Inner Saginaw Bay Reef Restoration Project

Bay County, MI

Quality Assurance Project Plan (QAPP)
Version 1.0

NOAA Grant Funding Source: Great Lakes Restoration Initiative

Grant #: NA22NMF4630144
Inner Saginaw Bay Reef Restoration Project

SECTION 1: BACKGROUND/OVERVIEW

Title and Approval Sheet

Inner Saginaw Bay Reef Restoration Project

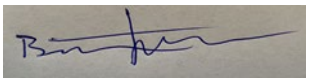
Tonya Lewandowski
Environmental Consulting Technology Inc.
3399 Veterans Drive
Traverse City, MI 49685

Award Number: NA22NMF4630144

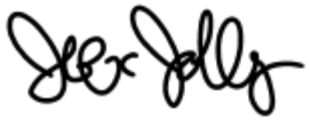
Effective Date: December 15, 2023

Approval: **Date:**

Tonya Lewandowski, ECT, Senior Engineer — 12/7/2023



Bretton Joldersma, MI EGLE, Lake Huron Coordinator — 12/7/2023



Jeff Jolley, MDNR, Southern Lake Huron Fisheries Supervisor — 12/08/2023

Mike Jury, MI EGLE, MPART PFAS Specialist — 12/13/2023

Jeff Tyson, GLFC Fisheries Management Project Manager — 12/7/2023

HEATLIE.TERRY.SCOTT.1230473559

Digitally signed by HEATLIE.TERRY.SCOTT.1230473559
Date: 2023.12.19 11:15:35 -05'00'

Terry Heatlie, NOAA Technical Monitor

Table of Contents

Section 1: Background/Overview 2
Title and Approval Sheet 2
Table of Contents 3
Distribution List 4
Project/Task Organization 4
Problem Definition/Background 4
Project/Task Description 5
Data Collection 5
Personnel 7
Work Schedule 7

Section 2: Data Collection & Quality Standards 7
Sediment Sample Collections 7
Sample Handling and Custody 8
Sediment Chemistry Analytical Methods 8
Modeling 11
Quality Objectives and Criteria for Measurement of Data 11
Instrument/Equipment Testing, Inspection, Calibration, & Maintenance 12

Section 3: Data Management & Reporting 13
Data Handling/Storage 13
Data Review, Validation, & Verification 13
Reconciliation with User Requirements 13

Appendix A: Inner Saginaw Bay Reef Restoration Project Proposal 14

Appendix B: Inner Saginaw Bay Reef Restoration Project Feasibility Study (NFWF) 16

Appendix C: MI EGLE Standard Operating Procedures 38

Distribution List

The following individuals and their organizations will receive copies of this approved QAPP and any revisions. This includes people responsible for implementation.

Name	Organization	Telephone Number Email
Terry Heatlie	NOAA – Technical Monitor	(734) 741-2211 terry.heatlie@noaa.gov
Tonya Lewandowski	ECT-Senior Engineer	(231) 676-3024 tlewandowski@ectinc.com
Bretton Joldersma	MI EGLE-Lake Huron Coordinator	(517) 256-1773 joldersmab@michigan.gov
Jeff Jolley	MDNR-Southern Lake Huron Fisheries Supervisor	(989) 686-2678 Jolleyj1@michigan.gov
Michael Jury	MI EGLE-Environmental Specialist	(517) 242-9578 jurym@michigan.gov
Jeff Tyson	GLFC – Program Manager	(734) 649-2033 jtyson@glfc.org

Project/Task Organization

Name	Organization	Roles and Responsibilities
Tonya Lewandowski	ECT Inc.	Project Manager and point-of-contact; Contractor selection and oversight; Project QA Manager
Bretton Joldersma	MI EGLE	Project coordination
Jeff Jolley	MDNR	Project coordination
Michael Jury	MI EGLE	Project coordination, Field Task Manager, collection and processing review
Jeff Tyson	GLFC	Program coordination; Grant administration; QAPP technical guidance
Terry Heatlie	NOAA	Monitoring, QAPP and project technical guidance
Rina Studds	NOAA	Project administration and oversight

Problem Definition/Background

The Inner Saginaw Bay Reef restoration project is exploring the feasibility for ~3 acres (tentatively) of constructed reef in the vicinity of the Kawkawlin River outlet into Saginaw Bay and near Spoils Island, pending this additional feasibility work, as detailed in the NOAA-GLFC Regional Partnership Proposal (Grant #: NA22NMF4630144) (Appendix A). Historically, reef habitats in Saginaw Bay have been degraded by the impacts from physical destruction, degradation from shoreline development, sedimentation, chemical contamination, and aquatic invasive species (e.g. dreissenid mussels, rusty crayfish). The Lake Huron Committee (LHC) has long recognized the value of restoring degraded reef habitat to enhance fish production and identified reef restoration as an environmental priority for increasing populations of various species that support fisheries throughout Lake Huron. The LHC, along with federal partners, are in the process of rehabilitating self-sustaining stocks of both lake trout and cisco in Lake Huron, with Saginaw Bay being the site for initial rehabilitation stocking for cisco. Reef restoration is also a prescribed strategy in the Michigan Department of Natural Resource's (MDNR) Saginaw Bay Walleye Recovery Plan, adding another source of recruitment to Saginaw Bay (and Lake Huron) from a reef-spawning stock, complementing benefits derived from a diverse suite of reef- and river-spawning stock contributions (e.g., portfolio effect). This reef restoration project will also complement completed and ongoing projects by various agencies (USFWS, USDA, MDNR) to address shoreline and terrestrial impairments (e.g., sedimentation) to Saginaw Bay reefs during the past decade. Initial feasibility work has been completed as a part of a National Fish and Wildlife Foundation (NFWF)

Grant to MDNR and ECT (Appendix B), however, as a part of a stakeholder workshop, additional feasibility studies were identified by the project team. Several additional feasibility components were identified for the Kawkawlin River site, including further sediment transport modeling studies to better understand:

1) The performance and impact of the proposed Kawkawlin reef structure at various Lake Huron water levels;
2) The transportation and fate of sediment, particularly down-drift, of the proposed Kawkawlin reef;
3) The impact of the Kawkawlin reef on Kawkawlin river mouth dredging (frequency, quantity, and economic impact);
4) The impact of the Kawkawlin reef on potential flooding frequency in the vicinity of the Kawkawlin River;

None of these feasibility components will require additional environmental data collection, but will utilize existing secondary data to supplement knowledge on the impacts of the Kawkawlin reef site detailed in the current feasibility study (Appendix B).

For the Spoils Island site, additional feasibility components identified included:

5) Further consultations with USACE to ensure that reef placement does not impact current USACE dredge disposal operations. Currently, the USACE has detailed some constraints on placement (e.g. 2000' buffer from operational area), however outreach and consultation support will further refine these. This activity will not require any additional environmental data collection.
6) Collection of 30 additional sediment samples in a refined area of interest at the Spoils Island site to generate information on sediment contaminants, grain size, and depth of refusal in the refined area of interest for reef restoration. These additional sediment samples will help to further refine reef placement in the vicinity of Spoils Island (Figure 1).

A separate QAPP is currently being developed for biological assessment of the sites pre- and post-restoration and will be appended to this QAPP when developed.

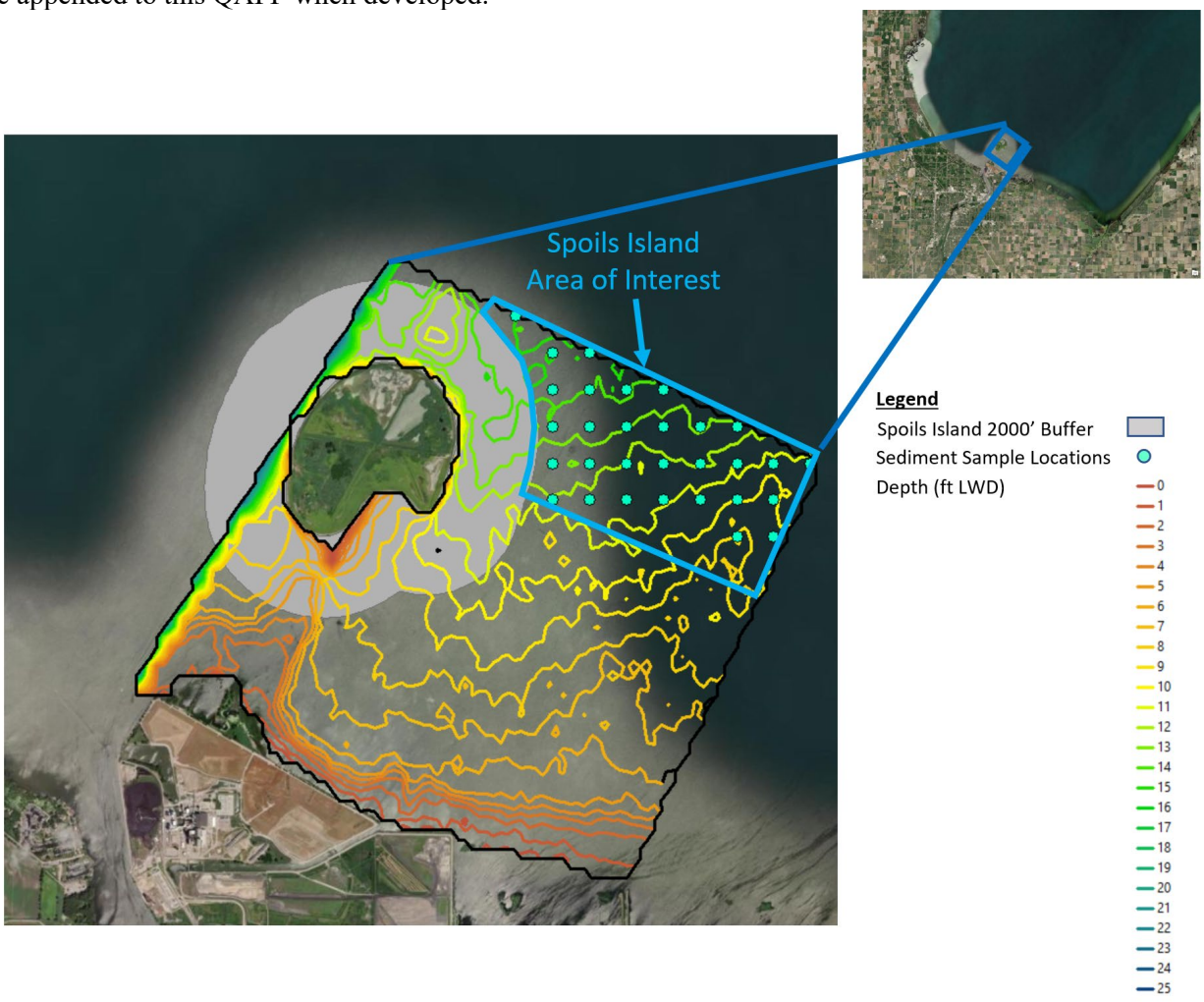


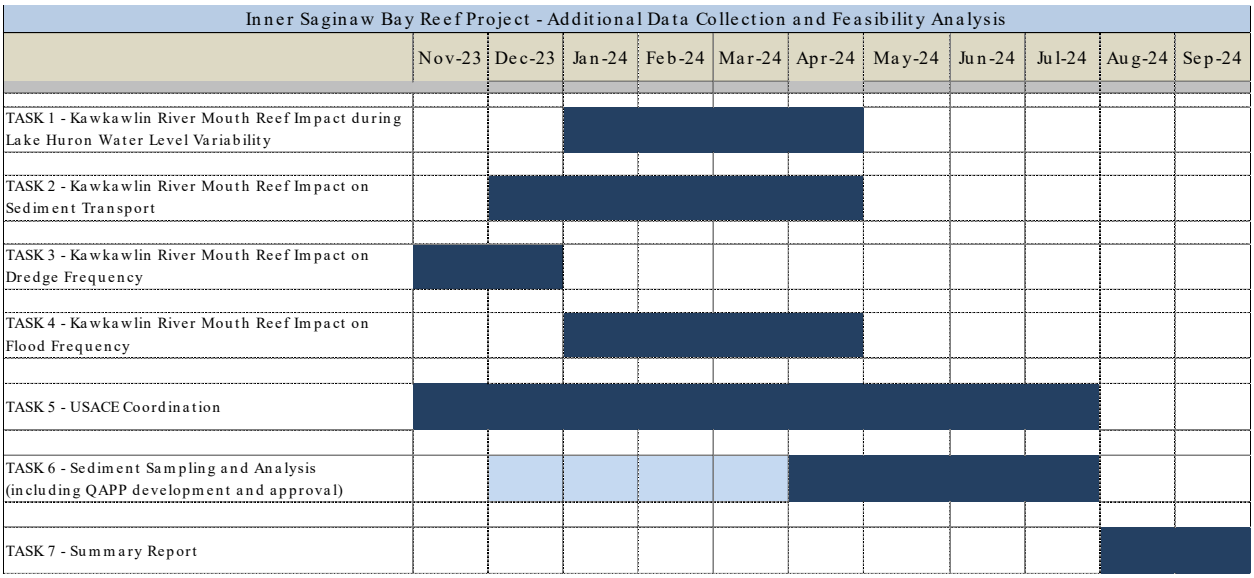
Figure 1. Proposed sediment sampling locations at Spoils Island site, Inner Saginaw Bay Reef Restoration project.

Project/Task Description

Data Collection

Upon QAPP approval, data will be compiled and/or collected to gain a better understanding of the Kawkawlin River and Spoils Island sites to help refine 1) impacts of proposed reef structures (Kawkawlin), and to help refine placement of reef structures (Spoils Island). Because adequate information on bathymetry and bottom hardness were collected as a part of the NFWF funded feasibility study (Appendix B), no additional bathymetry or bottom hardness data will be collected. Secondary data will be utilized in addressing Kawkawlin River reef impacts, with the only primary environmental data being collected as part of this QAPP being sediment samples for contaminant analysis, grain size analysis, and depth of refusal. All environmental data will be collected consistent with this approved QAPP. The data and modeling results from this QAPP will be appended to the existing feasibility study and provided to the GLFC as a part of the data management plan. The above detailed tasks will be completed according to Table 1 – Milestone Schedule. These dates are considered approximate and are subject to change based upon personnel availability and weather conditions.

Table 1. Milestone Schedule. Lighter shading indicates QAPP and data management plan development.



- Task 1 – The project manager will work with LimnoTech to utilize the existing Saginaw Bay hydrodynamic and sediment transport models, including additional modeling of wave height and resuspension potential under different water level conditions to better understand the performance of the proposed Kawkawlin Reef site at various Lake Huron water level stages. This will require a Saginaw Bay wind-wave model based on the SWAN (Simulating Waves Nearshore) model re-run iterations at various prescribed water levels. Information on sediment transport and deposition, projected depths on and inshore of the structure, and associated vegetated communities will be described at various water levels based upon these model results. These results will be appended to the existing feasibility study (Appendix B).

- Task 2 – The project manager will work with LimnoTech to utilize the existing Saginaw Bay hydrodynamic and sediment transport models to develop a general understanding of how the currently proposed reef configuration will impact down-drift sediment deposition and composition.

