over silt-clay, somewhat coarser near surface with bits of debris incorporated. Medium mud clast (wiper artifact) on surface. Short tubes on surface. Small thin polychaete near base of aRPD on left. Relict SWI at depth.
DIDS-01	D	14	3	10/13/2011	9:05:09	35	14.6	4-3/>4	0	>4	255.2	17.5	17.4	17.7	0.3	B	43.6	3.0	1	o	none	No	>17.5	3	4.6	9.1	6.8	1 on 3	Silty very fine sand over silt-clay, somewhat coarser near surface with bits of debris incorporated. Few short tubes at SWI. Small mud clast at surface. Few small polychaetes near base of aRPD. Two voids are right below aRPD, transected burrows @ depth.
DIDS-02	B	14	3	10/13/2011	8:49:58	33	14.6	4-3/>4	0	>4	215.8	14.8	13.6	15.7	2.1	B	29.3	2.0	0	-	none	No	>14.8	1	3.7	4.6	4.1	1 on 3	Silty very fine and fine sand over silt-clay. Debris at surface, including two larger white bivalve shells at surface. Few sand-lined burrows and small polychaetes. Void is just below oxidized sed, evidence of more burrowing at depth.
DIDS-02	C	14	3	10/13/2011	8:50:50	33	14.6	4-3/>4	0	>4	263.5	18.1	16.3	19.4	3.1	B	23.0	1.6	0	-	none	No	>18.1	2	2.8	9.7	6.2	1 on 3	Silty very fine and fine sand over silt-clay. Bits of coarser sed and debris at SWI. Discontinuous aRPD. Voids are small, one w/in aRPD on right. Evidence of burrowing at base of aRPD as well as vertical burrow on right and one at base of image in center.
DIDS-02	D	14	3	10/13/2011	8:51:40	33	14.6	4-3/>4	0	>4	257.3	17.7	17.3	18.2	0.9	B	20.6	1.4	3	o, r	none	No	>17.7	1	5.2	5.4	5.3	1 on 3	Silty very fine and fine sand over sit clay. Bits of coarser sed, debris, and one thin tube at SWI. Mud clasts at surface on right. Evidence of burrowing and small polychaetes within aRPD. Evidence of burrowing at depth.
DIDS-03	B	14	3	10/13/2011	9:09:47	37	14.6	4-3/>4	1	>4	286.5	19.7	19.3	20.3	1.0	B	73.6	5.0	2	o, r	none	No	>19.7	0	-	-		2 on 3	Silty very fine sand over silt-clay. Small-medium mud clasts on surface. Bits of debris incorporated in aRPD. Deep aRPD with evidence of burrowing and small polychaetes. Collapsed, filled-in void, visible burrow near void area at mid-depth.
DIDS-03	C	14	3	10/13/2011	9:10:37	37	14.6	4-3/>4	1	>4	267.9	18.4	18.0	19.0	1.0	B	52.7	3.6	0	-	none	No	>18.4	0	-	-		2 on 3	Silty very fine sand over silt-clay. Small mud clasts on surface. Some small tubes in background. Evidence of burrowing through and below aRPD, burrow transected in lower right quadrant.
DIDS-03	D	14	3	10/13/2011	9:11:28	37	14.6	4-3/>4	1	>4	271.5	18.6	18.3	18.9	0.6	B	63.8	4.4	0	-	none	No	>18.6	0	-	-		1 on 3	Silty very fine sand over silt-clay. Multiple tiny tubes at SWI. Small burrows and polychaetes through aRPD, evidence of burrowing at depth.
DIDS-04	A	14	3	10/13/2011	8:05:13	33	14.6	>4	2	>4	237.2	16.3	15.4	17.0	1.6	B	9.5	0.7	0	-	none	No	>16.3	4	2.2	9.8	6.0	1 on 3	Silty very fine sand over silt-clay in upper couple cm. Thin, discontinuous aRPD. Small, thin burrows in aRPD. Few medium polychaetes cms below aRPD. One void w/ reduced fecal pellets.
DIDS-04	B	14	3	10/13/2011	8:06:03	33	14.6	4-3/>4	2	>4	216.0	14.8	14.1	15.7	1.6	P	44.3	3.0	0	-	none	No	>14.8	3	4.0	5.6	4.8	1 on 3	Sitl, grading to very fine sand. Short tubes at SWI and in background. Small void at base of aRPD, voids below aRPD. Evidence of small burrowing polychaetes in aRPD.
DIDS-04	C	14	3	10/13/2011	8:06:51	33	14.6	>4	2	>4	237.2	16.3	16.0	16.7	0.8	B	16.4	1.1	2	o, r	none	No	>16.3	1	5.3	8.5	6.9	1 on 3	Silty very fine sand over silt-clay. Shallow burrowing in aRPD. Several capitellids below aRPD and at mid-depth. Larger polychaete at 13.2cm. Void is large and multi-level.
DIDS-05	A	14	3	10/13/2011	10:23:00	40	14.6	4-3/>4	2	>4	252.6	17.3	17.0	17.6	0.6	B	75.7	5.2	2	o	none	No	>17.3	2	8.5	11.5	10.0	1 on 3	Silty very fine sand over silt-clay. Bits of debris and multiple tubes at SWI. Mud clasts at surface. Few thin polychaetes throughout aRPD, evidence of burrowing throughout entire profile beyond base of image.
DIDS-05	B	14	3	10/13/2011	10:23:49	40	14.6	4-3/>4	2	>4	230.3	15.8	15.5	16.9	1.4	B	50.1	3.4	0	-	none	No	>15.8	0	-	-		1 on 3	Silty very fine sand over silt-clay. Evidence of burrowing and thin polychaetes throughout aRPD. Evidence of larger burrowing fauna at base of aRPD.
DIDS-05	C	14	3	10/13/2011	10:24:41	40	14.6	4-3/>4	1	>4	273.8	18.8	18.5	18.9	0.4	B	62.8	4.3	0	-	none	No	>18.8	0	-	-		1 on 3	Silty very fine sand over silt-clay. Shallow burrowing and evidence of burrowing and thin polychaetes throughout aRPD. Evidence of larger burrowing fauna at base of aRPD.
DIDS-06	C	14	3	10/13/2011	8:24:55	36	14.6	4-3/>4	0	>4	96.7	6.6	6.3	7.1	0.8	B	26.1	1.8	0	-	none	No	>6.6	1	5.1	5.7	5.4	2 on 3	Silty very fine sand over silt-clay, thin layer of coarser fine sand at SWI. Evidence of burrowing and thin polychaetes throughout aRPD.
DIDS-06	E	16	5	10/13/2011	11:13:48	42	14.6	>4	2	>4	84.5	5.8	5.1	6.3	1.2	P	13.3	0.9	0	-	none	No	>5.8	0	-	-		1 on 3	Silty very fine sand over silt-clay. Bits of plant/algal debris at surface. Discontinuous aRPD. Larger capitellid head-down at left at 3.55 cm. Burrows transected at depth.
DIDS-06	F	16	5	10/13/2011	11:14:41	42	14.6	4-3/>4	-1	>4	107.5	7.4	7.0	7.6	0.6	P	24.3	1.7	4	o, r	none	No	>7.4	0	-	-		1 on 3	Silty very fine sand over silt-clay, coarser in upper cms. One medium and four large mud clasts at surface. One large amphipod tube at SWI at rihgt; few short tubes in background. Burrowing @ depth.
DIDS-07	B	14	3	10/13/2011	8:13:07	36	14.6	4-3/>4	1	>4	81.1	5.6	5.4	5.9	0.5	B	30.0	2.1	0	-	none	No	>5.6	1	3.0	3.2	3.1	2 on 3	Compact, silty very fine sand over silt. Shallow burrowing. Couple small polychaetes at base of aRPD. Small void just below aRPD.
DIDS-07	C	14	3	10/13/2011	8:14:15	36	14.6	3-2/>4	-1	>4	139.8	9.6	8.8	10.1	1.4	B	26.4	1.8	0	-	none	No	>9.6	0	7.4	7.7	7.6	2 on 3	Silty fine sand over silt-clay. Debris, shell frag, pebbles on surface. Evidence of shallow burrowing in upper cm. Void in lower left & burrowing throughout depth of profile.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
DIDS-07	D	14	3	10/13/2011	8:15:01	36	14.6	4-3/>4	0	>4	152.4	10.5	10.1	10.7	0.6	B	21.1	1.4	0	-	none	No	>10.5	0	-	-		1 on 3	Silty very fine sand over silt-clay. Coarser grains at surface. Bits of debris at SWI. Shallow burrowing. Couple small polychaetes at base of aRPD on right, possible capitellids.
DIDS-08	A	14	3	10/13/2011	9:56:34	39	14.6	>4	2	>4	237.0	16.3	15.8	16.6	0.8	B	22.4	1.5	0	-	none	No	>16.3	4	2.9	4.6	3.8	1 on 3	Very fine sandy silt-clay. Shallow burrowing in aRPD, blue clay inclusions @ depth typical of DM layer.
DIDS-08	B	14	3	10/13/2011	9:57:22	39	14.6	4-3/>4	1	>4	243.1	16.7	16.5	17.0	0.5	B	45.7	3.1	5	o, r	none	No	>16.7	1	4.1	4.3	4.2	2 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Evidence of burrowing through aRPD, former SWI horizon visible at base of image.
