Guide to Policies and Projects Related to Beneficial Use of Dredged Material in the Great Lakes

GREAT LAKES DREDGING TEAM

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List of Abbreviations and Acronyms

AOC	area of concern
BUD	beneficial use determination
BUI	beneficial use impairment
CDF	confined disposal facility
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CY	cubic yard
DEM	Department of Environmental Management
DMMP	Dredged Material Management Plan
DNR	Department of Natural Resources
EC	engineering circulars
ECL	Environmental Conservation Law
ERDC	Engineer Research and Development Center
EM	engineering manuals
EP	engineering pamphlets
ER	engineering regulations
EWN	Engineering with Nature
GLC	Great Lakes Commission
GLDT	Great Lakes Dredging Team
GLLA	Great Lakes Legacy Act
GLNS	Great Lakes Navigation System
GLRI	Great Lakes Restoration Initiative
HARS	Historic Area Remediation Site
HTAC	Harbor Technical Advisory Committee (Duluth-Superior)
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
IDNR	Illinois Department of Natural Resources
Illinois EPA	Illinois Environmental Protection Agency

List of Abbreviations and Acronyms (cont.)

IlDNR	Illinois Department of Natural Resources
InDNR	Indiana Department of Natural Resources
IJC	International Joint Commission
LAMP	Lakewide Action and Management Plan
MCY	million cubic yards
MDEQ	Michigan Department of Environmental Quality
MPCA	Minnesota Pollution Control Agency
NDC	National Dredging Center
NEPA	National Environmental Policy Act of 1969
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
PADEP	Pennsylvania Department of Environmental Protection
PEIS	Preliminary Environmental Impact Statement
RSM	Regional Sediment Management
SDS	state disposal system
SRV	soil reference value
USACE	U.S. Army Corps of Engineers
U.S. EPA	U.S. Environmental Protection Agency
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WDNR	Wisconsin Department of Natural Resources
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act of 2014

Executive Summary

Sediment is a valuable resource within the Great Lakes ecosystem, and many dredged sediments are suitable for a variety of beneficial uses. Around the country and the Great Lakes, beneficial use of dredged sediment has been successful in nourishing beaches and replenishing eroding shorelines, creating habitat, and restoring brownfields. All of these success stories offer lessons that can be applied throughout the Great Lakes, starting with local recognition that dredged sediments are a resource to be used strategically to realize local economic and environmental opportunities.

Communities across the country, including those around the Chesapeake Bay, Delaware Estuary, Galveston Bay, Hudson Raritan Estuary, Cleveland Lakefront, Grand Haven Harbor, and Green Bay have benefited from using dredged material generated from local navigation projects. Additionally, critical dredged material management challenges exist in several Great Lakes navigation channels, ports, and harbors as confined disposal facilities (CDFs) reach capacity. Limited CDF capacity is an opportunity for states and local stakeholders to beneficially use dredged sediments generated from maintenance dredging or harvested from CDFs.

Increasing beneficial use of dredged material is a key part of identifying a viable and sustainable solution for managing dredged material in the Great Lakes region. When and where appropriate, successful beneficial use projects can yield benefits well beyond those of traditional dredged material management and CDF placement since they offer reliable sources of sediment for aquatic habitat improvement, brownfield restoration, road construction, mine reclamation, industrial redevelopment, and other uses.

To promote an increase in beneficial use of dredged sediments, it is first necessary to understand the federal, regional, and local regulatory frameworks, opportunities, and attitudes towards dredged material and beneficial use. This guide is designed to help states, port authorities, local governments, and local stakeholders develop beneficial use options by providing them with a background on dredged material management in the Great Lakes and an overview of the applicable federal and state regulations and guidance.

Successful projects to date indicate that beneficial use is best accomplished when led by local stakeholders. Positive stakeholder involvement can have a profound effect on the success of beneficial use projects. Dredged material management is more and more becoming a shared responsibility between the U.S. Army Corps of Engineers (USACE) and harbor stakeholders. As the main agency responsible for maintaining the Nation's federal navigation channels, USACE is uniquely positioned to support such local initiatives in accordance with applicable authorities and the Corps' Environmental Operating Principles.

