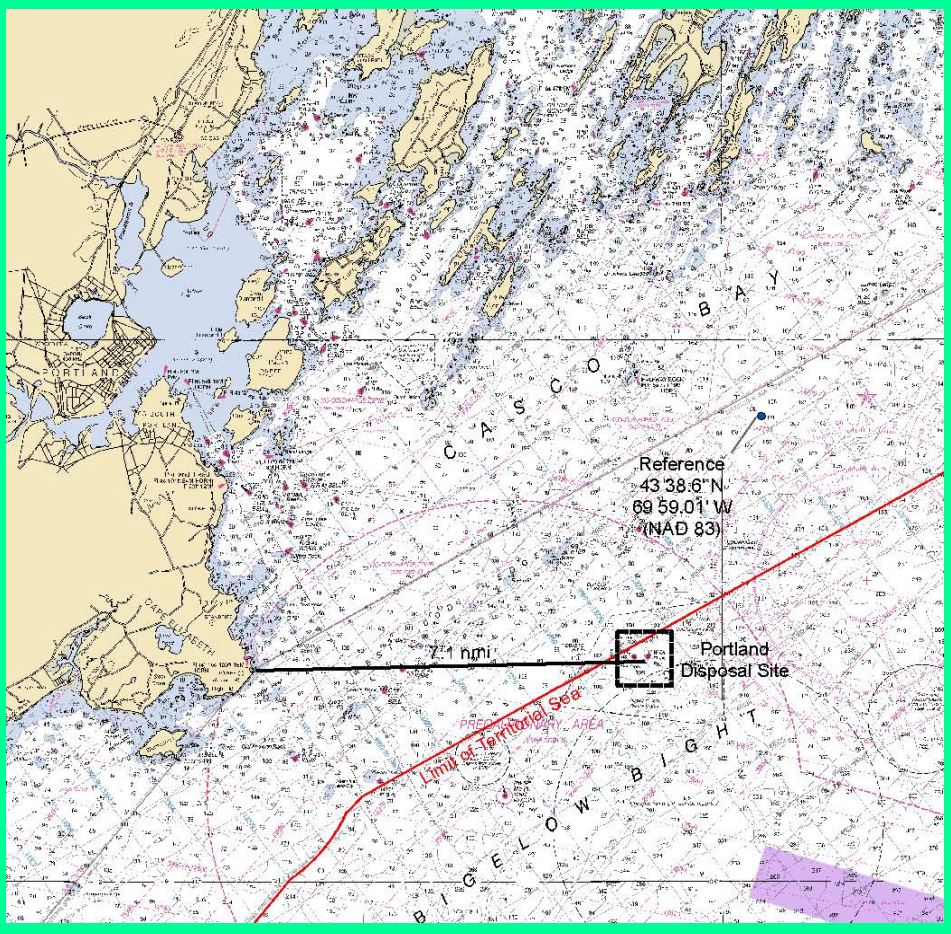
GREAT CHEBEAGUE ISLAND
MAINE
NAVIGATION IMPROVEMENT PROJECT

APPENDIX H
DREDGED MATERIAL SUITABILITY DETERMINATION



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CENAE–PDE August 1, 2018

Memorandum For: William Bartlett, Project Manager, CENAE-PDP

Subject: Suitability Determination for the Great Chebeague Island Landing Federal Navigation Improvement Project, Chebeague Island, Maine.

1. **Summary:**

This memorandum addresses the suitability of dredged material from the proposed Section 107 Federal navigation improvement project for the Great Chebeague Island Landing for unconfined open water disposal at the Portland Disposal Site (PDS). The New England District (NAE) of the U.S. Army Corps of Engineers (USACE) finds that sufficient data has been provided to satisfy the evaluation and testing requirements of Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA, or Ocean Dumping Act). Based on an evaluation of the project site and the material proposed to be dredged, these sediments have been found to be suitable for unconfined open water disposal at PDS.

2. **Project Description:**

The Town of Chebeague Island, Maine requested that NAE investigate potentially establishing a Federal channel to allow fulltime vessel traffic to the Great Chebeague Island Landing. The results of this investigation determined that a 0.5 acre turning basin and a 100 to 150 foot wide channel extending approximately 1,600 feet from the landing to deep water would be required to meet the project objectives (Figure 1). The proposed depths for the turning basin and channel would be 8 and 10 feet, respectively, at mean lower low water (MLLW) plus 1 foot of allowable overdepth. This would produce approximately 33,000 cubic yards of mixed gravel, sand, and silt. It is expected that this material would be mechanically dredged and placed at the Portland Disposal Site (PDS).

3. **Conceptual Site Model:**

The Town of Chebeague Island is comprised of several islands located in the central portion of Casco Bay. Great Chebeague Island, the largest and most populated island, is the center for town commerce and features a landing and stone pier along the northwest shore which serves as the town's principal link to the mainland. Town officials report that shallow water depths hinder the operation of the many activities that rely on the landing including commercial fishing, barging, public safety, and ferry operations.

