

**DRAFT**

**ILLINOIS BEACH STATE PARK, LAKE COUNTY, ILLINOIS  
SECTION 204 BENEFICIAL USE OF DREDGED MATERIAL**

**DETAILED PROJECT REPORT/  
REGIONAL SEDIMENT MANAGEMENT PLAN  
& ENVIRONMENTAL ASSESSMENT**

**NEPA PUBLIC REVIEW DOCUMENT**



**November 2013**



**DEPARTMENT OF THE ARMY  
CHICAGO DISTRICT, CORPS OF ENGINEERS  
231 SOUTH LASALLE STREET  
CHICAGO, ILLINOIS 60604**

**DRAFT**

Page Intentionally Left Blank

# DRAFT

## Executive Summary

The Illinois Department of Natural Resources (IDNR) requested that the Chicago District, USACE initiate a study to ascertain the feasibility of beneficially utilizing dredged material from the Waukegan Harbor Approach Channel for the purpose of ecosystem restoration at Illinois Beach State Park. The Approach Channel is part of the authorized Federal navigation channel and is routinely dredged to maintain navigation at the Federal project.

This study is authorized under Section 204 of the Water Resources Development Act (WRDA) of 1992, as amended (P.L. 102-980). Section 204 authorizes the Corps to carry out projects for structural and non-structural flood control, hurricane and storm damage reduction, and environmental protection and restoration, in connection with dredging for construction, operation, or maintenance of an authorized navigation project.

The study area is part of the Lake Michigan coastline, and is located in northeastern Illinois within the northeast boundary of Lake County. The proposed restoration project would be located along the 2-mile shoreline of the North Unit of Illinois Beach State Park (IBSP). The park contains the only significant natural coastline remaining in Illinois. IBSP supports 14 natural communities and provides habitat for hundreds of plant and animal species, including several threatened and endangered species. However, the coastal zone exhibits sediment starved conditions due to the construction of numerous in-lake structures north of the park that interfere with natural littoral processes and has led to the North Unit experiencing the most severe erosion along the entire Illinois shoreline. As a result, the IBSP North Unit has lost more than a hundred acres of coastal habitat over the past century. This study seeks opportunities to utilize Waukegan Harbor Approach Channel dredged material to repair littoral function, stabilize coastal communities, and restore/preserve lacustrine, beach, and dune habitats along the coastline.

Three alternative plans, including the No Action, were considered for implementation. After considerations of habitat benefits, costs, risk & uncertainty, and plan acceptability, completeness, efficiency, and effectiveness, the Littoral Nearshore Placement (LNP) plan was selected as the National Ecosystem Restoration (NER)/ Recommended Plan. This plan provides 47 net average annual habitat units (AAHUs) over the 200 acres of coastal zone. The plan has a total project cost of [REDACTED] (2013 price levels). The Recommended Plan proposes the placement of Waukegan Harbor Approach Channel dredged material into the littoral zone of Lake Michigan along the coastline of the IBSP North Unit. The sediment would be placed at an estimated rate of 80,000 cubic yards per year over 10 dredging cycles, which is expected to occur over a period of 10 years. However, the specific timing and quantities of sediment placement will be dependent on future operations and maintenance funding for Waukegan Harbor. All costs associated with the restoration of the Illinois Beach State Park coastal zone ecosystem have been considered.

# DRAFT

## Illinois Beach State Park, Lake County, Illinois Section 204 Beneficial Use of Dredged Material Detailed Project Report/ Regional Sediment Management Plan & Environmental Assessment

### NEPA PUBLIC REVIEW DOCUMENT

#### TABLE OF CONTENTS

<b>1. Introduction .....</b>	<b>1</b>
1.1 Study Authority .....	1
1.2 *Study Purpose & Background .....	1
1.3 Study Area .....	2
1.4 Federal Navigation Project.....	4
1.5 Plans, Projects, and Reports .....	9
<b>2. Inventory &amp; Forecasting.....</b>	<b>13</b>
2.1 *Current Conditions.....	13
2.1.1 Physical Resources .....	13
2.1.2 Ecological Resources .....	22
2.1.3 Cultural Resources .....	24
2.1.4 Hazardous, Toxic & Radioactive Waste (HTRW) Analysis .....	26
2.2 Problems and Opportunities.....	27
2.3 Habitat Assessment Methodology.....	28
2.4 Future Without Project Conditions.....	30
2.5 Goals, Objectives & Constraints.....	35
<b>3. Plan Formulation and Evaluation .....</b>	<b>38</b>
3.1 Sand Placement Options.....	38
3.2 *Measure Identification.....	39
3.3 Measure Costs & Assumptions .....	41
3.4 *Alternative Benefits vs Costs.....	42
3.5 Cost Effectiveness/ Incremental Cost Analysis .....	44
3.6 Significance of Ecosystem Outputs.....	46
3.6.1 Acceptability, Completeness, Effectiveness, and Efficiency .....	49
3.6.2 Risk and Uncertainty .....	50
3.7 Selection of the National Ecosystem Restoration Plan.....	51
<b>4. *Environmental Assessment .....</b>	<b>54</b>
4.1 Need & Purpose .....	54
4.2 Alternatives Considered.....	54
4.3 The Affected Environment.....	54
4.4 Direct & Indirect Effects of the Preferred Plan .....	54
4.4.1 Physical Resources .....	54
4.4.2 Ecological Resources .....	56
4.4.3 Cultural Resources .....	57
4.4.4 17 Points of Environmental Quality .....	59
4.5 Cumulative Effects .....	60
4.5.1 Scope of Cumulative Effects Analysis.....	60

# DRAFT

4.5.2	Cumulative Effects on Resources .....	61
4.5.3	Cumulative Effects Summary .....	62
4.6	Public Review .....	62
4.7	General Compliance Public Review.....	62
<b>5.</b>	<b>Description of Preferred Plan .....</b>	<b>65</b>
5.1	*Plan Components .....	65
5.2	Plans & Specifications .....	66
5.3	Real Estate.....	66
5.4	Operations and Maintenance .....	66
5.5	Mitigation.....	67
5.6	Monitoring Plan .....	67
5.7	Division of Responsibilities.....	67
<b>6.</b>	<b>*Recommendation .....</b>	<b>70</b>
<b>7.</b>	<b>References .....</b>	<b>71</b>

Sections required by NEPA demarcated with an asterisk (\*).

## Appendices

Appendix A – Coastal Analysis

Appendix B – Civil Design

~~Appendix C – Cost Engineering~~

Appendix D – Geotechnical Analysis

Appendix E – Contaminant Determination

~~Appendix F – Real Estate Plan~~

Appendix G – Coordination, 404b1, Draft FONSI

# DRAFT

## List of Tables

Table 1	Waukegan Harbor Approach Channel dredging records (1977–2012)	7
Table 2	IDNR nourishment at IBSP (1987–1997)	11
Table 3	Recent sediment sampling data from Waukegan Harbor Approach Channel	21
Table 4	Recent elutriate data from Waukegan Harbor Approach Channel	21
Table 5	Demographics of communities surrounding IBSP	26
Table 6	Ten year dredging forecast for the Waukegan Harbor Approach Channel	31
Table 7	Future Without Project Habitat Conditions	34
Table 8	Planning level measure cost estimate	41
Table 9	Planning level average annual measure cost	42
Table 10	Costs and benefits of alternative plans	44
Table 11	Incremental cost analysis of best buy plans	45
Table 12	Project implementation schedule	66
Table 13	Estimated project schedule*	66
Table 14	Total project cost (above and beyond the Base Plan)	67
Table 15	Cost Sharing Breakout	67

## List of Figures

Figure 1	Map of northeastern Illinois	2
Figure 2	Map of Illinois Beach State Park	3
Figure 3	Map of Waukegan Harbor	5
Figure 4	Previous shallow water placement sites for Waukegan Approach Channel dredged material	6
Figure 5	Sand placement at North Unit feeder beach in 1995 (from Chrzastowski and Frankie 2000)	12
Figure 6	Lake Level fluctuations in Lake Michigan-Huron (1918-2012)	13
Figure 7	Soil map of IBSP	15
Figure 8	Topography of IBSP	17
Figure 9	Nearshore profiles of the Zion beach-ridge plain at Illinois Beach State Park and the bluff coast at Highwood, Illinois (From Chrzastowski and Trask 1995)	17
Figure 10	Calculated annual erosion/accretion rates at the North Unit of IBSP from 2000-2011	19
Figure 11	Shoreline conditions at IBSP following the remnants of Hurricane Sandy	20
Figure 12	Forecasted without project shoreline erosion	33
Figure 13	Expected average reduction in habitat units under the without project scenario	34
Figure 14	Comparison of future with project and future with project conditions	44
Figure 15	Cost effective analysis of alternative plans	45
Figure 16	Incremental cost and benefits of best buy plans	46
Figure 17	NER/ Preferred Plan for IBSP Section 204	53

# DRAFT

## Illinois Beach State Park, Lake County, Illinois Section 204 Beneficial Use of Dredged Material Detailed Project Report/ Regional Sediment Management Plan & Environmental Assessment

### 1. INTRODUCTION

#### 1.1 STUDY AUTHORITY

This investigation is being conducted under the authority of Section 204 of the Water Resources Development Act (WRDA) of 1992, as amended (P.L. 102-980). Section 204 authorizes the Corps to carry out projects for structural and non-structural flood control, hurricane and storm damage reduction, and environmental protection and restoration, in connection with dredging for construction, operation, or maintenance of an authorized navigation project. The Federal per project expenditure limit under Section 204 is \$5,000,000.

Section 2037 of WRDA 2007 modified the implementation guidance for Regional Sediment Management Plans that is currently contained in Appendix F of ER1105-2-100 (Planning Guidance Notebook). The development of Section 204 Regional Sediment Management Plans are now funded 100% Federally and implementation costs are cost-shared at 65% Federal and 35% non-Federal. Only implementation costs beyond the Base Plan are cost-shared. The Base Plan, or least cost disposal plan consistent with sound engineering and environmental practices, remains a 100% Federal responsibility. Any operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) associated with project is a 100% non-Federal responsibility.

#### 1.2 \*STUDY PURPOSE & BACKGROUND

For more than a century, a combination of stressors related to both anthropogenic influences and natural processes have led to the deterioration of nearly all coastal habitats within Illinois. Illinois Beach State Park (IBSP) represents the only significant remaining area, which has not been heavily altered by urbanization and coastal engineering. The park supports 14 natural communities and provides habitat for more than 500 plant species and 300 animal species, including several threatened and endangered species. However, shoreline erosion, which has been exacerbated by a multitude of constructed shoreline protection and navigation structures throughout the Lake Michigan coastline, continues to threaten the dune, beach, and lacustrine habitats of IBSP.

The Illinois Department of Natural Resources requested that the Chicago District, U.S. Army Corps of Engineers initiate a study to ascertain the feasibility of beneficially utilizing clean dredged material from nearby Waukegan Harbor for the purposes of protecting, restoring, or creating aquatic ecosystems at Illinois Beach State Park. This Detailed Project Report/ Regional Sediment Management Plan and Integrated Environmental Assessment will assess and identify problems and opportunities, identify and evaluate measures, and recommend and design the most cost effective and feasible solution to the ecological problems currently existing within the area of study.

# DRAFT

## 1.3 STUDY AREA

The study area is part of the Lake Michigan coastline and is located in northeastern Illinois within the northeast boundary of Lake County (Figure 1) located along a 6.5-mile shoreline of Illinois Beach State Park (IBSP). At over 4,000 acres, IBSP contains the largest single tract of undeveloped coastal habitat left in Illinois and contains the only natural coastal dunes and wetlands remaining in the state. The park is divided into two distinct units, a North Unit and South Unit that are separated by the now decommissioned Zion Nuclear Power Station (Figure 2). The Zion Nuclear Power Station is outside of the project area of this Study and will not be affected by any proposed Section 204 activities. The 2-mile shoreline of the North Unit experiences the most severe erosion and is the focus of this investigation. IBSP borders the municipalities of Winthrop Harbor, Zion, Beach Park, and Waukegan, Illinois.

The land bordering the Illinois coast has varied landscape characteristics that characterized by three geomorphic settings (Chrzastowski and Trask 1995): the low-lying Zion beach-ridge plain to the north, the bluff coast in the middle and the Chicago lake plain to the south. Illinois Beach State Park is located within the Zion beach-ridge plain.

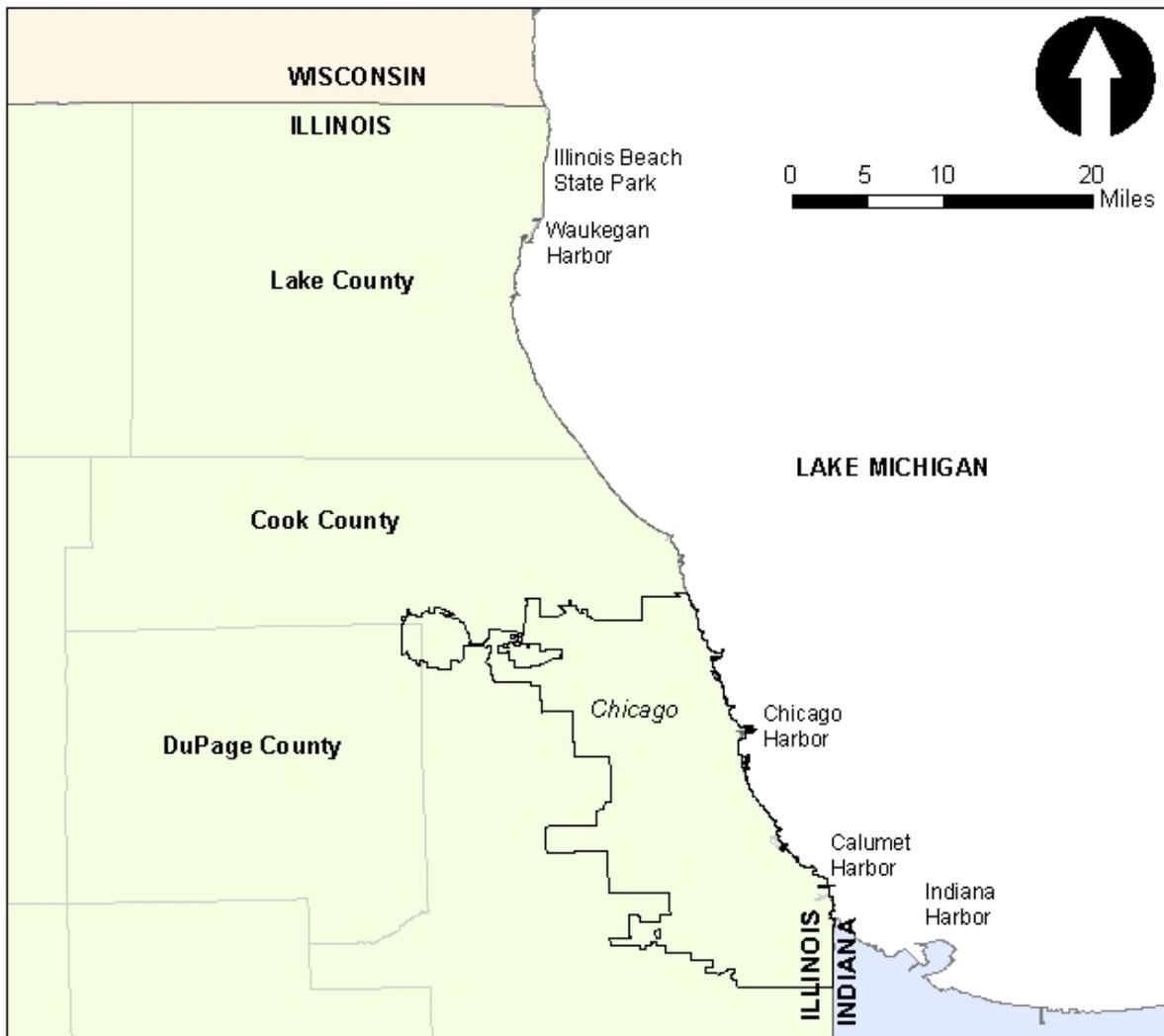


Figure 1 Map of northeastern Illinois

# DRAFT



Figure 2 Map of Illinois Beach State Park

# DRAFT

## 1.4 FEDERAL NAVIGATION PROJECT

The Section 204 authority authorizes the Corps to carry out environmental protection and restoration projects, in connection with dredging for construction, operation, or maintenance of an authorized navigation project. Waukegan Harbor is a Federally authorized navigation project located in Waukegan, Illinois, on the southwestern shore of Lake Michigan. The harbor is approximately 40 miles north of downtown Chicago, Illinois; 10 miles south of the Illinois-Wisconsin state line and immediately south of Illinois Beach State Park. Waukegan Harbor is used for both industrial and recreational activities. Waukegan Harbor is one of seven navigation facilities maintained by USACE Chicago District. Waukegan Harbor is primarily a receiving harbor of bulk commodities.

Initial Federal improvements at Waukegan Harbor began in 1880s, with the majority of the modern-day harbor structures constructed in the early 20<sup>th</sup> century. The Federal project and navigation channel has maintained its present configuration since 1966. The Federal project includes a 1,894 outer breakwater and two parallel entrance piers. The north entrance pier is 998 feet in length and the south entrance pier is 3,225 feet in length. The Federal navigation channel consists of an 18 foot deep Inner Harbor, 22 foot deep Outer Harbor, and 22 foot deep Approach Channel (Figure 3). All channel and harbor depths are referenced to Lake Michigan low water datum (LWD), 577.5 feet International Great Lakes Datum of 1985 (IGLD 85).

The Inner Harbor is comprised of the innermost basin of the Federal channel and an entrance channel that is formed by the parallel piers. The Inner Harbor is approximately 3,000 feet in length with its width ranging from 180 feet to 370 feet. The Outer Harbor is comprised of an area that is protected by the outer breakwater but outside of the parallel entrance piers. The Outer Harbor is 1,050 feet in length with its width ranging from 180 feet to 450 feet. The Approach Channel consists of an open lake area outside of the protection of the outer breakwater. The Approach Channel is approximately 1,800 feet in length with widths ranging from 450-500 feet. In addition to authorized Federal channel, the Corps has also designated an open lake Advanced Maintenance Area that is located to the north of the Approach Channel and to the east of the outer breakwater.

Unlike many Great Lakes harbors, Waukegan Harbor is not positioned at the outlet of an inland tributary and therefore does not receive inland stream flow or fluvial sediments, with the exception of stormwater from a portion of downtown Waukegan. While the Waukegan River watershed drains much of the surrounding area, the river outlets into Lake Michigan approximately 2,500 feet south of the harbor and does not have any influence on the Federal navigation project. As such, the primary source of sediment within the harbor is the littoral drift system, which transports sediment from north to south along this reach of Lake Michigan. The majority of incoming littoral sediments are captured on the updrift side of the outer breakwater or settle within the Federal navigation channel. Natural bypass around the harbor represents a very small percentage of the total sediment budget.

# DRAFT



Figure 3 Map of Waukegan Harbor

## Navigation Dredging

USACE has been involved with dredging operations at Waukegan Harbor since 1889. With the exception of some intermittent harbor deepening projects, the vast majority of dredging operations have focused on maintaining navigable conditions – primarily within the Approach Channel. Since sediment inputs to the harbor are almost exclusively littoral, the majority of shoaling occurs within the Approach Channel, immediately south of the outer breakwater.

Since the mid 1970s, navigation dredging has occurred exclusively within the Approach Channel. Environmental and logistical constraints have prevented USACE from dredging the Inner and Outer Harbor during this period. Since 1977, USACE has dredged 1.4 million cubic yards from the Approach Channel at an average rate of 39,000 cubic yards per year (Table 1). Dredging operations have generally occurred on either an annual or a biennial basis. A mechanical bucket is typically utilized for the dredging operations.

However, over the past 6 years, the average dredging rate has increased significantly to 62,000 cubic yards per year. Most recently in September 2013, the District dredged approximately 63,000 cubic yards from the Approach Channel, which matched the short term dredging rate almost exactly. Even at this increased rate, dredging activities are not keeping up with the increased rate of shoaling. A separate investigation currently being prepared under the Section 216 authority, suggests that the northern fillet beach has reached capacity and is no longer providing any significant sediment storage to the littoral cell. It is currently estimated that annual shoaling in the Approach Channel may be as high as

# DRAFT

80,000 cubic yards per year, thus dredging will need to occur at approximately the same rate to maintain project depths at Waukegan Harbor.

Unlike the other areas of the Federal navigation channel, Approach Channel sediments have remained clean and suitable for open water disposal. The current Base Plan, or least cost disposal plan, consists of towing the mechanically dredged material via barge approximately 1 mile south of the harbor and placing the material into approximately 18-20 feet of water using a bottom dump scow.

Since 1999, an alternative disposal plan has also been implemented. Under this plan, dredged material is towed approximately 8 miles north to Illinois Beach State Park. The dredged material is placed into designated shallow water areas along the North Unit of the park (Figure 4). Because this plan is more expensive than the Base Plan, it can only be implemented when the Illinois Department of Natural Resources is able to provide 100% of the additional funding above and beyond the Base Plan. However, no official long-term plan or partnership is currently in place; this alternate plan has been implemented in an ad-hoc manner contingent on IDNR funding and coordination. IDNR favors this plan and has been willing to fund it since it provides ecosystem and shore protection benefits to the IBSP, a priority coastal resource to the State of Illinois.

Prior to 1977, all dredged material was disposed in deepwater areas, which removed millions of cubic yards of sediment from the littoral drift. This practice contributed to increased erosion along shoreline areas south of Waukegan Harbor.

