DRAFT ENVIRONMENTAL ASSESSMENT

BROOKLEY HOLE DEMONSTRATION: BENEFICIAL USE OF DREDGED MATERIAL FROM MOBILE HARBOR FEDERAL NAVIGATION CHANNEL MOBILE COUNTY, ALABAMA

May 2012

Prepared by

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INTRODUCTION

1.0 Mobile Harbor Project Description

1.1 Project Authorization. Mobile Harbor, Alabama, is located in the southwestern part of the state, at the junction of the Mobile River with the head of Mobile Bay (**Figure 1**). The port is about 28 nautical miles north of the Bay entrance from the Gulf of Mexico and 170 nautical miles east of New Orleans, Louisiana. The navigation channel dredging in Mobile Bay and Mobile River began in 1826 with enactment of the River and Harbor Act of 1826. During the period 1826 to 1857, a channel 10 feet deep was dredged through the shoals in Mobile Bay up to the city of Mobile. Subsequently, further modifications to the channel were authorized and the original Federal project was enlarged by the addition of the Arlington, Garrows Bend, and Hollingers Island channels within the bay, and a channel into Chickasaw Creek from the Mobile River. Section 104 of the River and Harbor Act of 1954 authorized a 40-foot depth channel with a 400-foot width in Mobile Bay to the mouth of the Mobile River and a 40-foot depth in the Mobile River to the Cochran Bridge with the width varying from 400 to 775 feet. The Senate Public Works Committee on 16 July 1970 and the House Public Works Committee on 15 December 1970, under the provisions of Section 201 of the 1965 Flood Control Act, authorized a 40- foot by 400-foot channel, branching from the main ship channel and extending through a land cut to the Theodore Industrial Park. The Theodore Ship Channel was reauthorized in the Water Resources Development Act of 1976.

Further improvements to the existing federal project were initially authorized in the 1985 Energy and Water Resources Appropriation Act (PL 99-88, Ninety-ninth Congress, First Session). The improvements

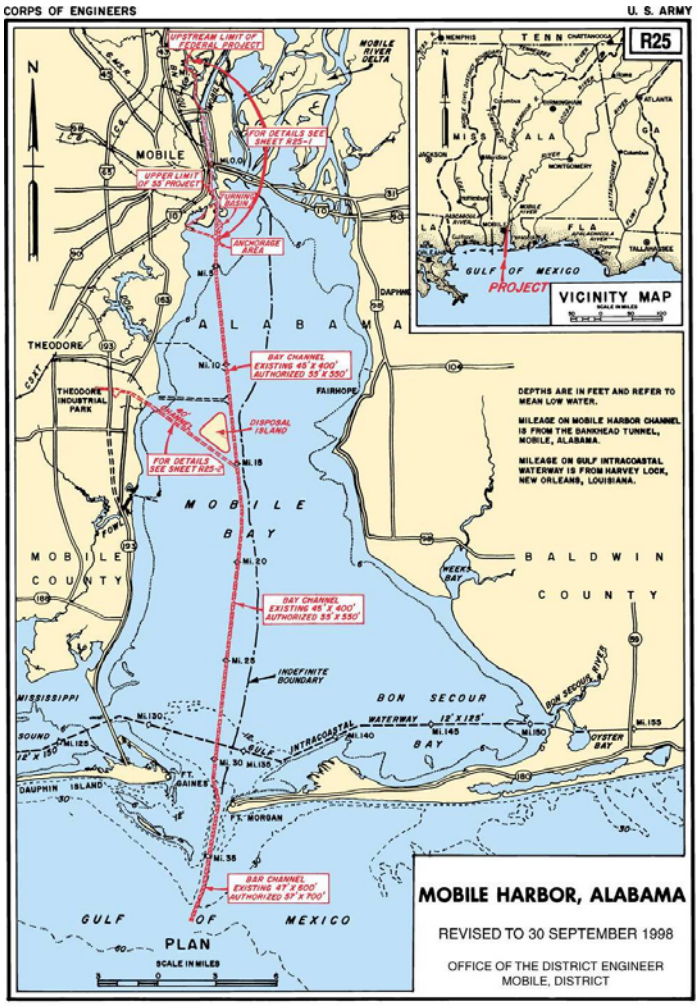

Figure 1: Vicinity Map of Mobile Harbor Project Area

were reauthorized in Section 201 of the Water Resources Development Act of 1986 (PL 99 – 662, Ninety-ninth Congress, Second Session), which was approved 17 November 1986, and subsequently amended by Section 302 of the Water Resources Development Act of 1996. The report referenced by this authorization recommended the following improvements to the Federal project: deepening and widening the Gulf entrance channel to 57 by 700 feet; deepening and widening the main ship channel to 55 by 550 feet in Mobile Bay, except for the upper 3.6 miles which require a width of 650 feet; deepening the Mobile River channel to 55 feet to a point about 1 mile below the Interstate 10 highway tunnels; and, constructing turning and anchorage basins near the upper end of the main ship channel.

1.2 Mobile Harbor Project Features. The federally-authorized Mobile Harbor navigation project consists of the following features:

a. A 57’ x 700’ channel from the Gulf of Mexico for approximately eight (8) miles to Mobile Bay;

b. A 55’ x 550’ channel from the mouth of the Mobile Bay for a distance of approximately 29 miles to near the mouth of Mobile River, including a 2-mile long channel dimension 625’ wide at mid-bay

c. A 55’ x 750’ x 4000’ anchorage area just south of McDuffie Island;

d. A 55’ x 1500’ x 1500’ turning basin opposite McDuffie Island;

e. A 40’ deep channel with the width varying from 700’, near the Mobile River mouth, to 500’, near the Cochrane Bridge (U.S. Highway 98), a distance of approximately four (4) miles;

f. A 40’ x 800’ – 1000’ x 2500’ turning basin opposite the Alabama State docks between river miles 1.0 to 1.5;

g. A 40’ x 1000’ x 1600’ turning basin just south of the Cochrane Bridge.

The authorized dimensions of all segments of the Mobile Harbor Project have not been constructed. A summary of both the authorized and the existing maintained dimensions are listed in **Table 1**. The maintained dimensions of the bay channel are 45’ by 400’ and the outer bar channel is 47’ by 600’. Each of these areas is maintained to a depth that is 10’ less than the authorized depth. Several additional features of the authorized project have not been constructed at this time. The anchorage areas that would be located south of the mouth of the Mobile River have not been constructed, and the bay channel and the bar channel, have not been widened. The new turning basin opposite McDuffie Island, between Pinto Island and Little Sand Island was constructed in 2010.

Table 1. Authorized and Existing Dimensions for Mobile Harbor

Channel	Authorized Dimensions	Existing Dimensions
Outer Bar Channel (a.)	57' x 700'	47' x 600'
Bay Channel (b.)	55' x 550'	45' x 400'
Anchorage Area (c.)	55' x 750' x 4000'	*As Authorized*
Turning Basin (d.)	55' x 1500' x 1500'	*As Authorized*
River Channel (e.)	40' x 500'-700'	*As Authorized*
Turning Basin (f.)	40' x 800' – 1000' x 2500'	*As Approved*
Turning Basin (g.)	40' x 1000' x 1600'	*As Authorized*

Approval for advanced maintenance for the Federal Mobile Harbor navigation project was received from South Atlantic Division in the mid-1990s as per the Navigation Regulations ER1130-2-530, 29 November 1996. As such, the navigation channels have associated advanced maintenance to accomplish dredging in an efficient, cost-effective, and environmentally responsible manner. In addition to the federally-authorized channel dimensions providing for navigation, two (2) sediment basins in the lower Mobile River and three (3) sediment basins in the bay channel, have been previously authorized and approved. These sediment basins are to provide improved channel maintenance efficiency. Each of the basins are several thousand feet long and have depths ranging from 4 (4) feet to 10 feet lower than the existing navigation channel bottom. The basins decrease frequency of dredging to provide a more cost effective and reliable channel. In addition to sediment basins, an advanced widening feature is authorized for the bar channel.

The main navigation channel in the bay typically requires the annual removal of about four (4) million cubic yards of material to maintain the channel dimensions. The maintenance of the navigation channels and sediment basins is accomplished by a hopper dredging equipment. All material removed from the bay channel section is placed in the previously-approved Mobile-North Ocean Dredged Material Disposal Site (ODMDS) located in the Gulf of Mexico to the southwest of the mouth of Mobile Bay. The U.S. Army Corps of Engineers, Mobile District (Corps) was issued a Water Quality Certification (WQC) and Coastal Zone Consistency (CZC) determination for the continued maintenance of Mobile Harbor from the Alabama Department of Environmental Management (ADEM) dated April 10, 2012 (Permit Number FP11-MH01-06).

2.0 Mobile Bay Watershed Regional Sediment Management (RSM) Study Initiative

The Mobile Bay watershed covers two thirds of the state of Alabama and portions of Mississippi, Georgia, and Tennessee, **Figure 2**. It is the fourth largest watershed in the United States in terms of flow volume and is the sixth largest river system in the U.S. in terms of area. The lower Mobile Bay is a designated national estuary under the EPA's National Estuary Program. The Mobile Bay and the rivers draining into it support major uses with national implications which include the Tennessee-Tombigbee Waterway, the Port of Alabama, various commercial fisheries, large industry, tourism and recreation,

and abundant development. Water entering the system in the upper-most reaches of the watershed makes its way to the Gulf of Mexico through Mobile Bay. Throughout this process sediments and nutrients are transported and deposited along the way. It is important to understand these processes throughout the entire watershed to able to manage sediments effectively.

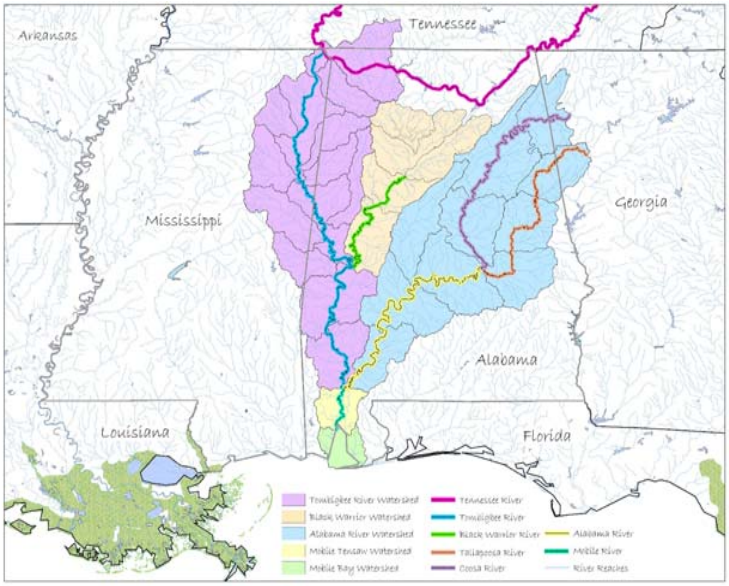

Figure 2. Mobile Bay Watershed Area

The Mobile Bay Basin project offers the interrelations and connectivity between inland and coastal watersheds, and has been the subject of numerous studies and projects by various agencies including: EPA, NASA, USACE SAM and ERDC, NRCS, NOAA, Northern Gulf Institute, Mississippi State University, and others. A holistic picture and understanding of how each of the various projects and studies contribute to overall dredging management, sediment loads, water quality improvements, and environmental considerations does not currently exist. The Mobile Bay Basin offers an excellent opportunity to focus holistically with a comprehensive overview of the system. Implementing the RSM approach provides the ability to coordinate and collaborate; integrate numerous tools, technology, and data; leverage funding; and enhance partnerships.

With competition for dredging funds expected to increase in the near future, difficult choices will have to be made on how and where to prioritize available dredging funds, especially for specific navigation reaches within the Mobile Bay watershed. Therefore, it is important to understand the mechanisms and processes of how sediments move through the entire watershed to be able to optimize and leverage dredging funds and concentrate on resolving sedimentation issues associated with specific problem areas. Such knowledge is key towards making informed navigation O&M management decisions that considers sedimentation, water quality, environmental resources, habitat management, and human uses.

2.1 Mobile Bay Watershed Study Objectives. The objectives of the Mobile Bay Basin Watershed project is bringing the lessons learned through application of the Regional Sediment Management (RSM) principles and practices in the coastal environment to a broader watershed perspective for sediment and related environmental management planning. By linking the watershed and coastal environments through application of RSM concepts, the understanding of watershed processes along with the ability to make informed cooperative watershed management decisions by recognizing regional and localized sedimentation issues will be greatly improved. This effort capitalizes on the opportunities presented through collaboration and leveraging ongoing efforts in the watershed, available tools, and established relationships.

As a result of this study, the Mobile District is in the process of developing a sediment management strategic action plan to aid in the management of dredged sediments from the Mobile Harbor Federal Navigation Project. This plan will help towards the understanding of sediment transport dynamics throughout the watershed and how USACE projects are affected. The plan will provide the necessary elements for the management of sediment resources while considering environmental restoration, conservation, and preservation. This RSM approach provides the ability to coordinate and collaborate; integrate numerous tools, technology, and data; leverage funding; and enhance partnerships.

2.2 Sediment Management Strategic Action Plan: Recommended Actions. Although currently in preparation, the strategic action plan utilizes the knowledge gained from the study and resulted in recommendations, both long and short term, that should be implemented to improve sediment management throughout the Mobile Harbor Navigation Project. Long term recommendations include actions such as:

- Evaluation of alternative disposal methods such as in-bay disposal
- River bank channel modifications
- Examine measures towards reducing sedimentation in navigation channels
- Establish partnerships with watershed stakeholders to identify and leverage beneficial use opportunities

Short term recommendations that will be presented in the strategic action plan include:

- Utilizing river disposal area sediments
- Beneficial use opportunities in the Bay

Of particular interest concerning the short term recommendations is the selection of an implementable project that would demonstrate beneficial use of sediment from a problem reach of channel exhibiting high shoaling rates. Being able to beneficially use this material in a cost effective manner would demonstrate how the implementation of RSM could mutually benefit the navigation program and the environment.

