2. EXISTING CONDITIONS

The Masonville site has been studied at the conceptual, reconnaissance, pre-feasibility and State feasibility levels. This chapter provides results from these studies and describes the existing conditions of the environmental, cultural, socioeconomic, and recreational resources within the vicinity of the Masonville site. On-site construction materials (sand and clay) are being considered as part of this project and the sediment quality within the dredged material containment facility (DMCF) footprint was assessed. This is referred to as on-site borrow material. The use of off-site construction material from the Seagirt Marine Terminal channel deepening and widening project is also being considered. This is referred to as the Seagirt borrow material. Studies have been completed to assess the quality of this material and its suitability for use as construction material.

The Masonville site consists of the existing Masonville Marine Terminal (MMT) property and the open water adjacent to the MMT site that is owned by the State of Maryland (Figure 2-1). This area includes shoreline, upland, and aquatic or open water areas. Prior to its acquisition by Maryland Port Administration (MPA) in 1978, Masonville was used first for sand and gravel mining and then later as a dredged material placement site by the Arundel Corporation. The site was also used for the disposal of building and ship debris, mining tailings, and incinerator waste. After acquiring the property, the MPA continued to use the site for dredged material placement through 1989.

The Masonville peninsula is comprised of two sections, Phase I and Phase II (Figure 2-1). Phase I was completed as an automobile terminal in 2000. Final construction of Masonville Phase II to prepare this area for automobile storage began in 2002 and is ongoing. A channel directly east of the existing MMT, and bordered by the former Kurt Iron and Metal (KIM) facility, is included within the proposed alignment for the proposed Masonville DMCF. The former KIM site was operated as a ship scrapping facility until 1997. Since its purchase by the MPA, an environmental survey of the site has been completed and clean-up efforts are currently underway. The former KIM property and adjacent channel are within the Masonville DMCF footprint and include 25 sunken and derelict vessels. A project is currently underway to convert 10.5 acres of the former KIM property for additional automobile storage.

The northern and western shorelines of Masonville Phase II are characterized by stable areas with sparse to moderate vegetation, beaches, and banks with signs of erosion. Erosion is severe in some portions of the shoreline. The shoreline along Phase II is vegetated and extends at a steep slope to the top of Masonville Phase II, which has an elevation of approximately 30 feet (ft). Along the western side of Phase II, there is a bench at an elevation of approximately 15 ft. The majority of this western shoreline is made up of rubble, concrete, and old pilings. Severe erosion is occurring along the banks in some areas.

The southern shoreline of Masonville Cove has gentler slopes, with maximum elevations typically less than 5 ft. The southern and western shorelines of the Cove are vegetated and stable. Along the southern shoreline there are exposed tanks and a defunct pier that decrease wave action and are causing shoaling in parts of the Cove. There are two stormwater outfalls located in the southeastern portion of the Cove. A large amount of debris is present along the

Figure 2-1. Proposed Project Area, Proposed Masonville DMCF Footprint, and Adjacent Existing Land Area

shoreline of the Cove, ranging from plastic bottles and other floatable debris to electrical insulators and other rubble. Masonville Cove provides habitat for aquatic species and birds. The Cove is designated a Habitat Protection Area by the City of Baltimore and the Maryland Department of Natural Resources (DNR).

Environmental studies were conducted from 2003 through 2005 to examine the potential for using the Masonville site in Baltimore City, MD as a containment facility for dredged material from Harbor channels and anchorages of the Port of Baltimore. Initially, this included only reconnaissance studies. State feasibility-level studies were conducted in the spring, summer, and fall of 2004 (EA 2005a, 2005b, 2005c). Throughout the study, a variety of footprints were examined and sampling locations were adjusted to accommodate the changing plans. All proposed alignments studied during the reconnaissance and State feasibility-level phases included KIM channel, which serviced the former KIM facility, in the footprint (Figure 2-1). In addition, a cove immediately west of Masonville was studied as a habitat protection and restoration area. Masonville Cove is used in the proposed mitigation plan (Chapter 6) and the KIM Channel lies within the proposed DMCF footprint and would be part of the DMCF (Figure 2-1). The reconnaissance study included literature searches, reviews of existing environmental conditions, and a reconnaissance-level field investigation. State feasibility-level environmental studies included more in-depth seasonal studies of the aquatic and other natural resources adjacent to and within the site. State feasibility-level environmental studies included water quality; sediment quality; aquatic resources; terrestrial resources; and rare, threatened, and endangered (RTE) species. Aquatic resource studies were divided into the following areas: plankton (free-floating, generally microscopic, aquatic organisms), fisheries, benthos (bottom-dwelling organisms, primarily aquatic insects), and submerged aquatic vegetation (SAV). Birds and other wildlife were investigated as part of terrestrial resource studies. Table 2-1 summarizes the studies completed in each year. Surveys that specifically targeted avian species were also completed in February, March, April, June, August, and September of 2005.

Table 2-1. Environmental Studies Completed During Each Survey Period

	2003 Reconnaissance Study	2004 Spring Feasibility[1] Survey	2004 Summer Feasibility Survey	2004 Fall Feasibility Survey	2005 Spring Survey	2005 Summer Survey	2005 Fall Survey
Water Quality	X[2]	X	X	X	X	X	
Sediment Quality	X		X			X	
Nutrient Analysis	X		X				
Fish	X	X		X		X	
Benthos	X	C	X	C		X	
Plankton			X				
SAV	W	W		W		W	X
Terrestrial Vegetation and Wetlands	X	W	W	W			
Avian and Wildlife	X	W	W	W			

(1)Feasibility refers to the State feasibility-level.
(2)X indicates that the study was completed. C indicates that only Masonville Cove was studied. W indicates that observations from the water were recorded. A blank cell indicates that the study was not conducted.

2.1 ENVIRONMENTAL RESOURCES

2.1.1 Project Setting

2.1.1.1 Location

The proposed Masonville DMCF site (Figure 2-1) is located in the Patapsco River, which drains into the upper Chesapeake Bay north of the Bay Bridge (Route 50). The site is located approximately 3 miles south of the Inner Harbor area of Baltimore and 1 mile southwest of Fort McHenry. The site is located half a mile northwest of the Baltimore Harbor Tunnel toll plaza (I-895) in the Fairfield area of South Baltimore. The site lies entirely within the Baltimore City limits and is approximately 1.5 miles from the Baltimore County and Anne Arundel County lines (Figures 1-1, 1-3).

The proposed Masonville DMCF site is bordered by the Patapsco River to the north, an industrial site to the south, and approximately 55 acres of habitat protection area to the west. The shoreline adjacent to the proposed Masonville site is owned by the Maryland Department of Transportation (MDOT) and managed by the MPA. The channel, referred to as KIM Channel, located directly east of the Masonville site is bordered by the former KIM site and is part of the current Mercedes Benz facility, which is used for automobile importation. KIM Channel is included in the Masonville containment facility footprint. The proposed project footprint includes six acres that are not connected to the main portion of the proposed alignment. These six acres are referred to as the Wet Basin (Figure 2-1).

The Seagirt borrow material source is located adjacent to Seagirt Marine Terminal within the Seagirt dredging area for the access channel deepening and widening project. Seagirt Marine Terminal is located along the north shore of the Patapsco River, just west of Colgate Creek. The site is approximately 1.5 miles east of Fort McHenry, less than 1 mile east of the Harbor Tunnel (I-895), and approximately 3 miles southeast of the Inner Harbor area of Baltimore. The Seagirt dredging area is approximately 2 miles east of the proposed Masonville DMCF. Seagirt Marine Terminal is situated within the Baltimore City limits, but is less than 1 mile from the Baltimore City-Baltimore County line (Figure 1-4). The Seagirt dredging area is bordered by Colgate Creek and Dundalk Marine Terminal to the east, the Patapsco River to the south, the Point Breeze Industrial Park to the north, and the Canton Industrial Area to the west (Figure 1-4). The area proposed for dredging is located in the Patapsco River, just south of Seagirt Marine Terminal (Figure 1-4). This area is owned by the State of Maryland.

2.1.1.2 Climate

The Baltimore area is characterized by hot summers and cool winters. The highest recorded temperature for the city of Baltimore is from July 10, 1936 when the temperature was 107 degrees Fahrenheit and the lowest temperature on record is -7 degrees Fahrenheit, which was recorded on February 10, 1899. The average annual precipitation is 42.34 inches. The average annual snowfall is 20.5 inches. On average, only seven days per year have at least one inch of snow on the ground. The sun shines an average of 63 percent of the time in the summer and an average of 52 percent of the time in the winter. The prevailing wind comes from the west-northwest (USDA NRCS 1998).

2.1.2 Physiography, Geology, Soils, and Groundwater

2.1.2.1 Physiography

Most of the proposed project area is open water (130 acres). Approximately 10 acres of uplands and 1 acre of vegetated wetlands are also within the proposed project area. The upland portion reaches from MHW to approximately +32 ft MLLW, which is the height of MMT Phase 2. The vegetated wetlands are at approximately MHW, portions of them are tidal. The depth of the water is discussed in Section 2.1.3.1.

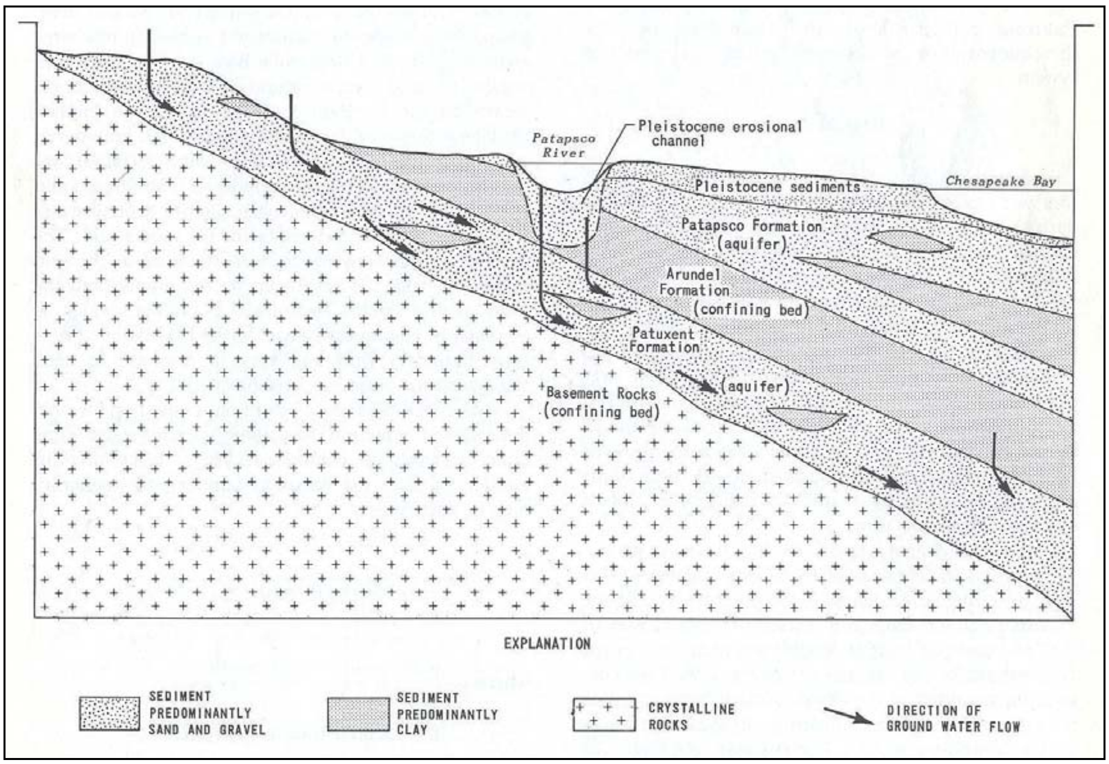
The Seagirt dredging area is located entirely underwater. Bathymetry for this area is discussed in Section 2.1.3.1.

2.1.2.2 Geology

The proposed Masonville DMCF site, the Seagirt dredging area, and the City of Baltimore lie on the fall line between the Atlantic Coastal Plain (Western Shore Uplands Region) and the Piedmont Plateau. The Chesapeake Bay lies within the Coastal Plain. The Coastal Plain is characterized by low hills, shallow valleys, flat plains and terraces. The Brooklyn-Curtis Peninsula that the Masonville site is located on is a long, narrow peninsula extending and sloping southeast toward the Chesapeake Bay (Greiner Engineering Science *et. al.* 1982, USDA NRCS 1998).

The Coastal Plain is made up of soft, unconsolidated and easily-eroded deposits of coarse to fine sediments. These sediments were transported over time onto the Piedmont Plateau, which was flat and only a few feet above sea level prior to the deposition of these sediments. During the Cretaceous period, the Coastal Plain was lowered and the Piedmont Plateau was elevated, resulting in an increase in deposition of eroded material in the lower coastal regions. This caused sediment formations that slope toward the southeast and the Chesapeake Bay (Greiner Engineering Sciences *et. al*. 1982)

Three formations of sediments comprise the Coastal Plain: the Patuxent, Arundel and Patapsco formations. The Masonville site is located within the outcrop zone of the Patapsco Formation. This formation is separated from the Patuxent Formation by the Arundel formation, which is comprised of an approximately 50 ft thick layer of impervious clays. The Patuxent Formation consists of irregular deposits of sand and gravel intermeddled with clay (Figure 2-2) (Greiner Engineering Sciences *et. al*. 1982).



Source: Chapelle 1985

Figure 2-2. Potential Method of Saltwater Intrusion in the Patuxent Formation

2.1.2.3 Soils

The soil types present at the existing MMT include Sulfaquepts (32, 37), Udorthents (42E), and Urban Land (44UC). These soils are listed and described in Table 2-2. Both types of Sulfaquepts found in the study area are nearly level and poorly drained. Sulfaquept soils are composed of sulfur rich sediments dredged from the Harbor and can consist of organic or inorganic waste from human activity or salty, sandy, gravelly, clayey soil matter. These soils are extremely acidic, potentially corrosive to building materials, and may be toxic to some species because of their acidity and high metal content. These soils are also subject to subsidence, which makes them generally unsuited for building sites (USDA NRCS 1998).

The areas consisting of Udorthents, smoothed, 0 to 35 percent slopes are made up of earthen fill and nonsolid material. According to the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), this soil may consist of organic or inorganic waste from human activity or salty, sandy, gravelly, clayey soil matter. The surface layer is a very dark, grayish brown, gravelly, sandy loam with brick and glass fragments and is generally five inches thick. The subsoil fill material is made up of stratified layers of sand, sandy loam, and gravelly sandy loam with charcoal, ash, and brick fragments. Areas with Udorthents soils are subject to differential settling, which makes them poor building sites (USDA NRCS 1998).

Urban land areas are more than 80 percent covered with impervious surfaces, such as parking lots. They are generally level or moderately sloping (USDA NRCS 1998).

Table 2-2. Soil Types at the Existing Masonville Site

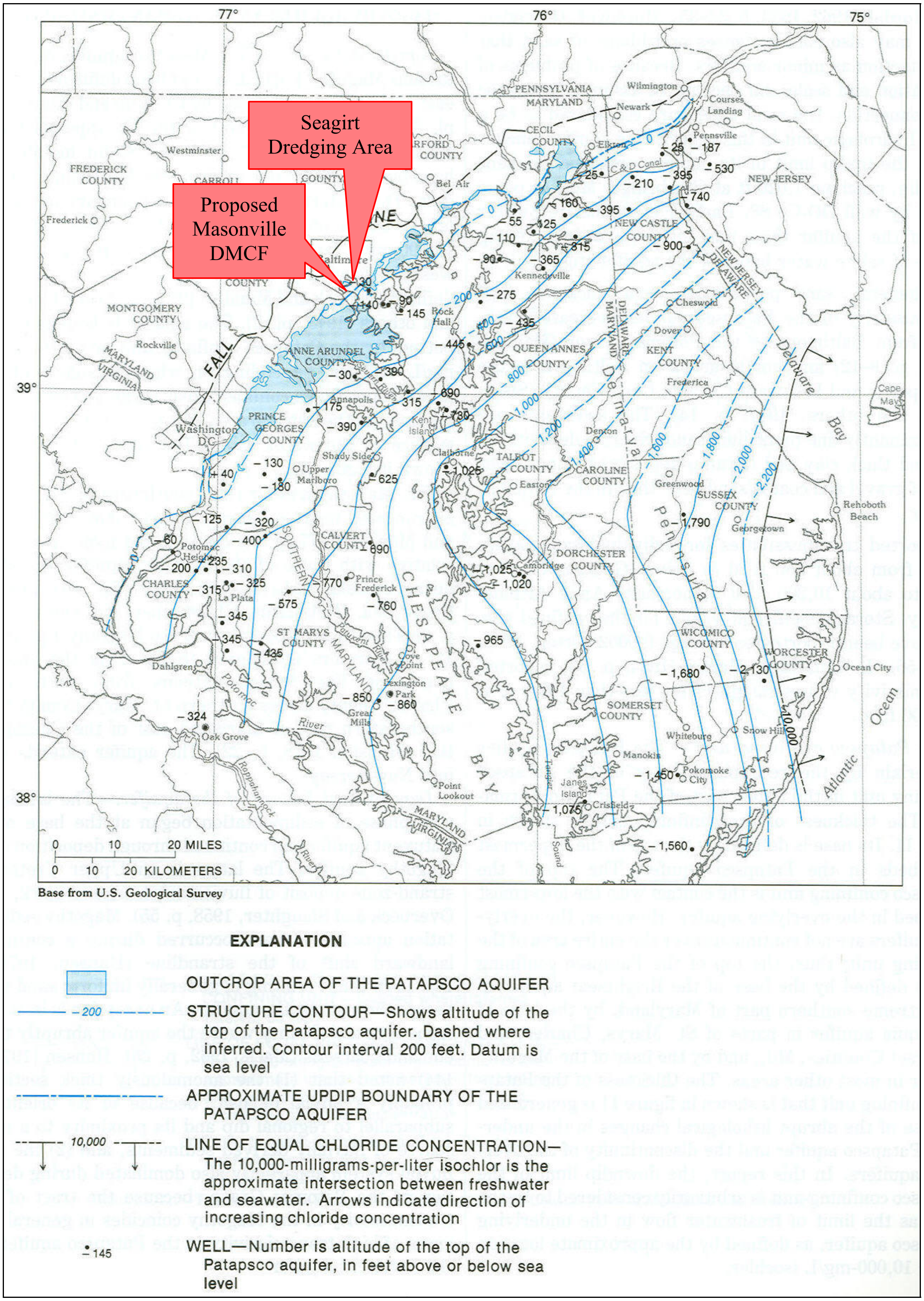
Soil Type	Permeability	Available Water Capacity	Slopes	Shrink-Swell Potential	Flooding	Soil Constraints
Sulfaquepts, dredge (32)	Variable	Variable	Complex and Irregular	High	--	Subsidence, acidic, high metal content, wetness
Sulfaquepts, frequently flooded (37)	Variable	Variable	Nearly Level	High	Yes	Subsidence, acidic, high metal content, wetness
Udorthents, smoothed, 0 to 35% slopes (42E)	Variable	Variable	Complex and Irregular	High	--	Differential settling, low fertility
Urban Lands (44UC)	Impervious	None	Nearly Level	Low	--	Soil types undetermined

Source: USDA NRCS 1998

Since the Seagirt dredging area is located entirely underwater, there are no soils in the dredging area.

2.1.2.4 Groundwater

There are two aquifers at the proposed Masonville DMCF site. These same two aquifers underlie the Seagirt dredging area. An aquifer is a layer of underground rock or sand that stores and carries water. The surficial aquifer is the Patapsco formation. The leading edge of this aquifer begins in the Masonville area; the Patapsco Formation thickens east of the site. The outcrop of the Patapsco formation occurs just southeast of the site (Figure 2-3) (USGS 1991).



Source: USGS 1991

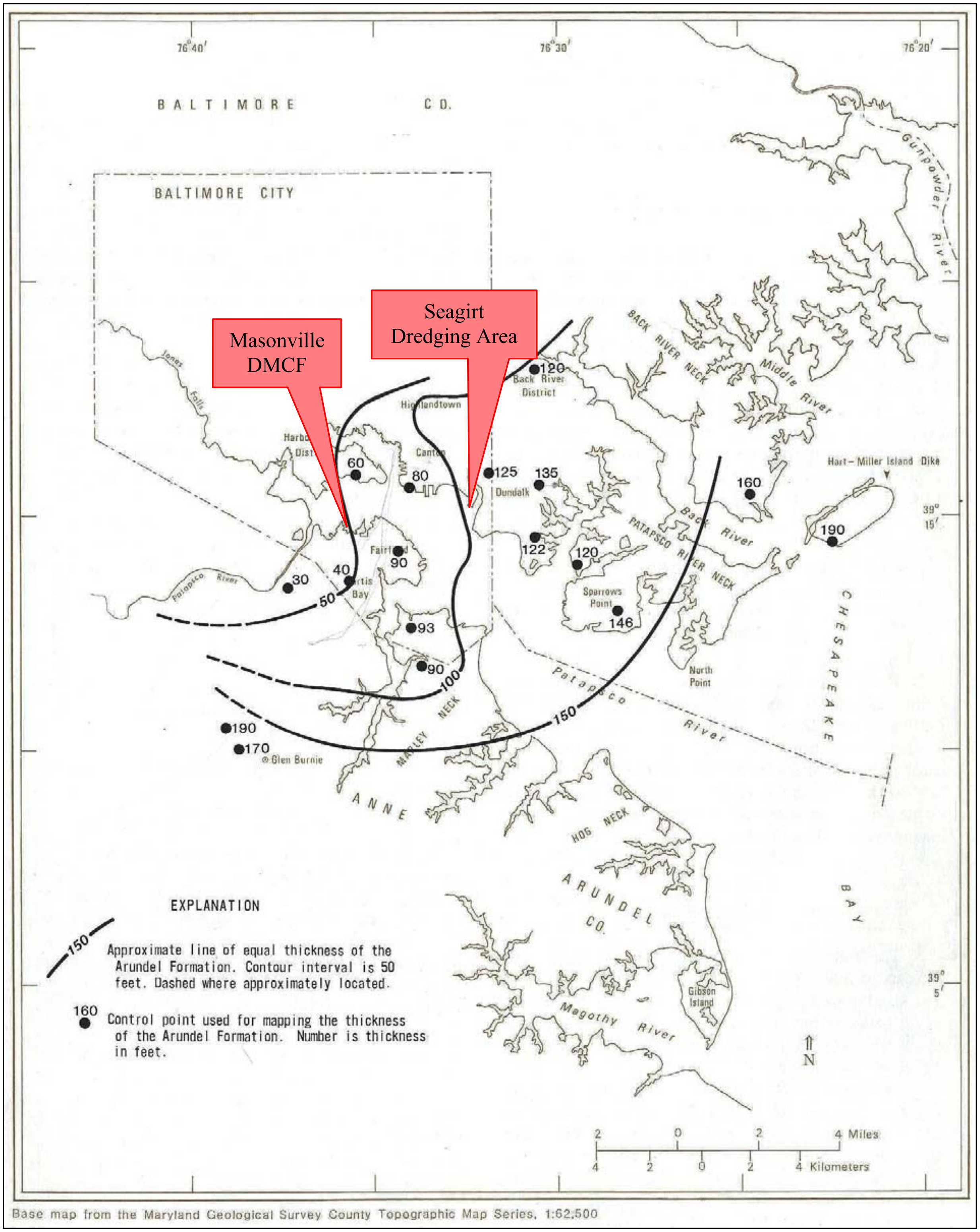
Figure 2-3. Outcrop Elevations of the Patapsco Formation

The Patapsco formation has been eroded in this area and begins adjacent to the Fairfield Marine Terminal. The site abuts the northwestern edge of the upper Patapsco and waters of the Patapsco River likely communicate with this leading northwest edge of the outcrop zone. This aquifer consists primarily of medium- to fine-grained quartz sand and functions as the water table throughout the Masonville project site and Seagirt dredging areas (Chapelle 1985). The Patapsco Formation and overlying units in the Baltimore Harbor region have been naturally eroded over geologic time and, thus impacted by salt water intrusion.

The lower aquifer is the Patuxent formation. This formation overlies the basement rocks and is composed primarily of medium- to coarse-grained quartz sand (Chapelle 1985). This is the most productive source of groundwater in the Baltimore area and rate of groundwater movement ranges from 2,000 to 8,000 cubic ft per day (Chapelle 1985). These two aquifers are separated by the Arundel formation, which is a clay confining layer 30 to 50 ft thick in the Masonville project area (Figure 2-4) (Chapelle 1985). This confining layer is approximately 100 ft thick in the Seagirt dredging area. This clay confining layer prevents water from the surficial aquifer from intruding into the lower aquifer. The Arundel formation is continuous beneath the entire area including the proposed DMCF site and Seagirt dredging area (Figure 2-4). The Patuxent Formation begins at a depth of approximately 150 feet in the Seagirt dredging area and 100 feet in the Masonville project area (Figure 2-5) (Chapelle 1985). Elevations of the Patuxent formation indicate that groundwater flows toward the southeast (Figure 2-5). The water table may flow towards the Patapsco River.

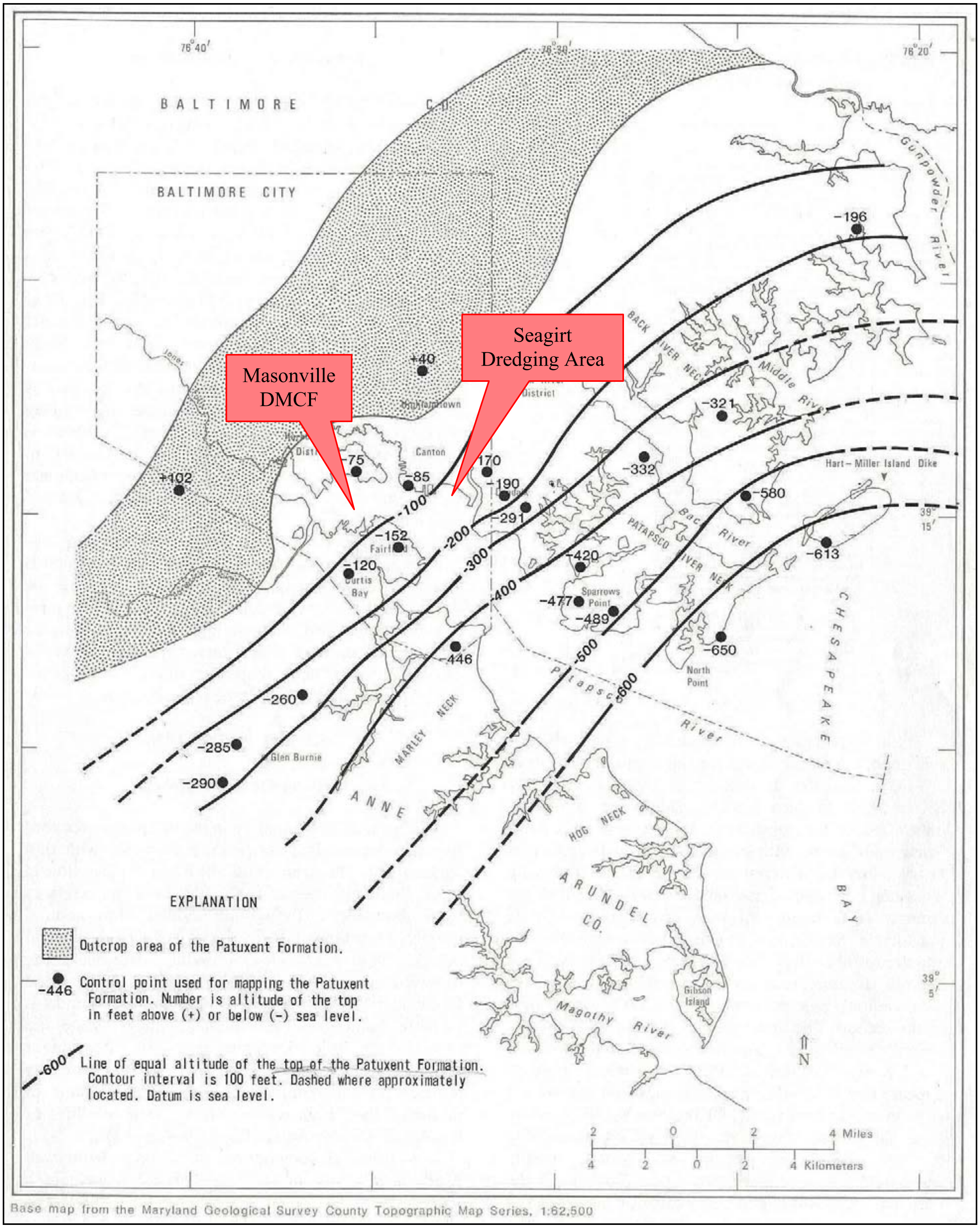
The Patuxent aquifer is confined beneath the Masonville site and the Seagirt dredging area. Between 1945 and 1982 there has been a decrease in groundwater use in the Patuxent formation resulting in a rise in water levels in this formation. While the Patuxent formation is contaminated with chlorides (which originated from areas where it sub crops beneath the Patapsco estuary) (Chapelle 1985), the Arundel clay formation prevents further intrusion in the area of the Masonville site. The Arundel formation is extremely dense, tight clay with very low hydraulic conductivities. It functions as an aquaclude preventing communication between the upper Patapsco formation and the lower Patuxent formation. The formation is estimated to have vertical hydraulic conductivities that range between 10^{-9} and 10^{-11} feet per second (Chapelle 1985). This functionally prevents intrusion from the upper formations to the lower. The basement rock formation beneath the Patuxent is considered essentially impermeable although some minor movement can occur in secondary cracks and fractures (Chapelle 1985).

Groundwater in the Masonville and Seagirt areas was heavily used by industry in the early 1900s. After heavy withdrawal of groundwater around the time of World War II, saltwater intruded into the aquifer in the Patuxent Formation. This contamination of the aquifer with salt water included the Masonville and former KIM facility area (Chapelle 1985). This, combined with the availability of public water, resulted in a decline of industrial well use of groundwater in the area (Greiner Engineering Sciences *et. al*. 1982). The most recent data available (1982) indicated that the Patuxent aquifer contains a circular plume of brackish water, which has a salinity between that of freshwater and saltwater, approximately five miles in diameter. Figure 2-2 shows how the intrusion of brackish water may have occurred. The plume contained in the Patuxent formation grew during the period from 1945 to 1982. No in depth studies on groundwater are known to have been completed on this area since that time.



Source: Chapelle 1985

Figure 2-4. Thickness of the Arundel Formation in the Patapsco River



Source: Chapelle 1985

Figure 2-5. Elevations of the Patuxent Formation

The Upper Patapsco Formation was also used for its groundwater resources during the early development of the Masonville/Fairfield peninsula. In the early part of the 20th century, water was withdrawn at a rate of about 3 to 4 million gallons per day (mgd). By 1945 the only major user in the Baltimore Harbor area was the Bethlehem Steel plant at Sparrows Point which was withdrawing 3 mgd. By 1985, there was no major use of the Patapsco aquifer around the Harbor (USACE 1997). The intrusion of saltwater into this aquifer ended its use (Greiner Engineering Sciences *et. al*. 1982). Information from the 1982 study also indicated that the Patapsco Formation contained a zone of brackish water contamination. This zone of contamination decreased during the period from 1945 to 1982. Modeling indicated that the plume within the Patapsco formation will remain immobile if pumping patterns remain consistent with those from 1982 (Chapelle 1985).

Data from groundwater studies conducted by EBA Engineering at the former KIM facility in 2004 (EBA 2005) indicated concentrations of a number of constituents that exceeded the U.S. Environmental Protection Agency's (USEPA's) drinking water criteria. These constituents and the concentrations measured are listed in Table 2-3.

Table 2-3. Groundwater Contaminants Exceeding Groundwater Cleanup Standards

Compound	Groundwater Cleanup Standard(mg/L)	Sample Values Greater Than the Standard (mg/L)
Benzene	0.005	0.017
Chlorobenzene	0.011	0.746
Chrysene	0.01	0.029
Dibenz(a,h)anthracene	0.01	0.016
Dibenzofuran	0.01	0.016, 0.040
1,3 Dichlorobenzene	0.018	0.983
Hexachloroethane	0.01	0.022
Indeno(1,2,3-c,d)pyrene	0.01	0.041
Isophorone	0.07	2.071
2-Methylnaphthalene	0.02	0.050, 0.034, 0.026
Naphthalene	0.02	1.2701, 1.310
N-Nitrosos-di-n-propylamine	0.01	0.016
2,2 Oxybis(1-Chloropropane)	0.01	0.042
Mercury (total)	0.002	0.0029, 0.0277, 0.0034, 0.0050, 0.0030, 0.0054
Arsenic	0.005	0.06, 0.06
Copper	1.3	3.22, 1.58
Lead	0.015	2.60, 1.39, 2.51, 0.51, 0.51, 0.38,
Nickel	0.07	0.08, 0.37, 0.10, 0.06
Silver	0.02	0.09
Zinc	1	2.53, 1.37, 3.56, 8.38, 3.66, 1.26, 2.53

Source: EBA 2005

The former KIM site has been approved by Maryland Department of the Environment (MDE) for remediation through the Voluntary Cleanup Program. This program was designed to "encourage the investigation of eligible properties with known or perceived controlled hazardous substance contamination, protect public health and the environment, accelerate cleanup of properties, and provide liability releases and finality to site cleanup" (MDE 2005a). The Response Action Plan, which is the plan to address on-site contamination, includes capping (covering) the site, which has been cleared of all surface sources of contaminants. Once capped, further infiltration would cease on that site and all stormwater would no longer come in contact with soil contaminants, which would prevent the leaching of contaminants into groundwater.
0
A well search was completed to determine whether or not there were any drinking water wells located within 1 mile of the Masonville site. There were three USGS wells located within a 1 mile radius. Each of these wells intersects the Patuxent aquifer. Additional information on these wells can be found in Appendix A. The remaining wells appeared to be monitoring wells (EDR 2006). Groundwater within the area surrounding Masonville was not identified as being used as a potable source of water. Residents residing within close proximity of the site receive potable water from the Baltimore Department of Public Works supply system reservoirs in Baltimore County. A search for wells supplying potable water within City of Baltimore indicated that all drinking water within the City of Baltimore comes from surface water sources (Appendix A). Consultation with the City of Baltimore Environmental Health Division indicated that there are no wells supplying potable water permitted within the City of Baltimore (Bohenek 2006). A permit would be required for a portable water well to be installed. The groundwater in the Masonville area and the City of Baltimore as a whole is not used as a source of potable water. Residents residing within close proximity of the site receive potable water from the Baltimore Department of Public Works supply system reservoirs in Baltimore County. Although the groundwater flowing below the site is not used as a drinking water source, the groundwater may also be transporting contaminants to the surface waters of the Patapsco River.

2.1.3 Hydrology and Hydrodynamics

2.1.3.1 Bathymetry

The average depth within the proposed Masonville DMCF is approximately 10 ft and ranges from 0 to 20 ft throughout most of the site, but reaches a depth of approximately 40 ft along the eastern portion of the site. Figure 2-6 shows the existing bathymetry at the Masonville site, which was taken from single-beam hydrographic survey data provided by Gahagan and Bryant Associates, Inc. (GBA) in April 2005.

The Seagirt borrow material comes from a dredging area that abuts a bulkhead adjacent to Seagirt Marine Terminal and covers an area of 128 acres. The existing depth of the site ranges from 15 feet to 47 ft. Most of this site has been dredged to -42 ft MLLW. The site bathymetry is shown in Figure 2-7.

2.1.3.2 Freshwater Inflow

The drainage area of the Chesapeake Bay is approximately 64,000 square miles and includes

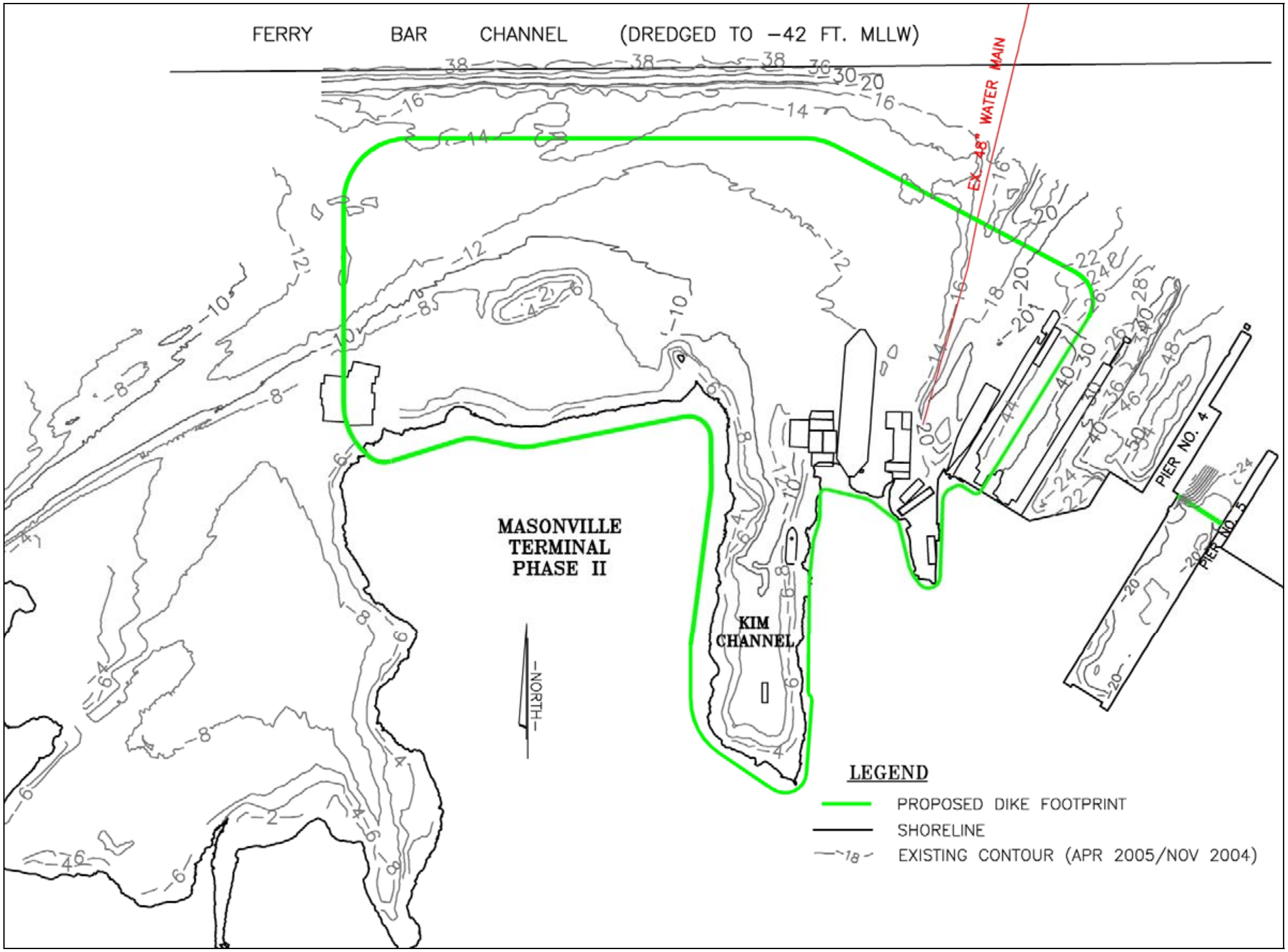


Figure 2-6. Proposed Masonville DMCF Site Bathymetry

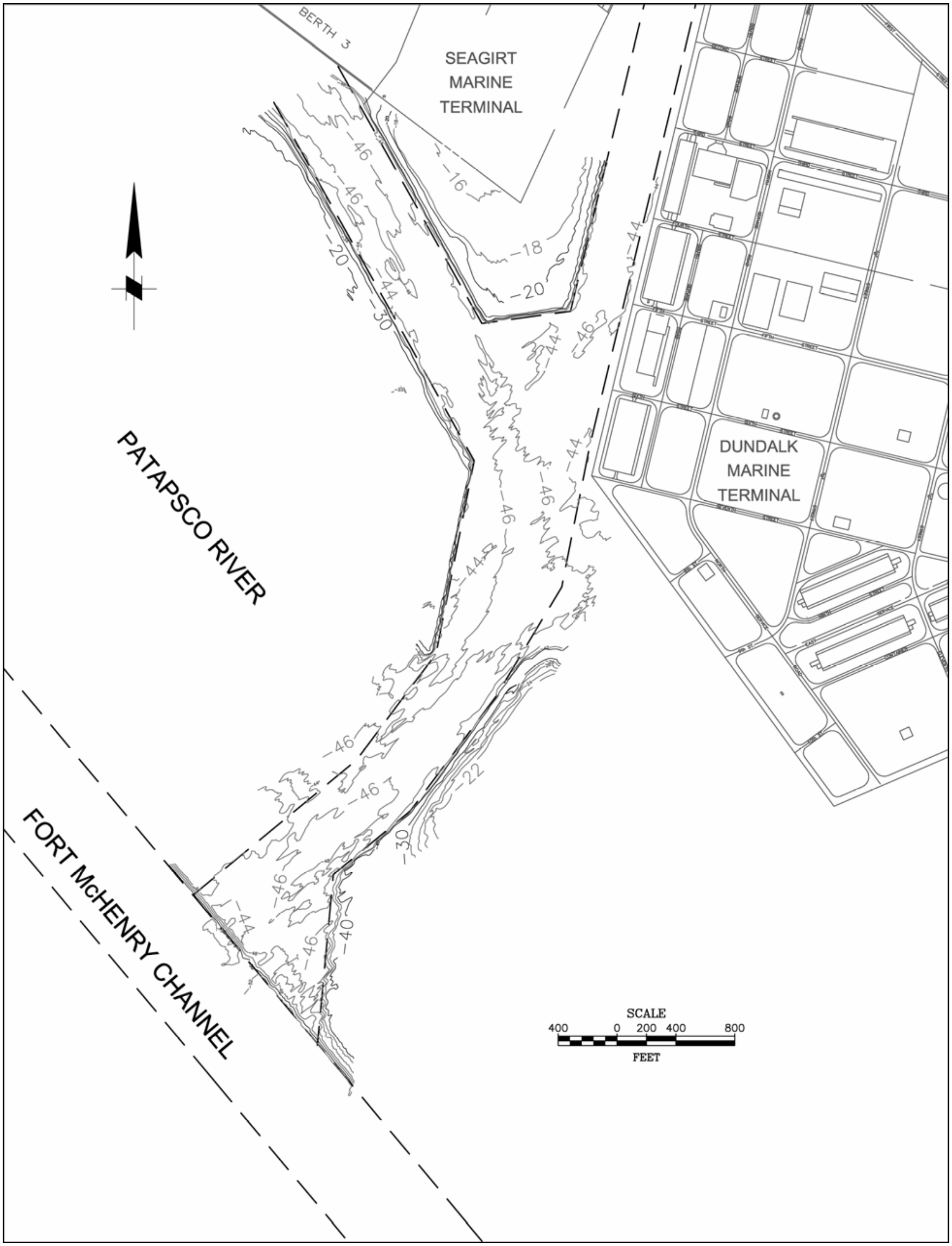


Figure 2-7. Seagirt Dredging Area Bathymetry

portions of Maryland, Virginia, West Virginia, Pennsylvania, New York and the District of Columbia. Freshwater enters the Chesapeake Bay via approximately 150 major rivers and streams at a rate of approximately 80,000 cubic feet per second (Schubel and Pritchard 1987). The primary rivers within the Chesapeake Bay drainage basin are the Susquehanna, Chester, Severn, Choptank, Patuxent, Nanticoke, Potomac, Rappahannock, York, and James. The Susquehanna River provides, on average, 48 percent of the total freshwater inflow into the Bay. Additionally, the other major rivers on the western shore of the Bay are the Potomac, James, Rappahannock, York, and Patuxent, contributing 13.6 percent, 12.5 percent, 3.1 percent, 3.0 percent, and 1.2 percent, respectively. Two major sources of freshwater flow on the eastern shore of Maryland and Virginia are the Choptank and Nanticoke Rivers, contributing 1.2 percent and 1.1 percent, respectively (Schubel and Pritchard 1987).

The project site is located in Baltimore Harbor, which is on the Patapsco River. The Harbor portion of the Patapsco River is a tributary to the Chesapeake Bay and is influenced primarily by the tidal flow from the Bay. The Patapsco River originates inland (Figure 2-8) and the non-tidal portion of the River drains into the middle Branch of the Patapsco River west of Masonville site. This inflow is relatively low, 430 cubic feet per second, when compared with the total inflow from the Chesapeake Bay. This is approximately 0.5 percent of the total flow into the Bay (USGS 1994).

The North Branch of the Patapsco River originates in Carroll County, north of Westminster, MD and flows south into Liberty Reservoir, then southeast to the Chesapeake Bay. The river flows 65 miles. Of this, the lower 15 are tidally influenced. The Masonville site is approximately nine miles west of the mouth of the river. The total drainage area of the watershed is about 550 square miles.