1 Introduction

This guide summarizes existing statutes, regulations, and policies relating to beneficial use of dredged material that are applicable to the Great Lakes region. It also describes the background and many of the challenges related to dredged material management. This guide was developed by the Great Lakes Dredging Team (GLDT), a regional arm of the National Dredging Team, and comprises a partnership between federal and state agencies and stakeholders in the Great Lakes region. Its purpose is to ensure that dredging of federal harbors and channels throughout the Great Lakes, including dredged material management, is conducted in a timely, consistent, and cost-effective manner while meeting environmental protection, restoration, and enhancement goals.

The GLDT is currently organized into four committees: an overarching steering committee, a technical committee, an outreach committee, and a legislative committee. The Great Lakes Commission (GLC)[1] has been providing administrative support to the GLDT and it also provides a forum for exchanging information related to the beneficial use of dredged material. The GLDT hosts a website that provides information about all aspects of dredged material management; it is available at http://greatlakesdredging.net

1.1 Background

There are more than 300 ports in the United States with more than 3,700 terminals. These have resulted in the dredging of an average of 300 million cubic yards (MCY) of sediment annually (USACE National Dredging Center [NDC] 2014). In the Great Lakes, the U. S. Army Corps of Engineers (USACE) Great Lakes and Ohio River Division operates and maintains the United States portion of the Great Lakes Navigation System (GLNS), an interdependent system that consists of 140 harbors (i.e., 60 commercial and 80 recreational shallow-draft channels) and includes 3 lock complexes, 104 miles of navigation structures, and over 600 miles of maintained navigation channels (USACE 2012). Each year, the USACE dredges between 2 to 5 MCY (3.3 MCY on average) from up to 47 federal navigation channels and harbors (typically between 20–30 harbors) in the Great Lakes (USACE 2012).

Continued dredging in the GLNS is vital to commercial shipping and recreational boating, local and regional economies, and environmental improvement and ecosystem restoration in the Great Lakes region. The GLNS contains 26 of the Nation's top 100 harbors (by tonnage), which are interlinked through trade and commerce with the system's smaller harbors, Canada, and the rest of the world (Northeast-Midwest Institute 2013). Unlike other coastal ports, Great Lakes ports

[1] The Great Lakes Commission is an interstate compact agency that promotes the orderly, integrated, and comprehensive development, use, and conservation of the water and related natural resources of the Great Lakes basin and St. Lawrence River.

do not compete with each other for tonnage. Rather, they "compete" against other modes of transportation or against lost economic activity. Use of the GLNS is integral to the U.S. and Canadian economies and annually provides or supports[2]

- A savings rate of approximately $3.6 billion (comparison to other modes of transportation).
- 227,000 jobs.
- $33.5 billion in business revenue.
- $14.1 billion in personal income.
- $4.6 billion in tax revenue.

The USACE Great Lakes and Ohio River Division is responsible for managing the regional resources associated with the Great Lakes and Ohio River Basin. The division consists of seven districts: Buffalo, Chicago, Detroit, Huntington, Louisville, Nashville, and Pittsburgh. The Buffalo, Chicago, and Detroit Districts have jurisdiction in the watershed of the Great Lakes. The Buffalo District is responsible for maintaining approximately 100 miles of navigation channels and waterways and 14 harbors in Lake Ontario and Lake Erie. The Chicago District maintains the waterways to seven harbors in the Indiana and Illinois portions of Lake Michigan. The Detroit District maintains more than 35 congressionally authorized federal navigation projects annually and serves Michigan, Minnesota, and Wisconsin.