An area known as Brookley Hole was selected by the Mobile Bay Interagency Working Group (IWG) as the most viable demonstration project to illustrate this concept. Brookley Hole is an historic borrow pit, used decades ago for the construction of the Brookley airfield, is located in the western upper portion of Mobile Bay in close proximity to the Mobile Bay channel as illustrate in **Figure 3**. Baseline surveys have shown that the deepest areas of Brookley Hole basin exhibit hypoxic conditions resulting in degraded environmental productivity. Beneficially using dredged material from a high shoaling reach of the upper bay channel to begin filling the basin to some level of productivity would not only provide an alternative method for the disposal of the dredged material but would also return the area into environmentally productive bay bottom. This proposed action will be discussed in greater detail below.

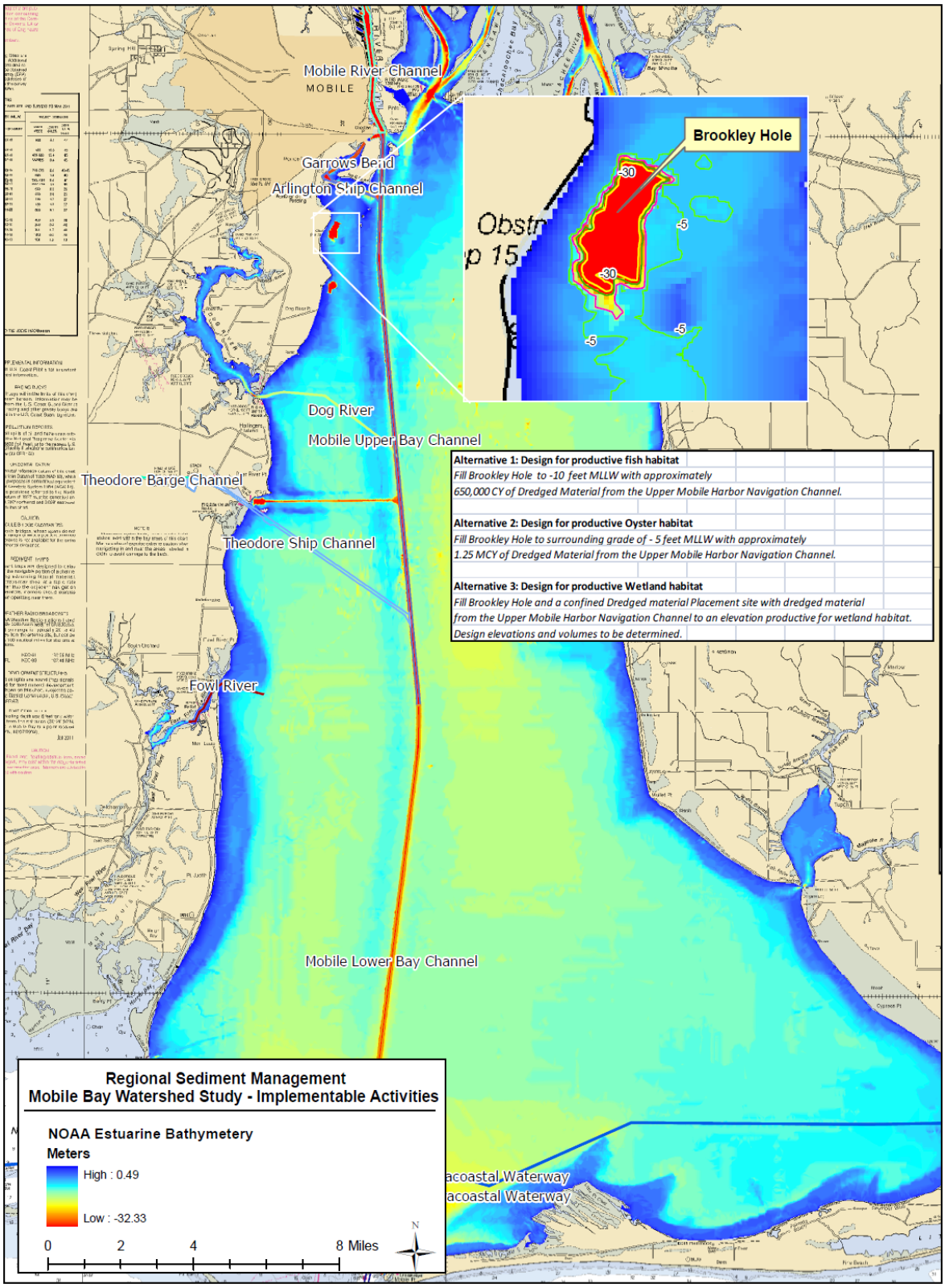

Figure 3. Location of Brookley Hole in the Upper Mobile Bay

2.3 Interagency Coordination. The successful planning of a project necessitates the early coordination and work of multidisciplinary interagency teams to identify and implement beneficial use opportunities associated with the Mobile Harbor navigation project. Such a team should be comprised of federal and state agency representatives, as well as representatives of the local project sponsor, who work collaboratively throughout the project's life to address the following: identifying BU opportunities, engineering and construction, environmental compliance, monitoring, maintenance, and management processes to strengthen and streamline the development and implementation of the project. The Mobile Bay Interagency Working Group (IWG) has been established to provide this important function. The IWG has played a key role in assisting the USACE in the identification of alternatives to be considered in determining how best dredged material can be beneficially utilized, as well as studies needed for environmental compliance. The IWG was actively involved in the selection of Brookley Hole as the most viable alternative as a locally preferred disposal plan for BU of dredged material from the Mobile Bay navigation channel. The agencies that make up the IWG include:

- Alabama State Port Authority (ASPA)
- US Army Corps of Engineers (Corps)
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- Alabama Dept. of Public Health (ADPH)
- Alabama Dept. of Environmental Management (ADEM)
- Mississippi-Alabama Sea Grant
- U.S. Fish and Wildlife Service (FWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation Division
- Mobile Bay National Estuarine Preserve (NEP)
- Mobile Airport Authority (MAA)
- Dauphin Island Sea Lab (DISL)
- The Nature Conservancy (TNC)

3.0 Existing Related Environmental Documentation

- Environmental Impact Statement, Mobile Harbor Channel Improvements, Mobile County, Alabama, October 1980.

- Supplemental Environmental Impact Statement, Mobile Harbor Channel Improvements, Offshore Dredged Material Disposal, November 1985.

- Environmental Impact Statement, United States Navy Gulf Coast Strategic Homeporting, Appendix V, August 1986.

- Environmental Impact Statement, Choctaw Point Terminal Project, Mobile, Alabama, August 2004.

- Environmental Assessment, Mobile Harbor Turning Basin, Mobile County,

Alabama, March 2009.

- Environmental Assessment, Recertification of the Mobile Harbor Federal Navigation Project, Mobile County, Alabama, March 2012.

4.0 Proposed Action

The proposed action, as described in Public Notice FP12-MH03-10 dated May 14, 2012, will begin the process of utilizing Brookley Hole as an alternative disposal site for dredged material from the upper reach of the Mobile Bay navigation channel. The action will demonstrate beneficial use of dredged material for restoration of valuable ecosystem services that exists in this region of the Bay. To demonstrate this approach, three filling scenarios were considered by the IWG.

The first consideration was to place just enough material into the Brookley Hole basin to bring the bottom elevation up to a level where it would no longer exhibit hypoxic conditions and allow the bottom of the basin to return to some level of environmental productivity. Reversing the hypoxic conditions would allow the typical benthic communities to become reestablished. Additionally, by remaining deeper than the surrounding bay bottom, the area could be utilized by fish as a haven during the winter months.

The second consideration, through successive dredge and fill cycles, is to return the elevation of the basin to that of the surrounding grade. Filling to this level would allow the bottom to become suitable for the establishment of natural communities such as submerged aquatic vegetation (SAV) and oyster beds. This level of filling would provide numerous ecosystem services towards improving the overall health of the bay.

The third option considered is to continue filling cycles to elevations to achieve a combination of an emergent feature containing marsh vegetation which grade into a shallow submerged environment. Such a feature would provide a variety of natural ecosystems that would be beneficial to numerous birds, fish, and benthic communities.

A consensus was reached by the MBIWG that it would be beneficial to, at the very least, initiate filling the Brookley Hole Basin. Information from subsequent monitoring would then be used to evaluate the performance of the fill to determine the desired level of future restoration alternatives.

4.1 Initial Fill Placement. The initial placement action will consist of removing approximately 1.2 million cubic yards (mcy) of fine grained material from the upper reach of the Bay channel and placing it in the deepest areas of Brookley Hole as illustrated in **Figure 4**. The red hatched area represents the reach of channel to be dredged and the green hatched area represents the placement within Brookley Hole. A 30-inch hydraulic cutterhead pipeline dredge will remove and deposit the material. A submerged 30-inch pipeline will run east to west from the Mobile Bay Ship Channel to the Brookley Hole placement site. An anchored placement barge will be tethered to the

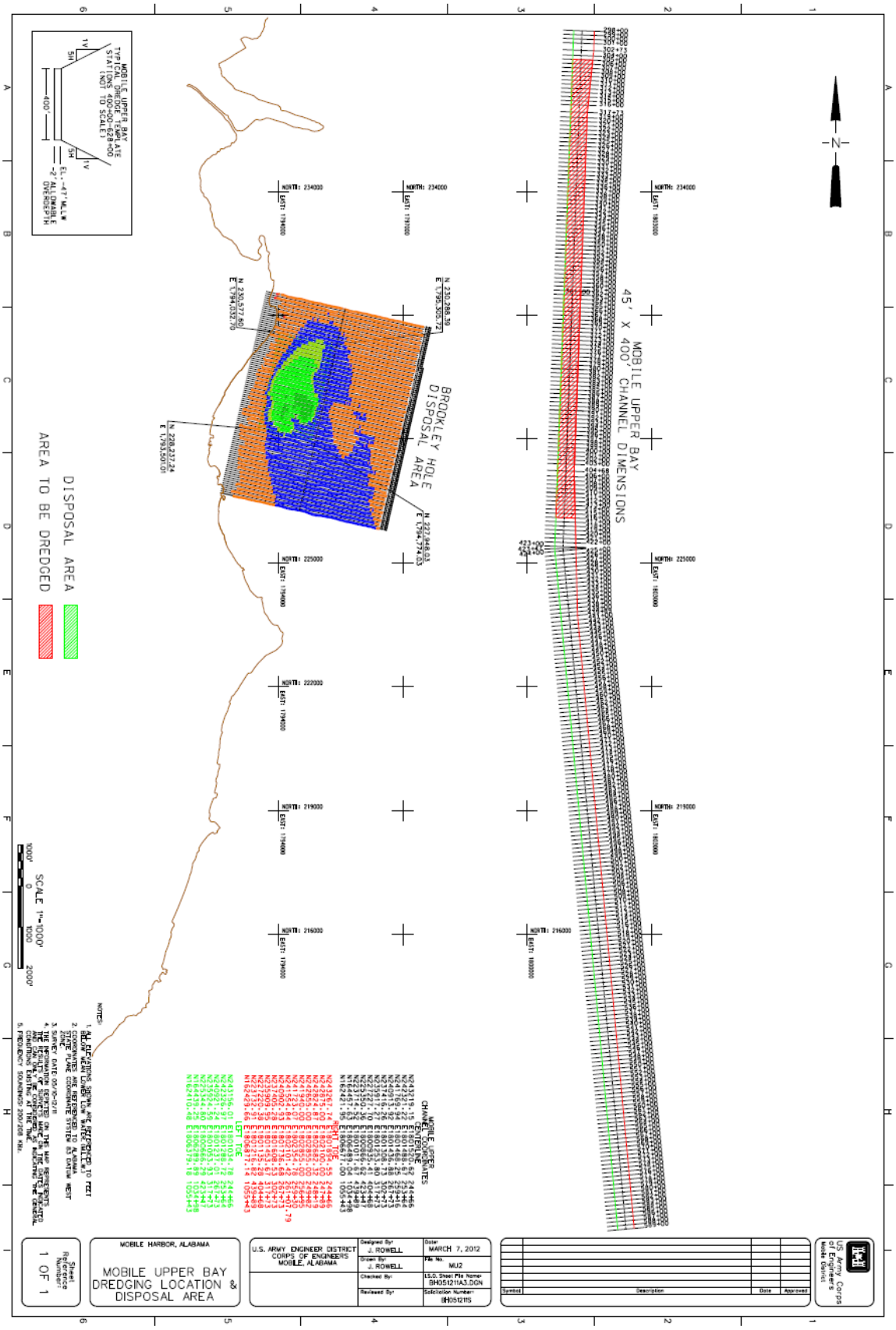

Figure 4. Location of Brookley Hole and reach of dredged channel

submerged line using approximately 1,000 feet of floating pipeline. The placement barge will be outfitted with a down-pipe extending to a depth of approximately -15 Ft MLLW for subaqueous placement within the hole. The dredge slurry will be discharged through the down-pipe with a baffle plate, approximately 5 feet above the existing bottom. This method acts to force the slurry through a 15-foot tall water column to assist in energy dissipation and reducing the turbidity before water exits the placement area. Using the down-pipe method, allows the capability to place bulked material to an elevation of -7 feet Mean Lower Low Water (MLLW). Consolidation of the bottom foundation and newly placed material is anticipated to eventually settle to an elevation ranging between -11 and -14 feet MLLW.