- Task 3 – The project manager will work with LimnoTech to better estimate the contribution of alongshore current to Kawkawlin River channel infilling. The current estimated range is 10-25% of the total channel infilling is associated with alongshore current. The team will utilize the USGS Spatially Referenced Regression on Watershed attributes (SPARROW) model to further refine these estimates, and work with other partners (e.g. Bangor Township, Bay County, USACE) to understand historic dredging amounts, frequency, and costs. This will then be used to inform potential reduction in dredging frequency and costs for comparison.

- Task 4 – The project manager will work with LimnoTech to explore the extent of the impact of the proposed Kawkawlin River reef structure, primarily associated with wave-related backflow pushing water from the lake into the river and slowing flow from upstream, and apply some simplified assumptions about river flow, wind direction, and wave height, to explore the relative magnitude of this impact, in comparison to other, likely more significant, factors.

- Task 5 – The project manager will work with the project team and USACE to ensure coordinated communication and outreach is occurring such that Spoils Island reef placement does not impact USACE navigational dredging operations and ensure proper consultations occur prior to implementation

- Task 6 – The project manager will work with the project team to ensure that sediment samples are collected at 30 locations in the Spoils Island area of interest (Figure 1) and processing occurs according to MI EGLE standards.

Secondary data, data that is collected outside of this grant, to address modeling Tasks 1-4 will include:
Saginaw Bay water levels will be collected from the NOAA tides and currents website. This data shall be used as lake level inputs into the model.

- Saginaw Bay wind and wave climate history will be collected from the USACE Wave Information Studies website. This data shall be used as wave climate inputs into the model.
- Kawkawlin River flow and suspended solids data will be retrieved from SVSU, if available. This data shall be used as flow and suspended solids inputs to the model.
- Kawkawlin River ice jam anecdotes will be sourced from various places, including USACE CRREL ice jam website and the local media. This is qualitative information about the effects of ice jams.
- Saginaw Bay bathymetry will be collected from various sources, including NOAA National Center for Environmental Information (NCEI) website (secondary data) and MDNR data to be collected in summer 2021 (primary data). This data will be used as bathymetric input to model.
- Saginaw Bay topography will be sourced from USACE LiDAR data. This data will be the topographic input to the model.
- Saginaw Bay and Kawkawlin River substrate will be sourced from the prior feasibility study substrate data (secondary data), which will be used as sediment transport input to model (sediment type/grain size).
- Kawkawlin River bathymetry from the USACE hydrographic survey data (pre-dredge: 2015, 2016, 2017; postdredge 2019), FEMA Flood Insurance Study data for Bangor Township. This will be used as bathymetric input to model.
- Saginaw Bay meteorology from the NOAA National Data Buoy Center (NDBC) website as meteorological
- input to model.
- Kawkawlin Federal flood control channel project details will be sourced from https://lreops.usace.army.mil/OandM/projectmaps/Kawkawlin_Project_Map.jpg. This will be used as comparison of bathymetric data with the design specifications.
- Saginaw Bay shoreline position at different lake levels will be observed using the NOAA Lake Level Viewer. This will be for a qualitative interpretation of historical shoreline positions.
- The Lake Huron National Shoreline Management Study from https://www.lrb.usace.army.mil/Portals/45/docs/PublicReview/Lake%20Huron/Great%20Lakes%20National%20Shoreline%20Management%20Study%20-%20Lake%20Huron%20Draft%20Report%20dated%20October%202019.pdf?ver=2019-10-09-091032-043 will be used for a qualitative interpretation of recent shoreline conditions

Work Schedule

Sediment sampling surveys will be conducted spring/summer of 2024 during daylight hours of normal business days, with fair weather being the target ambient condition and wind and wave conditions suitable for field sampling on Saginaw Bay.

SECTION 2: FIELD DATA COLLECTION & QUALITY STANDARDS

Sediment Sample Collections

MI EGLE staff will collect sediment samples. Sampling locations will be recorded as latitude and longitude using a GPS unit for subsequent mapping approximately at the sampling locations identified in Table 2.

Table 2. Sediment sampling locations, depth (ft LWD) and bottom hardness index, in the Spoils Island Area of Interest.

Sample ID	Latitude	Longitude	Depth (LWD ft)	Relative Bottom Hardness
1	43.66866	-83.78687	10	Hard
2	43.66619	-83.79711	11	Hard
3	43.66866	-83.80735	12	Hard
4	43.66866	-83.80394	12	Hard
5	43.67113	-83.80735	13	Hard
6	43.67113	-83.80394	13	Hard
7	43.67113	-83.79370	13	Hard
8	43.67360	-83.80735	15	Hard
9	43.67854	-83.81077	15	Hard
10	43.66372	-83.79028	9	Moderate
11	43.66372	-83.78687	9	Moderate
12	43.66619	-83.78687	9	Moderate
13	43.66619	-83.79370	10	Moderate
14	43.66619	-83.79028	10	Moderate
15	43.66866	-83.78346	10	Moderate
16	43.66619	-83.80735	11	Moderate
17	43.66619	-83.80394	11	Moderate
18	43.66619	-83.80053	11	Moderate
19	43.66866	-83.80053	11	Moderate
20	43.66866	-83.79711	11	Moderate
21	43.66866	-83.79028	11	Moderate
22	43.67113	-83.79711	12	Moderate
23	43.67113	-83.79028	12	Moderate
24	43.67113	-83.80053	13	Moderate
25	43.67360	-83.79711	14	Moderate
26	43.67360	-83.80394	15	Moderate
27	43.67360	-83.80053	15	Moderate
28	43.67607	-83.80735	15	Moderate
29	43.67607	-83.80394	15	Moderate
30	43.66866	-83.79370	12	Moderate

The water depth at the sampling location will be measured by weighted tape in conjunction with on-vessel sonar and recorded. Samples will be collected using vibracore sampling procedures performed from a pontoon barge or ponar dredge, depending on the requisite depth of sample. Each sediment core will extend to a maximum depth of 5 ft below the lake bed and will be collected in clear, cellulose acetate butyrate (CAB) liners.

Latitude, longitude, depth, and field observation of the sediment characteristics will be recorded on field data sheets, including sediment thickness and sediment type, as observed in the CAB liner. The cores (when utilized) will be cut open and a log of the sediment classification will be prepared along with any visual or olfactory observations. Following classification, aliquots of the sediments from the entire depth will be transferred to a stainless-steel bowl and composited. The composite material will be used to prepare specific analytical containers for chemical laboratory submittal. One composite sample will be collected from each core, broken into upper and lower halves, if necessary, for accurate analysis.

The extraction, sampling, and analysis of sediment cores will aid in the evaluation of chemical impacts to soft sediments, and to satisfy regulatory requirements for sediment displacement considerations. Samples will be

transferred to the laboratory for analysis based on EGLE protocol for dredge characterization. Sediment sampling is being conducted as part of the feasibility study to determine particle size and characteristics for transport modeling and also chemical characterization for feasibility in permitting. As such, preliminary sampling locations have been identified in Figure 1 and Table 2above. Those required for particle size analysis will be sampled via core sampling methodology, whereas those sent for laboratory chemical analysis will be sampled via ponar dredge. Field observation of sediment characteristics will be noted, and the locations recorded as latitude and longitude using a GPS unit for subsequent mapping. The samples will be prepared and transferred to the EGLE or other certified laboratory, for analysis of the required parameters by the Project Manager. The sediment evaluation will provide data to further refine site selection at the Spoils Island site. Additional details on sediment sampling and safe boating can be found in Appendix C.

Sample Handling and Custody

The sediment chemistry and particle size analyses are the only data collection effort for this project that will require chain of custody (COC) procedures. These samples will follow COC procedures to provide documentation of the handling of each sample from the time of collection through receipt by the laboratory. EGLE Laboratory shall provide COC forms to be filled out by the sampler/sample team leader to accompany each sample through transit from the field to the laboratory. This form is used by both the field sampler and the laboratory to verify the contents of each shipment of samples. When transferring possession of the samples, both the individual relinquishing the container(s) and the receiver are required to sign and date the COC form. Upon receipt of the shipment at the laboratory, the contents of the cooler are checked against the completed COC form. Any discrepancies are to be immediately reported by the laboratory to the sampling team leader for clarification/resolution. All samples will be delivered to the laboratory within the requisite hours of sample collection to give the laboratory enough time to begin to process the samples while maintaining the analysis specific holding time. Samples are kept in coolers with enough ice to maintain ideal sample temperature. Upon arrival at the laboratory, the sample temperature is verified by laboratory personnel and recorded on the COC.

2.3 Sediment Chemistry Analytical Methods

Sediment chemistry analysis will be conducted from the same 8 oz. glass sample jar. However, to ensure detection limits can be met the sample material will be homogenized and then split into two 8 oz. sample jars to be sent to the laboratory to ensure plenty of material is submitted for analysis. The following table provides a list of the parameters to be analyzed, the method used to analyze the sample, the reporting limit, the sample holding times, and the sample preservation required.

Table 3. Sediment chemistry laboratory analysis information

Parameter	Method	Reporting Limit (ug/kg)	Sample Holding Time	Preservation Required
Metals				
Arsenic	SM6020	100	6 months	None
Cadmium	SM6020	50	6 months	None
Chromium	SM6020	2500	6 months	None
Copper	SM6020	1000	6 months	None
Lead	SM6020	1000	6 months	None
Mercury	SM7471	100	28 days	$\leq$6˚C
Nickel	SM6020	1000	6 months	None
Selenium	SM6020	500	6 months	None

Zinc	SM6020	1000	6 months	None
Polychlorinated Biphenyls (PCBs)				
Total PCBs	SM8082	330	40 days	≤6˚C
Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	SM8270	330	40 days	≤6˚C
Acenaphthylene	SM8270	330	40 days	≤6˚C
Anthracene	SM8270	330	40 days	≤6˚C
Benzo(a)anthracene	SM8270	330	40 days	≤6˚C
Benzo(b)fluoranthene	SM8270	330	40 days	≤6˚C
Benzo(k)fluoranthene	SM8270	330	40 days	≤6˚C
Benzo(g,h,i)perylene	SM8270	330	40 days	≤6˚C
Benzo(a)pyrene	SM8270	330	40 days	≤6˚C
Chrysene	SM8270	330	40 days	≤6˚C
Dibenzo(a,h)anthracene	SM8270	330	40 days	≤6˚C
Fluoranthene	SM8270	330	40 days	≤6˚C
Fluorene	SM8270	330	40 days	≤6˚C
Indeno(1,2,3-cd)pyrene	SM8270	330	40 days	≤6˚C
2-Methylnaphthalene	SM8270	330	40 days	≤6˚C
Naphthalene	SM8270	330	40 days	≤6˚C
Phenanthrene	SM8270	330	40 days	≤6˚C
Pyrene	SM8270	330	40 days	≤6˚C
General Chemistry				
BOD (using Pore Water)	SM5210B-MOD	2,000	48 hours	≤6˚C
Total Phosphorus	EPA365.2	200	28 days	≤6˚C
Dioxins and Furans (Rl ng/kg)				
2,3,7,8-TCDD	SM8290	1.0	30 days	≤4˚C
2,3,7,8-TCDF	SM8290	1.0	30 days	≤4˚C
1,2,3,7,8-PeCDD	SM8290	5.0	30 days	≤4˚C

1,2,3,7,8-PeCDF	SM8290	5.0	30 days	≤4˚C
2,3,4,7,8-PeCDF	SM8290	5.0	30 days	≤4˚C
1,2,3,4,7,8-HxCDD	SM8290	5.0	30 days	≤4˚C
1,2,3,6,7,8-HxCDD	SM8290	5.0	30 days	≤4˚C
1,2,3,7,8,9-HxCDD	SM8290	5.0	30 days	≤4˚C
1,2,3,4,7,8-HxCDF	SM8290	5.0	30 days	≤4˚C
1,2,3,6,7,8-HxCDF	SM8290	5.0	30 days	≤4˚C
1,2,3,7,8,9-HxCDF	SM8290	5.0	30 days	≤4˚C
2,3,4,6,7,8-HxCDF	SM8290	5.0	30 days	≤4˚C
1,2,3,4,6,7,8-HpCDD	SM8290	5.0	30 days	≤4˚C
1,2,3,4,6,7,8-HpCDF	SM8290	5.0	30 days	≤4˚C
1,2,3,4,7,8,9-HpCDF	SM8290	5.0	30 days	≤4˚C
OCDD	SM8290	10.0	30 days	≤4˚C
OCDF	SM8290	10.0	30 days	≤4˚C

All samples submitted for analysis will be analyzed for metals, PCBs, PNAs, BOD, total phosphorus, and dioxins/furans. The Laboratory Manager is responsible for initiating and scheduling the laboratory analysis to ensure that all samples are processed within their holding times.

Modeling

LimnoTech will utilize an existing Saginaw Bay wind-wave based on the SWAN (Simulating Waves Nearshore) model to accommodate sufficiently detailed representations of the Kawkawlin River reef to address Tasks 1-4 in Table 1. The model will be extended far enough upstream into the Kawkawlin River to represent the seiche. This model will be applied to simulate hydraulics, wave activity, and sediment transport patterns under existing average conditions or for extreme event scenarios and various lake water levels. Sediment transport output will semi-quantitatively illustrate the degree to which different locations in the project area are susceptible to deposition from each of these three sources.

LimnoTech will apply a downscaled model with a higher resolution grid or subgrid for the Kawkawlin River reef site to compare pre- and post-construction water levels, wave energy, and sedimentation patterns. Again, the sediment transport model will be applied with hypothetical solids loads from the three sources (Kawkawlin River mouth, resuspended littoral sediments, and resuspended bay sediments) so output will be semi-quantitative in nature, and not indicative of actual sedimentation rates.

Model output will be mapped and compared with existing conditions to quantify project benefits for the Kawkawlin River reef site and findings from tasks 1-4 will be documented in a brief technical memorandum that will be appended to the feasibility study.

Quality Objectives & Criteria for Measurement Data

The project for which the data are being collected will restore reef spawning habitats for lake whitefish, walleye, and cisco and will also complement completed and ongoing projects by various agencies (USFWS, USDA, MDNR) to

address shoreline and terrestrial impairments (e.g., sedimentation) to Saginaw Bay reefs during the past decade. The data being collected will help address specific components of reef siting in the Spoils Island Area of Interest (Figure 1) and provide additional insights into the impact of the Kawkawlin River reef site. Quality Control will be achieved for all activities primarily using sampling plans and protocols. Data collection will be conducted in accordance with the applicable plans and procedures to ensure consistent, quality data are collected. Secondary data used throughout the project will come from validated sources and studies. Any additional supplemental data will come from trusted professional sources (e.g. MNFI, USGS etc.). For the purposes of this project, a validated study is a document prepared by an individual or organization that has produced the study based on quantified information either collected by the author or cites other professional(s) that have the same or greater credentials. Further data evaluation will not be conducted.