The South Branch of the Patapsco river originates near Mount Airy, MD and flows east into the main branch about 2 miles south of the Liberty Reservoir. The Middle Branch flows into the main branch at Ferry Bar and Harbor Hospital; the origin of the Middle Branch is at Glyndon, MD and is named the Gwynns Falls. The third major tributary is the Jones Falls which flows from Owings Mills, MD south into the Northwest Branch at the Baltimore Inner Harbor. Curtis Creek flows north into Curtis Bay, which flows east into the Patapsco River about 3 miles bayward of Masonville. Bear Creek is primarily a relatively large, 800 acre, embayment of the Patapsco River; it is about 5 miles from Masonville and near the mouth of the river. These areas are shown in Figure 2-8.

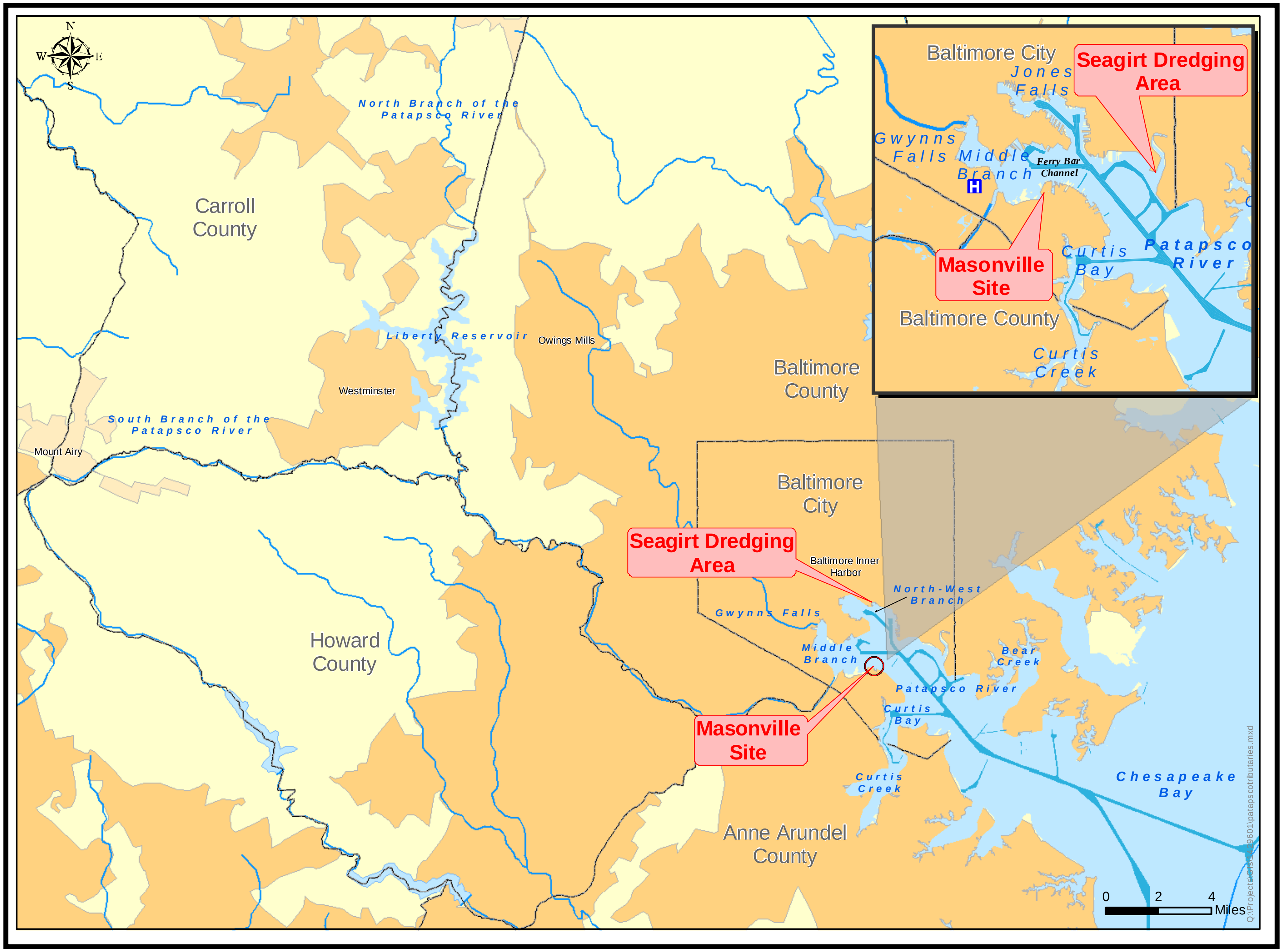


Figure 2-8. The Patapsco River and Its Tributaries

2.1.3.3 Water Levels

Normal water level variations in the Patapsco River are generally dominated by astronomical tides, although wind effects and freshwater discharge can be important. Extreme water levels are dictated by storm tides.

Astronomical Tides

Water levels in the Chesapeake Bay are dominated by a semidiurnal lunar tide, which is a tide multiple times a day driven by the gravitational pull of the moon. Tides enter the Bay via the Chesapeake Bay entrance and the Chesapeake and Delaware (C&D) Canal. The combination of tides and freshwater inflow creates a spring tide (a high tide caused by a new or full moon) approximately 30 to 40 percent larger than mean tide and a neap tide (the lowest tides that occur during quarter and last quarter phases of the moon) approximately 30 to 40 percent smaller than the mean tide (Schubel and Pritchard 1987). Hydrodynamic studies of the Baltimore Harbor (Boicourt and Olson 1982) included field measurements of current velocity, temperature and salinity at several locations in the Patapsco River. Results from the study's tidal current measurements indicated the existence of a three-layer, density-driven circulation that can dominate flow such that typical semi-diurnal tidal current direction reversals (shifting between high and low tide) do not necessarily occur. The study also determined that wind events often dominate circulation patterns, especially within the Middle Branch and the tributaries; however, high flow events from the Patapsco River often produce a typical two-layer estuarine circulation. Two-layer circulation consists of fresh river water flowing out on the surface and higher salinity bay water flowing in at the bottom. The study determined that the short-term variability of circulation and density is as significant as seasonal variability.

Datums near the study area reported from National Ocean Service (NOS) for the tidal epoch 1983-2001 are presented in Table 2-4. The mean sea and mean tide level are about 0.8 ft above mean lower low water (MLLW). The mean tidal range is 1.1 ft. The spring tidal range is 1.7 ft (NOS 2003). MLLW will serve as the datum for this project.

Table 2-4. Astronomical Tidal Datum Characteristics for Baltimore, Fort McHenry

Tidal Datum	Tidal Levels (ft MLLW)
Mean Higher High Water	1.66
Mean High Water	1.36
North American Vertical Datum – 1988	0.83
Mean Sea Level	0.80
Mean Tide Level	0.79
National Geodetic Vertical Datum – 1929	0.28
Mean Low Water	0.22
Mean Lower Low Water	0.00

Source: NOS 2003

Storm Surge

The water levels for the study area are dominated by storm effects, such as storm surge and wave setup, in combination with astronomical tides. Storm surge is a temporary rise in water level generated either by large-scale storms originating in the mid-latitudes known as northeasters, or by hurricanes. The rise in water level is caused by wind action, the low pressure of the storm disturbance and the Coriolis force, which is a weak vortex force caused by the Earth's rotation. A comprehensive evaluation of storm-induced water levels for several Chesapeake Bay locations has been conducted by the Virginia Institute of Marine Science (VIMS 1978) as part of the Federal Flood Insurance Program. Results of this study, summarized in Table 2-5, were used to generate the water level versus return period curve presented in Figure 2-9. Return period is used to represent the probability of exceedance of a given wind speed (e.g., the 10-year return period has a probability of exceedance of 0.1 in any given year). The curve provides water levels in feet above MLLW for various return periods. Data in Figure 2-9 are from Fort McHenry in Baltimore, the closest tide observation station to the project site. The Fort McHenry station is less than one mile northeast of Masonville. The graph shows that water level elevation for a 25-year return period at Fort McHenry is +5.4 ft MLLW and for a 100-year return period is +8.4 ft MLLW.

Table 2-5. Storm Induced Water Levels

Return Period (years)	Water Level (ft MLLW NAVD 1929)
10	+4.4
50	+7.1
100	+8.4
500	+11.0

Source: VIMS 1978

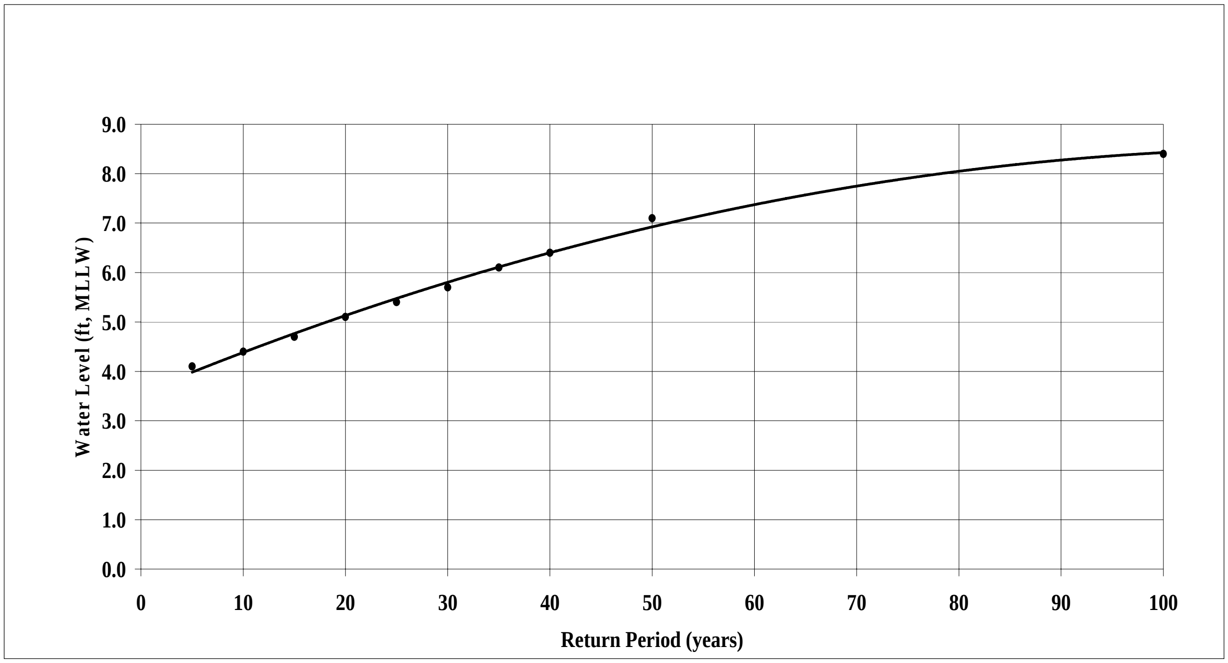


Figure 2-9. Water Levels per Return Period

A numerical model was developed to assess storm surge using Danish Hydraulic Institute's MIKE21 modeling software. The model uses hydrodynamic models to determine water surface elevations and hurricane, or cyclone, models to define the driving force wind and pressure fields in the study area. Several possible tracks of hurricanes were modeled in order to determine the one resulting in the highest water levels at Baltimore. For this study three historical hurricanes, the unnamed 1933 hurricane occurring on August 17th through 26th, 1933, Hurricane Fran occurring on August 23rd through September 8th, 1996, and Hurricane Isabel, which occurred on September 6th through September 19th, 2003 were simulated to estimate storm surge levels for the study area.

Storm induced water surface elevations at the observation points under without-project conditions are shown for each hurricane simulation in Figures 2-10 through 2-12. As seen in the figures, Hurricane Isabel produces the largest storm surge.

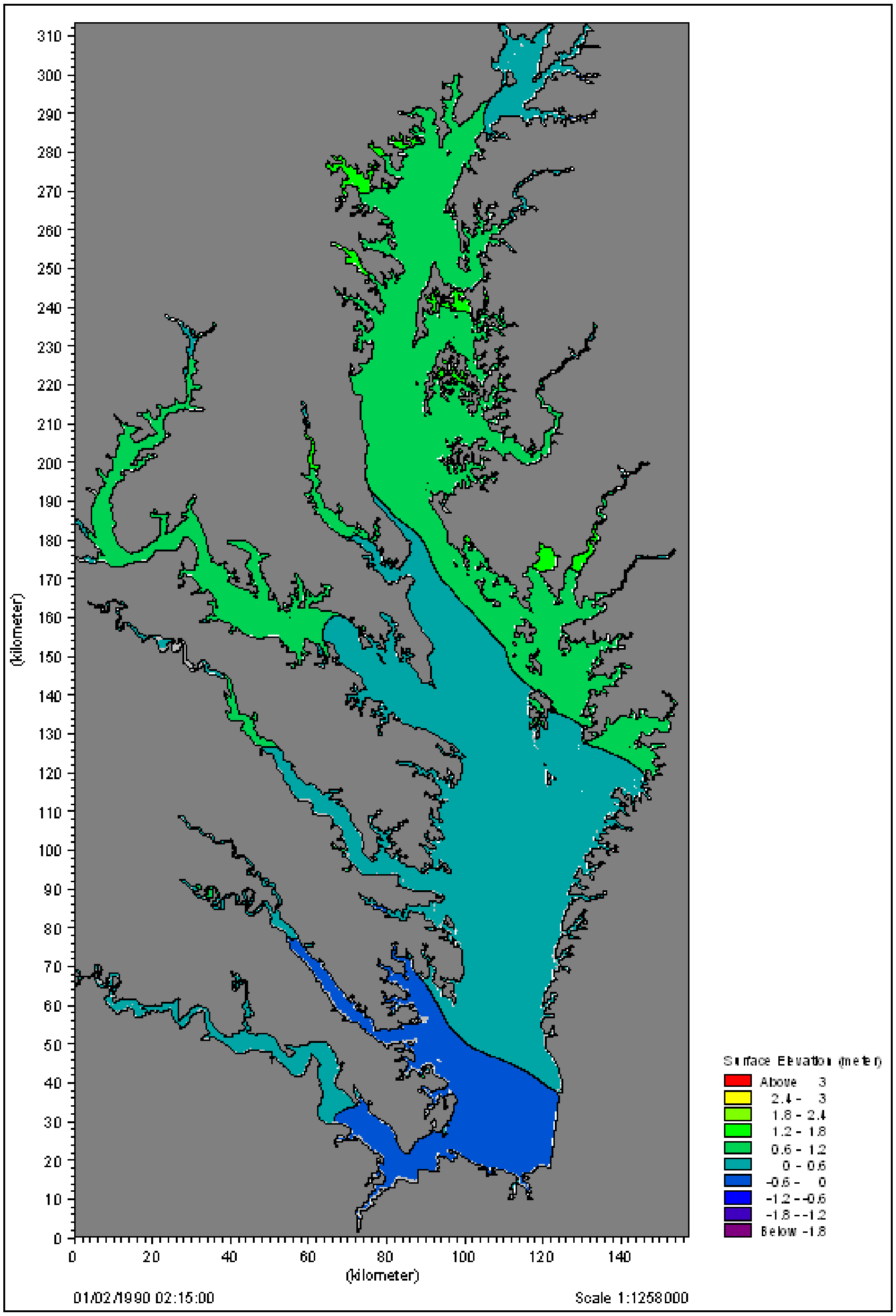


Figure 2-10 Without-Project Peak Storm Surge in Chesapeake Bay for 1933 Hurricane

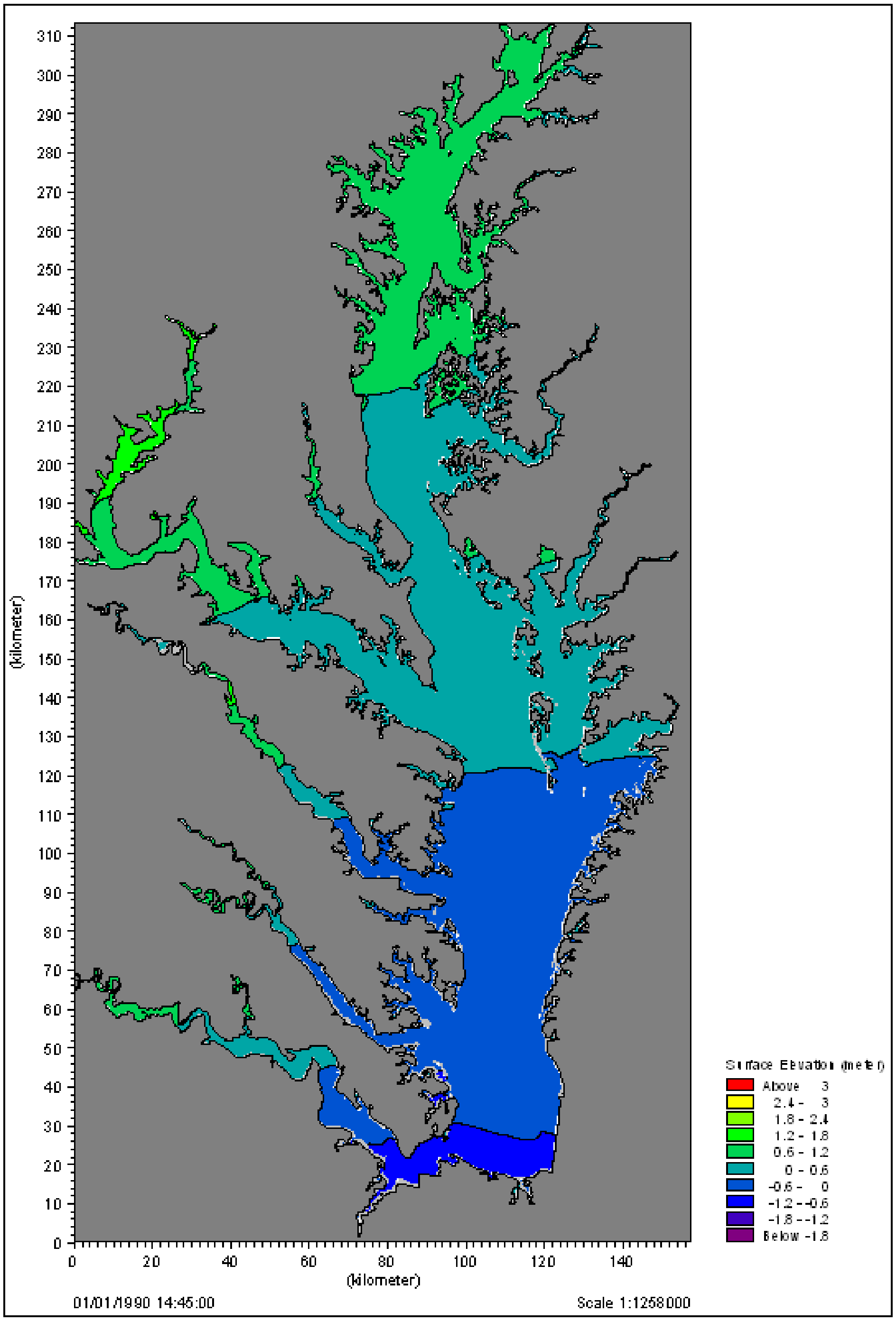


Figure 2-11 Without-Project Peak Storm Surge in Chesapeake Bay for Hurricane Fran

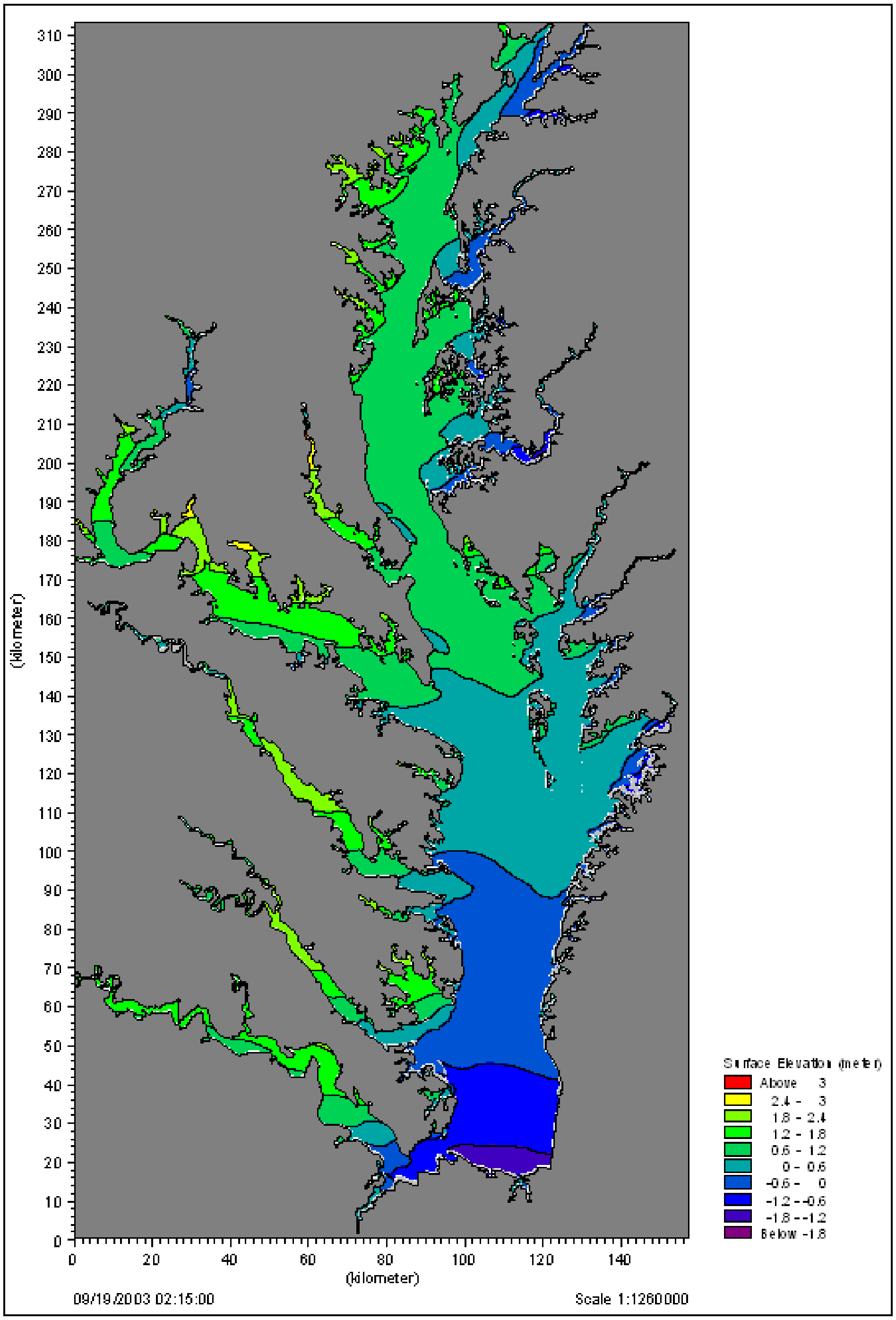


Figure 2-12 Without-Project Peak Storm Surge in Chesapeake Bay for Hurricane Isabel

Figure 2-13 shows observation points within the model at which water surface elevations were extracted. Table 2-6 shows the water levels predicted by the modeled during the peak storm surge for the 1933 hurricane, Hurricane Fran, and Hurricane Isabel.

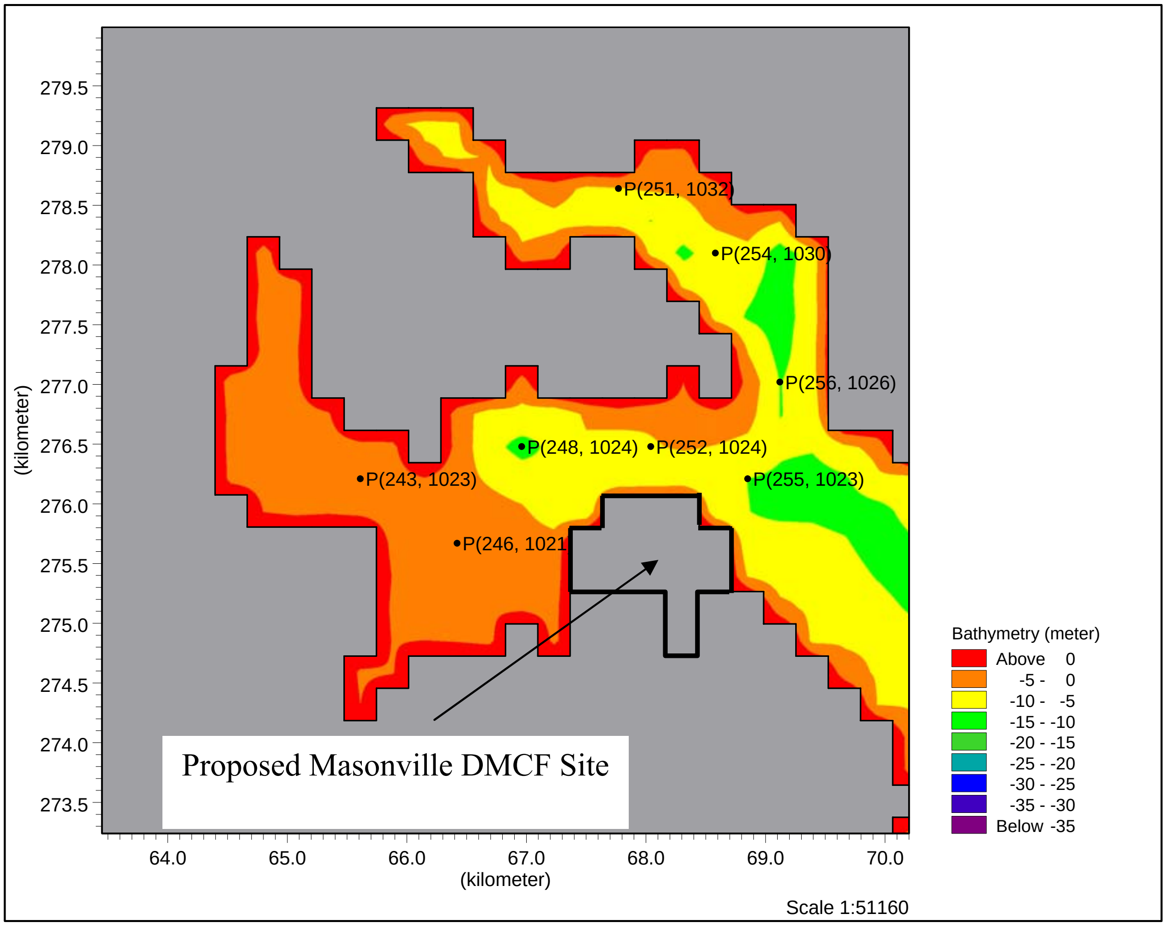


Figure 2-13 Observation Points within Model

Table 2-6. Peak Storm Surge Water Levels for Baltimore Harbor

Water Surface Elevation Point	Storm Surge Water Level (m)		
	1933 – Without Project	Fran – Without Project	Isabel – Without Project
P(255, 1023)	1.418	0.980	2.031
P(252, 1024)	1.427	0.984	2.056
P(243, 1023)	1.449	1.010	2.167
P(248, 1024)	1.435	0.991	2.089
P(246, 1021)	1.415	0.991	2.073
P(256, 1026)	1.435	0.983	2.056
P(254, 1030)	1.460	0.990	2.107
P(251, 1032)	1.476	0.997	2.146

2.1.3.4 Wind Conditions

Prevailing Wind Conditions

Wind speed and direction are available at a number of stations along the Chesapeake Bay from several sources. Recent data have been collected by the Chesapeake Bay Physical Oceanographic Real-Time System program of National Oceanic and Atmospheric Administration's (NOAA's) National Ocean Service Center for Operational Oceanographic Products and Services. The closest station for which wind data are available is the Francis Scott Key Bridge (Figure 2-14), however the station data collection at this station has been ongoing for only one year. Hourly wind speed and direction are available for the station located at Tolchester Beach for the period from 1995 to 2001. Data was collected at six minute intervals from spring 2002 to 2005.

Wind speed and direction were analyzed for the seven year period of 1995 through 2001. The wind rose (diagram showing the relative frequencies of different wind directions for a given station and period of time) presented in Figure 2-15 summarizes the percent occurrence of wind speeds and directions at the Tolchester Beach Station. Findings presented in previous studies of hydrodynamic and sediment transport modeling indicate that only winds with speeds higher than 13 miles per hour (mph) (11.3 knots) will cause sediment suspension for cohesive sediments (sediments that stick together) (M&N 2003a). For non-cohesive sediments it was found that even higher wind speeds are necessary in order to produce any noticeable sediment transport. The non-cohesive sediments are generally larger than the cohesive sediments and tend to settle out quickly. The non-cohesive sediments include sands and the cohesive sediments include clays. Analysis of the data shows that the wind speed at the Tolchester Beach Station is above 11 knots approximately 20 percent of the time. The data is shown in Figure 2-16, which presents the frequency distribution by direction. Figure 2-16 also shows the frequency distribution of wind speeds below and above 11 knots. For wind speeds higher than 11 knots, in 90 percent of the cases, the wind direction is between west and north-northeast.

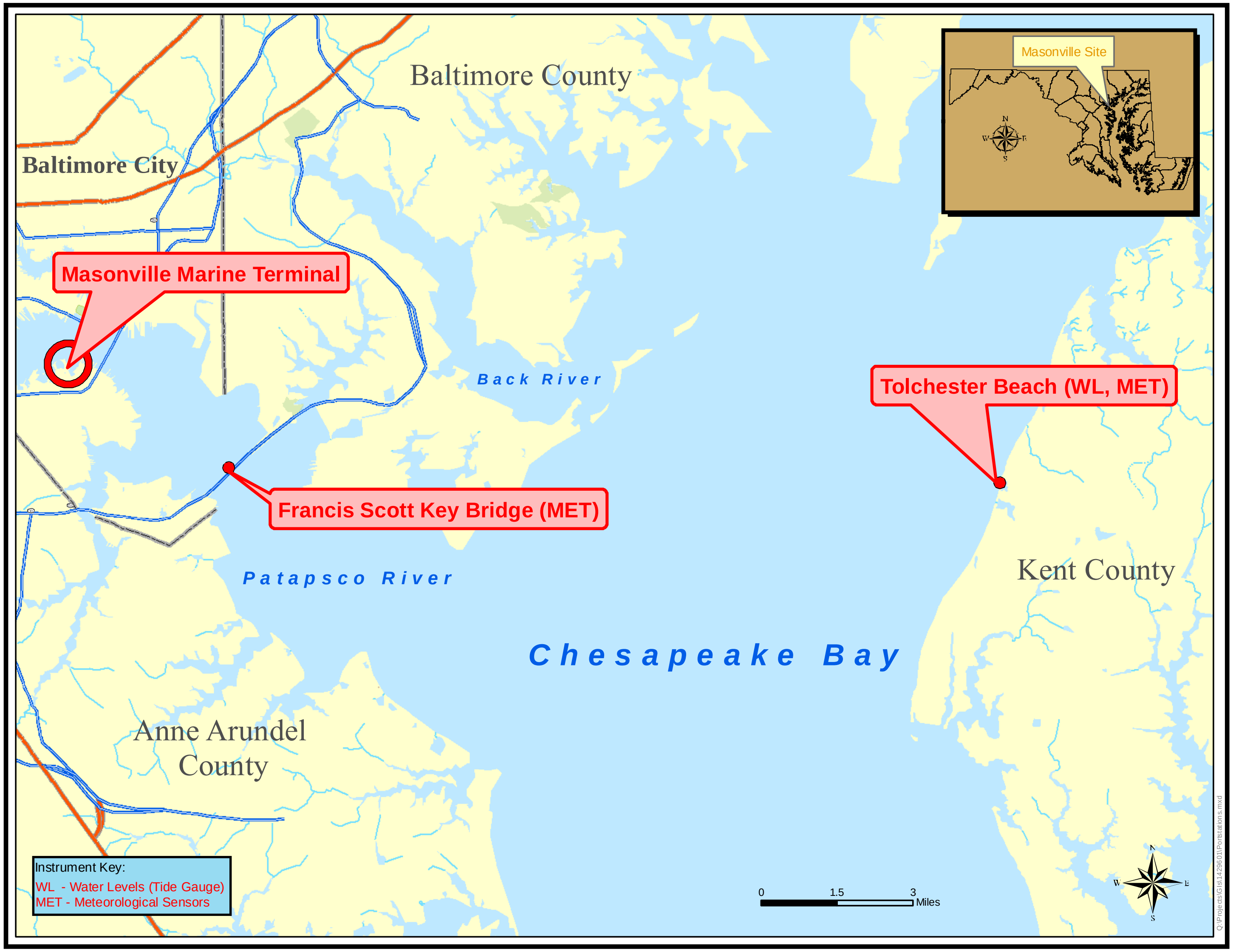


Figure 2-14. Chesapeake Bay Physical Oceanographic Real-Time System Stations

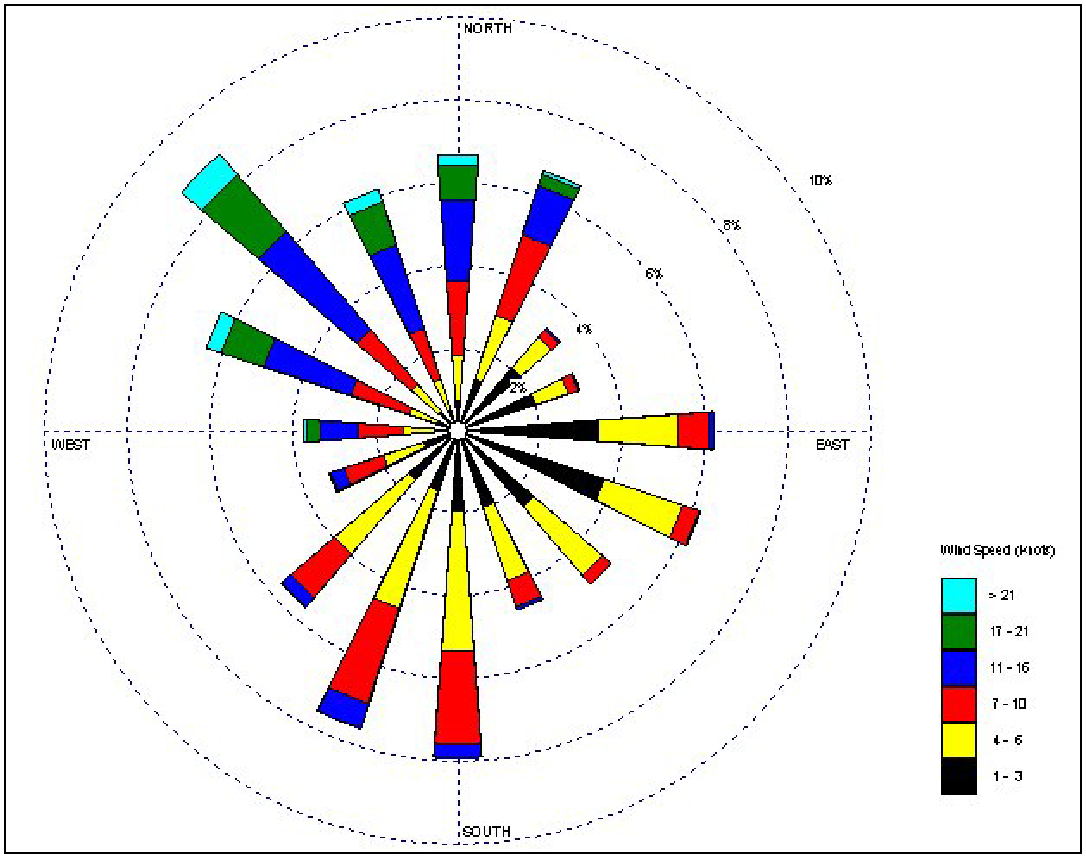


Figure 2-15. Wind Rose at Tolchester Beach

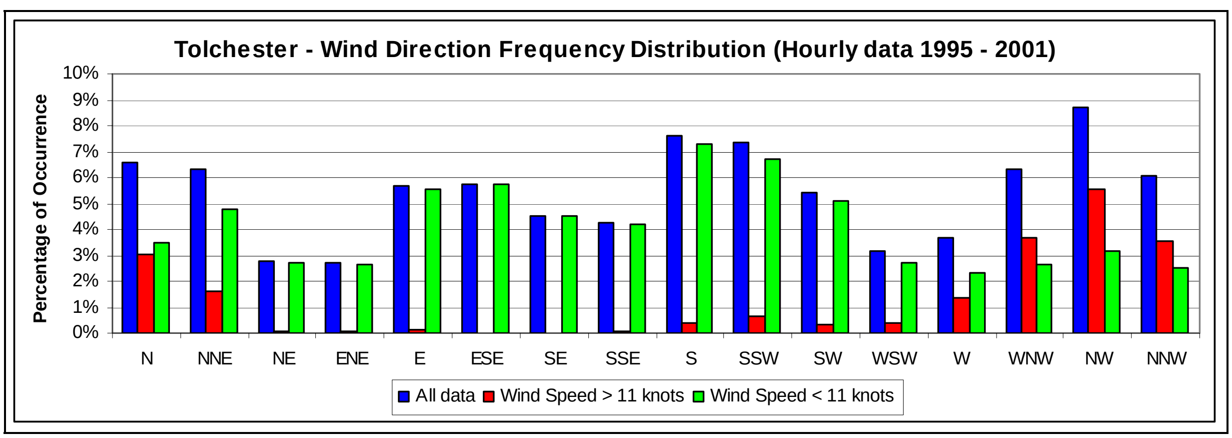


Figure 2-16. Wind Direction Frequency Distribution at Tolchester Beach

Extreme Wind Conditions

Winds are a major hydrodynamic force in the Patapsco River and affect both water levels and wave conditions. Annual extreme wind speed data from NOAA's National Climatic Data Center for Baltimore-Washington International Airport (BWI), for the period 1951 through 1982, were used in computing design wind conditions for this study. The design wind conditions were used for sizing armor stone and dike crest elevations (NOS 1982 and National Climatic Data Center 1994). While closer sources of wind speed data are available, none has as long a period of record as BWI. The BWI data were used to develop wind speed-return period relationships based on a Type I (Gumbel) distribution for eight directions: North (N), Northeast (NE), East (E), Southeast (SE), South (S), Southwest (SW), West (W) and Northwest (NW). Return period is used to represent the probability of exceedance of a given wind speed (e.g. the 10-year return period has a probability of exceedance of 0.1 in any given year). Table 2-7 contains the design winds by return period.

Table 2-7. Design Wind Speeds per Direction and Return Period (mph)

Return Period (yrs)	Direction							
	N	NE	E	SE	S	SW	W	NW
5	40	37	32	37	36	47	50	54
10	48	44	38	45	43	56	54	59
15	52	48	41	50	47	61	56	62
20	56	52	45	55	51	67	59	65
25	59	55	47	58	54	70	60	67
30	62	57	49	61	56	73	61	68
35	64	60	51	63	58	76	62	70
40	66	62	53	65	60	78	63	71
50	69	66	55	69	63	82	64	73
100	81	76	65	82	74	97	69	81

2.1.3.5 Wave Conditions

The Masonville site is exposed to wind-generated waves from all directions except the south. Thus, wind-generated wave calculations were completed for the southwest, west, northwest, north, northeast, east and southeast directions. In accordance with procedures recommended by the U.S. Army Corps of Engineers (USACE) Coastal Engineering Manual (CEM), a fetch (line) distance was averaged for each direction (USACE 2001b). This is also referred to as the radially averaged fetch distance. Table 2-8 presents the radially averaged fetch distances and means water depths corresponding to each direction.

Table 2-8. Radially-Averaged Fetch Distance and Mean Water Depth Used for Wave Hindcasting

Direction	Mean Fetch Distance (miles)	Mean Water Depth (ft MLLW)
North	0.70	25.3
Northeast	1.1	30.9
East	1.9	30.2
Southeast	1.3	23.1
South	N/A	N/A
Southwest	0.62	6.2
West	1.1	4.7
Northwest	0.95	26.4

A sea state is normally composed of a spectrum of waves with varying heights and periods, which may range from relatively short ripples to long waves. In order to summarize the spectral characteristics of a sea state it is customary to represent that wave spectrum in terms of a distribution of wave energy over a range of wave periods. Having made this distribution, known as a wave spectrum, it is convenient to represent the wave spectrum by a single representative wave height and period. The significant wave height (H_s) is defined as the average of the highest one-third of the waves in the spectrum. Depending on the duration of the storm condition represented by the wave spectrum, maximum wave heights may be as high as 1.8 to 2 times the significant wave height. The peak spectral wave period (T_p) corresponds to the maximum wave energy level in the wave spectrum.

Wave conditions, which were hindcast (using old data to predict the outcome of specific circumstances) along each fetch direction for the design winds and adjusted appropriately for duration, are presented in Table 2-9. Water levels are presented in Figure 2-9 using methods published in the CEM (USACE 2001b). Wave hindcast results are presented in Table 2-9 and Table 2-10. Calculations and more detailed analysis of hindcasting can be found in the Masonville Coastal Engineering Investigation Reconnaissance Study (GBA/M&N JV 2003).

Table 2-9. Offshore Significant Wave Heights (ft) - Masonville

Return Period (years)	N	NE	E	SE	S	SW	W	NW
5	1.2	1.3	1.4	1.4	NA*	1.3	1.7	1.9
10	1.4	1.6	1.7	1.7	NA*	1.5	1.8	2.1
15	1.6	1.7	1.9	2.0	NA*	1.7	1.9	2.2
20	1.7	1.9	2.1	2.2	NA*	1.9	2.0	2.3
25	1.8	2.0	2.2	2.3	NA*	2.0	2.0	2.4
30	1.9	2.1	2.3	2.4	NA*	2.1	2.1	2.4
35	2.0	2.2	2.4	2.5	NA*	2.2	2.1	2.5
40	2.0	2.3	2.5	2.6	NA*	2.2	2.2	2.5
50	2.1	2.5	2.6	2.8	NA*	2.4	2.2	2.6
100	2.6	2.9	3.1	3.4	NA*	2.9	2.4	2.9

* Not applicable

Table 2-10. Peak Spectral Wave Periods (sec) - Masonville

Return Period (years)	N	NE	E	SE	S	SW	W	NW
5	1.7	1.9	2.2	2.0	NA*	1.8	2.1	2.1
10	1.9	2.1	2.3	2.2	NA*	1 .9	2.2	2.2
15	1.9	2.2	2.4	2.3	NA*	1.9	2.2	2.3
20	2.0	2.2	2.5	2.4	NA*	2.0	2.2	2.3
25	2.0	2.3	2.5	2.4	NA*	2.0	2.3	2.3
30	2.1	2.3	2.6	2.5	NA*	2.1	2.3	2.3
35	2.1	2.3	2.6	2.5	NA*	2.1	2.3	2.4
40	2.1	2.4	2.6	2.5	NA*	2.1	2.3	2.4
50	2.2	2.4	2.7	2.6	NA*	2.2	2.3	2.4
100	2.3	2.6	2.9	2.8	NA*	2.3	2.4	2.5

* Not applicable

2.1.3.6 Tidal Currents

NOAA Tidal Current Tables (1996) provide that currents in the Patapsco River, from the mouth at North Point, Brewerton Channel to the Middle Branch entrance at the Hanover Street Bridge, are weak and variable, with a maximum velocity of less than 30 cm per second (cm/sec).

Data Collection

One of the recommendations from the Boicourt and Olson (1982) study was to collect additional data using continuous vertical-profiling current measurements for a period of time greater than three weeks. As part of the preparation of this final environmental impact statement (FEIS), a field data collection program was developed using Acoustic Doppler Current Profilers (ADCP) to collect current measurements. In addition, three-dimensional hydrodynamic numerical modeling was performed to evaluate existing conditions with regard to tidal currents, suspended sediment movement, and salinity.

Current meters and conductivity-temperature-depth (CTD) profilers were deployed in nine locations in the Patapsco River (Figure 2-17), with several locations around the Masonville project location (Figure 2-18), in order to collect data to evaluate typical current speed and direction. The nine locations include:

1) The mouth of the Patapsco River estuary at the Cutoff Angle;
2) The Curtis Bay Channel Angle;
3) Curtis Bay Channel;
4) The Fort McHenry Angle;
5) The mouth of Masonville Cove;
6) North of the existing Masonville site, about 50 ft from a point feature along the shoreline, east of the derelict vessels;
7) Within Masonville Cove about 150 ft from the shoreline;
8) The approximate middle of the mouth of the main branch of the Patapsco River, about 20 ft downstream of the Hanover Street bridge crossing (Figure 1-2), halfway between two bridge pilings to avoid their effects on the flow; and
9) The main branch Patapsco River, about 1,250 ft upstream from the mouth.

Statistical analysis was performed to compute mean speed and directions for flood and ebb tides.

The minimum, maximum, mean, median, and mode of the current speeds at the nine locations are presented in Table 2-11. These data show that mean speeds near Masonville are very low, at about 3.5 to 4.4 cm/sec, with occasional highs from 14.2 to 24.4 cm/sec. These low values can be attributed to two factors: 1) Most of the tidal influence from the Chesapeake Bay remains in the main part of the Bay and does not enter the Patapsco River; and 2) The freshwater discharge from the Patapsco River is not significantly large. Values in the upstream Patapsco River, near stations 7 and 8, are slightly higher with means of 6.5 to 7.4 cm/sec and maximum speeds of 38.1 to 47.4 cm/sec. Values in the Patapsco River increase in velocity moving closer to the Bay (progressing from stations 3 to 2 to 1), with mean velocities up to 18.2 cm/sec and maximum measurements of 88 cm/sec.