NAE reviewed historic testing data, land-use, water quality data, and interviewed local officials to develop a conceptual site model (CSM) for the Great Chebeague

Island Landing navigation improvement project (Figure 2). NAE used the CSM to characterize the system and identify potential sources of contamination, site-specific contaminants of concern, exposure pathways, and biological receptors in order to inform the sampling, testing, and analysis of the project.

The islands that surround the proposed project; including Great Chebeague, Cousins, and Little John; are mainly low density residential properties. There is also the William F. Wyman oil-fired power plant on Cousins Island, a golf course on Great Chebeague Island, and the existing ferry landings on Cousins and Great Chebeague Islands.

There is no major freshwater input to the harbor. Water quality is dictated by tidal exchange with Casco Bay to the north and west and is classified as Class SB by the State of Maine (Maine DEP 2012). Class SB marine waters are the second highest classification in the State and are considered unimpaired with the ability to support recreation, fishing, aquaculture, and provide quality habitat for marine life.

Based on a review of available data, and communication with local officials, NAE has determined that there are no known outfalls or recent spills in the vicinity of the project area.

NAE proposes to place the material generated from the Great Chebeague Island Landing navigation improvement project at the Portland Disposal Site (PDS) approximately 13 nautical miles from the project area. PDS is regularly monitored by the NAE Disposal Area Monitoring System (DAMOS) Program. The most recent DAMOS report on PDS was based on a 2007 survey of the site (AECOM 2009); a subsequent survey was performed in 2014 with a contribution expected in 2018.

Following this tier one review of the site characteristics and the available historical data, the Great Chebeague Island Landing navigation improvement project was given a low-moderate risk ranking according to the following matrix (adapted from USACE 2014):

Rank	Guidelines
Low	Few or no sources of contamination. Data available to verify no significant potential for adverse biological effects.
Low-Moderate	Few or no sources of contamination but existing data is insufficient to confirm ranking.
Moderate	Contamination sources exist within the vicinity of the project with the potential to produce chemical concentrations that may cause adverse biological effects.
High	Known sources of contamination within the project area and historical data exists that has previously failed biological testing.

4. **Sampling, Testing, and Analysis:**

Based on the low-moderate risk ranking for the Great Chebeague Island Landing navigation improvement project, NAE prepared a sampling and analysis plan (SAP) for the project on 18 November 2016 that was coordinated with the Maine Department of Environmental Protection (MEDEP), the National Marine Fisheries Service (NMFS), and the United States Environmental Protection Agency (EPA) Region 1. The SAP called for eight sediment cores, identified as stations A through H on Figure 1, to be collected to the dredge depth plus one foot of allowable overdepth.

Physical and Chemical Analysis of Sediments

NAE collected dredge area sediment cores in April 2017 and analyzed individual cores for grain size. Samples from the outer portion of the proposed channel (Stations A, B, C, D, and F) had large fractions of fine-grained material (45% - 54.1% fines). Stations from the inner portion of the proposed channel and the turning basin (Stations E, G, and H) were predominately sand and gravel with percent fines less than 18% in any sample. Grain size results are presented in Table 1.

Table 1. Grain Size Results from Great Chebeague Island Landing

	A	B	C	D	E	F	G	H
% Gravel	1	0.2	0.4	0.1	2	0.1	1.9	24.4
% Medium Sand	14.9	9.1	7.6	6.6	15.2	8.3	24.6	21.4
% Coarse Sand	3.4	2.7	2.2	2.2	4.6	0.6	5.7	14.9
% Fine Sand	35.7	37.5	35.7	37.8	62.7	40.4	56.6	22.1
% Total Fines	45	50.5	54.1	53.4	15.5	50.6	11.2	17.2

Samples were combined into three composites for bulk chemical analysis (AB, CD, and F). Bulk chemistry analysis was not performed on Stations E, G, and H due to the coarse nature of the material. As no project specific contaminants

of concern were identified in the CSM the composite samples were analyzed for the standard suite of contaminants specified in the Regional Implementation Manual (RIM, EPA/USACE 2004).

To examine the project sediment concentrations in an ecologically meaningful context NAE screened the values with Sediment Quality Guidelines (SQGs). Applicable SQG screening values for marine and estuarine sediments are the National Oceanic and Atmospheric Administration (NOAA) effects-range low (ERL) and effects-range median (ERM). ERL/ERM values are empirically derived guidelines that identify contaminant levels that indicate when toxic effects are unlikely (ERL) and when an increased probability of toxic effects is evident (ERM). These SQGs serve as a useful screening tool to inform the sampling and testing process; but to evaluate the Great Chebeague Island Landing navigation improvement project under MPRSA the suitability determination is based on the results of the biological testing presented in the subsequent sections.