As will be discussed in later sections of this document, baseline characterization surveys were conducted within the Brookley Hole basin to determine and document the degraded conditions exhibited in the deepest areas of the basin. In addition to the baseline characterizations, monitoring of the basin area will be conducted following the initial placement using the same parameters as the pre-placement surveys. The information obtained from these surveys will be used to determine the desired level of restoration for the Brookley Hole basin.

5.0 Need for the Proposed Action

With stagnated O&M funding levels and a restriction that confines the use to hopper dredges, limits the Corps' access to a smaller percentage of the available dredging fleet. Along with the realities that disposal areas have limited capacities, choices will have to be made on how to lower maintenance costs for Mobile Harbor and similar projects. Hopper dredging in Mobile Bay typically doesn't clear the channel template as well as a cutterhead dredge; thereby increasing the dredge cycle frequency. The hopper dredging in Mobile Bay is also restricted to no overflow, which drastically reduces the volume hauled per load. The cost of hauling the material to the Ocean Dredged Material Disposal Site (ODMDS), especially in the upper reaches of the Bay channel is for the most part inefficient given the average U.S. fleet hopper volume. Having the ability to utilize both hopper and cutterhead dredging equipment would provide options and flexibility on maintenance scheduling and cost. This flexibility would allow the Corps to maintain the product quality provided to our customer and the nation.

In addition to the operational constraints, hauling material from the Bay channel to the ODMDS permanently removes sediment from the natural system. It is believed that removal of sediment from the bay may not be the appropriate disposal method for Mobile Bay. Reestablishing beneficial use alternatives may contribute to the much needed conservation efforts for the reestablishment and conservation of the various ecological resources that exist in the Bay system. By demonstrating the benefits of using dredged material to return the Brookley Hole basin into an environmentally productive area, would be valuable towards providing information for planning and implementing other similar actions around the country. By reducing the amount of sediment disposal in the ODMDS, more of the bay sediment will subsequently be retained in the natural sediment transport system. Additionally, having this option will allow the utilization of

cutterhead dredge equipment with more cost effective disposal practices and provide the flexibilities to utilize a greater percentage of the available dredging fleet.

6.0 Alternatives to the Proposed Action

6.1 No Action. By not conducting and demonstrating the benefits of the Brookley Hole action, such benefits will go unrealized and dredged material will continue to be transported to the ODMDS at great expense to the Corps' navigation program. The Brookley Hole basin will continue to exhibit hypoxic characteristics and remain an environmental liability in the upper Mobile Bay and the direct environmental benefits of utilizing dredged material in this manner will go unrecognized.

6.2 Other Beneficial Use Alternative Considerations. The Brookley Hole alternative was selected by the IWG as a project that could be quickly implemented in Fiscal Year 2012 to demonstrate the benefits of using dredged material from the Mobile Bay navigation channel to provide some degree of environmental restoration in the upper portions of the Bay. In addition to the Brookley Hole action, several other demonstration projects were considered and are summarized below.

6.2.1 Beneficial Use of Upland Disposal Areas. Sand from Lower Tombigbee River Upland Sites within the Mobile Basin was considered as source material to construct various BU site in Mobile Bay. These disposal areas are reaching their capacity and use of this material would be beneficial toward restoring disposal capacity in this section of the navigation project. Material from two sites on the Lower Tombigbee River were investigated and determined to have suitable sand for these types of BU applications. However, due to the haul distance required (approximately 78 and 92 miles, respectively, to the mouth of the Mobile River) and the resulting prohibitive costs, this alternative was eliminated from further consideration.

6.2.2 Little Sand Island. This alternative considered the construction of a large brackish marsh cell on the south end of Little Sand Island near the mouth of the Mobile River. The cells would require containment on all sides by a low-sill riprap breakwater or other semi-containment system. This project would utilize sediment dredged from Mobile River navigation channel or from other sources, such as the beneficial use of dredged materials located in upland disposal areas on Blakely Island, Pinto Island and/or along the lower Tombigbee and Alabama Rivers, to fill the cell to appropriate elevations for the establishment of brackish marsh vegetation. Appropriate marsh vegetation would then be planted. Because of the required containment and costs associated with its construction as well as the time it would take to conduct the environmental coordinations, this alternative was eliminated from further consideration.

6.2.3 Brookley Breakwaters. This alternative considered the construction of one to three large brackish marsh cells along the western side of the Mobile Bay navigation channel, south of Arlington Channel. The cells would be enclosed on the southern, eastern and northern side by a low-sill riprap breakwater or other semi-containment system. The western side would be open, allowing for the exchange of

water during tidal cycles. Sediment for the project would be obtained from the Mobile Bay navigation channel and/or from other sources, such as the beneficial use of dredged materials located in upland disposal areas on Blakely Island, Pinto Island and/or along the lower Tombigbee and Alabama Rivers. The cells would be filled to appropriate elevations to establish brackish marsh vegetation. Mash vegetation would then be planted. Because of the required containment and costs associated with their construction as well as the time it would take to conduct the environmental coordinations, this alternative was eliminated from further consideration.

7.0 Scope

6.1 This Environmental Assessment (EA) was prepared in accordance with Engineer Regulation (ER) 200-2-2, *Procedures for Implementing the National Environmental Policy Act (NEPA)* and the Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 Code of Federal Regulations (CFR) Pts. 1500-1508). The objective of the EA is to determine the magnitude of the environmental impacts of the proposed action. If such impacts are relatively minor, a Finding of No Significant Impact (FONSI) will be issued and the Mobile District, U.S. Army Corps of Engineers may proceed with the action. If the environmental impacts are significant according to CEQ's criteria (40 CFR Pt. 1508.27), an Environmental Impact Statement (EIS) or a supplement to the existing 1976 Final Environmental Impact Statement would be prepared before a decision is reached to implement the proposed action.

The Corps has requested concurrence from the Alabama Department of Environmental Management (ADEM) for the use of this site associated with the Federal navigation project. A Coastal Zone Consistency (CZC) determination will be obtained from the Alabama Department of Environmental Management (ADEM) prior to construction.

8.0 Existing Conditions

The proposed project is located near the city of Mobile, Alabama, in the southwestern portion of the state just south of the mouth of the Mobile River in the upper reach of Mobile Bay as illustrated in **Figure 3**. It is approximately 1.5 miles south of downtown Mobile along the west side of the Mobile Harbor Ship Channel.

8.1 Climatic and Physical Conditions

8.1.1 Climate. Coastal areas of the Gulf of Mexico (Gulf) have a humid, warm-temperature to sub-tropical climate. Occasional subfreezing temperatures occur in the area. The water temperature of the Gulf influences winter air temperatures in the Mobile area. Air temperatures usually reach 90°F or higher about 70 days per year with occasional temperatures in excess of 100°F (Navy 1986). The climatic effect of the Gulf is demonstrated in the relatively mild average annual air temperature of 68°F with January being the coldest month and July the warmest month.

Tropical storms occur in the Gulf in summer and fall with Hurricane season extending from June 1 to November 30. The season averages ten (10) named storms, six (6) of which become hurricanes (Atlantic Tropical Weather Center 2002). These storms are most likely to occur in the Mobile Bay area from late August to early October (Navy 2002).

Rain. The Mobile area receives an average annual rainfall of 65 inches, among the highest for metropolitan areas in the continental US. This rainfall can be accentuated by hurricanes, tropical storms, and El Nino events. The driest period of the year is typically from August through November (TAI 1998). Rainfall is somewhat evenly distributed throughout the year with the exception of a slight maximum at the height of the summer thunderstorm season and a slight minimum during the late fall. Average monthly maximum rainfall occurs in July with 7.7 inches and average minimum monthly rainfall in October, with 2.6 inches (Navy 1986).

Wind. Wind is one of the basic forces governing circulation of estuarine and continental shelf waters, and speed and direction are the most important aspects of its influence. These forces interact with atmospheric pressure to produce circulation patterns, wind-stress, tide and current modifications, and coastal erosions and deposition processes. These processes are strongly influenced during the spring and summer by the Bermuda High while a series of high and low pressure systems affect the fall and winter weather patterns. There are no consistent seasonal wind directions, but net wind movement is northward from March through August and southward from September through February. When calculated as an annual average, winds blow from the south or southeast 19 percent of the time and from the north or northeast 18 percent of the time. This pattern is well-developed, and these forces generate moderately strong southerly daytime winds, particularly during the summer months (Navy 1986). The highest wind speed ever measured in Mobile was 145 mph during Hurricane Frederic in 1979 (Navy 1986).

8.1.2 Currents. Circulation patterns within Mobile Bay are controlled by astronomical tides, winds, and freshwater inflows. The tidal prism of the Bay, based on the weighted mean tidal range of 1.4 feet and a surface area of 236,000 acres, is about 330,000 acre-feet. In the past, during periods of relatively low freshwater inflow, i.e., when inflow is about 12,200 cubic feet per second, the "flushing time" of the Bay is estimated at between 45 and 54 days (Navy 1986).

The tidal circulation of Mobile Bay was investigated by Austin (1954) during a period of low river discharge. This study indicated that the incoming current from the Gulf enters through the main pass. A portion of this water flows up the west side of the bay and part enters the Mississippi Sound through Pas aux Herons. Within about four hours, the flow through Pas aux Herons reverses and water enters Mobile Bay from the Sound. Another part of the flooding water mass flows to the east into Bon Secour Bay before turning west to rejoin the generally northward trending flood tide entering the central part of the bay.

In the northern, upper portion of the Bay, the tidal inflow from the south is forced to the east of the bay by the inflow from the Mobile River delta. The freshwater inflow generally continues on the surface in a southerly direction along the western side of the Bay. This flow pattern sets up a generally counter-clockwise circulation within the upper Bay (Navy 1986).

8.1.3 Salinity. Salinity distribution of Mobile Bay is dependent upon river flows and tides. Both surface and bottom salinity appear to be lowest in March and April and highest during the four-month period from September through December. Salinity is always higher in the bottom water, although the Bay's average depth is only 9.7 feet (Navy 1986). The relationships between river discharge and salinity profile along the ship channel were reported by McPhearson (1970) (Navy 1986). High river discharges can reduce surface salinities from 20 parts per thousand (ppt) to nearly 0 ppt even in the southernmost portion of the Bay. High stream flow results in a high hydrostatic head that produces higher tides and currents at the mouth of the Bay. Under extremely high flows, an outward-moving surface current can continue even during flood tide. During low stream flows, saline water can intrude as much as 21 miles upstream in the Mobile River (Navy 1986).

During low river discharges, riverine and transitional waters in the upper and middle Bay form a surface lens over the more saline bottom waters. During periods of moderate to high river discharge riverine and transitional waters tend to dominate the entire surface field in the lower portion of the Bay (Navy 1986). High-salinity water from the Gulf can move as overflow from the Main Ship Channel, as a broad bottom intrusion, or as a combination of the two. The broad bottom intrusion of marine waters tends to favor the east side of the Bay, whereas riverine and transitional waters favor the bottom of the west side of the Bay (Navy 1986). Observed salinity ranges in the vicinity of Pinto Island are from 0.03 ppt during periods of high rainfall to a high of 13.0 ppt during the typical drier periods (Navy 1986).

8.1.4 Tides. In Mobile Bay and adjacent Gulf waters, the tidal variation is diurnal with an average period of 24.8 hours. The tidal wave progresses from south to north. Tidal movement into Mobile Bay is a continuation of the tidal progression within the Gulf. The Bay has a diurnal tidal cycle, typically with one high and one low tide over the average period. Two high or two low tides occur during the biweekly neap tides. The mean tidal range in Mobile Bay varies from 1.2 feet at the entrance to 1.5 feet at the head end of the Bay. Within the tidal inlets and bayous along the Alabama coast, the mean tidal range varies from about 0.6 to 1.8 feet. Mean Low Water (MLW) during the winter months and varies from 0.5 to 1.0 foot below the summer month range. The reported range of most tides within the Bay is between 1.0 and 2.5 feet (Navy 1986).

Winds can induce large variation in the range of the tidal flows. Strong northerly winds can force water out of the Bay, resulting in current velocities of several knots at the main pass. Water levels as much as 1.9 feet below MLW have been recorded under such conditions. The steadier and more prevailing southeast-to-southwest winds induce an opposite condition whereby winds pile water up in the upper portion of the Bay. An indication of the frequency of abnormal wind-driven waves and water setup resulting

from these southerly winds has been derived from the frequency with which the eastbound lane of Battleship Parkway had been closed. The eastbound lane, at an elevation of 2.5 feet MLW, is more susceptible to flooding than the westbound lane.

8.1.5 Sediments. The sediment of Mobile Bay consists of sand to clays with various mixtures of sand, silt, and clay covering most of the bay bottom. The Mobile Bay sediments are approximately 50 percent sand and 50 percent clay as described by the Navy (1986). The northern portion of the bay is comprised of deltaic sands and silty sands and silts and clayey silts carried in by the Mobile River. Sediments of the lower bay are primarily estuarine silty clay and clay. The western shoreline exhibits sands which grade to clayey sand, sandy clay and clays towards the deeper parts of the bay. Oyster reefs and shell occur in isolated locations in the southern part of Mobile and Bon Secour Bays (COE 1985).

The upper portion of Mobile Harbor is predominantly silt and clay with higher concentrations of sand in mouth of the Mobile River. The northernmost part of the harbor and Mobile River mouth which reflects the conditions within the turning basin area is sandier due to the larger grain sizes initially deposited into the estuary by the mouth of the river while the finer silts and clays were deposited in the deeper portions of the harbor area.