Precision and Accuracy: Neither duplicate nor replicate measurements will be made during the sediment sampling surveys. The equipment (e.g. vibracore, ponar dredge, vessel, GPS and sonar equipment) used to collect the sediment samples are anticipated to function normally and therefore produce precise and accurate data. Vessels and equipment will be calibrated, operated, and maintained in accordance with the attached Policies and Procedures (Appendix C). Any indication of erroneous measurements will immediately be corrected by the survey crew.

Representativeness, Comparability, and Sensitivity: All sediment samples will be collected and analyzed using similar methods to the initial feasibility study (Appendix B) and therefore will be comparable in nature among and between sample collection times. Sediment sampling locations in the Spoils Island Area of Interest (Figure 1) (n=30) were established on an evenly spaced grid sampling pattern (380 m) and were distributed across depths (9-15 ft) and bottom hardness values found in the Area of Interest, and should be representative of sediment contaminant and grain size characteristics in the Area of Interest.

Completeness: All surveys are expected to be completed in the prescribed timeframes as detailed in Table 1. Every effort will be made to obtain valid data for each sampling point at each monitoring visit. Completeness will be measured by dividing the number of planned usable sample results (n=30) by the total number of actual sample results. The completeness objective for this project is for 90% of the planned data to be usable (samples collected and analyses generated within the established control limits).

Instrument/Equipment Testing, Inspection, Calibration, & Maintenance

The data objectives will be met through standardized methods and repeated use of properly functioning and calibrated equipment. Any field sampling equipment that will come into contact with the sample is decontaminated prior to use. This is performed with a biodegradable soap (Alconox), water (distilled, deionized, or tap), alcohol (methanol or ethanol). Additionally, if the equipment is not dedicated to this project site, it undergoes a bleach water wash prior to and after use at the project site to minimize the potential for invasive species transport. All calibration records will be maintained in the equipment case for each piece of equipment, and upon each site calibration, the date, calibration parameter, and name or initials of the personnel performing the calibration are specified on this document. For laboratory equipment, the laboratory will perform calibration of the instruments, as needed, by following manufacturer's instructions. Details on instrument and equipment calibration can be found in the method specific laboratory SOPs available upon request. The Field Task Manager will be responsible for ensuring all supplies are available for sampling (cooler with ice, sample bottles, COC forms, data sheets etc.). The Field Task Manager will also ensure decontamination supplies are available.

SECTION 3: DATA MANAGEMENT & REPORTING

Personnel

The Project Manager will oversee data collection and retention and provide summary reports as well as collected data to the GLFC for posting on the GLFC Inner Saginaw Bay Reef Project webpage (http://www.glfc.org/rhp-saginaw-bay.php) per the Data Management plan. The sediment sample collection will be conducted by MI EGLE staff with the Field Task Manager overseeing field collections. Coordination will occur between MI EGLE, MDNR, GLFC and ECT through the Project Manager and Project Coordinators. The GLFC will coordinate project reporting and milestone achievement.

Data Handling/Storage

All sediment sample survey data will be recorded immediately upon collection, either on paper or electronic forms, as noted above. Data on paper forms will be transcribed to computer software such as MS Excel, proofed for transcription errors, and corrected as necessary by the individuals who collected the data and the Project Manager. Laboratory analysis data will be supplied to the Project Manager via email and the report will be appended to the existing Feasibility Study (Appendix B). All data will be shared with the Great Lakes Fishery Commission for its publicly accessible project page as a part of the data management plan. The Project Manager will oversee all data handling and storage and will prepare any summary reports, which will include the following NOAA disclaimer:

> "These data and related items of information have not been formally disseminated by NOAA and do not represent any agency determination, view, or policy."

Data Review, Validation, & Verification

All data will be reviewed by a second individual against original data after the data are entered into a Microsoft Excel® spreadsheet. The data will be reviewed to ensure that it was entered accurately and that it was collected in conformance with the QAPP, sampling plans, and applicable standard operating procedures. Any nonconformity will be noted with the data and considered under Reconciliation with User Requirements below. Validation and Verification will occur at all levels of data collection through the Project Manager.

Reconciliation with User Requirements

Data will be used by the project team to perform a feasibility assessment and establish baseline conditions for the project area. The reference sampling and monitoring plans have been carefully prepared in cooperation with staff from EGLE, the MDNR, LimnoTech, and ECT staff to ensure that the data will meet the project needs. The data review and validation steps mentioned above will also provide an opportunity for the data users to verify that the data collected meet project needs.

The review of data collected shall consider the number and nature of the data collected and any deviations from the sampling plans and QAPP. If data were obtained by means other than those indicated in the plans/QAPP, the field lead will discuss the nature of the deviation with the Project QA Manager, and the data will be evaluated based on whether they can still meet the user requirements. If the methods used deviated significantly from the QAPP/plans, the methods used will be summarized in a memorandum and sent to the NOAA Technical Monitor, and MDNR technical reviewer. This memo will be attached as an addendum to the QAPP Documentation & Records

Appendix A: Inner Saginaw Bay Reef Restoration Project Proposal

INNER SAGINAW BAY REEF RESTORATION PROJECT – Bay County, MI
Coordinates: 43.6557, -83.8705. Exact location still to be determined but within a mile
Relevance to the Program Priorities: This project addresses the GLRI Action Plan III goal to identify habitats that support important Great Lakes species and take actions to restore, protect, enhance, and/or provide connectivity for these habitats. The proposed project addresses a Lake Huron Committee (LHC) priority to implement actions to address reef degradation to enhance production for multiple species of common concern across Lake Huron, including lake trout, lake whitefish, walleye, and cisco in the Saginaw Bay, Michigan region. In addition, reef restoration is identified as a priority action in the 2017-2021 Lake Huron Lakewide Action and Management Plan (LAMP).
Habitat Issues Addressed: The restoration site for ~3 acres (tentatively) of constructed reef will be in the vicinity of the Kawkawlin River outlet into Saginaw Bay and near Spoils Island, pending additional feasibility work. Historically, reef habitats in Saginaw Bay have been degraded by the impacts from physical destruction, degradation from shoreline development, sedimentation, chemical contamination, and aquatic invasive species (e.g. dreissenid mussels, rusty crayfish). The LHC has long recognized the value of restoring degraded reef habitat to enhance fish production and identified reef restoration as an environmental priority for increasing populations of various species that support fisheries throughout Lake Huron. The LHC, along with federal partners, are in the process of rehabilitating self-sustaining stocks of both lake trout and cisco in Lake Huron, with Saginaw Bay being the site for initial rehabilitation stocking for cisco. Reef restoration is also a prescribed strategy in the Michigan Department of Natural Resource's (MDNR) Saginaw Bay Walleye Recovery Plan, adding another source of recruitment to Saginaw Bay (and Lake Huron) from a reef-spawning stock, complementing benefits derived from a diverse suite of reef- and river-spawning stock contributions (e.g., portfolio effect). This reef restoration project will also complement completed and ongoing projects by various agencies (USFWS, USDA, MDNR) to address shoreline and terrestrial impairments (e.g., sedimentation) to Saginaw Bay reefs during the past decade.
Community Benefits: The project will ultimately provide recreational/commercial/tribal fishery benefits and move the LHC closer to the achievement of its fish community objectives, particularly through the rehabilitation of lake trout and cisco populations and contribute to diversifying walleye and lake whitefish production.
Technical Merits/Project Description: This reef restoration project builds off of a pre-construction assessment project, funded by the USFWS Great Lakes Fish and Wildlife Restoration Act (Supporting Habitat in Saginaw Bay – Restoring Fish Spawning Reefs), which indicated that conditions in inner Saginaw Bay are suitable for reef restoration and will use lessons learned from a nearby recent reef restoration project (2-acre Coreyon Reef). Saginaw Bay is an area of high productivity and warm temperatures serving as a nursery area for many species of fisheries importance to Saginaw Bay and the main basin of Lake Huron. Historically, inner Saginaw Bay contained rock reef habitat that provided important spawning habitat for many native species, including walleye and lake whitefish, but was largely lost and degraded by sedimentation resulting from logging and other land use changes. Restoring reef habitat within the inner bay is essential, as reefs in the outer bay appear to warm too late to be attractive to spring spawners and may lack suitable connected nursery habitat for both spring and fall spawners. This proposed project will address this spatial disconnect by establishing needed spawning habitat, using natural materials and techniques similar to the Coreyon Reef restoration, in proximity to appropriate thermal spawning conditions and nursery environments. In addition to enhancing production from important fish species that support fisheries, this project will be conducted in concert with other shoreline infrastructure work to reduce coastal flooding and erosion, reduce the frequency of navigational dredging, increase recreational access, and increase coastal resilience to climate change. The amount of reef acreage to be restored is uncertain at present but is likely to be similar to the Coreyon Reef restoration which used natural substrates and design components. Initial feasibility completed through a National Fish and Wildlife Foundation (NFWF) funding award to MDNR in 2019 (Attachments 5 and 6) includes shoreline sediment transport modeling utilizing existing hydrodynamic, wind/wave, and sediment deposition models, as well as extensive side-scan sonar bathymetric mapping, with the intent to develop a range of conceptual alternatives (30% design) for consideration for use in selection of final design. Funds requested for this project will support stakeholder meetings to scope the full range of alternatives generated from initial feasibility studies, further develop feasibility information and engineering and design plans, and for construction of reefs at the two locations detailed in the Feasibility Study. During the decision-making process, NOAA staff will be engaged and decisions will honor the Notice of Funding Opportunity guidelines that the reef restoration project will restore historic conditions and/or complement previous or planned habitat restoration efforts and that use natural substrates (e.g. gravel, cobble, woody debris, plant material). The Inner Saginaw Bay Reef Restoration project will not involve the use of molluscicides and will utilize natural stone similar to an adjacent reef restoration in Saginaw Bay (Coreyon Reef). Stakeholder consultations will include a diverse group of agency and stakeholder representatives to engage in the project from the feasibility to the completion of the construction phase. The group will consist of two co-chairs and will draft a Terms of Reference that describe how the group will function and make decisions once formed. MDNR will utilize existing stakeholder consultation

networks as a starting point for developing the team. Once formed, MDNR will convene a 2-day workshop in the Saginaw Bay Region. The workshop will include a synthesis of the results from the feasibility study, a discussion to develop goals and objectives for the nearshore habitat restoration work, a brainstorming discussion on innovative approaches to include, and development of a plan for the engineering and design phase of the project. The workshop will also include a detailed discussion of the various grants, funding, and match available. Project team members have experience with reef restoration, creation, and augmentation through restoration projects on Lake Huron (Coreyon Reef, Thunder Bay Reefs), and will be in consultation with Michigan's Reef Team with experience in Lake Michigan and the St. Clair-Detroit River system. Lessons learned from those projects will be incorporated into feasibility and design work for this project. MDNR will act as the primary land manager and be the responsible party for operation and maintenance, if needed, as the project will occur on State of Michigan bottomlands.

Timelines and Milestones: The planned timeline includes a request for funds in FY2022 for stakeholder workshop scoping, additional feasibility work, and completion of design plans, expected in late 2023. Funds for construction are requested in FY2023 after identification of the preferred alternative and completion of final design plans and include funds for material, transportation and barging, and reef restoration/construction. Permitting for the project has not yet begun but will begin in 2023 as designs are developed.

Project Assessment/Monitoring Plan: As-built surveys (e.g., reef placement, thickness, height, substrate characteristics) and fish community response surveys will be conducted once construction is complete, and a NOAA Tier 1 monitoring plan will be developed during the feasibility and design stages with assistance from NOAA staff. Much of the pre-construction environment is already being assessed as part of the NFWF funding and will provide pre-site characterizations for comparison to post-construction environmental conditions. MDNR currently has multiple assessment projects in the project location that will help inform project outcomes, and will add various fisheries surveys to inform both the design phase of the project as well as post-restoration response. MDNR will work with NOAA staff to provide a timeline for additional assessment and monitoring work. MDNR will conduct three fisheries surveys in Saginaw Bay that will help to inform this project including a 10-month creel survey to measure angler effort and harvest in the area.

Sustainability: Similar reef restoration projects have proven to offer considerable longevity and construction sustainability including Coreyon and Thunder Bay reef restorations (Lake Huron), Elk Rapids Reef (Lake Michigan), and reefs in the Detroit River.

NOAA Role: Project partners expect that with the cooperative agreement in place, NOAA will partner with grantees and will remain substantially involved throughout the award period. Assistance with feasibility study design development, including hydrodynamic modeling, stakeholder engagement and options analysis, engineering and design, and permitting.

Outreach and Education: The MDNR, the LHC, and the Lake Huron LAMP recognize the potential value of restoring reef habitats and the LHC identified this as an environmental priority, particularly in this area. Active participation from local and state agency personnel will ensure long-term stewardship. Additionally, information and progress will be shared with Michigan's Reef Team to guide future restoration projects as well as for communication of the benefits of reef restoration. The GLFC will provide outreach materials through communiques and the GLFC website on project benefits.

Project Costs: Total project costs are estimated at $2,642,554. MDNR has secured Dow Chemical Natural Resource Damage Assessment funds of $1,000,000 as leverage for project implementation. Therefore, the federal funding request would be for $1,642,554, to include $100,000 for stakeholder workshops and additional feasibility work, $200,000 for engineering and design, and $29,303 for GLFC personnel, fringe, travel, and indirect costs in FY22, and $1,230,000 for construction, and post-restoration monitoring, and $27,553 for GLFC personnel, fringe, travel and indirect costs in FY23. In FY24 and FY25, the federal funding request would be $55,698 for post-restoration monitoring, and for GLFC personnel, fringe, travel, indirect, and project close-out. MDNR will be the sub-awardee for the project given their extensive knowledge of the project site, experience with reef restoration in Saginaw Bay/Lake Huron at previous sites, will serve as the primary land manager upon completion, and are engaged on the project team.

Non-federal Match: No non-federal match has been secured for this project.

Project Partners: MDNR – Jeff Jolley has a BS from North Dakota State University, MS from Auburn University, and PhD from South Dakota State University in Fisheries Science, has spent 8 years working for the U.S. Fish and Wildlife Service in the Pacific Northwest, 3 years in Missouri as a Research Fishery Biologist with the U.S. Geological Survey, and is currently a Fisheries Supervisor with MDNR as the

Southern Lake Huron Unit Manager. His career focus has been on transparent, science-supported and collaborative approaches to conservation and natural resource management. **MI EGLE – Bretton Joldersma** is the Lake Huron Coordinator for Michigan's Department of Environment, Great Lakes, and Energy. He works with federal, state, provincial, tribal, and local partners to advance efforts to meet the requirements of the Great Lakes Water Quality Agreement. His work focuses on helping to facilitate and coordinate efforts to protect and restore the environmental integrity of Lake Huron. Bretton has worked for the State of Michigan for the past 18 years and holds a BS in Environmental Studies from Michigan State University, an MA in International Affairs from American University, and an MA in Natural Resource and Sustainable Development from the United Nation's University for Peace. **MDNR – Randy Claramunt** is the Lake Huron Basin Coordinator for Michigan Department of Natural Resources. He has worked on the Great Lakes for twenty-five years, during which he has extensive research and management experience including complex topics such as the management of salmonines and their prey, reef restoration, and Great Lakes food webs. He has also specialized in coregonid (whitefish and cisco) research, recruitment of native fishes, and spawning reef habitat protection in the Great Lakes. Other project partners include Michigan Sea Grant and a number of local stakeholder groups

Appendix B: Inner Saginaw Bay Reef Restoration Project Feasibility Study (NFWF)

See attached

Appendix C: EGLE Standard Operating Procedures

DEC\	Geological Services Unit Remediation & Redevelopment Division POLICY AND PROCEDURE		DEPARTMENT OF ENVIRONMENTAL QUALITY
Original Effective Date: 5/10/13 Revised Date: Reformatted Date:	Operating a Boat-Mounted Vibrating Coring Unit to Collect Sediment Samples		Category: Internal/Administrative D External/Non-Interpretive D External/Interpretive
	Number: **GSU-41**	Page: 1 of 3	

A Department of Environmental Quality (DEQ) Policy and Procedure cannot establish regulatory requirements for parties outside of the DEQ. This document provides direction to DEQ staff regarding the implementation of rules and Jaws administered by the DEQ. It is merely explanatory; does not affect the rights of, or procedures and practices available to, the public; and does not have the force and effect of law.