Bulk chemistry results showed detectable levels of trace metals, with the exception of mercury, in the three composite samples but at concentrations that were well below the ERL (Table 2). There were also detectable concentrations of individual polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) in the composite samples but Total PAHs and Total PCBs were also well below the ERL (Table 2). There were no detected pesticides in any of the composite samples (Table 2).

Table 2. Bulk Sediment Chemistry Results from the Great Chebeague Island Landing with Sediment Quality Guidelines

		AB	CD	F	ERL	ERM
Arsenic	mg/kg	6.2	5.6	9.8	8.2	70
Cadmium	mg/kg	0.5	0.6	0.6	1.2	9.6
Chromium	mg/kg	24.3	25.2	41.8	81	370
Copper	mg/kg	10.0	11.3	28.7	34	270
Lead	mg/kg	7.5	8.3	24.8	46.7	218
Mercury	mg/kg	ND	ND	ND	0.15	0.71
Zinc	mg/kg	41.6	39.8	82.2	150	410
HMW PAH	ug/kg	73.7	429.4	1111.1	1700	9600
LMW PAH	ug/kg	35.0	93.5	326.0	552	3160
Total PCB	ug/kg	8.0	18.3	13.5	22.7	180
Total DDT	ug/kg	ND	ND	ND	1.58	46.1

HMW = High Molecular Weight, LMW = Low Molecular Weight
ERL = Effects Range Low, ERM = Effect Range Median
ND = Non-detect

Biological Analysis of Sediments

NAE collected samples for subsequent biological testing in October 2017. Samples were collected from all three composite locations in order to determine the potential for the dredged sediment to cause adverse effects to the biological receptors identified in the CSM. Sediment toxicity was measured through a 10-day whole sediment acute toxicity test, human health risk was determined through a 28-day bioaccumulation test, and water column toxicity was determined through a suspended particulate phase test as described in the Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual (Green Book, EPA/USACE 1991).

Evaluating Potential Effects to Benthic Organisms

Mean mortality in the control samples of the 10-day whole sediment acute toxicity tests were less than 10% for the amphipod (*Leptocheirus plumulosus)* and the mysid (*Americamysis bahia)*; therefore the tests were valid based on criteria established in the testing protocol. Mean survivability for *L. plumulosus* ranged from 91% to 93% for the three composite samples and was not statistically different when compared to survivability in the PDS reference sediment. The material proposed to be dredged is not considered acutely toxic to the amphipods used in this assessment.

Mean survivability for *A. bahia* ranged from 93% to 97% for the three composite samples and was not statistically different when compared to survivability in the PDS reference sediment. The material proposed to be dredged is not considered acutely toxic to the mysids used in this assessment. Results from the 10-day whole sediment toxicity test are summarized in Table 3.

Table 3: Mean Survivability in the 10-day Whole Sediment Toxicity Test

Organism	Lab Control	PDS REF	Composite AB	Composite CD	Composite F
Americamysis bahia	92%	90%	93%	97%	93%
Leptocheirus plumulosus	98%	92%	91%	93%	93%

Evaluating Potential Risk to Human Health

In order to assess the potential risk to human health through the potential exposure pathways identified in the CSM a 28-day bioaccumulation test was performed with the clam *Macoma nasuta* and marine worm *Nereis virens.* Results showed statistically significant increases of certain metals in tissue samples from clams exposed to project sediments when compared to tissue samples from clams exposed to reference area sediments including cadmium,

mercury, and zinc. There were no significant increases in tissue samples from worms exposed to project sediments when compared to tissue samples from worms exposed to reference area sediments. Based on these results NAE analyzed the tissue burden data with the EPA Bioaccumulation Evaluation Screening Tool (BEST) model to determine the toxicological significance of bioaccumulation from exposure to the dredged sediment.

The BEST model includes an evaluation of the non-carcinogenic risk, carcinogenic risk, and any observed exceedances of Food and Drug Administration (FDA) thresholds to determine potential adverse impacts to human health from the consumption of lobster, fish, or shellfish exposed to project sediments. Modeling based on the tissue contaminant loads measured in the Great Chebeague Island Landing navigation improvement project found that all contaminants were below the EPA Hazard Quotient for non-carcinogenic risk of 1.0, below the EPA carcinogenic risk threshold (1×10^{-4}), and were also less than established FDA action levels. BEST model outputs are provided in Appendix A.

Evaluating Potential Effects to Fish and Marine Invertebrates

The conceptual site model identified the uptake of contaminants from the water column during the placement of dredged material at PDS as a primary exposure pathway for project sediments. NAE determined the potential for water column toxicity though a suspended particulate phase toxicity test as described in the Green Book (EPA/USACE 1991).