8.2 Environmental Conditions

8.2.1 Estuarine Environment. The Brookley Hole site is in the upper Mobile Bay and characterized as shallow water habitat. The basin and the surrounding area is totally submerged and ranges in depth from approximately 23 feet in the basin and 3 to 6 feet in the surrounding bay bottom. Existing biological and ecological documentation of the shallow aquatic habitat is not considered to be extensive.

In 2002 a submerged aquatic vegetation (SAV) survey was conducted of the Garrows Bend (COE 2004) area to determine if SAV exists in the project area. Based on the survey, the occurrence of SAV within Garrows Bend is extremely rare. Individual plants were found anchored in the exposed water bottoms, but there was no congregation of plants that could constitute a grassbed. Earlier SAV inventories of Mobile Bay (Stout et al. 1982; COE 1985a) identified as much as 20 species of submerged aquatic vegetation occurring in the shallow shoreline areas of Mobile Bay. Data show that through the 1960s and 1970s, grassbeds in the bay have steadily declined. Historically, a combination of changes has occurred to produce a decline in submerged grassbeds in Mobile Bay. Dredging activities have physically removed suitable habitat by deepening portions of the bay. Increased boat traffic, hydraulic dredging, and shoreline construction during the last 20 years have led to increases in turbidity levels. More efficient agricultural methods have been developed to compensate for a decline in the availability of agricultural land. These changes have increased the use of concentrated fertilizers and herbicides. The resulting excessive nutrient loading is considered to be a negative impact upon submerged grassbeds because it often causes dramatic increases in the productivity of planktonic algal populations.

The environmental studies conducted by the Navy (1986) for the Gulf Coastal Strategic Homeporting Project is in the same general vicinity. A reconnaissance was conducted to locate grassbeds within the project footprint and surrounding areas. The investigation revealed at that time that no grassbeds were observed off the southwestern tip of Pinto Island.

8.2.2 Benthic Environment. Studies of the benthic characteristics of Mobile Bay have been conducted and somewhat extensive in comparison to other similar estuarine areas. Two historic studies were performed around Garrows Bend to characterize the benthic habitat (Vittor 1978; 1981). This study area is in close proximity to the project area and considered to exhibit the same benthic characteristics. These studies indicated that most representative of the shallow water habitat in the project area showed a low diversity index for benthic macroinvertebrate species. Species equitability (distribution of different species) was low for these same samples with the dominant species being polychaete worms and amphipods. The amphipods are thought to be a primary food source for several forage and recreational fish (Vittor 1981). At that time the report indicated that past use and activities of the area has greatly diminished the quality of the benthic and aquatic habitats.

Vittor and Associates, Inc. (1982) studied the benthic macrofauna of bay waters off the southeastern edge of Pinto Island. This study included the location proposed for the turning basin. The study showed that densities ranged from 573 to 2,943 individuals per square meter, reaching the highest levels at the deeper sampling locations. The total number of taxa collected at a given station varied from 9 to 19. Numerical dominants in decreasing order of abundance included annelids (64.8 percent), molluscs (25.6 percent), arthropods (5.7 percent), and other phyla (3.9 percent). An earlier study (ACAB 1981) was conducted near Pinto Island indicated no consistent trends in seasonal abundance. However, species richness (total number of taxa) was lowest in late spring and summer, whereas the highest number of taxa was collected during the winter months. *Mediomastus ambiseta*, *Mulinia lateralis*, and *Mulinia ponchatrainensis* dominated the benthic assemblages at that time.

Study results at D'Olive Bay benthos was dominated by the polychaete (*Laeonereis culveri*) and the marsh clam (*Rangia cuneata*) was abundant at some stations. Benthic community composition and abundance were influenced by salinity and dissolved oxygen fluctuations. Similar conditions apparently exist for most of upper Mobile Bay (COE 1985a) with Gastropods dominating the upper bay including *Maritida reclivata*, *Probythinella protera*, and *Taxadine sphinctostoma*. Predominant annelids include *L. culveri*, *Mediomastna californiensis*, *Neanthes succinea*, *Parendelia americana*, *Streblospio benedicti*, *M. californiensis*, *N. succinea*, and *S. benedicti* with *R. cuneata*, *P. protera*, *T. sphinctostoma*, and L. culveri as the most suitable indicators of specific habitat types in Mobile Bay (Vittor 1979).

8.2.3 Fish and Shellfish. A number of studies evaluating the fish and invertebrates of Alabama estuaries were conducted in the past (Swingle 1971 and Swingle and Bland 1974). The studies looked at species abundance and diversity in

coastal waters. A later study by Shipp (1979) provides a summary of available data on Mobile Bay forage fish species. The study indicates that species composition and abundance have been well-documented through the years but that there is a need for research related to environmental changes in Mobile Bay. Shipp's study categorized estuarine forage fish as nearshore and marsh, demersal, or pelagic estuarine species. The nearshore and marsh species are comprised largely of fish in the families *Poeciliidae*, *Cyprinodontidae*, and *Atherinidae* which serve as the prey for the Southern flounder (*Paralichthys lethostigma*) and seatrout (*Cynoscion spp.*) both important sport and commercial species.

Demersal fish of the estuary are dependent upon benthic organisms as their food source base. Some of these fish are migratory with the three most common species in the study area in order of abundance are Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), and sand seatrout (*Cynoscion arenarius*). The most important forage fish within Mobile Bay estuary are the pelagic species; Bay anchovy (*Anchoa mitchilli*), striped anchovy (*Anchoa hepsetus*), and Gulf menhaden (*Brevoortia patronus*) being the most abundant. The highest ranking pelagic forage species in Mobile Bay watercourses are bay anchovy, Gulf menhaden, and threadfin shad (*Dorosoma petenense*) (Shipp 1979). Other investigations conducted by the ACAB (1981) focused on regional and seasonal concentrations of fish eggs and larvae of Mobile Bay. It was found that the perimeter of the bay is utilized as nursery habitat by larvae and juveniles of commercially important fish species.

The most commercially important shellfish found in Mobile Bay include the brown and white shrimp, blue crab, and American oyster. The shrimp species spawn in the Gulf and spend a major portion of their life cycle in estuarine system and are an important component of the food web, being preyed upon by fish and birds. The brown shrimp (*Penaeus aztecus*) has a peak spawning period from December through January. The post-larvae move into the estuarine waters between February and May seeking out soft bottom, shallow areas. The juvenile shrimp move eventually from the bay to the Gulf of Mexico. The white shrimp (*Penaeus setiferus*) spawns in the spring in Gulf waters. The demersal eggs hatch March to October, and post-larval movement into the Mobile Bay estuary peaks from June to September. After living as benthic feeders in very shallow waters, the shrimp passed into deeper estuarine waters and eventually emigrate to the deeper Gulf waters during ebbing tides during June through November.

Another important and very abundant crustacean which utilizes Mobile Bay for portions of its life cycle is the blue crab (*Callinectes sapidus*). Blue crab mate and ovulate in spring and summer in the bay. The females migrate offshore where the eggs hatch and early larval stages develop. Later larval stages enter the estuarine habitat. Juvenile crabs generally congregate in channels and brackish marshes along the bay throughout the year. They prefer soft mud sediments and low salinities (5 to 15 ppt).

Oysters are quite abundant within the middle and lower reaches the Mobile Bay estuary with the majority located in the southern half of the bay (Alabama Marine Resources Laboratory 1971; Smith 1984). However, the presence of oysters is becoming

more common in the northern-most reaches of the Bay. Spawning of oysters involves external fertilization in which eggs and sperm mix in the water column. Spawning generally occurs late May through early June and again in September. Eggs are demersal and develop into free-swimming larvae, eventually settling into sedentary existence, congregating in the presence of mature oysters to form oyster beds or reefs.

8.2.4 Protected Species. The project area is host to wildlife on the State and Federal protected species list. Of particular concern in the proposed project vicinity are sea turtles, Florida manatee, and the Gulf sturgeon. Sea turtles are known to be present within the Mobile Bay and actively nest on adjacent Gulf of Mexico beaches. However, they are not known to actively use the upper reaches of the Bay.

The Florida manatee is a subspecies of the West Indian Manatee. Between October and April, Florida manatees concentrate in areas of warmer water. During summer months, the species may migrate as far west as the Louisiana coast on the Gulf of Mexico and may occasionally be found along the Alabama coast. Manatees inhabit both salt and fresh water of sufficient depth (about 5 feet to usually less than 18 feet). Florida manatees may be encountered in canals, rivers, estuarine habitats, saltwater bays, and on occasion have been observed as much as 3.7 miles off the Florida Gulf coast. These manatees will consume any aquatic vegetation available to them including sometimes grazing on the shoreline vegetation. Although rare, manatee sightings have been documented in Mobile Bay and/or its tributaries for the past several years, during the period May through December.

The Gulf sturgeon is a subspecies of the Atlantic sturgeon. Subadult and adult Gulf Sturgeon spend six to nine months each year in rivers and three to six of the coolest months (September-March) in estuaries and/or the adjacent Gulf of Mexico. It appears that Gulf Sturgeon less than two years old reside in lower reaches of riverine habitats and estuaries throughout the year. In general, subadult and adult Gulf Sturgeon begin to migrate into rivers from the Gulf of Mexico as river temperatures increase to about 16 to 23° C (60.8 to 75.0° F). They continue to immigrate through early May, but most arrive when temperatures reach 21° C. Most Gulf Sturgeon return to estuaries or the Gulf of Mexico by mid-November to early December. Adults migrate up the river and other streams during the period of March through September to spawn. Juvenile Gulf Sturgeon use the bay primarily from September through June, although they may be found in the bay or adjacent estuaries during any month of the year. The proposed turning basin area may be used by Gulf sturgeon for foraging during their migration periods. However, the turning basin is not within designated Gulf Sturgeon critical habitat.

8.2.5 Essential Fish Habitat (EFH). EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity and include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate. In estuarine waters such as Mobile Bay, these EFH include areas such as estuarine emergent wetlands, seagrass beds, algae flats, mud, sand, and shell substrates, and the

estuarine water column. The EFH in the upper Mobile Bay area includes emergent wetlands, mud substrate, and estuarine water column for species such as red drum, brown shrimp, pink shrimp, and white shrimp. The area also provides habitat for prey species (e.g. Gulf menhaden, shad, croaker, and spot) that are consumed by larger commercially important species. In addition, the area provides habitat for spotted seatrout, striped mullet, southern flounder, Atlantic croaker, and Gulf menhaden.

8.2.6 Cultural Resources. An extensive background search of both published and grey literature focused on the Mobile Bay area, the Archaeological Site Files for Mobile County, historical maps, aerial photography, and various repositories including the Museum of Mobile, the Mobile Public Library Archives and History, the Oakleigh Historic Museum and Archives, the Alabama State Site Files at Moundville, and records of the Mobile District, U.S. Army Corps of Engineers revealed a great deal of activity in the Mobile Bay and harbor, particularly in the last two hundred years. More than fifty vessels have been reported lost in the vicinity of Mobile Harbor, Mobile River, since the eighteenth century. Some have been reported sunk at the dock, while the greater number of vessels lost has been a result of hurricanes in 1906 and 1916, and casualty of the Civil War. However, no shipwreck previously has been recorded in the immediate project area.

Two archaeological sites have been recorded within one mile of the project area. Battery Gladden, located on the southeastern tip of Pinto Island was originally called "Pinto Battery." The cannon battery was established there in 1861 during the Civil War. Additionally, several Confederate Obstructions were put in place between 1861 and 1865 by the Confederate Corps of Engineers. This system consisted of a complex assortment of pilings, sunken vessels, cannon batteries, and mine (torpedo) fields to obstruct the entrance channels to the Mobile River. Included in the Confederate Obstructions, and reported as comprising this state historic site, were three vessels: one was an unnamed river flat filled with brick, an early stern-wheel paddleboat named *Cremona*, and a small river steamboat called *Carondelet.* Most of the obstructions were salvaged after the war or removed to prevent an impediment to boat traffic. Neither of these sites lay within the proposed project area. All efforts will be made to assure that all equipment, staging areas, and construction activities avoid these historic sites.

8.3 Brookley Hole Baseline Characterizations. Baseline surveys were conducted in August and December, 2011 and again in April, 2012. During these sampling events Ponar grabs were taken at 16 stations for benthic community characterization and sediment grain size and total organic carbon content analyses. Water quality parameters, including salinity, temperature, and dissolved oxygen concentration, were measured at the same 16 stations. Stations were allocated between Brookley Hole and a nearby smaller hole, designated as the "Airport Hole", which serves as a reference site. At each site, 5 stations were located within the two holes and 3 stations in the surrounding natural bottom. During each sampling event conventional otter trawling was conducted, consisting of 3 trawls within each hole using an 8-ft shrimp net. In conjunction with the otter trawling, fisheries hydroacoutic surveys were conducted to assess fishery resource occupation within the holes. Monitoring will be conducted using these same baseline parameters after placement of the fill material.

8.3.1 Dissolved Oxygen. With respect to water quality in the August survey, Brookley Hole was shown to contain hypoxic waters at depths below 9 feet. Hypoxic conditions are defined as dissolved oxygen (DO) levels being less than 4 parts per million (ppm). DO concentrations were measured as low as 0.5 ppm in the deepest portion of the basin. In December, the volume of hypoxic water in Brookley Hole had decreased, extending downward from a depth of 13 ft. Final results from the subsequent are surveys were not available at the time of this writing of the draft EA, but preliminary results indicate that the deepest portions of the basin remain hypoxic. The final results of all the surveys will be summarized in the final EA.