Before the 1970s, virtually all dredged material from the Great Lakes was placed in established open-lake placement areas (USACE 2012). In 1970, Section 123 of the Rivers and Harbors Act (Public Law 91–611) authorized construction of CDFs in the Great Lakes with a nonfederal interest being required to provide 25 percent of the construction costs unless certain criteria were met and the cost-share was waived. By law, these CDFs were initially designed with a capacity not to exceed ten years of dredged sediment, allowing time, it was thought, for watersheds to clean up following the passage of several key environmental laws such as the Clean Water Act (CWA). It was assumed that ten years of treatment of municipal and industrial wastes at their sources would make sediments in harbors and channels clean enough again for open-lake placement (Holmes 1979). The intent was to return in time to the less costly alternative of open-lake placement when such a practice became compliant with the CWA. However, in many areas, the sediment has not cleaned up as quickly as originally anticipated, requiring the modification of existing CDFs to maximize capacity and the construction of some additional facilities pursuant to other statutory authorities. Although many of the CDFs still in use today are near capacity, more and more dredged material is becoming suitable again for open-lake placement based on federal guidelines. This should be seen as an objective indicator of the federal,

[2] Values provided in the bullets in this section are from 2013.

state, and local progress that has been made toward restoring the ecology of the Great Lakes since the 1970s.

The United States and Canada entered into the Great Lakes Water Quality Agreement in 1972 (amended in 1978, 1987, and 2012) to provide a framework for binational consultation and cooperation to restore, protect, and enhance the water quality of the Great Lakes and to promote the ecological health of the Great Lakes basin[3]. These Great Lakes Water Quality Agreements led to several efforts, including Lakewide Action and Management Plans (discussed in Section 4.1). They also established the 43 areas of concern (AOCs) within the Great Lakes basin. These are defined as "geographic areas designated by the Parties where significant impairments of beneficial uses (beneficial use impairments, BUI) have occurred as a result of human activities at the local level."[4]

Sediment remediation programs in the Great Lakes, like the Great Lakes Legacy Act, have succeeded in removing contaminated legacy sediments, which are often located outside or under navigation channels. These programs have improved overall sediment quality, and the need for CDF placement no longer exists at some harbors.

In 2002, the GLLA authorized $270 million from fiscal years 2004 through 2008 to help fund the remediation of contaminated sediment in the 31 Great Lakes AOCs located in the United States. The GLLA was reauthorized in 2008. As of 2015, seven AOCs have been completely delisted (four AOCs in the United States and three in Canada) (U.S. Environmental Protection Agency [U.S. EPA] 2015b). Additionally, management actions have been completed in three other AOCs, and 56 BUIs (out of a total of 255) have been removed throughout the Great Lakes (U.S. EPA 2015b).

The Great Lakes Restoration Initiative (GLRI) was launched in 2010 and is led by the U.S. EPA and coordinated through the Great Lakes Interagency Task Force. The initiative receives an average annual budget of approximately $300 million, which has been used for various USACE projects and complements GLLA cleanup efforts: construct dredged material disposal facilities that benefit habitats (e.g., facilities associated with Cat Island restoration) and support beneficial use of dredged material planning, design, and construction (USACE 2010).

Environmental regulations enacted by federal, state, and local agencies have reduced the influx of new pollution into waterways (e.g., CWA circa 1972). Therefore, sediments in harbors and rivers around the Great Lakes are becoming cleaner, especially those sediments which are removed on a regular basis from navigation channels.

[3] The implementation of the Great Lakes Water Quality Agreement is supported by the International Joint Commission (IJC). The IJC is an international organization created by the Boundary Waters Treaty, signed by the United States and Canada in 1909.

[4] It is important to note that not all federally maintained harbors in the Great Lakes are AOCs, nor are all AOCs harbors.

1.2 Current Dredged Material Management

The Great Lakes region consists of eight states along the Great Lakes, each with different policies, programs, and procedures for dealing with dredged sediment management and beneficial use in their respective state jurisdictions. An understanding of these policies, programs, and procedures within the backdrop of federal regulations and policies is important to developing a cohesive approach to increasing beneficial use in the Great Lakes region.

Beneficial use in the Great Lakes region includes in-water uses, such as habitat restoration and creation, beach nourishment, and aquaculture. Upland uses include forestry applications, agriculture, mine reclamation, construction fill, and brownfield redevelopment.

There are 21 harbors around the Great Lakes with active CDFs (USACE 2016). Other locations where dredged material is placed in the Great Lakes (as of 2012) include 7 upland sites, 13 nearshore placement sites, and 15 open-lake placement areas (USACE 2012). Approximately 70 percent of Great Lakes harbors now use open-lake (i.e., in-water) placement to manage dredged sediment. Of those harbors that do not, many are never or rarely dredged. Several key factors have influenced dredged material management options in recent years, including the fact that CDFs are reaching capacity, and costs and siting issues have made developing new confined facilities difficult (Bailey et al. 2010).

