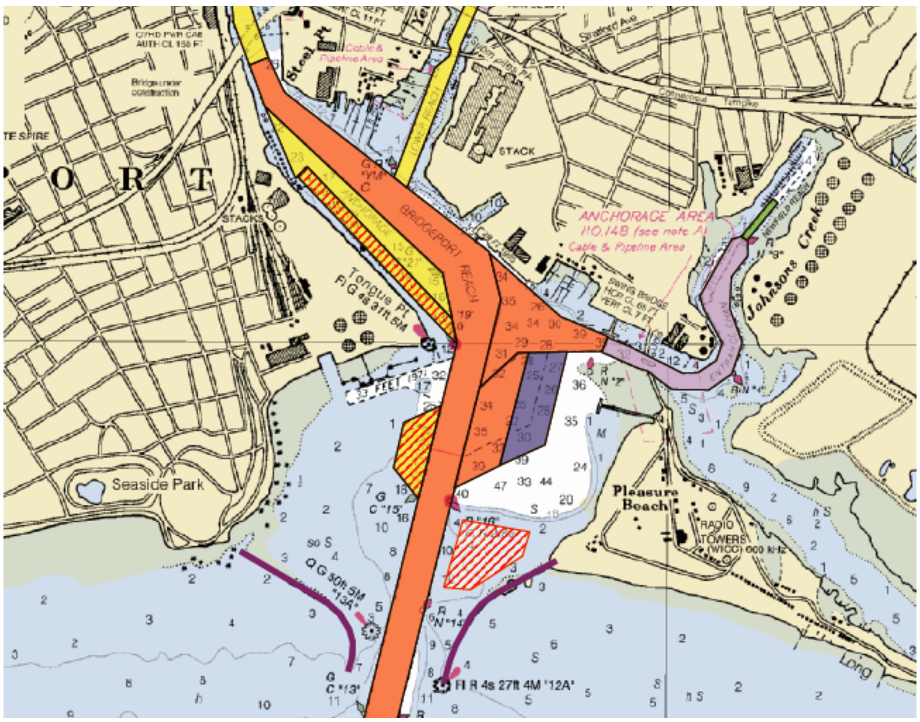
Draft Environmental Assessment, FONSI and §404(B)(1) Evaluation for Maintenance Dredging and Dredged Material Disposal Facility Construction

Bridgeport Harbor
Bridgeport, Connecticut



US ARMY CORPS
OF ENGINEERS
New England District

February 2010

DRAFT
ENVIRONMENTAL ASSESSMENT
FINDING OF NO SIGNIFICANT IMPACT
AND
CLEAN WATER ACT §404 (b)(1) EVALUATION

BRIDGEPORT HARBOR
BRIDGEPORT, CONNECTICUT

FEDERAL MAINTENANCE DREDGING NAVIGATION PROJECT
DREDGED MATERIAL MANAGEMENT PLAN

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ENVIRONMENTAL ASSESSMENT

I. INTRODUCTION

This Environmental Assessment provides support to the Dredged Material Management Plan (DMMP) and assessment of the potential environmental effects of dredging and disposing of material from the Bridgeport Harbor Federal navigation channels in Bridgeport, Connecticut. DMMPs are developed to identify specific measures necessary to manage the volume of material likely to be dredged over the next 20 years from either a specific harbor or area. The proposed work would dredge approximately 1,774,000 cubic yards (CY) of material from the navigation channels from within Bridgeport Harbor.

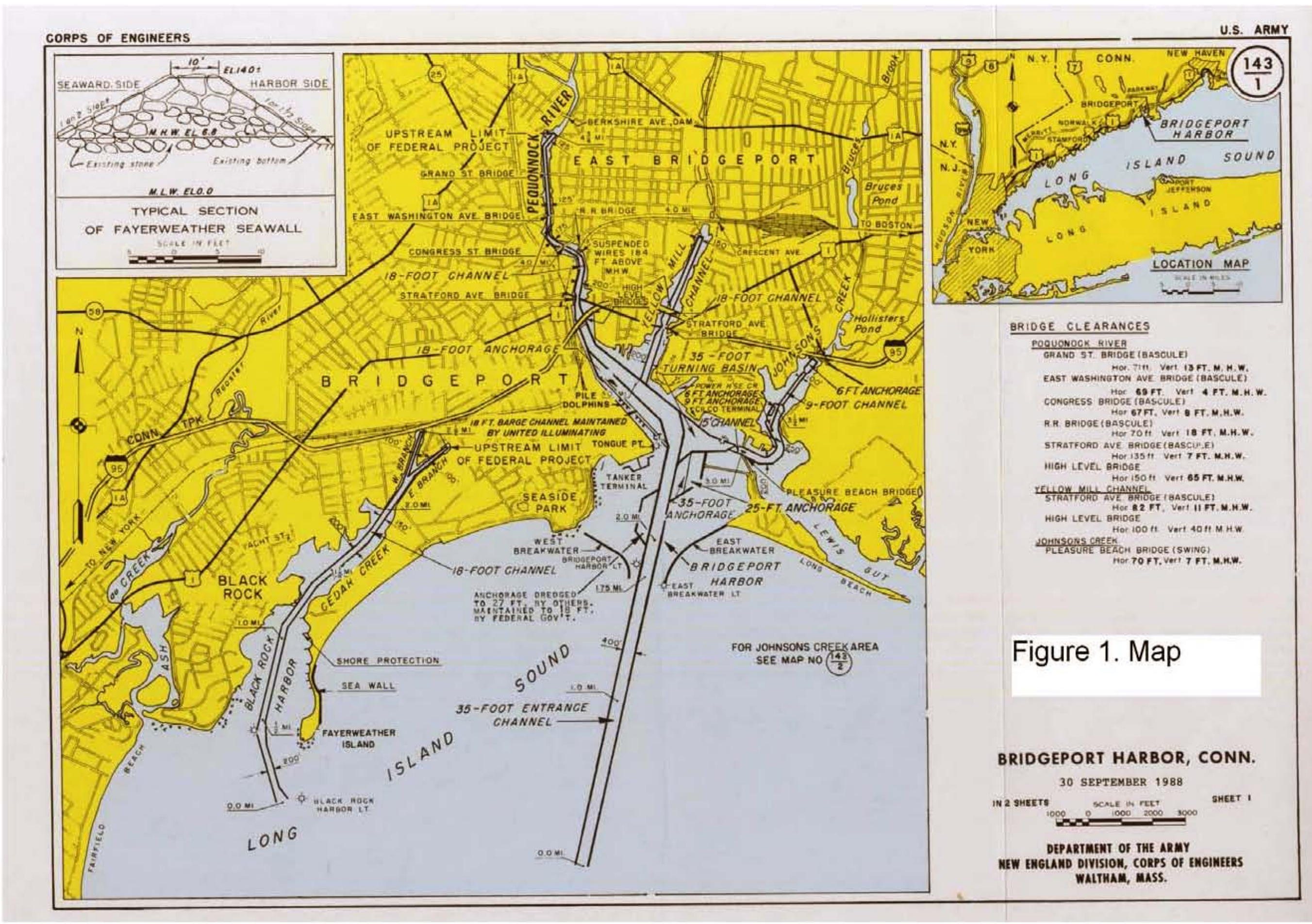
Bridgeport Harbor is located on the northern shore of Long Island Sound at the mouth of the Pequonnock River. Tributaries include the Yellow Mill Creek and Johnson Creek, which are located along the east side of the harbor. Black Rock Harbor is located approximately two miles to the west of Bridgeport Harbor. The location of the project area is shown in Figure 1.

II. PURPOSE AND NEED

The purpose of the proposed dredging is to restore the Federal navigation channels in Bridgeport Harbor to their authorized dimensions. The last maintenance dredging occurred in 1963, forty-five years ago. Since that time, shoaling has reduced the controlling depth in the navigation channels to between four and seven feet less than their authorized depths, creating a need for dredging. In response to the shallow condition of the harbor, vessels are required to either lighter their load (transfer goods to shallower draft vessels) before entering the harbor or as in the case of petroleum vessels use alternative harbors such as New Haven, New London, or New York. This results in higher transportation costs and threatens the operation of the port. Transporting the petroleum back through Bridgeport by either rail or highway can further strain a transportation system that is already overcrowded and also have a negative environmental impact on air quality.

III. AUTHORITY

The Federally authorized project at Bridgeport Harbor was authorized in 1836 and has been modified several times. The harbor contains the following Federal navigation features (see Figure 2):


CORPS OF ENGINEERS
U.S. ARMY
TYPICAL SECTION OF FAYERWEATHER SEAWALL
SEAWARD SIDE
HARBOR SIDE
M.L.W. EL 0.0
143/1
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EAST BRIDGEPORT
BRIDGEPORT
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SHORE PROTECTION
SEA WALL
FAYERWEATHER ISLAND
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FOR JOHNSONS CREEK AREA SEE MAP NO 143/2
BRIDGE CLEARANCES
POQUONOCK RIVER
GRAND ST. BRIDGE (BASCULE)
Hor. 71ft. Vert 13 FT. M.H.W.
EAST WASHINGTON AVE. BRIDGE (BASCULE)
Hor 69 FT. Vert 4 FT. M.H.W.
CONGRESS BRIDGE (BASCULE)
Hor 67 FT. Vert 9 FT. M.H.W.
R.R. BRIDGE (BASCULE)
Hor 70 ft Vert 18 FT. M.H.W.
STRATFORD AVE. BRIDGE (BASCULE)
Hor 135 ft Vert 7 FT. M.H.W.
HIGH LEVEL BRIDGE
Hor 150 ft Vert 65 FT. M.H.W.
YELLOW MILL CHANNEL
STRATFORD AVE. BRIDGE (BASCULE)
Hor 82 FT. Vert 11 FT. M.H.W.
HIGH LEVEL BRIDGE
Hor 100 ft Vert 40 ft M.H.W.
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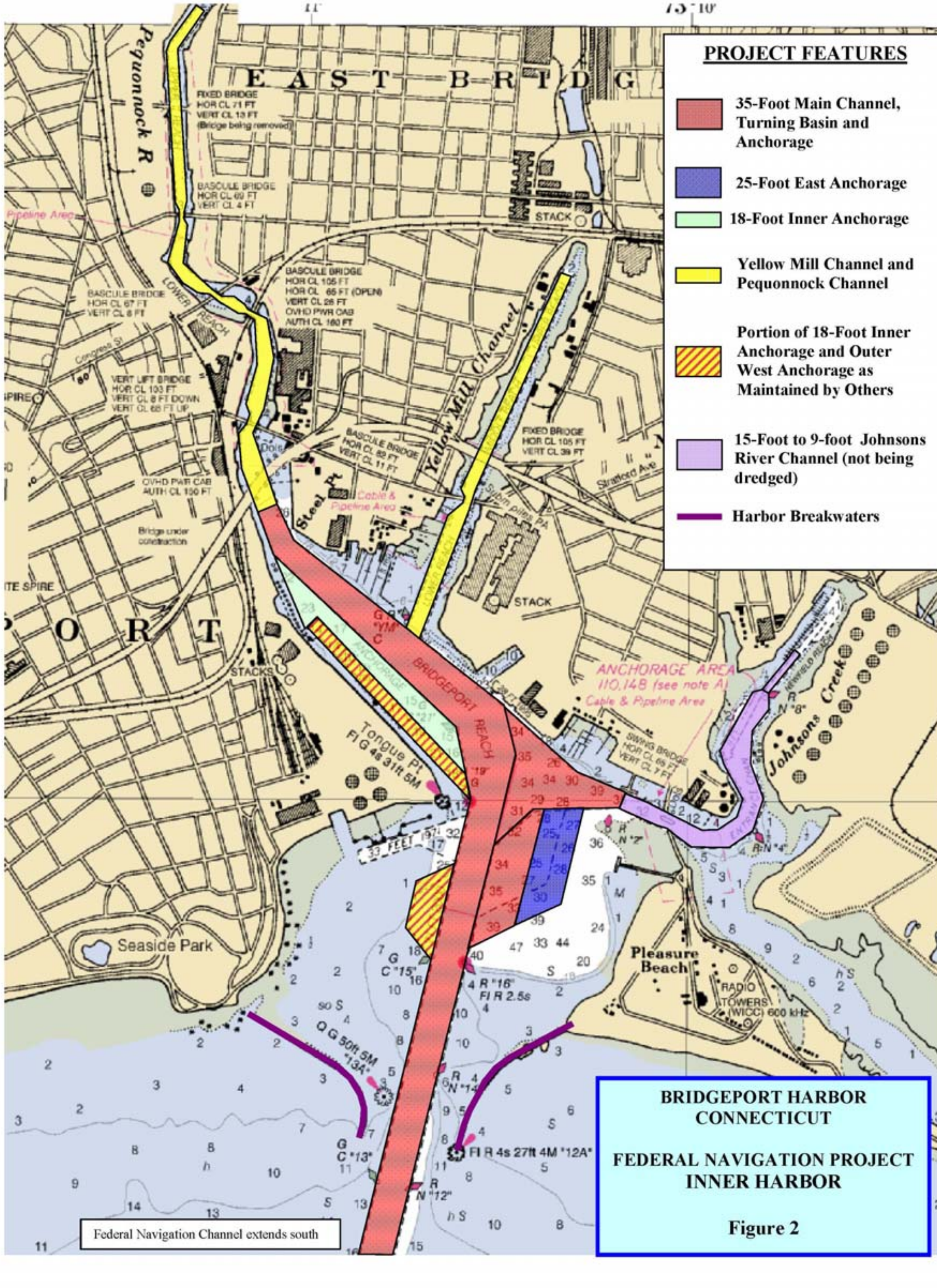
PLEASURE BEACH BRIDGE (SWING)
Hor 70 FT. Vert 7 FT. M.H.W.
BRIDGEPORT HARBOR, CONN.
30 SEPTEMBER 1988
IN 2 SHEETS
SHEET 1
SCALE IN FEET
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

Figure 1. Map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25-Foot East Anchorage
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BRIDGEPORT HARBOR
CONNECTICUT
FEDERAL NAVIGATION PROJECT
INNER HARBOR
Figure 2

- A main ship channel extending from Long Island Sound to the inner harbor. From Long Island Sound to Tongue Point, the channel is 35 feet deep mean lower low water (MLLW) (all depths referenced to MLLW) and 400 feet wide. It widens to 600 feet at the northwest bend (opposite Cilco Terminal), then narrows to 300 feet at a point 800 feet before the Stratford Avenue Bridge as it heads up the Pequonnock River. The deepening of the main ship channel to 35 feet was completed in 1963.
- A 1.1-mile-long, 18-foot-deep channel, 125 to 200 feet wide, extending from the vicinity of the Stratford Avenue Bridge, up the Pequonnock River, to a point 500 feet below the dam at Berkshire Avenue.
- Two breakwaters at the entrance to the main harbor. The easterly breakwater is 3,823 feet long, and the westerly breakwater has a length of 2,110 feet.
- Three anchorage basins inside the inner harbor. The first, 25 feet deep and 23 acres in area, lies opposite Tongue Point on the east side of the main ship channel (a small portion of this anchorage was dredged by others to 33.5 feet to facilitate the movement of large commercial ships); the second, 18 feet deep and 29 acres in area, lies on the west side of the main channel, parallel to the shoreline, directly across from Yellow Mill Channel; the third basin is 18 feet deep (but maintained to 27 feet by others) is also located on the west side of the main ship channel and south of Tongue Point.
- A turning basin 35-foot deep and 18 acres in area located east of the main ship channel and south and southeast of Cilco Terminal.
- A 15-foot-deep channel, 200 feet wide, extending from the turning basin up Johnsons River to a point 1,700 feet below Hollisters Dam, where for 1,100 feet it becomes nine feet deep and 100 feet wide until terminating at the six-foot-deep anchorage, two acres in area, at the head of the Johnsons River channel, near Hollisters Dam.
- A one-mile-long, 18-foot-deep channel, 150 to 200 feet wide, extending up Yellow Mill Pond Channel to a point about 370 feet from Crescent Avenue.

IV. ALTERNATIVES

A. NO ACTION ALTERNATIVE

More than four million tons of goods flow into Bridgeport Harbor, which is the second most active port in the State of Connecticut (Bridgeport Port Authority website). Goods transported through Bridgeport Harbor include coal, sand, gravel, stone, gasoline, and oil. The harbor is also the home of the Bridgeport Ferry. This ferry transports people and cars between Bridgeport, Connecticut and Port Jefferson, New York.

The No Action Alternative would allow shoal conditions in the channel to continue and likely worsen over time. Commercial vessels using the project area could experience delays and potential groundings and damages. Over time, navigation would become increasingly restricted and dangerous. As a result, this alternative was determined to be unacceptable.

B. ALTERNATIVE DREDGING METHODS

Alternative dredging methods that were considered for this project include hydraulic, hopper, and mechanical. A hydraulic dredge consists of a cutterhead on the end of an arm connected to a pump which loosens the bottom sediments and entrains them in a water slurry that is pumped up from the bottom through a pipeline to a disposal area. This type dredge is generally used for sandy material to be disposed in an upland area, nearby beach, or for pumping material into an upland confined (diked) disposal/dewatering area. Since the material to be dredged from the Federal channel is mostly silty, the use of a hydraulic dredge is not appropriate for this dredging.

A hopper dredge uses a suction pump similar to a hydraulic dredge to loosen and remove material from the bottom. The material is then deposited into hoppers aboard the dredge vessel. When the hoppers are full, the suction arm is raised and secured to the vessel, which then travels to the disposal site and releases or pumps off the material from the hoppers. The dredge then returns to the dredging site to begin another cycle. Hopper dredges come in various sizes from a few hundred cubic yards bin capacity to several thousand yards capacity. In New England, hopper dredges are most often used to remove sandy materials from harbor entrance channels and deposit the material offshore of beaches to nourish littoral bar systems. In order to fill the hopper bins, the water component of the suctioned slurry is allowed to overflow the bins back into the harbor at the dredging site. Since the material in Bridgeport Harbor is predominantly black organic silt, and intended for disposal into a CAD cell, this dredging method is not an appropriate method for dredging the Federal project.

A mechanical bucket dredge involves the use of a barge-mounted crane, backhoe or cable-arm with a bucket to dig the material from the harbor bottom. Typical dredging buckets come in various sizes from five cubic yards to about 35 cubic yards. The material is placed in a scow for transport to the disposal site by tug. For open-water or ocean disposal, a split-hull scow is usually used to release the dredged material and to minimize the discharge plume. Material is typically released at a specific buoy, or by using preset coordinates monitored by the tug. Mechanical dredging can be continuous as one scow can be loaded as another scow filled with dredged material is moving and unloading the dredged material. Since the material in Bridgeport Harbor is predominantly black organic silt, and intended for open water disposal, this method was selected as the preferred method for the dredging of the Federal project.

To minimize turbidity from dredging silt in the inner harbor and from the top of the proposed CAD cell located inside the breakwaters, a closed mechanical bucket will be used. A closed bucket minimizes the amount of material lost in the water column as the material is lifted from the bottom. In addition, no overflow from the scows will be allowed during the dredging of silt.

C. ALTERNATIVE DISPOSAL SITES

The objective of plan formulation phase of the DMMP is to identify various alternatives for the management of dredged material removed during maintenance dredging of Bridgeport Harbor. The DMMP will evaluate the alternatives and identify a "base plan" for the management of the sediment to be dredged from the Bridgeport Harbor. The base plan (or Federal standard) is defined as the least costly, environmentally acceptable alternative, consistent with sound engineering practices.

Disposal is to be consistent with sound engineering practices and meet environmental standards, including those established by Section 404 of the Clean Water Act of 1972, as amended and Section 103 or the Marine Protection, Resources and Sanctuaries Act (MPRSA) of 1972, as amended. Sediments to be dredged from the navigation channels in Bridgeport Harbor and during CAD cell construction contain material that is both suitable and unsuitable for unconfined open water disposal, as determined by the MPRSA and the Clean Water Act. (See Appendix A for suitability testing memorandums). The discussion below includes an alternative analysis for disposal of both suitable and unsuitable dredged material for this project.

1. <u>Upland Disposal</u>

<u>Landfill</u>: Transporting the dredged material from Bridgeport Harbor to a managed landfill was considered. This disposal alternative would need to include the following components:

- identifying available waterfront locations for dewatering and re-handling the dredged material,
- practicability of constructing these faculties,
- unloading of scows, drying of material, and loading of material into trucks,
- transport of material by truck to a landfill accepting dredged material,
- paying the tipping fee per load, if applicable, at the landfill.

Three landfills were identified that are permitted to accept dredged sediments for disposal (telecom, Bill Sigmund, CT DEP, Dec 2, 2008). The three landfills are located in the cities of Hartford, Windsor, and Manchester. Two of these landfills, Hartford and Windsor, will be closing in 2008 and 2009, respectively, and would not be available for this project. The other landfill in Manchester will be open until 2015. This landfill has remaining capacity for about 500,000 CY of material. It is not known how much of this capacity may already be under contract. Tipping fees are $80/ton for dredged material.

Dewatering would be necessary prior to landfill disposal. For example, dewatering of 100,000 CY of material would require about a 20 acre area and a constructed berm to contain the material and dispose of the material three feet deep. Once the material is dewatered, it can be transported to the landfill. Five thousand (5,000) truck trips would be required to transport 100,000 CY of material, assuming a 20 CY capacity truck would be used to transport the material from the dewatering site to the landfill. The Manchester landfill is about 60 miles from Bridgeport Harbor.

Landfill disposal is estimated to cost about $125 CY (see calculation below) and will be more expensive than open water disposal (cost about $10/CY) or disposal in a confined aquatic disposal cell (cost about $15/CY). This option was dropped from further consideration due to the high cost.

Estimated Disposal Cost per Cubic Yard at the Manchester, Connecticut, Landfill

Handling and dewatering cost	$30/CY
Transport to landfill	$15/CY
Tipping fee (1)	$80/ton or $108/CY (based on 1.35 tons/year)
TOTAL	$125/CY
(1) Tipping fee for the Manchester landfill, December 2008.	

<u>Upland Strip Mine Reclamation</u>: This alternative would consist of transporting dredged material to assist in the reclamation of strip mines in the northeast. In January 2005 the Pennsylvania Department of Environmental Protection approved modification to Lehigh Coal & Navigation Co.'s surface mining permit to allow the beneficial use of dredged sediment, coal ash, cement kiln dust and lime kiln dust in the reclamation of the Springdale Pit in Tamaqua, Schuylkill County (www.ahs.dep.state.pa.us/newsreleases). This mine would require testing prior to each shipment of 10,000 CY of dredged material and approval by the Pennsylvania Department of Environmental Protection before it could be shipped to the site. Once at the site each shipment would be mixed with material as directed and then retested before placed in the mine pit. Initial cost estimates to handle and transport the dredged material to Pennsylvania is over $200 per CY. This compares to the cost of open water disposal of $10 per CY. In addition, a news release in October 2006 stated that the owners of the mine informed the Department of Environmental Protection that they no longer intend to pursue the use of dredged materials in the reclamation of the Springdale Pit in Tamaqua, Schuylkill County. This alternative was removed from further consideration based on the excessive cost.

<u>Construction/Industrial Development</u>: The following two sites were considered for disposal of dredged material after screening for locally available upland sites for commercial and industrial redevelopment.

Stratford Development Company Site - This area is located to the east of Bridgeport Harbor. The Stratford Development Company was contacted in 2005 and again in 2008 to determine their interest in receiving dredged material from the harbor project for use in developing their site. The company has completed development of their west campus site. However, they still had a need for about 150,000 CY of fill material for their east campus site in 2008. After inquiry, it was determined that there may be a potential need for the sand and gravel material generated from construction of the SE CAD cell (see #7 below).

The preferred method of transporting suitable material to this site is to use a mechanical dredge. A mechanical dredged would load scows which would then be transported to a shoreline location for offloading and dewatering prior to trucking to the disposal site. Dewatering of the material is expected to take only a few weeks. If a suitable dewatering site is not available, then a hydraulic dredge and pump could be used. A hydraulic pump is another means to transport dredged material to the development site. Since this site is located adjacent to wetlands, some form of containment and sediment control would be required. The additional cost, approximately $550,000, to mobilize and demobilize another type of dredge (hydraulic vs. mechanical), construction of berms and sediment control features means this measure would not be a least cost alternative when compared to open water disposal.

Also, timing of the dredging would need to occur before the company begins construction on the site. Construction of the site is dependent on economic factors and a willing partner to develop the site. It is expected to take approximately 12 months to develop the site once an economic partner has been identified. As there is a large amount of uncertainty associated with the time frame for initiation of the dredging project and the availability of this upland site at the right time, and the extra cost to use this site, the viability of this site cannot be adequately assessed. As a result it was removed from further consideration in light of other available alternatives as discussed below.

Steel Point - Steel Point is about a 52-acre peninsula located at the mouth the Pequonnock River at the north end of the harbor. This is the site of a former fossil fuel power generating station. The City of Bridgeport has acquired the 52 acres at the site from the former land owners. The City is in the process of selling the property to Bridgeport Landing Development LLC. The agreement for the development and acquisition was executed in November 28, 2007 between the City of Bridgeport and the Developer (Telecom: Edward Lavernoich, City of Bridgeport, December 10, 2008). The Developer is planning a 1.5 billion dollar mixed use development with retail stores, restaurants, housing, offices, entertainment venues, a marina, a hotel, convention center, and waterfront park. The current economic climate has slowed the development at the site.

The Steel Point site might be used for the disposal of sand and gravel from the SE CAD cell if the developer is interested in the material for use at the site. This would require constructing a dewatering area, unloading the material from the scows to the dewatering area, dewatering the material, decommissioning the dewatering area, and spreading material at site. It is estimated that this would cost about $38 per CY including mechanical dredging. Steel Point was also considered as a temporary storage site for some of the unsuitable material from the CAD cell construction. This would require constructing a dewatering area, unloading the material from the scows to the dewatering area, dewatering the material, decommissioning the dewatering area, and spreading material at the site or trucking the material off the site. It is estimated that this would cost about $50 CY, not including the upland disposal costs. Due to the higher costs to dispose of material at Steel Point, this site was dropped from consideration.

2. Confined Disposal Facility

An alternative to placement of unsuitable material for open water disposal is construction of an engineered structure designed to provide the required storage volume for dredged material, i.e. a confined disposal facility (CDF). Initial investigation identified two areas as potential CDF locations, the Powerhouse Creek canal and the upstream portion of Yellow Mill Creek.

Powerhouse Creek is a small canal (150 ft. wide by 580 ft. long) located adjacent to the Bridgeport Regional Maritime Center. A CDF was considered for construction at this location by using a bulkhead to contain the material within the confines of the canal. This proposed CDF alternative was expected to store up to 50,000 CY of unsuitable material. Planning level design of this bulkhead structure determined an approximate unit cost of $60 per cubic yard. This is due to the fact that a steel cellular bulkhead would be required because of the geotechnical conditions of the site. This does not include the additional cost to relocate a sewer outfall (60 inch reinforced concrete pipe) which now empties into the upstream end of Powerhouse Creek canal. Due to the limited disposal capacity, and high cost, this measure was dropped from further consideration.

The Yellow Mill Channel is a feature of the Federal Navigation Project. The 18 feet deep channel ranges from 150 to 200 feet wide and is about 1-mile long. The west side is zoned light industrial. The east side of the channel has two small parks and two marinas and is zoned residential and light industrial. The channel is currently used for recreation boating with some industrial use. O&G Industries is located along the east side of the Yellow Mill Channel above I-95. Because of the channels navigation use, Yellow Mill Creek channel is also scheduled to be dredged.

Yellow Mill Creek drains an upland area of about 4.72 square miles and discharges to this channel. Two small water bodies; Stilman Pond and Success Lake are included in the Yellow Mill Creek's drainage area. The 100-year discharge to the channel is a bout 1,400 cubic feet per second (cfs). A tidal flat/marsh is located where the creek discharges to the channel.

Consideration was given to creating a CDF along the shoreline upstream of the I-95 Bridge in the upper channel. This would require a linear cellular bulkhead structure. Although the waterway averages about 300 feet wide in this area, a portion of this width (at least 50 feet) must be reserved to convey flood flows. This leaves an area of about 200 feet wide that could be used for a CDF. The CDF could be about 2,400 feet in length and would hold about 300,000 CY. It would cost approximately $40/CY to construct the CDF for disposal.

Environmental resource agencies including CT Department of Environmental Protection are not in favor of filling intertidal and subtidal habitat in Yellow Mill Creek to create a CDF. Due to the high cost of this measure and the environmental impacts, this measure was dropped from further consideration.

3. Riverine Disposal

Sand and gravel mining in the Housatonic River from the Route 15 bridge (Merritt Parkway) north to Derby created several depressions (holes) within the waterway that are 45-50' deep at mean low water (MLW). The authorized channel depth in this reach of the River is seven feet deep at MLLW. These deep borrow pits have served to degrade the aquatic habitat of the river system by creating sediment traps which result in silt and contaminant accumulation along with anoxic conditions unfavorable for marine life. Some areas also have a saltwater wedge at the bottom of the river that further reduces water quality and biological productivity. Filling the holes with dredged material would help restore aquatic resources by reducing anoxic conditions in the summer.

However, existing depths within the waterway (7 feet MLLW at the upstream end) make it impractical for dredge scows requiring between 13 and 16 feet of water to access these areas and would require dredging a channel approximately seven miles long. Passage of the scows would also be constrained by a railroad bridge with bascule gates that cross the river in the area. Trains constantly use this bridge to cross the Housatonic River. The largest window of opportunity for the barges to pass under the opened gates of the railroad bridge to the depressions upstream is three hours. In addition, only small draft scows (<8 feet) could be used to ride the high tide or light load larger scows. This would increase the cost of the project and delay completion of the project due to the time constraints and scow capacity. In addition, two pipelines cross the river, one in particular, the Southern Connecticut Gas line is located approximately seven feet MLLW. This would create obvious logistical difficulties to dredging deeper depths over the pipe. These logistical considerations along with the anticipated high cost of accessing these areas resulted in this alternative being dropped from further consideration.

4. Beneficial Use - Habitat Creation

Habitat creation includes using dredged material to build and restore wildlife habitat, especially degraded wetlands or other water-based habitat (e.g., nesting islands and offshore reefs). Habitat restoration and/or creation were examined early in the study process. The use of dredged material to create bird habitat in the harbor or Long Island Sound was discussed with National Marine Fisheries Service (NMFS) and Connecticut Department of Environmental Protection (CT DEP). Island creation could include creating small islands within existing open water areas just outside of the harbor, or as part of larger efforts such as enlarging Faulkner's Island by filling shallow areas to create intertidal habitat. In exploring these alternatives both agencies voiced concerns regarding impacts to and displacement of aquatic habitat. CT DEP stated that this alternative would not be consistent with CZM policies and NMFS opposed the expansion and/or creation of islands for bird habitat due to potential impacts to existing shellfish beds. As a result, this alternative was dropped from further consideration.

5. Beneficial Use - Beach Nourishment

The material to be dredged from the entrance channel is composed primarily of silt with some sand. The material from the inner harbor is comprised primarily of silt (even finer). As a result it was determined that this material is not compatible or suitable to be used for beach renourishment purposes. However, the material to be excavated from the upper 30 feet of the SE CAD cell (see #7 below) is comprised of well-graded coarse to fine sand and would be suitable for placement on area beaches. The three area beaches within close proximity to Bridgeport Harbor are Seaside Park (Fayerweather Island) located to the west of the harbor, and Pleasure Beach in Bridgeport and Long Beach in Stratford located to the east of the harbor (Figures 1 and 2).

Of these beaches, the Seaside Park Beach Coalition of the City of Bridgeport has requested that the Corps consider placing sand at Seaside Park. Long Beach and Pleasure Beach could also be alternatives if the communities expressed an interest in receiving the sandy dredged material. Seaside Park was selected for sand placement evaluation as there was local interest in placing sand at this location. Additionally, littoral drift along this area is from east to the west and sand placed at Seaside Park would not be transported back into the navigational areas.

However, placing sand at Seaside Park is more expensive than disposing of it at CLIS. The additional cost is about a dollar more per cubic yard plus the additional mobilization cost of approximately $550,000 to obtain a hydraulic dredge. Although there are additional costs associated with this beneficial use alternative, it remains a viable alternative within the context of this EA and DMMP as an option. However, in order to carry out this alternative, the community would be responsible for paying the incremental cost over the identified Federal Base Plan (disposal at CLIS), if they wish to pursue this alternative.

If it were to be demonstrated that there was a justified project under the Corps Section 204 program to placing sand on the beach (e.g. benefits due to flood damage reduction greater than the cost), then the local community would be eligible for cost sharing the increment at 35% non-Federal and 65% Federal. However, it is it is unlikely that Seaside Beach would qualify as a Section 204 project due to the lack of infrastructure that would potentially be protected by a beach project. Thus, the community will likely be responsible for 100% of the incremental cost of placing sand at Seaside Beach.

6. Beneficial Use - Borrow Pit

Morris Cove, located in New Haven Harbor, contains a borrow pit created decades ago when sand and gravel were removed to create fill for the Interstate Highway 95 embankment in New Haven. The sediments were excavated along a north-northwest to south-southeast axis, resulting in a submerged pit approximately 650 feet wide and 2,450 feet long. Currently, water depths in the vicinity range from about 10 feet MLLW adjacent to the Morris Cove borrow pit, to about 30 feet within the deepest portion of the borrow pit.

This site has been previously utilized for open water disposal of suitable material. During January and May 2000, an estimated total of 18,600 CY of sediment dredged from the U.S. Coast Guard Base in East Haven, Connecticut, was placed in the Morris Cove borrow pit.

Studies of the site following the disposal of dredged material into this area included bathymetric surveys and side-scan sonar. The data showed a clearly defined borrow pit boundary and good differentiation between softer sediments within the borrow pit and the coarser, more compact sediments that comprise its outer margin. The managed placement of approximately 600,000 CY of additional dredged material would fill the man-made depression and return the bottom of Morris Cove to a surface roughly even with the surrounding ambient bottom (SAIC, 2003).

The National Marine Fisheries Service (NMFS) has identified Morris Cove as an important spawning and nursery area for a variety of commercially important fish species, including winter flounder. NMFS has expressed concern regarding the presence of the existing borrow pit within Morris Cove and the potential for reduced water exchange (flushing) to trap organic material within the bottom feature. As organic material within the borrow pit undergoes the process of decay, the quality of the bottom waters (dissolved oxygen, nutrient content, pH, etc.) degrades sufficiently to result in poor habitat conditions for marine organisms. These conditions are especially prevalent and have the most profound impacts during the summer months when dissolved oxygen concentrations tend to be lower due to the warmer water temperatures within New Haven Harbor and Long Island Sound (in excess of 20° C), as well as reduced surface mixing (i.e., gas exchange via short-period waves) relative to the remainder of the year to produce anoxic conditions. Filling this borrow pit would reduce or eliminate the anoxic conditions that currently exist, especially in the summer, and return this area to biological productivity.