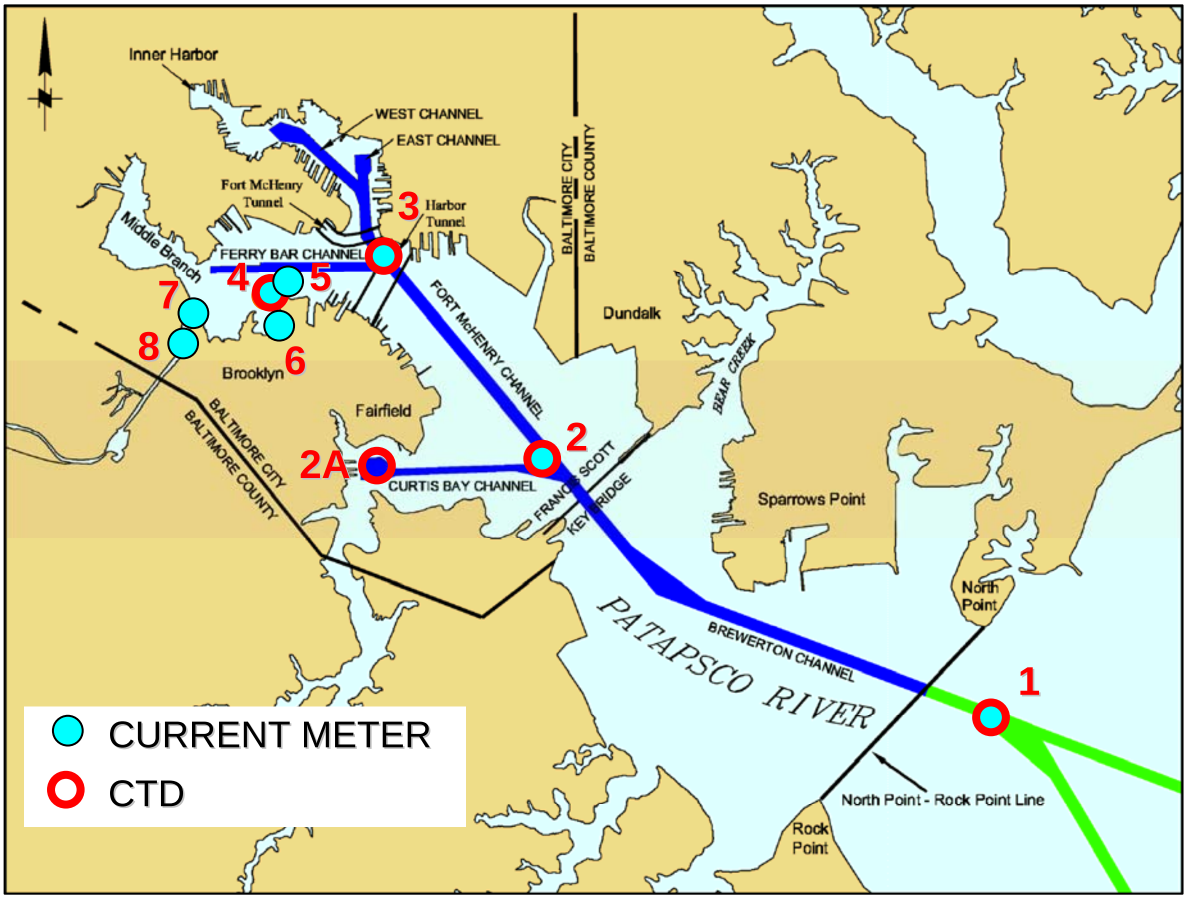


Figure 2-17. Current Meter and Conductivity-Temperature-Depth (CTD) Profiler Deployment Locations in Patapsco River

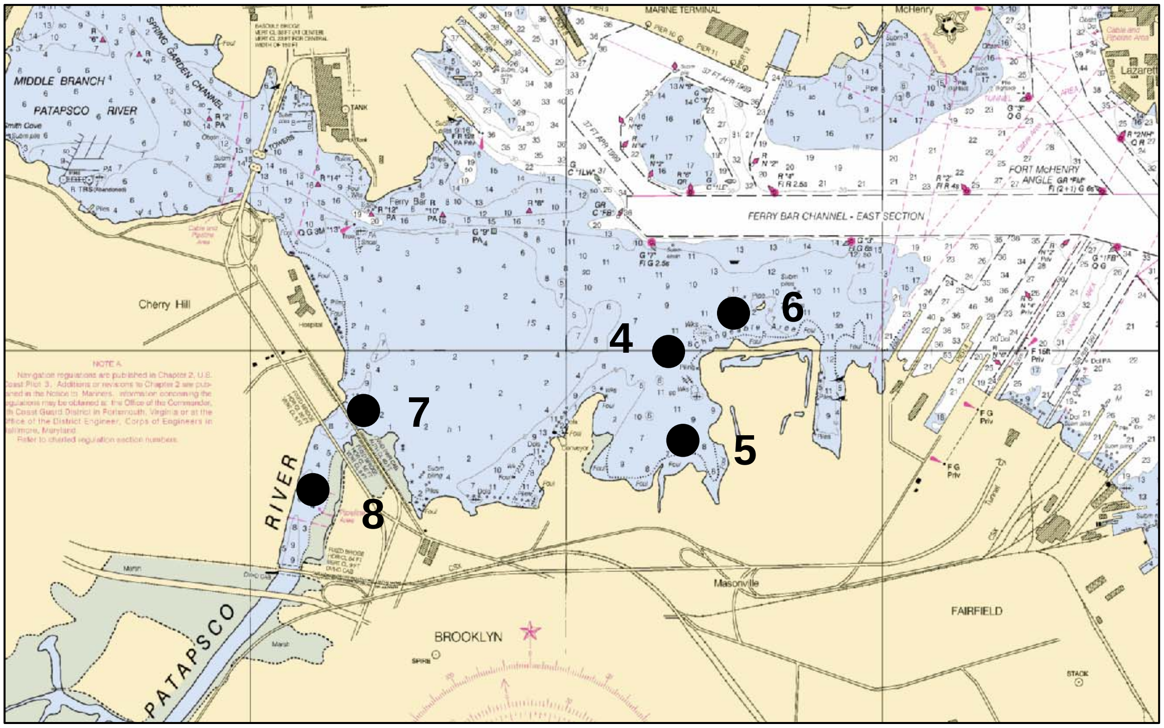


Figure 2-18. Current Meter Deployment Locations near Masonville

Table 2-11. Measured Current Speeds (cm/sec) – Patapsco River

Location No.	Minimum	Maximum	Mean	Median	Mode
1 – Surface	0	88.0	13.4	11.4	2.9
1 – Mid-Depth	0	74.5	18.2	16.7	4.7
1- Bottom	0	51.9	10.1	9.2	9.7
2 – Surface	0	54.3	6.5	5.0	2.5
2 – Mid-Depth	0	46.1	8.0	7.0	4.3
2- Bottom	0	37.2	6.2	5.4	3.6
3 – Surface	0	27.9	8.0	7.2	3.6
3 – Mid-Depth	0	27.3	6.4	5.8	3.9
3- Bottom	0	38.0	6.4	5.6	5.5
4	0	14.3	4.4	4.1	3.8
5	0	14.2	3.5	3.4	2.4
6	0	24.4	4.2	3.4	2.9
7	0	38.1	6.5	5.4	3.9
8	0	47.4	7.4	5.9	2.9

Numerical Modeling of Hydrodynamics

A three-dimensional hydrodynamic numerical model of the Patapsco River and portions of the Chesapeake Bay was used to evaluate currents in the site vicinity. The model encompasses the area from the Chesapeake Bay Bridge to the Sassafras River, and includes the tidal portion of the Patapsco River.

This local model was forced by output from the regional, Chesapeake Bay model that includes all of the Chesapeake Bay from the Susquehanna River to the Atlantic Ocean. Please refer to Appendix B for details of the model development and methodology.

This model was used to calculate typical ebb and flood conditions. Figures 2-19 and 2-20 depict typical ebb and flood conditions, respectively, for the site vicinity, based on model results. Both figures show the surface layer and the bottom layer. The figures show that in the surface layer, both ebb and flood flows are stronger along the southern shore of the Patapsco River near Masonville. In the bottom layers, however, the flow is more uniformly spread across the whole width of the river, with a slight increase in the channels. The model shows that current directions are variable in the Patapsco River and exhibit some circular patterns. The model results are consistent with the data collected in the Boicourt and Olsen (1982) study and with the recent study.

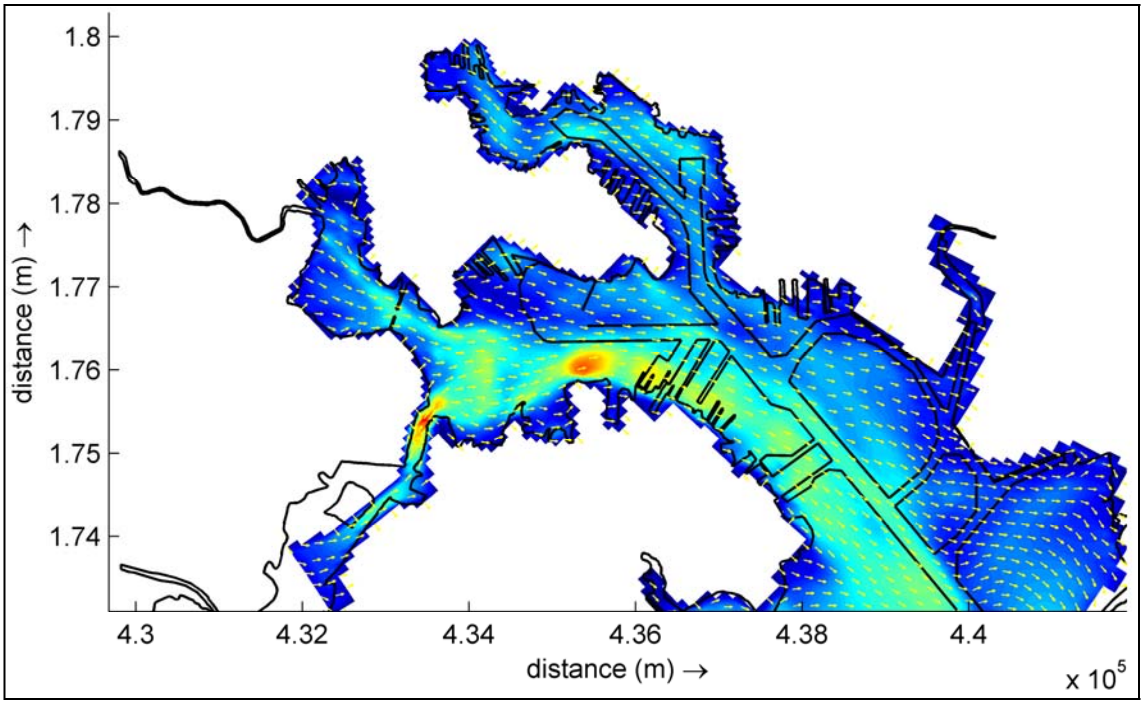
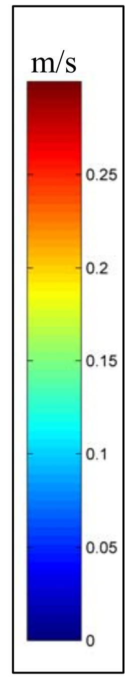


Figure 2-19(a). Ebb Tide Surface Current Velocity



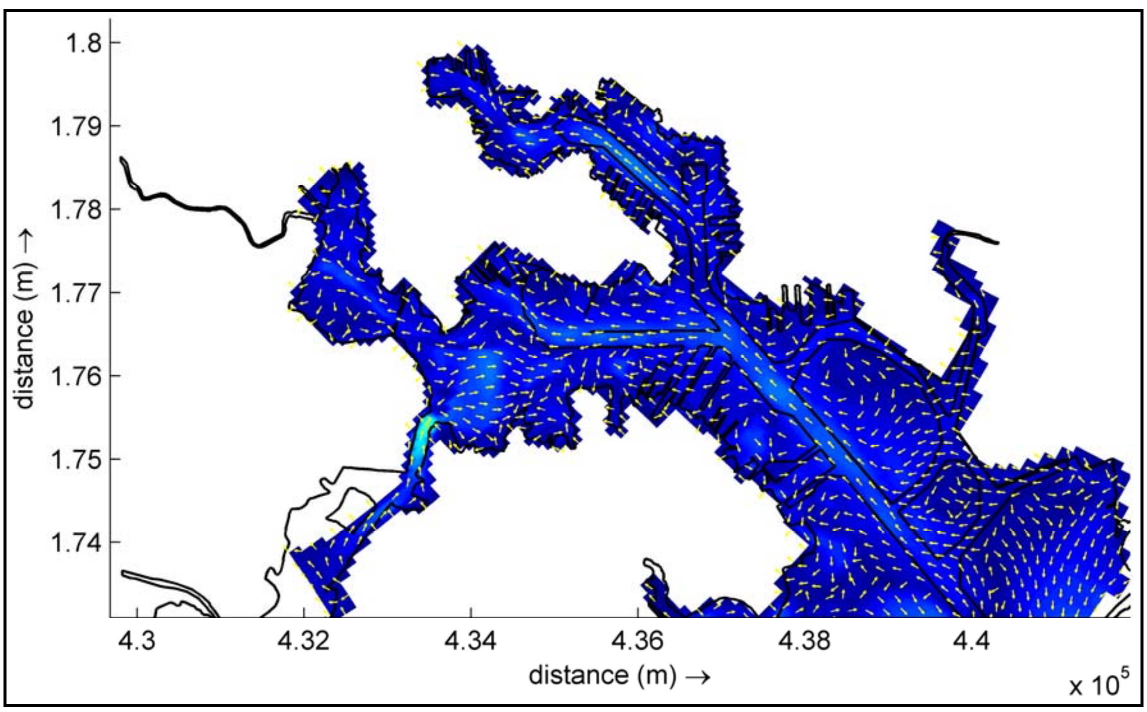


Figure 2-19(b). Ebb Tide Bottom Current Velocity

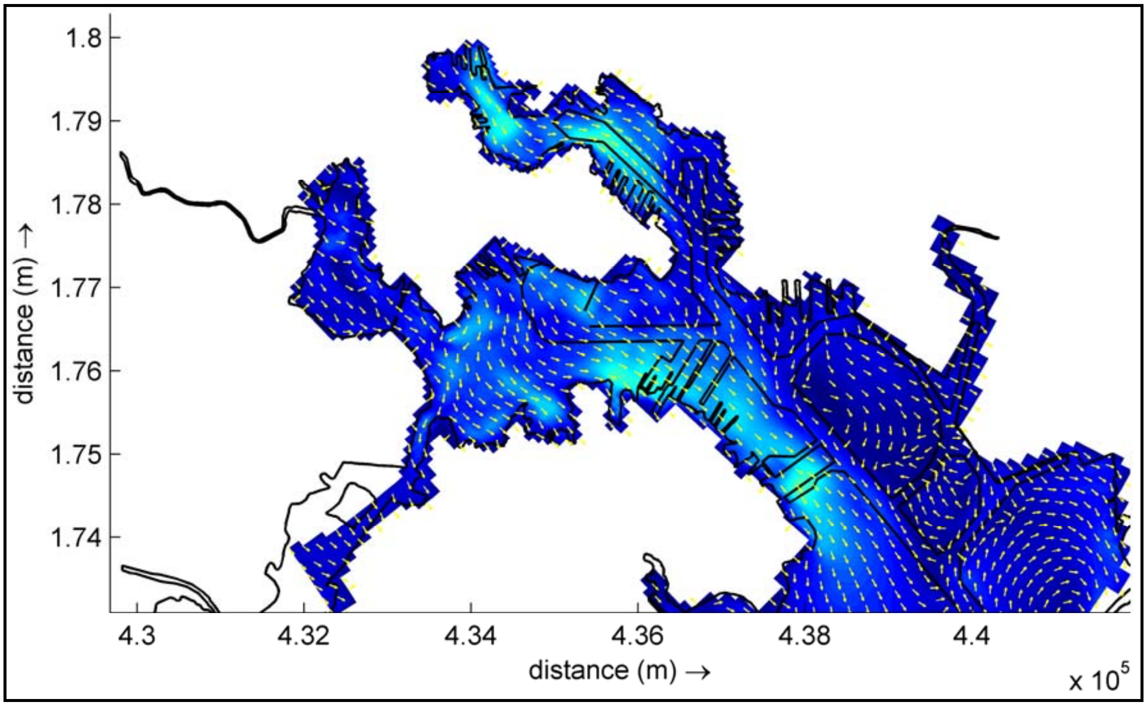
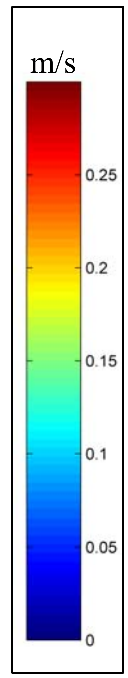


Figure 2-20(a). Flood Tide Surface Current Velocity



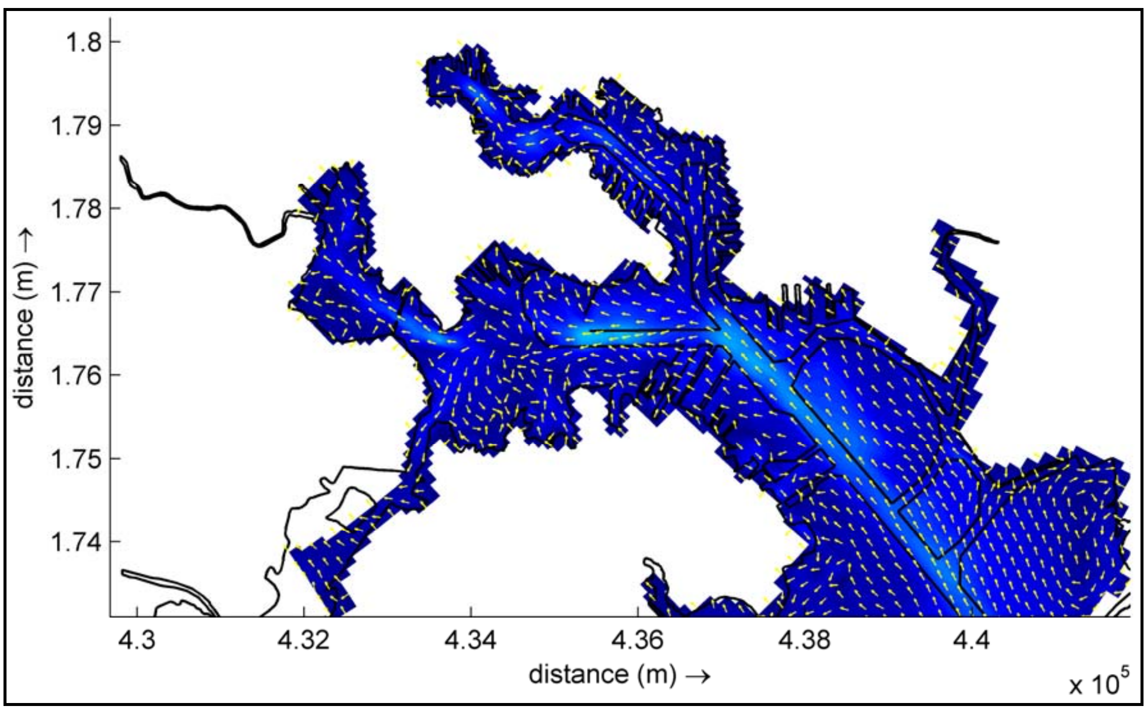


Figure 2-20(b). Flood Tide Bottom Current Velocity

2.1.4 Sediment Quality

As previously stated, the Chesapeake Bay is located in the Atlantic Coastal Plain Physiographic Province and is underlain by sequences of unconsolidated clays, silts, sands, and gravel dating from the Cretaceous, Tertiary, and Quaternary Periods. Changes in the physical environment are of particular interest because the sedimentary environment can impact both chemical analyte concentrations and the benthic community structure. The distribution and concentrations of chemical analytes are influenced by the dominant grain size because metals and organics are preferentially bound to fine-grained sediments. The composition of the benthic community is also influenced by the dominant grain size because coarse and fine-grained sediments provide different habitats for organisms. Grain size can also dictate the amount of available organic matter that benthic organisms utilize as a food source.

Sediments in urbanized watersheds can contain measurable quantities of contaminants that originate from both point sources (e.g., industrial and municipal effluents) and non-point sources (e.g., stormwater runoff, agricultural runoff, and atmospheric deposition). Sediments in the Baltimore Harbor/Patapsco River have been contaminated from industrial and municipal inputs, as well as from non-point sources, as would be expected in an urbanized/industrialized region. Disturbance of sediments by construction, dredging, or storm events can mobilize fine-grained particulates, and the contaminants bound to them, into the water column.

Previous investigations of sediment quality at the Masonville site include an Environmental Site Assessment at the former KIM facility in 1997 (EBA 1997). The 10.5-acre KIM facility was formerly used for ship/boat demolition and other associated activities. Elevated levels of copper, lead, nickel, and zinc were measured in subsurface soils, surface soils, sediment, and ground-water samples. Measured concentrations of PCBs, pesticides, and volatile organic compounds (VOCs) were low and generally below reporting limits (EBA 1997).

2.1.4.1 Surface Sediment Sampling

Surface sediment samples for Masonville were collected in June 2003 (four locations), February 2004 (five locations), July 2004 (four locations), and June 2005 (five locations) (EA 2003a, EA 2005a, EA 2005b, 2005c). Samples were collected from areas inside the proposed DMCF footprint, from within Masonville Cove, from within the KIM Channel, and from the Wet Basin on the eastern side of the Fairfield Terminal (Figure 2-21).

Surface sediment chemistry samples were tested according to standard methods as described in Appendix A. Chemical concentrations were compared to biological-effects-based marine sediment quality guidelines (SQGs). The Threshold Effects Level (TEL) / Probable Effects Level (PEL) approach was developed as an informal (non-regulatory) guideline for use in interpreting chemical data from analyses of sediments (MacDonald *et. al*. 1996). The TEL and PEL values were derived using concentrations associated with both adverse effects and no observed effects to benthic organisms (Long and MacDonald 1998). TELs typically represent concentrations below which adverse biological effects are rarely observed, while PELs typically represent concentrations in the middle of the effects range and above which effects are more frequently observed (Long and MacDonald 1998). Analyte concentrations that exceed the PEL

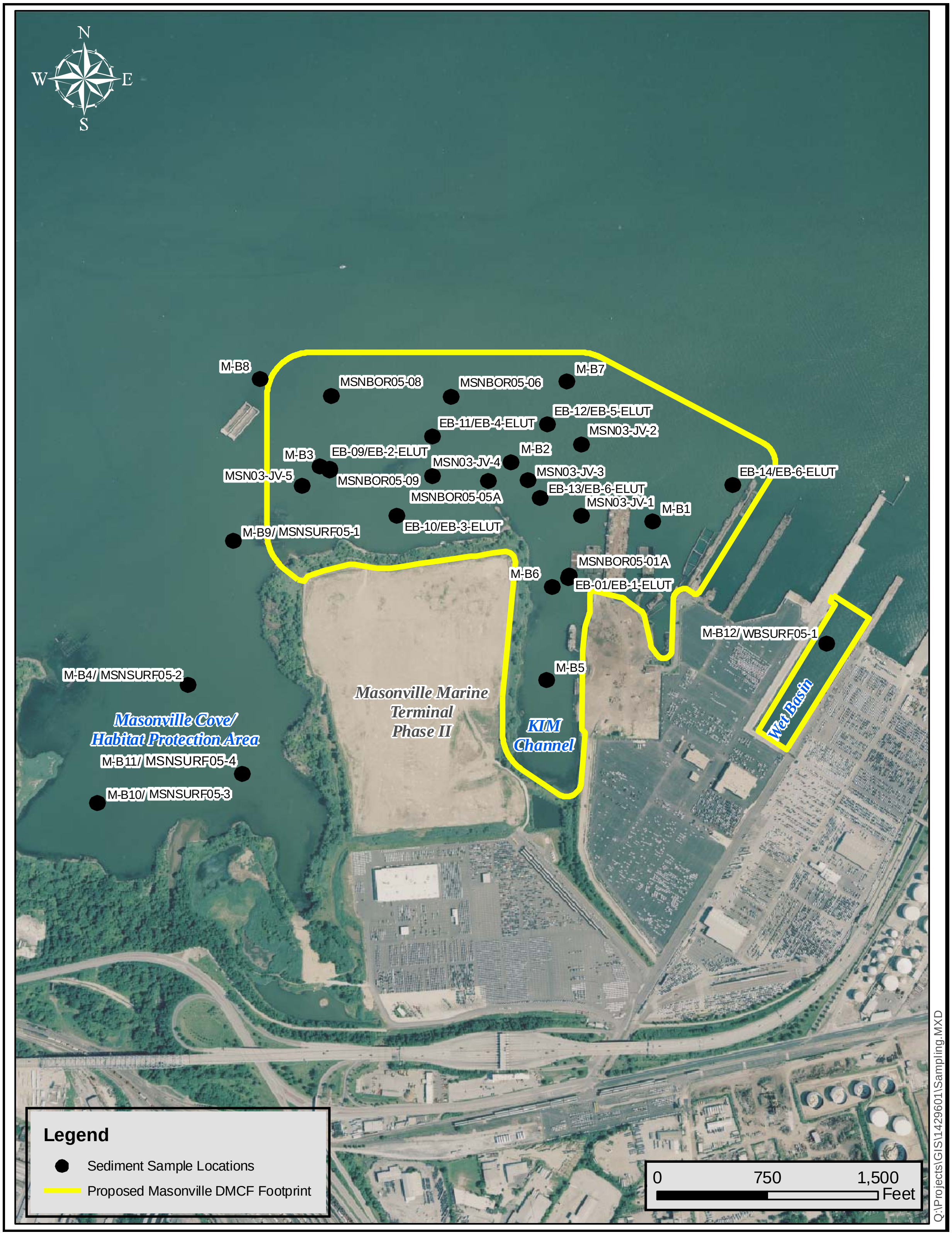


Figure 2-21. Sediment Sample Locations

indicate that a chemical constituent is present in a concentration that may impact marine organisms. TELs and PELs have been derived for only a few of the analytes tested as part of the Masonville sampling effort. These TEL and PEL values are based on large-scale toxicity testing and this testing has only been completed for analytes of particular ecological concern or those ssociated with past large scale projects. TEL and PEL values for tested constituents are located on the summary tables and in Appendix A.

Proposed Masonville DMCF Footprint

Surface sediments collected from within the proposed Masonville DMCF footprint, excluding KIM Channel and the Wet Basin, are predominately silt-clay (51-99 percent) with total organic carbon (TOC) ranging from 2.0 to 3.6 percent (Appendix A).

Surface sediment samples were collected from two locations within the KIM Channel (M-B5, M-B6). Surface sediments collected from within the KIM Channel (Figure 2-21) were predominately silt-clay (90.5 percent) at one location, and predominately sand (61 percent) at the other location. TOC concentrations from locations in the KIM Channel were 2.6 and 3.7 percent (Appendix A).

Surface sediment was collected from one location within the Wet Basin (M-B12/WBSURF05-1), located to the east of Fairfield Terminal (Figure 2-21). Surface sediment from the Wet Basin was analyzed for a reduced list of parameters. Surface sediment collected from the Wet Basin was predominately silt-clay (92.2 percent), with a TOC concentration of 3.7 percent.

Metals – Nine of the tested metals have TEL and PEL values. Concentrations of seven metals (arsenic, chromium, copper, lead, mercury, nickel, and zinc) were between the TEL and PEL values at each of the sampled locations, and concentrations of cadmium and silver were between the TEL and PEL values at seven and four locations, respectively (Table 2-12). Concentrations of seven metals (arsenic, chromium, copper, lead, mercury, nickel, and zinc) had concentrations greater than the PEL value in at least one surface sediment sample from within the proposed Masonville DMCF footprint, indicating the potential for adverse effects to biological organisms at these locations.

The simultaneously extracted metals (SEM) / acid volatile sulfide (AVS) ratio was less than one at each location (Appendix A). An SEM/AVS ratio less than one indicates a high degree of probability that the metals (specifically cadmium, copper, lead, nickel, and zinc) are bound to organic material and not bioavailable to aquatic organisms.

Concentrations of seven metals (arsenic, chromium, copper, lead, mercury, nickel, and zinc) had concentrations greater than the PEL value in at least one surface sediment sample from within the KIM Channel (Table 2-12), indicating the potential for adverse effects on

Table 2-12. Metal Concentrations in Surface Sediments

	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TEL*	7.24	0.676	52.3	18.7	30.24	0.13	15.9	0.73	124
PEL*	41.6	4.21	160.4	108.2	112.18	0.696	42.8	1.77	271
Proposed DMCF Footprint									
M-B1	18.1	0.74	119	**353**	**213**	**0.7**	**56.2**	--	**1790**
M-B2	11.7	--	90.5	**118**	85	0.36	33.2	--	262
M-B3	15.7	--	93	102	104	0.29	25.6	--	230
M-B5	20.4	1.9	**193**	**263**	**204**	**0.91**	**43.5**	0.95	**582**
M-B6	12.1	--	129	**176**	**141**	**0.8**	28.8	**--**	**357**
MSN03-JV1	**64.3**	2.5	**229**	**399**	**223**	**1**	41.7	0.78	**483**
MSN03-JV2	24.9	1.2	**176**	**220**	**147**	0.64	**46.5**	0.78	**495**
MSN03-JV3	23.7	1.3	**181**	**223**	**160**	**0.72**	**45**	0.76	**503**
MSN03-JV4	38	1.1	125	**213**	**142**	**0.74**	34.8	--	**336**
MSN03-JV5	13.2	0.85	107	**110**	96	0.37	33.5	--	268
M-B7	38.1	2.1	**225**	**303**	**157**	**0.75**	**46.5**	1.1	**541**
M-B8	11.1	--	66.3	65.9	53.7	0.22	34.3	--	162
MSNSURF05-1	9.9	1.3	74.3	95.9	69.3	0.24	33.7	--	219
WBSURF05-1	25.6	2	**176**	**232**	**174**	**0.82**	**45.6**	1.1	**551**
Masonville Cove									
MSNSURF05-2	14.3	1.5	94.7	**145**	110	0.31	**43.6**	**--**	**308**
MSNSURF05-3	15.8	1.8	109	**179**	**140**	0.41	**47.4**	0.74	**360**
MSNSURF05-4	9.0	1.3	62.6	**217**	**128**	0.35	**46.2**	**--**	**314**

**Source: MacDonald et. al. 1996*

Values that are shaded and bold exceed PEL values; all other values are between the TEL and PEL.

biological organisms at these locations. The simultaneously extracted metals (SEM) / acid volatile sulfide (AVS) ratio was less than one at each location (Appendix A). An SEM/AVS ratio less than one indicates a high degree of probability that the metals are bound to organic material and not bioavailable to aquatic organisms.

Concentrations of six metals (chromium, copper, lead, mercury, nickel, and zinc) had concentrations greater than the PEL value in the surface sediment sample from within the Wet Basin (Table 2-12), indicating the potential for adverse effects on biological organisms at these locations.

Organics **-** Concentrations of total PCBs [non-detect (ND) = ½ detection level (DL)] were between the TEL (21.55 µg/kg) and PEL (188.79 µg/kg) at four locations and concentrations exceeding the PEL at seven locations (Table 2-13). Total PCB concentrations (ND = ½ DL) exceeded the PEL concentrations by factors ranging from 1.1 to 4.3. Concentrations of total PCBs (ND = ½ DL) greater than the PEL indicate the potential for adverse effects on biological organisms at these locations.

Total PAH concentrations (ND = ½ DL) were between the TEL (1,684.06 µg/kg) and PEL (16,770.4 µg/kg) at each of the sampled locations within the proposed Masonville DMCF footprint. Concentrations of 4,4-DDD and 4,4-DDT (chlorinated pesticides) that exceeded PEL values for some locations (Table 2-13). Dioxin TEQs (ND=1/2DL) ranged from 6.2 to 33.3 ng/kg. Three PCB Aroclors (1248, 1254, and 1260), tributyltin, and dibutyltin were each detected in surficial sediments from within the proposed Masonville DMCF footprint.

Hexavalent chromium, asbestos, and organophosphorus pesticides were not detected in any of the surface sediment samples from within the proposed Masonville DMCF footprint at Masonville. Low concentrations of one VOC and seven semivolatile organic compounds (SVOCs) were detected in the surface sediments from within the proposed Masonville DMCF footprint.

Concentrations of total PCBs (ND = ½ DL) were high, with values that exceeded the PEL (188.79 µg/kg) at most locations, indicating the potential for adverse effects on biological organisms at these locations. Locations MB-2, MSN03-JV-1, MB-4, and MSNSURF05-1 had values below the TEL but above the PEL. Total PAH concentrations (ND = ½ DL) were between the TEL (1,684.06 µg/kg) and PEL (16,770.4 µg/kg) at each of the sampled locations. Concentrations of detected chlorinated pesticides were elevated, with concentrations of 4,4-DDT that exceeded PEL values at both locations (Table 2-13). Dioxin TEQs (ND = ½ DL) were 7.24 to 18.5 ng/kg. Three PCB Aroclors (1248, 1254, and 1260), tributyltin, dibutyltin, and Bis(2-Ethylhexyl)Phthalate were each detected in surface sediments from KIM Channel.

Organophosphorus pesticides were not detected in any of the surface sediment samples from KIM Channel. Low concentrations of one VOC and three SVOC were detected in the surficial sediments from KIM Channel.

Table 2-13. Concentrations of Organics and Dioxin TEQs for Surface Sediments within the Proposed DMCF Footprint and at Masonville Cove.**

	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Bis (2-Ethylhexyl) Phthalate	Total PAHs (ND=1/2DL)	Total PCBs (ND=1/2DL)	Dioxin TEQ (ND=1/2DL)
	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	pg/g
TEL*	1.22	2.07	1.19	0.715	182.16	1,684.06	21.55	--
PEL*	7.81	374.17	4.77	4.3	2,646.51	16,770.4	188.79	--
Proposed DMCF Footprint								
M-B1	4.9	5.2	3.2	1.1	--	3,940	**805**	17.3
M-B2	4.9	3.2	2.8	0.93	--	3,050	184	14.0
M-B3	7.4	3.2	3.7	1.3	--	2,720	**288**	9.4
M-B5	5.2	5.6	**12**	1.5	350	4,260	**347**	7.24
M-B6	7.5	14	**11**	1.5	440	3,360	**324**	18.5
MSN03-JV1	**17**	11	--	2.1	--	7,450	133	19.9
MSN03-JV2	**12**	12	--	--	--	5,000	**385**	25.3
MSN03-JV3	**20**	13	--	--	--	6,510	**422**	33.3
MSN03-JV4	**23**	11	--	3.2	--	4,250	101	16.0
MSN03-JV5	5	8.1	--	1.9	--	5,240	**199**	6.16
M-B7	**11**	10	**12**	--	770	5,600	**694**	32.5
M-B8	7.0	4.4	2.8	1.1	--	2,090	**290**	10.4
MSNSURF05-1	1.6	--	--	--	430	3,900	125	13.9
WBSURF05-1	**37**	17	**14**	3.6	830	3,920	**341**	13.9
Masonville Cove								
MSNSURF05-2-S	7.4	3.7	**6.2**	1.4	530	4,750	130	26.5
MSNSURF05-3-S	**8.3**	3.4	--	--	510	4,460	100	43.2
MSNSURF05-4-S	3.9	5.7	--	1.5	1,600	13,100	**249**	59.4

**Source: MacDonald et. al. (1996)*

***There are no TEL and PEL values for dioxin and furan congeners*

Values that are shaded and bold exceed PEL values; all other values are between the TEL and PEL

ND=non-detect, DL= detection limit, -- = sample not tested for this parameter

The concentration of total PCBs (ND = ½ DL) exceeded the PEL (188.79 µg/kg) at the Wet Basin location by a factor of 1.8 (Table 2-13). Concentrations of total PCBs (ND = ½ DL) greater than the PEL indicate the potential for adverse effects on biological organisms at this location. Concentrations of detected chlorinated pesticides were elevated, with concentrations of 4,4-DDD and 4,4-DDT that exceeded PEL values (Table 2-13). Low concentrations of one VOC and two SVOCs were detected. Asbestos was not detected in the surface sediment from the Wet Basin.

Masonville Cove

Surface sediment samples were collected from three locations within Masonville Cove (Tables 2-12 and 2-13). Surface sediments collected from within Masonville Cove are predominately silt-clay (78-99 percent) with total organic carbon (TOC) ranging from 3.1 to 3.3 percent (Appendix A).

Metals - Concentrations of four metals (copper, lead, nickel, and zinc) had concentrations greater than the PEL value in at least one surface sediment sample from within Masonville Cove (Table 2-12), indicating the potential for adverse effects on biological organisms at these locations. The simultaneously extracted metals (SEM) / acid volatile sulfide (AVS) ratio was less than one at each location (Appendix A). An SEM/AVS ratio less than one indicates a high degree of probability that the metals are bound to organic material and not bioavailable to aquatic organisms.

Organics - Concentrations of total PCBs (ND = ½ DL) were generally high, with concentrations between the TEL (21.55 µg/kg) and PEL (188.79 µg/kg) at two locations and concentrations above the PEL by a factor of 1.3 at one location (Table 2-13). Concentrations of total PCBs (ND = ½ DL) greater than the PEL indicate the potential for adverse effects on biological organisms at these locations.

Total PAH concentrations (ND = ½ DL) were between the TEL (1,684.06 µg/kg) and PEL (16,770.4 µg/kg) at each of the three sampled locations. Concentrations of 4,4-DDT exceeded the PEL value for one location (Table 2-13), and concentrations of 4,4-DDD, 4,4-DDE, and dieldrin were between the TEL and PEL for two, three, and two locations, respectively from Masonville Cove. PCB Aroclor 1250 was also detected in surface sediments from Masonville Cove.

Asbestos, butyltins, and organophosphorus pesticides were not detected, and concentrations of one VOC (methylene chloride) and two SVOCs (bis(2-thylhexyl)phthalate and dibenzofuran) were detected in the surface sediments from Masonville Cove.

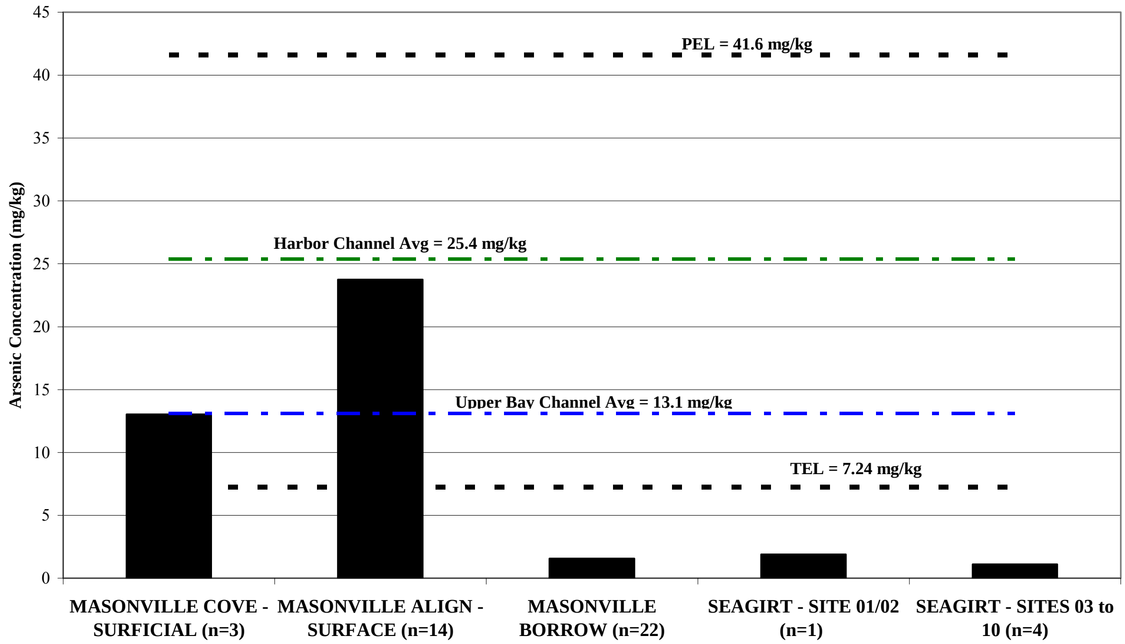
Surface Sediment Chemistry Summary and Comparison with Other Surficial Sediment Data for the Harbor and Upper Chesapeake Bay Channels

Surface sediment samples from within the proposed Masonville DMCF footprint, including the KIM Channel and the Wet Basin, and within Masonville Cove each have elevated levels of metals, PAHs, PCBs, and dioxin/furan congener concentrations. Several analytes (Tables 2-12 and 2-13) have concentrations of analytes greater than the PEL, which indicates the potential for adverse effects on biological organisms at these locations. There is no clear differentiation in the surface sediment quality among locations; instead, analyte concentrations are generally high throughout the proposed project location.

Mean concentrations of select metals (specifically arsenic, chromium, copper, lead, mercury, nickel, and zinc) and organic contaminants (specifically total PAHs, total PCBs, and dioxin TEQs) were compared to mean concentrations reported in surficial sediments that are maintenance dredged from the Federal navigation channels in the Harbor and Upper Chesapeake Bay (EA 2006, EA 2000a, EA 2000b). Comparisons are provided in Figures 2-22 through 2-31 and described below.

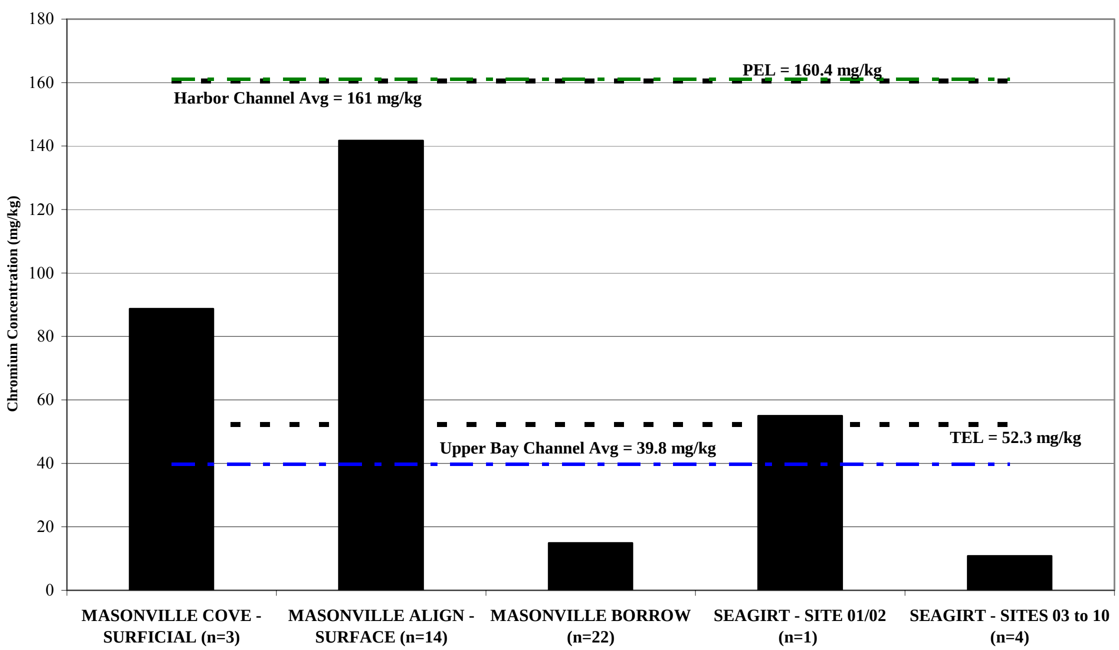
Metals **-** Results indicated that mean arsenic concentrations in the proposed Masonville DMCF footprint and the Wet Basin were comparable to concentrations measured in surficial sediments in the Harbor Federal navigation channels (Figure 2-22). Arsenic concentrations in Masonville Cove sediments were comparable to the mean concentrations measured in the Upper Chesapeake Bay Approach Channels. Arsenic concentrations in the KIM Channel were higher than Upper Bay Channels, but lower than the Harbor Channels. Mean chromium concentrations in the KIM Channel and the Wet Basin were similar to concentrations reported for the Harbor Channels (Figure 2-23), and Masonville Cove and the proposed Masonville DMCF footprint surficial sediments were measured at mean concentrations below the Harbor Channel average. Mean concentrations of copper and lead in Masonville Cove, the proposed project footprint (including the KIM Channel and the Wet Basin) exceeded not only the PEL value but also the mean concentrations reported for the Harbor Federal navigation channels (Figure 2-24 and 2-25, respectively). Mean mercury and zinc concentrations were elevated above the Harbor Channel average in the proposed project footprint (including the KIM Channel and the Wet Basin) (Figure 2-26 and Figure 2-28, respectively). The mean nickel concentration at each location was similar to concentrations reported for the Upper Bay Channels (Figure 2-27).