NAE used results from the suspended particulate phase toxicity analysis to determine the median lethal concentration (LC_{50}) for three target species exposed to the sediment elutriates. The mysid *Americamysis bahia,* the minnow *Menidia beryllina,* and the urchin *Arbacia punctulata* showed no adverse effects on survival after exposure to the elutriate from Composite AB with LC_{50} values of >100%. The mysid and the minnow also showed no adverse effects on survival after exposure to the elutriate from Composite CD but the urchin did sustain a negative effect on larval survival with an with LC_{50} of 23%. All three organisms sustained a negative effect on survival after exposure to the elutriate from Composite F with LC_{50} values that ranged from 3%-76%. Results from the suspended particulate phase test are presented in Table 4.

Table 4: LC_{50} Values in the Suspended Particulate Phase Toxicity Test

Organism	Composite AB	Composite CD	Composite F
Americamysis bahia	>100%	>100%	43%
Menidia beryllina	>100%	>100%	76%
Arbacia punctulata	>100%	23%	3%

Suitability Determination for the Great Chebeague Island Landing Federal Navigation Improvement Project, Chebeague Island, Maine.

The Limiting Permissible Concentration (LPC) for disposal in Federal waters is defined in the RIM (EPA/USACE 2004) as 1% of the lowest LC_{50} or 0.03% for the Great Chebeague Island Landing navigation improvement project based on the lowest LC_{50} for *A. punctulata*. To determine if the discharge of dredged material would attain compliance with water quality criteria NAE utilized the Short-Term Fate (STFATE) numerical model to analyze the physical behavior of the disposal cloud as it is descends through the water column after release from a scow. Results of the STFATE evaluation predicted that the water column would attain the LPC within four hours of disposal of up to 4,000 cubic yards of material at PDS and therefore meet the criteria in the RIM (EPA/USACE 2004).

5. **Suitability Determination:**

According to 40 CFR Chapter 1 Subpart G – Evaluation and Testing § 230.60 General Evaluation of Dredged or Fill Material the coarse grained material from Stations E, G, and H meet exclusionary criteria of dredged material composed primarily of sand or gravel from a high energy coastal area that is not likely a carrier of contaminants. The material from these portions of the Great Chebeague Island Landing navigation improvement project are suitable for unconfined open water disposal as proposed without further testing.

Based on the results of biological testing and subsequent risk modeling no significant adverse impacts through the exposure pathways identified in the conceptual site model were found for the fine-grained material of the Great Chebeague Island Landing navigation improvement project. Based on the testing and evaluation requirements set forth in Section 103 of the MPRSA the sediments to be dredged from the Great Chebeague Island Landing navigation improvement project are considered suitable for unconfined open water disposal at PDS.

Copies of this determination were sent to USEPA and Maine DEP.

Suitability Determination for the Great Chebeague Island Landing Federal Navigation Improvement Project, Chebeague Island, Maine.

6. **References:**

AECOM 2009. Monitoring Survey at the Portland Disposal Site, August 2007. DAMOS Contribution No. 179. U.S. Army Corps of Engineers, New England District, Concord, MA.

EPA/USACE 2004. Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters. U.S. EPA Region 1, Boston, MA/U.S. Army Corps of Engineers, New England District, Concord, MA.

EPA/USACE 1991. Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual. Environmental Protection Agency, Office of Water and Department of the Army, United States Army Corps of Engineers. Washington, D.C.

Maine DEP 2012. Integrated Water Quality Monitoring and Assessment Report. State of Maine, Department of Environmental Protection. DEPLW-1246

USACE 2014. Dredged Material Evaluation and Disposal Procedures, User Manual. Dredged Material Management Program, U.S. Army Corps of Engineers, Seattle District.