DIDS-08	D	14	3	10/13/2011	9:59:16	39	14.6	4-3/>4	1	>4	269.9	18.5	18.2	18.8	0.6	B	63.1	4.3	0	-	none	No	>18.5	1	6.5	16.5	11.5	2 on 3	Silty very fine sand over silt-clay. Few very thin tubes at surface. Several thin polychaetes in aRPD and evidence of larger burrows in aRPD on right. Void is more of a long open burrow that extends over half the image.
DIDS-09	B	14	3	10/13/2011	10:03:50	39	14.6	4-3/>4	1	>4	240.4	16.5	15.9	17.1	1.2	P	69.8	4.8	1	r	none	No	>16.5	3	5.4	7.3	6.3	2 on 3	Silty very fine sand over silt-clay. Surface slopes down to right. Short, old/collapsed tubes at surface. Evidence of fomer SWI horizon at depth
DIDS-09	C	14	3	10/13/2011	10:04:40	39	14.6	4-3/>4	2	>4	252.1	17.3	16.8	17.7	0.9	B	79.6	5.5	0	-	none	No	>17.3	1	6.5	6.9	6.7	2 on 3	Silty very fine sand over silt-clay. Evidence of burrowing throughout entire profile; former SWI horizon visible at approx 12.2 cm
DIDS-09	D	14	3	10/13/2011	10:05:32	39	14.6	4-3/>4	2	>4	248.7	17.1	16.7	17.5	0.8	B	58.2	4.0	0	-	none	No	>17.1	4	4.3	11.6	7.9	3	Silty very fine sand over silt-clay. Voids are thin. Evidence of burrowing through aRPD.
DIDS-10	B	14	3	10/13/2011	8:18:45	35	14.6	4-3	1	>4	48.3	3.3	3.0	3.7	0.7	P	26.6	1.8	10	r	none	No	>3.3	0	-	-		ind	Compact silty very fine sand. Small to medium mud clasts on surface. Couple thin polychaetes in aRPD. Insufficient penetration to determine successional stage
DIDS-10	C	14	3	10/13/2011	8:19:37	35	14.6	4-3/>4	1	>4	102.4	7.0	6.5	7.7	1.2	P	40.6	2.8	0	-	none	No	>7.0	0	-	-		2 on 3	Compact silty very fine sand over silt. Shallow burrowing. Few small polychaetes, with one at base of aRPD at 3.6 cm. Burrow transected on left near base of aRPD.
DIDS-10	D	14	3	10/13/2011	8:20:28	35	14.6	4-3/>4	1	>4	144.9	9.9	9.3	10.4	1.1	B	24.0	1.6	6	o, r	none	No	>9.9	3	3.1	6.6	4.9	1 on 3	Silty very fine sand over silt-clay. Small mud clasts on surface; patchy area of reduced sediment on surface at middle. Few short tubes at surface.
DIDS-11	A	14	3	10/13/2011	7:59:05	33	14.6	4-3/>4	1	>4	147.2	10.1	9.8	10.3	0.5	B	37.1	2.5	0	-	none	No	>10.1	0	-	-		1 on 3	Silty very fine sand over silt-clay. Couple thin polychaetes at base of aRPD. Former SWI and sandy horizon at base of image.
DIDS-11	B	14	3	10/13/2011	7:59:52	33	14.6	>4	1	>4	225.9	15.5	14.4	16.4	2.0	B	36.2	2.5	0	-	none	No	>15.5	2	3.0	9.7	6.4	1 on 3	Silty very fine sand over silt-clay. Few thin and short tubes at surface. Two polychaete on right at 2.2 and 4.1 cms; burrow enlarged by prism artifact of dragging shell or debris.
DIDS-11	C	14	3	10/13/2011	8:00:43	33	14.6	4-3/>4	1	>4	252.2	17.3	17.2	17.7	0.5	B	58.5	4.0	7	r	none	No	>17.3	5	5.0	16.9	11.0	2 on 3	Silty very fine sand over silt-clay. Small to large mud clasts at surface. Few short tubes at SWI. Evidence of burrowing in aRPD as well as at base of image.
DIDS-12	B	14	3	10/13/2011	10:49:42	40	14.6	>4	2	>4	242.6	16.6	16.4	17.1	0.7	B	20.9	1.4	0	-	none	No	>16.6	1	3.4	4.0	3.7	1 on 3	Very fine sandy silt-clay. Ripple on surface. Former SWI horizon visible at base of image, evidence of burrowing throughout profile.
DIDS-12	C	14	3	10/13/2011	10:50:35	40	14.6	>4	1	>4	286.1	19.6	19.1	19.9	0.8	B	19.8	1.4	2	r	none	No	>19.6	0	-	-		2 on 3	Vvery fine sandy silt-clay. Small mud clasts at surface. Small bivalve ~2cm below SWI on left. Mottled sediment fabric typical of dredged material, burrowing at depth.
DIDS-12	D	14	3	10/13/2011	10:51:24	40	14.6	>4	1	>4	221.3	15.2	14.8	15.4	0.6	B	20.2	1.4	100+	o, r	none	No	>15.2	2	2.8	5.4	4.1	1 on 3	Very fine sandy silt-clay. Numerous very small mud clasts (camera artifacts) at surface. Shallow burrowing in upper cm as well as throughout profile.
DIDS-13	A	14	3	10/13/2011	9:49:40	38	14.6	4-3/>4	2	>4	289.3	19.9	19.7	20.3	0.5	B	91.7	6.3	0	-	none	No	>19.9	4	6.4	16.4	11.4	2 on 3	Silty very fine sand over silt-clay. Evidence of burrowing through aRPD. Higher bioturbation/density of Stage 3 taxa compared with previous stations sampled.
DIDS-13	B	14	3	10/13/2011	9:50:27	38	14.6	4-3/>4	1	>4	259.7	17.8	17.4	18.1	0.7	B	54.5	3.7	0	-	none	No	>17.8	4	2.6	17.7	10.1	2 on 3	Silty very fine sand over silt-clay. One void near base of aRPD. Evidence of burrowing in aRPD. Area below aRPD with bits of debris incorporated.
DIDS-13	D	14	3	10/13/2011	9:51:57	38	14.6	4-3/>4	2	>4	310.7	21.3	20.6	21.8	1.2	B	45.4	3.1	0	-	none	No	>21.3	10	5.0	20.2	12.6	2 on 3	Silty very fine sand over silt-clay. Left half of image, slight over-penetration. Evidence of burrowing throughout aRPD, highly bioturbated.
DIDS-14	A	14	3	10/13/2011	7:52:53	32	14.6	4-3/>4	0	>4	272.3	18.7	18.1	19.2	1.1	B	54.2	3.7	0	-	none	No	>18.7	1	17.4	18.3	17.8	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Evidence of burrowing throughout profile.
DIDS-14	C	14	3	10/13/2011	7:54:26	32	14.6	4-3/>4	1	>4	269.5	18.5	17.9	19.0	1.2	B	47.2	3.2	8	o, r	none	No	>18.5	3	3.9	11.8	7.8	1 on 3	Silty very fine sand over silt-clay. Surface slopes down to right. Small mud clasts at surface. Evidence of burrowing throughout profile, highly bioturbated.
DIDS-14	D	14	3	10/13/2011	7:55:15	32	14.6	4-3/>4	1	>4	257.7	17.7	17.5	18.0	0.6	B	79.4	5.5	6	o, r	none	No	>17.7	3	5.6	8.7	7.2	1 on 3	Silty very fine sand over silt-clay. Two thin capitellids near center at base of aRPD at 4.5 cm. Evidence of burrowing throughout profile, all 3 reps similar.
DIDS-15	B	14	3	10/13/2011	10:56:13	39	14.6	4-3/>4	1	>4	238.2	16.3	16.1	16.5	0.4	B	51.5	3.5	0	-	none	No	>16.3	1	3.3	4.0	3.7	1 on 3	Silty very fine sand over silt-clay. Some short tubes, possible amphipods, at SWI. Evidence of burrowing throughout profile and former SWI horizon visible at depth.
DIDS-15	C	14	3	10/13/2011	10:57:04	39	14.6	4-3/>4	1	>4	225.8	15.5	15.3	15.8	0.5	B	51.4	3.5	0	-	none	No	>15.5	2	13.8	14.8	14.3	2 on 3	Silty very fine sand over silt-clay. Evidence of burrowing throughout profile and former SWI horizon visible at depth.
DIDS-15	D	14	3	10/13/2011	10:57:52	39	14.6	4-3/>4	2	>4	247.2	17.0	16.8	17.1	0.3	B	40.2	2.8	8	o, r	none	No	>17.0	3	5.7	9.4	7.6	2 on 3	Silty very fine sand over silt-clay. Small to large mud clasts at surface. Couple thin polychaetes at base of aRPD. Part of infauna visible in upper void.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
DIDS-16	A	14	3	10/13/2011	10:17:06	39	14.6	4-3/>4	1	>4	259.7	17.8	17.5	18.1	0.6	B	60.4	4.1	0	-	none	No	>17.8	2	14.3	15.4	14.8	2 on 3	Silty very fine sand over silt-clay. Polychates visible at SWI and at depth against faceplate. Evidence of burrowing throughout profile, former SWI horizon @ depth.