8.3.2 Benthic Communities. With respect to benthic communities, assemblages at the stations within the holes were barren in comparison to assemblages outside the holes. Abundances in the two basins were uniformly low, less than 75 organisms per grab sample in Brookley Hole and less than 310 organisms per grab in Airport Hole, as compared to 400 to over 800 organisms per grab in natural bottom samples. Likewise, benthic diversity was generally lower in both holes, with 3 to 9 taxa represented in August samples and 9 to 14 taxa in December, as compared to 14 to 16 and 23 to 26 taxa in the August and December natural bottom samples respectively. All samples were dominated by typical oligohaline benthic infauna, notably opportunistic polycheates of the genera *Mediomastus* and *Streblospio*.

8.3.3 Fisheries Resources. With respect to fishery resource use of the holes, the August trawl catch in both holes was dominated by bay anchovies and threadfin shad. Spot and Atlantic croaker were also notably represented in the catch, as well as smaller numbers of silver perch, hardhead catfish, and white seatrout. White shrimp were present in both holes, and present in higher numbers in the Brookley Hole than in the Airport Hole. In December the trawl catch in Brookley Hole was dominated by Atlantic croaker, with smaller numbers of bay anchovies and spot, whereas the catch at Airport Hole consisted largely of bay anchovies and spot. White shrimp were again present in both holes, comprising a larger percentage of the catch at Airport Hole than at Brookley Hole. Hydroacoustic surveys in August revealed a distinct pattern of fishes in the water column avoiding the deeper hypoxic zone, generally staying above a depth of 12 ft. In December fishes did move to a deeper depth in the Airport Hole, although substantially fewer fish were present. Both the trawl catches and the hydroacoustic surveys indicated that fishes present in the holes were small, generally less than 20 cm total length. This reflects the occurrences of anchovies and juvenile stages of other species.

9.0 Environmental Impacts

9.1 General. Activities associated with the initial filling of the Brookley Hole basin would result in a number of unavoidable but minor impacts to the immediate project area. The adverse impacts are minimal and temporary in nature and include destruction of benthos, reduced esthetics, reduced air quality, increased turbidity, increased noise, and aquatic organism disturbance.

9.2 Impacts.

9.2.1 Habitat. Adverse impacts to benthic organisms would be encountered as a result of the dredging operations within the footprint of the navigation channel. While most of the immobile organisms within the upper reaches of Mobile Bay area are quite adaptable to seasonal changes in temperature, salinity, dissolved oxygen, water clarity and water level fluctuations due to the tidal cycle, the direct removal and disposal of the dredged material would destroy some sediment dwelling organisms. Also, some mortality of motile organisms may result from entrainment by the dredge equipment. Natural recruitment of benthic organisms, encrusting organisms and fishes into the navigation and Brookley Hole basin area would occur rapidly, usually within one year. It is expected that benthic organisms will be recruited via currents and sediment carried into the navigation channel and Brookley Hole basin. Recovery of the benthos will rapidly approach the same levels that exist in the adjacent bay bottom areas, especially after the Brookley Hole basin recovers from the hypoxic conditions. The overall impact are considered not be significant. Previous environmental studies cited in Section 2.0 of this document have indicated that submerged aquatic vegetation (SAV) is rare in this area. Therefore, it has been determined that there would be no effect on existing SAV.

9.2.1.1 *No Action*. By not implementing this demonstration BU project, the Brookley Hole basin will continue to exhibit hypoxic characteristics and remain an environmental liability in the upper Mobile Bay. The direct environmental benefits of utilizing dredged material in this manner will go unrecognized and benthic assemblage characteristics will remain unchanged.

9.2.2 Esthetics. Esthetics would be reduced in the project area during the dredging and disposal operations, due to the physical presence of the dredge and pipeline used to transport the dredged material as well as the presence of other land-based equipment. However, these impacts would be temporary and insignificant.

9.2.2.1 *No Action.* No aesthetic impacts would result from this alternative.

9.2.3 Water Quality. Some silty material will be associated with the dredging and placement operations and its suspension may result in a slight localized increase in turbidity at the dredging and disposal sites. The finer materials being excavated will be conducted using a hydraulic pipeline dredge. Disposal of the finer grained materials will be mostly confined with the Brookley Hole basin. The State of Alabama's water quality standards would not be significantly affected and water clarity would return to ambient conditions shortly after sediment placement at the dredge and disposal sites. As required by the Clean Water Act, a Section 404 (b)(1) evaluation report for the removal of sediment from the Mobile Bay channel and placement of material in the Brookley Hole disposal area has been prepared and is included as Appendix A.

9.2.3.1 *No Action.* No water quality impacts would result from this alternative.

9.2.4 Air Quality. Air quality would be temporarily and insignificantly affected by the proposed action. Emissions are expected to occur and would result from the operation of the dredge, land-based equipment, and any other support equipment which may be on or adjacent to the job site. The project area is currently in attainment with National Ambient Air Quality Standards parameters. The proposed action would not affect the attainment status of the project area or region. A State Implementation Plan conformity determination (42 United States Code 7506 (c) is not required since the project area is in attainment for all criteria pollutants.

9.2.4.1 *No Action.* No air quality impacts would result from this alternative.

9.2.5 Noise. Noise from the dredge and other associated support equipment would be evident in the project area. Noise levels would be typical of what is already commonly accepted and occurring at the Corps' dredging operation sites. While this noise would be evident to those workers on the job and any users in close proximity of the project, it would be short-term and insignificant. Normal noise levels would be achieved at the end of each workday and after completion of the job.

9.2.4.1 *No Action.* No noise impacts would result from this alternative.

9.3 Federally-protected Species.

9.3.1 Essential Fish Habitat (EFH). The proposed turning basin area serves as habitat for prey species such as gulf menhaden, shad, croaker, and spot that are consumed by other Federally managed species such as Spanish and king mackerel, various snappers and groupers, bluefish, dolphin and cobia found in Mobile Bay and/or the Gulf of Mexico. Other recreational and commercial species that have been documented in the area are spotted seatrout, southern flounder, and blue crab. The proposed action will not fill or destroy habitat considered necessary to sustain these species. Coordination with the NMFS, Protected Species Management Branch, in Panama City, Florida in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) has been initiated through Public Notice FP12-MH03-10 for the operations involving placement of dredged material in Brookley Hole. Preliminary findings from the baseline characterizations indicate that the deepest part of the basin is hypoxic and that filing these areas would have minimal effect on EFH.

9.3.1.1 *No Action.* By not implementing this demonstration BU project, the Brookley Hole basin will continue to exhibit hypoxic characteristics and remain an environmental liability in the upper Mobile Bay. The direct environmental benefits of utilizing dredged material in this manner will go unrecognized and the species considered under EFH would not benefit from the potential enhancement of ecosystem services.

9.3.2 Threatened and Endangered Species. Coordination with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), Daphne, Alabama was initiated under FP12-MH03-10. In accordance with the Endangered Species Act (ESA).

coordination of such species for this area was conducted in 1980 in the authorized project EIS for Mobile Harbor, Alabama Channel Improvements. Since that time, the Gulf sturgeon has been added to the list of Federally protected species. It is believed that sturgeon may use the surrounding areas for foraging during migration periods. It has been determined, however, that the action will have no effect on Gulf sturgeon as the use of hydraulic pipeline equipment are not known to take or harm this species. The proposed action area does not fall within designated Gulf sturgeon critical habitat.

Other aquatic species such as the Florida manatee and sea turtles would not normally use the project area and would not likely exhibit incidental use of the area during project implementation. To minimize potential contact with manatees, the Manatee Construction Conservation Measures will be observed if deemed appropriate at the time of project construction. Because the area is not a major provider of life history requirements for these species, it has been determined that there will be no effects to these species as a result of the proposed action. Based on these findings it is determined that the placement of dredged material in Brookley Hole will have no effect to any Federal listed threatened or endangered species. Subsequent coordination with the U.S. Fish and Wildlife Service has been initiated through Public Notice FP12-MH03-10. The response indicated no adverse impacts to threatened or endangered under their purview if the recommended measures are followed. Such measures are considered reasonable and typically implemented for operations of this nature.

9.3.2.1 *No Action.* By not implementing this demonstration BU project, the Brookley Hole basin will continue to exhibit hypoxic characteristics and remain an environmental liability in the upper Mobile Bay. The direct environmental benefits of utilizing dredged material in this manner will go unrecognized and the endangered species considered under the ESA would not benefit from the potential enhancement of ecosystem services.

9.4 Environmental Justice. On February 11, 1994, the President issued Executive Order (E.O.) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations.* The order required that Federal agencies conduct programs, policies, and activities that substantially affect human health or the environment so that there is no disproportionately high and adverse human health or environmental effects on minority and low-income populations. This project is not designed to create a benefit for any group or individual, but rather benefits on a nationwide basis. There are no indications that the proposed sand bypassing operation would be contrary to the goals of E.O. 12898, or would create disproportionate, adverse human health or environmental impacts on minority or low income populations of the surrounding community.

9.4.1 No Action. No impacts to environmental justice would result from this alternative.

9.5 Cultural Resources. In compliance with the National Historic Preservation Act, the proposed action is being coordinated with the Alabama State Historic

Preservation Officer (ASHPO). The APE for this project is confined to previously dredged areas. The APE was the subject of multiple cultural resources assessments conducted during the 1980's (Irion 1983; Irion and Bond 1984; Mistovich and Knight 1983). The most recent cultural resources assessment was conducted in (Hall) 2007 for the recently created turning basin in Choctaw Pass and the widening of an approximate 7650 linear foot section Mobile River Navigation Channel located towards the western side of Little Sand Island. The assessments identified no historic properties within the current project APE. The result of the surveys and no effects determinations were coordinated with the Alabama State Historic Preservation Officer (SHPO). Since all proposed work is occurring in previously disturbed areas, the activity does not have the potential cause effects to historic properties. The USACE has determined that the proposed project has no potential to cause effects to historic properties as per 36 CFR 800.3(a)(1) and therefore will have no significant impact to cultural resources. Copies of the Public Notice and subsequent coordinations have been sent to the ASHPO.

9.5.1 *No Action.* No impacts to historic resources would result from this alternative.

9.6 Protection of Children. On April 21, 1997, the President issued Executive Order (EO) 13045*, Protection of Children from Environmental Health and Safety Risks*. To the extent permitted by law and appropriate, and consistent with the federal agencies' mission, the Corps of Engineers shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. The proposed action for the Mobile Harbor Turning Basin project poses no environmental health risks or safety risks disproportionately to children in the vicinity of the project.

9.6.1 *No Action.* No impacts to children would result from this alternative.

9.7 Cumulative Impacts. Studies conducted associated with the 1980 EIS and other subsequent Environmental Assessments as list in Section 3.0 of this document indicated that the modifications to the Mobile Harbor project may cause some change in the overall currents, salinities, and sedimentation in the project vicinity. These changes are the apparent result of the deepening of the channel and turning basin area. Current models indicate an increase in sedimentation rates within the turning basin which is also a result the deepening. It is believed that these effects will cause an increase in maintenance operations which may result in temporary impacts to air quality, water turbidity, and esthetics during maintenance activities.

The filling of Brookley Hole using dredged material from the Mobile Bay channel will act to further optimize the maintenance of the commercial shipping channel which may result in increased automobile, trucking, and rail activities in the immediate area. These secondary impacts may increase levels of noise, water, and air pollution related to increased economic development associated with the improvement to Mobile Harbor.

This may further lead to a slight increase in employment, population, housing, industrial and commercial development, and port expansion. However, these basic patterns and general magnitude of growth would be expected to occur with or without the proposed project.

10.0 Conclusion. The hydraulic pipeline dredging equipment that will be used for filling the Brookley Hole basin is not known to take or harm any Federally listed threatened or endangered species. Filling of Brookley Hole by demonstrating the beneficial use of dredged material from the navigation channel has been determined by the IWG to provide environmental benefits by alleviating the hypoxic conditions known to exist within the basin. By alleviating this condition, the area would return to a state that would provide valuable ecosystem services to that portion of the upper Mobile Bay. Providing the flexibility to utilize hydraulic pipeline dredging equipment to clear specifies reaches of the Mobile Bay channel and not transporting the material to the ODMDS would result in significant cost savings to the Corps' navigation program. Based on the above discussion of the minor impacts and potential benefits, which would result from the implementation of the proposed action and due to the lack of long-term adverse impacts, it is believed that no significant cumulative impacts resulting from the demonstration of beneficially using dredged material to fill the Brookley and adjacent areas would occur.

Upon completion of the required coordinations and consultations, the Corps will be requesting a water quality certification (WQC) and Coastal Zone Consistency (CZC) concurrence from the Alabama Department of Environmental Management (ADEM).

11.0 List of Agencies, Interested Groups and Public Consulted

Region 4, U.S. Environmental Protection Agency
Field Representative, Fish and Wildlife Service
Regional Director, National Park Service
Regional Director, National Marine Fisheries Service
Commander, Eighth Coast Guard District
Alabama State Historic Preservation Officer
Alabama Department of Environmental Management
Alabama Department of Conservation and Natural Resources

Other Federal, State, and local organizations, affiliated Indian Tribe interests, and U.S. Senators and Representatives of the State of Alabama have been notified of the proposed action through Public Notice FP12-MH03-10 and are being asked to participate in coordinating this proposed demonstration project.

12.0 References

Alabama Coastal Area Board (ACAB) and the Marine Environmental Sciences Consortium 1981. Final Report CAB 81-05, Daphne, Alabama.