A variety of techniques are used to maximize CDF capacity. These include drying material, interior mounding, and/or raising dike walls. However, even these techniques cannot increase CDF capacity indefinitely; as a CDF approaches capacity, it is less able to settle out solids from dredge water (i.e., supernatant), which can make it difficult for CDF weir discharges to meet some regulatory turbidity thresholds. Therefore, many CDFs will eventually be unable to accept new dredged material unless some material is removed. However, transportation costs for removing sediments can easily be greater than obtaining fill from traditional sources (e.g., typically ranging from $8 to over $30 per cubic yard[5] depending on distance; see Appendix C).

The GLDT has developed a website to provide information on how dredged material can be used beneficially, including harvesting from CDFs (GLDT 2014). Harvesting from CDFs was a potentially viable management strategy identified by the Engineer Research and Development Center (ERDC) in its 2010 study (described in the paragraph below) and is the subject of a new initiative in Wisconsin, in which material from CDFs is being physically and chemically characterized (CFIRE 2014, GLC 2016). Successful beneficial use projects that use material from CDFs are described in Sections 3 and 4. Beneficially using

[5] 2015 costs.

dredged sediment as a dredged material management option aligns with the USACE Environmental Operating Principles introduced in 2002 and other guidance identified in Section 2 and described in Appendix B (USACE 2002).

There are numerous barriers to beneficial use of dredged material, according to the ERDC's 2010 study, *Sustainable Confined Disposal Facilities for Long-term Management of Dredged Material* (ERDC TN-DOER-D10) (Bailey et al. 2010). Typically, only 15–20 percent of dredged material from navigation dredging is used beneficially. Reasons for this often include sediment characteristics, transportation cost, logistics, and regulatory considerations. Seventeen USACE districts around the country reported barriers such as:

- There is a lack of a comprehensive national guidance on determining suitability of dredged material for beneficial use.
- There is a lack of complementary state regulatory framework for evaluating and using dredged material as a resource.
- There is uncertainty in sampling and characterizing dredged material due to wide variations in physical and chemical characteristics.
- There is uncertainty in predicting costs due to the heterogeneous nature of material, which results in limited transfer to commercial applications.
- Ownership of dredged sediment needs to be determined along with future USACE liability.
- Costs of beneficial use are not well defined for economic analysis and alternatives comparisons.
- There is no USACE funding for additional costs above a base plan.
- Non-USACE cost-share requirements may be unavailable and/or discourage local stakeholder collaboration.

In understanding that many dredged sediments are a natural resource and to encourage their beneficial use, the Great Lakes Commission requested that the USACE provide greater flexibility in the development of the Federal Standard, which is the least costly dredged material disposal or placement alternative that is consistent with sound engineering practices and meets all federal environmental requirements (GLC 2014). The Federal Standard is described in greater detail in Section 2.1. The USACE can consider dredged material placement options that provide other benefits, such as habitat creation or restoration and brownfield redevelopment. The GLC's resolution requesting flexibility on the part of USACE in determining the Federal Standard also provided encouragement to states and local governments to identify, develop, and expand the demand for the beneficial use of dredged material from Great Lakes harbors to make beneficial use a more viable and cost-effective solution. However, the amount of financial investment that the USACE may make on such beneficial use projects is limited (Section 2.2 & Appendix B). For example, if the requester desires a dredged

sediment management alternative more costly than the Federal Standard (i.e., CDF or open-lake placement), any additional costs beyond what is required to meet that Federal Standard would require fiscal contributions from a non-USACE partner.