Organics **-** Results indicated that mean total PAHs at Masonville were substantially elevated above the mean Harbor Channel concentrations at each of the Masonville sites (Cove and project footprint) (Figure 2-29). The mean concentrations of PAHs did not exceed the PEL value. Mean total PCB concentrations were also substantially elevated above the mean Harbor Channel concentrations (five to eight times higher) at each of the Masonville sites, including the Masonville Cove sites (Figure 2-30). The dioxin TEQ in sediments within the proposed project footprint and within the KIM Channel were below the Harbor Channel average; however, the dioxin TEQ in Masonville Cove was nearly two times higher than the Harbor Channel average (Figure 2-31).



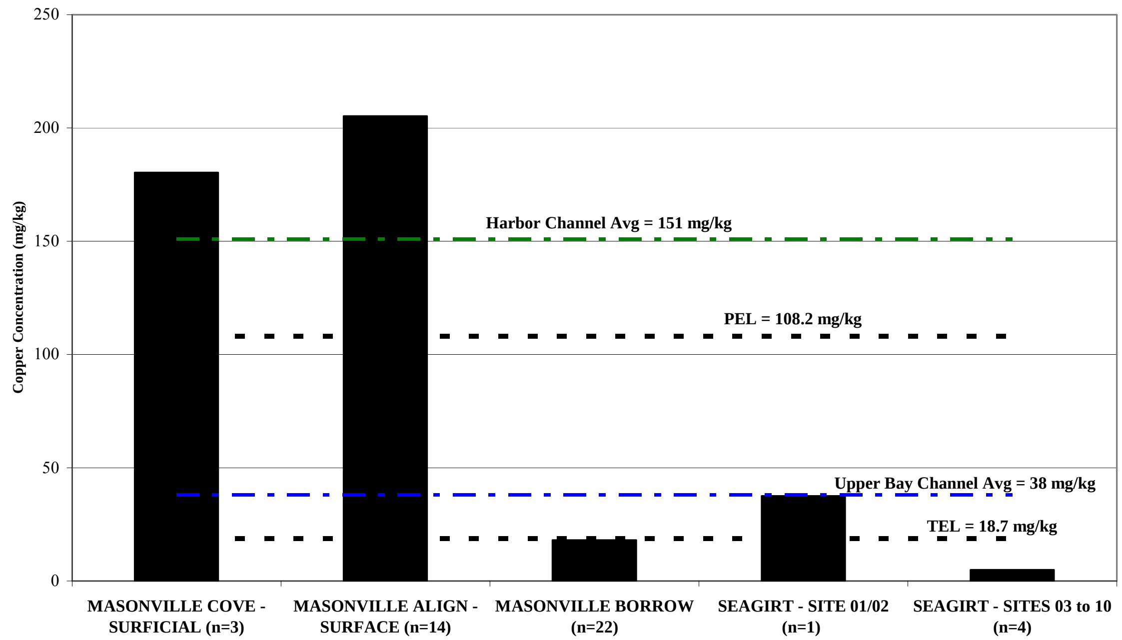
Mean arsenic concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment arsenic concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-22. Arsenic Concentrations in Sediment Samples



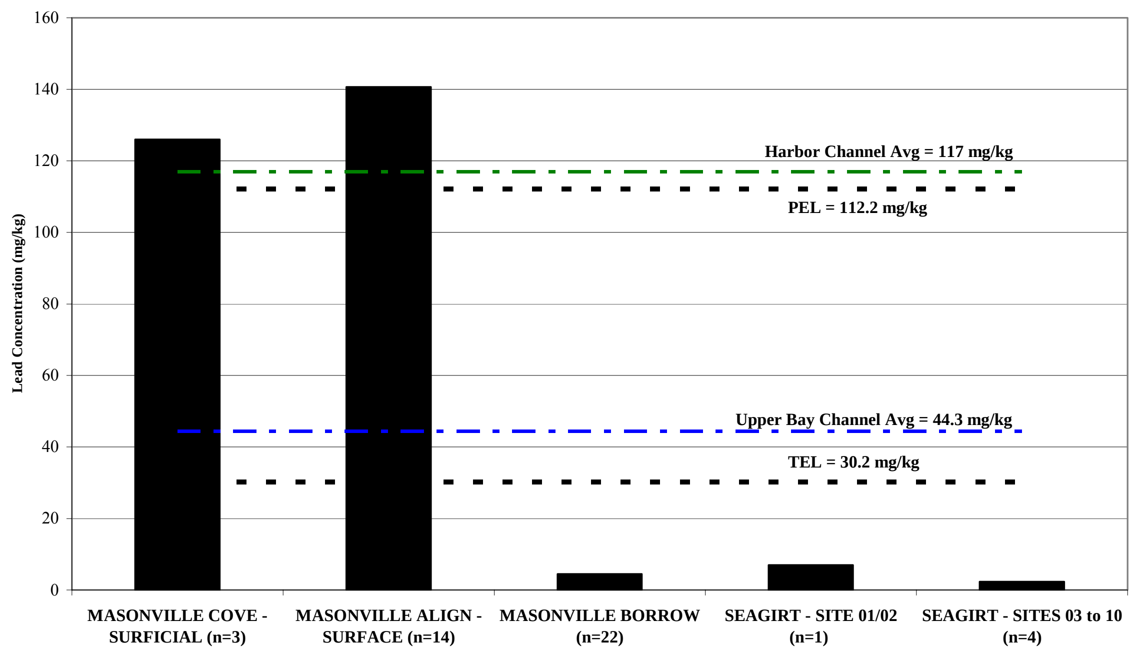
Mean chromium concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment chromium concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-23. Chromium Concentrations in Sediment Samples



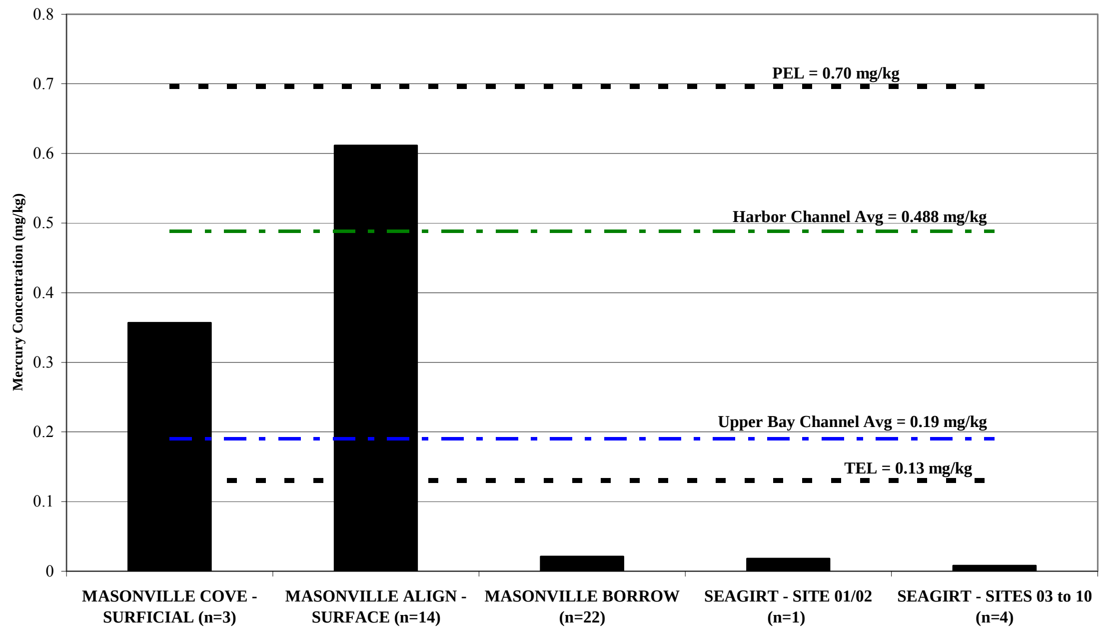
Mean copper concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment copper concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-24. Copper Concentrations in Sediment Samples



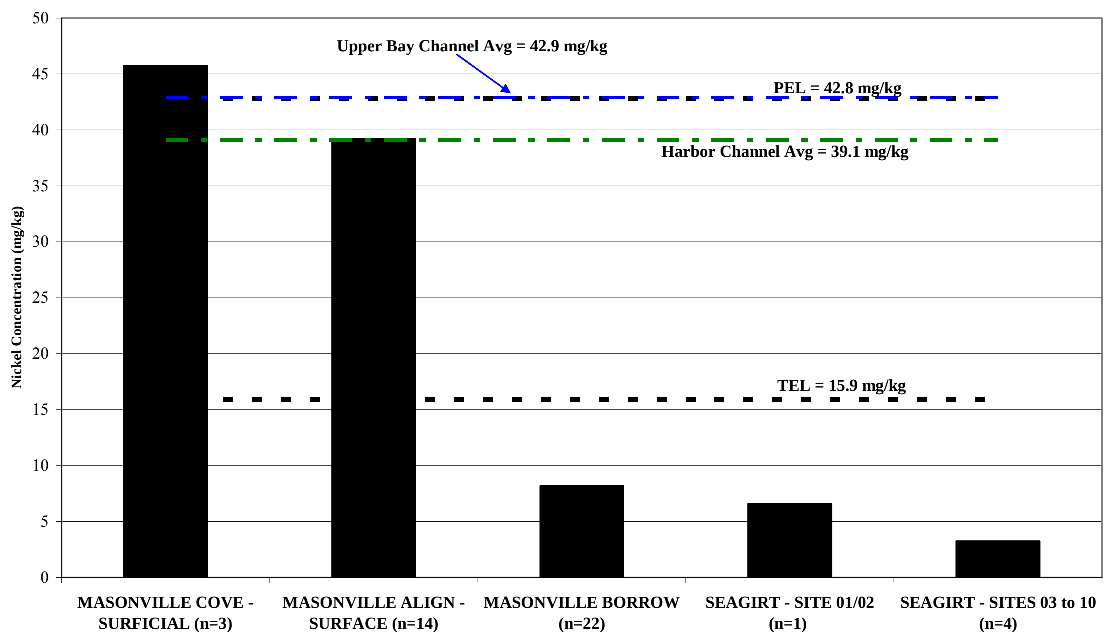
Mean lead concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment lead concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-25. Lead Concentrations in Surface Samples



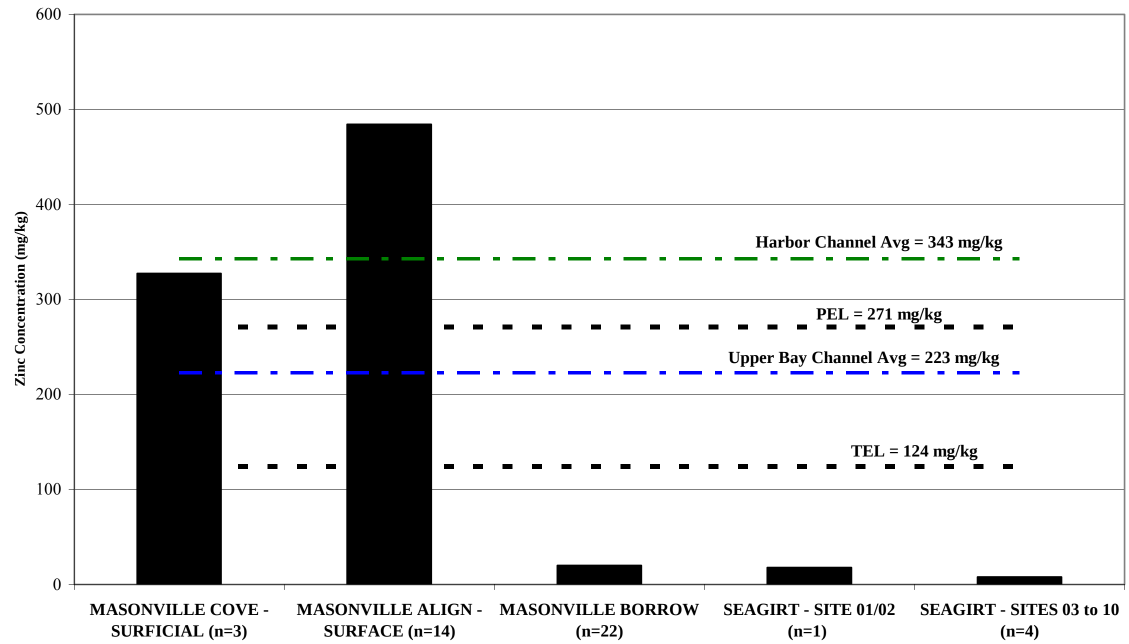
Mean mercury concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment mercury concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-26. Mercury Concentrations in Surface Sediment Samples



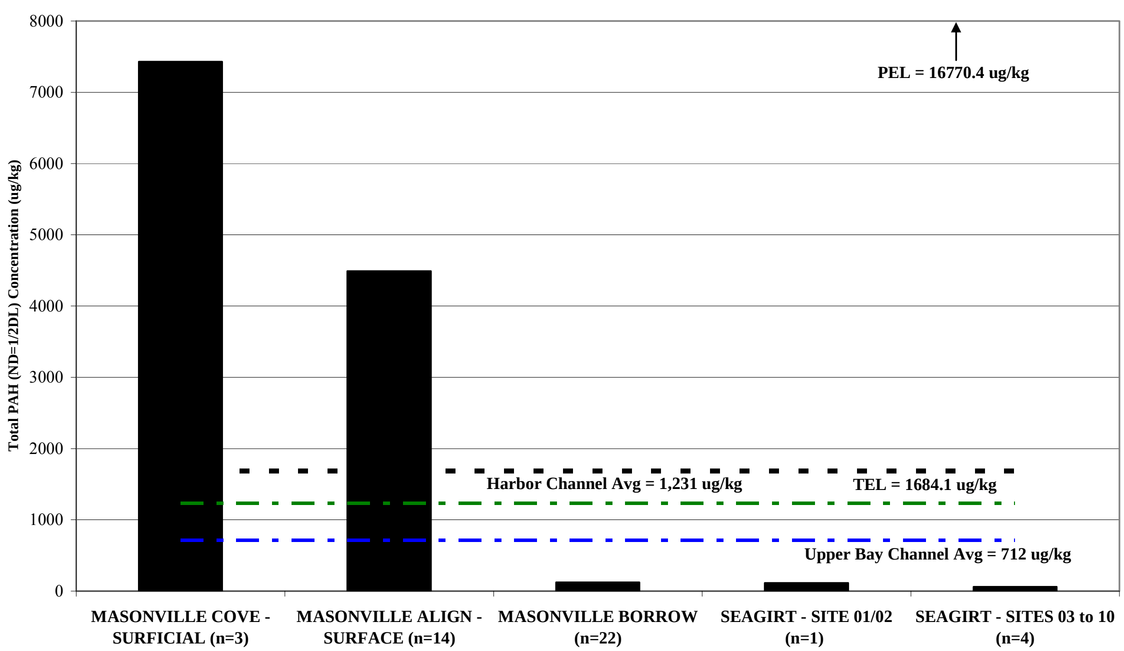
Mean nickel concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment nickel concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-27. Nickel Concentrations in Surface Sediment Samples



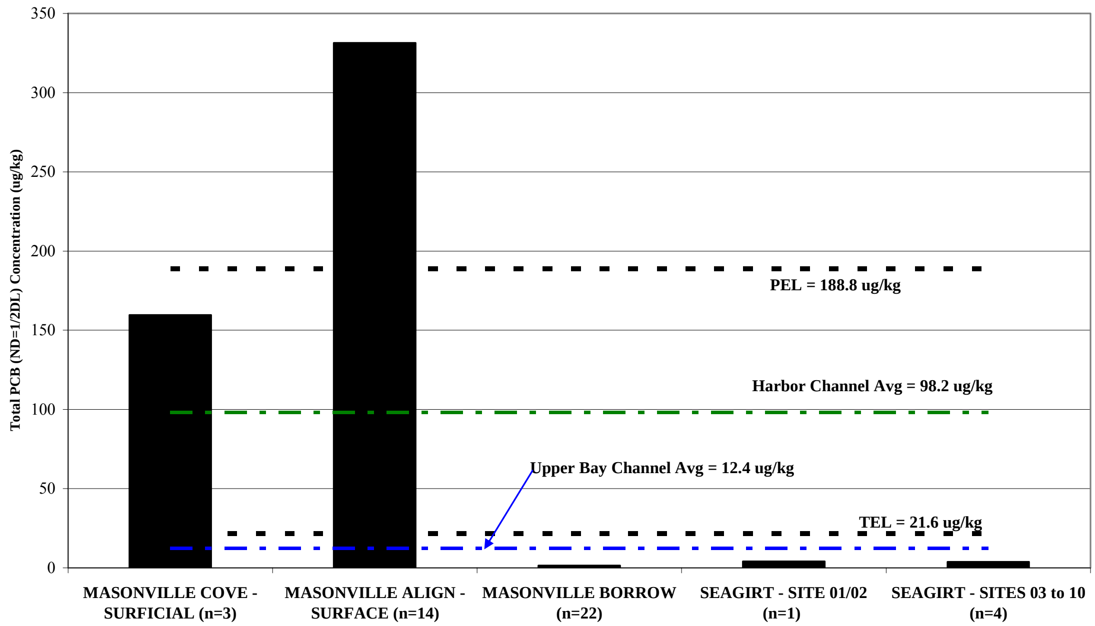
Mean zinc concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment zinc concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-28. Zinc Concentrations in Surface Sediment Samples



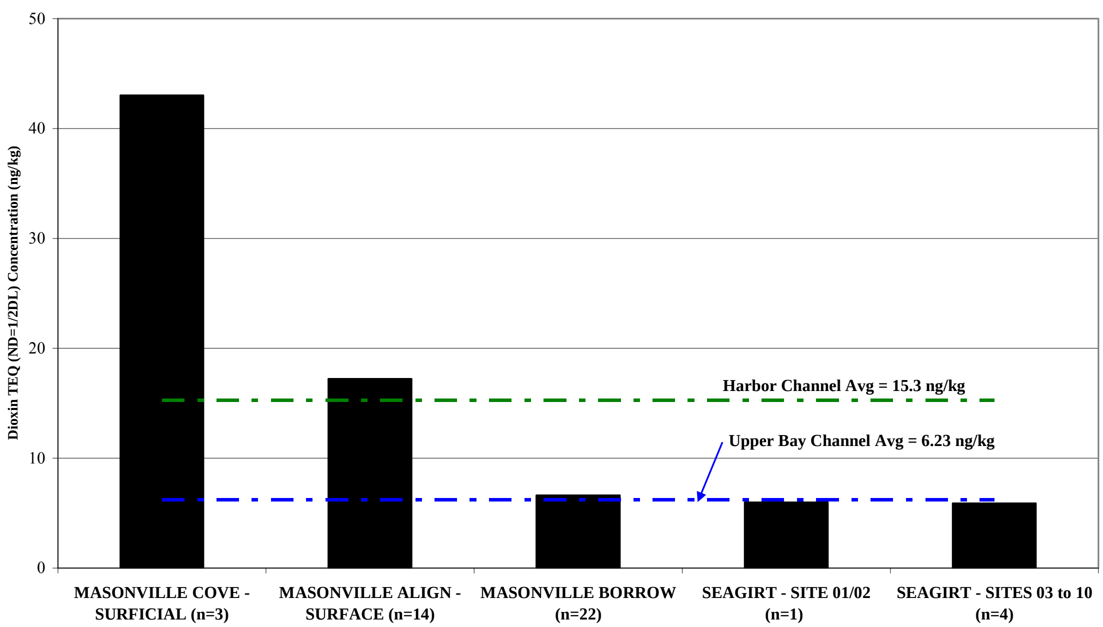
Mean total PAH (ND=1/2DL) concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment total PAH (ND=1/2DL) concentrations from Baltimore Harbor (n=113) and the Upper Chesapeake Bay Approach Channels (n=159) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison.

Figure 2-29. Total PAH (ND=1/2DL) Concentrations in Surface Sediment Samples



Mean total PCB (ND=1/2DL) concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area compared to the Threshold Effect Level (TEL) and Probable Effects Level (PEL) screening criteria (MacDonald et al. 1996). Average surface sediment total PCB (ND=1/2DL) concentrations from Baltimore Harbor (n=98) and the Upper Chesapeake Bay Approach Channels (n=142) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented

Figure 2-30. Total PCB (ND=1/2DL) Concentrations in Surface Sediment Samples

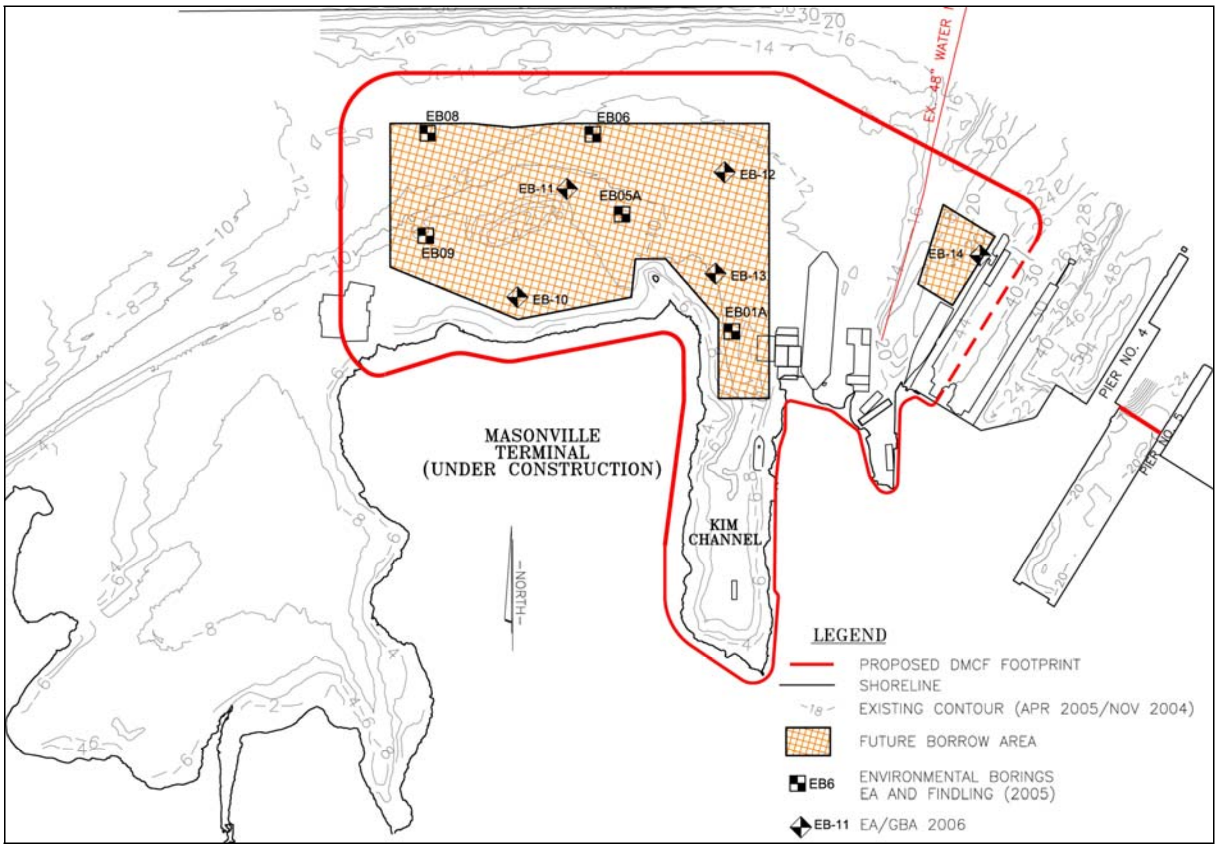


Mean Dioxin TEQ (ND=1/2DL) concentrations from sediment samples collected from within the proposed Masonville DMCF alignment, Masonville Cove, and the Seagirt dredging area. Average surface sediment dioxin TEQ (ND=1/2DL) from Baltimore Harbor (n=21) and the Upper Chesapeake Bay Approach Channels (n=35) (EA 2006, 2000a, 2000b and EA unpublished data) are also presented for comparison. NOTE: there are no PEL or TEL values for Dioxins.

Figure 2-31. Dioxin TEQ (ND=1/2DL) Concentrations in Surface Sediment Samples

2.1.4.2 Subsurface Sediment Sampling

Subsurface sediment samples were collected from five locations within the proposed Masonville sand borrow area (Figure 2-32) during the June 2005 sampling effort (EA 2005b) and from 7 locations from December 2005 to January 2006 (hereafter referred to as the January 2006 sampling). Boring logs from each location are located in Appendix A. The depths at which samples were collected for chemical analysis was determined in the field based on changes in sediment composition and were different for each sampled location. Sample depths are available in Appendix A.

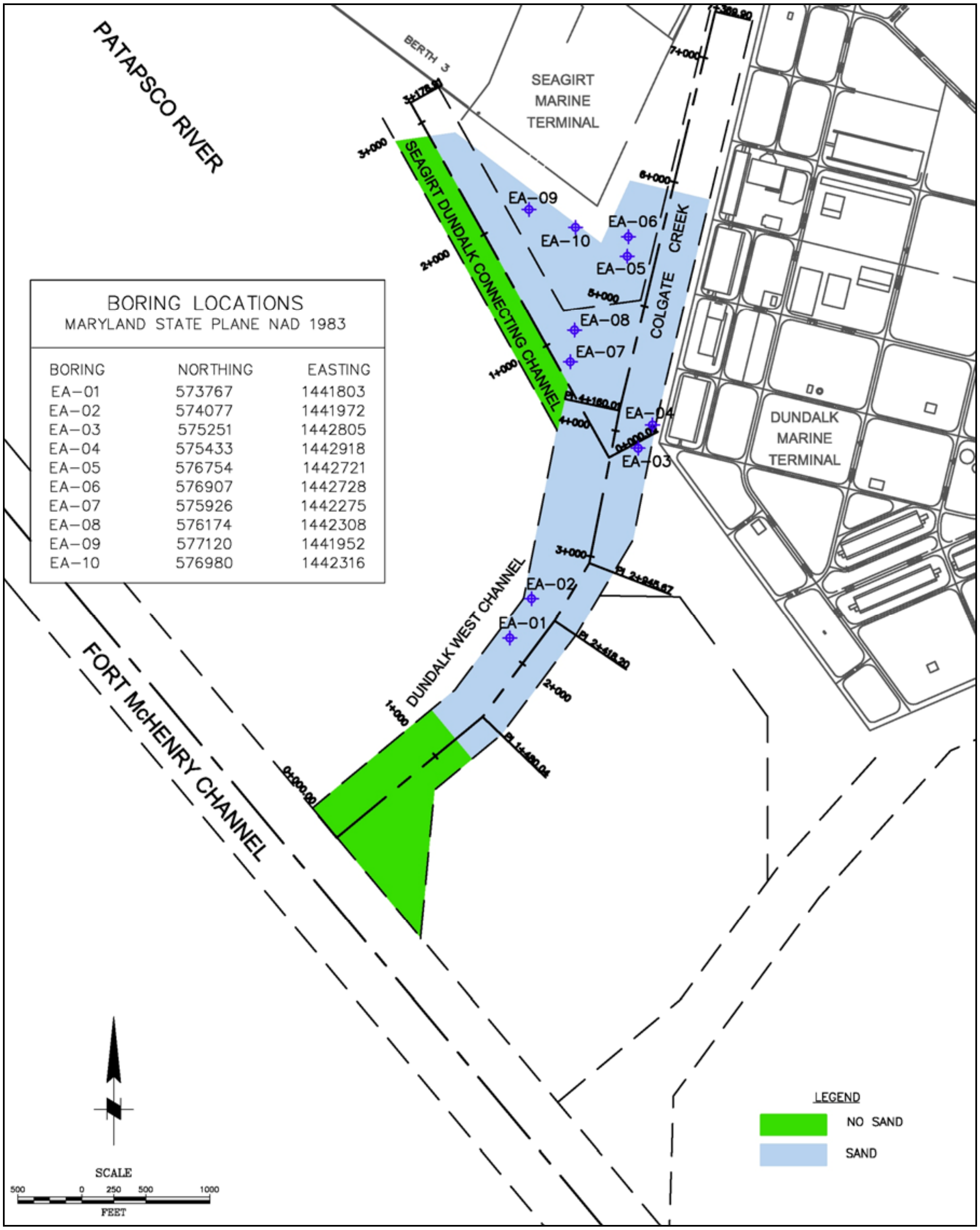


Note: 2005 Site EB-01A was also 2006 site EB-01, 2005 site EB09 was also 2006 site EB-09.

Figure 2-32. Location of the Borrow Area Sample Locations

Subsurface sediment samples were also collected from ten locations in the Seagirt dredging area. These locations are shown on Figure 2-33. Samples from the ten locations were paired to form five composite samples. Samples were analyzed to depths of -57 feet MLLW.

The purpose of this sampling was to collect physical and chemical data that would characterize the subsurface sand targeted for recovery and use in construction of the perimeter dikes for the proposed Masonville DMCF. Sediment from the upper silty-clay layer at Masonville, regardless of the depth, was composited and tested for the Hart-Miller Island (HMI) DMCF analytical parameters because this material would be excavated and placed at the HMI DMCF. The HMI



BORING	NORTHING	EASTING
EA–01	573767	1441803
EA–02	574077	1441972
EA–03	575251	1442805
EA–04	575433	1442918
EA–05	576754	1442721
EA–06	576907	1442728
EA–07	575926	1442275
EA–08	576174	1442308
EA–09	577120	1441952
EA–10	576980	1442316

Figure 2-33. Location of the Seagirt Dredging Area Borings

DMCF list of parameters includes the following constituents: metals, oil and grease, total phosphorus, TOC, chlorinated pesticides, PCB congeners, VOCs, SVOCs, chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN), grain size, pH, specific gravity, and percent moisture. The surface sediment within the Seagirt dredging area is already slated for placement at the HMI DMCF. This material was previously tested for placement suitability (EA 2006).

Samples from subsurface sand layers at Seagirt and Masonville were composited and tested for *Inland Testing Manual* (ITM) parameters (USEPA/USACE 1998), which include the following analytes: AVS/SEM, TOC, TKN, nitrate+nitrite, biological oxygen demand (BOD), Chemical Oxygen Demand (COD), cyanide, total phosphorus, sulfide, metals, PCB congeners, PCB aroclors, chlorinated and organophosphorus pesticides, PAHs, dioxin and furan congeners, butyltins, VOCs, and SVOCs. Results of subsurface sediment testing are presented in the following subsections.

Masonville Subsurface Sediment Chemistry Results

Results from the June 2005 sampling and the January 2006 sampling are summarized below. Detailed results are available in Appendix A. At locations 01A and 09 (June 2005 sampling), sample recovery within the borrow material was poor. The sample results from those locations were not used and the January 2006 sampling was performed to provide additional data. The 2005 sites 01 and 09 were resampled in January of 2006 and data from those locations is included in this section.

Metals – The June 2005 sample analysis detected concentrations of arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. Location 05A had concentrations of cadmium, chromium, lead, mercury, and zinc above the TEL and concentrations of arsenic and copper above the PEL from a depth of 0 to 19ft. Concentrations of copper and nickel were detected above the TEL from a depth of 25 to 27.5 ft at location 05A. Concentrations of arsenic, cadmium, chromium, lead, mercury, and zinc were detected above the TEL and copper was detected above the PEL at location 06 from a depth of 0 to 26 ft. No metal concentrations exceeded the TEL or PEL at location 08. A ration of SEM/AVS was calculated for location 05A for the depth of 19 to 25 ft. This ratio was less than one, which indicates a high degree of probability that the metals are bound to organic material and are not bioavailable to aquatic organisms.

The January 2006 sample analysis detected concentrations of antimony, arsenic, beryllium, total chromium, copper, lead, mercury, nickel, selenium, thallium, and zinc. Concentrations of copper were detected above the TEL at sites EB-01B, EB-11C, EB-12D, EB-14A and above the PEL at EB-09C. Concentrations of nickel were detected above the TEL at EB-11B, EB-11C, and EB-12D. All but three of the sample sites (EB-12A, EB-01C, EB-09A) had an SEM/AVS ratio of 1 or less. This indicates that there is a high degree of probability that the metals are bound to organic material and are not bioavailable to aquatic organisms.

Organics – The June 2005 sample analysis detected concentrations of total PCBs (ND=½DL) at sample locations 05A, 06, and 08. Total PCBs (ND=½DL) exceeded the TEL at location 05A from a depth of 0 to 19 ft and at location 06 from a depth of 0 to 26 ft. No PCB aroclors were detected during the June 2005 sampling. The January 2006 sample analysis detected total PCBs (ND=½DL) at all sample locations. None of these values exceeded the TEL or PEL. PCB aroclor 1254 was detected at sample locations EB-01A, EB-09A, and EB-13C. There are no TEL and PEL values for PCB aroclors.

The June 2005 sample analysis detected total PAH concentrations (ND=½DL) at locations 05A, 06, and 08. Total PAH concentrations (ND=½DL) at these locations did not exceed the TEL or PEL. Total PAH concentrations (ND=½DL) were detected at all of the January 2006 sample locations. None of the concentrations at these sites exceeded the TEL or PEL.

Chlorinated pesticides were detected in the June 2005 sample locations 05A from 0 to 19 ft and location 06 from 0 to 26 ft. The following chlorinated pesticides were located at both sites: 4,4'-DDD; 4,4'-DDE; dieldrin; and endrin. Endosulfan II was detected only at location 06. Concentrations of 4,4'-DDD exceeded the TEL at both locations and concentrations of 4,4'-DDE and dieldrin exceeded the TEL at location 05A. There are no TEL or PEL values for endosulfan II and endrin. The January 2006 sample analysis detected chlorinated pesticides at three sample locations: 4,4'-DDE and 4,4'-DDT at EB-01A; 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT at EB-09A; and 4,4'-DDD and 4,4'-DDE at EB-12C. None of these values were above the TEL or PEL. Organophosphorous pesticides were not detected in the samples from June 2005 and the samples from January 2006.

Dioxin TEQ (ND=½DL) was detected at all three June 2005 sample locations. Dioxin TEQ (ND=½DL) was also detected in all of the January 2006 samples. There are no TEL and PEL values for dioxin and furan congeners.

Dibutyltin and tributyltin were detected at June 2005 sample location 06 from a depth of 26 to 33 ft. Tributyltin was detected at January 2006 sample locations EB-14A and EB-14B. There are no TEL or PEL values for butyltins.

Only one VOC, methylene chloride, was detected in samples from June 2005 and January 2006. Methylene chloride was detected at June 2005 locations 05A, 06, and 08 at all depths and was detected at all but two January 2006 locations (EB-01A and EB-11A). There are no TEL and PEL values for VOCs. Two SVOCs were detected in samples from June 2005, benzoic acid (location 06 from 0 to 26 ft) and phenol (05A from 19 to 25 ft and from 25 to 27.5 ft, 06 from 0 to 26 ft, 08 from 26 to 31 ft). Four SVOCs were detected in samples from January 2006: acenaphthene (6 locations, results in Appendix A), bis(2-ethylhexyl) phthalate (18 locations, results in Appendix A) butyl benzyl phthalate (14 locations, results in Appendix A), and pyrene (18 locations, results in Appendix A).

Results of Masonville Grain Size Analysis

The results of the grain size analysis from the June 2005 and January 2006 samples are available in Appendix A. The sediment samples collected in June 2005 included the surficial sediments. Those samples collected from the surface contained a higher percentage of silts and clays (85.4 percent and 93.9 percent) than the deeper borings at the same location (18.2 to 63.5 percent silts and clays). Sand content at these locations ranged from 6.1 to 74.5 percent, with the lowest percentages of sand occurring in the sediment samples that included the surficial sediments. The January 2006 samples had percentages of silts and clays that were on average lower per site than the June 2005 samples (5.0 to 55.0 percent silts and clays) and ranged from 2.9 to 75.4 percent silts and clays. Sand content ranged from 10.9 percent to 92.6 percent within the January 2006 borings. This differs from the surface sediments within the proposed borrow area, which range from 72.6 to 96.2 percent silts and clays and from 3.8 to 26.7 percent sand. Additional detail on grain size is available in Appendix A.

Seagirt Dredging Area Subsurface Chemistry Results

Metals - Of the 19 metals analyzed only one (hexavalent chromium) was not found in any of the samples. Most of the metals (16 of 19) were detected in all of the samples, but in relatively low concentrations (metals include: aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, thallium, tin, and zinc). Only two metals were detected over the threshold effects level (TEL) chromium (TEL=52.3mg/kg) and copper (TEL=18.7mg/kg). Both of these exceedances were detected in sample EA-01/02-SED. None of the metal concentrations exceeded the probable effects level (PEL). In sample EA-01/02-SED copper concentrations exceeded the effects range low (ERL) value. No metals exceeded the effects range median (ERM) value (Appendix A).

Organics - At least one PCB congener was detected in each of the samples. Total PCBs were detected in all five sites; concentrations of Total PCBs (ND=1/2DL) ranged from 3.17 to 4.96 ug/kg. None of the samples exceeded the TEL, PEL, ERL, or ERM values (Appendix A).

None of the PCB aroclors were detected in any of the samples (Appendix A).

None of the PAH or total PAHs concentrations detected exceed the TEL, PEL, ERL, or ERM values and were found in relatively low concentrations. Total PAHs (ND=1/2DL) concentrations range from 56.1 to 114.3 mg/kg (Appendix A).

No chlorinated pesticides or organophosphorus pesticides were detected in the sediment samples (Appendix A).

Of the 17 tested dioxin and furan congeners, seven were detected in sediment samples. However, the most toxic dioxin congener, 2,3,7,8-TCDD, was not detected in any of the samples. Dioxin TEQs (ND=1/2DL) for sediment ranged from 5.64 to 6.23 pg/g. There are no TEL or PEL values for dioxin and furan congeners (Appendix A).

Butyltins were not detected in any of the samples. SVOCs were not detected in any of the sediment samples. Only one VOC was detected in the samples, methylene chloride. This compound was detected in all of the samples. The concentrations of methylene chloride in all five samples were detected below the reporting limit and the values are estimated. Methylene chloride was detected in the method blank and is a common laboratory contaminant (Appendix A).

Results of the Seagirt Grain Size Analysis

Results of physical analyses for sediment samples are shown in Appendix A. Four of the five sediment samples (EA-03/04-SED, EA-05/06-SED, EA-07/08-SED, EA-09/10-SED) were comprised primarily of sand and gravel. Percentages of sand and gravel ranged from 79.2 to

92.3 percent. One of the samples (EA-01/02-SED) was comprised of sand (57.2 percent), silts (26 percent), and clay (16.4 percent), which gives the sample a fines content of 42.4 percent. All of the samples were non-plastic.

2.1.4.3 Comparison of Masonville Surficial and Subsurface Chemistry Results

Generally, concentrations of detected metals and organic constituents were highest in the overburden layers. This is primarily the result of a combination of two factors: 1) the lower sediment layers sampled at Masonville are generally below the levels of historical contamination; and 2) contaminants preferentially bind to the organic carbon fraction of sediments, and TOC concentration decreased with depth for the Masonville samples as the sand fraction of the sediments increased. Therefore, the concentrations of metals and organic constituents generally decreased in the borrow material. The concentrations of detected metals and organic constituents decreased to low concentrations that were below the TEL at most sites. Detected concentrations of various constituents from the borrow material were also lower than mean concentrations detected in surface sediments from the upper Chesapeake Bay approach channels to the Port of Baltimore (Appendix A) (EA 2000a, EA 2000b, EA 2006, EA 2005b). Figures 2-22 to 2-31 show a comparison between the surficial sediment samples (overburden) within the project footprint and the subsurface samples (borrow) within the alignment. In all cases, the concentrations of contaminants in the borrow are notably lower than the concentrations of contaminants within the overburden.

2.1.4.4 Comparison of Masonville and Seagirt Borrow Material

The quality of the sand and gravel at Seagirt was tested and compared to the Masonville borrow material (Figures 2-22 to 2-31). The majority of tested constituents were below detection limits in the Seagirt sand. Of the detected compounds, nearly all met aquatic sediment quality guidelines (TEL/PEL) required for in-water placement and residential soil cleanup criteria. Copper and chromium slightly exceed TELs in one location (EA-01/02-SED). The fines composition ranged from 8 to 21 percent at all locations except Sta. 01/02 (which had approximately 42 percent fines).

With the exception of copper and chromium at one location (EA-01/02-SED), the chemical quality of the Seagirt sand and gravel was comparable to or of better quality than the proposed Masonville Borrow material. For both copper and chromium, the detected concentrations were only slightly above the most conservative sediment quality guidelines (TEL) and well below the Harbor averages. To assess the potential for water quality impacts, Standard elutriate testing was conducted on the Seagirt material. Results are included in Section 5.1.5.

2.1.5 Water Quality

The Baltimore Harbor is on Maryland's 303(d) list of impaired water bodies under the following impairment categories: metals, toxics, nutrients, bacteria, and biological. Potential sources of the listed impairments include industries that are or were located along the river, non-point sources, and unknown sources. Waterway designations by the State of Maryland dictate what activities or uses occur in different areas. The middle branch of the Patapsco River is considered Use II, which are tidal waters of the U.S [Code of Maryland Regulations (COMAR) 26.08]. The middle branch of the Patapsco is considered by the COMAR regulations to be mesohaline and includes the following designated uses: migratory spawning and nursery use from February 1 to May 31, shallow water (to a depth of 1 m) SAV use from April 1 to October 1, open water fish and shellfish use from January 1 to December 31, seasonal deep water fish and shellfish use from June 1 to September 30, and shellfish harvest (COMAR 26.08.02.02).

Eutrophic conditions are considered common in the lower portion of the Patapsco River estuary (Maryland DNR 2005a). Excess nutrients entering the Chesapeake Bay from human sources (including agricultural activities, wastewater treatment plants, urban and storm runoff, and septic systems) promote algal growth that impairs water clarity and causes low oxygen conditions in bottom waters. Bottom waters below the pycnocline (portion of the water column with the greatest change in density) are especially prone to low oxygen events during warmer weather. This process of nutrient enrichment, and the resulting poor water quality, is known as eutrophication and is a primary concern within the Chesapeake Bay watershed. Nitrogen inputs from anthropogenic sources are currently entering the Bay at about seven times greater than natural levels (Howarth *et. al*. 2002). Phosphorus inputs from anthropogenic sources are entering the Bay at a rate 16.5 times greater than natural levels (Malone *et. al*. 1999). In addition to the anthropogenic sources above, natural causes of poor water quality include wave action that resuspends bottom sediments and erodes the shoreline, reducing near shore water clarity. In contrast, 'good' water quality implies a balanced amount of nutrients, normal fluctuations in salinity and temperature, a low volume of suspended solids, and a sufficient year-round supply of oxygen.

2.1.5.1 Water Quality Parameters

Temperature, dissolved oxygen (DO), salinity, and pH were measured at Masonville locations in conjunction with sediment investigations and seasonal benthic and fisheries surveys conducted between 2003 and 2005 (EA 2003a, EA 2005a, 2005b, and 2005c). Water depths, at the time of the surveys, were generally between 7 and 12 ft. Exceptions include two shallow (less than 5 ft) and one deep (greater than 22 ft) sampling locations. Sampling was completed during all sampling events for benthos, fisheries, and sediment studies at those sample locations. Sampling was conducted in three seasons: spring, summer, and fall.

Generally, the average temperature, pH, DO, and salinity values followed trends that would be expected for a well-mixed tidal water column (Table 2-14). Average water temperatures were highest in the summer and lowest in the fall. Salinity was highest at the surface and mid-depth in the fall and was lowest at the bottom in the fall. Salinity at the site ranges from 4.0 to 9.0 parts per thousand (ppt). In the reach that includes Masonville, the Patapsco River ranges from oligohaline to low mesohaline, with salinities generally ranging from 2 to 10 ppt. The CBP defines mesohaline as 5 to 18 ppt and oligohaline conditions as 0.5 to 5 ppt (CBP 2006). Fall had the lowest average pH, and spring and summer had similar average pH values. As expected, DO concentrations had the greatest variability in the water column, with bottom concentrations generally lower than those measured at the surface. This trend of lower DO concentrations was most pronounced during summer sampling events, although the measured DO concentrations did not indicate anoxic (DO ≤ 2 mg/L) conditions in the vicinity of Masonville during the period of sampling. Collected raw water quality data are available in Appendix A.

Table 2-14. Average Seasonal Water Quality Data Measured at Masonville Sampling Locations

Parameter	Depth	Spring	Summer	Fall
Temperature (^oC)	Surface	24.4	26.3	18.2
	Mid	23.4	26.1	19.1
	Bottom	22.7	24.9	19.9
pH	Surface	8.3	8.3	6.1
	Mid	8.1	8.1	6.2
	Bottom	7.7	7.8	7.5
Dissolved Oxygen (mg/L)	Surface	9.4	9.6	8.1
	Mid	8.2	7.9	7.8
	Bottom	6.7	5.1	7.4
Salinity (ppt)	Surface	4.8	4.6	9.0
	Mid	5.3	4.9	7.4
	Bottom	5.5	5.8	4.0
Turbidity (NTU)	Surface	5.7	16.4	2.9
	Mid	6.7	14.7	4.5
	Bottom	9.2	10.9	5.5

**Water depths at the time of sampling generally ranged between 7 and 12 ft. Samples were collected from 2003-2005 (EA 2003a, 2005a, 2005b, 2005c)*

Water quality parameters measured at the Masonville sampling locations between 2003 and 2005 were generally consistent with concentrations measured at Chesapeake Bay Program (CBP) monitoring location WT5.1. These results indicated that the water quality parameters recorded at Masonville were within the normal and average ranges for this portion of the Patapsco River (Table 2-15) (CBP 2004a). CBP monitoring location WT5.1 is located approximately 4.5 miles from the proposed Masonville DMCF site in the Patapsco River. The station location is tidally influenced, mesohaline, and approximately 40 ft deep. The location of the monitoring station WT5.1 is shown in Figure 2-34 and is approximately 4.5 miles from the proposed Masonville DMCF site.