DIDS-16	B	14	3	10/13/2011	10:17:56	39	14.6	4-3/>4	1	>4	254.3	17.5	17.0	17.9	0.8	B	50.3	3.4	0	-	none	No	>17.5	1	12.6	13.0	12.8	1 on 3	Silty very fine sand over silt-clay. Burrowing throughout profile, fomer SWI & redox layer @ depth.
DIDS-16	D	14	3	10/13/2011	10:19:38	39	14.6	4-3/>4	1	>4	240.8	16.5	16.3	16.8	0.5	B	59.8	4.1	10+	o, r	none	No	>16.5	2	8.3	9.4	8.9	1 on 3	Silty very fine sand over silt-clay. Small to medium-large mud clasts at surface. Polychaete at 5.5 cm, former SWI & redox layer @ depth.
DIDS-17	A	14	3	10/13/2011	10:40:47	40	14.6	4-3/>4	1	>4	212.3	14.6	14.4	14.9	0.5	B	58.6	4.0	0	-	none	No	>14.6	0	-	-		2 on 3	Silty very fine sand over silt-clay. Some macrophyte/plant material on surface. Neried against faceplate at depth on right.
DIDS-17	B	14	3	10/13/2011	10:41:35	40	14.6	4-3/>4	1	>4	261.0	17.9	17.6	18.2	0.6	B	54.7	3.8	0	-	none	No	>17.9	0	-	-		1 on 3	Silty very fine sand over silt-clay. Few short tubes at SWI. Burrowing throughout profile, transected burrow in lower right quadrant.
DIDS-17	C	14	3	10/13/2011	10:42:27	40	14.6	4-3/>4	1	>4	254.7	17.5	17.0	17.8	0.9	B	72.7	5.0	0	-	none	No	>17.5	1	6.1	7.5	6.8	2 on 3	Silty very fine sand over silt-clay. Edge of void transected just below aRPD at center.
DIDS-18	A	14	3	10/13/2011	10:09:32	38	14.6	4-3/>4	1	>4	213.1	14.6	14.4	15.1	0.7	B	42.5	2.9	4	o	none	No	>14.6	1	8.6	9.2	8.9	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Shallow burrows and couple thin polychaetes at base of aRPD. Relict aRPD and former SWI @ depth
DIDS-18	B	14	3	10/13/2011	10:10:21	38	14.6	4-3/>4	1	>4	233.9	16.1	15.5	16.9	1.4	B	36.4	2.5	0	-	none	No	>16.1	1	7.4	7.8	7.6	2 on 3	Silty very fine sand over silt-clay. aRPD is deeper on right. Burrowing in aRPD, at least down to 2.5 cm. Relict aRPD at depth
DIDS-18	D	14	3	10/13/2011	10:12:01	38	14.6	4-3/>4	1	>4	251.7	17.3	16.4	18.0	1.6	P	ind	2.4	8	o, r	none	No	>17.3	1	12.6	12.9	12.8	1 on 3	Silty very fine sand over silt-clay; aRPD obscured by smearing of artifact mud clasts, based on linear measurement. Evidence of burrowing @ depth and fomer SWI visible.
DIDS-19	A	14	3	10/13/2011	11:03:45	43	14.6	4-3/>4	0	>4	241.5	16.6	15.8	17.9	2.1	B	13.2	0.9	0	-	none	No	>16.6	7	2.3	10.3	6.3	1 on 3	Silty very fine sand over silt-clay, few coarser grains at surface. DM greater than penetration, evidence of burrowing throughout profile.
DIDS-19	B	14	3	10/13/2011	11:04:30	43	14.6	>4	2	>4	182.8	12.5	10.2	13.5	3.3	P	4.7	0.3	0	-	none	No	>12.5	4	1.3	12.3	6.8	1 on 3	Silt-clay, classic texture of recent DM disposal recolonized by underlying fauna. DM > penetration.
DIDS-19	D	14	3	10/13/2011	11:06:18	43	14.6	4-3/>4	1	>4	290.3	19.9	19.3	20.9	1.6	B	17.1	1.2	0	-	none	No	>19.9	8	1.7	18.6	10.2	1 on 3	Silty very fine sand over silt-clay. DM > penetration, similar to previous rep, heavily bioturbated.
DIDS-20	A	14	3	10/13/2011	8:55:44	35	14.6	4-3/>4	1	>4	213.8	14.7	14.3	15.3	1.0	B	16.9	1.2	0	-	none	No	>14.7	5	3.7	10.2	7.0	1 on 3	Silty very fine sand over silt-clay. DM > penetration, clay inclusions throughout profile, extensive evidence of bioturbation.
DIDS-20	C	14	3	10/13/2011	8:57:25	35	14.6	4-3/>4	2	>4	238.9	16.4	15.4	17.1	1.7	P	7.8	0.5	6	r	none	No	>16.4	0	-	-		1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface (wiper blade artifacts). Evidence of burrowing throughout profile.
DIDS-20	D	14	3	10/13/2011	8:58:23	35	14.6	4-3/>4	2	>4	223.0	15.3	14.7	16.1	1.5	B	8.8	0.6	3	r	none	No	>15.3	2	3.4	8.3	5.8	1 on 3	Silty very fine sand over silt-clay. DM > penetration, similar to rep A, heavily bioturbated.
DIDS-21	B	14	3	10/13/2011	8:42:16	38	14.6	>4	1	>4	253.5	17.4	17.2	17.9	0.7	B	14.0	1.0	3	o, r	none	No	>17.4	2	10.6	17.1	13.9	1 on 3	Silt-clay with a minor fraction of very fine sand in the top 1-2 cm. Small mud clasts at surface. Few small tubes at surface.
DIDS-21	C	14	3	10/13/2011	8:43:08	38	14.6	4-3/>4	1	>4	253.7	17.4	16.9	17.7	0.8	B	13.9	1.0	2	o, r	none	No	>17.4	3	4.2	10.2	7.2	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Few short tubes at SWI. DM > pen as in previous image. Polychaete visible in upper void.
DIDS-21	D	14	3	10/13/2011	8:43:59	38	14.6	4-3/>4	1	>4	264.7	18.2	17.7	18.5	0.8	B	59.9	4.1	1	r	none	No	>18.2	1	5.9	16.8	11.3	1 on 3	Silty very fine sand over silt-clay. Few tubes at surface. Former SWI visible at depth.
NREF-01	A	16	5	10/12/2011	15:48:34	34	14.6	4-3/>4	1	>4	164.0	11.3	10.5	11.8	1.3	B	39.4	2.7	0	-	none	No	0	2	2.3	5.6	3.9	1 on 3	Silty very fine sand over silt-clay. Slightly higher sand component than sediments on disposal site and much higher bearing strength.
NREF-01	B	16	5	10/12/2011	15:49:15	34	14.6	4-3/>4	1	>4	160.2	11.0	10.7	11.2	0.5	B	60.9	4.2	1	o	none	No	0	1	4.4	4.6	4.5	1 on 3	Silty very fine sand over silt-clay. Edge of void transected just below aRPD at center; similar to previous rep.
NREF-01	D	16	5	10/12/2011	15:50:43	34	14.6	4-3/>4	1	>4	138.0	9.5	8.7	10.1	1.4	B	25.6	1.8	0	-	none	No	0	2	7.3	8.8	8.1	2 on 3	Silty very fine sand over silt-clay. Two wide burrows extending down from SWI, horizontal burrows/galleries transected @ depth.
NREF-02	B	16	5	10/12/2011	16:01:16	35	14.6	>4	2	>4	267.1	18.3	17.8	18.8	1.0	B	42.7	2.9	0	-	none	No	0	2	12.2	18.2	15.2	2 on 3	Very fine sandy silt-clay. Large, wide burrow open to SWI. Bioturbation depth exceeds prism penetration depth.
NREF-02	C	16	5	10/12/2011	16:02:06	35	14.6	4-3/>4	2	>4	276.8	19.0	18.9	19.3	0.4	B	60.5	4.2	4	o, r	none	No	0	2	7.4	11.2	9.3	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Evidence of burrowing throughout profile.
NREF-02	D	16	5	10/12/2011	16:02:53	35	14.6	4-3/>4	1	>4	257.8	17.7	17.3	18.2	0.8	B	45.3	3.1	7	r	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Small to medium mud clasts at surface (camera artifacts). Couple small tubes. Evidence of burrowing throughout profile.
NREF-03	A	16	5	10/12/2011	16:05:52	35	14.6	4-3/>4	1	>4	249.8	17.1	17.0	17.5	0.5	B	37.4	2.6	0	-	none	No	0	0	-	-		2 on 3	Silty very fine sand over silt-clay. Small to large fecal pelletson surface, several small polychaetes near base of aRPD. One long burrow extending from SWI to depth on right.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
NREF-03	B	16	5	10/12/2011	16:06:35	35	14.6	4-3/>4	1	>4	243.5	16.7	16.6	17.1	0.5	B	43.3	3.0	0	-	none	No	0	1	11.4	13.0	12.2	2 on 3	Silty very fine sand over silt-clay. Couple small polychaetes near base of aRPD, ~2.5 cm, one in u-shape. Possible small bivalve at SWI to right, burrowing throughout profile.
NREF-03	C	16	5	10/12/2011	16:07:21	35	14.6	4-3/>4	1	>4	237.1	16.3	16.1	16.6	0.6	B	35.7	2.4	0	-	none	No	0	1	6.5	7.0	6.8	2 on 3	Silty very fine sand over silt-clay. One polychaete at base of aRPD at ~3.43cm. Burrow lumen bisected at depth. Bits of white shell fragments at mid-depth
