Lake Montauk Harbor, East Hampton, NY
Navigation Improvements
Feasibility Study
Final Feasibility Report
October 2020
Revised December 2020

New York State
Department of
Environmental Conservation

U.S. Army Corps of Engineers
North Atlantic Division
New York District

EXECUTIVE SUMMARY

This study has determined that insufficient channel and harbor depth of the existing navigation project at Lake Montauk Harbor, New York, is causing problems and economic inefficiencies to the commercial fishing fleet that use the harbor. In response to the navigation problem, plan formulation activities identified, evaluated, and compared a range of navigation measures as documented in this Feasibility Report.

The final array of alternative navigation improvement plans under consideration included deepening the existing channel, creating a deposition basin next to the east side of the authorized channel, and mining 7,000 – 10,000 cubic yards of sand from updrift of the channel. The Recommended Plan includes deepening of the existing navigation channel from the existing authorized -12 feet Mean Low Lower Water (MLLW) depth to -17 feet MLLW, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing the dredged material on the shoreline west of the inlet for a distance of 3,000 feet and a width of approximately 44 feet.

The Recommended Plan has an incidental coastal storm risk management benefit of responding to the erosion damages along the Block Island Sound shoreline, within the first mile west of the harbor inlet, by the placement of dredged sand from the navigation channel on the beach as the least cost disposal method.

The estimated total first cost for project implementation is $6,405,000 at Fiscal Year 2021 (FY21) Price Level. Annual project costs, including interest during construction are estimated at $228,000. The estimated present worth of future maintenance is $3,871,000 which will be 100% at Federal expense. It is important to note that this expense is less than what maintenance would cost the Federal government if the project was not constructed (this cost savings for this alternative is counted as a benefit). Total benefits are $2,325,000 to commercial navigation and $60,000 for reduced annual project maintenance for a total of $2,385,000. Annual net benefits are $2,157,000 and yield a benefit-cost ratio of 10.5 to 1. Initial placement of the dredged material on the western beach would result in incidental coastal storm risk management benefits in the amount of $176,000/year, which are not included in the total project benefit.

Cost sharing for design and construction would be 90% Federal and 10% non-Federal. Because the estimated cost of obtaining the required lands, easements, rights-of-way, and relocations (LERR) creditable to the non-Federal sponsor ($643,000) is greater than 10% of the initial first cost ($640,500), no cash would be required upfront. An additional 10% of the total cost of design and construction will be required from the non-Federal sponsor after project turnover in credit remaining from LERR (if determined appropriate based on final accounting) and then in cash or over up to 30 years at a rate equivalent to current Department of the Treasury bond rates. The fully funded project cost estimated escalated to the anticipated period of construction in FY23 is $7,274,000.

The non-Federal study sponsor, New York State Department of Environmental Conservation (NYSDEC), has indicated its support for the Recommended Plan, which is the same as the

Tentatively Selected Plan in the Draft Feasibility Report. NYSDEC cost-shared its portion of the study cost with a local sponsor, the Town of East Hampton. East Hampton would serve as the non-Federal sponsor for design and construction because navigation improvement is outside of NYSDDEC's departmental mission. Subject to report finalization, East Hampton has indicated its willingness to enter into a Project Partnership Agreement (PPA) with the Federal Government for the design and construction of the Recommended Plan if the Project is implemented under the Continuing Authorities Program, Section 107 of the River and Harbor Act of 1960 as amended (33 U.S.C. Section 577).

PERTINENT DATA

DESCRIPTION
The Recommended Plan for the Lake Montauk Harbor, New York, Navigation Improvement Feasibility Study provides for deepening the existing Federal channel from the existing authorized -12 feet MLLW to a depth of -17 feet MLLW and the creation of a deposition basin 100 feet wide immediately east of the channel. Disposal of dredged material will take place on the shoreline west of the inlet over the first 3,000 feet.

LOCATION
The study area is located in East Hampton, Suffolk County, NY, to include Lake Montauk Harbor as well as the inlet connecting it to Block Island Sound and along the Block Island Sound shoreline west (and also east, to consider sediment transport).

FEATURES
The project is deepening the existing Federal navigation channel from the existing authorized -12 feet MLLW to a depth of -17 feet MLLW, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing the dredged material on the shoreline west of the inlet for a distance of 3,000 feet.

REAL ESTATE REQUIREMENTS
The project will require easements for construction in the form of a non-standard estate. The estimated cost for real estate to obtain the easements is $898,000.

Easements	23.875 acres

PROJECT COSTS (FY21 price levels)

Initial Project First Cost	$6,405,000
Present Value of Maintenance Costs	$3,871,000

ECONOMICS (FY21 price levels)

Annual Project Cost (Discounted at 2.50% over a 50-year period)	$ 228,000
Annual Navigation Benefits (Discounted at 2.50% over a 50-year period)	$2,385,000
Annual Incidental CSRM Benefits (Discounted at 2.50% over a 50-year period)	$ 176,000
Average Annual Net Benefits*	$2,157,000
Benefit Cost Ratio*	10.5:1

- Does not include the incidental CSRM benefits. With them, these economics increase to an annualized net benefit of $2,333,000 and a BCR of 11.2:1.

COST APPORTIONMENT (FY21 price levels)

Project First Cost	$6,405,000
Federal (90%)	$5,765,000
Non-Federal (10%*)	$ 640,500

**The non-Federal share requires that 10% ($640,500) be provided upfront. Because the estimated cost of obtaining the required LERR creditable to the non-Federal sponsor ($643,000) is greater, no cash would be required upfront. An additional 10% of the total cost of design and construction will be required from the non-Federal sponsor after project turnover in credit remaining from LERR (if determined appropriate based on final*

accounting) and then in cash or over up to 30 years at a rate equivalent to current Department of the Treasury bond rates.

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Chapter 1: Introduction

1.1 Study Purpose and Scope

The U.S. Army Corps of Engineers (USACE) North Atlantic Division (NAD), New York District (NAN) prepared this Feasibility Report for the Lake Montauk Harbor, New York, Navigation Improvements Study. It includes input from the non-Federal Study partner, local governments, natural resource agencies, and the public. This report presents potential solutions to improve navigation in and around the Lake Montauk Harbor inlet in the Town of East Hampton, Suffolk County, New York (Figure 1).

Figure 1. Location Map for Lake Montauk Harbor in East Hampton, Suffolk County, New York

The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with managing and reducing risk to the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (Principles and Guidelines (P&G), 1983). Water and related land resources projects are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. This feasibility report will: (1) summarize the current and potential water resource problems, needs, and opportunities for navigation improvement in and around the Lake Montauk Harbor study area; (2) present and discuss the results of the plan formulation for water resource management solutions; (3) identify specific details of the Tentatively Selected Plan (TSP) and then the optimized recommended plan, including inherent risks and (4) determine the extent of Federal interest and local support for the plan.

1.2 Purpose and Need for Action

The purpose of the study is to determine if Federal participation is warranted in providing feasible engineering improvements that are economically justified and environmentally acceptable to the Federal Navigation Project at Lake Montauk Harbor, New York. The need for the study stems from insufficient depth in the Federally-authorized inlet channel, currently only -12 feet Mean Lower Low Water (MLLW), and in the harbor for many vessels due to increased vessel size. Further, maintaining the channel depth and width has become more difficult with the accretion of sand on the eastern side of the east jetty through and around which sand migrates generally to the west into the channel.

1.3 Study Authority

The study is being conducted under the authority of two Congressional resolutions. First, a resolution was adopted by the United States Senate Committee on Environment and Public Works on October 17, 1991:

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Lake Montauk Harbor, East Hampton, New York, published as House Document 369, Seventy-sixth Congress, First Session, and other pertinent reports, with a view to determining if further improvements for navigation are advisable at this time. Beneficial use of any dredged material for improvements to the environment should also be considered."*

In accordance with this resolution, the reconnaissance report was completed in May 1995. The reconnaissance report also recognized that there were erosion problems on the shoreline west of the inlet partially related to the navigation project and opportunities for multipurpose solutions. With this finding, the scope of the study was further expanded by authority of a resolution adopted by the United States Senate Committee on Transportation and Infrastructure on May 22, 2002:

> "*Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army is requested to review the report of the Chief of Engineers, published as House Document 369, 76th Congress, 1st Session, and other pertinent reports, to determine whether modifications to the recommendations contained therein in the interest of navigation improvements, to include beneficial uses of dredged material and sand- bypassing, in accordance with Section 110 of the River and Harbor Act of 1962, to determine the need for measures to address storm damage reduction, shoreline protection, environmental restoration and protection and allied purposes in the vicinity of Lake Montauk Harbor, East Hampton, New York."*

A Feasibility Cost Sharing Agreement (FCSA) under this 2002 authority was signed with the non-Federal sponsor on 24 February 2003. Following Hurricane Sandy in 2012, the Lake Montauk Harbor study was identified in the May 2013 Second Interim Report to Congress in response to the Disaster Relief Appropriation Act of 2013 (PL 113-2) as a feasibility study to be completed at 100% Federal expense. The study was re-scoped to focus on coastal storm risk management (CSRM) as an interim response to the original congressional authorities, and a FCSA amendment was signed on 31 March 2014, with a separate response to the navigation improvement purpose to be completed in the future. A TSP for CSRM was identified and coordinated with the Non-Federal sponsor and its local partner, the Town of East Hampton, in 2016. Feedback from public meetings indicated a lack of non-Federal support for the CSRM TSP. The non-Federal sponsor, by letter dated 6 April 2017, requested that this study focus on navigation improvements only. By

memo dated 15 May 2017, the U.S. Army Corps of Engineers New York District responded to this request and is now completing the study to recommend navigation improvements only. The recommendation of this study will be a partial response to the 2002 congressional authorization because it focuses on the navigation mission only. As PL 113-2 funding is solely for CSRM studies and projects, the Lake Montauk Harbor study is being completed with cost-shared funds on hand under the original 2003 FCSA that included navigation as a project purpose.

1.4 The Planning Process

In compliance with the USACE planning process, a draft Feasibility Report was released for concurrent public and agency technical review of the TSP in July 2019. For the TSP, the study team evaluated an array of alternatives to arrive at a selected alternative of authorizing the existing channel to a deeper depth of -17 feet MLLW and a lateral deposition basin immediately east of the channel 100 feet in width. The exact details have now been determined in a process called optimization for this Final Feasibility Report. Optimization has happened after comments from public review and agency review have been received and incorporated into the draft report package. Through optimization, the TSP has been confirmed as the Recommended Plan. Following final rounds of agency reviews, the study team has now prepared this Final Feasibility Report to present the Recommended Plan.

1.5 Prior Studies, Reports, and Existing Water Projects

The navigation channel was initially improved by private interests beginning in 1914 and was studied by USACE beginning in 1935 with a report in 1939 recommending maintaining a channel -12 feet deep MLLW, 150 feet wide, extending from the 12-foot contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island; a boat basin -10 feet deep MLLW and 400 by 900 feet northwest of Star Island; and the repair and extension shoreward of the east and west jetties. A General Design Memorandum (USACE, 1967) recommended the following improvements: raising the west jetty crest elevation by 2 feet to match all other sections of the east and west jetties and the addition of sport fishing facilities on top of both jetties.

Recently, navigation problems in Lake Montauk Harbor (as well as storm damages west of the harbor inlet) warranting federal interest were identified in a Reconnaissance Report (USACE, 1995) of the area. Table 1 presents a summary of relevant studies, reports, authorizations, as well as projects pertaining to Lake Montauk Harbor.

Table 1: Historical Summary of Lake Montauk Harbor

Date	Historical Item/Event
1914	Private interest constructs a timber bulkhead across the inlet at Lake Montauk Harbor.
1926	Two parallel stone jetties were constructed by private interests to protect the harbor entrance. An approximately 700' long west jetty and a 750' long east jetty are separated by a distance of 500 feet.
1927	Dredging of the entrance channel and yacht basin by private interests.
1935	Section 3 of the River and Harbor Act directed a survey investigation of Lake Montauk Harbor.
1936	The Chief of Engineers authorized the survey investigation for the assessment of Federal participation in further improvements and maintenance of the privately owned Lake Montauk Harbor development.

Date	Historical Item/Event
1939	In response to a U.S. House Resolution, adopted by the Committee on Rivers and Harbors, a second report was prepared, including the results of the previous unpublished report of 1938. This report contained a favorable recommendation for the following improvements: a channel 12 feet deep at MLLW, 150 feet wide, extending from the 12-foot contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island; a boat basin 10 feet deep at MLLW and 400 by 900 feet northwest of Star Island; and the repair and extension shoreward of the east and west jetties.
1942	Federal extension of west jetty shoreward. The work was accomplished at the request of the U.S. Navy with Navy funds. The U.S. Army Corps of Engineers supervised the work. The west jetty was extended 280 feet with crest elevation at +8 feet MLLW. The total length is 981 feet.
1942 - 1943	Entrance Channel was dredged to -12 feet MLLW, and to a width of 150 feet. The work was accomplished at the request of the U.S. Navy with Navy funds. The U.S. Army Corps of Engineers supervised the work.
1945	The River and Harbor Act of 2 March 1945 authorized the recommended Federal project.
1949	The first dredging project authorized by Congress began.
1967	General Design Memorandum for Lake Montauk Harbor, New York was prepared. The initial project was justified with a BCR of 1.8. The benefits were primarily recreational. Work remaining from the authorized project: dredging of the boat basin, extension of the east jetty, and repairs to the east and west jetties. Modification to the plan as contained in the authorizing document includes: raising the west jetty crest elevation to +8 feet MLLW during repair from present +6 feet, to match all other section of the east and west jetties, and the addition of sport fishing facilities on top of both jetties.
1968	East jetty extended shoreward 350 feet with crest elevation to +8 feet MLLW. Length becomes 750+350=1,100 feet Initial dredging of boat basin to -10 feet MLLW. Repair of the east and west jetties. Added jetty sport fishing facilities.
1991	U.S. Senate Resolution adopted by the Committee on the Environment and Public Works for authorization of a shallow draft navigation reconnaissance study at Lake Montauk Harbor, New York.
1995	Lake Montauk Harbor, New York Reconnaissance Report completed.
1995	Rehabilitation of East Jetty
1998	Partial Removal of Inner Harbor Shoal
1999	Advance maintenance dredging conducted by USACE for NYSDEC under Support for Others Program
2002	Lake Montauk Harbor Navigation and Storm Damage Improvement Feasibility Study Authorized with NYSDEC as Local Sponsor.
2003	Feasibility Cost Sharing Agreement (FCSA) with NYSDEC for this multipurpose coastal storm risk management and navigation study and report signed.
2013	Following Hurricane Sandy in 2012, the Lake Montauk Harbor study was identified in the May 2013 Second Interim Report to Congress in response to the Disaster Relief

Date	Historical Item/Event
	Appropriation Act of 2013 (PL 113-2) as a feasibility study to be completed at 100% Federal expense.
2014	The study was re-scoped to focus on coastal storm risk management as an interim response to the original congressional authorities, and a FCSA amendment was signed on 31 March 2014, with a separate response to the navigation improvement purpose to be completed in the future.
2016	The U.S. Army Corps of Engineers identified a tentatively selected plan for coastal storm risk management and coordinated with the non-Federal sponsor to obtain its support and held a public meeting.
2017	The non-Federal sponsor, by letter dated 6 April 2017, requested that this study focus on navigation improvements only. By memo dated 15 May 2017, the U.S. Army Corps of Engineers New York District responded to this request and is now completing the study to recommend navigation improvement only.
2019	A draft feasibility report and draft environmental assessment recommending a tentatively selected plan was released for a 30-day public review.

