# 3. ALTERNATIVES DEVELOPMENT AND ANALYSIS

Anticipating the need for dredged material placement, the State and Federal governments have studied numerous dredged material placement options for over 35 years. The screening and studies performed by both the State and Federal governments have identified that within the next 20 years, there will be a critical shortage of dredged material placement capacity for maintenance dredging of the Baltimore Harbor and Channels (USACE 2005). Analysis by the State, as described in Chapter 1 has identified a critical need for placement capacity following the 2008 dredging season. These studies have also resulted in plans to meet this need, known as dredged material management plans.

The first portion of this chapter presents the option screening process and conceptual studies conducted by both the State and the Federal governments for placement of material dredged from the Baltimore Harbor and lists site-specific options recommended for further study.

Based upon the recommendations of a screening process that was completed, which is described in this chapter, the Maryland Port Administration (MPA) conducted reconnaissance studies for three sites within the Harbor: Masonville, Sparrows Point, and British Petroleum (BP)-Fairfield. Those reconnaissance studies recommended carrying each of the sites forward to the State feasibility-level study phase, also conducted by MPA. Interim findings of the MPA feasibility studies revealed that Masonville was the most feasible option to satisfy Harbor material placement needs beginning in 2009 or after the 2008 dredging season. Thus, the State's Dredged Material Management Program (DMMP) Management Committee recommended that Masonville be the first site to be submitted for a permit application. The latter portion of this chapter provides the criteria for the evaluation of the three recommended sites, the rationale for the Masonville recommendation, the alternatives analysis performed for the Masonville option, and the specific Masonville alternative selected as the recommended plan.

## 3.1 PROJECT PURPOSE

The State of Maryland, through the MPA, strives to promote the Port of Baltimore, maintain navigation safety, and support commerce. Supporting navigation by improving and maintaining channels of interstate commerce is also a mission of the U.S. Army Corps of Engineers (USACE). To support this objective, the USACE has a need to provide placement capacity for materials that have been dredged to maintain safe passage in the Federally-maintained Baltimore Harbor Channels. The MPA also has a need to provide placement capacity for materials dredged from berthing areas and other privately maintained areas in the Harbor.

The project purpose of dredged material placement is not necessarily 'water dependent.' However, practical considerations in large-scale dredged material placement operations will generally dictate that placement sites be at least within a reasonable distance from the water so that cost-effective offloading can occur.

Presently, material dredged from Federal projects in Baltimore Harbor is placed at the Hart-Miller Island (HMI) dredged material containment facility (DMCF) and at the Cox Creek DMCF; a decision document was approved by the USACE Headquarters in May 2002 allowing cost sharing for placement of Federal material at Cox Creek. However, at this time, the USACE has neither the authorization nor the funding to conduct feasibility studies of additional placement sites for Baltimore Harbor material, including Masonville, that could make a site eligible to receive Federal cost sharing. Consequently, the MPA has made a decision to pursue construction of the Masonville site without initial Federal funding and has applied for permits through the USACE that are required pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

## 3.2 DMMP PLANNING OBJECTIVES AND CONSTRAINTS

Since 2003 the State and Federal DMMP processes have been working toward a solution to the dredged material placement needs within the region. As stated in Section 1.1, the State has directed the MPA to develop a plan to accommodate the annual volume of material dredged from the Baltimore Harbor channels and berths that service the Port of Baltimore for the next 20 years. Similarly, the USACE recently completed its own (Federal) DMMP for placement of material dredged from the Baltimore Harbor and approach channels. This Federal DMMP (December 2005) assessed placement capacity for material dredged from Federal Channels for a 20-year planning horizon. The Federal DMMP is a tiered Environmental Impact Statement (EIS) that contains recommendations for placement of dredged material. However, the Federal DMMP does not make site-specific determinations for future placement sites for material dredged from the Harbor, including Masonville (USACE 2005). Differences between the two plans are outlined in Section 3.4.4.

Since 2002, the MPA has been actively seeking options within the Baltimore Harbor area. In order to accomplish this, a special committee of the State DMMP, called the Harbor Team, was formed (Section 3.4.2.1). The Harbor Team has been an integral part of the site selection process. The Team was initially created to assist the Executive Committee of the State DMMP in developing short- and long-term management strategies for the Harbor dredged material placement need. Harbor Team recommendations were screened for environmental parameters by the long-standing multi-agency Bay Enhancement Working Group (BEWG), a technical committee of the State DMMP.

To evaluate the project relative to the goals, objectives, and constraints, the MPA completed the reconnaissance studies and funded State feasibility-level studies, as recommended by the Harbor Team (Section 3.4.2.1). To evaluate the sites during the State feasibility-level study, the MPA used a list of multidisciplinary planning objectives and constraints. This section describes the studies conducted for each site, as well as the objectives and constraints.

### 3.2.1 Studies Conducted

The State planning process for the selection of DMCF options for the Harbor's dredged material occurred in two phases leading to the development of this draft environmental impact statement (DEIS) for the proposed alternative:

- ***Reconnaissance Phase*** **–** the reconnaissance phase, approximately one year in length was designed to determine if there were any serious, quickly identifiable problems, which would prevent a proposed concept from progressing to State feasibility-level studies.

This phase included some field sampling as well as preliminary geotechnical evaluations and field assessments.

- ***State Feasibility-Level Study Phase*** – provided a more in-depth analysis of proposed project sites including: physical, chemical, biological and socio-economic review to provide information for the National Environmental Policy Act (NEPA) process and evaluation of all requirements necessary for permitting, construction, and, ultimately, the operation of a project. Engineering studies were also conducted. This phase also considered issues such as effects on viewsheds, property values, and hydrodynamic and sedimentation changes in nearby areas.

As described previously, the Masonville, Sparrows Point and BP-Fairfield sites progressed through these discussed State feasibility-level studies. The process for selecting these sites is described in this chapter.

While the State was actively identifying and screening potential sites for the Harbor placement needs, the USACE was conducting the first tier of the Federal DMMP by screening sites throughout the Bay watershed and preparing an EIS (USACE 2005). Details of this study can be found in Section 3.4.3.

### 3.2.2 Objectives and Constraints

The three placement site options (Masonville, Sparrows Point and BP-Fairfield) were then compared using the following factors, which are discussed in this section:

- Site Characteristics
- Environmental Impacts
- Cultural and Socioeconomic Impacts
- Costs (initial and total site costs)

The potential exists for mitigation issues to increase the initial site costs. The cost for development of the site for its final use after placement capacity is not incorporated into the final unit cost. A more detailed breakdown of costs can be found in Section 3.2.2.4, Section 4.2.5, and Section 4.10.

Due to the potential for the State to fund development of the first Harbor site without initial participation from the USACE, the initial site costs become a critical factor in evaluating of alternatives to meet and manage the overall goals of the dredging program.

#### 3.2.2.1 Community Enhancements and Socioeconomic Objectives and Constraints

As part of a State feasibility-level study, the impact on the community surrounding the site is evaluated. The history of the site is also researched to determine if development of the site would impact any structures or land of cultural or historical significance. The following factors are evaluated when studying the local community:

- Socioeconomics
- Cultural Impacts
- Aesthetics and Noise

#### 3.2.2.2 Environmental Objectives and Constraints

A State feasibility-level study involves an extensive inventory of the existing ecological baseline conditions at a site and an in-depth evaluation of the potential impacts of the proposed actions. Multiple seasons of field investigations are generally required. For this study, three seasons (spring, summer, and fall) of field investigations were required by the resource agencies and have been performed at the Masonville, Sparrows Point, and BP-Fairfield sites. Based on the environmental investigations, an assessment of potential environmental impacts from the construction and operation of a DMCF are determined. The following impact categories are assessed:

- Surface- and Groundwater Quality
- Soil and Sediment Quality
- Air Quality
- Aquatic and Terrestrial Habitats
- Wetlands and Critical Areas
- Aquatic Resources
- Avian and Terrestrial Resources
- Rare, Threatened and Endangered Species
- Cultural and Historical Resources (Phase I)

State feasibility-level screening is conducted to identify particularly sensitive ecological issues and identify any fatal flaws in the proposed project that could preclude site permitting or implementation.

#### 3.2.2.3 Engineering Objectives and Constraints

The objective of the engineering assessment is to provide the most desirable site characteristics, while minimizing cost and negative impacts. Site characteristics are the relevant and quantifiable aspects of the site. Important site characteristics include: footprint and effective site area, total and annual site capacity, site life, initial and final dike elevation, final dredged material surface elevation, construction duration, and completion date. These characteristics are quantified by studying the existing physical and environmental conditions at the site and designing the placement option. Site characteristics were used in conjunction with costs and impacts to evaluate and compare each alternative.

#### 3.2.2.4 Economic Objectives and Constraints

Evaluation of the economics of various options is typically based on the final unit cost. This unit cost encompasses the entire cost to remove material from the shipping channels and berths and the cost of DMCF construction and material placement. The final unit cost for a specific option is the sum of the costs listed below divided by the option's total capacity.

- **Initial Cost –** sum of study, design, and construction costs
- **Site Operational Cost –** cost to maintain and monitor the site while it is accepting dredged material

- **Dike Raising Cost –** cost to raise dikes using dried dredged material, as specified in the design
- **Dredging, Transportation, and Placement Cost –** cost to dredge the material, transport it to the site, and place the material onsite

The goal of the State feasibility-level study was to identify the option meeting all objectives and constraints with the least cost. That said, the sites were recommended by the Harbor team with the understanding that the cost to dredge material from the Harbor and place it in a facility would be approximately $15 per cubic yard (cy). This includes the costs to study, permit, construct, and maintain a placement site.

In addition to costs, the impacts of two other constraints of site development and development costs were considered. These included:

- **Legislative Restrictions –** laws that would specifically restrict or preclude site development at any of the proposed locations were considered
- **Site Ownership –** not all sites considered are owned by the MPA and potential impediments to acquisition of other sites were considered. The Masonville site is owned by MPA.

## 3.3 INVENTORY AND FORECAST

The next step of the study process is to develop an inventory and forecast of critical resources (physical, demographic, economic, and social, etc.) relevant to the problems and opportunities under consideration in the planning area. A quantitative and qualitative description of the current condition of these resources is made, and is used to define existing and future without-project conditions. This inventory of existing conditions was provided in Chapter 2.

Through iterative review by the project team, the information developed during the inventory process was used to define and characterize the problems, opportunities, objectives, and constraints of project alternatives.

The anticipated dredging need and shortfall of capacity is discussed in Section 1.2. This section details the anticipated Federal, State, and local dredging projects and their anticipated placement site. The result is the need for a new placement facility for Harbor dredged materials to be open by 2009.

## 3.4 DEVELOPMENT AND SCREENING OF ALTERNATIVES

### 3.4.1 Option Screening Process and History

Developing a 20-year plan that meets the Baltimore Harbor's dredged material placement needs involved examining numerous placement options and groupings of placement options. This process includes the consideration of environmental impacts, State and Federal regulations, sociopolitical issues, economic feasibility, economic impacts, and placement capacity.

To equitably balance competing interests and conflicting issues, both the Federal government and the State of Maryland have developed a process for screening options as part of their respective Dredged Material Management Plans. Each agency conducted screening for Harbor placement options. The result of the USACE (Federal) screening process was the general recommendation that multiple DMCFs be constructed within the Harbor. The result of the State's screening process was a recommendation to carry three specific DMCF options (Masonville, Sparrows Point, and BP-Fairfield) and their respective community enhancements to State feasibility-level investigations. The following is an overview of the screening processes and steps followed by both the USACE and the State in coming to their respective dredged material management recommendations. The general flow of the process is shown in Figure 3-1.

### 3.4.2 State Screening Process and Dredged Material Management Program

The DMCF site identification process for the State of Maryland has been ongoing for over 35 years. A timeline of this process is shown in Table 3-1 below and also depicted in Figure 3-1. Details of each study are included in the following sections.

**Table 3-1. Timeline of Dredged Material Management in the State of Maryland**

| Year(s) | Study | Result/Recommendation |
|---|---|---|
| 1970 | Identification and screening for a DMCF | 70 sites screened; HMI identified as preferred option |
| 1982 | Baltimore Harbor Environmental Enhancement Plan | Inventory to identify enhancement and mitigation options; 5 sites recommended |
| 1986-1989 | Dredged Material Master Plan | 475 sites screened Bay-wide. Nine potential Harbor options forwarded (including Masonville) |
| 1990-1991 | Governor's Task Force on Dredged Material Management | Policy level assessment that recommended an integrated approach to dredged material management |
| 1992-2001 | Dredging Needs and Placement Options Program (DNPOP) | Strategic Plan which included need to identify new open water sites and development of a new Upper Bay containment faculty |
| 2001 | Dredged Material Management Act | Limited potential placement options in Harbor to confined placement facilities. |
| 2001 | Port Land Use Study | Real Estate evaluation of lands adjacent to Harbor. Indicated that no new shoreline sites available. |
| 2001-2003 | State DMMP (Bay-wide screening) | Screened 28 options. Sollers Point ranked highest among Harbor sites (but Masonville not considered). Identified a need for Harbor-specific site identification |
| 2003-present | Harbor Team | Re-screened all past Harbor options and identified potentially new sites. Recommended Masonville, BP-Fairfield and Sparrows Point for further study |
| 2003-present | Federal DMMP | Screened Options Bay-wide. Recommended multiple Confined Placement Facilities to meet harbor placement needs |

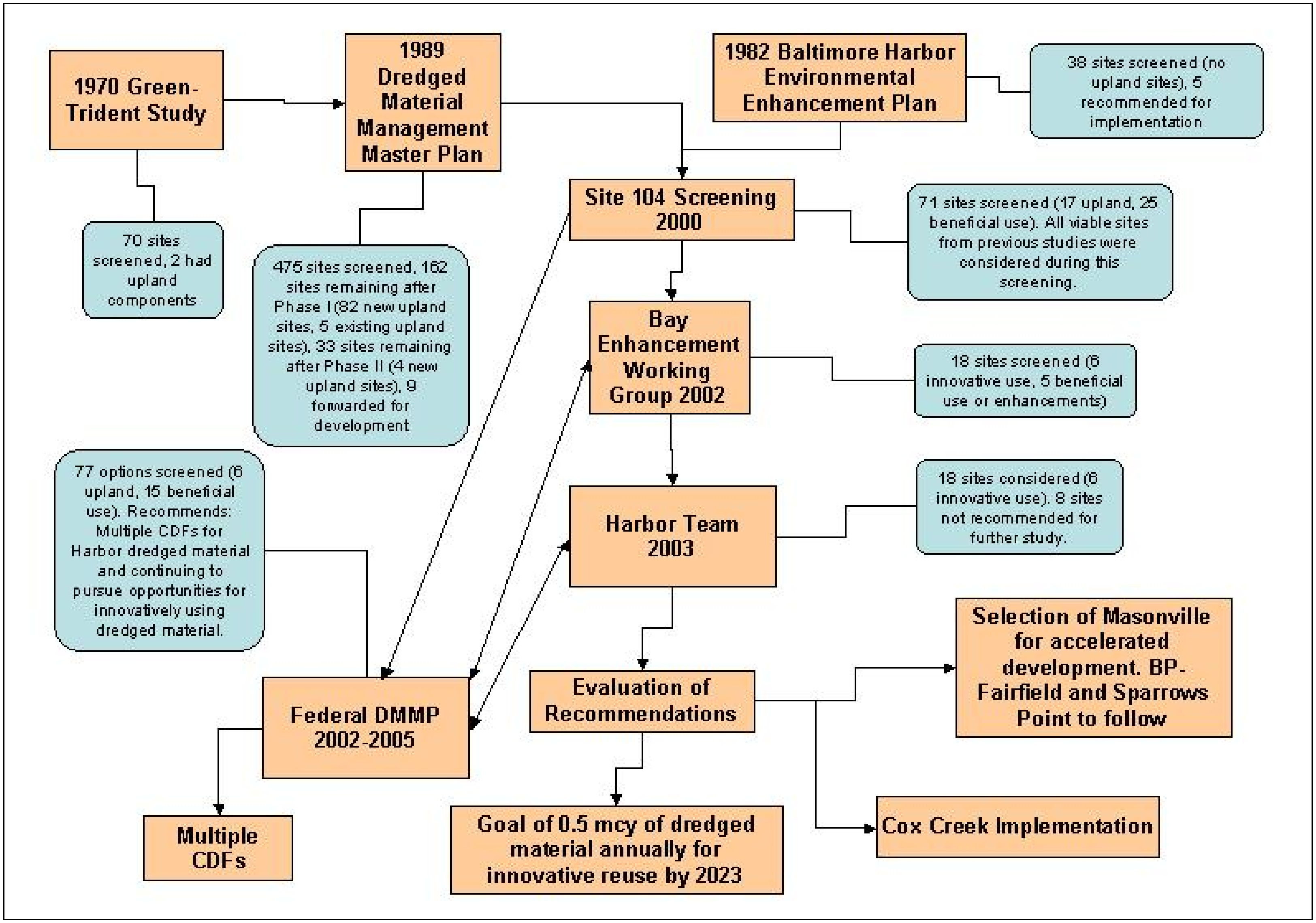



**Figure 3-1. Screening of Dredged Material Placement Sites for Harbor Material**

#### 3.4.2.1 Maryland State Screening History, 1970 – Present

The earliest work in the State of Maryland began in 1970 with the identification and screening for a DMCF in the upper Bay. This effort identified HMI as a preferred option (Green Associates and Trident Engineering Associates 1970). In the early 1980s, sites along Baltimore Harbor were screened as placement options that might provide environmental benefits to the area (RPC 1982). In the late 1980s, the State initiated a dredged material management program. The first action of this program was the preparation of the Dredged Material Management Master Plan, completed from 1986 to 1989 (MPA 1989). The Master Plan was followed by the Governor's Task Force on Dredged Material Management, from 1990 to 1991, and the Dredging Needs and Placement Options Program (DNPOP), from 1992 to 2001. At the end of 2001, the MPA planning effort was changed to the State DMMP. The continually evolving State DMMP prompted the creation of the Harbor Team in 2003. The Harbor Team recommended further investigation of the three DMCFs studied in this report. The planning efforts leading to the recommendations of the Harbor Team are briefly described in this section to show the screening process followed by the State. Maps and a table of the screened sites are included in Appendix F.

***Selection and Preliminary Design of Diked Disposal Areas for Dredged Spoil from the Baltimore Harbor, 1970***

The study titled *Selection and Preliminary Design of Diked Disposal Areas for Dredged Spoil from the Baltimore Harbor* determined the location and site design for a placement facility to contain 100 million cubic yards (mcy) of dredged material (Green Associates and Trident Engineering Associates 1970). At the time of the study, it was estimated that the deepening of 25 miles of channel leading to and within the Baltimore Harbor would generate 100 mcy of dredged material over the course of 20 to 25 years. It was also anticipated that another DMCF would be required 25 years after the development of the DMCF resulting from this study.

Over 70 sites in the Maryland portion of the Chesapeake Bay, including a variety of upland and in-water projects, were initially considered as dredged material placement sites (Green Associates and Trident Engineering Associates 1970, USACE 1973). Many of the options considered, particularly the upland sites, were small and had access or real estate issues. Ultimately, fifteen sites were considered for Harbor materials (Appendix F) and five sites were recommended that included: HMI, Black Marsh, Six-Seven-Nine Foot Knolls, Belvidere Shoal, and Patapsco River Mouth. Of these potential placement sites, only HMI, the preferred placement site, was developed and used as a DMCF at that point in time. The selection of HMI as the placement site included consideration of the following:

- Cost of construction and transportation of dredged material to the site
- Ecological impacts to oyster beds, sport and commercial fishing, and fish spawning areas
- Ecological impacts as a result of heavy metal content within the dredged material
- Federal and State regulations with regard to the construction of DMCF
- Projected plans for State, county, and city agencies in the Greater Baltimore area

HMI provided a site with lower construction costs than most of the other sites since one side of the property was land and suitable diking material was already present. In addition, the development of HMI would have few ecological impacts since there were no oyster beds or significant fish spawning habitats in the area, and the construction of a DMCF at this site would have little or no effect on water flow.

### *The Baltimore Harbor Environmental Enhancement Plan, 1982*

The Baltimore Harbor Environmental Enhancement Plan (BHEEP) (RPC 1982) included an inventory of existing aquatic resources in the Harbor, and an implementation program that would balance both ecological and economic needs within the Harbor and reduce the amount of time required to process permits. Thirty-eight sites were evaluated (Appendix F) and five were selected for the implementation of enhancement activities. These five sites included: Patapsco Ponds, Sollers Point, North Side of the Western Key Bridge Approach, Fort Howard, and Hog Neck. Table 3-2 below summarizes the mitigation or enhancement plan for each of these selected sites.

**Table 3-2. Selected Enhancement Sites from the 1982 BHEEP**

| Site | Proposed Enhancement or Mitigation |
|---|---|
| Patapsco Ponds | Shoreline stabilization |
| Sollers Point | Fringe marsh creation and establishment of fish reefs |
| North Side of the Western Key Bridge Approach | Clean-up and development of a fringe tidal salt marsh |
| Fort Howard | Fish reef establishment, shoreline erosion control, and fringe marsh creation |
| Hog Neck | Habitat improvement |

The matrices created as part of the BHEEP were made available for use in evaluating potential sites for habitat improvement for future Baltimore Harbor projects.

### *MPA Dredged Material Master Plan, 1986 – 1989*

The Master Plan effort was a multidisciplinary, MPA-sponsored planning initiative that began in 1986 as a participatory process to resolve long-term dredged material placement needs. The goal was to develop a comprehensive, consensus-based, long-term plan for managing dredged material. This effort laid the foundation for the State's process for screening options.

The initiative involved representatives from a range of State and Federal resource and regulatory agencies, local USACE districts, county and local governments, and public interest groups. During Phase I of this two-phased Master Plan, more than 475 Bay and Harbor options for dredged material placement were initially identified. Of the 475 options, all were considered to have sufficient merit to warrant preliminary screening. In Phase II, 162 options were formally assessed for their dredged material placement value based upon their potential feasibility. The remaining 313 were screened out due to environmental or implementation considerations. The MPA prepared a summary report titled *Dredged Material Management Master Plan* (MPA 1989) that recommended various dredged material placement options.

With the cooperation and input of key local and regional natural resource agencies, a suite of environmental factors of regional significance was identified. These resource agencies included: Maryland Department of the Environment (MDE), U.S. Fish and Wildlife Service (USFWS), Maryland Department of Natural Resources (DNR), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), and U.S. Environmental Protection Agency (USEPA).

Information on existing conditions was gathered at each of the 162 sites listed for formal assessment. The environmental data, in conjunction with estimates of site development costs, were used to identify fatal flaws among the 162 listed sites. Twenty-two Bay and nine Harbor potential placement areas survived the rigorous two-phase evaluation process. The nine Harbor sites included the following:

- Patapsco River Mouth,
- Sollers Point,
- B&O Kennecott,
- Hart-Miller Island Bayside Expansion,
- HMI Southward Expansion,
- HMI Dike at 28 feet (ft),
- Masonville,
- Hawkins Point/Thoms Cove, and
- Deadship Anchorage.