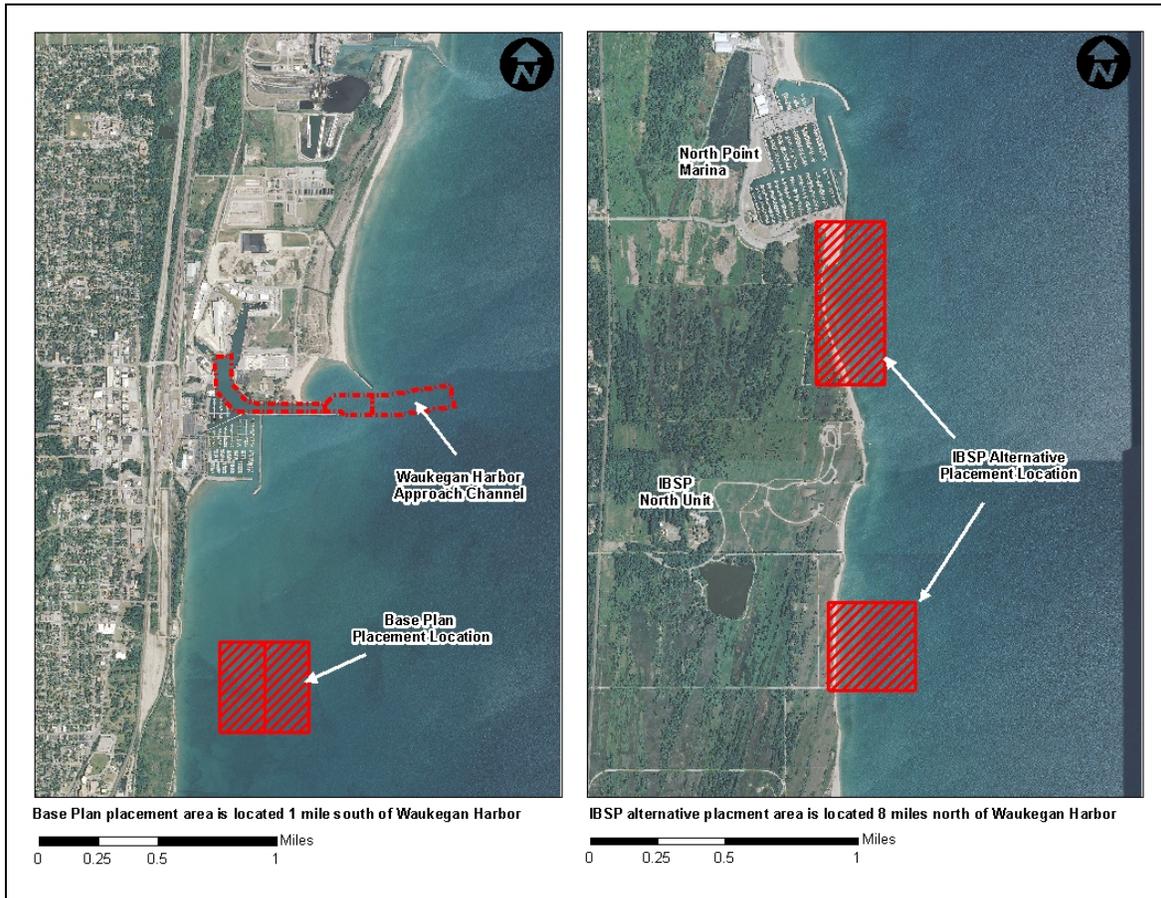


Figure 4 Previous shallow water placement sites for Waukegan Approach Channel dredged material

# DRAFT

**Table 1 Waukegan Harbor Approach Channel dredging records (1977–2012)**

Year	Dredging Quantity (cubic yards)	Placement IBSP North Unit (cubic yards)
2013	73,000	63,000
2012	105,422	36,300
2011	4,000	-
2010	60,890	29,000
2009	67,820	67,820
2008	71,789	60,000
2005	30,142	8,300
2003	30,712	-
2002	48,623	48,623
2001	56,194	56,194
2000	56,275	56,275
1999	61,675	61,675
1998	40,000	-
1997	29,000	-
1996	53,515	-
1994	44,879	-
1993	66,597	-
1991	79,482	-
1990	49,513	-
1988	100,996	-
1985	26,180	-
1984	81,000	-
1982	85,396	-
1977	130,000	-
<b>Total Volume (CY)</b>	<b>1,444,000</b>	<b>487,200</b>
<b>Average Annual Quantity</b>	<b>39,000</b>	<b>13,200</b>

\* Approach Channel shoaling is currently estimated to be 80,000 cubic yards per year

\* Prior to 1977, material was disposed in deep water

## Environmental History

In 1975, polychlorinated biphenyls (PCBs) were discovered in discharge water from the nearby Outboard Marine Corporation (OMC) facility and later found in Waukegan Harbor sediments and fish tissue. The PCBs were traced to hydraulic fluid used by OMC from 1961-1972. Ultimately, the OMC plant grounds were contaminated with an estimated 700,000 pounds of PCB contaminated sediment, and the Waukegan Inner Harbor was contaminated with an estimated 300,000 pounds of PCB contaminated sediment. In 1983, the OMC site including portions of the Inner Harbor and non-Federal harbor areas were placed on the National Priorities List making it eligible for long-term remediation under USEPA’s Superfund Program. In 1981, Waukegan Harbor was identified as one of 43 Areas of Concern (AOC) on the Great Lakes. Six of the 14 beneficial use impairments (BUIs) associated with AOCs were identified at Waukegan Harbor. The identified BUIs include:

# DRAFT

- Restrictions on fish and wildlife consumption
- Beach closures
- Degradation of benthos
- Degradation phytoplankton and zooplankton populations
- Restriction on dredging activities
- Loss of fish and wildlife habitat

While the Inner Harbor and private industrial grounds experienced significant contamination, there is little evidence to suggest that PCB contamination spread to the Outer Harbor, Approach Channel, or Lake Michigan. This has been confirmed by numerous sediment sampling events conducted over the past decade. The extent of contamination was limited in part due to the relatively stagnant flow conditions within the harbor, which produces minimal sediment transport. Since the vast majority of sediment that enters the harbor is littoral in nature, newer sediment tends to be consistent with Lake Michigan sediment quality and free of contamination. As a result, Approach Channel sediment has continued to meet Lake Michigan standards for open water disposal.

## Inner Harbor Dredging

Under the Superfund Program, USEPA has completed several rounds of soil and groundwater remediation. The first dredging effort took place from 1992-1993, and included the removal of 50,000 cubic yards of the most highly contaminated sediment. The PCB contaminated sediment was placed in multiple confined disposal cells located throughout the project area as well as taken to private landfills. A second dredging action is currently underway to remove any residual PCB contamination from the Inner Harbor and surrounding non-Federal slips. This effort will hydraulically dredge an additional 150,000 cubic yards and place the material in nearby confined disposal cells. Intake water is being treated on site and returned to the harbor. This dredging effort commenced in 2012 and is scheduled for completion in 2014. This second round of environmental dredging will remove practically all residual PCBs from the sediment. Following this effort, future Inner Harbor dredged material will no longer require confined disposal and will be suitable for upland unconfined disposal.

## Outer Harbor Dredging

Under the Great Lakes Restoration Initiative (GLRI), USACE through an Economy Act agreement with USEPA is planning to dredge 100,000 cubic yards of sediment from the Outer Harbor in 2014. Unlike the Inner Harbor sediment, this sediment has remained free of PCB contamination and does not require confined disposal. Outer Harbor sediment was determined unsuitable for open water placement since its finer textures results in high suspension times and elevated nutrient concentrations. USEPA is planning to use the dredged material as a source of clean fill material at the former Waukegan Manufactured Gas & Coke Plant (Coke Plant) property, which is a remediated Superfund site located adjacent to the harbor. The completion of these dredging efforts will support the effort to remove the “restriction on dredging activity” that is currently identified as a BUI for the Waukegan Harbor AOC.

# DRAFT

## 1.5 PLANS, PROJECTS, AND REPORTS

### Federal Plans, Projects, and Reports

#### Waukegan Harbor Section 216, Initial Appraisal Report (USACE, Ongoing)

This Initial Appraisal is assessing the current conditions at Waukegan Harbor to determine if there is a Federal interest in investigating structural or operational modifications to the project that would result in economic or environmental benefits. The recent increase in shoaling and dredging requirements has raised concerns about the ultimate long-term economical viability of Waukegan Harbor as a commercial harbor.

#### Zion Beach-Ridge Plain Restoration Section 506, Detailed Project Report (USACE, Ongoing)

This study is investigating potential restoration measures for restoring beach-ridge plain coastal areas in Lake County, Illinois and Kenosha County, Wisconsin. Development and urbanization has impacted the marshes, ravines, and forests that historically covered this region. The watersheds now experience a much flashier flow regime (e.g. higher peak flows for shorter durations) due to the increase in impervious area and urban stormwater drainage systems, which results in increased pollutant and sediment loads to the receiving waters. The restoration project seeks to reestablish and naturalize beach-ridge plain hydrology with the intent of restoring coastal zone native fish and plant communities.

#### Waukegan Outer Harbor, Draft Interim Dredged Material Management Plan (USACE, 2012)

This study investigated dredging and disposal alternatives for Outer Harbor portion of Waukegan Harbor. The Outer Harbor, which has experienced a slow rate of sediment accumulation over the past several decades, has now reached a point where commercial navigation is being adversely affected. The report recommended mechanically dredging approximately 100,000 cubic yards of sediment and placing the material at an adjacent industrial property that has undergone soil and groundwater remediation through the Superfund program and is in need of clean fill material. This plan is currently in the design phase with work being performed by USACE through an Economy Act agreement with USEPA.

#### Illinois Shoreline Erosion Interim I, Draft Feasibility Report (USACE, 2001)

This study investigated opportunities for reducing shoreline erosion damages along a 9-mile reach of shoreline from Waukegan Harbor to the Illinois-Wisconsin state line, including Illinois Beach State Park. The report evaluated annual shoreline nourishment of 60,000 cubic yards of sand obtained from inland sources and nearshore sediment traps. Preliminary analysis suggested this plan may have resulted in a positive benefit cost ratio (BCR) but the report was not completed due to funding limitations.

### Non-Federal Plans, Projects, and Reports

#### Illinois Beach State Park Southern Buffer Restoration Project (Waukegan Harbor CAG, Ongoing).

The Illinois Beach State Park (IBSP) Southern Buffer Restoration Project is designed to improve degraded habitats adjacent to the Illinois Beach Nature Preserve, located in Beach Park and Zion, Illinois. Goals of the project include protection of high-quality areas, restoration of degraded habitat, hydrological improvements, and improved public access. The work will be conducted in coastal dunes and wetlands,

# DRAFT

adjacent ravines and upland sites, and adjoining developed areas. The project, which commenced in 2011, was expected to last for 3 years.

## Illinois Coastal Management Program (IDNR 2012)

The Illinois Coastal Management Program (ICMP) is a partnership between the Illinois Department of Natural Resources (IDNR) and the National Oceanic and Atmospheric Administration (NOAA). The ICMP aims to protect, restore, and responsibly manage the State of Illinois' coastal communities and resources. The ICMP takes a comprehensive approach to coastal resource management – balancing the often competing and occasionally conflicting demands of coastal resource use, economic development, and conservation. Program priorities include areas such as invasive species, ecosystem restoration, Areas of Concern, non-point source pollution, and sustainable development.

The ICMP, which was approved by NOAA in January 2012, is still in a preliminary phase and has not yet formally developed and prioritized all of its programmatic initiatives. However, the ICMP has established Illinois Beach State Park as a critical concern particularly with respect to managing and mitigating long-term erosion.

The ICMP will not fund beach nourishment directly, but will prioritize other avenues that are ICMP compliant to assist IDNR erosion monitoring and management. The ICMP coastal management approach will involve pursuing partnerships with appropriate municipal, county, state, and Federal agencies concerned with coastal erosion along the Illinois coast and inland waterways.

## Long-Term Coastal Stewardship at Illinois Beach State Park (IDNR 2001)

The IDNR Task Force for Coastal Stewardship completed a report titled, “Long-Term Coastal Stewardship for the IDNR Shore of Lake Michigan at North Point Marina and Illinois Beach State Park” in February 2001. Given the general infancy of the ICMP, this document was an important resource for identifying local goals, objectives, and constraints for shoreline management and ecosystem restoration projects planned at Illinois Beach State Park.

The report documented that sand nourishment shall be the exclusive means to counter erosion at the park, and that the state should not consider the implementation of hardened shore protection structures. Additionally, any proposed actions should avoid impacts to shoreline aesthetics and habitat, while seeking to restore and enhance coastal area communities. The report recommended forging partnerships with other agencies and organizations as a means to manage and protect the coastal zone. The report made the following recommendations:

- Long-term erosion management control is an essential component of good stewardship at IBSP and is necessary for compliance with the Illinois Natural Areas Preservation Act
- Sand nourishment should be the exclusive means to counter erosion along the shore
- The total volume of nourishment supplied along the IBSP beach and nearshore should be a minimum of 80,000 cubic yards per year. The actual nourishment volume would be adjusted from year to year as conditions warrant
- In a partnership with Waukegan Power Station, IDNR should pursue the possibility of constructing of a sand trap, and make a permanent commitment of IDNR resources to periodically remove sand from this trap and recycle it northward as nourishment within IBSP

# DRAFT

- In a partnership with USACE, IDNR should accept sand acquired and offered by USACE from maintenance dredging of the Waukegan Harbor Approach Channel and use this sand as nourishment with IBSP
- IDNR should forge a partnership with Prairie Harbor Yacht Club in Wisconsin to accept all clean sand from maintenance dredging of the harbor and use this sand as nourishment with IBSP

## IDNR Nourishment at Illinois Beach State Park

The IDNR has conducted intermittent nourishing activities (independent of USACE) at both the North Unit and South Unit of Illinois Beach State Park. Between 1989 and 1997, the State of Illinois nourished the park with close to 1.8 million cubic yards of sediment (Foyle et al. 1998), with the vast majority of nourishment occurring following the construction of North Point Marina (NPM) in the late 1980s. Nourishment activities occurring during this period are listed below in Table 2. The nourishment involved stockpiling sands at feeder beaches cells located at the north end of the North Unit and South Unit. The material was spread over a small section of beach (Figure 5) where it was allowed to slowly drift into Lake Michigan and nourish the littoral zone.

**Table 2 IDNR nourishment at IBSP (1987–1997)**

<b>Date</b>	<b>Quantity (CY)</b>	<b>Location</b>	<b>Source</b>
1987-1989	1,500,000	North Unit	Construction of NPM
1990	150,000	North Unit	Dredging at Prairie Yacht Club
1994	32,000	North Unit	Inland Quarry
1995	24,000	South Unit	Dredging at Waukegan Power Station
1995	20,000	North Unit	Dredging at Waukegan Power Station
1995-1996	26,000	North Unit	Dredging at Waukegan Power Station
1997	20,000	North Unit	Inland Quarry
1997	20,000	South Unit	Inland Quarry

# DRAFT



**Figure 5 Sand placement at North Unit feeder beach in 1995  
(from Chrzastowski and Frankie 2000)**

## 2. INVENTORY & FORECASTING

The following chapter outlines the past, present and future without-project conditions of the Illinois Beach State Park coastal environment, both ecological and human.

### 2.1 \*CURRENT CONDITIONS

#### 2.1.1 *Physical Resources*

##### Climate

The climate in northeastern Illinois and southeastern Wisconsin is classified as humid continental, characterized by warm summers, cold winters, and daily, monthly, and yearly fluctuations in temperature and precipitation. Average annual rainfall is usually between 30 to 40 inches per year, with greater amounts falling between April and August. Annual seasonal snowfall averages approximately 28 inches. Early spring floods occur when snow accumulations extend into a period of increasing temperatures that result in melting. If extensive melting of accumulated snow occurs when soils are already saturated, the associated runoff increases dramatically because of the large area of impervious surfaces located within the basin, which are largely a result of urban development.

##### Lake Levels

The level of Lake Michigan naturally varies annually, seasonally, daily, and hourly. On an annual basis, lake levels generally vary by about 1 foot, with higher water in the summer and lower water in the winter. Long-term lake level fluctuations result from long-term changes in the overall water budget of the Great Lakes system. Short-term fluctuations result from the lake surface responding to wind and atmospheric pressure. During the period of record, the maximum monthly mean water level occurred in October 1986 (582.3 ft) and the minimum monthly mean water level occurred in March 1964 (576.1). Periods of sustained high water conditions tend to result in increased erosion and damages along the bluffs and beaches. Periods of sustained low water tend to result in increased impacts to navigation and increased downcutting along the nearshore lake bottom. For more than a decade, lake levels have consistently remained low in Lake Michigan (Figure 6).

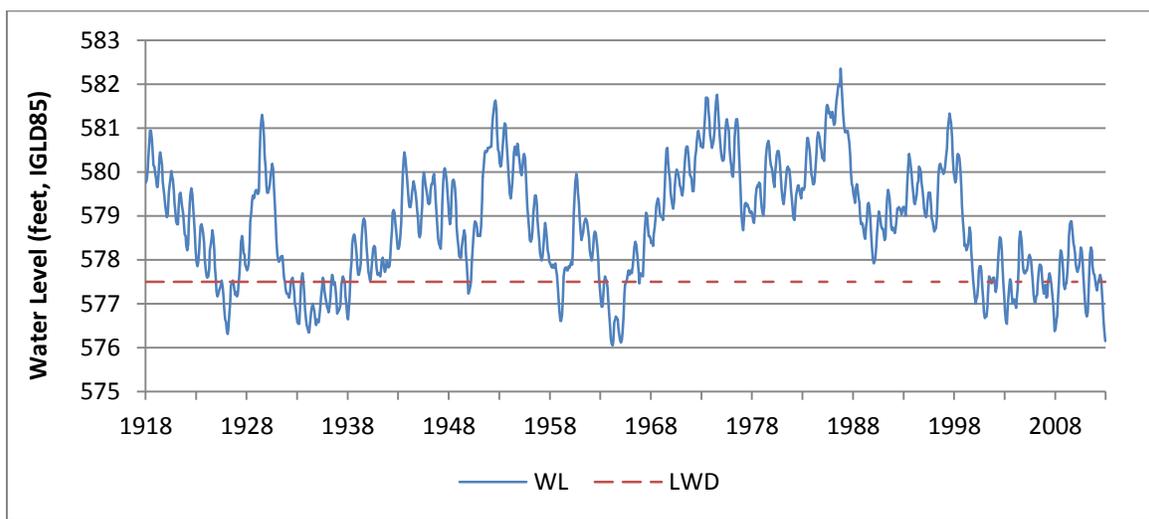


Figure 6 Lake Level fluctuations in Lake Michigan-Huron (1918-2012).

# DRAFT

## Geology

Silurian Age Bedrock – The underlying regional bedrock is Silurian-age dolomite, most likely of the Niagaran Series (Willman 1971). This rock resulted from marine deposition when all of northeastern Illinois and much of the neighboring Great Lakes region was the floor of a tropical sea from about 440 to 410 million years ago.

Wadsworth Till Member – The dominant material in the Illinois coastal zone is a compact, gray, silty and clayey till of the Wadsworth Till Member. The till may contain discontinuous layers of sand and gravel mixed with sand. This till, which is ubiquitous across the coastal zone, was deposited by glacial ice during the most recent (Wisconsinan) glacial episode. The till is exposed along the coastal bluffs, as well as the material first encountered beneath most of the soils in the area. It also occurs beneath the beach sand and it occurs on the nearshore lake bottom either beneath the nearshore sand or exposed where sand cover is absent.

Analysis of the till exposed in the bluffs indicate that a typical sediment size distribution is 48 percent clay, 42 percent silt, and 10 percent sand (Chrzastowski 1995). When bluff erosion occurs, only the sand-size material ultimately remains along the beaches and nearshore. The dominant clay and silt are transported offshore for eventual deposition in deep water (Colman and Foster 1994). The grayish or milky coloration that is common along the Illinois coast following times of large waves, results from the suspension of the silt and clay from erosion along the bluffs or across the lake bottom.

The thickness of the till sequence above the bedrock is variable depending on the surficial landscape or lake-bottom topography compared to the subsurface bedrock topography. In general, within the Illinois coastal area, the thickest sequence of till occurs in Lake County where thickness can be 300 to 400-feet.

Lake Border Morainic System – The study area lies within the Lake Border Morainic System. It consists of five moraines that are separated throughout much of their length by parallel valleys. The Zion City Moraine forms the ridge visible to the west of the project site. Drift present in all the moraines' is a gray clayey till similar to that in the Valparaiso Moraines. The topography of the Lake Border Moraines is much less than that of the adjacent Valparaiso Moraines. Kames, eskers, and lakes are scarce in this area.

## Soils

The surficial sediments of the Zion beach-ridge plain consist of a broad range of materials that include organic-rich sand, silt, and clay in the marsh deposits of the swales, well-sorted medium sands in the dunes, and localized deposits of concentrated coarse sand, pebbles, and cobbles along the beach. The Lake County soil survey developed by the Natural Resources Conservation Service identified five dominant soils within Illinois Beach State Park: beach sand, Granby, Orthents, Udipsamments, and Adrian Muck (Figure 7).

Beach Sands – Beach sediments along the Illinois coast consist of mixed sand, sandy gravel, and gravel. The primary source for beach sediments is erosion of the coastal bluffs.

Udipsamments – These soils are found landward of the beach sands throughout the sand and dune areas. Udipsamments consist of very deep, moderate to somewhat poorly drained soils formed in wind-worked beach sand on beach ridges and terraces. Slopes typically range from 1 to 6 percent.

# DRAFT

Adrian Muck – These soils are primarily found landward of the beach and dune areas at IBSP. Adrian soils consist of very deep, very poorly drained soils formed in herbaceous organic materials over sandy deposits on outwash plains, lake plains, lake terraces, flood plains, moraines, and till plains. Slopes typically range from 0 to 1 percent

Granby – These soils are found sporadically throughout the park, primarily in the North Unit. Granby soils consist of very deep, poorly drained or very poorly drained soils formed in sandy outwash or sandy glaciolacustrine deposits on outwash plains, lake plains, and glacial drainage ways. Slopes typically range from 0 to 2 percent.

Orthents – Naturally, Orthents are recently eroded material stemming from mountain terrain. These soils are defined as Entisols that lack horizon development due to either steep slopes or parent materials that contain no permanent weatherable minerals (such as ironstone). Typically, Orthents are exceedingly shallow soils. They are often referred to as "skeletal soils" or, in the FAO soil classification, as Lithosols. The basic requirement for recognition of an Orthent is that any former soil has been either completely removed or so truncated that the diagnostic horizons typical of all orders other than Entisols are absent. This classification was most likely given because of the lack of soil horizons and the rocky nature of the inadequate soil that was used to fill in the ravine.

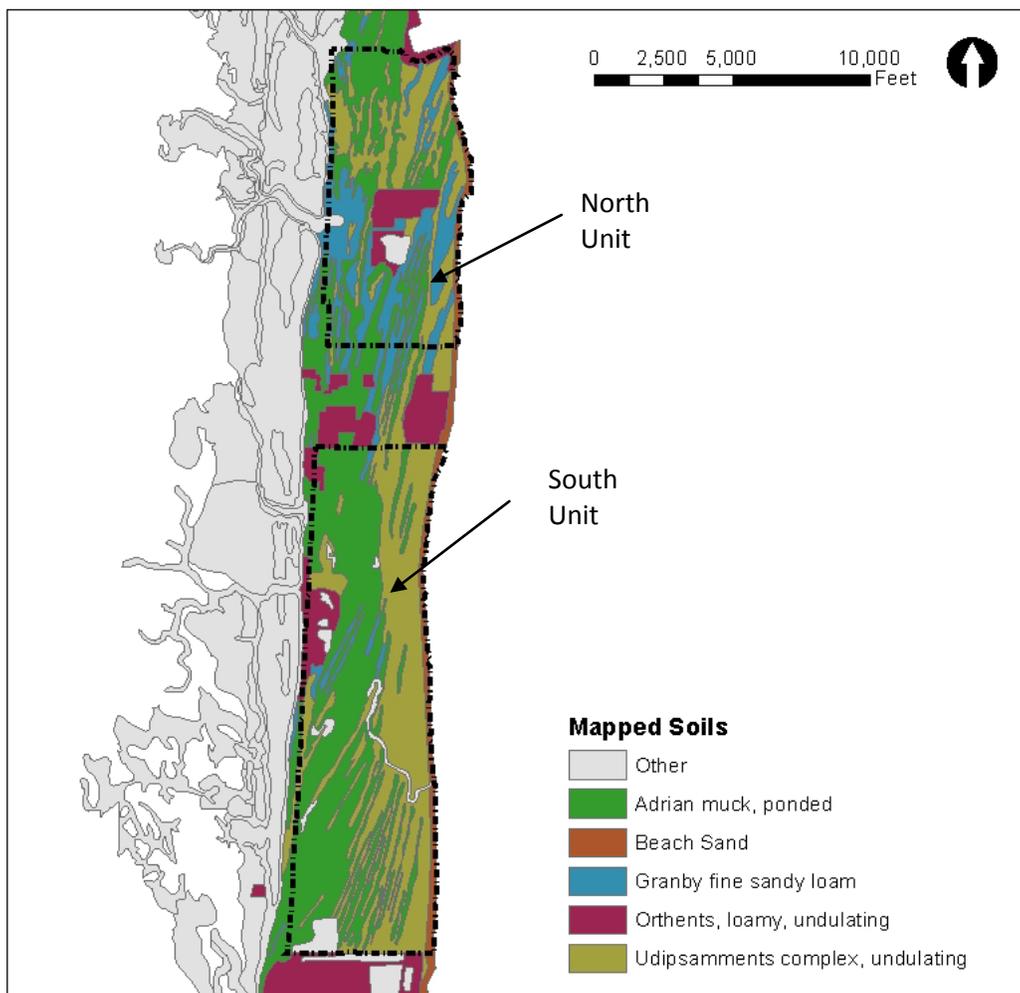


Figure 7 Soil map of IBSP

# DRAFT

## Coastal Geomorphology

Illinois Beach State Park occupies a prominent coastal feature called a beach-ridge plain. This type of coastal landform occurs worldwide along sandy coasts. Beach-ridge plains consist of linear, generally coast-parallel mounds of sand and/or gravel (adjacent to each other) that have been built up by wave action to extend the coast outward into the adjacent ocean or lake. The Zion beach-ridge plain extends along the Lake Michigan shore for nearly 18 miles from Kenosha, Wisconsin, to North Chicago, Illinois. The plain has a maximum width of about 1 mile opposite Zion, Illinois, and has thus been named after this city. The plain defines one of the three different coastal/geomorphic zones along the Illinois coast and has a geologic history very different from the rest of the Illinois coast.