1.6 Study Area

The study area is the area within which significant project impacts may occur. The study area and its existing conditions are described in this study as Lake Montauk and the harbor itself, including the Federally-authorized navigation channel, and the Block Island Sound shorelines bounded by Fort Pond Bay on the west and Shagwong point on the east.

Lake Montauk Harbor is on the northern shore of the south fork of Long Island, three miles west of Montauk Point and approximately 125 miles east of New York City. It is within the Town of East Hampton, Suffolk County, New York (Figure 1). The harbor is landlocked on the east, south, and west sides and connected on the north side with Block Island Sound through a stabilized inlet. The study area also encompasses the Block Island Sound shorelines bounded by Fort Pond Bay on the west and Shagwong point on the east (Figure 2). These extended shoreline areas were included in the study area to fully consider the littoral transport system, erosion and accretion problems of the shorelines adjacent to the inlet, and the sources and quantities of material contributing to channel shoaling. The shoreline east of the inlet jetties is accreting and is generally undeveloped parkland. The shoreline to the west of the inlet jetties is eroding and is developed with residential and commercial properties (including rental properties with supporting roads and infrastructure). The inlet jetties are a contributing cause of these erosion problems because they block some sediment flow from the east.

Lake Montauk itself is two miles long in a north-south orientation. It has an average width of 0.7 miles and encompasses 1,037 acres with a mean depth of 7 feet. It is a home port and a port of call for commercial fishing and recreational vessels. There are several marinas for commercial vessels, a yacht club, and small-craft facilities on both sides near the entrance to Montauk Harbor. Two rock jetties stabilize the inlet. The east and west jetties are approximately 1,100 and 980 feet in length, respectively, with top elevations of +8’ MLLW. There is a 500-foot separation between them.

Within the stabilized inlet is the Federally authorized channel -12 feet deep at MLLW, 150 feet wide, extending from the 12-foot contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island. The jetties are part of the Federal Navigation Project.

Figure 2: Study Area of Lake Montauk Harbor

Star Island, located south of the inlet within the lake, is 0.5 miles long in a north-south direction and 0.2 miles wide. It is connected to the mainland by a causeway. A U.S. Coast Guard Station is situated at the northern end of Star Island with direct access to the inlet. Coonsfoot Cove is between Star Island and the western shore of the lake. The Federal Navigation Project also includes a boat basin -10 feet deep at MLLW and 400 feet wide by 900 feet long northwest of Star Island. The channel and turning basin servicing Coonsfoot Cove have been maintained by Suffolk County. There has been extensive development of the Coonsfoot Cove area to provide marine services for commercial fishing vessels, charter boats, and pleasure craft.

1.6.1 Project Area

The project area is the geographical extent designated for the consideration of navigation improvement measures, or the project footprint. The project area is a subset of the study area (Figure 3). It includes the inlet, including the Federally authorized navigation channel, and extends west toward Culloden Point.

1.7 Non-Federal Sponsor

The non-Federal Sponsor for the study is the New York State Department of Environmental Conservation (NYSDEC). East Hampton is an active participant in the study and is a local sponsor partnering with NYSDEC per a signed agreement between East Hampton and NYSDEC. On 24 February 2003, the District and NYSDEC executed the FCSA to initiate the feasibility phase with a cost-share of 50% / 50%. The passage of the Disaster Relief Appropriation Act of 2013, Pub. L. No. 113-2, resulted in a FCSA amendment signed on 31 March 2014 for the CSRM purpose of this study to be completed at 100% Federal cost; however, as described in 1.3 above,

no TSP for CSRM was supported by the non-Federal sponsor. This study of navigation improvement only now is being completed under the original 2003 FCSA with cost-shared funds on hand. NYSDEC has indicated that since their agency does not have a navigation mission that they expect the Town of East Hampton will be the non-Federal partner for construction of this project.

Figure 3: Lake Montauk Harbor Study Area and Project Area

Chapter 2: Existing Conditions

Existing conditions, which serve as the basis for the characterization of problem identification and projection of future without project conditions, are described in this section. More detailed descriptions of environmental resources for compliance with the National Environmental Policy Act of 1970 (NEPA) can be found in the companion document to this Feasibility Report, the Lake Montauk Harbor Environmental Assessment.

2.1 Land Use

The land use in the extended study area includes parkland, commercial and private marinas, vacation rental properties, and private residences. Immediately west of the inlet on Block Island Sound is a beach owned by the Town of East Hampton open to the public. The Town beach is widened to varying widths, with no engineering design, upon the placement of maintenance dredging material, but over the last few decades it rapidly eroded to just a sliver of beach at high tide. Due to recent storms there is little, if any, dry beach seaward of the bulkheads and dunes/bluffs.

The area east of the inlet is a park owned by the Town for the first 500 feet east of the inlet and beyond that first 500 feet are park lands owned by Suffolk County. The Suffolk County shores further to the east are used in the warmer seasons for camping and recreational vehicle (RV) use. The land east of the east jetty can be subject to erosion during storms, but more typically this shore is growing in width and elevation especially closer to the east jetty which impounds littoral material transported from the east.

As for the shoreline inside of Lake Montauk inlet, currently approximately 75% is tidal wetland, which is a decrease over the past three decades as a result of development. Moving southeast inside the Lake the shore is heavily developed with marinas for commercial and recreational fishing including headboats which take customers out for fishing trips. The marinas have a total of approximately 1,235 dockside slips. Currently, the largest slip is 70 feet long. A few of the marinas have slips designated for transient boats and fishing and charter boats. Lake Montauk Harbor has two town docks, one named Star Island and the other Montauk Dock with 23 and 17 slips, respectively. Nearly all of these slips are occupied. About 400 additional moorings are used by transients during the summer. The demand for moorings is greater than the availability by 200 moorings. The docks are backed by marinas, fish storage or handling facilities, and restaurants and seafood snack bars.

2.2 Access Routes

The study area can be accessed by water via Block Island Sound and the Lake Montauk inlet, by highway via State Route 27, by rail by the Long Island Rail Road, and by air via Montauk Airport. Within the study area is West Lake Drive, part of which runs parallel to the 1,200 foot section of shoreline immediately west of the western jetty. This is a main local roadway, and its disruption would be a threat to public health and safety. Further west is Soundview Avenue, which provides access to the residential and commercial properties along the shore to the vicinity of Culloden Point. Access to the shoreline at the town beach within the 1,200 feet west of the inlet is public. Access to the shoreline fronted by structures is currently restricted to the property owners individually or as part of an association. Access to the Town and County beaches east of the inlet is fully open to the public.

2.3 Socioeconomics

A formal census update of post-Hurricane Sandy demographic information is not currently available, however information from the American Community Survey provides detailed socioeconomic information until the 2020 census data are available for the Town of East Hampton, Suffolk County, and New York State. The population of the Town of East Hampton has grown quickly for the area and has experienced relatively strong economic conditions. The population of the Town of East Hampton grew at 3.6% from 2010 to 2017 to 21,935 people. The population of Suffolk County grew at a slower pace of 1.0% from 2010 to 2017, while the population of New York State grew 3.0% over the same period. Employment trends from 2010 to 2017 follow the same pattern as growth in population; the Town of East Hampton experienced a 7.0% increase in employment, while Suffolk county employment grew at 2.1% and employment in New York State grew at 4.6%. Finally, real median household income is a third measure of the Town's socioeconomic status, and has grown by 5.8% to $92,516[1] over 2010 – 2017. Conversely, real median household income fell by 3.6% in Suffolk County and by 1% in New York State

2.3.1 Environmental Justice and Protection of Children

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," requires Federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children. The 2017 combined minority population is 7% in the Town of East Hampton and 20% in Suffolk County. Moreover, 9.3% of individuals and 6.1% of families were living below the poverty line in the Town of East Hampton in 2017. These figures are of the same magnitude as the 7.2% of individuals and 5% of families who were living below the poverty line in Suffolk County in the same year.

2.4 Existing Navigation

Lake Montauk Harbor can accommodate recreational craft, fishing boats, and other small commercial craft with lengths up to approximately 200 feet. There are currently 18 marinas and five temporary docking and ramp facilities within Lake Montauk Harbor. The marinas have a total of approximately 1,235 dockside slips. Currently, the largest slip is 70 feet long. A few of the marinas have slips designated for transient boats and fishing and charter boats. Lake Montauk Harbor has two town docks, one named Star Island and the other Montauk Dock with 23 and 17 slips, respectively. Nearly all of these slips are occupied.

The heavy volume of vessel traffic using the Federal entrance channel authorized to a depth of -12 feet MLLW consists primarily of pleasure boats and commercial fishing boats. The channel is used by an average of 500 boats per day during the warmer months. Although subject to turnover and change, the commercial fleet has at times throughout recent years comprised as many as 30 trawlers, 12 inshore and 7 offshore lobster boats and 53 long liners, including as many as 32 transient boats from other areas of the east coast. Fish landings average 12.2 million pounds and $17.1 million annually (average from 2012 – 2017). The fleet throughout recent years has consisted of vessels with deeper drafts. For reference points, the Lake Montauk Harbor General Design Memorandum (USACE, 1967) reported a design depth of vessels using the

[1] Real median household income is measured in 2017 dollars using the CPI: All Items Less Food and Energy.

harbor of from 4 to 9 ft. Anecdotally the current harbor master reports that during his career at the harbor since 1986 vessels with a draft of 11 ft. have gone from being considered as having a very deep draft to being common with the largest vessels now drawing 13.5 and 16.0 ft. This increase in vessel draft since 1967 is documented in Table 15 of the Engineering Appendix to this report. Within the fleet, approximately 11 of the largest vessels are constrained by the current authorized channel depth. These boats all use local service facilities with slips having depths of at least -15 ft. MLLW, including Star Island and Montauk Dock listed above as well as Gozman's and Inlet Seafood. All of these local service facilities are located immediately as the channel enters the harbor and before the boat basin and do not need to be adjusted if boats come in drawing a deeper draft. Therefore, there are no local service facility improvements needed for the recommended plan.

To inform discussion of the Federal navigation channel in this report, the tide range and the relation of this range to Mean Sea Level and North Geodetic Vertical Datum of 1929 (NGVD29) is provided here for historical consistency.

Table 2: Astronomical Tide Elevations

Tide	***Elevation***		
	(ft, MLLW)	**(ft, NGVD29)**	**(ft, NAVD88)**
Mean Higher High Water (MHHW)	+2.46	+1.66	+0.66
Mean High Water (MHW)	+2.17	+1.37	+0.37
North American Vertical Datum (NAVD)	+1.80	+1.00	0.00
Mean Sea Level (MSL)	+1.17	+0.37	-0.63
National Geodetic Vertical Datum (NGVD)	+0.80	0.00	-1.00
Mean Low Water (MLLW)	+0.17	-0.63	-1.63
Mean Lower Low Water (MLLW)	0.00	-0.80	-1.80

The costs for recent USACE dredging operations are shown in Table 3. One action that is not listed in Table 3 is an advance maintenance dredging conducted by USACE for the NYSDEC under the Support for Others (SFO) program in 1999. The SFO action included removal of 20,980 cubic yards (cy) from the navigation channel. These costs (excluding the SFO action from 1999) are used to develop the future without project conditions in Section 3.2 below. To these, approximately $350,000 for construction supervision and administration and 25% overall contingency have been added (last column).

Table 3: Lake Montauk Harbor Maintenance Dredging Costs

Year	Volume (cubic yards)	Contract Cost	Estimated Overall Maintenance Cost
2011	12,000	$400,000	$937,500

2014	19,000	$530,000	$1,100,000
2018	37,000	$780,000	$1,412,500

The approximate annualized cost for maintenance is $300,000. Note that the larger maintenance operation in 2018 allows for a lower annualized maintenance cost of approximately $180,000 while larger operations are conducted.

2.4.1 Recreation

The vessel fleet at Lake Montauk Harbor includes a number of recreational vessels as well as commercial vessels used for recreational fishing charters. Lake Montauk Harbor is the easternmost harbor of refuge in New York and the only harbor of refuge on the south coast of Long Island for vessels westbound to New York Harbor and the New Jersey Coast, or eastbound to the open Atlantic. In addition, the shoreline along Block Island Sound is used for recreation by the respective private owners; the Suffolk County shores east of the inlet are used in the warmer seasons for camping and recreational vehicle (RV) use.

2.5 Sediment Budget

Shoreline and bathymetry change data, as well as channel dredging quantities, formed the primary sources of information for developing a sediment budget for the periods 1892 to 1933 (41 years), and 1933 to 2004 (71 years) using the USACE Sediment Budget Analysis System (SBAS). These time periods were chosen to represent pre- and post-construction intervals relative to initial stabilization of the entrance in 1926. The post-jetty construction period was further subdivided to develop a recent sediment budget for the 1965-2004 time periods, which captures the effects of major rehabilitation of the entrance structures done in 1968. The results of sediment budget analyses are shown in Tables 4, 5, and 6 and are illustrated graphically in Figures 4, 5, and 6. As shown in the figures and tables, net longshore sediment transport is to the west. West-directed transport quantities were determined by balancing volume change estimates derived from shoreline change results, offshore losses due to storms, estimates of sediment deposition inside the harbor, and dredging quantities placed on the beach west of the entrance harbor jetties. Channel maintenance dredging of shoaling material has been deposited as beach fill west of the jetties (bypassed) into what is shown as Reach 4 in Figure 4 and Table 4 since 1945. Maintenance dredging data were used to derive average annual beach fill/bypassing rates of 6,100 cubic yards per year for 1933 to 1965, 7,400 cubic yards per year for 1965-2004, and 6,800 cubic yards per year for 1933 to 2004. These channel maintenance bypassing rates are reflected in the sediment budget as inputs into Reach 4 from the east.

Pre-Jetty Construction 1892-1933

The pre-jetty construction sediment budget provides an overview of the un-interrupted shoreline evolution and sediment transport pattern from 1892-1933. As shown in Table 4 and Figure 4, the net sediment transport direction is westward. Erosion of the eastern headland at Shagwong Point provided approximately 15,000 cubic yards per year source of littoral material. The general shoreline between the two headlands (Shagwong Point to the east and Culloden Point to the west) was erosive. There were approximately 20,000 cubic yards per year net sediment transport across the inlet and approximately 30,000 cubic yards per year net transport passing Culloden Point. Most of the littoral material passing Culloden Point continued moving offshore; creating a sub aerial spit southwest of Culloden Point as shown on the 1933 and 1999 bathymetric maps. The result was a net 10,000 cubic yards per year sediment deficit on the downstream (west of the inlet) shoreline even with a constant supply of 20,000 cubic yards per year of littoral material from upstream shoreline across the inlet before the jetties were constructed.

Post-Jetty Construction 1933-2004

The post-jetty construction sediment budget (Table 5 and Figure 5) represents the general sediment transport pattern and can be used as a basis to predict the future without project sediment transport and shoreline condition at the project site. Based on the 1933-2004 sediment budget, the available upstream littoral source entering Reach 6 was reduced to 13,000 cubic yards per year. Approximately 5,000 cubic yards per year of that littoral material was retained in the east sediment fillet (east of east jetty) while the rest was bypassed onto the downdrift shoreline via maintenance dredging or lost permanently offshore. Even with 7,000 cubic yards per year sand being bypassed at the inlet, approximately 23,000 cubic yards per year leave the project area at Culloden Point, which results in the downdrift shoreline west of the inlet experiencing erosion at a rate of 16,000 cubic yards per year.

