

INVESTIGATION OF BENEFICIAL USE OPPORTUNITIES

For

The Long Island South Shore Estuary Reserve

September **2010**

Prepared for:

New York State Department of State
With funds provided under Title 3 of the
Environmental Protection Fund Act
Albany, NY 12231-0001

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1.0 INTRODUCTION

The following report has been prepared by Woods Hole Group, under contract to the New York State Department of State Division of Coastal Resources on behalf of the South Shore Estuary Reserve Council (Council). The Council is the management board charged with creating and implementing the South Shore Estuary Reserve Comprehensive Management Plan, as provided in Article 46, of the New York State Laws of 1993. The South Shore Estuary Reserve (Reserve) is a resource of unparalleled biological, economic, and social value. The Comprehensive Management Plan (CMP), adopted by the Council on April 12, 2001, called for the development of a dredging and dredged materials management plan as one of a number of priority actions aimed at fostering the conservation and enhanced use of the Reserve. This report is the third in a series of 5 reports that will provide the Council with the necessary background to prepare a Dredge Materials Management Plan (DMMP) for the Reserve. The reports will address the following aspects of an overall plan:

- Assessment of Current Dredging Conditions and Future Needs
- Inventory and Distribution Assessment of Contaminated Sediments
- Investigation of Opportunities for Improved Sediment Management
- Investigation of Beneficial Use Opportunities
- Recommendations to Facilitate Implementation

The benefits provided by a Reserve-wide dredging and dredged materials management plan are far reaching. The general concept is to identify management solutions for dredged materials that facilitate channel dredging and maritime center development, while also minimizing negative impacts to marine and cultural resources. The first component of the dredge materials management plan was to quantify the current and future needs for dredging. Through this process, the volume and type of material produced by dredging activities in the Reserve was identified.

The fourth component of the dredge materials management plan, and the subject of this report, involves the investigation of beneficial use opportunities within the Reserve. This effort will identify potential nearshore and coastal beneficial reuse sites, as well as potential upland sites that may be used for materials processing and for final beneficial use of dredged materials. By combining results from the Assessment of Current Dredging Conditions and Future Needs, the Inventory and Distribution Assessment of Sediment Chemistry, the Investigation of Opportunities for Improved Sediment Management, and the Investigation of Beneficial Use Opportunities, with the ensuing report on implementation recommendations, the South Shore Estuary Reserve Council will have many of the basic components needed to prepare the Reserve-wide Dredging and Dredged Materials Management Plan recommended by the CMP.