NREF-04	B	16	5	10/12/2011	16:12:33	36	14.6	4-3/>4	1	>4	200.4	13.8	13.3	14.0	0.7	B	41.2	2.8	0	-	none	No	0	0	-	-		2 on 3	Silty very fine sand over silt-clay. Evidence of burrowing and small thin polychaetes visible near base of aRPD. Indications of deeper burrowing throughout profile.
NREF-04	C	16	5	10/12/2011	16:13:20	36	14.6	>4	0	>4	218.1	15.0	14.6	15.2	0.7	B	47.8	3.3	0	-	none	No	0	0	-	-		1 on 3	Very fine sandy silt. Burrowing in aRPD. Capitellid at 4 cm on right. Indication of larger burrower at base of aRPD to right of center.
NREF-04	D	16	5	10/12/2011	16:14:05	36	14.6	>4	1	>4	221.5	15.2	14.7	16.0	1.3	B	50.0	3.4	3	o, r	none	No	0	0	-	-		1 on 3	Very fine sandy silt. Small mud clasts at SWI on right. Pocket of small oblong fecal pellets just below SWI at far left. Small polychaetes visible against faceplate.
NREF-05	D	14	4	10/12/2011	14:34:45	40	14.6	4-3/>4	0	>4	154.5	10.6	10.5	10.8	0.2	B	40.9	2.8	0	-	none	No	0	2	3.2	9.8	6.5	1 on 3	Silty very fine sand over silt-clay, some coarser grains near surface. Few parts of small polychaetes visible near base of aRPD, including one capitellid.
NREF-05	E	16	5	10/12/2011	15:42:37	37	14.6	4-3/>4	1	>4	158.5	10.9	10.5	11.3	0.8	B	35.7	2.4	0	-	none	No	0	1	7.0	7.6	7.3	1 on 3	Silty very fine sand over silt-clay. Multiple tubes @ SWI and thin polychaetes near base of aRPD. Burrowing throughout depth of profile.
NREF-05	F	16	5	10/12/2011	15:43:20	37	14.6	4-3/>4	0	>4	164.3	11.3	10.9	11.7	0.9	B	17.0	1.2	0	-	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay, thin layer of darker coarser sand grains at SWI. Two capitellids at ~4.3cm; few other thin polychaetes visible above. Part of larger infauna visible at 8.75 cm.
NREF-06	A	16	5	10/12/2011	15:54:17	33	14.6	4-3/>4	1	>4	173.3	11.9	11.8	12.2	0.4	B	41.3	2.8	0	-	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Small bits of algal debris at SWI. Small polychaete fragment visible near base of aRPD at middle. Edge of burrow transected at depth.
NREF-06	B	16	5	10/12/2011	15:55:02	33	14.6	4-3/>4	0	>4	170.9	11.7	11.5	12.1	0.6	B	56.5	3.9	0	-	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Tubes at surface, thin polychaetes at base of aRPD on right. Infauna bisected against faceplate at 6.5cm.
NREF-06	C	16	5	10/12/2011	15:55:48	33	14.6	4-3/>4	0	>4	164.3	11.3	10.7	11.6	0.9	B	39.5	2.7	0	-	none	No	0	5	2.7	10.1	6.4	1 on 3	Silty very fine sand over silt-clay. Small tubes at SWI. Burrowing through aRPD. Infauna fragment visible in deepest void. Bioturbation depth > prism penetration depth.
SEREF-01	A	14	3	10/13/2011	13:06:25	46	14.6	4-3/>4	1	>4	257.1	17.6	17.3	18.0	0.7	B	59.3	4.1	2	o	none	No	0	1	13.8	16.9	15.4	2 on 3	Silty very fine sand over silt-clay. Many very small white shell fragments and other bits of debris incorporated in upper 2 cms. Bioturbation depth > prism penetration.
SEREF-01	B	14	3	10/13/2011	13:07:31	46	14.6	4-3/>4	1	>4	256.6	17.6	17.3	18.2	0.9	B	63.0	4.3	0	-	none	No	0	7	6.2	17.3	11.8	1 on 3	Silty very fine sand over silt-clay. Many very small white shell fragments incorporated in upper cms;.small thin tubesat surface. Bioturbation depth > penetration.
SEREF-01	C	14	3	10/13/2011	13:08:24	46	14.6	3-2/>4	1	>4	214.6	14.7	14.4	15.0	0.6	B	41.9	2.9	0	-	none	No	0	2	3.1	11.7	7.4	2 on 3	Silty fine sand over silt-clay. Small white bivalve just below SWI near center. Polychaete- looks like Pectinaria- at ~8cm to right of center.
SEREF-02	E	14	3	10/13/2011	11:44:40	44	14.6	4-3/>4	1	>4	269.0	18.5	17.7	19.4	1.7	B	43.1	3.0	0	-	none	No	0	3	5.1	15.3	10.2	2 on 3	Silty very fine sand over silt-clay. Short tubes at surface. aRPD is relatively thin given amount of deeper burrowing. Thin polychaete at depth.
SEREF-02	F	14	3	10/13/2011	11:45:30	44	14.6	4-3/>4	1	>4	272.3	18.7	18.3	19.3	1.0	B	65.6	4.5	0	-	none	No	0	4	10.7	15.9	13.3	1 on 3	Silty very fine sand over silt-clay. Small tubes and debris at surface. Polychaete at base of aRPD to left. Burrowing throughout profile.
SEREF-02	G	14	3	10/13/2011	11:46:17	44	14.6	4-3/>4	0	>4	236.5	16.2	15.4	17.1	1.7	B	49.9	3.4	7	o, r	none	No	0	2	5.2	13.2	9.2	1 on 3	Silty very fine sand over silt-clay. Short tubes, some in background may be amphipod tubes, and collapsed tubes at SWI. Almost completely filled in large void at depth.
SEREF-03	A	14	3	10/13/2011	13:12:19	42	14.6	4-3/>4	1	>4	212.0	14.6	14.1	14.9	0.8	B	44.4	3.0	3	o	none	No	0	2	3.9	9.8	6.9	2 on 3	Silty very fine sand over silt-clay. Reduced fecal mound at SWI. Podocerid tube at right above SWI, bioturbation to depth of penetration.
SEREF-03	C	14	3	10/13/2011	13:13:54	42	14.6	>4	1	>4	133.5	9.2	8.1	10.3	2.2	P	ind	Ind	4	o	none	No	0	0	-	-		tage 3	Very fine sandy silt, SWI and aRPD disturbed by previous replicate imaging. Polychaete at 7.8cm on right.
SEREF-03	D	14	3	10/13/2011	13:14:42	42	14.6	4-3/>4	1	>4	275.7	18.9	18.8	19.1	0.3	B	69.5	4.8	5	o	none	No	0	3	9.0	10.1	9.5	1 on 3	Silty very fine sand over silt-clay. Thin tubes at SWI on right. Small polychaetes at base of aRPD. Filled in/old void below aRPD, evidence of burrowing to depth of image
SEREF-04	A	14	3	10/13/2011	13:18:09	46	14.6	4-3/>4	0	>4	225.9	15.5	15.1	15.9	0.8	B	42.6	2.9	0	-	none	No	0	1	8.5	10.0	9.3	2 on 3	Silty very fine sand over silt-clay. aRPD thinner on left than right. Relict aRPD. Polychaete visible in void. Small wormmay be Pectinaria, also at 4.78cm
SEREF-04	B	14	3	10/13/2011	13:19:01	46	14.6	4-3/>4	0	>4	261.6	18.0	17.2	18.7	1.5	B	38.1	2.6	0	-	none	No	0	2	6.2	13.6	9.9	2 on 3	Silty very fine sand over silt-clay. aRPD is thinner on right. Voids are both very small; evidence of burrowing to depth of image.
SEREF-04	C	14	3	10/13/2011	13:19:55	46	14.6	4-3/>4	1	>4	288.4	19.8	19.0	20.4	1.4	B	61.1	4.2	3	o, r	none	No	0	3	5.7	13.8	9.7	2 on 3	Silty very fine sand over silt-clay. Very small bits of shell fragments and other debris incorporated in upper cm. Extensive reworking throughout depth of profile.
SEREF-05	B	14	3	10/13/2011	13:00:47	60	14.6	4-3/>4	1	>4	194.5	13.3	13.0	13.5	0.5	B	34.3	2.4	2	o	none	No	0	5	3.0	12.4	7.7	1 on 3	Silty very fine sand over silt-clay. Very small bits of white shell fragments incorporated in upper cm. Short tubes at SWI. Bioturbation depth > penetration depth.
SEREF-05	C	14	3	10/13/2011	13:01:37	60	14.6	4-3/>4	1	>4	217.2	14.9	14.6	15.2	0.7	B	34.5	2.4	0	-	none	No	0	1	5.3	5.8	5.5	1 on 3	Silty very fine sand over silt-clay. Very small bits of white shell fragments incorporated in upper cms. Small tubes at SWI. Few small thin polychaetes at base of aRPD.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