MPA's Master Plan initiative was discontinued in 1990 as a policy response to public controversy over the proposed use of the area known as the "Deep Trough", a deep remnant of the ancient Susquehanna River channel 1.2 miles west of Bloody Point on Kent Island, for open-water placement. Nevertheless, the Master Planning process was the foundation for building resource agency consensus with respect to the selection of dredged material placement options within the State. The Master Plan set forth a specific set of screening criteria, both environmental and cost factors that formed the conceptual basis for future dredged material placement option screenings. Subsequent planning efforts (e.g., the Governor's Task Force, the DNPOP, and Maryland's Strategic Plan for Dredged Material Management) have included multi-organizational working (advisory) groups and have used a similar multi-factor approach to placement site screening. Although some environmental factors have been added or changed since 1990, the basic multi-factor environmental screening approach from 1986 has been the basis for subsequent preliminary evaluations and option selections.

***Governor's Task Force, 1990 – 1991***

To facilitate development of a broadly supported State DMMP, former Governor William Donald Schaefer (Maryland Governor 1987-1995) convened a task force to provide a recommended approach as a replacement for the MPA's Master Plan. The membership of the task force was broad-based, representing Federal, State, and local governments; members of the academic community; groups concerned with protection of the environment; parties involved in maritime commerce; and groups whose livelihood is dependent upon the quality of Chesapeake Bay waters.

In a 1991 report, the Governor's Task Force recommended an integrated approach to dredged material management, with a desire to increase the beneficial uses of dredged material. It also stated that the use of existing placement sites and creation or designation of new sites (including containment sites, open-water placement sites, and upland placement sites) would be required to accommodate both short- and long-term demands for dredged material placement.

***Dredging Needs and Placement Options Plan, 1992 - 2001***

The DNPOP was specifically developed to implement the recommendations of the Governor's 1991 Task Force. This effort was assisted by Federal and State resource and regulatory agencies. The original Master Plan sites (Section 3.4.2.1) were considered under this program, and other options were added.

Under the DNPOP, a study was initiated in 1992 to look for shoreline rehabilitation options in the vicinity of Sparrows Point. Two potential options were identified that would have created wetlands within the Harbor and included: Thoms Cove and Sparrows Point. Sparrows Point was identified as the preferred option for ecological reasons, but it was impracticable because of Statute 5-1103, which precludes dredged material placement within five miles of the HMI DMCF.

In 1996, under the DNPOP, the MPA prepared a strategic plan for the management of dredged material. This plan contained seven recommended placement sites. These sites were:

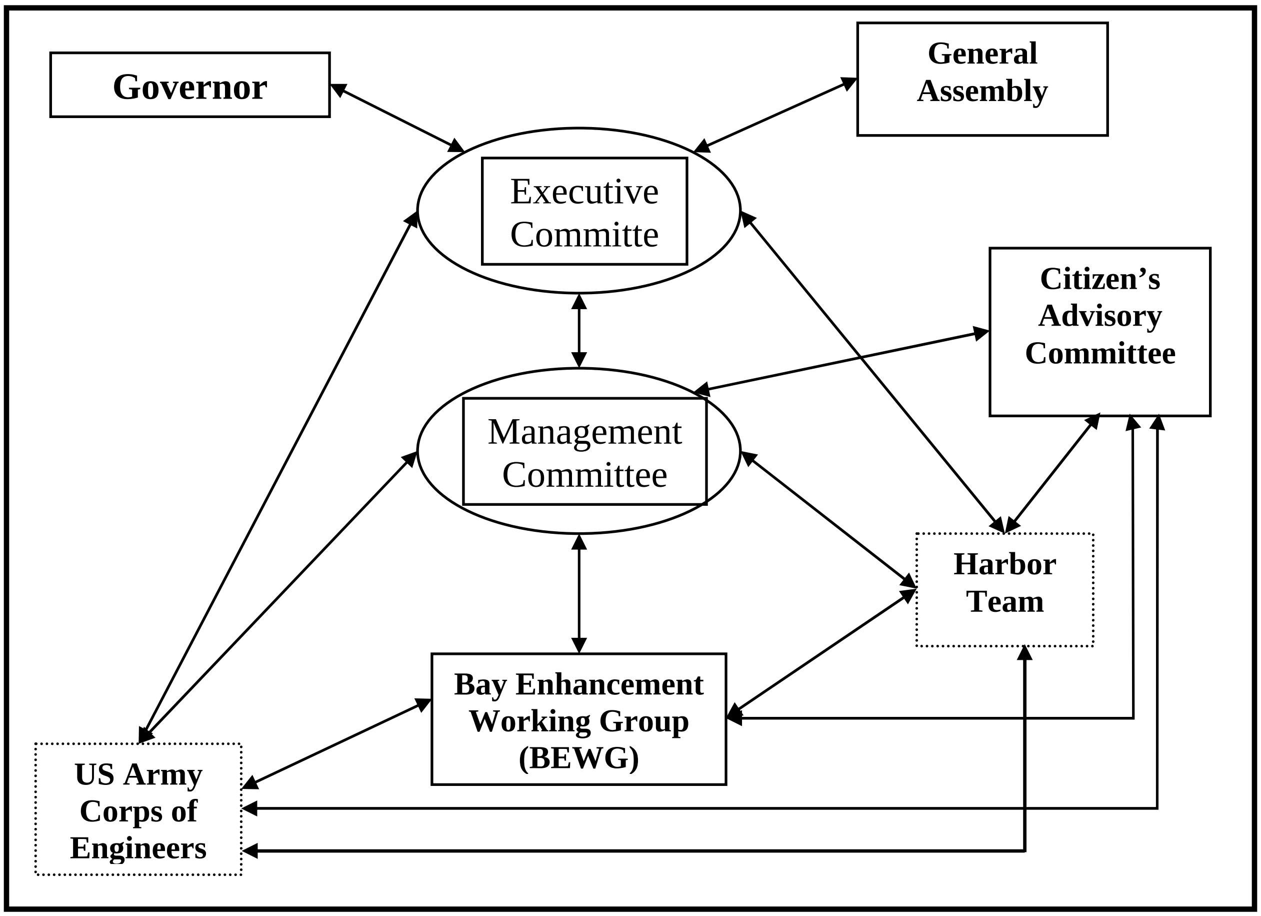
- Pooles Island
- HMI
- Poplar Island
- CSX/Cox Creek
- Site 104
- Open water sites
- New Upper Bay containment facility with beneficial use

If implemented, these sites would have provided sufficient capacity for the placement of dredged material from the Bay and Harbor for 20 years. Site 104, which was an existing open water placement site used from 1924 to 1974, was the preferred option. The Site 104 option was studied in-depth and an EIS was prepared to support the permitting for Site 104 (USACE 1999). A summary of the alternatives analysis for Site 104 details many of the sites screened in the DNPOP program and is provided in Appendix F. However, the use of Site 104 was removed from consideration in 2000, by the Governor, because of perceived potential environmental impacts. As a result, MPA initiated studies in 2000 to modify the 1996 strategic plan.

The studies initiated in 2000 documented an impending need for placement options in the Harbor, as well as sociopolitical concerns over placement options. This work subsequently led to the passing of the Dredged Material Management Act of 2001, and the subsequent creation of the State DMMP.

***State DMMP, 2001 – 2003***

The State of Maryland DMMP is a comprehensive process used to establish long-term dredging placement plans and to identify potential new placement sites. The State DMMP relies on input from a variety of stakeholders, including citizens and environmental groups and State and Federal agencies. Stakeholders are organized into three committees, the Executive Committee, the Management Committee, and the Citizens' Advisory Committee, and are supported by several technical working groups, including the BEWG and the Harbor Team (Figure 3-2). These committees and groups are tasked with identifying, studying, reviewing, and prioritizing potential dredged material placement sites. The State DMMP is an on-going process that continuously reevaluates dredging options in response to changes in the short- and long-term dredging requirements. Over 100 individuals are included in the committee structure.




*Source: DMMP Management Committee 2002*

**Figure 3-2. Committee Structure and Information Flow in the State DMMP**

The following committees form the framework of the State of Maryland's DMMP process (DMMP Management Committee 2002):

- Executive Committee – The Executive Committee is composed of eight members who oversee the development of the State DMMP and report directly to the Governor of the State of Maryland. Members include Secretaries of the State, Departments of Natural

Resources, Environment, and Transportation, a representative from the Management Committee, as well as the USACE District Commanders from Baltimore and Philadelphia, a Governor-appointed citizen representative, and the Chesapeake Bay Foundation. The State DMMP Executive Committee is responsible for reviewing and recommending options to meet the short- and long-term placement capacity requirements for maintenance and new work dredging projects in Maryland waters, and presenting those recommendations to the Governor and the Maryland General Assembly.

- Management Committee – The Management Committee is composed of State and Federal agencies, Port-related industry representatives, and other stakeholder group representatives. This committee reviews both the technical work of the BEWG and input from the Citizens' Advisory Committee, as well as considering additional factors such as costs, timing, and need. This committee makes recommendations to the Executive Committee on an annual basis and manages the overall progress of dredged material management option selection.
- Citizens' Advisory Committee – The Citizens' Advisory Committee is composed of representatives from citizens groups, community groups, and local governments interested in the environmental health and economic development of the Bay. This Committee reviews BEWG ranking information and provides input to the Management and Executive Committees regarding potential social, community, and local government concerns for each potential placement option and management strategy.
- Bay Enhancement Working Group (BEWG) – The BEWG is composed of technical personnel from State and Federal agencies and other organizations with expertise in the environmental issues of the Chesapeake Bay region. The BEWG is the primary group tasked with evaluating management options for dredged material. The BEWG has created a technical matrix within which management options can be scored to assess environmental impacts or benefits and ranked relative to one another.
- Harbor Team – The Harbor Team was established in 2003 to develop recommendations for dredged material management options specific to Baltimore Harbor for the next 20 years. Team members include representatives of local governments, community and environmental groups, and businesses with local interests.
- Other Task Forces – Additional tasks forces are added to the State of Maryland's DMMP as needed to support the decision making process for dredged material placement options.

### *Dredged Material Management Act of 2001*

Maryland's Dredged Material Management Act of 2001 limited potential placement options under the State's consideration for Harbor material. The law (Maryland Code Environment, Section 5-1102 and Section 5-1103) effectively prohibits the following, as it pertains to Harbor material:

**1)** Unconfined disposal of Harbor material in the Chesapeake Bay or its tributaries; and

**2)** Placement or re-deposition of dredged material in an unconfined manner of the Chesapeake Bay or its tributaries except when used for a beneficial use project.

The law also established the existence of an Executive Committee charged with "…reviewing and recommending DMMP options to meet both short- and long-term disposal capacity requirements; based on the following hierarchy:

**1)** Beneficial use and innovative reuse of dredged material.

**2)** Upland sites and other environmentally sound confined capacity.

**3)** Expansion of existing dredged material disposal capacity other than Hart-Miller Island.

**4)** Other dredged material placement options to meet long-term placement needs, except for redepositing dredged material in an unconfined manner." (DMMP Management Committee 2002)

The State DMMP process was developed by the Executive Committee based on the advisory committees' recommendations. The process is heavily based on the screening framework laid out in the 1989 Master Plan and subsequent State management plans. The process is as follows:

**1)** The program looks at the options identified by the 1989 Master Plan, and other options proposed since then.
**2)** The program identifies and distributes readily available information about a specific option.
**3)** The option is then screened by the BEWG using local and expert knowledge and available information. This is accomplished using a multi-metric screening technique that scores the presence or absence of resources and the potential for impacts.
**4)** The results of the BEWG activities are reported to the Management Committee, the Citizens' Advisory Committee, and Executive Committee. The culmination report of the Bay-wide screening is included in MPA (2002a). All of the sites considered are included in Appendix F.

The Bay-wide site screening resulted in a list of preferred options that the Management Committee described in a report to the Maryland legislature (MPA 2002a). The list included site-specific options for managing mainstem Bay and Harbor materials. Among the highest ranked options were non-site-specific upland and innovative reuse options including agricultural application, mine/quarry reclamation, wetland thin layering, and other innovative reuses (making brick, aggregates, etc.). All of the non-site specific options had very low total and annual capacities, and most are only currently in very preliminary stages of research and development. All were retained for consideration of future placement needs if or when potential sites become available and technologies evolve to make implementation feasible. A subset of highly ranked potential placement sites were identified and taken through a series of conceptual, pre-feasibility, and State feasibility-level studies to examine environmental, engineering, geotechnical, and social considerations and constraints for each site. The technical experts involved in the BEWG developed a matrix to evaluate positive and negative environmental impacts for each option. Fifty-two environmental factors (Table 3-3) were identified and used to rank the 28 options identified as potential placement sites (Table 3-4).

**Table 3-3. Environmental Factors Considered in the State DMMP Screening Process**

| | | |
|---|---|---|
| • Dissolved Oxygen | • Thermal Refuge | • Fossil Shell Mining |
| • Nutrient Enrichment | • Recreational Fishery | • Floodplains |
| • Turbidity | • Protected Species | • Recreational Value |
| • Salinity | • Habitat of Particular Concern | • Aesthetics and Noise |
| • Groundwater | • Waterfowl Use | • Cultural Resources |
| • Benthic Community | • Wading and Shorebird Use | • Navigation |
| • Shallow Water Habitat | • Wildlife Habitat | • Beneficial Use – Wetlands |
| • Submerged Aquatic Vegetation | • Forests | • Beneficial Use – Uplands |
| • Tidal Wetlands | • Streams | • Beneficial Use – Faunal |
| • Non-tidal Wetlands | • Lakes and Ponds | • Beneficial Use – Recreational |
| • Finfish Spawning Habitat | • Other Natural Avian Habitat | • Hydrodynamic Effects |
| • Finfish Rearing Habitat | • Toxic Contaminants | • Essential Fish Habitat |
| • Larval Transport | • Substrate and Soil Characteristics | • Infrastructure |
| • Air Quality | • Public Health | • Existing Land Use |
| • Socioeconomics – Commercial Income and Assets | • Public Safety | • Shoreline Protection |
| • Socioeconomics – Residential Assets | • Environmental Justice | • Beneficial Use – Adjacent Habitat Enhancement |
| • Commercially Harvested Species and Habitat | • Prime or Unique Agricultural Land | • Noise |
| • Comprehensive Environmental Response Compensation and Liability Act (CERCLA)/Unexploded Ordnance (UXO) Potential | | |

*Source: DMMP Management Committee 2002*

Potential placement sites were screened using five sorting variables: 1) environmental screening, 2) the year the placement site would become available, 3) annual capacity of the placement site, 4) capacity through year 2022, and 5) unit cost. Based on the results of the screening process, sites were next prioritized (high priority, low priority, or not feasible), and additional studies were conducted, or are on-going, as needed. The Harbor sites that were considered included: Dead Ship Anchorage, Hawkins Point/Thoms Cove, Sollers Point, and Sparrows Point (wetland option only) (Figure 1-1). Of these, Sollers Point ranked highest in the environmental and feasibility rankings but the option met with significant community opposition, due to the proximity of residential neighborhoods.

The results of the screening process were then presented to the Executive Committee in late 2002. The Executive Committee recommended further investigation of the expansion of the Poplar Island Environmental Restoration Project and a Mid-Bay Island restoration project at James Island. The committee also recognized the insufficiency of the Harbor options currently being evaluated and the immediate need to identify viable options for the Harbor. The Executive Committee recommended the formation of a special committee (Harbor Team) to accomplish this task.

**Table 3-4. Placement Options Included in the State DMMP Screening Process**

| | |
|---|---|
| • Aberdeen Proving Ground | • Poplar Island Modification (Dike Raising) |
| • Agriculture | • Poplar Island Modification (Lateral Expansion) |
| • Barren Island | • Sharps Island |
| • Dead Ship Anchorage | • Site 170 (Mouth of Patapsco) |
| • Furnace Bay | • Site 1 – Tolchester West |
| • Hawkins Point/Thomas Cove | • Site 2 – Tolchester/Brewerton Angle |
| • Holland Island | • Site 3 – Swan Point West |
| • Innovative Reuse at Cox Creek | • Site 3S – Swan Point West |
| • James Island | • Site 4a – Pooles Island |
| • Lower Eastern Neck Island | • Site 4b – Pooles Island |
| • MD – C&D Placement Sites (6) | • Site 4br – Pooles Island |
| • Mines and Quarries | • Sollers Point |
| • Ocean Placement | • Sparrows Point |
| • Parsons Island | • Wetland Thin Layering (Dorchester County) |

*Source: DMMP Management Committee 2002*

***Dredged Material Management Program (DMMP), 2003- present***

Harbor options screening activities since early 2003 have been largely driven by the Harbor Team with technical guidance coming from the BEWG. Details on Harbor Team activities are in the following section. As of 2004, the State of Maryland's DMMP Executive Committee recommendations for dredged material from Baltimore Harbor included the initiation or continuation of State feasibility-level studies for three potential DMCFs that include: Masonville, BP-Fairfield, and Sparrows Point (DMMP Management Committee 2004). Each proposed DMCF has a suite of community enhancements associated with the project. The Masonville Cove restoration and enhancement would include the development of either Masonville or the BP-Fairfield Facility. For Sparrows Point, the suite of enhancements includes wetlands creation at Sparrows Point and Sollers Point (east), Jones Creek Community enhancements of shoreline restoration and wetlands creation, Bear Creek and Old Road Bay cleanup, Sollers Point (west) Community enhancements, and a "Heritage Trail" Community enhancement. The Executive Committee also recommended developing a strategy for incorporating the innovative reuse of dredged material options into the State DMMP.

Recommendations of the Executive Committee also included the conclusion of the State feasibility-level studies for the Poplar Island Environmental Restoration Project re-evaluation and the Mid-Bay Island Restoration.

The MPA is currently pursuing various options for the management of dredged material through the State DMMP. This is a multidisciplinary, inter-organizational program that was formed by MPA, with assistance from MES, as part of the implementation of Maryland's Dredged Material Management Act of 2001.

***Harbor Team, 2003 to Present***

The Harbor Team was created to assist the Executive Committee of the State DMMP in developing short- and long-term management strategies for Baltimore Harbor. The mission of the Harbor Team was: "…by October 31, 2003 to recommend options for further study able to manage approximately 1.5 mcy annually of material dredged from Baltimore Harbor for 20 years." The section below lists the Harbor Team members, the process followed by the Team, the options examined, and the Team's recommendations to Maryland's General Assembly. The information in this section is taken from Harbor Team's Final Report to the Executive Committee.

Membership and Process

Harbor Team members included: local government leaders, representatives from citizens' groups and associations, and businesses in the area with investment or interest in dredging projects. The Harbor Team is composed of the following groups and individuals:

- Anne Arundel County Government
- Baltimore City Government
- Baltimore County Government
- Baltimore Harbor Watershed Association
- Bethlehem Steel Corporation
- Brooklyn and Curtis Bay Coalition
- Domino/The American Sugar Refining Company
- Dundalk Area Citizens
- Dundalk Renaissance Corporation
- Greater Dundalk Alliance
- Greater Dundalk Community Alliance
- Living Classrooms Foundation
- Marley Neck
- Maryland Pilots Association
- National Aquarium in Baltimore
- North County Land Trust
- Cox Creek Citizens Committee
- North Point Peninsula Community Council
- Patapsco Back Rivers Tributary Team
- Rukert Terminal
- Turner Station
- W.R. Grace & Company

The members of the Harbor Team met once every three weeks from March to October 2003 to gather information, discuss options, and develop recommendations. The team requested information it deemed necessary from various State and Federal agencies and interest groups. The information requested included environmental, sociopolitical, economic, cultural, and policy information, as well as citizens' opinions. Based on this information, the team examined and evaluated potential options for the Harbor.

The Harbor Team then utilized the existing State DMMP procedures, asking the BEWG to rank these options on the basis of environmental and quality of life factors and requesting the MPA to provide estimates of Harbor capacity needs and potential capacities and costs for each option.

The BEWG provided the Harbor Team with a technical matrix that included over 50 categories ranging from environmental factors to human use and beneficial attributes (refer to Harbor Team 2003, Appendices II and III for details on the BEWG rankings). MPA provided estimates of Harbor need and conceptual level design estimates for total capacity, annual capacity, site life, initial and total cost, and other relevant site characteristics.

The Harbor Team then used the BEWG rankings and MPA's preliminary design estimates to evaluate each option and develop its recommendations.

***Harbor Waterfront Land Use Study, 2001***

One critical piece of research that the Harbor Team used to help identify and screen potential sites for dredged material management around the Harbor was the *Baltimore Harbor Land Use Study*, which was completed in 2001 (MPA 2001). The study looked at all properties adjacent to the Harbor and researched current landuse as well as future (proposed) landuse. The objective was to identify upland areas adjacent to the Harbor that would be suitable for Port utilization/development. The general use categories included:

- Existing Commercial, Residential, and Recreational
- Existing Industrial, Power Generation, and Utilities
- Public Marine Terminals
- Private Marine Terminals
- Recent Transactions and Developments

These land uses are shown in Figure 3-3; a full set of maps from the study are included in Appendix F. The study concluded that there was very little available land around Baltimore Harbor that would be available for any type of Port development. Areas unavailable for development are shown in black on Figure 3-3. This demonstrated the low potential to identify new sites for Harbor development (including DMCFs).

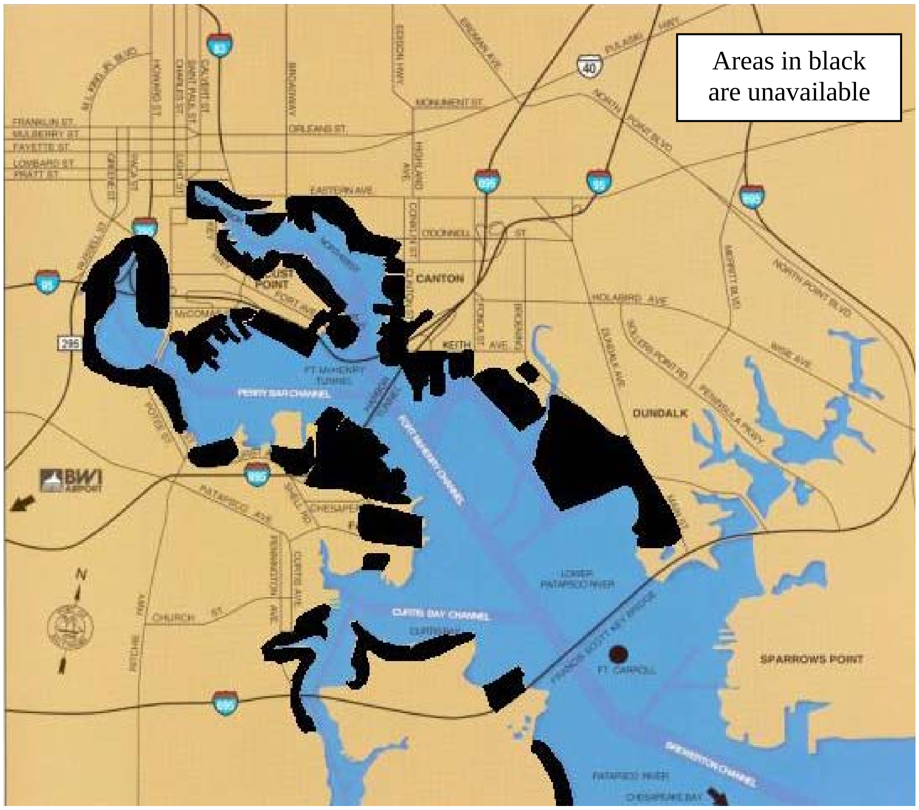



**Figure 3-3. Existing Land Use in the Baltimore Harbor, 2001**

***Options Evaluated at the December 2004 MPA Innovative Use Forum***

***The Harbor Team Evaluation*** began with an initial list that included dredged material placement options, innovative reuse options, the no action alternative, and community enhancement or beneficial use options (Harbor Team 2003, Appendix II contains fact sheets for the options evaluated). The options were taken from the prior State screening efforts, and screened by the Harbor Team. The following is the list of the options examined by the Harbor Team. (Screening details are provided in Appendix F):

1 Innovative Reuse Options
- Agricultural Use
- Creation of Bricks and Other Aggregate Materials
- Innovative Reuse at Cox Creek
- Key Bridge Piling Protection
- Mines and Quarries

2 Dredged Material Placement Options
- Dead Ship Anchorage
- Masonville
- Sparrows Point Beneficial Use
- Sparrows Point Conceptual
- Sollers Point
- Thoms Cove
- BP-Fairfield

3 Community Enhancement/Beneficial Use Options

- Fort Howard
- Hog Neck
- Key Bridge Southwest
- Patapsco Ponds
- Masonville Cove

***Harbor Team Recommendations***

The Harbor Team recommended options for further study. These options would be capable of handling 1.5 mcy annually of dredged material for 20 years. The Team followed existing State DMMP procedures and based their recommendations on the BEWG's environmental ranking; preliminary site design, capacity, and cost information; data and facts presented by various State and Federal agencies; and recommendations of representatives from local citizens' groups, governments, and businesses.