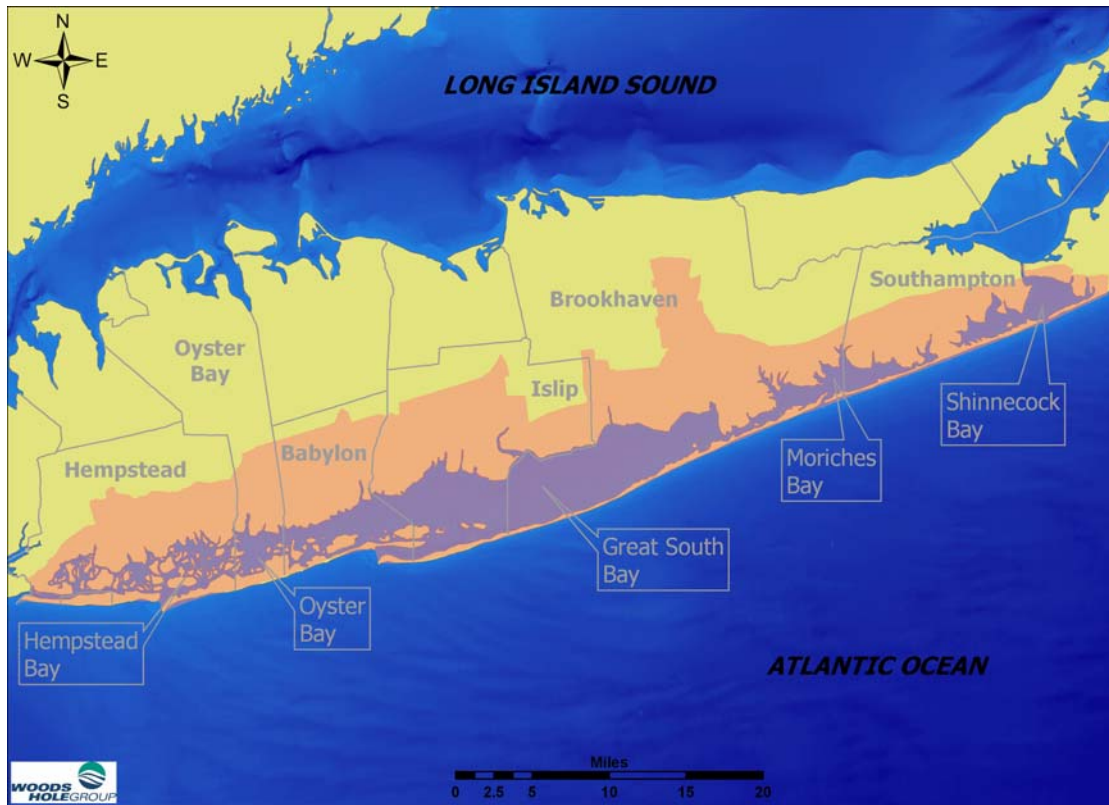


Figure 1. Site map showing extent of the South Shore Estuary Reserve, as well as encompassing towns and major water bodies.

2.0 ALTERNATIVES FOR BENEFICIAL USE OF DREDGED MATERIAL

Increased pressures on limited resources for the management of dredged material have lead to the consideration of a variety of alternatives for its placement. Heavy coastal development in combination with new environmental regulations has resulted in tight restrictions on both land and water placement options. These pressures are being felt not only locally in the Reserve, Long Island Sound, and New York Harbor areas, but also nationally in most coastal areas where maintenance of navigable waterways is a priority. However, within the recent past the perceptions of dredged material have changed from something that must be disposed of, to a potentially valuable resource. The ongoing research and application of alternative technologies has opened up new opportunities for dredged materials processing and beneficial reuse.

A summary of available technologies and beneficial uses for dredged material is provided below. Examples of specific beneficial use opportunities are provided, along with information on required sediment characteristics (Table 1), construction requirements, and average unit costs where available.

2.1 BENEFICIAL USE APPLICATIONS

- **Beach Nourishment**

Beach Nourishment uses dredged sand to supply sediment to eroding beaches and dunes (Figure 2). The additional sand increases beach and dune volume, providing a temporary reduction in erosion rates and thereby reducing storm damage in the near term. It also serves to enhance recreational resources or natural habitat. Beach nourishment can be accomplished through direct and indirect measures. Direct beach nourishment dredges material from inshore or offshore locations, and physically moves it by various means such as truck, split-hull hopper dredge, or hydraulic pipeline to the receiving beach. Indirect beach nourishment uses dredged material to construct underwater berms that act as sediment supplies to receiving beaches. The stability of a beach nourishment project is enhanced by using source sand that closely matches the sediment composition of the eroding beach. Finer sands tend to erode rapidly. Designs can be optimized to increase the height and width of a beach, and to enhance and/or restore coastal dunes. Costs for beach nourishment generally range between \$10/cy and \$30/cy depending on the dredge methodology, equipment mix, and placement alternatives.

- **Nearshore Berm Creation**

Nearshore berms can be effectively used to initiate offshore wave breaking, thereby reducing incident wave energy at the shoreline, and reducing storm erosion impacts. Nearshore feeder berms can also be placed as long linear subaqueous features constructed with beach-quality sand within the envelope of active sand movement, and intended to feed sand to eroding beaches. Nearshore berms offer an excellent beneficial use opportunity for dredged sediments. Transport and placement of the sand usually occurs by split-hull hopper dredge or scow, hydraulic pipeline, or mechanically. Nearshore berms are most effectively created using granular sand-sized material. Costs generally

range between \$10/cy and \$30/cy depending on the dredge methodology and equipment mix.



Figure 2. Example of hydraulically placed beach nourishment on the south shore of Cape Cod, Falmouth, MA.

- **Capping**

This engineering practice places clean dredged material over other sediment or waste for the purpose of burying the material. The cap can be used to encapsulate contaminated waste or simply to cover refuse. Capping is a common practice in the open-water environment where it is used to bury contaminated sediments, and at upland sites such as landfills where it is used for daily cover or final capping as part of landfill closure (Figure 3). Transport and placement at open-water capping sites usually occurs by split-hull hopper dredge or scow, hydraulic pipeline, or mechanical means, while landfill work involves trucking. Landfill sites also require that the material be dewatered first, with acceptable material commonly being identified using the paint filter test, which identifies the presence of free liquids. A wide range of material sizes from gravel to sand and consolidated clay can be used for capping activities, depending on the specific application. Generally, sand sized material is required for open-water use, as wave and current-induced transport of the cap layer is not desirable. Costs for capping also vary widely depending on the application and demand for cap materials. Open-water capping operations can be higher than other similar types of marine work due to the precision required in placing the cap and controlling the thickness; costs from \$20/cy to \$40/cy have been reported depending on the travel distance from dredge location to cap site. Costs associated with placement of dredged material at landfills can vary depending on

trucking distance and tipping fees. Average trucking costs run between \$10/cy and \$35/cy, while tipping fees can be as high as \$30/cy where landfill space is at a premium.