1.3 Organization of This Guide

This guide is divided into five main sections with references and appendices. Section 1 provides background on dredging in the Great Lakes and issues confronting traditional dredged material management. Section 2 provides a brief overview of the federal statutes and regulations governing dredging and beneficial use. Section 3 is a review of beneficial use policies of the eight Great Lakes states. This section also includes highlights of port authority policies concerning beneficial use and provides some examples of successful beneficial use projects in those states. Section 4 provides a brief synopsis of trends in attitudes towards dredged material both inside and outside the Great Lakes region, awareness of regional sediment management, integration of sediment management and ecosystem restoration, and beneficial use practices, which provide lessons learned that could be applied in the Great Lakes region. Section 5 suggests next steps to help overcome identified challenges and maximize opportunities to increase beneficial use of dredged material in the Great Lakes region. Appendix A lists applicable statutes and codes, while Appendix B expands on federal statutes and USACE policies to further inform the reader of their application to beneficial use project planning. Appendix C provides some information about costs of some aspects of beneficial use projects.

1.4 Data Sources

Ecology and Environment, Inc., under contract to USACE, prepared an initial draft of this guide for the GLDT. Ecology and Environment reviewed data from the USACE, ERDC, GLDT, GLC, and the Great Lakes states (i.e., New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Minnesota, and Wisconsin). It used information from numerous USACE sources, including engineering regulations (ERs), engineering pamphlets (EPs), engineering manuals (EMs), engineering circulars (ECs), and policy letters that applied to dredging, dredged material management, and/or beneficial use of dredged material. Other data sources included legal databases, agency websites, port authority documents and reports, scientific and engineering journal articles and conference presentations, and other applicable sources that are identified in Section 6. Numerous statutes, regulations, and policies relating to beneficial use were also considered in the preparation of this guide (Appendices A and B).

The initial Ecology and Environment draft was provided to the entire GLDT for review and input. The following agencies provided feedback, and it was incorporated to the extent possible in this guide.

- Lake Carriers Association
- Erie Western Port Authority
- Toledo Port Authority
- Duluth Port Authority
- New York State Department of Environmental Conservation
- Illinois Department of Natural Resources
- Minnesota Pollution Control Agency
- U.S. Army Corps of Engineers (Chicago, Detroit, Buffalo, and Division offices)

2 Overview of Federal Statutes and USACE Policies and Regulations

The Council on Environmental Quality (CEQ) coordinates federal environmental efforts and works closely with government offices to develop environmental policies and initiatives. Congress established the CEQ within the Executive Office of the President as part of the National Environmental Policy Act of 1969 (NEPA). The CEQ provides many of the principles, requirements, and guidelines to federal agencies for water and land-related resources considerations. These include implementation studies that govern how federal agencies evaluate proposed water resource development projects. Since 1983, the CEQ has provided direction to federal agencies on evaluating and selecting major water projects, including projects related to navigation, storm resilience, wetland restoration, and flood prevention (CEQ 2015).

Among other guidance and requirements, the CEQ incorporates public input. It emphasizes that water resource projects should maximize economic development, avoid unwise use of floodplains, protect and restore natural ecosystems. It encourages allowing communities more flexibility to pursue local priorities and proposes taking a more comprehensive approach to water projects, one that maximizes economic, environmental, and recreational benefits, promotes more transparent and informed decision-making across the federal government, and ensures responsible taxpayer investment.

The following subsections describe the Federal Standard, applicable federal statutes and regulations, as well as USACE policies, planning guidance, and procedures that provide a foundation for beneficial use of dredged material. These USACE policies, guidance, and procedures are set out in a series of planning guidance letters, ERs, ECs, EPs, and EMs. They are further described in Appendix B. This section also describes the how local stakeholders can work with USACE through these federal statutes, regulations, guidance, and programs to develop successful beneficial use of dredged sediment projects.

2.1 Federal Standard

The definition of the Federal Standard for dredged material disposal was established in 1988 in the Code of Federal Regulations (CFR), Discharge of Dredged Material into Waters of the U.S. or Ocean Waters, Operation and Maintenance (33 CFR Parts 335-337). The Federal Standard is the dredged material management alternative identified by USACE that represents the least costly alternative(s) consistent with sound engineering practices and is environmentally acceptable. As stated in that regulation, “The environmental assessment or environmental impact statement, in conjunction with the [Clean Water Act] section 404(b)(1) guidelines and public notice coordination process, can be used as a guide in formulating environmentally acceptable alternatives.”