The Team recognized the necessity to meet the short-term need of the Harbor, as well as the importance of developing viable innovative reuse options over the long term. With this in mind, the Team made general policy and specific recommendations for both confined placement and innovative reuse options. The Harbor Team, with concurrence from the BEWG, recommended that further studies be conducted for three sites within the Harbor that included: Masonville, Sparrows Point, and BP-Fairfield. Each has site-specific enhancement projects. Specifics of the Harbor Team recommendations are found in Section 3.4.5. Although some sites such as Deadship Anchorage, Sollers Point, and Hawkins-Point/Thoms Cove had been considered previously, they ranked lower for various environmental reasons. These sites were generally less degraded from an ecological stand point and, therefore, contained more valuable aquatic habitat.

For full details on site screening and the general policy recommendations of the Harbor Team refer to the *Final Report of the Harbor Team to the Management Committee and Executive Committee of Maryland's DMMP* (Harbor Team 2003).

**3.4.2.2 Innovative Reuses**

As stated in Section 1.4, the MPA has committed to developing a strategy to process 0.5 mcy of dredged material annually through cost-effective and safe innovative reuses by 2023, in accordance with the recommendations of the Harbor Team (Harbor Team 2003).

In response to the Harbor Team request for the MPA to pursue innovative reuse options, the MPA sponsored an open forum on innovative reuse technologies on December 9, 2004. The forum involved presentations on topics including decontamination processes, engineering uses, and business models. The forum also provided an opportunity for open discussion between meeting attendees and the presenters. The event was held at the Radisson Hotel in Annapolis, Maryland and was attended by approximately 160 people representing various Federal, State, and local agencies, environmental and neighborhood organizations, and Baltimore's Port community. Attendees traveled from 19 different states, and one presenter traveled from Hamburg, Germany to speak about the innovative technologies used at the Port of Hamburg.

***Summary of the Information Presented***

Presentations on various innovative reuse technologies and applicable business models were made by 12 technical experts. Technologies were grouped into two process types:

1) Thermal and non-thermal decontamination processes that produce cement-type and light- weight aggregates, and
2) Stabilization technologies that produce materials for landfill cover, construction fill, and mine reclamation.

Innovative reuse technologies are viable and promising, yet economics remain the greatest implementation challenge. In addition, most of the processes presented have not yet been implemented for large-scale operations. Clean Earth Dredging Technologies Inc., operates fully commercial projects in New Jersey and Pennsylvania that have processed over 2 mcy of amended dredged material to date. The dredged material is amended with other products (such as coal combustion products, incinerator ash, waste lime products, and cement and lime production byproducts). The material is approximately 8 percent amended material and 92 percent dredged material.

Past European experience has not found a large scale, economically sustainable reuse process, and markets for end products have not been developed. European ports have reportedly recognized confined disposal as a necessary ongoing option for contaminated sediments. Relocation (e.g., open water disposal) is the preferred method for managing clean sediments. In addition, policy makers are directing fiscal resources into sediment and erosion control efforts, because those efforts are viewed as more effective strategies over the long-term than ongoing programs to process sediments.

A full summary of the proceedings can be found at:
http://www.mpasafepassage.org/forumpresents/FINALForumSummary.pdf

From the information gathered by the Innovative Use Forum, it became apparent that implementation of innovative reuses would take more research and development than time allowed to meet the short-term placement needs of the Harbor. Large volume upland options, such as mine and quarry reclamation that were already occurring at other ports, require infrastructure, expansion/renovation, and development. Creation of bricks and aggregate materials requires development of manufacturing facilities and dewatering of dredged materials. In addition to dewatering, reuse for land applications such as landfill capping or agricultural application would require identification of suitable sites. It has been suggested that the Cox Creek facility could act as a dredged material dewatering/mining source to support innovative reuses, although infrastructure redevelopment and onsite processing facilities would be required. The engineering and NEPA requirements for implementation of these reuse options would make them impossible to implement in time to meet the 2009 shortfall and, therefore, not practicable for the short-term need.

Although not viable for the short-term placement need, the MPA is actively pursuing innovative reuses. As stated in Section 1.4, the MPA has created an Innovative Reuse Committee to develop a strategy to manage this material through safe and cost-effective innovative resuses by 2023. The committee held its first meeting in March 2006.

**3.4.2.3 Upland Options**

Previous sections have outlined the general screening and analysis of all of the sites considered for Harbor dredged material placement. This section focuses specifically on all of the options considered that would facilitate placement of materials without filling a waterway. A detailed list of all upland options is included in Appendix F. A description of the reasons that the sites were not practicable for this placement need is included below. Figure 3-1 presents locations for the discussion below.

- 1970: The Trident Green study identified two options with upland components. One was unsuitable due to UXO and high ecological value and the other involved navigation obstruction and had conflicting land use.
- 1989: The Master Plan screened 87 upland alternatives. Most had significant environmental factors (Appendix F) making them less than desirable for dredged material placement. Four sites were forwarded for future consideration.
- 2000: The Site 104 alternatives analysis screened 17 upland options, including updating the information (re-screening) for several options from the 1989 Master Plan. Details are included in Appendix F. Many of the upland options affected significant environmental resources or were not practicable due to conflicting land use.
- 2002: The State DMMP included several innovative reuses that are upland placement alternatives: agricultural land application, innovative reuses at Cox Creek, Furnace Bay (mine regrading); Mine and quarries (reclamation); and six Chesapeake and Delaware (C&D) Canal Placement Sites. All except the C&D Canal sites were forwarded to the Harbor Team for further consideration. Issues associated with these options were presented previously (Section 3.4.2.2).
- 2003: The Harbor Team evaluated all of the innovative reuse and upland options considered during the 2002 State DMMP screening (above) and also recommended the BP-Fairfield site (which could include an upland component) for further study. The BP-Fairfield site is analyzed in detail in Section 3.5.2 but is less practicable than Masonville at this time due to ownership issues, which would preclude development in time to meet the short-term placement need.

As stated in Section 3.4.2.2, innovative reuses, which are also upland placement options, are being studied and further developed by the Innovative Reuse Committee. Although most of the innovative reuses may become practicable in the future, all the options require more research and development than can be accomplished in time to meet the current placement shortfall. In addition, the MPA is continuing to identify and investigate potential upland placement options for future use. Two examples are described below:

- The MPA has been investigating a specific mine reclamation site in Tamaqua, Pennsylvania. The present study is focused on the feasibility of processing 500,000 cy of dredged material annually through the Cox Creek DMCF and transporting the material to the mine site. The MPA is examining this option over a 20-year period to not only increase the capacity of the DMCF, but also to support mine reclamation. The mine is permitted to accept 40 mcy of dredged material. This option is in the earliest stages of development and would not be functioning in time to meet the Harbor placement need shortfall.

- Under the new ownership of Sparrows Point, there may be several upland areas becoming available that could be redeveloped for dredged material placement. This potential option became recently apparent (early 2006) and is only in the earliest stages of conceptual development. This option would not be ready to accept material in time to meet the Harbor Placement shortfall. In addition, any diked placement of material at Sparrows Point is currently precluded by law (Section 3.5.5).

### 3.4.3 Federal Dredged Material Management Plan

The USACE Publication Engineering Regulation (ER) 1105-2-100 (April 22, 2000) mandates that each USACE district develop a DMMP for all Federal harbor projects where there is an indication of insufficient placement capacity to accommodate maintenance dredging for the next 20 years. The Federal DMMP is a planning document that ensures that maintenance dredging activities are performed in an environmentally acceptable manner, that sound engineering techniques are used, and that the options are economically warranted. The plan addresses a full range of placement alternatives to ensure that sufficient placement capacity is identified for the next 20 years. The USACE - Baltimore District's goal was to develop a comprehensive, regionally supported DMMP that produced a long-term strategy for providing viable placement alternatives for dredging the Port of Baltimore Federal Channels. The USACE Baltimore District's (Federal) DMMP covers the dredging of the channels from the mouth of the Chesapeake Bay in Virginia, to and including the Port of Baltimore, and the southern approach channels to the C&D Canal as far north as the Sassafras River.

The Federal DMMP addresses navigation and dredging needs, annual placement capabilities, existing capacity of placement areas, placement site management practices, environmental compliance requirements, potential beneficial use of dredged materials, and assesses the economic viability of continued maintenance. The Federal DMMP identified, evaluated, screened, prioritized, and ultimately optimized such alternatives resulting in the recommendation of a specific viable plan of action for the placement of dredged materials over the next 20 years. The plan also considered non-Federal, permitted dredging within the related geographic area, as placement of material from these sources would affect the size and capacity of placement areas required for the Federal project.

#### 3.4.3.1 Federal DMMP Study Summary

A preliminary assessment of the Federal dredged material management needs for the next 20 years was completed in July 2001 (USACE 2001a). The preliminary assessment had three primary conclusions: (1) that there was insufficient capacity remaining to accommodate the dredging needs of USACE - Baltimore District and MPA in the next 20 years, (2) that there was insufficient time to develop new placement sites, and (3) that unless new placement sites were identified, the existing sites would not be efficiently managed, resulting in overloading, which would reduce site capacity and increase costs. The preliminary assessment recommended that studies of the feasible alternatives be conducted to offset the capacity shortfall.

In May 2002, the USACE - Baltimore District issued the Notice of Intent (NOI) [Federal Register: February 11, 2005 (Volume 70, Number 28), Page 7256-7257] to prepare the *Baltimore Harbor and Channels Dredged Material Management Plan and Tiered Environmental Impact Statement* (Federal DMMP study) for the Port of Baltimore. The Federal DMMP study was initiated in January 2003. Details of the Federal DMMP process, placement sites evaluation, the screening and ranking process, and results can be found in the *Baltimore Harbor & Channels Dredged Material Management Plan and Tiered EIS* (USACE 2005).

The purpose of the Federal DMMP was to identify, evaluate, screen, and recommend dredged material management alternatives so that dredging and placement operations could be conducted in a timely, environmentally sensitive, and cost-effective manner. The Federal DMMP established the "Federal Standard" for the placement of sediment dredged from the channels serving the Port of Baltimore. The Federal standard is defined as the least costly, environmentally acceptable method of discharging the dredged material, consistent with sound engineering practices [33 Code of Federal Regulations (CFR) Part 335]. The Federal standard was developed from a national perspective and considers, but is not bound by State or local regulations. The Federal standard may, therefore, include alternatives that fully comply with Federal law but may be restricted by State laws. For example, the State of Maryland has passed laws that severely restrict the placement of material in the open waters of the Chesapeake Bay and limit placement of material from Baltimore Harbor to existing containment sites that have defined closure and capacity restraints. The Federal standard includes options, that in the absence of these State laws, could provide sufficient potential capacity for 20 years of anticipated Federal maintenance needs, comply with Federal laws, and are based on sound engineering practices. Currently, the Federal standard for material dredged from Baltimore Harbor (upstream of the North Point-Rock Point line in the Patapsco River) is HMI (Figure 3-4); for dredged material from the C&D Canal Southern Approach Channels, the Federal standard is open water placement at the Pooles Island placement sites (Figure 3-4); and for the Chesapeake Bay (Baltimore Harbor Approach) channels, the Federal standard is open water placement in the Deep Trough (Figure 3-4). The Federal standard is used for the evaluation of cost sharing. The USACE would not implement a project that violates State law.

In many cases, a non-Federal local sponsor is required to identify the project's dredged material placement sites. A locally preferred plan can be identified other than the Federal standard. In such instances, the costs above those required for the Federal Standard are either a non-Federal or shared responsibility, depending on the placement site. If the placement site is an approved Federal project, costs above the Federal Standard are shared between the USACE and the non-Federal sponsor. If the placement site is not an approved Federal project, the non-Federal sponsor would be responsible for all costs above the Federal Standard costs.

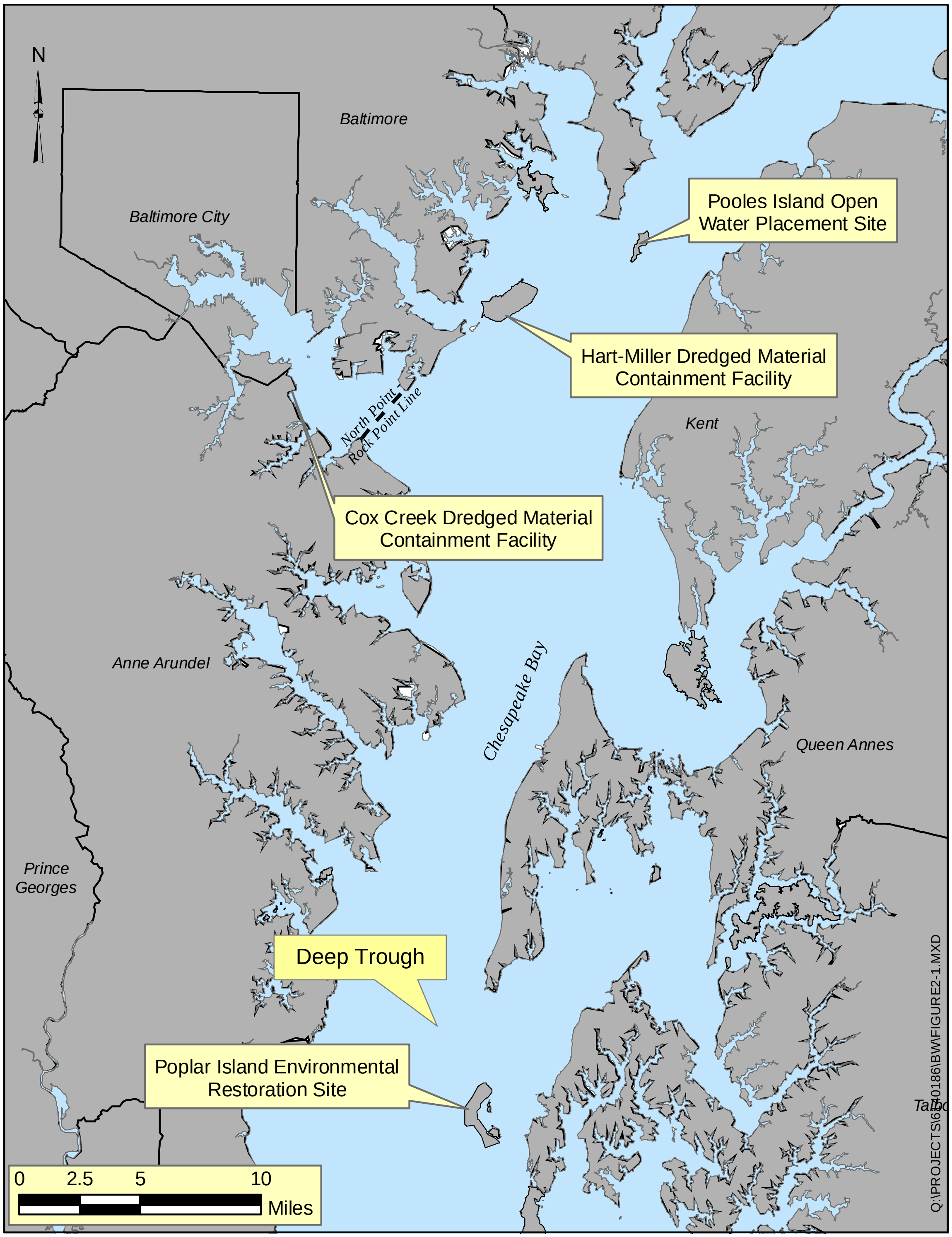



**Figure 3-4. Map of Existing Placement Locations (Hart-Miller Island, Pooles Island, Cox Creek Facility, Deep Trough, and Poplar Island)**

#### 3.4.3.2 Assessment of Existing Dredged Material Placement Capacity

To define the scope for the Federal DMMP, an assessment of the remaining capacity at the existing dredged material placement sites was conducted to quantify the magnitude of the dredged material shortfall predicted in the Preliminary Assessment (USACE 2001a). This assessment formed the basis of the "no action alternative" for the Federal DMMP and assumed the continuation of the current maintenance dredging at the currently maintained channel dimensions (see Section 1.4.2) and placement of the dredged material at the existing placement sites as currently constructed (USACE 2005). Results of the placement capacity assessment for the 20-year planning period indicated that:

- For the Baltimore Harbor Channels and Anchorages, the two existing placement sites – HMI DMCF and Cox Creek DMCF – have an estimated remaining capacity of 10 and 6 mcy, respectively. The projected dredging need for the Harbor Channels and Anchorages is estimated to be 33 mcy, resulting in a capacity shortfall of 17 mcy.

- For the Upper Chesapeake Bay Approach Channels in Maryland, the Poplar Island Environmental Restoration Project (PIERP) is the only existing placement site. The PIERP is estimated to have a remaining placement capacity of 27 mcy. The projected dredging need for the Upper Chesapeake Bay Approach Channels is estimated to be 43 mcy, resulting in a capacity shortfall of 16 mcy.

- For the Southern Approach Channels to the C&D Canal, the existing placement site is the Pooles Island Open Water Site, with an estimated remaining capacity of six mcy. The projected dredging need for the Southern Approach Channels to the C&D Canal is estimated to be 30 mcy (approximately 1.2 mcy per year), resulting in a capacity shortfall of 24 mcy.

- For the Virginia Chesapeake Bay approach channels in Virginia, the four existing placement sites – Rappahannock Shoal Deep Alternate Open Water Site, Wolf Trap Alternate Open Water Site, Norfolk Ocean Open Water Site, and Dam Neck Ocean Open Water Site – have sufficient capacity to handle the projected quantity of dredged material from the Virginia channels.

Based on the evaluation of remaining capacity in existing placement sites (Table 3-5), the Federal DMMP identified the need for an additional 17 mcy of additional placement capacity for dredged material from within the Baltimore Harbor, and an additional 40 mcy of additional placement capacity for dredged material from the Upper Chesapeake Bay Approach Channels, including the Southern Approach Channels to the C&D Canal, within the next 20 years (USACE 2005).

**Table 3-5. Projected Dredging Need and Capacity Shortfall through 2025**

| Channel Reach | Need (mcy) | Existing Sites | Capacity (mcy) | Shortfall (mcy) |
|---|---|---|---|---|
| Baltimore Harbor Channels | 33 | HMI and Cox Creek | 16 | 17 |
| Chesapeake Bay Approach Channels (MD) | 43 | Poplar Island Environmental Restoration Project (PIERP) | 27 | 16 |
| Southern Approach Channels to C&D Canal | 30 | Pooles Island Open Water Placement Site | 6 | 24 |
| Virginia Channels | 16 | Dam Neck, Norfolk Ocean, Wolf Trap Alternate and Rappahannock Deep Alternate | Sufficient | None |

***Source:*** *USACE 2005.*

### 3.4.3.3 Screening Process for the Federal DMMP

The Federal DMMP process included the evaluation of 36 types of placement facilities (Table 3-6) for dredged material from four locations that included: (1) the Baltimore Harbor channels (Figure 1-2), (2) the C&D Canal approach channels, (3) the Chesapeake Bay approach channels in Maryland, and (4) the Virginia Chesapeake Bay approach channels in Virginia, for a total of 77 alternatives (USACE 2005). The screening process for the Federal DMMP is briefly summarized in the following sections.

The screening criteria for the Federal DMMP included three main quantitative criteria: (1) capacity of the placement alternative, (2) cost to dredge, construct, operate, and maintain each placement alternative, (3) and the environmental benefit or impact caused by each placement alternative (USACE 2005). Two qualitative criteria were also considered that included (1) technical and logical risk, and (2) acceptability risk (USACE 2005).

In the Federal DMMP screening process, the alternatives scoring matrix that was developed by the BEWG was used to evaluate the environmental benefit and/or impact of a placement alternative. The BEWG alternatives scoring matrix included 52 criteria grouped under subsets that included the following: water quality; shallow water habitat; wetlands; aquatic biology; rare, threatened, and endangered species; waterbirds; terrestrial; physical parameters; human use attributes; and beneficial attributes. Each criterion was assigned a weighting factor that represented the BEWG's assessment of the relative importance of that criterion in the screening process. For each criterion, the BEWG assigned a score, either a +1 for a beneficial impact, a 0 for little or no impact, or a -1 for a negative impact. This was completed for each alternative. When the score for each alternative was multiplied by the weighting factor for each criterion, a total score was calculated and then evaluated against the full list of alternatives. Also included in the alternatives evaluation for the Federal DMMP were concept-level design assumptions for each alternative that included life-cycle cost estimates.

**Table 3-6. Types of Placement Facilities Evaluated in the Federal DMMP**

- Agricultural Placement- Maryland (MD)
- Agricultural Placement- Virginia (VA)
- Artificial Island Creation- Lower Bay
- Artificial Island Creation- Upper Bay
- Beach Nourishment- Virginia
- Building Products
- C&D Canal Upland Sites Expansion
- Capping- Landfill/Brownfields
- Capping- Elizabeth River, VA
- Capping- Patapsco River, MD
- Confined Aquatic Disposal Area- Patapsco River, MD
- Confined Disposal Facility- Lower Bay
- Confined Disposal Facility- Patapsco River, MD
- Cox Creek Expansion
- Hart-Miller Island Expansion
- Large Island Restoration- Lower Bay
- Large Island Restoration- Mid Bay
- Mine Placement- Cecil County, MD
- Mine Placement- Western Maryland
- Norfolk Ocean Open Water Placement
- Pooles Island Open Water Site Expansion
- Poplar Island Environmental Restoration Project (PIERP) Expansion
- Rappahannock Shoal Deep Alternate Open Water Site Expansion
- Shoreline Restoration- Lower Bay
- Shoreline Restoration- Mid Bay
- Shoreline Restoration- Upper Bay
- Small Island Restoration- Lower Bay
- Small Island Restoration- Mid Bay
- Wetland Restoration- Dorchester County, MD
- Dam Neck Ocean Open Water Placement (Existing)
- Hart-Miller Island (Existing)
- New Open Water Placement – Mid Bay (Deep Trough)
- Pooles Island Open Water Site (Existing)
- Rappahannock Shoal Deep Alternate Open Water Site (Existing)
- Wolf Trap Alternate Open Water Placement (Existing)

*Source: USACE 2005*

Seven alternatives were selected as the recommended plan to meet the 20-year dredged material capacity needs of the Port of Baltimore. These alternatives were then evaluated in the Programmatic (Federal) DMMP and Tiered EIS Evaluation (USACE 2005). Three of these seven alternatives were applicable to dredged material placement for the Baltimore Harbor Channels:

- Multiple Confined Disposal Facilities- Patapsco River, MD.
- Optimized use of existing dredged material management sites in Maryland, including PIERP, Pooles Island Open Water Site, HMI DMCF, and Cox Creek DMCF.