A characteristic of a beach-ridge plain is "washboard" topography of sub-parallel ridges separated by low areas called swales. The difference in elevation between the ridges and swales in the state park is generally no more than 10 feet, except where sand dunes built atop the ridges add to their height. The ridges are typically formed by storm waves that have enough energy to move large volumes of sediment and deposit sediment in a mound (i.e., ridge) that can have a lateral continuity for great distances along the shore. Although the topography consists of multiple ridges and swales, this type of coastal landform is called a plain because the elevation difference between tops of the ridges and bottom of the swales is minor compared to the length and breadth of the overall landform. Elevations at IBSP generally range from water level to around 20 feet above the lake.

The Zion beach-ridge plain is a geologic feature that owes its origin and evolution to coastal processes. These processes include wave dynamics, the movement of sediment by wave action, short- and long-term changes in lake level, and the influence of coastal ice. The areal extent and configuration of Lake Michigan provides a setting in which many of the coastal processes operating along the shore of the Zion beach-ridge plain are comparable to coastal processes operating along many ocean coasts. In contrast to most ocean coasts, this Great Lakes setting can have rapid changes in mean water level due to wind and pressure disturbances across the confined water area of the lake. This Great Lakes coast also experiences the dynamics of coastal ice, a phenomena that only occurs along arctic and near-arctic reaches of ocean coasts.

DRAFT

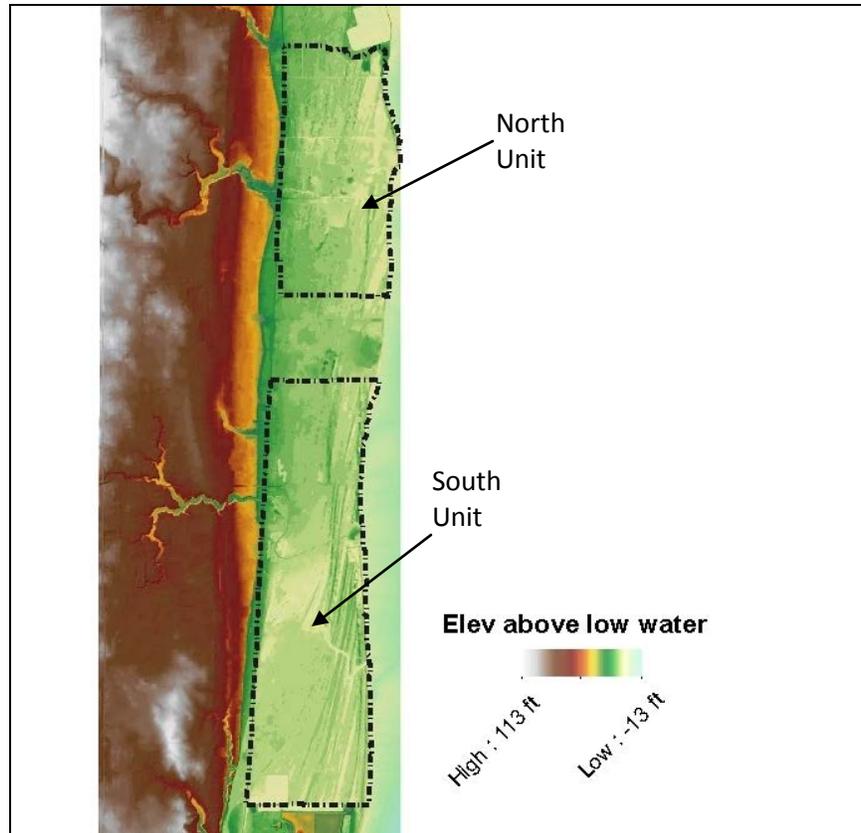


Figure 8 Topography of IBSP

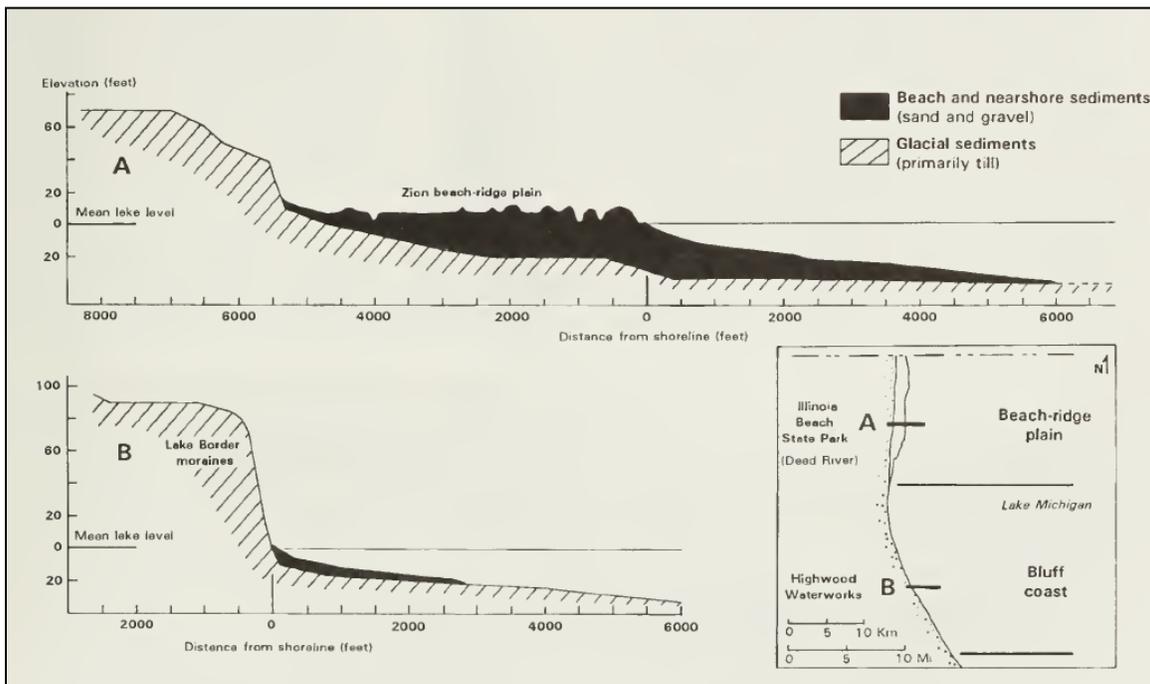


Figure 9 Nearshore profiles of the Zion beach-ridge plain at Illinois Beach State Park and the bluff coast at Highwood, Illinois (From Chrzastowski and Trask 1995).

# DRAFT

## Littoral Transport

Littoral transport refers to the movement of sediment along beaches and in the nearshore (littoral) zone under the influence of wave action and wave-induced currents. The sediment moved in this process is referred to as littoral drift. Seasonal variation in the dominant wind direction results in variability to the waves and currents experienced along the Lake Michigan shoreline. During the majority of the year, winds blow across the long axis of the lake from the southeast, resulting in a regional circulatory pattern moving along the Illinois shoreline in a counterclockwise direction. The resultant wave climate along this reach is relatively benign. Beginning in late fall and continuing until spring, however, these trends reverse. Northerly winds drive wave fields towards the southern end of Lake Michigan, generating a significantly larger wave climate. The dominant influence by northerly waves results in a net southward littoral transport along the entire Illinois coast. Waves from the southeast can influence a northward movement of beach and nearshore sediment; however, the stronger northerly waves counteract this influence and produce net transport from north to south. The Illinois coast was formerly a single, continuous pathway for the southward transport of littoral sediment. This was part of a larger littoral cell that originates in Wisconsin near Sheboygan and extends to eastern Indiana near Indiana Dunes (Chrzastowski et al 1994).

Studies have estimated that the net littoral transport rate passing IBSP ranges between 73,000 and 95,000 cubic yards per year (USACE 1953, Tetra Tech 1978, Foyle et al. 1998). A volume of 80,000 cubic yards per year is generally used as the representative or average value. The available data suggest that the long-term average transport rate has not changed much over historical time. What has changed is the contribution to this supply that reaches the Illinois coast from the Wisconsin shore. Prior to human modification of the southern Wisconsin shore, erosion and transport along this reach could contribute several tens of thousands of cubic yards per year to littoral transport. The combination of shore protection and harbor/channel dredging along much of the shore of southern Wisconsin have drastically reduced the quantity of littoral sediment reaching the Illinois shore. The estimated volume of littoral transport crossing the state line is at most 10,000 cubic yards per year (Foyle et al. 1998). South of state line and North Point Marina sediment transport increases to more than 70,000 cubic yards per year due primarily to sediment contributions from eroding beaches and bluff areas along the North Unit of Illinois Beach State Park – though in some years the littoral sediment supply is supplemented through nourishment activities.

For decades, shoreline erosion has been a primary coastal management issue at Illinois Beach State Park. The most severe erosion is found along the shore of the North Unit immediately south of North Point Marina. This erosion is part of the naturally occurring erosion shore along the northern end of the beach-ridge plain but it also exacerbated by the severe littoral deficit previously discussed. Long-term shoreline erosion within the North Unit has been observed as high as 10 feet per year (Jennings 1990).

In order to identify more recent trends and erosion/accretion along the North Unit, shoreline positioning was digitized in aerial photography for the majority of years from 2000-2011. The shoreline positioning was corrected for lake level variation and evaluated to determine the 10-year average erosion rates. The short-term erosion rates ranged from as high as 12 foot per year to slightly accretional (Figure 10). The results of this shorter-term analysis matched closely with a long-term analysis (1872-1987) completed by Jennings. The areas of highest erosion were observed immediately south of North Point Marina, and in the southern portion of the North Unit. The areas with minimal shoreline erosion tended to be armored either with rubblemound revetments or with steel sheet pile.

# DRAFT

Shoreline erosion along the North Unit provides the supply of littoral sediment that moves southward and eventually reaches the South Unit. The southward moving sediment supply contributes to a more balanced sediment budget towards the south. As a result, the South Unit is able to maintain an annual littoral transport volume close to 80,000 cubic yards in most years and does not experience the same levels of erosion commonly observed to the north. The vast majority of littoral sediment passing the South Unit is eventually trapped by in-lake structures at Waukegan Power Station and Waukegan Harbor.

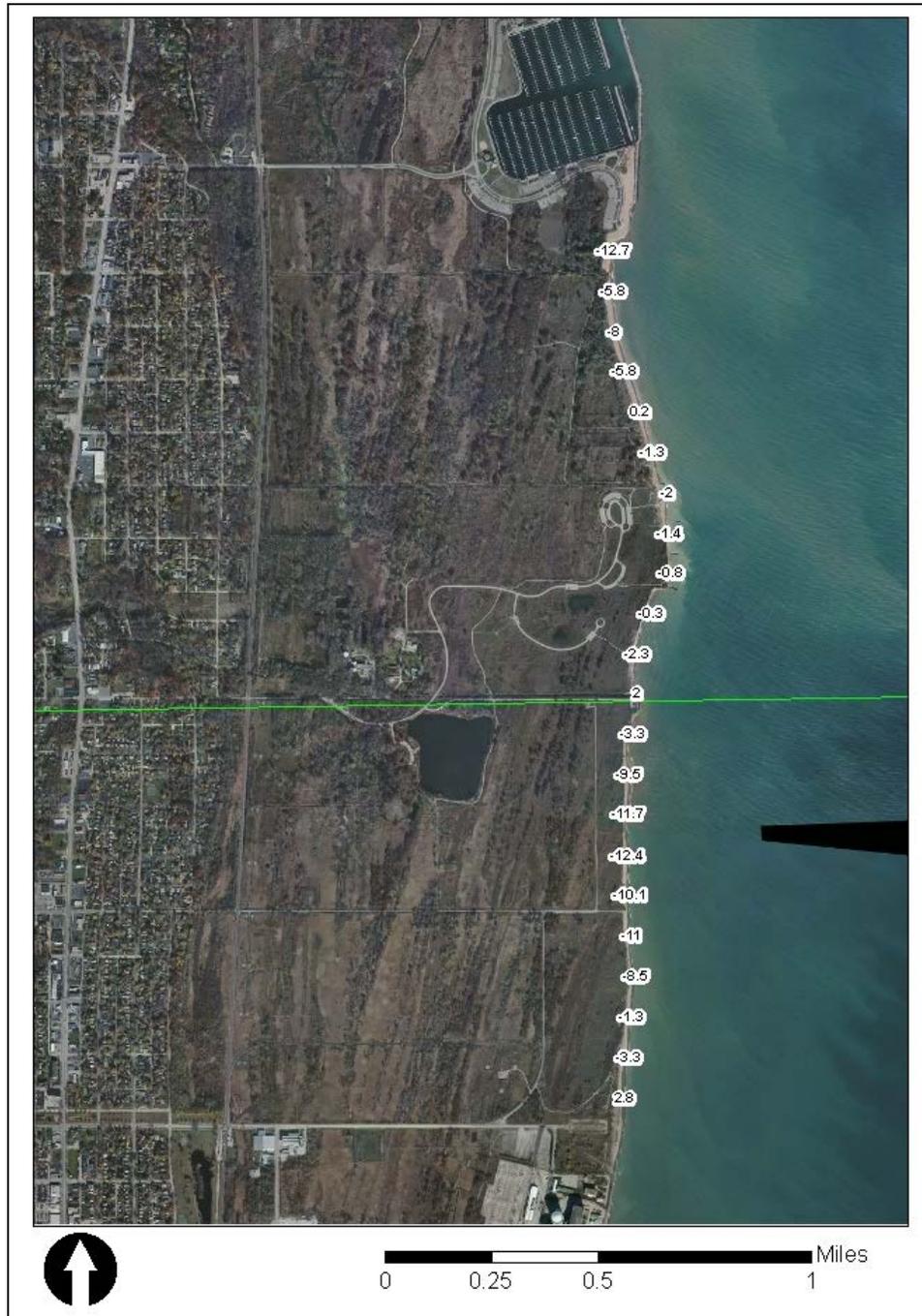


Figure 10 Calculated annual erosion/accretion rates at the North Unit of IBSP from 2000-2011

# DRAFT

## Physical Effects of Hurricane Sandy

A severe storm event caused by the remnants of Hurricane Sandy passed through Lake Michigan on October 30-31, 2012. The storm produced 15-20 foot waves on Lake Michigan and 30 mph winds. At Illinois Beach State Park, severe erosion was observed in the North Unit, particularly north of Camp Logan where as much as 30 feet of sand was eroded in some sections (Figure 11). The South Unit was affected minimally and even experienced minor accretion in some sections.

Additional impacts were felt to the south at Waukegan Harbor. The storm transported a large slug of sediment towards the harbor, which formed a substantial shoal and reduced depths to less than 10 feet in some areas of the Approach Channel. As a result, the harbor was temporarily closed for deep-draft navigation and was unable to serve as a Harbor of Refuge for the US Coast Guard. A hydrographic survey of the harbor completed in April 2013, showed the harbor to have a dredging backlog of 88,000 cubic yards.



Figure 11 Shoreline conditions at IBSP following the remnants of Hurricane Sandy

## Approach Channel Sediment Quality

Recent sediment and elutriate sampling indicates that Approach Channel sediment is generally clean, (with generally low levels of fines and nutrients) and suitable for placement within the beach or littoral zone at Illinois Beach State Park. The results of past sampling events show no level of contamination that would cause environmental impacts related to water quality. The historical and current data show that the sediment and elutriate results have been consistent over time, for more than 10 years. Water

# DRAFT

quality impacts have not been noted in the past despite water quality monitoring during sediment disposal activities. Based on the similarity of current results with historical data, water quality impacts are not anticipated. Dilution of the nutrients during placement in a mixing zone would meet water quality standards outside the mixing zone. In accordance with permit conditions, sediment and water samples are collected in advance of all maintenance dredging events at Waukegan Harbor. Note that PCB and asbestos analyses are requested by the State due to historical concerns at other sites; the historical sources of these contaminants have been remediated by USEPA.

The results of recent sediment sampling tests are shown in the tables below. A more complete discussion of the environmental quality of Approach Channel sediment can be found in *Appendix E – Contaminant Determination*.

**Table 3 Recent sediment sampling data from Waukegan Harbor Approach Channel**

Sample Number	Sample Date	PCB Concentration (mg/kg)	Asbestos Concentration (%)	Grain Size (% fines)
WH-SED-0712-1	07/12/12	<0.0214	ND	6.3
WH-SED-0712-2		<0.0214	ND	1.4
WH-SED-0712-3		0.0163	ND	2.7
WH-SED-0810-1	08/10/10	<0.00271	ND	25
WH-SED-0810-2		<0.00271	ND	33
WH-SED-0810-3		<0.00271	ND	30
WH-SED-1027-1	10/27/09	<0.0216	ND	16
WH-SED-1027-2		<0.0216	ND	2.8
WH-SED-1027-3		<0.0216	ND	3.1
WAM-1008-001	10/08/08	0.08	ND	0.73
WAM-1008-002		0.049	ND	0.57
WAM-1008-003		<0.017	ND	0.53
WAM-0905-001	09/05/07	<0.0269	ND	1.4
WAM-0905-002		<0.0264	ND	0.5
WAM-0905-002		<0.0289	ND	4.2

**Table 4 Recent elutriate data from Waukegan Harbor Approach Channel**

Parameter <sup>1</sup>	Limits <sup>2</sup>	2008	2009	2010	2012
Sediment % fines (avg)	20%	0.61%	7.3%	29.3%	3.4%
TSS	15 mg/L	82 mg/L	2230 mg/L	1540 mg/L	131 mg/L
TVS	---	69 mg/L	5.09 mg/L	9.14 mg/L	164 g/L
TDS	---	190 mg/L	187 mg/L	185 mg/L	280 mg/L
Total phosphorus (as P)	0.007 mg/L	0.033 mg/L	0.0037 mg/L	<0.005 mg/L	0.16 mg/L
Ammonia-nitrogen (as N)	0.02 mg/L	0.51 mg/L	3.13 mg/L	0.44 mg/L	0.195 mg/L
Sulfate	---	25 mg/L	26 mg/L	28 mg/L	26 mg/L
Chloride	12 mg/L	14 mg/L	14.2 mg/L	18.6 mg/L	9.45 mg/L
Lead (total)	---	0.020 mg/L	0.0094 mg/L	0.029 mg/L	0.00398 mg/L
Zinc (total)	---	0.089 mg/L	0.031 mg/L	0.10 mg/L	0.0131 mg/L
Total PCBs	0.1 µg/L	<0.15 µg/L	<0.02 µg/L	<0.02 µg/L	<0.143 µg/L

<sup>1</sup> Elutriate/supernatant parameters are for a four hour settling time.

<sup>2</sup> Limits are the State of Illinois Lake Michigan Discharge Standards for the sediment placement activities (from IEPA permit 2005-LM-2830)

# DRAFT

## 2.1.2 Ecological Resources

The following is a description of the ecotypes that occur within the study area of this project. Dominant vegetation and organisms that inhabit the particular ecotype will be presented to paint a contextual picture that relate to the restoration alternatives investigated under this study.

### Aquatic Communities

The Lake Michigan beach habitat consists of shallow, high-energy water over a sand/gravel substrate. The sand/gravel beaches experience substantial wave action. Here, fish species that benefit from the shallow water and wave action are predominantly of the family of Cyprinidae (minnows). These include Longnose Dace (*Rhinichthys cataractae*), Emerald Shiner (*Notropis atherinoides*), Sand Shiner (*Notropis stramineus*), Spottail Shiner (*Notropis hudsonius*), and juvenile Lake Chub (*Couesius plumbeus*). Other juvenile fish utilize the Lake Michigan beach habitat as nurseries as well, which include Smallmouth Bass (*Micropterus dolomieu*) and Yellow Perch (*Perca flavescens*).

The Lake Michigan sand flats occur off shore in about 10 to 40 feet of water. This habitat is primarily occupied by adult Lake Chub, Longnose Suckers, and adult Yellow Perch the majority of the year.

There are few recent studies on lower order organisms within the area but several studies from within the last few decades provide insightful information on other aquatic resources within the area. The area of Lake Michigan near the study area has a major phytoplankton bloom in the spring and fall (Great Lakes Basin Commission 1976). Harder structures such as boulders, pilings and sunken flotsam are covered in filamentous algae and zebra mussels. Zooplankton within the area is dominated by diaptomid copepods but protozoans and rotifers can be dominant (Makarewicz et al. 1989). In addition, benthic invertebrates mainly consist of aquatic worms.

### Reptiles and Amphibians

Reptiles and amphibians found in the park include snapping turtle (*Chelydra serpentina*), musk turtle (*Sternotherus odoratus*), plains garter snake (*Thamnophis radix*), eastern tiger salamander (*Ambystoma tigrinum*), fox snake (*Elaphe vulpina*), eastern hognose snake (*Heterodon platyrhinos*), Fowler's toad (*Bufo woodhousei fowleri*) and green frog (*Rana clamitans*).

### Resident & Migratory Birds

Birds make up the largest number of wildlife species found in the park. Many species of birds use the park for resting and foraging during migration. Ducks, geese, shorebirds and hawks are the most common migrants in the park, but a number of passerines pass through the park as well. Many bird species nest in the park; the Illinois Coastal Zone Biological Inventory lists 53 species as probable nesters in the area. Some of the more uncommon nesters for the state include Least Bittern (*Ixobrychus exilis*), King Rail (*Rallus elegans*), Black-billed cuckoo (*Coccyzus erythrophthalmus*), Belted Kingfisher (*Mapaceryle alcyon*) Sedge Wren (*Cistothorus palustris*), Eastern Bluebird (*Sialia sialis*), Ovenbird (*Seiurus auropanillus*), Yellow-breasted Chat (*Icteria virens*) and Scarlet Tanager (*Piranga olivacea*).

### Mammalian Community

Mammal species found in the park include eastern cottontail rabbit (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), red fox (*Vulpes fulva*), raccoon

# DRAFT

(*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis marsupialis*) and muskrat (*Ondatra zibethica*).

## Plant Communities

Illinois Beach State park is home to more than 500 plant species. The principal plant communities within the park include beach, foredune, sand prairie, interdunal pond, coastal black oak sand savanna, fen, marsh and globally rare pannes.

The panne habitat is now uncommon in the Great Lakes but is found in the park. A remnant of this habitat exists south of the park lodge. Hair bladderwort (*Utricularia subulata*), one of the most fascinating plants of central North America and the only known population in Illinois, grows there. Species typical of this habitat include shrubby cinquefoil (*Potentilla fruticosa*), twig rush (*Cladium mariscoides*), hair beak rush (*Rhynchospora capillacea*), small fringed and fringed gentian (*Gentiana procera* and *G. crinita*), arrowgrass (*Triglochin maritima*) and sedges (*Carex viridula* and *C. crawei*).