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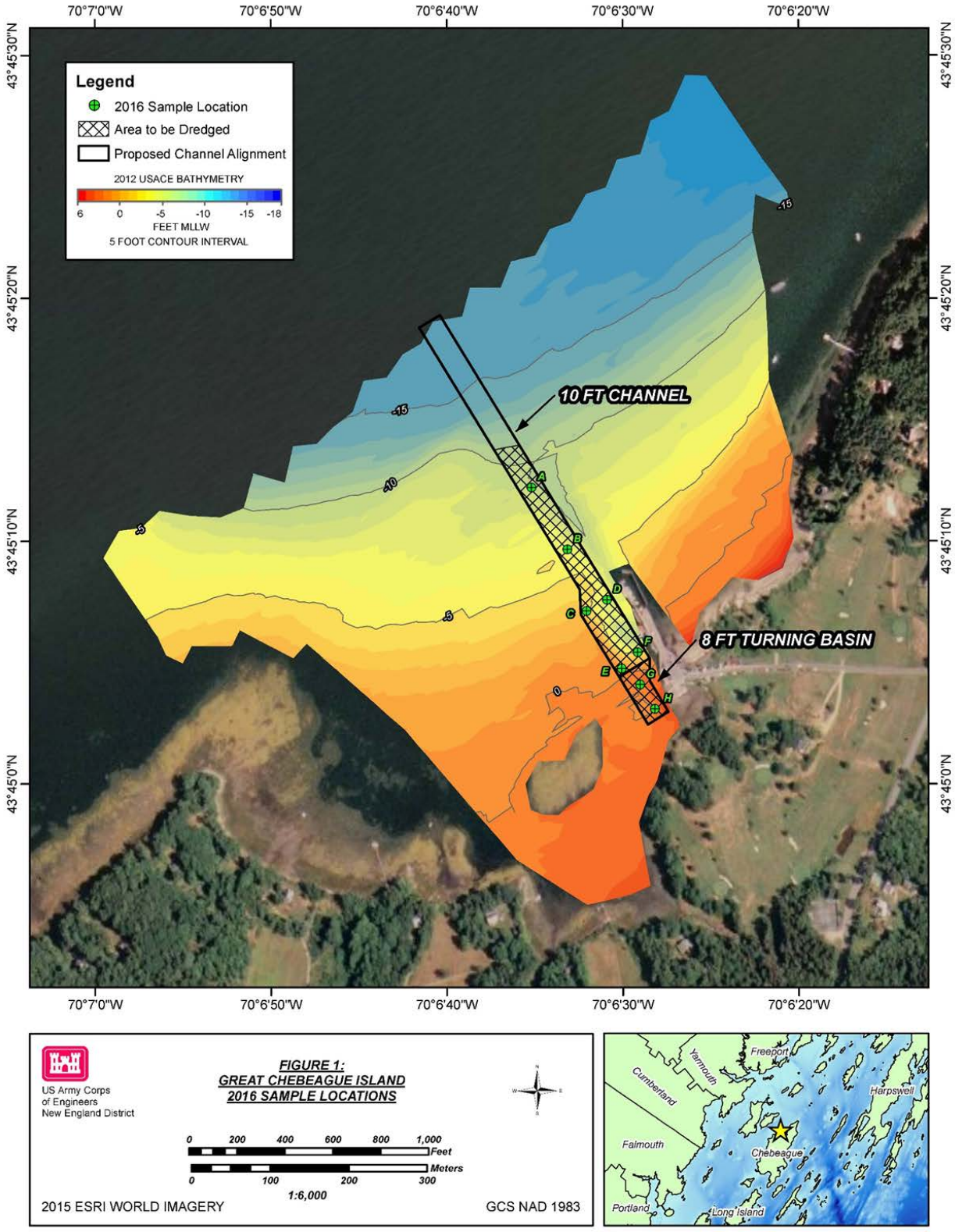
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70°6'40"W
70°6'30"W
70°6'20"W
43°45'30"N
43°45'20"N
43°45'10"N
43°45'0"N
Legend
2016 Sample Location
Area to be Dredged
Proposed Channel Alignment
2012 USACE BATHYMETRY
6 0 -5 -10 -15 -18
FEET MLLW
5 FOOT CONTOUR INTERVAL
10 FT CHANNEL
8 FT TURNING BASIN
A
B
C
D
E
F
G
H
-15
-10
-5
0
US Army Corps
of Engineers
New England District
FIGURE 1:
GREAT CHEBEAGUE ISLAND
2016 SAMPLE LOCATIONS
0 200 400 600 800 1,000
Feet
0 100 200 300
Meters
1:6,000
2015 ESRI WORLD IMAGERY
GCS NAD 1983
Yarmouth
Freeport
Cumberland
Harpswell
Falmouth
Chebeague
Portland
Long Island