- Continue to work with the State of Maryland to investigate innovative reuse alternatives.

The other four alternatives evaluated in the Federal DMMP included: (1) continued use of open water placement sites in Virginia for dredged material from the three Federal navigation channels located in the Virginia portion of the Chesapeake Bay, (2) PIERP expansion, (3) large Island restoration in mid-Chesapeake Bay, and (4) wetlands restoration in Dorchester County, MD.

### 3.4.4 Differences Between the Federal and State DMMP

The Federal and State DMMP processes both have similar goals of identifying suitable placement sites to contain dredged material from the Federal, State, and local non-Federal channels over at least the next 20 years. However, the USACE - Baltimore District’s plan is conducted from a Federal perspective and it is intended to ensure that the Port's Federal navigation projects continue to be completed and maintained in an environmentally acceptable and cost-effective manner, thereby justifying an ongoing investment of Federal funds.

The Federal DMMP differs from the State DMMP in that the Baltimore District's (Federal) DMMP is more inclusive geographically than the State DMMP. The Federal DMMP encompasses all of the Baltimore Harbor and Channels project channels located in Virginia waters in addition to those located in Maryland waters. The Baltimore District’s DMMP includes an economic evaluation to determine the Federal interest in continued maintenance of the channels, which is not required in the State DMMP process. The Baltimore District’s DMMP addresses a wide range of dredged material placement alternatives, including some that may be prohibited by Maryland State law, to determine the appropriate Federal authorities for constructing and cost sharing dredged material placement sites. Because Federal actions require NEPA evaluation and a NEPA decision document, Baltimore District’s DMMP also includes a programmatic tiered EIS that addresses the placement alternatives and updates the NEPA documentation for dredging all of the Baltimore Harbor and Channels project channels.

The USACE - Baltimore District is an integral player in the State's program and has representatives on the State's Executive and Management Committees and working groups. The USACE has adopted the State DMMP process for the Baltimore District's DMMP, as well as for the PIERP Expansion Study and the Mid-Bay studies. The Baltimore District also attends and provides periodic briefings to the State's Citizens’ Advisory Committee and the Harbor Team. Dredging and dredged material management for the Chesapeake Bay and Baltimore Harbor Channels is a cooperative process that benefits from the involvement of key government and non-government stakeholders. The USACE - Baltimore District works closely with the State to integrate the two processes, share information, and prevent the duplication of effort. However, results from the State DMMP process cannot be used to justify Federal projects and are not legally sufficient to ensure compliance with environmental laws. This close coordination between the USACE - Baltimore District and the State has been essential in developing a comprehensive program for the Port of Baltimore, providing cost effective dredging and placement operations, and protecting, conserving, and restoring coastal resources.

Despite the differences outlined above, the outcomes of both the Federal and State DMMP processes recommended the development of multiple confined placement facilities for the management of Harbor dredged materials for the next 20 years. (USACE 2005, DMMP Management Committee 2004).

### 3.4.5 Harbor Team's Site Specific Recommendations

The results of the studies conducted since 1982 were a series of recommendations to the Executive Committee from the Harbor Team. All Harbor Team recommendations were evaluated by the multi-agency BEWG in order to identify significant environmental concerns and potential benefits. Along with general policy recommendations for the MPA to move toward increased management of dredged materials through innovative reuses (0.5 mcy annually by 2023), the Harbor Team recommended three placement options to carry to State feasibility-level study, each with one or more potential community enhancements (Harbor Team 2003). The following sections include the three options (Masonville, BP-Fairfield, and Sparrows Point) and their corresponding enhancements as described in Harbor Team (2003).

#### 3.4.5.1 Masonville

One DMCF project is proposed for a site adjacent to the existing Masonville Marine Terminal (MMT) in the Middle Branch of the Patapsco River in the City of Baltimore. As part of the project, community enhancement projects and compensatory mitigation projects are proposed for Masonville Cove, located immediately to the west of the proposed placement facility site. The MPA purchased the existing Masonville site in 1978 and also currently owns the property adjacent to Masonville Cove. The proposed project could be designed to create additional land (fastland) extending into the water along the northern shore of the existing MMT property using dredged material. This land area would have the potential use for a maritime, industrial, or commercial facility. The proposed Masonville Cove enhancement and mitigation project could restore wetlands, provide public access to the Cove, and enhance beach habitat. Masonville Cove is designated as a City of Baltimore Designated Habitat Protection Area (DHPA).

#### 3.4.5.2 BP-Fairfield

BP-Fairfield is a potential DMCF location. The proposed site is adjacent to the former BP Amoco Asphalt Terminal in Fairfield on Fishing Point, which is bordered by Curtis Bay on the southwestern side and the Patapsco River on the eastern and southeastern sides.

#### 3.4.5.3 Sparrows Point

The Harbor Team recommended that State and Federal agencies, Baltimore and Anne Arundel Counties, and local citizens work with Mittal Steel to develop a placement project at Sparrows Point in Baltimore County to create fastland on the southwestern portion of the peninsula. The facility would require a design that would minimize the loss of waterway space for recreational and commercial boaters and watermen. The Team also recommended that this project include necessary environmental cleanup in the area and contribute to the economic reuse of surplus International Steel Group (ISG) properties. As part of the Sparrows Point-ISG package, the Harbor Team suggested beneficial wetlands, shoreline stabilization, buffer creation, habitat restoration and water quality improvements on the southeastern portion of the peninsula. However, the Team recognizes that MPA will only be one of the funding partners necessary to implement this package, and that Baltimore County government and citizens along with the State and Federal government would need to pursue other funding sources.

## 3.5 EFFECTS AND COMPARISON OF ALTERNATIVES

### 3.5.1 Environmental Evaluation Criteria

The environmental evaluation criteria used to compare the three sites recommended by the Harbor Team were based upon the existing site conditions that were described in the ecological evaluations of the State feasibility-level studies for the individual sites (EA 2005a; 2005b; 2005c). The descriptions of existing conditions were based upon site-specific field investigations and other existing data at the sites. The criteria were chosen to reflect the environmental concerns expressed by the State DMMP groups, the BEWG, and the Harbor Team during the site ranking and selection processes from 2003 to the present. The Masonville, BP-Fairfield, and Sparrows Point sites were compared based upon the environmental and human-use parameters and criteria described in Table 3-7.

**Table 3-7. Environmental Evaluation Parameters and Criteria**

| Parameter | Criterion |
|---|---|
| **Water Quality** | - Current nutrient and turbidity conditions<br>- Potential for anoxia |
| **Sediment Quality** | - Exceedances of sediment quality criteria |
| **Fisheries** | - Abundances and numbers of species compared to controls and other Harbor sites |
| **EFH** | - Potential for presence of and utilization by Magnuson Stevens Fisheries Conservation Management Act species |
| **Fish Consumption Advisories** | - Current consumption advisories that are in place for fish and crabs taken near either site. |
| **Plankton** | - Composition of the plankton community near the site. |
| **Benthos** | - Chesapeake Bay Index of Biological Integrity at stations within the proposed footprint or near proposed enhancements. |
| **Submerged Aquatic Vegetation (SAV) and Shallow Water Habitat (SWH)** | - Presence of SAV and SWH (Tier II SAV habitat) within any areas proposed for site development |
| **Terrestrial Vegetation** | - Presence and species composition of terrestrial vegetation in areas that may be impacted by site construction and operation. |

| | |
|---|---|
| **Wetlands** | - Presence of tidal and non-tidal wetlands, including open water, in areas that may be impacted by site construction and operation. |
| **Birds and Other Wildlife** | - Presence of and utilization by terrestrial and aquatic wildlife that may be impacted by site construction and operation. |
| **RTE Species** | - Potential for presence of and utilization by State- and Federally-listed RTE species |
| **Commercial Fisheries** | - Potential for commercial fisheries/crab harvesting within and adjacent to the proposed project footprints |
| **Recreational Resources** | - Potential for recreational fisheries/crab harvesting and outdoor recreation within and adjacent to the proposed project footprints |
| **Groundwater** | - Current quality of groundwater at the site |
| **Aesthetics, Noise, and Light** | - Potential for impacts to the viewshed to nearby residences from site development/operation<br>- Potential for noise impacts from site development/operation<br>- Potential for light impacts from site development/operation |
| **CERCLA Liability** | - Current hazardous, toxic, and radioactive waste (HTRW) status of the site and potential for clean up liability if MPA develops site. |
| **Critical Areas** | - Percentage of site that lies within the critical area and acreage of the critical area due to site development |
| **Navigation** | - Proximity to Federal navigation channels<br>- Potential for impacts to navigation from site development and operations or increased recreational utilization |

Site-specific existing conditions field investigations were completed at all three sites and included collecting/documenting the following: water quality; sediment quality; fisheries; plankton; benthic community; SAV; terrestrial vegetation; wetlands; birds and other wildlife; rare, threatened, and endangered (RTE) species; and aesthetics. Water quality data included recording temperature, salinity, pH, and dissolved oxygen (DO) measurements seasonally and nutrient parameter analyses during at least one summer for each site. Surficial sediments were collected and tested for concentrations metals, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and other contaminants and compared to threshold effects levels (TEL) and probable effects levels (PEL) values, when applicable. Fisheries surveys included collecting fish through seining, gillnet sampling, and trawling at Masonville, Sparrows Point and BP-Fairfield and comparing those results with the results of fisheries surveys at the two Baltimore Harbor control sites, Thoms Cove and Sollers Point. Benthic invertebrates were collected and these samples were used to calculate the Chesapeake Bay Benthic Index of

Biological Integrity (B-IBI) values for each sample location at Masonville, Sparrows Point and BP-Fairfield. The B-IBI values were used to assess the health of the benthic community at Masonville, Sparrows Point and BP-Fairfield. Vegetation and wildlife surveys were completed on the upland area adjacent to the site. All observed species were recorded. Any RTE species found during site visits were recorded and the potential for transient use of the site by RTE species was also assessed. University of Maryland Center for Environmental Science (UMCES) also conducted viewshed and noise impact analyses based upon the proximity of residential receptors adjacent to the proposed sites.

Information on essential fish habitat (EFH) potential, SAV presence, SWH, fish consumption advisories; recreational resources; groundwater quality; hazardous, toxic and radioactive waste (HTRW) sites; Chesapeake Bay Critical Areas; and navigation were collected and analyzed for all sites (Table 3-7). This information and the data collected from the field studies were evaluated and compared for each of the three sites to determine which site would be more suitable for development based upon environmental criteria. The environmentally preferred alternative is generally the site that has the most environmentally degraded conditions or would have the least negative impact on the ecology and human use of the area. The preferred alternative considers all of the environmental characteristics of the site.

### 3.5.2 Evaluation Based on Environmental Criteria

The potential Masonville, Sparrows Point and BP-Fairfield sites were compared to each other based upon the ecological conditions recorded at each site. A summary of the comparisons as well as significant observations and conclusions are outlined in Table 3-8.

Ecologically, all of the sites had relatively poor terrestrial resources and few sensitive species or habitat issues. The Masonville area had the poorest aquatic resource conditions (benthic and sediment quality and fish utilization) relative to the other two sites. All of the sites provide some opportunity for cleanup and harbor improvement. However, there are significant opportunities for contaminant remediation within the proposed Masonville footprint and for ecological enhancements within the Cove. Development of DMCFs at Masonville, BP-Fairfield and Sparrows Point are ecologically feasible, and none of these sites should be excluded as a potential site for future dredged material management needs. However, several differences are apparent. Masonville, and BP-Fairfield lie within an area that is more likely to have time of year (TOY) construction restrictions for waterfowl and also lies closer to anadromous fish spawning areas. However, any TOY restrictions that may be applied (to either site) would be construction management issues and would not separate the sites ecologically.

Sediment quality and benthic conditions are somewhat more degraded at Masonville, which would tend to make this site more desirable for DMCF development. Due to the salinity regime and proximity to the mainstem of the Bay, the Sparrows Point facility supports higher abundances and diversities of fish in most seasons, and lies in an area that supports recreational harvesting. Commercial harvesting is also conducted near the site. Sparrows Point lies within an area of higher recreational boat and fishing use. For all of these reasons, the Masonville site is most desirable for DMCF site development, in the short-term, based upon ecological and human-use attributes.

**Table 3-8. Comparison of Environmental Characteristics at Sparrows Point and BP-Fairfield**

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Water Quality** | - DO ranged from 1.8 mg/L to 13.9 mg/L<br>- One sample from Summer 2003 was anoxic<br>- Salinity ranged from 0.67 parts per thousand (ppt) to 10.7 ppt<br>- Oligohaline conditions in the spring due to rainfall and run-off<br>- pH ranged from 7.3 to 9.2<br>- Turbidity ranged from 0 to 37 nephelometric turbidity unit (NTU)<br>- Mean nitrate concentration was 0.363 mg/L<br>- Mean phosphate concentration was 0.0031 mg/L<br>- Mean total suspended solids (TSS) concentration was 19.8 mg/L<br>- Mean chlorophyll a concentration was 31.93 µg/L | - DO ranged from 2.24 to 13.7 mg/L<br>- Salinity ranged from 5.1 to 8.9 ppt<br>- Typically a low mesohaline environment<br>- pH ranged from 7.28 to 7.8<br>- Turbidity ranged from 0 to 19.4 NTU<br>- Mean nitrate concentration was 0.275 mg/L<br>- Mean phosphate concentration was 0.0053 mg/L<br>- Mean TSS concentration was 12.3 mg/L<br>- Mean chlorophyll a concentration was 41.55 µg/L | - DO ranged from 5.1 to 9.6 mg/L<br>- Salinity ranged from 4.0 to 9.0 ppt<br>- Typically a low mesohaline environment<br>- pH ranged from 6.1 to 8.3<br>- Turbidity ranged from 2.9 to 16.4 NTU<br>- Mean nitrate concentration was 0.424 mg/L<br>- Mean phosphate concentration was 0.0029 mg/L<br>- Mean TSS concentration was 12.2 mg/L<br>- Mean chlorophyll a concentration was 29.34 µg/L |

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Sediment Quality** | - Concentrations of all metals at all sites are above the Threshold Effect Level (TEL,where some ecological effect may occur) , except cadmium at site S-B5. Concentrations of all metals at site S-B1 were above the Probable Effects Level (PEL, the level where ecological effects are likely to occur).<br>- Total PCBs (ND = ½ DL) exceed the PEL at S-B1 and S-B3 and exceed the TEL at all locations.<br>- Total PAHs [Non-detection (ND) = ½ Detection Limit (DL)] are nine times the PEL at S-B1 and thirteen times the PEL at S-B3. Total PAHs (ND = ½ DL) at S-B2 and S-B4 exceed the PEL and PAHs at S-B5 exceed the TEL<br>- Concentrations of dioxins at site S-B1 were three times higher than at the other sample locations | - All metals at BP-B2 and BP-B4 exceeded their TEL. The concentration of copper exceeded the TEL at BP-B3. Five metals at BP-B2 and six metals at BP-B4 exceeded their PEL.<br>- Total PCBs (ND = ½ DL) at BP-B2 exceeded the PEL and exceeded the TEL at BP-B4<br>- Total PAHs (ND = ½ DL) exceeded the TEL at BP-B2 and BP-B4<br>- 4,4'-DDT exceeded the PEL at BP-B2 and BP-B4. Concentrations of 4,4'-DDD, 4,4'-DDE, dieldrin, and gamma-BHC (lindane) exceeded the TEL at BP-B2 and BP-B4. | - Seven metals exceeded their TEL and seven additional metals exceeded PEL at most stations<br>- Total PCBs (ND = ½ DL) at exceeded the TEL at all locations and exceeded the PEL at 7 locations.<br>- Total PAHs (ND = ½ DL) exceeded the TEL value at all locations<br>- Concentrations of 4,4-DDT exceeded the TEL value at one station and pesticides elevated at most locations. |
| **Fisheries** | - 26 species from 16 families were collected | - 18 species from 11 families were collected | - 16 species from 10 families were collected<br>- More diversity found in Cove enhancement area. |
| **EFH** | - Bluefish and summer flounder were collected | - Bluefish and summer flounder were collected | - Bluefish and summer flounder were collected |

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Fish Consumption Advisories** | - American eel, channel catfish, common carp should be avoided because of pesticides and PCBs<br>- MDE recommends a maximum number of servings per year of Brown Bullhead from the Patapsco River because of PCBs and pesticides<br>- Blue crabs should be avoided because of PCBs<br>- Women and children should avoid consumption of white perch and there are recommended meals per year for men because of PCBs | - American eel, channel catfish, common carp should be avoided because of pesticides and PCBs<br>- MDE recommends a maximum number of servings per year of Brown Bullhead from the Patapsco River because of PCBs and pesticides<br>- Blue crabs should be avoided because of PCBs<br>- Women and children should avoid consumption of white perch and there are recommended meals per year for men because of PCBs | - American eel, channel catfish, common carp should be avoided because of pesticides and PCBs<br>- MDE recommends a maximum number of servings per year of Brown Bullhead from the Patapsco River because of PCBs and pesticides<br>- Blue crabs should be avoided because of PCBs<br>- Women and children should avoid consumption of white perch and there are recommended meals per year for men because of PCBs |
| **Plankton** | - Samples dominated by mud crab and fiddle crab zoea<br>- Moderate densities of copepods were collected | - Samples were dominated by crab zoea<br>- Moderate densities of copepods were collected | - Samples dominated by mud crab and fiddle crab zoea<br>- Moderate densities of copepods were collected |
| **Benthos** | - B-IBI scores ranged from 2.5 to 3.0<br>- B-IBI scores at the Sparrows Point enhancement stations ranged from 3.0 to 4.5 | - B-IBI scores ranged from 3.0 to 4.0 | - B-IBI scores ranged from 1.5 to 3.5 with degraded or severely degraded communities in most areas. |
| **SAV and SWH** | - No SAV has been found in the VIMS flyovers from 1994 to 2004<br>- 25 acres of SWH | - No SAV has been found in the VIMS flyovers from 1994 to 2004<br>- 19 acres of SWH | - 0.38 acres of SAV were found in KIM Channel and Masonville Cove<br>- 10 acres of SWH |
| **Terrestrial Vegetation** | - Little vegetation near the shoreline | - Little vegetation near shoreline, the area is mostly impervious surface | - Little vegetation along most of the shoreline. |

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Wetlands (excluding tidal open water)** | - No tidal or non-tidal wetlands exist adjacent to the proposed alignments | - Several former tank basins that retain water and may support water dependent species, including the common reed and cattail | - A 0.25 acre tidal and non-tidal swale would lose its tidal source. |
| **Birds and Other Wildlife** | - White-tailed deer was the only mammal observed<br>- 17 bird species were observed at the site<br>- There is likely to be other wildlife acclimated to an urban environment on-site | - 6 bird species were observed at the site<br>- No other wildlife was observed<br>- There is likely to be other wildlife acclimated to an urban environment on-site | - Bird utilization of most of site low, although Cove is Conservation Area.<br>- Signs of white-tailed deer were the only indication of mammal use.<br>- There is likely to be other wildlife acclimated to an urban environment on-site |
| **RTE Species** | - None observed at the site | - None observed at the site | - Eagles nesting in the Cove enhancement area, but the nest tree fell in 2005 |
| **Commercial Fisheries** | - Site lies near only area of the Patapsco estuary that is commercially harvested.<br>- A registered pound net lies just over one mile from the site.<br>- Some commercial crabbing (trotlining) may occur in the proposed wetland cell alignment and would be displaced | - Limited in the Patapsco River, only east of the Key Bridge<br>- One pound net registered in the Patapsco, seven miles away | - Limited in the Patapsco River, only east of the Key Bridge<br>- One pound net registered in the Patapsco, over eight miles away |
| **Recreational Resources** | - Recreational fishing and boating may be affected<br>- Recreational boaters would be forced to travel closer to the shipping channel | - Little recreational activity occurs near the site, impacts are expected to be minimal | - Little recreational activity occurs near the site, impacts are expected to be minimal |

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Groundwater** | - Contaminated with elevated levels of benzene, toluene, xylene, PCBs and several metals (including lead and mercury).<br>- No groundwater wells for potable water are located near the site | - Contaminated with benzene and bis(2-ethylhexyl)phthalate<br>- Groundwater not used for drinking water | - Contaminated with PAHs and chlorobenzene<br>- Groundwater not used for drinking water |
| **Aesthetics, Noise, and Light** | - Minimal aesthetic impacts<br>- Nearest residential parcel is 4,000 ft away, minimal noise impacts<br>- Minimal long-term lighting impacts | - Aesthetics would be consistent with the current view<br>- No residential parcels within one mile, noise impacts are expected to be minimal<br>- Minimal long-term lighting impacts | - Aesthetics would be consistent with the current view<br>- No residential parcels within one mile, noise impacts are expected to be minimal<br>- Minimal long-term lighting impacts |
| **CERCLA Liability** | - 11 potential hazardous waste sites in the vicinity<br>- The nearest NPL site is the Curtis Bay Coast Guard Yard over five miles away | - 17 potential hazardous waste sites in the vicinity<br>- Closest NPL site is the Curtis Bay Coast Guard Yard over two miles away<br>- BP-Fairfield is a formerly investigated site and no further remedial action planned site | - 19 potential hazardous waste sites in the vicinity<br>- Closest NPL site is the Curtis Bay Coast Guard Yard over two miles away |
| **Critical Areas** | - Located adjacent to the Chesapeake Bay Critical Area<br>- Is considered an IDA<br>- 0 acres in the critical area | - Located in the Chesapeake Bay Critical Area and portions of the site are within the Chesapeake Bay Critical Area Buffer<br>- Is considered an IDA<br>- 38 acres in the critical area | Located in the Chesapeake Bay Critical Area and portions of the site are within the Chesapeake Bay Critical Area Buffer<br>- Is considered an IDA<br>- 10 acres are within the critical area. |

| Characteristic | Sparrows Point | BP-Fairfield | Masonville |
|---|---|---|---|
| **Navigation** | - Located adjacent to the Brewerton Channel between the Coal Pier and Ore Pier Channels.<br>- Proposed dike is 750 feet from the Brewerton Channel<br>- May have an impact on Bear Creek and Old Road Bay access channels | - 1,000 ft from the Curtis Bay Channel and one mile from the Fort McHenry Channel | -1,000 ft from the Ferry Bar Channel |

### 3.5.3 Socioeconomic and Cultural Comparison

Screening of the socioeconomics and cultural constraints indicated that none of the sites had significant potential to cause negative impacts to these resources. Environmental Justice was considered in the screening of the three proposed Harbor sites. Masonville and BP-Fairfield are more removed from direct community access than some parts of the Sparrows Point site, and therefore, they would have less potential for adverse impacts related to aesthetics, noise, and light. Masonville, in particular, provides significant opportunities for ecological and community enhancements due to the integration of Masonville Cove into the site development plans.