The prairie community is dominated by grasses such as big and little blue stem (*Andropogon gerardii* and *A. scoparius*), prairie dropseed (*Sporobolus heterolepis*), and blue joint grass (*Calamagrostis canadensis*). Typical prairie forbs include golden alexanders (*Zizia aurea*), shooting stars (*Dodecatheon meadia*), blazing stars (*Liatris* sp.) and goldenrods (*Solidago* sp.).

The marsh communities contain standing water during most of the year because the low marsh areas extend below the water table. Much of the marsh habitat is characterized by dense stands of cattails (*Typha* sp.), as well as prairie cordgrass (*Spartina pectinata*), and sweet flag (*Acorus calamus*) with several species of rushes (*Juncus* sp.) along the wetland margins. There are scattered willows (*Salix* sp.) which are typically found on the higher ridges as well as boneset (*Eupatorium perfoliatum*) and spotted joe pye weed (*E. maculatum*).

The oak savanna habitat can be found along the relic beach ridges; the dominant species is black oak (*Quercus velutina*). In recent years regular prescribed burns have been instituted in the Park and the savannas have extremely high species diversity. Where the light intensity is low at ground level in the oak woods due to fire suppression, the understory lacks diversity, being dominated by poison ivy (*Toxicodendron radicans*) and some burr oak (*Quercus macrocarpa*).

The foredune habitat is dominated by plant species that are sand binders; they possess the ability to hold sand in place by their rhizomatous root systems. These species, which are primarily grasses, play an important role in dune stabilization. Common graminoid species on the foredune include marram grass (*Ammophila breviligulata*), sand reed grass (*Calamovilfa longifolia magna*), bog reed grass (*Calamagrostis inexpansa*), and wild rye (*Elymus canadensis*). Other species include sand cherry (*Prunus pumila*), beach pea (*Lathyrus japonicus*), and silverweed (*Potentilla anserina*). The federally listed dune thistle (*Cirsium pitcheri*) grows on foredunes and beaches, and less commonly in the rear dune. Rear-dune species include bearberry (*Arctostaphylos uva-ursi*), trailing juniper (*Juniperus horizontalis*), flowering spurge (*Euphorbia corollata*) and beach wormwood (*Artemisia caudata*). Downy yellow-painted cup (*Castilleja sessiliflora*) can be found in the Hosah Prairie in the north unit and in the northern portion of the south unit.

# DRAFT

## Threatened & Endangered Species

The County Distribution of Federally-listed Threatened, Endangered, Proposed and Candidate Species was reviewed for Lake County by the Chicago District. The following federally listed species and their critical habitats are identified by the USFWS as occurring within Lake County and are known to be present in IBSP:

- Piping plover (*Charadrius melodus*) – Endangered – Wide, open, sandy beaches with very little grass or other vegetation
- Eastern massasauga (*Sistrurus catenatus*) – Candidate – Graminoid dominated plant communities (fens, sedge meadows, peat lands, wet prairies, open woodlands, and shrublands)
- Karner blue butterfly (*Lycaeides melissa samuelis*) – Endangered – Pine barrens and oak savannas on sandy soils and containing wild lupines (*Lupinus perennis*), the only known food plant of the larvae
- Eastern prairie fringed orchid (*Platanthaera leucophaea*) – Threatened – Moderate to high quality wetlands, sedge meadow, marsh, and mesic to wet prairie.
- Pitcher's thistle (*Cirsium pitcheri*) – Threatened – Lakeshore dunes

During a site visit on June 4, 2013, six state listed species were identified along the coastal zone of the North Unit. These species include:

- Kalm's St. John's-Wort (*Hypericum kalmianum*) – State Endangered
- Bearberry (*Arctostaphylos uva-ursi ssp. coactilis*) – State Endangered
- Creeping Juniper (*Juniperus horizontalis*) – State Endangered
- Northern Cranesbill (*Geranium bicknellii*) – State Endangered
- Beach Grass (*Ammophila breviligulata*) – State Endangered
- Beach Rocket (*Cakile edentula*) – State Threatened

### 2.1.3 Cultural Resources

#### Archaeological & Historic Properties

The Camp Logan National Guard Rifle Range Historic District is listed on the National Register of Historic Places. The listing includes 10 buildings, 2 structures, and 1 object. Camp Logan was an Illinois National Guard Training Facility that operated between 1892 and the 1970s. The buildings and land of the camp qualified as a historic site because this is the best remaining example of a pre-World War II National Guard training facility in Illinois, and because this camp played a major role in the evolution of the Illinois National Guard. Camp Logan, which is located on the North Unit of IBSP would not be affected by any proposed restoration activities.

Within the general vicinity of Illinois Beach State Park there are several other properties listed on the National Register of Historic Places, however none of them will be affected by any proposed restoration activities at Illinois Beach State Park.

# DRAFT

- Henry I. Paddock House – Winthrop Harbor, IL
- Shiloh House – Zion, IL
- Zion Chapter House – Zion, IL
- Joseph T. Bowen Country Club – Waukegan, IL

There are at least three shipwrecks located in Lake Michigan off the coast of Illinois Beach State Park. None of these shipwrecks will be affected by any proposed restoration activities at the park.

Coordination with the Illinois Historic Preservation Agency (SHPO) commenced with a project scoping letter on 26 July 2011. A response letter was received from SHPO regarding the project on 8 August 2011 and again on 8 August 2013. In the letters, SHPO did not identify any adverse affects to historic properties as defined by 36 CFR Part 800.5. Copies of the letters can be found in *Appendix G - Coordination*.

## Land Use History

The area around Illinois Beach State Park was originally occupied by the Potawatomi Indians and part of the Northwest Territory and passed through many changes of governmental authority between 1787 and 1836. When Illinois became a state in 1818, the area was occupied mostly by transient hunters and trappers. As the state became settled and population grew, cities were incorporated along the northern Illinois shoreline.

The South Unit, which is the original part of the park, was established in 1953. Some commercial activities, such as the sand mining that produced Dead Lake, did occur prior to park establishment, but overall the landscape was minimally impacted. One of the factors providing the impetus for establishing the park was the early 1900s expansion of industrial activities immediately to the south in Waukegan.

During the 1920s, much of the northern coastal property around the present day IBSP was subdivided and sold as building lots. Subsequently, some 300 homes were constructed in the area, in addition to Camp Logan, which was used by the Illinois National Guard. These lands, which were acquired by the state of Illinois throughout the 1970s, became part of the North Unit and North Point Marina. Severe shoreline erosion was a prime impetus for residential property owners to sell to the state.

The North and South Units are separated by a section of non-State land that is part of the City of Zion. This area contains Hosah Park, which is maintained by the Zion Park District and the decommissioned Zion Nuclear Power Station. The power station was completed in 1973 and decommissioned in 1998.

## Social Properties

Illinois Beach State Park is surrounded by several communities including Winthrop Harbor, Zion, Beach Park, and Waukegan (Table 5). In general, these communities have racially and ethnically diverse populations.

# DRAFT

Table 5 Demographics of communities surrounding IBSP

Community	Area (sq mi)	Population (2010)	Median Household Income (2010)
Winthrop Harbor, IL	4.76	6,742	\$74,901
Zion, IL	9.81	24,413	\$51,650
Beach Park, IL	7.1	13,638	\$72,998
Waukegan, IL	23.88	89,078	\$45,656

## Recreational Activities

Recreational activities at Illinois Beach State Park include boating, swimming, hiking, bicycling, camping, bird watching, and picnicking. IBSP is the most visited state park in Illinois with more than 2.8 million visitors per year. The Illinois Beach Resort & Conference Center is also located within the South Unit. Additional, recreational boating and swimming activities can be found immediately to the north and south of IBSP at North Point Marina, Prairie Harbor Yacht Club, and Waukegan Harbor while a number of other public recreational facilities are present in the surrounding communities.

### 2.1.4 Hazardous, Toxic & Radioactive Waste (HTRW) Analysis

A Contaminant Determination (*Appendix E*) investigated potential environmental impacts associated with utilizing Waukegan Harbor Approach Channel dredged material for ecosystem restoration at Illinois Beach State Park. The investigation determined that sufficient data exists to evaluate the sediment quality of the Waukegan Harbor Approach Channel and Advance Maintenance Area. Land uses in the harbor area have not changed and former contaminated areas in the inner harbor and adjacent properties are being remediated. No other contamination sources appear to exist. Recent sediment and elutriate sampling indicates that the material is good quality sand, with generally low levels of fines and nutrients. The results of past sampling events show no level of contamination that would cause environmental impacts related to water quality. The historical and current data show that the sediment and elutriate results have been consistent over time. Water quality impacts have not been noted in the past. Based on the similarity of current results with historical data, water quality impacts are not anticipated. Dilution of the nutrients during placement in a mixing zone would meet water quality standards outside the mixing zone. More than 10 years of sediment data for the Approach Channel has confirmed that the Approach Channel material is clean littoral drift sediment.

#### PCB Analysis

An evaluation of Approach Channel sediment sampling dating back to 1997 (most recently 2012) found almost all samples to be non-detect for PCBs except for an occasional result which was still below the calculated historic mean of 0.2 mg/kg and well below the TSCA-regulated level of 50 mg/kg for PCB-contaminated material. PCBs have not been found in any appreciable quantity. The historical source of PCBs, a superfund site on the inner harbor, has been remediated by USEPA.

#### Asbestos Analysis

An evaluation of Approach Channel sediment sampling dating back to 1997 (most recently 2012) found almost all samples to be non-detect for asbestos. One sample each from 1999 and 2000 detected a trace amount of asbestos, but not at a concentration high enough to classify it as asbestos containing material (ACM). More intensive sampling of 12 core samples from Waukegan Harbor in 2006 found only

# DRAFT

trace amounts of asbestos, and a subsequent risk evaluation found that the upland placement of the sediment was not significant to human health. The historical source of asbestos, an industry north of the harbor area, has been remediated as of 2010.

## Elutriate Analysis

Elutriate test has been conducted (most recently in 2012) to evaluate the risk of potential contaminants being released into the water column. In general, solids and nutrients tend to be above the water quality standard, but are still low. Metals are very low and PCBs are non-detectable. The use of a mixing zone analysis would suggest that low levels of solids and nutrients are not an issue for open water placement, particularly in an active littoral or wave zone where the materials will be quickly diluted. During past placement of the sediment, a shallow near shore area has always been chosen for this reason. Monitoring during disposal operations has found no significant impacts to Lake Michigan. No fish mortality or morbidity has been noted, and measured aquatic concentrations are found to be very low or at background concentrations.

## **2.2 PROBLEMS AND OPPORTUNITIES**

The overall problem within the study area is a decrease in the quality and quantity of coastal habitat. Coastal habitat, particularly within the North Unit, has been impaired as a response to highly altered littoral processes along this stretch of the Illinois shoreline. The littoral deficit present within this reach has resulted in significant erosion of both the lakebed and beaches of Illinois Beach State Park, which directly affects the lacustrine, beach, and foredune habitats.

Littoral processes transport sediment from north to south where it settles along the Indiana shoreline. However, since the late 1800s, the government, communities, and individuals have been installing in-lake and riparian structures in support of navigation, recreation, and shore protection. This infrastructure has hardened much of the shoreline to a point where it contributes minimal sediment to the littoral drift and has impeded the natural movement of sediment through the littoral drift system. These actions have left Illinois Beach State Park increasingly vulnerable to shoreline erosion and coastal habitat degradation.

IBSP contains the only significant natural and underdeveloped shoreline remaining in Illinois. However, recreation, development, and industry have had a major influence on the physical structure of coastal habitat and the processes that created and sustained these habitats. Lacustrine process of littoral drift and wave/current patterns have been altered from their natural state through shoreline development; the construction of harbors, break walls, jetties, piers, etc. Coastal habitat can no longer rely on the natural replenishment and movement of sand down the coast since these structure now intercept a great deal of the material. The lakebed, beach, and dunes are dramatically affected by these altered conditions. It is apparent that littoral sediment accumulates where humans have built structures and erode away from natural areas where there are no effective structures. Specific problems affecting the ecosystems of the Illinois Beach State Park study area include:

- Reduced acres (quantity) of the native coastal communities and habitat
- Reduced richness and abundance (quality) of the native species per community type
- Reduced richness and abundance of higher level organisms including insects, amphibians, reptiles, birds and mammals
- Altered coastal geomorphology from manmade infrastructure and land use

# DRAFT

Opportunities to remedy these issues and return some stability in terms of littoral processes exist. Waukegan Harbor, a Federal navigation facility located to the south of IBSP traps as much as 80,000 cubic yards of clean, littoral sediment each year which must be dredged to maintain navigable conditions in the Federal channel. There are opportunities to utilize this sediment, which is readily available, for a variety of measures that could help restore natural littoral processes, stabilize the shoreline, and preserve/ restore coastal habitat. Based on the problems of the Illinois Beach State Park study area, the following opportunities exist to improve ecological resources within the lacustrine, beach, dune and bluff communities:

- Nourish the shoreline to reduce the erosion of beach and dune habitat
- Repair the littoral processes to preserve the quality and abundance of lacustrine, beach, and dune habitat
- Increase quantity and improve quality of habitat for hundreds of migratory and resident birds

## 2.3 HABITAT ASSESSMENT METHODOLOGY

Many methods are available to measure current ecosystem resource conditions and to predict future conditions of those resources. Habitat assessment methods developed for individual species may have limitations when used to assess ecosystem restoration problems and objectives. They do not consider communities of organisms and typically consider habitat in isolation from its ecosystem context. The assessment methodology selected for this study is community based and governed by how well the technique meets the needs of the study goals, objectives, and level of detail. The assessment methodology, or Habitat Suitability Index (HSI), focuses on native species richness and function of plant and fish communities. This HSI was developed to assess the ecological value of the proposed future without-project condition and any proposed management measures for the Illinois Beach State Park. This index is based on how native species of plants will respond to a given condition and will be quantified through use of the Floristic Quality Assessment (FQA). The FQA model has been certified by USACE for regional use within the Chicago District boundaries.

### Floristic Quality Assessment

The determination of “quality” with respect to plant assemblages has been the subject of much research and development since the mid 1970’s. Quality, as used in this study, is essentially an assessment of the degree to which native plant species are present within defined plant communities. Plants are exceptional indicators of short and long-term disturbance in terms of habitat function and structure. Out of the approximate 2,500 plant species known to occur in the Chicago Region, around one-third were not present before European colonization. Non-native species did not evolve within the same environmental conditions as the native species, and their persistence indicates a certain degree of functional disablement. Numerically describing the quality of an area using vegetation reflects the level of disturbance to the biological integrity of the site. In the Chicago Region, there is one commonly used approach that attempts to describe plant community quality with a simple numerical metric, which is the FQA (Swink and Wilhelm 1979). This assessment tool was designed to be used as an all inclusive method, not just as a way to identify high quality sites. The FQA was originally developed for the Chicago Region, but has since been developed for regions and states throughout North America. This method has been extensively studied as a quick and easily understood method of assessing the quality of plant communities.

# DRAFT

The FQA method specifically excludes the use of “indicator” species, instead assessing the sensitivity of individual plant species that inhabit an area. Species “conservatism” is used as its basis for assessment; conservatism being known as a level of tolerance each plant species exhibits to disturbance type, amplitude, and frequency, as well as fidelity to specific habitat types. As an area’s equilibrium is disturbed, the habitat’s capacity to absorb disturbance is weakened and the first plants lost will come from the high end of the conservatism spectrum. Therefore, what is being measured is the extent to which an area supports conservative native plants.

Based on species inventory, the FQA generates two essential metrics: the mean C, which is the average coefficient of conservatism for a site, and the floristic quality index (FQI), which is derived by multiplying mean C by the square root of N, the number of native species inventoried:

**Equation 1:**  $FQI = \bar{C}\sqrt{N}$

Where C is the coefficient of conservatism and N is the species richness. The FQI, therefore, is a function of both conservatism (function) and species richness (structure). Typically, larger sites have a greater number of habitat types and likely will have greater species richness. Generally, both mean C and FQI values are considered in the evaluation of an area or landscape unit. Based on statistical analysis of previous studies, the FQI shows a significant positive relationship to species richness (Ervin et al. 2006) and as such the mean C value represents the more comparable and accurate metric.

Each native species has been assigned a coefficient of conservatism (C), ranging from 0 to 10. C values were assigned to species within a predefined geographic area by Swink and Wilhelm (1979). A zero (0) is assigned to species that are highly tolerant to disturbance and are considered general in their habitat distribution and a ten (10) is assigned to species with a very low tolerance to disturbance which display very specific relationships to certain habitat types. The following descriptions of categories were used to assign coefficients of conservatism to native plant species:

- 0-3 Wide range of ecological tolerance and found in a variety of conditions
- 4-6 Mid range of ecological tolerance and a smaller variety of conditions
- 7-8 Low range of ecological tolerance and associated with advanced succession
- 9-10 Very low range of ecological tolerance and niche specific

It has been demonstrated that sites with mean C and Floristic Quality Index (FQI) values less than 2.8 and 20 respectively, as surveyed during the growing season, are degraded or derelict plant communities. Sites with mean C values that approach 3.2 are considered to be moderately disturbed. When site inventories yield mean C values greater than 3.4 or higher, one can be confident that there is sufficient native character present for the area to be at least regionally noteworthy - such landscapes are essentially irreplaceable in terms of their unique composition of remnant biodiversity. Sites with mean C and FQI values greater than 4.0 and 50, respectively, are rare and indicate highly significant natural areas of statewide importance.

With an active land management plan and time, the mean C and FQI values will reflect the extent to which conservative species are being recruited and the floristic quality is improving. In this way, the FQA method can be used to assess restoration management decisions, as well as to document floristic changes (positive or negative) in the landscape over time.

# DRAFT

## Habitat Suitability Index

Habitat outputs for the future without and future with project conditions were estimated over a 25-year period of analysis. In order to restore the ecosystem within the project site, ecosystem function and structure were assessed through the habitat assessment. Since FQA was the only model employed for this assessment, the habitat suitability index (HSI) is set equal to the mean C. Total habitat outputs, in terms of habitat units (HUs) were calculated by multiplying the affected area in acres (A) times the habitat suitability index (HSI).

$$\text{Equation 2: } HSI = \bar{C}$$

$$\text{Equation 3: } HUs = A(HSI)$$

## 2.4 FUTURE WITHOUT PROJECT CONDITIONS

Since the Section 204 authority provides for the beneficial use of dredging material from a Federal navigation project, this section discusses the future conditions of both Waukegan Harbor and IBSP.

### Waukegan Harbor Operations and Maintenance

As discussed in Section 1.4, the Waukegan Harbor Approach Channel requires annual navigation dredging in order to maintain navigable conditions at the Federal harbor. Over the past 5 years, shoaling within the Approach Channel has increased dramatically due to the loss of storage capacity in the updrift fillet beach. During this period, the rate of dredging has increased from the historical average of around 40,000 cubic yards per year to more than 60,000 cubic yards per year, with additional dredging still needed to maintain project depths in the Approach Channel. Historically, significant volumes of littoral sediment was trapped at the maintained channel of the Waukegan Power Station or settled along the updrift fillet beach prior to reaching Waukegan Harbor. However, conditions of the localized littoral cell seem to have substantially altered resulting in nearly the entire sediment supply of the littoral drift now reaching and settling in the Approach Channel. Thus, the rate of future shoaling in the Approach Channel is estimated to be nearly 80,000 cubic yards per year on average.

While future dredging quantities will fluctuate due to annual need and funding availability, the Approach Channel is expected to require average annual dredging of approximately 80,000 cubic yards per year for the near future. The Chicago District is currently preparing an Initial Assessment of conditions at Waukegan Harbor to ascertain whether there is a Federal interest in pursuing a new navigation improvement study under either the Section 216 or Section 107 authority. Beyond the immediate 10-year forecast displayed in Table 6, dredging activities are difficult to forecast due to the uncertainty surrounding the economic viability of the harbor, funding availability, or the potential impact of a future project carried out under the Section 107 or 216 authority. There is significant uncertainty in forecasting dredging activities and future dredging quantities could fluctuate substantially.

# DRAFT

Table 6 Ten year dredging forecast for the Waukegan Harbor Approach Channel

Year	Volume (CY)
2014	80,000
2015	80,000
2016	80,000
2017	80,000
2018	80,000
2019	80,000
2020	80,000
2021	80,000
2022	80,000
2023	80,000
Total (CY)	800,000
Average (CY/YR)	80,000

## Habitat loss due to Shoreline Erosion

Shoreline erosion is expected to continue at rates similar to those observed over the past couple decades. However, shoreline erosion can be quite variable and is dependent on a number of factors such as seasonal storm climate and lake level fluctuations. Within the North Unit of IBSP, areas with existing shore protection are expected to recede at a very slow rate and may even experience minor accretion. However, these protected areas do not provide the same high quality habitat as found along the unprotected reaches of the park. Areas immediately downdrift of shore protection are generally expected to experience the highest rates of erosion. In addition to actual erosion/accretion (e.g. loss or gain of beach material), shoreline positioning is highly dependent on Lake Michigan lake levels. While lake levels have remained consistently low since around the year 2000, each foot of lake level fluctuation results in an approximate 5-20 foot horizontal shift in shoreline positioning within the vicinity of the park. A lake level rise will shift the shoreline landward, while lake level drop will shift the shoreline lakeward, with the magnitude of the shift being dependent on the slope of the beach and nearshore profile.

Shoreline erosion is expected to continue at a similar rate as observed in the short-term analysis (2000-2011) and the long-term analysis (1872-1974), over the next 25-years, the most vulnerable portions of the shoreline are expected to recede by 250-300 feet (Figure 12) resulting in a loss of 30 acres of coastal habitat. As previously discussed, the erosion of the North Unit tends to supply the littoral sediment budget with sufficient sediment volumes to maintain a relatively stable budget along the shoreline of the South Unit. As such, the South Unit does not experience the severe erosion and habitat loss experienced within the North Unit therefore was not the focus area of this study.

The shoreline erosion will not only affect the sandy beach but it will affect the entire cross-sectional profile of the shoreline. Upland habitats will be degraded as the beach shifts landward and shallow water habitat will be lost due to the deepening of the nearshore profile. The overall net effect of this erosion will be the loss and degradation of multiple coastal habitats. While this process will result in a loss of habitat acres, it will not necessarily result in a decline in the habitat quality of the remaining coastal zone. While the study area has experienced continual erosion over many decades, it has

# DRAFT

consistently remained a high quality habitat. The field habitat assessment found the study area to possess a mean C value of 4.97, which correlates to a landscape of rare and highly significant characteristics. As the shoreline continues to recede, the total habitat units will decrease, but the habitat quality of the remaining project area (as defined by the HSI) is expected to remain relatively constant, though the project will experience a loss of total habitat units due to the decrease in project area.

The greatest habitat loss is expected at those areas which have historically exhibited the greatest shoreline erosion – most notably the area due south of the North Point Marina and the area south of 17<sup>th</sup> Street. On average, the North Unit is expected to lose a little more than 1 acre per year of coastal habitat, which equates to approximately 30 acres lost over the 25-year period, with the vast majority of habitat loss occurring within the two erosional hotspots.