Use of the pit for disposal of material from Bridgeport harbor would involve transporting material about 25 miles by dump scow to the site. This is about five miles further than transport of the material for disposal at CLIS. However this site would be useful for some of the material not suitable for disposal at CLIS, when capped with suitable material. An access channel would need to be created from the Federal navigation channel in New Haven Harbor to the borrow pit in Morris Cove for the scows transporting the dredged material. A channel about 6,000 ft in length, 100 feet wide, and 15 feet deep at MLLW would be needed. However, only about 38,000 CY of material would need to be dredged from the last 2,500 feet to create the access channel. This site was retained as a viable alternative.

7. Confined Aquatic Disposal (CAD) Cell

The material proposed to be dredged from the inner harbor (inside the breakwaters) is composed of silt and has been determined to be unsuitable for unconfined open water disposal. Several potential CAD cell locations were investigated before selecting the proposed disposal site. A CAD cell is an underwater hole dug into the harbor bottom in to which the fine-grained dredged material is placed. The material dug from the CAD cell is of higher quality (suitable for unconfined open water disposal) and has the potential for more beneficial uses for disposal (see above alternatives). The fine-grained contaminated material removed from the dredging areas is often capped with cleaner cap material to "confine" the silty unsuitable material and minimize exposure to the aquatic environment. Three CAD cell locations were investigated prior to selecting the fourth site for the proposed disposal site. See Figure 2a.

The first CAD cell, located just north of the currently proposed Southeast CAD Cell disposal site, was determined to be not suitable as a disposal site. Upon investigation, it was found that the first CAD cell was used as an old borrow site for the I-95 highway embankment. As a result, the site had filled with thick deposits of silty material, similar to the maintenance dredged material, and would also need to be confined in a CAD cell. The need to develop another CAD cell to confine material needed to be removed to develop a different CAD cell makes this an impracticable site.

A second site was investigated within the 35-foot deep Main Ship Channel just seaward of the power cable crossing at the northern end of the project area. This site was eliminated from further consideration for the following reasons. First, logistical problems of finding a temporary home for approximately 300,000 CY of unsuitable material that would need to be removed from the top of the CAD cell before it could be constructed, prevented this site from being practicable. Second, construction of a CAD cell in this portion of the Main Ship Channel would prevent future deepening of the harbor, if needed.

A third site (West CAD Cell) was investigated on the west side of the harbor; west of the navigation channel and just north of the breakwater. Borings indicated that rock ledge would substantially reduce the size of the West CAD Cell, making it inadequate to store all of the maintenance dredged material. In addition, this CAD cell is in the location of an oyster bed habitat area, which would be disturbed during CAD cell construction.

The fourth and final CAD cell location investigated is the Southeast CAD Cell. It is located just north of the east breakwater, and has the capacity to store a majority of the unsuitable dredged material. In addition, no shellfish beds would be disturbed during construction. This SE CAD cell was retained as a proposed disposal alternative for unsuitable material, although the West CAD Cell is carried forward as an option in case the Morris Cove borrow pit is not supported as a disposal alternative.

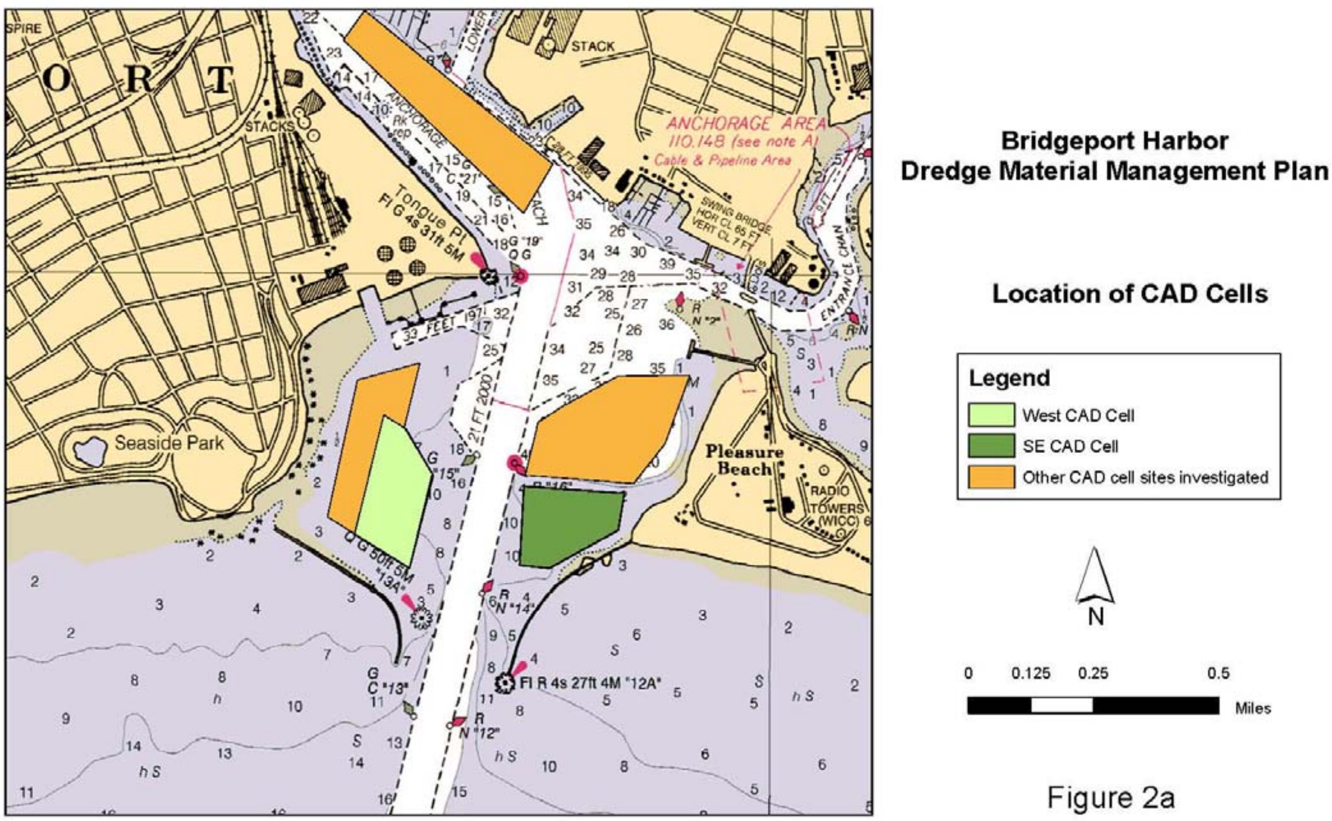

Bridgeport Harbor
Dredge Material Management Plan
Location of CAD Cells
Legend
West CAD Cell
SE CAD Cell
Other CAD cell sites investigated
N
0 0.125 0.25 0.5
Miles
SPIRE
STACKS
STACK
Tongue Pt
Fl G 4s 31ft 5M
ANCHORAGE AREA
110.148 (see note A)
Cable & Pipeline Area
SWING BRIDGE
HOR CL 65 FT
VERT CL 7 FT
ENTRANCE CHAN
33 FEET
21 FT 2000
Seaside Park
Pleasure
Beach
RADIO
TOWERS
(WICC)
Fl R 4s 27ft 4M "12A"

Figure 2a

8. <u>Ocean Disposal</u>

There are currently four available regional dredged material disposal sites located in Long Island Sound. These disposal sites are available to accept only material suitable for ocean water disposal after receiving pertinent approvals based on extensive physical, chemical and biological testing.. The EPA-designated Western Long Island Sound (WLIS) and the Central Long Island Sound (CLIS) disposal sites are the closest disposal sites to Bridgeport Harbor. The WLIS disposal site is located 3.2 miles south of Long Neck Point, Norton, Connecticut and approximately 22 miles southwest of Bridgeport Harbor. It has accepted small to moderate volumes of dredged material originating from Stamford, Norwalk, and other coastal communities of Connecticut and New York. The CLIS disposal site is located approximately 6.4 miles south of South End Point, East Haven, Connecticut and is located approximately 20 miles southeast of Bridgeport Harbor. Historically, CLIS has been one of the most active disposal sites in the New England region. Since 1980, 6,301,000 CY of dredged material has been disposed at the site. Sediments deposited at CLIS have been dredged from New Haven, Bridgeport, Stamford, and Norwalk Harbors, as well as other adjacent coastal areas. The lack of available upland disposal and beneficial use alternatives, the close distance from the dredge site, and the determination that the dredged material from Bridgeport Harbor is suitable for ocean water disposal makes disposal at CLIS an attractive alternative.

D. ALTERNATIVE TECHNOLOGIES

One of the activities that must be performed in planning for dredging is to test to determine if the dredged material is suitable for ocean placement. The Bridgeport inner harbor shoal material, which is comprised mostly of silt, was found to be unsuitable for ocean disposal. This type of material is also difficult to use in a beneficial manner. It is too silty for beach placement and not suitable for construction purposes because of the high percentage of fines. It may be applicable to use as a landscape material but the level of contaminants may significantly restrict its use to situations where it is "buried."

In the past decade or so there have been several demonstration efforts where maintenance material undergoes specific treatment processes to immobilize or reduce chemical concentrations to a level that may be acceptable for either open water placement or to be used in various beneficial manners. There are two specific technologies that seem promising in being able to treat the dredged material that will allow it to be used in a beneficial manner. One process involves thermal treatment of dredged material where the resulting end product can be mixed with Portland cement. This "blended cement" can then be used in construction. Another process washes the material under pressure and adds surfactants to clean the material. The end result of this process is a soil that can be mixed or amended with other material that can be used in landscaping.

In response to an interest in potential treatment technologies for dredged material, an on-going demonstration project known as the Long Island Sound Innovative Technology Demonstration Project (LIS Demo) is being funded by the Corps of Engineers and the

Bridgeport Port Authority. As part of this LIS Demo Project, earlier treatment technologies conducted by others, as well as on-going or currently planned efforts were identified and reviewed. This review identified a demonstration project that was currently underway.

BioGenesis Washing BGW, LLC conducted a full-scale demonstration project of the BioGenesisSM Sediment Washing Technology for dredged material from the New York/New Jersey Harbor. The main purposes of the demonstration project were to: 1) determine the ability of the BioGenesisSM process to treat contaminated sediments to levels acceptable for beneficial use and, 2) develop commercial scale operation and cost data. The demonstration project was conducted under contract to the New Jersey Department of Transportation, Office of Maritime Resources (NJDOT/OMR) under the State of New Jersey's Sediment Decontamination Technology Demonstration Program and in coordination with the U.S. Environmental Protection Agency (EPA) under the Water Resources Development Act (WRDA).

One of the goals of the demonstration project was to refine the projected capital and operating costs for a commercial-scale facility built in the New York/New Jersey Harbor region. For the purposes of the Lower Passaic River Focused Feasibility Study, treatment costs were estimated for several scenarios depending on the quantity of sediment to be dredged and delivered to a BioGenesisSM Sediment Washing Facility. Based on discussions with the Lower Passaic River Restoration team, it was assumed that a dedicated facility would be required for the Lower Passaic River Restoration project, and that a site with offloading and storage facilities would be provided. The non-CERCLA dredged material in the Lower Passaic has very similar physical and chemical characteristics as the Bridgeport Harbor material and the cost estimate developed by Biogenesis is considered applicable to the treatment of Bridgeport Harbor material.

Three cost scenarios were considered:

- 50,000 CY project (to be dredged over the duration of the restoration project)
- 250,000 CY/year facility to be operated for 1 to 10 years
- 500,000 CY/year facility to be operated for 1 to 10 years

The cost for treatment of the material would vary depending on whether the treatment facility was developed for a single project or for multiple projects over a significant processing period such as 10 years. Since any treatment facility developed as a result of the DMMP for Bridgeport Harbor would be exclusive for the proposed maintenance effort, we have used the cost information for the period of time it would take to process the Bridgeport Harbor material. The unsuitable material in Bridgeport Harbor would require a 500,000 CY per year processing facility that would operate for two years to treat the material. The treatment cost associated with a plant of this size for this period of time was $86.59/CY. If the plant only processed half of the material and operated for one year the cost would increase to $101.89/CY.

V. PROPOSED PROJECT DESCRIPTION

Approximately 1,774,000 CY of dredged material (including two-foot of overdepth dredging) would be removed to maintain the current authorized depths in the navigation channels, anchorages and turning basin in Bridgeport Harbor, except for Johnsons Creek (see Figure 2). The material would be dredged with a mechanical dredge and placed into scows for disposal. Of that amount, approximately 666,000 CY of material is suitable for unconfined ocean disposal and the other 1,108,000 cubic yards is not suitable for unconfined ocean disposal (see Table 1). The Federal base plan would dispose of the unsuitable material into a Confined Aquatic Disposal (CAD) cell(s) located in Bridgeport Harbor and the Morris Cove borrow pit located in New Haven Harbor. The suitable material would be disposed at the Central Long Island Sound Disposal Site (CLIS), in the Morris Cove borrow pit, and used to cap the CAD cell(s).

TABLE 1. Dredging Quantities (CY) From the Navigation Channels and CAD Cell

Location	Suitable Material	Unsuitable Material	Overdepth	TOTAL
Navigation Channels (Depths in MLLW)				
Entrance Channel	302,500		363,100	665,600
Main Channel		399,000	188,000	587,000
35’ East Anchorage		46,000	26,000	72,000
25’ East Anchorage		8,100	18,200	26,300
35’ Turning Basin		69,900	50,100	120,000
18’ Inner Anchorage		4,700	6,400	11,100
18’ West Anchorage		100	100	200
Yellow Mill Creek		93,500	33,400	126,900
Pequonnock River		130,300	34,400	164,700
Subtotal	**302,500**	**751,600**	**719,700**	**1,773,800**
Southeast CAD Cell and the Access Channel to Morris Cove Borrow Pit				
SE CAD Cell	1,151,300	53,800		1,205,100
[1]Access Channel		37,800		37,800
Subtotal	**1,151,300**	**91,600**		**1,242,900**
Total Dredged Material Quantity by Type				
			Total Suitable Material	**1,816,900**
			Total Unsuitable Material	**1,199,800**
			TOTAL DREDGING QUANTITY	**3,016,700**

[1] The material from the Morris Cove access channel was not considered for open water disposal for cost savings and beneficial use reasons. Thus, this material appears in the unsuitable column for display purposes only.

The Southeast (SE) CAD Cell would be constructed in Bridgeport Harbor to the east of the navigation channel and just north of the breakwater (Figure 3). This CAD cell would be dredged to a depth of about 90 feet MLLW and would contain the majority of the contaminated (unsuitable) material dredged from Bridgeport Harbor, approximately 910,000 CY. The remainder of the unsuitable material from the harbor, as well as the top two feet excavated from the SE CAD Cell and the material from the access channel to Morris Cove, would be disposed at the Morris Cove borrow pit. Suitable material from the project would be used to provide a minimum three-foot cap for the unsuitable material disposed in the SE CAD Cell and the Morris Cove borrow pit. The remaining suitable material would be disposed at CLIS.

A total of approximately 3,017,000 CY of suitable and unsuitable material would be dredged from the Bridgeport Harbor navigation project features, the SE CAD Cell and the access channel which will provide adequate depth to the Morris Cove borrow pit. See Table 1 above for a summary of the total amount and breakdown of the suitable and unsuitable material to be dredged from the CAD cell and access channel.

Table 2 provides a summary of the proposed disposal locations for the suitable and unsuitable material dredged from the project channel and anchorages, SE CAD Cell and access channel to Morris Cove. Figure 3 shows the disposal locations and Figure 4 the location of the access channel to the Morris Cove borrow pit. Construction will be sequenced to minimize potential impacts to natural resources (see Affected Environment Section below).

Construction would begin with the dredging of the access channel to the Morris Cove borrow pit. In order to minimize impacts to leased shellfish beds in Morris Cove, dredging of this channel will not occur from May 31 to September 30. No dredging in the Main Ship Channel would occur between Tongue Point and the Stratford Avenue Bridge in Bridgeport Harbor from February 1 through May 31 in order to avoid potential impacts to spawning winter flounder. In addition, the portions of the Main Ship Channel above the confluence with Yellow Mill Creek would be restricted from dredging operations from April 1 to June 30 due to anadromous fish runs. The top layer of the footprint of the proposed Bridgeport CAD cell needs to be excavated prior to start of winter flounder spawning season (February 1). Removing the silty layer of the CAD cell prior to the spawning season will allow dredging of the parent material being excavated to create the CAD cell by minimizing impact to winter flounder. Dredging activities in the entrance channel between Buoy No. 9 and the breakwaters may be restricted from May 31 to September 30 to minimize potential impacts to shellfish beds nearby. Further review is underway to determine if this restriction is necessary. If an alternative CAD cell is constructed west of the Main Ship Channel, dredging may not occur there from May 31 to September 30 to protect nearby shellfish resources. The project is expected to take approximately one and one-half years to complete.

TABLE 2. Quantities (CY) and Source of Dredged Material for Each Disposal Location

Source of Dredged Material	- DISPOSAL LOCATIONS -				
	CLIS	Southeast CAD Cell		Morris Cove	
	Suitable	Unsuitable	Suitable	Unsuitable	Suitable
Entrance Channel	592,400		73,200*		150,000*
Main Channel, Turning Basin, and Anchorages		620,400			
Pequonnock River		164,700			
Yellow Mill Creek		126,900			
Main Channel (remaining)				196,200	
Top 2' SE CAD				53,800	
SE CAD	1,001,300				
Access Channel				37,800	
Disposal Subtotals		**912,000**	**73,200***	**287,800**	**150,000**
*cap material	**1,593,700**	**985,200**		**437,800**	
TOTAL DISPOSAL QUANTITY					
3,016,700					

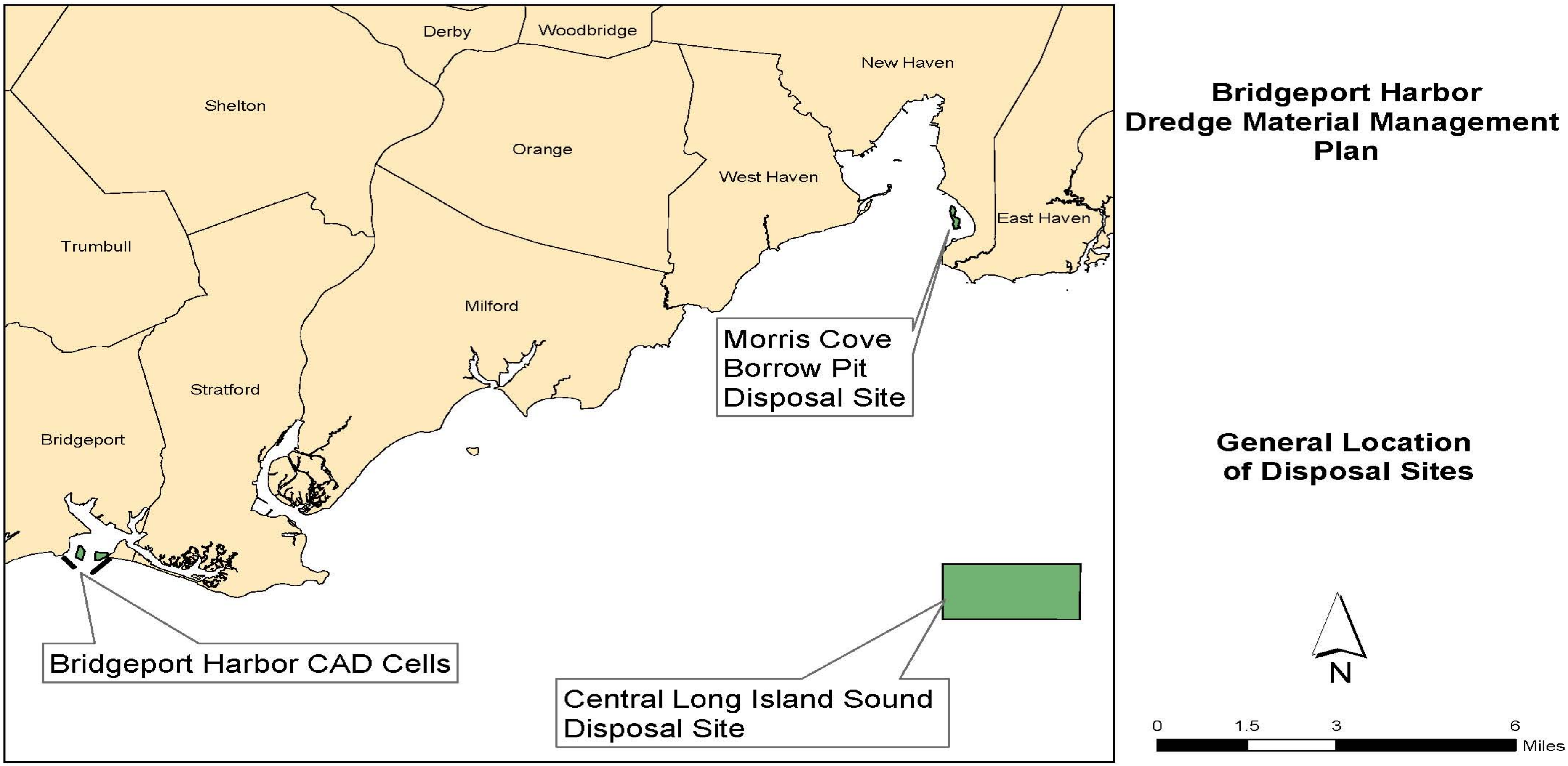


Figure 3. Dredged Material Disposal Locations

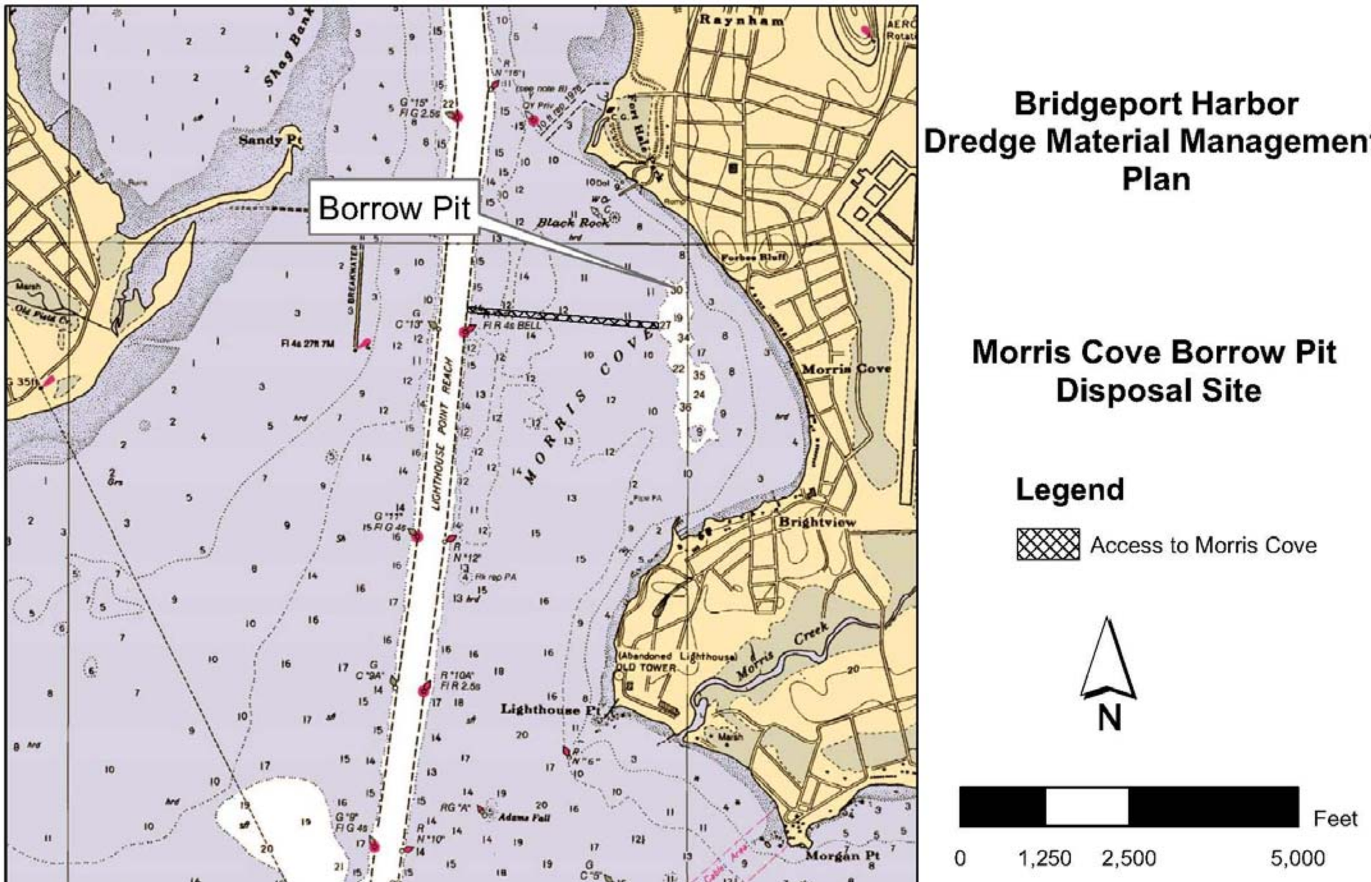

Bridgeport Harbor
Dredge Material Management Plan
Morris Cove Borrow Pit Disposal Site
Legend
Access to Morris Cove
N
Feet
0
1,250
2,500
5,000
Borrow Pit
Raynham
Sandy Pt
Black Rock
Morris Cove
Brightview
Lighthouse Pt
Morgan Pt
LIGHTHOUSE POINT REACH
MORRIS COVE
Morris Creek
Shag Bank
BREAKWATER

Figure 4

VI. AFFECTED ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Bridgeport Harbor

Bridgeport Harbor, located along the northern shore of Long Island Sound, is one of three deep water ports in Connecticut. The Pequonnock River enters the harbor from the north and the Yellow Mill and Johnsons Creek from the east. The highly developed harbor is dominated by industrial, commercial and recreational uses (Bridgeport Harbor Management Plan, 1995). This alteration has resulted in substantial change and/or function impairment of natural physiographic features. Bridgeport has developed shorefront along Johnsons Creek, Yellow Mill Channel, the Pequonnock River and Bridgeport Harbor from Tongue Point north.

Bridgeport's shorefront features consist of beaches and modified bluffs and escarpments stabilized by control structures such as revetments, bulkheads, or seawalls. Glacial drift, beaches, and artificial fill characterize Bridgeport's coastal area. Pleasure Beach in Bridgeport and Long Beach in Stratford form a long barrier beach which extends from the mouth of Bridgeport Harbor east to Point No Point in Stratford. Seaside Park and Fayerweather Island beaches form the westerly side of the mouth of the harbor.

2. Morris Cove

Morris Cove is located on the east side of New Haven Harbor in a small embayment near the outer harbor. The shoreline is characterized by parks, historic sites, and residential structures. Morris Creek and Tuttle Brook empty into Morris Cove.

3. Central Long Island Sound Disposal Site (CLIS)

The Central Long Island Sound Disposal Site is one of four regional dredged material disposal sites located in the waters of Long Island Sound. CLIS is situated approximately 6.5 miles south of South End Point, East Haven, Connecticut. The Central Long Island Sound Disposal Site is centered at 41° 08.906' N, 72° 53.072' W (NAD 83) and occupies an area of 2.6 square miles. It covers a rectangular area on the seafloor of 2.3 x 1.1 miles.

B. SEDIMENT CHARACTERISTICS

Sediments were collected at different times from the Federal main ship channel, turning basin, entrance channel, and proposed CAD cell locations in Bridgeport Harbor for physical characterization and chemical analysis. These results along with the results from the biological tests (which were performed only when necessary), were used to determine the suitability of the material for ocean disposal. Although material from the access channel to

Morris Cove is most likely suitable for ocean disposal, based on it's location within New Haven Harbor, a conservative approach was taken and the material assumed to be unsuitable for ocean disposal because the material was not tested for suitability.

As a result of the Ambro Amendment to the Marine Protection, Research, and Sanctuaries Act (MPRSA), dredged material disposal in Long Island Sound from Federal projects (both projects carried out under the Corps civil works program or the actions of other Federal agencies), or from non-Federal projects involving more than 25,000 CY of dredged material, must satisfy the requirements of both the Clean Water Act § 404 and the MPRSA. Disposal from non-Federal projects involving less than 25,000 CY of material or disposal landward (inland) of Long Island Sound is subject to the Clean Water Act only.

1. Bridgeport Harbor Entrance Channel, Main Channel, and Turning Basin and Anchorage Area

Samples were collected from 20 stations using a vibracore from the Bridgeport Harbor entrance channel, main ship navigation channel inside the breakwaters, and the 35-foot turning basin and anchorage area on August 22 to 24, 1998 for physical and chemical analysis. A stainless steel mini-box core was used to collect sediment required for performing biotoxicity evaluations. See Figure 5 for sampling locations.

Bottom materials recovered inside the breakwaters from navigation features were primarily black silt to the full penetration depth with only two exceptions. At stations "A" and "B," adjacent to the ferry landing, a hard gray clay-silt was recovered in the core cutter indicative of the indigenous materials residing at depth.

The entrance channel, located outside the breakwaters, was generally a dark gray to black silt overlying fine sand at depth. Fine sand was recovered at depth at stations "N" and "Q", the bottom eight inches of the core recovered from station "R" contained a large percentage of sand. Larger proportions of sand were observed further offshore in a southerly direction towards station "T" where gray silty sand with entrained shells was recovered. All the samples were analyzed for grain size. See Table 3 for grain size results.

Samples were then analyzed for total organic carbon (TOC), metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), polynuclear aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyl (PCB) congeners. Subsamples of C, F, and K, and CLIS were also analyzed for dioxin/furans. The results showed that pesticides were not generally detected in the samples at the specific detection limit. Many of the blank samples also detected dioxin/furans. The results for TOC, metals, PAHs and PCBs are shown in Table 4. These results show levels generally above the CLIS reference sample.

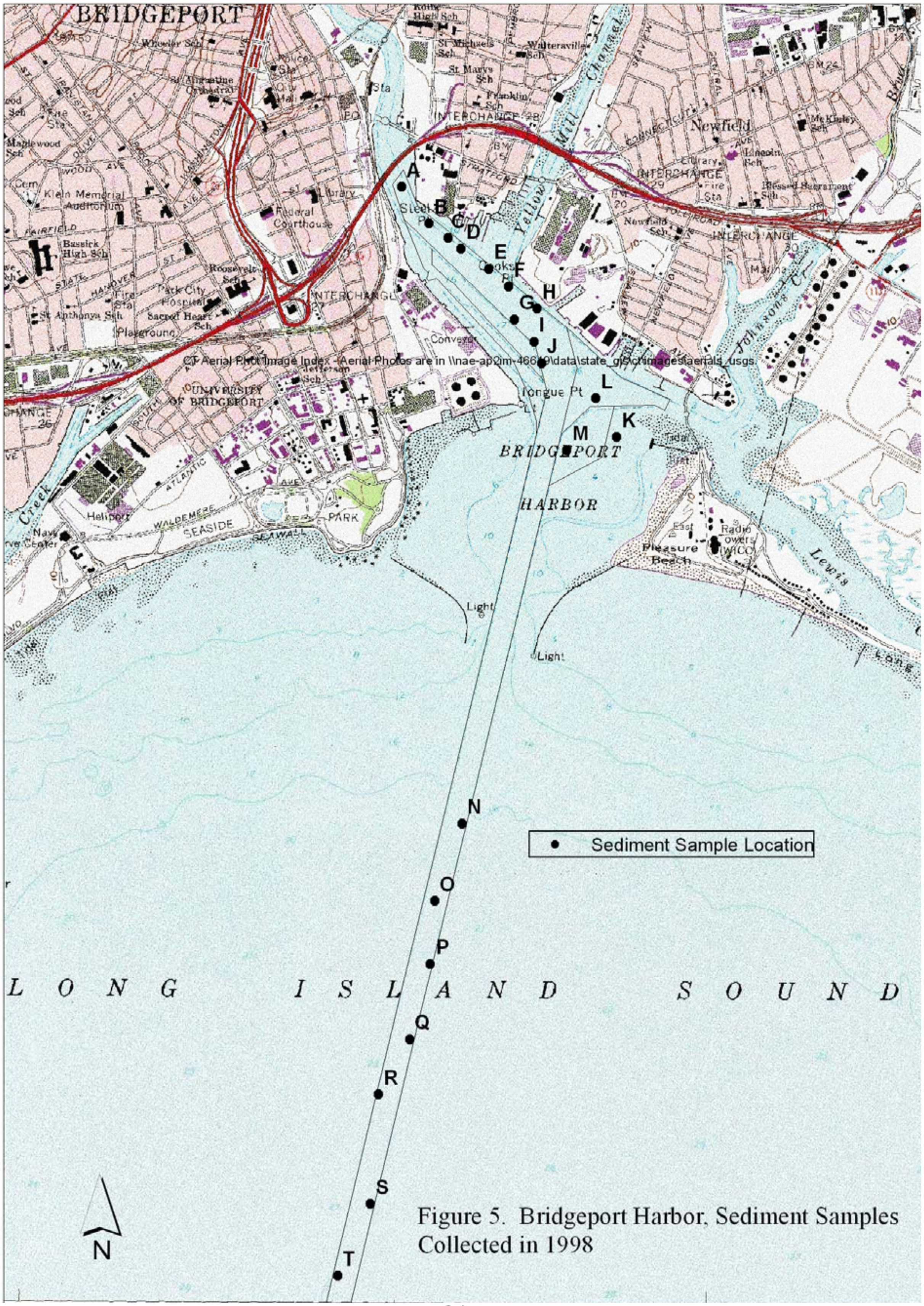


Figure 5. Bridgeport Harbor, Sediment Samples Collected in 1998

TABLE 3. Grain Size Results from the Bridgeport Harbor Collected in 1998

Sample ID	% Sand	% Fines	Sample ID	% Sand	% Fines
“A”	5	95	“L”	10	90
“B”	10	90	“M”	6	94
“C”	5	95	“N”	14	86
“D”	3	97	“O”	9	91
“E”	3	97	“P”	31	69
“F”	5	95	“Q” (0-36”)	8	92
“G”	11	89	“Q” (36-51”)	37	63
“H”	10	90	“R”	13	87
“I”	9	91	“S”	12	88
“J”	10	90	“T” (0-37”)	6	94
“K”	12	88	“T” (37-49”)	48	52

Based on the above results, biological (biotoxicity) testing of the sediments using composites “A”, “BCD”, “EF”, “GHI”, “J”, “KL”, “M”, and “NQ” sediments were evaluated against the CLIS reference sediment. The 10-day amphipod bioassay test used whole sediment, while the 48-hour sea urchin, 96-hour fish, and 96-hour mysid shrimp test used sediment elutriate samples.