Recent Time Period 1965-2004

In the second half of the post-jetty period (1965-2004), due to slowed-down bluff erosion (providing littoral material source) and man-made shore protection structures, the littoral transport rates along the project shoreline have slowed down gradually (Table 6 and Figure 6). As shown in the 1965-2004 sediment budget, the downdrift erosion along shoreline west of the inlet reduced to 12,200 cubic yards per year with approximately same updrift sediment supply as in the overall 1933-2004 time period. The downdrift erosion along shoreline west of the inlet is naturally (that is, even if the jetties hadn't been built), 2 feet/year.

Predicted Future Sediment Budget

Based on the results of the pre-construction, post-construction, and recent sediment budgets, and the observation that the updrift fillet is fully saturated and can no longer impound additional material, the future without project sediment budget was estimated as follows:

Updrift sediment source (Reach 6) to be bypassed: 10,000 - 12,000 cubic yards/year;
Downdrift shoreline net (westward) transport at Culloden Pt: 20,000 cubic yards/year;
Net downdrift shoreline sediment deficit (after bypassing): 8,000 - 10,000 cubic yards/year;
Majority of littoral material passing Culloden Point ends up in sub aerial spit.

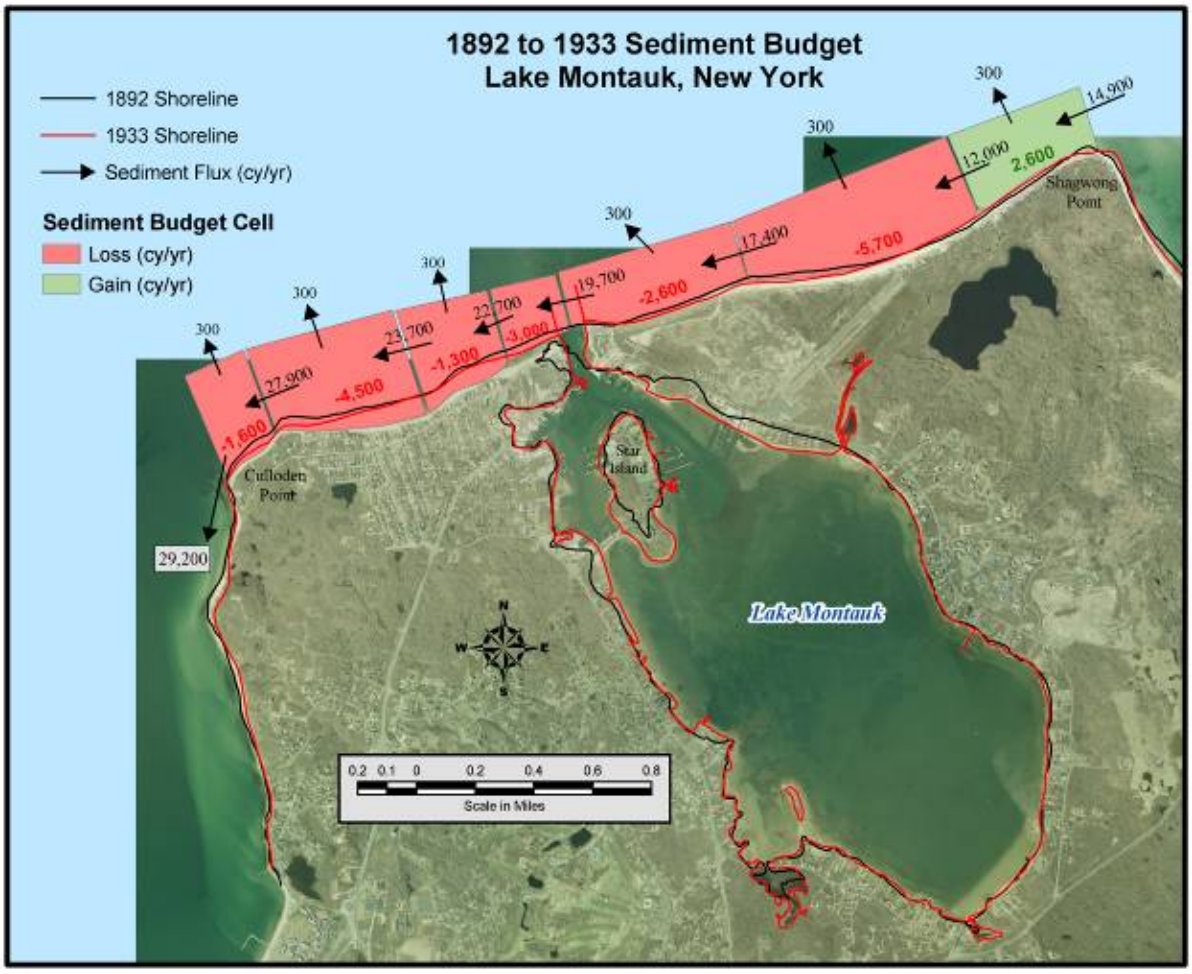

Figure 4: Pre-jetty construction sediment budget

Table 4: Lake Montauk Beach Sediment Budget, 1892 to 1933 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	27,900	23,700	22,700	19,700		17,400	12,000	14,900
Output (-)	29,200	27,900	23,700	22,700		19,700	17,400	12,000
Offshore	300	300	300	0		300	300	300
Residual	**-1,600**	**-4,500**	**-1,300**	**-3,000**		**-2,600**	**-5,700**	**2,600**

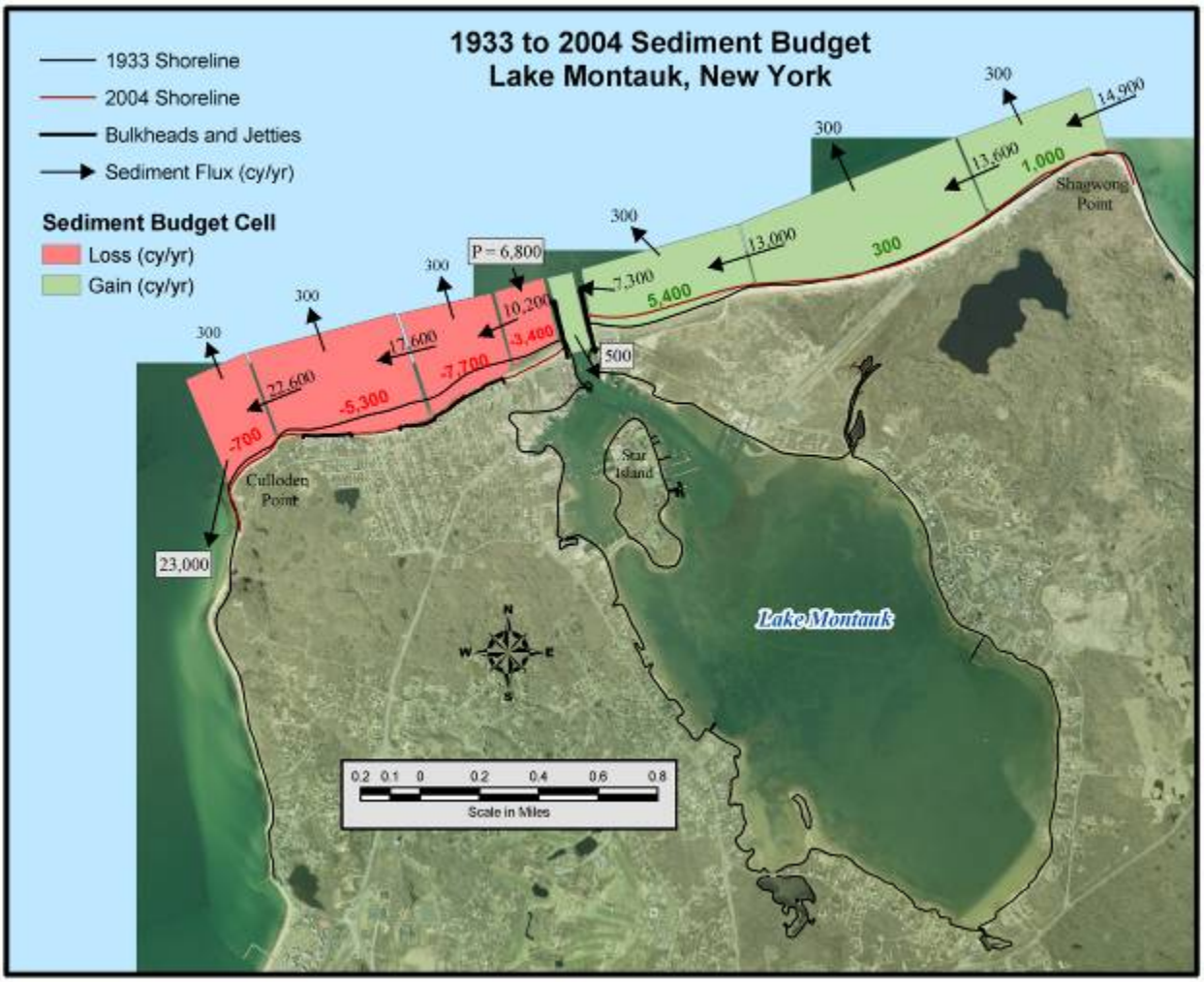

Figure 5: Post-jetty construction sediment budget

Table 5: Lake Montauk Beach Sediment Budget, 1933 to 2004 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	22,600	17,600	10,200	6,800	7,300	13,000	13,600	14,900
Output (-)	23,000	22,600	17,600	10,200	6,800	7,300	13,000	13,600
Offshore	300	300	300	0	0	300	300	300
Residual	**-700**	**-5,300**	**-7,700**	**-3,400**	**500**	**5,400**	**300**	**1,000**

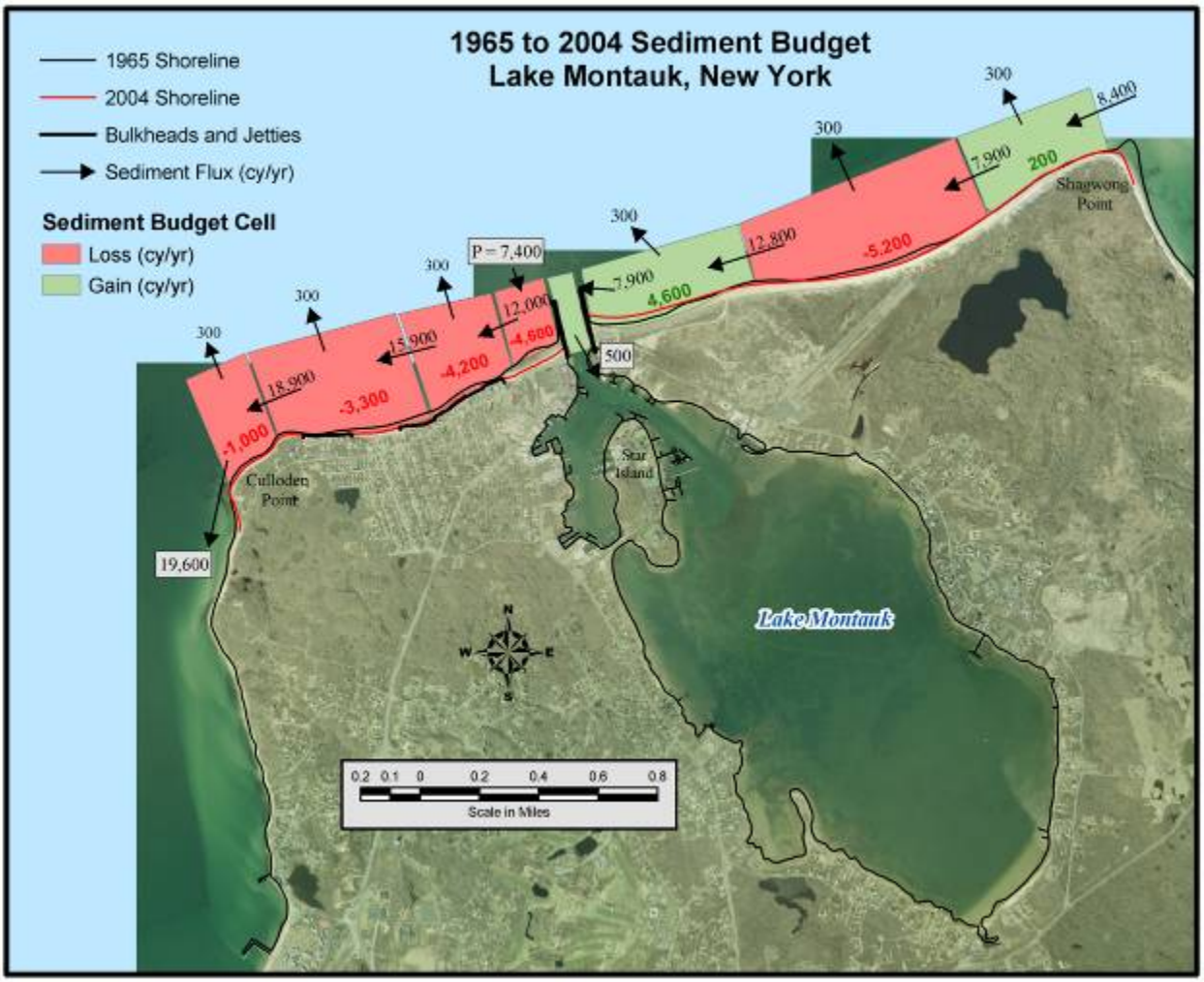

Figure 6: Recent sediment budget

Table 6: Lake Montauk Beach Sediment Budget, 1965 to 2004 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	18,900	15,900	12,000	7,400	7,900	12,800	7,900	8,400
Output (-)	19,600	18,900	15,900	12,000	7,400	7,900	12,800	7,900
Offshore	300	300	300	0	0	300	300	300
Residual	**-1,000**	**-3,300**	**-4,200**	**-4,600**	**500**	**4,600**	**-5,200**	**200**

The primary sediment transport is either around the jetty or through the jetty as a result of the porosity of the structure. There is no indication that transport over the structure is an issue, therefore, increased sea level change is not expected to change this sediment budget in the future.

2.6 Physical Characteristics

The shoreline from Montauk Point westward to Fort Pond Bay, the western limit of the study area, is a succession of wave-formed beaches. The beaches are backed by sand dunes or coastal

bluffs with widths ranging from 20 to 50 feet and heights ranging from 10 to 25 feet above mean sea level. At most parts of the shoreline west of the inlet, narrow beach at low tide and a mild foreshore slope backed by a steep dune or bluff face characterizes the beach profile; in recent years there has been little, if any, dry beach seaward of the bulkheads and dunes/bluffs.

Lake Montauk is a well-mixed estuary in the northern two-thirds of the Lake and a partially mixed estuary in the southern third. Water circulation is impeded by Star Island and causeway; two one-way valves underlying the causeway to Star Island, which were installed to increase tidal flushing north of the causeway, have silted in and are not functioning properly. Water circulation in the lake is also impeded by the presence of bottom vegetation, such as eelgrass (*Zostera marina*) and green fleece (*Codium fragile*).

Groundwater recharge for Montauks' principle aquifer is precipitation which amounts to about 50 inches per year. Suffolk County Water Authority supplies water to most dwellings on the west of Lake Montauk. Dwellings on the east side of the Lake obtain potable water from individual wells or from the Capuso Water Company.

2.7 Summary of Environmental Resources

This section presents a summary of environmental resources most likely to be affected by implementation of these alternatives. See the Environmental Assessment for more details on these resources.

The entire Montauk Peninsula complex has been designated as a Significant Habitat Complex of the New York Bight watershed, and contains regionally significant, unique, and relatively pristine coastal complexes including maritime forest communities (USFWS 1997).