Table 2-15. Average Seasonal Surface Water Quality Data Measured at CBP Monitoring Location WT5.1 (1995 – 2004)

Parameter	Winter	Spring	Summer	Fall
Temperature (^oC)	4.48	12.6	25.4	18.8
pH	7.98	8.00	7.99	7.85
Dissolved Oxygen (mg/L)	11.7	9.99	7.49	8.15
Salinity (ppt)	9.47	6.44	7.40	10.2

Source: CBP 2004a.

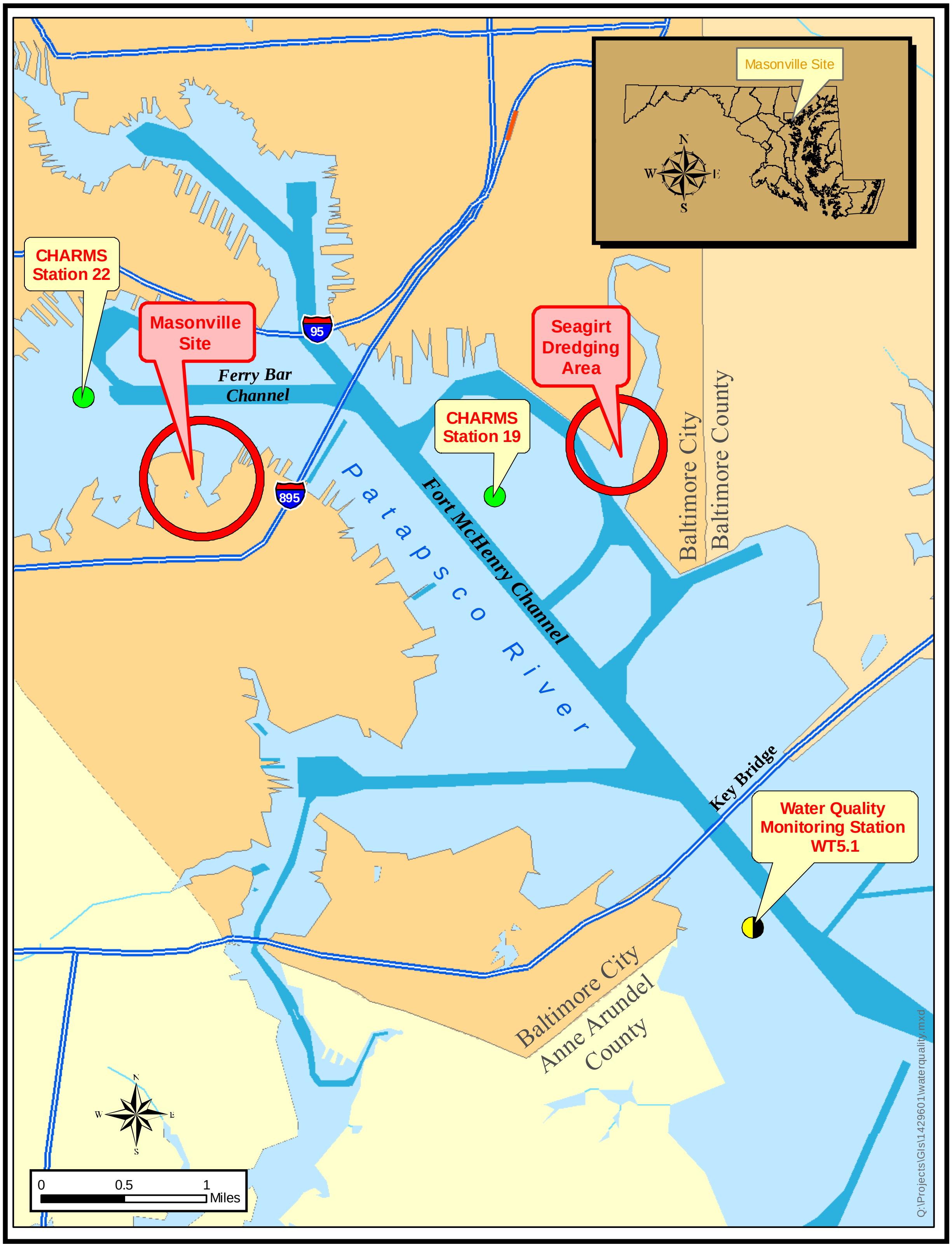


Figure 2-34. Location of CBP Water Quality Monitoring Station WT5.1 and Comprehensive Harbor Assessment and Regional Modeling Study (CHARMS) Stations 19 and 22

Recent water quality trends in this part of the Patapsco have indicated, based on nitrogen and DO concentrations, that summer water quality is still poor, but improving (Maryland DNR 2005b).

The Comprehensive Harbor Assessment and Regional Modeling Study (CHARMS) is a multi-year effort to develop a water quality model for the Harbor that would predict potential concentrations of toxics in the water column based upon sediment concentrations. In order to calibrate the model, the study included surficial water quality sampling within the Baltimore Harbor. Two of the sampling sites (22 and 19) are located within approximately 1 mile of Masonville (Figure 2-34). Station 22 was immediately east of the Hanover Street Bridge near the north shore of the Middle Branch and Station 19 was due south of Fort McHenry, within the navigation channel. The data collected at these sites provide concentrations of metals, Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), and pesticides for the area. The concentrations measured at Stations 19 and 22 can be found in Appendix A.

Although metals were detected throughout the Harbor, water column concentrations were relatively low and the concentrations near Masonville were below the overall averages for the Harbor. Copper concentrations were detected in many locations; however, most concentrations (Harbor-wide) met State water quality criteria. All dissolved nickel concentrations (Harbor-wide) met both acute and chronic freshwater water quality criteria used to determine effects. Acute water quality criteria are set at a level where short-term exposure to the constituent is likely to have an effect. Chronic water quality criteria are set at a level where long-term exposure to the constituent is likely to have an effect. Concentrations of total PCBs varied across the Harbor and elevated levels were found in the Outer Harbor (near Old Road Bay and Bear Creek) and also in the Inner Harbor and Middle Branch of the Patapsco River (near and upstream of Masonville) after precipitation events. Concentrations of total PAHs were variable, with peaks associated with stormwater inputs; this was a Harbor-wide occurrence. Total chlordane concentrations were variable but generally below 10 ng/L with four exceptions (Harbor-wide); chlordane concentrations near Masonville were elevated but average for the Harbor.

No site-specific water quality data are available for the Seagirt dredging area. The nearest Chesapeake Bay Program water quality monitoring station is WT5.1 and is located approximately 3.6 miles from Seagirt Marine Terminal (Figure 2-34). The station location is tidally influenced, mesohaline, and in approximately 40 feet of water which is similar to the conditions at Seagirt, presently. The average seasonal water quality data from 1995 to 2004 for station WT5.1 is shown in Table 2-15.

The Seagirt dredging area ranges from 15 to 47 feet deep. Therefore, most of the project lies below the pycnocline and would be susceptible to seasonal hypoxia and anoxia in warmer months.

2.1.5.2 Nutrient Sampling

The Chesapeake Bay Water and Habitat Quality Monitoring Program have collected water quality samples in the Maryland tributaries since 1985. Samples are analyzed for nutrients, such as total nitrogen and total phosphorus concentrations and for physio-chemical parameters, such as dissolved oxygen. The newest data trends indicate that, while nutrient conditions are improving, nitrogen and phosphorus concentrations, and related algal densities are still poor. Total suspended solids (TSS) concentrations have also improved and are currently "fair" (Maryland DNR 2005b).

Surface water samples for nutrient analysis were collected from four locations in the footprint of the Masonville project area (Figure 2-35). Two sites in the footprint were sampled in 2003 (M-B1, M-B3) and two were sampled in 2004 (M-B5, M-B6). One location sampled in 2004 in Masonville Cove (M-B4) was also sampled in June 2003 (Figure 2-35). Samples were collected and analyzed according to established Chesapeake Bay Water Quality Monitoring Protocols as defined in D'Elia *et. al*. (1995) and CBP (1993). Concentrations of the measured nutrient parameters are presented in Table 2-16.

Table 2-16. Water Quality Data from Masonville Nutrient Sampling Locations in 2003 and 2004

		CBP Location	Masonville Sampling Locations				
			Summer 2003			Summer 2004	
Analyte	**Units**	**WT5.1***	**M-B1**	**M-B3**	**M-B4**	**M-B5**	**M-B6**
Nitrite	mg N/L	0.0240	0.0256	0.0268	0.0254	0.0089	0.0088
Ammonium	mg N/L	0.120	0.301	0.260	0.177	0.061	0.055
Nitrate	mg N/L	0.192	0.558	0.600	0.681	0.268	0.27
Total Dissolved Nitrogen	mg N/L	0.74	1.10	1.06	1.09	0.66	0.63
Particulate Nitrogen	mg N/L	0.450	0.255	0.377	0.388	0.316	0.311
Phosphate	mg P/L	0.0110	0.0019	0.0017	0.0021	0.0037	0.0044
Total Dissolved Phosphorus	mg P/L	0.0250	0.0097	0.0085	0.0086	0.0139	0.0159
Particulate Phosphorus	mg P/L	0.0490	0.0447	0.0403	0.0507	0.0384	0.0376
Dissolved Organic Carbon	mg C/L	4.19	4.06	3.88	4.11	4.35	6.04
Particulate Carbon	mg C/L	2.65	1.42	2.15	2.35	1.77	1.68
Total Suspended Solids	mg/L	13.9	17.0	14.0	32.0	9.2	8.5
Phaeophytin	mg/L	5.55	6.56	6.94	8.82	10.68	11.08
Chlorophyll *a*	mg/L	31.80	25.93	38.79	52.36	27.54	25.11

***Source**: CBP 2004a.*
Chesapeake Bay Program Water Quality Monitoring Program, Annapolis, MD. Data represent mean surface water concentrations at WT5.1 from the summer months (June, July, and August) collected between 1999 and 2004.

Figure 2-35. Nutrient Sample Locations

Concentrations of most nutrients and water quality parameters measured at all locations adjacent to Masonville, during both sampling efforts, were within the range of typical summer concentrations at the CBP Patapsco River monitoring location (WT5.1), but concentrations of nitrate and total dissolved nitrogen at Masonville were consistently higher than concentrations at monitoring station WT5.1. The results indicated that the Masonville site has typical water quality for Baltimore Harbor in summer. The Baltimore Harbor is listed as impaired for nutrients on Maryland's 303(d) list and the lower portion of the Patapsco River commonly has eutrophic conditions (Maryland DNR 2005a). Nutrient concentrations measured in the KIM Channel (M-B5 and M-B6, Figure 2-35) were not elevated relative to the other areas of the site.

2.1.6 Aquatic Resources

2.1.6.1 Shallow Water Habitat (SWH)

SWH is defined as open water with a depth less than 6.5 ft (two meters), generally found at the edge of shorelines. Shallow waters continuously shift with the tides and are constantly affected by climatic change, undergoing extreme temperature fluctuations throughout the year. Sediments are suspended in the water column and salinity is constantly changing during storm events in shallow waters (CBP 2005b). Fluctuations in temperature and DO are more frequent in shallow water, and, as a result, the shallow subtidal environment has the potential to be more stressful than deeper benthic environments (Day *et. al.* 1989). SWH may also include high marsh tide pools that are typically flooded during spring high tides, and serve as refuge habitat for larval and juvenile saltmarsh-oriented species. Light can penetrate to the bottom of clear shallow waters. Therefore, these waters can support SAV species.

SWH less than 6.5 ft deep is considered to be habitat that SAV could potentially colonize if water clarity is adequate. Unvegetated shallow waters less than 3.2 ft (one meter) deep are considered to be areas of high potential for SAV recovery, and are included in the Tier II SAV recovery zone of the Chesapeake Bay Program; unvegetated shallows between 3.2 and 6.4 ft (one and two meters) deep are contained in the Tier III recovery zone.

Although SWH is a harsh environment, SWH is rarely prone to hypoxic (low oxygen) and anoxic (no oxygen) conditions that routinely impact deeper waters below the pycnocline. A vast diversity of aquatic life inhabits these areas (CBP 2005b). Many Chesapeake Bay species depend on vegetated SWH at some point during their life cycle. Grass shrimp (*Palaemonetes pugio*), killifish, and juveniles of larger fish species use shallow-water shorelines as nursery areas and for refuge. Shallow water areas, particularly those with SAV or other suitable cover, are important refuges for older juveniles and soft crabs (Funderburk *et. al.* 1991). Predators, including blue crabs, spot, striped bass, summer flounder, waterfowl, colonial waterbirds, and raptors forage in SWH for prey. Prey species that utilize SWH include species such as grass shrimp, bay opossum shrimp (*Neomysis americana*), Atlantic silversides (*Menidia menidia*), and bay anchovy.

SWH at the Masonville site includes areas in close proximity to the shoreline and one shallow mound of sediment in the center of the site (Figure 2-36). Approximately ten acres of SWH are found in the DMCF footprint. This includes approximately 0.38 acres of Tier I SAV habitat, approximately 4.81 acres of Tier II SAV habitat, and 5.93 acres of Tier III SAV habitat. There is no SWH contained within the Seagirt dredging area.

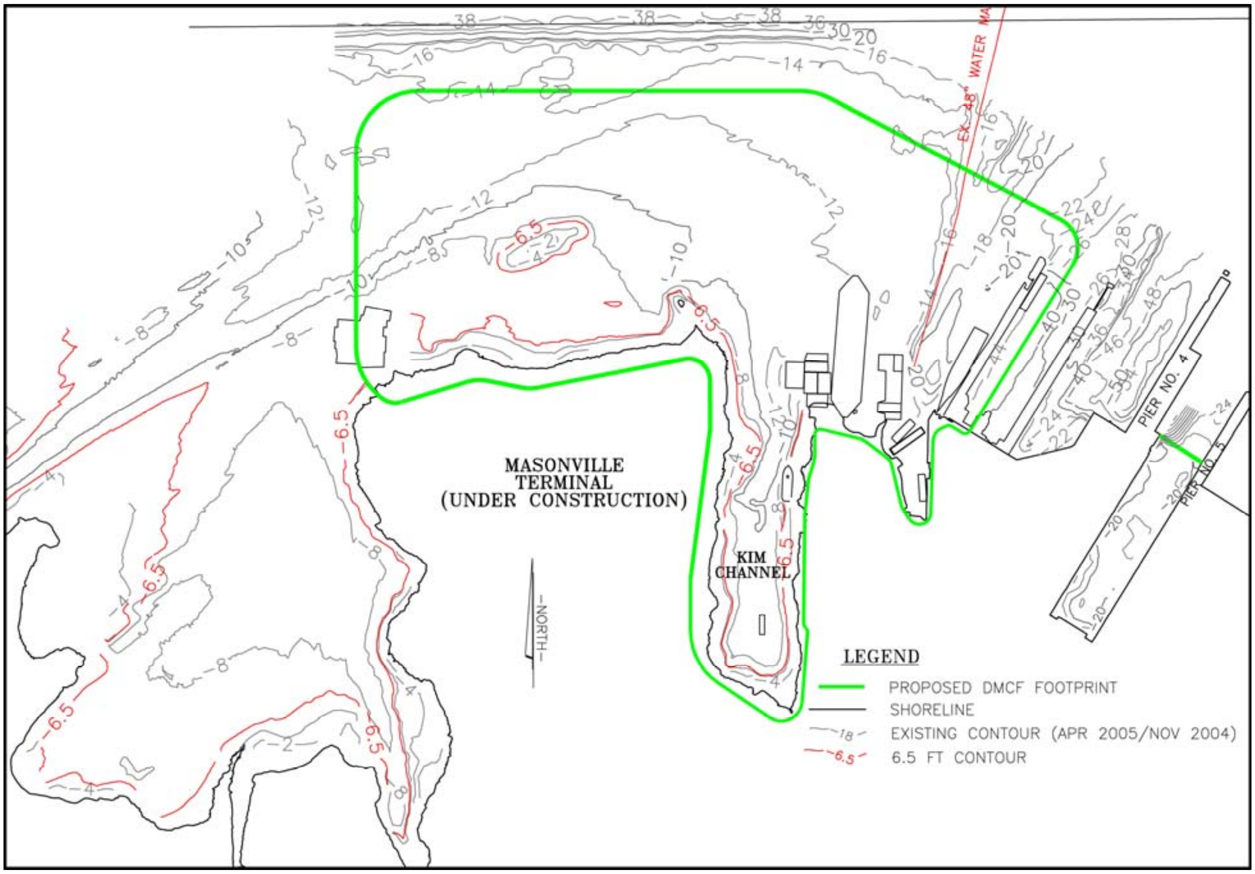


Figure 2-36. Areas of Shallow Water Habitat in the Proposed Masonville DMCF Footprint

2.1.6.2 Submerged Aquatic Vegetation (SAV)

SAV is an important water quality indicator because SAV will not grow in areas with poor water quality and is sensitive to changes in water quality. It produces oxygen, filters and traps sediments, and protects shorelines from erosion. The growth of SAV is influenced by light levels, water quality, water depth, salinity, and nutrients. High nutrient levels in the Bay increase algae populations, which in turn decrease the amount of light that reaches aquatic plants. Historically, the Chesapeake Bay's shoreline supported more than 200,000 acres of aquatic grasses (CBP 2005a). However, there was a sharp decline in SAV species in the late 1960s and 1970s that is statistically correlated with a reduction in light levels. This decline in light penetration was hypothesized to be caused by an increase of sedimentation and erosion of high nutrient agricultural soils and industrial runoff (CBP 2005a).

The VIMS conducts annual SAV surveys throughout the Chesapeake Bay using aerial photography. No SAV has been found within the proposed Masonville site by the VIMS over flight surveys in recent years, including 2004 (VIMS 2005, MPA 2002b). The Patapsco River segment was not surveyed in 2001 because of government air restrictions after the September 11th tragedy. In Shallow Creek, near the northern edge of the mouth of the Patapsco River, small amounts of SAV have been recorded during VIMS surveys. The SAV species Eurasian water milfoil (*Myriophyllum spicatum*) was found in very low densities in Masonville Cove, southwest of the site, during the 2003 and 2004 summer surveys (EA 2003a and 2005b). No SAV exists in the Seagirt dredging area due to the depth of the area.

To assess the progress of SAV restoration throughout the Chesapeake Bay, the CBP established a tiered set of SAV distribution restoration targets for each monitoring segment of the Bay. The targets represent increases in SAV distribution anticipated in response to improvements in water quality. The Tier I target is the restoration of SAV to areas currently or previously inhabited by SAV as mapped through regional and Bay wide aerial surveys from 1971 through 1990 (Batiuk *et. al*. 1992; Dennison *et. al*. 1993). The Tier II target is the restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the one-meter depth contour (CBP 2000). The Tier III target is the restoration of SAV to all shallow water areas delineated as existing or potential SAV habitat down to the two-meter depth contour (CBP 2000). There are approximately 0.38 acres of Tier I SAV habitat, approximately 4.81 acres of Tier II SAV habitat, and 5.93 acres of Tier III SAV habitat within the proposed DMCF footprint.

During these surveys, a few very small pockets of Eurasian water milfoil were observed near the shoreline of this area. The SAV densities observed during the summer 2004 survey were greater than observations recorded during the summer 2003 survey. There is approximately half an acre of SAV within Masonville Cove.

An engineering crew reported SAV near the sunken barges on the western side of the proposed project footprint on 28 July 2005. The species of this SAV is uncertain, but suspected to be Eurasian water milfoil. An SAV survey was completed within the proposed project footprint in October 2005 by EA (EA 2005c). None was observed growing in the vicinity of the sunken barges. Eurasian water milfoil was observed growing within the KIM Channel in the shallow areas along the shoreline. The western shoreline of KIM Channel contained sparse beds of Eurasian water milfoil five feet wide and several hundred feet long (Figure 2-37). There were also sparse beds along the southern shore of the channel and in the southeast corner of the channel. The SAV covered approximately 16,700 square ft or 0.4 acres (Table 2-17). Density of these beds ranged from one to three based on a method developed by the USFWS (Appendix C). Since this survey was conducted after the peak growing season for SAV, the distribution, density, and species composition may be under-represented. The total acreage of Tier I/Tier II habitat is approximately 10 acres within the footprint (equivalent to SWH, see below). There is approximately an acre of SAV growing in the Masonville project area (Table 2-17.

Table 2-17. Acres of SAV within the Vicinity of Masonville

Location	Acres
KIM Channel	0.4
Masonville Cove	0.5
TOTAL	**0.9**

Additional SAV surveys were completed in June and August of 2006 (Attachment C). Both the June and August 2006 surveys sampled 109 stations along north-south transects in Masonville Cove. Transects were spaced at 500 foot intervals and samples were taken every 100 feet along

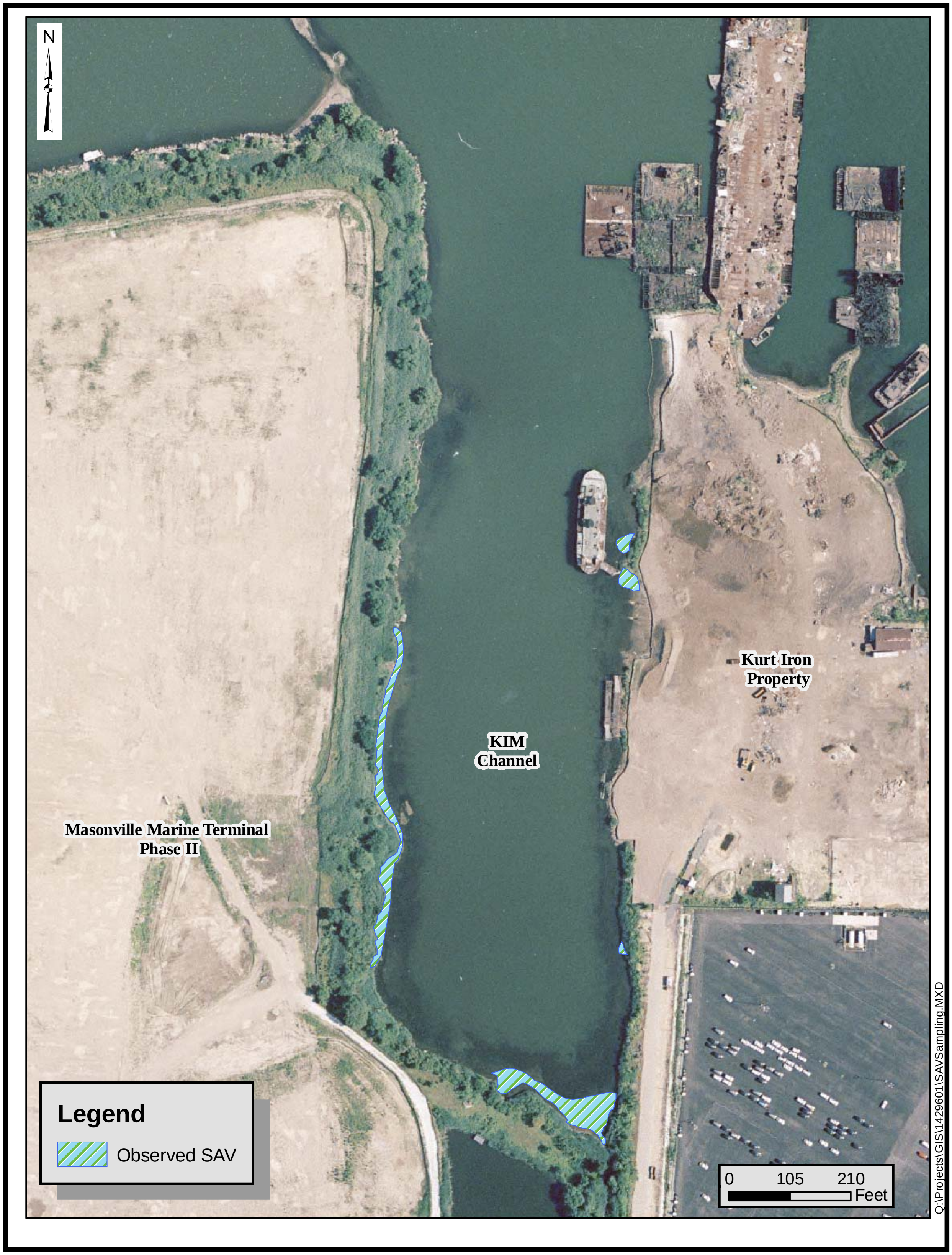


Figure 2-37. SAV Observed During the October 2005 Survey.

the transect. Two species were observed during the June 2006 survey: horned pondweed (*Zannichellia palustris*) and Eurasian water milfoil. Horned pondweed was observed at 18 of the stations and Euasian water milfoil was observed at two of the stations (Figure 2-38). Water depths at these sites ranged from 1.5 to 6.4 feet at the time of the survey. The density of SAV

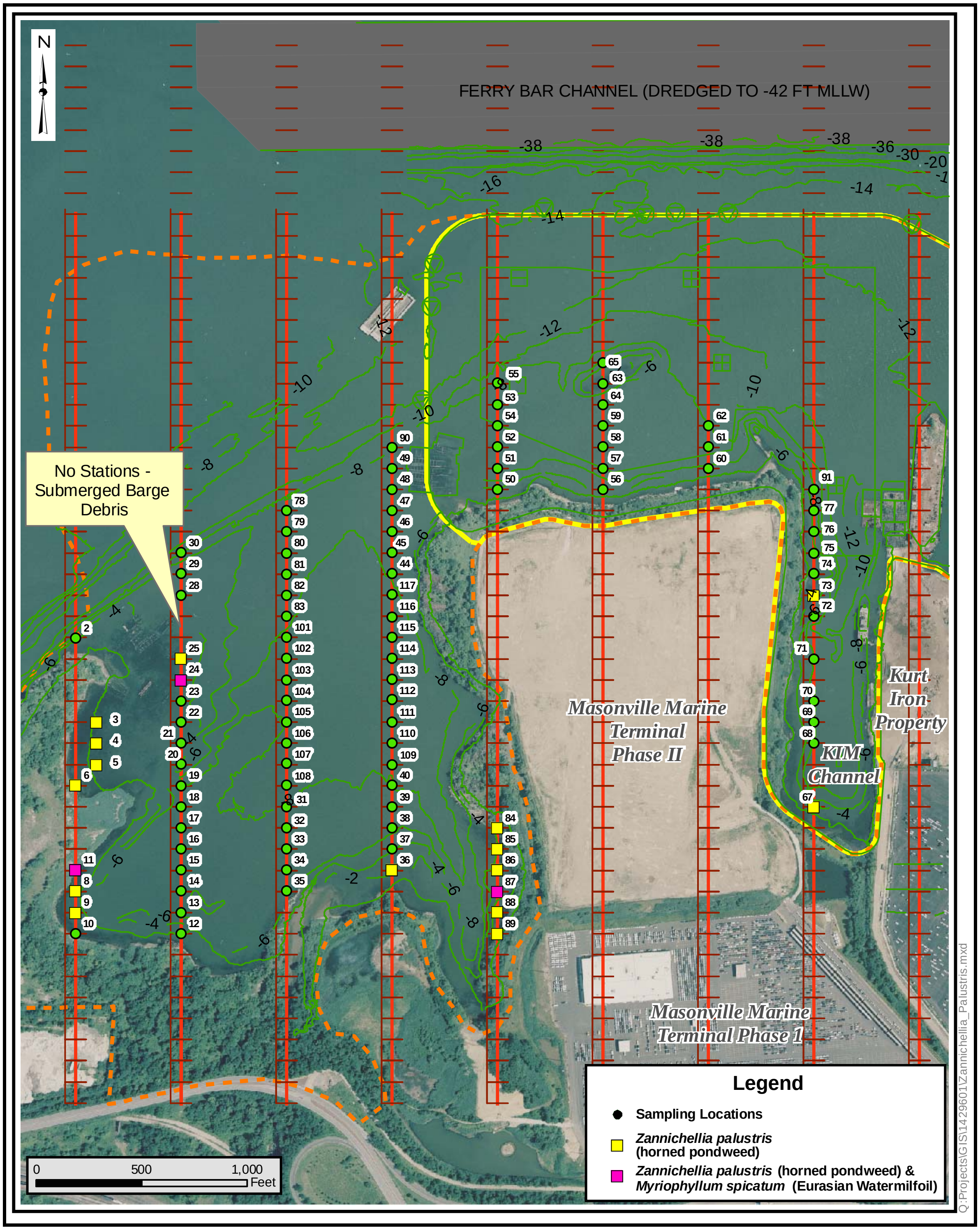


Figure 2-38. SAV Observed During the June 2006 Survey

within Masonville Cove ranged from 1 to 4 using the USFWS sampling methodology. The density of SAV within the KIM Channel had a density of 1. Sample specific density information is available in Appendix C. No SAV was observed at any of the stations during the August 2006 survey. Additionally, no signs of SAV were observed along the shoreline or floating throughout the study area. The Seagirt dredging area is too deep to support SAV growth.

2.1.6.3 Plankton

Plankton are tiny, open-water plants, animals or bacteria that generally have limited or no swimming ability and are transported through the water column by currents and tides. In the Chesapeake Bay, plankton communities serve as a base for the food chain that supports commercial and recreational fisheries. Plankton are often used as indicators of environmental and aquatic health because of their high sensitivity to environmental change and short life span. Plankton can be divided into three major size classes (CBP 2004b):

- phytoplankton–microscopic plants and bacteria
- zooplankton–microscopic animals
- macrozooplankton–larger fish eggs and larvae and pelagic (ocean-dwelling) invertebrates

Phytoplankton

Like terrestrial plants, phytoplankton, commonly known as algae, fix carbon through photosynthesis making it available for organisms at higher trophic levels. The major environmental factors influencing phytoplankton growth are temperature, light, and nutrient availability. Phytoplankton growth is usually limited to the photic zone. The availability of nutrients such as nitrogen and phosphorus can also limit phytoplankton growth. Phytoplankton can undergo rapid population growth or "algal blooms" when water temperatures rise in the presence of excess nutrients, which typically occurs each spring in the Chesapeake Bay (CBP 2004b). Phytoplankton blooms can also occur in eutrophic or high-nutrient waters that result from surface water runoff. While increased phytoplankton populations provide food to organisms at higher trophic levels, phytoplankton blooms can harm the overall health of the Chesapeake Bay. During these phytoplankton blooms, most of the phytoplankton die and sink to the bottom, where they decompose, depleting the bottom waters of the dissolved oxygen necessary for the survival of other organisms, including fish and crabs. Major groups of phytoplankton in the Chesapeake Bay include (CBP 2004b):

- diatoms (Bacillariophyta)
- golden-brown algae (Chrysophyta)
- green algae (Chlorophyta)
- blue-green algae (Cyanophyta)
- dinoflagellates (Pyrrophycophyta)
- cryptomonads (Cryptophyta)
- microflaggellates (Prasinophyta, Euglenophycota)

Phytoplankton populations are especially sensitive to changes in nutrient levels and other water quality conditions because of their limited mobility. This makes them excellent indicators of environmental conditions within the Chesapeake Bay. General water quality conditions in the Chesapeake Bay can be determined by evaluating key phytoplankton indicators such as chlorophyll *a*, primary production rates, biomass, and species composition.

Phytoplankton biomass concentrations in the Chesapeake Bay follow an annual trend, with a peak in the spring, called the spring bloom that is often dominated by diatoms (NOAA 2004). Freshwater inflow to the Chesapeake Bay has a major influence on the timing, duration, and location of the spring bloom since it is the primary source of dissolved inorganic nutrients necessary to fuel phytoplankton growth. Since phytoplankton have little or no mobility, environmental conditions that limit access to dissolved nutrients or light, such as turbidity in the water column, cloud cover, precipitation, and wind strength, will regulate local phytoplankton growth. In areas like Baltimore Harbor with intensive anthropogenic nutrient inputs, weak currents, and poor natural flushing, nutrients can easily build to eutrophic levels. Harbor-wide studies of nutrients have indicated that eutrophic conditions are common within the Harbor (Maryland DNR 2005c), which could cause micro algae blooms.

Chlorophyll *a* and its degradation product, phaeophytin, are pigments involved in plant photosynthesis. The amount of these photosynthetic compounds detected in water samples provides an estimate of phytoplankton biomass in the surface water. Both chlorophyll *a* and phaeophytin were measured as part of the summer nutrient monitoring sampling conducted near Masonville. Generally, concentrations of chlorophyll *a* and phaeophytin at the monitoring and reference locations were typical for Baltimore Harbor, which commonly has eutrophic conditions (Maryland DNR 2005c), when compared to conditions at CBP water quality monitoring station WT5.1 (Table 2-16). Long-term monitoring of phytoplankton densities in the lower Patapsco River and main stem of the Bay have documented higher surface phytoplankton concentrations in the Patapsco River relative to the main stem Bay in most seasons, particularly in spring and summer (Maryland DNR 2005c).

Zooplankton & Ichthyoplankton

Zooplankton are planktonic animals that range in size from microscopic rotifers to macroscopic jellyfish. Their distribution within the Chesapeake Bay is governed by salinity, temperature and food availability. Zooplanktons are important food for forage fish species and larval stages of all fish. Zooplanktons are the link between primary producers, phytoplankton, and the higher trophic-level organisms. Zooplankton can be classified into three size classes:

- Microzooplankton– protozoans and rotifers, usually less than 200 microns in size.
- Mesozooplankton– including copepods and invertebrate larvae between 200 microns and 2 millimeters in size.
- Macrozooplankton– including amphipods, shrimp, fish larvae and gelatinous zooplankton or jellyfish greater than 2 millimeters in size.

Zooplankton, like phytoplankton, are excellent indicators of environmental conditions within the Bay, because of their sensitivity to changes in water quality. They respond to low dissolved oxygen, high nutrient levels, contaminants, poor food quality or abundance and predation. Spatial and temporal changes in zooplankton community composition and abundance have been observed in response to freshwater input in the Chesapeake Bay. The distribution of zooplankton biomass in the Chesapeake Bay appears to vary considerably throughout the year.

Ichthyoplankton are the early life stages (egg, larvae) of finfish and are an important link between zooplankton and higher trophic levels. They are indicators of spawning activity within an area and often provide the only indication of the presence of some species, such as those that are not easily captured in other gear.

Plankton studies were conducted at trawling locations in summer of 2004 to evaluate the forage base within the Harbor (Figure 2-39). Ichthyoplankton samples indicated low diversity and low abundance of fish species during summer 2004 surveys at Masonville (Table 2-18). Fish species included northern pipefish and goby. None of the fish identified in the plankton samples were juveniles or eggs of fish with commercial or recreational importance. The low diversity and abundance of ichthyoplankton found in samples collected near Masonville may be attributed to the high abundances of comb jellies inhabiting these waters during the July sampling events. Ichthyoplankton are prey for comb jellyfish (Ctenophora). The absence of eggs and larval stages of commercially and recreationally important fish is expected in the Patapsco estuary in summer, since most species spawn in freshwater or in more saline waters in winter and spring. Bay anchovy, an important forage species, were also absent near Masonville, although some were collected at Thoms Cove and Sollers Point (Table 2-19).

Based upon general distribution data for the Chesapeake Bay, (Setzler-Hamilton 1987), all fish and zooplankton species collected during the plankton trawls at Masonville were typical for this reach of the Bay. Results of the near-field control site plankton investigations at Sollers Point and Thoms Cove showed no major differences, other than the presence of bay anchovy, when compared to the plankton collections at Masonville and the Patapsco River (Tables 2-18 and 2-19) (Funderburk *et. al*. 1991, and EA 1991, 2005b). White perch and yellow perch are known to spawn in the Patapsco River and Gwynns Falls. River herring also utilize the Patapsco River for spawning. The closest known anadromous fish spawning activity is at least 5 miles upstream of Masonville in the Patapsco River.

Early lifestages of anadromous fish tend to drift downstream from the spawning grounds. Scientific literature does not contain evidence that anadromous fish early lifestages use the waters near Masonville. A two-year plankton study was conducted in the upper Middle Branch in 1990 and 1991 (EA 1994). One station was located adjacent to Ferry Bar Channel, downstream of the Hanover Street Bridge and less than 1 mile from Masonville. Surface and bottom plankton tows were made monthly from March through October. Although the Ferry Bar plankton station was in the channel and not along the south shore of the Patapsco estuary, no early lifestages of any anadromous species were found at this station. In addition, no early lifestages of anadromous fish were found at any of the plankton stations at the mouth of the Gwynns Falls or within the Middle Branch during the study. Young blue back herring, white perch, and yellow perch were found in the year round (monthly) seining surveys that were conducted over four years as part of the same study. Young of anadromous fish began showing up in seine surveys in May in all years sampled. This result is similar to the findings of the seine

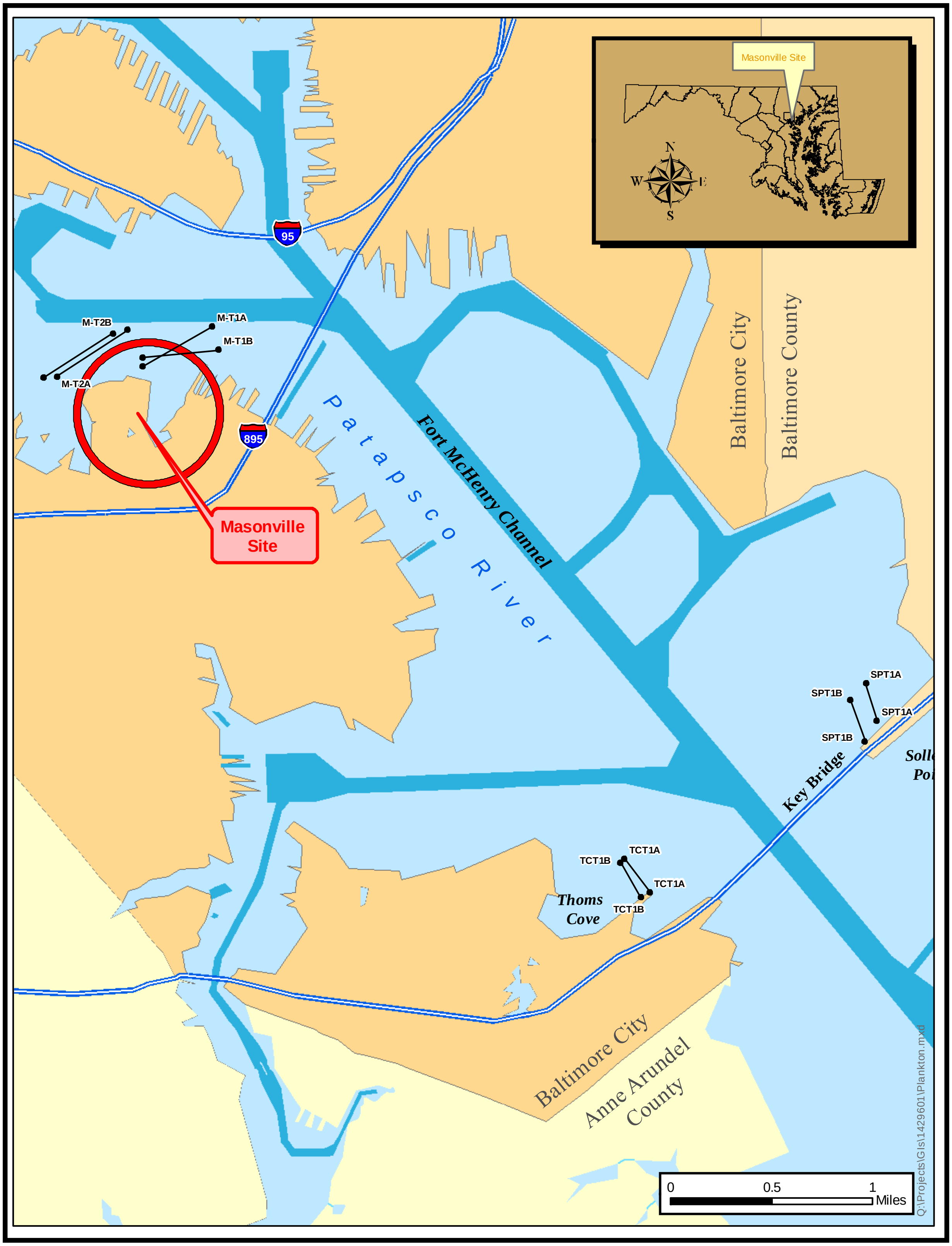


Figure 2-39. Plankton Trawl Locations for Masonville, Sollers Point, and Thoms Cove

Table 2-18. Summary of Plankton Collected in the Masonville Study Area

Species	MT1				MT2			
	Surface		Bottom		Surface		Bottom	
	MT1-SL	MT1-SR	MT1-BL	MT1-BR	MT2-SL	MT2-SR	MT2-BL	MT2-BR
Zooplankton								
crab zoea	3,964.6	1,558.7	514.5	241.5	839.1	969.7	800.5	257.7
shrimp larvae	25.1	21.5	9.1	4.4	1.6	0.0	23.5	14.3
Copepoda	10.3	4.3	1.5	1.5	17.4	103.9	14.1	14.3
Amphipoda	0.0	0.0	0.0	0.0	0.0	31.7	11.7	2.0
Isopoda	1.5	1.4	0.0	0.0	3.2	2.9	0.0	0.0
Argulus sp.	4.4	0.0	0.0	0.0	1.6	2.9	9.4	2.0
Cladocera	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chironamid Larvae	0.0	0.0	0.0	0.0	0.0	1.4	2.3	2.0
Pelecypoda	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0
Cnidaria	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0
Icthyoplankton								
Syngnathus fuscus	2.9	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Gobiosoma sp.	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0
Blenniidae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Anchoa mitchilli	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Menidia sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Data presented are densities per 100 meters squared.

Table 2-19. Summary of Plankton Densities at the Sollers Point and Thoms Cove Control Sites

SPECIES	SP-T1				TC-T1			
	Surface		Bottom		Surface		Bottom	
	SP-T1SL	SP-T1SR	SP-T1BL	SP-T1BR	TC-T1SL	TC-T1SR	TC-T1BL	TC-T1BR
Zooplankton								
crab zoea	8,374.6	7,385.0	738.4	2,049.5	579.1	314.8	177.6	60.7
shrimp larvae	13.4	26.2	14.3	8.7	3.5	19.8	10.6	3.3
Copepoda	19.4	63.4	814.8	2,848.5	204.2	92.8	188.2	136.2
Amphipoda	1.5	0.0	0.0	0.0	0.0	0.0	3.5	0.0
Isopoda	7.5	2.8	1.6	1.4	0.0	0.0	0.0	0.0
Argulus sp.	0.0	4.1	1.6	4.3	0.0	1.5	0.0	1.6
Cladocera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ichthyoplankton								
Syngnathus fuscus	1.5	0.0	1.6	0.0	0.0	0.0	1.8	0.0
Gobiosoma sp.	0.0	0.0	1.6	0.0	0.0	0.0	17.6	1.6
Blenniidae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Anchoa mitchilli	0.0	0.0	1.6	0.0	0.0	0.0	7.0	3.3
Menidia sp.	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0

Note: Data presented are densities per 100 meters squared.

surveys in Masonville Cove. Based on these findings, it is likely that anadromous fish tend to develop beyond their planktonic stages before reaching the Masonville area.

Zooplankton collected in the Masonville plankton samples were dominated by mud and fiddler crab zoea, a larval stage in the life cycle of a crab, with moderate densities of copepods, shrimp larvae, and amphipods (Table 2-18). The plankton communities near Masonville were similar to the control sites, Sollers Point and Thoms Cove (Table 2-19). Plankton densities were low-to-moderate for mesohaline areas of the Bay (Table 2-18) (Setzler-Hamilton 1987). Low abundances and diversity of plankton collected may be attributed to predation by the high densities of comb jellyfish that were observed inhabiting the waters during the July 2004 sampling efforts (EA 2005b).

No site-specific plankton studies have been completed for the Seagirt dredging area.

2.1.6.4 Benthic Community

Benthic invertebrates are used extensively as indicators of environmental status and trends. Numerous studies have demonstrated that benthos respond predictably to many kinds of natural and anthropogenic stress (Weisberg *et. al.* 1997).

Benthic samples were collected from four locations in the vicinity of the proposed project area during the June 2003 surveys. Five additional sampling locations were added in summer 2004 to accommodate the new site designs that emerged during State feasibility-level studies. In both spring and fall 2004, Masonville Cove data were collected to create a baseline dataset. Benthic samples were also collected from three locations in the summer of 2005. Sampling locations are shown in Figure 2-40. No site-specific benthic surveys were completed in the Seagirt dredging area.