SEREF-05	D	14	3	10/13/2011	13:02:29	60	14.6	4-3/>4	0	>4	203.3	13.9	13.7	14.2	0.5	B	24.7	1.7	1	o	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Very small white shell fragments incorporated in upper cms, Many tubes at SWI. Large burrow extending from SWI to 10.2 cm.
SEREF-06	A	14	3	10/13/2011	11:50:55	48	14.6	4-3/>4	1	>4	258.4	17.7	17.6	18.0	0.4	B	42.4	2.9	0	-	none	No	0	1	7.7	8.1	7.9	1 on 3	Silty very fine sand over silt-clay. Few short tubes at SWI. Small thin polychaetes in aRPD. Evidence of burrowing through aRPD. One long thin polychaete at center at depth.
SEREF-06	B	14	3	10/13/2011	11:51:51	48	14.6	4-3/>4	1	>4	256.2	17.6	16.7	18.3	1.6	B	53.5	3.7	0	-	none	No	0	2	16.0	16.6	16.3	1 on 3	Silty very fine sand over silt-clay. Very small bits of shell frag and debris incorporated in upper cms. Few short tubes at SWI. Small infauna visible in deepest void.
SEREF-06	C	14	3	10/13/2011	11:52:46	48	14.6	4-3/>4	0	>4	248.5	17.1	16.6	17.3	0.8	B	48.1	3.3	6	o, r	none	No	0	5	6.1	12.0	9.1	1 on 3	Silty very fine sand over silt-clay. Very small bits of shell fragments incorporated in upper cms. Small to large mud clasts at surface, pile on right. Bioturbation depth > prism penetration depth.
SWREF-01	A	14	3	10/13/2011	14:10:27	38	14.6	4-3/>4	0	>4	247.8	17.0	16.7	17.3	0.6	B	55.1	3.8	5	o	none	No	0	2	3.4	15.5	9.5	1 on 3	Silty very fine sand over silt-clay. Very small bits of shell incorporated into upper cms. Short tubes at surface. Upper void is at base of aRPD. Several thin polychaetes near base of aRPD. Bioturbation depth > prism penetration depth.
SWREF-01	B	14	3	10/13/2011	14:11:15	38	14.6	4-3/>4	1	>4	237.0	16.3	15.9	16.8	0.9	B	35.3	2.4	5	o, r	none	No	0	1	5.7	15.9	10.8	1 on 3	Silty very fine sand over silt-clay. Small to large mud clasts at surface. Few collapsed tubes and debris at surface, SWI disturbed by camera.Signs of burrowing in aRPD and a couple thin polychaetes near base of aRPD.
SWREF-01	C	14	3	10/13/2011	14:12:05	38	14.6	4-3/>4	0	>4	271.9	18.7	18.3	19.1	0.8	B	52.4	3.6	0	-	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Short tubes at SWI. Several thin polychaetes near base of aRPD. Indication of deeper burrow at depth on right.
SWREF-02	A	14	3	10/13/2011	13:36:40	36	14.6	4-3/>4	0	>4	245.1	16.8	15.2	18.1	2.9	P	43.4	3.0	0	-	none	No	0	0	11.6	14.1	12.9	2 on 3	Silty very fine sand over silt-clay. Surface covered with brownish-red algal growth. Couple small thin polychaetes near base of aRPD. Edge of void transected at depth.
SWREF-02	C	14	3	10/13/2011	13:18:14	36	14.6	4-3/>4	1	>4	283.4	19.5	19.3	20.1	0.8	B	73.2	5.0	4	o, r	none	No	0	2	4.2	8.0	6.1	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Evidence of burrowing through aRPD. Couple small polychaetes visible in aRPD.
SWREF-02	D	14	3	10/13/2011	13:38:55	36	14.6	4-3/>4	1	>4	246.4	16.9	16.4	17.6	1.2	B	44.9	3.1	5	o, r	none	No	0	5	6.3	13.6	10.0	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Evidence of burrowing in aRPD. Small bivalve just below aRPD and one near base of aRPD.
SWREF-03	A	14	3	10/13/2011	13:42:56	38	14.6	4-3/>4	0	>4	295.5	20.3	19.9	20.8	0.9	B	70.6	4.8	0	-	none	No	0	1	15.8	16.7	16.3	1 on 3	Silty very fine sand over silt-clay. Couple small short tubes and debris at surface. Evidence of burrowing throughout entire profile.
SWREF-03	C	14	3	10/13/2011	13:44:37	38	14.6	4-3/>4	0	>4	297.2	20.4	20.1	20.7	0.6	B	68.8	4.7	3	o, r	none	No	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Several small thin polychaetes near base of aRPD. Small bivalve near base of aRPD at center, evidence of burrowing at depth.
SWREF-03	D	14	3	10/13/2011	13:45:29	38	14.6	4-3/>4	1	>4	>316.58	>21.75	>21.75	>21.75	Ind	ind	Ind	Ind	ind	ind	none	No	0	3	>=4.62	=11.69		tage 3	Over penetration. Evidence of deeper burrowing at base of aRPD. Reworked to depth of penetration.
SWREF-04	B	14	3	10/13/2011	13:58:20	31	14.6	>4	0	>4	285.1	19.6	19.1	20.0	1.0	B	68.2	4.7	0	-	none	No	0	4	8.0	14.1	11.1	1 on 3	Very fine sandy silt-clay. Short tubes at surface. Many small thin polychaetes and burrows throughout aRPD. Infauna at depth in void on left. Polychaete against faceplate at ~12.2cm.
SWREF-04	C	14	3	10/13/2011	13:59:09	31	14.6	>4	1	>4	291.1	20.0	19.7	20.3	0.6	B	29.9	2.1	3	r	none	No	0	2	5.6	13.2	9.4	1 on 3	Very fine sandy silt-clay. Small mud clasts & tubes at surface. Evidence of larger burrowers at base of aRPD, evidence of bioturbation throughout profile.
SWREF-04	D	14	3	10/13/2011	13:59:57	31	14.6	>4	0	>4	28.8	2.0	19.0	20.6	1.5	B	60.5	4.2	5	o, r	none	No	0	2	6.5	14.5	10.5	1 on 3	Very fine sandy silt-clay. Small to medium clasts at surface. Highly re-worked profile, bioturbated to depth.
SWREF-05	A	14	3	10/13/2011	14:03:45	39	14.6	4-3/>4	0	>4	282.3	19.4	19.0	19.7	0.7	B	39.5	2.7	0	-	none	No	0	3	7.4	19.3	13.3	1 on 3	Silty very fine sand over silt-clay. Small tubes & podocerid amphipod @ SWI, bioturbation depth > prism penetration depth.
SWREF-05	B	14	3	10/13/2011	14:04:33	39	14.6	4-3/>4	1	>4	244.4	16.8	16.0	17.7	1.7	B	34.4	2.4	2	o	none	No	0	3	1.5	9.5	5.5	1 on 3	Silty very fine sand over silt-clay. Burrow pit and mound from conveyor belt feeder. Bioturbation depth > penetration depth.
SWREF-05	C	14	3	10/13/2011	14:05:22	39	14.6	4-3/>4	0	>4	251.1	17.2	17.0	17.4	0.4	B	54.6	3.7	6	o, r	none	No	0	2	6.7	16.8	11.8	1 on 3	Silty very fine sand over silt-clay. Small mud clasts at surface. Short and thin tubes near surface. Large subsurface void & gallery in lower right corner.
SWREF-06	A	14	3	10/13/2011	13:49:57	40	14.6	4-3/>4	1	>4	248.6	17.1	16.8	17.5	0.7	B	42.2	2.9	0	-	none	No	0	1	14.5	14.6	14.5	2 on 3	Silty very fine sand over silt-clay. Polychaete against faceplate at depth. Bioturbation depth most likely exceeds penetration depth.
SWREF-06	C	14	3	10/13/2011	13:51:39	40	14.6	4-3/>4	0	>4	276.1	19.0	18.1	19.5	1.4	B	67.8	4.7	2	r	none	No	0	1	13.9	16.4	15.1	2 on 3	Silty very fine sand over silt-clay. Numerous small thin polychaetes in aRPD/ bioturbation > penetration.
SWREF-06	D	14	3	10/13/2011	13:52:28	40	14.6	4-3/>4	1	>4	269.8	18.5	18.5	19.1	0.7	B	50.5	3.5	10+	o, r	none	No	0	4	1.6	9.1	5.4	2 on 3	Silty very fine sand over silt-clay. Surface covered with small to medium-large mud clasts (camera artifacts). Thin polychaetes at base of aRPD.
TRANS-01	A	16	5	10/12/2011	16:45:02	31	14.6	>4	2	>4	235.8	16.2	15.7	16.7	1.0	B	76.5	5.2	0	-	none	No	>16.2	2	8.2	9.6	8.9	2 on 3	Very fine sandy silt-clay. Worms visible burrowing through aRPD. Couple small polychaetes at base of aRPD.
TRANS-01	B	14	3	10/12/2011	16:45:47	31	14.6	>4	1	>4	250.0	17.2	16.8	17.5	0.8	B	61.3	4.2	5	o, r	none	No	>17.2	2	5.1	15.8	10.5	2 on 3	Very fine sandy silt-clay. Small mud clasts at surface. Evidence of burrowing through aRPD. Two distinct depositional horizons.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