2.7.1 Vegetation

There are six vegetation types within the Montauk watershed: tidal wetlands, freshwater wetland, forest vegetation, maritime shrubland, dune vegetation, and pasture land/open field. Additional vegetated cover type designations include two invasive species identified in the study area: Japanese knotweed and common reed. Lake Montauk contains areas of submerged aquatic vegetation including eel grass beds and seaweeds. Tidal wetlands in the study area are generally located around the perimeter of the Lake, or directly adjacent and hydrologically connected to the Lake, according to the survey conducted. These include intertidal marshes, high marsh area, and formerly connected wetland. Tidal wetlands comprise about 75% of Lake Montauk's shoreline (see Environmental Assessment). Finally, there are 4 Federal plant species of concern and 27 state-listed plant species in the study area. Coordination with the USFWS and NMFS pursuant to Section 7 of the Endangered Species Act is on-going.

2.7.2 Fish and Wildlife

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) may occur in the study area. The list of Federally-listed endangered species that may be found in this area include: Atlantic ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles, northern right whales (*Eubalaena glacialis*), finback whales (*Balaenoptera physalus*), and humpback whales (*Megaptera novaengliae*).

Northern Long-eared bats are also documented as being in the vicinity of the study area.

Threatened species that may be found in the area include: threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles, least bittern (*Ixobrychus exilis*) and northern

harrier (*Circus cyanus*), and three species of concern, the red-shouldered hawk (*Buteo lineatus*), whip-poor-will (*Caprimulgus vociferous*), and osprey (*Pandion haliatus*).

Piping Plover (*Charadrius melodus*) may also occur in or utilize the study area. Other species requiring coordination are the rufa red knot and the roseate tern.

2.7.3 Cultural Resources

There are no known sites within the project area. Within half a mile of the project area, but outside of the Area of Potential Effect there are nine sites, five historic and four prehistoric. The nearest resource is the Caleb Bragg Estate, which is about 150 feet from the federal channel to be dredged. Next, there are three US Coast Guard buildings about 350 feet from the federal channel. Two of these buildings are eligible for the National Register of Historic Properties (NRHP) while the third is ineligible. Then, about ¼ mile (1,500 feet) from the federal channel is the NRHP eligible Star Island Prehistoric Site. The remaining four sites are about ½ mile from the APE. These include the NRHP listed wreck of the HMS Culloden, a British Man-of War that ran aground in 1781 (~2,500 feet west from the sand placement area), and three prehistoric sites: Culloden Point Prehistoric Sites; Culloden Point IV Prehistoric Site; and Culloden Point Area F Extension (all ~2,800 feet from the sand placement area). The first of which is eligible for the NRHP and the other two have undetermined eligibility. These cultural resources are not expected to be affected by navigation measures under consideration.

2.7.4 Hazardous, Toxic, and Radioactive Waste

No evidence of Hazardous, Toxic, Radioactive Waste (HTRW) has been identified within the study area. However, there were two sites nearby that contain HTRW. The Montauk landfill is located several miles away from the Project area and was investigated for potential seepage from septic lagoons. However, there is no evidence that any seepage would impact Lake Montauk or any locations within the project study area. Camp Hero, a former military installation, is approximately 3.6 miles southeast of the Project area. Potential HTRW at Camp Hero consisted of underground storage tanks (oil storage), above ground storage tanks, transformers, and a deteriorating sewage treatment plant. Although some seepage from these HTRW sources may have occurred at Camp Hero, there is a very low probability that the contaminants would impact the Project area. The project site itself, consisting primarily of sand with no history of dumping or nearby outfalls, is not considered to offer an HTRW threat.

Chapter 3: Plan Formulation

Through planning activities, including feasibility studies, USACE study teams help decision-makers identify water resources problems, conceive solutions to them and compare the importance of the inevitable conflicting values inherent in any solution. The 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies (Principles and Guidelines) lay out an iterative 6-step planning process that is used for all USACE Civil Works studies. The Study team followed this planning process, as described in this chapter, to choose a Tentatively Selected Plan.

3.1 Problem Statement

Problem definition is the detailed description of a problem. It begins with a problem statement; a simple assertion of the basic problem.

Problem statement: Insufficient channel and harbor depth at various times, such as low tide, due to both the channel's currently authorized depth and it regularly being shoaled in above this depth.

The existing Federally-authorized -12-foot MLLW channel and harbor depths are only marginally adequate for many of the current commercial vessels. Further, maintaining the channel depth and width has become more difficult with the accretion of sand on the eastern side of the east jetty through and around which sand migrates generally to the west into the Federal navigation channel. Maintenance dredging has been historically necessary every 4 to 5 years, and in the past several years, necessary even as often as every 3 to 4 years (2011, 2014, and 2018).

In recognition of a need for maintenance dredging at least every 4 years, USACE determined that its maintenance work planned for the fall of 2018 included advance maintenance (of an additional 2 feet of depth) allowing the estimated maintenance cycle to be extended from 4 years to 8 years. Some deeper draft vessels, accounting for a significant portion of the commercial fish landings, must transit the channel only during high tides or must sail at less than their full load capacity to restrict their operating drafts. Vessels with loaded drafts that exceed the authorized -12-foot depth must time their passages to coincide with higher stages of the tide. Further, in the year leading up to the most recent maintenance operation, 9 vessels grounded on the channel bottom even on departure when they were not loaded, including the *Evening Prayer* which has a draft of 11 feet.

Delays in commercial activity, under-loading of vessels, and potentially unsafe navigation practices can result. Vessel damages from groundings have occurred. Additionally, Lake Montauk Harbor is the easternmost harbor of refuge in New York and the only harbor of refuge on the south coast of Long Island for vessels westbound to New York Harbor and the New Jersey Coast, or eastbound to the open Atlantic. Finally, Lake Montauk Harbor includes a U.S. Coast Guard station, underscoring the importance of efficient operations in the Federal navigation channel for their mission.

In addition, beach erosion along the shoreline west of the western jetty of the Federally authorized navigation channel is an issue of concern to the local interests. Erosion concerns are also considered in accordance with ER 1110-2-1150, C-2.6.2, which states:

> *Coastal navigation projects at the entrance to the mouth of any river or at any inlet must be assessed with respect to their effects on the adjacent shores. Particular reference shall be made to erosion and/or accretion for a distance of not less than 10 miles on either side of the*

entrance. Most of the studies, pertaining to coastal processes, are required by ER 1110-2-1407 and shall be used to assess the adjacent shore characteristics before and after the entrance modifications

The area of erosion extends for approximately 5,100 feet along this shoreline west of the inlet. Over the years, property owners have constructed timber bulkheads, some of which have included stone toe protection, to prevent erosion from undermining the residential and commercial structures. Approximately 3,000 feet of the 5,100 feet shore to Culloden Point is bulkheaded.

In addition, at the eastern end of this shore (adjacent to the western jetty) there is 500 feet of stone revetment along West Lake Drive. The eroding shoreline is endangering West Lake Drive, the existing bulkheads, the approximately 35 residential and rental properties behind the bulkheads, and the structures behind narrow dunes or bluffs in the unbulkheaded reach. Based on a comparison of historical shorelines, the average long-term erosion on the downdrift shoreline was approximately 2 feet/year up through jetty construction in 1926.

Following jetty construction, the shoreline erosion rate increased to approximately 3.3 feet/year until 1980, but recent placement of dredged material every 4 to 5 years since 1980 in combination with shoreline property owners hardening the shoreline in front of their development has, in effect, decreased this erosion rate to 2 feet/year again. Storm erosion and wave attack forces from recent nor'easters and Hurricane Sandy has caused additional rapid and extreme shoreline losses, bulkhead failures, and even damages to structures. Very little beach area remains, even at low tide. Dredging of the inlet presents an opportunity to beneficially use the dredged material from the FNP to nourish the western beach areas.

3.2 Opportunities

Opportunities to solve the problem in the study area over the 50-year period of analysis have been identified by the study team. There are opportunities in the Lake Montauk Harbor project area to:

1. Respond to the problem –by providing more reliable navigation in Lake Montauk Harbor.
2. In addition, respond to the erosion issues on the western shoreline, potentially by placement of dredged sand from the navigation channel on the beach as least cost disposal, which could provide coastal storm risk management as an ancillary benefit to navigation improvements.

3.3 Federal Action

Per the 1983 Principles and Guidelines, the Federal objective of water and related land resources project planning is to "contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." Water and related land resources project plans are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. Contributions to National Economic Development (NED) are increases in the net value of the national output of goods and services.

3.4 Planning Goal

A Study goal based on problems and opportunities was developed to help create and evaluate alternative plans. It is the overarching intent of the project.

Goal: The project goal is to provide navigation improvement, specifically to provide more sufficient channel depths for commercial vessels and improve public safety as well as provide more efficient Federal channel maintenance.

3.5 Planning Objectives

Plans are formulated to achieve planning objectives. Planning objectives and constraints are inexorably linked to problems and opportunities. A planning objective states the intended purposes of the planning process. It is a statement of what solutions should try to achieve. Objectives provide a clear statement of the study purpose.

In support of the goal, the planning objectives are to:

1. Provide adequate channel dimensions to ensure reliable navigation for two-way traffic of existing and future fleet at Lake Montauk Harbor.
2. Provide for efficient navigation project maintenance.
3. Efficiently utilize beach quality material obtained from channel improvements and future channel maintenance to mitigate erosion on the shoreline between the west jetty and Culloden Point as long as there is no additional cost to the proposed navigation improvement project, or if non-Federal interests agree to pay any increase in cost.

These objectives will be measured by estimating benefits to the commercial fleet from more efficient operations and, if Objective 3 can be achieved, reduced erosion damages west of the inlet jetties. Assuming the proposed project is expected to be operational in January 2024, the planning period of analysis for the forecast of the future without and with project condition is 2024-2073.

3.6 Environmental Operating Principles

The USACE has reaffirmed its commitment to the environment in a set of "Environmental Operating Principles". These principles foster unity of purpose on environmental issues and reflect a positive tone and direction for dialogue on environmental matters. By implementing these principles within the framework of USACE regulations, the USACE continues its efforts to evaluate the effects of its projects on the environment and to seek better ways of achieving environmentally sustainable solutions in partnership with stakeholders.

The seven “Environmental Operating Principles” are as follows:

1. Foster sustainability as a way of life throughout the organization.
2. Proactively consider environmental consequences of all USACE activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.
4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.
5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

3.7 USACE Campaign Plan

The U.S. Army Corps of Engineers Campaign Plan guides USACE policy decisions on how we organize, train, and equip our personnel; how we plan, prioritize, and allocate resources; and how we respond to emerging requirements and challenges and meet national priorities. The Campaign Plan is regularly updated and the current version of the plan covers the period of FY2018 to FY2022.

The USACE strategic plan effort towards improvement began in August 2006 with the "12 Actions for Change" and has evolved to four goals and associated objectives. Although the effort originally developed with a focus on missions that seek to manage risk associated with flooding and storm damage, the Campaign Plan Goals and Objectives are applied to all aspects of the USACE service to the nation including its civil works mission. USACE Campaign Plan Goals and Objectives are derived, in part, from the Commander's Intent, the Army Campaign Plan, and Office of Management and Budget guidance. The four goals are (1) Support National Security, (2) Deliver Integrated Water Resource Solutions, (3) Reduce Disaster Risk, and (4) Prepare for Tomorrow.

The goal and associated objectives most closely related to the study and recommendation of a navigation improvement project at Lake Montauk Harbor are:

Goal 2: Deliver Integrated Water Resource Solutions

Objective 2a – Deliver Quality Water Resources Solutions and Services
The Recommended Plan for navigation improvements at Lake Montauk Harbor meets this objective by delivering a project which, within the limits of Federal participation established by Congress, meets to the extent practicable the expectations of our partners and stakeholders in providing safe and efficient navigation for the commercial fleet operating at Lake Montauk Harbor.

Objective 2c – Develop the Civil Works Program to Meet the Future Needs of the Nation
The Recommended Plan for navigation improvements at Lake Montauk Harbor meets this objective by delivering a project which, within the limits of Federal participation established by Congress, provides sustainable system of channel improvements and improves coastal resilience through beneficial use of the dredged sand to nourish the beach along the shoreline west of the inlet, which, as described in Chapter 2, is subject to erosion by coastal storms. The study and recommendation were conducted with stakeholder engagement and the public provided an opportunity to review and comment on the study and its recommendations through the NEPA process.

Objective 2d – Manage the Life-Cycle of Water Resources Infrastructure Systems to Consistently Deliver Reliable and Sustainable Performance
The project has been formulated with the complete life-cycle in mind, with a consideration of the costs and impacts of both initial construction and future operations and maintenance, to determine the most cost-effective alternative solution to address problems and opportunities with navigation at Lake Montauk Harbor.

3.8 Planning Constraints

Constraints are restrictions that limit the extent of the planning process. They can be divided into universal constraints and Study-specific constraints. Universal planning constraints are the legal and policy constraints to be included in every planning Study. Study-specific planning constraints are statements of things unique to a specific planning Study that alternative plans should avoid.

Constraints are designed to avoid undesirable changes between without- and with-plan conditions.

Universal planning constraints include:

Environmental constraints:

1. Plans should avoid and minimize environmental impacts to the maximum degree practicable.
2. Plans should not adversely impact threatened or endangered species, and their habitat.
3. Plans should be compliant with all Federal environmental laws, Executive Orders, and guidance.

Study specific constraints:

1. Alternatives will not impact stability of the existing jetties.
2. Any material placed on downdrift beaches will be beach quality material. Any unsuitable material (i.e. silt or clay) removed during channel deepening or maintenance will not be placed on the downdrift beaches because this would be unacceptable to the non-Federal sponsor and other stakeholders.

Study specific considerations:

Though not constraints, study-specific considerations are:
1. Plans (for disposal of dredged material) will be developed, to the extent practical, consistent with the State Coastal Zone Management policies, as specifically adjusted by the Town of East Hampton's Local Waterfront Revitalization Plan (LWRP)
2. Plans will consider the effects of proposed navigation improvements on Lake Montauk's ecosystem.
3. Plans will not increase coastal storm damage risk within Lake Montauk and on shorelines adjacent to Lake Montauk.

3.9 Future Without Project Conditions

The future without project condition serves as the base conditions for all the alternative analyses.

In the future without project condition, over the period of analysis of 2024-2073, the navigation channel will increasingly continue to experience constraints and suboptimal operation. In existing conditions and into the future without project conditions, fishing production is not fully realized. The 2011 survey of fishing captains suggests that the sub-optimal production level occurs because the commercial fishing vessels are constrained by the depth of channel, and this is assumed to continue in the future without-project-condition. The 2011 survey results were updated in 2019 with information from captains of 10 of the 11 depth-limited vessels that are most impacted by the current conditions of the channel.

The survey evidence has shown that vessels demanding use of the harbor continue to grow in size, resulting in a growing level of inefficiencies over time. The growing number of depth-limited vessels in the future without-project condition would require extensive repair and maintenance from groundings and the like, would expend high levels of fuel and supplies used per trip (such as due to weather conditions preventing transit of the channel), would have low relative average value of commercial fish production as the timeliness to market depends on access to the channel, would obtain a low quantity of fish landings relative to potential (such as due to light-loading), and

would experience a persistent risk of total loss of the fishing vessel. As a result of these inefficiencies, up to $2,325,000 of annualized commerce would be not realized in the future without-project condition. The survey evidence suggests that current and future without-project operations occupy the nation's scarce resources in a sub-optimal way.

The Federal interest here is clear given the importance of marine commerce, including commercial fishing, to the regional and national economy. The Federal government maintains the U.S. Coast Guard facilities here which are important to emergency response and homeland security. Suffolk County has limited resources which are already strained by the demand for maintaining several dozen small harbors per year. Assuming the responsibility for improving and then maintaining what is now a large Federal commercial small craft harbor currently maintained by the Federal government would be a significant additional burden on local government and would not be practicable in the long term.