Figure 3. Example of landfill cap on Long Island using sediment resource.

- **Land Improvement**

Use of dredged materials for land improvement can be an effective method of beneficial reuse, and a wide variety of applications have been demonstrated. Dredged materials can be used to raise the elevation of low lying areas to prevent flooding (FEMA A Zones), to improve the physical quality or soil structure for agricultural purposes and recreation areas, and as part of remediation at Brownfield, Superfund, or other cleanup sites. Both coarse and fine-grained dredged sediments can generally be used for these purposes; however, fines require proper dewatering and are not capable of bearing loads that coarse material can. Placement at these upland sites generally requires trucking, grading and contouring, and subsequent planting to stabilize the soil. Costs associated with land improvement using dredged materials are highly variable, depending on the type of application.

- **Aggregate Processing**

Dredged materials can be used in a variety of construction applications. Depending on the physical characteristics, sediments can be used as concrete aggregates, a component of bituminous mixtures and mortar (Figure 5), a component of brick manufacturing, a component of ceramic insulation pellets, or as a component of compressed blocks for security barriers and decorative landscaping products. Dredged material that is free of

gravel and rock may be used directly as topsoil, depending on the physical characteristics, or blended with organic matter and biosolids (treated sewage sludge) to manufacture enhanced fertile topsoil. Recent applications have also used dredged sediment to manufacture flowable fill and gunnite, where fine-grained and sandy material have been mixed with recycled materials such as glass, gypsum to create construction materials. The process usually involves the transport of dewatered dredged material via truck to the processing or manufacturing facility. Sediment types that can be used are as varied as the products manufactured, ranging from rock, gravel, sand, silt and clay.



Figure 4. Example of fill use to restore a Brownfield site in Virginia.



Figure 5. Example of aggregate processing facility.

- **Environmental Enhancement**

Dredged materials can be used for environmental restoration or enhancement of wetlands, fisheries, and other wildlife habitats. Dredged materials can be used to restore marsh wetlands by gradually raising the elevation to an intertidal elevation, and then planting with appropriate salt marsh vegetation (Figure 6). This application requires extensive engineering to ensure adequate tidal flooding and protection from wave erosion. Placement of material is usually accomplished by hydraulic pipeline or mechanically. Sediment suitable for marsh restoration includes consolidated clay, silt and soft clay, or a mixture of sand and fine-grained material. Dredged materials have also been used successfully to create or improve wildlife habitat (Figure 7). This application usually involves the placement of dredged material on upland or floodplain sites, followed by careful habitat management to ensure plant colonization for conditions that are attractive to nesting waterfowl, mammals, or songbirds.



Figure 6. Example of initial stages of salt marsh restoration project using dredged material.



Figure 7. Example of dredge material reuse for habitat restoration at Poplar Island, MD.

Table 1. Sediment Characteristics Required for Beneficial Use of Dredged Materials.

	Rock	Gravel & Sand	Consolidated Clay	Silt/Soft Clay	Mixture
Agricultural/Product Uses					
Construction materials	✓	✓	✓	✓	✓
Aquaculture			✓	✓	✓
Topsoil				✓	✓
Engineered Uses					
Land creation	✓	✓	✓	✓	✓
Land improvement	✓	✓	✓	✓	✓
Berm creation	✓	✓	✓		✓
Shore protection	✓	✓	✓		
Replacement fill	✓	✓			✓
Beach nourishment		✓			
Capping		✓	✓		✓
Environmental Enhancements					
Wildlife habitats	✓	✓	✓	✓	✓
Fisheries improvement	✓	✓	✓	✓	✓
Wetland restoration			✓	✓	✓

Source: US Army Corps of Engineers – Engineer Research and Development Center, Environmental Laboratory. 2006. Beneficial Uses of Dredged Material. Accessed December 1, 2009 at <<http://el.erdc.usace.army.mil/dots/budm/budm.cfm>>.