When applying the HSI to the loss of acreage, the 200-acre North Unit coastal zone is expected to decrease from 994 habitat units (HUs) to 845 HUs for a total loss of 149 HUs. While Figure 13 displays habitat loss in a smooth linear manner, in reality habitat loss rates will fluctuate due to a variety of environmental factors that drive shoreline erosion such as storm climate and lake levels. Over the 25 year period of analysis, the study area is expected to exhibit 919 average annual habitat units (AAHUs) for the without project condition scenario (Table 7)

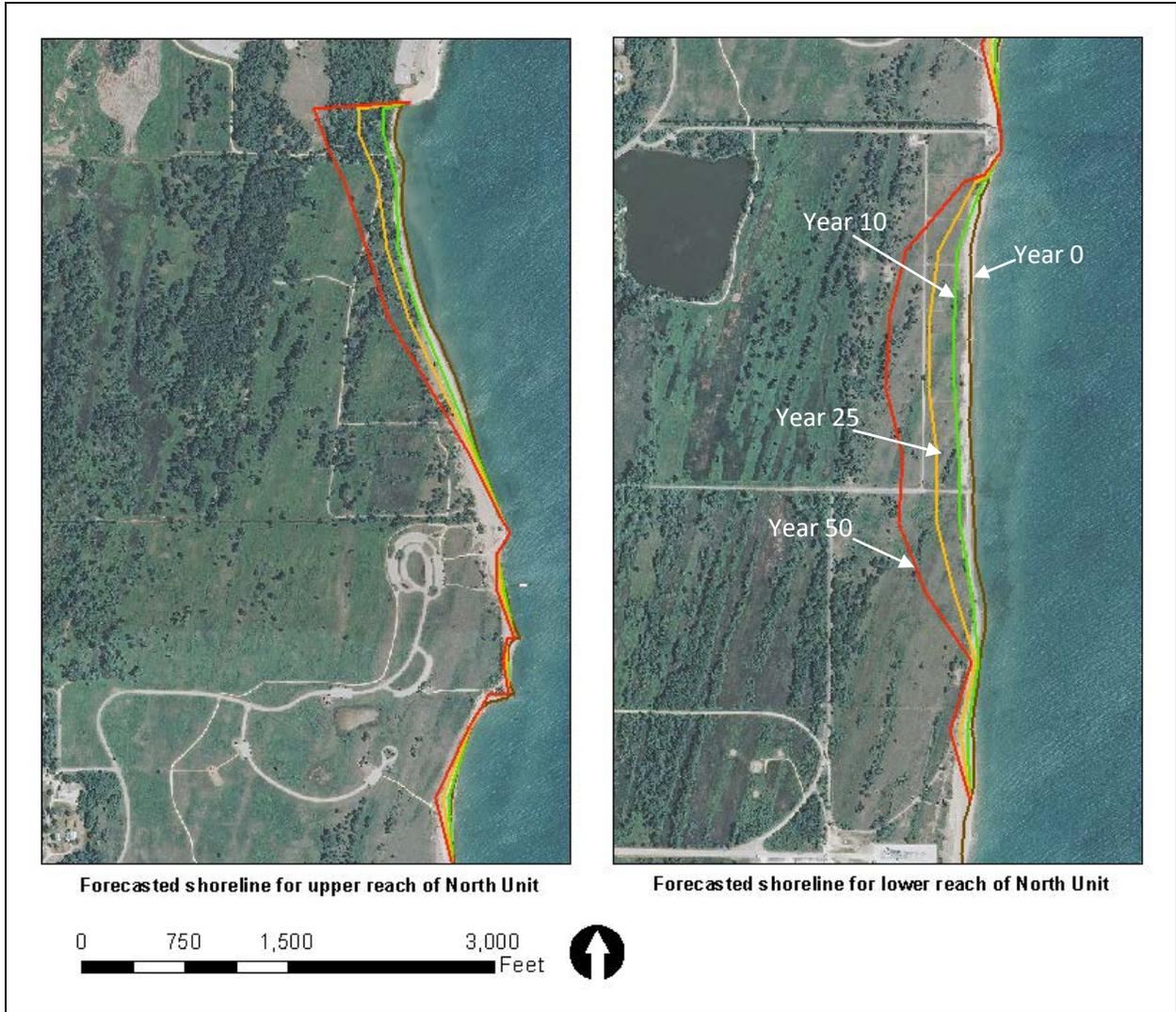


Figure 12 Forecasted without project shoreline erosion

# DRAFT

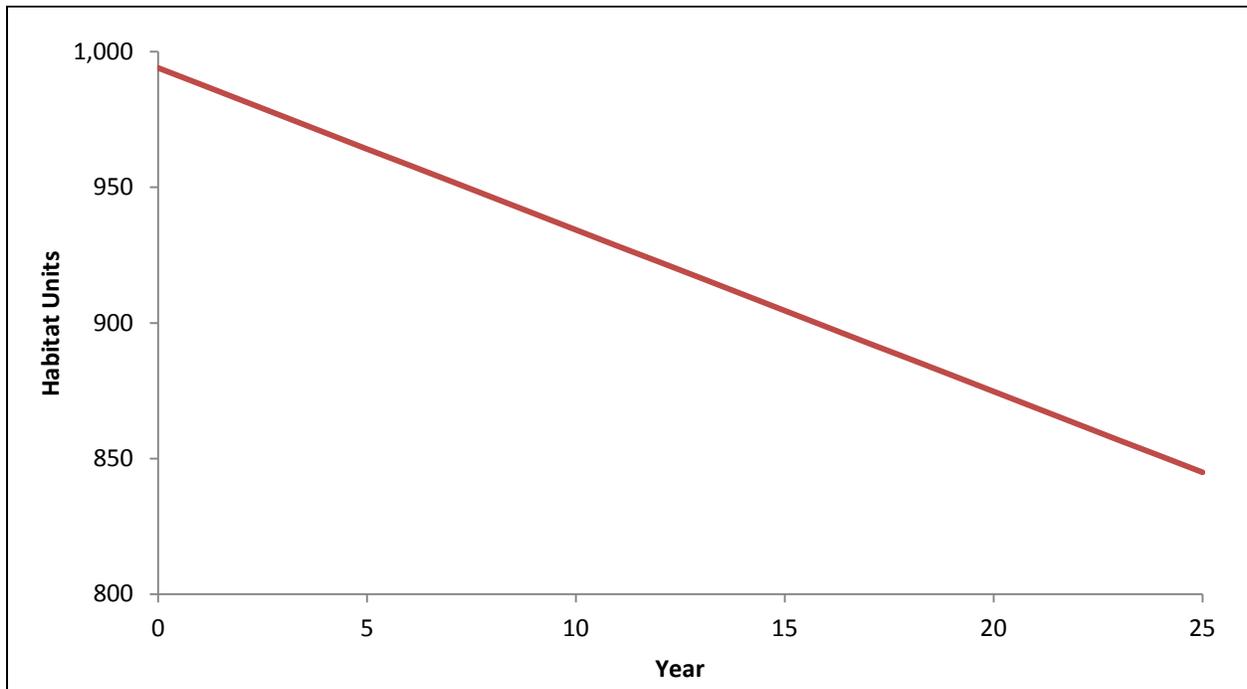


Figure 13 Expected average reduction in habitat units under the without project scenario

Table 7 Future Without Project Habitat Conditions

Year	Mean C	HSI	Acres	HUs
0	4.97	4.97	200	994
10	4.97	4.97	188	934
25	4.97	4.97	170	845
AAHUs = 919				

## State of Illinois Nourishment at IBSP

In the absence of a Section 204 project, modest sand nourishment of the beach and littoral zone is expected to occur through state actions. Over the past 20-years, the State of Illinois has collaborated in an ad hoc manner with the operators of the Waukegan Power Station (currently Midwest Generation) and USACE to secure dredged sand for Illinois Beach State Park. Outside of a Section 204 project, the State of Illinois has provided funding to USACE to cover the costs of transporting dredged material from Waukegan Harbor to Illinois Beach State Park. These actions were handled through a series of memorandums of agreement (MOAs) and were not part of a long-term management or restoration plan. In the absence of a Section 204 project, actions similar to these would likely continue to occur in an ad hoc manner, but would not be comprehensive enough to adequately repair littoral function, mitigate shoreline erosion, and restore/preserve coastal communities.

# DRAFT

## Additional Considerations

Several ongoing Chicago District investigations could potentially affect the future conditions of Illinois Beach State Park or Waukegan Harbor. The Zion Beach-Ridge Plan Restoration Section 506 project could result in native plant establishment and invasive species removal at Illinois Beach State Park. These actions would improve the quality of the existing beach and dune communities and may further stabilize the shoreline against erosion. Additionally, the Illinois Shore Erosion study is investigating the regional shoreline erosion problem along the entire “North Coast” of Illinois, which includes Illinois Beach State Park. A future project could stabilize the entire coastal zone thus reducing future erosion at the North Unit of the park. Also, the District is currently preparing a Section 216 Initial Appraisal of potential navigation improvement alternatives at Waukegan Harbor that would reduce long-term dredging requirements for the Federal navigation channel. One such alternative being considered is an updrift sediment trap just south of IBSP that could potentially result in an additional source of sediment for restoration activities at the park. However, given the significant uncertainty relating to the eventual outcome of these feasibility efforts, the effects of these potential Federal projects were not included in the future conditions forecast.

## **2.5 GOALS, OBJECTIVES & CONSTRAINTS**

The primary goal of this Feasibility Study is to determine a cost effective restoration plan, whether it be the No Action Plan or a plan with recommended restoration activities. The restoration plan must account for the interconnection between the littoral processes of Lake Michigan and the lacustrine, beach, and dune communities of Illinois Beach State Park.

### **National Ecosystem Restoration (NER) Goal**

The primary goal of this project is to beneficially use dredged material from the Waukegan Harbor Approach Channel to preserve and restore the critical lacustrine, beach, and dune habitat areas of Illinois Beach State Park for native plant and animal communities within the coastal zone of Lake Michigan.

### **Objectives**

Planning objectives are statements that describe the desired results of the planning process by solving the problems and taking advantage of the opportunities identified. The planning objectives must be directly related to the problems and opportunities identified for the study and will be used for the formulation and evaluation of plans. Objectives must be clearly defined and provide information on the effect desired, the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect.

### Federal Objective

The Federal objective of water and related land resources planning is to contribute to national economic and/or ecosystem development in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements and policies. The use of the term “Federal objective” should be distinguished from planning/study objectives, which are more specific in terms of expected or desired outputs whereas the Federal objective is considered more of a National goal. Water

# DRAFT

and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to study objectives and to the Federal objective. Contributions to national improvements are increases in the net value of the national output of goods, services and ecosystem integrity. Contributions to the Federal objective include increases in the net value of those goods, services and ecosystems that are or are not marketable.

Protection of the Nation's environment is achieved when damage to the environment is eliminated or avoided and important cultural and natural aspects of our nation's heritage are preserved. Various environmental statutes and executive orders assist in ensuring that water resource planning is consistent with protection. The objectives and requirements of applicable laws and executive orders are considered throughout the planning process in order to meet the Federal objective. The following laws and executive orders that specifically provided guidance for this study are not limited to, but include:

- Invasive Species (E.O. 13112)
- Nonindigenous Aquatic Nuisance Prevention & Control Act of 1990, as amended (16 U.S.C. 4701 et seq.)
- National Invasive Species Act of 1996 (Public Law 104 – 332)
- Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)
- Fish and Wildlife Coordination Act, as amended (16 USC 661)
- Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.)
- Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186)
- Clean Water Act of 1977, as amended (33 USC. 1251 et seq.)
- Safe Drinking Water Act of 1986 as amended (42 USC 201)
- National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
- Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901, et seq.)
- Protection and Restoration of the Great Lakes (E.O. 13340)
- Protection and Enhancement of Environmental Quality (E.O. 11514)
- Floodplain Management (E.O. 11988)
- Protection of Wetlands (E.O. 11990)
- Wild and Scenic Rivers Act of 1968 (16 USC 1271-1287 Public Law 90-542 82 Stat. 906)
- Federal Water Project Recreation Act, as amended (16 USC 460 (L),(12))

## Study Objectives

The overall objectives for this study is to identify beneficial uses for dredged material from the Waukegan Harbor Approach Channel for the purposes of protecting, restoring, or creating coastal ecosystems at Illinois Beach State Park. More specifically, this study seeks to promote natural littoral processes and provide stability to the lacustrine, beach, and dune ecosystems along the shoreline. The excessive infrastructure along the coastline has greatly impaired the littoral drift, which naturally sustains and creates coastal habitat features such as lake, beach, and dune. While the southeast shoreline of Lake Michigan is a naturally eroding geologic feature, human alternations and engineering have greatly exacerbated the rate of erosion along unprotected reaches of coastline. Given, the natural erosive nature of the shoreline, dramatically improving the quality (mean C) of the existing habitat may not be a cost-effective and attainable approach (Additional discussion on mean C can be found in Section 2.3). However, repairing littoral function and stabilizing coastal ecosystems is an achievable object that will help to mitigate the erosion and destruction of coastal habitat. Additionally, this study seeks to promote a more sustainable approach to regional sediment management.

# DRAFT

## NER Constraints

Planning constraints are items of consideration that limit the planning process and are used along with the objectives in the formulation and evaluation of solutions. The establishment of planning constraints is done in concert with the entire study team and in cooperation with stakeholders. A list of planning constraints for the NER purpose follows.

Opportunities are limited by:

- Highly impaired littoral drift processes
- Future dredging at Waukegan Harbor/ availability of dredged material
- Illinois Department of Natural Resources does not support the permanent removal of sands from the littoral zone of Lake Michigan

Any measures/alternatives implemented should:

- Avoid removing sediment from the littoral drift of Lake Michigan
- Avoid adverse impacts to the Federal or state listed species present on site

## 3. PLAN FORMULATION AND EVALUATION

The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the Corps' planning process. These steps are often referred to collectively as plan formulation. Plan formulation is an iterative process that involves cycling through these steps to develop a reasonable range of alternatives, and then narrow those plans down to a final plan, which is feasible for implementation.

Plan formulation for ecosystem restoration (ER) presents a challenge because alternatives have non-monetary benefits. To facilitate the plan formulation process, the methodology outlined in the Corps' Engineering Circular 1105-2-404, "Planning Civil Work Projects under the Environmental Operating Principles," 1 May 2003 was used. The steps in the methodology are summarized below:

1. Identify a primary project purpose. For this portion of the study, ecosystem restoration (ER) is identified as the primary purpose.
2. Formulate management measures to achieve planning objectives and avoid planning constraints, where measures are the building blocks of alternative plans.
3. Identify and select those sites most beneficial for ecological restoration.
4. Formulate, evaluate, and compare an array of alternatives to achieve the primary purpose (ER) and identify cost effective plans.
5. Perform an incremental cost assessment on the cost effective plans to determine the National Ecosystem Restoration (NER) plan.

### 3.1 SAND PLACEMENT OPTIONS

Under the Section 204 authority, alternative plans must involve the beneficial use of dredged material; for this study the source of material is the Waukegan Harbor Approach Channel. As discussed in Section 2.2, the driving source of ecological impairment is the erosion of the lacustrine, beach, and dune areas. As such, the most appropriate use of dredged material is for restoration and nourishment of the coastal zone habitat areas.

The USACE Coastal Engineering Manual (EM 1110-2-1100) discusses four primary methods for the placement of sand at beach nourishment/restoration sites:

- **Direct Placement:** In this method, the fill is placed at one time throughout the stretch of shore to be protected. This is the most frequently used method of placement. Usually, fill is pumped as a slurry onto the beach via hydraulic pipeline, then reworked into the desired configuration using earth-moving equipment. Additional pipeline is added in sections to extend the placement zone along the beach. Providing a sand dike behind which most of the discharge occurs will reduce loss of fines and provide better water quality in the area.
- **Nearshore Placement:** This method is appealing because large volumes of material can be made available at low costs by hopper dredges or split-haul barges. The principle is that the material, dumped in shallow water is transported towards the beach by wave action. Nearshore placement has been found to be more effective if the disposal depth is less than the closure depth, which allows the disposal sediment to be active and move towards the beach. Although nearshore dumping may be more economical, it does not provide the level of protection to upland property that direct placement on the beach does.

# DRAFT

- **Continuous Supply:** This method is typically used at a littoral barrier (i.e., navigation channel or inlet) where sand trapped at the updrift side of the barrier is bypassed to the beach on the downdrift side. These operations are more commonly thought of and designed as sand bypassing systems rather than as a method of beach nourishment. The purpose of this approach is to restore the natural flow of littoral transport at the location where such interruption occurs.
- **Feeder Beaches:** Feeder beaches involve the stockpiling of fill at the updrift end of the areas intended to receive the fill as the feeder beach erodes. This method is typically used for smaller projects where sand may be trucked in and/or access to discharge points on the beach is limited. The intent is for the stockpiled material to be distributed by natural littoral processes. Feeder beaches generally work well in areas that serve as a source of material for adjacent beaches. Examples are areas immediately downdrift from inlets or other man-made structures that form a littoral barrier. An erosional hot spot may be another area where a feeder beach is useful as a means for maximizing sand retention.

The placement method that has recently been employed by the Corps for disposal of Approach Channel dredged material at IBSP encompasses elements of the nearshore placement, continuous supply, and feeder beach methods. Additional discussion of the pros and cons of sand placement options can be found in *Appendix A – Coastal Analysis*.

## 3.2 \*MEASURE IDENTIFICATION

In general, two types of activities were initially investigated and considered for this project – physical repair and biological reestablishment. The physical measures utilize the available sandy material dredged from the Waukegan Harbor Approach Channel and focus on sand equilibrium, protection of plant communities from wave action, and maintaining/increasing the size of lacustrine, beach, and dune habitats. Biological measures are dependent upon fixing the current conditions of the physical environment and could include such activities as native species establishment or invasive species control. However, biological measures may not be appropriate for this project due to the narrow scope of the Section 204 authority, whose purpose is limited to the beneficial use of dredged material.

### Littoral Nearshore Placement (LNP)

This measure seeks to repair littoral function along the study area by supplementing the local sediment budget with the dredged sands. This measure would stabilize the shoreline of the entire reach and mitigate beach and dune habitat degradation driven by shoreline erosion. A previously established disposal zone located south of North Point Marina at the north end of the park would be utilized as the placement location. Sandy material dredged from the Approach Channel would be transported via barge approximately 8-miles from Waukegan Harbor to the placement location where it would be placed in the shallowest water practical (18-20 feet of water) using a bottom dump scow. The exact placement location would be determined based on current conditions at the time of dredging. The deposited sand would gradually migrate south along the nearshore zone via longshore sediment transport where it would counterbalance the annual littoral sediment deficit and naturally replenish the most sand starved pockets of coastal habitat. The dredged material would be placed and monitored in accordance with the existing dredging permit. This measure essentially replicates the recent placement methods utilized for Waukegan Harbor Approach Channel dredged material.

# DRAFT

This measure would be implemented over ten dredging cycles (approximately 80,000 cubic yards per cycle), which is expected to extend for approximately ten years and result in the total placement of approximately 800,000 cubic yards of sand into the littoral zone of Illinois Beach State Park.

## Potential Issues:

- The material must be placed within the closure depth of the nearshore profile, which is the active zone close to shore that is influenced by littoral processes. For this segment of shoreline, the depth of closure is estimated to be around 20-feet.
- Sediment placed in deeper waters may not be subject to longshore or cross-shore transport and therefore not provide significant benefits to the shoreline.

## Direct Beach Placement (DBP)

This measure proposes placing sandy dredged material directly onto the beach to restore and replenish the degraded beach and dune habitats in highly erosive areas. This measure would stabilize beach and dune habitat and provide erosion protection, particularly during high-energy storm events. The direct beach placement would potentially target two areas within the North Unit where erosion and habitat loss is most prevalent. The northern placement area would consist of a 2,000 foot stretch of unprotected shoreline located immediately south of North Point Marina, and the southern placement area would consist of a 3,000 foot stretch located south of 17<sup>th</sup> Street. Sandy dredged material from the Approach Channel would be transferred from the dredger to an upland staging area at Waukegan Harbor. The material would be allowed to briefly drain then loaded onto dump trucks where it would be transported via surface roads to the placement areas where it would be placed and spread with a bulldozer or other appropriate earth moving equipment. Hydraulic placement options were also considered but were determined unfeasible due to the substantial distance between Waukegan Harbor and Illinois Beach State Park. Pumping the material would be logistically impractical and cost prohibitive.

This measure would be implemented over ten dredging cycles (approximately 80,000 cubic yards per cycle), which is expected extend for approximately ten years and result in the total placement of approximately 800,000 cubic yards of sand directly onto the littoral zone of Illinois Beach State Park.

## Potential Issues:

- An appropriate upland staging area at Waukegan Harbor must be available during dredging to facilitate the transfer of sediment from the dredger to dump trucks.
- At the placement area, suitable access is needed to facilitate the transfer of sediment from truck to the beach.
- Beach widths must be wide enough to allow for adequate bulldozer operations well above the water line to ensure that Lake Michigan water quality is not impacted.
- This method would remove sand from the Lake Michigan littoral zone, which may not be policy compliant with the State of Illinois's Coastal Zone Management Plan.
- This method of sand placement will require the material to be handled several times leading to higher costs.
- Direct beach placement is significantly more expensive than the littoral nearshore placement and placement quantities could be limited by the Federal cost limit of \$5 million associated with Section 204 projects.

# DRAFT

## Native Plant Establishment/ Invasive Species Removal (NPE)

Potential biological measures were also considered to increase the diversity and populations of native plant communities and to control invasive species at the site. However, the biological measures were considered outside the scope of the Section 204 authority since they would be implemented somewhat separable from any sand placement measures. Additionally opportunities for implementing biological measures can be found in projects conducted under the Section 206 or Section 506 (GLFER) authorities such as the Zion Beach-Ridge Plain Restoration, Section 506 project.

### **3.3 MEASURE COSTS & ASSUMPTIONS**

Detailed discussion on planning level feature costs is presented in the *Appendix C - Cost Engineering*. Conceptual, planning level cost estimates were prepared for measures/features that were identified by the study team in conjunction with the non-Federal sponsors. These cost estimates do not represent complete project construction cost estimates, but rather individual measures of work or components of the entire project. The measures were used to provide an economic basis for the development of project alternatives. Once the project alternatives have gone through the plan formulation process, and additional design information was developed for the recommended plan, a more detailed and reliable cost estimate was performed. Estimates were developed using cost information from previous studies, lump sum and unit prices, and for plant, labor and material methods. Planning level unit costs were placed into a matrix to utilize the different costs for each measure of work.

**Table 8 Planning level measure cost estimate**

**\* Intentionally Left Blank**

The littoral nearshore placement cost estimate was developed based on the average price of similar work performed over the past five maintenance dredging contracts at Waukegan Harbor. In previous dredging contracts, the low cost disposal option (i.e. Base Plan) was included in the unit dredging cost while the alternative disposal at Illinois Beach State Park was included as an optional line item. Thus, this cost estimate represents the incremental costs above and beyond the Base Plan.

The direct beach placement plan was developed assuming dredged material is offloaded at rented dock space within Waukegan Harbor, then loaded onto dump trucks and hauled to IBSP where it would be graded with a dozer. The material could not be transported via barge because the park lacks a suitable docking location. This cost estimate also represents the incremental costs above and beyond the Base Plan.

#### **Cost Amortization**

Annualizing costs is a method whereby the project costs are discounted to a base year then amortized over the period of analysis. The base year for this project was determined to be the year in which the first phase of the project is to be completed (calendar year 2014). The period of analysis for this project is 25 years. Costs are compounded or converted to present value for the base year then amortized over the 25-year period of analysis to give the annual cost. The discount rate of 3.5% was determined by the FY14 Economic Guidance Memorandum 08-01, Federal Interest Rates for Corps of Engineers Projects. The method shown in the above table does this for each measure. Each year of every measure is either compounded or discounted to the base year. Calculation of the measures Average Annual Cost (AA Cost) is completed by multiplying the present value to the 25-year amortization factor.

# DRAFT

Table 9 Planning level average annual measure cost

\* Intentionally Left Blank

## Monitoring

Annual bathymetric surveying of the nearshore zone will be conducted to optimize the sediment placement locations, track erosion/accretion patterns of the nearshore profile, and evaluate the success of the restoration measures. Surveying will be conducted in conjunction with project surveys of Waukegan Harbor. The preliminary cost estimate for this activity is [REDACTED] per year.