Benthic Toxicity Test: Mean amphipod survival for the Long Island Sound (LIS) performance control was 81%. Mean amphipod survival for the CLIS reference sample was 80%. Survival of the Bridgeport Harbor test sediment samples ranged from 17% to 63%. When normalized to the to the CLIS reference sample, mean survival ranged between 21% and 79% (composite: “A”-44%, “BCD”-30%, “EF”-57%, “GHI”-21%, “J”-26%, “KL”-48%, “M”- 79%, “NQ”-59%). Mean survival for “M” was not statistically different from mean survival for the CLIS reference sediment sample. Mean survival for composites, “A”, “BCD”, “EF”, “GHI”, “J”, “KL”, and “NQ” were statistically less than (p=0.05) and less than 80% of the CLIS reference sample amphipod survival. Except for sample “M” the rest of the material would not be acceptable for ocean water disposal at CLIS.

Water Column Test: Forty-eight hour tests using sea urchins *Arbacia punctulata*, 96-hour tests using the fish *Menidia beryllina*, and the 96-hour test using the mysid *Mysidopsis bahia* were conducted according to the scope of work titled “Laboratory Testing in Support of Environmental Assessment NAE 0&M Projects” dated 23 July 1998. Testing was conducted in two test series of five replicates. Each sample was diluted (i.e. 10, 50, and 100%) using the CLIS dilution water. In addition, each test series included a CLIS dilution water treatment and a laboratory performance control (NSW) treatment for a total of seven treatments for each test series.

Reduced development of the sea urchin was noted in full strength and 50% dilutions for all of the samples tested in Test Series 1. Reduced development was limited to full strength and 50% dilutions in all samples but CLIS, where only the full strength elutriate

TABLE 4. Summary of Sediment Contaminant Results (dry weight) for Bridgeport Harbor Collected in 1998

Composite	Total PCB[(a)] (ug/kg)	Total PAH[(b)] (ug/kg)	As (ug/g)	Cd (ug/g)	Cr (ug/g)	Cu (ug/g)	Hg (ug/g)	Ni (ug/g)	Pb (ug/g)	Zn (ug/g)	Mean TOC (mg/kg)
CLIS Reference	47	767	7.9	0.09	41.9	35	0.097	22.1	29.4	104	18000
A2	556	11379	10.9N	8.3	274	578	1.3N	204	45.0	441	49000
B (0-39")	498	7604	10.0	6.1	265	469	0.49	186	51.2	387	27000
B (39-49")	101	424	9.2N	0.82	46.3	41.9	0.032N	20.3	23.2	88.3	33000
C	157	5187	9.4N	10.0	185	363	0.40N	144	41.4	339	56000
D	148	4521	8.0N	6.5	173	322	0.35N	123	39.9	315	59000
E	150	4363	7.7N	10.5	166	293	0.36N	106	39.5	297	32000
F	173	4671	7.2N	11.7	200	318	0.33N	124	49.7	342	40000
G	125	2910	7.0N	7.3	161	284	0.29N	101	36.5	288	38000
H	144	5168	7.4N	7.3	147	249	0.27N	91.4	37.5	269	60000
I	116	4056	7.0N	5.0	138	249	0.29N	82.8	33.1	252	35000
J	105	3866	7.2 N	5.0	140	258	0.51N	87.9	34.2	260	48000
K	177	6696	65N	7.5	124	235	0.24N	89.7	33.9	305	38000
L	108	3519	7.3N	3.6	131	227	0.25N	83.1	32.6	243	32000
M	119	2954	6.9N	1.5	104	174	0.20N	64.8	28.7	210	34000
N	97	4631	6.2N	0.75	128	207	0.21N	62.6	26.1	203	32000
O	97	2403	6.0N	0.65	115	182	0.19N	56.2	27.1	201	26000
P	83	3597	5.6N	0.48	82.9	146	0.22N	42.5	20.1	154	21000
Q (0-36")	101	2413	7.4N	0.60	110	170	0.23N	62.7	27.4	206	30000
Q (36-51")	76	396	6.1	0.098	26.8	29.8	0.048	9.6	14.2	57.2	7400
R	97	1500	11.2N	0.65	105	158	0.20N	56.6	24.0	180	38000
S	97	3172	4.7N	0.54	87.0	140	0.20N	52.3	23.9	173	30000
T (0-37")	104	3751	5.5N	0.80	127	186	0.28N	64.8	24.9	211	32000
T (37-49")	72	236	5.0	0.072U	18.0	9.1	0.019U	4.5	12.3	37.6	7000

(a) Total PCB = 2 x Σ* denoted PCBs
(b) Total PAH = Σ target PAHs

N = MS and/or MSD recovery not within control limits
U = Not detected at specified detection limit

elicited a response in Test Series 2. In addition, for the “EF” elutriate, reduced normal development was evident even in the 10% dilution.

Reduced survival for the fish was limited to full strength dilutions of “A”, “BCD”, “M” and “NQ” for Test Series 1. In Test Series 2, reduced survival was limited to full strength dilutions for “EF”, “GHI”, “J”, and “KL” although 74% and 76% survival occurred in 59% dilutions of “EF” and “J”, respectively. Survival was not reduced in the CLIS at any dilution.

Reduced survival of the mysid in Test Series 1 was limited to full strength dilutions of “A”, “BCD”, “M” elutriates. In Test Series 2, reduced survival was limited to full strength dilutions of “EF”, “J”, “KL” elutriates. Survival was not reduced in the CLIS and “GHI” elutriates at any dilution.

Bridgeport Harbor has sediment contaminant levels that are comparable to those found in other industrial harbors in the Northeast. The above tests indicate that material would not be suitable for ocean water disposal based on the amphipod tests. Upon further evaluation of the biological test sample from the entrance channel “NQ”, it was determined that the unusual variability among the five replicates warranted additional testing of the entrance channel material.

2. Bridgeport Harbor Entrance Channel

Due to the unusual variability among the five replicates from the first round of biological testing noted above, 15 additional sediment samples were collected with a vibracore from the entrance channel for grain size analysis on September 6 and 7, 2001. See Figure 6 for sample locations and Table 5 for grain size results. After review of the grain size results, the samples were composited for bulk sediment chemistry and biological testing. See Table 6 for the compositing scheme.

PCB, PAH, metals, and TOC results from the Bridgeport Harbor entrance channel are summarized in Table 7. All four Bridgeport Harbor composites had TOC values above 2% dry weight. Concentrations of total PCB ranged from 140 to 180 ug/kg dry-weight in Bridgeport Harbor entrance channel sediments. Total PCBs in the CLIS reference sediments were lower (50 ug/kg dry weight). No pesticides were detected above the target detection limits of 20 ug/kg dry weight. However, DDTs, dieldrin, and heptachlor epoxide were detected in all harbor sediments at levels above the method detection limits. Total PAH concentrations ranged from 5,502 to 7,244 ug/kg dry weight in the sediments. Total PAHs in the CLIS reference sediment, while elevated, where lower than the harbor sediments. Except for arsenic and nickel, the metal concentrations in the reference sediment were lower than the harbor sediment concentrations. Based on the elevated results of the sediment chemistry in the entrance channel over the reference sediment, it was determined to move to tier three (biological testing) to determine suitability of the entrance channel material for ocean disposal.

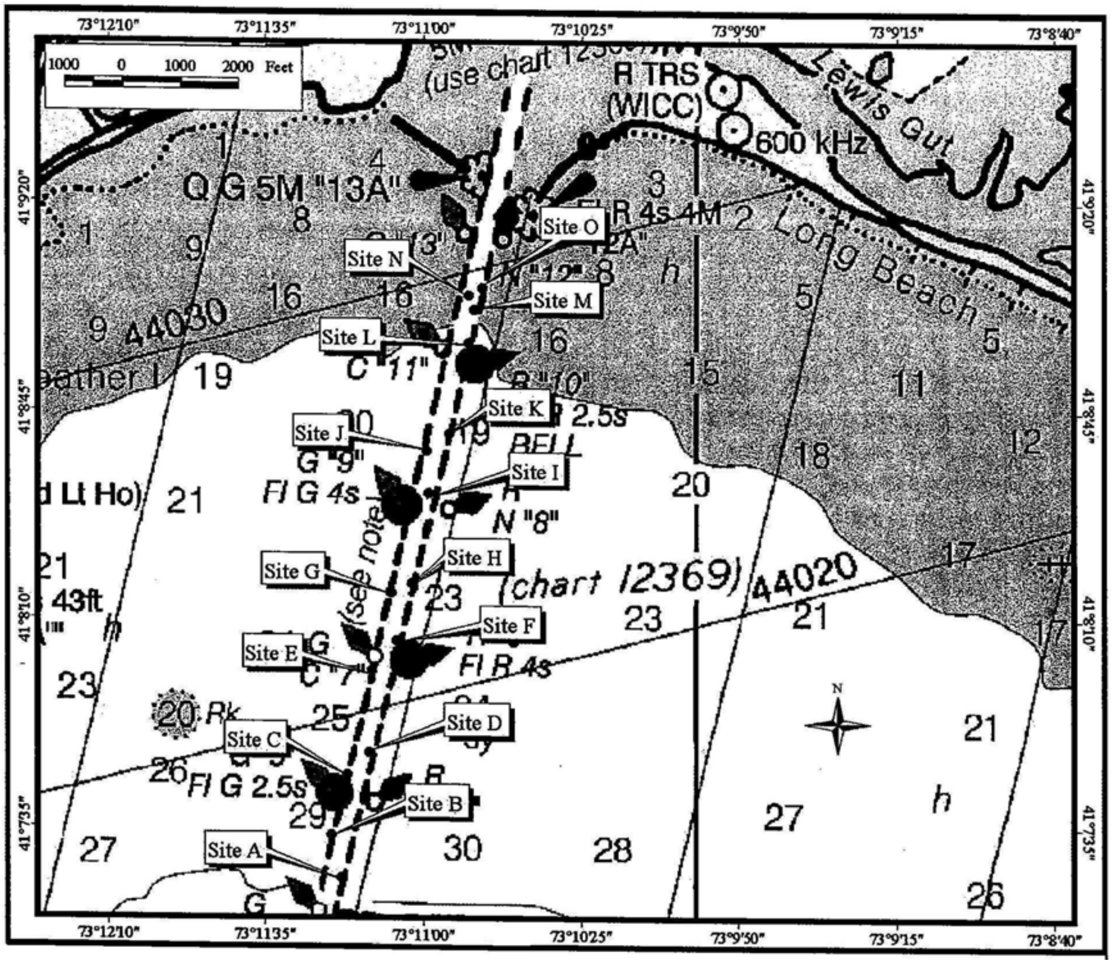


Figure 6. Bridgeport Harbor, Entrance Channel Sediment Sample Locations, Collected in 2001

TABLE 5. Grain Size Results from the Bridgeport Harbor Entrance Channel Collected in 2001

Sample ID	% Gravel	% Sand	% Silt	% Clay	% Fines*
“A”	36.2	8.1	32.7	23.1	55.8
“B”	0.7	8.9	53.9	36.5	90.4
“C”	0.0	10.0	53.5	36.5	90.0
“D”	0.7	11.2	50.6	37.5	88.1
“E”	1.5	37.7	35.0	25.8	60.8
“F”	1.5	25.2	42.6	30.7	73.3
“G”	0.1	8.7	53.0	38.3	91.3
“H”	0.0	11.3	50.5	38.2	88.7
“I”	0.1	8.4	53.4	38.1	91.5
“J”	0.0	9.1	53.9	37.0	90.9
“K”	0.0	12.9	48.9	38.2	87.1
“L”	0.1	18.6	47.3	34.0	81.3
“M”	0.0	15.0	47.5	37.4	84.9
“N”	0.3	15.6	49.6	34.5	84.1
“O”	0.2	18.4	46.7	34.7	81.4
*% fines = total of % silt and % clay					

TABLE 6. Composting Scheme for Sediment Cores from Bridgeport Harbor Entrance Channel Collected in 2001

Sample Site	Composite ID
“A”	---
“B”	Composite “BCD”
“C”	
“D”	
“E”	Composite “EFGH”
“F”	
“G”	
“H”	
“I”	Composite “IJK”
“J”	
“K”	
“L”	Composite “LMNO”
“M”	
“N”	
“O”	

Next, the sediment composites from the entrance channel and the reference sediment from CLIS underwent bioassay and bioaccumulation testing, following the guidance provided in the *Green Book* (EPA/USACE, 1991) and the *Regional Guidance Manual* (EPA/USACE, 1989). These three tests included:

1) a solid phase (benthic) toxicity test which assessed two species of test organisms, an amphipod *Ampelisca abdita* and the mysid shrimp *Americamysis bahia* through direct sediment exposure;
2) a water column toxicity test which assessed the exposure of three species of organisms (a vertebrate (fish) *Menidia beryllina*, a crustacean *Americamysis bahia*, and zooplankton-the larvae of *Arbacia punctulata*) to the suspended particulate phase (SPP) of the proposed dredged material; and
3) the bioaccumulation of pollutants of concern was assessed through a 28-day exposure of two marine macroinvertebrates to the proposed dredged material. The two marine macroinvertebrates tested were the burrowing polychaete *Nereis virens* and the bentnose clam *Macoma nasuta*.

Benthic Toxicity Test: The *Green Book* states that for the amphipod test, project test material will not meet the limiting permissible concentration under MPRSA for benthic toxicity when the organism survival in the project test sediment and the reference site sediment is statistically significantly different, and the decrease in survival observed exceeds 20% for *A. abdita* and 10% for *A. bahia* in the test treatment relative to the reference treatments. Based on these criteria, none of the composites from the Bridgeport Harbor were statistically significantly different or acutely toxic compared to the CLIS reference.

Water Column Test: Three water column toxicity tests were conducted in support of the Bridgeport Harbor evaluation; two 96-hour exposures using a vertebrate *M. beryllina* and a crustacean *A. bahia* and a 72-hour test using larvae of the Eastern purple urchin *A. punctulata*. If mortalities were greater than 50% in any of the dilutions, LC_{50} values were estimated. The significance of these estimates is based on the likelihood of 0.01 of these concentrations existing at the edge of the mixing zone after disposal operations, after allowance of four hours for initial mixing. Numerical models are available to determine whether these acutely toxic concentrations present a disposal problem.

The SPP solutions prepared from the “BCD” composite, the “EFGH” composite, and the “LMNO” composite were all observed to have an impact on the minnow *M. beryllina*, and the sea urchin *A. punctulata*, but not the mysid shrimp *A. bahia*. The SPP solution prepared from the “IJK” composite was observed to have an impact on all three species.

Bioaccumulation: The clam *M. nasuta* and the polychaete worm *N. virens* were used to test the potential of organisms to bioaccumulate contaminants from the Bridgeport Harbor entrance channel sediments. The four composite samples were statistically compared to results from the CLIS reference site. Tissue samples were analyzed for lipids, metals, PCBs, and PAHs. Tissue concentrations of all metals (As, Cd, Cr, Cu, Hg, Pb, Ni, and Zn) were above the method detection limits in all replicates analyzed for both species. The

TABLE 7. Summary of Sediment Contaminant Results (dry weight) for Bridgeport Harbor Entrance Channel Collected in 2001

Composite	Total PCB[(a)] (ug/kg)	Total PAH[(b)] (ug/kg)	As (ug/g)	Cd (ug/g)	Cr (ug/g)	Cu (ug/g)	Hg (ug/g)	Ni (ug/g)	Pb (ug/g)	Zn (ug/g)	Mean TOC (%)
CLIS Reference	50	2,166	6.77	0.171	69.7	43.9	0.184	24.9	45.1	129	1.73
"BCD"	170	7,244	7.74	0.663	161	208	0.403	30.4	72.6	219	2.42
"EFGH"	140	5,502	7.00	0.606	146	185	0.332	27.1	67.5	196	2.11
"IJK"	160	6,308	7.86	0.626	149	188	0.381	29.8	77.5	205	2.55
"LMNO"	180	6,467	7.03	0.884	157	208	0.353	29.9	19.0	208	2.21

(a) Total PCB = 2 x Σ* denoted PCBs
(b) Total PAH = Σ target PAHs

concentrations of Cr and Cu in tissues of clams exposed to all four Bridgeport test composites were statistically greater than those in tissues of clams exposed to the reference sediment.

Concentrations of 22 PCB congeners in tissues of the clam and worm exposed to the four Bridgeport Harbor entrance channel sediment and the CLIS reference sediment were analyzed. Concentrations of one PCB congener (PCB184) in tissues of the clam exposed to all sediments were lower than the method detection limit. Concentrations of one additional PCB congener (PCB08) in tissues of clams exposed to the reference sediment were lower than the method detection limit. Among the remaining 20 congeners, concentrations of 19 congeners in tissues of clams exposed to all four test composites were significantly greater than those in tissues of clams exposed to the reference sediment.

Concentrations of one PCB congener (PCB184) in tissues of the polychaete worm exposed to all sediments were lower than the method detection limit. Among the remaining 21 congeners, concentrations of 15 congeners in tissues of worms exposed to all four test composites were significantly greater than those in tissues of worms exposed to the reference sediment.

Concentrations of 23 PAHs in tissues of the clam and polychaete worm were exposed to the four Bridgeport Harbor composites and CLIS reference sediment and analyzed. The concentrations of all PAH analytes in tissues of the clams exposed to the CLIS reference sediments and to all Bridgeport Harbor test composites were greater than the method detection limits. Tissue concentrations of 18 analytes in clams exposed to all four test composites were statistically greater than they were in clams exposed to the reference sediments.

The concentrations of all PAH analytes, except dibenz(a,h)anthracene, in tissues of the polychaete worm exposed to the CLIS reference sediments were greater than the method detection limits. Among the remaining 22 PAH analytes, the concentrations of 11 were statistically greater in all four test composites than they were in tissues of worms exposed to the reference sediment.

As noted above, PAHs, PCBs, chromium and copper bioaccumulated in test organisms exposed to project sediments at higher levels than organisms exposed to reference sediments. As a result, additional evaluations were conducted to determine if the material would be suitable for open water disposal. Comparison of bioaccumulation values from the harbor samples to the applicable U.S. Food and Drug Administration's (FDA) Action and Tolerance Levels for the compounds referenced above was conducted. However, only PCBs have U.S. FDA Action/Tolerance levels. The steady-state corrected mean clam and worm bioaccumulation concentrations of PCBs for all stations were below the FDA Action and Tolerance Levels for these species. Therefore, this project is in compliance with this regulatory level and the analysis goes directly to the next step, risk-based evaluations.

The following risk-based evaluations were used to determine compliance with the

MPRSA. They are: 1) consideration of steady-state bioaccumulation and food-chain transfer, 2) consideration of potential carcinogenic effects on human health, 3) consideration of potential non-carcinogenic effects on human health, 4) comparison with published FDA "levels of concern" for shellfish, and 5) consideration of potential ecological effects. Based on the analysis of the risk-based evaluations, it was determined that the material from the entrance channel is suitable for ocean water disposal. Refer to the suitability determination dated June 28, 2002 in Appendix A for additional details of the evaluations conducted and the results.

3. CAD Cells

Four sediment cores were collected in April 2006 from within the West CAD Cell. Five sediment cores were collected on October 19, 2007 from the Southeast CAD Cell (Figure 7). These cores were tested for grain size and metals (chromium, copper and zinc). The purpose of this testing was to determine if there are portions of the material that are suitable for unconfined open water disposal and to determine the interface between suitable and unsuitable material.

When the dredged material is substantially the same as that at the disposal site and the dredged material is taken from a site far removed from known sources of pollution, it meets the testing exclusion and can be disposed without further testing. This project's material, the underlying glacial material found one (1) foot below the sediment surface at the Southeast CAD Cell and the West CAD Cell, does meet this exclusion.

As shown in Tables 8 and 9, which give the grain size and metals results for the West and Southeast CAD Cells respectively, there are clear differences between the two layers in each core. The lower layer is clearly sandier and has lower concentrations of copper, chromium, and zinc in the Southeast and West CAD Cells. This lower layer is the parent material and is therefore substantially the same as the disposal site and is far removed, in time, from known sources of pollution. As the sediment meets this exclusion, it is suitable for ocean water disposal.

The material to be dredged from the entrance channel (seaward of the breakwaters), as well as the material located below the first foot of shoal on top of the West and Southeast CAD Cells, has been determined to be suitable for unconfined ocean water disposal. See Appendix A for the suitability determination memorandums. The material located within the navigation features inside the breakwaters and the top foot of shoal in the proposed CAD cell locations is not suitable for unconfined open water disposal.

4. Central Long Island Sound Disposal Site (CLIS)

The Central Long Island Sound Disposal Site was considered and found to be the most suitable disposal option for a portion of this project given its location relative to the project area, and the fact that the area has previously been used for the disposal of dredged material.

To determine the suitability of the proposed dredged material for disposal at this site, the sediments were subjected to physical, chemical, and biological testing (see above). Test results indicate that the proposed dredged material from the entrance channel and the underlying parent material from the CAD cell(s) are suitable for unconfined open-water disposal as specified by the MPRSA (Marine Protection, Research, and Sanctuaries Act) regulations and therefore acceptable for disposal at this site.

Alternative Review by the Long Island Sound Regional Dredging Team - When the U.S. Environmental Protection Agency designated the Western Long Island Disposal Site (WLIS) and the Central Long Island Disposal Site (CLIS) in a June 2005 rulemaking, they imposed several restrictions or requirements on the use of the sites. One of these restrictions required the formation of a Long Island Sound Regional Dredging Team (LISRDT) that will review dredging projects proposing to use WLIS or CLIS for dredge material placement to ensure that a thorough effort has been conducted to identify practicable alternatives to ocean disposal.

Although all regulatory agencies will retain their respective decision-making authority and time-frames for decision-making, the LISRDT provides guidance for project proponents to assist in independently analyzing the practicability of identified alternatives to open water disposal.

Project proponents provide their completed alternatives analysis for review by the LISRDT during the application process. At the conclusion of the LISRDT's evaluation, the LISRDT chairperson will advise the applicable regulatory agencies as to whether, in the LISRDT's opinion, the applicant or proponent has satisfactorily addressed the practicability of the alternative(s) with respect to the goals and objectives of the final rulemaking. Notwithstanding any review comments or recommendations of the LISRDT, all regulatory agencies will retain their respective decision-making authority and time frames for decision-making.

The LISRDT consist of representatives of the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the National Marine Fisheries Service, the Connecticut Department of Environmental Protection, the New York State Department of State, and the New York State Department of Environmental Conservation.

The CLIS Disposal Site has the longest continuous record of use of any disposal site in the Long Island Sound. Material was disposed at this site from 1941-1945 and again from 1954 to the present. Overall, CLIS has received close to 14 million cubic yards of dredged material since 1941. Historical records of volumes of material placed at CLIS from 1982-2005 indicate that in most years the total volume of material disposed at CLIS is less than 600,000 cubic yards, with the average over this period being approximately 300,000 cubic yards. CLIS receives the largest volume of dredged material from Federal navigation projects in New Haven and Bridgeport Harbors although numerous smaller harbors in Connecticut and New York contribute to the total disposal volume.

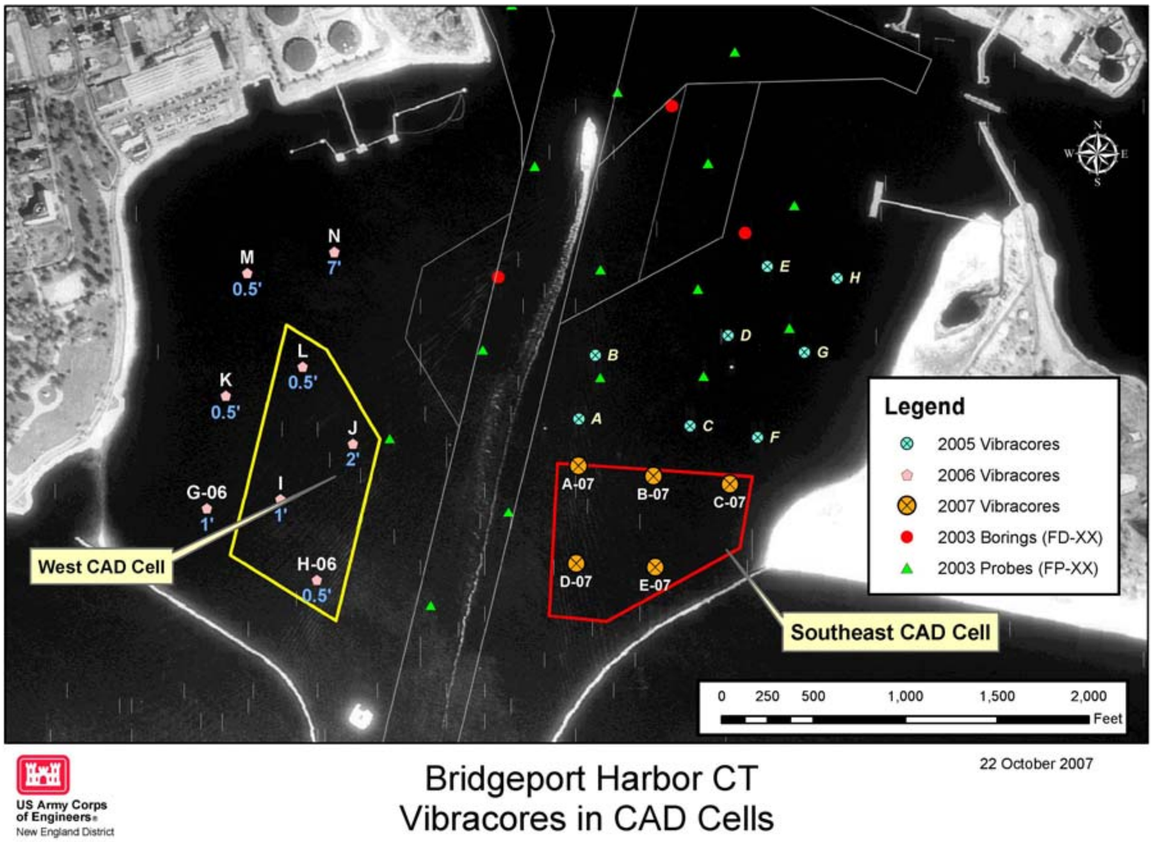


Figure 7. Sediment Sample Locations in the CAD Cells

TABLE 8. Grain Size and Metals (mg/Kg, dry wt.) Results From the West CAD Cell in Bridgeport Harbor

Sample ID	Depth Interval (feet)	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Total Fines (%)[(a)]	Cr	Cu	Zn
G	0-1’	15.25	0.84	7.48	70.45	5.81	0.17	5.98	14.5	38.7	36.9
G	1-2’	1.49	1.75	20.40	72.60	2.09	1.66	3.75	2.7	1.3	4.1
H	0-1’	2.82	1.23	19.14	73.36	1.88	1.58	3.46	8.0	22.6	16.6
I	0-1’	2.26	1.56	17.14	75.31	2.19	1.54	3.73	5.4	10.8	14.7
I	1-1.9’	31.31	4.03	17.09	45.13	1.06	1.38	2.44	3.5	1.9	7.6
I	3.0-4.4’								13.4	13.7	43.8
J	0-1’	6.81	2.24	5.71	22.69	40.48	22.06	62.54	148	404	281
J	1-2’	2.46	4.76	20.53	53.63	10.88	7.73	18.61	18.7	47.4	55.5
K	0-1’	0.00	0.03	6.24	90.50	1.72	1.50	3.22	8.2	24.0	19.2
K	3.9-4.9’	0.00	0.00	0.77	51.11	46.21	1.91	48.12			
L	0-1’	0.28	0.64	8.34	85.53	3.41	1.81	5.22	11.4	25.2	25.4
L	2-2.5’	2.47	1.61	7.99	82.43	3.65	1.84	5.49	5.0	1.8	8.2
M	0-1’	12.32	4.92	8.39	65.27	6.59	2.51	9.10	22.8	78.8	47.9
M	4-4.8’	0.00	0.33	1.15	20.96	73.88	3.69	77.57	12.3	23.7	40.1
N	4-5’	0.00	0.00	0.66	11.76	54.21	33.37	87.58	252	437	302
N	5.5-6.5’	18.81	5.75	6.32	21.49	26.68	20.95	47.63	28.6	29.7	55.5

(a) total fines = % silt and % clay

TABLE 9. Grain Size and Metals Results (mg/Kg, dry wt.) From the Southeast CAD Cell in Bridgeport Harbor

Sample ID	Depth Interval	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Total Fines (%)[(a)]	Cr	Cu	Zn
A	0-0.8’	19.21	7.17	35.32	29.76	5.69	2.85	8.54	10.7	19.7	21.5
A	0.9-1.9’	83.93	4.15	6.56	4.27	0.58	0.51	1.09	5.5	6.4	13.5
B	0-0.8’	1.68	4.09	33.66	55.77	2.72	2.08	4.80	9.2	22.1	14.9
B	1.0-2.2’	46.01	7.01	19.33	25.63	0.92	1.1	2.02	4.9	2.4[(b)]	8.6
C	0-0.6’	3.66	2.51	31.7	58.1	1.84	2.19	4.03	9.9	23.1	14.6
C	1.0-1.9’	49.34	14.81	20.61	13.32	0.68	1.24	1.92	6.9	3.3	12.9
D	0-0.6’	0.61	1.68	23.91	58.94	13.9	0.99	14.89	16.0	38.7	38.5
D	0.6-2.0’	0.61	1.82	24.8	58.4	13.5	0.88	14.38	4.8	2.8	9.6
E	0-0.75’	24.77	2.3	15.54	45.82	7.35	4.22	11.57	95.3	50.4	44.6
E	0.9-1.8’	71.52	10.15	8.63	8.52	0.43	0.75	1.18	6.0	4.9	11.4

(a) total fines = % silt and % clay
(b) value less than reporting limit but greater than method detection limit

The sediments at the site are predominately uniform clayey silt with an area of mixed sand, silt, and clay. These sediments are typical of those found in fine-grained depositional environments of the central basin of Long Island Sound. In addition to the ambient silts, there are deposits of dredged material with mixed grain sizes from harbors and navigation channels throughout the western and central basin (EPA and Corps, 2004).

CLIS has been monitored under the Corps Disposal Area Monitoring System (DAMOS) program. Field surveys and investigations conducted under the DAMOS program have shown that the CLIS is in a depositional area with a gradually sloping bottom ranging from a depth of 56 feet in the northwest corner to 75 feet in the southeast. Low to moderate kinetic energy, as evidenced by the low measured tidal current velocities and the ambient fine silt and clay sediments, is generally found in the disposal site region of CLIS. This means that CLIS is considered a containment site since sediment deposited at this location will remain within the site's boundaries. Surface currents at CLIS average 28 cm/sec on the flood tide and 38 cm/sec on the ebb tide; bottom currents average 29 cm/sec, and wave-induced currents are low. Net drift is to the west with a southerly component which is more pronounced during periods of spring runoff.

Despite active mixing, strong, mid-layer stratification occurs in Long Island Sound during summer months. Long Island Sound is characterized by high water column turbidity with sediment resuspension driven by tidal dynamics. Natural concentrations of suspended sediment are relatively high (up to 100 mg/cm^2). The turbidity extends vertically, being bounded by the water density gradient. Turbidity measurements in Long Island Sound (Gordon, 1974) revealed that when 2,615 cubic yards of dredged material were discharged in waters 66 feet deep, the density surge carried less than 18% of the material outside a 98 foot (0.018 nautical miles) radius. Essentially none of the material was detected beyond 394 feet (0.065 nautical miles). The residual turbidity in the water column, which drifts with the tidal stream, contained less than one percent of the material discharged (COE, 1979).

Bathymetric surveys following major storm events confirm that dredged material mounds at CLIS are highly stable under severe conditions. Long-term monitoring of historical mounds suggests that stability extends through decades (SAIC, 1989). Thus, the mixing and transport characteristics of the site do not represent an undue constraint on disposal.

Current sediment quality conditions at four potential disposal sites (including CLIS) were assessed through the collection of surface sediment samples in 2000 in support of the EIS for designation of dredged material disposal sites in Long Island Sound (EPA and Corps, 2004). For CLIS, the average concentrations of four metals (copper, nickel, silver, and mercury) exceeded the Effects Range-Low (ER-L). ER-L values represent concentrations below which adverse biological effects rarely occur, and ER-M (Effects Range-Median) values represent concentrations above which biological effects frequently occur. None of the stations at CLIS exceed ER-M. Average concentrations of silver, cadmium, copper, and mercury exceeded the average background concentration for depositional environments in Long Island Sound for at least one type of station. In general, average contaminant concentrations were higher in active area samples than in samples from historical, far-field, or reference locations.

Acid volatile sulfide (AVS) and simultaneously extracted metal (SEM) concentrations in sediment samples collected in support of the Long Island Sound EIS (EPA and Corps, 2004) were measured to assess whether metals are likely to be bioavailable (i.e. available for uptake by aquatic organisms). If AVS concentrations exceed SEM concentrations, then the metals are likely to be present in the sediment as insoluble sulfides and not be available for uptake into aquatic life. CLIS samples indicate that in general, metals in sediment are not likely to be bioavailable to organisms at this site.

Sediments at CLIS were also analyzed for organic contaminants; that are PAHs, PCBs, dioxins/furans, butyltins, pesticides, and radionuclides (EPA and Corps, 2004). At CLIS, concentrations of the most common organic contaminants were below the ER-Ls with the exception of total PCBs at the active and historic stations. Total analyte concentrations were generally higher at the historic or active stations than at the reference or far-field stations.

The potential toxicity of sediment of the alternative disposal sites and reference locations were evaluated by testing sediments collected from stations in 2000 (EPA and Corps, 2004). To determine sediment toxicity, mean amphipod survival associated with sediments from each alternative site was statistically and arithmetically computed to those associated with the appropriate reference sediment. At CLIS, mean percent survival ranged from 94 to 100 percent. Amphipod survival in the test sediments was not significantly different from that in the reference site samples (the difference in survival between test sediments and reference sediment did not exceed 20 percent). Therefore, sediments at the active, historic, and far-field sites at CLIS were not acutely toxic to the amphipod.

C. WATER QUALITY

1. <u>Bridgeport Harbor</u>

The water quality within Bridgeport Harbor is impaired due to point and non-point pollutant sources which may include combined sewer overflows (CSOs), sewage treatment plant outfalls, industrial discharges, contaminated sediments and urban and highway runoff (BHMP, 1995). The current water quality classification within Bridgeport Harbor is SC/SB. This includes the Pequonnock River, and the tributaries of Johnsons Creek, Yellow Mill Creek, and Lewis Gut. The water quality goal inside the Bridgeport Harbor breakwaters is SB; however, due to point or non-point sources of pollution, certain criteria of one or more designated uses assigned to Class SB surface waters are not consistently achieved. Waters classified as SB are designated for marine fish habitat, other aquatic life and wildlife habitat, commercial shellfish harvesting, recreation, industrial water supply and navigation. Class SC water quality results from conditions that are usually correctable through implementation of established water quality management programs to control point and non-point sources. Class

SC waters may be suitable for certain fish and wildlife habitat, certain recreational activities, certain aquaculture operations, industrial use, and navigation. Class SC waters may have good aesthetic value. Examples of conditions that warrant a Class SC designation include combined sewer overflows, urban runoff, inadequate municipal or industrial wastewater treatment, and community-wide septic system failures (CT DEP, 2002).