3.0 BENEFICIAL USE SITE INVENTORY

As the first step in designating new beneficial reuse sites for material dredged from the Reserve, an inventory of potential sites was conducted. The inventory included identification of potential sites for the following types of beneficial reuse:

- Beach and dune nourishment
- Landfill daily cover or capping
- Agricultural uses
- Remediation sites
- Aggregate processing facilities
- Environmental enhancement sites

In addition, an inventory of candidate dredge materials dewatering and/or processing sites was performed. The inventory was conducted using information compiled as part of the Reserve DMMP database, as well public information available on the internet and through Google Earth. Results from the site inventory will be used in follow-on work conducted as part of the DMMP development process to guide more detailed investigations of the individual sites.

3.1 METHODOLOGY FOR SITE IDENTIFICATION

Depending on the type of site under investigation, a number of different methodologies were utilized to identify the potential locations for beneficial use and materials dewatering/processing. A summary of these methodologies is provided below.

- Beach and dune nourishment sites – Municipal, county, and state public beach sites were identified and mapped using tools available in Google Earth. The facility addresses were obtained from internet research on municipal, county, and state web sites, and then mapped using Google Earth. In some cases, the public beach locations were identified using the *NYS Public Land Boundaries* shapefile downloaded from the NYS GIS Clearinghouse and stored as part of the Reserve DMMP database. All potential public beach and dune nourishment sites were converted from Google Earth .kml files to ArcGIS point shapefiles and entered into the Reserve DMMP database.
- Landfills – Information on existing Long Island landfills was obtained from the NYS DEC Division of Solid and Hazardous Materials web site (NYSDEC, 2009). The names and addresses of the facilities were recorded and mapped using Google Earth. The landfill locations were then converted from Google Earth .kml files to ArcGIS point shapefiles and entered into the Reserve DMMP database.
- Remediation sites – Information on existing remediation sites where clean dredge materials may be needed for fill or reconstruction purposes, was obtained from the NYS DEC Environmental Site Database (NYSDEC, 2009b). Cleanup and restoration sites in Suffolk and Nassau Counties associated with the following

programs were identified: brownfield cleanup, voluntary cleanup, environmental restoration, and the state superfund program. The site information was downloaded as a database file with x,y coordinates, and then imported into the ArcGIS Reserve DMMP database to create point shapefiles.

- Aggregate processing facilities – Information on potential aggregate processing facilities on Long Island that could utilize dredge materials was obtained from internet and yellow book research. The names and locations of asphalt processing and concrete production companies were compiled and mapped using Google Earth. The site information was then converted from Google Earth .kml files to ArcGIS point shapefiles and entered into the Reserve DMMP database.
- Environmental enhancement sites – Information on potential and existing environmental enhancement sites was obtained from internet research and review of USACE and US Fish and Wildlife reports. Since few existing wildlife habitat or marsh restoration sites were identified within the Reserve boundaries, the area of consideration was expanded to include potential sites outside the Reserve. Additionally, aerial photography of the Reserve was used to identify potential new environmental enhancement sites, based on existing wetland type and extent. For each site identified, the name, location, and type of enhancement were compiled and mapped using Google Earth. The site information was then converted from Google Earth .kml files to ArcGIS point shapefiles and entered into the Reserve DMMP database.
- Historical placement sites – Information on previously used dredge material placement sites was included in the site inventory, as potential locations that could be used in the future. These historically used sites were identified as potential beneficial use opportunities or as future dewatering sites, and are separate from the existing placement sites in the *Disposal Locations* shapefile within the Reserve DMMP database. The locations of the historically used sites were entered into the Reserve DMMP database as polygon shapefiles.
- USACE Upland Sites for LIIW – The New York District US Army Corps of Engineers performed a preliminary analysis of potential upland placement sites for material dredged from the Long Island Intracoastal Waterway (LIIW; USACE, 2004). This work identified a number of potential upland dewatering and placement sites surrounding the LIIW from the entrance to Patchogue Bay in Brookhaven to the eastern end in Shinnecock Bay. Although additional work has not been conducted by the USACE to investigate these sites further, they have been included in this study as possible locations for dredge materials management. The site selection process included upland areas that are within 2 miles of the LIIW, greater than 5 acres in size, minimal wetland impact, and proximal to deep water access by barges and upland transportation facilities. Sites screened by the USACE for further evaluation were included in this study. The site locations were digitized into Google Earth using available maps and photographs in the USACE report. The resulting Google Earth .kml files were

converted to ArcGIS polygon shapefiles and entered into the Reserve DMMP database.

- Dewatering and/or processing sites – Information of potential new dewatering or dredge materials processing sites in Suffolk County was derived from a combination of assessor’s parcel data, wetland information, and aerial photography. Since digital assessors data are not publically available for Nassau County, this analysis was not performed for the Western Bays sub-region of the Reserve. The Suffolk County parcel data were used to screen sites meeting the following criteria: publically owned, greater than 5 acres in size, within 1 mile of the estuary shoreline, minimal wetland extent, little to no existing development, outside the Fire Island National Seashore, and not currently being used as a dredge materials disposal site. The remaining parcels were saved as an ArcGIS polygon shapefile and entered into the Reserve DMMP database.