### 3.5.4 Engineering Comparison

Engineering studies indicated that development at all three sites was feasible and that operational, dredging, and placement costs would be similar. However, the foundation conditions in some parts of the Sparrows Point site are poor, which would drive up both initial and dike construction costs. Some parts of the BP-Fairfield area may be equally costly to construct.

### 3.5.5 Other Factors

The current owners of BP-Fairfield and Sparrows Point sites have been open to working with the MPA. These sites could be developed through real estate acquisitions or land use agreements. The Masonville site is already owned by the MPA.

There are two State laws that would affect development of any DMCF in the Harbor. The first is a restriction on placing dredged material from within the Harbor in an unconfined manner anywhere within the Chesapeake Bay or its tributaries [Maryland Code Section 5-1102(a)]. This could potentially affect the ability to mine (borrow) dike building materials from beneath any of the sites. Although the law was written to preclude unconfined placement of Harbor dredged materials within the Bay, the definition is sufficiently broad as to potentially include any materials from within the Harbor, regardless of origin or quality. Clarification of this rule is currently being sought by MPA. Since it applies to all potential sites, this restriction does not serve to help screen out any of the three options.

The second rule precludes development of diked facilities within five miles of the HMI DMCF [Maryland Code Section 5-1103]. This statute would only apply to the Sparrows Point site and is considered a significant impediment to the potential development of that site in the near term.

### 3.5.6 Conclusions of Inter-Site Comparison

Studies to date have shown that development is feasible at all three sites. However, Masonville is the preferred option from an environmental and engineering perspective, and it meets the economic requirements of the MPA. The site is owned by MPA and it has the fewest constructability issues. Thus, Masonville is the preferred alternative for a placement facility by MPA in this permit application and DEIS.

## 3.6 OPPORTUNITIES ASSOCIATED WITH THE MASONVILLE DMCF

Within Baltimore Harbor, there is a history of environmental degradation due to past human inputs. Even with pollutant discharges improving over the past 30 years, there is a legacy of contaminants within the sediments of the Harbor. In some areas, the contaminant concentrations exceed the PEL and TEL, resulting in poor benthic (bottom dwelling) communities and degraded aquatic (in-water) habitat. Poor sediment quality also impacts water quality by making contaminants readily available for resuspension and dissolution. Sediments are an unchecked source of nutrients and contaminants that affect the total loadings (total amounts) of various constituents within a waterbody. The sediments located within the project area would be isolated from the Patapsco River within the proposed DMCF or the HMI DMCF (Chapter 4). Improvement of sediment quality by isolating contaminated sediment would have localized improvements to water quality. Improved water quality would have positive affects on the aquatic organisms living within the vicinity of the proposed alignment. Organisms, particularly fish and shellfish, living and feeding near the DMCF may have a lowered potential for contaminant accumulation, which also lowers the potential risk for consumption by humans.

The State of Maryland (through the MDE) has identified sediment contaminant reduction and cleanup as priority to the overall health of the Patapsco River (Beaman 2002).

Some of the methods typically used for sediment cleanup include isolating contaminants from the waterway by removal or capping. A key factor to the success of any sediment cleanup program is to stop or limit the source inputs. Current industrial users are held to strict waste handling and discharge limits, based upon State and Federal laws. However, legacy sources of contaminants from historically unregulated or illegal activities (such as illegal dumping of wastes) still exist within Baltimore Harbor. Remediation and cleanup of these sources remaining from pervious use is critical to the successful cleanup of Baltimore Harbor.

Key to the success of any cleanup and recovery program is the participation of local stakeholders. Engaging stakeholders in all stages of a recovery program (planning, cleanup, and long-term maintenance) facilitates both current community investment in any action plan as well as community stewardship in the long-term. Public outreach, or efforts to engage the general public, initiates stakeholder involvement, while continued environmental education promotes and ensures long-term stewardship. Projects throughout Baltimore utilize education programs to bring the issues of Harbor cleanup and stewardship into communities.

## 3.7 MASONVILLE ALTERNATIVES ANALYSIS

This section presents the Masonville site alternatives evaluated at a State feasibility-level to determine a recommended plan. This section describes the history of the alignment selection for the Masonville site, the development of the alternatives evaluated, the alternatives and their design costs and characteristics, and the comparison of the Masonville alternatives. These characteristics include geotechnically unsuitable foundations for construction and borrow (construction) material. The foundation for construction must be able to support the proposed facility and provide an acceptable base for construction, or it is considered to be unsuitable for construction and may be referred to as a poor foundation.

The State feasibility-level costs, quantities, capacities, containment structure cross-sections, and site plans presented in this section were used to select a plan for the Masonville DMCF. Following selection of a plan, further studies beyond the State feasibility-level were performed to refine the plan. Thus, the values and figures describing the site in this section differ from those in Chapter 4, which describes the recommended plan.

### 3.7.1 Alignment History

After selection as a potential DMCF site, three levels of site investigations were performed on the Masonville site prior to the State feasibility-level study. The alignments from each these three phases are discussed in the first part of this section: Conceptual Alignments (CA), Reconnaissance Alignment (RA), and Pre-Feasibility Alignments (PFA).

The three Final Feasibility Alignments (FFA) 1, 2, and 3 are evaluated in the State feasibility-level study and alternatives analysis presented in this section. The process from the CA through the FFA is shown in Figure 3-5.

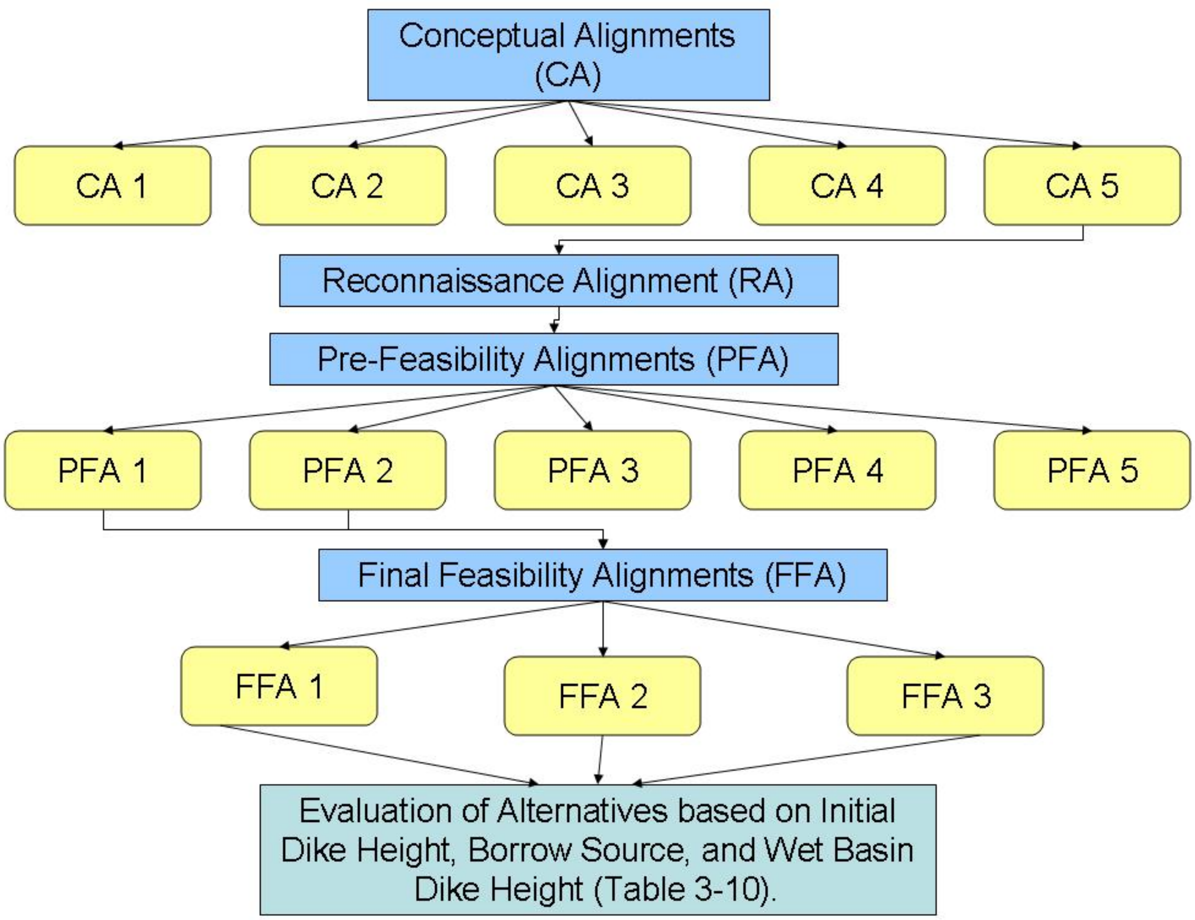



**Figure 3-5. Screening of Masonville DMCF Alignments**

#### 3.7.1.1 Conceptual Alignments (CA)

Prior to its acquisition by MPA in 1978, Masonville was used first for sand and gravel mining, and then later used as a dredged material placement site by the Arundel Corporation. Initially, MPA continued to use the site for dredged material disposal. The last material was deposited at Masonville in 1989. In addition to dredged material from the Baltimore Harbor, the site was also used for the disposal of building and ship debris, sand and gravel mining tailings, and incinerator waste.

Expanding the Masonville dredged material containment site was first discussed as a Harbor placement option on the short-list of options presented in the Port of Baltimore Dredged Material Management Master Plan (MPA 1989). In the Master Plan, the suggested action for the Masonville site was to modify and expand the existing terminal site for fastland creation.

The list presented in the 1989 Master Plan was later reviewed and screened by the Harbor Team. The Harbor Team, a collaboration of stakeholders in Port dredging activities, was appointed by the Management Committee to recommend options capable of managing 1.5 mcy of dredged material annually for 20 years for further study. As part of the Harbor Team site screening and conceptual development process, five conceptual alignments (Figure 3-6) were developed for the Masonville site. These alignments were developed in 2002 and early 2003 through a review of existing data, while considering and balancing the following objectives:

- Avoid encroaching on valuable aquatic habitats,
- Confine existing contaminated areas,
- Do not encroach on navigational channels,
- Maximize footprint for placement needs,
- Avoid areas with poor foundation, and
- Encompass areas where sand borrow is available.

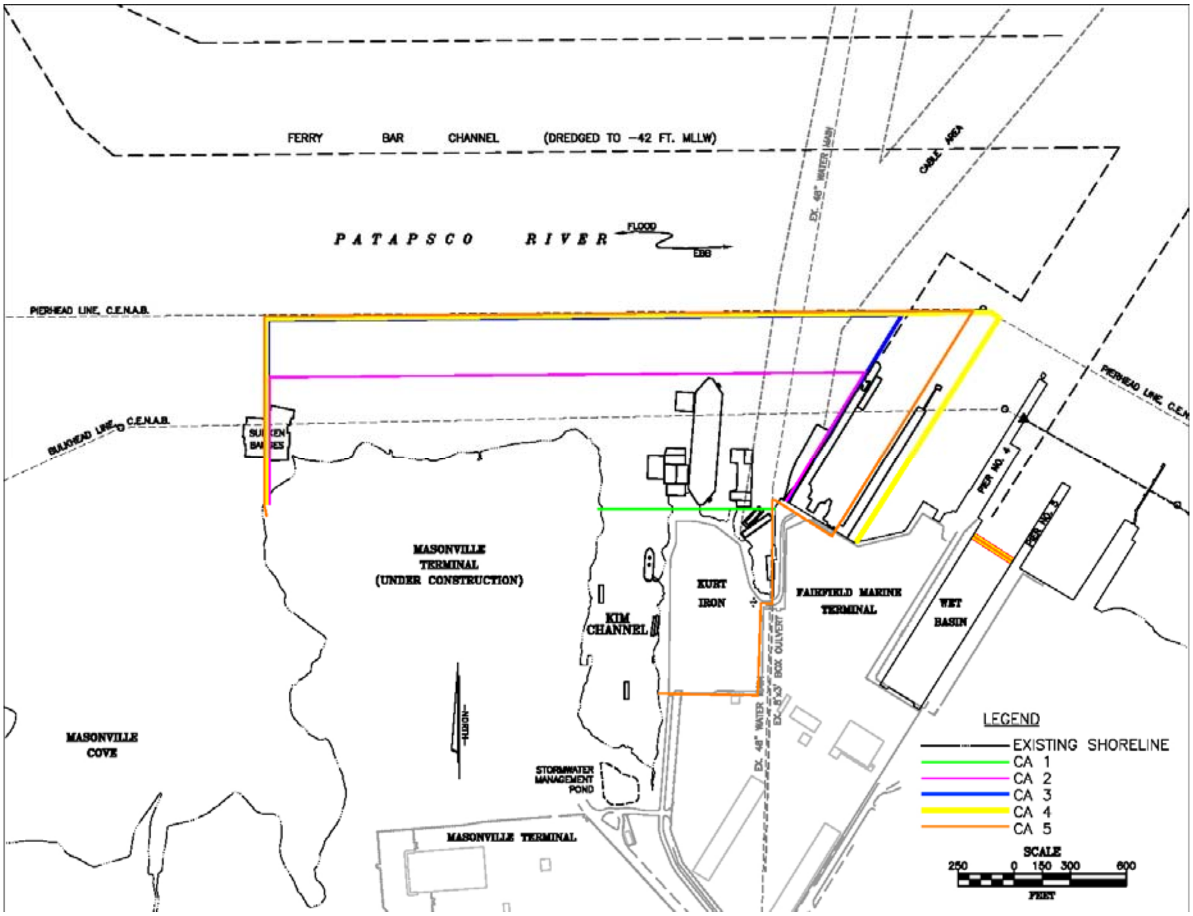


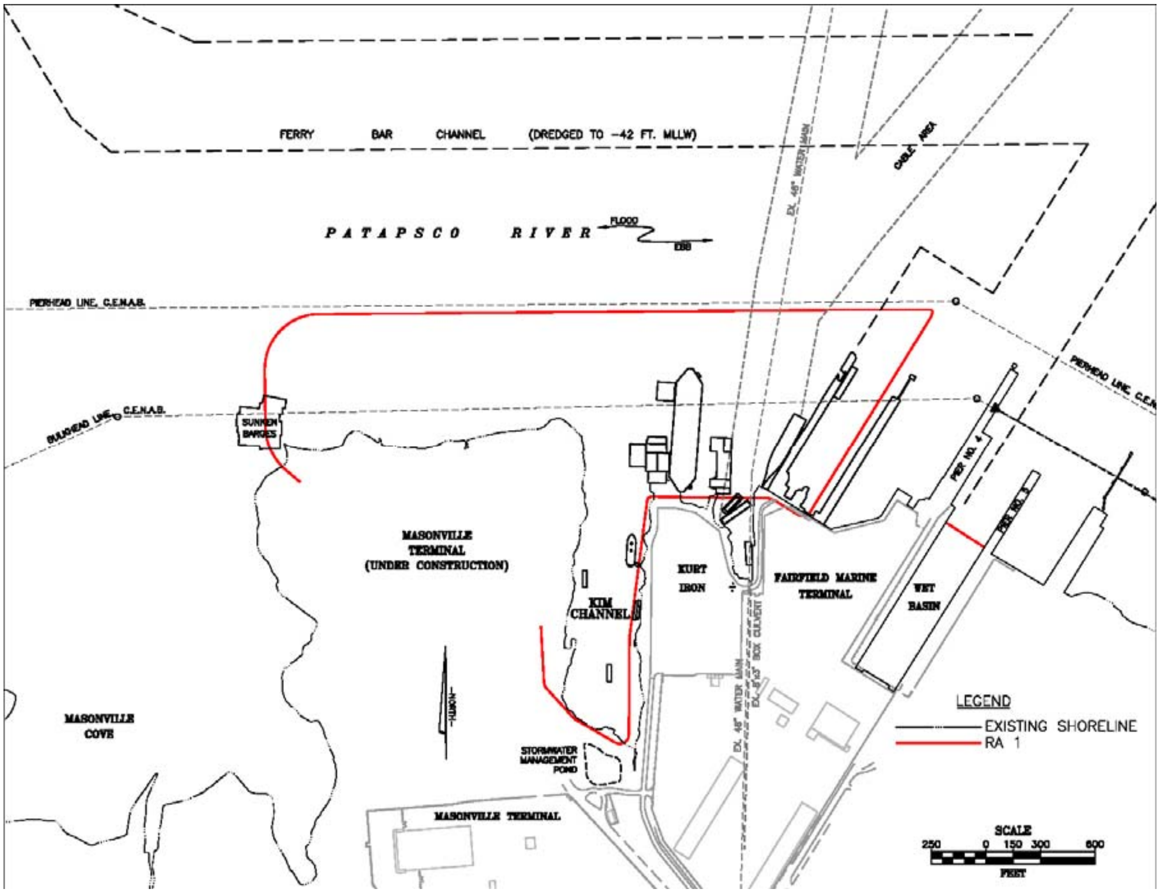

**Figure 3-6. Masonville Conceptual Alignments (CA)**

The five conceptual alignments shown in Figure 3-6 are described as follows:

- CA 1 allows for filling the two existing inlets and encloses nine acres.
- CA 2 establishes its northern perimeter (center of dike) halfway between the USACE bulkhead line and pierhead line, extends to the west side of existing Pier No.1, and encloses 37 acres.
- The perimeter of CA 3 is at the USACE pierhead line and west of Pier No. 1 and encloses 58 acres.
- CA 4 follows the pierhead line, extends to the east side of existing Pier No.3 and encloses 71 acres.
- CA 5 also runs along the pierhead line but uses a cofferdam bulkhead west of Pier No. 3, enclosing approximately 87 acres. Alignment CA 5 also closes off the Wet Basin between Piers 4 and 5. The material for filling the Wet Basin would be excavated from within the Masonville DMCF and placed into the Wet Basin.

### 3.7.1.2 Reconnaissance Alignment (RA)

The reconnaissance alignment examined in the Masonville Reconnaissance Study was a modification of Alignment CA 5 recommended by the Harbor Team, and is displayed in Figure 3-7.




*Source: EA 2003*

**Figure 3-7. Masonville Reconnaissance Alignment RA**

The recommendation of the reconnaissance study was to continue study of the RA, shown in Figure 3-6, through the State feasibility-level study. Between the time of the recommendation and the beginning of the State feasibility-level report, it was discovered through discussions with the USACE, the Coast Guard, and the Bay Pilots that the perimeter dike could be pushed outboard of the Pierhead Line. Therefore, a new alignment, PFA 2 (Figure 3-8 and Section 3.7.1.3), was developed by moving the northern boundary of the site (toe of placement dike) to within 250 ft of the top of slope of the Ferry Bar Channel.

### 3.7.1.3 Pre-Feasibility Alignments (PFA)

Borings drilled along the PFA 2 encountered thick deposits of soft silts and clays in the northeast corner of the Masonville site. Therefore, three new alignments avoiding the northeast corner were developed. To maintain the annual placement capacity supported by PFA 2, two of the new alignments were extended to the west, just north of Masonville Cove. PFA 2 and four new expanded alignments were renumbered to make up five PFAs considered in this study. The five PFAs are displayed in Figure 3-8. Each of the alignments includes the Wet Basin between Piers No. 4 and 5.

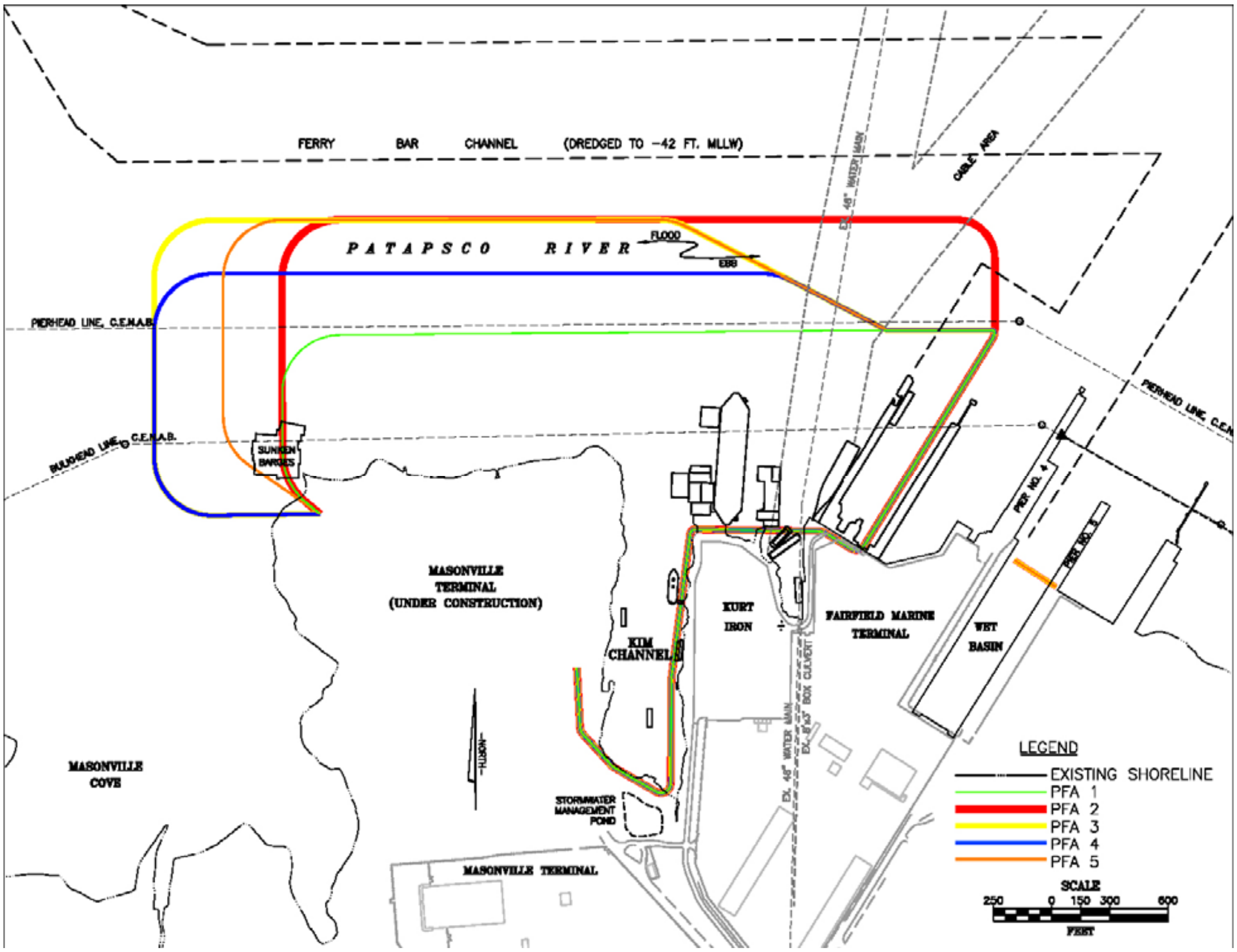



**Figure 3-8. Masonville Pre-Feasibility Alignments (PFA)**

The five PFAs are shown in Figure 3-8 and described as follows:

- PFA 1 was the recommended alignment from the reconnaissance level study and contains 82 acres.

- PFA 2 lies just west of Pier No. 3 and extends from the Fairfield Marine Terminal to the 250 ft boundary from the toe of the Ferry Bar Channel. The alignment follows the 250 ft boundary to the eastern edge of Masonville Cove, where it turns south to meet the shoreline of the existing MMT. This alignment would contain 130 acres.