Water quality outside the Bridgeport Harbor breakwaters is classified as SB, with a water quality goal of SA. Class SA surface waters are designated for marine fish habitat, other aquatic life and wildlife habitat, shellfish harvesting for direct human consumption, recreation, industrial water supply, and navigation (CT DEP, 2002).

2. <u>Morris Cove</u>

Water quality in Morris Cove in the outer harbor of New Haven Harbor is classified as SD/SC with a goal of SB.

3. <u>CLIS</u>

CLIS would be expected to follow the general spatial and temporal water quality trends in Long Island Sound (EPA and Corps, 2004). With the exception of toxic contaminants, none of the water quality data in Long Island Sound is specific to CLIS. In the summer months, water clarity is expected to be higher at CLIS than in the western basin. However, based on its location in the central Long Island Sound basin, CLIS is expected to exhibit similar water quality conditions to the Sound in general. The average annual salinity is expected to be higher than those sites farther to the west and water temperatures in the summer and fall are expected to be slightly lower. Based on the general trends documented for Long Island Sound, hypoxic (low dissolved oxygen in the water) conditions in the waters of CLIS are not expected annually. If they do arise, the hypoxia will arrive later in the season, be less severe, and be briefer than in the waters to the west. The levels of toxic contaminants (metals, pesticide/PCBs, and polycyclic aromatic hydrocarbons (PAHs) were measured in the water from CLIS and found to be low. Water quality standards were met where Connecticut State Water Quality Standards are available for listed contaminants (arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc).

D. AQUATIC RESOURCES

1. <u>Bridgeport Harbor</u>

Due to the highly developed nature of Bridgeport Harbor, little remains of the historical natural habitat and natural resources within the project area, as indicated below.

<u>Wetlands</u>: There are very few remaining tidal wetlands located within Bridgeport Harbor proper. Very small patches may exist on the east side of the harbor between Tongue Point and the west breakwater. However, Great Meadows, a unit of the Stewart B. McKinney

National Wildlife Refuge, consists of tidal wetlands, tidal flats, a tidal embayment (Lewis Gut located behind Long Beach), and tidal creeks. Great Meadows is located east of Bridgeport Harbor in the City of Bridgeport and the Town of Stratford. This 680-acre area is one of the most valuable salt marshes in the State because of its productivity and general absence of mosquito ditches (BHMP, 1995). The Great Meadows serves as an anadromous fish run and high concentrations of shorebirds occur here. The area also contains moderate concentrations of hard clams *Mercenaria mercenaria*, soft clams *Mya arenaria*, and oysters *Crassostrea virginica*.

Eelgrass: There are no known eelgrass *Zostera marina* beds located west of Clinton Harbor, which includes Bridgeport Harbor and New Haven Harbor (State of CT, 2007).

Intertidal Flats: Intertidal flats are located along the southside of Seaside Park between Fayerweather Island and Tongue Point; at the northern end of Pleasure Beach near the mouth of Johnsons Creek; along both side of Johnsons Creek; and along portions of Yellow Mill Creek, particularly the west shore. The benthic resources of the intertidal areas of the beaches are discussed in more detail below.

Benthos: Benthic infaunal communities are composed of a variety of small organisms including worms, clams, snails, and crustaceans. The major ecological functions of the benthos include the production of biomass as food resources for higher trophic levels and the bioturbating (mixing) of sand and mud.

Benthic organisms are very sensitive to habitat disturbances, including organic enrichment and contamination of sediments by toxic substances. Benthic communities can therefore provide a useful environmental monitoring tool to evaluate estuarine systems.

Benthic samples were collected from the Federal navigation channel in Bridgeport Harbor and Morris Cove in New Haven in July 2003, from the local beaches and Powerhouse Creek in July 2005, from the West CAD Cell in March 2006, and from the Southeast CAD Cell in May 2008. Subtidal samples were taken with a standard 0.04 m^2 VanVeen grab with one replicate taken at each station. Beach samples were taken with a 0.003 m^2 core from three transects at the high, mid and low tide mark. All sediment samples were washed through a 0.5 mm mesh screen. The benthic data are located in Appendix B. See Figures 8 and 9 for sample locations.

In general, the benthic community in the Bridgeport Harbor Federal navigation channels and tributaries, including Powerhouse Creek, has very low diversity and very low abundance. Several stations were represented by a single species (Bridgeport Harbor station #7 and #16, Pequonnock River station #19 and #20, Johnsons Creek station #10, and Powerhouse Creek station #2) with a few stations completely devoid of organisms (Yellow Mill Channel station #15 and Bridgeport Harbor station #17). The dominant species present (the polychaetes *Mediomastus ambiseta* and *Streblospio benedcti* and the amphipod *Ampelisca vadorum*) are typically opportunistic pioneering species that generally occur in recently disturbed or highly stressed environments.

Although the benthic community abundance and diversity are very low, the benthic samples collected from the West CAD Cell were representative of the different substrates they inhabited. For example, samples #3 and #5 were located in silt and the numbers of species and individuals were usually lower than the remaining samples which were located in fine sand. In general, the number of species is twice as much than in the sandier substrate and the number of individuals three to five times higher than in the finer sediment.

Samples collected from the Southeast CAD Cell indicated that the benthic community generally had higher number of species and individuals than the West CAD Cell location. The substrate was all sandy material, some with shell pieces, with one sample “C” silty sand. The dominant species collected from both CAD cell locations (the polychaetes *Mediomastus ambiseta* and *Streblospio benedicti*), and the low number of species and individuals, indicate that the areas outside the navigation channels are still a stressed environment.

Benthic samples collected from the intertidal areas of Long Beach, Pleasure Beach, Seaside Beach and Fairfield Beach show low to moderate levels of species diversity and abundance. The low tide area had the highest number of species but not necessarily the highest number of individuals. An unidentified oligochaete caused the abundance at the high tide level at Long Beach and Pleasure Beach to increase sharply. Usually the low tide area has a greater abundance of individuals and species than at mid tide or high tide where conditions are less favorable for benthic organisms.

Shellfish: Bridgeport Harbor supports oyster shellfish beds (BHMP, 1995). Oysters can be found at the mouths of Pequonnock River and Yellow Mill Channel, between Tongue Point and the west breakwater, in most of Johnsons Creek, halfway between Tongue Point and the mouth of Johnsons Creek, and northwest and south of Pleasure Beach. Hard shell clams can be found in Lewis Gut.

Connecticut’s shellfish areas are classified by the Department of Agriculture/ Aquaculture Bureau according to the following six categories:

- Approved Area
- Conditionally Approved Area
- Restricted Area
- Conditionally Restricted Area
- Prohibited Area
- Closed Area.

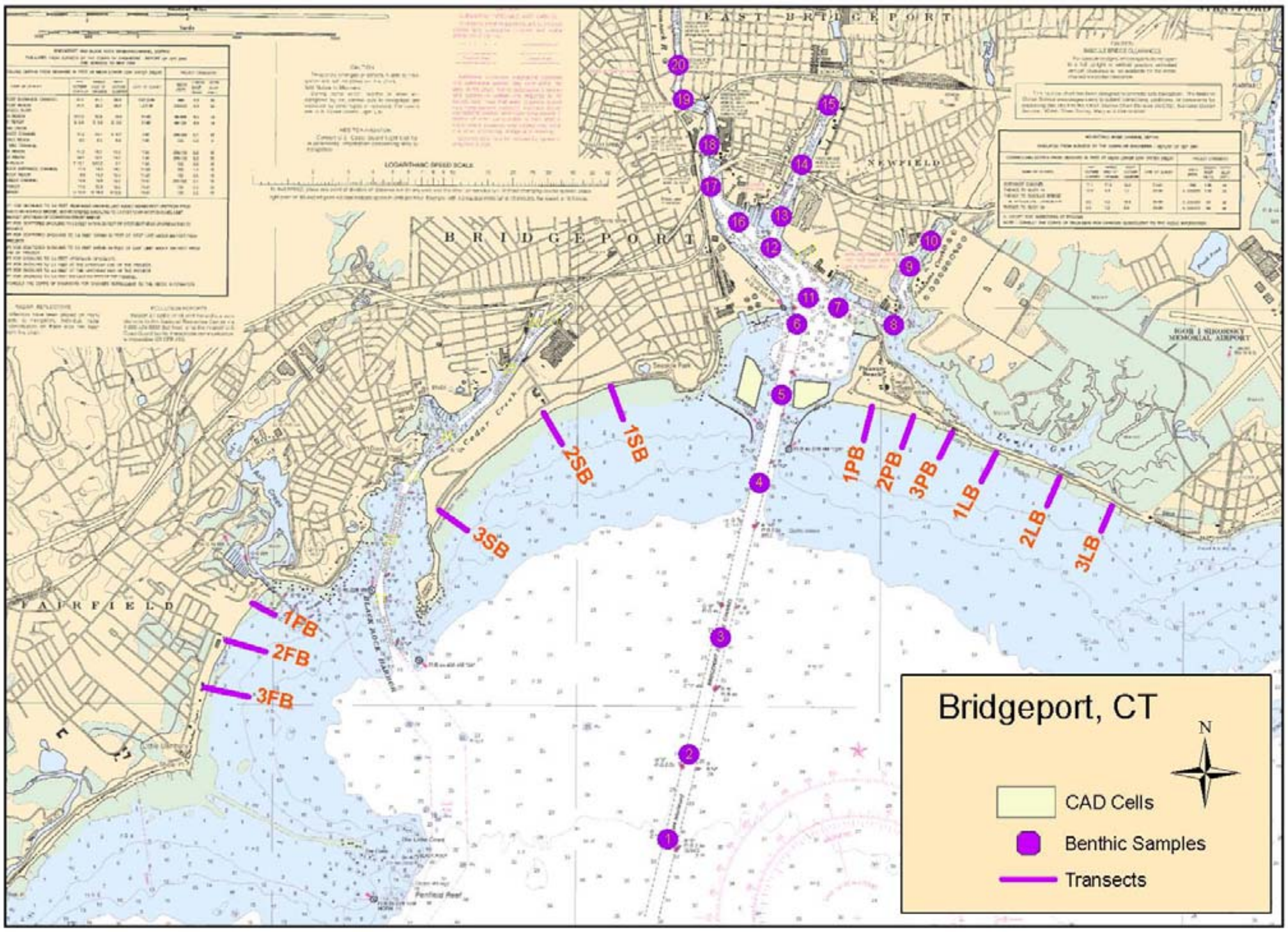


Figure 8. Benthic Sample Locations

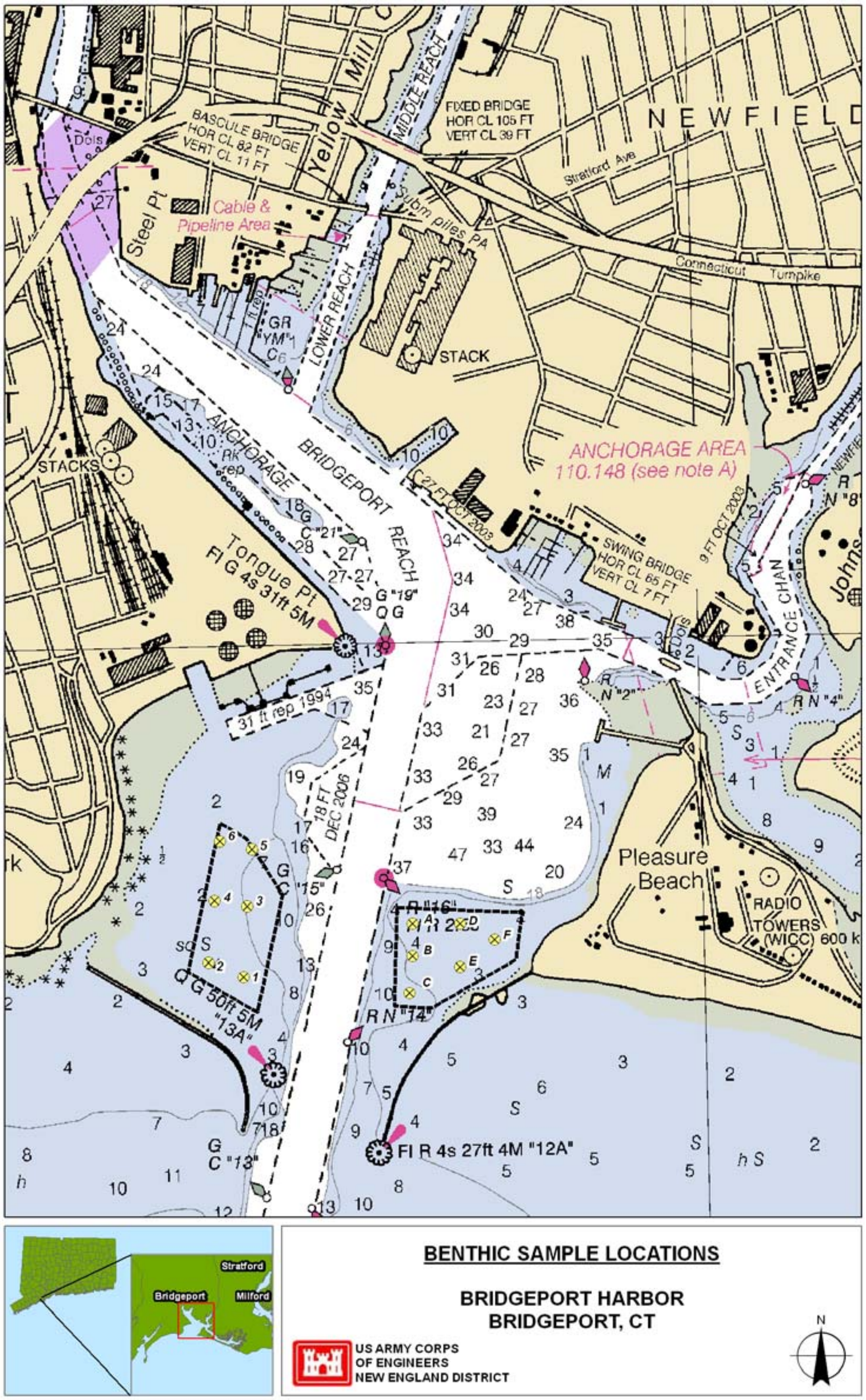


Figure 9. Benthic Sample Locations Within the CAD Cells

All of Bridgeport's coastal waters are classified as prohibited areas. Prohibited areas are defined as State waters that have been classified by the Department of Agriculture/ Aquaculture Bureau as prohibited for the harvesting of shellfish for any purpose except depuration and aquaculture activities. The State of Connecticut provides oyster leases for shellfish harvesting outside the harbor and on the west side of the harbor inside the breakwater.

Only an occasional hard shell clam was collected in the benthic samples from Bridgeport Harbor. No other commercially important bivalve is noted in Bridgeport Harbor. See the Benthos Section above.

Bridgeport Harbor is also not an important habitat for lobsters *Homarus americanus* (Johnson, personal communication). However, some adult lobsters may use the breakwaters as habitat for cover. Juveniles may use the rocky tidal nearshore area habitat adjacent to Seaside Beach on the west side of the harbor as cover also.

<u>Finfish</u>: Anadromous fish that transit Bridgeport Harbor to spawn in the Pequonnock River; are the alewives *Alosa pseudoharengus*, and, possibly, the blueback herring *Alosa aestivalis* (Johnson, pers. com). In general, these fish begin migration the beginning of April and complete their migration by the end of June. In the warmer months, the migratory fish tautog *Tautoga onitis*, striped bass *Morone saxatilis*, scup *Stenotomus chrysops* may utilize the harbor for forage and cover. Table 10 lists some finfish species that may be commonly found in Bridgeport Harbor and New Haven Harbor. This list was compiled based on the best professional judgment using data from the CT Marine Fisheries Division sampling programs in Long Island Sound and New Haven Harbor, and NPDES related fisheries studies conducted by Bridgeport Energy and Wisvest New Haven Harbor Station (now PSEG) (Mark Johnson, Senior Fisheries Biologist, CT DEP, Inland Fisheries Division, October 27, 2008).

Winter flounder is a common demersal fish in Connecticut coastal waters and is an important commercial and recreational fisheries in coastal and sound waters. In Bridgeport Harbor, spawning is suspected to occur north of Tongue Point (Johnson, 2008). No known flounder spawning areas have been found in the navigation channel.

2. <u>Morris Cove</u>

<u>Eelgrass</u>: There are no known eelgrass beds located in New Haven/Morris Cove (State of CT, 2007).

<u>Intertidal Flats</u>: Intertidal habitat is located along the shoreline of Morris Cove, almost 600 feet from the borrow site.

<u>Benthos</u>: Benthic samples were collected from Morris Cove in New Haven in July 2003. Subtidal samples were taken with a standard 0.04 m^2 VanVeen grab with one replicate

taken at each station. Sediment samples were washed through a 0.5 mm mesh screen. The benthic report is located in Appendix B.

TABLE 10. Common Finfish Species in Bridgeport Harbor and New Haven Harbor

Common Name	Scientific Name	Common Name	Scientific Name
anchovy, bay	*Anchoa mitchilli*	herring, blueback	*Alosa aestivalis*
bass, striped	*Morone saxatilis*	hogchoker	*Trinectes maculatus*
black sea bass	*Centropristes striata*	killifish, striped	*Fundulus majalis*
bluefish	*Pomatomus saltatrix*	menhaden, Atlantic	*Brevoortia tyrannus*
butterfish	*Peprilus triacanthus*	mummichog	*Fundulus heteroclitus*
cunner	*Tautogolabrus adspersus*	oyster toadfish	*Opsanus tau*
dogfish, smooth	*Mustelus canis*	perch, white	*Morone americana*
eel, American	*Anguilla rostrata*	pipefish, northern	*Syngnathus fuscus*
flounder, fourspot	*Paralichthys oblongus*	puffer, northern	*Sphoeroides maculatus*
flounder, smallmouth	*Etropus microstomus*	rockling, fourbeard	*Enchelyopus cimbrius*
flounder, summer	*Paralichthys dentatus*	scup	*Stenotomus chrysops*
flounder, windowpane	*Scophthalmus aquosus*	searobin, striped	*Prionotus evolans*
flounder, winter	*Pseudopleuronectes americanus*	silverside, Atlantic	*Menidia menidia*
goby	*Gobiosoma sp.*	skate, little	*Leucoraja erinacea*
grubby	*Myoxocephalus aeneus*	stickleback, four-spine	*Apeltes quadracus*
gunnel, rock	*Pholis gunnellus*	stickleback, nine-spine	*Pungitius pungitius*
hake, red	*Urophycis chuss*	stickleback, three-spine	*Gasterosteus aculeatus*
hake, silver	*Merluccius bilinearis*	tautog	*Tautoga onitis*
herring, alewife	*Alosa pseudoharengus*	tomcod, Atlantic	*Microgadus tomcod*
herring, Atlantic	*Clupea harengus*	weakfish	*Cynoscion regalis*

The results of the benthic analysis indicated that the benthic community within the borrow pit at Morris Cove was mostly non-existent. Two of the four samples analyzed contained no organisms. One station, #32, was represented by a single amphipod and station #35, was represented by a single individual polychaete. No commercially important bivalve is noted in Morris Cove.

Shellfish: No shellfish resources are located within the borrow pit. However, leased oyster beds are located in the area adjacent to the borrow pit and proposed access channel. The Morris Cove area is classified as Restricted Relay, meaning the shellfish are transported for depuration and testing prior to market harvest.

Finfish: See description above for Bridgeport Harbor. The observed distribution of winter flounder eggs indicates that the northern end of Morris Cove and the area adjacent to it and east of the main channel are spawning areas for winter flounder (Peirra, 1999). Due to the depths and quality of the borrow pit, winter flounder is not suspected to spawn directly in the pit.

3. Central Long Island Sound Disposal Site (CLIS)

The Central Long Island Sound disposal area has had extensive monitoring conducted of its benthic populations since 1979 (SAIC, 1989; SAIC, 1995, ENSR, 2005). As with many temperate benthic populations, benthic biota in the entire site undergoes seasonal fluctuations in densities, numbers of species, and dominants. A total of 184 species averaging 2,267.6 individuals per square meter have been identified at the CLIS site. The dominant species were the polychaete *Nephtys incisa*, and the bivalves *Mulinia lateralis* and *Yoldia limatula*.

The reference station was located in an area where the sediments and benthic population are characteristic of the natural bottom within the study region. The CLIS reference sediments are a clayey-silt, and the predominant macro-infaunal species are the bivalve *Nucula proxima* (43.3%) and the polychaete worm *Nephtys incisa* (16.8%), the same two species that dominated the area three decades earlier. Samples from disposal mounds were all sandier than ambient sediment, ranging from just slightly sandier to nearly 100% sand. A total of 66 species were identified in 22 samples collected in the spring of 1980 while 99 species were found in 18 samples collected during the summer of 1980. In general, the suite of dominant species reflected, to a great degree, the season in which the collection was made more than the station from which the organisms were collected. However, several of the disposal mounds developed communities characteristic of coarser-grained habitats dominated by the polychaetes, *Spiophanes* and *Ampharete*, and the suspension-feeding bivalves, *Tellina* and *Ensis*. Such data indicate that, if coarser-textured sediments are available, a different community type will develop.

The CLIS disposal site is removed from the near-shore estuarine environment (6.3 miles) that provides spawning, nursery, and productive feeding grounds for many marine resources, including summer and winter flounder. There is little finfishing activity at the site, excepting lobstermen trawling for bait and fisherman trawling for scup. Divers have seen, in decreasing order of abundance, winter flounder, windowpane flounder, fourspot flounder, striped searobin, summer flounder, grubby sculpin and silver hake (SAIC, 1989). In fish trawls taken by CTDEP from 1992 to 1997, 35 species of finfish were identified. The top five dominants were butterfish (*Peprilus triacanthus*), winter flounder (*Pseudopleuronectes americanus*), scup (*Stenotomus chrysops*), bluefish (*Pomatomus saltatrix*) and windowpane flounder (*Scopthalmus aquosus*). Although these resources cannot be avoided, interference will be minimized through application of seasonal restrictions on the disposal of dredged materials when fishing and spawning activities are highest and through other permit conditions and management practices at the disposal site that minimize impact to these resources. Lobster is the most important shellfish harvested at CLIS.

E. ESSENTIAL FISH HABITAT

The 1996 amendments to the Magnuson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Managed species listed for the 10' x 10' squares of latitude and longitude which includes Bridgeport Harbor, Morris Cove, and the Central Long Island Sound Disposal Site are: Atlantic salmon *Salmo salar* (juveniles and adults), pollock *Pollachius virens* (juveniles and adults), whiting *Merluccius bilinearis* (adults), red hake *Urophycis chuss* (eggs, larvae, juveniles, adults), winter flounder *Pseudopleuronectes americanus* (eggs, larvae, juveniles, adults), windowpane flounder *Scophthalmus aquosus* (eggs, larvae, juveniles, adults), American plaice *Hippoglossoides platessoidess* (juveniles, adults), Atlantic sea herring *Clupea harengus* (juveniles, adults), bluefish *Pomatomus saltatrix* (juveniles, adults), Atlantic mackerel *Scomber scombrus* (eggs, larvae, juveniles, adults), summer flounder *Paralicthys dentatus* (juveniles), scup *Stenotomus chrysops* (eggs, larvae, juveniles, adults), black sea bass *Centropristus striata* (juveniles), king mackerel *Scomberomorus cavalla* (eggs, larvae, juveniles, adults), Spanish mackerel *Scomberomorus maculatus* (eggs, larvae, juveniles, adults), cobia *Rachycentron canadum* (eggs, larvae, juveniles, adults), sand tiger shark *Odontaspis taurus* (larvae).

The above listed species and their appropriate life stages are discussed in Appendix C.

F. THREATENED AND ENDANGERED SPECIES

No Federally threatened or endangered species listed by NOAA Fisheries Service are known to occur in Bridgeport Harbor or Morris Cove (letter dated July 9, 2008). There are no known occurrences of Federally threatened or endangered species listed by the U.S. Fish and Wildlife Service in the project area (email dated October 2, 2008). However, according to the U.S. Fish and Wildlife Service, the Seaside Park Beach disposal option, as described, will create suitable habitat conditions for the Federally-threatened piping plover (*Charadrius melodus*). The creation of new habitats for this species may be beneficial, provided that the General Piping Plover Dredge Disposal Conditions to Avoid Adversely Affecting Piping Plovers are implemented. If implemented, then the project is not likely to adversely affect the piping plover. If the management guidelines can not be implemented, then the project is likely to result in adverse affects to the plover and further consultation with the U.S. Fish and Wildlife Service is required.

G. HISTORIC AND ARCHEOLOGICAL RESOURCES

This report addresses proposed harbor maintenance dredging to restore the authorized project dimensions. Maintenance dredging will be confined to previously disturbed contexts and impacts to significant resources are not expected. The CT State Historic Preservation Officer (CT SHPO) would however, like a remote sensing survey of the authorized Federal Navigation Project. There are three known, historic barges in the vicinity of the project area. The CT SHPO would like to ensure that the barges have not slipped/slumped into the project area since the area was last dredged.

CAD cell(s) are proposed inside the Harbor but outside the channel limits. Although there is mention in historical records of several shipwrecks in Bridgeport Harbor, there are no known resources within the proposed activity areas. However, the Pequot Tribal Historic Preservation Officer (THPO) would like a survey of the harbor area to ensure that archaeological resources important to the tribe are not impacted by the proposed project. As necessary, an archaeological survey would be included in an underwater remote sensing survey, as requested by the CT SHPO.

Morris Cove Borrow Pit is a previously disturbed area and there will be no impacts here. Placement of sand on Seaside Beach has occurred in the past and there would be no cultural resources impacted by placing sand on the beach.

The use of CLIS for disposal of suitable material will not have any effect on cultural resources since it is a previously utilized disposal area for dredging activities.

H. AIR QUALITY

Ambient air quality is protected by Federal and State regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

The EPA designated all counties in Connecticut as moderate non-attainment areas for the 1997 8-hour ground level ozone standard, including Fairfield County where the project is located (U.S. Environmental Protection Agency webpage, as of September 2, 2008).

The EPA intends to designate New Haven and Fairfield Counties (Bridgeport) in Connecticut as nonattainment for the 24-hour $PM_{2.5}$ NAAQS as part of the New York City metropolitan nonattainment area. EPA's proposed nonattainment area for Connecticut is the same as that recommended by the State (EPA letter to CT Governor Rell). EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour $PM_{2.5}$

standard was revised from 65 micrograms per cubic meter (average of 98 percentile values for three consecutive years) to 35 micrograms per cubic meter. The level of the annual standard for $PM_{2.5}$ remained unchanged at 15 micrograms per cubic meter (average of annual averages for three consecutive years). EPA intends to make final designation decisions for the 2006 24-hour $PM_{2.5}$ standards by December 18, 2008.

VII. ENVIRONMENTAL CONSEQUENCES

A. DREDGE SITE

1. Turbidity

In the summer of 1977, the extent and duration of the impacts from dredging the Thames River/New London Harbor channels were studied (Bohlen, *et. al.*, 1979). Bohlen (1979), estimated that 1.5% to 3.0% of the volume of substrate (fine-grained sands and silts) contained in an open clamshell dredge bucket is introduced into the water column. The conclusions of this study defined the plume extending 700 meters downstream. Analysis of the composition and concentration of the plume indicated the majority of material suspended occurred within 300 meters of the dredge. Suspended material concentrations closest to the dredge ranged from 200 mg/l to 400 mg/l.

However, a number of operational variables, such as bucket size and type (open or enclosed), prohibiting scow overflow, volume of sediment dredged per cycle, operator experience, hoisting speed, and hydrodynamic conditions in the dredging area can significantly affect the quantity of material suspended (LaSalle, 1988; Lunz *et al*., 1984). Sediment resuspension from clamshell dredges can be reduced by using an enclosed clamshell bucket or by slowing the raising or lowering of the bucket through the water column. The latter reduces the production rate of the dredge (Hayes, 1986).

An enclosed bucket was used to dredge the material unsuitable for open water disposal (silt) during the Boston Harbor navigation improvement project. Results from this dredging operation showed that the plume was confined to the navigation channel and returned to background levels between 600 and 1,000 feet downstream (Corps, 2002).

Monitoring of dredge induced suspended sediment concentrations was conducted at New Haven Harbor to address concerns relative to winter flounder spawning grounds near the Federal channel (Corps, 1996). Dredging at New Haven Harbor was conducted with an enclosed bucket. The two major objectives of the New Haven monitoring were to 1) establish the background suspended solids concentration before and after dredging, and 2) document the movement of the dredge plume relative to fisheries resource areas such as winter flounder spawning grounds.

The results of the acoustic survey revealed that the dredge-induced sediment plume did protrude into the shoal areas to the east and west of the navigation channel. These excursions onto the shoals only occurred when the dredge was in the immediate vicinity. The DAISY (Disposal Area In-Situ System), which was deployed on the eastern end of the winter flounder spawning area, also showed elevated suspended materials concentrations attributable to the dredge operating in the upper reaches of the harbor. The time series of the DAISY data showed numerous aperiodic short duration spikes of 100 mg/L. The observed concentrations were an order of magnitude higher than the preceding background concentrations. However, in the last half of the deployment, while the dredge was located well south of the DAISY site, there were several long duration (1-3 days), and very high perturbations. During these events concentrations reached 700 mg/L that could not be related to the dredging operation. Evidence from the meteorological data and wastewater effluent records indicate that these events are likely the result of winds and wind-generated waves, alone or in combination with discharges from wastewater treatment plant outfalls.

All the material dredged, monitored, and discussed above is composed primarily of silt and from larger harbors. Based on these findings, dredged induced sediment resuspension is a minor perturbation when compared to the much longer duration, larger amplitude events associated with wind, wind-waves, and effluent discharges from outfalls. The effects of dredge related spikes in suspended sediments on the winter flounder spawning grounds, and the regional water quality in general, appear limited in duration and of relatively low amplitude (Corps, 1996).

However, to reduce potential turbidity impacts on natural resources from dredging, a closed bucket will be used and no scow overflow allowed while the dredge is in the inner harbor (inside the breakwaters) dredging the silty unsuitable material.

2. <u>Chemical Impact</u>

No significant release of contaminants is expected as the material generally contains low to moderate levels of contaminants and the amount of material expected to be released during dredging is low, especially with the use of an enclosed bucket in the inner harbor. See the Affected Environment Sediment Section above for details.

3. <u>Biological Impact</u>

Sessile benthic organisms inhabiting the shoal areas to be dredged would be destroyed by the dredging. The type of benthic community inhabiting within Bridgeport Harbor indicates that Bridgeport Harbor is a stressed urban area. Unaffected organisms inhabiting the substrate outside of the dredged areas, however, should recolonize the disturbed areas. The loss of forage for predators such as crabs and finfish would be temporary due to recolonization of the benthic organisms.

Dredging the access channel to the Morris Cove borrow pit would occur in the fall to avoid the seeding and harvesting of oyster shell activities in Morris Cove.

Impacts to winter flounder and anadromous fish runs would be minimized by prohibiting dredging in areas north of Tongue Point in the inner harbor during the months of February, March and April.

B. DISPOSAL SITES

1. Turbidity

Dredged material will be released from a scow or barge. The material will pass through several stages as it travels to the sea bottom. Several factors influence the behavior of the descending plume, including the properties of the sediment (e.g. silt, sand, clumps, etc.), water depth, water column stratification, and the interplay of the descending sediment with the water through which it passes. In general, the behavior of the plume can be described as occurring in three phases: convective descent, dynamic collapse, and passive diffusion.

Effects of turbidity at the SE CAD Cell and Morris Cove borrow pit disposal sites may be less than those occurring at the dredge site. There will be an increase of suspended solids in the water column due to the mixing of unconsolidated sediments. Turbidity will decrease as the fine particles settle out, and would be localized at the disposal site. Turbidity studies performed at the CAD cells in Boston Harbor showed that the turbidity plumes were not significant 300 feet downstream on an ebb tide one hour after disposal (Corps, 2002). Dredged material from Boston Harbor and Bridgeport Harbor contain similar silty material. Turbidity may stay confined to the areas of the Bridgeport Harbor project CAD cells due to the more sheltered locations.

Turbidity measurements at CLIS (Gordon, 1974) showed that when 2,000 cubic meters of dredged material were discharged in waters 20 meters deep, the density surge carried less than 18 percent of the material outside a circle of a 30 meter radius, and essentially none beyond about 120 meters. The residual turbidity in the water column, which drifts with the tidal stream, contained less than one percent of the material discharged (Corps, 1979). Monitoring studies performed during disposal operations at CLIS of suspended solids indicated that approximately one percent of the sediments remained suspended in the water column after disposal of clamshell dredged silty material (Corps, 1985), meaning that almost all of the dredged material travels and settles to the seafloor.

2. Chemical Impact

Testing of the dredged material under the MPRSA has determined that the material is suitable for ocean disposal, even if some contaminants may be released during descent of the dredged material. Biological resources are not expected to have a significant uptake of contaminants as the unsuitable material will be capped with suitable material.

3. <u>Biological Impact</u>

The disposal activity would result in a deposit of material on top of organisms at the disposal site. The mechanical method of dredging would maintain the cohesive nature of the dredged material. Recolonization of the disposal site by adjacent populations should occur soon after disposal operations are completed. The benthic productivity of adjacent areas could provide similar habitat and forage for harbor survivors without overcrowding or over-exploiting the resident food supplies (Corps, 1985). Sediment-profile imaging surveys were performed at CLIS in 2001 of recently formed disposal mounds and historic mounds. The sediment-profile images were used to examine the benthic recolonization status and habitat conditions over individual disposal mounds relative to three CLIS reference areas and to results of previous monitoring efforts. The recently formed mounds showed rapid colonization by benthic organisms, indicative of an undisturbed benthic habitat and suggesting habitat recovery was progressing more rapidly than anticipated (SAIC, 2003). Except for one station, the historic mounds also showed benthic improvement (SAIC, 2003).

Mobile forms not directly buried by the disposed sediment would be expected to avoid the immediate disposal area. Any temporary increases in suspended solids during disposal operations would not have appreciable adverse effects on finfish. To avoid potential turbidity impacts from disposal activities in Morris Cove, disposal will not occur during the months of February and March.

Beneficial biological impacts can accrue from the filling the hole at Morris Cove by eliminating anoxic conditions. The filling of the hole and capping the material with sandy material will provide additional habitat for benthic organisms such as polychaete worms, shellfish, and fish.

C. ESSENTIAL FISH HABITAT

Of the managed species listed for Bridgeport Harbor, Morris Cove and CLIS, only the following species and their life stages are expected to be in the project area due to the depths, salinity, or substrate type. They are: red hake *Urophycis chuss* (eggs, larvae, juveniles, adults), winter flounder *Pseudopleuronectes americanus* (eggs, larvae, juveniles, adults), windowpane flounder *Scophthalmus aquosus* (eggs, larvae, juveniles, adults), bluefish *Pomatomus saltatrix* (juveniles, adults), Atlantic mackerel *Scomber scombrus* (eggs, larvae, juveniles, adults), summer flounder *Paralicthys dentatus* (juveniles), scup *Stenotomus chrysops* (eggs, larvae, juveniles, adults), black sea bass *Centropristus striata* (juveniles), Spanish mackerel *Scomberomorus maculatus* (juveniles), and sand tiger shark *Odontaspis taurus* (larvae).