3.2 RESULTS OF BENEFICIAL USE SITE INVENTORY

Results from the site inventory of potential beneficial use opportunities in the Reserve were summarized by region (Table 2; Figures 8-11). A total of 457 sites were identified, with 24% in the Western Bays region, 45% in the Great South Bay region, and 31% in the Eastern Bays region. The largest group of sites was identified as historically used dredge material placement areas as classified by the NYS DEC. While not all of these sites should be considered viable for current beneficial reuse, they do represent previously disturbed areas where additional material could be placed without significant environmental impact. Environmental enhancement sites represent the smallest group of potential locations, with only 8 areas being identified. Appendix A provides a list of the sites by type and location.

Table 2. Summary of Potential Beneficial Use Sites Identified for Further Screening.

Site Type	Reserve Region		
	Western Bays	Great South Bay	Eastern Bays
Aggregate Processing	8	10	3
Landfill	0	4	0
Remediation	31	46	7
Beach/Dune	14	15	12
Env. Enhancement	0	3	5
Historical Dredge Placement	56	77	61
USACE Potential (LIIW)	0	4	24
Dewatering	N/A	47	30
TOTAL	109	206	142

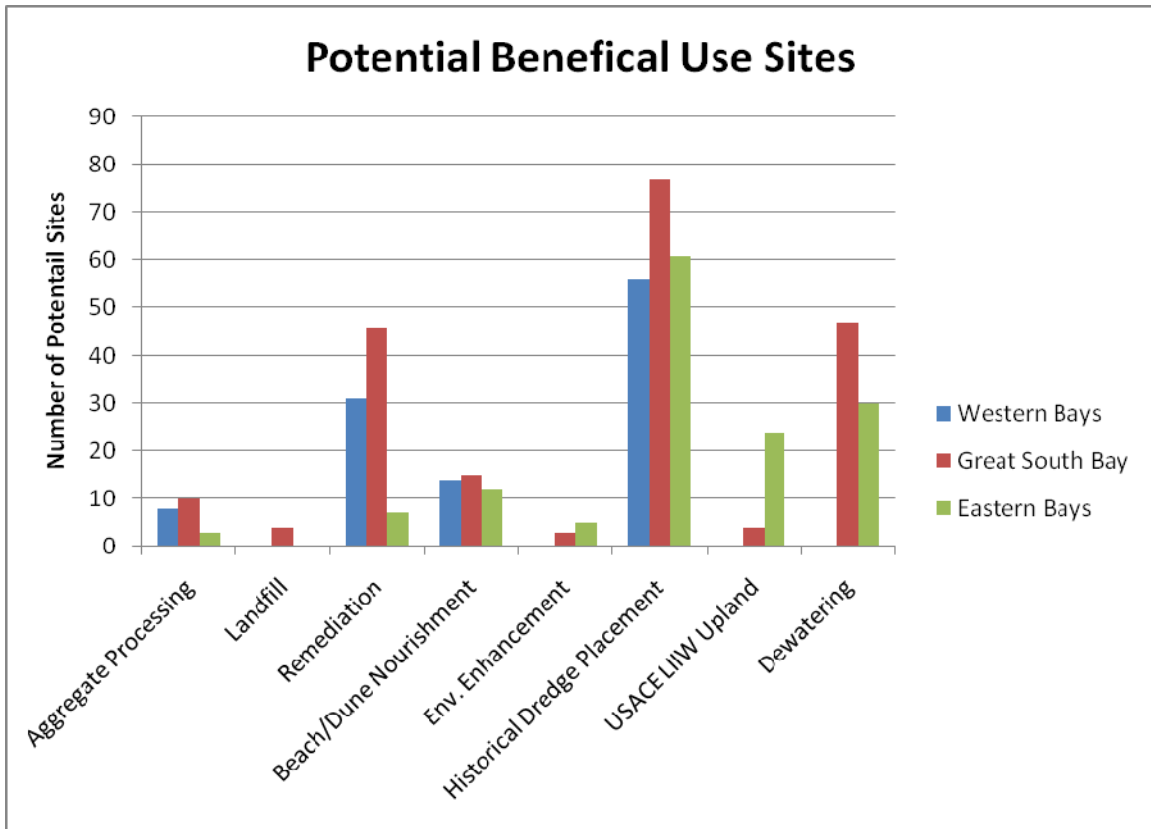


Figure 8. Summary of potential beneficial use sites by Reserve region.