INTRODUCTION, PURPOSE OR ISSUE:
The Geological Services Unit has the ability to collect underwater sediment samples for analyses. The Unit has a 24-foot pontoon boat and a *"VibeCore-D"* coring system manufactured by Specialty Devices, Inc. (SDI) in Wylie, Texas. The operating crew usually consists of a boat operator, an observer, and the core operator. All three crew have differing jobs on deck depending on what is going on at the time.

The VibeCore-D A-frame structure is mounted onto the deck of the boat before leaving the dock (see Attachment 1). Once on location, the boat is anchored and held steady via a 3-point anchoring system. Global Positioning System (GPS) and depth data are then collected at the location. The vibrating head is attached to the winch line and the coring tube is then attached to the vibrating head. The system is then lowered to the bottom using the winch and the vibrating head is turned on to vibrate the tube into the sediment. When the tube stops advancing, the head is turned off and the winch is used to raise the system back to the surface to retrieve the core tube. The core tube is detached and stored on deck. The boat is then moved to the next location and the operation repeated.

Maximum working water depth is up to about 100 feet. Depth is controlled by the amount of anchor line for the 3-point anchor system.

Core tubes are typically 6 feet in length and about 3 inches in diameter. The amount of sediment collected in the core tube is based on sediment thickness and hardness of underlying soils below the sediment layer.

The operation of the boat is covered separately under the multi-section document titled *"Policy/Procedure: Boat Safety and Use,"* dated April 15, 2010.

PROCEDURES:

Who	DoesWhat
All	Set up the system A-frame and anchor it to the boat while at the dock.
Boat Operator	Operates the pontoon boat in a safe manner and all crew follow safety guidelines as described in *"Polic'flProcedure: Boat Safet'lf.. and Use,"* RRD, dated April 15, 2010, when away from the dock and on the water.
All	Anchor boat on coring location with 3-point anchor system.
Core Operator	Collect GPS and bottom depth data at location.
All	Sets up the VibeCore-D system as per *"VibeCore-D Og_erating_ Manual."*
All	Operate the VibeCore-D system as described in *"VibeCore-D Og_erating Manuaf'* to collect a sediment core.
Boat Operator	Move boat to next corino location.
All	Anchor and repeat system operation until all locations are sampled.
Boat Operator	Returns boat to dock as per *Polic'lfProcedure: "Boat Safet'lf.. and Use,"* RRD, dated April 15, 2010.
Core Operator	Once back on land, logs and collects a sediment sample from the sediment core for analysis.

REFERENCES:
"Polic'flProcedure: Boat Safet'lf.. and Use," RRD, dated April 15, 2010.
"VibeCore-D Og_erating_ Manual," by SDI, 2006, 22 pages.

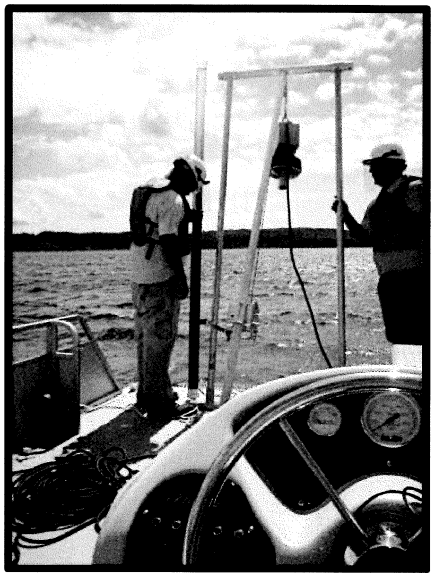
APPENDICES:
Attachment 1-VibeCore-D system photos

UNIT CHIEF APPROVAL:

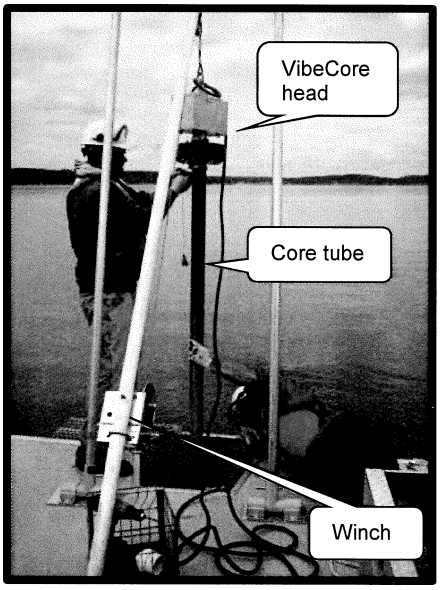
Burrell P. Shirey, Chief
Geological Services Unit

5/10/13
Date

Attachment 1
VibeCore-D System



VibeCore-D setup with A-frame



VibeCore-D, on front of pontoon boat, retrieving a *sediment core.*

Department of Natural Resources and Environment
Remediation and Redevelopment Division
Program Support Section and Superfund Section

Policy/Procedure: Boat Safety and Use

April 15, 2010

POLICY:

This policy/procedure establishes the minimum requirements for the safe use and operation of boats managed and operated by the Superfund and Program Support Sections, and the minimum training requirements for boat operators. Staff shall conduct work duties in a safe and professional manner while using the boats.

PROCEDURE:

Qualifications

Before operating a boat with a motor, the operator must meet the following conditions:

1. Regardless of hands-on experience, staff must satisfactorily complete the United States Power Squadron "Boat Smart Course," or equivalent course as determined by the Captains Committee (defined in this policy/procedure), covering the following topics:

    - Proper trailer hook up
    - Towing procedures
    - Motor operation and fueling
    - Proper boat operation
    - Common safety procedures including use of personal floatation devices (PFDs)
    - Navigational rules while on the water
    - Other information to promote safe boat handling

2. Staff expected to use boats on the Great Lakes, and/or connecting channels, must have successfully completed the United States Power Squadron "The Squadron Boating Course" or equivalent course(s). The ten week course will provide a more detailed review of boating issues that are more relevant to boating on the Great Lakes, and/or connecting channels, including:

    - Piloting a boat
    - Charting a course
    - Reading a mariner's compass
    - Marine Radio use, Knots and Lines

    Other staff may attend the "The Squadron Boating Course" or equivalent course(s) upon their supervisor's approval.

3. Staff must also demonstrate to a member of the Captains Committee competency at the following basic skills prior to operating a boat.

    - Proper trailer hook up
    - Towing procedures
    - Motor operation, fueling, and troubleshooting
    - Properly launching and loading the boat
    - Ability to operate the tow vehicle and boat in reverse as necessary
    - Proper boat operation
    - Safe boating practices

4. Staff planning to operate a boat as the designated Operator in Charge {OIC) shall satisfactorily complete an annual hands-on test run and/or refresher course with a boat, while accompanied by a member of the Captains Committee. The test run and review will include an update on the boating equipment, safety equipment, safe boat handling, trailer towing, and expected condition of boats and equipment upon return to the storage location. The use and installation of any auxiliary equipment (electronics, sampling equipment) on the boat may also be reviewed at this time.

Exceptions

Staff who have previously completed the United States Power Squadron's "The Squadron Boating Course" do not need to complete the "Boat Smart Course." Staff who have completed other formal classroom training may provide a description of the course to the Captains Committee for determination as to whether additional classroom training (i.e., Boat Smart course) is needed.

The Captains Committee may waive any of the necessary requirements for experienced staff on a case-by-case basis, as appropriate. Documentation of the waiver and the basis for the waiver shall be sent to the appropriate Unit and Section Chief.

Check-out Procedure for Boats and Trailers

Boats may be reserved and checked out by RRD staff through a calendar maintained by the Superfund Section on the Division's shared drive at:

S:_Superfund Section\Boats\20_ Boat Rese ation and Info.xis

This reservation system requires staff to notify via e-mail, the appropriate staff responsible for each individual boat as designated in the calendar.

Other department staff may use RRD boats upon availability and with approval of their supervisor. The supervisor must consider the staff person's skills and knowledge of boating safety consistent with the preceding qualifications. Repairs necessitated by any damage to the boats, trailers, and/or equipment caused by another division's staff person due to misuse, abuse, and/or carelessness shall be charged to the division that borrowed the boat. The Captains Committee will coordinate the necessary repairs or equipment replacement.

Pontoon Boat

The Pontoon Boat was specifically designed to run bathymetric/hydrographic studies and sample sediments with a specialized vibe-core system. The equipment is only to be used by staff trained on its proper use. Other uses will have to be approved by the Captains Committee.

Rules for Usage of All Boats

1. Remove all visible aquatic plants and animals from the boat, motor, trailer, and accessory equipment before leaving the access site.

2. Drain all water from the boat, including live wells and transom wells, thoroughly before leaving the access site.

3. Boats are to be returned to their designated storage facility clean. If a boat is not cleaned the day it is returned due to time constraints, it is the user's responsibility to ensure that it is cleaned the next day and prior to other staff's use of the boat.

4. Any damage or problems with the boat, motor, or equipment should be reported to the boat's responsible staff person designated on the scheduling calendar, a member of the Captains Committee, and the user's immediate supervisor in writing within one work day of its return to the designated storage facility. Boat, trailer, motor, or equipment should be tagged in a highly visible manner to aid in identification of the necessary repair.

5. All portable boat gas tanks shall be returned to the proper storage location at the designated storage facility.

6. All boats must have the appropriate safety equipment on board while on the water as identified in Appendix 2.

7. Boats with built-in fuel and fluid reservoirs should be returned to the storage facility with all fluids full.

8. All modifications or additions that may affect the integrity of a boat must be approved by the Captains Committee. The committee will evaluate all requests to determine if the modification may affect the structure of the boat, whether the modifications may prevent other tasks that are important to RRD from being completed, and whether the equipment is duplicative and/or necessary. Upon receiving approval from the Captains Committee, the requesting section would then proceed with all the necessary steps required to purchase the equipment and pay for the modifications. The requesting section will be responsible to oversee all work completed to insure that the integrity of the boat is maintained. Purchasing should be done per the DNRE purchasing requirements and must have the approval of the respective Section Chief. The Superfund and Program Support Section Chiefs will keep each other informed on purchasing actions.

9. Accidents should be reported per the DNRE accident reporting policy.

10. Near miss cases and accidents should be discussed in detail by the Captains Committee to find methods to reduce future risk.

Safe Manning Requirements

1. The boats shall be manned by qualified operators and crewmembers to ensure that operations are conducted in a safe, efficient, and professional manner. Personnel who are onboard primarily to conduct mission-related operations may assume crew duties only if the OIC has determined that the individual possesses the necessary skills and qualifications prior to assuming those duties. Crewmembers may, if conditions warrant, assist personnel with their mission at the discretion of the OIC.

2. The OIC shall conduct daily Safety Orientation Briefings prior to departure. This briefing will include, but is not limited to, the topics presented in Appendix 3.

3 Should the OIC become incapacitated, the next most senior operator of the crewmembers must take the lead in maneuvering the boat to a position of safety and contacting emergency services to make necessary arrangements.

Float Plan

All use of RRD boats shall be documented in a Float Plan. All Float Plans must be filed prior to departure, and shall conform, at a minimum, to the standardized Float Plan (See Appendix 4).

All Float Plans must be submitted in writing, or electronically, to a designated Contact Person (i.e., Unit Chief) and the unit secretary, regardless of voyage duration. The OIC shall tender the Float Plan, prior to departure, with the above designees as follows:

1. The Float Plan shall establish a specific tracking and communications procedure that requires the OIC to report to the Contact Person daily before departure and upon return. During operations, all changes in operation from the Float Plan must be relayed to the Contact Person prior to the execution of the operation.

2. The Contact Person shall be responsible for determining whether the boat is overdue for arrival or check-in. If the boat is overdue, the Contact Person shall take appropriate action to either determine the location and status of the boat and its crew by contacting the crew or, if contact with the crew members cannot be made, the Contact Person will initiate the emergency response actions designated in the Float Plan.

3. The OIC and crew shall ensure that live verbal contact has been made to the Contact Person on a daily basis. This is extremely important upon return.

DEFINITIONS AND RESPONSIBILITIES:

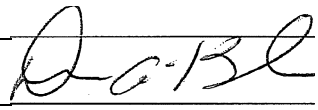
Captains Committee: The committee will consist of staff designated by their respective Section Chief who have received the appropriate training as specified below and who have actual boating experience. The committee will consist of representatives from the Superfund and Program Support Sections and the current list of representatives is given in Appendix 1.
Additional representatives may be appointed by the Division Chief. The committee's responsibilities are to instruct others on boat use, to review and approve the competency of

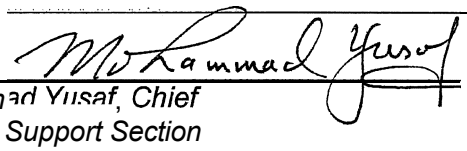
others' boat use skills, to review boat safety and use policy, and approve boat modification proposals and uses.

Operator in Charge (OIC):
The OIC is the qualified individual that is responsible for the safe operation of the boat and for the embarked personnel. The OIC is responsible for ensuring that the Float Plan is submitted prior to departure and that daily contact is made with the Contact Person as appropriate to communicate operational status.

Contact Person: The single person designated by the OIC who remains on land and is the contact person the boat crew calls to let them know when the boat leaves and returns to land or
,if there are any changes to the filed Float Plan. The contact person is responsible to initiate emergency rescue procedures if the boat crew is overdue in reporting when they return to land at the end of the day and no contact can be made with the boat crew.

APPROVAL:

Signed: 	
David Kline, Acting Chief *Superfund Section*	*Date* 4/16/2010

Signed: 	
Mohammad Yusaf, Chief *Program Support Section*	*Date* ***,/f-JS-:-10***

Attachments
Appendix 1 - RRD Captains Committee Members Appendix 2
- Safety Equipment
Appendix 3 - Safety Orientation Briefing Appendix
4 - Float Plan

APPENDIX 1

RRD CAPTAINS COMMITTEE MEMBERS:

Name	Section
Joseph Walczak	Superfund
Matt Williams	Superfund
Aaron Berndt	Program Support
Nicholas Ekel	Program Support

APPENDIX 2

SAFETY EQUIPMENT:

State and federal regulations require the possession of various equipment and/or safety gear while boating. The following list represents the minimum amount of safety equipment that should be on a vessel before heading out on the water.