- PFA 3 also runs west of Pier No. 3, extends to the pierhead line, and follows the pierhead line west. The alignment then extends, with an armored sand dike, at an angle to within 250 ft of the Ferry Bar Channel. This angle is followed in order to avoid areas with deep unsuitable foundations. The alignment follows this boundary beyond the extent of the Masonville terminal, turns south until it meets Masonville Cove, and then turns east to meet the shoreline of the Masonville terminal. This alignment would contain 145 acres.

- PFA 4 follows PFA 3 until it reaches an intermediate boundary between PFA 1 and 2, where it follows this boundary until it meets Alignment 3 and would contain 123 acres.
- PFA 5 follows PFA 3, but extends only 300 ft west along the 250 ft Ferry Bar Channel boundary and would contain 130 acres.

#### 3.7.1.4 Final Feasibility Alignments (FFA)

During the initial phase of the State feasibility-level study, the five PFAs were presented at a meeting with the Baltimore City Department of Planning and the Brooklyn-Curtis Bay Coalition on May 19, 2004. Objections to PFA 3 and PFA 4 were voiced, due to their proximity to the Masonville Cove entrance. Further discussions on these alignments were held with the Brooklyn-Curtis Bay Coalition on August 18, 2004 and September 20, 2004. PFA 3 and PFA 4 were eliminated from further study, due to public perception of environmental concerns. PFA 2 was eliminated from study based on high construction cost estimates because deep unsuitable foundation conditions existed in the northeast corner of the alignment.

The remaining alignments were then renumbered and became FFAs. PFA 1 became FFA 1 and PFA 5 became FFA 2 (Figure 3-9). Another alignment, FFA 3, was added to the study as a compromise between the two alignments as shown in Figure 3-8. FFA 3 follows FFA 2 towards the Ferry Bar Channel, but turns to meet up with FFA 1 as FFA 2 continues west. The final three Masonville State feasibility-level study alignments are FFA 1, FFA 2, and FFA 3.

These final three alignments (FFA 1, 2, and 3) are the product of the extensive evaluation process described in this section. State feasibility-level site evaluations and cost estimates were performed on the three feasibility alignments.

### 3.7.2 Development of MPA's Masonville Feasibility Study Alternatives

Alternatives were developed from proposed site alignments with the following elements defined:

- Type of containment structure,
- Containment structure elevation (in particular initial elevation),
- Future raising plan for containment structure,
- Means of obtaining materials for containment structure (borrow source), and
- Means of disposing of geotechnically unsuitable material that underlies the containment structure and covers onsite borrow sources (overburden removal).

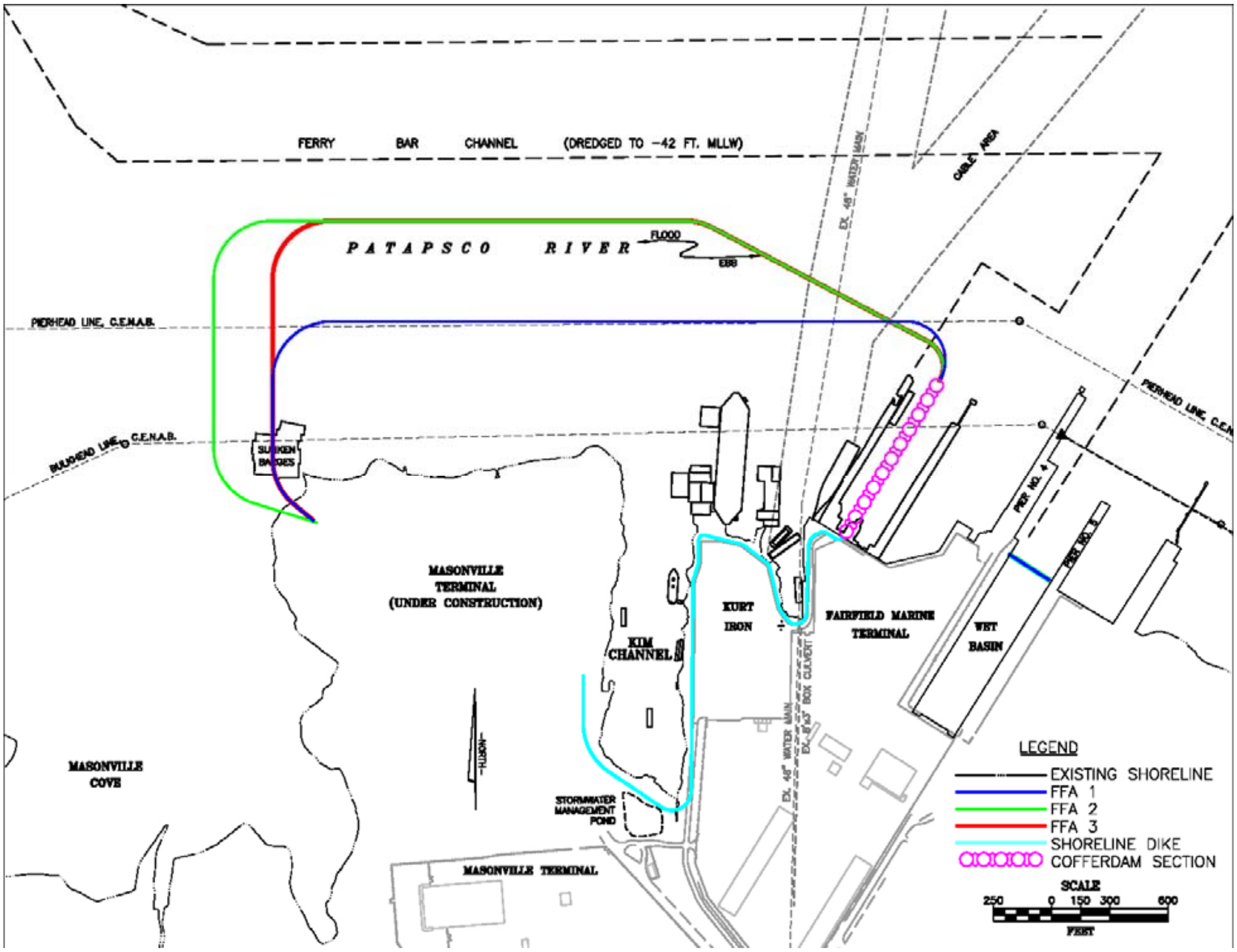



**Figure 3-9 Masonville Final Feasibility Alignments (FFA)**

### 3.7.2.1 Type of Containment Structure

Typically, in-water containment structures are sand dikes protected by rock armoring. The sand can be placed by either hydraulic or mechanical methods. Dike slopes are determined by geotechnical and coastal protection considerations. Stiff clays have also been used to construct dikes.

The long-term development plan proposes a wharf structure along the margin of the east boundary of the site. Existing water depths in this area are fairly deep, varying from 35 to 45 ft in depth. The surface soils are 10 to 15 ft of soft silty clays. Cellular steel cofferdams, 69 ft in diameter, were selected as the containment structure in the Reconnaissance Study. A rock dike is evaluated as another potential retention structure at the State feasibility-level.

### 3.7.2.2 Containment Structure Elevations

The crest elevations of the containment structures are a function of the final grading of the site after filling is completed. Proposed surface elevations for the existing land vary from + 9 ft mean lower low water (MLLW) at the former KIM facility to +36 ft MLLW at MMT Phase 2. Since one of the primary objectives of this project is to optimize capacity, an average post-fill elevation of +36 ft

MLLW has been selected within the proposed Masonville DMCF, except along the marginal wharf. The proposed final grade along the wharf containment structure is +9 to +10 ft MLLW.

The final height of the dike is established by adding a freeboard requirement, the mandatory height that must be kept between the top of the dredged material and surface water to allow for rainfall without overtopping the containment structure, to the final site elevation (+36 ft MLLW) plus any anticipated consolidation after the last lift. For this study, a freeboard of 2 ft has been selected based on experience at HMI. Consolidation settlements are a function of placed material type, subsoil type, method of placement, lift thickness, and site management practices. For this study, a consolidation estimate of 3 ft has been assumed after placement of the last lift. An allowance is also required to account for slopes of the material across the site. For this site, an allowance of 1 ft is used. Therefore, the proposed top of dike elevation is +42 ft MLLW. This elevation is temporary and the site will be graded to +36 ft MLLW. This number was obtained by adding the final site elevation, the freeboard requirement, the consolidation estimate, and the allowance together. This is shown in the equation below:

| | |
|---|---|
| Final Site Elevation: | +36 ft MLLW |
| Freeboard Requirement | 2 ft |
| Consolidation Estimate | 3 ft |
| Allowance | + 1 ft |
| Temporary Top of Dike Elevation | +42 ft MLLW |

The initial elevation selected would impact the geometry of the containment structure and ultimately site capacity. Three elevations for initial dike construction were considered: +10, +20, and +36 ft MLLW. Incremental construction to a temporary height of +42 ft MLLW and grading to a final site elevation of +36 ft MLLW would occur for each of the initial elevations.

### 3.7.2.3 Incremental Dike Construction Plan

It is anticipated that dikes would be raised during dredged material placement by constructing an inboard berm using either common borrow or dried dredged material. The final elevation of the dike raisings is anticipated to be +36 ft MLLW. The dikes will be temporarily raised to +42 ft MLLW and graded to the final elevation of +36 ft MLLW. The raising of the dikes would be done in phases of varying sizes depending on the initial dike elevation, projected placement needs, and available onsite construction materials.

### 3.7.2.4 Borrow Source

The proximity to the site of the source(s) of borrow for construction of the armored dikes is a significant factor in determining construction methods, schedules, and costs as well as site capacity. Sand with a fines content of less than 30 percent is the preferred borrow material for dike construction. Where the availability of sand is limited, stiff clays may also be used as borrow for dike construction.

Figure 3-10 shows the plan location of the borrow areas inside the dikes. The size of the borrow area depends on the selected dike alignment. Sections A, B, and C taken from Figure 3-10 depict the subsurface strata within the borrow area as shown in Figure 3-11. Stratum I is the soft silts and clays, which are geotechnically unsuitable material. Stratum II is comprised of medium dense to dense sands, and Stratum III is comprised of stiff to hard clay. Stratums II and III are layers that are suitable borrow materials. In calculating borrow quantities, an elevation of -60 ft MLLW is assumed as the limiting depth of excavation.

### 3.7.2.5 Overburden Removal

Soft silts and clays (Stratum I), frequently overlie the onsite borrow source. These materials must be stripped off to expose the borrow source and then disposed of. In addition, the soft silts and clays must be excavated below the footprint of the containment structure and disposed of in an appropriate facility.

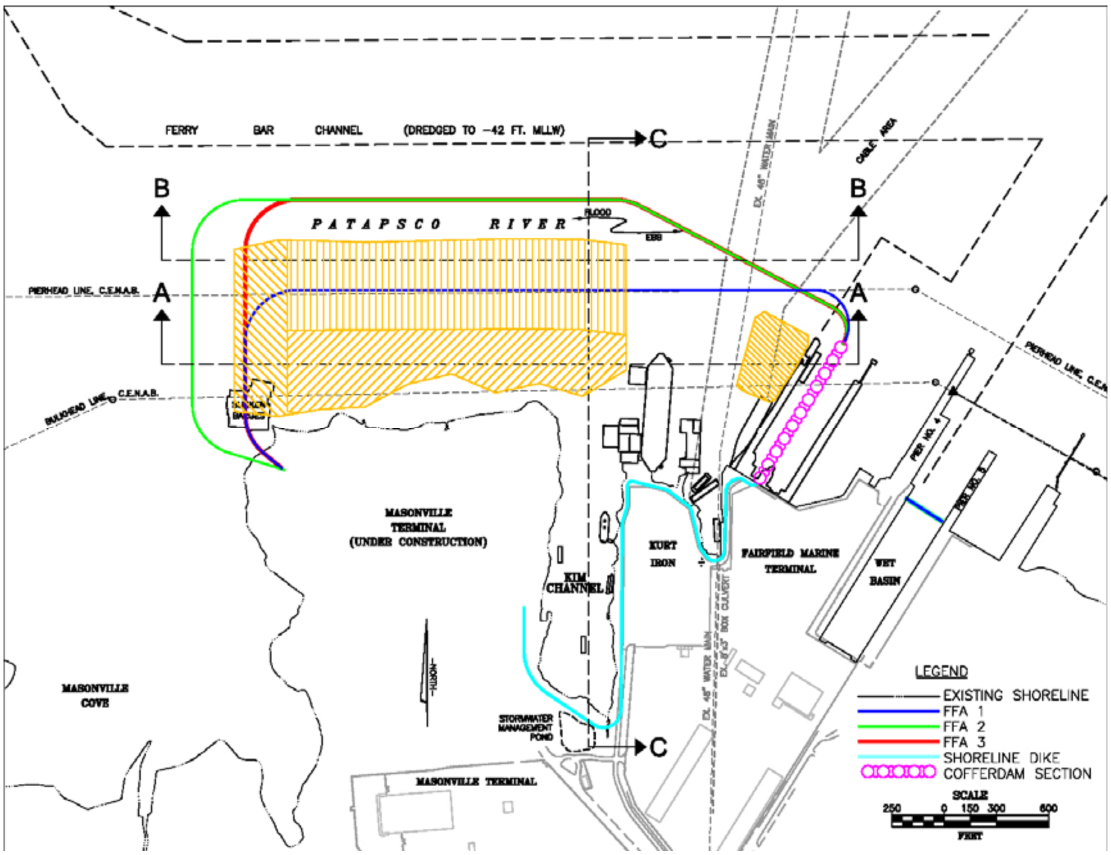



**Figure 3-10. Containment Structure Segments and Onsite Borrow Areas**

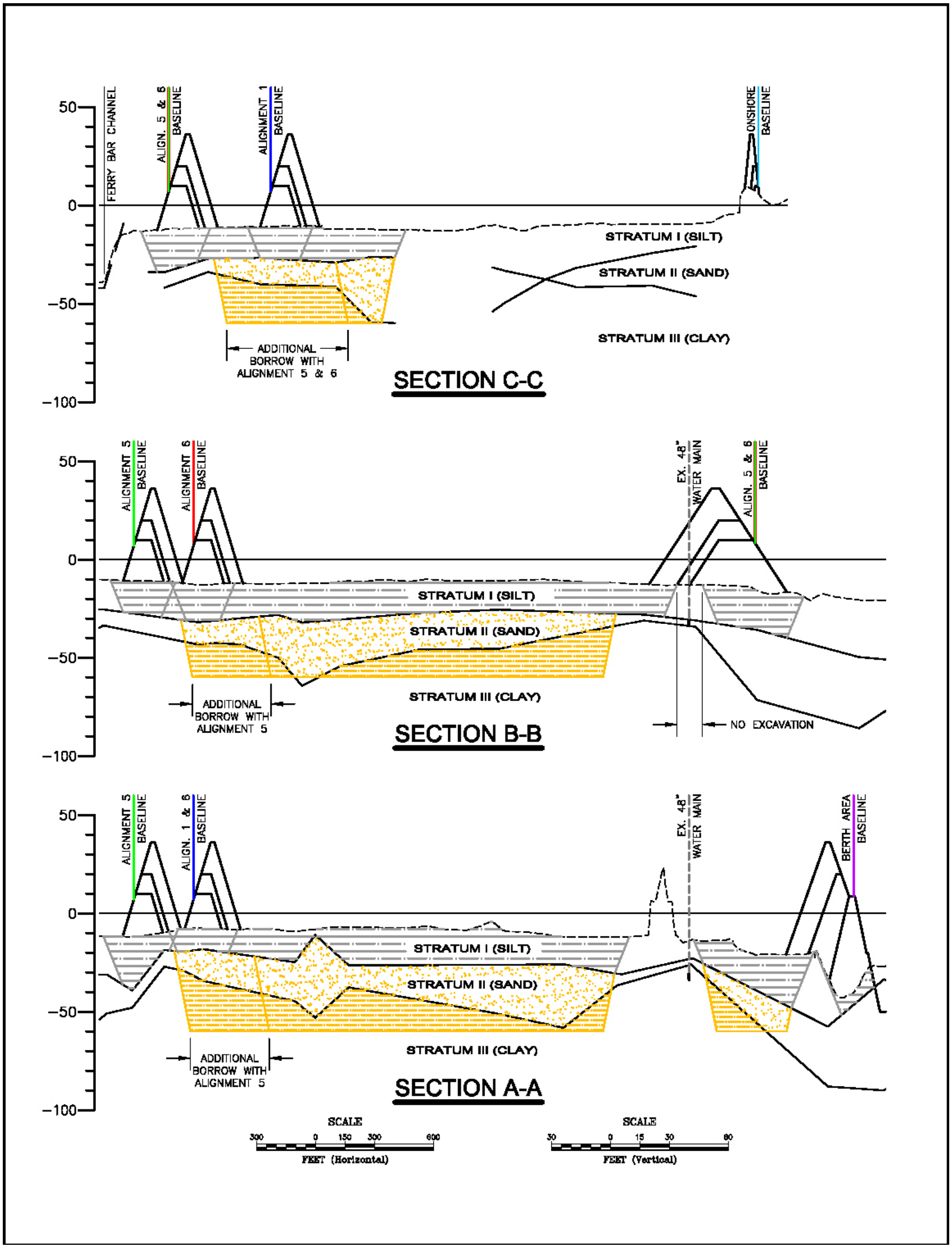



**Figure 3-11. Borrow Area Sections**

### 3.7.3 Masonville Alternatives

This section describes the alternatives analyzed at the State feasibility-level for the Masonville DMCF and presents the containment structure cross-sections, site characteristics, and costs for each alternative.

Eighteen alternatives exist for the Masonville DMCF based on the aspects discussed above in Section 3.7.2. The combination of dike alignment, initial dike elevation, and berth containment structure type defines an alternative. Three specific alignments (FFAs 1, 2, and 3), three initial dike elevations (10, 20, and 36 ft MLLW), and two structures (cofferdam and rock dike) forming the berth area combined to make 18 study alternatives. The alternatives are evaluated under four dredging scenarios. This method allows not only the best alternative to be selected, but also the best dredging scenario to be identified.

#### 3.7.3.1 Borrow Material and Overburden Dredging Scenarios

This section describes the advantages and disadvantages of onsite and offsite borrow. Further, this section presents four scenarios aimed at highlighting these pros and cons to allow selection of the preferred dredging methods.

***Borrow Source***

Borrow can be obtained from either onsite sources, offsite sources, or a combination of both. An extensive geotechnical exploration identified potential sources of onsite borrow material. Figure 3-10 shows the general location of the onsite borrow. The choice of a borrow site directly influences construction methods and costs, site capacity, and resource utilization.

The general issues necessary for consideration when determining the optimal borrow source for the project are: 1) use of an onsite source would increase site placement capacity and is cost effective, but requires stripping off a thick layer of overburden, and 2) use of offsite borrow incurs a higher cost and effectively covers a borrow resource, but may require less stripping and disposal of overburden.

***Overburden Dredging***

Overburden material would be removed in the area of the proposed containment structure and over an onsite borrow source. This material may be disposed of onsite or offsite. Placement of overburden material onsite reduces site capacity and causes difficulty in scheduling construction, as well as expensive construction waiting periods and delays. Offsite placement of unsuitable material requires valuable placement capacity at an existing Harbor site.

***Scenarios for Borrow Source, Overburden Dredging***

Four dredging scenarios for obtaining borrow material from dike construction are described below. Each scenario describes whether an on-site borrow source or off-site borrow source would be used. If an on-site borrow source would be used under a scenario, the scenario describes the amount of borrow material that would be used from on-site and where the geotechnically unsuitable borrow materials covering the on-site borrow source would be permanently placed. These scenarios were evaluated to determine the most advantageous construction methods and borrow sources. These borrow scenarios are not included in the 18 alternatives analyzed. There may be up to 18 possible alternatives for each borrow scenario. The borrow scenarios are described as Scenarios A through D in more detail below:

- **Scenario A –** The maximum amount of on-site borrow material available would be used in the construction of the dikes. The geotechnically unsuitable borrow material (overburden) would be placed off-site at HMI DMCF. A licensed off-site borrow source approved for in-water placement would be used for construction of the cofferdam cells. If on-site borrow material is insufficient to meet construction needs, an additional licensed off-site upland source approved for in-water placement would be used. If the off-site source was not already approved for in-water placement, testing would be done to obtain that approval prior to use of the off-site borrow source.

- **Scenario B –** The maximum amount of on-site borrow material available would be used in the construction of the dikes. The geotechnically unsuitable borrow material (overburden) would be placed both on-site and off-site at HMI DMCF. A licensed off-site borrow source approved for in-water placement would be used for construction of the cofferdam cells. If on-site borrow material is insufficient to meet construction needs, an additional licensed off-site upland source approved for in-water placement would be used. If the off-site source was not already approved for in-water placement, testing would be done to obtain that approval prior to use of the off-site borrow source.

- **Scenario C –** The maximum amount of on-site borrow material available would be used in the construction of the dikes. The geotechnically unsuitable borrow material (overburden) would be placed on-site. A licensed off-site borrow source approved for in-water placement would be used for construction of the cofferdam cells. If on-site borrow material is insufficient to meet construction needs, an additional licensed off-site upland source approved for in-water placement would be used. If the off-site source was not already approved for in-water placement, testing would be done to obtain that approval prior to use of the off-site borrow source.

- **Scenario D –** The borrow material would be obtained from a licensed off-site upland source approved for in-water placement. If the off-site source was not already approved for in-water placement, testing would be done to obtain that approval prior to use of the off-site borrow source. Unsuitable construction materials would be disposed of at HMI.

Construction methods and sequencing for the above scenarios are provided in Appendix F. For each of these scenarios, off-site borrow would be used to construct the landside dike and to fill the cofferdams (some alternatives do not include cofferdams). The off-site borrow material required for these activities would be approximately 152,000 cy. Current estimates indicate that maximizing onsite borrow may provide enough material to meet the remainder of the construction material needs, if a scenario using on-site borrow were to be selected.

***Scenario Advantages and Disadvantages***

The advantages of the borrow scenarios are described in Table 3-9. Scenario A provides ease of construction through the placement of overburden offsite and allows for onsite borrow, which reduces transportation costs, utilizes a valuable borrow resource, and increases site capacity. Scenario A requires availability of an offsite Harbor placement.

Scenario B puts less of a strain on the existing Harbor placement options by handling approximately 40 percent of the overburden onsite. This scenario also provides the benefits of onsite borrow, but creates construction waiting periods and construction efficiency issues. This, however, reduces available long-term capacity for Harbor derived dredged materials. Material can only be placed at HMI for a limited time. If available capacity is not used by December 31, 2009 then it is no longer available. By maximizing use of HMI prior to that date, overall placement capacity is increased.

Scenario C provides no influx of material to an already stretched existing Harbor placement capacity. However, this scenario results in longer construction times, higher construction costs (vary based on scenario, each scenario's cost is outline in Appendix F), and the potential for claims. The potential for claims arises from tight scheduling required to place overburden in the excavated borrow area and potential issues with separating borrow and overburden placed onsite. Tight scheduling makes the job prone to claim situations where the contractor may ask for money to cover equipment standby costs or other issues. Should no Harbor placement capacity be available for the Masonville overburden, this scenario may be required. This also reduces the available long-term capacity of the site.