## 3.4 \*ALTERNATIVE BENEFITS VS COSTS

The evaluation of habitat benefits is a comparison of the with-project and without-project conditions for each measure. Environmental outputs are the desired or anticipated measurable products or results of restoration measures and plans. The term “outputs” is often used interchangeably with “benefits” or “habitat units (HUs).” Ecosystem restoration proposals may possess multiple output categories, as well as other effects that may need to be considered, but the evaluation must at least address cost and an output category that has been determined to represent reasonable ecosystem restoration benefits. A comparison of the future without-project and future with-project HUs was performed in order to determine if a measure, or group of measures, will actually have beneficial effects to the affected area’s lacustrine, beach, and dune ecosystem. The measures for this study were evaluated with the HSI methodology described in Section 2.3.

The initial measure identification phase identified two potential physical measures involving the beneficial use of dredged material from the Waukegan Harbor Approach Channel. Given the limited availability of dredged material and the lack of biological measures, each physical measure was retained as a standalone alternative plan.

Both alternatives will provide the local littoral and beach system with the sediment volume needed to balance the annual sediment deficit and promote shoreline stability and protect coastal habitats, though at a dramatically different cost. Under the Littoral Nearshore Placement (LNP) plan, the dredged sand will be placed into the shallow water and not directly onto the beach. This activity will prevent additional sand loss from the beach and dune natural areas and possibly result in additional beach formation due to cross-shore wave energy naturally transporting the littoral sand landward. The applied sand will naturally transport south along the shore and supplement shoreline areas with greater need for sand supply. Ecosystem benefits will primarily be achieved through the avoidance of future habitat loss due to erosion.

Under the Direct Beach Placement (DBP) plan, the dredged sand will be directly applied to beach areas that currently experience the most severe erosion and coastal habitat loss. This process will allow for immediate benefits to the most threatened coastal habitat areas and likely lead to short-term beach habitat creation. However, due to the highly dynamic nature of the coastal zone much of the placed sand is expected to enter the littoral drift system via wind, waves, and littoral currents. From there, the material will be distributed along the shoreline in the same manner described for the LNP Plan. As with the LNP Plan, the DBP Plan will result in ecosystem benefits primarily through the avoidance of future habitat loss due to erosion.

# DRAFT

Following the 10-year sand placement phase, the current trend of coastal habitat loss induced by shoreline erosion will likely return to the project area. While, the future implementation of additional Federal or non-Federal projects could potentially mitigate long-term erosion at Illinois Beach State Park, there are currently no such projects ready for implementation thus this scenario was not considered for the future conditions forecast.

Both plans are expected to produce very similar ecosystem output over the 25-year period of analysis. The LNP plan is expected to halt habitat loss due to shoreline erosion, but is not expected to create any new habitat. The DBP plan is expected to perform in much the same manner, however since material is being placed directly onto the beach, some temporary habitat creation is expected (Figure 14).

Over the 25-year period of analysis, the LNP plan is expected to result in 966 average annual habitat units (AAHUs) across the 200-acre coastal zone for a gain of 47 net AAHUs. Due to the immediate benefits of placing sand directly on the beach, the DBP plan is expected to result in slightly more AAHUs (970) for a gain of 50 net AAHUs. While the LNP plan is expected to result in slightly lower ecosystem output, it can be implemented for only 5% of the cost of the DBP plan. Table 10 includes a breakdown of the costs and benefits of each plan. Furthermore, the DBP plan as it is currently formulated would exceed \$5 million Federal cost limit for Section 204 projects. A scaled down version of the DBP plan, which met the Federal cost limit would net significantly fewer AAHUs than the LNP plan and still be significantly more expensive than the LNP Plan.

Under the No Action Plan, no Section 204 project would be implemented at Illinois Beach State Park. Coastal communities will continue to degrade due to shoreline erosion. Dredged material from the Waukegan Harbor Approach Channel will be disposed according the current Base Plan, which is the least cost disposal plan consistent with sound engineering and environmental practices. The Base Plan consists of shallow water placement south of Waukegan Harbor. The Base Plan will provide no benefits to Illinois Beach State Park.

# DRAFT

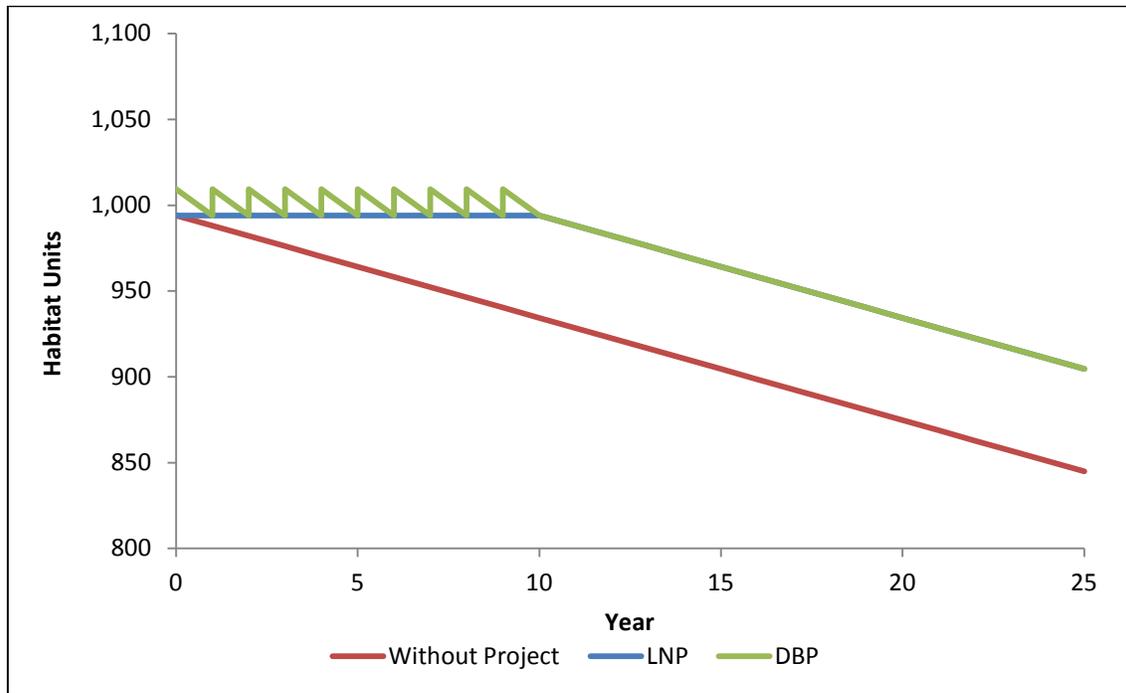


Figure 14 Comparison of future with project and future with project conditions

Table 10 Costs and benefits of alternative plans

Alternative Plan	Mean C	HSI	Acres	HUs	AAHUs	Net AAHUs	AA Cost
No Action	4.97	4.97	170	845	919	-	-
Littoral Nearshore Placement	4.97	4.97	182	905	966	47	\$43,368
Direct Beach Placement	4.97	4.97	182	905	970	50	\$915,320

### 3.5 COST EFFECTIVENESS/ INCREMENTAL COST ANALYSIS

Cost effectiveness and incremental cost analysis (CE/ICA) are two distinct analyses that must be conducted to evaluate the effects of alternative plans according to USACE policy. First, it must be shown through cost effectiveness analysis that a restoration plan’s output cannot be produced more cost effectively by another alternative. Cost effective means that for a given level of non-monetary output, no other plan costs less and no other plan yields more output at a lower cost. Subsequently, through incremental cost analysis, a variety of alternatives and various-sized alternatives are evaluated to arrive at a “best” level of output within the limits of both the sponsor’s and the USACE’s capabilities.

The subset of cost effective plans are examined sequentially (by increasing scale and increment of output) to ascertain which plans are most efficient in the production of environmental benefits. Those most efficient plans are called “best buys.” As a group of measures, they provide the greatest increase in output for the least increases in cost. They have the lowest incremental costs per unit of output. In most analyses, there will be a series of best buy plans, in which the relationship between the quantity of outputs and the unit cost is evident. As the scale of best buy plans increases (in terms of output produced), average costs per unit of output and incremental costs per unit of output will increase as

# DRAFT

well. The incremental analysis by itself will not point to the selection of any single plan. The results of the incremental analysis must be synthesized with other decision-making criteria (i.e., significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, reasonableness of costs) to help the study team select and recommend a particular plan.

## CE/ICA

The LNP and DBP Plans as well as the No Action Alternative were evaluated using IWR-Planning software. The cost effectiveness screening identified all three plans as Best Buy Plans since they all produced a different level of output (Figure 15). However, the incremental cost analysis revealed a clear breakpoint between the LNP plan and the DBP plan. The LNP plan produces 47 net AAHUs for an average annual cost of \$914/ unit. While the DBP plan does achieve a slightly higher output, 50 AAHUs, achieving those three extra units would require an incremental cost increase of close to \$300,000 per unit (Table 11 and Figure 16). The results of the CE/ICA analysis suggest that the LNP plan appears to be the National Ecosystem Restoration (NER) Plan. However, the result of CE/ICA is only one consideration for selecting the NER Plan. Additional selection criteria will be considered in the following sections.

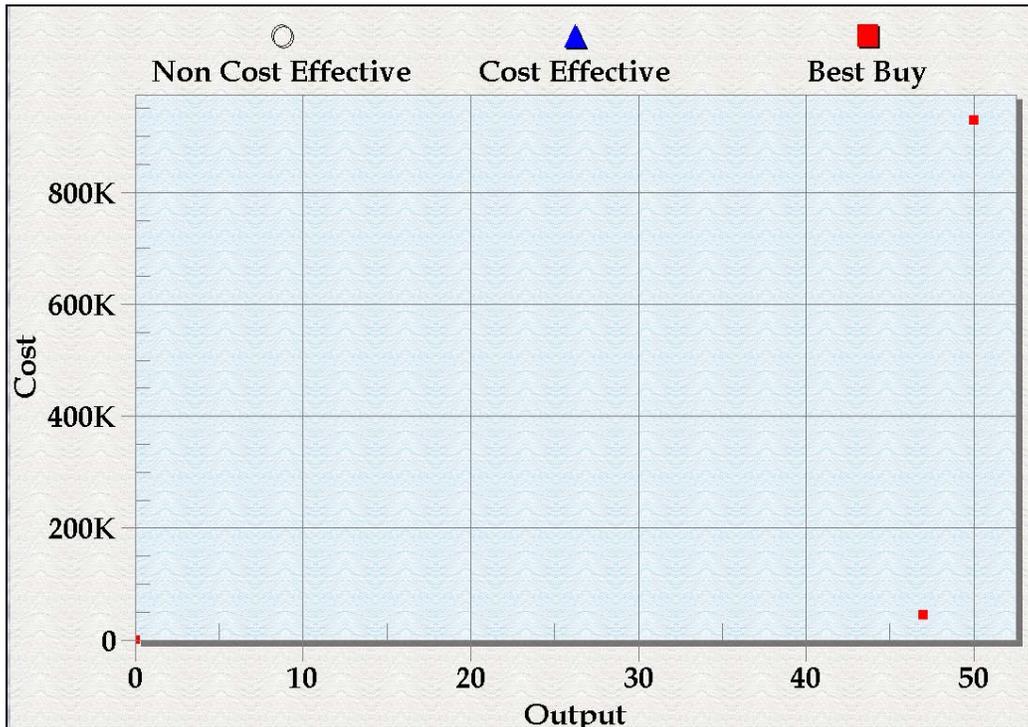


Figure 15 Cost effective analysis of alternative plans

Table 11 Incremental cost analysis of best buy plans

Alternative Plan	HUs	AA Cost	AA Cost/ HU	Inc HUs	Inc Cost	Inc Cost/ HU
No Action Plan	0	-	-	-	-	-
Littoral Nearshore Placement (LNP)	47	\$43,368	\$923	47	\$43,368	\$923
Direct Beach Placement (DBP)	50	\$915,320	\$18,306	3	\$871,952	\$290,651

# DRAFT

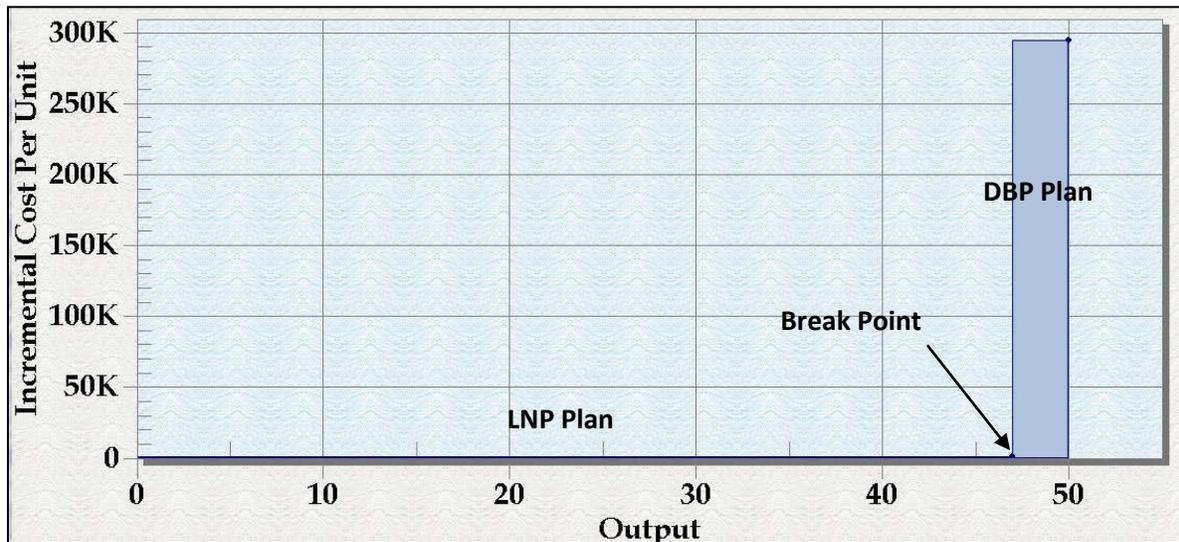


Figure 16 Incremental cost and benefits of best buy plans

### 3.6 SIGNIFICANCE OF ECOSYSTEM OUTPUTS

Due to the challenge of dealing with non-monetized benefits, the concept of output significance plays an important role in ecosystem restoration evaluation. Along with information from cost effectiveness and incremental cost analyses, information on the significance of ecosystem outputs will help determine whether the proposed environmental investment is worth its cost and whether a particular alternative should be recommended. Statements of significance provide qualitative information to help decision makers evaluate whether the value of the resources of any given restoration alternative are worth the costs incurred to produce them. The significance of the Illinois Beach State Park restoration and preservation outputs are herein recognized in terms of institutional, public, and/or technical importance.

#### Institutional Recognition

Significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Sources of institutional recognition include public laws, executive orders, rules and regulations, treaties, and other policy statements of the Federal Government; plans, laws, resolutions, and other policy statements of states with jurisdiction in the planning area; laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area; and charters, bylaws, and other policy statements of private groups.

Clean Water Act – Restore the chemical and biological integrity of the Nation’s waters. Restoration and preservation of littoral processes will not only improve habitat diversity, but also biogeochemical processes important in the filtering of precipitation and runoff. This in turn will mean the return of higher quality water to Lake Michigan.

Endangered Species Act of 1973 – All Federal departments and agencies shall seek to conserve endangered species and threatened species. The purpose of the act is to provide a means whereby the

# DRAFT

ecosystems upon which endangered and threatened species depend may be conserved and to provide a program for the conservation of such endangered and threatened species. Although no Federal listed species have been recorded from the project site, project features would be beneficial to Federally endangered and/or threatened species that may colonize the area in the future. In addition, restored site conditions could support colonization or continued habitation of state rare, threatened, and endangered species such as the following species: common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), marram grass (*Ammophila breviligulata*), sea rocket (*Cakile edentula*), seaside spurge (*Chamaesyce polygonifolia*), common juniper (*Juniperus communis*), downy Solomon's seal (*Polygonatum pubescens*), longnose sucker (*Catostomus catostomus*), and lake herring (*Coregonus artedii*).

Fish and Wildlife Conservation Act of 1980 – All Federal departments and agencies to the extent practicable and consistent with the agencies authorities should conserve and promote conservation of non-game fish and wildlife, and their habitats. Restoring and preserving the structure of lake, beach, and dune habitats will enhance the habitat diversity of the Illinois Beach State Park coastal system. All habitat improvements will benefit plants, invertebrates, fish, birds, amphibians, reptiles, and other wildlife.

EO 11514 Protection and Enhancement of Environmental Quality – The Federal Government shall provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life. Improving the quality of Illinois Beach State Park will help to restore and preserve the unique Zion beach plain ridge-Lake Michigan interface, an area that once had many environmental treasures.

EO 11990 Protection of Wetlands – Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. This project will restore and protect dune, beach, and lacustrine communities, while protecting adjacent high quality habitats.

EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds – Federal agencies shall restore or enhance the habitat of migratory birds and prevent or abate pollution or detrimental alteration of the environment for migratory birds. This project will benefit native plant diversity and thus provide better forage and shelter to numerous migratory bird species.

EO 13340 Establishment of Great Lakes Interagency Task Force - Identified the Great Lakes as a national treasure and defined a Federal policy to support local and regional efforts to restore and protect the Great Lakes ecosystem through the establishment of regional collaboration. A number of activities have been accomplished by Federal agencies working in partnership with state, tribal and local governments in response to the Executive Order. The USACE has been a major participant in these activities. The Executive Order established the Great Lakes Interagency Task Force. The Task Force worked with the governors of the eight Great Lakes states, mayors, and tribal leaders to establish the Great Lakes Regional Collaboration. The initial goal of the Collaboration was to develop a "strategy for the protection and restoration of the Great Lakes" within 1 year. The Collaboration developed the strategy by using teams consisting of 1,500 stakeholders for the following eight priority issues identified by the Great Lakes governors and mayors with items in bold relative to this project:

# DRAFT

1. Toxic contaminants
2. Non-point source pollution
- 3. Coastal health**
- 4. Habitat/species**
5. Contaminated sediments/AOCs
6. Indicators/information
7. Sustainable development
8. Invasive species

## Technical Recognition

Technical recognition means that the resource qualifies as significant based on its “technical” merits, which are based on scientific knowledge or judgment of critical resource characteristics. Whether a resource is determined to be significant may of course vary based on differences across geographical areas and spatial scale. While technical significance of a resource may depend on whether a local, regional, or national perspective is undertaken, typically a watershed or larger (e.g., ecosystem, landscape, or ecoregion) context should be considered. Technical significance should be described in terms of one or more of the following criteria or concepts: scarcity, representation, status and trends, connectivity, limiting habitat, and biodiversity.

Scarcity is a measure of a resource’s relative abundance within a specified geographic range. Generally, scientists consider a habitat or ecosystem to be rare if it occupies a narrow geographic range (i.e., limited to a few locations) or occurs in small groupings. Unique resources, unlike any others found within a specified range, may also be considered significant, as well as resources that are threatened by interference from both human and natural causes.

Scarcity is represented at Illinois Beach State Park by the presence of significant and unusual topographic features including beach, foredune, ridge, and swale habitat. Illinois Beach State Park lies within the Illinois Beach Resource Rich Area (RRA) which has the second highest percentage of urban/built-up acreage (63%). Only 24% of the RRA contains natural habitats such as forest, wetland, and grassland. This narrow band of habitats is comprised of beaches, sand dunes, swales, marshes, sand prairies, savannas, and oak forests that occur along the coast of Illinois as a result of the gradual lowering of Lake Michigan. The Illinois Beach RRA is one of the most biologically diverse areas in the state with more than 650 species of plants having been identified from this area.

Representation is a measure of a resource’s ability to exemplify the natural habitat or ecosystems within a specified range. The presence of a large number and percentage of native species, and the absence of exotic species, implies representation as does the presence of undisturbed habitat. Illinois Beach State Park contains some of the least disturbed natural areas within the southwestern Lake Michigan coastal zone. This project would repair littoral processes to a more representative form, which will stabilize and enhance lacustrine, beach, and dune habitat communities.

Status and Trends of the Illinois Beach State Park describe a once highly functional lacustrine habitat that has become degraded primarily due to effects of urbanization from the ever expanding Chicago metropolitan area. However, Illinois Beach State Park is part of the Illinois Beach RRA which is one of the most ecologically rich and unique areas in Illinois. This RRA is comprised of a diverse array of habitats that were created because of its proximity to the shores of Lake Michigan. Illinois Beach State Park contains many of these unique habitats. With implementation of the proposed project, Illinois

# DRAFT

Beach State Park's distinctive habitats may be restored to their former excellence and provide beneficial outputs to terrestrial and aquatic wildlife.

Connectivity of Illinois Beach State Park to other natural areas is crucial for fish species as well as migratory birds. Illinois Beach State Park is one of several areas along the Lake County lakeshore to be undergoing restoration or proposed restoration. Additional areas where coastal restoration has been proposed to occur within the next decade are Moraine Park, Central Park, Millard Park, and Rosewood Park, and Fort Sheridan. Extensive restoration of this coastline will provide connected high quality habitat for wildlife, especially migrant birds that follow the Lake Michigan Flyway during spring and fall migration. In addition, Illinois Beach State Park is located within the Illinois Beach RRA, which encompasses 49,172 acres stretching from Cook County to Lake County, Illinois.

Limiting Habitat exists at Illinois Beach State Park. Currently, one federally endangered bird, Piping Plover (*Charadrius melodus*) is found within the project area. In addition, numerous state listed species have been recorded. The project will help preserve critical coast habitat and support the continued habitation of state rate, threatened, and endangered species such as: common tern (*Sterna hirundo*) and Forster's tern (*Sterna forsteri*) as well as the longnose sucker (*Catostomus catostomus*) and lake herring (*Coregonus artedii*) which may use surrounding streams adjacent to the project area. Several state listed plant species were recorded within the project area and they include: marram grass (*Ammophila breviligulata*), Kalms' St. John's-Wort (*Hypericum kalmianum*), Bearberry (*Arctostaphylos uva-ursi*) Creeping Juniper (*Juniperus horisontalis*), Northern Cranesbill (*Geranium bicknellii*) and beach rocket (*Cakile edentula*).

Biodiversity within the Chicago Region is in decline due to the replacement of a number of high quality species that have links throughout the food web and ecosystem, with species that have few or no users in the system. As more species are lost, a cascade effect results in the loss of the species that are dependent on the ones immediately affected by the problem. Through the restoration and preservation of lacustrine, beach, and dune habitat; diversity would increase logarithmically along with existing populations of fish, amphibians, and other species.

### **3.6.1 Acceptability, Completeness, Effectiveness, and Efficiency**

Acceptability, completeness, effectiveness, and efficiency are the four evaluation criteria specified the USACE uses in the screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans.

#### **Acceptability**

An ecosystem restoration plan should be acceptable to state and Federal resource agencies and local governments. There should be evidence of broad-based public consensus and support for the plan. A recommended plan must be acceptable to the non-Federal cost-sharing partner. However, this does not mean that the recommended plan must be the locally Preferred Plan.

The No Action Plan is not acceptable to local Federal and state agencies' representatives including the non-Federal sponsor. The No Action plan does not accomplish the goals of restoring littoral function and preserving coastal communities. The Littoral Nearshore Placement Plan is the most acceptable plan to Federal, state, and local agencies since maximum benefits are achieved in a cost effective manner.

# DRAFT

## **Completeness**

A plan must provide and account for all necessary investments or other actions needed to ensure the realization of the planned restoration outputs. This may require relating the plan to other types of public or private plans if these plans are crucial to the outcome of the restoration objective. Real estate, operations and maintenance, monitoring, and sponsorship factors must be considered. Where there is uncertainty concerning the functioning of certain restoration features and an adaptive management plan has been proposed it must be accounted for in the plan.