Polychaetes, Oligochaetes, and Bivalves were the dominant groups found at the summer 2003 survey locations (Table 2-20). Polychaetes and Amphipods dominated at the spring and summer 2004 survey locations. Polychaetes also dominated at the fall 2004 and summer 2005 survey locations. The cumulative list of benthic species collected by seasonal density and station number are located in Appendix C.

Abundance was similar at the Masonville summer 2003 sample locations except for the station in Masonville Cove, which had less than half the number of individuals that the other locations had (Table 2-20 and Appendix C). Spring 2004 sampling in Masonville Cove yielded a slightly more tolerant benthic community with higher densities and a slightly higher number of taxa than in summer 2003. However, the additional biomass and taxa were of tolerant species, which would tend to make the community less stable. These variations in abundance are not unusual in riverine estuary areas reflecting the variable conditions caused by flow fluctuations, salinity changes, and temperature swings in the River (Weisberg *et. al.* 1997).

The Chesapeake Bay Benthic Index of Biotic Integrity (B-IBI) is a multi-metric measurement of benthic community health that compares various components of the benthic community to norms for the same substrate and salinity regime within the Bay. Total B-IBI scores generally indicated that the benthic community condition at Masonville sample locations falls into three

Figure 2-40. Benthic Community Sampling Locations

Table 2-20. Summary of Selected Masonville Benthic Data

Year	Season	Location	Number of Taxa	Dominant Groups	Abundance (#/m^2)	B-IBI Abundance Score	Pollution Indicative Taxa (%)	B-IBI Pollution Indicative Taxa Score	Pollution Sensitive Taxa (%)	B-IBI Pollution Sensitive Taxa Score	Total B-IBI
2003	Summer	M-B1	15	Polychaetes, Bivalves, Oligochaetes	4,889	1	59.1	3	18.5	3	2
2003	Summer	M-B2	13	Amphipods, Oligochaetes, Polychaetes	6,025	1	17.3	3	15.1	5	2.5
2003	Summer	M-B3	16	Polychaetes, Amphipods, Oligochaetes	6,773	1	4.3	5	48.4	5	3
2003	Summer	M-B4	9	Oligochaetes, Polychaetes, Bivalves	1,958	5	17.0	3	17.4	3	3.5
2004	Spring	M-B4	11	Polychaetes, Amphipods	7,473	NA	26.9	NA	21.8	NA	NA
2004	Summer	M-B5	11	Polychaetes, Amphipods	1,890	5	30.6	1	4.7	1	2.5
2004	Summer	M-B6	15	Polychaetes, Amphipods	4,685	3	17.3	3	11.3	3	3
2004	Summer	M-B7	15	Polychaetes, Amphipods	8,772	1	23.3	1	5.0	3	2
2004	Summer	M-B8	14	Polychaetes, Amphipods	4,733	3	54.0	1	6.0	3	2.5
2004	Summer	M-B9	15	Polychaetes, Amphipods	9,309	1	21.8	1	3.5	1	1.5
2004	Fall	M-B4	10	Polychaetes	1,074	NA	64.6	NA	2.5	NA	NA
2005	Summer	MB-12	5	Polychaetes	3,638	3	88.7	1	2.1	1	1.5
2005	Summer	MB-10	11	Polychaetes	5,304	3	73.1	1	4.9	1	1.5
2005	Summer	MB-11	16	Polychaetes, Amphipods	3,896	3	33.9	1	8.5	3	3

classifications: "severely degraded," "degraded," and "meets restoration goals." Table 2-21 shows the B-IBI values and their corresponding community condition designation. Sample sites and their relative B-IBI values are shown in Figure 2-41.

Table 2-21. Benthic Community Conditions for Corresponding B-IBI Values

B-IBI Value	Benthic Community Condition
3.0 and higher	Meets Restoration Goals
2.7-2.9	Marginal
2.1-2.6	Degraded
2.0 and lower	Severely Degraded

Most of the sites within or adjacent to the DMCF footprint were degraded or severely degraded which is consistent with the sediment quality measured within the DMCF footprint. Two locations within the DMCF footprint met the restoration goal even though surficial sediment contamination was moderate (M-B3) or high (M-B6). Substrates at M-B6 were sandier than most other stations. Sandy substrates tend to harbor a slightly different benthic community and hold less total organic carbon and contaminants, which would explain this result.

The eastern side of the site, the Wet Basin, and two of the stations near the shipping channel were severely degraded (Figure 2-41). The southern part of the KIM Channel, the stations in the center of the site, and a site to the northwest of the proposed project footprint were degraded. Two of the three sampling locations in Masonville Cove met restoration goals, while the southern most station (M-B10) was severely degraded. One station at the northwest corner of the proposed footprint was degraded (M-B8) while the other western station was severely degraded (M-B9) (Figure 2-41). This is consistent with the sediment quality analysis, in that the eastern area at the mouth of the KIM Channel and some of the stations near the shipping channel had several constituents that exceeded the PEL values, the level beyond which an ecological effect may be observed. One station in the northern part of Masonville Cove met the restoration goal, which is somewhat unexpected due to the conditions of the benthos at nearby stations and the overall sediment quality at that station.

Based on sampling presented in the water quality Section 2.1.5, Masonville lies at the threshold between low mesohaline and oligohaline salinities where benthic communities may differ considerably according to habitat. However, the B-IBI was designed to account for this variability and adjusts the metrics for habitat class (Versar 2002). As a comparison to the Masonville site, the B-IBI values calculated for Sparrows Point range from 2.5 to 3.0 and values calculated for BP-Fairfield range from 3.0 to 4.0 (EA 2005d, EA 2005e, EA 2005f, EA 2005g, EA 2005h). The BP-Fairfield and Sparrows Point B-IBI values are higher than the range of B-IBI values collected at Masonville, which range from 1.5 to 3.5 where eight of the twelve B-IBI values were below 3.0.

No site-specific benthic surveys have been completed for the Seagirt dredging area. This area has been dredged in the past, so this community has been disturbed previously.

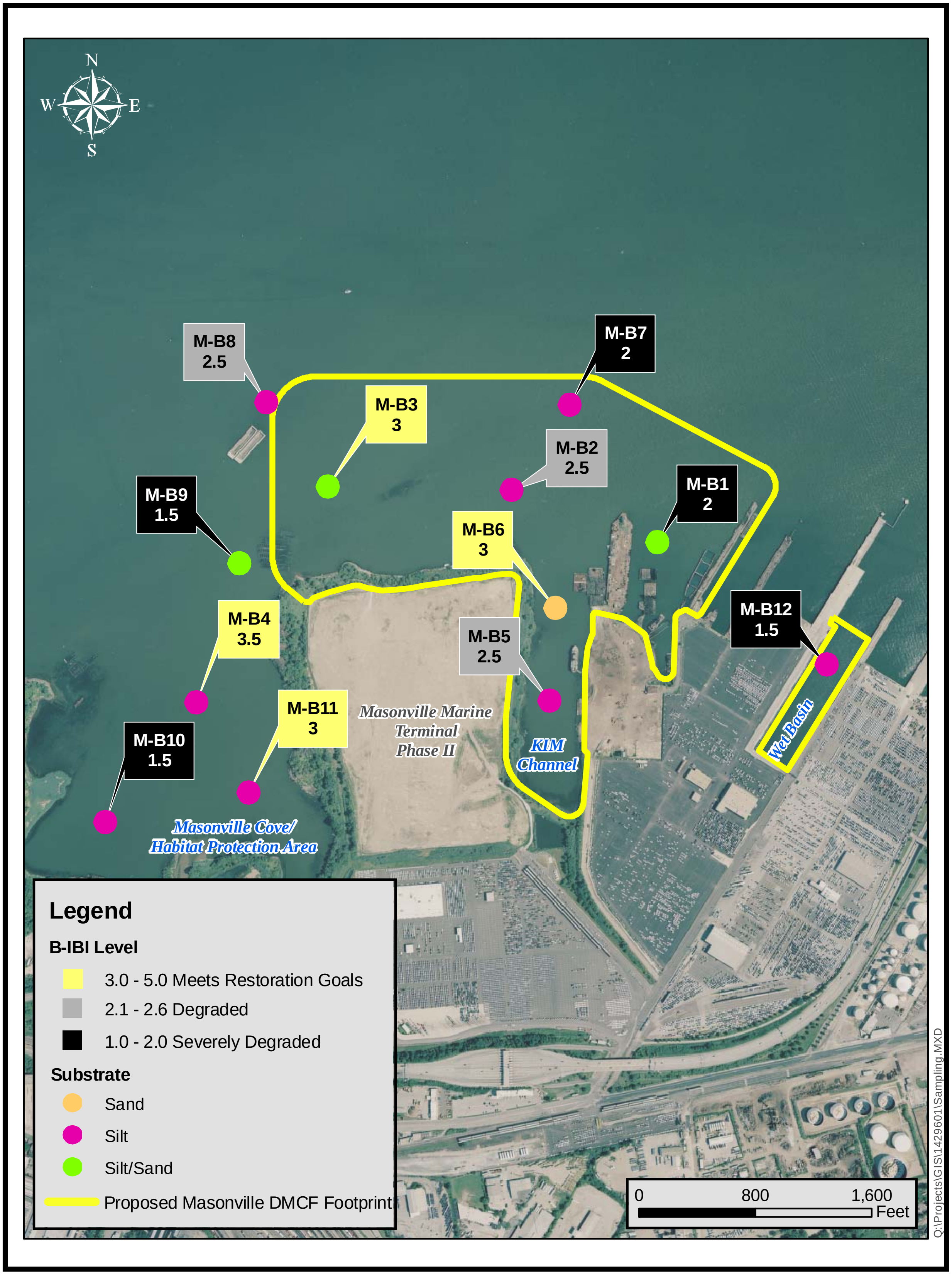


Figure 2-41. B-IBI Values for Each Sample Location

2.1.6.5 Fisheries

The Baltimore Harbor is the tidal, estuarine portion of the Patapsco River. In the reach that includes Masonville, the Patapsco River ranges from oligohaline to low mesohaline, with salinities generally ranging from two to ten ppt. This salinity regime supports a slightly different finfish community than the main stem Chesapeake Bay and outer reaches of the Baltimore Harbor, which tend to have higher average salinities. Finfish and shellfish support valuable commercial and recreational fisheries. The Patapsco River and Chesapeake Bay also support a diverse fish community beyond those recognized as commercial or recreational resources. The area in the vicinity of the Masonville site is known to support species of commercial value, although commercial harvesting is minimal.

In the reach that includes the Seagirt Marine Terminal, the Patapsco River ranges from oligohaline to low mesohaline. This salinity regime supports a slightly different finfish community than the main stem Chesapeake Bay and outer reaches of the Baltimore Harbor, which tend to have higher average salinities. The dominant species in all collections in the vicinity of the Seagirt Marine Terminal were white perch, silversides, striped bass, largemouth bass, mummichogs, Atlantic menhaden, and bluefish. Finfish and shellfish support valuable commercial and recreational fisheries. The Patapsco River and Chesapeake Bay also support a diverse fish community beyond those recognized as commercial or recreational resources. The area in the vicinity of the Seagirt Marine Terminal is known to support species of commercial value, although commercial harvesting is prohibited in the shipping channels and, therefore, does not occur in the project area. There are no unique intertidal or shallow water habitat areas for pelagic fish communities within the dredging area. This area abuts a bulkhead from shore and has a minimum depth of 15 feet, which is too deep to provide nursery habitat for pelagic fish.

Masonville Finfish Studies

Fisheries studies were conducted within and adjacent to the proposed Masonville DMCF footprint in July 2003, May 2004, October 2004, May 2005 and August 2005. No site-specific fisheries studies were completed for the Seagirt dredging area.

Trawling and gillnetting were conducted within the proposed Masonville DMCF footprint in three seasons: spring, summer, and fall. Most stations at Masonville were sampled in July 2003, May 2004 and October 2004. Trawling targets bottom dwelling fish and gillnetting is more effective at collecting pelagic species. Seining was also conducted within Masonville Cove to assess the fish community utilizing the intertidal and near shore shallow water habitat (SWH) areas. Seining and gillnetting were also conducted at two control sites near the Key Bridge: Thoms Cove and Sollers Point. All of the fish collected were typical species of the mesohaline reaches of the Chesapeake Bay. In spring and summer 2005, gillnetting was conducted in the Wet Basin and KIM Channel to assess fish utilization. Appendix C includes tables summarizing the numbers of species and total numbers of fish collected at each site, by sampling event. Sampling locations for the Masonville site are shown in Figure 2-42. A map of the reference area locations is included in Appendix C.

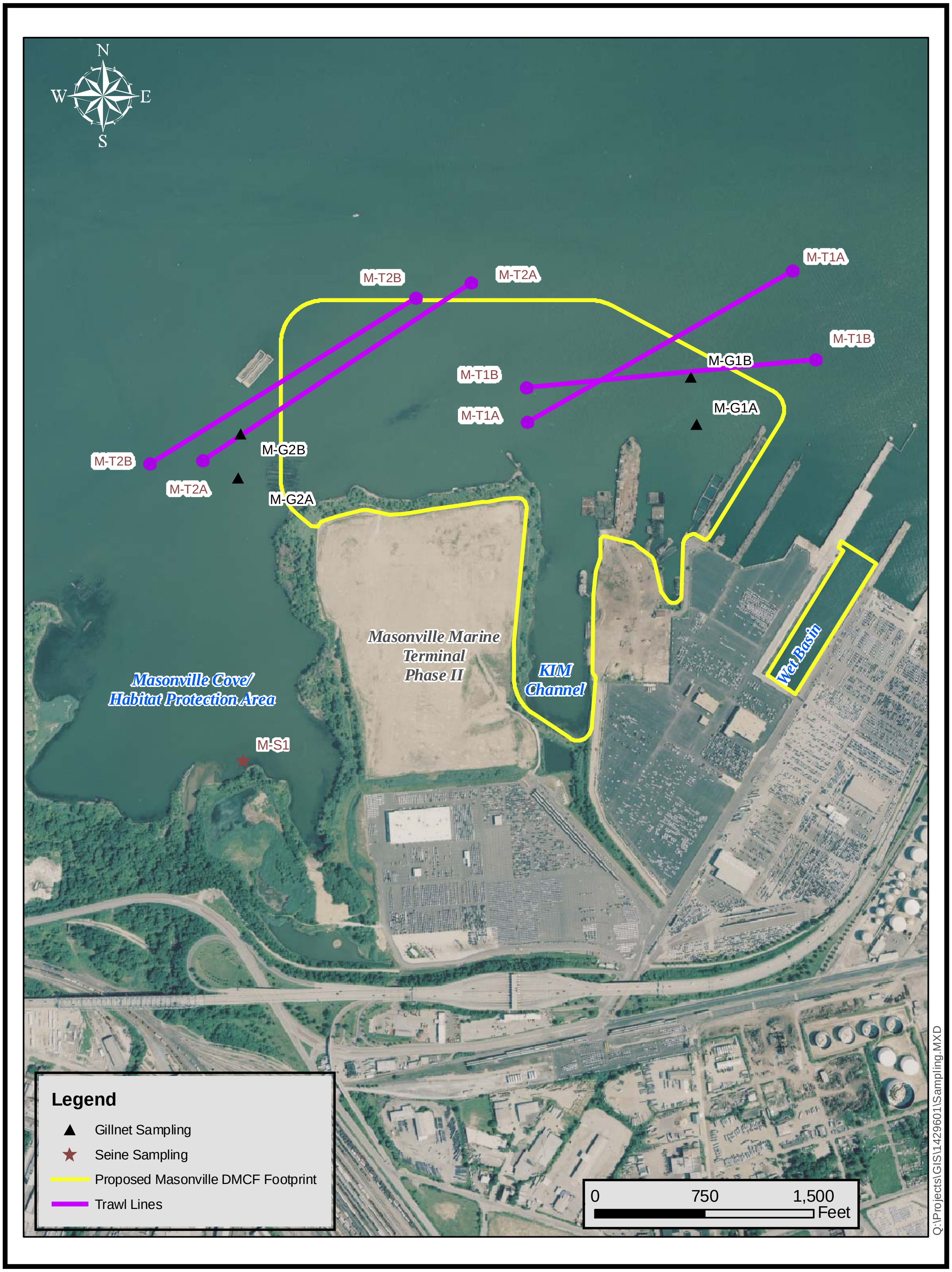


Figure 2-42. Fisheries Sample Locations

Commercially and/or recreationally important species collected at Masonville sample locations included striped bass (*Morone saxatilis*), white perch (*Morone americana*), Atlantic menhaden (*Brevoortia tyrannus*), bluefish (*Pomatomus saltatrix*), largemouth bass (*Micropterus salmoides*), American eel (*Anguilla rostrata*), and blue crab (*Callinectes sapidus*). White perch dominated the collection for both trawl and gillnet efforts in all three seasons and striped bass was the dominant species in summer seining efforts at Masonville. Bay anchovy (*Anchoa mitchilli*) dominated the collection during fall seining efforts. Atlantic menhaden were among the most dominant species in the Wet Basin and KIM Channel in summer 2005.

Based upon the lengths of the fish collected as part of the Masonville studies, trawl and gillnet efforts yielded larger adult and sub adult specimens. Seine efforts yielded predominantly juveniles of most species, indicating that the intertidal and near shore (SWH) areas of the existing MMT are providing nursery habitat. Additionally, Masonville Cove is being used as a foraging and nursery area. However, deeper areas of the site supported only limited numbers of pelagic species.

Comparisons of the Masonville fish collections to the fish collections at the Sollers Point and Thoms Cove control sites indicated some notable differences in spring 2004 (Table 2-22 and Appendix C). The intertidal and near shore (SWH) areas, sampled in the seines along the south shore of the Patapsco River at Masonville, had higher numbers of species than the intertidal and near shore (SWH) areas at either Sollers Point or Thoms Cove. The abundances were similar to that of Sollers Point, along the north shore of the Patapsco River, but higher relative to the intertidal and near shore (SWH) areas community at Thoms Cove, along the south shore of the Patapsco River. This differs from the results from summer 2003 where Thoms Cove and Masonville fish communities were more similar to each other. The differences noted between summer and fall sampling events are reflective of the fisheries utilization of this area of the Patapsco estuary in spring. The control sites would be expected to have more similar fish communities relative to Masonville in the summer and early fall when juveniles of anadromous species are migrating through the area. Masonville Cove also had higher numbers of species and higher abundances than any other station in fall 2004.

Gillnet collections, a measure of the pelagic community and of commercial fishery potential, yielded higher species richness in the proposed project footprint for the Masonville DMCF relative to either control site. Abundances at Masonville were similar to Sollers Point but higher than those at Thoms Cove in summer 2003. These results differ from summer 2003 results where the control sites were more similar to each other and reflected lower abundances of fish than Masonville (Table 2-22). Seining efforts in fall 2004 for Masonville indicated similar diversity to both control sites and a similar abundance to Thoms Cove. Sollers Point had lower abundances of fish collected during the fall 2004 seining efforts than both Thoms Cove and Masonville (Table 2-22). These results can be explained by the higher number of freshwater species using Masonville's south shore of the Patapsco River in the fall 2004 (Table 2-22). The gillnet and seine results are likely driven by the higher anadromous fish abundances expected in the typically lower mesohaline reaches of the Patapsco estuary in spring and during the fall out migration. Gillnet collections in the KIM Channel and Wet Basin yielded relatively low abundances of fish in spring and summer relative to the control sites, although the numbers of species were similar, particularly in summer.

Overall, it can be concluded that most of the areas within the DMCF footprint do not provide unique habitat for intertidal and near shore (SWH) areas for pelagic fish communities in comparison to reference site fish collections at Sollers Point and Thoms Cove. Seining studies could not be conducted within the KIM Channel (due to restricted access to the site), although the fish community is expected to be similar to that found in Masonville Cove. These shallow cove areas along the south shore of the Patapsco River are attractive habitat for small fish. The benthic habitat within the proposed Masonville DMCF is not supporting the higher abundances and numbers of species found during trawling efforts at other proposed DMCF sites in the Harbor: BP-Fairfield and Sparrows Point (EA 2003b, EA 2004a, EA 2005d, EA 2005e, EA 2005f, EA 2005g, EA 2005h). Data from this sampling is presented in Appendix C.

No site-specific fisheries surveys have been completed for the Seagirt dredging area. The area in the vicinity of the Seagirt Marine Terminal is known to support species of commercial value, although commercial harvesting is prohibited in the shipping channels and, therefore, does not occur in the project area.

There are no unique intertidal or shallow water habitat areas for pelagic fish communities within the Seagirt dredging area. This area abuts a bulkhead from shore and has a minimum depth of 15 feet, which is too deep to provide nursery habitat for pelagic fish.

Table 2-22. Summary Fisheries Data

Site and Type of Equipment		Number of Species					Abundance				
		Summer 2003	Spring 2004	Fall 2004	Spring 2005	Summer 2005	Summer 2003	Spring 2004	Fall 2004	Spring 2005	Summer 2005
Masonville	Seine	12	7	10	--	--	1647	432	803	--	--
	Gillnet	7	12	12	8	9	679	729	1137	447	780
	Trawl	4	4	4	--	--	453	24	30	--	--
	Total	16	17	19	8	9	2779	1185	1970	447	780
Sollers Point	Seine	6	4	10	6	3	233	361	465	135	66
	Gillnet	9	7	5	7	9	477	463	122	363	520
	Trawl	--	--	--	--	--	--	--	--	--	--
	Total	13	8	12	10		710	824	587	498	586
Thoms Cove	Seine	7	5	9	5	9	2218	114	774	131	763
	Gillnet	9	7	6	5	9	408	245	505	281	653
	Trawl	--	--	--	--	--	--	--	--	--	--
	Total	13	10	12	8	17	2626	359	1279	412	1416

Note: Spring and summer 2005 surveys including gillnetting only at Masonville (in Wet Basin and Kurt Iron Channel. Total number of species for diversity does not equal the sum of the species from seine, gillnet, and trawl sampling because there are species that were collected by more than one of the sampling methods. Species are not double counted. Complete summary is included in Appendix C.

Fish Consumption Advisories

To protect the general public from possible contaminants within certain fish species, the MDE publishes advisories with recommended maximum meals each year and issues consumption advisories that can be used as a guide to minimize exposure to the contaminants that accumulate in fish tissue. The advisories recommend limited or no consumption of various species when fish are taken from the advisory area. The contaminants of concern are PCBs and some pesticides. Currently, the consumption advisories for the Patapsco River and Baltimore Harbor include the American eel, channel catfish (*Ictalurus punctatus*), and brown bullhead (*Ameiurus nebulosus)* because of PCB and pesticide contamination. There is a consumption advisory for common carp (*Cyprinus carpio*), blue crab, and white perch because of PCB contamination (MDE 2005b).

There is also an MDE advisory for blue crabs that recommends against consuming the crab's hepatopancreas ("mustard") when eating blue crabs from the Patapsco River.

2.1.6.6 Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC 1801 et seq. Public Law 104-208) establishes the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fish habitat (EFH). The Act specified that each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by such agency that may adversely affect any EFH identified under this act. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

A summary EFH designation specific to the Patapsco River does not exist at this time. However, consultations with local NMFS staff indicated that all areas of the Bay with 0.5 ppt or greater salinity should technically be considered as EFH, based on EFH definitions for those federally managed species that occur in Maryland tidal waters of the Bay. Furthermore, an EFH Summary Designation for upper Bay waters nearest to the Patapsco River should be used for determining which federal species have EFH designated for waters of the project vicinity. In this case, the Summary Designation for the Chester River estuary in Kent and Queen Anne's County on Maryland's Eastern Shore was used in the preparation of an EFH Assessment for this project. Additionally, recent literature on fish distribution and ecology for the Chesapeake Bay, fish surveys conducted in association with the Masonville site review, and personal communications with local NMFS staff (Nichols 2005), were used for determining which federal species with EFH designated for the Patapsco River likely occur in the project vicinity.

It should also be noted that areas such as the Middle Branch of the Patapsco River, which possess environmentally impaired conditions, as well as a prevailing oligohaline-lower mesohaline salinity regime, create marginal habitat conditions for federally designated EFH species. Consequently, waters of the Middle Branch provide less benefit to federal species as compared to: e.g., waters of the mid-Bay and lower-Bay regions, and/or waters less affected by intense industrial activity characteristic of the Inner Harbor region.

The Chester River lies within waters designated as EFH for the following species and their life stages: summer flounder (*Paralicthys dentatus*), juvenile and adult life stages; bluefish (*Pomatomus saltatrix*), juvenile and adult life stages; windowpane flounder (*Scopthalmus aquosus*), juvenile and adult life stages; cobia (*Rachycentron canadum*), all life stages; red drum (*Sciaenops ocellatus*), all life stages; king mackerel (*Scomberomorus cavalla*), all life stages; and

Spanish mackerel (*Scomberomorus maculatus*), all life stages (NMFS 2005). Based on informal coordination with NMFS, it was determined that of the species with EFH designated in the Masonville project area, only juvenile and adult summer flounder and adult and juvenile bluefish are likely to occur (Nichols 2005). Summer flounder are generally rare north of the Bay (William Preston Lane) Bridge. Bluefish are more ubiquitous within the Bay and occur in the Harbor, but have to be considered common to be of concern for EFH (Nichols 2005).

Bluefish were collected at the Masonville site, but in very low numbers and only in warmer months. Length data suggests that all were juveniles. This is consistent with seine surveys of the upper Middle Branch of the Patapsco conducted over multiple years (EA 1991). Bluefish were generally more abundant at the control sites sampled in the Patapsco River (Sollers Point and Thoms Cove). This is expected because these sites have higher salinities than Masonville. A low number of summer flounder were also collected in the gillnets in fall 2004 surveys (Appendix C). This species was also collected in low numbers in gillnets and bottom trawls at all other sampling locations except Thoms Cove in fall 2004. One individual was also taken in trawls at BP-Fairfield in summer 2004. Based upon size distributions, both juvenile [less than approximately 170 millimeters (mm)] and second year sub adults (greater than 220 mm) were collected at bottom salinities ranging from approximately 4.4 to 10.7 ppt. This is unusual for the Harbor based upon results of previous investigations and the salinity preference for this species. Summer flounder prefer salinities greater than 10 ppt. (Nichols 2005).

EFH habitat that is judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, is identified as habitat areas of particular concern (HAPC) to help provide additional focus for conservation efforts. In addition to EFH, some regions of the Chesapeake Bay have also been designated as HAPC. HAPC are areas of special importance within EFH that may require additional protection from adverse effects. HAPC are defined on the basis of its ecological importance, sensitivity, exposure, and rarity of the habitat (Dobrzynski and Johnson 2001). The regional council that oversees the Chesapeake Bay, the Mid-Atlantic Fisheries Management Council (MAFMC), has designated HAPC for the summer flounder, and has specifically identified SAV and macro algae beds in areas used by adult and juvenile summer flounder as HAPC. However, the MAFMC has not specifically identified map locations or geographic coordinates associated with HAPC for the Chesapeake Bay.

NMFS identifies HAPC in the Chesapeake Bay areas associated with juvenile and adult summer flounder. Juvenile and adult summer flounder HAPC are defined as areas with native species of macro algae, sea grasses, and freshwater and tidal macrophytes in any size bed and as loose aggregations, which are the general reach for summer flounder EFH (NMFS 2005). SAV have been observed in the KIM Channel, although the only species is the non-native species Eurasian water milfoil. Even though it is non-native, this species is often a pioneer for other SAV species and indicates the presence of SAV habitat within the project area (Nichols 2005). When SAV is present in an area where summer flounder occur, it is considered HAPC (Nichols 2005). However, the low densities of SAV and low, transient occurrence of bluefish and summer flounder indicate that the Middle Branch of the Patapsco River is probably not a significant EFH area for these species (Nichols 2005). Adult and juvenile bluefish are uncommon in the Patapsco

River, but occur more often during years of increased salt wedge intrusion into the Chesapeake Bay. Potential project impacts to EFH are assessed in Chapter 5 and Appendix D.

2.1.6.7 Commercial Fisheries

Due to habitat limitations, consumption advisories, and shipping traffic considerations, commercial fin fishing and crabbing are limited in the Patapsco River. Commercial fin fishing occurs primarily in the portion of the Patapsco River to the east of the Key Bridge (Figure 2-43). The abundance of harvestable finfish species decreases toward the head of the river. Some commercial species occur at harvestable levels, but are not harvested because MDE's consumption advisories recommend against consumption, including American eel and channel catfish (MDE 2005b). In addition, use of passive fishing gear, such as pound nets and gill nets, would interfere with the high volume of shipping traffic in the Patapsco. For these reasons, there is currently only one registered pound net location in the Patapsco. Its location is just west of the North Point/Rock Point line, nearly 9 miles from the proposed Masonville DMCF and 6.5 miles from the Seagirt dredging area.

The volume and value of finfish caught in the Patapsco (Maryland DNR Waterbody Code 066) is considered low (Table 2-23). Ten species were commercially harvested in the Patapsco between 1998 and 2003 (Table 2-24). White perch and striped bass account for over 65 percent of the volume and nearly 95 percent of the value of commercial finfish caught in the Patapsco River from 1998 through 2003.

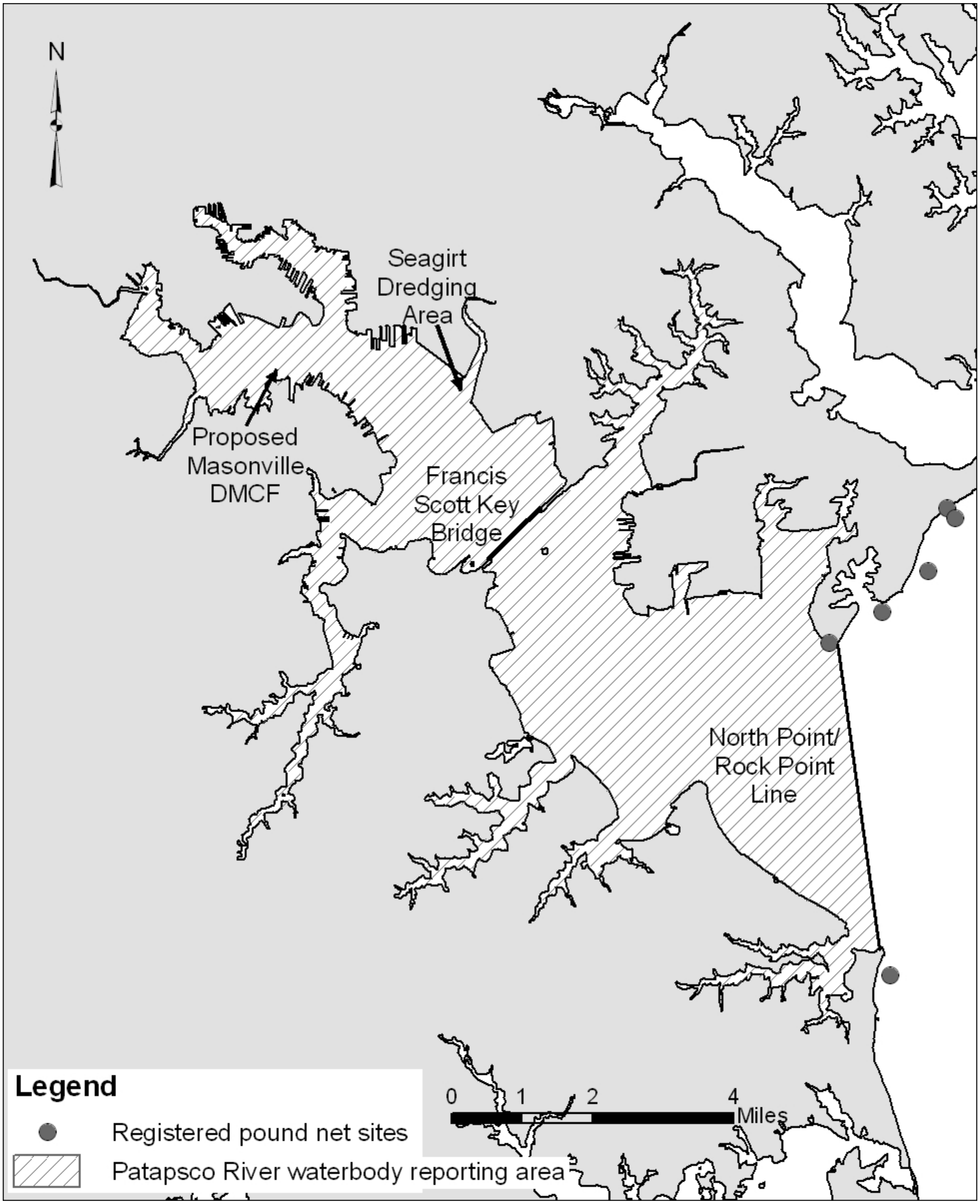
Most commercial crabbing also occurs east of the Key Bridge, although a small amount is done to the west of the bridge (MPA 2002a). From 1998 through 2003, the volume and value of blue crabs caught in the Patapsco (Table 2-23) accounted for no more than 0.6 percent of the volume and value of blue crabs caught in the Maryland portion of the Chesapeake Bay.

There are no Natural Oyster Bars (NOBs) and currently no commercial shell fishing in the Patapsco River. A 4-acre oyster restoration project is located near Fort Carroll (EA 2003a), but this site lies approximately 5 miles from Masonville and 2.5 miles from the Seagirt dredging area.

Table 2-23. Volume and Value of Commercial Fisheries in the Patapsco River

	Fishery			
	Finfish		Blue Crabs	
Year	Pounds	Value	Pounds	Value
1998	5,406	$5,254	90,163	$102,056
1999	11,678	$9,793	65,208	$61,069
2000	8,016	$5,746	114,768	$148,143
2001	639	$841	59,775	$70,595
2002	25,831	$15,430	88,148	$86,600
2003	42,685	$16,374	59,228	$70,862

Source: Maryland DNR 2005f



Source: Maryland DNR 2005

Figure 2-43. Registered Pound Net Locations and Waterbody Reporting Area for Fishery Catch Data

Table 2-24. Total Volume and Value of Finfish Species Commercially Harvested in the Patapsco River, 1998-2003

Species	Pounds	Value
White Perch	39,531	$17,226
Gizzard Shad	25,750	$1,803
Striped Bass	21,948	$33,295
Menhaden	5,249	$376
Spot	600	$252
Croaker	546	$172
Channel Catfish	416	$162
Gray Sea Trout	165	$119
Common Eel	30	$32
River Herring	20	$3

Source: Maryland DNR 2005f

No commercial fishing occurs within the Seagirt dredging area since it is within a shipping channel.

2.1.7 Wetlands

The proposed Masonville DMCF site consists of 130 acres of tidal open water and less than 1 acre of vegetated wetlands. A wetland delineation was completed in April 2006. There is a combined tidal and non-tidal wetland that covers approximately 0.5 acres (Appendix C).

The Seagirt dredging area consists of 128 acres of tidal open water. There are no vegetated wetlands within the dredging area.

2.1.8 Terrestrial Resources

2.1.8.1 Birds

Wildlife usage of the proposed Masonville DMCF was observed during the site reconnaissance in summer 2003 (August) and during the spring (May), summer (July), and fall (October) 2004 State feasibility-level studies (EA 2003a, EA 2005a, EA 2005b, EA 2005c). These studies included recording both avian and mammalian observations at the Masonville site. Bird census monitoring at Masonville Cove was initiated and conducted in February 2005 to determine avian utilization of the site. The bird census monitoring surveys were conducted in February, March, April, June, August, and September of 2005. The avian surveys are available through September 2005. Additional surveys may be completed in the future by an MPA volunteer, but as these surveys are completed on a volunteer basis it is unknown when another survey will be completed. The cumulative results of all avian observations are located in Appendix C.

Birds observed during the site visits associated with the shoreline and open water include resident species of waterfowl and herons such as Canada goose (*Branta canadensis*), mallard (*Anas brachyrhynchos*), and great blue heron (*Ardea herodias*). Year round resident species are complemented from fall through spring with a variety of wintering and migrant species of waterfowl including bufflehead (*Bucephala albeola*), green-winged teal (*Anas crecca*), lesser scaup (*Aythya affinis)*, ring-necked duck (*Aythya collaris*), canvasback (*Aythya valisineria*), gadwall (*Anas strepera*) and ruddy duck (*Oxyura jamaicensis*). Summer resident species include great egret (*Ardea alba*), green heron (*Butorides virescens*), black-crowned night-heron (*Nycticorax nycticorax*) and double-crested cormorant (*Phalocrocorax auritus*). Great egret, black-crowned night-heron, and yellow-crowned night-heron are known to nest at Fort Carroll, approximately 5 miles southeast of Masonville (Ringler 2005). In addition, a cumulative species list that includes all species recorded during the 2003 site reconnaissance, 2004 State feasibility-level studies, and 2005 seasonal bird surveys is presented in Appendix C.

Although not specifically observed in all seasons, species observed in the terrestrial habitats at Masonville, that are probable year-round resident species, include: ring-necked pheasant (*Phasianus colchicus*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), Carolina wren (*Thryothorus ludovicianus*), northern mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), and red-winged blackbird (*Agelaius phoeniceus*). Spotted sandpiper (*Actitis macularia*), eastern kingbird (*Tyrannus tyrannus*), house wren (*Troglodytes aedon*), cedar waxwing (*Bombycilla cedrorum*), yellow warbler (*Dendroica petechia*), blue grosbeak (*Guiraca caerulea*), indigo bunting (*Passerina cyanea*) and orchard oriole (*Icterus spurious*) exemplify some of the species present as summer residents and nesting species. In addition, a number of wintering sparrows were observed in February 2005, including swamp sparrow (*Melospiza georgiana*), savannah sparrow (*Passerculus sandwichensis*), fox sparrow (*Passerella iliaca*), American tree sparrow (*Spizella arborea*), field sparrow (*Spizella pusilla*), and white-throated sparrow (*Zonotrichia albicollis*).

September 2005 sightings included a number of fall migrants including Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), red-shouldered hawk (*Buteo lineatus*), northern harrier (*Circus cyaneus*), yellow-billed cuckoo (*Coccyus americanus*), bobolink (*Dolichonyx oryzivorus*), palm warbler (*Dendroica palmarum*), Nashville warbler (*Vermivora ruficapilla*), yellow-bellied sapsucker (*Sphyrapicus varius*), and marsh wren (*Cistothorus palustris*). The swamp sparrow and savannah sparrow were sighted during the September visit and may either migrate further south or winter in this area.

A pair of bald eagles (*Haliaeetus leucocephalus*) were utilizing Masonville cove and were observed during the spring, summer and fall 2004 surveys. An adult bald eagle was sighted during the September 2005 survey. The tree containing the bald eagle nest fell in March 2005. The eagles did not build a new nest adjacent to Masonville Cove or in the vicinity of the proposed Masonville DMCF project site. Additional information on bald eagles is contained in Section 2.1.9.

Two wintering/migrant species bufflehead and dark-eyed junco (*Junco hyemalis*), were observed out of the usual wintering and migrant periods; the bufflehead was seen in May and August and the dark-eyed junco was seen in September. While unusual, it is not extraordinary to occasionally find individuals of wintering and/or migrant species that remain in an area instead of completing their migration.

Masonville Cove is designated a Historic Waterfowl Concentration Area under Maryland's Critical Area law. Because of its location along the Atlantic flyway, Baltimore Harbor and the adjacent Chesapeake Bay provide resting and foraging areas for wintering and migrant waterfowl. The City of Baltimore Critical Area Management Plan (CAMP) describes the west cove adjoining the proposed Masonville DMCF site as a documented "area of special importance to wintering waterfowl" (City of Baltimore 2002). The shallow depths also make the area good habitat for wading birds.

The Maryland DNR reported that the only active water bird nesting colony in the Harbor is on Fort Carroll, nearly four miles from the site, comprised of a variety of heron and egret species (Brinker, 2003). Additionally, a variety of waterfowl over-winter in the Harbor, although not all of the areas are considered waterfowl concentration areas. Wood duck and black duck have historically utilized the Masonville peninsula and nearby waters as a waterfowl concentration area.

No site-specific bird surveys have been completed in the Seagirt dredging area. Since the area is currently part of shipping channels and adjacent to industrial facilities, bird usage of the area is assumed to be low.

2.1.8.2 Mammals

The only evidence of mammal species recorded during any of the environmental surveys and State-feasibility-level studies at Masonville were white-tailed deer (*Odocoileus virginianus*). No other species or evidence of other species was observed during any studies in the Masonville project area.

Species that may occur in the Masonville project area include: raccoon (*Procyon lotor)*, opossum (*Didelphis marsupialis*), muskrat (*Ondatra zibethicus*), Norway rat (*Rattus norvegicus*), white-footed mouse (*Peromyscus leucopus*), red fox (*Vulpes vulpes*), grey squirrel (*Sciurus carolinensis*), eastern cottontail rabbit *(Sylvilagus floridanus*), and groundhog or woodchuck (*Marmota monax*).

No terrestrial mammals occur in the Seagirt dredging area since this area is entirely underwater.

2.1.8.3 Reptiles and Amphibians

No reptile or amphibian species were recorded during any of the EA surveys and State feasibility-level studies conducted in the Masonville project area for this project.

Though no reptile or amphibian species were recorded during the seasonal studies, several species have been recorded in the Patapsco River and Baltimore Harbor area as part of the Maryland Biological Stream Survey (MBSS) and the 1998 Patapsco River Basin Environmental Assessment of Stream Conditions (Maryland DNR 1998, Maryland DNR 2003a). Reptile and amphibian species identified in the Bodkin Creek and Baltimore Harbor area, including the Patapsco River, observed by Maryland DNR during the MBSS were: stinkpot turtle (*Sternotherus odoratus*), eastern painted turtle (*Chrysemys picta picta*), northern two-lined salamander (*Eurycea bislineata*), northern green frog (*Rana clamitans melanota*), and American bullfrog (*Rana catesbeiana*) (Maryland DNR 2003a).

Reptile and amphibian species identified as part of the 1998 Patapsco River Basin Environmental Assessment of Stream Conditions were: eastern box turtle (*Terrapene carolina carolina*), eastern snapping turtle (*Chelydra serpentina serpentina*), northern watersnake (*Nerodia sipedon sipedon*), queen snake (*Regina septemvittata*), eastern garter snake (*Thamnophis sirtalis sirtalis*), northern ring-necked snake (*Diadophis punctatus edwardsi*), eastern-backed salamander (*Plethodon cinereus*), northern dusky salamander (*Desmognathus fuscus*), northern red salamander (*Pseudotriton ruber ruber*), northern spring salamander (*Gyrinophilus porphyriticus porphyriticus*), northern two-lined salamander, long-tailed salamander (*Eurycea logicauda longicauda*, American toad (*Bufo americanus americanus*), Fowler's toad (*Bufo fowleri*), wood frog (*Rana sylvatica*), pickerel frog (*Rana palustris*), northern green frog, and American bullfrog (Maryland DNR 1998).

No terrestrial reptiles and amphibians occur in the Seagirt dredging area since this area is entirely underwater.

2.1.8.4 Upland Habitats

Vegetation and habitat characterizations were conducted during the EA site reconnaissance visit to the Masonville project site in August 2003 and observations were also made during the spring, summer, and fall 2004 State feasibility-level surveys (EA 2003a, EA 2005a, EA 2005b, EA 2005c). An additional land-side survey was conducted adjacent to Masonville Cove during March 2005. A complete list of vegetation identified during the site visits is listed in Table 2-25.

The land use adjacent to the Masonville site is urban and industrial with little natural habitat. The majority of the existing Masonville site is a flat, graded area. This area is being paved for temporary parking of offloaded automobiles awaiting shipment. The border areas beginning from the south end of the KIM Channel around the north end and extending to the south end of the Cove on the western side consist of a narrow band of vegetated slopes (Figure 2-1). These slopes are vegetated with a variety of species. The area is disturbed throughout. There are debris piles and discarded timbers, concrete, rubble, and other materials. Vegetation is also sparse along the bulkhead and concrete-rubble shorelines. The narrow forested buffer has areas of dense vegetation along the perimeter and there is a 0.42 acre wetland that has both tidal (0.05 acres) and non-tidal portions (0.37 acres) located at the end of the KIM Channel. Most of the plants observed in this buffer and within the study area are native to moist, coastal, or wetland soils. Several of the species found are non-native species, such as royal paulownia (*Paulownia tomentosa*), tree-of-heaven (*Ailanthus altissima*), mulberry (*Morus alba*), and curly dock (*Rumex crispus*). Along the northern portion of the existing Masonville Terminal, the shoreline is composed of rubble and concrete with a steep, upland berm of herbaceous and deciduous vegetation. Most of the vegetation is comprised of opportunistic species that are invasive, non-native, or both. The dominant deciduous trees identified in the area included black locust (*Robinia pseudoacacia*), redbud (*Cercis canadensis*), and tree-of-heaven. Dominant herbaceous plants included common reed (*Phragmites australis*) and pokeweed (*Phytolacca Americana*). Poison ivy (*Toxicodendron radicans*) was also present.