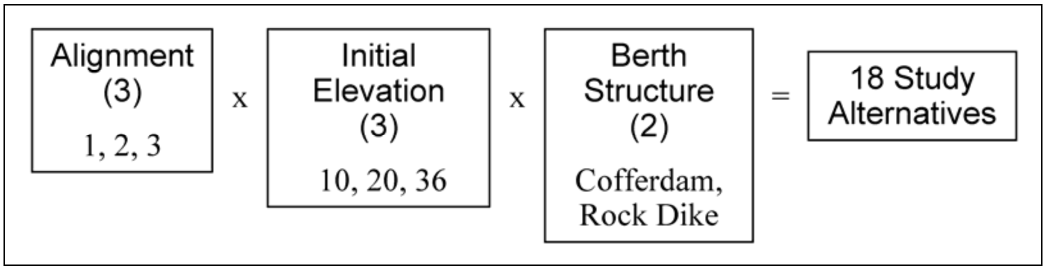
Scenario D provides ease of construction through offsite overburden placement and use of an accessible offsite borrow source. In this scenario, the overburden is excavated only from underneath the containment structure (dike). No on-site borrow would be used. This scenario does not provide the capacity benefit of onsite borrow, and effectively covers up a borrow resource.

**Table 3-9. Advantages and Disadvantages of Scenarios A, B, C, and D**

| | Advantages | Disadvantages |
|---|---|---|
| Scenario A | • Meets time requirements for Harbor need.<br>• Highest capacities for the lowest initial cost (and lowest final unit cost).<br>• Utilizes onsite borrow resource.<br>• Flexibility for contracts and construction scheduling. | • Requires placement capacity at HMI |
| Scenario B | • Meets time requirement for Harbor need.<br>• Has a low unit cost.<br>• Requires less Harbor placement capacity at HMI than Scenario A<br>• Utilizes onsite borrow resource. | • Potential risk of contractual issues and construction scheduling problems. |
| Scenario C | • Requires no Harbor placement capacity at HMI.<br>• Utilizes onsite borrow source. | • Does not meet the date available required for Harbor need.<br>• By far the highest initial cost and final unit cost.<br>• High risk for contractual issues and construction scheduling problems. |
| Scenario D | • Meets time requirement for Harbor need.<br>• Requires less Harbor placement capacity at HMI.<br>• Provides option if onsite borrow is found to be less extensive than anticipated. | • Initial costs and final unit costs are relatively high.<br>• Does not utilize the valuable borrow resource at the Masonville site. |

### 3.7.3.2 Study Alternatives

The combination of dike alignment area, initial dike elevation, and berth containment structure type defines an alternative. At the onset of this State feasibility-level study, three specific alignments, three initial dike elevations, and two structures forming the berth area combined to make 18 study alternatives. Two of the alignments were eliminated, due to community opposition, and one was eliminated due to a cost and foundation issue. Thus, the three remaining alignments combined with the potential site characteristics to form eighteen State feasibility-level study alternatives (Figure 3-12).




*Note: Each of the boxes that are multiplied together contain an aspect of an alternative. The number in parentheses is the number of options for each aspect. The options for each aspect are listed in the boxes. Multiplying the number of options for each aspect together yields a total of 18 study alternatives.*

**Figure 3-12. Potential Study Alternatives**

The alternatives were evaluated under the four borrow scenarios to allow determination of not only the best alternative, but also the optimal borrow source and overburden placement location.

Several alternatives are immediately eliminated from consideration under specific borrow and overburden placement scenarios. These are alternatives for Scenarios A, B, and C where either FFA 1 or a +36 ft MLLW dike are utilized

Figure 3-13 displays the 18 alternatives examined in this study and the borrow source and overburden placement scenarios under which they were evaluated.

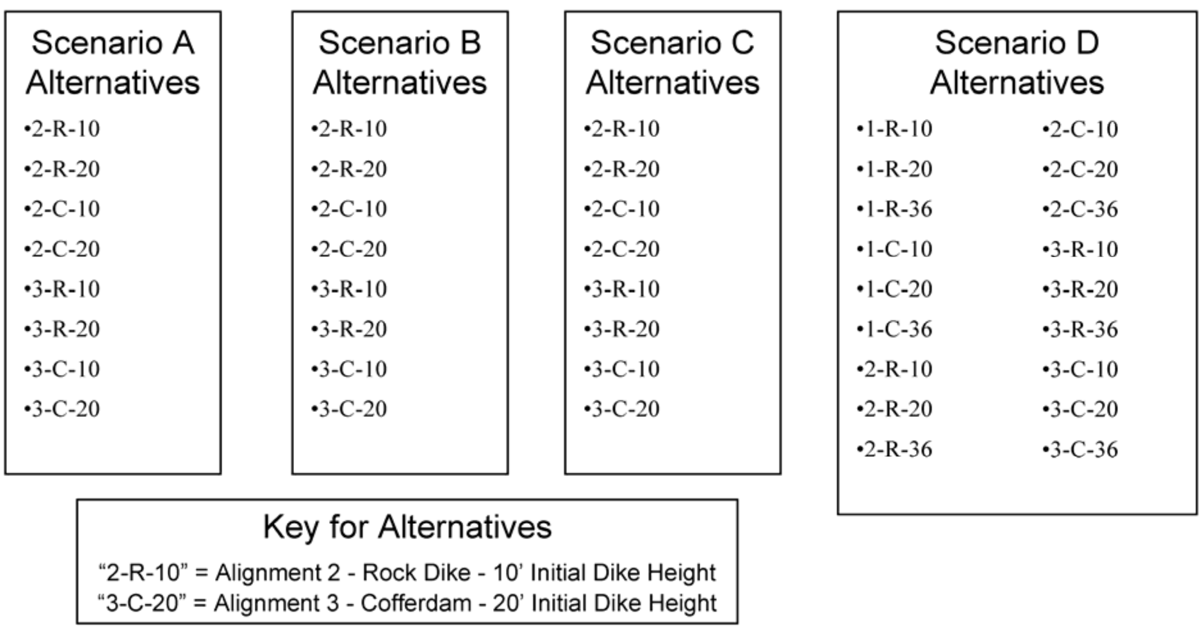



**Figure 3-13. Alternatives Evaluated Under Each Scenario**

*Notes: The alternatives presented are the 18 alternatives that were evaluated in the Masonville alternatives analysis. The names of the alternatives are indicative of the study aspects making up each alternative. For example, alternative "2"-"R"-"10" indicates that the following study aspects of which they consist: "Alignment 2" - "Rock Dike berth area" – "Initial dike elevation of +10 ft MLLW".*

### 3.7.4 Site Design

State feasibility-level design of the Masonville site is based on recommendations of the reconnaissance- and conceptual-level studies, as well as the existing conditions discussed in Chapter 2. The following section provides a discussion of the factors considered in design, presentation of the site layouts, discussion and presentation of the containment structure, and the site characteristics for each alternative.

#### 3.7.4.1 Design Considerations and Site Layout

Input from the various stakeholder and citizens' groups was considered in taking the dike alignments developed during the reconnaissance study to the next level. The following design considerations were then taken into account to adapt the alternate dike alignments to the specific site conditions and to develop design aspects:

- **Substantial Deposits of Soft Silty Clays –** The reconnaissance-level dike alignments were modified to avoid areas where the thickness of the very soft silty clays (Stratum I) exceeded 15 ft. At this thickness, the cost for pre-dredging and backfilling with sand borrow begins to exceed the benefit of realizing additional site capacity.

- **Removal of Overburden –** Stratum I soils must be removed below the containment structures and in the borrow excavation areas to expose onsite borrow. There are several different scenarios for disposing of overburden.

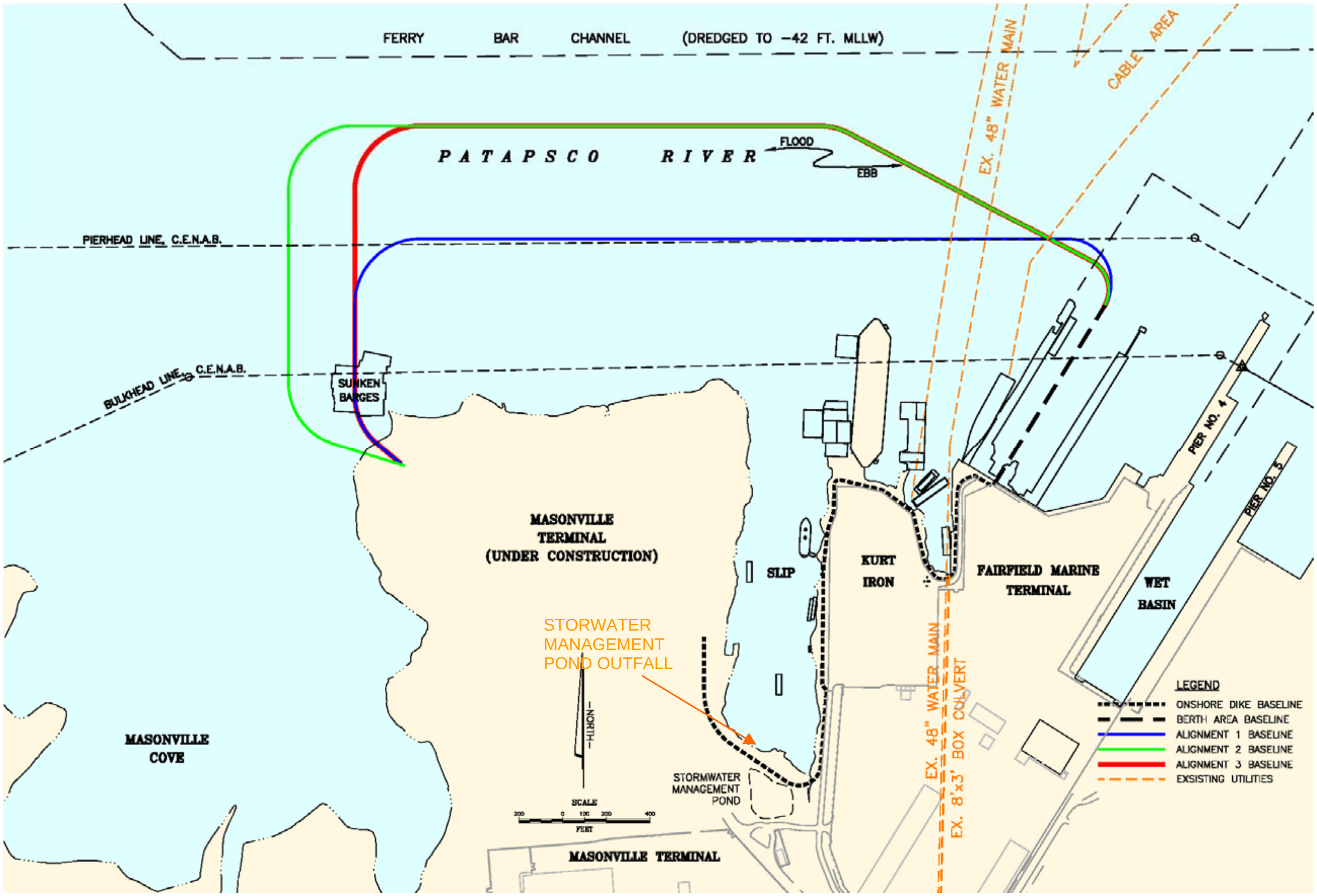
- **Borrow Sources –** Potential borrow sources include onsite borrow and upland mined sources. Use of onsite borrow provides both additional site capacity as well as the potential for reduced transportation and handling costs. However, this option requires stripping and disposal of overburden.

- **Landside Interface –** The landside parcels that abut the site are either developed or are in the process of being developed for cargo operations.

- **Relocation of Existing Infrastructure –** There are several utilities that are in or cross the proposed Masonville DMCF alignment. This infrastructure, as depicted in Figure 3-13, includes:

    - 48 inch Baltimore City waterline
    - 8 ft x 3 ft Baltimore City box culvert
    - Masonville Phase 1 stormwater management pond outlet

These utilities would have to be relocated either prior to or during the proposed Masonville DMCF initial construction, thereby impacting the development schedule and creating additional costs. The general site layout with the above design considerations applied for each alignment is shown in Figure 3-14.

1628 


1629 **Figure 3-14. Utilities Affected by the Proposed Project**

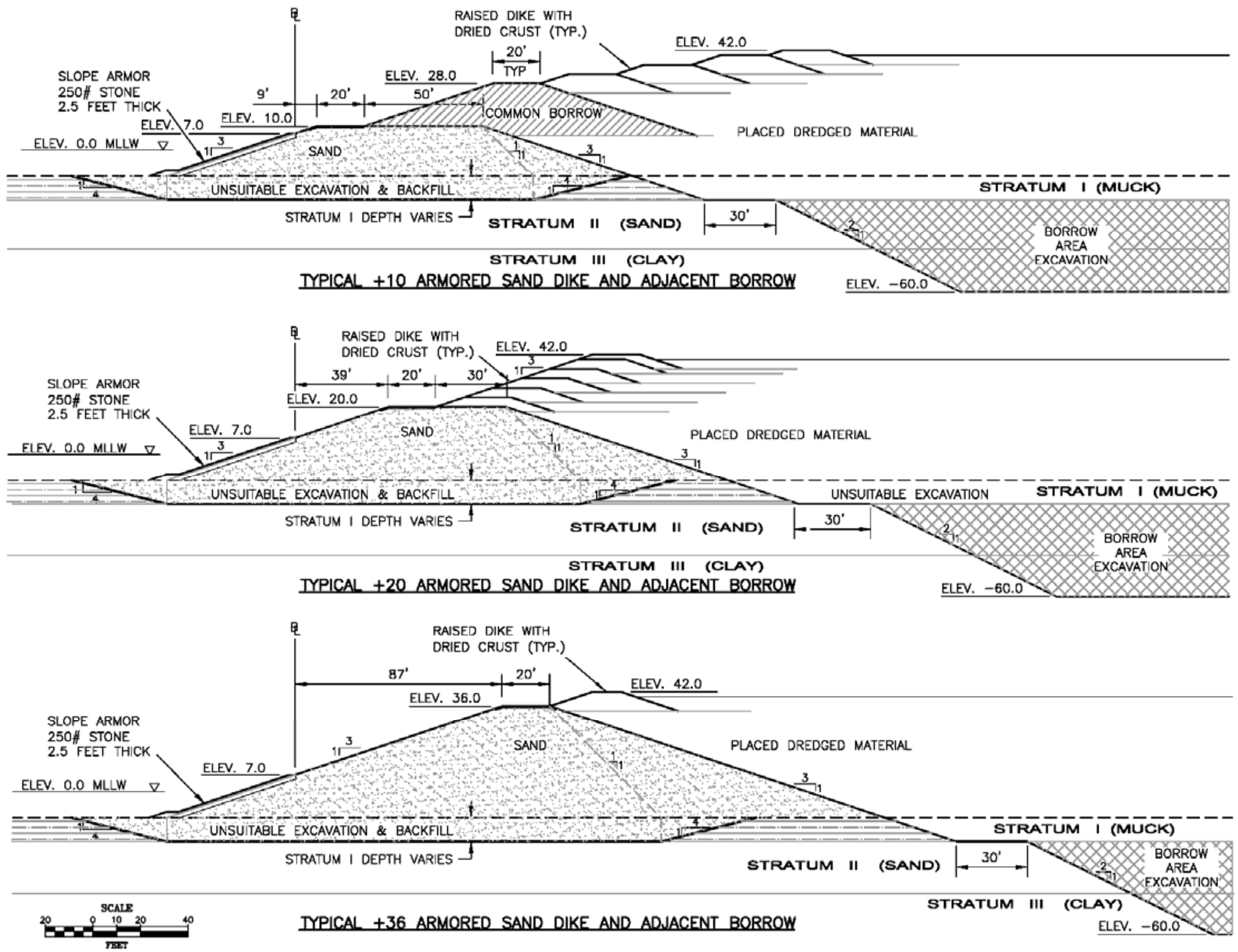



**Figure 3-15. Typical Dike Cross Sections**

### 3.7.4.2 Typical Containment Structure Cross-Sections

The site layouts in Figure 3-14 show the centerline of the containment structure for the Masonville site. This structure has four segments, an armored sand dike, an onshore dike, a cofferdam, and a berth area.

Along each segment, the water and unsuitable material depths vary, but the general design structure remains the same. Typical cross-sections for each of the design structures are shown in Figure 3-15 and described in more detail in the following paragraphs.

***Armored Sand Dike Segment***

This segment's design structure is a dike constructed of sand and protected against wave and scour action using stone armament. Three initial elevations for this sand dike were considered when designing the site with a maximum dike elevation of +42 ft MLLW. The site would then be graded to a final elevation of +36 ft MLLW. Figure 3-15 presents the typical cross-section for each design elevation.

*Typical 10 ft Armored Sand Dike* - The typical 10 ft armored sand dike cross-section shows the geometry of Stratum I unsuitable material excavation and sand backfill. The 4:1 slopes rising from the toe of the cut to the bay bottom were determined based on the estimated Stratum I angle of repose.

For initial construction, a sand dike would be raised to an elevation of +10 ft MLLW with a width of 70 ft and 3:1 side slopes on both the river and landward sides. A second raising of the dike to elevation +28 ft MLLW would occur using common borrow. This raising would have a width of 20 ft, 3:1 side slopes, and would rest partially on the crest of the initial sand dike and partially on consolidated dredged material. The dike would then be incrementally raised, as needed, to elevation +42 ft MLLW using dikes constructed of dried dredged material. The dikes would be graded to a final elevation of +36 ft MLLW prior to the closure of the DMCF. The slope armament is a 2.5 ft thick layer of 250 pound (lb) stone. Geotextile fabric and a layer of quarry run stone underlies the armament.

The cross-section figure also shows the borrow area (Figure 3-15). Stability issues required that constraints be placed on the extent of the borrow near the armored sand dike. The boundary for the borrow area is determined by projecting the landward dike slope through the Stratum I unsuitable material to the Stratum I - Stratum II interface. An additional buffer of 30 ft inward from this point provides a greater factor of safety. The anticipated slope of the cut borrow material is 2:1, based on estimated angles of repose.

*Typical 20 and 36 ft Armored Sand Dikes* - The designs of the 20 and 36 ft initial sand dikes are very similar to the 10 ft dike. The required unsuitable material excavation typical cross-section is determined in the same manner for each, and the armament is the same. The following provides brief descriptions of the 20 and 36 ft armored sand dikes.

The 20 ft armored dike is initially built to +20 ft MLLW, with a width of 50 ft, and 3:1 side slopes. The dike would be incrementally raised, as needed, to a temporary elevation of +42 ft

MLLW and a final elevation of +36ft MLLW using dikes constructed of dried dredged material. The 36 ft armored dike is initially built to +36 ft MLLW, with a width of 20 ft, and 3:1 side slopes. The dike would be incrementally raised, as needed, to a temporary elevation of +42 ft MLLW and a final elevation of +36 ft MLLW using dikes constructed of dried dredged material.

***Berth Area Segment***

Two options, a rock dike and a cofferdam, exist for the design structure of this segment (Figure 3-16). The two designs are being evaluated and compared in this study. Each of these structures

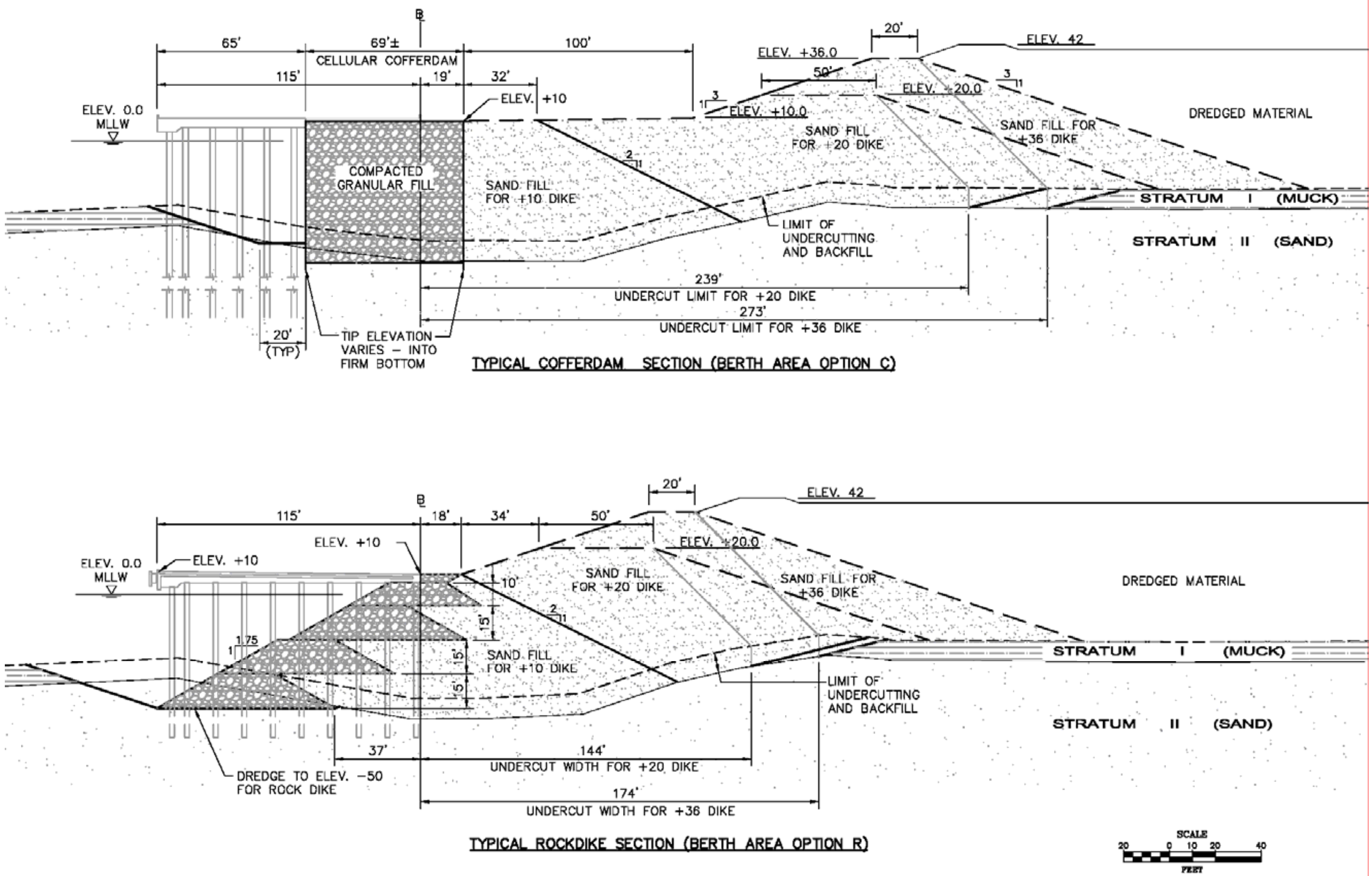
is constructed to +8.67 ft MLLW in elevation to accommodate a relieving platform for the berthing of ships. Options exist for the initial containment structure to be built to +20 or +36 ft MLLW. In these cases, sand dikes behind the berth area segment would be initially constructed to the required elevation. The typical rock dike and cofferdam segments are shown in Figure 3-15 and described below.