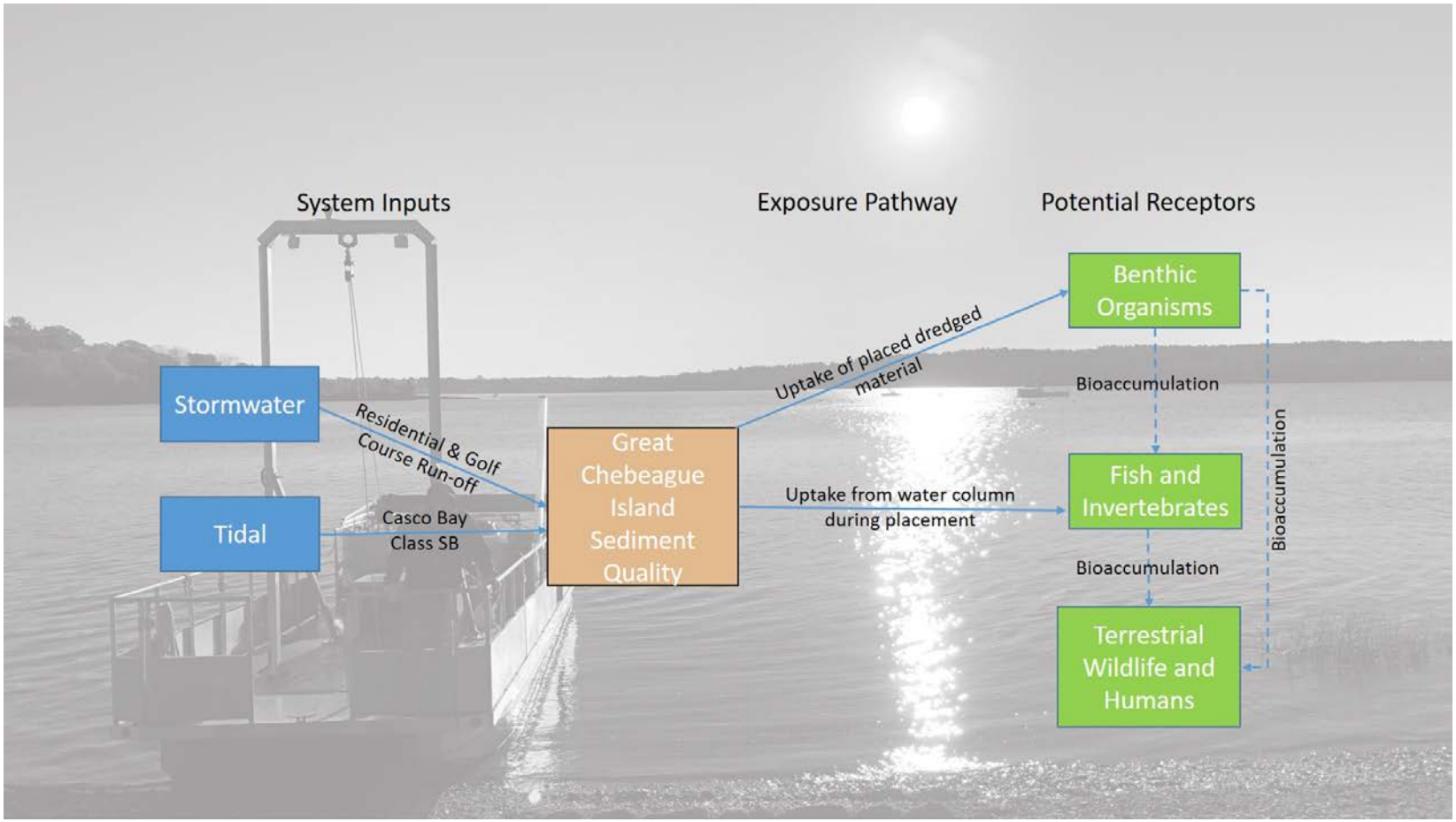

Figure 2. Great Chebeague Island Landing Conceptual Site Model

APPENDIX A

BEST Model Output

Project name: Chebeague Island FNP

Project number:

Model filename: Chebeague_PDS.best

Chemical filename: Chemical_List_for_EPA_Reg1_template (in progress).xlsx

Table Of Contents

Human Subreport

Human: Adult Angler

Total Estimated Risks From Organics(see EPA Table Xa)

Receptor: Adult Angler

Organism: Macoma nasuta

		Cancer Risk	Non-Cancer Risk
Composite 1		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 1		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0

		Cancer Risk	Non-Cancer Risk
		Fish Fillet	
	Test	0	0
	Reference	0	0
Composite 2		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 2		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0
		Fish Fillet	
	Test	0	0
	Reference	0	0
Composite 3		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 3		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0

		Cancer Risk	Non-Cancer Risk
		Fish Fillet	
	Test	0	0
	Reference	0	0

Total Estimated Risks From Organics(see EPA Table Xa)

Receptor: Adult Angler

Organism: Nereis virens

		Cancer Risk	Non-Cancer Risk
Composite 1		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 1		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0
		Fish Fillet	
	Test	0	0
	Reference	0	0
Composite 2		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 2		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0

		Cancer Risk	Non-Cancer Risk
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0
		Fish Fillet	
	Test	0	0
	Reference	0	0
Composite 3		Total Lobster	
	Test	0	0
	Reference	0	0
Composite 3		Lobster Muscle	
	Test	0	0
	Reference	0	0
		Macoma nasuta	
	Test	0	0
	Reference	0	0
		Nereis virens	
	Test	0	0
	Reference	0	0
		Lobster Hepatopancreas	
	Test	0	0
	Reference	0	0
		Fish Fillet	
	Test	0	0
	Reference	0	0

Seafood Non-Cancer Risks (see EPA Table 6a, Columns F & G)

Receptor: Adult Angler

Organism: Macoma nasuta

			Non-Cancer Risk
Composite 1	Cadmium	**Test**	3.98E-3
		Reference	3.05E-3
	Mercury	**Test**	1.09E-2
		Reference	9.29E-3
	Zinc	**Test**	4.51E-3
		Reference	2.75E-3
Composite 2	Cadmium	**Test**	3.99E-3
		Reference	3.05E-3
	Mercury	**Test**	9.09E-3
		Reference	9.29E-3
	Zinc	**Test**	4.09E-3
		Reference	2.75E-3
Composite 3	Cadmium	**Test**	3.81E-3
		Reference	3.05E-3
	Mercury	**Test**	9.81E-3
		Reference	9.29E-3
	Zinc	**Test**	4.37E-3
		Reference	2.75E-3