Alabama Marine Resources Laboratory 1971. *A Survey of the Oyster and Oyster Shell Resources of Alabama.*

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APPENDIX A

SECTION 404(b)(1) EVALUATION REPORT

BROOKLEY HOLE DEMONSTRATION: BENEFICIAL USE OF DREDGED MATERIAL FROM MOBILE HARBOR FEDERAL NAVIGATION CHANNEL MOBILE COUNTY, ALABAMA

I. DESCRIPTION OF THE AUTHORIZED FEDERAL PROJECT AREA

Mobile Harbor, Alabama, is located in the southwestern part of the state, at the junction of the Mobile River with the head of Mobile Bay (**Figure 1**). The port is about 28 nautical miles north of the Bay entrance from the Gulf of Mexico and 170 nautical miles east of New Orleans, Louisiana. The navigation channel dredging in Mobile Bay and Mobile River began in 1826 with enactment of the River and Harbor Act of 1826. During the period 1826 to 1857, a channel 10 feet deep was dredged through the shoals in Mobile Bay up to the city of Mobile. Subsequently, further modifications to the channel were authorized and the original Federal project was enlarged by the addition of the Arlington, Garrows Bend, and Hollingers Island channels within the bay, and a channel into Chickasaw Creek from the Mobile River. Section 104 of the River and Harbor Act of 1954 authorized a 40-foot depth channel with a 400-foot width in Mobile Bay to the mouth of the Mobile River and a 40-foot depth in the Mobile River to the Cochran Bridge with the width varying from 400 to 775 feet. The Senate Public Works Committee on 16 July 1970 and the House Public Works Committee on 15 December 1970, under the provisions of Section 201 of the 1965 Flood Control Act, authorized a 40- foot by 400-foot channel, branching from the main ship channel and extending through a land cut to the Theodore Industrial Park. The Theodore Ship Channel was reauthorized in the Water Resources Development Act of 1976.

Further improvements to the existing federal project were initially authorized in the 1985 Energy and Water Resources Appropriation Act (PL 99-88, Ninety-ninth Congress, First Session). The improvements were reauthorized in Section 201 of the Water Resources Development Act of 1986 (PL 99 – 662, Ninety-ninth Congress, Second Session), which was approved 17 November 1986, and subsequently amended by Section 302 of the Water Resources Development Act of 1996. The report referenced by this authorization recommended the following improvements to the Federal project: deepening and widening the Gulf entrance channel to 57 by 700 feet; deepening and widening the main ship channel to 55 by 550 feet in Mobile Bay, except for the upper 3.6 miles which require a width of 650 feet; deepening the Mobile River channel to 55 feet to a point about 1 mile below the Interstate 10 highway tunnels; and, constructing turning and anchorage basins near the upper end of the main ship channel.

The federally-authorized Mobile Harbor navigation project consists of the following features:

a. A 57’ x 700’ channel from the Gulf of Mexico for approximately eight (8) miles to Mobile Bay;

b. A 55’ x 550’ channel from the mouth of the Mobile Bay for a distance of approximately 29 miles to near the mouth of Mobile River, including a passing lane two (2) miles long and 625’ wide at mid-bay;

c. A 55’ x 750’ x 4000’ anchorage area just south of McDuffie Island;

d. A 55’ x 1500’ x 1500’ turning basin opposite McDuffie Island;

e. A 40’ deep channel with the width varying from 700’, near the Mobile River mouth, to 500’, near the Cochrane Bridge (U.S. Highway 98), a distance of approximately four (4) miles;

f. A 40’ x 800’ – 1000’ x 2500’ turning basin opposite the Alabama State docks between river miles 1.0 to 1.5;

g. A 40’ x 1000’ x 1600’ turning basin just south of the Cochrane Bridge.

The authorized dimensions of all segments of the Mobile Harbor Project have not been constructed. A summary of both the authorized and the existing maintained dimensions are listed in **Table 1**. The maintained dimensions of the bay channel are 45’ by 400’ and the outer bar channel is 47’ by 600’. Each of these areas is maintained to a depth that is 10’ less than the authorized depth. Several additional features of the authorized project have not been constructed at this time. The anchorage areas that would be located south of the mouth of the Mobile River have not been constructed, and the bay channel and the bar channel, have not been widened. The new turning basin opposite McDuffie Island, between Pinto Island and Little Sand Island was constructed in 2010.

Table 1. Authorized and Existing Dimensions for Mobile Harbor

Channel	Authorized Dimensions	Existing Dimensions
Outer Bar Channel (a.)	57’ x 700’	47’ x 600’
Bay Channel (b.)	55’ x 550’	45’ x 400’
Anchorage Area (c.)	55’ x 750’ x 4000’	*As Authorized*
Turning Basin (d.)	55’ x 1500’ x 1500’	*As Authorized*
River Channel (e.)	40’ x 500’-700’	*As Authorized*
Turning Basin (f.)	40’ x 800’ – 1000’ x 2500’	*As Authorized*
Turning Basin (g.)	40’ x 1000’ x 1600’	*As Authorized*

Approval for advanced maintenance for the Federal Mobile Harbor navigation project was received from South Atlantic Division in the mid-1990s as per the Navigation Regulations ER1130-2-530, 29 November 1996. As such, the navigation channels have associated advanced maintenance to accomplish dredging in an efficient, cost-effective,

and environmentally responsible manner. In addition to the federally-authorized channel dimensions providing for navigation, two (2) sediment basins in the lower Mobile River and three (3) sediment basins in the bay channel, have been previously authorized and approved. These sediment basins are to provide improved channel maintenance efficiency. Each of the basins are several thousand feet long and have depths ranging from 4 (4) feet to 10 feet lower than the existing navigation channel bottom. The basins decrease frequency of dredging to provide a more cost effective and reliable channel. In addition to sediment basins, an advanced widening feature is authorized for the bar channel.

The main navigation channel in the bay typically requires the annual removal of about four (4) million cubic yards of material to maintain the channel dimensions. The maintenance of the navigation channels and sediment basins is accomplished by a hopper dredging equipment. All material removed from the bay channel section is placed in the previously-approved Mobile-North Ocean Dredged Material Disposal Site (ODMDS) located in the Gulf of Mexico to the southwest of the mouth of Mobile Bay. The U.S. Army Corps of Engineers, Mobile District (Corps) was issued a Water Quality Certification (WQC) and Coastal Zone Consistency (CZC) determination for the continued maintenance of Mobile Harbor from the Alabama Department of Environmental Management (ADEM) dated April 10, 2012 (Permit Number FP11-MH01-06).

a. Location. The project is location is within the upper portion of the Mobile Bay Federal Navigation project as illustrated in **Figure 2**.

b. General Description of the Proposed Action. The proposed action will be to begin the process of utilizing Brookley Hole as an alternative disposal site for dredged material from the upper reach of the Mobile Bay navigation channel. The action will demonstrate beneficial use of dredged material for restoration of valuable ecosystem services that exits in this region of the Bay. To demonstrate this approach, three filling scenarios were considered.

The first consideration was to place just enough material into the Brookley Hole basin to bring the bottom elevation up to a level where it would no longer exhibit hypoxic conditions and allow the bottom of the basin to return to some level of environmental productivity. Reversing the hypoxic conditions would allow the typical benthic communities to become reestablished. Additionally, by remaining deeper than the surrounding bay bottom, the area could be utilized by fish as a haven during the winter months.

The second consideration, through successive dredge and fill cycles, is to return the elevation of the basin to that of the surrounding grade. Filling to this level would allow the bottom to become suitable for the establishment of natural communities such as submerged aquatic vegetation (SAV) and oyster beds. This level of filling would provide numerous ecosystem services towards improving the overall health of the bay.

The third option considered is to continue filling cycles to elevations to achieve a combination of an emergent feature containing marsh vegetation which grade into a shallow submerged environment. Such a feature would provide a variety of natural ecosystems that would be beneficial to numerous birds, fish, and benthic communities.

The initial placement action will consist of removing approximately 1.2 million cubic yards (mcy) of fine grained material from the upper reaches of the Bay channel and placing the material in the deepest areas of Brookley Hole as illustrated in **Figure 2**. The red hatched area represents the reach of channel to be dredged and the green hatched area represents the placement within Brookley Hole. A 30-inch hydraulic cutterhead pipeline dredge will be used to remove and deposit the material. A submerged 30-inch pipeline will run east to west from the Mobile Bay Ship Channel to the Brookley Hole placement site. An anchored placement barge will be tethered to the submerged

c. Authority and Purpose. The navigation channel dredging in Mobile Bay and Mobile River began in 1826 with enactment of the River and Harbor Act of 1826. During the period 1826 to 1857, a channel 10 feet deep was dredged through the shoals in Mobile Bay up to the city of Mobile. Subsequently, further modifications to the channel were authorized and the original Federal project was enlarged by the addition of the Arlington, Garrows Bend, and Hollingers Island channels within the bay, and a channel into Chickasaw Creek from the Mobile River. Section 104 of the River and Harbor Act of 1954 authorized a 40-foot depth channel with a 400-foot width in Mobile Bay to the mouth of the Mobile River and a 40-foot depth in the Mobile River to the Cochran Bridge with the width varying from 400 to 775 feet. The Senate Public Works Committee on 16 July 1970 and the House Public Works Committee on 15 December 1970, under the provisions of Section 201 of the 1965 Flood Control Act, authorized a 40- foot by 400-foot channel, branching from the main ship channel and extending through a land cut to the Theodore Industrial Park. The Theodore Ship Channel was reauthorized in the Water Resources Development Act of 1976.

Further improvements to the existing federal project were initially authorized in the 1985 Energy and Water Resources Appropriation Act (PL 99-88, Ninety-ninth Congress, First Session). The improvements were reauthorized in Section 201 of the Water Resources Development Act of 1986 (PL 99 – 662, Ninety-ninth Congress, Second Session), which was approved 17 November 1986, and subsequently amended by Section 302 of the Water Resources Development Act of 1996. The report referenced by this authorization recommended the following improvements to the Federal project: deepening and widening the gulf entrance channel to 57 by 700 feet; deepening and widening the main ship channel to 55 by 550 feet in Mobile Bay, except for the upper 3.6 miles which require a width of 650 feet; deepening the Mobile River channel to 55 feet to a point about 1 mile below the Interstate 10 highway tunnels; and, constructing turning and anchorage basins near the upper end of the main ship channel.

With stagnated O&M funding levels and a restriction that confines the use to hopper dredges, limits the Corps' access to a smaller percentage of the available dredging fleet. Along with the realities that disposal areas have limited capacities, choices will

have to be made on how to lower maintenance costs for Mobile Harbor and similar projects. Hopper dredging in Mobile Bay typically doesn't clear the channel template as well as a cutterhead dredge; thereby increasing the dredge cycle frequency. The hopper dredging in Mobile Bay is also restricted to no overflow, which drastically reduces the volume hauled per load. The cost of hauling the material to the ODMDS site, especially in the upper reaches of the Bay channel is for the most part inefficient given the average U.S. fleet hopper volume. Having the ability to utilize both hopper and cutterhead dredging equipment would provide options and flexibility on maintenance scheduling and cost. This flexibility would allow the Corps to maintain the product quality provided to our customer and the nation.

In addition to the operational constraints, hauling material from the Bay channel to the ODMDS permanently removes sediment from the natural system. It is believed that removal of sediment from the bay may not be the appropriate disposal method for Mobile Bay. Reestablishing beneficial use alternatives may contribute to the much needed conservation efforts for the reestablishment and conservation of the various ecological resources that exist in the Bay system. By demonstrating the benefits of using dredged material to return the Brookley Hole basin into an environmentally productive area, would be valuable towards providing information for planning and implementing other similar actions around the country. By reducing the amount of sediment disposal in the ODMDS, more of the bay sediment will subsequently be retained in the natural sediment transport system. Additionally, having this option will allow the utilization of cutterhead dredge equipment with more cost effective disposal practices and provide the flexibilities to utilize a greater percentage of the available dredging fleet.

d. General Description of the Dredged or Fill Material. The sediment of Mobile Bay consists of sand to clays with various mixtures of sand, silt, and clay covering most of the bay bottom. The Mobile Bay sediments are approximately 50 percent sand and 50 percent clay as described by the Navy (1986). The northern portion of the bay is comprised of deltaic sands, silty sand, silts and clayey silts carried in by the Mobile River. The upper portion of Mobile Harbor is predominantly silt and clay with higher concentrations of sand in the mouth of the Mobile River and reflects the sediments within the upper bay navigation channel.

(1) Sediment Contaminant Analyses. Previous sampling of Mobile Harbor was conducted in 2004 by EA Engineering, Science and Technology of Sparks, Maryland, and included bulk sediment analysis, elutriate testing (Tier II), water column bioassays, whole sediment bioassays, and bioaccumulation studies (Tier III) of sediment samples proposed for maintenance dredging. The 2010 testing program was similar to the one conducted in 2004 that determined that the Mobile Bay sediment was suitable for ocean placement and the Mobile River sediment was suitable for upland placement, as described below.

In 2004, the bulk sediment, site water, and elutriate testing consisted of analyses for metals, chlorinated pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) congeners, dioxin and furan congeners, butyltins, semi-volatile organic compounds (SVOCs), ammonia, cyanide, total sulfides, acid volatile

sulfide (AVS) (sediment only), simultaneously extracted metals (SEM) (sediment only), total Kjeldhal nitrogen (TKN), total organic carbon (TOC), total phosphorus, nitrate, and nitrite. The results from the project indicated that the sediment from the Mobile Bay navigation channel met the Limiting Permissible Concentration (LPC) for water quality, water column toxicity, benthic toxicity, and benthic bioaccumulation. The Mobile Bay sediments were approved for placement at the Mobile-North ODMDS.

Target analytes for the 2010 sediment testing were chosen based on the results of the 2004 sediment sampling in Mobile Harbor and consultation with USEPA-Region 4. Sediments, site water, and standard elutriates were tested for the following target constituents: metals, chlorinated pesticides, PCB congeners, SVOCs, PAHs, dioxin and furan congeners, ammonia (NH_3-N), TKN, nitrate+nitrite, total phosphorus, TOC, total sulfide, cyanide, butyltins, SEM (sediment only), and AVS (sediment only).