APPENDIX C
Sediment-Profile Imaging Results
October 2011

Station	Rep	Stop Collar Settings (in)	# of weights per chassis	Date	Time	Water Depth (ft)	Calibration Constant (cm)	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Penetration Area (sq.cm)	Average Penetration (cm)	Minimum Penetration (cm)	Maximum Penetration (cm)	Boundary Roughness (cm)	Origin of Boundary Roughness	RPD Area (sq.cm)	Mean RPD (cm)	Mud Clast Number	Mud Clast State	Methane	Low DO?	Dredged Material Thickness (cm)	# of Feeding Voids	Void Minimum Depth (cm)	Void Maximum Depth (cm)	Void Average Depth (cm)	Successional Stage	Comment
TRANS-01	C	14	3	10/12/2011	16:46:28	31	14.6	>4	1	>4	249.5	17.1	16.9	17.5	0.6	B	49.1	3.4	0	-	none	No	>17.1	5	6.6	16.1	11.3	1 on 3	Very fine sandy silt-clay. Polychaete near base of aRPD at center and at far right below aRPD. Bioturbation depth exceeds penetration depth.
TRANS-02	A	16	5	10/12/2011	16:38:01	31	14.6	>4	2	>4	266.7	18.3	18.1	18.8	0.7	B	59.7	4.1	3	o	none	no	>18.3	1	12.4	12.0	12.2	1 on 3	Very fine sandy silt-clay. Short tubes at SWI. Burrowing through aRPD. Polychaete at ~1.5cm on left. Cerianthid against faceplate at depth on left.
TRANS-02	B	16	5	10/12/2011	16:39:24	31	14.6	>4	2	>4	259.1	17.8	17.5	18.3	0.8	B	61.4	4.2	4	o, r	none	no	>17.8	2	6.0	14.2	10.1	2 on 3	Very fine sandy silt-clay. Few short tubes at surface. Evidence of burrowing through aRPD. Couple thin polychaetes visible near base of aRPD. Bioturbation > penetration.
TRANS-02	D	16	5	10/12/2011	16:40:53	31	14.6	>4	2	>4	266.7	18.3	17.9	19.1	1.3	B	54.5	3.7	1	r	none	no	>18.3	0	-	-		2 on 3	Very fine sandy silt-clay. Mud clast artifact at surface. Short tubes at surface. Evidence of deeper burrowing in aRPD. Burrow openings obvious in PV image
TRANS-03	A	16	5	10/12/2011	16:31:19	31	14.6	4-3/>4	1	>4	151.1	10.4	9.9	10.8	0.9	B	30.0	2.1	7	o	none	no	0	0	-	-		1 on 3	Silty very fine sand over silt-clay. Bits of algal debris at surface. Short tubes at surface and in background. Evidence of burrowing in aRPD and at depth.
TRANS-03	C	16	5	10/12/2011	16:31:49	31	14.6	4-3/>4	1	>4	159.7	11.0	10.7	11.4	0.7	B	31.6	2.2	10+	o, r	none	no	0	1	6.1	7.0	6.6	2 on 3	Silty very fine sand over silt-clay. SWI covered with very small mud clasts (camera artifact). Burrowing through aRPD. Several thin polychaetes near base of aRPD and below.
TRANS-03	D	16	5	10/12/2011	16:33:36	31	14.6	4-3/>4	1	>4	103.1	7.1	6.5	7.7	1.3	B	35.6	2.4	0	-	none	no	0	0	-	-		2 on 3	Silty very fine sand over silt-clay, somewhat coarser in upper cms. Surface covered with algal debris. Pile of tubes on surface in background. Evidence of burrowing in aRPD. Couple small polychaetes at base of image just right of center.