Seafood Non-Cancer Risks (see EPA Table 6a, Columns F & G)

Receptor: Adult Angler

Organism: Nereis virens

			Non-Cancer Risk
Composite 1	Cadmium	**Test**	3.65E-3
		Reference	4.68E-3
	Mercury	**Test**	2.74E-3
		Reference	7.03E-3
	Zinc	**Test**	3.32E-3
		Reference	4.09E-3
Composite 2	Cadmium	**Test**	3.19E-3
		Reference	4.68E-3
	Mercury	**Test**	3.09E-3
		Reference	7.03E-3
	Zinc	**Test**	4.78E-3
		Reference	4.09E-3
Composite 3	Cadmium	**Test**	3.6E-3
		Reference	4.68E-3
	Mercury	**Test**	3.26E-3
		Reference	7.03E-3
	Zinc	**Test**	4.07E-3
		Reference	4.09E-3

FDA Action Limit/Tolerance (see EPA Table 3, Columns D & E)

Receptor: Adult Angler

Organism: Macoma nasuta

	Contaminant	FDA Action Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Total PCBs	2E3	7.54E1
Composite 1	Mercury	1E0	1.27E-2
Composite 1	Total DDT	5E3	0
Composite 1	Total Chlordanes	3E2	0
Composite 2	Total PCBs	2E3	7.6E1
Composite 2	Mercury	1E0	1.06E-2
Composite 2	Total DDT	5E3	0
Composite 2	Total Chlordanes	3E2	0
Composite 3	Total PCBs	2E3	7.67E1
Composite 3	Mercury	1E0	1.14E-2
Composite 3	Total DDT	5E3	0
Composite 3	Total Chlordanes	3E2	0

FDA Action Limit/Tolerance (see EPA Table 3, Columns D & E)

Receptor: Adult Angler

Organism: Nereis virens

	Contaminant	FDA Action Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Total PCBs	2E3	7.77E1
Composite 1	Mercury	1E0	3.2E-3
Composite 1	Total DDT	5E3	0
Composite 1	Total Chlordanes	3E2	0
Composite 2	Total PCBs	2E3	7.48E1
Composite 2	Mercury	1E0	3.6E-3
Composite 2	Total DDT	5E3	0
Composite 2	Total Chlordanes	3E2	0
Composite 3	Total PCBs	2E3	7.74E1
Composite 3	Mercury	1E0	3.8E-3
Composite 3	Total DDT	5E3	0
Composite 3	Total Chlordanes	3E2	0

Ecological Effect Level

Receptor: Adult Angler

Organism: Macoma nasuta

	Contaminant	Ecological Effect Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Anthracene	3.75E3	8.94E0
Composite 1	Benzo(a)pyrene	8E3	1.79E1
Composite 1	PAH Total	1E4	1.43E2
Composite 1	Total PCBs	4E3	7.54E1
Composite 1	Arsenic	1.26E1	2.16E0
Composite 1	Cadmium	3.03E0	4.64E-2
Composite 1	Chromium	1.18E1	3.66E-1
Composite 1	Copper	9.6E0	1.96E0
Composite 1	Lead	1.19E1	2.33E-1
Composite 1	Mercury	2E-1	1.27E-2
Composite 1	Nickel	3.8E0	4.4E-1
Composite 1	Zinc	1.52E3	1.58E1
Composite 1	Total DDT	3E3	0
Composite 2	Anthracene	3.75E3	9.01E0
Composite 2	Benzo(a)pyrene	8E3	1.8E1
Composite 2	PAH Total	1E4	1.44E2
Composite 2	Total PCBs	4E3	7.6E1
Composite 2	Arsenic	1.26E1	1.81E0
Composite 2	Cadmium	3.03E0	4.66E-2
Composite 2	Chromium	1.18E1	3.46E-1
Composite 2	Copper	9.6E0	1.45E0
Composite 2	Lead	1.19E1	2.61E-1
Composite 2	Mercury	2E-1	1.06E-2
Composite 2	Nickel	3.8E0	4.07E-1
Composite 2	Zinc	1.52E3	1.43E1
Composite 2	Total DDT	3E3	0
Composite 3	Anthracene	3.75E3	9.09E0
Composite 3	Benzo(a)pyrene	8E3	1.82E1
Composite 3	PAH Total	1E4	1.46E2
Composite 3	Total PCBs	4E3	7.67E1
Composite 3	Arsenic	1.26E1	1.97E0
Composite 3	Cadmium	3.03E0	4.44E-2
Composite 3	Chromium	1.18E1	3.2E-1
Composite 3	Copper	9.6E0	1.72E0