1. A personal floatation device (PFD) is required for each person on the boat.

2. Navigational lights are required on power boats (any boat with a motor) if operating during the period from sunset to sunrise, or during low light conditions (fog, rain, haze).

3. A type B fire extinguisher is required on any RRD boat being operated with a motor.

4. A sound producing device such as a whistle or air horn is required on all vessels, regardless of size, operating on the Great Lakes or connecting waters. Boats less than 16 feet long that are operated on inland lakes or rivers are not required to have a sound producing device on board. However, it is recommended that a sound-producing device be kept on each boat.

5. Day and night visual distress signals are required on all vessels that will be operated on **federally controlled waters, such as the Great Lakes and connecting waters, and on all** vessels 16 feet or larger that are operated on state waterways. If pyrotechnic visual distress signals (orange smoke, flare, red meteor) are used there should be a minimum of three (3) pyrotechnic devices on board

APPENDIX3

SAFETY ORIENTATION BRIEFING

Vessel: _____
Date: _____
OIC: _____

Topics presented in orientation session:

1. PFDs
   a. PFD policy
   b. Location of PFDs

2. Man overboard
   a. Maintain lookout
   b. Sound alarm
   c. Throw rings and floating gear

3. Fire
   a. Alarms
   b. Portable extinguishers

4. Abandon ship
   a. Safety Equipment location and operation
   b. Radio

5. Personal safety gear
   a. PFD - on deck, underway
   b. Hard hats (if required for mission-related operations)
   c. Safety shoes (if required for mission-related operations)
   d. Polarized sunglasses, sunscreen, hats, insect repellant, etc.

6. Medical situations
   a. Inform crew
   b. First aid kit location

7. Roles and responsibilities
   a. OIC and crew
   b. Others including science crew

8. Verbally confirm
   a. All understand the safety briefing
   b. All understand the mission
   c. All are well rested and fit for the mission

APPENDIX4

FLOAT PLAN

Michigan Department of Natural Resources and Environment
Remediation and Redevelopment Division

Date: _ _,/ ____ /___ **Operator In Charge: _____**

Boat Name: _____ **Contact Person: _ _ _ _ _ _ _ _ _ _ _ _**

Boat Description:

Make: _____
Model Number: _____
Type of watercraft: _____
Draft: _____
Color: _____
Length: _____
Trim: _____
Registration No.: _____

Boat Operator:

Name: _____
Phone: _____

Tow Vehicle:

Make: _____
Model: _____
Color: _____
Plate#: _____
Location Parked: _____

Itinerary Information:

Water Body: _____
Project Coordinates: __ Dock Available:
_____ County:
_____
City: _____
Local Sheriff: _____ Phone#: _____
Local Marina: _____ Phone#: _____
Coast Guard: _____ Phone#: _____

APPENDIX4

FLOAT **PLAN**
(page 2)

Project Schedule:

Sunrise:	*Sunset:*	*Start Time: (1)*	*End Time:*	*Check-in Time (2)*

(1). On a daily basis, the OIC will check in with the contact person at or before Start Time.
(2). On a daily basis, the OIC will check in with the contact person by Check-in Time.

All changes in operation from the Float Plan must be relayed to the Contact Person prior to the execution of the change in operation. •

Operator in Charge: _____
Cell Phone number while aboard: _____

Contact Person: _____
Phone numbers: Office: _____ Cell: _____ Home: _____

List of Cell Phones Aboard Vessel:

OIC:_____
Other:_____
Other:
Oth_____
Other:_____
Other ---------- ◆?◆ _

Radio Information:

While operating on the Great Lakes or connecting waters, the crew will be monitoring Marine Radio Frequency #_____ _
Note: The crew will at times be using the marine radio to get updates on the weather conditions but after such updates will switch back to the monitoring frequency.

Persons Aboard:

Name	Age	Swim?	Medical Conditions	Emergency Contact#
OIC:				

APPENDIX

FLOAT PLAN
(page 3)

Required Equipment List:

PFD: Type I _____
PFD: Type II _____
Throwable PFD: _____
Medical Kit: _____
Distress Signals: _____
Paddles or oars: _____
Nautical Chart: _____
Marine Radio: _____
Fire Extinguisher: _____
Anchor(# and type): _____
Water (drinking): _____
Other: _____
Other: _____
Other: _____
Other: _____

Note:
Class I, II, and Ill boats, regardless of their operating area or water temperature, shall carry one or rrtore throwable lifesaving devices such as Type IV buoyant cushions and/or Ring Life Buoys.

Type I PFDs are required on all water craft

Emergency Response Action Plan:

In the event that the OIC or another crew member does not contact the Contact Person by the specified Check-in Time, the Contact Person will conduct the following response actions.

1) Contact the OIC by cell phone. If unable to reach, leave a message.
2) If unable to verbally contact the OIC, attempt to contact any other crew member using the cell phone numbers listed in this Float Plan. If unable to reach, leave a message with each crew member.
3) If the. OIC or crew members do not respond to the messages within 15 minutes of the time of the last message, contact the marina contact listed in this Float Plan (if the crew launched from a marina) to determine whether the crew's tow vehicle is still at the marina.
4) If the tow vehicle is still at the marina, or the crew launched from a site with no marina (i.e. boat access site), contact the local Sheriff's Department to report the crew being overdue for returning. If operations are on the Great Lakes or connecting waters, the Sheriff's Department may request that the Contact Person contact the local Coast Guard station to report the overdue crew. Provide the Sheriff's Department or Coast Guard with all pertinent information provided in this Float Plan regarding the boat and its crew. Be sure to include contact information and marine radio frequency if applicable.
5) Follow all instructions of the Sheriff's Department or Coast Guard.

APPENDIX4

FLOAT PLAN
(page4)

Mission Operations:
Briefly describe mission operations.

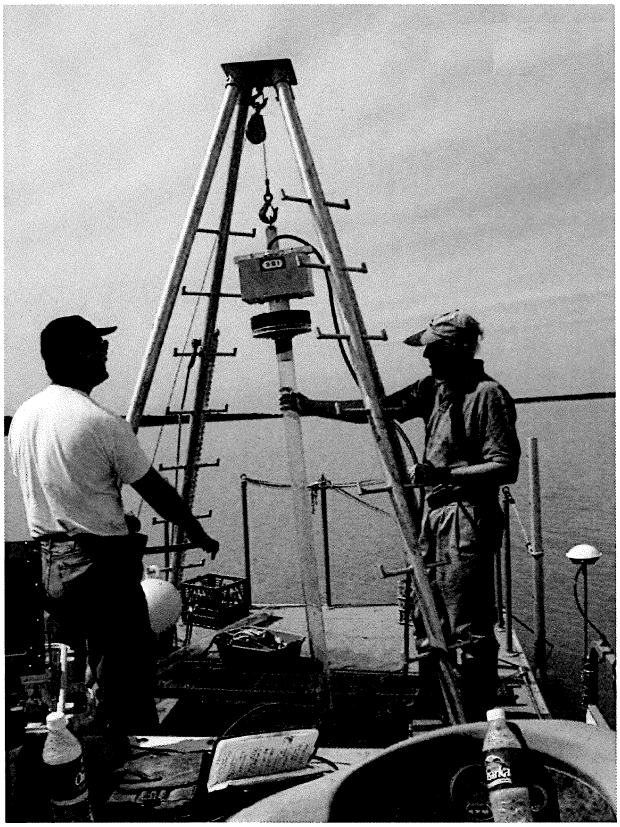
Prepared by: _____ Date: _____

Approved by: _____ Date: _____

Specialty Devices, Inc

Specialty Devices, Inc. 2905 Capital Street, Wylie, Texas U.S.A. *75098*
Ph: 972-429-7240 **Fax:** 972-429-7243 SDIPDH@aol.com www.SpecialtyDevices.com

VibeCore-D
Operating Manual



November 2004
Serial Number 009
Revision 5 April 2006

STATEMENT OF LIABILITY 4
Warranty 5
Introduction 7
Description of the VibeCore....7
Coring with the VibeCore-D....8
Stainless Steel / Aluminum tube 9
Plastic/Lexan tube....9
Core Tube Attachment 9
Powering the VibeCore-D....10
Useful Tools and Tips 12
Tools and Materials 12
Tips....12
Plastic Core Tube Drilling Tips.... 13
Cleaning the Flapper Valve....13
Tighten Clamps 13
Securing the Lift Cable 14
Boat Mooring....14
Verifying Core Tube Seal 15
Getting the best results from the VibeCore-D....15
Float/weight Coring Method 15
Core Keepers for Soft Sediment or Coarse Sand....16
VibeCore-D Keeper Installation Instructions....17
Appendix 1 Standard System Components....21
Appendix 2 Optional equipment available:....21
Appendix 3 Recommended Parts List for Field Operations....21
Standard Equipment List 21
Additional Equipment for saving core samples....22
Additional Equipment for Organochlorine Pesticide Screen 22
Additional Equipment for Heavy Metal Screen 22

STATEMENT OF LIABILITY

Specialty Devices, Inc. (SDI) shall not be liable for any loss, costs, expenses, damages, liabilities, fees, duties, taxes, property damage or personal injury, including death sustained or suffered directly or indirectly out of the purchase, installation, operation, or use of the equipment, or licensing or resulting products or services, operating, handling, data production, data analysis, results or conclusions derived from application or use of the equipment. In no event will SDI be liable for special, indirect incidental or consequential damages of any kind or nature due to any cause resulting from use or application of the equipment. Purchaser shall be responsible for any taxes, duties, fees, assessments, or other charges incurred during shipping or use of the equipment and shall comply with all laws relating to operation of the equipment, including obtaining any permits or licenses required to operate this equipment. No warranty is either expressed or implied regarding the suitability or fitness of any SDI produced, manufactured, leased, rented or sold equipment for a particular purpose or that the equipment will satisfy the requirement of any law, rule, specification, or contract.

Warranty

Specialty Devices, Inc. (SDI)
"Limited Manufactured Equipment One Year Warranty"

COVERED EQUIPMENT
This warranty applies to equipment manufactured by SDI and designated as covered by SOi's "Limited Manufactured Equipment One Year Warranty" in the quotation, purchase contract or in the manual for the equipment. This warranty does not apply to prototype, leased, rented or refurbished, experimental, developmental, pre-production, sample, incomplete or out of specification product or to returned products if the original identification marks have been removed or altered unless stated in writing from SDI.

PERIOD
The period of this warranty shall extend for the period of one year from the date the equipment is originally shipped from SDI.

TERMS
SDI warrants that the equipment will be in good operating condition when shipped and for a period of one year following shipment.

Should there be defects in the covered equipment during the warranty period, the equipment will be repaired or replaced at SOi's choice, should, in the opinion of SDI, there be a fault due to materials or workmanship. This warranty does not cover abuse, use beyond design purpose, or damage to the equipment beyond
normal wear and tear. Determination of normal wear and tear shall be at the sole discretion of SDI.

The foregoing warranties do not extend to (I) nonconformities, defects or errors in the products due to accident, abuse, misuse or negligent use of the products or use in other than a normal and customary manner, environmental conditions not conforming to Specialty Devices, lnc.'s specifications, or failure to follow prescribed installation, operating and maintenance procedures, (II) defects, errors or nonconformities on the products due to modifications, alterations, additions or changes not made in accordance with Specialty Devices lnc.'s specifications or authorized by Specialty Devices Inc., (Ill) Normal wear and tear,
(IV) Damage caused by force of nature or act of any third person, (V) shipping damage; or (VI) service or repair of product by the dealer without prior written consent from Specialty Devices Inc..

CLAIM PROCEDURE
To claim under this warranty the purchaser shall obtain an RMA number via telephone or E-Mail and ship the equipment prepaid to SDI.

WARRANTY TRANSFER
This warranty is transferable within the warranty period. To validate the transfer of this warranty, SDI should be informed of the new owner name, address, telephone contact and E-mail contact.

SHIPPING
Purchaser shall pay shipping cost to SOi's Plano, Texas office. SDI will pay return shipping cost, within the continental United States, if equipment is determined to require warranty repair. Return shipping for non-warranty repairs will be to the account of the purchaser.

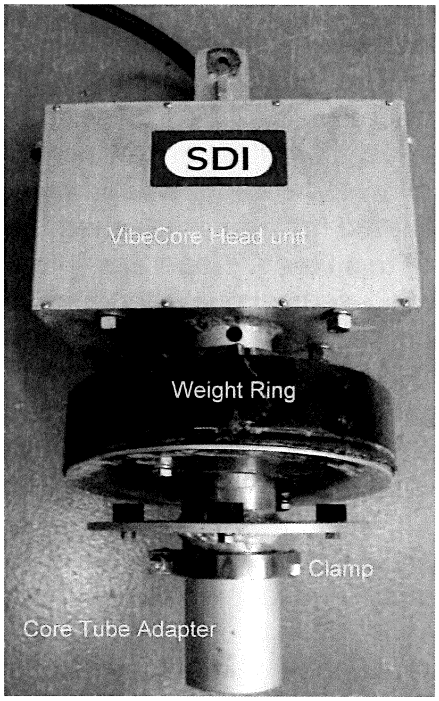
LIABILITY
Specialty Devices, Inc. (SDI) shall not be liable for any loss, costs, expenses, damages, liabilities, fees, duties, taxes, property damage or personal injury, including death sustained or suffered directly or indirectly out of the purchase, installation, operation, or use of the equipment, or licensing or resulting products or services, operating, handling, data production, data analysis, results or conclusions derived from application or use of the equipment. In no event will SDI be liable for special, indirect incidental or consequential damages of any kind or nature due to any cause resulting from use or application of the equipment. Purchaser shall be responsible for any taxes, duties, fees, assessments, or other charges incurred during shipping or use of the equipment and shall comply with all laws relating to operation of the equipment, including obtaining any permits or licenses required to operate this equipment. No warranty is either expressed or implied regarding the suitability or fitness of any SDI produced, manufactured, leased, rented or sold equipment for a particular purpose or that the equipment will satisfy the requirement of any law, rule, specification, or contract.

EXCLUSIVITY
The warranties and remedies are exclusive and all other warranties, express or implied, written or oral, including the implied warranties of merchantability or fitness for any particular purpose are excluded.

Introduction

The VibeCore-D is a sediment sampler which is used to obtain 3" diameter multiple foot depth samples by vibration a liner less core tube into the bottom. The VibeCore-D operates from two 12 volt car batteries wired in series to produce 24 vdc. This note describes the VibeCore-D and the methods for operating the VibeCore-D.

Description of the VibeCore



Picture 1 VibeCore-D

The VibeCore assembly consists of the vibrating head unit, the connecter with weight ring, and the core tube adapter. The power cord is connected to the head unit and includes an on-off switch in waterproof housing.

The VibeCore is designed to be operated with a 20-28 VDC high current source. The simplest method is to use two marine 12V batteries in series. Alternatively, standard top post car batteries can be used with marine battery adapters.