In addition, the following physical analyses were conducted for the bulk sediment samples: grain size determination, specific gravity, and percent solids. Sediment concentrations for the 2010 Mobile Harbor samples were generally within the range of concentrations detected in the 2004 Mobile Harbor sediment samples (EA 2008). Of the 163 tested chemical constituents, 101 (62 percent) were detected in the sediments from Mobile Harbor. Concentrations of analytes detected in the sediments from Mobile Harbor were generally higher than concentrations of analytes detected at the reference site. None of the 101 chemical constituents detected in the Mobile Harbor sediments exceeded probable effects level (PEL) values. TOC concentrations in the sediments from the Mobile River and Mobile Bay Channels ranged from 0.547 to 1.91 percent. Three metals (arsenic, copper, and nickel) had concentrations exceeding threshold effects level (TEL) values by factors ranging from 1.0 to 1.8.

PAHs were generally detected at low concentrations below the laboratory reporting limit. The highest concentrations of PAHs detected were observed in sediments from the Mobile River. Total PAH concentrations [non-detects equal one half of the method detection limit (ND=½MDL)] in the sediments from the Mobile River and Mobile Bay locations were all below the TEL value (1,684 µg/kg). Total PCB concentrations (ND=½MDL) for the Mobile River and Mobile Bay sediments were also below the TEL value (21.6 µg/kg) at each of the sampling locations, except MH10-04 (33.1 µg/kg). 4,4'-DDE and gamma-BHC (lindane) were detected in Mobile River and Mobile Bay sediment samples at concentrations that exceeded the TEL value by factors ranging from 1.0 to 2.0. Dioxin and furan congeners were detected at low concentrations, and dioxin toxicity quotients (TEQs) [non-detects equal one half of the reporting limit (ND=½RL)] ranged from 5.81 to 19.1 ng/kg. SVOCs were detected at low concentrations, and did not exceed the TEL values.

On April 20, 2010 *The Deepwater Horizon* exploded in the Gulf of Mexico while drilling on the Macondo oil well approximately 41 miles southeast of Louisiana. Oil spilled into the Gulf until it was capped on July 15, 2010. A sampling effort was conducted by EA on behalf of USACE–Mobile in late-November and early-December 2010 to determine if the surface sediment quality in the Mobile Harbor Federal

Navigation Channels had been impacted by the oil spill. Based on results of PAH and total petroleum hydrocarbon (TPH) testing of surface sediments collected in the Mobile Lower Ship Channel, Mobile Bar Channel, USEPA-designated reference site, and the Mobile-North ODMDS in November and December 2010, there were no discernable changes observed in the sediment quality that could be attributed to the *Deepwater Horizon* Oil Spill (EA 2011). Therefore, the results of the dredged material testing provided in this Section 103 document are assumed to accurately represent the current physical, chemical, and toxicological characteristics of the maintenance sediments.

e. General Description of the Discharge Sites.

(1) Location Map. Maps illustrating the location of the existing Brookley Hole demonstration disposal areas is presented in Figures 2 and 3.

(2) Type of Habitat. The Brookley Hole site is in the upper Mobile Bay and characterized as shallow water habitat. The basin and the surrounding area is totally submerged and ranges in depth from approximately 23 feet in the basin and 3 to 6 feet in the surrounding bay bottom. Existing biological and ecological documentation of the shallow aquatic habitat is not considered to be extensive. However, baseline characterization for the Brookley Hole Basin was conducted in 2011 and 2012 with respect to benthic communities and found that assemblages within the basin were barren in comparison to assemblages outside the basin. Abundances were uniformly low, less than 75 organisms per grab sample in Brookley Hole as compared to 400 to over 800 organisms per grab in natural bottom samples. All samples were dominated by typical oligohaline benthic infauna, notably opportunistic polycheates of the genera *Mediomastus* and *Streblospio*.

With respect to fishery resource use of Brookley Hole, the trawl catches were dominated by bay anchovies and threadfin shad. Spot and Atlantic croaker were also notably represented in the catch, as well as smaller numbers of silver perch, hardhead catfish, and white seatrout. White shrimp were present in the basin. Subsequent trawls were dominated by Atlantic croaker, with smaller numbers of bay anchovies and spot. White shrimp comprised a large percentage of the catch. Hydroacoustic surveys revealed a distinct pattern of fishes in the water column avoiding the deeper hypoxic zone.

(3) Timing and Duration of Discharge. The placement in the Brookley Hole basin is anticipated to occur sometime in FY12.

f. Disposal Method. A 30-inch hydraulic cutterhead pipeline dredge will be used to remove and deposit the material. A submerged 30-inch pipeline will run east to west from the Mobile Bay Ship Channel to the Brookley Hole placement site. An anchored placement barge will be tethered to the submerged line using approximately 1,000 feet of floating pipeline. The placement barge will be outfitted with a down-pipe extending to a depth of approximately -15 Ft MLLW for subaqueous placement within the hole. The dredge slurry will be discharged through the down-pipe with a baffle plate, approximately 5 feet above the existing bottom. This method acts to force the slurry

through a 15-foot tall water column to assist in energy dissipation and reducing the turbidity before water exits the placement area. Using the down-pipe method, allows the capability to place bulked material to an elevation of -7 feet Mean Lower Low Water (MLLW). Consolidation of the bottom foundation and newly placed material is anticipated to eventually settle to an elevation ranging between -11 and -14 feet MLLW.

II. FACTUAL DETERMINATIONS.

a. Physical Substrate Determinations.

(1) Substrate elevation and slope. The substrate placed in Brookley will be confined with the basin of the disposal area. The materials placed will be redistributed by local currents and waves to a more natural configuration consistent with the surrounding bay bottom.

(2) Sediment type. Approximately 1.2 million cy of fine-grained dredged material will be in Brookley Hole. The material is typical of the sediment regular removed from the navigation channel during O&M maintenance operations.

(3) Dredged/fill material movement. The dredged material placed in the Brookley Hole basin will be confined.

(4) Physical effects on benthos. Within the Brookley Hole basin some benthic organisms would be destroyed by the proposed action; however, due to the improvement of the benthic environment from the proposed action it is believed that the benthic communities would return as consistent with the surrounding bay bottom and that no significant changes in community structure or function are expected in the surrounding areas.

(5) Other effects. No other significant effects due to movement of the physical substrate are noted.

(6) Actions taken to minimize impacts. No actions, which would further reduce impacts due to the placement of the dredged material are deemed necessary.

b. Water Circulation/Fluctuation, and Salinity Determination.

(1) Water

(a) Salinity. No significant effects.

(b) Water chemistry. No effects.

(c) Clarity. Water clarity may locally be decreased slightly during the proposed placement of dredged material, but this would not be significant.

(d) Color. No effects.

(e) Odor. No effects.

(f) Taste. No effects.

(g) Dissolved gases. No effects.

(h) Nutrients. No effects.

(i) Eutrophication. No effects.

(2) Current Patterns and Circulation

(a) Current patterns and flow. Changes in water circulation and flow due to placement of sand in the Brookley Hole basin are not expected to occur. Natural currents and flow will occur during tidal, wave, and storm activities.

(b) Velocity. No significant effects.

(c) Stratification. No effects.

(d) Hydrologic effects. No significant effects.

(3) Normal Water Level Fluctuations. No effects.

(4) Salinity Gradients. No significant effects.

(5) Actions That Will Be Taken To Minimize Impacts. No other actions that would minimize impacts on water circulation/fluctuation and salinity are deemed necessary.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected changes in suspended particulate and turbidity levels in the vicinity of the disposal site. Suspended particulate and turbidity levels are expected to undergo minor increases during dredging and placement activities, however, suspended sediment will quickly fall out of the water column and return to normal conditions once the placement activities are completed. No significant effects would occur as a result of these increases.

(2) Effects on the chemical and physical properties of the water column.

(a) Light penetration. Increased turbidity levels in the area as a result of the placement of dredged material would reduce the penetration of light into the water column only slightly and would be a minor short-term impact. The light penetration

would return to normal conditions once the placement activities are completed.

(b) Dissolved oxygen. No detrimental effects.

(c) Toxic metals and organics. No significant effects.

(d) Pathogens. No effects.

(e) Esthetics. The placement of dredged material would likely decrease the esthetic qualities of the project area for a short period of time during and shortly after placement. The disposal areas equilibrate and rapidly return to normal upon exposure to the wave climate.

(f) Others as appropriate. None appropriate.

(3) Effects on biota.

(a) Primary production, photosynthesis· No significant effects.

(b) Suspension/filter feeders. Some local increases in suspended particulates may be encountered during the dredging and disposal actions, but these increases would not cause significant impacts to these organisms unless they are directly covered with sediment. If directly covered with dredged material, it is expected that some organisms will be destroyed. Rapid recruitment of these organisms will promote a rapid recovery to normal populations. Overall, the impact to these organisms is expected to be minor and insignificant.

(c) Sight feeders. Sight feeders would avoid impacted areas and return when conditions are suitable. However, it is difficult to relate the presence or absence of sight feeders in an area to the placement of dredged material. Sight feeders, particularly fishes, may vary in abundance as a result of temperature changes, salinity changes, seasonal changes, dissolved oxygen level changes, as well as other variables. No significant impacts are expected to occur on sight feeders.

(4) Actions taken to minimize impacts. No further actions are deemed necessary.

d. Contaminant Determination. No significant effects. The preliminary findings of the sediment chemical analyses indicate that no contaminants are present at detectable levels and did not exceed critical thresholds.

e. Aquatic Ecosystem and Organism Determinations.

(1) Effects on plankton. No effects.

(2) Effects on benthos. Benthic organisms would be destroyed by the deposition of dredged material within the Brookley Hole basin, but no significant effects are expected on the benthic community as a result of the proposed action.

(3) Effects on nekton. No effects.

(4) Effects on aquatic food web. No effects.

(5) Effects on special aquatic sites.

(a) Sanctuaries and refuges. Not applicable

(b) Wetlands. Not applicable

(c) Mud flats. Not applicable.

(d) Vegetated shallows. Not applicable'

(e) Coral reefs. Not applicable.

(f) Riffle and pool complexes. Not applicable.

(6) Threatened and endangered species. In accordance with the Threatened and Endangered Species Act, coordination of listed species for this area was conducted in 1980 in the EIS for Mobile Harbor, Alabama Channel Improvement. Further coordination was also conducted for the adjacent area associated with the Choctaw Point Terminal Project, Mobile, Alabama in a 2004 EIS and considered to be the same environmental conditions. Based on these findings the action to fill Brookley Hole will have no effect to any Federal listed threatened or endangered species. Aquatic species such as the Florida manatee, Gulf sturgeon, and sea turtles would not normally use the project area and would not likely exhibit incidental use of the area during project implementation. Because the area is not a major provider of life history requirements for these species, it has been determined that there will be no effect to these species as a result of the proposed action.

(7) Other wildlife. No significant effects.

(8) Actions to minimize impacts. No other actions to minimize impacts on the aquatic ecosystem are deemed appropriate.

f. Proposed Disposal Site Determination.

(1) Mixing zone determinations. The Alabama Department of Environmental Management (ADEM) delineates mixing zones on a case-by-case basis. Any requirements placed on the project would be followed to the maximum extent practicable.

(2) Determination of compliance with applicable water quality standards. Preliminary finding show that action would be in compliance to the maximum extent practicable, with all applicable water quality standards.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supply. No effects.

(b) Recreational and commercial fisheries. No effects.

(c) Water-related recreation. No effects.

(d) Esthetics. No significant effects.

(e) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves. Not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. No significant cumulative effects on the aquatic ecosystem would occur as a result of the proposed action.

h. Determination of Secondary Effects on the Aquatic Ecosystem. No significant effects.

III. FINDING OF COMPLIANCE.

a. Adaptation of Section 404(b)(1) Guidelines. No significant adaptations to the guidelines were made relative to this evaluation.

b. Alternatives.

(1) Beneficial Use of Upland Disposal Areas. Sand from Lower Tombigbee River Upland Sites within the Mobile Basin was considered as source material to construct various BU site in Mobile Bay. These disposal areas are reaching their capacity and use of this material would be beneficial toward restoring disposal capacity in this section of the navigation project. Material from two sites on the Lower Tombigbee River were investigated and determined to have suitable sand for these types of BU applications. However, due to the haul distance required (approximately 78 and 92 miles, respectively, to the mouth of the Mobile River) and the resulting prohibitive costs, this alternative was eliminated from further consideration.

(2) Little Sand Island. This alternative considered the construction of a large brackish marsh cell on the south end of Little Sand Island near the mouth of the Mobile River. The cells would require containment on all sides by a low-sill riprap breakwater or other semi-containment system. This project would utilize sediment dredged from Mobile River navigation channel or from other sources, such as the beneficial use of dredged materials located in upland disposal areas on Blakely Island, Pinto Island and/or along the lower Tombigbee and Alabama Rivers, to fill the cell to appropriate elevations for the establishment of brackish marsh vegetation. Appropriate marsh vegetation would

then be planted. Because of the required containment and costs associated with its construction as well as the time it would take to conduct the environmental coordinations, this alternative was eliminated from further consideration.