Table 2-25. Vegetation Observed During the Reconnaissance and State Feasibility-Level Surveys of Masonville, August 2003, May 2004, July 2004, October 2004, and March 2005

Common Name	Scientific Name	Common Name	Scientific Name
Submerged Aquatic Vegetation			
Eurasian water milfoil	*Myriophyllum spicatum*		
Trees			
Black locust	*Robinia pseudoacacia*	Royal paulownia	*Paulownia tomentosa*
Black willow	*Salix nigra*	Sassafras	*Sassafras albidum*
Boxelder	*Acer negundo*	Slippery elm	*Ulmus rubra*
Northern catalpa	*Catalpa speciosa*	Tree-of-heaven	*Ailanthus altissima*
Redbud	*Cercis canadensis*	White mulberry	*Morus alba*
Shrubs			
Blackberry	*Rubus allegheniensis*	Staghorn sumac	*Rhus typhina*
Fragrant sumac	*Rhus aromatica*	Sumac species	*Rhus* sp.
Groundsel-tree	*Baccharis halimifolia*	Swamp rose mallow	*Hibiscus palustris*
Marsh-elder	*Iva frutescens*		
Vines			
Grape species	*Vitis* sp.	Sweet autumn clematis	*Clematis terniflora*
Poison ivy	*Toxicodendron radicans*	Virginia creeper	*Parthenocissus quinquefolia*
Herbs			
Beggar ticks species	*Bidens* sp.	Night-flowering catchfly	*Silene noctiflora*
Common reed grass	*Phragmites australis*	Pokeweed	*Phytolacca americana*
Curly dock	*Rumex crispus*	White snakeroot	*Eupatorium rugosum*
Jewelweed	*Impatiens capensis*		

Along the more natural shoreline areas to the southwest of the site in Masonville Cove, the vegetation is primarily upland and herbaceous, but is deciduous further inland. Tidally influenced wetlands are located along the western shoreline of the Cove and are dominated by pockets of common reed. Masonville Cove is considered to be an important water bird habitat, as discussed in 2.1.7.1.

The Seagirt dredging area does not contain upland habitat since the entire area is underwater. The dredging area consists of 128 acres of tidal open water.

2.1.9 Rare, Threatened, and Endangered (RTE) Species

Informal consultation letters were sent to the NMFS, the USFWS, and the Maryland DNR in September 2005. The NMFS requested a Section 7 Consultation for sea turtles and shortnose sturgeon (*Acipenser brevirostrum*) in a letter dated October 11, 2005 (Appendix D and Appendix O). A Section 7 consultation was prepared but before it could be sent to NMFS, a subsequent letter was received (on March 23, 2006), which expanded the species of concern to include large listed whales that could be struck by ships as a result of port expansion activities supported by the proposed DMCF. A revised Section 7 consultation was prepared (Appendix D) and was sent to the NMFS. NMFS responded in a letter dated July 28, 2006 concurring with the Section 7 consultation and requesting additional consultation if the DMCF is developed into a marine terminal after its closure. In a letter dated October 14, 2005, the Maryland DNR stated that there were no State or Federal records for RTE species in the project area and had no comments or requirements at the time of the letter. The letter noted that a bald eagle nest had been located adjacent to Masonville Cove, but that the nest tree had fallen during the previous winter (Appendix D and Appendix O). In a letter dated December 8, 2005, the USFWS noted the bald eagle nest that was discussed in the Maryland DNR letter and suggested consulting with Maryland DNR. A survey for bald eagle nests was completed in April 2006 and no evidence of nesting was found. It is doubtful that the eagle's would build a new nest in the area since the trees in the area are unlikely to be able to support an eagle nest. No additional coordination with the Maryland DNR and the USFWS is required for bald eagle's at this time.

The list of RTE plant species for Baltimore City is shown in Table 2-26. None of these plants were observed during surveys of Masonville Cove. The area that encompasses the proposed Masonville DMCF is wholly aquatic or industrial and would not be expected to support rare plants or animals. The existing Masonville Marine Terminal offers only poor habitat that is unlikely to support rare plants or animals. However, the adjacent Masonville Cove supports a variety of plants and terrestrial resources, though most are common and invasive species.

Table 2-26. RTE Plant Species of Baltimore City

Common Name	Scientific Name	Status
Broad-glumed brome	*Bromus latiglumis*	State Endangered
Grass-pink	*Calopogon tuberosus*	State Endangered
Goldthread	*Coptis trifolia*	State Endangered
Darlington's spurge	*Euphorbia purpurea*	State Endangered
Striped gentian	*Gentiana villosa*	State Endangered
American feverfew	*Parthenium integrifolium*	State Endangered
White fringed orchid	*Platanthera blephariglottis*	State Endangered
Southern mountain-mint	*Pycnanthemum pycnanthemoides*	Endangered-Extirpated
Mossy-cup oak	*Quercus macrocarpa*	Highly State rare
Bristly crowfoot	*Ranunculus pennsylvanicus*	Endangered-Extirpated
Dwarf prairie willow	*Salix tristis*	Highly State rare
Showy goldenrod	*Solidago speciosa*	State Threatened
Coastal false asphod	*Tofieldia racemosa*	Endangered-Extirpated

The shortnose sturgeon, a federally listed endangered species (USFWS 2005a), is a concern within the Chesapeake Bay. To gather information on shortnose sturgeon in the Chesapeake Bay area, the USFWS, in 1996, initiated a reward program for incidental catches of Atlantic and shortnose sturgeon in commercial gear. Data from the returned tags has resulted in information on 71 captured shortnose sturgeon. The reward data collected thus far indicates that shortnose sturgeon are primarily found in the upper Chesapeake Bay and Susquehanna River, above the City of Baltimore from January through May (USFWS 2005b). Scattered collections from the mid-Bay below the Chesapeake Bay Bridge predominantly occur from April through June.

No shortnose sturgeon have been captured in the vicinity of the Masonville project site or Seagirt dredging area (Mangold 2005). The closest collection was one shortnose sturgeon caught by hook and line at Fort Smallwood Park approximately 8.5 miles southeast of the Masonville area and 7.6 miles southeast of the Seagirt dredging area in June 2005. Four other collections have been made near the mouth of the Patapsco River within approximately 1 mile of Fort Smallwood. No shortnose sturgeon have been captured upstream of the Key Bridge, which is approximately 4 miles from Masonville and 2.7 miles from the Seagirt dredging area. During the Bay Enhancement Working Group (BEWG) site ranking process in 2002, the NMFS indicated that the shortnose sturgeon is probably transient to the Harbor (Nichols 2002) and it is likely they are only using the channels.

Sea turtles found in the Chesapeake Bay include the following species: loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), leatherback turtle (*Dermochelys coriacea*), and the green sea turtle (*Chelonia mydas*). Neither the Maryland DNR nor the National Aquarium's Marine Animal Rescue Program has any records of sea turtle sightings or strandings in the Inner Harbor or Patapsco River (Kimmel 2005, Perry 2005). It would be unusual to find a sea turtle in the Inner Harbor area of the Chesapeake Bay (Perry 2005). It is unlikely that sea turtles are within or adjacent to the proposed Masonville DMCF footprint or Seagirt dredging area.

Though whales are only rarely found in the Chesapeake Bay, there are six listed large whale species in the region (Mid-Atlantic coast): the northern right whale (*Eubalaena glacialis*), the humpback whale (*Megaptera novaeangliae*), the fin whale (*Balaenoptera physalus*), the sei whale (*Balaenoptera borealis*), the Blue whale (*Balaenoptera musculus*); and the Sperm whale (*Physeter macrocephalus).* No whales are known to utilize the Baltimore Harbor. The closest record of large whale utilization was several humpback whales seen feeding under the Bay Bridge approximately 27 miles south of Masonville and 25 miles south of the Seagirt dredging area in 1992. It is unusual for large whales to be utilizing resources that far north in the Chesapeake Bay. There are four sources of information on the presence of marine mammals in the Maryland waters of the Chesapeake Bay: the Marine Animal Rescue Program (MARP) operated out of the National Aquarium in Baltimore, the Marine Mammal and Sea Turtle Stranding Program established by the MDNR at the COL, the NOAA marine mammal stranding database, and NOAA large whale ship strike database. These sources indicate that large listed whales are not found in the Patapsco River and it is unlikely that any are within or adjacent to the proposed Masonville DMCF alignment. Five dead listed whales have been reported in Baltimore Harbor (three fin and two sei whales) since 1979, but all appear to have come in on the bows of ships.

NOAA incidental take reports from the northeast coast from 2002 to 2006 did not include any right, fin, or humpback whales. These incidental take reports did include some dredging as well as fishing. No listed large whales have been entrained in dredging equipment or entangled in fishing gear within the Chesapeake Bay since 2000. Listed whale ship strikes are relatively rare in the mid-Atlantic region and very few have been recorded in Maryland and Virginia Waters. Since 1904, 7 humpbacks, 10 fin whales, 4 right whales and 3 sei whales have been reported as actually or possibly struck by ships. The only ship strikes of large listed whales reported in the Bay in the last 10 years have been near the mouth of the Bay, over 130 miles south of the Masonville site. On April 18, 2006 a sei whale was found dead on the bow of a cargo ship at Seagirt Marine Terminal in the Baltimore Harbor. It is likely that the sei whale was struck in the ocean and brought all the way up the Bay with the ship. Prior to this incident, the most recent confirmed whale in the Maryland waters of the Chesapeake Bay was a dead minke whale in 1999 on Kent Island which is over 27 miles south of the Masonville site and over 25 miles south of the Seagirt dredging area.

In addition to listed Species, the NMFS also expressed concerns about Atlantic sturgeon (*Acipenser oxyrhynchus*), which has been recorded in the Bay. Atlantic sturgeon were also included in the USFWS Reward Program collections. To date, 856 Atlantic sturgeon have been collected in Maryland waters as a result of the Reward Program. The closest specimen was taken approximately 7 miles from Masonville, in the mouth of the Patapsco River. However, greater than 98 percent of the Atlantic sturgeon have been collected south of the Bay Bridge (over 23 miles from the Masonville Site). This is expected because Atlantic sturgeon tend to be found at higher salinities than shortnose sturgeon (Collins and Smith 1997). Due to their preferred salinities and known distributions within the Bay Atlantic sturgeon are expected to be transients within the Patapsco River and uncommon at the Masonville site.

The bald eagle, a Federally and State of Maryland listed threatened species, was observed in the vicinity of Masonville during the May, July, October, and September avian surveys. An active bald eagle nest (BC-04-01) was located on the northwestern tip of Masonville Cove. However, the nest tree fell during late winter 2005 and the eagles have not built a new nest in the area. The nearest known bald eagle nest site, aside from the aforementioned nest site, is located near Black Marsh near the mouth of Back River, approximately eight miles from the Masonville project area (USACE 2001c). Bald eagles may use the waters surrounding Masonville for foraging throughout the year.

The American peregrine falcon (*Falco peregrinus anatum*), was once a Federally-listed species, but is no longer listed due to population recovery. This species has been observed by the USFWS nesting at the Inner Harbor in downtown Baltimore and on the Key Bridge. The peregrine falcon is ranked in the State as S2, which means that it is imperiled within Maryland and is being actively tracked by the Wildlife and Heritage Service. The peregrine falcon is considered to be "In Need of Conservation" in the State of Maryland, but is no longer legally protected under the Endangered Species Act (Maryland DNR 2003b). This species has not been observed during bird surveys at the Masonville site.

Consultation with the Maryland DNR has indicated that hooded mergansers (*Lophodytes cucullatus*) are known to occur within Baltimore City limits. This species is currently ranked as S1B, which means that it is highly State rare and that it is a migrant with breeding status. The species is actively tracked by the Wildlife and Heritage Service (Maryland DNR 2003b). Hooded mergansers prefer habitat undisturbed by human activity (e.g., forested) and wooded edges of freshwater lakes, ponds, streams, small rivers, and swamps This species requires habitat with clear water for feeding and large trees with natural cavities for nesting (Sea Duck Joint Venture 2005). In winter, their habitat also includes coastal estuaries. Hooded mergansers would not find preferred nesting habitat at the Masonville site, even in the Cove, and were not observed utilizing either the proposed Masonville DMCF area or Masonville Cove during any of the seasonal surveys and has not been observed during the avian surveys of the site. Based upon habitat requirements, any utilization would likely be transient winter foraging (Sea Duck Joint Venture 2005).

Consultation with the Maryland DNR indicated that the Masonville site may be habitat for the common moorhen (*Gallinula chloropus*), which is designated in the State of Maryland as "In Need of Conservation." The Common Moorhen is ranked as S2B, which means that this species is imperiled in the State of Maryland. The "B" qualifier indicates that this species is a migrant and has a breeding status in the State of Maryland. Species with this ranking are actively tracked by the Wildlife and Heritage Service. However, this species is not legally protected (Maryland DNR 2003b). Common moorhens were not found during any avian surveys at Masonville.

2.1.10 Air Quality

The USEPA has set National Ambient Air Quality Standards (NAAQS) for six pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead. The air quality standard for ozone is based on an 8-hour averaging period. Particulate matter standards are divided by the diameter size of the particulate, particulate matter 10 and particulate matter 2.5, which refers to particulates with a diameter smaller than 10 micrometers and 2.5 micrometers, respectively. Both sizes of particulate matter are thought to have potential human health risks (USEPA 2005a).

Any area where a pollutant does not meet the air quality standards set by the USEPA is considered to be in non-attainment. Non-attainment categories for ozone range from sub marginal to extreme. Both the Masonville site and Masonville Cove are located in the Baltimore region for air quality monitoring purposes. The Baltimore region was in severe non-attainment for 1-hour ozone prior to the new standards, however, it is now classified as in moderate non-attainment based on the new 8-hour ozone standard. The region is in non-attainment for particulate matter 2.5 (USEPA 2005b). The Baltimore region is in attainment for carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead.

The entire State of Maryland is part of the Northeast Ozone Transport Region (OTR), which was established in the 1990 Clean Air Act Amendments in recognition of the long-standing ozone non-attainment problems in the northeast. The OTR is the area consisting of the Northeast and Mid-Atlantic States that historically has had a ground-level ozone problem, a large amount of which is accounted for by emissions generated outside the region. The Ozone Transport Commission (OTC), which is a multi-state organization, provides oversight of the region and is responsible for advising the USEPA on transport issues. The Northeast OTC is also responsible for developing and implementing regional solutions to the ground-level ozone problem.

The existing Masonville site is currently owned by MDOT and managed by the MPA and is used as a parking lot. Automobile exhaust is the main source of emissions.

2.1.11 Hazardous, Toxic, Radioactive Wastes (HTRW)

Preliminary evaluations of the areas surrounding the proposed site have indicated the existence of 17 potential hazardous waste sites in the vicinity of Masonville (MDE 2005a). These are sites that potentially handle Hazardous, Toxic, and Radioactive Wastes (HTRWs) but are not necessarily sites designated by the USEPA or State of Maryland for a response action, such as removal or remediation under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Two of the sites are participating in a voluntary cleanup program and six have been designated as having No Further Remedial Action Planned (NFRAP). The NFRAP sites are listed as HTRW sites. However, the USEPA has decided not to take further remedial action under CERCLA based on the information available at the time of evaluation. None of these sites are on the Superfund National Priority List (NPL). The closest NPL site is the Curtis Bay Coast Guard Yard, which is a ship repair facility, located within the mouth of Curtis Creek over four miles from the Masonville site (USEPA 2005c).

The existing 42-acre Masonville site was initially created by the disposal of rubble from the 1904 Baltimore fire. Following that disposal, the Maryland Port Administration used the site for the placement of dredged material from the Baltimore Harbor channels. Over the last 40 years, various materials have been disposed of at the site, including large amounts of wooden timber with creosote preservative.

2.1.11.1 Kurt Iron and Metal Site

Landside Areas

The former KIM facility was purchased by the MPA in September 2000 to expand port facilities and has known legacy contaminants from the previous owners. Although not a CERCLA site, it is currently being remediated under the MDE Voluntary Cleanup Program (VCP). A Response Action Plan (RAP) has been prepared and approved by MDE (EBA 2005). The plan includes capping impacted soil to prevent further transport of and contact with soil contaminants to isolate site soil contaminants from the ecosystem. All hazardous materials and equipment have been removed in preparation for the cap.

In Water Areas

The major area of environmental concern is the KIM Channel, which has 25 sunken and derelict vessels and barges with various materials on board and a steel dry dock. MPA conducted an in-depth investigation of the materials including sampling each of the 25 vessels structures, dry-dock, and sediments beneath the dry-dock and debris piles. The primary regulated materials of concern associated with the structural materials of the vessels and dry dock include lead paint, PCB contaminated transformers and paint, asbestos, and various petroleum products and wastes.

The MPA is consulting with the MDE on the applicable, or relevant and appropriate, requirements for cleaning these vessels. The condition and types of suspected and known hazardous materials are relatively well understood (EBA 2003, EBA 2005). Table 2-27 provides an inventory of the vessels, equipment, and hazards at the site.

2.1.11.2 Masonville Cove Sites

A site reconnaissance of the shoreline of Masonville Cove was conducted in July 2005 as part of the existing conditions survey. In addition, a representative portion of interior, non-shoreline, areas was also observed. The purpose of the site reconnaissance was to attempt to identify the content of anthropogenic fill materials present, to assess the potential methodology and feasibility involved in their removal, and to identify areas that may warrant additional investigation.

During the reconnaissance survey, the property was divided into 11 areas, each designated by a letter corresponding to its location, shown in Figure 2-44. Table 2-28 contains a brief description of the materials observed and correlates with Figure 2-44.

Discussion of Findings

The beach areas appear to be impacted primarily by water and wind deposited litter consisting primarily of plastic bottles, Styrofoam waste, and municipal trash. Due to the topography of the site, several low-lying areas also appear to have been impacted by the influx of litter-laden water

Table 2-27. Kurt Iron and Metal Derelict Vessel and Hazards Inventory

Item	Status	Suspected Hazards	Known Hazards	Other
1. Steel Dry Dock	Beached; Deck & Hull Deteriorating	Tributyl tin; PCBs; tires; batteries; creosoted timbers	PCBs in sediments; asbestos; lead-based paint (LBP); lead-contaminated sand blasting grit	
2. Jacob Pilsch – tank cleaning barge	Watertight hull; beached by MPA		Residual oil in tanks and motors	
3. Sea witch – container vessel	Hull fully or partially breached and flooded; bow underwater;		PCBs; heavy metals; oil/tar in sediments and in hull	
4. Ferry	Decks and hull deteriorating and flooded	PCBs and asbestos	LBP	Scrap metal; glass
5. Timber Dry Dock	Partially collapsed; fire damage	Creosoted timbers		
6. Barge #3	Decks and hull deteriorating; possibly flooded	Creosoted timbers		
7. Timber Barge	Sunken	NA	NA	
8. Timber Float	Floating	NA	NA	
9. Barge #1	Hull breached; probably flooded	LBP	NA	
10. Barge #2	Hull breached; probably flooded	LBP	NA	
11. Crane Barge	Floating	LBP; diesel fuel	NA	
12-16. Timber Barge Series	Spiked together; floating	Creosoted timbers	NA	
17. Timber Ship	Sunken	Asbestos	NA	
18. Catherine – Tug boat	Sunken	NA	NA	
19. Sailboat	Sunken	NA	NA	
20. Beverly	Beached & flooded	NA	NA	
21. Barge #4	Fractured steel hull	NA	NA	

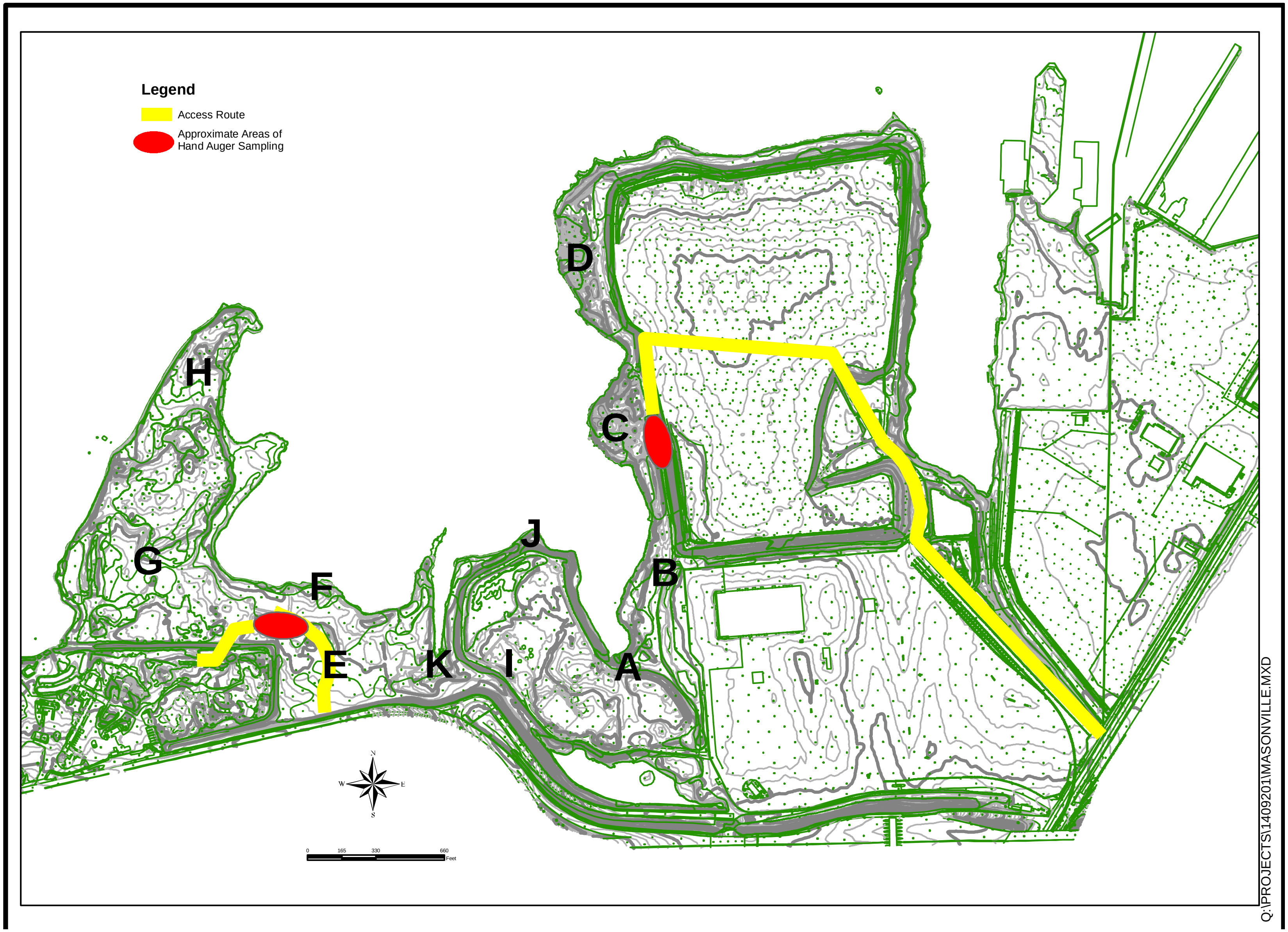


Figure 2-44. Locations of Debris and Materials Observed During July 2005 Reconnaissance

Table 2-28. Materials Observed During July 2005 Reconnaissance Visit

Area	Description	Primary Materials Observed
A	Outfall	Beached plastic bottles, Styrofoam, brick and concrete rubble, municipal trash, concrete slabs, portions of brick wall
B	Small Cove	Submerged, buried and beached electrical insulators, approximately 50 tires submerged in cove, steel cable on land, Styrofoam, plastic bottles, possible fly ash
C	Elevated land	Surficial scrap metal and timbers, mounded area, crushed, buried 55-gallon rusty drums, large truck tires, discarded steel storage tank (former contents unknown), one 55-gallon bung-top drum filled with a white solid material, four 55-gallon drums on surface, steel I-beams, metal piping, railroad ties, discarded pier pylons, brick rubble fill
D	Elevated land	Exposed timbers, telephone poles, burned timbers, carpet, foam, slag on surface, concrete slabs and blocks with re-bar, large pieces of scrap iron sheet metal, cementitious gray concrete, insulators, kiln bricks, cable wires, aluminum tie straps, railroad ties, old refrigerator
E	Mixed hardwoods/Forest	Sporadic piles of rubble (brick, concrete), large (2 x 3 ft) blocks of slag (approximately 15-20 blocks), some blocks of concrete and slag are partially buried, surface appears mounded, at least one crushed drum observed partially buried, trees in area have roots on surface due to obstructions in subsurface, plastic sheeting, scrap metal, buried lead pipe, waste tires
F	Beach area	Relic dredging barge located atop a submerged wooden platform, large concrete blocks, plastic bottles, Styrofoam municipal trash, possible fly ash, burned timbers, slag, large support beams (iron with concrete-filled posts), brick, and scrap metal
G	South of western peninsula	Open area, one pile of discarded household appliances, household trash and debris, area of sandy gravel fill, buried timbers with iron, mounds of concrete fill
H	Western peninsula	Beached plastic bottles, a few large concrete pieces, older mounds of municipal trash (glass bottles), ash fill, concrete rubble on shoreline
I	Steep vegetated slope / stormwater conveyance	Discarded truck tires, roadside litter, large concrete pipes
J	Beach area	Beached plastic bottles, timbers, driftwood, plastic bottles, Styrofoam, and municipal trash, burned timbers, slag
K	Stormwater conveyance	Large (20 ft) concrete pipes with rebar, approximately 40-50 waste truck tires, municipal trash, bottles from stormwater
L	Cove and side slope	Scrap metal, discarded tires, municipal waste, slag, burned timbers

during high tides or storm events. This was most evident in the beach area of Area H. In addition, at least one beach area contained submerged discarded tires and discarded ceramic electrical insulators from the electric distribution industry. This was most evident in the beach area of Area B. Brick and concrete rubble were also observed along the majority of beach areas. This material was probably displaced due to erosion of historic fill at the site or from down slope migration during dredged material placement or construction activities. At the shoreline areas, Area B also exhibited fill material, which could be observed beneath the vegetation on the slope.

Non-beach areas exhibited evidence of historic filling in Area E as a result of improper waste disposal. The topography of these areas appeared mounded, indicative of numerous truckloads of waste being deposited at the site over time. This was most evident in Area C and Area E. Materials observed on the surface or partially buried in these areas included waste auto tires, truck tires, rusty 55-gallon industrial drums, metal debris, ceramic electrical insulators, steel cable, a discarded aboveground storage tank, maritime rope, large blocks of slag (concentrated in Areas E and F), large pieces and blocks of concrete (concentrated in Areas B and E), possible fly ash, brick rubble, asphalt rubble, and glass bottles. In addition, large piles of timbers, railroad ties, and telephone poles were observed throughout the property (concentrated in Area B, C and D). Areas that had large piles of the aforementioned wood-based waste were usually co-mingled with large pieces of scrap metal and railroad spikes. Metal debris was also observed at the shoreline on the eastern portion of the site (Area F). This material appears to be a floating relic barge or floating dock associated with historic dredging and is located atop a submerged wooden platform.

Of the observed materials, none appeared to be listed wastes. The only materials, which appeared to potentially require special handling, were the treated timbers. Core samples were taken of the timbers and these were subjected to Resource Conservation and Recovery Act (RCRA) characterization. Results of this testing would be used to appropriately manage and dispose of these materials. Sampling was undertaken to characterize the depth and nature of the large areas of fill materials at Areas C and E. These areas exhibited the most pronounced mounding of soils, which is typically evidence of repeated surface dumping of waste. Additional investigations of the entire area would be performed at the time mitigation and restoration is initiated.

The existing terrestrial habitat consists primarily of opportunistic invasive species, many of which are non-native (Section 2.1.8.4). Many of the trees, shrubs, and ground cover species are growing in, around, and on top of debris piles.

Additional information on the upland survey and the results of the survey is included in Appendix E.

2.1.11.3 Seagirt Dredging Area

No HTRW are known to occur within the proposed dredging area. No site specific surveys for HTRW have been completed at this time. The area has been dredged previously to a depth of 42 ft and serves as an active shipping channel within the Baltimore Harbor.

2.1.11.4 Munitions of Explosive Concern (MEC)

Suspect unexploded ordnance (UXO) was found on land at the former KIM facility during debris removal activities. No live ordnance has been found at the site. No suspect UXO found at the site was suspected of containing or contained chemical warfare agent (EBA 2005). No additional MEC have been found at the former KIM site, on the existing MMT, or adjacent to Masonville Cove. No in-water surveys for MEC in the Masonville project area have been completed at this time. No MEC has been observed by any environmental or engineering survey team during any site visits or environmental surveys that have occurred.

Munitions of explosive concern have been unexpectedly discovered in the past while dredging new work projects in the Baltimore Harbor Anchorages. The closest of these locations are the anchorages in the vicinity of Seagirt Marine Terminal and Dundalk Marine Terminal approximately 1/8 mile from the Seagirt dredging area. No in-water surveys for MEC have been completed in the Seagirt dredging area at this time. Based upon past experience, there is a very small potential for encountering MEC in the upper depths. The deeper sand and gravel layer is below any depth that would have been potentially subject to MEC. No MEC surveys would be required by the USACE prior to the Seagirt dredging. However, a protocol for dealing with MEC has been established and can be found within Appendix N.

2.1.12 Navigation

Federal navigation channels lie within one-half mile of the proposed Masonville DMCF, although commercial traffic near Masonville is less than that of areas to the north and east. Fairfield Marine Terminal is located near the proposed Masonville site. Marine traffic reaching the Fairfield Marine Terminal uses the Fort McHenry Channel and the Ferry Bar Channel to access the piers. The South Locust Point Marine Terminal is located north of the proposed Masonville DMCF. Marine traffic calling on the terminal uses the Ferry Bar Channel to access the South Locust Point Channels and would pass by the Masonville DMCF enroute to the South Locust Point Marine Terminal. A mooring buoy was identified at the northwest corner of the proposed terminal expansion area. The mooring buoy is being used to moor barged cargo.

The Seagirt dredging area is located adjacent to Seagirt Marine Terminal within a shipping channel, which is one of the most productive and efficient container handling terminals in the United States (MPA 2006). The Terminal had 371 ship and 150 barge calls in 2005. Seagirt Marine Terminal is 1.2 miles west of the Dundalk Marine Terminal and 2.2 miles north of Fairfield Marine Terminal. Access to Dundalk Marine Terminal is via the Fort McHenry Channel and access to the Fairfield Marine Terminal is via the Fort McHenry and Curtis Bay Channels.

The Fort McHenry Federal navigation channel is approximately 1.0 mile from the Seagirt dredging project. The dredging project will take place in the Seagirt Marine Terminal Access Channel, which connects Seagirt Marine Terminal with the Fort McHenry Channel.

2.1.13 Floodplains

Floodplain Management, Executive Order 11988, issued May 24, 1977, and the USDA Department Regulation 9500-3 Land Use Policy, directs all Federal agencies to avoid both long- and short-term adverse effects associated with occupancy, modification, and development in the 100-year floodplain, when possible. Specifically, the regulations indicate that growth should not be encouraged in the floodplain, unless there are no alternatives. The regulations also stipulate that floodplain value and habitat should be protected.

Floodplains are defined in the executive order as “the lowland and relatively flat areas adjoining inland and coastal waters, flood prone areas of offshore islands that, at a minimum, are subject to a one percent or greater chance of flooding in any given year.” The 100-year floodplain is described as an area with a one percent chance in any given year for floodwaters to meet or exceed the base flood elevation. Additional Federal and State programs concerned with floodplain management include the National Flood Insurance Program [44 Code of Federal Regulations (CFR) 59-79]; the State Waterway Construction Permit Program for Non-tidal Floodplains; the State Tidal and Non-tidal Wetlands Permit Programs; the USACE Sections 10 and 404 Permit Programs; and the Maryland Coastal Zone Management Program.

Approximately 10 acres of the proposed Masonville DMCF footprint area is within the floodplain. Of the 141 acre footprint, 130 acres are tidal open water (including the 3 acres of unauthorized dry dock), which is not considered part of the floodplain under the definition in the previous paragraph (Figure 2-45). The Seagirt dredging area is located underwater and is not part of the floodplain.

Figure 2-45. 100 Year Floodplain

2.1.14 Critical Areas

The Maryland General Assembly approved the Chesapeake Bay Critical Area Protection Program in 1984 because of concerns about the decline of certain natural resources of the Chesapeake Bay (Redman *et. al*. 2003). The State of Maryland created a Critical Area Commission for the Chesapeake and Atlantic Coastal Bays.

The critical area is defined as all tidal waters (including State and private wetlands) and all land within 1,000 ft of tidal waters and wetlands (COMAR 27.01.01.01.01). The critical area buffer is the first 100 ft landward from the mean high water (MHW) line of tidal waters, tributary streams, and tidal wetlands (COMAR 27.01.09.01.01). The proposed Masonville DMCF falls under the critical area regulations outlined in COMAR, Title 27.02 "Critical Area Commission for the Chesapeake and Atlantic Coastal Bays – Development in the Critical Area Resulting from State and Local Agency Programs" (Figure 2-46). The lands currently owned by the MPA are State-owned lands and, therefore, fall under the jurisdiction of the Critical Area Commission. The land portion of Masonville Cove is owned by the State and most of the Cove is below MHW and, therefore, is also State-owned. Enforcement of the Critical Area regulations in Masonville Cove and the surrounding State-owned land area, therefore, falls to the full State Critical Area Commission rather than the Baltimore City department normally responsible for enforcing Critical Areas Regulations within the boundaries of the city.

All of the landside portions of the proposed Masonville DMCF site lie within the Chesapeake Bay Critical Area. The site is also within an Intensely Developed Area (IDA). IDAs are areas of concentrated development where little natural habitat exists. As required by Maryland law, new development and redevelopment of an IDA must be accompanied by techniques to decrease water quality impacts, due to stormwater runoff, by greater than 10 percent. Construction of a containment site or beneficial use project would involve shoreline impacts, requiring review and approval by the Critical Areas Commission. Changes in impervious surface would be reviewed and may require mitigation or monetary offset.

Masonville Cove is designated as an IDA in accordance with COMAR 27.01.02.05.05. All of the landside area that would be restored within Masonville Cove is within the 100-ft Critical Areas buffer (Figure 2-46). Masonville Cove is also a designated habitat protection area (DHPA), as determined by the City of Baltimore (City of Baltimore 2002). The DHPA has been designated based on historical use of the open water area of the Cove adjacent to the existing Masonville Marine Terminal by wintering and migrating waterfowl. This designation is part of the City of Baltimore Critical Area Management Program.

The Seagirt dredging area is located entirely underwater and is, therefore, not within the 1000-ft critical area or the 100-ft critical area buffer.

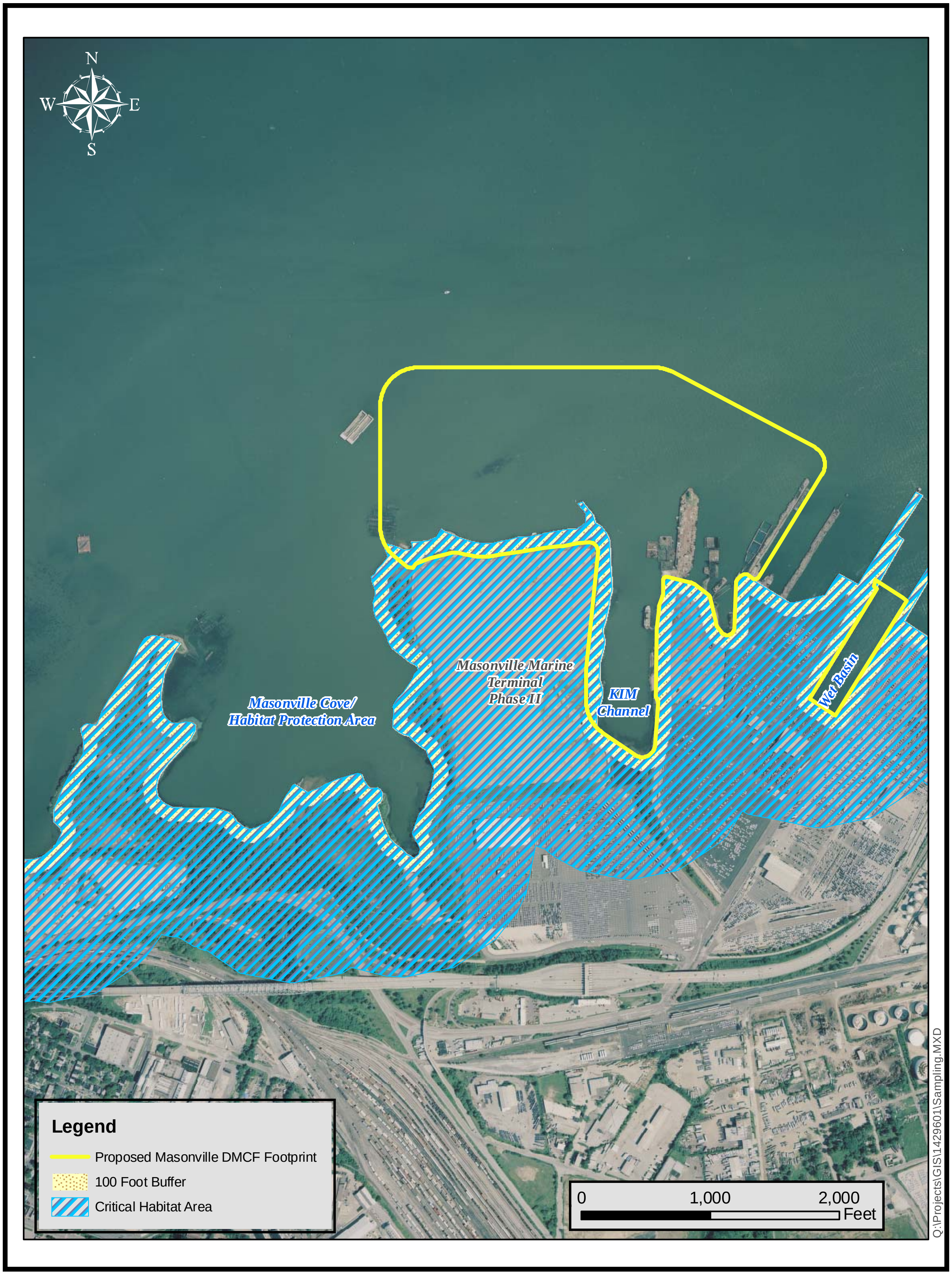


Figure 2-46. Critical Area and the 100-ft Critical Area Buffer in the Vicinity of Masonville

2.1.15 Coastal Zone Management

The Federal Coastal Zone Management Act of 1972 (CZMA) was enacted by Congress to encourage States to protect, preserve, and when possible, to restore or enhance valuable natural resources of the coastal zone. The law provides funds for the development and implementation of State coastal zone management programs. Section 307 of the CZMA requires that all proposed Federal activities affecting a State's coastal zone, including direct Federal actions, Federal licenses and permits, and financial assistance to State and local governments, be consistent to the maximum extent practicable with a State's Federally-approved coastal zone management program.

Maryland's Coastal Zone Management Program (CZMP) was approved by the Department of Commerce, National Oceanic and Atmospheric Administration, in 1978. The State's CZMP is a comprehensive and coordinated program, based on existing laws and authorities, for the protection, preservation, and orderly development of Maryland's coastal resources.

Although the Maryland DNR is the lead agency for the CZMP, the MDE is responsible for implementing the CZMA Federal Consistency requirements. The Chesapeake Bay Critical Area Protection Act and the Tidal Wetlands Act, both applicable to the proposed Masonville DMCF, are examples of State laws that are a part of the CZMP.

The proposed Masonville DMCF site, Masonville Cove, and the Seagirt dredging area are located within Maryland's coastal zone as defined in the CZMP. Thus, the CZMA Section 307 Federal Consistency requirements apply to the project. The proposed Federal activity/action is the required USACE permit. The USACE may not authorize the project until a Federal Consistency determination is made by the State [15 CFR Part 930, subpart C, Section 307 (c)(3)].

2.1.16 Wild and Scenic Rivers

The Wild and Scenic Rivers Act (16 USC 1271-1287) was passed on October 2, 1968. It declares that certain “selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments, shall be protected for the benefit and enjoyment of present and future generations.”

The Patapsco River is not listed as a Wild and Scenic River.

2.1.17 Prime and Unique Farmland

The Farmland Protection Policy Act (FPPA) authorized the USDA to develop criteria for identifying the effects of Federal programs on the conversion of farmland to non-agricultural use. USDA Land Use Policy designates prime farmland as land with the definitive combination of both the “physical and chemical characteristics for producing (and its use is available) for food, feed, forage, fiber, and oilseed crops.” In general, prime farmland has the necessary and essential combination of soil quality, growing season, and moisture supply needed to produce economically-sustained high yields of crops when treated and managed according to acceptable farming methods. In addition, unique farmlands are classified by USDA as any land other than prime farmland that is used for the "production of specific high-value food and fiber crops." According to the FPPA, farmland, either prime or unique, does not include farmland already "in or committed to urban development."

The FPPA does not apply to the proposed Masonville DMCF site because none of the soil types are considered farmland. The FPPA does not apply to the Seagirt dredging area because the entire area is underwater.

2.2 CULTURAL RESOURCES

MPA completed a cultural resource investigation for the Masonville study area. The historical background of the site, a discussion of previous investigations, and surveys conducted at the Masonville study area are described in detail in the following paragraphs. The Seagirt dredging area lies within an area that is regularly dredged. No cultural resources are known to occur within the Seagirt dredging area footprint. Any SHPO concerns involving the Seagirt dredging area would have been addressed when the initial permit was issued or in the general Harbor-wide permit. Both of these permits were issued and no additional consultation with SHPO is required for the Seagirt dredging area. Consultation with the MHT on November 29, 2006 indicated that they have no objections to dredging to an additional depth of up to 54 ft MLLW.

2.2.1 Historic Background – Colonial Era Occupation of the Masonville Study Area

Historic information specific to the Masonville study area collected by R. Christopher Goodwin & Associates (RCG&A) relied heavily on: USGS navigational charts for Baltimore Harbor, published from 1895 to 1955; a Sanborn® fire insurance map dated 1913; aerial photographs; literature on shipwrecks; NOAA's Automated Wreck and Obstruction Information System (AWOIS); U.S. Inland and Geodetic Service nautical charts; historic maps; USACE reports; and vessel directories (RCG&A 2005). Archeological reports of previous investigations within the vicinity of the current Baltimore Harbor projects were also used.

The 1895 USGS navigational chart for Baltimore Harbor was determined to be the earliest available map to include the Masonville survey area. The map depicts the southern shoreline in the Masonville survey area as an undeveloped, wooded, marshy area. The nearest areas depicted as developed are the area covered by the Baltimore & Ohio (B&O) Railroad lines that traversed this neck to service Tyson's and Raisins wharfs on the main channel of the Patapsco (RCG&A 2005), located approximately 500 ft south of the survey area; the developing community of Brooklyn, located approximately 950 ft southwest of the survey area, through which the railroad lines pass; and a marine hospital depicted approximately 1400 ft southeast of the survey area, and approximately 600 ft north of the railroad lines (RCG&A 2005).

According to the 1895 USGS chart, a "Long Bridge" with a draw span replaced the Revolutionary War era ferry shown in Berthier's 1782 map. This bridge, which spanned the Patapsco from Brooklyn to Ferry Point, was located northwest of the survey area in South

Baltimore (RCG&A, 2005). A cluster of buildings to the east of the Long Bridge was identified by RCG&A as the precursor to Acton's Resort, an amusement park identified on a later USGS navigational chart dated 1900 (RCG&A 2005).

By the time of completion of the 1895 map, limited dredging had been done along the northern boundary of the Masonville survey area. However, the main Patapsco River channel above Fort McHenry had not been dredged (RCG&A 2005). "Significant infilling and bulk-heading to modify the south shoreline of the river in this area began in 1900, beginning with the northwestern point of the neck, near the present Baltimore [Harbor] Tunnel western terminus" (RCG&A 2005).

The community of Masonville was first depicted on the 1900 USGS navigational chart. The southern shoreline in this area changed dramatically soon after 1900. By 1917, the marine hospital to the southeast of the survey area had all but disappeared, although Acton's Resort was still depicted. In addition, a new 27 ft deep channel had been dredged near Fort McHenry (RCG&A 2005).

2.2.2 Historic Background – "Modern" Era Occupation of the Masonville Study Area

The 1931 edition of the USGS Navigational Chart depicts extensive development of terminal facilities on the eastern side of the Fort McHenry Channel, near Lazaretto Point, as well as north and east of the Masonville survey area. The Ferry's Point/South Baltimore "Long Bridge" is not depicted. The shallow water depths along the shoreline of this neck were assumed by RCG&A to be attributed to the disposal of materials generated during the dredging of Middle Branch in 1930 and construction of an access channel at South Locust Point. In addition, only one wreck is depicted in the Masonville survey area. Therefore, RCG&A suggests that the potential vessel resources, addressed in their remote sensing survey, date to wrecks that occurred no earlier than circa 1930 (RCG&A 2005).

Due to shoaling and erratic sandbar build-up concurrent with developing shoreline configuration in the early 1940s to late 1950s, two to five vessel wrecks were identified in the general vicinity of the Masonville survey area on the 1940, 1945, and 1955 USGS Navigational Charts. The area once occupied by the former Maryland Shipbuilding and Dry-dock Company (MSDC) facility is occupied by portions of the KIM facility. At the time, the KIM facility dominated the shoreline in the Masonville area, with the exception of a dry-dock and several piers abandoned by the former MSDC. "The southern bank was further altered between 1953 and 2001" (RCG&A 2005).