Littoral material estimated to be 10,000 to 12,000 cubic yards per year on average is transported westward along the beaches east of the jetties and will continue to supply the inlet system with sediment at a rate of 7,000 to 8,000 cubic yards per year, which will need to be dredged and bypassed. Following the maintenance cycle begun in the fall of 2018 USACE estimated (to justify the advance maintenance performed) that maintenance dredging will be required more often to maintain the authorized channel depth (24,000 cubic yards every 3 years). This determination was based on dredging history (including the past several years), engineering analysis, and sediment budget. More frequent channel maintenance would cause increased disturbance of the area's littoral system. Further, the annualized maintenance costs (100% Federal) would rise significantly beginning in approximately 2026, largely because maintenance dredging would now be required every three or four years.

West of the inlet, the shoreline will continue to recede, at approximately 2 feet/year. The existing erosion of the shores downdrift of the west jetty will continue to worsen due to storm waves and surges, and the natural condition in which less sediment is arriving on the western shoreline than is being transported away from it past Culloden Point, as well as the littoral sediment depravation of the western shores from the blocking effects of the jetties at the stabilized inlet channel. There will also be lowering of the beach profile, resulting in deeper water fronting bulkheads and revetments. There will be an increased threat of undermining of West Lake Drive immediately adjacent to the inlet, and engineering models predict that after 20 years this road will be undermined along any reach that is not hardened. Therefore, it is anticipated that the remaining 700 feet of road would receive riprap protection as the shoreline narrows. Eventually, the entire 1,200-foot-long stretch of road would end up being bulkheaded. The continuing erosion, along with future storm damage, would require repairs to the bulkheads and even the road itself. These future without project conditions damages have been estimated at approximately $1,889,000 on an annualized basis.

3.9.1 Future Without Project Conditions for the Environmental Setting

In the absence of Federal action, the condition of wetlands, air quality, flora & fauna, threatened and endangered species, cultural resources, and HTRW is expected to remain consistent with current conditions. More frequent disturbances may be expected from channel maintenance dredging due to the increased shoaling. Additional bulkheading might be needed along the shore west of the western jetty to protect the residential structures, particularly new bulkheading between Stations 33+00 and 42+00 as well as continued repairs to bulkheading already constructed. Environmental impacts may occur due to new bulkheading and repairs to existing bulkheads. For the narrow beaches seaward of the bulkheads and in dunes and low bluffs not

protected by bulkheads, degradation and lowering of the remaining beach will continue to occur leaving little, if any, shorebird foraging area. Finally, for the shore east of the east jetty there will be continued but limited growth of the updrift fillet in terms of beach width and elevation.

3.9.2 Sea Level Change and Climate Change

In accordance with Engineer Regulation (E.R.) 1100-2-8162, three sea level change (SLC) curves are provided in Figure 7 for the 50-year period of analysis and the 100-year adaptation horizon. SLC will not significantly affect the navigation project as the channel depth is referenced to a tidal datum and local service facilities will adapt to SLC as they are maintained (i.e. steel bulkheads have approximately a 15 year lifespan; waterfront businesses will raise top elevation as necessary). SLC may result in a seaward response to the cross-shore profile of the updrift beach, however the longshore currents are not strong enough to impact dredging requirements.

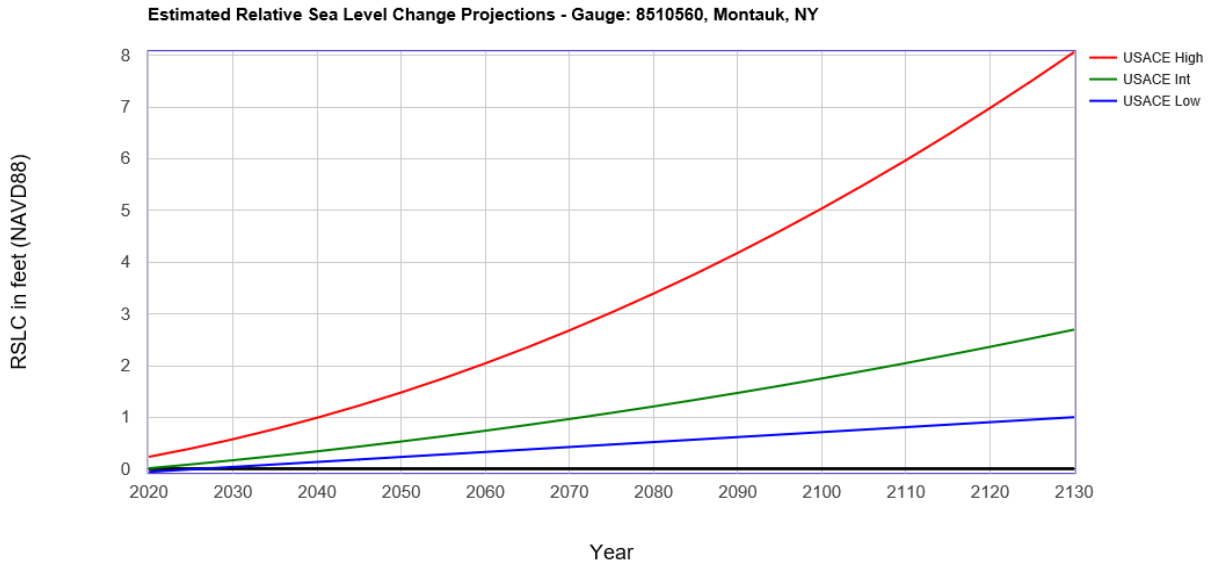

Figure 7: Relative Sea Level Change at Montauk, NY

Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise of 2-6 feet over the next century (Frumhoff et al. 2007). Increases in sea level and continued coastal storms will result in more inundation of coastal areas, and subsequent increases in shoreline erosion and wetland loss. Inundation of low-lying areas will result in the potential for saltwater to infiltrate into freshwater surface waters and aquifers. Increased flooding and erosion has the potential to negatively impact transportation infrastructure and sewage and septic systems.

Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined effects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al. 2007).

It is difficult to predict the ways in which warming of water temperatures will influence other factors that affect marine ecosystems, including nutrient dynamics, ocean circulation, and plankton production. However, commercial fish and shellfish have water temperature thresholds that define conditions suitable for reproduction, growth, and survival. Increased water temperatures over the last decade have already led to declines in lobster landings in Long Island Sound (Fogarty et al. 2007). In addition, warmer water temperatures also appear to facilitate the spread of shellfish disease, the frequency and intensity of harmful algal blooms, and the ability of invasive species to reproduce and spread (Frumhoff et al. 2007).

3.10 Key Uncertainties

Limitations to the quantity and quality of information result in uncertainties, specifically knowledge uncertainties. Natural variability may also cause uncertainty. The study team dealt with one major uncertainty.

Sea level change projections: Three sea level change (SLC) curves are considered for the 50-year period of analysis and the 100-year adaptation horizon. SLC will not significantly affect the navigation project as the channel depth is referenced to a tidal datum and local service facilities will adapt to SLC as they are maintained (i.e. steel bulkheads have approximately a 15 year lifespan; waterfront businesses will raise top elevation as necessary). However, SLC may result in a seaward response to the cross-shore profile of the updrift beach, but the longshore currents are not strong enough to impact dredging requirements.

3.11 Navigation Improvement Measures

Plans are composed of measures. A measure is an activity or a feature that can be implemented at a specific geographic site to address one or more planning objectives. They can be used individually or combined with other management measures to form alternative plans. Measures were developed to address problems and to capitalize upon opportunities. They were derived from a variety of sources including prior Lake Montauk Harbor studies, the public scoping process, and the project delivery team. The following measures were considered in the Lake Montauk Harbor navigation improvement feasibility study. Table 7 at the end of this section shows the results of the screening of identified measures.

3.11.1 Non-structural Measures

1. Unconventional drafts. Use of larger vessels with shallower drafts was considered, but this is not the present trend. It is not projected that the commercial fishing fleet at Lake Montauk Harbor will deviate from the general trend of using larger, deeper draft vessels. This measure was removed from further consideration because it does not meet study objective 1, specifically, it does not provide adequate channel depths for the existing fleet. Rather, it would call for the replacement of the existing fleet. It also meets no other study objective.

2. High water transit; Waiting for high tide to traverse the inlet for deeper draft vessels. Astronomical tides in the study area are semi-diurnal, flooding and ebbing twice a day. The mean and spring tides range from 2.0 to 2.4 feet. Waiting for the tide leads to costly delays for commercial fishing vessels, estimated by local fishing captains. The U.S. Coast Guard reports that potentially unsafe navigation practices result from the limited channel depth. This measure is

considered a component of Alternative 1 below and is removed from further consideration because it does not meet study objective 1 in that it does not provide reliability nor is it cost effective, based on, for example, at least a portion of the without project commerce not realized.

3. Relocation of the Existing Fleet. Relocation of the existing fleet would be to the nearest major commercial fishing fleet, which is at Shinnecock Inlet. This measure was removed from further consideration because it is not cost effective. Indeed, boats still calling at Lake Montauk Harbor would relocate to another harbor if it were cost effective.

3.11.2 Structural Measures

4. Channel Extension East and West of Star Island. Extending the channel into the former yacht basin area, east of Star Island, was also given consideration. The use of the area, maintained by the Town of East Hampton, for purposes including a turning basin for transient vessels and for access to southern portions of the Lake, was investigated. The presence of sea grass beds and productive shellfish areas in the shallow portions of Lake Montauk, south of Star Island, would require a detailed evaluation of potential environmental impacts associated with such extension. The option would likely be less cost effective than other viable plans as there is no advantage for the large fishing boats to transit further into the harbor. Generally, only recreational vessels would benefit from a channel extension and Corps projects cannot be formulated with recreation as a purpose. The Federal Government is restricted from participating in maintenance of private marinas, berthing areas, and access points. In addition, extending the Federal channel into the Coonsfoot Cove area, west of Star Island, was given consideration. However, the large percentage of silts and clays in the sediment would make this material unsuitable as beach fill and would require further environmental testing. This measure was removed from further consideration because it does not meet study objective 1 in that it does not provide adequate channel depths. The requirement for detailed environmental evaluation also makes this measure likely technically not feasible.

5. Channel Widening. The present authorized channel width of 150 feet was determined to be sufficient for two-way vessel traffic clearances at a depth of 12 feet. Given the fact that channel deepening (assuming a cut slope of 1 vertical to 3 horizontal) would result in a wider navigational area at the same 12 foot depth, this option was not given further consideration. It also meets no other study objective.

6. Channel Realignment. Any major shift in the authorized channel due to its large initial costs would likely be not feasible. Shifting the outer channel west of its present position would temporarily improve the present shoaling condition resulting from east jetty leakage, but this plan would not solve the deeper draft requirements of the larger vessels per Objective 1. It also would not provide a long-term safeguard against shoaling because, without jetty rehabilitation, sand bars would begin to form again. This option was not considered as an effective use of resources. It also meets no other study objective, and it was not considered further.

7. Deepening of Boat Basin. Sediment sample analyses indicated the presence of many silts and clays in this area, which is currently authorized at -10 feet MLLW. This may be a disposal hindrance, pending further testing. The area is currently used primarily by shallow draft recreational craft. Based on boating survey conducted in 2005, there are not enough transient vessels or turning basin needs to deepen the existing depth. Further, this measure does not address the channel. It also meets no other study objective. As a result, this option was not considered further.

8. Sand-Bypassing. Based on the results of sediment budget analysis, there is an approximately 12,800 cubic yards per year of sediment supply from the updrift (east) shoreline. Of the total supply, approximately 7,000 cubic yards per year is bypassed to the downdrift beach via channel dredging and approximately 800 cubic yards per year is lost to deep water offshore. The remaining 5,000 cubic yards per year continues to accumulate to the east of the inlet. The east sediment fillet is close to saturation and the accumulated sediment is shoaling the entrance channel both around the east jetty and by migration into the inner channel via gaps in east jetty. The accumulated updrift sediment fillet could be bypassed to the downdrift beach via trucking or hydraulic pumping across the channel to reduce future channel shoaling and maintenance dredging costs. Due to the small bypassing rate, temporary hydraulic pumping equipment or trucking would be more effective than using a fixed bypassing plant which requires a high investment cost (close to $1,000,000) and has inherent risks with regard to its effectiveness.

9. Jetty Rehabilitation. Rehabilitation of the eastern jetty could play an essential role in improving the navigation through the channel for the vessel fleet. A large portion of the shoaling material that enters the channel results from leakage through the eastern jetty. Accordingly, this plan component could reduce the future Operation and Maintenance Costs for the navigation channel. The without project future condition would mean continued deterioration of the eastern jetty and a mandate for more frequent dredging (shorter dredging cycles). Since the shoal that results from leakage tends to be localized but quite intrusive at certain channel points, this component could help enhance navigation maneuverability. The U.S. Army Corps of Engineers New York District, under a separate Operations and Maintenance Authority, rehabilitated a section of the eastern jetty from Station 5+55 to 9+55 together with a tie-in at the inshore end in year 1999. Despite this, it is projected that seepage of sand into channel through the voids of the east jetty would continue without further rehabilitation.

10. Deepening of the Federal Navigation Channel. There is a trend toward larger, deeper draft commercial fishing vessels. In 1993, there were 24 vessels overall with a loaded draft of 12 to 13 feet that listed Lake Montauk Harbor as a homeport. According to local fishing captains who were recently interviewed, there are approximately 15 large fishing vessels that operate out of the harbor. The vessels range from 50 to 100 feet in length with loaded drafts of 10 to 16 feet. When considering squat requirements, wave allowance requirements, and safety clearances, deepening would be necessary under present guidance and would meet concerns of local interests. Deepening would improve navigation through the channel for the existing and future fleet and would enhance navigation maneuverability. This measure is considered further.

11. Removal of shoal at the inshore end of the East Jetty. A large sand shoal has been developing near the inshore end of the eastern jetty, just northeast of Star Island. It has been infringing upon the authorized channel width. In 1995, 2000, 2004, 2009, 2011, and 2014 the U.S. Army Corps of Engineers New York District removed part of this shoal during maintenance dredging. Local interests have indicated however that it has already begun to shoal in again because the jetty has not been rehabilitated enough to prevent further leakage into this area. However, due to the construction of a bulkhead, complete removal of the shoal will result in flanking of the structure; therefore this measure is no longer technically feasible and does not meet technical constraints.

12. Deposition basin outside the current authorized channel limits. Over the past several dredging cycles (1991, 1995, 2000, 2009, 2011, and 2014), advanced maintenance dredging measures have been employed. Essentially, for a length of channel approximately equal to the existing east jetty length, an additional 50 feet (outside and to the east of the existing channel) is dredged. This additional cut serves as a deposition basin to protect the authorized channel. This

is also done for economic reasons because removing larger quantities is more efficient, given the high dredging mobilization and demobilization costs. This practice could be authorized and extended around the bend and into the inner channel, approximately an additional 1,800 foot length. The width of the deposition basin could be extended from 50 feet to 100 feet to increase the capacity. This measure further reduces environmental impacts from more frequent maintenance and the costs caused by the shoal migration into the harbor. This measure is carried forward for further consideration.