(3) Brookley breakwaters. This alternative considered the construction of one to three large brackish marsh cells along the western side of the Mobile Bay navigation channel, south of Arlington Channel. The cells would be enclosed on the southern, eastern and northern side by a low-sill riprap breakwater or other semi-containment system. The western side would be open, allowing for the exchange of water during tidal cycles. Sediment for the project would be obtained from the Mobile Bay navigation channel and/or from other sources, such as the beneficial use of dredged materials located in upland disposal areas on Blakely Island, Pinto Island and/or along the lower Tombigbee and Alabama Rivers. The cells would be filled to appropriate elevations to establish brackish marsh vegetation. Mash vegetation would then be planted. Because of the required containment and costs associated with their construction as well as the time it would take to conduct the environmental coordinations, this alternative was eliminated from further consideration.

c. Compliance with State Water quality Standards. A Clean Water Act (CWA), Section 401 Water Quality Certification is required for the proposed action. The certification from ADEM will be obtained.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean water Act. The action is consistent with the Alabama Coastal Program to the maximum extent practicable. Recertification of the existing project and addition of the new disposal area is being requested from the State of Alabama.

e. Compliance with Endangered Species Act. The proposed activity is not expected to harm Federally-protected species. No critical habitats of any Federally-protected species exist within the project area. Regarding potential impacts to Federally-protected species, coordination with the appropriate Federal agencies have been initiated through Public Notice FP06-MH13-10. Sufficient safeguards exist to protect Federally-protected species which may enter into the project area.

f. Compliance with Specific Protection Measures for Marine Sunctuaries Designated by the Marine Protection, Research, and Sanctuaries Act. The proposed activity would not result in any significant adverse effects on human health or welfare, including municipal or private water supplies, recreation and commercial fishing, plankton, fish, shellfish, and wildlife. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values would not occur. No wetlands would be impacted by the proposed action.

g. Evaluation of Extent of Degradation of the Waters of the United States. The proposed fill plan is specified as complying with the requirements of these guidelines.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse

Impacts of the Discharge on the Aquatic Ecosystem. The proposed fill plan is specified as complying with the requirements of these guidelines.

i. On the Basis of the Guidelines, the proposed Disposal Site for the Discharge of Dredged Material. Specified as complying with the requirements of these guidelines.

DATE: _____

_____
Steven J. Roemhildt, P.E.
Colonel, Corps of Engineers
District Engineer

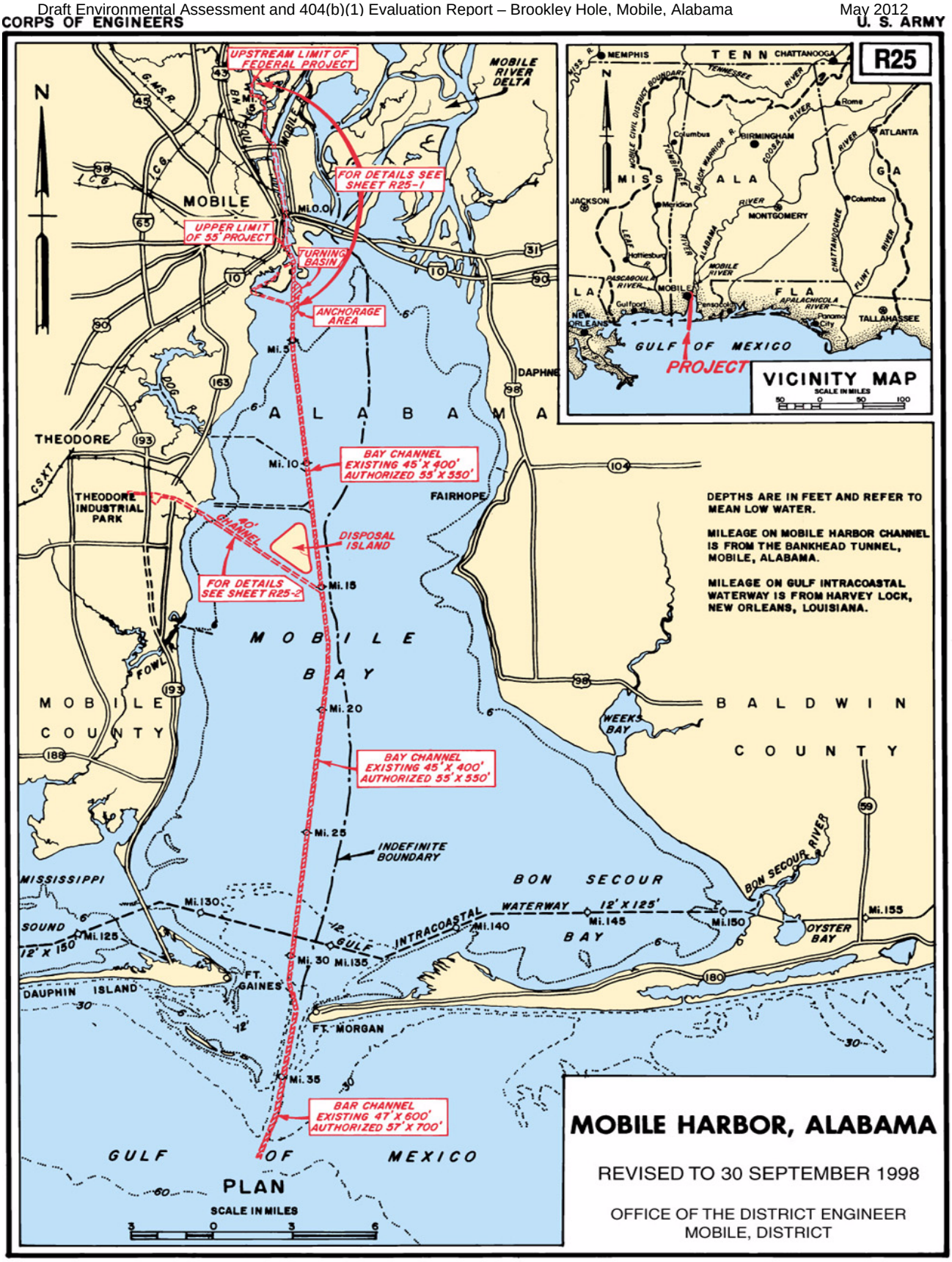

Figure 1. Overall project map illustrating general location and project dimensions.

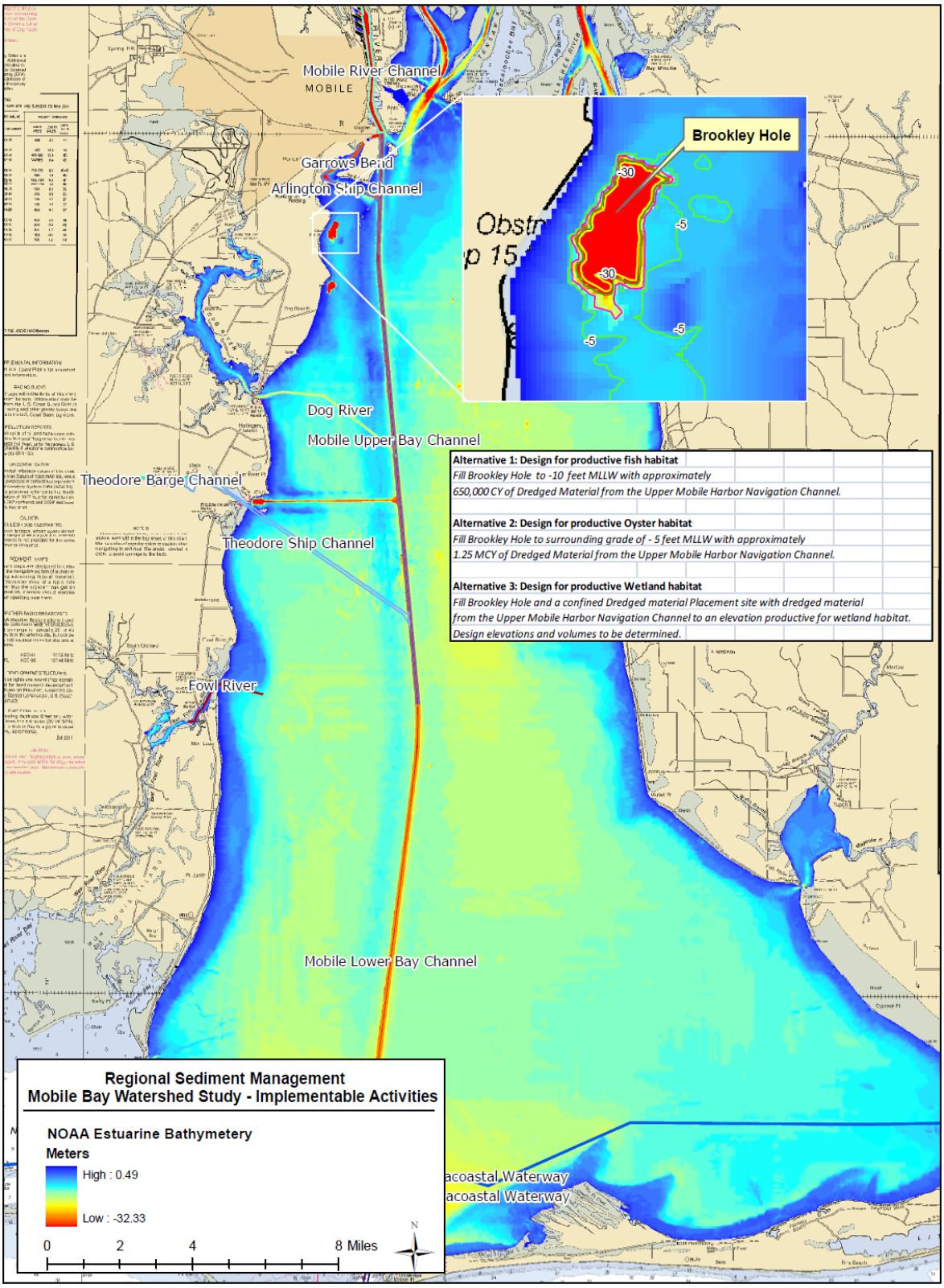

Figure 2. Location of Brookley Hole in the Upper Mobile Bay

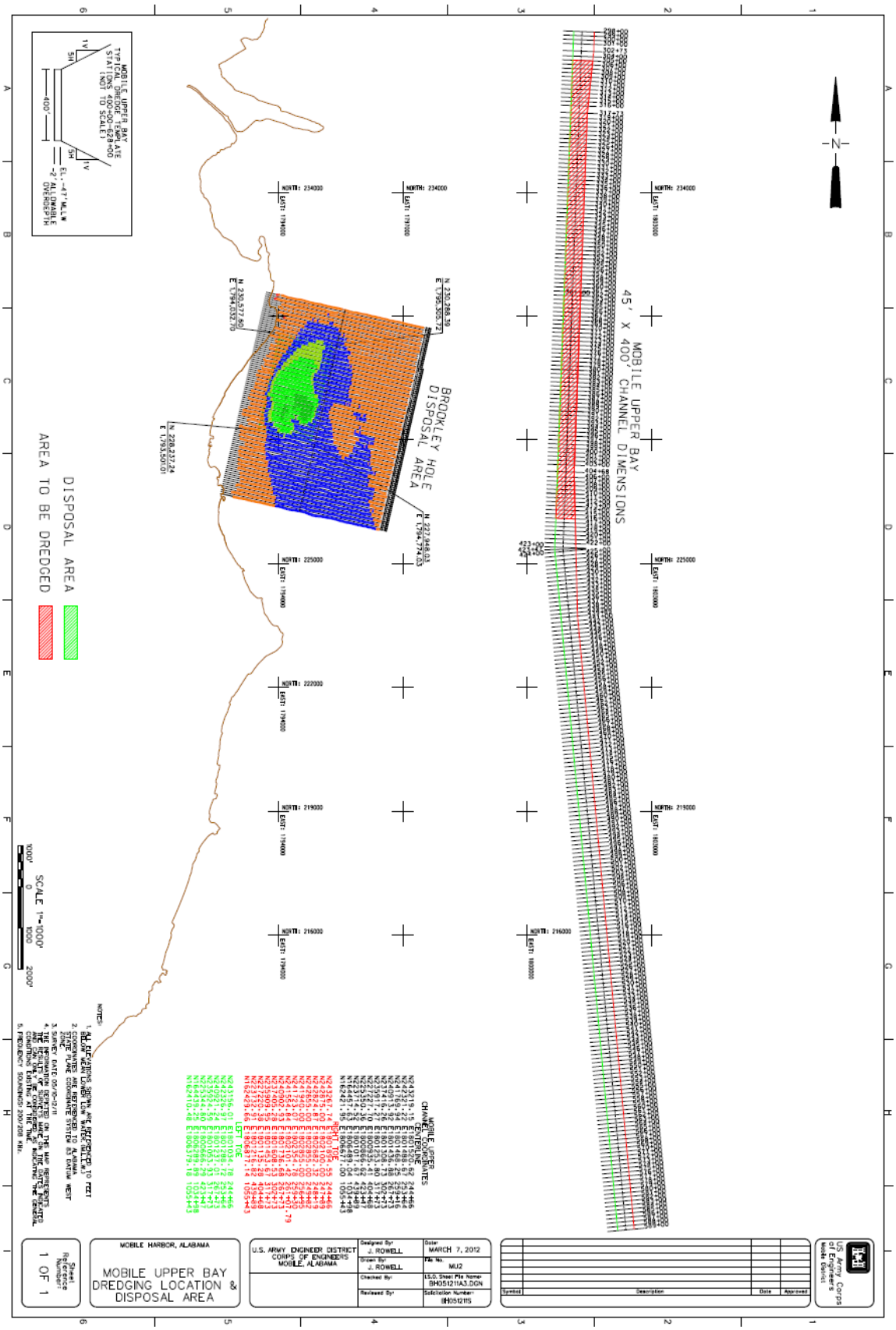

Figure 3. Location of Brookley Hole and reach of dredged channel