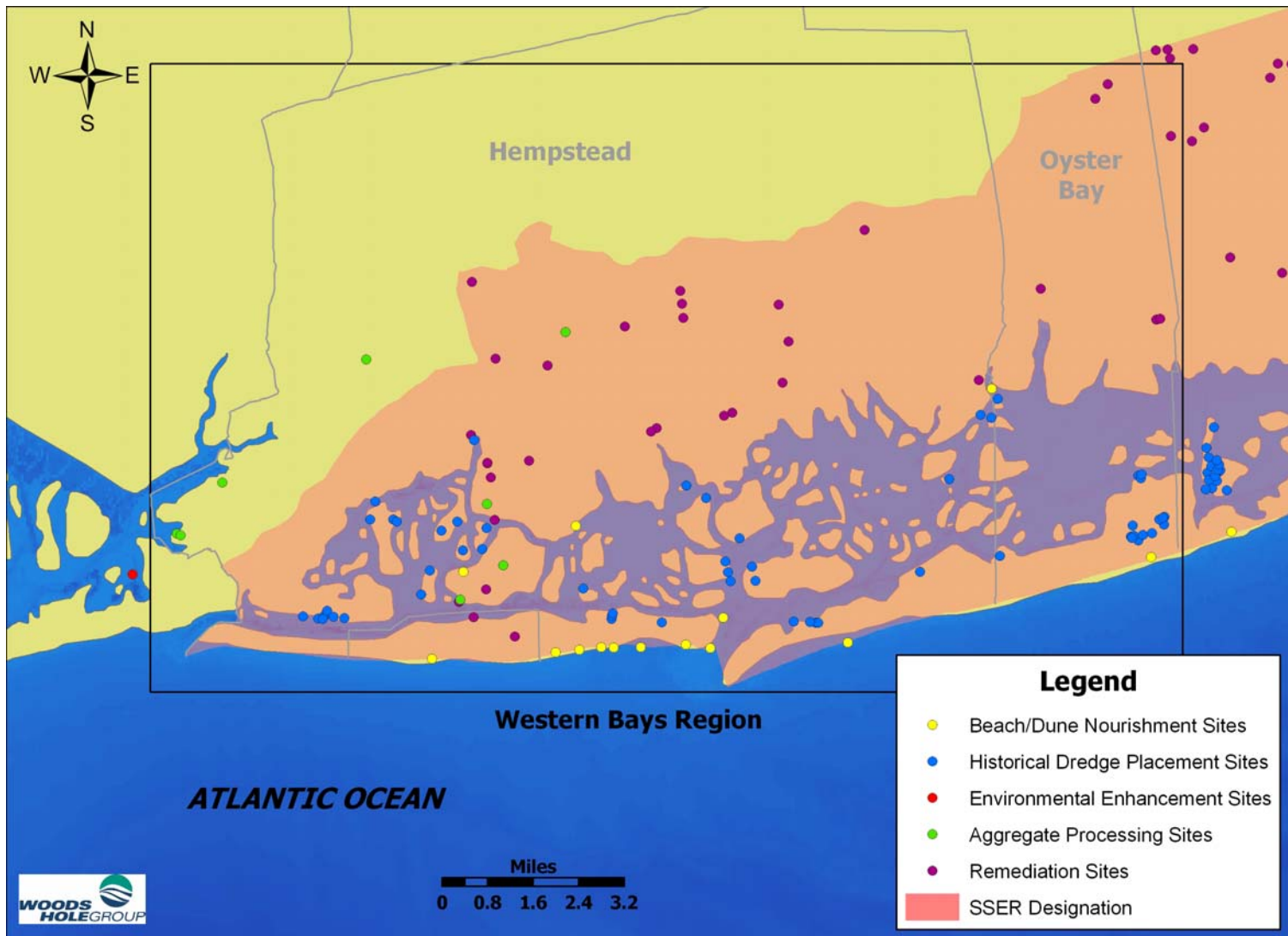


Figure 9. Potential beneficial use sites for the Western Bays region of the Reserve.