Note: ind = indeterminate; Origin of Boundary Roughness: B=Biological, P=Physical; Mud clast state: o=oxidized, r=reduced

Appendix D

Plan-View Imaging Results

APPENDIX D
Plan-View Imaging Results
October 2011

Station	Rep	Date	Time	Image Width (cm)	Image Height (cm)	Field of View imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
DIDS-01	A	10/13/2011	9:02:28	73.23	55.61	0.41	silty-sand	no	yes	no	yes	no	no	no	darkish brown sed or flocc over silty-sand; few small burrows visible
DIDS-02	A	10/13/2011	8:48:49	78.70	59.76	0.47	silty-sand	no	ind	ind	ind	ind	ind	yes-shells	silty-sand; shell debris on surface in upper left corner, bivalve and razor clam; much of image is obscured by suspended sediment
DIDS-03	A	10/13/2011	9:08:40	73.23	55.61	0.41	silty-sand	no	yes	yes	yes	no	yes	no	silty-sand; few bands of lighter silt; small to medium burrows visible; image quality is somewhat blurry
DIDS-04	A	10/13/2011	8:04:58	86.63	65.79	0.57	silt	no	yes	yes	yes	no	no	no	silt, soft; small, medium, and one large burrow, surface covered with foraging tracks (most likely shrimp & crabs).
DIDS-05	A	10/13/2011	10:22:45	83.52	63.43	0.53	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; long tracks; possible few small to medium burrows visible; image resolution is somewhat blurry
DIDS-05	C	10/13/2011	10:24:47	82.35	62.54	0.51	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; possible tracks and a few small to medium burrows visible; image resolution is somewhat blurry
DIDS-06	A	10/13/2011	8:23:13	74.70	56.73	0.42	silt	no	yes	yes	yes	no	no	yes-shell	silt; some small tracks; few small burrows; large white bivalve shells, one covered in silt in lower left
DIDS-06	E	10/13/2011	11:13:34	86.16	65.43	0.56	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; numerous small-medium tracks; few small burrows visible; possible string bryozoan in upper right
DIDS-06	G	10/13/2011	11:15:23	Ind	Ind	ind	silty-sand	no	yes	yes	yes	no	ind	yes-shell	silty-sand; large bivalve shell at right middle; small to medium tracks; few small burrows; left half of image is obscured by suspended sediment
DIDS-07	A	10/13/2011	8:11:52	79.82	60.62	0.48	silt	no	yes	yes	yes	yes	no	yes-shells	sandy-silt; small to medium burrows; multiple tracks, some wide; two mussel or oyster shells in upper left; small gastropod or hermit crab on right
DIDS-07	C	10/13/2011	8:14:00	78.64	59.72	0.47	silt	no	yes	yes	yes	yes	no	yes-shells	sandy-silt; small to medium-large burrows; few small tracks; couple mussel or oyster shells; hermit crab at right
DIDS-07	D	10/13/2011	8:14:46	78.36	59.51	0.47	silt	no	yes	yes	yes	no	no	yes-shells	sandy-silt; small to medium-large burrows; few small tracks; couple mussel or oyster shells; left third of image is obscured by suspended sediment
DIDS-08	A	10/13/2011	9:56:19	81.39	61.81	0.50	silt	no	yes	yes	yes	no	no	yes-shells	sandy-silt, light w/ darker-brown; few small burrows visible; few tracks; a few white shell fragments
DIDS-09	A	10/13/2011	10:02:41	91.82	69.73	0.64	silty-sand	no	yes	yes	yes	no	no	no	silty sand; kelp in left upper quarter; several tracks and small burrows visible
DIDS-09	B	10/13/2011	10:03:36	92.66	70.37	0.65	silty-sand	no	yes	yes	yes	no	no	no	silty sand; several tracks and small burrows visible
DIDS-10	A	10/13/2011	8:17:39	87.37	66.35	0.58	silt	no	yes	yes	yes	no	no	no	silt, soft; numerous small to medium burrows, two very large burrows or pits in upper left; many small tracks
DIDS-10	C	10/13/2011	8:19:23	77.55	58.89	0.46	silt	no	yes	yes	yes	no	no	no	silt, soft; numerous small to medium burrows; many small tracks
DIDS-11	A	10/13/2011	7:58:49	80.39	61.05	0.49	silt	no	yes	yes	yes	no	no	no	silt; numerous short tracks, one long wider track; several small to medium burrows
DIDS-11	B	10/13/2011	7:59:37	76.75	58.29	0.45	silt	no	yes	yes	yes	no	no	yes-shell	silt; numerous small to small-medium burrows; some tracks; large pit w/ white bivalve shell; possible epifauna in upper right
DIDS-12	A	10/13/2011	10:48:38	86.76	65.89	0.57	silty-sand	no	yes	yes	yes	no	no	yes-shell	silty-sand; two small burrows visible; tracks; pile of sand tubes, likely fecal mound; one shell covered with sed
DIDS-12	B	10/13/2011	10:49:28	88.90	67.51	0.60	silty-sand	no	yes	yes	yes	no	no	yes-shell	silty-sand; few small burrows; tracks; white bivalve shell in right
DIDS-13	A	10/13/2011	9:49:25	90.48	68.72	0.62	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; many long tracks; several small to medium burrows
DIDS-14	A	10/13/2011	7:52:38	79.20	60.14	0.48	silty-sand	no	yes	yes	no	no	no	no	silty-sand; small burrows; one pit in upper left
DIDS-15	A	10/13/2011	10:55:09	88.48	67.19	0.59	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; small burrows; many tracks
DIDS-16	A	10/13/2011	10:16:51	86.69	65.84	0.57	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; few small burrows, one large burrow or pit on lower right; multiple long tracks
DIDS-16	B	10/13/2011	10:17:42	83.52	63.43	0.53	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; few small burrows, multiple short and few long tracks, algal coating on surface
DIDS-17	A	10/13/2011	10:40:32	86.16	65.43	0.56	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; several long tracks or scouring marks; burrows, algal coating on surface
DIDS-17	B	10/13/2011	10:41:20	87.44	66.40	0.58	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; few short tracks or scouring marks, long trails, algal covering on surface
DIDS-17	C	10/13/2011	10:42:12	89.33	67.84	0.61	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; few small burrows visible; few short tracks, similar to previous reps at this location
DIDS-18	A	10/13/2011	10:09:17	86.43	65.63	0.57	silt	no	yes	yes	yes	no	no	no	silt, soft; object, ind, in lower right; several wide tracks; very small burrows, piece of kelp in lower right corner
DIDS-19	A	10/13/2011	11:03:31	78.97	59.97	0.47	silt	no	yes	yes	yes	no	no	yes-shell	silt; many small burrows; few tracks; mussel shell at bottom of image; few tubes visible near divot area; divot/pit in upper right, with what appears to be fragments of an old lobster trap?
DIDS-19	C	10/13/2011	11:05:10	77.93	59.18	0.46	silt	no	yes	yes	no	no	no	yes-shells	silt; white shell fragments scattered across image; multiple small burrows; imprint of camera base from previous rep visible at top of image
DIDS-20	A	10/13/2011	8:55:29	76.91	58.41	0.45	silty-sand	no	yes	yes	yes	no	no	no	silt; few small to medium burrows; longer tube lying on surface to left of center; short tracks, extensive mounding of reduced sediment brought to surface from infaunal bioturbation.
DIDS-21	A	10/13/2011	8:41:12	83.58	63.47	0.53	silt	no	yes	yes	yes	no	no	no	silt, soft; two very large burrows or pits; multiple small to medium burrows; numerous short tracks
DIDS-21	B	10/13/2011	8:42:02	72.52	55.07	0.40	silt	no	yes	yes	yes	no	no	no	silt, soft; two large burrows; multiple small to medium burrows; one track in upper right
DIDS-21	C	10/13/2011	8:42:53	76.02	57.73	0.44	silt	no	yes	yes	yes	no	no	yes-shells	silt, soft; two large burrows; multiple small to medium burrows; numerous short tracks; few bits of white bivalve shells
NREF-01	A	10/12/2011	15:48:19	80.05	60.79	0.49	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; numerous small to medium burrows; short and long tracks across entire image
NREF-01	B	10/12/2011	15:49:00	71.50	54.30	0.39	silty-sand	no	yes	yes	yes	no	no	maybe	silty-sand; numerous small tracks; small to medium burrows; branching debris
NREF-02	A	10/12/2011	16:00:13	77.23	58.65	0.45	silty-sand	no	yes	yes	yes	yes	no	no	sitly-sand; small burrows; numerous short tracks, hermit crab
NREF-03	A	10/12/2011	16:05:38	75.51	57.34	0.43	silty-sand	no	yes	yes	yes	no	no	no	sitly-sand; small burrows; numerous short tracks
NREF-03	B	10/12/2011	16:06:21	74.85	56.84	0.43	silty-sand	no	yes	yes	yes	yes	no	no	sitly-sand; small to medium burrows; numerous short tracks and few longer wide tracks; Cerianthid anemone at far middle right
NREF-04	A	10/12/2011	16:11:28	74.80	56.80	0.42	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; small to medium-large burrows; many short and one long track.
NREF-04	B	10/12/2011	16:12:18	75.86	57.61	0.44	silty-sand	no	yes	yes	yes	no	no	yes-shell; leaf	silty-sand; many small to medium-large burrows; many short tracks; white bivalve shell at upper middle; silt-covered leaf near center
NREF-05	E	10/12/2011	15:42:22	69.24	52.58	0.36	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; few small tracks; small to medium burrows
NREF-05	F	10/12/2011	15:43:05	75.20	57.11	0.43	silty-sand	no	yes	yes	yes	no	yes	yes-shells	silty-sand; small tracks; few small to medium burrows; area of disturbed sediment at middle top
NREF-06	A	10/12/2011	15:54:02	76.28	57.93	0.44	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; multiple short to medium tracks hatching; few small-medium burrows
NREF-06	B	10/12/2011	15:54:47	76.64	58.21	0.45	silty-sand	no	yes	yes	yes	no	no	yes-shells	silty-sand; multiple short to medium tracks; few small burrows; two large white bivalve shells lying on surface, one covered with sediment
SEREF-01	A	10/13/2011	13:06:10	81.21	61.67	0.50	silt	no	yes	yes	yes	no	no	no	silt; tracks, one long; small burrows
SEREF-01	B	10/13/2011	13:07:17	89.69	68.11	0.61	silt	no	yes	yes	yes	no	no	no	silt; tracks; small-medium to very large (2) burrows; one mound
SEREF-02	A	10/13/2011	11:36:41	85.11	64.63	0.55	silty-sand	no	yes	yes	yes	no	no	yes-shells	silty-sand; small to medium-large burrows; tracks; few tubes lying on surface; few small white bivalve shells
SEREF-02	B	10/13/2011	11:37:34	81.21	61.67	0.50	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; many small burrows; tubes lying on surface
SEREF-02	E	10/13/2011	11:44:25	85.96	65.28	0.56	silty-sand	no	yes	yes	yes	no	no	ind	silty-sand; small to medium burrows; short tracks; in upper left-debris or epifauna
SEREF-03	A	10/13/2011	13:12:03	75.20	57.11	0.43	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; some short and one long track; small burrows
SEREF-03	B	10/13/2011	13:12:50	88.55	67.25	0.60	silty-sand	no	yes	yes	yes	no	no	yes-seaweed	silty-sand; numerous small tracks; few small burrows, one large burrow or pit; long piece of kelp
SEREF-04	A	10/13/2011	13:17:54	85.57	64.98	0.56	silty-sand	no	yes	yes	yes	ind	no	ind	silty-sand, soft; numerous tracks, short and long; small to medium burrows; seaweed or epifauna in lower left
SEREF-04	B	10/13/2011	13:18:46	84.91	64.49	0.55	silty-sand	no	yes	yes	yes	no	no	yes-seaweed	silty-sand, soft; tracks, a copule long; small to large burrows, 2 large burrows or pits
SEREF-05	A	10/13/2011	12:59:42	86.03	65.33	0.56	silty-sand	no	yes	yes	yes	no	no	yes-seaweed, shells	silty-sand; few small burrows; tracks; piece of seaweed; bivalve and gastropod shells