The Littoral Nearshore Placement plan is the most complete alternative plan in that it addresses all of the resource problems identified at Illinois Beach State Park. The plan will address the impaired littoral function and instability of coastal communities due to shoreline erosion.

## **Effectiveness**

An ecosystem restoration plan must make a significant contribution to addressing the specified restoration problems or opportunities (i.e. restore important ecosystem structure or function to some meaningful degree). The LNP plan makes significant contributions to addressing the problems identified in Section 2.2. Based on planning level assessments, the plan would help repair littoral function and preserve critical coastal habitats along the North Unit of Illinois Beach State Park while avoiding any of the identified planning constraints.

## **Efficiency**

An ecosystem restoration plan must represent a cost-effective means of addressing the restoration problem or opportunity. It must be determined that the plan's restoration outputs cannot be produced more cost effectively by another agency or institution. Using the IWR-Plan software, it was determined that the Littoral Nearshore Placement plan was the most cost-effective plan for addressing the resource problems of the study area.

The Littoral Nearshore Placement plan provides outputs that cannot be produced more cost effectively by another agency or institution. All components of the LNP Plan have passed tests of redundancy, habitat output significant, cost effectiveness, and Corps Authority expertise.

### ***3.6.2 Risk and Uncertainty***

When the costs and outputs of alternative restoration plans are uncertain and/or there are substantive risks that outcomes will not be achieved, which may often be the case, the selection of a recommended alternative becomes more complex. It is essential to document the assumptions made and uncertainties encountered during the course of planning analyses. Restoration of some types of ecosystems may have relatively low risk. For example, removal of drainage tiles to restore hydrology to a wetland area. Other activities may have higher associated risks such as restoration of coastal marsh in an area subject to hurricanes. When identifying the NER plan the associated risk and uncertainty of achieving the proposed level of outputs must be considered. For example, if two plans have similar outputs but one plan costs slightly more, according to cost effectiveness guidelines, the more expensive plan would be dropped from further consideration. However, it might be possible that, due to uncertainties beyond the control or knowledge of the planning team, the slightly more expensive plan will actually produce greater ecological output than originally estimated, in effect qualifying it as a cost effective plan. But

# DRAFT

without taking into account the uncertainty inherent in the estimate of outputs, that plan would have been excluded from further consideration.

For this project, risk and uncertainty is most prevalent with respect to future dredging, placement location, and climate uncertainty. The proposed project features are completely reliant on the continued dredging of the Waukegan Harbor Approach Channel. For planning purposes, dredging was forecasted to continue on a yearly basis with an annual dredging quantity of 80,000 cubic yards per year. In reality, annual dredging quantities will fluctuate contingent on need and funding availability. Without available dredged material, the beneficial use activities recommended in this report cannot be executed.

Identifying appropriate placement locations for the dredged material at Illinois Beach State Park introduces uncertainty to the project. The coastal zone is highly dynamic, thus the most beneficial placement location at the park could change from year to year. For the Littoral Nearshore Placement Plan, dredged sand must be placed within the depth of closure to ensure the sand remains in the nearshore littoral zone. At Illinois Beach State Park, this depth is estimated to be 20 feet, though project monitoring will allow this depth to be more accurately defined. For the Direct Beach Placement Plan, dredged sand should be placed in the most eroded and degraded areas which will fluctuate from year to year. Additionally, there must be enough beach area to allow earth-moving equipment to operate without violating Lake Michigan water quality requirements.

Natural fluctuations in climate patterns affect Lake Michigan water levels. Lake Michigan has been experiencing sustained low water conditions for more than a decade, which adversely affects commercial navigation and increases dredging requirements at navigation projects such as Waukegan Harbor. Additionally, lower water levels also shift the shoreline lakeward therefore increasing beach and dune area. A return to higher lake levels may decrease dredging requirements at Waukegan Harbor and inundate a greater area of the coastal zone at Illinois Beach State Park thus increasing environmental stressors on the existing coastal communities.

### **3.7 SELECTION OF THE NATIONAL ECOSYSTEM RESTORATION PLAN**

When selecting a single alternative plan for recommendation from those that have been considered, the criteria used to select the NER plan include all the evaluation criteria discussed above. Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness. Additional factors to consider include the following items.

#### **Partnership Context**

This beneficial use/ restoration project was planned in cooperation with the Illinois Department of Natural Resources (IDNR). This project makes a significant contribution to regional, national, and international programs that include the Lake-wide Management Plans and the Coastal Zone Management Plan.

#### **Reasonableness of Costs**

All costs associated with a plan were considered and tests of cost effectiveness and incremental cost analysis have been satisfied for the alternatives analyzed. The cost estimate underwent an Agency

# DRAFT

Technical Review (ATR) and was certified by the Walla Walla Cost Engineering Mandatory Center of Expertise. An abbreviated risk analysis was also performed to establish the level of confidence associated with the estimated costs. All costs associated with a plan were considered and tests of cost effectiveness and incremental cost analysis have been satisfied for the alternatives analyzed. The cost estimates were based on current ecosystem restoration projects of similar type that are in construction.

Having established confidence in the estimated implementation costs, the remaining test of reasonableness is to assess the value of the resource to be improved based on the cost to implement the improvement. The importance of the Great Lakes in terms of habitat and human uses has been documented through numerous sources. The importance of the Great Lakes to the nation was established through Executive Order 13340. As previously noted, the Great Lakes is one of the world's largest bodies of freshwater, providing drinking water, food, recreation, and aesthetics for about 32 million people.

In terms of non-monetary values, the ecosystem of Illinois Beach State Park and its importance to the region is emphasized by the institutional significance of being surveyed by the Illinois Natural Areas Inventory. Observation of fish and plant ecology in the immediate area classifies this site as critical habitat for rare and conservative flora (e.g. state listed marram grass) and fauna, inclusive of resident and migratory birds. These analyses conclude that restoration and preservation measures are well worth the investment.

## **The NER Plan/ Preferred Plan**

The plan that reasonably maximizes net national ecosystem restoration benefits, consistent with the Federal objective, is identified as the NER plan. Two alternative plans and the No Action plan were evaluated using the cost effective/ incremental cost analysis (CE/ICA) procedures. The Littoral Nearshore Placement (LNP) plan was found to be more cost effective than the Direct Beach Placement (DBP) plan and deemed a "cost effective" and "best buy" plan in terms of costs per benefits. The LNP plan was compared to the No Action using in the incremental cost analysis.

The LNP plan will result in 47 net AAHUs over the approximately 200-acre coastal zone, and was the only best buy plan that addressed the resource problems of the site at a reasonable cost. The No Action Plan does not address the resource problems of the study area and was not deemed an acceptable alternative. In keeping with the NER objective of water resources planning, the plan that reasonably maximizes ecosystem benefits compared to costs is selected for implementation unless there are compelling reasons not to do so. Therefore, the NER plan, the Littoral Nearshore Placement Plan, is also the Preferred Plan (Figure 17). A discussion of 1) existing survey, utility, and topographic; 2) design criteria, engineering methods and procedures that were used to layout the project features shown on *Plate EX-01*; and 3) the methods used and calculations developed for construction quantities; along with an accompanying plate are contained in *Appendix B – Civil Design*.

DRAFT

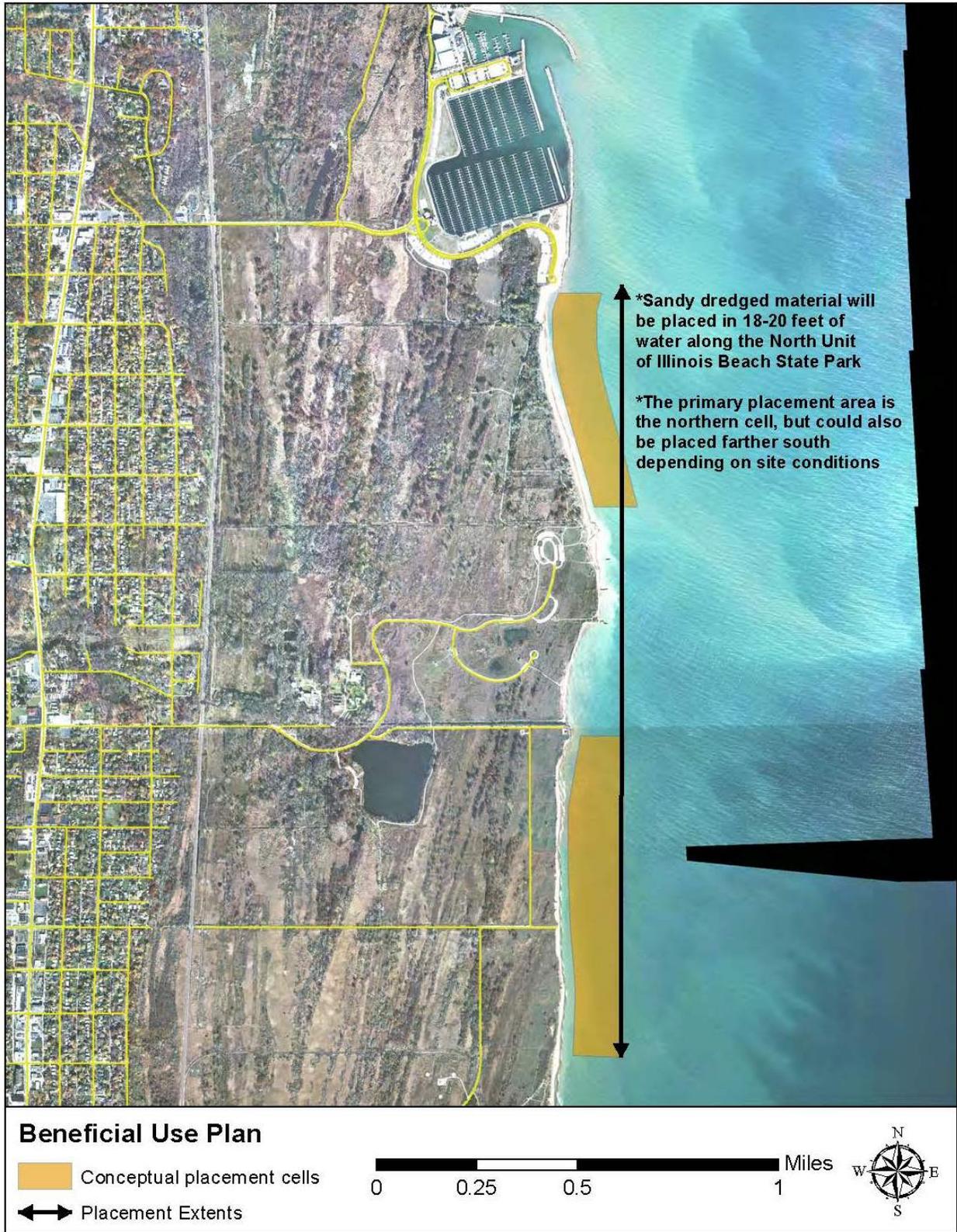


Figure 17 NER/ Preferred Plan for IBSP Section 204

# DRAFT

## 4. \*ENVIRONMENTAL ASSESSMENT

This chapter involves identification of direct environmental effects to current conditions stemming from any of the proposed alternatives if they were to be implemented. All sections denoted with an asterisk are pertinent to the Environmental Assessment.

### 4.1 NEED & PURPOSE

Over the past several centuries, a combination of stressors related to both anthropogenic influences and natural processes have led to the deterioration of nearly all coastal habitats within Illinois. Illinois Beach State Park represents one of the few remaining areas, which has not been heavily altered by urbanization and coastal engineering. The park supports 14 natural communities and provides habitat for more than 500 plant species and 300 animal species, including several threatened and endangered species. However, shoreline erosion, which has been exacerbated by a multitude of constructed shoreline protection and navigation structures throughout the Lake Michigan coastline, continues to threaten the dune, beach, and lacustrine habitats of the park, particularly along the shoreline of the park's North Unit.

The Illinois Department of Natural Resources has requested that the Chicago District, US Army Corps of Engineers initiate a study under Section 204 Beneficial Use of Dredged Material to ascertain the feasibility of utilizing clean dredged material from nearby Waukegan Harbor for the purposes of protecting, restoring, or creating coastal ecosystems at Illinois Beach State Park.

### 4.2 ALTERNATIVES CONSIDERED

Section 3 details the plan formulation process and the selection of the NER/ Preferred Plan. An iterative screening process ultimately looked at three alternatives. The alternatives consisted of no action, littoral nearshore placement and direct beach placement. After considerations for habitat benefits, costs, risk and uncertainty and plan acceptability, completeness, efficiency, and effectiveness, the NER plan was selected. The Littoral Nearshore Placement Plan was selected as the NER/ Preferred Plan which recommends placing Waukegan Harbor Approach Channel dredged material into the littoral zone offshore of the Illinois Beach State Park North Unit.

### 4.3 THE AFFECTED ENVIRONMENT

The affected environment is described in detail in Section 2 Inventory & Forecasting.

### 4.4 DIRECT & INDIRECT EFFECTS OF THE PREFERRED PLAN

Affects for the Future Without Project Condition or No Action are provided in Section 2.4.

#### 4.4.1. *Physical Resources*

##### **Climate**

The minor scale of the proposed project would not be able to affect the regional climate. No significant adverse effects are expected as a result of implementing the proposed project.

# DRAFT

## Geology & Glacial Stratigraphy

The proposed project would not adversely affect geology or glacial stratigraphy. All of the proposed features under the proposed project are too small in scale to affect the local geology and glacial stratigraphy.

## Soils

The result of the proposed project will provide beneficial effects to the soils within the project area. First, the placement of the sand will prevent erosion and loss of soils throughout the park. Secondly, the proposed will restore the accumulation of sands and aid in the transport of sandy soils throughout the coastal habitat and into the back dune habitat. No adverse effects to soils are expected to occur from implementation of the Preferred Plan.

## Fluvial Geomorphology & Topography

Implementation of the proposed project would not result in any impacts to fluvial geomorphology or topography. No adverse affects to fluvial geomorphology and topography are expected resulting from implementation of the Preferred Plan.

## Littoral Processes

Only beneficial effects to littoral processes are expected from the implementation of the proposed project. The project will restore the littoral drift of sand along the coastal habitat. No adverse affects to the littoral process resulting from implementation of the Preferred Plan.

## Hydrology, Hydraulics & Land Use

Hydrology: Implementation of the proposed project will have minimal effects on the surrounding hydrology. Without the project, sections of the North Unit may become more susceptible to erosion and habitat degradation due to stormwater runoff. The project will increase sand supply and support beach and dune plant communities thus making the coastal zone more resistant to erosion caused by overland stormwater flows.

Hydraulics: Beneficial impacts to the coastal hydraulics are expected. Placement of the sand will help replenish and increase the total acres of beach and dune habitat through wave action. The project would not adversely affect fluvial or coastal hydraulics.

Land Use: Implementation of the proposed project would result in no changes to the current land uses. No adverse impacts are expected to occur from implementation of the proposed study.

## Water Quality

The proposed project is not expected to adversely affect water quality in Lake Michigan. Elutriate sampling and monitoring during previous dredging events indicate that the proposed source sediment, Waukegan Harbor Approach Channel, is generally coarse grained, low in nutrients and free from anthropogenic impacts. Localized, temporary turbidity at the sediment placement location is the only anticipated impact. The transportation of dredged material (barges pushed by tugs) would present a

# DRAFT

similar risk to water quality as numerous other vessels operating on Lake Michigan and would not be significant.

## **Air Quality**

Lake County, Illinois is considered a non-attainment zone for PM-2.5 (particulate matter). The proposed project will not impact the status of conformity for Lake County. The only air impacts expected are diesel equipment emissions associated with the dredging equipment and transport tugs. These short duration, temporary impacts would be de minimis; a more detailed general conformity analysis was not conducted.

## **4.4.2. Ecological Resources**

### **Plant Communities**

Implementation of the proposed project would ultimately improve beach and dune plant communities. Through time, the beach/dune habitat may increase or maintain the current number of acres and allow for native flora and fauna to colonize and thrive within the project area. There are no significant adverse effects expected.

### **Mammalian Community**

The proposed plan will benefit mammalian communities. The preferred plan will preserve approximately 30 acres of beach and dune habitat that is used by a number of mammals. The preserved habitat will ensure that mammals have the 30 acres for forage, refuge, and reproductive habitat. No adverse effects are expected.

### **Resident & Migratory Birds**

The project area is within a major fly-zone for migratory birds. Many of these species concentrate along the western shore of Lake Michigan. The preferred plan will ensure that 30 acres of important and rare coastal habitat is preserved for used of migratory and resident bird species alike. No adverse impacts are expected from the implementation of the project.

### **Reptiles and Amphibians**

Similar to the above impacts, only beneficial impacts are expected to occur to reptile and amphibian populations within the study area. The preservation of the 30 acres provides habitat that would otherwise be lost via erosion and provides the necessary habitat for reptiles and amphibians.

### **Aquatic Communities**

The primary habitats in which sand placement would affect is sand flat and surf zone. The method in which sand would be assimilated into the drift pattern and distributed is through natural wave action and storm surges. The sand being used is taken from the same littoral drift pattern so there would be no change in grain size that may affect macroinvertebrate communities or fish spawning habitat. The macroinvertebrate and fish communities of these habitats are adapted to the sand continuously shifting, suspending and smothering. It is also expected that there would be no net increase in turbidity based on the highly dynamic wave conditions of Lake Michigan's surf zone and that the sand particles are the

# DRAFT

same particles reintroduced into the drift pattern. The constant wave action churns up the smaller particles of sand that creates a permanent suspension of sand, which is actually necessary to sustain the minnow species (*Rhinichthys cataractae*, *Notropis stramineus*, *Notropis atherinoides*, *Notropis hudsonius*) dominating these habitat zones. These species actually depend on the shifting and suspending sands to properly incubate their eggs and provide predatory protection for both juvenile and adult fishes. Direct and indirect effects resulting from the Preferred Plan are considered negligible since the sand placement area is so small compared to the vast sand flats that occur within the littoral zone of IBSP, the macroinvertebrate and fish communities are adapted to these ever dynamic conditions and that turbidity and sand smothering is part of everyday life for these organisms. The Preferred Plan would neither adversely or beneficially affect aquatic communities within the littoral and surf zones of Lake Michigan.

## Threatened & Endangered Species

Implementation of the proposed project would only benefit endangered or threatened species if they colonize the project site. Currently, one federally endangered bird, Piping Plover (*Charadrius melodus*) is found within the project area. In addition, numerous state listed species have been recorded. The project will help preserve critical coast habitat and restore littoral drift and perhaps maintain habitat used by common tern (*Sterna hirundo*) and Forster's tern (*Sterna forsteri*) as well as the longnose sucker (*Catostomus catostomus*) and lake herring (*Coregonus artedii*) which may use surrounding streams adjacent to the project area. Several state listed plant species were recorded within the project area and they include: marram grass (*Ammophila breviligulata*), Kalms' St. John's-Wort (*Hypericum kalmianum*), Bearberry (*Arctostaphylos uva-ursi*) Creeping Juniper (*Juniperus horizontalis*), Northern Cranesbill (*Geranium bicknellii*) and beach rocket (*Cakile edentula*). The USACE has determined that there would be no adverse affects, temporary or minor, to threatened and endangered species.

Coordination with the U.S. FWS was commenced on 26 July 2011 with a project scoping letter. Upon review of this document, the U.S. FWS concluded that the project is not likely to adversely affect federal or state listed species, and their letter dated 21 September 2011, precluded the need for further consultation on the IBSP Section 204 study as required under Section 7 of the Endangered Species Act of 1973, as amended.

### 4.4.3. Cultural Resources

#### Archaeological & Historical Properties

The proposed project would have no adverse impact on archaeological or historic properties including underwater shipwrecks. Illinois Historic Preservation Agency was contacted (Letter dated 16 July 2011) and replied with confirmation of no objections to the undertaking of the proposed plan (letters dated 8 August 2013 and 8 August 2011). In the event cultural resources are discovered during this project, work in that area will stop and the Illinois State Historic Preservation Agency will be notified.

#### Land Use History

The proposed project would result in no impacts to land use history. The project area is currently in a state park and will only preserve portions of the park and maintain its use for public enjoyment.

# DRAFT

## Social Properties

During construction, boat traffic would be localized and intermittent during dredging and sand transport. Employment could increase slightly during construction, and the region's labor force should provide the necessary workers. Noise levels would be increased during construction as a result of increased barge traffic. Any aesthetic impacts would be negligible and temporary. The proposed project would have no significant adverse effect on human health or welfare, municipal or private water supplies, recreational or commercial fisheries, property values or aesthetic values.

## Recreational Activities

The proposed project would not have any long-term adverse effects to recreation. Implementation of the plan would be planned so as to minimize interference between recreational opportunities and construction activities related to the project. Any impacts to recreational opportunities from construction of the proposed project would be temporary in nature.

## Hazardous, Toxic & Radioactive Waste (HTRW) Analysis

Since the Preferred Plan strictly involves the placement of dredged material into Lake Michigan, a Contaminant Determination (*Appendix E*) was completed to assess potential risks associated with sediment quality. Recent sediment and elutriate sampling indicates that the material is good quality sand, with generally low levels of fines and nutrients. The results of past sampling events show no level of contamination that would cause environmental impacts related to water quality. The historical and current data show that the sediment and elutriate results have been consistent over time. Water quality impacts have not been noted in the past. Based on the similarity of current results with historical data, water quality impacts are not anticipated. Dilution of the nutrients during placement in a mixing zone would meet water quality standards outside the mixing zone.

## Environmental Justice

All of the proposed alternative plans would not cause adverse human health effects or adverse environmental effects on minority populations or low-income populations. Executive Order 12898 (environmental justice) requires that, to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

A database search of the EPA EJView mapping tool (Accessed 29 July 2013), revealed that within the portion of surrounding area of Illinois Beach State Park (Winthrop Harbor to Beach Park, Illinois, approximately 10-100% of the population are reported as minorities. In addition, 0-40% of the population lives below the poverty line. Since the overall project is considered ecosystem restoration and will only benefit the surrounding environment and communities, no adverse effects to any low income populations and/or minority populations are expected.

# DRAFT

## **4.4.4. 17 Points of Environmental Quality**

The 17 points are defined by Section 122 of Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611) from (ER 1105-2-240 of 13 July 1978). Effects to these points are discussed as follows:

Noise: Any of the alternative plans would cause minor and temporary increase in noise levels beyond the current conditions. Minor noise increases may stem from tug boats moving barges and machinery used to relocate the dredged material. Long term, significant effects in terms of noise is not expected.

Displacement of People: None of the alternatives will displace residents as the work will be conducted in water.

Aesthetic Values: Any of the alternative plans would not reduce the aesthetic values of the study area. The proposed work will help preserve the aesthetic values of the IBSP and prevent the loss of acres from erosion.

Community Cohesion: Any of the alternative plans would not disrupt community cohesion.

Desirable Community Growth: Any of the alternative plans would not adversely affect community growth but may attract more people to the state park.

Desirable Regional Growth: Any of the alternative plans would not adversely or beneficially affect regional growth.

Tax Revenues: Any of the alternative plans would not adversely or beneficially affect tax revenues.

Property Values: Any of the alternative plans would not have adverse affects on property values.

Public Facilities: Any of the alternative plans would not adversely affect public facilities of Illinois Beach State Park, but will preserve the high quality ecosystem within the park.

Public Services: Any of the alternative plans would not adversely or beneficially affect public services.

Employment: Any of the alternative plans would not adversely affect employment and would temporarily increase employment during dredging and placement of sand.

Business and Industrial Activity: Any of the alternative plans would not adversely or beneficially affect local commerce.