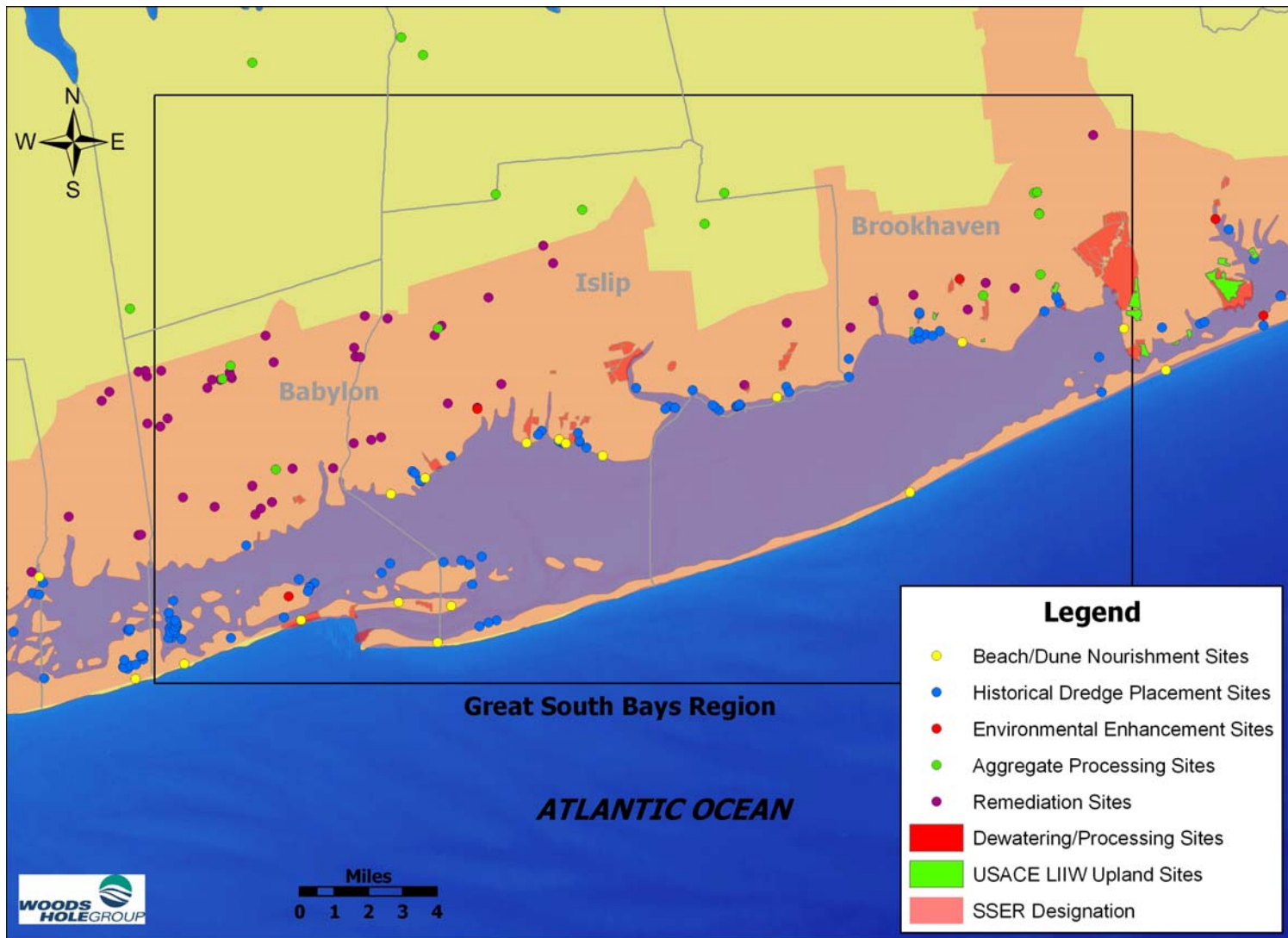


Figure 10. Potential beneficial use sites for the Great South Bays region of the Reserve.