There is negligible (little) potential for adverse effects, including cumulative effects, of the proposed action on Essential Fish Habitat for any of the managed species in the area as the project area is not optimal EFH for the majority of the above species due to unsuitable depth, temperature, salinity, or substrate. While there are both juvenile and adult fish species that might use the waters in the study area, these fish are mobile and would avoid areas of construction. If present, most of these species would only use the study area during the spring and summer, following warmer waters offshore in the winter. Eggs and larvae of windowpane flounder, scup and the larvae of winter flounder are planktonic (i.e. float in the water column) and would likely be unaffected by construction, as planktonic prey species.

The species and life stage that may be affected by the project is spawning winter flounder populations. Some winter flounder eggs were found in Bridgeport Harbor and also found in Morris Cove (Pereira, 1999). To avoid these impacts, based on discussions with the resource agencies, no dredging in the Main Ship Channel would occur between Tongue Point and the Stratford Avenue Bridge in Bridgeport Harbor from February 1 through May 31 in order to avoid potential impacts to spawning winter flounder. The top layer of the footprint of the proposed Bridgeport CAD cell needs to be excavated prior to start of winter flounder spawning season (February 1). Removing the silty layer of the CAD cell prior to the spawning season will allow dredging of the parent material being excavated to create the CAD cell by minimizing impact to winter flounder.

D. THREATENED AND ENDANGERED SPECIES

This project is anticipated to have no significant impact on any Federally listed threatened or endangered species. The coordination letter from NMFS regarding threatened and endangered species and email from the U.S. Fish and Wildlife Service is contained in Appendix A.

E. HISTORIC AND ARCHAEOLOGICAL RESOURCES

The Bridgeport Harbor Maintenance Dredging Project is anticipated to have no effect upon any significant site or structure of historic, archaeological, or architectural significance as defined by the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR 800.

The dredged material disposal plan proposed in this report was coordinated with the Connecticut SHPO and the Mashantucket Pequot and Mohegan THPO by letters dated November 19, 2008 and as part of the EA public review process. Maintenance dredging will be confined to previously disturbed areas and impacts to significant resources are not expected. However, to address concerns raised by the CT SHPO, an archaeological remote sensing survey will be conducted near the Strafford Avenue Bridge to investigate the reported presence of the historic canal boats submerged immediately south of the Bridge. Also, to address concerns raised by the Mashantucket Pequot Tribal Historic Preservation Office, a remote sensing survey will be conducted in previously undisturbed areas of the CAD cell to confirm that cultural resources do not exist in the Bridgeport Harbor CAD cell area. The results of this archaeological investigation will be coordinated with the THPO and CT SHPO prior to the start of construction.

F. ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. Executive Order 13045, "Protection of Children From Environmental Health Risks and Safety Risks," requires Federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children.

The following information was obtained from the American Community Survey 3-year Estimate located on the U.S. Census Bureau website. In 2006, Bridgeport had a total population of 136,000; of this population 70,000 (51 percent) were females and 66,000 (49 percent) were males. The median age was 33.1 years. Twenty-six percent of the population was under 18 years and twelve percent was 65 years and older, compared to the national average age below 18 years of 24.6% and 12.4% 65 years and older.

For people reporting one race alone in Bridgeport, 50 percent were White; 34 percent were Black or African American; less than 0.5 percent was American Indian and Alaska native; three percent was Asian; less than 0.5 percent was native Hawaiian and other Pacific Islander, and 13 percent was some other race. Two percent reported two or more races. Thirty-five percent of the people in Bridgeport city were Hispanic. Twenty-seven percent of the people in Bridgeport were White non-Hispanic. People of Hispanic origin may be of any race. This compares to the U.S. average of 74% of the population reporting to be White and 12.4% reporting Black or African-American, and 5.2% American Indian, Alaska Native, or Asian

In 2006, 21 percent of people were in poverty. Thirty percent of related children under 18 were below the poverty level, compared with 11 percent of people 65 years old and over. Eighteen percent of all families and 29 percent of families with a female householder and no husband present had incomes below the poverty level. This compares to the U.S. average poverty rate of 13.3%.

In 2000, East Haven had a total population of 28,189; 13,000 (48 percent) were males and 15,000 (52 percent) were females. The medial age was 38.8. Twenty-two percent of the population was under 18 years and seventeen percent was 65 years and older.

For people reporting one race alone, 94% was White and 1.4% was Black or African-American; two percent were American Indian, Alaska Native, or Asian. One and one-half percent were some other race and 1.1 percent was two or more races. Over four percent were of Hispanic origin. This compares to the 2000 U.S. average of 75% White and 12% Black or

African-American, and 4.5% American Indian, Alaska Native, or Asian.

In 2000, 5.2% of individuals were in poverty, compared to the U.S. average of 12.4%.

No significant adverse impacts to children, minority, or low income populations are anticipated as a result of this project. Although the poverty rate is higher than the national average in Bridgeport, the project is not expected to cause any disproportionately high or adverse human health or environmental effects to minorities or children, or for that matter, any population in the project area. Environmental impacts are expected to be minor and temporary. Maintaining the current authorized depth in Bridgeport Harbor, and filling the borrow pit in Morris Cove, is expected to have a positive social and economic benefit, and environmental benefit, respectively.

G. AIR QUALITY

1. Air Quality Statement Of Conformity

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA State Implementation Plans for geographic areas designated as non-attainment and maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) is found at 40 CFR Part 93. Also, Section 309 of CAA, authorizes EPA to review certain proposed actions of other Federal agencies in accordance with the National Environmental Policy Act (NEPA).

Clean Air Act compliance, specifically with EPA's General Conformity Rule, requires that all Federal agencies, including Department of the Army, to review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SIP attainment schedule of the NAAQS, or otherwise contradict the State's SIP.

The State of Connecticut is authorized by the EPA to administer its own air emissions permit program, which is shaped by its State Implementation Plan (SIP). The SIP sets the basic strategies for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS). The SIP is the Federally enforceable plan that identifies how that state will attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) established by the EPA (U.S. Environmental Protection Agency, 2004). In Connecticut, Federal actions must conform to the Connecticut SIP or Federal implementation plan. For non-exempt activities, the Corps must evaluate and determine if the proposed action (construction and operation) will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone. When the total direct and indirect emissions caused by the operation of the Federal action/facility are less than threshold levels established in the rule (40 C.F.R. § 93.153), a Record of Non-applicability (RONA) is prepared and signed by the facility environmental coordinator.

2. General Conformity

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. However, this maintenance dredging project is exempt from performing a conformity review based on 40 CFR 93.153(c)(2) "*The following actions which would result in no emissions increase or an increase in emissions that is clearly de minimis: (ix) Maintenance dredging and debris disposal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site.*"

H. CUMULATIVE IMPACTS

Cumulative impacts are those resulting from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Past and current activities in Bridgeport Harbor include maintenance dredging of the Federal channel and anchorage area, maintenance of the breakwaters, and boat traffic through the channel. Reasonably foreseeable future actions include the continuation of current maintenance and navigation traffic activities. The effects of these previous, existing and future actions are generally limited to infrequent disturbances of the benthic communities in the dredged areas and disposal areas. None or minimal impacts to winter flounder eggs or young of year are expected from this dredging event given the time of year restrictions for construction. Water quality, air quality, hydrology, and other biological resources are generally not significantly affected by these actions. The direct effects of this project are not anticipated to add to impacts from other actions in the area. Therefore, no adverse cumulative impacts are projected as a result of this project.

Potential groundings and spills could occur if no maintenance dredging occurs for many years. This could increase the possibility for environmental impacts or increased hardship for people dependent on a viable and safe navigation channel. The unsuitable silty material removed during maintenance dredging of Bridgeport Harbor, disposed into a CAD cell and then capped with clean sandy material would assist in reducing the exposure of contaminated material to biological resources. Also filling the borrow pit in Morris Cove would reduce anoxic conditions that reduce biological productivity in the hole.

VIII. MEASURES TAKEN TO MINIMIZE ENVIRONMENTAL IMPACTS

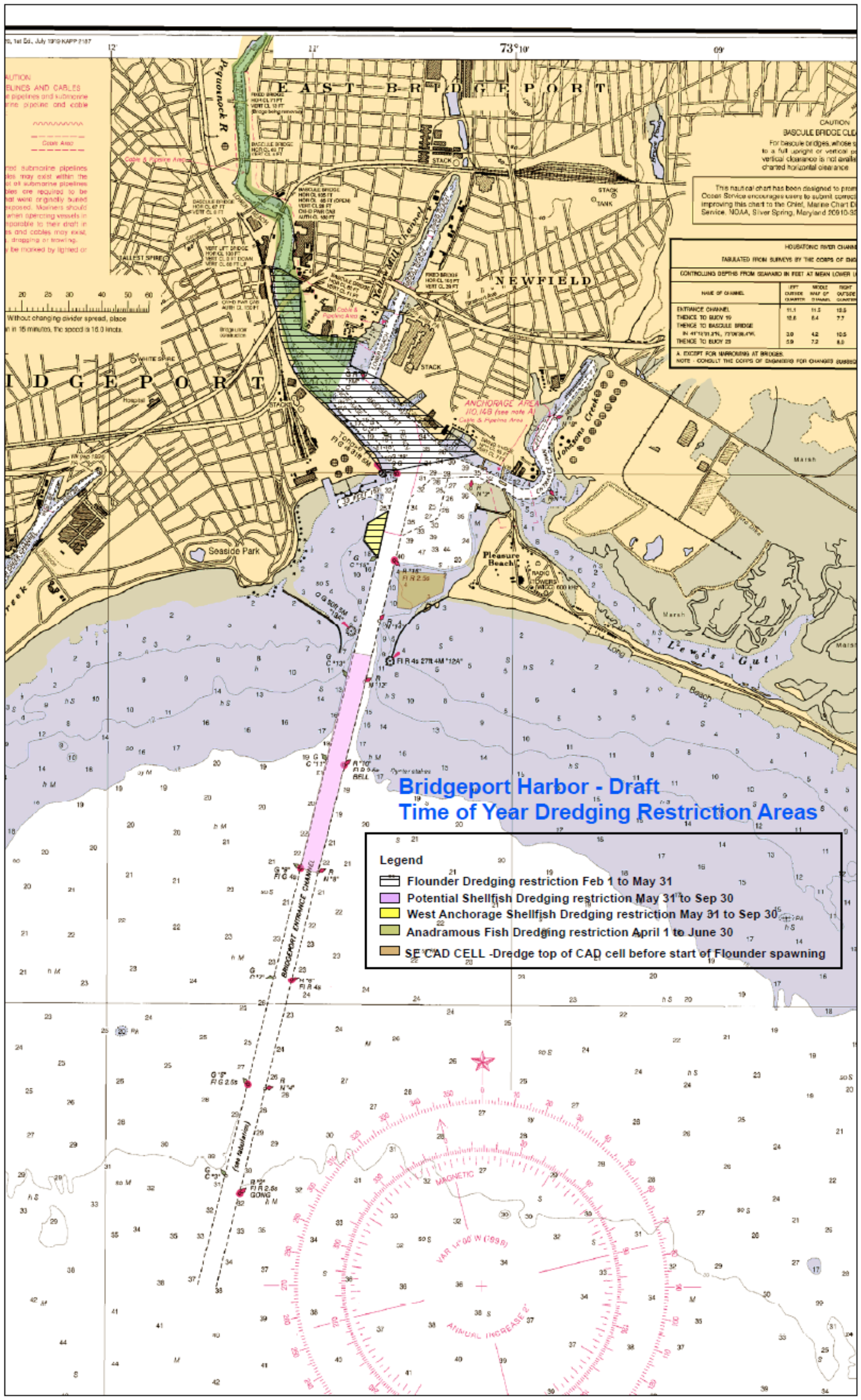
The following actions will be taken in order to minimize potential adverse impacts associated with this project.

1). Construction will be sequenced and dredging windows imposed to minimize potential impacts to natural resources. Construction would start with the deepening of an access channel to Morris Cove borrow pit. In order to minimize impacts to leased shellfish beds in Morris Cove, dredging of this channel will not occur from May 31 to September 30. No dredging in the Main Ship Channel would occur between Tongue Point and the Stratford Avenue Bridge in Bridgeport Harbor from February 1 through May 31 in order to avoid potential impacts to spawning winter flounder. In addition, the portions of the Main Ship Channel above the confluence with Yellow Mill Creek would be restricted from dredging operations from April 1 to June 30 due to anadromous fish runs. The top layer of the footprint of the proposed Bridgeport CAD cell needs to be excavated prior to start of winter flounder spawning season (February 1). The top layer is comprised of silty material which could temporarily suspended and cause turbidity in the water column. Removing the silty layer of the CAD cell prior to the spawning season will allow dredging of the parent material being excavated to create the CAD cell without any time of year restriction. This is because the parent material is comprised of a sandy gravelly mix which is unlikely to cause turbidity. Sequencing CAD cell excavation as identified above will minimize impact to winter flounder. Dredging activities in the entrance channel between Buoy No. 9 and the breakwaters may be restricted from May 31 to September 30 to minimize potential impacts to shellfish beds nearby. Further review is underway to determine if this restriction is necessary. If an alternative CAD cell is constructed west of the Main Ship Channel, dredging may not occur there from May 31 to September 30 to protect nearby shellfish resources.

2). A closed mechanical bucket will be used to minimize the turbidity from dredging the unsuitable material in the inner harbor, including the top of the CAD cell (s), In addition, no overflow from the scows will be allowed during the dredging of the unsuitable material.

3). The unsuitable material placed in the CAD cell(s) and Morris Cove borrow pit will be capped with suitable material of sufficient depth to isolate contaminants from the surrounding environment.

4). The navigation channel to the Morris Cove Borrow pit will be filled in once access to the Morris Cove pit is no longer required. The request to fill in the channel was made by shellfish interests who indicated filling in the channel will result in a better habitat for shellfish, particularly oysters. Dredged material from the outer harbor dredging will be used to fill in the channel after the capping of the Morris Cove borrow pit.



EAST BRIDGEPORT
NEWFIELD
Seaside Park
Pleasure Beach
Bridgeport Harbor - Draft
Time of Year Dredging Restriction Areas
Legend
Flounder Dredging restriction Feb 1 to May 31
Potential Shellfish Dredging restriction May 31 to Sep 30
West Anchorage Shellfish Dredging restriction May 31 to Sep 30
Anadramous Fish Dredging restriction April 1 to June 30
SE CAD CELL -Dredge top of CAD cell before start of Flounder spawning

Figure 10

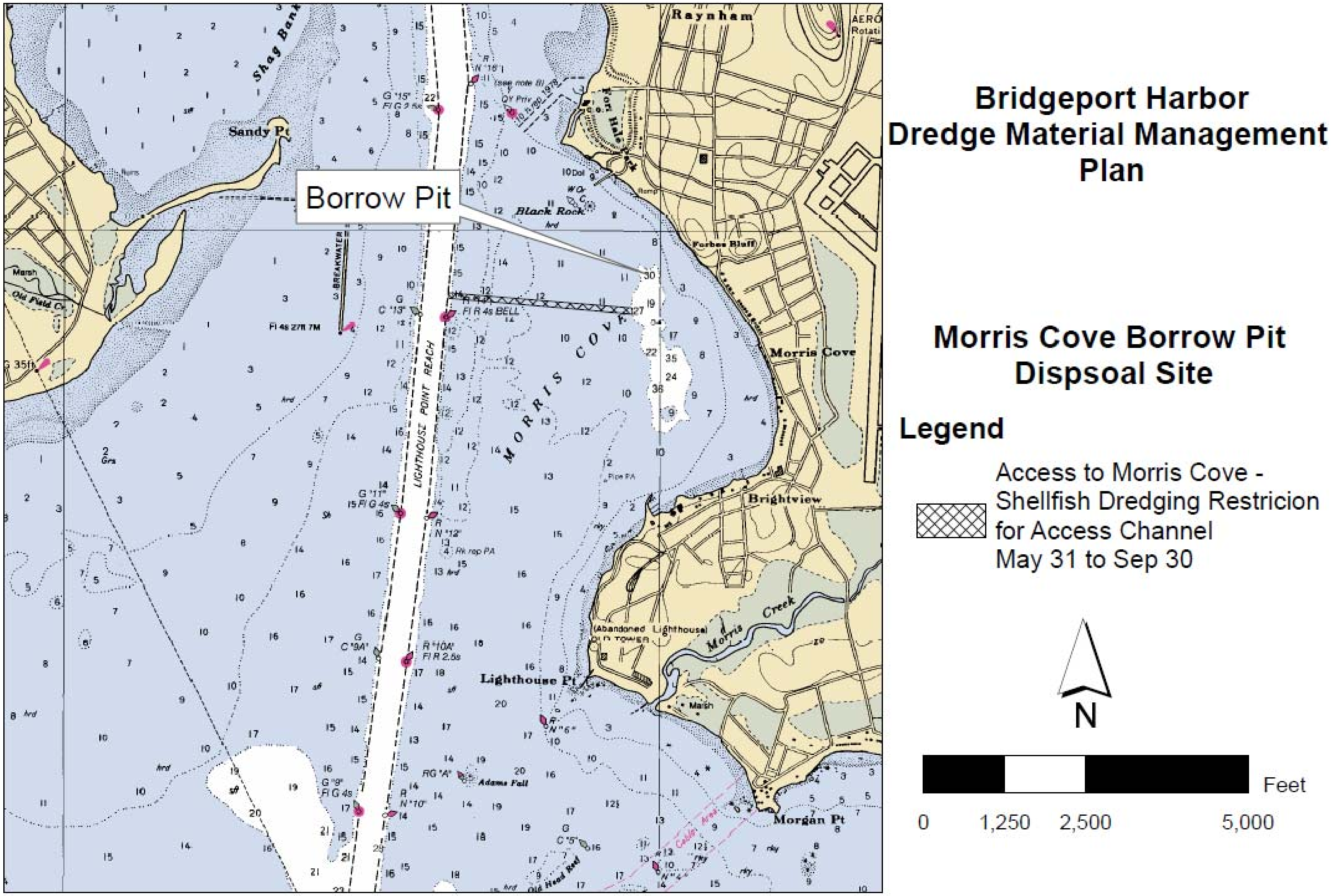

Bridgeport Harbor
Dredge Material Management Plan
Morris Cove Borrow Pit Dispsoal Site
Legend
Access to Morris Cove - Shellfish Dredging Restricion for Access Channel May 31 to Sep 30
N
Feet
0
1,250
2,500
5,000
Borrow Pit
Raynham
Shag Bank
Sandy Pt
Black Rock
Forbes Bluff
MORRIS COVE
Morris Cove
Brightview
LIGHTHOUSE POINT REACH
Lighthouse Pt
Morris Creek
Morgan Pt
Adams Fall

Figure 11

IX. COORDINATION

Coordination has been conducted with the appropriate state and Federal agencies. A public notice was released on February X, 2010. Copies of the public notice and coordination letters received are contained in Appendix A. Coordination has occurred with the following agencies:

US Environmental Protection Agency
US Fish and Wildlife Service
National Marine Fisheries Services
Connecticut Department of Agriculture, Aquaculture Bureau
Connecticut Department of Environmental Protection
Office of Long Island Sound
State Historic Preservation Commission

X. REFERENCES

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XI. COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Federal Statutes:

1. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review have been incorporated into this report. A State Water Quality Certification pursuant to Section 401 of the Clean Water Act will be obtained for this project.

2. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq.

Compliance: This project has been evaluated under Section 103 of the MPRSA and is in compliance.

3. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: The project is being coordinated with the State Historic Preservation Office and Tribal Historic Preservation Offices to determine whether historic or archaeological resources would be affected by the proposed project. No impacts to historic or archaeological sites are expected, however, additional archaeological investigations will be required based on consultation with the SHPO and THPO.

4. Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq. This amends the Reservoir Salvage Act of 1960 (16 U.S.C. 469).

Compliance: Not applicable. Project will most likely not require mitigation of historic or archaeological resources.

5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) signifies compliance with Section 7 of the Endangered Species Act. No impacts to threatened or endangered species under the jurisdiction of the USFWS or NMFS are expected.

6. The Estuary Protection Act (16 U.S.C. 1221)

Compliance: Not applicable, as this report is not being submitted to Congress.

7. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the USFWS, NMFS, and the Connecticut Department of Environmental Protection signifies compliance with the Fish and Wildlife Coordination Act.

8. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

Compliance: Preparation of this report signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

9. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Compliance: Not applicable.

10. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.

Compliance: A CZM consistency determination will be provided to the State to determine consistent, to the maximum extent practicable, with the approved State CZM program.

11. Clean Air Act, as amended U.S.C. 7401 et seq.

Compliance: Public notice of the availability of this report to the Regional Administrator of the Environmental Protection Agency for review pursuant to Sections 176c and 309 of the Clean Air Act signifies compliance.

12. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Not applicable.

13. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-1.

Compliance: Public notice of the availability of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

14. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for Corps of Engineers projects or programs authorized by Congress. The proposed maintenance dredging is included under the continuing authority of the Rivers and Harbors Act.

15. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Compliance: Not applicable.

16. Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.

Compliance: An Essential Fish Habitat Assessment will be provided to the National Marine Fisheries Service for recommendations.

17. Archaeological Resources Protection Act of 1979, as amended, 16 USC 470 et seq.

Compliance: Issuance of a permit from the Federal land manager to excavate or remove archaeological resources located on public or Indian lands signifies compliance. Not applicable to this project.

18. American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Compliance: Must ensure access by native Americans to sacred sites, possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. Not applicable to this project.

19. Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3000-3013, 18 U.S.C. 1170

Compliance: Regulations implementing NAGPRA will be followed if discovery of human remains and/or funerary items occur during implementation of this project.

Executive Orders:

1. Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971, (36 FR 8921, May 15, 1971).

Compliance: This order has been incorporated into the National Historic Preservation Act of 1980.

2. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Not applicable.

3. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: Not applicable.

4. Executive Order 12372, Intergovernmental Review of Federal Programs, July 14, 1982, (47 FR 3959, July 16, 1982).

Compliance: Not applicable.

5. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable to projects located within the United States.

6. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Not applicable. Project is not expected to have a disproportionate impact on any minority or low income populations in the project area.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, 21 April 1997.

Compliance: Not applicable. The project is not expected to have a disproportionate environmental health or safety risk for children.

8. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000.

Compliance: Consultation with Indian Tribal Governments, where applicable, and consistent with executive memoranda, DoD Indian policy, and U. S. Army Corps of Engineers Tribal Policy Principles signifies compliance.

<u>Executive Memorandum</u>

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable; the project does not involve or impact agricultural lands.

2. White House Memorandum, Government-to-Government Relations with Indian Tribes, 29 April 1994.

Compliance: Consultation with Federally Recognized Indian Tribes, where appropriate, signifies compliance.

APPENDIX A

COORDINATION

Connecticut Commission on Culture & Tourism

Historic Preservation and Museum Division

One Constitution Plaza
Second Floor
Hartford, Connecticut
06103

860.256.2800
860.256.2763 (f)

December 18, 2008

Mr. John R. Kennelly
Engineering/Planning Division
US Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Subject: Bridgeport Harbor Federal Navigation Channels
Bridgeport, CT

Dear Mr. Kennelly:

The State Historic Preservation Office has reviewed the draft *Dredged Material Management Plan* prepared by the New England Division regarding the above-named project. This office notes that the *Elmer D. Dailey*, *Priscilla Dailey* and *Berkshire No. 7*, historic canal boats which are listed on the National Register of Historic Places, are submerged immediately south of the Stratford Avenue Bridge. Therefore, we recommend that a professional reconnaissance survey be undertaken to identify the precise location of these significant maritime vessels with regards to the Stratford Avenue navigation channel. All archaeological studies must be undertaken in accordance with our *Environmental Review Primer for Connecticut's Archaeological Resources.*

No project-related activities should be initiated until this office has had an opportunity to review and comment upon the recommended archaeological survey report.

We anticipate working with all interested parties in the expeditious furtherance of the proposed undertaking as well as in the professional management of Connecticut's maritime heritage.

For further information please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,

David Bahlman
Deputy State Historic Preservation Officer

cc: Dr. Nicholas Bellantoni/OSA
Ms. Kate Atwood/ACOE

12-8-08

Mr. John R. Kennelly,
Chief of Planning
Department of The Army
New England Dist., Corps of Engineers
696 Virginia Rd.
Concord, MA 01742-2751

Re: DRAFT DREDGED MATERIAL MANAGEMENT PLAN (DMMP) & ENVIRONMENTAL ASSESSMENT FOR DREDGING AND DISPOSAL OF MATERIAL FROM THE BRIDGEFPORT HARBOR FEDERAL NAVIGATION CHANNELS IN BRIDGEPORT, CT

Dear Mr. Kennelly,

After reviewing the information provided, we have no knowledge of properties of religious and cultural importance to the Mashantucket Pequot Tribe. However, we recommend a Phase I Archaeological Survey be conducted to identify previously unknown properties of cultural and religious importance.
We would appreciate a copy of any work performed on this project.

Sincerely,

Kathleen Knowles

Kathleen Knowles,
Tribal Historic Preservation Officer
Mashantucket Pequot Tribe

MASHANTUCKET PEQUOT MUSEUM & RESEARCH CENTER

110 Pequot Trail, PO Box 3180
Mashantucket, CT 06338
Phone: 860 396 6800
Fax: 860 396 6850
www.pequotmuseum.org

-----Original Message-----
From: Anthony_Tur@fws.gov [mailto:Anthony_Tur@fws.gov]
Sent: Thursday, October 02, 2008 10:50 AM
To: Rogers, Catherine J NAE
Cc: Susi_vonOettingen@fws.gov
Subject: Bridgeport Harbor DMMP

Catherine,

There are no known occurences of federally listed species in the project are. However, the Seaside Park Beach disposal option, as described, will create suitable habitat conditions for the federally-threatened piping plover (Charadrius melodus). The creation of new habitats for this species may be beneficial, provide the General Piping Plover Dredge Disposal Conditions to Avoid Adversely Affecting Piping Plovers . If implemented, then the project is not likely to adversely affect the piping plover. If the management guidelines can not be implemented, then the project is likely to result in adverse affects to the plover and further consultation with this office is required.

2008 General Piping Plover Dredge Disposal Conditions to Avoid Adversely Affecting Piping Plovers

1. Any suitable piping plover habitat created by work performed under this authorization shall be managed in accordance with the U.S. Fish and Wildlife Service (U.S. FWS), Northeast Region, April 15, 1994 document titled, Guidelines for Managing Recreational Activities in Piping Plover Breeding Habitat on the U.S. Atlantic Coast to Avoid Take Under Section 9 of the Endangered Species Act ("Guidelines") for managing recreational beaches when federally listed piping plovers are present. See (http://www.fws.gov/northeast/newenglandfieldoffice/pdfs/Beach_management_guidelines.pdf).

2. Before work takes place, assurance of plover management must be provided to the U.S. FWS through a management plan implemented by the permittee or a signed management agreement between the permittee and a qualified entity. The U.S. FWS must approve the management plan. Permittees must contact Susi von Oettingen, U.S. FWS at (603) 223-2541, x22 or susi_vonOettingen@fws.gov for information on preparing a management agreement and its approval.

3. Beach nourishment in existing plover habitat should maintain a 10:1 slope and have no vegetation plantings.

4. Each year, before dredged material is placed in any site authorized under this permit a qualified piping plover monitor1 shall determine whether suitable piping plover nesting habitat exists at that site. If such habitat is present, it shall be posted with warning signs and/or

"symbolic fencing"2 before April 1 of each year and managed according to the Guidelines. (A qualified piping plover monitor is a person who has the skills, knowledge, and ability to conduct monitoring.)
(2"Symbolic fencing" refers to two strands of light-weight string, tied between posts to delineate at least a 50 meter radius around nests areas where pedestrians and vehicles should not enter.)

5. Each year, a qualified monitor shall determine whether suitable piping plover nesting habitat exists at disposal sites that have received dredged material under this authorization. If such habitat is present, it shall be posted with warning signs and/or "symbolic fencing" by April 1 of each year and managed according to Guidelines referenced above.

6. On suitable piping plover nesting habitat, all construction activities are prohibited during the period March 30 to September 1 of each year, unless the U.S. FWS [Supervisor, New England Field Office, U.S. FWS, 70 Commercial Street, Suite 300, Concord, NH 03301, (603) 223-2541] is notified two weeks prior and:

a. A qualified monitor is in place by April 1 to document location and activities of breeding plovers and to observe disposal activities relative to plover activities during the disposal period. In any calendar year pre-activity surveys shall begin one week prior to April 1 or one week prior to the commencement of any on-site project activity, whichever occurs first.
On at least four non-consecutive days the piping plover monitor shall survey the project area (including landing, staging, operation, sand-transport and beach nourishment areas) for the occurrence of territorial, courting or nesting piping plovers. Each day's monitoring shall consist of two separate surveys conducted during different times of the tidal cycle;

b. Dredge/disposal activities are located 100 meters or more from piping plover territories and/or nests;

c. Plovers are monitored continuously during project activities and, if it is determined that piping plovers are disturbed by the activity, (1) all work ceases immediately and (2) the U.S. FWS is notified immediately at (603) 223-2541 for further consultation. Piping plover monitoring field notes shall be provided to the U.S. FWS upon request. Piping plover monitoring is the process of observing and recording data on piping plover breeding activities without causing disturbance to the birds under observation.
Monitoring includes, but is not limited to, detecting and recording locations of territorial and courting adults, locating nests and incubating adults, locating broods, interpreting piping plover behaviors, and documenting observations in legible, complete field notes. Except to determine the number of eggs in a newly discovered

nest, monitoring is done using binoculars or spotting scopes from a distance of at least 50 meters;

d. If a crushed nest or a dead piping plover chick or adult is found,
the permittee immediately contacts the Division of Law Enforcement, U.S. FWS, Office of Law Enforcement, 70 Everett Avenue, Suite 315, Chelsea, MA 02150;
(617) 889-6616.

Thanks For Coordinating. In the future, please send your requests to us via the USPS.

Tony

Anthony Tur
Endangered Species Biologist
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301

Phone (603) 223-2541 x.24
Anthony_Tur@fws.gov

http://www.fws.gov/northeast/newenglandfieldoffice/

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JUL - 9 2008

Ms. Catherine Rogers
US Army Corps of Engineers
New England District
Engineering/Planning Division
Evaluation Branch
696 Virginia Road
Concord, MA 01742-2751

Re: Request for Information regarding fishery resources and endangered species within Bridgeport Harbor; Bridgeport Harbor Proposed Dredge Material Disposal Sites

Dear Ms. Rogers:

This letter is in response to your letter dated May 19, 2008 requesting information regarding the presence and distribution of Essential Fish Habitat (EFH), fishery resources, and protected resources within Bridgeport Harbor and Morris Cove, New Haven. Specifically, this request is in reference to the Bridgeport Harbor Proposed Dredge Material Disposal Sites. The Army Corps of Engineers (ACOE) has identified two potential locations within Bridgeport Harbor for the construction of a confined aquatic disposal (CAD) cell to dispose of material excavated from the Bridgeport Harbor federal navigation channel. Another potential site for dredge material disposal includes Morris Cove, New Haven. The National Marine Fisheries Service (NOAA Fisheries Service) provides the following information in an attempt to identify and address potential adverse impacts on NOAA trust resources within the project area.

Essential Fish Habitat

EFH has been designated for a number of federally managed species within the proposed work area of Bridgeport Harbor and Morris Cove. A complete list of species and life stages that have been designated for the proposed project location can be found on the NOAA Fisheries Service Habitat Conservation Division website at http://www.nero.noaa.gov/ro/doc/webintro.html

Among those species listed, particular attention should be focused on winter flounder (*Pseudopleuronectes americanus*) habitat that may be adversely affected by this project. Adult winter flounder utilize these areas for spawning and feeding, while eggs, larvae, and juveniles use the area for early life stage development. Suspended sediment deposition resulting from the proposed project can adversely affect winter flounder eggs and juvenile development. There is evidence that winter flounder spawn in waters surrounding Bridgeport and New Haven (Pereira et al. 1992; Nelson et al. 1991). Other federally managed species that have been identified within the project footprint should be evaluated for adverse effects resulting from the proposed project.

An existing borrow pit located within Morris Cove is also being proposed as a site for dredge material disposal. Water quality studies were conducted in Morris Cove by NOAA Fisheries Service staff from the Milford Laboratory in the summer of 2002. Data loggers measuring temperature, salinity, and dissolved oxygen were placed inside the dredged hole and immediately outside the hole. The data collected in August of 2002 show the conditions within the hole were anoxic, and dissolved oxygen levels were significantly higher immediately outside of this dredged area. This data suggest there could be benefits to marine resources by filling in this hole to grade so this area can function in a capacity similar to the surrounding fish habitat within Morris Cove.

EFH Assessment

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife Coordination Act require federal agencies to consult with one another on projects such as this. Insofar as a project involves EFH, as this project does, this process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure.

The required contents of an EFH assessment include: 1) a description of the action; 2) an analysis of the potential adverse effects of the action on EFH and the managed species; 3) the ACOE's conclusions regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable. Other information that should be contained in the EFH assessment, if appropriate, includes: 1) the results of on-site inspections to evaluate the habitat and site-specific effects; 2) the views of recognized experts on the habitat or the species that may be affected; 3) a review of pertinent literature and related information; and 4) an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH. Upon submittal of an EFH assessment, NOAA Fisheries Service will provide conservation recommendations for the proposed project, as necessary.

Fish and Wildlife Coordination Act

The substrate found within the project area also serves as habitat for benthic organisms, such as shellfish and other invertebrates living within and on the surface of the sediment. These organisms contribute to the productivity of the federally managed species by acting as a food source for both juvenile and adult life stages of finfish. Shellfish resources of concern within the project area include eastern oysters (*Crassostrea virginica).* According to Connecticut Department of Environmental Protection's (CTDEP) Bureau of Aquaculture, a valuable oyster bed is located inside Bridgeport Harbor, immediately west of the entrance channel, at the precise location of the proposed West CAD. Significant adverse impacts on shellfish resources would result from CAD cell construction in this location through direct impact (i.e., dredge) and by elevated levels of suspended sediment that can interfere with spawning success and feeding.

Connecticut state leased shellfish areas are located within Morris Cove and Bridgeport Harbor. Additional coordination with the CTDEP Bureau of Aquaculture should occur prior to the selection of any disposal areas. Pursuant to the Fish and Wildlife Coordination Act, recommendations will be provided in order to avoid and minimize adverse effects to the above referenced NOAA trust resources, as appropriate.

Endangered Species Act

No species listed by NOAA Fisheries Service under the Endangered Species Act (ESA) of 1973, as amended, are known to occur in the Bridgeport Harbor or Morris Cove proposed project areas. As such, no consultation pursuant to Section 7 of the ESA is necessary for the proposed project. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law, and: (a) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) if a new species is listed or critical habitat designated that may be affected by the identified action. Should you have any questions regarding Section 7 consultation, please contact Julie Crocker in NOAA Fisheries Service's Protected Resources Division at (978)281-9300 x6530.