Table 7: Measure Screening Summary

Measure	Does the measure…			Carried forward?
	1 - provide adequate channel depths for reliable navigation	2 - provide for efficient navigation maintenance	3 - efficiently utilize all dredged material	
1. Unconventional drafts	No	No	No	No
2. High water transit	No	No	No	No
3. Relocation of the existing fleet	No	No	No	No
4. Channel Extension East and West of Star Island	No	No	No	No
5. Channel Widening	No	No	No	No
6. Channel Realignment	No	No	Yes	No
7. Deepening of Boat Basin	No	No	No	No
8. Sand-Bypassing	No	Yes	Yes	Yes
9. Jetty Rehabilitation	No	Yes	N/A	Yes
10. Deepening of the Federal Navigation Channel	Yes	Yes	Yes	Yes
11. Removal of Shoal at the Inshore End of the East Jetty	Yes	Yes	Yes	No
12. Deposition Basin Outside the Current Authorized Channel Limits as a Deposition Basin	Yes	Yes	Yes	Yes

(Measures not carried forward for further consideration are crossed out)

3.12 Initial Set of Alternatives

Measures that remained after the initial screening were considered for the initial set of alternatives. For this set, navigation improvement measures were combined to arrive at 4 alternatives (Alternatives 2 – 5) for further evaluation and consideration. For the presentation of the initial set of alternatives, the costs remain at FY20 price levels and interest rate because plan selection is not affected by their update to FY21 price levels and interest rate. The recommended plan is presented at FY21 levels.

Alternative 1, for these evaluations, is the future without project condition. Specifically, Alternative 1 estimates that the current channel at -12 ft. MLLW and the regular practice of having the 50-ft. deposition basin will be maintained approximately every 4 years at a volume of 32,000 cubic yards (cy) per operation beginning in 2026, which is the date estimated in the formulation of the maintenance conducted in 2018. Measure 2 High Water Transit is an inherent component of this alternative. The annualized cost of this alternative during the period of analysis, 2024-2073, at the FY20 discount rate of 2.75% at FY20 price levels is $203,000.

Alternative 2: Uniform dredging of both the 150- foot-wide channel and 50-foot-wide deposition basin: This alternative includes Measures 10 and 12. For this alternative, for both the channel itself and the deposition basin, depths for new Congressional authorization to be considered range from -14 to -18 feet MLLW. Both the channel and deposition basin would be dredged to a uniform depth (both to -14, -15, -16, -17, or -18 feet MLLW). All dredged material would be placed on the downdrift beach but with no design (or disposed of offshore using the methods discussed in the next section). The expected maintenance cycle would be approximately 4 years at a volume of 32,000cy per operation beginning in 2027. The annualized cost of the maintenance of this alternative during the period of analysis at the FY20 discount rate of 2.75% at FY20 price levels is $197,000. The difference in the maintenance between this alternative and Alternative 1, the future without project condition, is a cost savings of $6,000 on an annualized basis and is counted as an added benefit of this alternative.

Alternative 3: Uniform dredging of both the 150-foot-wide channel and 100-foot-wide deposition basin: This alternative includes Measures 10 and 12 with the option in 12 to widen the deposition basin to 100 feet. For this alternative, for both the channel itself and the deposition basin, depths for new congressional authorization to be considered range from -14 to -18 feet MLLW. Both the channel and deposition basin would be dredged to a uniform depth (both to -14, -15, -16, -17, or -18 feet MLLW). All dredged material would be placed on the downdrift beach but with no design (or disposed of offshore using the methods discussed in the next section).

The post-construction jetty slope stability after the greater widening of the deposition basin will be analyzed based on USACE slope stability manual (EM 1110-2-1902) guideline during the Planning, Engineering & Design phase; and adaptations to manage any risk to jetty stability (such as a shallower, stepped up dredging depth within the proposed 100 ft wide deposition basin; or reduced width of the proposed deposition basin width; or a combination of both) will be implemented accordingly. Additional details of potential adaptations are discussed in Appendix A: Engineering and Design in the description of this alternative. The expected maintenance cycle would be approximately 7 years at a volume of 56,000cy per operation beginning in 2030. The annualized cost of the maintenance of this alternative during the period of analysis at the FY20 discount rate of 2.75% at FY20 price levels is $143,000. The difference in the maintenance between this alternative and Alternative 1, the future without project condition, is a cost savings of $60,000 on an annualized basis and is counted as an added benefit of this alternative.

Alternative 4: Uniform dredging of both the 150-foot-wide channel and 100-foot-wide deposition basin with East Fillet Mining: This alternative includes Measures 8, 10, and 12 with the option in 12 to widen the deposition basin to 100 feet. The east jetty impoundment offers an additional source of sand for the channel, and mining it reduces that source. The potential borrow region extends east from the inlet approximately 1000 ft and out to a depth of approximately -10 ft NAVD88. It was assumed the fillet would be mined back to the baseline with a final slope of 1 on 12 down to a depth of -10 ft NAVD. Originally it was thought a cutter-head dredged would be used to mine the fillet out from a depth of -17 ft NAVD up to the baseline, creating a construction slope of 1 on 3 that would gradually evolve to an equilibrium slope of 1 on 12. Field work (Mattituck Inlet) in 2014 indicated this is not a viable option for mining any appreciable volume of material. An alternative mining method of beach scraping and trucking of the subaerial portion of the fillet is considered, and it would yield a significantly smaller volume of material (approximately 7,000 to 10,000 cy of sand). The rate at which this sand would be replenished to the fillet was estimated to range between 8 and 11 years. This was constructed using the most recent sediment budget for the region, assuming equal distribution of sand within the transport cell and along the profile, and constraining the mineable area to the subaerial portion of the fillet. The gradual impoundment on the beach face and berm east of the jetty will reduce shoaling rates within the channel and deposition basin by roughly 3 to 5 percent, increasing the maintenance cycle by 1 year, to approximately 8 years. Maintenance dredging would be at a rate of 64,000cy per operation beginning in 2031. The annualized cost of the maintenance of this alternative during the period of analysis at the FY20 discount rate of 2.75% at FY20 price levels is $148,000. The difference in the maintenance between this alternative and Alternative 1, the future without project condition, is a cost savings of $55,000 on an annualized basis and is counted as an added benefit of this alternative.

Alternative 5: Uniform dredging of both the 150-foot-wide channel and 100-foot-wide deposition basin with Jetty Rehabilitation. This alternative includes Measures 9 and 10 with the option in measure 12 to widen the deposition basin to 100 feet. Some of the sand depositing in the main channel and deposition basin enters from leakage through the eastern jetty. It is estimated that decreasing the porosity of the structure may reduce overall shoaling by 5 to 7 percent, increasing the maintenance cycle by 1 year, approximately to 8 years (or 9 years if Measure 8, sand bypassing from scraping and trucking, is included). The rehabilitation of the east jetty is estimated to cost approximately $10 million. This is based on recently completed stone work at Long Beach, NY. The remoteness of the site, length of structure, and water depth at the jetty head significantly impact construction costs. Even if the rehabilitation efforts defer two maintenance dredging cycles (approximately $1.6 million) the cost savings would not be justifiable. This alternative was removed from further consideration as the analysis shows that it would not be cost effective.

Figure 8 of Lake Montauk Harbor shows the channel and deposition and the stationing to be used. The 150-foot navigation channel and 50-foot deposition basin are shown in red. The eastern 50-foot deposition basin extension proposed in Alternatives 3 and 4 is shown in blue.

Figure 8: Lake Montauk Harbor

Figures 9 – 11 show typical cross-sections of the alternatives at select depths. The angle of elevation of the sides of the channels are defined by their side slopes and are constructed at 1 vertical on 3 horizontal. Based on the historical pre- and post- channel dredging condition survey records, the equilibrium channel side slopes range from 1 vertical on 5 to 7 horizontal, with steeper slopes and deeper toe depths near the jetty entrance. As the side slopes of the constructed channel naturally evolve to equilibrium they should not impact structure stability as there appears to be a minimum distance of 50 feet between the top of the dredge cut and the toe off the jetties (See Figures 10 and 11).

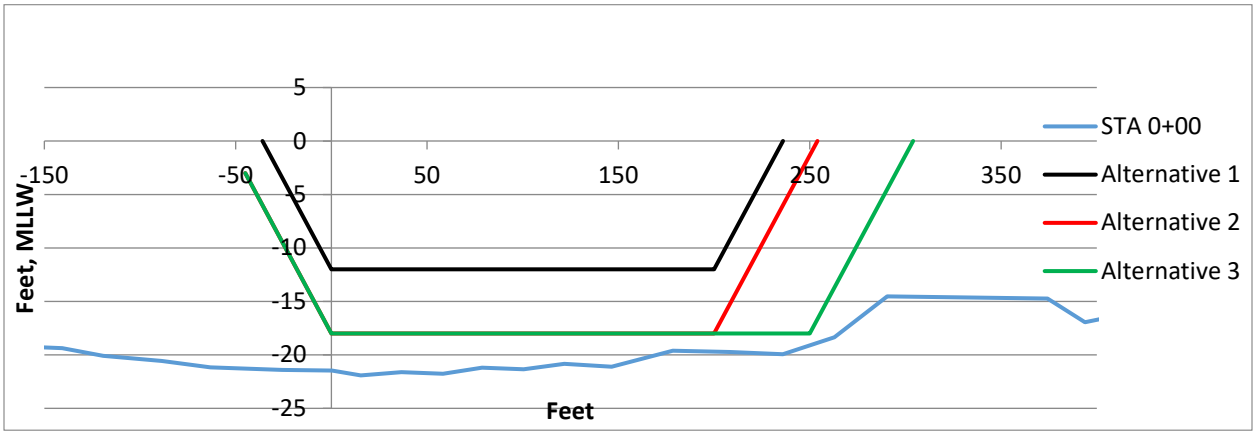

Figure 9: Select Channel Alternatives at Station 0+00

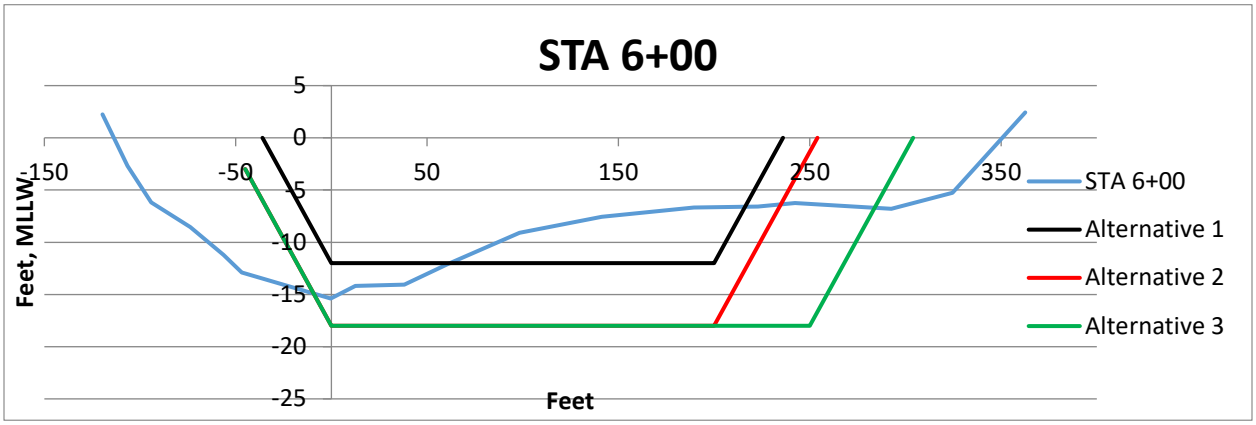

Figure 10: Select Channel Alternatives at Station 6+00

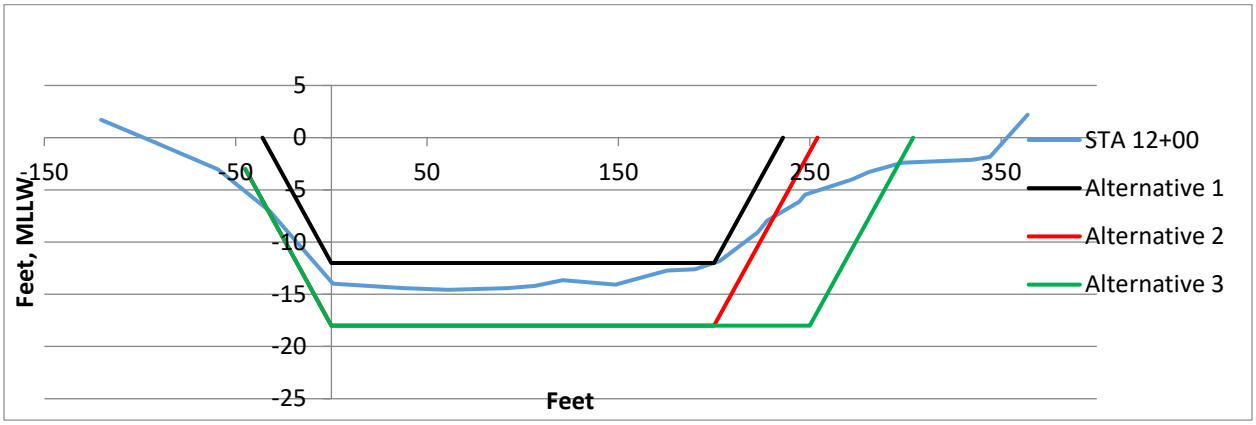

Figure 11: Select Channel Alternatives at Station 12+00

3.12.1 Dredging Method Selection

Volumes to be initially dredged for the final array of alternatives, Alternatives 2, 3, and 4, at depths ranging from -14 ft. MLLW to -18 ft. MLLW, with an additional 2 ft. tolerance, range from 51,800 cy to 205,300 cy. Volumes for Alternatives 3 and 4 are now calculated following feasibility level design to adjust the footprint slightly to avoid submerged aquatic vegetation. These volumes indicate that there are three potential dredge types and methods that could be used. It is noted here that all previous maintenance operations up through the operation conducted in 2018 (during which the channel was dredged below -14 ft. MLLW as advanced maintenance) was done by a cutterhead dredge. Dredging methods and dredged material disposal are interdependent in that some disposal methods are only practicable with certain dredging methods.

Mechanical Dredging: Mechanical dredging is typically accomplished using a barge mounted crane or excavator. A crane with a clamshell bucket can remove all but the most consolidated materials. Some clamshell buckets overlapping jaws and closure flaps to contain the dredged material and are known as environmental buckets, as they minimize loss of material to the water column during ascent. Other clamshells have teeth to facilitate removal of harder materials such

as gravel and tills. Barge mounted excavators generally have much heavier gage buckets with heavy teeth to remove harder material such as compacted sands, consolidated tills, and weathered rock that can be ripped. The dredged material is placed in scows which are then towed by tugs to a disposal or offloading site. Most bucket dredging involves open-water or ocean disposal of the dredged material. The number of scows and tugs used would depend on the distance to the disposal site and the rate of dredging, in order to keep the dredge working while some scows were in transit to or from the disposal site. The nearest open water site is the Eastern Long Island Sound site recently designated by the EPA off the Connecticut coast southwest of New London. That site is 14 miles from Lake Montauk Harbor. Use of this site would place sandy dredged material in deep ocean waters where it would be unavailable to any littoral system processes. This would not be consistent with the USACE policy of using dredged material beneficially wherever practicable. Placement even this close to Lake Montauk Harbor also raises the estimated unit cost to between $15 and $30 per cubic yard of material. Scows can also be offloaded and material moved upland for treatment and or disposal, but this would be at a similar unit cost. Harder materials can often be beneficially used for reef construction. Sands can be placed in nearshore feeder bars off of eroding beaches where spring tides can push some of the material onshore. Mechanical dredging with nearshore placement could be used at Lake Montauk Harbor, however NYSDEC considers this less environmentally acceptable than placing onshore and outside the tidal zone. Only a portion of the material placed nearshore would ultimately be made available to the western beaches, limiting achieving Objective 3 unless it is now found less costly than the longstanding practice of dredging contractors using a cutterhead.