*Rock Dike Segments* **–** The typical cross-section (Figure 3-15) shows excavation of the unsuitable Stratum I foundation material underneath the dike footprint. The rock dike would be placed in four lifts. A lift consists of a rock toe with sand fill behind it. Three of these lifts would raise the dike 15 ft each and the fourth would raise the dike 10 ft. The final elevation of the rock dike would be +8.67 ft MLLW. The slope of the rock face is 1.75:1, and the slope of the sand face is 2:1. Figure 3-15 shows the options for initially constructing the Rock Dike Section to +20 and +36 ft MLLW.

The +20 ft MLLW initial dike is constructed by adding sand fill to the +8.67 ft MLLW rock dike, creating a dike width of 50 ft at 20 ft MLLW in elevation, 34 ft back from the top of the 2:1 inner sand slope. The +36 ft MLLW initial dike is constructed by adding sand fill to the +8.67 ft MLLW rock dike, creating a dike width of 20 ft at +36 ft MLLW in elevation, 84 ft back from the top of the 2:1 inner sand slope.

***Cofferdam Section***

The typical cross-section of the cofferdam is shown in Figure 3-16. Steel cofferdam cells serve as the retention system and are later incorporated into the wharf structure. The cofferdam cells are 69 ft in diameter and are filled with compacted granular fill. The Stratum I material is removed by pre-dredging prior to cell construction, both within the cell footprint and inboard of the cells. To reduce active earth pressures behind the cells, a sand berm would be placed directly inboard of the cells. For the +10 ft MLLW foot dike this berm is 32 ft wide. For the +20 and +36 ft MLLW options the width of the berm increases to 100 ft wide.




1708

1709 **Figure 3-16. Typical Cofferdam and Rock Dike Cross-sections**

***Onshore Segment***

The onshore segment's design structure is a sand dike to be constructed on the existing shoreline. Three options exist for the initial elevation of the dike, +10, +20, and +36 ft MLLW. Figure 3-17 shows the typical cross-section for each initial elevation. The designs use a geogrid placed between two-foot sand lifts to allow for a 1:1 side slope of the dike. The width of the berm for all three dike elevations is 15 ft.

### 3.7.5 Site Design Characteristics

Site characteristics are used in conjunction with site costs and impacts to evaluate and compare each of the study alternatives. The pertinent site characteristics are footprint and effective site area, total and annual site capacity, site life, initial and final dike elevation, final dredged material surface elevation, construction duration and completion date, and dike baseline length. These characteristics are defined below, and several key characteristics are summarized for each alternative in Table 3-10.

Each of the final study alternatives was modeled using digital terrain modeling software. From the models, values for the following site characteristics were determined.

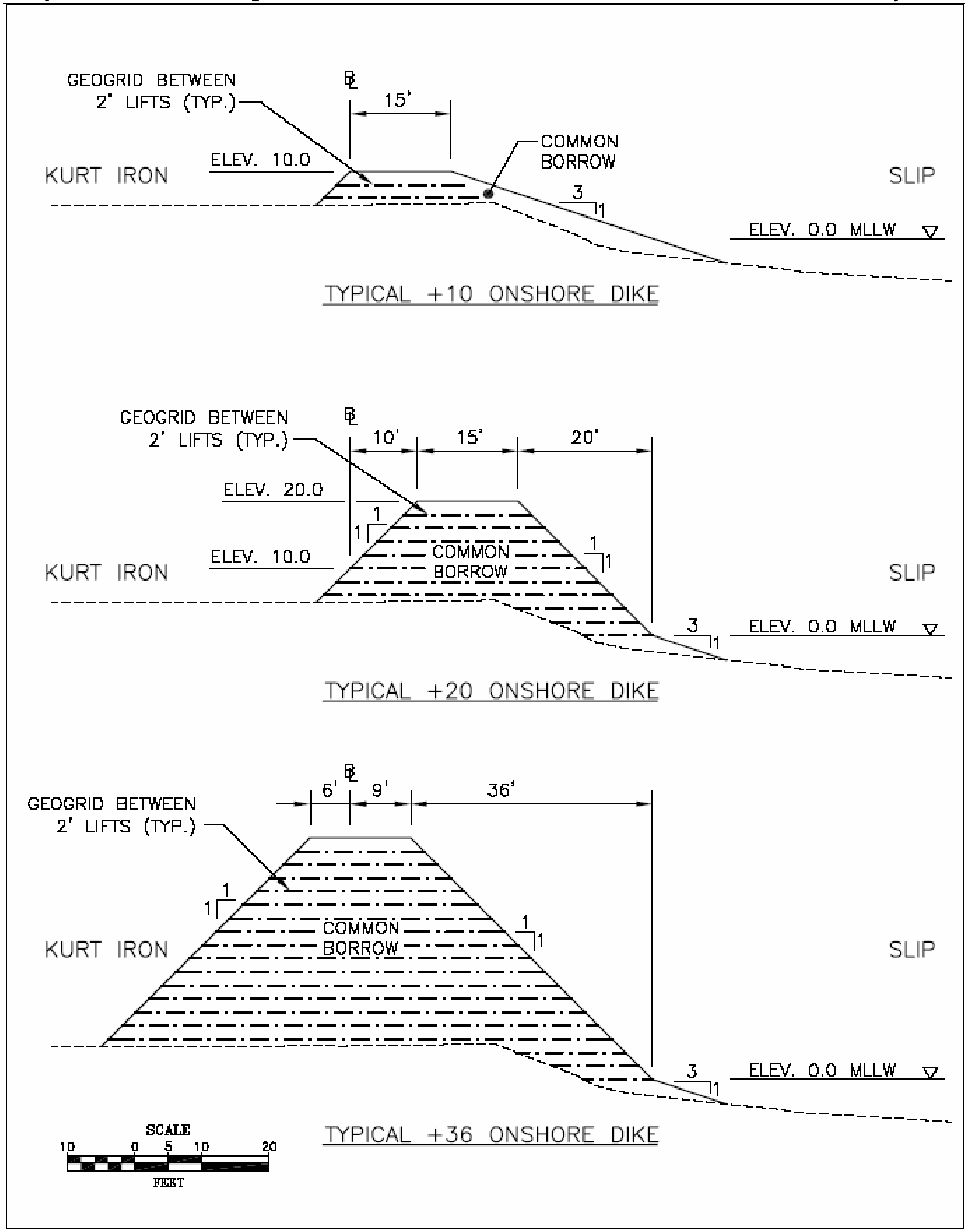



**Figure 3-17. Typical Onshore Dike Sections**

## Table 3-10. Summary of Site Characteristics

| Scenario | Alternative | Baseline Perimeter (ft) | Effective Site Area (acres) | Site Capacity (mcy) | Annual Capcity[1] (mcy) | Average Annual Use[2] (mcy) | Site Life (yrs) | Completion Date[3] (month-yr) |
|---|---|---|---|---|---|---|---|---|
| Scenario A | 2-R-10 | 10,554 | 110 | 18.5 | 0.4 | 0.8 | 24 | Dec-07 |
| | 2-R-20 | 10,554 | 103 | 17.7 | 0.4 | 0.8 | 23 | Dec-07 |
| | 2-C-10 | 10,554 | 110 | 18.3 | 0.4 | 0.8 | 23 | Feb-08 |
| | 2-C-20 | 10,554 | 103 | 17.4 | 0.4 | 0.8 | 22 | Mar-08 |
| | 3-R-10 | 9,990 | 101 | 16.1 | 0.3 | 0.8 | 21 | Dec-07 |
| | 3-R-20 | 9,990 | 95 | 16.0 | 0.3 | 0.8 | 20 | Dec-07 |
| | 3-C-10 | 9,990 | 101 | 16.0 | 0.3 | 0.8 | 20 | Jan-08 |
| | 3-C-20 | 9,990 | 95 | 15.7 | 0.3 | 0.8 | 20 | Feb-08 |
| Scenario B | 2-R-10 | 10,554 | 110 | 17.8 | 0.4 | 0.8 | 23 | Jan-08 |
| | 2-R-20 | 10,554 | 103 | 17.0 | 0.4 | 0.8 | 22 | Feb-08 |
| | 2-C-10 | 10,554 | 110 | 17.6 | 0.4 | 0.8 | 22 | Apr-08 |
| | 2-C-20 | 10,554 | 103 | 16.7 | 0.4 | 0.8 | 21 | May-08 |
| | 3-R-10 | 9,990 | 101 | 15.6 | 0.3 | 0.8 | 20 | Dec-07 |
| | 3-R-20 | 9,990 | 95 | 15.4 | 0.3 | 0.8 | 20 | Dec-07 |
| | 3-C-10 | 9,990 | 101 | 15.4 | 0.3 | 0.8 | 20 | Mar-08 |
| | 3-C-20 | 9,990 | 95 | 15.1 | 0.3 | 0.8 | 19 | Feb-08 |
| Scenario C | 2-R-10 | 10,554 | 110 | 15.0 | 0.4 | 0.8 | 19 | Jan-09 |
| | 2-R-20 | 10,554 | 103 | 14.4 | 0.4 | 0.8 | 18 | May-09 |
| | 2-C-10 | 10,554 | 110 | 14.8 | 0.4 | 0.8 | 19 | Apr-09 |
| | 2-C-20 | 10,554 | 103 | 14.1 | 0.4 | 0.8 | 18 | Sep-09 |
| | 3-R-10 | 9,990 | 101 | 13.2 | 0.3 | 0.8 | 17 | Feb-09 |
| | 3-R-20 | 9,990 | 95 | 13.1 | 0.3 | 0.8 | 17 | Apr-09 |
| | 3-C-10 | 9,990 | 101 | 13.0 | 0.3 | 0.8 | 17 | Mar-09 |
| | 3-C-20 | 9,990 | 95 | 12.8 | 0.3 | 0.8 | 16 | May-09 |
| Scenario D | 1-R-10 | 9,392 | 71 | 8.0 | 0.2 | 0.8 | 10 | Dec-07 |
| | 1-R-20 | 9,392 | 65 | 8.2 | 0.2 | 0.8 | 11 | Dec-07 |
| | 1-R-36 | 9,392 | 57 | 7.3 | 0.2 | 0.8 | 10 | Jan-08 |
| | 1-C-10 | 9,392 | 71 | 7.9 | 0.2 | 0.8 | 10 | Dec-07 |
| | 1-C-20 | 9,392 | 65 | 7.9 | 0.2 | 0.8 | 10 | Feb-08 |
| | 1-C-36 | 9,392 | 57 | 7.0 | 0.2 | 0.8 | 9 | Apr-08 |
| | 2-R-10 | 10,554 | 110 | 13.5 | 0.4 | 0.8 | 17 | Dec-07 |
| | 2-R-20 | 10,554 | 103 | 13.1 | 0.4 | 0.8 | 17 | Feb-08 |
| | 2-R-36 | 10,554 | 95 | 12.0 | 0.3 | 0.8 | 15 | Mar-08 |
| | 2-C-10 | 10,554 | 110 | 13.3 | 0.4 | 0.8 | 17 | Mar-08 |
| | 2-C-20 | 10,554 | 103 | 12.8 | 0.4 | 0.8 | 16 | Jun-08 |
| | 2-C-36 | 10,554 | 95 | 11.7 | 0.3 | 0.8 | 15 | Jun-08 |
| | 3-R-10 | 9,990 | 101 | 12.0 | 0.3 | 0.8 | 15 | Dec-07 |
| | 3-R-20 | 9,990 | 95 | 12.1 | 0.3 | 0.8 | 16 | Dec-07 |
| | 3-R-36 | 9,990 | 87 | 10.9 | 0.3 | 0.8 | 14 | Jan-08 |
| | 3-C-10 | 9,990 | 101 | 11.8 | 0.3 | 0.8 | 15 | Mar-08 |
| | 3-C-20 | 9,990 | 95 | 11.8 | 0.3 | 0.8 | 15 | Mar-08 |
| | 3-C-36 | 9,990 | 87 | 10.6 | 0.3 | 0.8 | 14 | May-08 |

[1]Based Upon 3ft Bulk Lifts [2]Projected based on Table 1-2. [3]Based on a Construction Start Date of April 1, 2007

#### 3.7.5.1 Site Area

Two areas are used to describe an alignment. The first is site footprint area, which is the area encompassed within the outer toe of the containment dike and defines the area of bay bottom impacted by the site. The second is site effective area, which is the average area within the inside slope of the containment dike and is used to determine the average annual capacity of the site.

#### 3.7.5.2 Site Capacity, Annual Placement Capacity, and Average Annual Site Usage

Site Capacity (or dredged material placement capacity) is defined as the total volume of dredged material (measured in *in-situ* volume) the site can hold when the placed material has a reached steady state of consolidation and the final design surface elevation. This value is calculated using the air space volume available within the site and making assumptions as to the properties of the dredged material placed within the site.

The annual quantity of dredged material placed at the Masonville site is anticipated to be approximately 0.5 to 1.0 mcy (See Table 1-2). This annual volume of placement exceeds the optimum annual placement (annual placement capacity) dictated by a bulked 3 ft lift (USACE 2001b). This exceedance would be necessary to accommodate Harbor needs and depending on its extent, may result in decreased site capacity. The average annual site usage is anticipated to be 0.8 mcy, based on current placement projections.

#### 3.7.5.3 Site Life

The life of the site is determined by dividing the average annual site usage into the site capacity. This value is critical for the long-term planning of dredged material placement.

#### 3.7.5.4 Containment Structure Elevation

Both the initial construction and final containment structure elevations are critical for planning the construction phases of a DMCF. The final structure elevation is determined using the final required site elevation and adding to that, assumptions for freeboard and consolidation of the dredged material. The initial elevation to which the structure is constructed has a direct effect on initial construction costs, quantities, and methods. Initial elevation also dictates the height the structure would need to be raised to a temporary elevation of +42 ft MLLW in order to meet the final required elevation of +36 ft MLLW. This is significant because the elevation to which the structure can be raised is limited by geotechnical and cost considerations.

#### 3.7.5.5 Final Surface Elevation

The final surface elevation value is a driving force for calculations determining the above listed site characteristics, and is determined by evaluating the anticipated final use of the site to maximize the placement capacity while effectively preparing the site for the final use. The final surface elevation for the Masonville site is assumed to be +36 ft MLLW, which is approximately the elevation of the existing adjacent terminal.

#### 3.7.5.6 Construction Completion Date

The construction completion date is the date at which the site can be completed given a start date of April 1st 2007. If the completion date exceeds December 1st 2008, the alternative does not meet the State established need for Harbor dredged material placement capacity.

#### 3.7.5.7 Containment Structure Baseline Length

The containment structure baseline length is the linear feet of containment structure found by measuring along the baseline of the structure. The baseline length is used to calculate quantities of materials and make estimates as to the annual maintenance costs for the site.

### 3.7.6 Comparison and Evaluation of Masonville Alternatives

The Masonville State feasibility-level study was narrowed to three State feasibility-level alignments, with Alignment 3 (FFA 3) being preferred by the Community and MPA (Figure 3-9). The three final alignments (FFA 1, 2, and 3) collectively have 18 potential alternatives, listed in Figure 3-13. The State feasibility-level study includes sufficient engineering studies and preliminary designs to provide environmental and socioeconomic impacts for Masonville and site characteristics and costs specific to each alternative. Table 3-9 summarizes the borrow scenario advantages and disadvantages. This section discusses the advantages and disadvantages of the borrow source and overburden placement scenarios and compares the study alternatives.

Site impacts, costs, and characteristics are used as the basis for elimination of alternatives and for determination of the preferential borrow source(s) and placement location(s). The most critical site characteristics and costs are the date available, annual capacity, total capacity, initial cost, and final unit cost.

#### 3.7.6.1 Borrow Source and Overburden Placement Scenario Evaluation

The goal of evaluating the scenarios (Scenarios A through D) is to determine the optimal borrow source(s) and placement location(s). Table 3-9 lists the advantages and disadvantages for each of the scenarios. Figure 3-18 is useful in evaluating the general trends in site capacity, initial cost, and site unit cost as they changed between scenarios.

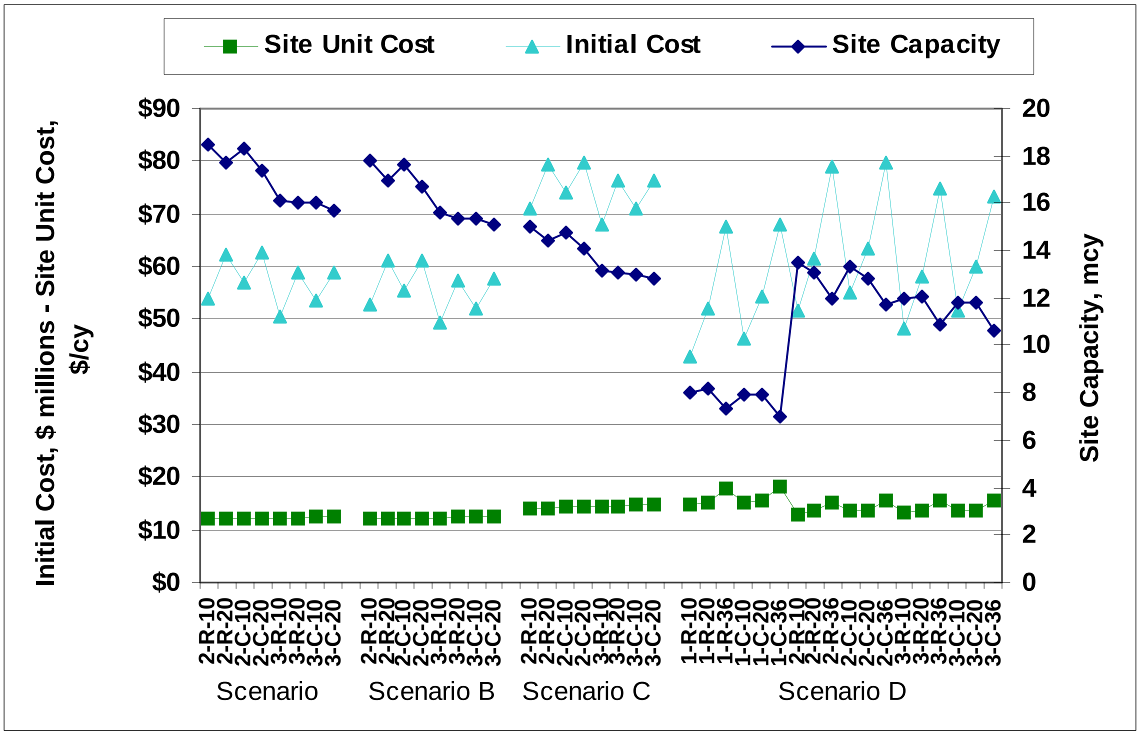



**Figure 3-18. Site Cost and Capacity Trends.**

Table 3-10 and Figure 3-18 show that Scenario A is the most desirable scenario proposed, as long as there is sufficient capacity at HMI to accept the overburden material from Masonville. In general, the State feasibility-level studies have shown that the optimal borrow source is onsite, and the optimal placement location for overburden material is HMI. The preferred dredging methods are those listed for Scenario A in Appendix F. These observations should be considered in future site study and design.

### 3.7.6.2 Comparison of Alternatives

The footprints of FFA 1, FFA 2, and FFA 3 are 97, 141, and 141 acres respectively. FFA 2 (preferred alignment by MPA) contains more SWH than alignments FFA 1 and FFA 3. FFA 1 affects the least amount of open water habitat. FFA 2 encapsulates the most acres of contaminated sediment and would likely have the greatest positive affect on water quality. The most amount of aquatic habitat would be lost with FFA 2 and the least amount of aquatic habitat would be lost with FFA 1. All three alignments would have a similar impact on terrestrial habitats, birds and wildlife, RTE species, SAV, recreational resources, groundwater, aesthetics, noise, and light. FFA 3 is a compromise between FFA 1 and FFA 2, because FFA 3 encapsulates more contaminated sediments than FFA 1, but affects less aquatic habitat than FFA 2. FFA 3 also affects fewer acres of SWH than FFA 2.

The site characteristics are listed in Table 3-9, and the cost trends are shown in Figure 3-18. The following observations can be made based on the results from the State feasibility-level study effort and evaluation of the trends in Figure 3-18 and the characteristics in Table 3-10.

1) Alternatives for FFA 2 and FFA 3 provide approximately 0.4 and 0.3 mcy, respectively, of annual capacity. FFA 1 alternatives provide approximately 0.2 mcy of annual capacity. The annual Harbor need that the Masonville site must meet is approximately 0.8 mcy (Table 1-2).
2) The trend throughout the alternatives is that initial and final unit costs increase as the initial dike elevation increases. Also, the trend is for capacity to decrease with increases in initial dike elevation.
3) The rock dike alternatives have a lower initial cost than the cofferdam alternatives.

The alternatives consisted of three variables: alignment (FFAs 1, 2, and 3), berth area structure (cofferdam or rock dike), and initial dike elevation (+10, +20, and +36 ft). The observations above led to selection of the preferred option for each variable. The selection and a brief description of why it was selected follows:

***Alignment***

Alternatives under FFA 1 did not meet the dredged material placement needs outlined in the study. Since Alternatives for FFA 3 and 2 provided similar annual capacities and FFA 3 impacted fewer acres of SWH and bay bottom, FFA 3 was selected as the preferred alignment.

***Berth Area Structure***

Two structures, a rock dike and a cofferdam, were evaluated. The rock dike alternatives had a lower initial cost. However, the MPA performed a cost benefit analysis of the two structures and determined that the cofferdam option would be less expensive overall. The Cost Benefit Analysis is available in Appendix F. Thus, the cofferdam was selected as the preferred option.

***Initial Dike Elevation***

Three initial dike elevations were evaluated (+10, +20, and +36 ft). The +10 ft initial dike option was found to be the least expensive with similar capacities and equivalent impacts. Thus, the +10 ft dike elevation was selected.

## 3.8 PREFERRED ALTERNATIVE

The preferred Alternative was found to be FFA 3 with a cofferdam berth structure and a +10 ft initial elevation (Alternative 3-C-10). This is the preferred alternative based on the results of the State feasibility-level study. The Cost Benefit Analysis conducted by the MPA resulted in 3-C-10 being recommended as the preferred alternative. The Cost Benefit Analysis is available in Appendix F.

The preferred source of material for constructing the sand dike portions of the facility is within the footprint of the proposed containment structure, and the preferred location for placement of the overburden material is HMI.

Two issues, which may limit or preclude the use of the onsite borrow material, have arisen since the alternatives analysis was performed. The first is a dispute over the legal interpretation of

Maryland Code, Section 5-1102, regarding the use of material mined from the bay bottom. The second is environmental suitability of the borrow material. Additional studies are being conducted to evaluate this suitability. These issues may require that an offsite borrow source be used. The potential offsite borrow sources for the Masonville project are discussed in Section 3.7.3.1 and are included in the cumulative impacts section of this document.

## 3.9 NO ACTION ALTERNATIVE

Under the no action alternative, the Masonville DMCF would not be developed. If the Masonville DMCF is not developed, the MPA would either defer currently scheduled dredging of the Port of Baltimore navigation channel system and associated public and private berthing facilities, or overload existing DMCFs, or some combination of these two actions.

Assessment of the without-project condition (no site development) is required under the NEPA. For this project that would include not filling 130 acres of open water in the Patapsco River, not losing 130 acres of Patapsco River bottom, and not affecting the 141 acres of the project footprint. If the Masonville DMCF is not constructed, there would be no regulatory reason to remediate the derelict vessels on the western side of the proposed DMCF site. The funding currently allocated for site development would be released to other Maryland Department of Transporation (MDOT) efforts and the remediation of the 25 derelict vessels would be deferred. The no action alternative is carried through the impacts analysis.