Determining the Federal Standard begins with evaluating proposed dredge sediment for its environmental acceptability for open-lake placement and other dredged material placement options. In the Great Lakes, this sediment evaluation is completed using the joint U.S. EPA/USACE *Inland Testing Manual* and the *Great Lakes Dredged Material and Evaluation Manual* (U.S. EPA and USACE 1998a, b). This evaluation supports and is typically made an appendix to the Clean Water Act Section 404(b)(1) Evaluation for a proposed discharge of dredged sediment into the open lake.

The costs of the various placement options are also considered. The USACE *Planning Guidance Notebook* (ER 1105-2-100, 2000) outlines requirements to determine the Federal Standard when developing a dredged material management plan (DMMP) and identifying the "base plan." The term "base plan" dictates the disposal or placement costs assigned to the "navigational purpose" of a project (U.S. EPA and USACE 2007b). Section 207 of the Water Resource Development Act (WRDA) of 1996 allows USACE to select, with the consent of the nonfederal interest, a disposal method that is not the least-cost option as determined by the Federal Standard, if the incremental costs of such disposal method are reasonable in relation to the environmental benefits. Incremental costs beyond the "base plan" for any dredged sediment management options must be borne by a non-USACE partner or sponsor. For ecosystem restoration or flood damage reduction, for example, the cost-sharing requirements are specified by the WRDA (i.e., Section 1135 of WRDA of 1986, Section 204 of WRDA 1992, Section 145 of WRDA 1976, or Section 207 of WRDA 1996 [U.S. EPA and USACE 2007a, b]).

2.2 Federal Statutes and Regulations

According to 40 CFR Part 232.2, dredged material means material that is excavated or dredged from waters of the United States. Dredged material is not federally defined as waste and is predominantly depositional sediment from natural processes. Discharge of dredged material means any addition of dredged material into, including redeposit of dredged material other than incidental fallback within, waters of the United States. Dredged material placement falls under the jurisdiction of both the U.S. EPA and USACE, depending on the location of the placement area. Regulatory authority is exercised pursuant to Section 404 of the CWA (33 United States Code [USC] 1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403). Applicable regulations are contained in Title 33 Navigation and Navigable Waters of the CFR. Permits for discharges of dredged or fill material into waters of the United States fall under 33 CFR Part 323.1. General policies fall under 33 CFR Part 320, and the procedures fall under 33 CFR Part 325.

Other than USACE, parties seeking to discharge dredged or fill material into waters of the United States, including wetlands, must obtain in advance a federal permit under Section 404 of the CWA and possibly Section 10 of the Rivers and Harbors Act. Additionally, they must apply for a CWA Section 401 water quality certification from the state. While USACE does not issue itself permits for such

activities, it does comply with the CWA through completion of a Section 404(a) public notice, a Section 404(b)(1) Evaluation, and receipt of a Section 401 water quality certification.

Numerous federal statutes and regulations may also be applicable, as follows:

- Rivers and Harbors Acts
- Clean Water Act
- Water Resources Development Act
- Water Resources Reform and Development Act of 2014 (WRRDA)
- National Environmental Policy Act
- Endangered Species Act
- Coastal Zone Management Act

The following amendments to the original Water Resources Development Act (WRDA) and the 2014 WRRDA have resulted in some of the most instrumental tools for local stakeholders soliciting USACE support on their projects to beneficially use dredged sediment. Please see Appendix B for a more complete description of these amendments, which include:

- Section 204 of WRDA of 1992 provides authority for USACE to restore, protect, and create aquatic and wetland habitats in connection with construction or maintenance dredging of an authorized navigation channel. Section 204 specifies that the local cost-share would be 25 percent.
- Section 206 of WRDA of 1996 provides authority for USACE to undertake aquatic ecosystem restoration, and it specifies that the local cost-share would be 35 percent.
- Section 207 of WRDA 1996 and amended by Section 2037 Regional Sediment Management of WRDA 2007, identified 11 priority areas for regional sediment management projects, including Toledo Harbor in Lucas County, Ohio. Other beneficial use projects that have proceeded under this authorization, such as the Delaware River Estuary in New Jersey and Pennsylvania, are described with lessons learned in Section 3.
- Section 506 of the WRRDA (2014) is the Great Lakes Fishery and Ecosystem Restoration Program (GLFER) and supports projects to restore fish habitat in the Great Lakes. It requires a 35 percent nonfederal cost-share and is implemented in partnership with the Great Lakes Fishery Commission.