Note: ind = indeterminate

APPENDIX D
Plan-View Imaging Results
October 2011

Station	Rep	Date	Time	Image Width (cm)	Image Height (cm)	Field of View imaged (m^2)	Sediment Type	Bedforms	Burrows	Tubes	Tracks	Epifauna	Mudclasts	Debris	Comment
SEREF-05	C	10/13/2011	13:01:22	Ind	Ind	ind	silty-sand	no	yes	yes	yes	ind	ind	yes-shells	sitly-sand; small burrows; one long track; large white bivalve shell and smaller shell fragments; right half of image is obscured by suspended sediment, only 1 laser visible (no accurate scale)
SEREF-06	A	10/13/2011	11:50:39	84.27	64.00	0.54	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; many short tracks; small to medium burrows; large foraging depression; few small shell fragments
SWREF-01	A	10/13/2011	14:10:13	86.56	65.74	0.57	silty-sand	no	yes	yes	yes	no	no	yes-shell	silty-sand; numerous small tracks, small burrows; bivalve shell covered with silt in lower right
SWREF-02	A	10/13/2011	13:36:25	83.58	63.47	0.53	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; couple small burrows; short tracks
SWREF-03	A	10/13/2011	13:42:41	85.83	65.18	0.56	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; small burrows; short tracks
SWREF-04	A	10/13/2011	13:56:07	86.96	66.04	0.57	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; short and long tracks; small to medium burrows
SWREF-04	B	10/13/2011	13:58:05	92.81	70.49	0.65	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; many short tracks, long tracks; small to medium burrows; kelp fragment on right edge of image
SWREF-05	A	10/13/2011	14:03:30	78.70	59.76	0.47	silt	no	yes	yes	yes	no	no	no	silt, soft; many short tracks; small to large burrows, three very large burrows
SWREF-05	C	10/13/2011	14:05:08	85.17	64.68	0.55	silt	no	yes	yes	yes	no	no	no	silt, soft; short tracks; small to medium-large burrows
SWREF-06	A	10/13/2011	13:49:43	84.21	63.95	0.54	silt	no	yes	yes	yes	no	no	no	silt, soft; short tracks along bottom; long tracks from top to bottom; small to large burrows
SWREF-06	C	10/13/2011	13:51:24	84.98	64.54	0.55	silt	no	yes	yes	yes	no	yes	no	silt, soft; short tracks; small to medium-large burrows; impression of SPI camera base sled on right
TRANS-01	A	10/12/2011	16:44:47	77.82	59.10	0.46	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; covered with short tracks; small to medium burrows; few tubes lying on surface
TRANS-01	C	10/12/2011	16:46:14	75.51	57.34	0.43	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; covered with short tracks; small burrows
TRANS-02	A	10/12/2011	16:37:47	76.17	57.85	0.44	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; many short tracks; few small burrows
TRANS-02	B	10/12/2011	16:39:05	77.33	58.73	0.45	silty-sand	no	yes	yes	yes	no	no	no	silty-sand; short tracks and couple long tracks; few small burrows
TRANS-02	C	10/12/2011	16:39:10	78.20	59.39	0.46	silty-sand	no	yes	yes	yes	no	no	yes-shell	silty-sand; short tracks and couple long tracks; few small burrows; mussel shell at upper edge
TRANS-03	A	10/12/2011	16:31:04	78.25	59.43	0.47	silty-sand	no	yes	yes	yes	yes	no	no	silty-sand; short and long thin tracks; small to medium burrows; Cerianthid anemone near center
TRANS-03	D	10/12/2011	16:33:21	76.91	58.41	0.45	silty-sand	no	yes	yes	yes	no	yes	yes-shell	silty-sand; many short tracks, long tracks; small to medium burrows; mud clasts near center

Note: ind = indeterminate

Appendix E

Common Conversions

APPENDIX E
Common Conversions

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