	Contaminant	Ecological Effect Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 3	Lead	1.19E1	3.19E-1
Composite 3	Mercury	2E-1	1.14E-2
Composite 3	Nickel	3.8E0	3.95E-1
Composite 3	Zinc	1.52E3	1.53E1
Composite 3	Total DDT	3E3	0

Ecological Effect Level

Receptor: Adult Angler

Organism: Nereis virens

	Contaminant	Ecological Effect Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Anthracene	3.75E3	9.1E0
Composite 1	Benzo(a)pyrene	8E3	1.82E1
Composite 1	PAH Total	1E4	1.46E2
Composite 1	Total PCBs	4E3	7.77E1
Composite 1	Arsenic	1.26E1	1.64E0
Composite 1	Cadmium	3.03E0	4.26E-2
Composite 1	Chromium	1.18E1	6.94E-2
Composite 1	Copper	9.6E0	9.25E-1
Composite 1	Lead	1.19E1	2.57E-1
Composite 1	Mercury	2E-1	3.2E-3
Composite 1	Nickel	3.8E0	8.96E-2
Composite 1	Zinc	1.52E3	1.16E1
Composite 1	Total DDT	3E3	0
Composite 2	Anthracene	3.75E3	8.87E0
Composite 2	Benzo(a)pyrene	8E3	1.77E1
Composite 2	PAH Total	1E4	1.42E2
Composite 2	Total PCBs	4E3	7.48E1
Composite 2	Arsenic	1.26E1	1.63E0
Composite 2	Cadmium	3.03E0	3.72E-2
Composite 2	Chromium	1.18E1	8.86E-2
Composite 2	Copper	9.6E0	1.14E0
Composite 2	Lead	1.19E1	2.1E-1
Composite 2	Mercury	2E-1	3.6E-3
Composite 2	Nickel	3.8E0	9.3E-2
Composite 2	Zinc	1.52E3	1.67E1
Composite 2	Total DDT	3E3	0
Composite 3	Anthracene	3.75E3	9.17E0
Composite 3	Benzo(a)pyrene	8E3	1.83E1
Composite 3	PAH Total	1E4	1.47E2
Composite 3	Total PCBs	4E3	7.74E1
Composite 3	Arsenic	1.26E1	1.61E0
Composite 3	Cadmium	3.03E0	4.2E-2
Composite 3	Chromium	1.18E1	4.68E-2
Composite 3	Copper	9.6E0	1.14E0

	Contaminant	Ecological Effect Level (mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 3	Lead	1.19E1	2.13E-1
Composite 3	Mercury	2E-1	3.8E-3
Composite 3	Nickel	3.8E0	7.42E-2
Composite 3	Zinc	1.52E3	1.42E1
Composite 3	Total DDT	3E3	0

FDA Level of Concern

Receptor: Adult Angler

Organism: Macoma nasuta

	Contaminant	FDA Level of Concern(mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Arsenic	8.6E1	2.16E0
Composite 1	Cadmium	3.7E0	4.64E-2
Composite 1	Chromium	1.3E1	3.66E-1
Composite 1	Lead	1.7E0	2.33E-1
Composite 1	Nickel	8E1	4.4E-1
Composite 2	Arsenic	8.6E1	1.81E0
Composite 2	Cadmium	3.7E0	4.66E-2
Composite 2	Chromium	1.3E1	3.46E-1
Composite 2	Lead	1.7E0	2.61E-1
Composite 2	Nickel	8E1	4.07E-1
Composite 3	Arsenic	8.6E1	1.97E0
Composite 3	Cadmium	3.7E0	4.44E-2
Composite 3	Chromium	1.3E1	3.2E-1
Composite 3	Lead	1.7E0	3.19E-1
Composite 3	Nickel	8E1	3.95E-1

FDA Level of Concern

Receptor: Adult Angler

Organism: Nereis virens

	Contaminant	FDA Level of Concern(mg/kg)	Steady State Corrected Mean Tissue Concentration (mg/kg)
Composite 1	Arsenic	8.6E1	1.64E0
Composite 1	Cadmium	3.7E0	4.26E-2
Composite 1	Chromium	1.3E1	6.94E-2
Composite 1	Lead	1.7E0	2.57E-1
Composite 1	Nickel	8E1	8.96E-2
Composite 2	Arsenic	8.6E1	1.63E0
Composite 2	Cadmium	3.7E0	3.72E-2
Composite 2	Chromium	1.3E1	8.86E-2
Composite 2	Lead	1.7E0	2.1E-1
Composite 2	Nickel	8E1	9.3E-2
Composite 3	Arsenic	8.6E1	1.61E0
Composite 3	Cadmium	3.7E0	4.2E-2
Composite 3	Chromium	1.3E1	4.68E-2
Composite 3	Lead	1.7E0	2.13E-1
Composite 3	Nickel	8E1	7.42E-2

Software version: BRAMS 3.0
Last date: 05/21/2018
User name: Lex