We appreciate the opportunity to provide these preliminary comments, and we look forward to receiving your EFH assessment for the proposed project. If you have questions regarding these comments, please contact Sue Tuxbury at 203-882-6544.

Sincerely,

Louis A. Chiarella

Louis A. Chiarella
New England Field Office Supervisor
for Habitat Conservation

cc: PRD – M. Colligan, J. Crocker
USEPA – M. Marsh
CTDEP – D. Carey
CTDEP – M. Johnson

References

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Pereira, J., Ziskowski, J., Mercaldo-Allen, R., Kuropat, C., Luedke, D., and Gould, E. 1992. Vitellogenin in winter flounder (*Pleuronectes americanus*) from Long Island Sound and Boston Harbor. *Estuaries* 15(3):289-297.

Suitability Determination Memorandums

U. S. Army Corps of Engineers
New England District

EPA
Region 1, New England

CENAE-R-PT
SUBJECT: Review of Compliance with the Testing Requirements of 40 C.F.R 227.6 and 227.27 for the Bridgeport Harbor Federal Navigation Project, Bridgeport, CT for Disposal into Long Island Sound.

MEMO FOR THE RECORD (INTERAGENCY) June 28, 2002

SUBJECT: Review of Compliance with the Testing Requirements of 40 C.F.R 227.6 and 227.27 for the Bridgeport Harbor Federal Navigation Dredging Project, Bridgeport,CT, Application# 200100850, for Disposal into Waters of Long Island Sound.

1. REFERENCES:

See attachment for references.

2. SUMMARY:

This memorandum for the Bridgeport Harbor Federal Navigation Dredging Project, Bridgeport, CT provides comprehensive review and analysis of the dredging test results. This memorandum addresses compliance with the regulatory testing requirements of 40 CFR Sections 227.6 and 227.27. This evaluation confirms that: 1) all tests required under the Ocean Dumping Regulations were conducted; 2) this project meets the ocean disposal requirements at 40 CFR Section 227.6 for trace contaminants and Section 227.27 for Limiting Permissible Concentration (LPC); and, 3) the dredged material is suitable for unrestricted ocean disposal under US Environmental Protection Agency (USEPA) Region 1/Corps of Engineers, N.E. District (NAE) guidance.

3. PROJECT DESCRIPTION

The proposal is to dredge and dispose of approximately 750,000 cubic yards (cyds) of material from the federal project. The area to be dredged is the entrance channel to Bridgeport Harbor.

4. MPRSA REGULATORY REQUIREMENTS

The disposal of dredged material in Long Island Sound is regulated pursuant to Section 404 of the Clean Water Act. In addition, Section 106(f) of the Marine Protection, Research, and Sanctuaries Act (MPRSA) provides that the dumping of dredged material in Long Island Sound from any Federal project (or pursuant to federal authorization) or from a dredging project by a non-federal applicant exceeding 25,000 cubic yards shall comply with the requirements of the MPRSA.

The MPRSA prohibits the dumping of materials into the ocean except as authorized by USEPA or, in the case of dredged materials, by the U.S. Army Corps of Engineers (USACE). Section 102 of the Act directs the USEPA to establish and apply requirements for reviewing and evaluating permit applications (33 U.S.C. Section 1412). The USEPA has adopted such requirements for the evaluation of permit applications for the ocean dumping of materials in the Ocean Dumping Regulations. 40 CFR Section 227.6(a) lists constituents that are prohibited from being dumped unless only present as trace contaminants in material otherwise suitable for dumping (hereinafter referred to as "listed constituents"). Section 227.27 addresses compliance with the LPC. See also, Section 227.13(c).

Section 227.6(b) states that the listed constituents are considered to be present as trace contaminants only when they are present in such forms and amounts that the "dumping of the materials will not cause significant undesirable effects, including the possibility of danger associated with their bioaccumulation in marine organisms." The regulations set forth requirements for determining the potential for significant undesirable effects in Section 227.6(c). In order to be found environmentally acceptable for ocean dumping, it must be found that the liquid phase does not contain any of the listed constituents in concentrations that would exceed applicable marine water quality criteria after allowance for initial mixing (Section 227.6(c)(1)). For the suspended particulate phase (Section 227.6(c)(2)) and the solid phase (Section

227.6(c)(3)), bioassay results must not indicate occurrence of significant mortality or significant adverse sublethal effects due to the dumping of wastes containing the listed constituents.

Section 227.27 of the regulations addresses the LPC. For the liquid phase, Section 227.27(a) provides that the LPC is that concentration which does not exceed applicable marine water quality criteria after initial mixing, or when there are no applicable marine water criteria, that concentration of material that, after initial mixing, would not exceed 0.01 of a concentration shown to be acutely toxic to appropriate sensitive marine organisms in a bioassay carried out in accordance with procedures approved by USEPA. For the suspended particulate phase and the solid phase, Section 227.27(b) provides that the LPC is that concentration of material which will not cause unreasonable acute or chronic toxicity or other sublethal adverse effects based on results of bioassays using appropriate sensitive organisms and conducted according to procedures that have been approved by USEPA and USACE, and which will not cause accumulation of toxic materials in the human food chain.

5. GUIDANCE FOR TESTING AND EVALUATION OF DREDGED MATERIAL

The discussion in Section 6, below, describes how the dredged material proposed for disposal from this project (as described in Section 3, above) was evaluated for compliance with the requirements of 40 CFR 227.6 and 227.27. Testing of the material was conducted following procedures approved by USEPA and USACE, and contained in the joint USEPA/USACE national guidance "Evaluation of Dredged Material Proposed for Ocean Dumping - Testing Manual" (February, 1991) (the "Green Book", USEPA/USACE, 1991), and the regional implementation manual developed by the USEPA Region 1 and NED (USEPA/USACE-NED 1989).

These test results were analyzed in accordance with the ocean dumping regulations to ensure that the proposed disposal meets the ocean dumping criteria. If the testing results indicate that the ocean dumping criteria are not met (that there is potential for significant undesirable effects), then disposal is prohibited under 40 CFR 227.6 and 227.13. If the analysis of the testing results indicates that the material satisfies the ocean dumping criteria and that no significant undesirable effects are expected from the dumping, then the material is suitable for disposal.

Applying the national (USEPA/USACE 1991) and regional guidance (USEPA/USACE-NED 1989) to this project, the material would be suitable for disposal if it meets the ocean dumping requirements including:

- acute toxicity requirements (water column and whole sediment);
- bioaccumulation test results are **below** reference values; or if **above** reference values
- bioaccumulation test results are below any applicable FDA Action/Tolerance Levels; and
- bioaccumulation test results above reference for the bioaccumulative chemicals of concern do not indicate a potential for significant undesirable effects using risk evaluation techniques.

6. RESULTS OF EVALUATION OF THE MATERIAL

a. Evaluation of the liquid phase

The liquid phase of the material was evaluated for compliance with Sections 227.6(c)(1) and 227.27(a). There are applicable marine water quality criteria for constituents in the material, including listed constituents, and the applicable marine water quality criteria were not exceeded after initial mixing. In addition, liquid phase bioassays run as part of the suspended particulate phase on three appropriate sensitive marine organisms show that after initial mixing (as determined under 40 CFR 227.29(a)(2)), the liquid phase of the material will not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic to appropriate sensitive marine organisms. Accordingly, it is concluded that the liquid phase of the material is in compliance with 40 CFR 227.6(c)(1) and 227.27(a). The specific test results and technical analysis of the data underlying this conclusion are described and evaluated in Nimeskern (2002a).

b. Evaluation of the suspended particulate phase

The suspended particulate phase of the material was evaluated for compliance with Sections 227.6(c)(2) and 227.27(b). Bioassay testing of the suspended particulate phase of the material has been conducted using three appropriate sensitive marine organisms. That information shows that after initial mixing (as determined under 40 CFR 227.29(a)(2)) at the Central Long Island Sound (CLIS), for barge volumes up to 6,000 cy, the suspended particulate phase of this material would not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic in the laboratory bioassays. Thus, to ensure that the LPC is met, the maximum volumes to be discharged in a 4-hour period is 6,000 cy. (Modeling of higher volumes was not performed by the NAE.) The specific test results and technical analysis of the data underlying this conclusion are described in Final Data Report for Bridgeport Harbor, Battelle (2002) and Nimeskern (2002a). The factor of 0.01 was applied to ensure that there will be no significant adverse sublethal effects. Moreover, because the suspended particulate phase would only exist in the environment for a short time after dumping, the suspended particulate phase would not cause significant undesirable effects, including the possibility of danger associated with bioaccumulation, since these impacts require long exposure durations (see USEPA, 1994a). Accordingly, it is concluded that the suspended phase of the material complies with 40 CFR 227.6(c)(2) and 227.27(b).

c. Evaluation of the solid phase

The solid phase of the material was evaluated for compliance with Sections 227.6(c)(3) and 227.27(b). This evaluation was made using the results of two specific types of evaluations on the solid phase of the material, one focusing on the acute (10-day) toxicity of the material, and the other focusing on the potential for the material to cause significant adverse sublethal effects due to bioaccumulation. Both types of tests used appropriate sensitive benthic marine organisms according to procedures approved by USEPA and the USACE. The remainder of this memorandum addresses the results of those tests and further analyzes compliance with the regulatory requirements of Sections 227.6(c)(3) and 227.27(b) and with EPA Region 1/USACE-NED guidance.

(1) <u>Solid phase toxicity evaluation</u>

Toxicity tests were conducted on project materials using amphipods, and mysids representing the characteristics in 40 CFR 227.27(c). These appropriate sensitive benthic marine organisms are good predictors of adverse effects to benthic marine communities (see USEPA, 1991). The toxicity of project sediments for both reaches was within 10% of the reference sediment toxicity for the worm and clam, and well within 20% for amphipods, and was not statistically greater than the reference sediment for any species tested. These results show that the solid phase of the material does not cause significant mortality and meets the solid phase toxicity requirements of Sections 227.6 and 227.27.

(2) <u>Solid phase bioaccumulation evaluation</u>

USEPA/USACE (1991) describes an approved process of evaluating bioaccumulation potential using comparative analysis of project sediment bioaccumulation to reference sediment bioaccumulation, FDA Action Levels and evaluation of eight additional factors for assessing the significance of bioaccumulation. These factors are:

- number of species in which bioaccumulation from the dredged material is statistically greater than bioaccumulation from the reference material;
- number of contaminants for which bioaccumulation from the dredged material is statistically greater than bioaccumulation from the reference material;
- magnitude by which bioaccumulation from the dredged material exceeds bioaccumulation from the reference material;
- toxicological importance of the contaminants whose bioaccumulation from the dredged material exceeds that from the reference material;
- phylogenetic diversity of the species in which bioaccumulation from the dredged material statistically exceeds that from the reference material;
- propensity for the contaminants with statistically significant bioaccumulation to biomagnify within aquatic food webs;
- magnitude of toxicity and number and phylogenetic diversity of species exhibiting greater mortality in the dredged material than in the reference material; and
- magnitude by which contaminants whose bioaccumulation from the dredged material exceeds that from the reference material also exceed the concentrations found in comparable species living in the vicinity of the proposed disposal sites.

In following the national and regional guidance, USEPA Region 1 and NAE used a framework (described in Figure 1) for evaluating project sediment bioaccumulation results. As shown in Figure 1, this process involves four consecutive evaluations. In the first three evaluations, the project sediment bioaccumulation test results for each compound of concern are sequentially compared to: a) reference test results; b) FDA Action/Tolerance Levels and c) general and project-specific risk-based evaluations. If these evaluations show that the project sediment does not exceed the reference test results in step (a) for a particular compound, this indicates that the disposal of the material would not result in adverse effects due to that chemical, and there is no need to further evaluate that individual chemical in the next step. The footnoted values in Table 1 indicate where project test results were statistically greater than the CLIS reference levels for the clam or the worm. If these evaluations show that the project sediment results exceed any FDA Action/Tolerance Levels, the material is determined in step (b) not to meet the ocean dumping requirements. General risk based evaluations are conducted in step (c) for compounds not resolved in steps (a) or (b). Carcinogenic compounds are summed to assess total risk in step (c). The fourth evaluation (d) uses all the information and results of the evaluations (particularly as these results relate to the eight Green Book factors listed above), to evaluate the solid phase of the dredged material as a whole. These evaluations for this project are discussed below in the order described in Figure 1.

The contaminants of concern were determined by a federal/state interagency regulatory work group. The specific chemicals, PAHs, pesticides, PCBs, and metals determined to be contaminants of concern for this project by the New England Federal/State regulatory agencies (Nemiskern 2001b). Bioaccumulation tests were conducted on the solid phase of the project material for the above contaminants of concern using two appropriate sensitive benthic marine organisms, *Nereis virens* and *Macoma nasuta*, which are representative of the three characteristics in 40 CFR 227(c) (Final Data Report, Battelle 2002). These species are considered to be good representatives of the phylogenetically diverse base of the marine food chain. The bioaccumulation test results were used in evaluating the potential sublethal impacts of the material. The determination is that the combined results of the toxicity and bioaccumulation tests indicated that the material met the requirements of Sections 227.6(c)(3) and 227.27(b) for ocean disposal, and that the material is suitable for disposal.

(a) Comparison of Bioaccumulation Test Results to Reference Sediment Test Results

Concentrations of contaminants in tissues of organisms exposed for 28 days to project sediments were compared to concentrations in tissues of organisms exposed for 28 days to reference sediment. Reference sediment serves as a point of comparison to identify potential effects of contaminants in the dredged material (USEPA/USACE, 1991). In essence, exposing test organisms to this sediment allows for the prediction of contaminant levels that would result in the test organisms were they "in the wild" at the area from which the reference sediment was taken. The tissue concentrations in two species of appropriate sensitive benthic marine organisms resulting from 28-day exposure to project sediments is compared to the tissue concentrations in the same species of organisms resulting from 28-day exposure to reference sediment. In order to make a statistically valid determination that the project sediment does/does not cause greater bioaccumulation than the reference sediment, several sub-samples of the dredged material and reference are run; these separate sub-samples are called replicates. A mean can then be calculated with a standard deviation for each sediment (i.e., Central Long Island Sound Reference). The means and standard deviations are compared using a standard statistical approach, and a determination is made, with 95 percent confidence, that there is or is not a true difference between the test and reference sediments. A statistical analysis is merely a quantification of the variability between the test and reference data, and a measure of the probability that a true difference exists between the test and reference data. For the remainder of this memorandum, statements regarding project sediment having greater or less bioaccumulation than the reference sediment are referring to statistically calculated differences at the 95% confidence level.

The bioaccumulation data for this project adequately addresses sediment to be dredged from the harbor. Of the fifteen locations 4 composite samples were chosen for biological testing per interagency agreement (i.e., composite samples BCD, EFGH, IJK, and LMNO). The samples are representative of the existing federal project. Information related to compositing of samples is explained (Nimeskern 2002b). The mean values used in the statistical comparisons with reference described above are listed in Table 1 for the project. The mean values used in the statistical comparisons with reference described above are listed in Table 1 for the project. Bioaccumulation statistically greater than reference was exhibited in the clam for all samples for the following contaminants: Chromium and Copper, PAHs, and PCBs. In the worm test species, bioaccumulation statistically greater than reference was exhibited for all samples for the following contaminants: PAHs, and PCBs. (Battelle, 2002). See Table 1 for specific data.

The reference sediments used in the bioaccumulation testing for this project were collected at the Central Long Island Sound Disposal Reference Site, in areas of clean, sandy mud sediments located in the central Long Island Sound near the disposal site, where the sediments are unaffected by prior dredged material disposal (see reference values in Tables 1 and 2) (USEPA/USACE 1991). When bioaccumulation in organisms exposed to project sediments is not greater than bioaccumulation in organisms exposed to appropriate reference sediments, this means that dumping of the material would not result in bioaccumulation above that found to occur in the "clean" reference sediment. Accordingly, such material would not result in bioaccumulation that would cause unreasonable degradation of the environment or human health, or significant adverse effects. In cases where bioaccumulation levels are greater than in the reference, further evaluation for potential effects is warranted. A statistically significant difference between test and reference bioaccumulation is not itself a quantitative prediction that an impact would occur in the field, nor is it related to any cause and effect. A key to understanding bioaccumulation and potential adverse impacts is that bioaccumulation is a phenomenon and an indicator of exposure and does not necessarily result in a significant adverse effect. Depending upon the exposure concentration, exposure duration and toxicity of the material, bioaccumulation may cause no harm. On the other hand, as exposure and subsequent bioaccumulation increases, the potential for adverse effects increases.

(b) Comparison to FDA Action/Tolerance Levels

This evaluation compares the bioaccumulation values in the harbor samples to applicable U.S. Food and Drug Administration's (FDA) Action and Tolerance Levels for the compounds measured above reference. As discussed above Chromium,Copper, PAHS, and PCBS were accumulated above reference values during the bioaccumulation test. Of the contaminants of concern listed for this project that were statistically above reference values (Table 1), only PCBs have US FDA Action/Tolerance levels. Tables 3a-1 and 3b-1 exhibit the steady-state corrected mean clam and worm concentrations of PCBs in comparison with the FDA levels. All stations were below these Action/Tolerance levels for both species. Therefore, the project is in compliance with these regulatory levels and the analysis goes directly to the next step, (c) Risk-based evaluations.

(c) Risk-based Evaluations

The potential for impacts due to compounds that produced greater bioaccumulation from project sediments than the reference sediments was determined using risk-based evaluations. As noted from Tables 1, 2 and the previous discussions for this project, PAHs, PCBs, Chromium and Copper bioaccumulated in test organisms exposed to project sediments higher than those exposed to reference sediments.

The highest replicate value for a given measured analyte was used in the FDA shellfish "levels of concern" and risk-based evaluations described below in sections (1), (3), (4) and (6). Table 1 of this memo summarizes the highest replicate values for the statistically accumulated bioaccumulation data for the BCD, EFGH, IJK, LMNO composites for the macoma nasuta, nereis virens species and the CLIS reference site. When practical quantification was not possible, the highest "J" value (i.e., detected but below the sample-specific detection level) was reported in the table or added in the sum.

For these compounds, the toxicological significance of bioaccumulation from the sediment into benthic organisms was evaluated by: *i) consideration of steady-state bioaccumulation and food-chain transfer; ii) consideration of potential carcinogenic effects on human health; iii) consideration of potential non-carcinogenic effects on human health; iv) comparison with published FDA "levels of concern for shellfish" (USFDA 1993a,b); and v) consideration of potential ecological effects.*

As a conservative measure, the assessment below utilized the highest replicate concentration (Tables 2 and 3) for each human health related risk assessment. The use of the highest replicate is consistent with Region I Risk Assessment guidelines (EPA 1995; Burke, personal comm.). This guidance recommends the use of the 95% upper confidence level (UCL) values for risk assessments which normally have at least 10 replicate samples for the calculation. However, when the sample number is below 10, as in this case (n = 5), the guidance recommends that the highest replicate be used as a surrogate for the 95% UCL as described above (Burke, personal comm.). The mean of the 5 replicates was used in sections *ii* (FDA Action Level) and *v* (ecological evaluation).

(1) <u>Consideration of Steady-State Bioaccumulation and Food-Chain Transfer</u>

Since highly lipophilic (high octanol/water partitioning coefficient or K_{ow}) contaminants generally are accumulated at relatively slow (weeks to months) rates, i.e., often longer than the 28 day test, it became necessary to adjust the 28 day concentrations to steady state values assuming the benthic organisms would likely achieve a thermodynamic equilibrium with persistent sediment contaminants at the disposal site over time.

Bioaccumulation tests were conducted using a 28-day exposure of appropriate sensitive benthic marine organisms to the project and reference sediments. As previously discussed, for bioaccumulation evaluations involving comparisons with "steady-state" tissue concentrations (as opposed to evaluations using other 28-day tissue concentrations such as the comparison to reference sediment), it may be necessary to understand the extent to which the organism tissue concentration has reached steady-state. Steady-state may be defined operationally as the lack of any significant difference (ANOVA, alpha = 0.05) among tissue residues taken at three consecutive sampling intervals (Lee, *et al.*, 1989). The 28-day test exposure period was selected as appropriate because most chemicals of concern will reach at least 80% of steady-state in benthic marine organisms within that time frame (Boese and Lee, 1992). For the few chemicals that may not meet steady-state tissue concentrations in 28 days, a factor may be used to adjust the data to steady-state when necessary. In order to better use the tissue concentration results of 28-day bioaccumulation exposure tests to assess the risks posed to the environment from the chemicals requiring further evaluation (see discussion above for the identification of such chemicals), consideration was given to the steady-state concentration of these compounds that could occur in the disposal site after extended periods of time. In addition, the potential movement of these compounds through the food chain was considered and appropriate trophic transfer factors applied to adjust the data accordingly, as described below.

Non-Polar Organic Chemicals

Uptake of non-polar organic contaminants from food is highly dependent on its hydrophobicity, a property measured by the octanol/water partition coefficient, K_{ow}. The higher the value of K_{ow}, the longer it takes non polar organics to reach steady-state in benthic marine organisms. For the organochlorine compounds DDT, chlordane, and some PAHs that have log $K_{ow} > 6$, it is possible that steady-state was not reached within 28 days. As discussed above, the steady state values were estimated using the kinetic models compiled by McFarland (1994, 1995). This series of formulas estimated the time required to reach steady state bioaccumulation based on the log K_{ow}. Then, the steady state value was estimated from determining the fraction of steady state that the 28 day concentration represented. The computations were simplified and incorporated into a curve in the Inland Testing Manual (Figure 6.1 in USEPA/USACE 1998). The inverse of the proportion of steady state concentration at 28 day (y axis) became the Steady State Correction Factor (Appendix I).

The potential for these chemicals to biomagnify was also evaluated. Although organic contaminants with values of log $K_{ow} > 4$ tend to biomagnify in the marine food chain, studies

(USACE, 1995) have shown that this is not true for higher molecular weight compounds such as the most highly chlorinated PCBs or for easily metabolized compounds such as PAHs. Those organic compounds which are not efficiently excreted, such as certain pesticides (e.g., DDT), can biomagnify in the food chain. One trophic level above the benthic invertebrate was chosen for evaluation. Winter flounder (*Pseudopleuronectes americanus*) and American lobster (*Homaris americana*) are common predators at the CLIS and WLIS disposal sites and commonly feed on benthic invertebrates at the site. For the organic constituents with a potential to biomagnify in the marine food chain, trophic transfer factors were calculated, using the approach described by Gobas (1993) as computed by Burkhard (1995). The values are summarized in Appendix I. This was used for risk-based evaluations for carcinogenic and non-carcinogenic risk to humans described below.

Metals

In general, metals bioaccumulate more rapidly than organics and 28 day tests are sufficient to evaluate potential effects (see USEPA/USACE, 1991) (Naqvi, *et al.*, 1990; Riedel, *et al.*, 1987; Oladimeji, *et al.*, 1984).

Trophic transfer of most metals is not sufficient to qualify as biomagnification (Brown and Neff, 1993). The lack of observed biomagnification for such metals as chromium, copper, lead, nickel, silver, and zinc is the result of incomplete absorption of metals across the gut, rapid excretion, and dilution in muscle, which represents a large part of the total body weight of most marine animals (Fowler, 1982; Suedel *et al.*, 1994). For purposes of conducting the human health and ecological evaluations below, a conservative trophic transfer coefficient equal to one will be used for these non-biomagnifying metals (Suedel *et al.*, 1994 and references cited therein).

(2) *Consideration of Potential Carcinogenic Effects on Human Health*

The carcinogenic risk of the observed bioaccumulation was evaluated using a standard risk screening approach. The general approach used is as follows:

a) The contaminants of concern which were bioaccumulated greater than reference are listed in Table 1. One PAH (benzo(a) pyrene) were identified as Class B2 probable human carcinogens (USEPA 1998). The analysis was based on the highest replicate values listed in Table 1 for these compounds, as described above. Toxic equivalent factors (TEFs) for PAHs (USEPA 1993) were used to calculate benzo(a)pyrene toxic equivalents (Appendix I, Table I-2) for all carcinogenic PAH compounds.

b) Each compound listed above was corrected for steady state and biomagnification as described above.

c) Fish (flounder), lobster and bivalve shellfish were chosen as target species as they are commonly harvested and consumed in Long Island Sound. All these species have a high potential for exposure to the dump site sediments associated contaminants. Although flounder and lobster are mobile predators, they have a high exposure potential because they are benthic feeders and commonly occur at the dump site. It was assumed that the flounder and lobster would feed exclusively on the clam or worm which was in equilibrium with the dump site sediment contaminants. Since shellfish and worms accumulate contaminants directly from the sediments, biomagnification factors were not applied for the molluscan shellfish. Thus, the steady state corrected clam and worm data were used as a surrogate for an edible bivalve shellfish. The values are listed for each species and reach in Table 1, Appendices II and III for the clam and worm, respectively.

d) Lipid normalization of the prey and predator species allowed estimation of human edible tissue concentration in lobster muscle and hepatopancreas and flounder fillet. The dosage to humans was then estimated using standard EPA risk formulas (USEPA 1989b) and conservative consumption rates. Carcinogenic risk for each of the organic contaminants of concern for which EPA-approved human health risk endpoints were available (USEPA 1998), were estimated in Tables 4-6, Appendices II and III for clam and worm prey species. Cancer slope factors were available from the EPA IRIS database for benzo (a) pyrene were used in standard EPA risk models to calculate risk to consumers (USEPA 1989, 1995a).

The results of the carcinogenic risk screen are exhibited in Table 4. Detailed analyses for the clam and worm data are exhibited in Appendices II and III, respectively. The estimated cancer risks ranged from 10^{-5} to 10^{-8}. Generally, each project is evaluated by estimating the carcinogenic risk value in comparison to reference site values. Each table indicates the risk sums for each consumed species. This analysis confirmed that, although the estimated New Haven Federal Navigation Project risks were above reference, the carcinogenic risk of consuming contaminated seafood was lower than the acceptable range (10^{-4} - 10^{-6}, USEPA 1989).

Since the analysis used conservative methods, the results represent conservative estimates of risk, or what are in effect plausible upper-bound estimates. Thus, the true risk is likely to be much lower than the estimated values.

(3) <u>Consideration of Potential Non-carcinogenic Effects on Human Health</u>

Non-carcinogenic risk was also evaluated on contaminants which were greater than reference. Reference doses (RfD) for the following were available from the IRIS data base: acenaphthene, anthracene, fluoranthene, fluorene, pyrene (USEPA 1998). An RfD for copper was available from USEPA (1997).

The edible tissue doses (lifetime average daily dose = LADD) for each of these compounds were estimated as described for the carcinogenic risk. The final dosage was estimated and divided by available reference doses. The potential for non-cancer impacts can be expressed as a hazard quotient (HQ), which is the ratio of the average daily intake divided by the toxicological reference dose for the chemical. If the HQ is less than unity (i.e., 1), an adverse noncarcinogenic effect is highly unlikely to occur. If the HQ exceeds unity, an adverse health impact may occur. The higher the HQ, the more likely that an adverse noncarcinogenic effect would occur as a result of exposure to the contaminant in the dredged material after disposal.

The HQ for all the above-listed contaminants is shown in Table 5. Based on the available EPA approved reference doses (RfD) for these contaminants, non-carcinogenic risks (hazard ratio) were below unity and therefore inconsequential for human health (Table 5). Based on the environmentally conservative assumptions (e.g., the high concentrations assumed to be present in the tissues and the high degree of exposure) assumed in the model combined with the extremely low reference dose of 2E-5, we have interpreted PCB hazard indices with indices in the 1-2 range as posing only a slight incremental risk.

(4) Comparison with Published FDA "Levels of Concern" for Shellfish

Additional human health criteria were not available from the US FDA for mercury which accumulated greater than reference. For the purposes of establishing seafood safety guidelines for heavy metals, the FDA has published risk-based "levels of concern" for a number of metals not including mercury (USFDA 1993a, b).

(5) Consideration of Potential Ecological Effects

A review of scientific information was also done to further evaluate the test results with respect to potential ecological impacts for the chemicals that bioaccumulated greater than reference.

Metals, Pesticides, and Industrial Chemicals

The potential for ecological effects from the bioaccumulation of copper and lead was evaluated by comparing to a calculated Water Quality Criterion Tissue Level (WQCTL) (see Appendix IV for details). The WQCTL is calculated by multiplying the Clean Water Act Section 304(a)(1) Federal water quality criterion chronic value (CV) for the chemical by the empirically determined bioconcentration factor (BCF) for the chemical for a representative marine organism (Lee, *et al.*, 1989). A BCF is the ratio of the concentration of a contaminant in an organism to the concentration of the contaminant in water. Thus, the WQCTL represents the tissue concentration that would be expected in an organism exposed to water containing the chemical at the CV concentration. This level is set to protect 95% of all tested organisms included in the water quality criterion database, thus representing a conservative level of protection (USEPA, 1985b). Table 9 lists the calculated WQCTLs. Sources of CVs and BCFs are USEPA ambient water quality criteria documents (USEPA 1980b, 1980c, 1980d, 1980f, 1984a and 1984b). Calculations are shown in Appendix IV. For all Reaches, none of the WQCTLs were exceeded in the bioaccumulation test results. Therefore, these bioaccumulation test results do not indicate a potential for significant undesirable effects.

Adverse effects values from the literature were found for DDT. The basis for these values is described in Appendix IV, Table IV-2. In all cases the steady state corrected values were below these effects concentrations.

PAHs

For PAHs, a more definitive method is available for evaluating the potential ecological effects. This method makes use of a direct comparison of total PAH tissue residues and the Critical Body Residue (CBR). This approach is supported by a review of the scientific literature. The CBR approach described by McCarty (1991) was used to evaluate the potential impacts of total PAHs accumulated in the dredged material bioaccumulation test organisms. CBRs are concentrations of chemical residues in organisms which elicit a deleterious biological response associated with narcosis, which is the primary non-cancer effect of PAHs. Narcotic responses measured can be acute (e.g., immobilization or death) or chronic endpoints (e.g., reduced reproduction, fecundity or growth). CBRs are represented as the ratio of the mass of toxicant to the mass of the organism, such as millimoles or micrograms of toxicant per kilogram (mmole or ug/kg) of organism. For the narcosis endpoint, each molecule of individual PAH congeners is generally equipotent; thus, the total PAH concentration is compared to the CBR. For example, a 400 ppb dose of naphthalene would elicit a similar toxicity response to that of 400 ppb of fluorene; if both chemicals are present together at these concentrations, then the dose would equal 800 ppb (see Appendix IV).

Total PAH levels in tissues from the dredged material bioaccumulation tests were well below levels at which chronic adverse effects might be expected from a narcotic mode of action in sensitive aquatic organisms (e.g., fish) as estimated by the CBR.

In addition, Widdows et al. (1987) found that PAHs body burdens of 10 ppm (= 10,000 ppb, Table 9), wet weight, were correlated with impacts to reproduction and recruitment in mussels (Appendix IV, TableIV-2). All steady state corrected total PAH values were below this value.

Effects of Mutagenic, Carcinogenic and Teratogenic PAHs:

Applying the uncertainty factor (UF) of 10 and a trophic transfer factor of 0.1 described in the Appendix IV, to the no-effects level for BaP calculated from Hannah, *et al.* (1982) (8,021 ppb) results in a no-effects level for BaP of approximately 8,000 ppb in benthic tissue, which is considerably greater than the highest mean tissue concentration of BaP found in the project bioaccumulation test results (approx. 38 ppb). Even when applying the more conservative steady-state factors for BaP derived from McFarland (1995), as identified above, the calculated concentrations (77 ppb for BaP) are still well below the no-effects level; the project tissue concentrations would still be well below this no-effects level if the higher trophic transfer factor (0.23) reported by McElroy, *et al.* (1991) was used. Therefore, the most relevant aquatic effects information reviewed indicates that the highest tissue levels accumulated in the dredged material bioaccumulation tests are well below the no-effects level.

Another study that was reviewed considered the carcinogenicity of BaP in rainbow trout resulting from embryo microinjection (Black, *et al.*, 1988). A statistically significant number of liver neoplasms was found at a concentration of approximately 200,000 ppb, with non-significant effects at up to one half that concentration. Therefore, using the above across-species UF of 10 and trophic transfer factor of 0.1 results in an aquatic no-effects level of 100,000 ppb. Since this is several orders of magnitude above the highest tissue concentration of BaP for this project, as described above (and even the highest BaP-equivalent levels for human health, as discussed above), this provides additional support for a finding that the test results do not indicate a potential for significant undesirable effects due to mutagenic, carcinogenic or teratogenic contaminants.

Hall and Oris (1991) reported on experiments that exposed fathead minnows to anthracene during long-term exposures and observed adverse effects on reproduction. The paper reported that a concentration of anthracene in the tissue of the egg in the range of 3,750 to 8,000 ppb resulted in no significant effects on egg hatching or survivorship. Using the same approach for accounting for species-to-species uncertainty and food chain transfer described above and in Appendix IV yields a conservative benthic tissue level of 3,750 ppb. Anthracene tissue concentrations from the project bioaccumulation tests are well below this level.

The clam and worm bioaccumulation levels were compared with environmentally conservative ecological effects data to evaluate the steady state corrected tissue contaminant levels. Table 6 compare clam and worm data with the suite of ecological effects levels. As with the human health risk screen, the highest replicate of each species was used in the analysis. Each value was corrected for steady state as discussed above.

It should be noted that the clam test data represent the maximum contaminant concentrations that benthic invertebrates would have accumulated from the dredged sediments because the species used is an infaunal deposit-feeder with minimal ability to metabolize these compounds. However, because polychaete worms can metabolize PAHs, the assessment of these compounds in this taxon is less conservative.

The concentrations of each steady state-corrected contaminant accumulated in the clam and worm test species in comparison to ecological effects levels are displayed in Table 6. All contaminants were found to be below potential effects levels.

(6) Risk-based Conclusions:

Human Health:
The carcinogenic risks for each species consumed (Table 4) indicate acceptable levels of risk for a human consumer who eats 1-2 meals per week. The risk sums that were estimated for this project (10^{-5} - 10^{-8}) although above reference are within the acceptable risk range (10^{-4} - 10^{-6}, USEPA 1989b). In addition, this risk screen was environmentally conservative, i.e., protective to human consumers. For example, our assumptions that a fisher consumes his/her catch from the dump site every week of the year and the catch exclusively feed on the contaminated food source (invertebrate prey) overestimate true risk. Other conservative assumptions are outlined in Section II B of this report. Therefore, particularly given the conservative nature of this screen, these test results indicate that the dredged material does not have the potential for significant undesirable effects.

The risk sums that were estimated for this project (10^{-1} - 10^{-8}) range from indicate that non-carcinogenic risk also proved to be inconsequential for the human consumer with all hazard ratios well below one.