Hydraulic Pipeline Dredging: Hydraulic Pipeline Dredging involves the use of a cutterhead suction dredge with onboard pump attached to a discharge line that carries the material to the location where the dredged material is deposited. The material is suctioned into the cutterhead arm and pump by mixing it with water as a slurry. Depending on the type of material being dredged (silt to sand) the slurry can be as much as 90 percent water. Silty dredged material can be pumped into containments to dewater, or onto other shallow areas for marsh creation. Sand can be pumped directly onto beaches where it can be spread and graded by heavy equipment as beach nourishment and shore protection. Cutterheads on pipeline dredges are general front mounted allow the dredge to dig its way in from deep water. Hydraulic pipeline dredges are typically classified according to their pump or discharge line diameter. Large pipeline dredges are typically employed on larger projects or those with greater dredge depths. Booster pumps, typically on barges, may be required along the discharge line for the slurry to reach more distant placement sites. Elevation can be an issue where the discharge point is significantly above the cutterhead's working depth. A hydraulic pipeline cutterhead dredge could be used for the improvement of Lake Montauk Harbor, provided it was of sufficient size to reach to the intended -20-foot (18+2) pay removal depth at high tide. The pipeline could be routed directly to the west beach areas in need of nourishment material. With proper site preparation (toe dikes, discharge diffusers) and timely grading of the beachfill this would ensure that the majority of the dredged material reached and remained on the beach. The estimated unit cost of this method is between $10 and $12 per cubic yard of material.

Hopper Dredging: A hopper dredge is similar to a pipeline dredge in that it suctions material from the dredge area. Instead of pumping the material through a pipeline the material is discharged into hoppers onboard the dredge. The dredge then places the material in ocean or open water disposal sites, into nearshore bar systems, or onto other subaqueous sites (such as those used for shellfish habitat creation). Hopper dredges can also work together with barge mounted pump-off equipment which re-fluidizes the dredge material to remove it from the hoppers and pumps it via pipeline to the placement site. Some larger hopper dredged can perform this action without a separate piece of equipment and merely need pipelines to connect to which extend to shore. In

this manner beaches more distant from the dredge site than could be reached by a pipeline dredge can be nourished. Most hopper dredges are trailing drag arm suction dredges, with the suction trailing the vessels as it moves forward. This limits the ability of the dredged to make deep vertical cuts. Hopper dredges also have significant differences in their loaded and unloaded drafts. Even smaller hopper dredges that draw 4 feet unloaded will draw 11 feet loaded making use in shallow draft channels such as the channel at Lake Montauk Harbor difficult and not having been preferred during previous maintenance. The USACE has two shallow draft modified split-hull drag arm hopper dredges (Currituck and Murden) that are used to dredge smaller east coast harbors and typically work in New York and New England in the May to October timeframe. A hopper dredge could be used for the improvement of Lake Montauk Harbor, however it would be limited by several factors that could make such a method impracticable, such as a need to work around the tide in the shallow draft channel.

Based on this analysis, costs have been estimated using a cutterhead with onshore disposal on the shore west of the inlet. This is most similar to longstanding maintenance practice.

3.13 The Federal Objective

Per the 1983 Principles and Guidelines, the Federal objective of water and related land resources project planning is to “contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements”.

Table 8 shows the costs for construction of Alternatives 2, 3, and 4 at the depths ranging from -14 feet to -18 feet MLLW (FY20 price level and interest rate of 2.75%).[2]

[2] The costs remain at FY20 price levels and interest rate for this analysis because plan selection is not affected by their update to FY21 price levels and interest rate. The recommended plan is presented at FY21 levels.

Table 8: First Cost and Annual Cost Summary of Alternatives 2 – 4

Alternative	Design Depth	Volume	Construction Duration (months)	First Cost	IDC Calculation	First Cost Annualized
Alt 2: Channel & Deposition Basin Deepening	14'	51,800	0.8	$1,992,000	**$4,500**	**$78,000**
	15'	83,200	1.2	$2,567,000	**$5,800**	**$99,000**
	16'	109,000	1.5	$2,997,000	**$6,800**	**$114,000**
	17'	135,400	1.9	$3,428,000	**$7,700**	**$129,000**
	18'	163,000	2.2	$3,877,000	**$8,700**	**$145,000**
Alt 3: Channel & Deposition Basin Deepening +100FT Widened Basin	14'	83,200	1.2	$2,643,000	**$6,000**	**$101,000**
	15'	117,300	1.7	$3,241,000	**$7,300**	**$122,000**
	16'	145,800	2.0	$3,699,000	**$8,300**	**$138,000**
	17'	174,900	2.4	$4,165,000	**$9,400**	**$155,000**
	18'	205,300	2.8	$4,640,000	**$10,500**	**$171,000**
Alt 4: Channel & Deposition Basin Deepening +100FT Widened Basin	14'	90,200	1.2	$2,883,000	**$6,500**	**$108,000**
	15'	124,300	1.7	$3,481,000	**$7,900**	**$129,000**
	16'	152,800	2.0	$3,939,000	**$8,900**	**$145,000**
	17'	181,900	2.4	$4,405,000	**$9,900**	**$162,000**
	18'	212,300	2.8	$4,880,000	**$11,000**	**$178,000**
	Note: Dredging volumes include a two-foot allowable overdepth increment to compensate for dredging inaccuracies in a marine environment					

3.13.1 Principles and Guidelines Criteria, 1983

The 1983 Principles and Guidelines require that plans are formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability.

Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. For the Lake Montauk Harbor navigation improvement feasibility study, no other actions are required before the proposed alternatives can be implemented.

Effectiveness is the extent to which the alternative plans contribute to achieve the planning objectives. Effectiveness of the alternatives was measured by the benefits that the alternative would provide to the commercial fishermen. Alternatives that have a benefit cost ratio (BCR) lower than one will be eliminated from consideration.

Efficiency is the extent to which an alternative plan is the most cost-effective means of achieving the objectives. Efficiency will be measured through a comparison of BCRs and benefits. Plans that provide the same benefits, but at higher cost, will be eliminated from consideration.

Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies. The alternatives were formulated to be in accord with applicable laws and regulations.

It is necessary to know the preliminary benefits and costs of the alternatives in order to assess their effectiveness and efficiency. Accordingly, the annual costs and benefits for the final array of alternative plans are presented in Table 10. The annual costs come from Table 8 above. Benefits of each alternative come directly from the additional commerce that commercial fishermen can realize and cost savings that they can achieve at each proposed deeper channel depth as they report on the study survey approved by the Office of Management and Budget. Survey results updated in 2019 reliably report benefits in three categories: (1) the increase in the net value of output from getting fish to market fresher, (2) savings in fuel and supplies used per trip, and (3) reduction in vessel maintenance and repair. Two captains, for the Megan Marie which draws 15 feet and the Jason & Danielle which draws 16 feet, were the only respondents to report incremental benefits in these three categories from a newly Congressionally authorized depth from -16 to -17 feet MLLW. Further, both reported in follow-up telephone interviews conducted by New York District staff that they would not have additional benefits quantifiable if the channel were to be newly Congressionally authorized at -18 feet MLLW or any deeper depth. Finally, all alternatives have an additional benefit for all depths for maintenance costs avoided relative to the future without project condition (Alternative 1) as shown in the table below.

Table 9: Annual Total Benefits for Final Array of Alternatives (FY20 price level and using the FY20 interest rate of 2.75%)

Alternative	Design Depth	Benefits to Commercial Fishing Fleet Annualized	Benefits from Avoided Maintenance Cost Annualized	Total Benefits Annualized[3]
Alt 2: Channel & Deposition Basin Deepening	14’	$762,000	$6,000	$768,000
	15’	$1,423,000	$6,000	$1,429,000
	16’	$2,217,000	$6,000	$2,223,000
	17’	$2,325,000	$6,000	$2,331,000
	18’	$2,325,000	$6,000	$2,331,000
Alt 3: Channel & Deposition Basin Deepening +100FT Widened Basin	14’	$762,000	$60,000	$822,000
	15’	$1,423,000	$60,000	$1,483,000
	16’	$2,217,000	$60,000	$2,277,000
	17’	$2,325,000	$60,000	$2,385,000
	18’	$2,325,000	$60,000	$2,385,000
Alt 4: Channel & Deposition Basin Deepening +100FT Widened Basin +Fillet Mining	14’	$762,000	$55,000	$817,000
	15’	$1,423,000	$55,000	$1,478,000
	16’	$2,217,000	$55,000	$2,272,000
	17’	$2,325,000	$55,000	$2,380,000
	18’	$2,325,000	$55,000	$2,380,000

[3] The benefits remain at FY20 price levels and interest rate for this analysis because plan selection is not affected by their update to FY21 price levels and interest rate. The recommended plan is presented at FY21 levels.

Table 10: Annual Costs and Annual Net Benefits for Final Array of Alternatives (FY20 price level and using the FY20 interest rate of 2.75%)

Alternative	Design Depth	Cost Annualized	Total Benefits Annualized	Net Benefits Annualized	Benefit to Cost Ratio (BCR)
Alt 2: Channel & Deposition Basin Deepening	14’	$78,000	$768,000	$690,000	9.8
	15’	$99,000	$1,429,000	$1,330,000	14.4
	16’	$114,000	$2,223,000	$2,109,000	19.5
	17’	$129,000	$2,331,000	$2,202,000	18.1
	18’	$145,000	$2,331,000	$2,186,000	16.1
Alt 3: Channel & Deposition Basin Deepening +100FT Widened Basin	14’	$101,000	$822,000	$721,000	8.1
	15’	$122,000	$1,483,000	$1,361,000	12.2
	16’	$138,000	$2,277,000	$2,139,000	16.5
	17’	$155,000	$2,385,000	$2,230,000	15.4
	18’	$171,000	$2,385,000	$2,214,000	13.9
Alt 4: Channel & Deposition Basin Deepening +100FT Widened Basin +Fillet Mining	14’	$108,000	$817,000	$709,000	7.6
	15’	$129,000	$1,478,000	$1,349,000	11.5
	16’	$145,000	$2,272,000	$2,127,000	15.7
	17’	$162,000	$2,380,000	$2,218,000	14.7
	18’	$178,000	$2,380,000	$2,202,000	13.4

Note: Dredging volumes include a two-foot allowable overdepth increment to compensate for dredging inaccuracies in a marine environment.
The costs and benefits remain at FY20 price levels and interest rate for this analysis because plan selection is not affected by their update to FY21 price levels and interest rate. The recommended plan is presented at FY21 levels.

Based on having the greatest net navigation improvement benefits, Alternative 3 with a 100-foot-wide deposition basin authorized to a depth of -17 feet MLLW is confirmed as the Recommended Plan. It is noted that for each alternative, including Alternative 3, depths of -16 ft. MLLW have a greater benefit-to-cost ratio (BCR). In addition, the design depth per engineering analysis (Appendix A) would recommend -18 ft. MLLW, but fishing captains report that their benefits top out at -17 ft. MLLW and that there is no incremental benefit for the extra foot of depth. Nonetheless, a depth of -17 ft. MLLW has greatest net benefits and would be recommended. Further, the U.S. Coast Guard based at Lake Montauk Harbor reports that the greater depth of -17 ft. MLLW would give it the ability to bring larger vessels in to safe haven. For example, there are often large yachts/ fishing vessels that transit off of Long Island, and sometimes those vessels become disabled (lose power, steering, etc.). By increasing channel depth to -17 ft. MLLW, the size of vessel that the Coast Guard is able to tow into Lake Montauk Harbor for repairs is increased, providing a public safety benefit.

Chapter 4: Recommended Plan

This section of the report describes the Recommended Plan. The Tentatively Selected Plan, which was the same as the now Recommended Plan, from the draft feasibility report has been optimized after agency and public reviews[4]. Additional Agency Technical Review has been conducted, leading to the refined costs presented in this chapter and in the report moving forward. It should be noted that the refinements to the costs are proportional to each alternative configuration and depth and would need to be made to each alternative considered.

4.1 Proposed Action/Plan Components

As reported in the previous chapter, based on having the highest average annual net benefits, Alternative 3 authorized to a depth of -17 feet MLLW is the Recommended Plan. This alternative consists of dredging the channel and a 100 foot-wide deposition basin to a depth of -17 feet MLLW and maintaining that authorized depth and deposition basin approximately every 7 years. The material dredged during initial construction would be placed along the approximately 3,000 feet west of the western jetty. The berm would not be engineered. The berm height would be no more than 9 feet, and the slope would be 1:20. The approximate berm width would be 44 feet. This berm would then be allowed to erode.

Real estate in the form of easements in the form of a non-standard estate will be needed for at least initial construction. These easements will be needed because beyond the first 1,200 feet west of the inlet, the shoreline is owned by the respective homeowners.

4.2 Benefits of the Plan

Benefits of each alternative come directly from the additional commerce that commercial fishermen can realize and cost savings that they can achieve at each proposed deeper channel depth as they report on the study survey approved by the Office of Management and Budget. Survey results updated in 2019 reliably report benefits in three categories: (1) the increase in the net value of output from getting fish to market fresher, (2) savings in fuel and supplies used per trip, and (3) reduction in vessel maintenance and repair. Further details on the economic evaluation are provided in Section 3.12.1 and Appendix C - Economics. Further, as described in the formulation of alternatives, Alternative 3's cost savings in future maintenance relative to the future without project condition is $60,000/year on an annualized basis. Through minor refinements, the annualized benefits from navigation are calculated at $2,385,000.

To calculate the incidental CSRM benefits for placement of the material dredged as part of the Recommended Plan, an @Risk spreadsheet model developed for (and certified on 1 April 2016 for) the study estimates that this initial placement would provide a benefit, annualized over the 50-year life of the recommended plan, of $176,000/year (at the FY21 interest rate of 2.5%) in coastal storm damage reduction benefits to structures in that first 3,000 feet west of the inlet. This benefit would be realized only in the first years of the newly-authorized project. Dredged material during maintenance every 7 years would also be placed along the shoreline beginning at the western jetty; any benefits of this placement of maintenance dredged materials is estimated to be negligible because it is at the same overall rate (8,000 cubic yards per year) as the without project future condition. The methodology for the calculation of the annualized coastal storm damage reduction benefits is detailed in Appendix C – Economics.

[4] Notably, Alternative 3 and 4 have been adjusted in their footprint slightly to avoid submerged aquatic vegetation.

4.3 Cost Estimate

The costs of the Lake Montauk Harbor navigation improvement recommended plan have been refined, updated, and certified by USACE to better reflect the costs of placement of the dredged material on the shoreline west of the inlet and the incidental costs of obtaining the needed real estate for placement. It should be noted here that the costs to the non-Federal sponsor to obtain the required real estate ($279,000) and their incidental costs ($364,000), refined and updated, total $643,000. A summary is presented in Table 11.

Table 11: Total Costs for Lake Montauk Harbor Navigation Improvement (FY21 P.L.)

LAKE MONTAUK HARBOR NAVIGATION IMPROVEMENT FEASIBILITY STUDY

October 2020 (FY21) Price Level

Feasibility Report Cost Estimate Summary

Feat. Acct	Description	Qty	UoM	Subtotal	Cont. %	Cont $$	Total Cost
01	LANDS AND DAMAGES	1	LS	$ 748,000	20%	$ 150,000	$ 898,000
12	NAVIGATION PORTS & HARBORS	174,900	CY	$ 3,272,000	25%	$ 817,000	$ 4,089,000
30	PLANNING, ENGINEERING & DESIGN	1	LS	$ 998,000	7%	$ 70,000	$ 1,068,000
31	CONSTRUCTION MANAGEMENT	1	LS	$ 328,000	7%	$ 23,000	$ 351,000
	TOTAL			$ 5,345,000		$1,060,000	$ 6,405,000

The initial project first cost is $6,405,000 (FY21 price levels). These costs include construction, easements, design, and supervision and associated administration costs. The material costs were based on a combination of MII database, RSMeans, quotes, and some historical information. The cost of the jetty stability analysis described in the description of Alternative 3 in Chapter 3 is included in the account for Planning, Engineering & Design. The contingencies were developed using Abbreviated Risk Analysis program (ARA). The summary of the results of this risk analysis, and more detail on the cost estimate, can be viewed in the Cost Appendix.