The Arundel Corporation aggregate distribution center is depicted in the southwest embayment of the Masonville project area on the February 1953 aerial photograph. Twelve wooden barges, assumed by RCG&A to be associated with transporting sand and other materials, are scattered along the eastern entrance of this embayment to extend the shore northward. An aggregate loading and offloading facility, protected by four to six additional barges, is depicted on the western margin of the embayment (RCG&A 2005). "Wrecks highlighted on current navigational charts of the Masonville area are representations of these abandoned barges. Wrecks along the eastern edge of the embayment were not visible on the aerial photographs and must have been scuttled post-1953" (RCG&A 2005).

RCG&A prepared a report and found that "additional infilling took place between 1955 and 2001, which resulted in a solid landform in the center of the southern shoreline" (RCG&A 2005). Although the maritime history of the Baltimore Harbor and the Chesapeake Bay spans four centuries, there was a low to moderate perceived possibility of encountering significant submerged cultural resources in the Masonville survey area due to "shoreline modifications, frequent channel dredging, an aggressive salvage industry, and a limited number of reported shipwrecks," (RCG&A 2005).

2.2.3 Previous Investigations

According to Maryland Historical Trust (MHT) files, numerous submerged or partially submerged historic resources have been located within a two-mile radius of the study area for Masonville. These resources include vessel wrecks, piers, wharfs, bridges, bridge abutments, and navigational aids, such as lights and markers. Three hundred fifty-four magnetic anomalies were identified as potentially located in the Masonville area based on information obtained from Berman's *Encyclopedia of American Shipwrecks* and Shomette's *Shipwrecks on the Chesapeake*, dated 1972 and 1982, respectively. Of these 354 magnetic anomalies, only 33 had corresponding acoustic anomalies (RCG&A 2005).

Of the numerous archaeological surveys conducted in the Baltimore Harbor and its channels, those deemed pertinent and referenced by RCG&A for this project include: those conducted by the Karell Institute in conjunction with proposed dredging projects in 1980 and 1981; a recent MHT survey conducted adjacent to the Fort McHenry National Monument; a Geophysical Foundation Exploration Report conducted in 1978 by Mueser, Rutledge, Wentworth & Johnson for the USACE, Baltimore District; a 1992 USACE Baltimore District archival study of Baltimore Harbor anchorages and channels; a 1994 survey for the USACE Baltimore District in the vicinity of Fort McHenry; and a subsequent survey conducted in the vicinity of Lazaretto Point, as detailed in a 2001 RCG&A report (RCG&A 2005).

The 1980 Karell Institute survey study area was related to a proposed terminal facility near the western approaches of the Baltimore Harbor, northeast of the Masonville project area. The three targets identified in the survey were dismissed as casual debris after further investigation. Of the numerous additional targets identified by the Karell Institute in a Phase I cultural resources survey for the Baltimore Harbor and Channels 50 ft Project, dated 1981, none were located in the current Masonville survey area. Site 18BC61, as identified in the Institute's cultural resource investigations for the I-95/Fort McHenry Tunnel, is located in the cable crossing corridor between Fort McHenry and Masonville. The site includes a wooden coal barge circa 1900; a 78-ft flat-bottomed wooden canal boat used to transport bulk cargoes; a flat-bottomed two-masted schooner circa 1865 to 1878; and an unidentified 29 ft double-ended lap strake hull. The subsequent MHT survey that re-examined the Fort McHenry survey area identified two anomalies, including one that was tentatively identified as a potential historic cultural resource (RCG&A 2005).

Of the eight targets initially identified in the 2001 RCG&A survey, one was determined to potentially be a barge worthy of avoidance (RCG&A 2005).

2.2.4 Phase I Survey Results for the Study Area

In February 2005, RCG&A conducted Phase I-level cultural resource investigations in the Masonville study area. The investigations included a background archival investigation and a marine archaeological remote sensing survey. The marine archaeological remote sensing survey utilized a differential global positioning system, a digital recording side scan sonar, a recording cesium vapor magnetometer, a sub-bottom profiler, a fathometer and hydrographic navigational computer software to identify and characterize potential cultural resources within the study area. However, the coverage area was reduced due to shallow water and other navigational hazards, including submerged stakes and pilings and scuttled barges along the southern shoreline. In addition, the coverage area was reduced, minimally, by the restrictive turning radii for the survey vessel. The Phase I survey block consisted of 254.28 acres divided into 100 track lines with a lane spacing of 50 ft (15.2 m) to ensure the greatest detail in coverage. In total, approximately 15.22 linear miles (approximately 24.49 km) of riverbed were surveyed around the Masonville survey area (RCG&A 2005).

Numerous magnetic, acoustical, and sub-bottom anomalies were initially recorded during the Phase I cultural resources remote sensing survey. The majority of the sub-bottom findings were scattered in the areas around: the KIM facility; the Baltimore Gas and Electric Company's water main and abandoned transmission line; and moored barges in the vicinity of the survey area (RCG&A 2005).

The majority of the magnetic anomalies were comprised of isolated or point source magnetic disturbances with low magnetic amplitudes, short to moderate duration times, no adjacencies and simple magnetic signatures, signifying the absence of a cultural resource. Likewise, acoustic imaging determined the majority of the sub-bottom findings to represent local geomorphic features and jettisoned material from passing ship traffic (RCG&A 2005).

Anomalies that were identified as linear iron debris, or defined as being geologic in nature, isolated debris, or related to the fishing or shipping industries, were excluded from further consideration as significant cultural resources (RCG&A 2005).

In some cases, multiple spatially overlapping anomalies were grouped into targets. Each of these targets was examined for characteristics consistent with submerged watercraft or other possible cultural resources (RCG&A 2005).

The remote sensing survey of the Masonville block resulted in the identification of five targets determined to have the potential to be significant cultural resources or archaeological resources eligible for listing on the National Register of Historic Places. These anomalies were identified as target numbers 1 through 5. The locations of these targets are presented in Figure 2-47 and are briefly described below. Magnetic contour maps and acoustic images of these targets can be found in the 2005 RCG&A report.

Figure 2-47. Potential Cultural or Archaeological Resource Targets Investigated for Eligibility for Listing on the National Register

Target 1 was identified along the northern boundary of the Masonville survey area, along a flat riverbed, approximately 12 to 13 ft below the surface. The target was comprised of two magnetic and one acoustic anomaly. Upon further examination of the magnetic contour and pattern, the magnetic anomalies were determined to comprise a single dipolar anomaly. The acoustic anomaly was determined to be representative of a linear object. Therefore, Target 1 was conclusively determined to represent the center of a medium-sized magnetic field shift associated with an iron cable, such as a tow cable. Based on its location adjacent to a charted barge mooring area, Target 1 was dismissed as an iron cable detached from a moored barge. No additional cultural investigation was recommended (RCG&A 2005).

Target 2 was identified in the center of the Masonville survey area, on a flat riverbed, approximately 10 to 12 ft below the surface. The target was comprised of two magnetic anomalies. The magnetic anomalies were determined to be unassociated based on magnetic contour and patterning analysis. This information, in addition to the lack of acoustic anomalies, and the lack of support of a buried cultural resource by sub-bottom data, lead to the determination of the anomalies as additional debris from a moored barge, and no additional cultural investigation was recommended (RCG&A 2005).

Target 3 was identified along the northern boundary of the Masonville survey area, along a flat riverbed, approximately 13 ft below the surface, and was comprised of two magnetic anomalies. The anomalies were determined to be unassociated based on magnetic contour and patterning analysis. The dispersed loci represented by the multi-component signature of one of the magnetic anomalies in Target 3 were determined to represent a scatter of iron debris. This determination, the lack of acoustic anomalies, sub-bottom data conclusions, and the target's position adjacent to a charted barge mooring area, led to the determination of Target 3 as not indicative of a cultural resource. The target was identified as a scatter of iron debris, likely jettisoned from a moored barge. No additional cultural investigation was recommended (RCG&A 2005).

Target 4 was identified along the northern boundary of the Masonville survey area, along a flat riverbed, approximately 13 ft below the surface. The target was comprised of two associated magnetic anomalies. The dispersed loci represented by the multi-component signature of one of the magnetic anomalies in Target 4 were determined to represent a scatter of iron debris. This determination, the lack of acoustic anomalies, sub-bottom data conclusions, and the target's position adjacent to a charted barge mooring area, lead to the determination of Target 4 as not indicative of a cultural resource. The target was identified as a scatter of iron debris, likely jettisoned from a moored barge. No additional cultural investigation was recommended (RCG&A 2005).

Target 5 was identified along the northern boundary of the Masonville survey area, along a flat riverbed, approximately 11 to 12 ft below the surface, and was comprised of two magnetic anomalies. The anomalies were determined as not associated based on magnetic contour and patterning analysis. The dispersed loci represented by the multi-component signature of one of the magnetic anomalies in Target 5 were determined to represent a scatter of iron debris. This determination, the lack of acoustic anomalies, sub-bottom data conclusions, and the target's position adjacent to a charted barge mooring area, lead to the determination of Target 5 as not indicative of a cultural resource. The target was identified as a scatter of iron debris, likely jettisoned from a moored barge. No additional cultural investigation was recommended (RCG&A 2005).

The SHPO concurs with these findings and no further action is recommended. The letter indicating concurrence can be found in Appendix O. Fort McHenry is a historic and cultural resource outside of the survey area but less than 1 mile from the proposed project site.

2.3 SOCIOECONOMIC CONDITIONS

In this section, socioeconomic and demographic characteristics that influence the potential economic impact of the project are identified and discussed.

2.3.1 Land and Water Use

Land and water use are briefly characterized to identify uses that may be affected by project construction and operation. Special attention is given to sensitive resources such as public lands and scenic areas.

2.3.1.1 Local and Regional Land Use

The proposed Masonville DMCF is located within Baltimore City along the southern shoreline of the Patapsco River and the Seagirt dredging area is located within Baltimore City along the northern shore of the Patapsco River. Much of the land area within Baltimore is characterized by urban development, although the type of development varies substantially within the City boundaries. On the north side of the City, land use is primarily medium-density residential with some low-density residential areas. Low density residential areas are defined as a low concentration of housing units in a specific area. High density residential areas are defined as a high concentration of housing units in a specific area but further south, development grades are defined as high-density residential and commercial areas. For that reason, land use becomes almost entirely commercial and institutional downtown. South and southeast of downtown, land use is predominantly industrial with residential and commercial development outside of the industrial core (Figure 2-48).

Much of the industry in Baltimore is concentrated in areas along the City's waterfront, including the area surrounding the proposed Masonville DMCF. The shore-side industry near the proposed Masonville DMCF site is primarily associated with port-related facilities. An aggregate storage, transport, and cement manufacturing plant is located immediately west of the site. Pockets of non-industrial land uses are also found along the Patapsco. Across the River, approximately one mile from the proposed project site, is the Fort McHenry National Monument and Historic Shrine (Figure 2-49). In addition, the National Historic Seaport scenic byway runs from Fort McHenry, around the Inner Harbor through Fells Point to Canton. About one mile to the west of Masonville is the Harbor Hospital (Figure 2-49). These areas, in addition to bridges and scattered small parks, offer some of the relatively limited opportunities for public access to the

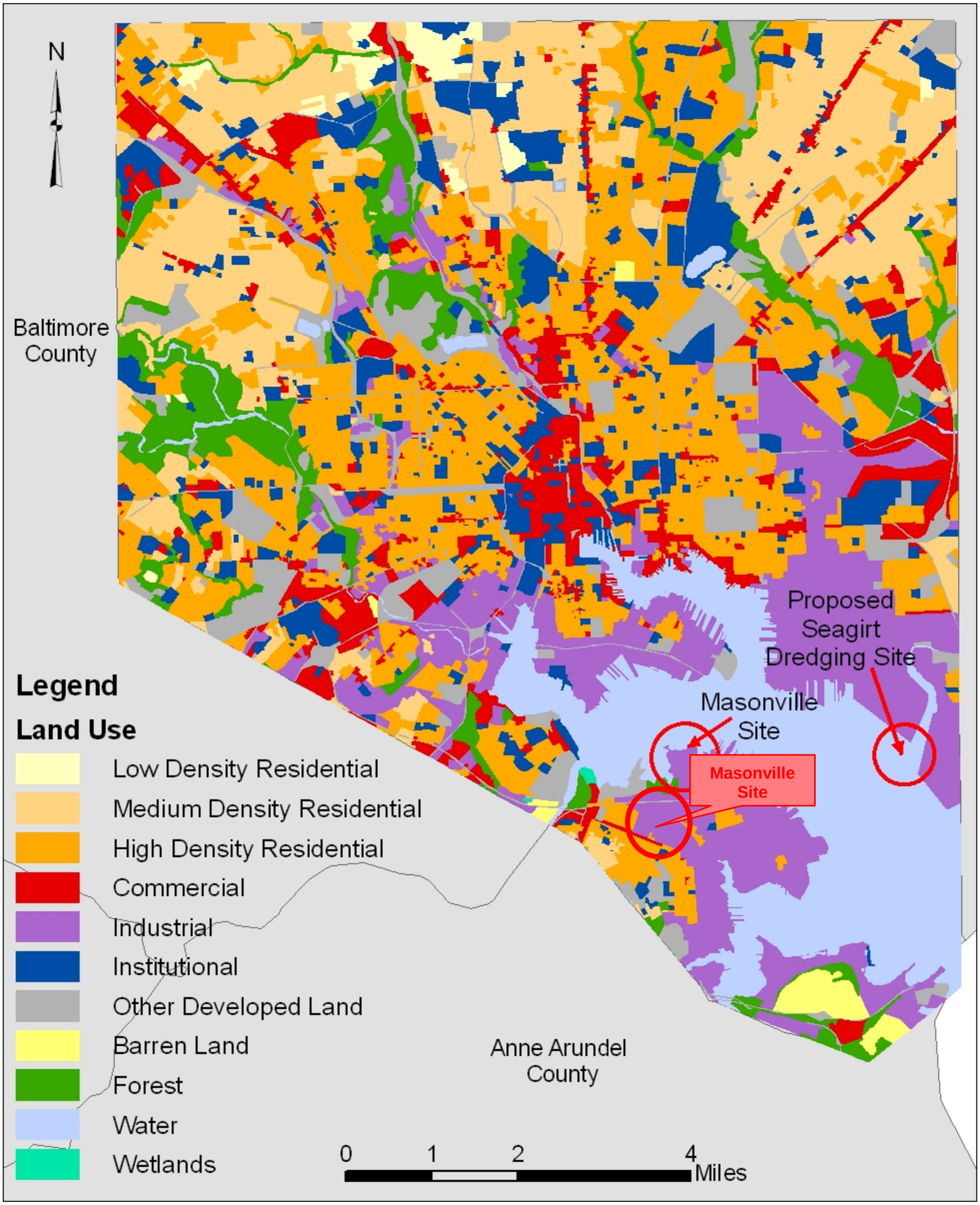


Figure 2-48. Baltimore City Land Use
Source data: Maryland Department of Planning

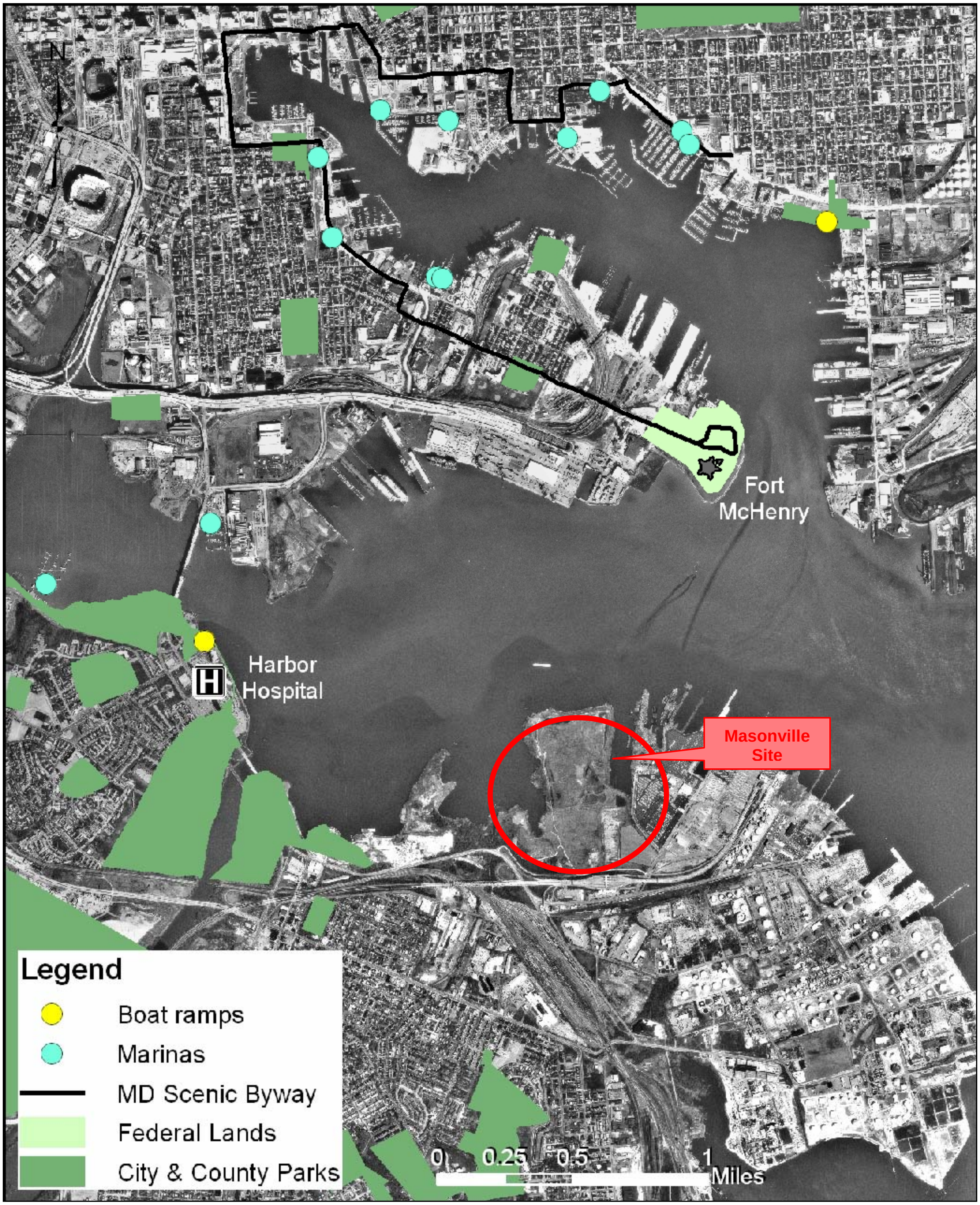


Figure 2-49. Points of Interest in the Vicinity of the Proposed Masonville DMCF

water. Additionally, Masonville Cove, which lies adjacent to the proposed project on its southwestern side, contains some of the only remaining natural shoreline in the Patapsco. However, access to Masonville Cove is limited due to potentially unsafe conditions, like HTRW, which are discussed in Section 2.1.11.

2.3.1.2 Water Use

The waters near the proposed Masonville DMCF and the Seagirt dredging area are used for domestic and international shipping, as well as recreational and commercial boating. Water use by recreational boaters is discussed in the Recreational Resources section below.

The primary water use near the proposed Masonville DMCF project site and the Seagirt dredging area are vessel traffic associated with the Port of Baltimore. The Port of Baltimore is the eighth largest port in the United States in terms of value of cargo and has the second-highest volume of imported and exported automobiles (MPA 2004). In 2004, the Port of Baltimore handled over 40 million tons of cargo, of which 31 million tons of this was foreign cargo (MPA 2005b).

2.3.2 Demographics

The area surrounding the Seagirt dredging area is industrial and, therefore, the demographics for the Seagirt dredging area are not considered (Figure 2-50). No one is living at or adjacent to this proposed project area. The nearest residential community is along the Baltimore City-Baltimore County line, approximately ¾ of a mile away from Seagirt Marine Terminal. The sections below described the demographics in the vicinity of the proposed Masonville DMCF project site.

2.3.2.1 Population Characteristics

To appropriately characterize the area adjacent to the proposed project site and account for the heterogeneity of land uses and demographics within the boundaries of Baltimore City, demographic data were collected at multiple scales. Data collected at the State, county, (in this case Baltimore City) and census tract geographies were used for evaluation and comparison. Seven census tracts were selected to characterize the area potentially affected by the proposed project: the largely industrial tract in which the site falls and the six contiguous tracts containing the neighborhoods of Brooklyn, Cherry Hill, and Curtis Bay (Figure 2-50). In the following sections, these seven census tracts are treated as a single area, and are referred to as "neighboring census tracts."

The demographic statistics vary considerably from State to city to neighboring census tracts. The population density, persons per square mile, is 541.9 for the State of Maryland, 8,058.4 for Baltimore City, and an average of 2,875.9 for the census tracts near the site (Table 2-29). The neighboring census tracts have somewhat higher percentages of young people and a slightly lower percentage of older people than the City as a whole (Table 2-29).

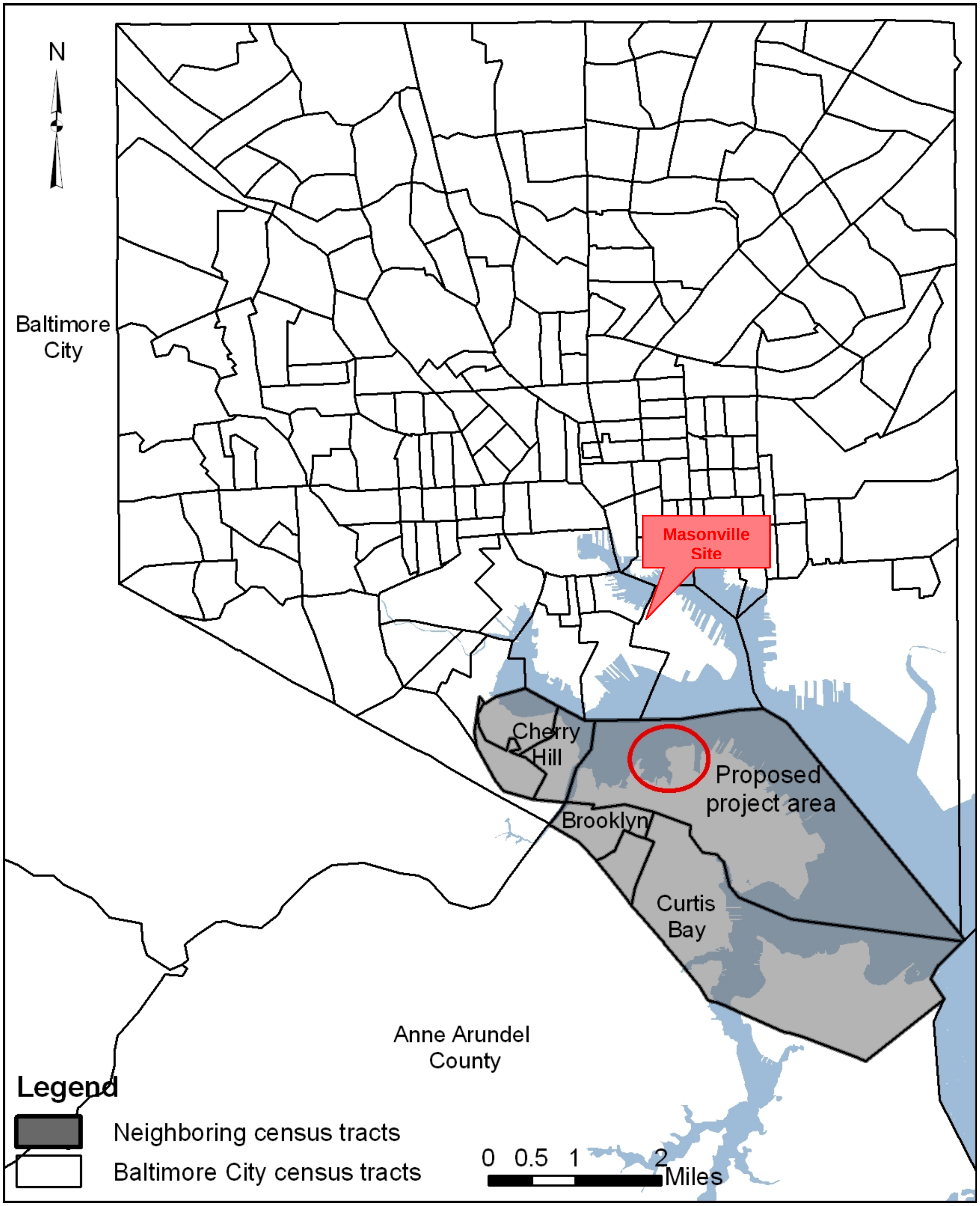


Figure 2-50. Baltimore City Census Tracts
Including Those in the Vicinity of the Proposed Masonville DMCF

Table 2-29: Geographic and Population Characteristics for Neighboring Census Tracts, Baltimore City, and State of Maryland

	Neighboring Census Tracts	Baltimore City	Maryland
Total land area, 2000 (square miles)	7.3	81	9,774
Persons per square mile, 2000	2,875.9	8,058.4	541.9
Population, 2003 estimate	NA	628,670	5,508,909
Population, percent change, April 1, 2000 to July 1, 2003	NA	-3.5%	4.0%
Population, 2000	21,006	651,154	5,296,486
Population, percent change, 1990 to 2000	-16.6	-11.5	10.8
Persons under 5 years old, percent, 2000	9.1	6.4	6.7
Persons under 18 years old, percent, 2000	31.2	24.8	25.6
Persons 65 years old and over, percent, 2000	10.0	13.2	11.3
White persons, percent, 2000 (a)	45.0	31.6	64.0
Black or African American persons, percent, 2000 (a)	50.9	64.3	27.9
Persons of Hispanic or Latino origin, percent, 2000 (b)	1.8	1.7	4.3
Living in same house past 5 years, percent age 5+, 2000	51.8	57.1	55.7
Foreign born persons, percent, 2000	2.2	4.6	9.8
Language other than English spoken at home, percent age 5+, 2000	8.3	7.8	12.6
High school graduates, percent of persons age 25+, 2000	59.0	68.4	83.8
Bachelor's degree or higher, percent of persons age 25+, 2000	5.9	19.1	31.4
Persons with a disability, age 5+, 2000	10,657	162,044	854,345
Mean travel time to work (minutes), workers age 16+, 2000	NA	31.1	31.2

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race and are included in all applicable race categories.
Note: several variables are not available at the census tract level.
Source: U.S. Census Bureau 2000

The percentage of Caucasians in the census tracts near the site (45.0 percent) is higher than that for the City (31.6 percent), but lower than that for the State (64.0 percent). African Americans make up a considerably smaller proportion of the population in the neighboring census tracts (50.9 percent) than for the City as a whole (64.3 percent). The percentage of foreign-born persons, at 2.2 percent for the nearby census tracts, is lower than the 4.6 percent for the City and 9.8 percent for the State.

In general, individuals in the neighboring census tracts near the site have lower educational attainment than those in Baltimore or the State of Maryland. The census tracts have 59.0 percent high school graduates, compared with 68.4 percent for the City and 83.8 percent for the State. Overall, 31.4 percent of Maryland’s population has a bachelor’s degree or higher, compared with only 5.9 percent in the census tracts near the site.

2.3.2.2 Housing and Income Characteristics

The neighboring census tracts appear to have a relatively high proportion of low-income residents based on several statistics (Table 2-30). The neighboring census tracts' median household income ($24,729) and per capita income ($12,715) were well below the values for the City ($30,078 and $16,978, respectively) and less than half of those for the State ($52,868 and $25,614, respectively). The percent of persons and families living below poverty was higher for the neighboring census tracts (34.8 percent and 32.9 percent, respectively) than for the City (22.9 percent and 18.8 percent, respectively) or the State (8.5 percent and 6.1 percent, respectively). In addition, homeownership rates are relatively low at 38.3 percent for the neighboring census tracts, compared to 50.3 percent for the City and 67.7 percent for the State.

2.3.3 Employment and Industry

Industry in the City of Baltimore centers around the Port of Baltimore. Therefore, the Port is a major employer in the City. The MPA estimates that the Port employs over 16,000 individuals in direct jobs, as well as over 17,000 in induced and indirect jobs (MPA 2005b).

The economic sectors employing the largest number of people in the neighboring census tracts near the proposed site are the wholesale and retail trade; education, health and social services; and manufacturing sectors (Table 2-31). These three sectors account for more than 44 percent of workers in this area. Compared to the City as a whole, a smaller proportion of people are employed in the information and finance sector and the education, health and social services sector. These neighboring census tracts have a greater proportion of workers in the construction sector and the arts, entertainment and tourism sector than the City, State, or country. Employment in the professional, scientific, and management services, and the public administration sectors are similar in the nearby communities and the other geographic regions.

Data on business characteristics are not available at the census tract scale, so these data are reported for Baltimore City and the State of Maryland only. In 1997, Baltimore City had lower retail sales per capita ($5,229 vs. $9,116) and a higher percentage of minority-owned firms (27.8 percent vs. 20.6 percent) than the State (Table 2-32). The percent change in employment increased at a higher rate in the City than the State, Baltimore City's unemployment rate, at 8.5 percent, was substantially higher than that of the State (4.5 percent).

Table 2-30: Housing and Income Characteristics for Neighboring Census Tracts, Baltimore City, and State of Maryland
Source: US Census Bureau

	Neighboring Census Tracts	Baltimore City	Maryland
Housing units, 2002	9,382	296,266	2,197,126
Homeownership rate, percent, 2000	38.3	50.3	67.7
Housing units in multi-unit structures, percent, 2000	28.0	34.8	25.8
Median value of owner-occupied housing units, 2000	$57,757	$69,100	$146,000
Households, 2000	8,128	257,996	1,980,859
Persons per household, 2000	2.63	2.42	2.61
Median household income, 1999	$24,729	$30,078	$52,868
Per capita money income, 1999	$12,715	$16,978	$25,614
Persons below poverty, percent, 1999	34.8	22.9	8.5
Families below poverty, percent, 1999	32.9	18.8	6.1

Table 2-31. Employment by Sector in 2000
Source data from US Census Bureau

	Employed Civilian Population	Agriculture, Forestry, Mining, Fishing	Construction	Manufacturing	Wholesale & Retail Trade	Transportation & Utilities
United States	129,721,512	2,426,053	8,801,507	18,286,005	19,888,473	6,740,102
		1.9%	6.8%	14.1%	15.3%	5.2%
Maryland	2,608,457	16,178	181,280	189,327	345,960	127,294
		0.6%	6.9%	7.3%	13.3%	4.9%
Baltimore City	256,036	289	12,939	20,082	29,792	14,285
		0.1%	5.1%	7.8%	11.6%	5.6%
Neighboring Tracts	7,094	0	637	912	1,179	422
		0.0%	9.0%	12.9%	16.6%	6.0%

	Information & Finance	Professional, Scientific, Management Services	Education, Health, Social Services	Other Services	Arts, Entertainment, & Tourism	Public Administration
United States	12,931,536	12,061,865	25,843,029	6,320,632	10,210,295	6,212,015
	10.0%	9.3%	19.9%	4.9%	7.9%	4.8%
Maryland	289,510	323,834	538,350	145,424	177,341	273,959
	11.1%	12.4%	20.6%	5.6%	6.8%	10.5%
Baltimore City	25,671	26,088	68,499	13,460	21,174	23,757
	10.0%	10.2%	26.8%	5.3%	8.3%	9.3%
Neighboring Tracts	482	660	1,046	391	707	658
	6.8%	9.3%	14.8%	5.5%	10.0%	9.3%

Table 2-32. Business Characteristics for City of Baltimore and State of Maryland

	Baltimore City	Maryland
Private non-farm establishments with paid employees, 2001	13,583	129,301
Private non-farm employment, 2001	305,394	2,091,198
Private non-farm employment, percent change 2000-2001	2.4%	1.6%
Non-employer establishments, 2000	26,582	322,819
Manufacturers shipments, 1997 ($1000)	9,822,188	36,505,948
Retail sales, 1997 ($1000)	3,438,384	46,428,206
Retail sales per capita, 1997	$5,229	$9,116
Minority-owned firms, percent of total, 1997	27.8%	20.6%
Women-owned firms, percent of total, 1997	27.6%	28.9%
Housing units authorized by building permits, 2002	293	29,293
Federal funds and grants, 2002 ($1000)	7,974,759	49,537,440
Annual unemployment, 2003	8.5%	4.5%

Source: U.S. Census Bureau 2000

2.3.4 Environmental Justice

In order to protect low income and minority populations, a concept termed ‘environmental justice’, Executive Order 12989, Environmental Justice in Minority Populations and Low-income Populations, dated February 11, 1994, was created. This order requires that proponents of Federal projects assess potential impacts of proposed projects on minority or low-income populations. The Order was established to protect low income and minority populations, a concept termed “environmental justice.” The term was created after it was recognized that, historically, some actions might have disproportionately favored higher income or majority populations, putting lower income or minority populations at higher health and safety risks. Such actions also include the industrialization of low income or minority neighborhoods, which, in addition to creating potential health and safety risks, may lower the property values by creating soil and groundwater contamination and decreased aesthetics from such industrialization. Environmental justice impacts are discussed in Chapter 5, Section 5.3.4.

2.3.5 Safety to Children

Executive Order 13045 requires the consideration of safety to children. The proposed Masonville DMCF project site and the Seagirt dredging area are located in an industrial area. All existing working Port terminals and sites under development are completely surrounded by chain link fencing with barbed wire to restrict access to established entry points. These points are kept closed and locked or are guarded at all times. No access by children to the Seagirt access channels is possible from the adjacent land areas since access is restricted by fencing. Currently, the existing Masonville Marine Terminal is being redeveloped for automobile storage and fencing has been erected by ATC around their leased property on Masonville Phase I and Mercedes will be erecting fencing around the property they have leased as they develop the site. Access to Port facilities is restricted by fencing and access gates, which should prevent access to such facilities by children.

2.4 AESTHETICS AND RECREATION

Landscape character, or the visual setting of a project, is assessed to determine whether the proposed activities would contrast with the existing setting including natural or built features. Major recreational uses are identified to evaluate potential conflicts with, or benefits of, the proposed project.

2.4.1 Aesthetics

The landscape in the area of the proposed site for the Masonville DMCF is dominated by urban development, the Patapsco River, and port-related industrial facilities. The site itself, which is currently tidal open water adjacent to a port terminal, lies along the southern edge of the Patapsco River in Baltimore City. Non-industrialized areas along the project footprint and nearby shoreline provide open space in this urban landscape, and also afford otherwise limited public access to the water. Despite the largely industrial landscape and limited access to the water, local residents take advantage of what public access they have for fishing and boating (Price 2005). Very little natural shoreline remains in the vicinity of the proposed site. The shoreline of Masonville Cove has never been hardened, but piles of large debris have accumulated along the banks of the river. Near the proposed site, abandoned, decaying ships, derelict vessels, and other debris on land and in the water are noticeable elements of the landscape.

The Seagirt dredging area is submerged under tidal open water in an area dominated by urban and industrial development. The dredging area is adjacent to the Seagirt and Dundalk Marine Terminals. There is no natural shoreline in the vicinity of the Seagirt dredging area.

2.4.1.1 Noise

Sources of existing noise are identified to provide a context for evaluating any potential noise-related impacts associated with the proposed project's construction and operation.

- *Sound* – A vibratory disturbance created by a vibrating object, which, when transmitted by longitudinal pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- *Noise* – Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- *Decibel* – A unit less measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- *A-Weighted Decibel (dBA)* – A frequency-weighted sound level, in decibels, which approximates the frequency response of the human ear.

Noise Measurement Methods

For purposes of regulation, noise is measured using a logarithmic weighted scale with a unit of A-weighted decibels or dBA. Individuals with good hearing perceive a change in sound of three dBA as just noticeable, a change of five dBA as clearly noticeable, and a change of 10 dBA is perceived as a doubling or halving of the sound level, depending on whether it is an increase or decrease in volume. The threshold of human hearing is 0 dBA. Values above 85-90 dBA would be considered very loud (Table 2-33) and have the potential to harm hearing given sufficient exposure time. Noise levels above 140 dBA can cause damage to hearing after a single exposure.

Noise transmission from source to receiver depends on many factors including air temperature, wind and atmospheric conditions. Two common rules of thumb for noise transmission are: sound drops by 6 dBA for every doubling of distance over land and by 5 dBA per doubling of distance over water (Komanoff and Shaw 2000). In other words, a person on land that hears an 88 dBA sound level at 50 ft will hear a sound level of 82 dBA if he doubles the distance between himself and the noise source by moving to 100 ft from the noise source. As a result, this relationship predicts that sound generally reduces rapidly with distance. For example, in an open setting, the loud noise of a truck (~88 dBA at 50 ft) would typically drop to nearly background levels (56 dBA) in about 2,000 ft.

Table 2-33. Typical Noise Levels and Subjective Impressions

Source	Decibel Level (dBA)	Subjective Impression
Normal breathing	10	Very quiet
Soft whisper	30	--
Library	40	Quiet
Normal conversation	60	--
Television audio	70	Moderately loud
Ringing telephone	80	--
Snowmobile	100	Very loud
Shouting in ear	110	--
Thunder	120	Pain threshold

Existing Sources of Noise

Noise levels around the proposed Masonville DMCF are consistent with an urban, industrial setting. The shoreline adjacent to the proposed site serves as a terminal for various automobile manufacturers. Therefore, these port facilities contribute to the existing noise environment. Port-related facilities also occupy much of the nearby Patapsco shoreline to the east. Port terminals primarily operate during daylight hours, so port facilities are producing less noise at night. Other noise sources, such as active train tracks and major highways, lie within one-half mile of the proposed Masonville DMCF site.

Several sensitive noise receptors are relatively close to the proposed Masonville DMCF site. The Harbor Hospital is about one mile to the west of the proposed Masonville DMCF. The hospital is located along the shoreline of the Patapsco River between the Middle Branch and Cherry Hill parks. The Fort McHenry National Monument and Historic Shrine is approximately one mile across the river from the proposed site. The neighborhood of Brooklyn is located less than one mile inland from the site.

Existing noise in the vicinity of the Seagirt dredging area was not assessed. The area is predominantly industrial and one of the closest noise receptors is Fort McHenry, which is over 2 miles from the Seagirt dredging area. The closest noise receptor is a residential community, St. Helena, located along the Baltimore City-Baltimore County line approximately 0.75 miles from the Seagirt dredging area. Noise levels around the Seagirt dredging area are consistent with an urban, industrial setting. The shoreline adjacent to the dredging area contains the Seagirt and Dundalk Marine Terminals. Therefore, these port facilities contribute to the existing noise environment. Port terminals primarily operate during daylight hours, so port facilities are producing less noise at night. Other noise sources, such as active train tracks and major highways, lie within the vicinity of the Seagirt dredging area.

2.4.1.2 Light

Sources of existing light are identified to provide a context for evaluating any potential light-related impacts associated with the proposed projects' construction and operation.

- *Glare* – Light emitted at an intensity great enough to reduce a viewer's ability to see, and in extreme cases, cause momentary blindness
- *Light trespass* – Light that shines beyond the boundaries of the property on which it is located, and onto areas where it is unwanted or interferes with land use

Existing Sources of Light

Many light sources exist in the urbanized area around the proposed Masonville DMCF. The shorelines adjacent to the proposed Masonville DMCF site and adjacent Seagirt Marine Terminal are dominated by port-related facilities including port terminals and large parking lots. This type of land development has several major light sources, including dock lights and tall light poles in the parking facilities. Existing light sources in the vicinity also include street lights along major highways, including the I-895 corridor, and residential streets, car headlights, and indoor and outdoor lighting of businesses and private homes. Therefore, the overall level of existing light in this urban, industrial area is high. Within the waterway, light sources include: lighted aids to navigation, such as buoys; low wattage dock lights; signage; lights on pilings or posts marking channels and marinas; vessels passing and at docks; and lights associated with the terminal facilities.

2.4.2 Recreation

2.4.2.1 Recreational Fishing and Boating

An analysis of marinas and boat ramps suggests the potential for substantial numbers of recreational boats near the proposed Masonville DMCF. However, evidence suggests that most boaters are not likely to be passing near the site. An internet search and phone survey of marinas revealed that there are more than 500 boat slips in the Middle Branch and over 2,000 boat slips in the Northwest Branch of the Patapsco River. Additionally, the Maryland DNR public boat ramp database identifies one boat ramp in the each of the Middle and Northwest branches. The boat ramp upstream of Masonville includes a fishing pier and a shared parking lot with Harbor Hospital, indicating modest use by local residents is likely. However, the bulk of the transient boat traffic in the Patapsco is likely en route to or from the Inner Harbor area of Baltimore. The Inner Harbor is a prime destination for tourists, and its waterfront amenities, including many transient boat slips, make it especially attractive to recreational boaters from all around the Chesapeake Bay. The Inner Harbor and other attractions lie at the head of the Northwest Branch of the Patapsco; therefore boaters traveling from the Chesapeake Bay toward the Inner Harbor would not enter the Middle Branch and would not pass the proposed Masonville DMCF site.

In the area immediately surrounding the proposed Masonville DMCF, there is limited recreational fishing due to poor water quality and low numbers of fish species (MPA 2002b). The Maryland DNR allows license-free fishing from a fishing pier or from shore at the Middle Branch Park, approximately one mile west of the proposed site. Some local residents use the area to fish for white perch and channel catfish, among other species (Price 2005). However, most recreational fishing in the Patapsco occurs primarily along the river's north shore from Fort McHenry, east to Fort Howard (EA 2003a). While a limited number of re-creators use the sites, a study found that, for most people, the environmental and aesthetic conditions in the Harbor were deemed to be poor or unacceptable for recreational uses including: fishing, crabbing, swimming, and boating (Alford and Abell 1987).

Currently, the number of non-motorized boats, such as canoes and kayaks, using the Patapsco River near the proposed Masonville DMCF, is presumed low due to the industrial nature of the area and the nearby shipping traffic.

There is no recreational fishing or boating in the vicinity of the Seagirt dredging area since this area lies within active shipping channels adjacent to the Seagirt and Dundalk Marine Terminals.

2.4.2.2 Other Recreational Activities

Other recreational activities occurring near the proposed Masonville DMCF include sightseeing and recreational birding. The Fort McHenry National Monument and Historic Shrine is a draw for tourists and sightseers wishing to visit the site that inspired the writing of the U.S. National Anthem. Masonville Cove, designated as a Waterfowl Concentration Area by the Maryland DNR, is an important area for wintering water birds. Multi-species rafts of as many as 10,000 ducks have been seen in the Cove in spring prior to northbound migration. Although this area is a draw for recreational birders, access is limited to those with shallow draft vessels. In addition, due to safety concerns, birders must have MPA permission to enter the Masonville Cove area from the landside (Ringler 2005). Since the Seagirt dredging area is located in a shipping channel surrounding by industrial facilities, no other recreational activities occur nearby.

2.5 MOST PROBABLE FUTURE WITHOUT PROJECT

The 'without project' condition is defined as the most likely condition expected to prevail over the length of the planning period (in this case, 20 years) in the absence of the MPA's implementation of the proposed alternatives. The without project condition provides the baseline condition for impacts associated with the proposed project.

The existing MMT includes an area that was previously filled, which is scheduled to be developed for automobile cargo. The KIM facility lies immediately east and is in various phases of remediation and cleanup. Substrates within the adjacent waters contain elevated levels of legacy contaminants from post-shipbuilding operations. Twenty-five derelict vessels have been identified along the shores of the former KIM site. Masonville Cove lies to the west, and although less intensively developed than the rest of the project area, contains a large amount of debris.

The project involves diking and filling of approximately 130 acres of tidal open water adjacent to the existing MMT and the former KIM site. This would provide 15.4 mcy of dredged material contaminant capacity in the short-term and expanded facilities for cargo, most likely automobiles, in the long term. Integral to the plan is the cleanup, rehabilitation, and enhancement of Masonville Cove as compensatory mitigation.

Without project development, a 0.7 mcy shortfall in placement capacity for Harbor dredged materials would occur in SFY 2007. This shortfall would impact the Port's and USACE's ability to maintain channels within Baltimore Harbor and conduct dredging for new work projects (such as berth deepening). Without the project, additional terminal space would not be available at this site and would result in a potential shortfall in Port expansion or have to be developed elsewhere.

Without the project, 130 acres of the Patapsco River would remain in its current state as tidal open water. It is assumed that the area would still be utilized by the aquatic resources that were found there during existing conditions surveys. However, the contaminated sediments that occur within the site footprint would remain exposed to the Patapsco River ecosystem. If the proposed Masonville DMCF is not constructed, there would likely be further delay in the remediation of the derelict vessels, which would potentially increase the cost of doing so.

Without development of the terminal facility, the adjacent compensatory mitigation and community enhancement project, the rehabilitation and enhancement of Masonville Cove, is unlikely to occur. The ecological, recreational, and education benefits projected for this part of the project would not be realized.

If the Masonville project alternative using Seagirt borrow material is not implemented, the Seagirt dredging project will occur; the project is already permitted and has been permitted since

March of 2005. In this case, approximately 128 acres of the Seagirt access channel would be dredged to a depth of 50 feet (with up to an allowable 2 foot over depth) not to 51 or 52 ft (with up to an allowable 2 foot over depth). Under the existing permit, the material dredged from the channel would be placed at the Hart-Miller Island DMCF and 0.5 mcy of useful construction material would most likely be buried.