Ecological:
All the steady state adjusted tissue residue levels in the worm and clam were below impact levels cited in the literature (Table 6). Therefore, these bioaccumulation test results indicate that the dredged material does not have the potential for significant undesirable effects.

d. Evaluation of Solid Phase Bioaccumulation Results for Dredged Material as a Whole

The evaluation of the testing results performed above indicates that the material does not have a potential to cause significant undesirable effects to aquatic marine biota due to chronic adverse effects (lethal and sublethal) including such effects due to mutagenic, carcinogenic, or teratogenic contaminants, or to human health due to cancer or non-cancer effects from the individual contaminants. That evaluation includes the information relevant to the eight factors identified in the Green Book for assessing bioaccumulation test results (USEPA/USACE, 1991). As a final and additional step in the evaluative process, however, it is appropriate to go beyond assessing the individual test results in order to look at the results as a whole so as to provide an opportunity for an integrated assessment of the individual test results (Figure 1, Box d).

As indicated above, the contaminants of concern that were accumulated statistically significant above reference values include PAHs, PCBs, Chromium, and Copper. No contaminants were above FDA Action/Tolerance levels. A potential for non-carcinogenic effects were exhibited all 5 samples. However, all of these samples were of low concern. Because of the conservative nature of the risk screen, it is likely that the true risk is well below the estimated values. Therefore, it is unlikely that the disposal of these sediments would cause significant unacceptable adverse effects to human health or the marine ecosystem. Thus, an evaluation of the solid phase bioaccumulation test results for the dredged material as a whole considering the factors in the Green Book (Figure 1, Box d) would not indicate a different outcome than that shown by the individual test results themselves; i.e., that the material does not have the potential for significant undesirable effects due to bioaccumulation.

CENAE-R-PT
SUBJECT: Review of Compliance with the Testing Requirements of 40 C.F.R 227.6 and 227.27 for the Bridgeport Harbor Federal Navigation Project, Bridgeport, CT for Disposal into Long Island Sound.

Taking into account all of the above information, it is determined that there is likely low potential for significant undesirable effects due to bioaccumulation as a result of the presence of individual chemicals or of the solid phase of the dredged material as a whole. Therefore, it is concluded that the solid phase of the material proposed for disposal meets the ocean disposal requirements at 40 CFR §227.6(c)(3) and 227.27(b), and is classified as suitable for disposal under USEPA Region 1/USACE-NED (1989) general guidance.

7. <u>OVERALL CONCLUSION ON THE PROPOSED PROJECT</u>

Based upon this review of the results of testing of the sediments proposed for dredging and dumping from Bridgeport Harbor Federal Navigation Project, the material meets the criteria for acceptability for ocean disposal as described in Sections 227.6 and 227.27 of the Ocean Dumping Regulations, and is suitable for unrestricted ocean disposal under US Environmental Protection Agency (USEPA) Region/1/USACE-NED (1989) guidance.

Melville P. Cote Jr, Chief Water Quality Unit Office of Ecosystem Protection EPA Region 1 - New England	Christine Godfrey, Chief Regulatory Division New England District U.S. Army Corps of Engineers

CENAE–R-PT 6 October 2008

MEMORANDUM THRU

RMP Ruth M. Ladd, Chief, Policy Analysis and Technical Support Branch

FOR: Michael F. Keegan, Project Manager, CENAE-PP-P

SUBJECT: Suitability Determination for the Southeast CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut.

1. **Project Description:**

The CENAE is proposing to create a Confined Aquatic Disposal (CAD) Cell in the southeastern portion of Bridgeport Harbor to receive the approximately 1,020,000 cu. yds. of sediment from the proposed maintenance dredging of the portion of the Bridgeport Harbor Federal Navigation Project (FNP) located within the breakwaters.

This CAD cell is proposed for southeastern Bridgeport Harbor, bounded by the 35' entrance channel and the East Breakwater. This site is approximately 850' by 1050' and has an area of approximately 16 acres. The CAD cell will be mechanically dredged and the parent material disposed at Central Long Island Sound Disposal Site (CLIS). Any material lying on top of the parent material will be disposed of within a CAD cell.

We do not know at this time the volume of parent sediment that will be dredged and disposed of at CLIS. This volume depends on how deep this CAD cell needs to be dug, which depends on how steeply the sides can be cut. We do not now have the technical data to make these decisions. As a rough estimate, a volume of 1,000,000 cu. yds. of parent materials will be dredged from this area and disposed of at CLIS. Also, roughly 64,000 cu. yds. of contaminated surficial materials will be dredged and disposed of in a CAD cell.

Two other possible sites for a CAD had previously been sampled and considered. The in-channel site was found to be inadequate and was dropped from consideration. The lower harbor site, west of the channel, was found to have less useable volume than expected, causing the necessity of looking at the present site.

In September 2006, a vibracore sample and two probes were taken in the southeast CAD. These showed a thin, 1' to 2' surficial layer of mud overlying sandy layers. The probes and core penetrated for more than 100' without finding bedrock.

SUBJECT: Suitability Determination for the Southeast CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut.

A sampling plan for this project was prepared on 21 June 2007. The plan called for **5** cores to be taken from the project area. Each core was horizontally sectioned into **2** 1-foot-thick samples. Each sample was individually analyzed for chromium, copper and zinc. The sediment data report was dated 4 January 2008.

2. **Summary:**

This memorandum addresses compliance with the regulatory evaluation and testing requirements of 40 CFR 227.13 for unconfined open water disposal at an Long Island Sound disposal site of sediment from a Federal Navigation Project. This evaluation confirms that sufficient information was obtained to properly evaluate the suitability of this material for open water disposal under the guidelines and finds the sediments suitable for disposal at CLIS.

3. **Ocean Dumping Act Regulatory Requirements:**

The disposal of sediments from a federal navigation project below mean low water in **Long Island Sound** is regulated according to both Section 404 of the Clean Water Act and Section 103 of the Ocean Disposal Act (Ambro Amendment).

§227.13 Dredged Materials.

(a) This paragraph defines dredged materials and does not give any criteria for the evaluation of sediments.

(b) This paragraph states that proposed dredged material which meets the criteria in one of the following three paragraphs is environmentally acceptable for ocean disposal without further testing.

(b)(1) Dredged material that is predominately sand, gravel, rock, or any other naturally occurring bottom material with particle size greater than silt and is found in areas of high current or wave energy can be disposed of in a 103 site without further testing. Although the material from this project is predominately **sands and gravel**, it does not meet this exclusion as this harbor is not a high energy area.

(b)(2) Dredged material that is proposed for beach nourishment and is predominantly sand gravel or shell with grain sizes similar to the receiving beaches can be disposed of without further testing. As the material from this project is not proposed for beach disposal, it does not meet this exclusion.

(b)(3) When the dredged material is substantially the same as that at the disposal site and the dredged material is taken from a site far removed from known sources of pollution, it can be disposed of without further testing. This project's material, the underlying glacial material found 1' below the sediment surface, does meet this exclusion.

As shown in the attached Tables 1 and 2, there are clear differences between the two layers in each core. The lower layer is clearly sandier and has lower concentrations of copper, chromium and zinc. This lower layer is parent material and is therefore substantially the same as the disposal site and is far removed, in time, from known sources of pollution. As the sediment meets this exclusion, it is suitable for disposal as proposed.

(c) This paragraph states that if the dredged material does not meet the criteria of paragraph b above, it must undergo further testing of the liquid, suspended particulate and solid phases before it can be considered acceptable for ocean disposal. This section does not apply to this project, as the dredge material meets the criteria in paragraph b (3) above.

(d) This subsection discusses the choice of the liquid phase analytes and does not give any criteria for the evaluation of sediments.

5. Copies of the above mentioned data and of the draft suitability determination were sent to the State DEP, US EPA, and US NMFS for their review. No responses were received from the Federal agencies within the 10-day response period so their concurrences may be assumed.

6. If you have any questions, please contact me at (978) 318-8660.

Phillip Nimeskern

PHILLIP NIMESKERN
Project Manager,
Marine Analysis Section

Table 1. Summary of the Grain Size Analyses, Water Content, Liquid and Plastic Limits and Specific Gravity Results

Sample ID	Station	Depth Interval	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Water Content (%)	Total Solids (%)	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index
GAI-007	A	0-0.8'	19.21	7.17	35.32	29.76	5.69	2.85	10	91	2.71	1 U	1 U	1 U
GAI-008	A	0.9-1.9'	83.93	4.15	6.56	4.27	0.58	0.51	7	93	2.69	1 U	1 U	1 U
GAI-009	B	0-0.8'	1.68	4.09	33.66	55.77	2.72	2.08	19	84	2.68	1 U	1 U	1 U
GAI-010	B	1.0-2.2'	46.01	7.01	19.33	25.63	0.92	1.1	9	92	2.71	1 U	1 U	1 U
GAI-011	C	0-0.6'	3.66	2.51	31.7	58.1	1.84	2.19	17	85	2.73	1 U	1 U	1 U
GAI-012	C	1.0-1.9'	49.34	14.81	20.61	13.32	0.68	1.24	7	93	2.73	1 U	1 U	1 U
GAI-013	D	0-0.6'	0.61	1.68	23.91	58.94	13.9	0.99	31	77	2.75	1 U	1 U	1 U
GAI-013 DUP	D	0-0.6'	0.61	1.82	24.8	58.4	13.5	0.88	31	77	2.74	1 U	1 U	1 U
GAI-014	D	0.6-2.0'	10.02	7.44	33.36	46.41	1.58	1.19	17	85	2.71	1 U	1 U	1 U
GAI-015	E	0-0.75'	24.77	2.3	15.54	45.82	7.35	4.22	27	79	2.69	1 U	1 U	1 U
GAI-016	E	0.9-1.8'	71.52	10.15	8.63	8.52	0.43	0.75	5	95	2.71	1 U	1 U	1 U

U – Not detected above laboratory detection limit; the reporting limit is reported.

Table 2. Summary of Metals Results

Sample ID	Station	Depth Interval	Units (dry wt.)	Chromium	Copper	Zinc
GAI-007	A	0-0.8'	mg/Kg	10.7	19.7	21.5
GAI-008	A	0.9-1.9'	mg/Kg	5.5	6.4	13.5
GAI-009	B	0-0.8'	mg/Kg	9.2	22.1	14.9
GAI-010	B	1.0-2.2'	mg/Kg	4.9	2.4B	8.6
GAI-011	C	0-0.6'	mg/Kg	9.9	23.1	14.6
GAI-012	C	1.0-1.9'	mg/Kg	6.9	3.3	12.9
GAI-013	D	0-0.6'	mg/Kg	16.	38.7	38.5
GAI-014	D	0.6-2.0'	mg/Kg	4.8	2.8	9.6
GAI-015	E	0-0.75'	mg/Kg	95.3	50.4	44.6
GAI-016	E	0.9-1.8'	mg/Kg	6.0	4.9	11.4

B - value less than RL but greater than MDL

SUBJECT: Suitability Determination for the Southeast CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut.

CENAE–R-PT 6 October 2008

MEMORANDUM THRU

Ruth M. Ladd, Chief, Policy Analysis and Technical Support Branch

FOR: Michael F. Keegan, Project Manager, CENAE-PP-P

SUBJECT: Suitability Determination for the West CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut or the Borrow Pit in Morris Cove East Haven, Connecticut.

Project Description:

1. As part of the proposed maintenance dredging of the Bridgeport Harbor Federal Navigation Project (FNP), CENAE is proposing to either create a Confined Aquatic Disposal (CAD) Cell in the southwestern portion of Bridgeport Harbor (West CAD) or use an existing borrow pit in Morris Cove, East Haven, Connecticut for disposal of some of dredged material. Either of these options is in addition to using the Southeast CAD cell, which will receive the bulk of the maintenance dredge material. Either the pit or the West CAD cell will receive the surficial material from the creation of the Southeast CAD plus some project material.

2. One proposed disposal option for the FNP is to excavate 53,800 cu. yds. of surficial material from the startup of the Southeast CAD cell and place it in the Morris Cove Borrow Pit. The pit is a 7 to 9 meter deep excavation in the Morris Cove area of New Haven Harbor off the East Haven shore. In addition, some 196,200 cu. yds. of maintenance dredge material from Bridgeport FNP will be disposed here. Finally, it will be capped with approximately 150,000 cu. yds. of clean parent material from Bridgeport Harbor to match the depths of the surrounding areas.

3. The other disposal option calls for the creation of a CAD cell in southwestern Bridgeport Harbor, bounded by the 35' entrance channel and the West Breakwater. This West CAD cell has a proposed area of approximately 18 acres. The cell will be mechanically dredged and the parent material, an estimated 477,700 cu. yds., will be disposed at Central Long Island Sound Disposal Site (CLIS). Any material lying on top of the parent material will be stored and then disposed of within the Southeast CAD cell. Finally, it will be capped with approximately 79,400 cu. yds. of clean parent material from Bridgeport Harbor

The West CAD cell is proposed to receive a total of approximately 345,400 cu. yds. of sediment from the proposed maintenance dredging of the

Pequannock River and Yellow Mill Creek portions of the Bridgeport Harbor Federal Navigation Project (FNP) as well as from the startup of the Southeast CAD.

A sampling plan for the West CAD was prepared on 13 April 2006. The plan called for eight cores to be taken from the project area, which was larger at that time. **Four** cores (H, I, J and L) are within the CAD as presently proposed. Cores I, J and L were horizontally sectioned into **2** 1-foot-thick samples, one from either side of the sediment transition zone. Core H hit refusal at about 1 foot deep, so only one sample was taken from this area. Each sample was individually analyzed for chromium, copper and zinc. The sediment data report was dated 26 May 2006.

2. **Summary:**

This memorandum addresses compliance with the regulatory evaluation and testing requirements of 40 CFR 227.13 for unconfined open water disposal at a Long Island Sound disposal site of sediment from a Federal Navigation Project and of 40 CFR Section 230.60 and 230.61, subpart G under the Clean Water Act 404(b)(1) guidelines for disposal of sediment in New Haven and Bridgeport harbors. This evaluation confirms that sufficient information was obtained to properly evaluate the suitability of this material for open water disposal under the guidelines and finds the sediments located below 1' deep at the proposed West CAD cell suitable for disposal at CLIS as proposed and the sediments proposed for disposal in either the West CAD or Morris Cove Borrow Pit suitable as proposed.

3. **Ocean Dumping Act Regulatory Requirements:**

The disposal of sediments from a federal navigation project below mean low water in **Long Island Sound** is regulated according to both Section 404 of the Clean Water Act and Section 103 of the Ocean Disposal Act (Ambro Amendment).

§227.13 Dredged Materials.

(a) This paragraph defines dredged materials and does not give any criteria for the evaluation of sediments.

(b) This paragraph states that proposed dredged material which meets the criteria in one of the following three paragraphs is environmentally acceptable for ocean disposal without further testing.

(b)(1) Dredged material that is predominately sand, gravel, rock, or any other naturally occurring bottom material with particle size greater than silt and is found in areas of high current or wave energy can be disposed of in a 103 site without further testing. Although much of the material from this project is predominately **sands and gravel**, it does not meet this exclusion as this harbor is not a high energy area.

(b)(2) Dredged material that is proposed for beach nourishment and is predominantly sand, gravel or shell with grain sizes similar to the receiving beaches can be disposed of without further testing. As the material from this project is not proposed for beach disposal, it does not meet this exclusion.

(b)(3) When the dredged material is substantially the same as that at the disposal site and the dredged material is taken from a site far removed from known sources of pollution, it can be disposed of without further testing. The West CAD's material, the underlying glacial material found 1' below the sediment surface, does meet this exclusion.

As shown in the attached Tables 1 and 2, there are clear differences between the two layers in each core. The lower layer is clearly sandier and has lower concentrations of copper, chromium and zinc. This lower layer is parent material and is therefore substantially the same as the disposal site and is far removed, in time, from known sources of pollution. As the sediment meets this exclusion, it is suitable for disposal as proposed.

(c) This paragraph states that if the dredged material does not meet the criteria of paragraph b above, it must undergo further testing of the liquid, suspended particulate and solid phases before it can be considered acceptable for ocean disposal. This section does not apply to this project, as the dredge material meets the criteria in paragraph b (3) above.

(d) This subsection discusses the choice of the liquid phase analytes and does not give any criteria for the evaluation of sediments.

3. **Clean Water Act Regulatory Requirements:**

The disposal of sediments waterward of the high tide line in **Bridgeport Harbor and New Haven Harbor** is regulated under Section 404 of the Clean Water Act. Subpart G of the Section 404(b)(1) guidelines describes the procedures for conducting this evaluation, including any relevant testing that may be required.

§230.60 General Evaluation of Dredged or Fill Material

(a) As the sediment proposed for disposal is not located in an area of high wave or current activity, this exclusion does not apply.

(b) As there have been many spills and are many outfalls in the project area, we cannot state that the surficial material has not been contaminated. This subsection therefore does not apply.

(c) The material to be dredged and the material at the disposal site are not adjacent, composed of the same materials and subject to the same sources of contaminants. This subsection therefore does not apply.

(d) This subsection states that further testing may not be necessary if the material to be dredged is constrained to reduce contamination within the disposal site and to prevent transport of contaminants beyond the boundaries of the disposal site. As such constraints in handling are proposed, by putting the sediments in either the CAD or borrow pit, this subsection does apply and further sampling and testing are not required.

§230.61 Chemical, Biological and Physical Evaluation and Testing

(a) This subsection describes the purpose of §230.61 and does not give any criteria for the evaluation of sediments.

(b) Water column and benthic bioassay testing is not needed as it was determined, on the basis of evaluation of §230.60, that the likelihood of contamination is low.

(c) An inventory of the total concentration of contaminants is not of value in comparing sediment at the disposal and dredging sites as the materials have already been determined to be suitable in section 230.60(d) above.

CENAE and the federal agencies did not think an analysis of biological community structure was needed for this project.

(d) The physical effects of the disposal of the dredged material at the disposal site should be minimal. Although some benthic marine organisms will be buried by the disposal, the disposal site should be rapidly re-colonized.

5. Copies of the above mentioned data and of the draft suitability determination were sent to the State DEP, US EPA, and US NMFS for their review. No responses were received from the Federal agencies within the 10-day response period so their concurrences may be assumed.

6. If you have any questions, please contact me at (978) 318-8660.

Phillip Nimeskern

PHILLIP NIMESKERN
Project Manager,
Marine Analysis Section

SUBJECT: Suitability Determination for the West CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut.

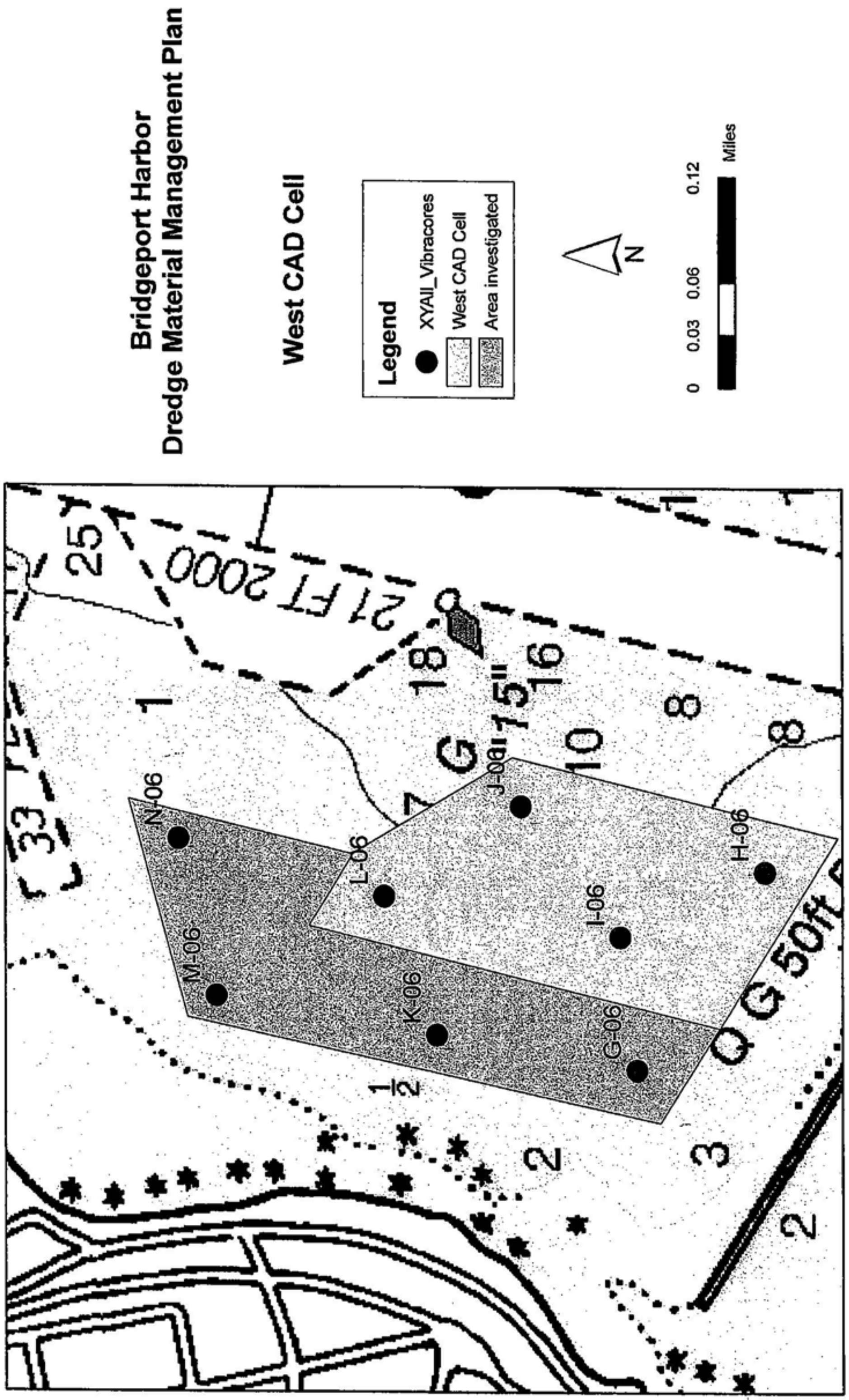
Table 1

Sample	Client ID	gravel	coarse sand	medium sand	fine sand	silt	clay
Core H, 0-1'	FAB-020	2.82	1.23	19.14	73.36	1.88	1.58
Core I, 0 - 1'	FAB-021	2.26	1.56	17.14	75.31	2.19	1.54
Core I, 1 to 1.9'	FAB-022	31.31	4.03	17.09	45.13	1.06	1.38
Core J, 0-1'	FAB-014	6.81	2.24	5.71	22.69	40.48	22.06
Core J, 1-2'	FAB-015	2.46	4.76	20.53	53.63	10.88	7.73
Core L, 0-1'	FAB-018	0.28	0.64	8.34	85.83	3.41	1.81
Core L, 2-2.5'	FAB-019	2.47	1.61	7.99	82.43	3.65	1.84

Table 2

Sample	Client ID		Chromium	Copper	Zinc
		mg/Kg			
Core H, 0-1'	FAB-020		8.0	22.6	16.6
Core I, 0 - 1'	FAB-021		5.4	10.8	14.7
Core I, 1 to 1.9'	FAB-022		3.5	1.9	7.6
Core J, 0-1'	FAB-014		148.0	404.0	281.0
Core J, 1-2'	FAB-015		18.7	47.4	55.5
Core L, 0-1'	FAB-018		11.4	25.2	25.4
Core L, 2-2.5'	FAB-019		5.0	1.8	8.2

SUBJECT: Suitability Determination for the West CAD Cell in Bridgeport Harbor Federal Navigation Project, Bridgeport, Connecticut.



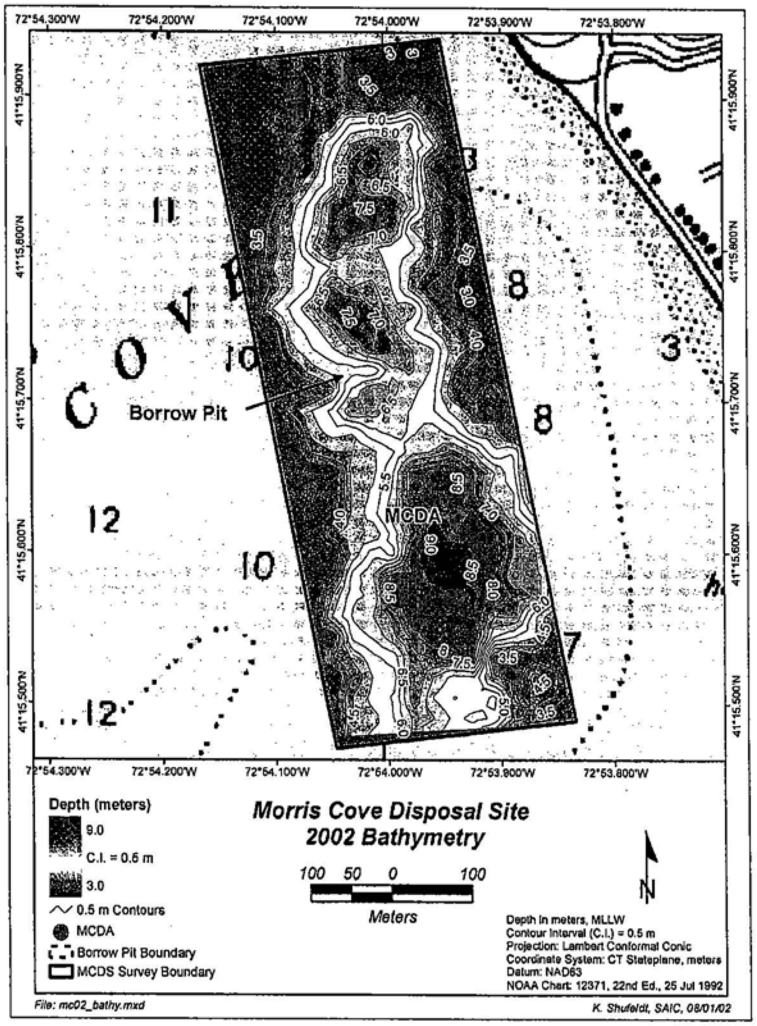


Figure 3-1. Bathymetric chart of the seafloor within the 0.24 km² survey area established over Morris Cove, 0.5 m contour interval. The blue dotted line designates the borrow pit boundary based on the 3.5 m bathymetric contour.

Correspondence

INSERT LETTERS HERE

APPENDIX B

BENTHIC REPORT

Benthic Invertebrates From Bridgeport Harbor Navigation Channels and Tributaries (Bridgeport, CT)

TABLE B-1. Benthos Collected in Bridgeport Harbor (Stations 1- 8). (Density Values per 0.04m^2) (July 29 and 30, 2003).

SPECIES	STA. 1	STA. 2	STA. 3	STA. 4	STA. 5	STA. 6	STA.7	STA. 8
ANNELIDA								
POLYCHAETES								
Ampharete americana								5
Cossura longocirrata					1			
Eteone longa								1
Glycera americana					2			1
Leitoscoloplos fragilis					3			8
Harmothoe extenuata								2
Mediomastus ambiseta				2	17	3		77
Nephtys incisa	5	1	23	4	1		1	1
Paraonis fulgens	1	2						
Pectinaria gouldii					1			
Phyllodoce mucosa					-			1
Streblospio benedicti					9			31
Tharyx acutus					1			23
Sigambra tentaculata		1						
Prionospio steenstrupi		1						
OLIGOCHAETES								
Unidentified Oligochaete sp. A	1	2		4	13	1		13
MOLLUSCA								
BIVALVES								
Mercenaria mercenaria					1			
Mulinia lateralis		1	1					
Yoldia limatula				1				
Pitar morrhuana	1							1
Retusa canalicualta	1							
Tellina agilis	2							7
Nucula annulata	19	15	29	30	4			
Pandora gouldiana	1	2						
GASTROPODS								
Nassarius trivitatus	2				1	1		
ARTHROPODA								
CRUSTACEANS								
Ampelisca vadorum				14	15			27
Pagurus longicarpus				1				
Euplera caudate				1				
Ampelisca verillli					2			
Unciola irrorata								1
Neopanopeus sayi								1

NEMERTEA								
Nemertean sp. A	1			2	11	1		
NEMATODA								
Unidentified Nematode					2			
TOTALS								
# of Species	**10**	**8**	**3**	**9**	**16**	**4**	**1**	**16**
# of Individuals	**34**	**25**	**53**	**59**	**84**	**6**	**1**	**200**

TABLE B-2. Benthos Collected in Bridgeport Harbor (Stations 9-16). (Density Values per $0.04m^2$) (July 29 and 30, 2003).

SPECIES	STA. 9	STA. 10	STA. 11	STA. 12	STA. 13	STA. 14	STA. 15	STA 16
ANNELIDA								
POLYCHAETES								
Mediomastus ambiseta								3
Nephtys incisa					1	1		
Nereis succinea				1				
Streblospio benedicti	1		2					
OLIGOCHAETES								
Unidentified Oligochaete sp. A			2					
MOLLUSCA								
BIVALVIA								
Mulinia lateralis					1			
GASTROPODS								
Nassarius trivitatus				1	1			
Ilyanassa obsolete	1	2			1	1		
ARTHROPODA								
CRUSTACEANS								
Ampelisca vadorum						1		
TOTALS								
# of Species	**2**	**1**	**2**	**2**	**4**	**3**	**0**	**1**
# of Individuals	**2**	**2**	**4**	**2**	**4**	**3**	**0**	**3**

TABLE B-3. Benthos Collected in Bridgeport Harbor (Stations 17-24). (Density Values per 0.04m^2) (July 29 and 30, 2003).

SPECIES	STA. 17	STA. 18	STA. 19	STA. 20	STA. 21	STA. 22	STA.2 3	STA 24
ANNELIDA								
POLYCHAETES								
Capitella sp.								6
Eteone heteropoda							4	
Glycera americana							1	
Leitoscoloplos robustus							2	
Mediomastus ambiseta					2	5		
Nephtys incisa						1		
Nereis succinea		1	1				5	
Polydora cornuta		1						
MOLLUSCA								
BIVALVES								
Mercenaria mercenaria							1	
GASTROPODS								
Nassarius trivitatus				1				
ARTHROPODA								
CRUSTACEANS								
Ampelisca vadorum		4			3	2	298	
TOTALS								
# of Species	**0**	**3**	**1**	**1**	**2**	**3**	**6**	**1**
# of Individuals	**0**	**6**	**1**	**1**	**5**	**8**	**312**	**6**

TABLE B-4. Benthos Collected in Bridgeport Harbor (Stations 25-27). (Density Values per 0.04m^2). (July 29 and 30, 2003).

SPECIES	STA. 25	STA. 26	STA. 27
ANNELIDA			
POLYCHAETES			
Capitella sp.	11		
ARTHROPODA			
CRUSTACEANS			
Ampelisca vadorum		2	
TOTALS			
# of Species	**1**	**1**	**0**
# of Individuals	**11**	**2**	**0**

TABLE B-5. Macrobenthic Community Structure of Powerhouse Creek. (Density Values per 0.04m^2) (July 21, 2005).

SPECIES	STATION 1	STATION 2	STATION 3
MOLLUSCA			
GASTROPODS			
Illyanassa obsoleta	3		8
Nassarius trivittatus		1	3
BIVALVES			
Mercenaria mercenaria	1		
TOTALS			
# of species	2	1	2
# of individuals	4	1	11

Benthic Invertebrates From Bridgeport Harbor CAD Cells
(Bridgeport, CT)

TABLE B-6. Macrobenthic Community Structure of the Southeast CAD Cell. (Density Values per $0.04m^2$) (May 15, 2008).

SPECIES	STATION A	STATION B	STATION C	STATION D	STATION E	STATION F
ANNELIDA						
POLYCHAETEA						
Leitoscoloplos robustus	12	10	1	15	7	9
Eteone heteropoda	7	9	6	20	2	8
Streblospio benedicti	59	231	302	73	172	141
Tharyx acutus	7	18			18	
Heteromastus filiformis		1			1	
Syllides setosa		5		3	9	12
Polycirrus eximius		1			1	
Eumida sanguinea		2		8		
Clymenella torquata		1	1			
Asabellides oculata			14			
Glycera americana			2	3	1	7
Spio setosa			2		7	4
Harmothe imbricata					1	
Nereis succinea					2	
Monticellina dorsobranchialis					1	
Mediomastus ambiseta	47	144	498	78	97	105
Goniadella gracilis		1	14		1	
OLIGOCHAETA						
Oligochaeta sp. A	11	31		35	28	10
NEMERTEA						
Nemertean sp. A			1			
MOLLUSCA						
BIVALVIA						
Gemma gemma	12			11		73
Tellina agilis	6	4	8	9	2	9
Lyonsia hyalina	1					
Mulinia lateralis			1			
Mercenaria mercenaria					1	
GASTROPODA						
Crepidula fornicata	8		3	3	23	
Nassarius trivitattus	1				2	
ARTHRPODA						
AMPHIPODA						
Unciola irrorata	1		1		1	

Elasmopus laevis		1			1	
Corophium insidiosum		1			2	
Ampelisca abdita			7		2	
Paraphoxus spinosus			3	2	6	
DECAPODA						
Panopeus herbsti			1			
Ovalipes oscellatus				1		
TOTALS						
# of Species	12	15	17	11	25	10
# of Individuals	172	460	865	250	396	378

TABLE B-7. Macrobenthic Community Structure of the West CAD Cell. (Density Values per 0.04m^2) (March 30, 2006).

SPECIES	STATION 1	STATION 2	STATION 3	STATION 4	STATION 5	STATION 6
ANNELIDA						
POLYCHAETEA						
Scoletoma tenuis	1					
Streblospio benedicti	26	38		21	4	22
Prionospio heterobranchia	3	6		3		17
Mediomastus ambiseta	73	7	6	50	2	4
Thrayx acutis	2					
Heteromastus filiformis	1					1
Leitoscoloplos robustus	12	11		13		
Paraonis fulgens	1			8		
Nephtys incisa			2		1	
Glycera americana				1		2
Polydora cornuta				2		
Eteone heteropoda				2		
OLIGOCHAETA						
Oligochaeta sp. A	15	9	4	14		14
MOLLUSCA						
GASTROPODA						
Illyanassa obsoleta	2	2			2	17
Nassarius trivitattus					1	
BIVALVIA						
Tellina agilis			2	3		3
ARTHRPODA						
CRUSTACEA						
Ampelisca abdita	17			3	15	3
Neomysis americana	1					
Pagurus longicarpus	1					
CNIDARIA						
ANTHOZA						
Actinothoe modesta			1			
TOTALS						
# of Species	13	6	5	11	6	9
# of Individuals	155	73	15	120	25	83

Benthic Invertebrates From Adjacent Bridgeport Harbor Beaches (Bridgeport, CT)

TABLE B-8. Macrobenthic Community Structure of Intertidal Habitats of Long Beach. (Number per beach core) (July 20, 2005).

SPECIES	Transect I			Transect II			Transect III		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
POLYCHAETES									
Nereis succinea	6						2		
Eteone heteropoda	1								
Capitella spp.				4					
Paradoneis lyra				2					
ARCHIANNELIDS	4								
OLIGOCHAETES									
Unidentified sp. A			89			85			
Unidentified sp. C			4			11	3		6
CRUSTACEANS									
Gammarus macronatus	6								
Ampelisca abdita	1								
Crab megalops	5								
Haustorius canadensis								1	
Corophium lacustre	4								
TOTALS									
# of species	**7**	**0**	**2**	**2**	**0**	**2**	**2**	**1**	**1**
# of individuals	**27**	**0**	**93**	**6**	**0**	**96**	**5**	**1**	**6**

TABLE B-9. Macrobenthic Community Structure of Intertidal Habitats of Seaside Beach. (Number per beach core) (July 20, 2005).