The refined costs annualized at the FY21 discount rate of 2.50% are $228,000. Compared against the annualized benefits of $2,385,000, the net annualized benefits are $2,157,000 and the BCR is 10.5 to 1. When the incidental CSRM benefits of $176,000 are included, the net benefits are $2,333,000 and the BCR is 11.2.

4.4 Operations, Maintenance, Repair, Replacement, & Rehabilitation

Operations and maintenance costs as described in Chapter 3 are an important, and in fact are a determinative part, of the Recommended Plan. Operations and maintenance are estimated to take place approximately every 7 years, during which the channel and deposition basin will be dredged back to their authorized -17-foot MLLW depth. At the FY21 interest rate of 2.5%, the estimated present value of O&M is $3,871,000 or $143,000/year. The annual OMRR&R comes in a total of $60,000 annually. It represents cost savings of O&M in the With Project condition compared to the Without Project Condition. It is important for the reader to note that this annualized cost is less than the future without project condition which would have maintenance costs of $203,000/year if the project were not built; therefore, for purposes of economic analysis this cost is 0..

4.5 Risk and Uncertainty Analysis

The following uncertainty has been identified: Relative sea level rise projections. In accordance with E.R. 1100-2-8162, three sea level change (SLC) curves are provided in Figure 6 in Section 2.4.2 for the 50-year period of analysis and the 100-year adaptation horizon. SLC will not significantly affect the navigation project as the channel depth is referenced to a tidal datum and local service facilities will adapt to SLC as they are maintained (i.e. steel bulkheads have approximately a 15 year lifespan; waterfront businesses will raise top elevation as necessary). SLC may result in a seaward response to the cross-shore profile of the updrift beach, however the longshore currents are not strong enough to impact dredging requirements.

Risks of implementation and ongoing maintenance of the Recommended Plan have been considered, and all risks have been resolved to an acceptable level.

4.6 Economic, Environmental, and Other Social Effects

Four accounts have been established to facilitate evaluation of alternative plans:

1. National Economic Development (NED) – changes in the economic value of the national output of goods and services
2. Environmental Quality (EQ) – non-monetary effects on significant natural and cultural resources
3. Regional Economic Development (RED) – changes in the distribution of regional economic activity that result from each alternative plan
4. Other Social Effects (OSE) – effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts.

The Lake Montauk Harbor navigation improvement TSP contributes to National Economic Development by allowing the commercial fishermen to realize more commerce. It also reduces the maintenance costs to the nation in the future. Incidentally, the TSP reduces damages from future coastal storm and flood events.

It further contributes to the RED account. Having the channel authorized to a deeper depth will attract commercial vessels from other ports throughout the northeastern United States and increase local commerce and tax revenue. As identified in the Environmental Assessment, there would be minimal environmental impacts because of the highly developed nature of the project area and the relatively tight footprint of the project. Finally, as for the OSE account, this project will increase public safety by giving the U.S. Coast Guard a greater ability to bring larger vessels into safe haven.

4.7 Environmental and Other Social Effects

For environmental compliance, there are no significant, non-routine controversies. Further, the Recommended Plan is not expected to have adverse effects to historic properties. Dredging the Federal channel will have no impact on the terrestrial sites that are nearby and upland of the Federal channel. Likewise, the dredged sand will be placed at a specific location on the beach and is not anticipated to affect either the submerged HMS Culloden or the terrestrial prehistoric sites. USACE does not expect any undiscovered sites to be affected by deepening the Federal channel. This is because the sediment composing the lake basin was deposited in late-glacial times, before humans occupied North America. Thus, the sediment that would be dredged predates the human occupation of North America and would not yield any cultural materials.

The greatest key social factor associated with the Recommended Plan (or any plan) would likely be the opportunity for benefits to the commercial fishing fleet.

Chapter 5: Plan Implementation

Because the Recommended Plan has an estimated cost of $6,405,000 and falls within the limit of the Continuing Authorities Program, Section 107 of the River and Harbor Act of 1960 (33 U.S.C. Section 577), it can be implemented under this continuing authority without congressional authorization. Only a single Project Partnership Agreement (PPA) for design and construction would be entered into with the anticipated non-Federal sponsor, the Town of East Hampton. A Project Management Plan (PMP) will be prepared to identify tasks, responsibilities, and financial requirements of the Federal Government and the non-Federal partner during PED and construction. A project schedule has been estimated to serve as the basis of the cost estimate based on reasonable assumptions for the detailed design and construction schedules. The schedule and PMP will be refined as more data are available in subsequent phases of the project.

5.1 Institutional Requirements

The Town of East Hampton has indicated its intent to participate in implementation of this project through a strong record of involvement and coordination in the Feasibility Study. A fully coordinated PPA package, which will include the non-Federal partner's financing plan, will be prepared subsequent to the approval of the feasibility phase to initiate design and construction. It will be based on the recommendations of this Feasibility Study. East Hampton has agreed to comply with all applicable Federal laws and policies and other requirements that include, but are not limited to:

a. Provide all lands, easements, rights-of-way, and relocations (LERR) uncontaminated with hazardous and toxic wastes necessary for construction and future OMRR&R of the project.

b. Provide 10 percent of the recommended project's initial cost for both design and construction upfront and then an additional cash contribution either at construction close-out or over up to 30 years at interest if the value of LERR contributions toward total project costs is less than 10 percent, so that the total share equals 20 percent.

c. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, waste-weirs, floodwalls, embankments, monitoring features, stilling basins, and dewatering pumps and pipes.

d. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

e. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Codes of Federal regulations (CFR) Section 33.20.

f. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances

regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law (P.L.) 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the construction, operation, and maintenance of the Project. However, for lands that the Federal Government determines to be subject to the navigational servitude, only the Federal Government shall perform such investigations unless the Federal Government; provides the non-Federal project partner with prior specific written direction, in which case the non-Federal project partner shall perform such investigations in accordance with such written direction.

g. Assume complete financial responsibility, as between the Federal Government and the non-Federal project partner for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the Project.

h. As between the Federal Government and the non-Federal project partner, the non-Federal project partner shall be considered the operator of the project for the purpose of CERCLA liability. To the maximum extent practicable, operate, maintain, repair, replace and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

i. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1790, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17),and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

j. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense directive 5500.11 issued pursuant thereto, as well as Army regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

k. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement.

l. Participate in and comply with applicable Federal flood plain management and flood insurance programs and comply with the requirements in Section 402 of the Water Resources Development Act of 1986, as amended.

m. Not less than once each year inform affected interests of the extent of risk management afforded by the Project.

n. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to

prevent unwise future development and to ensure compatibility with the coastal storm risk management provided by the project.

o. Provide, during construction, any additional funds needed to cover the non-Federal up-front share of PED costs.

p. Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-Federal project partner owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing or rehabilitating the project.

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal project partner has entered into a written agreement to furnish its required cooperation for the project or separable element.

r. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might hinder its operation and maintenance, or interfere with its proper function, such as any new development on project lands or the addition of facilities which would degrade the benefits of the project.

To keep the non-Federal project sponsor involved and the local partner informed, meetings were held throughout the feasibility phase. Coordination efforts will continue, including coordination of the study with other State and Federal agencies. Comments in support and none in opposition to the Recommended Plan were received during the 30-day comment period upon the release of the draft feasibility report and Environmental Assessment (which was at that time a report and assessment of this plan as a Tentatively Selected Plan) for public review.

5.2 Financial Analysis

For purposes of project implementation, East Hampton has indicated its intent to enter into a PPA at the conclusion of the study. It most recently stated its intention at the Agency Decision Milestone meeting held on 28 October 2019. The Letter of written Support from East Hampton and Self-Certification of Financial Capability are included in Appendix E: Pertinent Correspondence Appendix of this Feasibility Report.

5.3 Real Estate Requirements

The total lands and easements required in support of the project is approximately 23.875 acres of easements in the form of a non-standard estate. Costs to obtain these are currently estimated at $898,000. Please refer to the Real Estate Plan, Appendix D, for further details.

5.4 Preconstruction Engineering and Design

For the Lake Montauk Harbor navigation improvements Recommended Plan, PED costs are estimated at $1,068,000 (Oct. 2020 Price Level), to be cost-shared 90% Federal and 10% non-Federal. The approximate duration for PED is 6 to 9 months for tasks, including detailed field surveys, geotechnical data collection, the jetty stability analysis, and construction contract award.

5.5 Construction Schedule

The project assumes a construction period of approximately 2.0 to 2.5 months, in the fall in which all Federal and non-Federal funds become available for construction. Construction in the fall is necessary because of environmental windows limiting construction to between November 1 and December 31. The earliest year in which construction funds would become available is 2023 if implemented under CAP, Section 107 (a faster schedule than continuing to seek congressional authorization). This analysis assumes that construction will be complete in 2024, for a period of analysis spanning 2024-2073.

5.6 Cost Sharing and Non-Federal Sponsor Responsibilities

The details behind the initial project first cost as well as expected operations and maintenance estimated at every 7 years of implementing the Recommended Plan are shown in Table 12. The Federal share is 90% of the initial project first cost and the non-Federal share is 10%. Because the estimated cost of obtaining the required LERR creditable to the non-Federal sponsor ($643,000) is greater than 10% of the initial first cost ($640,500), no cash would be required upfront. An additional 10% of the total cost of design and construction will be required from the non-Federal sponsor after project turnover in credit remaining from LERR (if determined appropriate based on final accounting) and then in cash or over up to 30 years at a rate equivalent to current Department of the Treasury bond rates. Future operations and maintenance are 100% a Federal responsibility. However, the non-Federal sponsor should understand that budgeting for maintenance of low use small boat harbors is not a priority nationally. The Federal Government will design the project, prepare detailed plans and specifications and construct the project, exclusive of those items specifically required of non-Federal interests.

Table 12: Cost Apportionment (FY21 Price Level)

	First Cost (FY21)	Fully Funded (FY23)
Project First Cost	$6,405,000	$7,274,000
Local Service Facilities	$0	$0
Aids to Navigation	$0	$0
Federal (90%*)	$5,764,500	$6,546,400
Non-Federal (10%)	$640,500	$727,400
Lands, Easements, Relocations, and Rights-of-Way (LERR)	$643,000	$643,000
Additional Non-Federal Contribution Post-Construction*	$638,000	$727,400

*adjusted because the estimated LERR is greater than 10% of the project's first cost

5.7 Views of the Non-Federal Sponsor and Other Agencies

Investigations of the proposed action has received support from the non-Federal current study sponsor, NYSDEC, and the proposed project sponsor, East Hampton. This support is expressed through the Letter of Support. Through project planning and National Environmental Policy Act (NEPA) scoping between 2012 and 2019 a variety of other Federal agencies have been involved in this investigation and support the project goals. It is noted here that the recommendation is only a partial response to the 2002 Congressional resolution because it focuses solely on navigation improvements.

5.8. Major Conclusions and Findings

This Study has determined that overall marginally adequate inlet channel and harbor depth at Lake Montauk Harbor, NY, and, for many vessels, insufficient channel and harbor depth at various times, such as low tide, due to both the channel's currently authorized depth and the channel regularly being shoaled in above this depth are causing problems and economic inefficiencies to the commercial fishing fleet that use the harbor. There is an opportunity to provide more reliable navigation in Lake Montauk Harbor. In response to this problem and opportunity, plan formulation activities considered a range of measures as documented in this Feasibility Report. Through an iterative plan formulation process, potential navigation improvement measures were identified, evaluated, and compared.

Alternative navigation improvement plans that survived the initial screening of alternatives included authorizing the existing channel to a deeper depth, creating a deposition basin next to the east side of the authorized channel, and limited mining of material from the fillet east of the eastern jetty by scraping and trucking the material shoreward. Alternative 3 at a depth of -17 feet MLLW was found to be the most effective and efficient of the three alternatives. It was confirmed to be the alternative having the highest net benefits, making it the Recommended Plan.

The project includes approximately 250 feet within the inlet along the entire length of the inlet as well as, for disposal of dredged material, the shoreline west of the inlet for approximately a distance of 3,000 feet and a width of approximately 44 feet.

Further, periodic coastal storms, such as tropical storms, hurricanes, and nor'easters, pose a risk of damages to property along the Block Island Sound shoreline, within the first mile west of the harbor inlet. The Recommended Plan has an incidental coastal storm risk management benefit of responding to the erosion damages along the Block Island Sound shoreline, within the first mile west of the harbor inlet, by the placement of dredged sand from the navigation channel on the beach as the least cost disposal method.

The estimated total first cost for project implementation is $6,405,000 (FY21 Price Level), to be cost shared 90% Federal and 10% non-Federal. Because the estimated cost of obtaining the required LERR creditable to the non-Federal sponsor ($643,000) is greater than 10% of the initial first cost ($640,500), no cash would be required upfront. An additional 10% of the total cost of design and construction will be required from the non-Federal sponsor after project turnover in credit remaining from LERR (if determined appropriate based on final accounting) and then in cash or over up to 30 years at a rate equivalent to current Department of the Treasury bond rates. The present worth of future maintenance of $3,871,000 will be 100% a Federal expense. It is noted here that this expense is a cost savings to the Federal government relative to the future without project condition. Annual net benefits are in the amount of $2,157,000 and the benefit cost ratio is 10.5 to 1 (including incidental coastal storm risk management benefits of $176,000/year, the annualized net benefits are $2,333,000 and the benefit cost ratio is 11.2 to 1).

Chapter 6: Recommendations

In making the following recommendations, I have given consideration to all significant aspects in the overall public interest, including environmental, social and economic effects, engineering feasibility and compatibility of the project with the policies, desires and capabilities of the State of New York, the Town of East Hampton, and other non-Federal interests.

I recommend that the selected plan for navigation improvements at Lake Montauk Harbor, New York, as fully detailed in this Feasibility Report and the Environmental Assessment, be approved for construction as a Federal project under the Continuing Authorities Program, Section 107 of the River and Harbor Act of 1960 as amended (33 U.S.C. Section 577). These recommendations are made with the provisions that local interests will:

a. Provide to the United States all necessary lands, easements, rights-of-way, relocations (LERR), and suitable borrow and/or disposal areas deemed necessary by the United States for initial construction and subsequent maintenance of the project.

b. Hold and save the United States free from claims for damages that may result from construction and subsequent maintenance, operation, and public use of the project, except damages due to the fault or negligence of the United States or its contractors.

c. Contribute the local share of non-Federal costs for design and initial construction. This plan consists of authorizing the existing Federal channel to a depth of -17 feet MLLW and a deposition basin approximately 100 feet wide immediately east of the channel at a total first cost of $6,405,000 (October 2020 price levels) with a present worth of future maintenance of $3,871,000, which is less than what would have been if the project were not constructed. Under current guidelines, the project will be cost shared on a basis for initial construction of 90% Federal and 10% non-Federal (which may include the non-Federal sponsor's costs to obtain the required LERR). The sponsor must also make an additional contribution of 10 percent of the cost of design and construction once initial construction is completed which can either be paid in full or over a period of up to 30 years at a rate equivalent to current Department of the Treasury bond rates.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program or the Continuing Authorities Program nor the perspective of highest review levels within the Executive Branch.

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Matthew W. Luzzatto
Colonel, U.S. Army
Commander and District Engineer

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