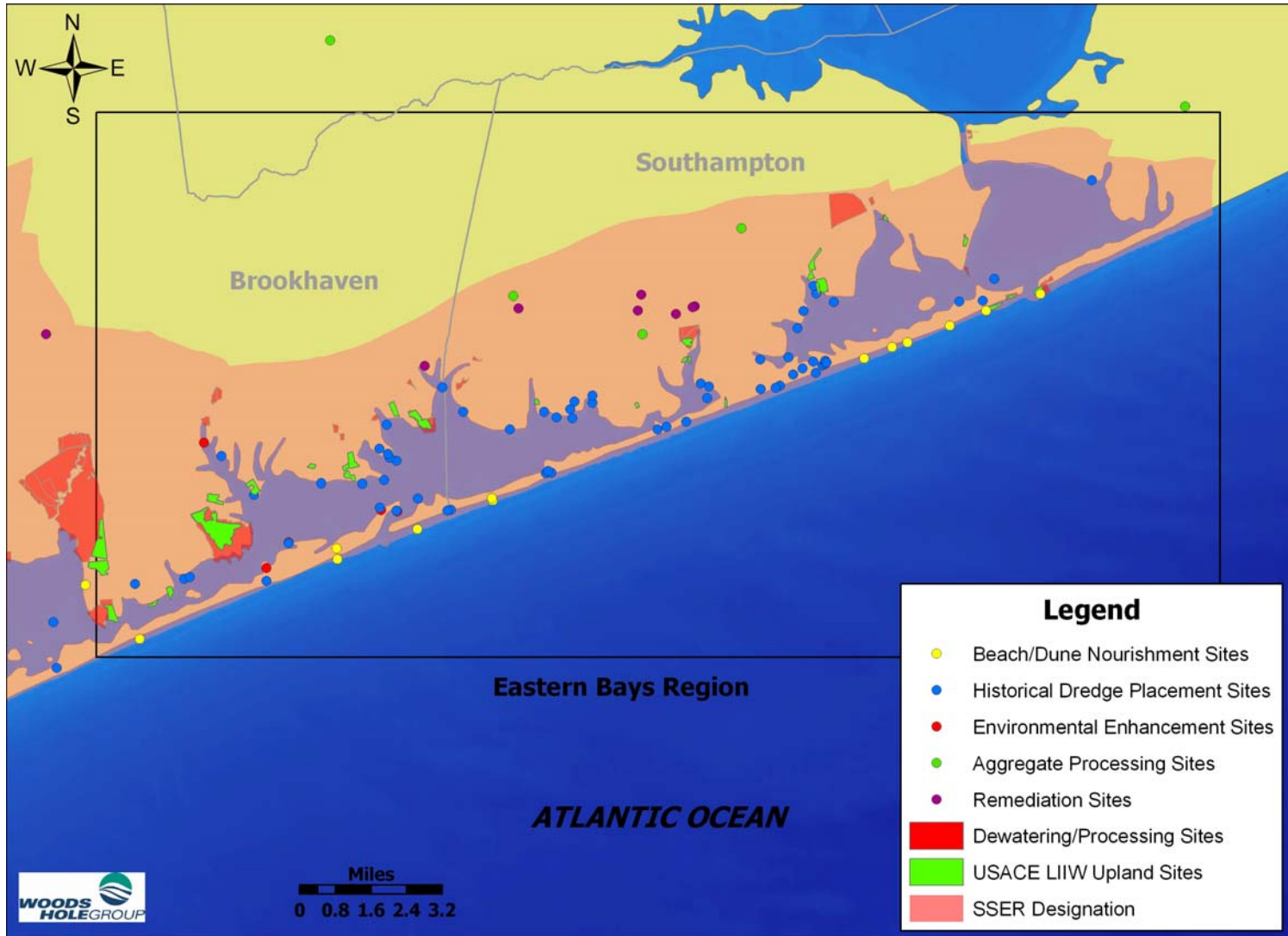


Figure 11. Potential beneficial use sites for the Great South Bays region of the Reserve.

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4.0 BENEFICIAL USE FINDINGS

Information gathered during this *Investigation of Beneficial Use Opportunities* has been used to develop the following findings:

- Beach nourishment is the most commonly used beneficial use option exercised today in the Reserve.
- The short-term dredged material placement needs of the Reserve can be accommodated by the existing sites and areas; however, the longer-term needs will require designation of new beneficial use sites such as environmental enhancement areas, dewatering areas, and material processing sites.
- Eight (8) potential environmental enhancement sites were identified for further investigation.
- Seventy-seven (77) sites were identified as potential new dewatering and/or dredge materials processing areas.
- Twenty-one (21) aggregate processing companies were identified in the Reserve with an additional ten (10) sites located on Long Island to the north of the Reserve boundary.

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5.0 RECOMMENDATIONS

Recommendations provided below have been developed using information generated as part of this *Investigation of Beneficial Use Opportunities*.

- Conduct a parcel level screening for new dewatering and/or dredge materials processing sites in Nassau County using digital assessor's parcel information.
- Conduct field investigations of dewatering sites and select historically used placement sites for suitability, potential for wetland impacts, and engineering constraints.
- Investigate the feasibility of establishing new regional dewatering and/or processing facilities with the various municipal, county, state, and federal property owners.
- Solicit input from private materials handlers and processors as to the economics and interest in establishing regional centers for dredge materials handling.
- Solicit feedback from the local, state, and federal regulatory agencies on the feasibility of establishing regional dredge materials processing and handling centers.
- Conduct a feasibility analysis for environmental enhancement sites, in terms of engineering feasibility, regulatory feasibility, and economics.

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