SPECIES	Transect I			Transect II			Transect III		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
POLYCHAETES									
Leitoscoloplos fragilis	3			15	6		7	11	
Scoletoma spp.	11								
Nereis succinea		6							
Capitella spp.		25							
Eteone heteropoda		1							
OLIGOCHAETES									
Unidentified sp. A		16		2					
ARCHIANNELIDS				1					
GASTROPODS									
Illyanassa obsoleta	9							12	
BIVALVES									
Gemma gemma					4			4	
CRUSTACEANS									
Gammarus macronatus		2							
Haustorius canadensis				1	3		1	12	
Monoculodes intermedius				1					
Trichophoxus epistomus				3					
Crangon septemspinosa				2					
Pagurus longicarpus							1		
TOTALS									
# of species	**3**	**5**	**0**	**7**	**3**	**0**	**3**	**4**	**0**
# of individuals	**23**	**50**	**0**	**25**	**13**	**0**	**9**	**39**	**0**

TABLE B-10. Macrobenthic Community Structure of Intertidal Habitats of Fairfield Beach. (Number per beach core) (July 20, 2005).

SPECIES	**Transect I**			**Transect II**			**Transect III**		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
POLYCHAETES									
Leitoscoloplos fragilis							3	2	
Eteone heteropoda							7		
Paradoneis lyra							1		
Scoletoma spp.							1	1	
OLIGOCHAETES									
Unidentified sp. C			4						5
BIVALVES									
Gemma gemma				7	4			1	
CRUSTACEANS									
Haustorius canadensis	11								
TOTALS									
# of species	**1**	**0**	**1**	**1**	**1**	**0**	**4**	**3**	**1**
# of individuals	**11**	**0**	**4**	**7**	**4**	**0**	**12**	**4**	**5**

TABLE B-11. Macrobenthic Community Structure of Intertidal Habitats of Pleasure Beach. (Number per beach core) (July 20, 2005).

SPECIES	Transect I			Transect II			Transect III		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
POLYCHAETES									
Capitella spp.	3								
Nereis succinea				2					
Leitoscoloplos fragilis				2			1		
Eteone heteropoda							3		
Marenzellaria viridis							3		
Paraonis fulgens								2	
OLIGOCHAETES									
Unidentified sp. A			3		19	64	8		15
Unidentified sp. B					8				
Unidentified sp. C			12				38		6
GASTROPODS									
Nassarius trivittatus	1						1		
Illyanassa obsoleta							2		
Crepidula fornicata	6						8		
BIVALES									
Gemma gemma	15			5					
Tellina agilis							1		
CRUSTACEANS									
Haustorius canadensis				12					
Emerita talpoida								1	
TOTALS									
# of species	**4**	**0**	**2**	**4**	**2**	**1**	**9**	**2**	**2**
# of individuals	**25**	**0**	**15**	**21**	**27**	**64**	**65**	**3**	**21**

Benthic Invertebrates From Morris Cove
(New Haven Harbor, CT)

TABLE B-12. Benthos Collected in Morris Cove (Stations 32-35) (Density values are per $0.04m^2$). (July 29 and 30, 2003)

SPECIES	STATION 32	STATION 33	STATION 34	STATION 35
ANNELIDA				
POLYCHAETES				
Leitoscoloplos robustus				1
ARTHROPODA				
CRUSTACEANS				
Gammarus lawrencianus	1			
TOTALS				
# of Species	**1**	**0**	**0**	**1**
# of Individuals	**1**	**0**	**0**	**1**

APPENDIX C

ESSENTIAL FISH HABITAT

ESSENTIAL FISH HABITAT EVALUATION

ESSENTIAL FISH HABITAT SETTING

The 1996 amendments to the Magnuson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Managed species listed for the 10' x 10' squares of latitude and longitude which includes Bridgeport Harbor and the Central Long Island Sound Disposal Site are: Atlantic salmon *Salmo salar* (juveniles and adults), pollock *Pollachius virens* (juveniles and adults), whiting *Merluccius bilinearis* (eggs, larvae, juveniles), red hake *Urophycis chuss* (eggs, larvae, juveniles, adults), winter flounder *Pleuronectes americanus* (eggs, larvae, juveniles, adults), windowpane flounder *Scophthalmus aquosus* (eggs, larvae, juveniles, adults), ocean pout *Macrozoarces americanus* (eggs, larvae, juveniles, adults), Atlantic sea herring *Clupea harengus* (juveniles, adults), bluefish *Pomatomus saltatrix* (juveniles, adults), Atlantic mackerel *Scomber scombrus* (eggs, larvae, juveniles, adults), summer flounder *Paralicthys dentatus* (juveniles), scup *Stenotomus chrysops* (eggs, larvae, juveniles, adults), black sea bass *Centropristus striata* (juveniles), king mackerel *Scomberomorus cavalla* (eggs, larvae, juveniles, adults), Spanish mackerel *Scomberomorus maculatus* (eggs, larvae, juveniles, adults), cobia *Rachycentron canadum* (eggs, larvae, juveniles, adults), sand tiger shark *Odontaspis taurus* (larvae).

The following lists the managed species and their appropriate life stage history for the designated 10' x 10' squares for Bridgeport Harbor and the CLIS Disposal Site.

Atlantic salmon (*Salmo salar*)

Juveniles: Bottom habitats of shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries. Generally, the following conditions exist where Atlantic salon parr are found: clean, well-oxygenated fresh water, water temperatures below 25^0 C, water depths between 10 cm and 61 cm, and water velocities between 20 and 92 cm per second. As they grow, parr transform into smolts. Atlantic salmon smolts require access downstream to make their way to the ocean. Upon entering the sea, “post-smolts” become pelagic and range from Long Island Sound north to the Labrador Sea.

Adults: For adult salmon returning to spawn, habitats with resting and holding pools in rivers and estuaries. Returning Atlantic salmon require access to their natal streams and access to the spawning grounds. Generally, the following conditions exist where returning Atlantic salmon adults are found migrating to the spawning grounds: water temperatures below 22.8^0 C, and dissolved oxygen above 5 ppm. Oceanic adult Atlantic salmon are primarily pelagic and range from the waters of the continental shelf off southern New England north throughout the Gulf of Maine.

<u>Pollock (*Pollachius virens*)</u>

Juveniles: Bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where pollock juveniles are found: water temperatures below 18^0 C, water depths from 0 to 250 meters, and salinities between 29-32‰.

Adults: Bottom habitats in the Gulf of Maine and Georges Bank and hard bottom habitats (including artificial reefs) off southern New England and the middle Atlantic south to New Jersey. Generally, the following conditions exist where pollock adults are found: water temperatures below 14^0 C, water depths from 15 to 365 meters, and salinities between 31-34‰.

Spawning Adults: Bottom habitats with a substrate of hard, stony or rocky bottom in the Gulf of Maine and hard bottom habitats (including artificial reefs) off southern New England and the middle Atlantic south to New Jersey. Generally, the following conditions exist where pollock adults are found: water temperatures below 8^0 C, water depths from 15 to 365 meters, and salinities between 32-32.8‰. Pollock are most often observed spawning during the months September to April with peaks from December to February.

<u>Whiting (*Merluccius bilinearis*)</u>

Adults: Bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where most whiting juveniles are found: water temperatures below 21^0 C, water depths from 20 to 270 meters, and salinities greater than 20‰.

Spawning Adults: Bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where most spawning whiting adults are found: water temperatures below 13^0 C and water depths from 30 to 325 meters.

<u>Red hake (*Urophycis chuss*)</u>

Eggs: Surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where hake eggs are found: sea surface temperatures below 10^0 C along the inner continental shelf with salinity less than 25‰. Hake eggs are most often observed during the months from May to November, with peaks in June and July.

Larvae: Surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake larvae are found: sea surface temperatures below 19^0 C, water depths less than 200 meters and salinity greater than 0.5‰. Red hake larvae are most often observed from May through December, with peaks September to October.

Juveniles: Bottom habitats with a substrate of shell fragments, including areas with an abundance of live scallops, in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake juveniles are found: water temperatures below 16^o C, depths less than 100 meters and a salinity range from 31 - 33‰.

Adults: Bottom habitats in depressions with a substrate of sand and mud in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake adults are found: water temperatures below 12^o C, depths from 10 to 130 meters, and a salinity range from 33 - 34‰.

Spawning Adults: Bottom habitats in depressions with a substrate of sand and mud in the Gulf of Maine, the southern edge of Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where spawning red hake adults are found: water temperatures below 10^o C, depths less than 100 meters, and salinity less than 25‰. Red hake are most often observed spawning during the months from May – November, with peaks in June and July.

Winter flounder (*Pseudopleuronectes americanus*)

Eggs: Bottom habitats with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder eggs are found: water temperatures below 10^o C, salinities between 10 - 30‰ and water depths less than 5 meters. On Georges Bank, winter flounder eggs are generally found in water less than 8^o C, and less than 90 meters deep. Winter flounder eggs are often observed from February to June with a peak in April on Georges Bank.

Larvae: Pelagic and bottom waters of Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder larvae are found: sea surface temperatures less than 15^0 C, salinities between 4 - 30‰, and water depths less than six meters. On Georges Bank, winter flounder larvae are generally found in water less than 8^o C, and less than 90 meters deep. Winter flounder larvae are often observed from March to July with peaks in April and May on Georges Bank.

Juveniles: *Young-of-the-Year*: Bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder young-of-the-year are found: water temperatures below 28^o C, and depths from 0.1 – 10 meters, and salinities between 5 - 33‰. *Age 1 + Juveniles*: Bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where juvenile winter flounder are found: water temperatures below 25^o C, and depths from 1 – 50 meters, and salinities between 10 - 30‰.

Adults: Bottom habitats including estuaries with a substrate of mud, sand and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where adult winter flounder are found: water temperatures below 25^o C, and depths from 1 – 100 meters, and salinities between 15 - 33‰.

Spawning Adults: Bottom habitats including estuaries with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where spawning adult winter flounder are found: water temperatures below 15^o C, depths less than 6 meters, except on Georges Bank where they spawn as deep as 80 meters, and salinities 5.5 - 36‰. Winter flounder are most often observed spawning during the months of February to June.

Windowpane flounder (*Scopthalmus aquosus*)

Eggs: Surface waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowpane flounder eggs are found: sea surface temperatures less than 20^0 C, water depths less than 70 meters. Windowpane flounder eggs are often observed from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

Larvae: Pelagic waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowpane flounder larvae are found: sea surface temperatures less than 20^0 C, water depths less than 70 meters. Windowpane flounder larvae are often observed from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

Juveniles: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowpane flounder juveniles are found: water temperatures below 25^0 C, water depths from 1 – 100 meters, and a salinity range from 5.5 – 36‰.

Adults: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, the following conditions exist where windowpane flounder adults are found: water temperatures below 26.8^0 C, water depths from 1 – 75 meters, and salinities between 5.5 – 36‰.

Spawning Adults: Bottom habitats with a substrate of mud or fine-grained sand in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, the following conditions exist where spawning windowpane flounder adults are found: water temperatures below 21^0 C, water depths from 1 – 75 meters, and salinities between 5.5 – 36‰. Windowpane flounder are most often observed spawning during the months February – December with a peak in May in the middle Atlantic.

Ocean Pout (*Macrozoarces americanus*)

Eggs: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Due to low fecundity, relatively few eggs (<4,200) are laid in gelatinous masses, generally in hard bottom sheltered nests, holes, or crevices where they are guarded by either female or both parents. Generally, the following conditions exist where ocean pout eggs are found: water temperatures below 10^0 C, depths less than 50 meters, and a salinity range from 32-34‰. Ocean pout egg development takes two to three months during late fall and winter.

Larvae: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Larvae are relatively advanced in development and are believed to remain in close proximity to hard bottom nesting areas. Generally, the following conditions exist where ocean pout larvae are found: sea surface temperatures below 10^0 C, depths less than 50 meters, and salinities greater than 25‰. Ocean pout larvae are most often observed from late fall through spring.

Juveniles: Bottom habitats, often smooth bottom near rocks or algae in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where ocean pout juveniles are found: water temperatures below 14^0 C, depths less than 80 meters, and salinities greater than 25‰.

Adults: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exit where ocean pout adults are found: water temperatures below 15^0 C, depths less than 110 meters, and a salinity range from 32-34‰.

Spawning Adults: Bottom habitats with a hard bottom substrate, including artificial reefs and shipwrecks, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where spawning ocean pout adults are found: water temperatures below 10^0 C, depths less than 50 meters, and a salinity range from 32-34‰. Ocean pout spawn from late summer through early winter, with peaks in September and October.

<u>Atlantic sea herring (*Clupea harengus*)</u>

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^0 C, water depths from 15 - 135 meters, and salinity range from 26 to 32‰.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10^0 C, water depths from 20 - 130 meters, and salinities above 28‰.

Spawning Adults: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15^0 C, water depths from 20 - 80 meters, and salinity range from 32 to 33‰. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring are most often observed spawning during the months from July through November.

<u>Bluefish (*Pomatomus saltatrix*)</u>

Juveniles: Pelagic waters found over the Continental Shelf from Nantucket Island south and all major estuaries between Penobscot Bay, Maine and St. John's River, Florida. Generally juvenile bluefish occur in North Atlantic estuaries from June through October within the "mixing" and "seawater" zones.

Adults: Over the Continental Shelf from Cape Cod Bay, Massachusetts south and all major estuaries between Penobscot Bay, Maine and St. John's River, Florida. Adult bluefish are found in North Atlantic estuaries from June through October in the "mixing" and "seawater" zones. Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in normal shelf salinities (> 25 ppt).

<u>Atlantic mackerel (*Scomber scombrus*)</u>

Eggs: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina; in areas that encompass the highest 75% of the catch where Atlantic mackerel eggs were collected. EFH is also the "mixing" and/or "seawater" portions of all the estuaries where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, Atlantic mackerel eggs are collected from shore to 50 feet and temperatures between 41^0 F and 73^0 F.

Larvae: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina; in areas that encompass the highest 75% of the catch where juvenile Atlantic mackerel were collected in NEFSC trawl surveys. EFH is also the "mixing" and/or "seawater" portions of all the estuaries where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, Atlantic mackerel larvae are collected in depths between 33 feet to 425 feet and temperatures between 43^0 F and 72^0 F.

Juveniles: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina; in areas that encompass the highest 75% of the catch where juvenile Atlantic mackerel were collected in NEFSC trawl surveys. EFH is also the "mixing" and/or "seawater" portions of all the estuaries where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, juvenile Atlantic mackerel are collected from shore to 1,050 feet and temperatures between 39^0 F and 72^0 F.

Adults: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina; in areas that encompass the highest 75% of the catch where adult Atlantic mackerel were collected in NEFSC trawl surveys. EFH is also the "mixing" and/or "seawater" portions of all the estuaries where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, adult Atlantic mackerel are collected from shore to 1,250 feet and temperatures between 39^0 F and 61^0 F.

Summer flounder (*Paralicthys dentatus*)

Juveniles: North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast to the EEZ) from the Gulf of Maine to Cape Hatteras, in the highest 90% of the area where juvenile summer flounder were collected. Juvenile summer flounder are found in water temperatures greater than 37^0 F and where salinities for optimal growth sin the 10 to 30 ppt range. Juveniles are found over muddy substrate but appear to prefer mostly sand.

Scup (*Stenotomus chrysops*)

Eggs: EFH is estuaries where scup eggs were identified as common, abundant, or highly abundant for the “mixing” and “seawater” salinity zones. In general, scup eggs are found from May through August in southern New England to coastal Virginia, in waters between 55 and 73^0 F and in salinities greater than 15 ppt.

Larvae: EFH is estuaries where scup were identified as common, abundant, or highly abundant for the “mixing” and “seawater” salinity zones. In general, scup larvae are most abundant nearshore from May through September, in waters between 55 and 73^0 F and in salinities greater than 15 ppt.

Juveniles: North of Cape Hatteras, EFH is the demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, in the highest 90% of the area where juvenile scup were collected. Generally, juvenile scup are found in water temperatures greater than 45^0 F and where salinities are greater than 15 ppt. Inshore, EFH is the estuaries where scup were identified as being common, abundant, or highly abundant for the “mixing” and “seawater” salinity zones. Juvenile scup are generally found in water temperatures greater than 45^0 F and where salinities are greater than 15 ppt. Juvenile scup, in general during the summer and spring are found in estuaries and bays between Virginia and Massachusetts. They are found in association with various sands, mud, mussel and eelgrass bed type substrates.

Adults: North of Cape Hatteras, EFH is the demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, in the highest 90% of the area where adult scup were collected. Wintering adults (November through April) are usually offshore, south of New York to North Carolina, in waters above 45^0 F. Inshore, EFH is the estuaries where scup were identified as being common, abundant, or highly abundant for the “mixing” and “seawater” salinity zones.

Black sea bass (*Centropristus striata*)

Juveniles: North of Cape Hatteras, EFH is the demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, in the highest 90% of the area where juvenile black sea bass were collected. Temperature preference is for areas warmer than 6^0 F with salinities greater than 18 ppt. Juvenile black sea bass are found in association with rough bottom, shellfish, and eelgrass beds, man-made structures in sandy-shelly areas; offshore clam beds and shell patches may also be used during the winter. They are found in coastal areas between Massachusetts and Virginia, but they winter offshore from New Jersey and south. Inshore, EFH is the estuaries where black sea bass were identified as being common, abundant, or highly abundant for the “mixing” and “seawater” salinity zones. Juveniles are found in the estuaries in the summer and spring.

Spanish mackerel (*Scomberomorus maculatus*)

Spanish mackerel is a marine species that can occur in the Atlantic Ocean from the Gulf of Maine to the Yucatan Peninsula. Bridgeport Harbor and surrounding waters are within an area designated as EFH for eggs, larval, juvenile, and adult Spanish mackerel. This species occurs most commonly between the Chesapeake Bay and the northern Gulf of Mexico from spring through autumn, and then over-winters in the waters of south Florida. Spanish mackerel spawn in the northern extent of their range (along the northern Gulf Coast and along the Atlantic Coast). Spawning begins in mid-June in the Chesapeake Bay and in late September off Long Island, New York. Temperature is an important factor in the timing of spawning and few spawn in temperatures below 26°C (79°F). Spanish mackerel apparently spawn at night. Studies indicate that Spanish mackerel spawn over the Inner Continental Shelf in water 12-34 m (39-112 ft) deep.

Spanish mackerel eggs are pelagic and about 1 mm in diameter. Hatching takes place after about 25 hours at a temperature of 26°C. Most larvae have been collected in coastal waters of the Gulf of Mexico and the east coast of the United States. Juvenile Spanish mackerel can use low salinity estuaries (~12.8 to 19.7 ppt) as nurseries and also tend to stay close inshore in open beach waters.

Overall, temperature and salinity are indicated as the major factors governing the distribution of this species. The northern extent of their common range is near Block Island, Rhode Island, near the 20°C (68°F) isotherm and the 18 meter contour. During warm years, they can be found as far north as Massachusetts. They prefer water from 21 to 27°C (70-81°F) and are rarely found in waters cooler than 18°C (64°F). Adult Spanish mackerel generally avoid freshwater or low salinity (less than 32 ppt) areas such as the mouths of rivers.

Because this is a marine species that prefers higher salinity waters, only occasional juvenile individuals may occur within Bridgeport Harbor and Long Island Sound.

King mackerel (*Scomberomorus cavalla*)

Bridgeport Harbor and surrounding waters is within an area designated as EFH for eggs, larval, juvenile, and adult king mackerel. King mackerel is a marine species that inhabits Atlantic coastal waters from the Gulf of Maine to Rio de Janeiro, Brazil, including the Gulf of Mexico. There may be two distinct populations of king mackerel. One group migrates from waters near Cape Canaveral, Florida south to the Gulf of Mexico, making it there by spring and continuing along the western Florida continental shelf throughout the summer. A second group migrates to waters off the coast of the Carolinas in the summer, after spending the spring in the waters of southern Florida, and continues on in the autumn to the northern extent of their range.

Overall, temperature appears to be the major factor governing the distribution of the species. The northern extent of its common range is near Block Island, Rhode Island, near the 20°C (68°F) isotherm and the 18-meter (59 ft) contour. King mackerel spawn in the northern Gulf of Mexico and southern Atlantic coast. Larvae have been collected from May to October, with a peak in September. In the south Atlantic, larvae have been collected at the surface with salinities ranging from 30 to 37 ppt and temperatures from 22 to 28°C (70-81°F). Adults are normally found in water with salinity ranging from 32 to 36 ppt.

King mackerel would likely occur only as rare transient individuals within the Bridgeport Harbor and surrounding waters in Long Island Sound. The proposed project would not result in adverse impacts to the EFH for this species.

Cobia (*Rachycentron canadum*)

Bridgeport Harbor and surrounding waters are within an area designated as EFH for eggs, larval, juvenile and adult cobia. Cobias are large, migratory, coastal pelagic fish of the monotypic family Rachycentridae. In the western Atlantic Ocean, cobia occur from Massachusetts to Argentina, but are most common along the south Atlantic coast of the United States and in the northern Gulf of Mexico In the eastern Gulf, cobia migrate from wintering grounds off south Florida into northeastern Gulf waters during early spring. They occur in the northwest Florida, Alabama, Mississippi, and southeast Louisiana wintering grounds in the fall. Some cobias overwinter in the northern Gulf at depths of 100 to 125 m (328 to 410 feet).

Information on the life history of cobia from the Gulf and the Atlantic Coast of the United States is limited. Essential fish habitat for coastal migratory pelagic species such as cobia include sandy shoal areas off of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone; but from the Gulf Stream shoreward, EFH includes areas inhabited by the brown alga *Sargassum.* For cobia, essential fish habitat also includes high salinity bays, estuaries, and seagrass habitat. The Gulf Stream is an essential fish habitat because it provides a mechanism to disperse coastal migratory pelagic larvae. Preferred temperatures are greater than 20°C and salinities are greater than 25 ppt.

Cobias are likely to occur only as rare transient individuals within the vicinity of the proposed project due to its coastal migrations, pelagic nature, and salinity requirements.

Sand tiger shark (*Odontaspis taurus*)

Neonate/early juveniles: Shallow coastal waters from Barnegat Inlet, NJ south to Cape Canaveral, FL to the 25 m isobath

FINDING OF NO SIGNIFICANT IMPACT

About 1,774,000 cubic yards of dredged material (including two-foot of overdepth dredging) would be removed to maintain the current authorized depths in the navigation channels, anchorages and turning basin in Bridgeport Harbor, except for Johnsons Creek. The material would be dredged with a mechanical dredge and placed into scows for disposal. Of that amount, approximately 666,000 cy of material is suitable for unconfined ocean disposal and the other 1,108,000 cubic yards is not suitable for unconfined ocean disposal.

The Federal base plan would dispose of the unsuitable material into a Confined Aquatic Disposal (CAD) cell(s) located in Bridgeport Harbor and the Morris Cove borrow pit located in New Haven Harbor. The suitable material would be disposed at the Central Long Island Disposal Site (CLIS) and also in the Morris Cove borrow pit. Digging the CAD cell and access channel to Morris Cove borrow pit would bring the total amount of material to be dredged to approximately 3,012,000 cubic yards.

I find that based on the evaluation of environmental effects discussed in this document, the decision on this application is not a major federal action significantly affecting the quality of the human environment. Under the Council on Environmental Quality ("CEQ") NEPA regulations, "NEPA significance" is a concept dependent upon context and intensity (40 C.F.R. § 1508.27). When considering a site-specific action like the proposed project, significance is measured by the impacts felt at a local scale, as opposed to a regional or nationwide context. The CEQ regulations identify a number of factors to measure the intensity of impact. These factors are discussed below, and none are implicated here to warrant a finding of NEPA significance. A review of these NEPA "intensity" factors reveals that the proposed action would not result in a significant impact--neither beneficial nor detrimental--to the human environment.

Impacts on public health or safety: The project is expected to have no effect on public health and safety.

Unique characteristics: There are no unique characteristics associated with this project.

Controversy: The proposed project is not controversial. State and Federal resource agencies agree with the Corps impact assessment.

Uncertain impacts: The impacts of the proposed project are not uncertain, they are readily understood based on past experiences the Corps has had with similar projects, such as the New Haven Harbor and Boston Harbor dredging projects.

Precedent for future actions: The proposed project is a maintenance dredging project and will not establish a precedent for future actions.

Cumulative significance: As discussed in the Environmental Assessment (EA), to the extent that other actions are expected to be related to project as proposed, these actions will provide little measurable cumulative impact.

Historic resources: The project will have no known negative impacts on any pre-contact, contact, or post-contact archaeological sites recorded by the State of Connecticut. An archaeological investigation has been requested by the CT State Historic Preservation Office (SHPO) and the Mashantucket Pequot Tribal Historic Preservation Officer (THPO). The investigation will require underwater remote sensing of all project areas. If any archaeological sites are discovered, action will be taken to avoid, minimize or mitigate any identified resources. These activities will be coordinated with the CT SHPO and the THPO in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations 36 CFR 800.

Endangered species: The project will have no known positive or negative impacts on any State or Federal threatened or endangered species.

Potential violation of state or federal law: This Federal action would not violate federal or state law.

Measures to minimize adverse environmental affects of the proposed action are discussed in Section 8 of the EA. These include measures to minimize turbidity and seasonal restrictions. Construction will be sequenced to minimize potential impacts to natural resources. Construction would begin in the fall and start with deepening the access channel to Morris Cove borrow pit. The access channel material would be disposed into the borrow pit. In order to minimize impacts to leased shellfish beds in Morris Cove, dredging of this channel will not occur from May 31 to September 30. No dredging in the Main Ship Channel would occur between Tongue Point and the Stratford Avenue Bridge in Bridgeport Harbor from February 1 through May 31 in order to avoid potential impacts to spawning winter flounder. In addition, the portions of the Main Ship Channel above the confluence with Yellow Mill Creek would be restricted from dredging operations from April 1 to June 30 due to anadromous fish runs. The top layer of the footprint of the proposed Bridgeport CAD cell needs to be excavated prior to start of winter flounder spawning season (February 1). Removing the silty layer of the CAD cell prior to the spawning season will allow dredging of the parent material being excavated to create the CAD cell by minimizing impact to winter flounder. Dredging activities in the entrance channel between Buoy No. 9 and the breakwaters may be restricted from May 31 to September 30 to minimize potential impacts to shellfish beds nearby. Further review is underway to determine if this restriction is necessary. If an alternative CAD cell is constructed west of the Main Ship Channel, dredging may not occur there from May 31 to September 30 to protect nearby shellfish resources.

A closed mechanical bucket will be used to minimize the turbidity from dredging the unsuitable material in the inner harbor, including the top of the CAD cell (s), In addition, no overflow from the scows will be allowed during the dredging of the unsuitable material. The unsuitable material placed in the CAD cell(s) and Morris Cove borrow pit will be capped with suitable material of sufficient depth to isolate contaminants from the surrounding environment. The navigation channel to the Morris Cove Borrow pit will be filled in once access to the Morris Cove pit is no longer required.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the maintenance dredging project at Bridgeport Harbor, Bridgeport, Connecticut is not a major Federal action significantly affecting the quality of the human environment. Therefore, this action is exempt from requirements to prepare an Environmental Impact Statement.

____________________	____________________________
DATE	Philip T. Feir Colonel, Corps of Engineers District Engineer

CLEAN WATER ACT SECTION 404 (b)(1) EVALUATION
U.S. ARMY CORPS OF ENGINEERS, NEW ENGLAND DISTRICT
CONCORD, MA

PROJECT: Bridgeport Harbor Dredged Material Maintenance Dredging Plan, Bridgeport, Connecticut

PROJECT MANAGER: Mr. Michael Keegan   Phone: (978) 318-8087

FORM COMPLETED BY: Ms. Catherine Rogers   Phone: (978) 318-8231

PROJECT DESCRIPTION:

About 1,774,000 cubic yards of dredged material (including two-foot of overdepth dredging) would be removed to maintain the current authorized depths in the navigation channels, anchorages and turning basin in Bridgeport Harbor, except for Johnsons Creek. The material would be dredged with a mechanical dredge and placed into scows for disposal. Of that amount, approximately 666,000 cy of material is suitable for unconfined ocean disposal and the other 1,108,000 cubic yards is not suitable for unconfined ocean disposal.

The Federal base plan would dispose of the unsuitable material into a Confined Aquatic Disposal (CAD) cell(s) located in Bridgeport Harbor and the Morris Cove borrow pit located in New Haven Harbor. The suitable material would be disposed at the Central Long Island Disposal Site (CLIS) and also in the borrow pit. Digging the CAD cell and access channel to Morris Cove borrow pit would bring the total amount of material to be dredged to approximately 3,017,000 cubic yards.

The following measures will be taken to minimize adverse environmental affects of the proposed action. These include measures to minimize turbidity and seasonal restrictions. Construction will be sequenced to minimize potential impacts to natural resources. Construction would begin in the fall and start with deepening the access channel to Morris Cove borrow pit. The access channel material would be disposed into the borrow pit. In order to minimize impacts to leased shellfish beds in Morris Cove, dredging of this channel will not occur from May 31 to September 30. No dredging in the Main Ship Channel would occur between Tongue Point and the Stratford Avenue Bridge in Bridgeport Harbor from February 1 through May 31 in order to avoid potential impacts to spawning winter flounder. In addition, the portions of the Main Ship Channel above the confluence with Yellow Mill Creek would be restricted from dredging operations from April 1 to June 30 due to anadromous fish runs. The top layer of the footprint of the proposed Bridgeport CAD cell needs to be excavated prior to start of winter flounder spawning season (February 1). The top layer is comprised of silty material which could temporarily suspended and cause turbidity in the water column. Removing the silty layer of the CAD cell prior to the spawning season will allow dredging of the parent material being excavated to create the CAD cell without any time of year restriction. This is because the parent material is comprised of a sandy gravelly mix which is unlikely to cause turbidity. Sequencing CAD cell excavation as identified above will minimize impact to winter flounder. Dredging activities in the entrance channel between Buoy No. 9 and the breakwaters may be restricted from May 31 to September 30 to minimize potential impacts to shellfish beds nearby. Further review is underway to determine if this restriction is necessary. If an alternative CAD cell is constructed west of the Main Ship Channel, dredging may not occur there from May 31 to September 30 to protect nearby shellfish resources.

A closed mechanical bucket will be used to minimize the turbidity from dredging the unsuitable material in the inner harbor, including the top of the CAD cell (s), In addition, no overflow from the scows will be allowed during the dredging of the unsuitable material. The unsuitable material placed in the CAD cell(s) and Morris Cove borrow pit will be capped with suitable material of sufficient depth to isolate contaminants from the surrounding environment. The navigation channel to the Morris Cove Borrow pit will be filled in once access to the Morris Cove pit is no longer required. The request to fill in the channel was made by shellfish interests who indicated filling in the channel will result in a better habitat for shellfish, particularly oysters. Dredged material from the outer harbor dredging will be used to fill in the channel after the capping of the Morris Cove borrow pit.

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS
Evaluation of Clean Water Act Section 404(b)(1) Guidelines

PROJECT: Bridgeport Harbor Dredged Material Maintenance Dredging Plan, Connecticut

1. Review of Compliance (Section 230.10(a)-(d)).

		YES	NO
a.	The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	| X |	|__|
b.	The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and 3) violate requirements of any Federally designated marine sanctuary	| X |	|__|
c.	The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values	| X |	|__|
d.	Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem	| X |	|__|

2. Technical Evaluation Factors (Subparts C-F).

	N/A	Not Signif-icant	Signif-icant*
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).			
1) Substrate.		X	
2) Suspended particulates/turbidity.		X	
3) Water.		X	
4) Current patterns and water circulation.		X	
5) Normal water fluctuations.		X	
6) Salinity gradients.	X		
b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D).			
1) Threatened and endangered species.	X		
2) Fish, crustaceans, mollusks and other aquatic organisms in the food web.		X	
3) Other wildlife.		X	
c. Potential Impacts on Special Aquatic Sites (Subpart E).			
1) Sanctuaries and refuges.	X		
2) Wetlands.	X		
3) Mud flats.	X		
4) Vegetated shallows.	X		
5) Coral reefs.	X		
6) Riffle and pool complexes.	X		
d. Potential Effects on Human Use Characteristics (Subpart F)			
1) Municipal and private water supplies.	X		
2) Recreational and commercial fisheries.		X	
3) Water related recreation.		X	
4) Aesthetics.		X	
5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves.	X		

3. <u>Evaluation and Testing (Subpart G)</u>.

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

1)	Physical characteristics.........................	| X |
2)	Hydrography in relation to known or anticipated sources of contaminants..............	| X |
3)	Results from previous testing of the material or similar material in the vicinity of the project...	| |
4)	Known, significant sources of persistent pesticides from land runoff or percolation.....	| |
5)	Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)........	| |
6)	Public records of significant introduction of contaminants from industries, municipalities, or other sources.....	| |
7)	Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities.............	| |
8)	Other sources (specify)	| |

List appropriate references.

Environmental Assessment for Bridgeport Harbor DMMP, Connecticut, 2008

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints.

X		|__|
YES	NO

4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

1)	Depth of water at disposal site	| |
2)	Current velocity, direction, and variability at the disposal site....................	| X |
3)	Degree of turbulence	| X |
4)	Water column stratification	| |
5)	Discharge vessel speed and direction....................	| |
6)	Rate of discharge................................	| |
7)	Dredged material characteristics (constituents, amount, and type of material, settling velocities)	| X |
8)	Number of discharges per unit of time	| |
9)	Other factors affecting rates and patterns of mixing (specify)....................	| X |

List appropriate references:

Environmental Assessment for Bridgeport Harbor DMMP, Connecticut, 2008

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone is acceptable

X	YES	NO
| X |	| |

5. Actions To Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.

YES	NO
| X |	| |

List actions taken:

See Project Description.

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

a.	Physical substrate (review sections 2a, 3, 4, and 5 above).	YES | X | NO | |
b.	Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5).	YES | X | NO | |
c.	Suspended particulates/turbidity (review sections 2a, 3, 4, and 5).	YES | X | NO | |
d.	Contaminant availability (review sections 2a, 3, and 4).	YES | X | NO | |
e.	Aquatic ecosystem structure, function and organisms (review sections 2b and c, 3, and 5)	YES | X | NO | |
f.	Proposed disposal site (review sections 2, 4, and 5).	YES | X | NO | |
g.	Cumulative effects on the aquatic ecosystem.	YES | X | NO | |
h.	Secondary effects on the aquatic ecosystem.	YES | X | NO | |

7. Findings of Compliance or non-compliance.

The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines. YES | X | NO | |

____
DATE

____
Philip T. Feir
Colonel, Corps of Engineers
District Engineer