There are several available core tube adapters. These adapters are designed to fit the varying inside diameters of the stainless steel, plastic and aluminum tubing commonly used for core tube. Selection of the proper adapter size is critical. Too large an adapter and your core tube will not install, too small an adapter and your tube will be very loose and sampling will be difficult.

The adapter is stamped on the bottom with an identifier.

A Aluminum tube nominal 2" or 3" diameter S
Stainless steel tube nominal 3" diameter
P Plastic Core Tube nominal 2" or 3" diameter

Other tubing sizes may be supported, contact us for details.

Coring with the VibeCore-D

The VibeCore-D coring device consists of a vibrating core head with weight ring, check valve, and core tube. The VibeCore-D obtains a 3" diameter vertical cylindrical sample of the reservoir sediments. These samples are obtained by vertically vibrating the liner less core tube at sufficient frequency to liquefy water saturated sediments and allow the core tube to progress into the sediment. Once dry, compacted, or consolidated material is reached the core tube progression into the bottom is halted. At this time the operator turns off the vibration action and the core it retrieved with a vertical pull. Standard core tube is aluminum.
Plastic and stainless steel core tubes are available for trace metal or organic sampling requirements. The VibeCore-D was designed for operation from a small boat and requires only a pair of 12 volt batteries for its power source. Core tube lengths are typically 3, 6, 8 and 12 foot in length. SDI Core Catchers were available for very soft sediments or for sampling in clean coarse sand sediments.

Depending upon the sampling requirements the VibeCore-D system supports either in field core sub-sampling or keeping the entire core for later analysis.

Following retrieval of a sample, the sediment level in the core tube is measured and the core tube is cut approximately 1 to 2 inches above the level of the uppermost sample. A core tube end cap is installed on each end and, if necessary, a Teflon film is applied between the end cap and the sample. The end cap is held in place with stainless steel hose clamp. Cores were stored either upright or at a minimum angle of 30 degrees from the horizontal until the time of sub-sampling.

Sub-sampling can be performed using a variety of methods. The core sample can be pushed out of the core tube, the core tube can be cut lengthwise and the sample sub-sampled or the core tube can be cut radially at small length increments and the samples taken. A common practice for trace metal and organic pesticide sampling uses stainless steel core tube and the core tube is cut at the desired length intervals. A stainless steel scoop is used to remove samples and the samples are stored certified glass containers with Teflon coated covers. Samples are labeled with a unique code indicating the core number, sample area and sample level. Sample 2R5 for instance might refer to core number 2 at the test site and sub-sample depth of 5 feet from the water/sediment interface.

Core Tube Preparation

Stainless Steel / Aluminum tube

1. Make sure the tube end in cut cleanly and square and the outside of the tube end is clean and dry
2. Slip the steel drilling guide over the end of the tube.
3. Mark the hole locations with a "Sharpie" marker
4. Carefully drill a starter hole with a small diameter (1/8" or so) drill bit
5. Enlarge the holes to approximately¼"

Plastic/Lexan tube

1. Make sure the tube end in cut cleanly and square and the outside of the tube end is clean and dry
2. Screw the setscrews on the core tube adapter in until they're flush with the outer surface of the adapter
3. Slide the tube over the adapter
4. With a "Sharpie" marker mark the set screw locations onto the outer surface of the core tube.
5. Remove the core tube from the adapter
6. Carefully drill a starter hole with a small diameter (1/8" or so) drill bit
7. Enlarge the holes to approximately¼"

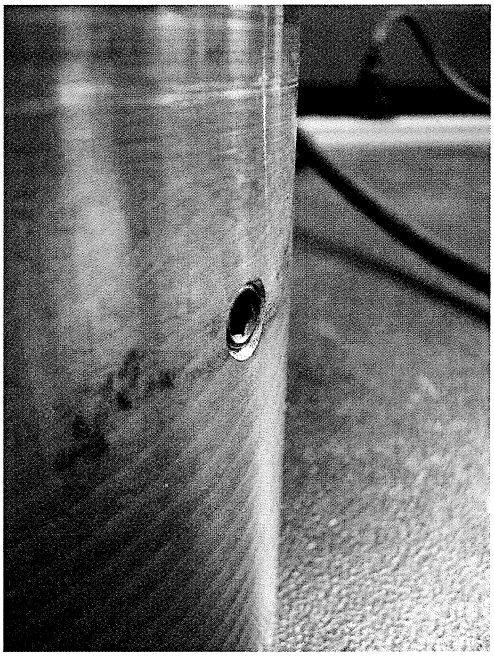
Core Tube Attachment

The core tube is held to the adapter with either 3 setscrews (metal tube) or 6 setscrews (plastic tube).

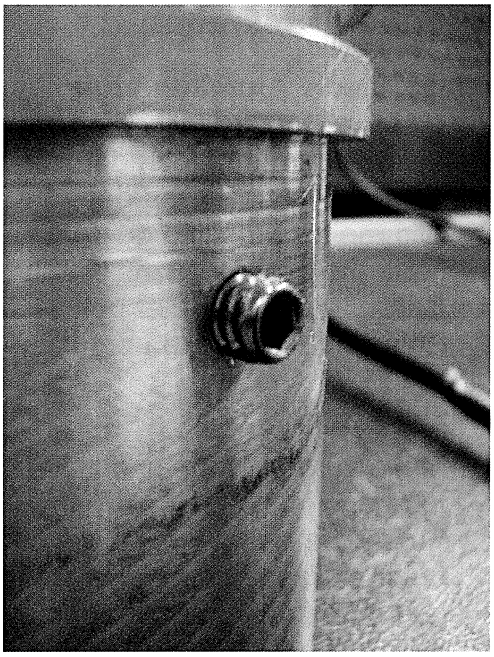
To remove/install the core tube screw the setscrews into the adapter so that the head of the setscrew is just flush with the outer surface of the adapter.

To secure the core tube, unscrew the setscrews until they are out past the outer surface of the core tube.

Secure/seal the core tube to the adapter with electrical tape, making sure to seal over the setscrews and the seam where the core tube meets the adapter.



Picture 2a Setscrew retracted

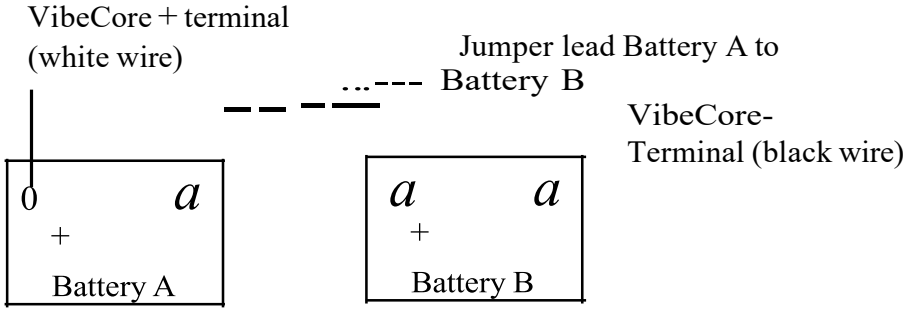


Picture 2b Setscrew extended

Powering the VibeCore-D

The VibeCore-D works best when powered by two charged 12VDC Automotive or Marine type batteries connected in series as show in Figure 1. If top terminal automotive batteries it will be necessary to attach the marine battery adapters.

Diagram 1 Connecting the batteries for the VibeCore-D



Quick Setup and Sampling guide

1) Moor the boat securely using 3 anchor points to maintain a fixed position over the desired sampling point.
2) Make sure that the head-unit to weight ring adapter and weight ring adapter to core tube adapter clamps are tight with cotter pins properly installed.
3) Attach the lifting line to the top eyehole on the VibeCore-D. **Secure the** shackle pin with tie wrap or safety wire!!!
4) Connect the batteries in series using the supplied jumper cable (see figure 2 below)
5) Connect the VibeCore power leads to the batteries, white power lead to positive terminal and black to the negative terminal
6) Install a core tube to the adapter. (see Pictures 2a and 2b)
    a. Make sure the setscrews are all flush in the adapter
    b. Slide a pre-drilled core tube over the adapter
    c. Back the setscrews out so that approx 1/8" of setscrew protrudes past the outer surface of the core tube
    d. Use vinyl electrical tape to seal over the setscrews and the joint between the core tube end and the adapter. Optional- wrap the electrical tape with an outer layer of duct tape.
7) Slowly lower the VibeCore-D into the water
8) Judging by the tension in the lifting line you can get a feel for when the end of the tube makes contact with the sediment
9) turn on the VibeCore-D
10) Continue to slowly lower the unit into the water. Again, use the tension/angle of the lifting line to judge when the unit stops sinking further into the sediment or starts to tip over
11) Turn off the power and wait for the Vibecore to stop vibrating.
12) Carefully lift the unit from the bottom until the head of the VibeCore-D is above the water surface.
13) Have an assistant prepare to grab the lower end of the core tube and cap it before it breaks the waters surface. This will prevent the core from sliding out of the tube.
14) Keeping the tube as vertical as possible, remove the core tube from the adapter.
15) Using a measure stick determine the top of the core sample. It's not unusual for the sediment at the top to be very close to water density
16) Once the top of the sample has been determined and measured, cut the core tube 1-2" above the top and cap the top of the tube.
17) For on the spot analysis, push the sediment sample carefully onto a flat work area using a core pusher.
18) If reusing the core tube make sure to rinse thoroughly before reattaching to the VibeCore-D

Useful Tools and Tips

Tools and Materials

Allen key
There should be an Allen key (1/8") supplied that fits the set screws used for installing the core tube. I find I drop these so you may want to take along a spare. The key is supplied with an attached lanyard that, if tied off, seems to stay on board. There are also spare cotter pins used to lock the core tube adapter clamps and tape to seal the core tube to the core tube adapter.

Core Tube Adapters

There are several available core tube adapters. These adapters are designed to fit the varying inside diameters of the stainless steel, plastic and aluminum tube commonly used for core tube. Selection of the proper adapter size is critical. Too large an adapter and your core tube will not install, too small an adapter and your tube will be very loose and sampling will be difficult.

Core Tube Caps

Core tube end caps or a tubing cutter for the core tube are useful if you are preserving the sample in the tube. These are available from SDI or can come from a local hardware store of pipe supply house. The caps are either 3" rubber pipe cap and include a hose clamp or are 3" polyethylene and are secured with duct tape. The tubing cutter should open far enough to cut 3" pipe. You would need two caps for each core sample you want to save. With a short core tube you may not need the tube cutter.

Tubing Cutter

Several styles of tubing cutters are available and the optimum type depends on the type of core tube you are using and the number of cuts you plan to make.
SDI can advise you on tubing cutter selection.

Tips

A few really good things to help get good cores are:

1. Make sure you have a really good three point mooring for the boat. Movement will cause the VibeCore to tip over and lay on the bottom. The alternative is to use the optional float and weight ring support for the Vibecore-D.

2. Get a good seal on the core tube to the VibeCore. This prevents losing the sample just as you pull it aboard. Electrical tape makes a good seal. You will want to use this on the joint between the core tube and the adapter. You should also cover the set screw holes. Bring plenty of electrical tape. You will use a few feet each core you take.

3. Screw in the set screws to remove the core tube, do not unscrew! The set screws will screw into the core tube adapter far enough to clear the core tube and allow you to remove the core tube. The natural inclination is to unscrew these. If you were to screw them out you may drop them and they will eventually damage the threads of the adapter.

Plastic Core Tube Drilling Tips

When using plastic pipe you will not need the drill guide. With clear tube most users slide the tube onto the VibeCore and mark the places to be drilled with a magic marker "Sharpie", then slide the tube off and drill the holes. If anything, make hole pattern a bit far from the end of the pipe so the pipe is held securely at the flange of the adapter. This helps the coupling from the adapter to the core tube and thus increases the force on the tube.

The following includes a few useful comments for drilling the holes in plastic core tube to make this work reliably:

1. When you slide the tube onto the adapter to mark the drilling locations, make sure it is all the way on and duct tape it to the VibeCore. Then mark it in all six places. This keeps it from moving while you mark the tube.

2. Start each hole with a small drill, about 1/8" or less, then enlarge the hole to 9/32". This makes it easier to get the hole in the right spot and provides a little wiggle room if it is not in the right spot. Drilling slowly with a cordless drill is the most controllable and least likely to crack the tube.

3. Trial fit the tube on the adapter before going to the field. It is easier to drag or enlarge a hole in the shop than on the boat.

Cleaning the Flapper Valve

The flapper valve that keeps the sample in the tube is inside the core tube adapter. If you sink the VibeCore head into soft mud you can cover the flapper with mud and prevent it from sealing well. To clean this flapper valve, lower the head, with a core tube attached, into the water so the water line is below the rectangular section of the Vibecore head. Pull and push against the lifting wire about 18" apart simultaneously so the head is rapidly lifted and lowered into the water. This creates a good flushing action on the flapper valve and should clean it out without the need to disassemble.

Tighten Clamps

Always check that the ring clamps are tight and that there is some small gap between faces of the ring clamp at the clamping bolt. The ring clamps are the ones that hold the core tube adapter to the weight ring section and the weight

ring section to the head. It is critical that these are tight. If they get loose they will quickly wear the seal faces and will require a return and repair at SDI. There are cotter pins and castle nuts to secure these in place.

Any ability to move between the flange ends causes rapid wear of the flange ends. You should check the castle nuts on the clamps after about 4 or 5 cores and then again after every 50 to 75 cores.

Securing the Lift Cable

Remember this is a VIBRATING VibeCore. Anything that can get loose will get loose. Secure anything that can screw together. This is particularly important for your lifting shackle. Whip, tape or tie -wrap these securely or you may find you are trying to retrieve the VibeCore with the power cable. That repair won't be covered under the warranty!

Make certain that when you retrieve your core you remove the core tube by screwing the pins back into the adapter. This reduces the wear on the pins and threads in the adapter.

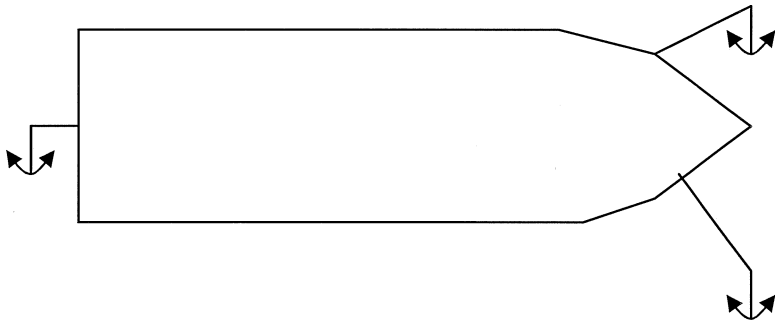
One other comment on coring: apparently some of our customers thought they needed to run the Vibecore 5 to 10 minutes for each core. Our experience shows very little additional progress after about a minute. We simply turn off the Vibecore when the lowering line shows no more progress.

Boat Mooring

For successful operation the VibeCore needs to be lowered in a vertical position to allow the core tube to penetrate the bottom sediment.

For best results 3 point mooring is preferred in order to provide a fixed position for the coring operation.