Displacement of Farms: Any of the alternative plans would not adversely affect farmland since project areas are all within water.

Man-made Resources: Any of the alternative plans would not adversely or beneficially affect man-made resources.

Natural Resources: The No Action Alternative allows for the continued erosion and loss of high quality and critically important coastal habitat. The proposed project would not adversely affect natural resources, but preserve them.

# DRAFT

Air: None of the alternative plans would adversely affect ambient air quality, due to the short term and limited nature of the work. Diesel emissions from the construction equipment would be considered a de minimis impact, and would not be noted outside the immediate work area.

Water: Only short-term increases in turbidity may occur on a small scale when sand is placed into shallow water. In the long-term, turbidity will not be an issue and no long-term adverse impacts are expected.

## 4.5 CUMULATIVE EFFECTS

Consideration of cumulative effects requires a broader perspective than examining just the direct and indirect effects of a proposed action. It requires that reasonably foreseeable future impacts be assessed in the context of past and present effects to important resources. Often it requires consideration of a larger geographic area than just the immediate “project” area. One of the most important aspects of cumulative effects assessment is that it requires consideration of how actions by others (including those actions completely unrelated to the proposed action) have and will affect the same resources. In assessing cumulative effects, the key determinant of importance or significance is whether the incremental effect of the proposed action will alter the sustainability of resources when added to other present and reasonably foreseeable future actions.

Cumulative environmental effects for the proposed ecosystem restoration project were assessed in accordance with guidance provided by the Council on Environmental Quality (CEQ) and U.S. Environmental Protection Agency (USEPA 315-R-99-002). This guidance provides an eleven-step process for identifying and evaluating cumulative effects for the NEPA analyses.

The overall cumulative impact of the proposed Illinois Beach State Park Section 204 project is considered to be beneficial environmentally, socially, and economically. The preservation of approximately 30 acres of beach and dune habitat will help maintain the strong ecological integrity of Illinois Beach State Park.

### 4.5.1 *Scope of Cumulative Effects Analysis*

Through this environmental assessment, the cumulative effects issues and assessment goals are established, the spatial and temporal boundaries are determined, and the reasonably foreseeable future actions are identified. Cumulative effects are assessed to determine if the sustainability of any of the resources is adversely affected with the goal of determining the incremental impact to key resources that would occur should the proposal be permitted.

The spatial boundary for the assessment has been broadened to consider effects beyond the footprint of Illinois Beach State Park, North Unit. The spatial boundary being considered is normally in the general area of the proposed ecological restoration; however, this area may be expanded on a case-by-case basis if some particular resource condition necessitates broadening the boundary.

Three temporal boundaries were considered:

- Past –1830s because this is the approximate time that the landscape was in its natural state, a vast dune and swale coastal habitat with pocket wetlands.
- Present – 2013 when the decision is being made on the most beneficial ecological preservation
- Future – 2038, the year used for determining project life end.

# DRAFT

Projecting the reasonably foreseeable future actions is difficult. The proposed action is reasonably foreseeable; however, the actions by others that may affect the same resources are not as clear. Projections of those actions must rely on judgment as to what are reasonable based on existing trends and where available, projections from qualified sources. Reasonably foreseeable does not include unfounded or speculative projections.

- Stable growth in both population and water consumption near the study area
- Continued increase in tourism/recreation in the open spaces of the region
- Continued, but slowed urban development near the study area
- Continued application of environmental requirements such as those under the Clean Water Act
- Community will increasingly value open space.

## ***4.5.2 Cumulative Effects on Resources***

### **Physical Resources**

The topography, soils, hydrology, hydraulics and geomorphology of the surrounding area has been significantly disturbed by prior development and urbanization. In addition, the construction of harbors and marinas has had major impacts on the coastal zone of the project area. Currently, the project area is protected as a state park, but remnant issues from development north of the project area persist. Placement of sand to limit erosion and restore natural littoral sand drift will protect critical coastal habitat. Future actions should focus on finding ways to restore and or simulate littoral sand drift and investigate ways to minimize erosion while preserving natural habitat types. Overall, no adverse impacts are expected to occur from the implementation of the proposed project. Instead, the effects will be beneficial to physical resources by helping to repair natural littoral function within the project area.

### **Ecological Resources**

The project area is within the Illinois Beach State Park and consists of critical coastal habitat, which is home to several state listed species, and one Federally endangered species. The ecological resources have been maintained fairly well in the past. However, development and land use within the area has created some issues such as invasive species. Currently, the project area is of high quality and is the largest tract of coastal habitat in the State of Illinois. The increased erosion and loss of littoral function has resulted in the loss of beach and dune habitat and a decrease in biodiversity. If the problem persists, approximately 30 acres of high quality habitat and the current species that reside in the area will be lost over the next 25 years. This amount of acres lost could result in a loss of biodiversity and lower the overall ecological integrity. Impacts to aquatic communities should be short-term and mostly be a result of increase turbidity during sand placement. The aquatic communities that may be impacted the most are benthic organisms. However, they are likely to re-establish from surrounding areas and from surviving individuals after sand placement. In addition, short-term increases to turbidity are likely during sand placement, but beach fishes are accustomed to increases in turbidity and should not be impacted. Future actions should focus on maintaining the current biodiversity within the park through restoration efforts and treatment of invasive species. Cumulatively, no adverse impacts to ecological resources are expected to occur from the implementation of the proposed plan. Instead, the effects will be beneficial to ecological resources by restoring and protecting scarce coastal habitats.

# DRAFT

## Cultural Resources

In the early 1800's the surrounding area was primarily agricultural and shortly after increased development began. During these periods impacts to archeological and cultural resources likely occurred. Historically, people owned houses within the Illinois Beach State Park and likely caused some problems to surrounding ecosystem. Currently, all houses have been removed from the park and it remains protected by the state of Illinois. The proposed project will not cause any impacts to cultural resources now or in the foreseeable future. The placement of sand will only help maintain the current coastal habitat and prevent the loss of land through increased erosion. Cumulative impacts of the proposed and combined future actions to the cultural resources would be beneficial to cultural resources by helping to preserve the integrity of an important State park.

### 4.5.3 Cumulative Effects Summary

The cumulative effects of the Illinois Beach State Park Section 204 project are considered to be beneficial environmentally, socially and economically. The irreversible and irretrievable commitment of resources was not identified to be resultant from implementation of the proposed action; NEPA 1502.16 (102(2)(C)(v)). Relationships between local short-term uses of man's environment and maintenance and enhancement of long term productivity would be beneficial environmentally by preserving critical coastal habitat and maintaining the beach for current activities of man; NEPA 1502.16 (102(2)(C)(iv)).

Only short-term and minimal adverse impacts, which cannot be avoided, are expected. Temporary increases in turbidity are expected to be minimal and similar to strong wave action from a thunderstorm. In addition, some benthic organisms may be smothered when sand is placed directly on top of them. However, the main benthos of the area consists of oligochaetes that live within the sand. These organisms will likely not be impacted and continue to thrive (NEPA 1502.16 (102(2)(C)(ii))).

The sand placement will provide protection from erosion, protect critical habitat, and supports the biodiversity of the park; this alternative is an inexpensive and natural alternative compared to other erosion prevention techniques.

## 4.6 PUBLIC REVIEW

An Environmental Assessment (EA) was prepared for the project and sent to Federal, State and local Agencies along with the general public for review. A 30-day Public Review period was held from **TBD to TBD** for the Environmental Assessment. Significant comments from the Federal, State or local agencies or the public were addressed and are attached to this FONSI. All comments and correspondence are attached to the FONSI. *Appendix G – Coordination* lists agencies and public entities that were provided opportunity to comment; however, the NEPA document was placed on the Chicago District USACE's internet page for the widest distribution possible.

## 4.7 GENERAL COMPLIANCE PUBLIC REVIEW

The NER/ Preferred Plan presented is in compliance with appropriate statutes and executive orders including the Endangered Species Act of 1973 as amended; the Fish and Wildlife Coordination Act of 1934 as amended; Executive Order 12898 (Environmental Justice); Executive Order 11990 (Protection of Wetlands); Executive Order 11988 (Floodplain Management); and the Rivers and Harbors Act of 1899 as

# DRAFT

amended; the Clean Air Act of 1970 as amended and the National Environmental Policy Act of 1969 as amended.

## Environmental Justice EO12898

To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands. The Preferred Plan would not have any adverse effects to any populations including minority and low-income populations.

## Clean Air Act

Due to the small scale, short duration and relatively unpolluted nature of the Section 204 project, it is assumed that the project is below the de minimis level of PM 100 tons per year. As a reference, other USACE projects that are much grander in scale and earthwork have General Conformity Act emissions well below the PM 100 tons per year.

## Section 401 & 404 of the Clean Water Act

A Section 404 analysis was completed for the Preferred Plan. Features addressed by the 404 include the dredged sand for restoring natural littoral drift. No adverse effects to water quality or aquatic habitat were determined. The full analysis can be found in *Appendix G – Coordination*.

The Waukegan Harbor Approach Channel maintenance dredging and disposal currently operates under permit 2005-LM-2830 from the Illinois Environmental Protection Agency (IEPA) and permit LM2005003 from Illinois Department of Natural Resources (IL DNR). The permits were received in 2005, and modified in 2008 and 2009. The existing permits expire in 2014, however new permits will be applied for in order to continue maintenance of the federal channel. The activities described for the Preferred Plan will be conducted under these permits.

## Coastal Management

Review of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR 930) indicates that since this project will take place within the boundaries of the Illinois Coastal Management Program, a Federal Consistency Determination is required. Since the proposed work is located in Lake Michigan, an Illinois Department of Natural Resources, Office of Water Resources/ Illinois Environmental Protection Agency joint permit has been applied for and is expected to be granted. The project will be consistent with the Illinois Coastal Management Program.

## USFWS Coordination

Coordination with the U.S. FWS and the Illinois Department of Natural Resources (IDNR) was commenced on 26 July 2011 with a project scoping letter. Upon review of this document, the U.S. FWS concluded that the project is not likely to adversely affect federal or state listed species, and their letter dated 21 September 2011 as required under Section 7 of the Endangered Species Act of 1973, as

# DRAFT

amended. Instead the letter states that the project will likely benefit the Federally Endangered Piping Plover. However, USFWS stated they would like to assess the dredged material to ensure that it is not contaminated.

## State of Illinois Historic Preservation Act

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 4701) and 36 C.F.R. Part 800, the staff of the Illinois State Historic Preservation Officer (Illinois SHPO) has conducted an analysis of the materials dated 26 July 2011. Based upon the documentation available, the staff of the Illinois SHPO has identified that no historic properties are affected in letters dated 8 August 2013 and 8 August 2011.

## Mitigation

No mitigation is required for this project.

## Finding of No Significant Impact (FONSI)

A FONSI was signed on \_\_\_\_\_ after a 30-day public review was completed with a finding of no significant environmental effects. An Environmental Assessment was completed for the proposed measures at the Illinois Beach State Park Project, which found no significant adverse affects to the resources on site. A 30-day Public Review period was held from \_\_\_\_\_ 2013 to \_\_\_\_\_ 2013 for the Environmental Assessment. There were \_\_\_\_ responses from state and federal agencies on the project. The proposed project is expected to be in full compliance with the National Environmental Policy Act, the Endangered Species Act, the Fish and Wildlife Coordination Act, the National Historic Preservation Act, the Clean Air Act, Sections 401 and 404 of the Clean Water Act, and the Corps of Engineer's regulations. The complete FONSI can be found in *Appendix G – Coordination*.

# DRAFT

## 5. DESCRIPTION OF PREFERRED PLAN

### 5.1 \*PLAN COMPONENTS

The Preferred Plan includes littoral restoration of the Illinois Beach State Park (IBSP) coastal zone. Lacustrine, beach, and dune habitat is currently threatened by shoreline erosion caused by sand starved conditions in the littoral drift system. Without stabilization, coastal habitats within the North Unit of IBSP will continue to erode at a rate of more than 1 acre per year. With the implementation of the Preferred Plan, Waukegan Harbor Approach Channel dredged material will be supplied to the littoral drift system at an expected rate of 80,000 cubic yards per year – the estimated sediment deficit of the system. Stabilized coastal conditions would improve the richness and abundance of native floristic species currently residing in project area.

Dredged material from the Waukegan Harbor Approach Channel would be transported via barge approximately 8-miles from the harbor to the North Unit of Illinois Beach State Park. Using a bottom dump scow, the dredged sand would be placed into the nearshore zone of Lake Michigan at a depth of approximately 18 feet. The general placement area will be the northern extends of the IBSP North Unit just south of North Point Marina, though the specific locations will need to be determined prior to each dredging event. The deposited sand will gradually migrate south via longshore sediment transport where it will naturally be dispersed to sand starved reaches of shore. This placement procedure will be repeated annually resulting in a total placement volume of 800,000 cubic yards into the littoral zone of Illinois Beach State Park. This activity is expected to occur over ten dredging cycles though the specific timing and quantities of each placement cycle will be dependent on future maintenance dredging within the Waukegan Harbor Approach Channel (Table 12). This feasibility study is scheduled for completion and approval in early 2014, which will facilitate implementation to commence with the summer 2014 dredging season (Table 13).

Under the current Base Plan (least cost disposal plan) for the Waukegan Harbor Approach Channel, dredged material is transported approximately 1 mile south of the harbor and placed into shallow water in the same manner described above. The District has also utilized an alternative disposal plan, which involves placing dredged material at IBSP in the same manner as described for the Preferred Plan. However, this alternate disposal plan is only executed if IDNR can fund 100% disposal costs above that of the Base Plan. As such, this alternative disposal plan has been utilized sporadically. By implementing the Preferred Plan under the Section 204 authority, the Chicago District can establish a long-term beneficial use plan that utilizes Approach Channel dredged material for ecosystem restoration at Illinois Beach State Park. Additionally, the Preferred Plan will result in cost savings for the State of Illinois since project implementation will be cost-shared.

# DRAFT

**Table 12 Project implementation schedule**

Date	Expected Sand Placement (CY)
Summer 2014	80,000
Summer 2015	80,000
Summer 2016	80,000
Summer 2017	80,000
Summer 2018	80,000
Summer 2019	80,000
Summer 2020	80,000
Summer 2021	80,000
Summer 2022	80,000
Summer 2023	80,000

\* Project implementation is dependent on future dredging activities at Waukegan Harbor

**Table 13 Estimated project schedule\***

Milestone	Date
AFB Meeting	Oct 31, 2013
Approval to Release EA	Nov 22, 2013
NEPA Public Review Ends	Dec 31, 2013
Draft Final Report to MSC	Jan 15, 2014
MSC Approval	Feb, 15 2014
Initiate P&S	Dependent on dredging schedule

## 5.2 PLANS & SPECIFICATIONS

During the design phase, a detailed set of plans and specifications will be prepared in order to solicit and award a construction contract. Prior to finalization of the plans and specifications, assurance will be made that all areas to be prepared by the non-Federal sponsor shall comply with ER 1165-2-132, Federal, State, and local regulations. A schedule, quality control plan, and labor estimate was prepared along with the DPR Quality Control Plan (QCP) for the plans and specifications phase; if approval is granted to this project, the QCP would continue to be followed.

## 5.3 REAL ESTATE

The Real Estate Plan for the project site was developed by the Detroit District's Real Estate Division. The Real Estate Plan is included as *Appendix F*, which was reviewed and approved through a formal ATR. Since the Preferred Plan will not involve any land-based construction or access, there are no LERRDs or non-Federal LERRDs credit associated with this project.

## 5.4 OPERATIONS AND MAINTENANCE

The NER plan will not require any operations, maintenance, repair, replacement, or rehabilitation.

# DRAFT

## 5.5 MITIGATION

No mitigation is required for this project.

## 5.6 MONITORING PLAN

Section 2039 of WRDA 2007 directs the Secretary to ensure that when conducting a feasibility study for a project (or a component of a project) for ecosystem restoration that the recommended project includes a plan for monitoring the success of the ecosystem restoration. Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost.

A ten-year monitoring plan will be implemented to coincide with each dredging and placement cycle. The monitoring activities will involve collecting and evaluating bathymetric surveys of the nearshore coastal zone of the Illinois Beach State Park North Unit. The surveys will be performed in conjunction with the pre-dredge survey performed at Waukegan Harbor. The surveying data will assist in evaluating project success and aid in identifying the most appropriate sand placement areas. The base cost estimate for bathymetric surveying activities is \$ [REDACTED] per year. Including escalation and contingency, the ten-year cost is estimated at [REDACTED].

## 5.7 DIVISION OF RESPONSIBILITIES

As established in PL99-662, as amended, project costs are shared with the non-Federal sponsor in accordance with project outputs. The Illinois Department of Natural Resources has agreed to serve as the non-Federal cost-sharing sponsor for the Illinois Beach State Park, Beneficial Use of Dredged Material Project. The cost-sharing requirements and provisions will be formalized with the signing of the Project Partnership Agreement (PPA) between the non-Federal sponsor and USACE prior to initiation of contract award activities. In this agreement, the non-Federal sponsor will agree to pay 35 percent of projects costs above the Base Plan for dredged material disposal. Based on the cost sharing requirements, the total project cost and pertinent cost-sharing information for the restoration project are summarized in Table 14 and Table 15. The cost data presented in these tables represent the incremental costs above and beyond the Base Plan.

**Table 14 Total project cost (above and beyond the Base Plan)**

**\*Intentionally Left Blank**

**Table 15 Cost Sharing Breakout**

**\*Intentionally Left Blank**

### Responsibilities

Federal - The estimated Federal cost share of the project is about [REDACTED]. The USACE would accomplish the plans and specifications phase, which includes additional design studies and plans and specifications, contract for construction, overall supervision during construction, prepare an operation and maintenance manual, and participate in a portion of the post construction monitoring.

# DRAFT

Non-Federal Responsibilities - Prior to initiation of the design phase, the Federal Government and the non-Federal sponsors will execute a Project Partnership Agreement (PPA). The non-Federal sponsors shall, prior to implementation, agree to perform the following items of local cooperation:

1. Provide 35 percent of the separable project costs allocated to environmental restoration as further specified below
  - a) Provide the non-Federal share of all complete planning and design work upon execution of the PPA
  - b) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the government to be necessary for the construction and O&M of the project
  - c) Provide or pay to the government the cost of providing all features required for the construction of the project
  - d) Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the separable project costs allocated to environmental restoration
2. Contribute all project costs in excess of the Federal statutory limitation of \$5,000,000
3. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project or the functional portion of the project at no cost to the government in accordance with applicable federal and state laws and any specific directions prescribed by the government
4. Give the government a right to enter, at reasonable times and in a reasonable manner, upon land that the local sponsor 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
5. Assume responsibility for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project or completed functional portions of the project, including mitigation features, without cost to the government in a manner compatible with the project's authorized purpose and in accordance with applicable federal and state laws and specific directions prescribed by the government in the OMRR&R manual and any subsequent amendments thereto
6. Comply with Section 221 of Public Law (P.L.) 91-611, Flood Control Act of 1970, as amended, and Section 103 of the WRDA of 1986, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resource project or separable element thereof until the nonfederal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element
7. Hold and save the United States free from damages due to construction of or subsequent maintenance of the project except those damages due to the fault or negligence of the United States or its contractors
8. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs
9. Perform or cause to be performed such investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 *U.S. Code* 9601 through 9675, that may exist in, on, or under lands, easements, or rights-of-way necessary for the construction, and O&M of the project, except that the nonfederal sponsor shall not perform investigations of lands, easements, or rights-of-way that the government determines to be subject to navigation servitude without prior written direction by the government
10. Assume complete financial responsibility for all necessary cleanup and response costs for CERCLA-regulated material located in, on, or under lands, easements, or rights-of-way that the government determines necessary for the construction and O&M of the project
11. To the maximum extent practicable, conduct OMRR&R of the project in a manner that will not cause liability to arise under CERCLA
12. Prevent future encroachment or modifications that might interfere with proper functioning of the project
13. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, as amended in Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, P.L. 100-17, and the uniform regulation contained in Part 24 of Title 49, *Code of Federal Regulations* (CFR), in acquiring lands, easements, and rights-of-way for construction and

# DRAFT

subsequent O&M of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said acts

14. Comply with all applicable federal and state laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964, P.L. 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto and published in 32 CFR, Part 300, as well as Army Regulation 600-7 entitled "Non-Discrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"
15. Provide 35 percent of that portion of the total cultural resource preservation, mitigation, and data recovery costs attributable to environmental restoration that are in excess of 1 percent of the total amount authorized to be appropriated for environmental restoration
16. Do not use federal funds to meet the nonfederal sponsor's share of total project costs unless the federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute

## **Financial Capability of Sponsor**

The Illinois Department of Natural Resources provided a letter of intent dated 12 June 2013 in which it stated it is prepared to negotiate a Project Partnership Agreement and meet its obligations. The letter clearly indicates that the IDNR understands the local requirements of the project.

# DRAFT

## 6. \*RECOMMENDATION

I have considered all significant aspects of the problems and opportunities as they relate to the project resource problems of Illinois Beach State Park. Those aspects include environmental, social, and economic effects, as well as engineering feasibility.

I recommend the approval of the Preferred Plan, the Littoral Nearshore Placement Plan, which consists of placing 800,000 cubic yards of dredged sand over ten dredging cycles into the littoral zone of the Illinois Beach State Park North Unit. The Preferred Plan has a total project cost of approximately [REDACTED] above and beyond the Base Plan (2013 price levels) and provides 47 net average annual habitat units over 200 acres of coastal zone. All costs associated with the restoration of the Illinois Beach State Park ecosystem have been considered.

---

Frederic A. Drummond Jr.  
Colonel, U.S. Army  
District Commander

# DRAFT

## 7. REFERENCES

Chrzastowski MJ. 2011. The Illinois Coast: Geologic history, human impact, and management challenges. Illinois State Geologic Survey. James R. Thompson Center, Chicago, IL . 18 February, 2011. Public Hearing Presentation.

Chrzastowski MJ and WT Frankie. Guide to the geology of Illinois Beach State Park and the Zion Beach-Ridge Plain, Lake County, Illinois. 2000. Illinois State Geologic Survey. Field Trip Guidebook 2000C.

Chrzastowski MJ and CB Trask. 1995. Nearshore geology and geologic processes along the Illinois shore of Lake Michigan from Waukegan Harbor to Wilmette Harbor. Illinois State Geologic Survey. Open File Series 1995-19.

Foyle AM, MJ Chrzastowski, and CB Trask. 1998. Erosion and accretion trends along the Lake Michigan shoreline at North Point Marina and Illinois Beach State Park [Year 3 report of a four-year study of coastal geology and coastal geologic processes]. Illinois State Geologic Survey. Open Files Series 1998-3.

Great Lakes Basin Commission. 1976. Appendix 8. Fish. Great Lakes Basin Framework study. Great Lakes Basin Commission. Ann Arbor, MI.

Jennings, James R., 1990, 150 year erosion history of a beach ridge and dune plain on the Illinois Lake Michigan shore: Program with Abstracts, 33<sup>rd</sup> Conference on Great Lakes Research, International Association of Great Lakes Research, The University of Michigan, Ann Arbor, p. 67.

Kranz, P.M. 1974. The anastrophic burial of bivalves and its paleoecological significance. *Journal of Geology*. Vol. 82, P. 237-265.

Makarewicz, J.C., T. Lewis, and P. Bertram. 1989. Phytoplankton and zooplankton composition, abundance and distribution and trophic interactions: offshore region of Lake Erie, Lake Huron, and Lake Michigan, 1985. Great Lakes Basin Commission Vol. 1, p 1-49.

Swink, F and G. Wilhelm. 1979. *Plants of the Chicago region*. 3rd edition. Indianapolis: Indiana Academy of Science.