The 2014 WRDA legislation provided additional reforms (the Water Resources and Reform Development Act), including a stipulation for Congress to utilize 100 percent of the Harbor Maintenance Trust Fund for its intended purpose: to maintain harbors across the United States. This should result in additional funding toward maintenance of Great Lakes harbors as well.

2.3 Applicable USACE Policies, Planning Guidance, and Procedures

In addition to the federal statutes, USACE policies, guidance, and regulations applicable to beneficial use of dredged sediment are listed below and are further described in Appendix B. The USACE publications are available online at http://publications.usace.army.mil. Although these apply mainly to USACE, they are included here for reference and context to aid other parties in understanding USACE policies and procedures.

Engineer Research Development Center Resources

- The USACE Environmental Laboratory of the Engineer Research and Development Center includes a Dredging Operations Technical Support Program. The main website for that program (https://dots.el.erdc.dren.mil/) provides a link to a website specifically on beneficial use of dredged material; it provides numerous examples of beneficial uses and resources for implementing beneficial use projects (https://budm.el.erdc.dren.mil/). The Environmental Effects & Dredging and Disposal (E2-D2) is a literature database of technical references on a diverse range of topics related to environmental effects of dredging and dredged material placement practices. The database presents broad topics, such as beneficial uses of dredged material, contaminated sediments, and effects of sediment resuspension and sedimentation on aquatic organisms and their habitats. The E2-D2 is available at https://dots.el.erdc.dren.mil/database.html.

Army Regulations

- *Environmental Protection and Enhancement*—AR 200-1

Engineering Regulations (ER)

- *Environmental Operating Principles*—ER 200-1-5
- *Procedures for Implementing NEPA*—ER 200-2-2
- *Planning Guidance Notebook and Dredged Material Management Planning*—ER 1105-2-100[6], including Appendix E

[6] As part of the USACE Planning Processes, a key resource to understanding the application of various WRDAs and other key laws can be found online at http://planning.usace.army.mil/toolbox/guidance.cfm?Option=WRDALaw&Side=No&Type=WRDA%20Implementation

- *Continuing Authorities for Aquatic Ecosystem* Restoration—ER 1105-2-100, Appendix F
- *Environmental Stewardship Operations and Maintenance Policies*—ER 1130-2-540
- *Civil Works Ecosystem Restoration Policy*—ER 1165-2-501
- *Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects* —ER 1165-2-132[7]

Engineering Circulars (EC)

- *Civil Works Review Policy*—EC 1165-2-214

Engineering Manuals (EM)

- *Dredging and Dredged Material Disposal*—EM 1110-2-5025
- *Beneficial Uses of Dredged Material*—EM 1110-2-5026
- *Confined Disposal of Dredged Material*—EM 1110-2-5027

Other USACE Initiatives/Programs

- **Regional Sediment Management Program (RSM)**, initiated in 1999, enables the optimization and use of sediments and management of projects through a systems-based approach. The RSM supports sustainable navigation and dredging, flood and storm damage reduction, and environmental practices to increase overall benefits and reduce lifecycle costs. The RSM is also a means to involve stakeholders to leverage resources, share technology and data, identify needs and opportunities, and develop solutions to improve the use and management of sediments. For more information, please visit http://rsm.usace.army.mil/
- The USACE has been exploring **public/private partnerships** on projects involving the Nation's waterways. For more information on this, please visit http://www.army.mil/article/129756/Corps_of_Engineers_explores_public_private_partnerships/
- The **Engineering With Nature (EWN)** program promotes sustainable delivery of economic, social, and environmental benefits associated with water resources infrastructure and its operation and maintenance (http://engineeringwithnature.org). This is a single collaborative and cost-

[7] ER 1165-2-132 states that dredged material from the navigation channel would not normally be considered hazardous waste (and therefore should be free from Comprehensive Environmental Responses, Compensation, and Liability Act liability). A possible exception to this may be if the dredged material originates from within an AOC.

effective approach for infrastructure development and environmental management and seeks to identify opportunities to better implement the USACE Environmental Operating Principles in existing or developing water resource development projects. These projects are to improve integration of scientifically sound engineering and natural systems.