Diagram 2 3 Point Mooring



Verifying Core Tube Seal

Suspend the VibeCore-D with the lifting wire to be used to deploy the VibeCore. The VibeCore air-tight integrity can be tested by lowering the VibeCore unit completely into the water and then raising it so that the bottom end of the core tube remains in the water. If the seal to the core tube is good, water will remain suspended in the core tube until the lower end of the core tube is raised to the surface and air is allowed to enter the bottom of the core tube.

Getting the best results from the VibeCore-D

We find the best results by lowering the VibeCore until we can feel the core tube has hit the bottom. Then turn on the VibeCore and lower it slowly so that there is always some tension on the lowering line. We stop and turn off the VibeCore when it is no longer going deeper. Wait for the VibeCore to stop and then start pulling the VibeCore up. If you have a good core you will usually feel a lot of initial resistance pulling the VibeCore. Continue pulling the VibeCore up until you can reach the bottom of the core tube and install a core tube cap. For a longer core sample you may find it best to tilt the VibeCore and lift the core tube end aboard. It is best to always keep the head of the VibeCore above the bottom end of the core tube as this prevents mixing of the core sample in the core tube.

Once the bottom of the core tube is capped you can remove the VibeCore from the core tube by screwing the setscrews into the core tube adapter until they are free of the core tube.

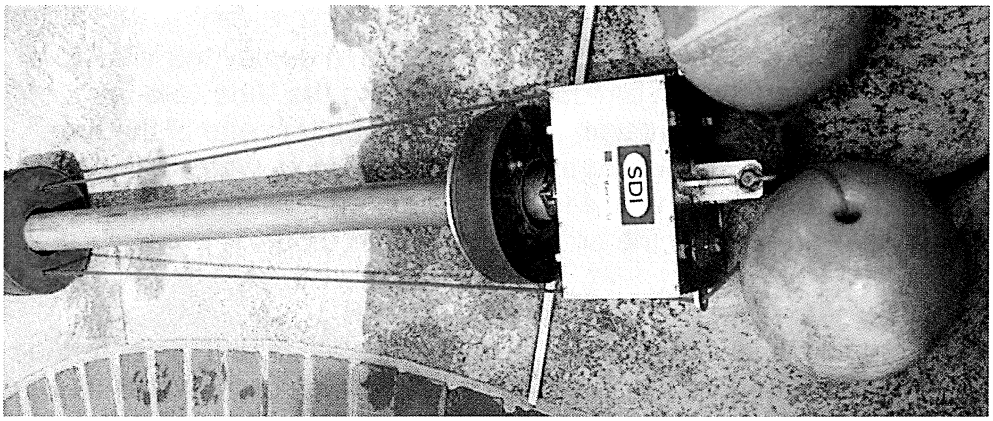
Float/weight Coring Method

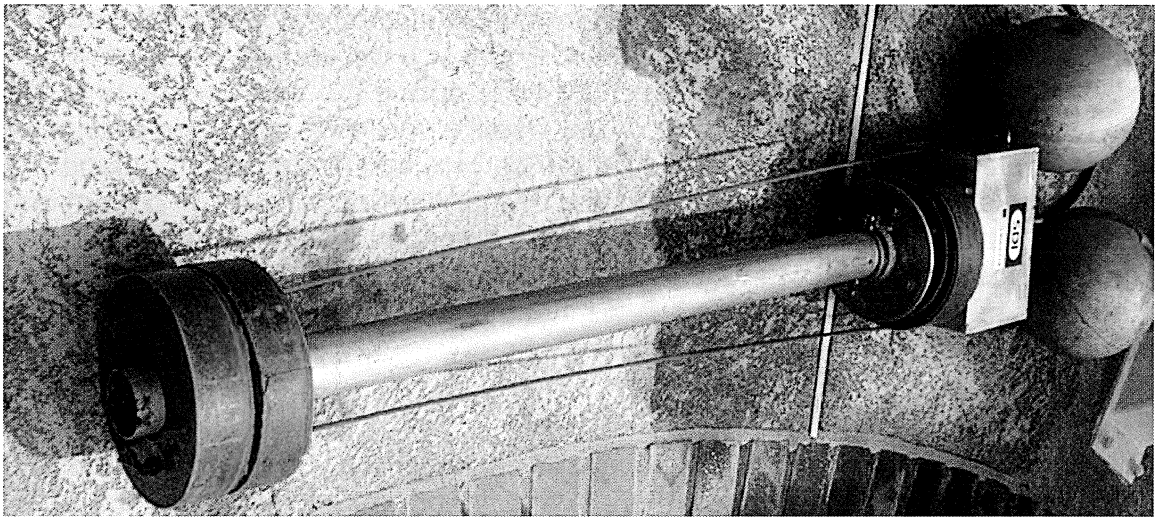
This is the option for coring in deep water or coring where you do not want to 3- point moor the boat. In this case, there is a float and weight arrangement that goes around the Vibecore and keeps the Vibecore vertical.

This rig consists of a pair of weight rings like the one on the Vibecore and a pair of lines that go thru the guides at the top of the Vibecore. Two floats are attached above the Vibecore and the Vibecore slides down these lines as it cores. If working from a very small boat it is a bit more cumbersome so most users use the Vibecore without the weight/float assembly.

The core float/weight assembly is intended to hold the Vibecore upright when the Vibecore reaches the bottom. As the Vibecore sinks into the bottom it slides down the two guide lines which attach the weights to the floats. There are knots below the weights to keep them on the ropes and knots above the guide ears on the top of the Vibecore to keep the weights from descending below the bottom of the core tube. Two floats are tied to the top of the guidelines, above the guide ears of the Vibecore. These floats should be tied very close above the padeye to which you shackle the lifting line. This limits the tangle of floats, weights and line when you retrieve the Vibecore.

Figure 8 knots and ¼" solid braid line work well for these guide lines.





Make certain you have secured the shackle attaching the Vibecore to your lifting line before trying to take a core. This Vibecore is intended to vibrate and as such will shack almost anything loose that is not seized securely in some manner. You should never lower the last few turns of wire off your winch as these last turns help carry the load. If you do lower all available wire off the winch you are relying solely on the termination of the wire to your winch and the structure of the winch attachment point to take the full load including surge load. The winch is not designed to carry the load in this manner.

Core Keepers for Soft Sediment or Coarse Sand

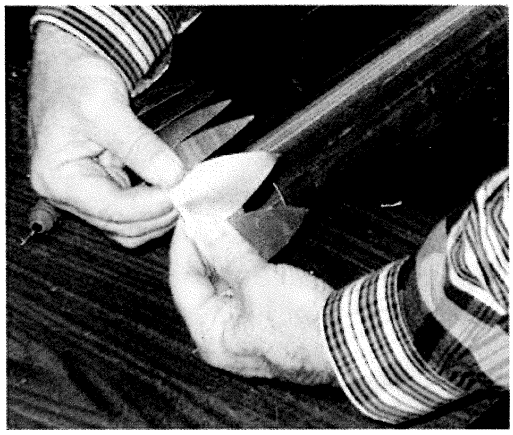
SDI core tube keepers are available for sediments consisting of clean coarse sand or when very soft sediments are to be sampled without reaching firm sediments that would normally for a core end plug. These keepers are simple formed aluminum or stainless steel keepers and are attached by either epoxy or rivets. The epoxy method requires an overnight cure but retains a very clean core tube end. The riveted keepers can be installed onboard but will cause a small edge trace in the core sample at each rivet. Both pop rivets and solid rivets may be used. The following procedure applies to the installation of keepers using solid rivets. A similar procedure is used when using epoxy or pop rivets.

VibeCore-D Keeper Installation Instructions

The following instructions are intended to provide the procedure for installing aluminum keepers in the 3" aluminum core tubes for the VibeCore-D core sampler. This procedure includes rivet installation and is useful also for the epoxy installation. These keepers are only needed when sampling loose sediments when the core tube does not penetrate to firm sediment that can plug the end of the core tube. These keepers are also useful when coring in clean sand without significant silt of clay. In these conditions the loose sand will tend to exit the bottom of the core tube during retrieval.

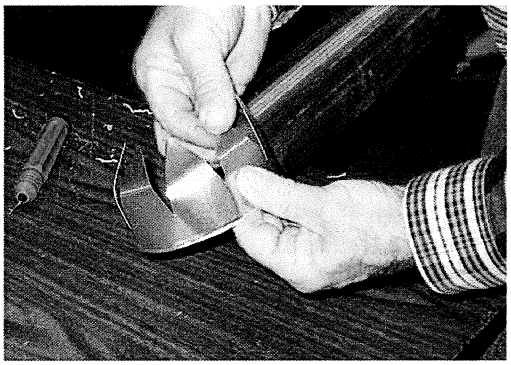
The SDI keepers are supplied either as flat stock with a small folded ridge or preformed into cylindrical keepers from the flat keeper stock.

Remove the ridge from the end of the core tube. This ridge is usually present when the core tube has been cut with a tubing cutter. A de-burring tool is a quick and simple way to remove this ridge from the end of the core tube.

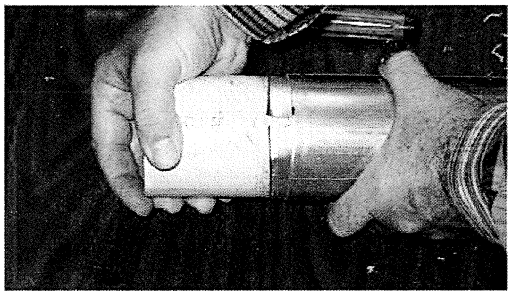


With the folded ridge at the edge of the keeper facing out, lightly form the keeper into a round shape to fit the core tube. Bending a small amount at three places below each finger produces a relatively smooth round shape. The folded ridge

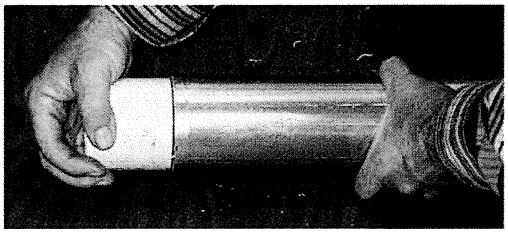
serves to stabilize the position of the keeper at the end of the core tube.



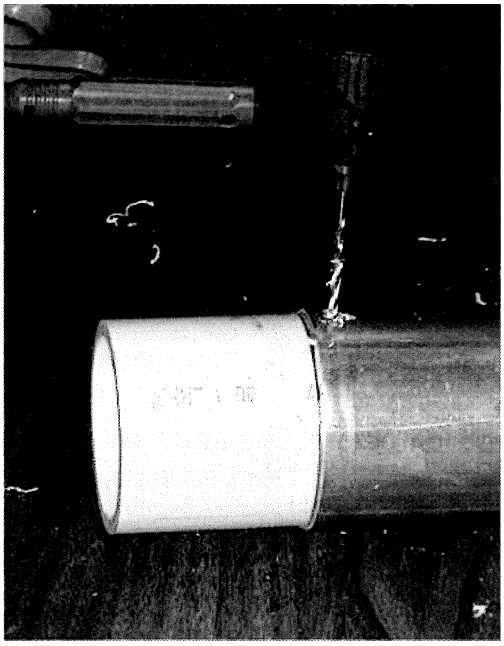
Bend each finger in towards the center. Only a slight amount of bend is required.



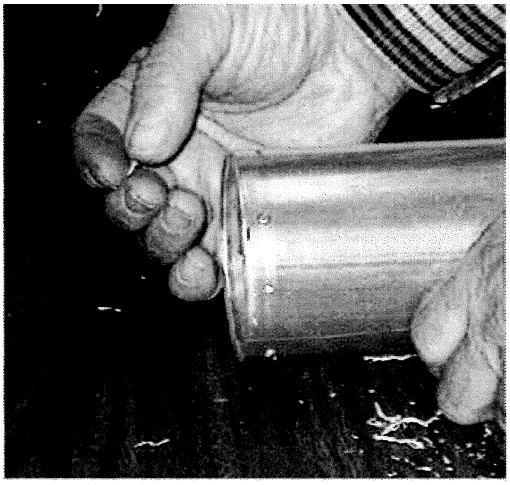
Insert the keeper into the bottom end of the core tube so that the fingers are entirely inside the core tube. Partially insert the plastic keeper guide tool and rock the tool around in the end of the core tube to help shape the keeper to the inside of the core tube. Make certain that the keeper does not overlap itself at the joint.



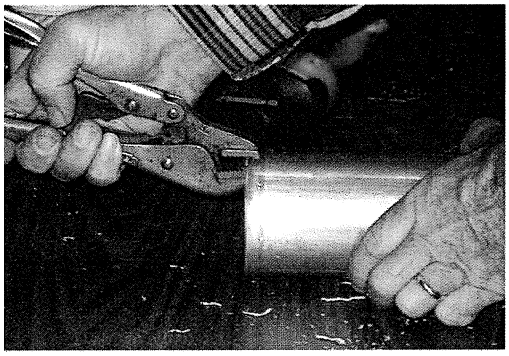
Work the keeper into the core tube until the ridge edge of the keeper is flush with the end of the core tube and the plastic keeper guide toll is fully inserted up to the machined lip.



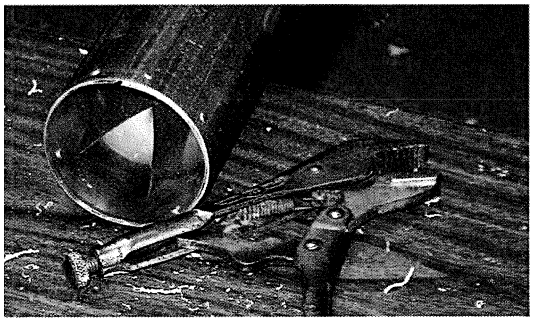
Using a 7/64" (or 2.75 mm) diameter drill bit, drill a hole thru the core tube and keeper. Don't worry about drilling into the plastic keeper guide. These are low cost expendable items. Drill the holes approximately½" (1 cm) to one side of the joint in the keeper and about½" (1 cm) from the end of the core tube. Repeat this about every 1 ½ to 2 inches (4 to 6 cm) around the core tube with the last hole about ½" (1 cm) on the other side of the joint in the keeper. Be careful not to allow the keeper to rotate in the core tube while doing this.



Carefully remove the plastic keeper guide tool and insert an aluminum rivet into the hole to one side of the keeper joint.



Using a pair of vise grips, crimp the rivet in place. Be careful that the keeper is firmly against the inside of the core tube and that the rivet is crimped with while the rivet is fully inserted.



Repeat this process in order sequentially around the tube.

Appendix 1 Standard System Components

As shipped the VibeCore-D has the following components:

VibeCore-D Head unit with power cord and on/off control box Weight
Ring and adapter
Aluminum Core Tube Adapter for 3" tubing with setscrews installed Ring
Clamps (2)
Serial Battery connector cable 1/8"
Allen wrench with float Spare Core
Tube setscrews Spare cotter pins

Appendix 2 Optional equipment available:

Core Tube Adapter- Stainless Steel 3" tube Core
Tube Adapter- Plastic 2" tube
Drilling guide for marking core tubes
Extra weight ring and float for deeper water coring

Appendix 3 Recommended Parts List for Field Operations

The following is a list of equipment which is typically used for sediment sampling where sediment grain size, trace metal screen and organic pesticides will be investigated.

Standard Equipment List (for on-site core evaluation) VibeCore D
Aluminum core tube adapter
OR
Stainless core tube adapter
OR
Plastic core tube adapter
Appropriate core tube sections (aluminum, stainless or plastic) Core tube adapter clamp w/ castle nut & cotter pin (w/ spares) Allen wrench for core tube adapter set screws (w/ spares) Core tube adapter set screws (w/ spares)
Core tube adapter hole guide w/ drill bits and rechargeable drill 3M electrical tape (3/4") and duct tape (core to adapter seal) 12vdc batteries (2) w/ chargers and serial wiring jumper cable Core pusher for core tube
Core keepers (stainless steel) w/ locking rivets
½ round file for core tube

Core log sheet
Navigation system (SurveyCase or BSS+ system) Core site
locations
Tape measure Digital
camera

Additional Equipment for saving core samples (Grain Size or Water Content analysis)
Core covers (2 per core sample w/ spares) Core
level probe rod
Core tube cutter w/ spare cutting heads "Sharpie"
marker and tube labels
Core cover nut driver (right angle orllT" handle drive)

Additional Equipment for Organochlorine Pesticide Screen

(sampling and preservation.) Teflon
coated sample trays
Stainless Steel sampling spoon Stainless
Core level probe
Cooler and ice or dry ice (if sample preservation is required)

Additional Equipment for Heavy Metal Screen (sampling and preservation.) Teflon
coated sample trays
Teflon coated sample spoon Teflon or
plastic core level probe
Teflon 24 gage sheet stock (core cap liners - unless using polyethylene core tube caps. Teflon film is only used with neoprene caps as the neoprene sometimes will leach contaminants into the sample).

DE-1	Remediation & Redevelopment POLICY AND PROCEDURE		DEPARTMENT OF ENVIRONMENTAL QUALITY
Original Effective Date: 5/1/13 Revised Date: Reformatted Date:	Subject: Operation of A Bathymetric Survey System Sonar Device		Category: [8J Internal/Administrative D External/Non-Interpretive D External/Interpretive
	Program Name: Geological Services Unit		
	Number: GSU - 40	Page: 1 of 6	

A Department of Environmental Quality (DEQ) Policy and Procedure cannot establish regulatory requirements for parties outside of the DEQ. This document provides direction to DEQ staff regarding the implementation of rules and laws administered by the DEQ. It is merely explanatory; does not affect the rights of, or procedures and practices available to, the public and does not have the force and effect of law.

INTRODUCTION, PURPOSE, OR ISSUE:
The Geological Services Unit conducts underwater bathymetric surveys on rivers and lakes. The purpose of these surveys varies. Some surveys are to evaluate the loading and transport of contaminated sediments through a river system or to determine thickness of sediments; others are to look for submerged drums; others are to determine underwater terrain both pre and post construction activities to determine the impact on the environment. The Unit provides these surveys to various divisions and agencies.

A typical bathymetric survey crew consists of a boat driver, sonar operator and an observer. The driver operates the boat; the observer is a lookout for submerged or floating objects that could damage the boat or the sonar unit. The observer either moves the object away from the boat or directs the driver to move the boat to avoid the object. The sonar operator operates the sonar device and collects the sonar data.

The Unit operates two different Sonar systems (see Attachment 1 - Bathymetric equipment). One system is a single point sonar system; the other is a multi-beam system. The single point system generates a single beam and collects data from a single point directly below the sonar. The single point is excellent for collecting hydrographic data in shallow depths and for determining sediment thickness. The multi-beam sonar generates and collects a "wide swath" line of data in a line perpendicular to the direction of boat movement and is suited for collecting hydrographic information in depths greater than 1O feet. The multi-beam also provides greater detail with better coverage of the survey area. Client survey needs dictate the system to use.

Equipment:
The equipment involved in conducting a bathymetric survey consists of the following:

Single-point system:
- A 14 foot boat or 24 foot pontoon boat with motor
- Specialty Devices lnc.(SDI) Bathymetric Survey System (BSS) hardware and software programs
- A Trimble 5800 Global Positioning System (GPS) instrument

Multi - beam system:

- A 14 foot boat or 24 foot pontoon boat with motor
- Teledyne Odom ES3 Multi-beam with Hypack Software
- Hemisphere GPS VS100 Series GPS instrument

The Sonar and GPS are attached to the boat. (see Attachment 1 - Bathymetric equipment) The

operation of the boat is covered separately under the multi-Section document titled *"Po/icy/Procedure: Boat Safety and Use"*, RRD, dated April 15, 2010.

The operation of the bathymetric and GPS equipment is carried out as per the instructions in the manufacturer's operating manuals.

Single-point system:

- *"BSS+ Manuaf'* by Specialty Devices, Inc., Revision 5, March 2006, 35 pages
- *"Trimble RB GNSS Receiver R6/5800 GPS Receivers"* User Guide, by Trimble Navigation Limited, Version 3.64, Revision A, 2008, 86 pages
- *"Trimble Survey Controller'* User Guide, by Trimble Navigation Limited, Version 10.0, Revision A, 2001, 504 pages.
-

Multi - beam system:

- *"DIG/BAR - PRO Profiling Sound Velocimeter'* Operators Manual, by Odom Hydrographic Systems, (OHS) Inc., 2001, 29 pages
- *"DIG/BAR V'* User Manual, by OHS, Inc., 2008, 165 pages
- *"HYPACK'* Hydrographic Survey Software and User Manual, by OHS, 2011, 1582 pages
- *"ES3PT Including ES3 Operating Software"* User Manual, version 1.4, by Teledyne Odom Hydrographic, Inc., 2011, 53 pages
- *"Hemisphere GPS Crescent VS 100 Series User Guide"*, by Hemisphere GPS, Revision C2, 90 pages

Field Operations:
Single-point:
GSU staff collect single point bathymetric and hydrographic data using a BSS +3 Sonar System by Specialty Devices, Inc. of Plano, Texas. The system includes an Intelligent Depth Sounder (IDS) with true digital sub-bottom profiling capability. The BSS +3 System uses three separate frequencies (24 kHz, 50 kHz, and 200 kHz) that provide bathymetry and high resolution sub- bottom profiling. The 200 kHz signal is rectified and integrated to resolve bottom reflection to less than 1-inch resolution. The BSS +3 System is a full, survey-grade, depth sounder that digitizes the subsurface echo to 16 bit resolution and stores the full digital record onto a hard- drive where it can be downloaded for processing later.

The bathymetric survey equipment utilizes a Trimble 5800 GPS that is capable of producing position accuracy of 1 centimeter while the data is being collected. It's used to acquire navigation data using MOOT CORS reference stations with known coordinates and elevations.

Differential correctors determined at these stations will be transmitted to the survey vessel where they will be used by the onboard receiver using Real Time Kinematic software to determine the accurate position of the GPS antenna in the vertical and horizontal planes. This data will be logged on board the boat.

Multi - beam:

The multi-beam sonar provides a continuous and complete picture along multiple traverses during a single pass (commonly referred to as a "swath"). GSU staff collect multi-beam bathymetric and hydrographic data using an ES3 sonar system by Teledyne Odom Hydrographic, of Baton Rouge, Louisiana. The system includes a 240 kHz ES3 sonar head with a selectable number of beams from 120 to 480 to provide the "swath" of data. The system utilizes a motion reference unit and a Hemisphere GPS to correct yaw, pitch, and roll in real time as well as data point location. GSU also utilizes a Velocimeter to correct data in real time for the changes in the speed of sound in the specific water body. The Digibar Pro is used to measure the speed of sound in the column of water vertically which is then applied to the data set in the post processing stage.

Data collection:

Data collection is usually done on a grid pattern. Along a river, several lines will be collected lengthwise (parallel) down the river as well as crosswise (perpendicular) from bank to bank. If spacing is not dictated by client needs, staff tries to conduct, on average, 5 lines parallel on the river section of interest and every 200 to 500 feet perpendicular to the river. The line spacing varies depending on the length, width and depth of the area of concern.

Water elevations in the survey area are collected with the GPS prior to and after the daily bathymetric data collection.

Post-Processing

Staff completes a preliminary examination of the bathymetric and hydrographic data for issues due to the loss of GPS signal and/or the primary processing program's inability to identify the lake bottom. Loss of GPS signal occurs from a variety of issues including loss of satellites, strength of the available signal, and equipment power loss. Individual data points that experienced a loss of a GPS fix are adjusted or deleted from further processing or the portion of the line is collected again to provide position information.

After all GPS issues are addressed, each record is then examined for erroneous data and processed with either DepthPic5 or Hypack and Hysweep by Hypack.

Horizontal and vertical coordinates along with depth to the riverbed are then exported and saved in an Excel document. The Excel document can be utilized in a contouring program (Surfer 8.0 by Golden Software or Hypack).

Calibration/Quality Control
The daily quality control operations shall include: performing an elevation check at a benchmark location, measurement of survey equipment offsets, daily speed of sound test (bar check), daily water elevation measurements pre and post data collection, and other pre-survey activities.

PROCEDURES:

Who	Does What
Boat Driver	Operates the boat in a safe manner consistent with the needs of the survey and under the guidelines as described in *"Policy/Procedure: Boat Safety and Use",* RRD, dated April 15, 2010.
Sonar Operator	Operates the Sonar and data collection computer in the proscribed manner in this SOP to collect the survey data while in the field. Once in the office, the operator analyses the collected data to produce the required information (spreadsheet, maps).
Observer	Keeps a lookout at the front of the boat for floating/submerged objects and either deflects the object away from the boat/sonar unit or directs the boat driver to move around the object

APPENDICES:
Attachment 1 - Bathymetric equipment

REFERENCES:
"Po/icy/Procedure: Boat Safety and Use", RRD, April 15, 2010.

Single-point system:

- *"BSS+ Manuaf'* by Specialty Devices, Inc., Revision 5, March 2006, 35 pages
- *"Trimble RB GNSS Receiver R6/5800 GPS Receivers"* User Guide, by Trimble Navigation Limited, Version 3.64, Revision A, 2008, 86 pages
- *"Trimble Survey Controller"* User Guide, by Trimble Navigation Limited, Version 10.0, Revision A, 2001, 504 pages

Multi - point system:

- *"DIG/BAR - PRO Profiling Sound Velocimeter"* Operators Manual, by Odom Hydrographic Systems, (OHS) Inc., 2001, 29 pages
- *"DIG/BAR V'* User Manual, by OHS, Inc., 2008, 165 pages
- *"HYPACK'* Hydrographic Survey Software and User Manual, by OHS, 2011, 1582 pages
- *"ES3PT Including ES3 Operating Software"* User Manual, version 1.4, by Teledyne Odom Hydrographic, Inc., 2011, 53 pages
- *"Hemisphere GPS Crescent VS 100 Series User Guide"* by Hemisphere GPS, Revision C2, 90 pages

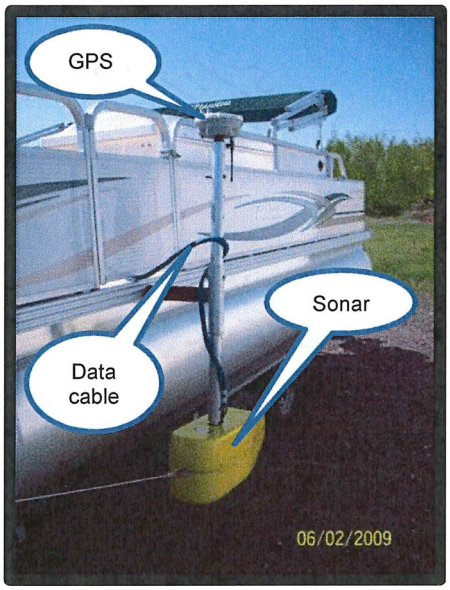
DIVISION/SECTION/UNIT CHIEF APPROVAL:

Burrell P. Shirey, Chief, Geological Services Unit

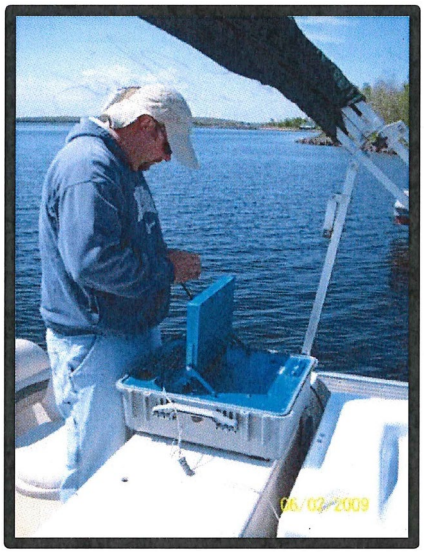
5/1/13

Date

ATTACHMENT
1
Bathymetric equipment



Sonar unit and GPS attached to pontoon boat for a *single-point survey*



Sonar data collector/computer on pontoon boat for a *single-point survey*

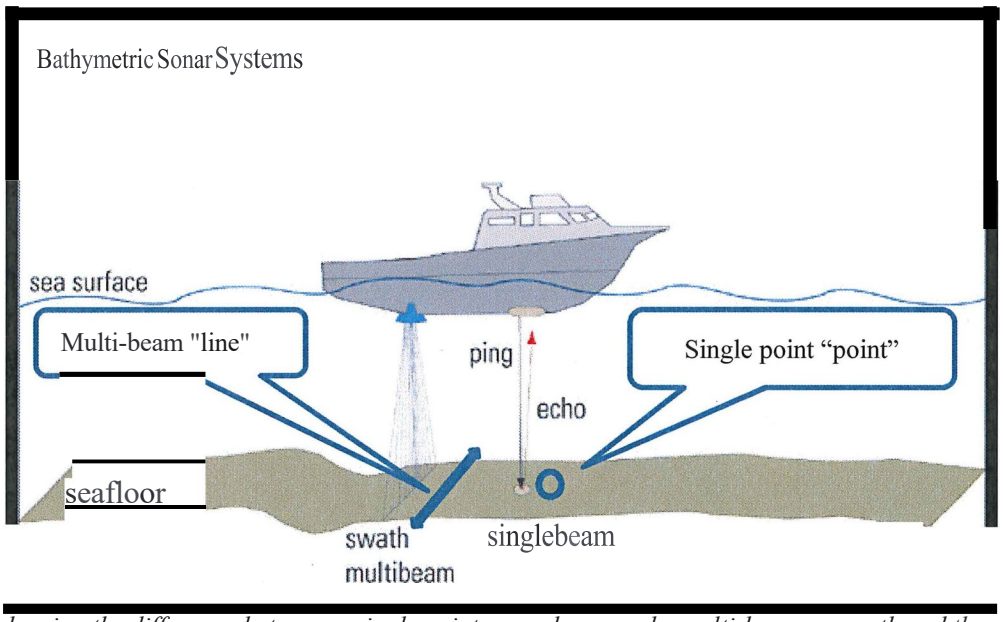


Diagram showing the difference between a *single point sonar beam and* a *multi-beam or swath and the amount of data and seaf/oor coverage by each system*