- Engineering With Nature is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaborative processes. Engineering With Nature directly supports the Corps' *Sustainable Solutions to America's Water Resources Needs: Civil Works Strategic Plan 2014–2018* and contributes to the achievement of its civil works mission and goals (Bailey 2014, USACE 2014c).

- The four key efforts of EWN are to (1) use science and engineering to produce operational efficiencies supporting sustainable delivery of project benefits, (2) use natural processes to maximum benefit, thereby reducing demands on limited resources, minimizing the environmental footprint of projects, and enhancing the quality of project benefits, (3) broaden and extend the base of benefits provided by projects, to include substantiated economic, social, and environmental benefits, and (4) use science-based collaborative processes to organize and focus interests, stakeholders, and partners to produce more broadly acceptable projects.

- There are a number of USACE projects related to beneficial use of dredged sediments that illustrate the EWN principles and practices listed above and that have broad applicability in Great Lakes waters. These projects are included in the examples presented in Section 3 (e.g., Cat Island in Wisconsin) and Section 4 (e.g., projects on the Gulf Coast).

- **Joint U.S. EPA and USACE Guidance** The U.S. EPA and USACE has provided additional national planning (U.S. EPA and USACE, 2007a, b):

- *Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material: Beneficial Use Planning Manual*

- *The Role of the Federal Standard in the Beneficial Use of Dredged Material from U.S. Army Corps of Engineers New and Maintenance Navigation Projects*

The steps outlined in the U.S. EPA/USACE's associated fact sheets regarding public involvement and outreach may assist in initiating a beneficial use project (U.S. EPA and USACE 2007c, U.S. EPA 2016c). Additionally, the National Dredging Team (of which USACE and U.S. EPA are foundational members) has provided an action plan to increase beneficial use (National Dredging Team 2003).

3 State Regulations/Policies

The following subsections summarize the statutes, regulations, and policies from Great Lakes states that relate to promoting beneficial use of dredged material. Note that all of the Great Lakes states have established a state coastal zone management program, which acts to reduce erosion and coastal hazards; preserve maritime and cultural heritage; support coastal dependent uses; create and enhance public access; balance coastal community development; and protect and restore coastal habitat, including wetlands. The USACE navigational maintenance projects are required to show consistency with the applicable state coastal zone management program(s).

The coastal states of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota are addressed in this section in their order of geographic position along the Great Lakes, from east to west. Where applicable, policies of major ports and harbors in these states are highlighted, and successful projects are described.

3.1 New York State

3.1.1 State Regulations/Policies

The New York State Department of Environmental Conservation (NYSDEC) regulates dredging under various parts of the state's Environmental Conservation Law (ECL), as codified in Title 6 of New York Code, Rules and Regulations (NYCRR). The sections applicable to the Great Lakes region include: 6 NYCRR Part 663, Freshwater Wetlands Permit Regulations; 6 NYCRR Part 505, Coastal Erosion Management; 6 NYCRR Part 422, Mining and Dredging; and 6 NYCRR Part 617, State Environmental Quality Review (NYSDEC 2015a).

Non-USACE dredging activities in New York waters require a permit from USACE and a permit or water quality certification (WQC) from NYSDEC. To streamline the application processes, a joint permit application form was developed. This allows the applicant to submit the same application form to the USACE and NYSDEC. This form is available at http://www.lrb.usace.army.mil/Missions/Regulatory.aspx

According to the permitting guidelines, the state provides flexibility in terms of beneficial uses of dredged material (NYSDEC 2014). Dredged material is defined as a solid waste except under 6 NYCRR 360-1.2(a)(4)(ix) and pursuant to a case-specific beneficial use determination (BUD) under 360-1.15(d). Specifically, any materials dredged under an Article 15, 24, 25, or 34 ECL permit, or a CWA Section 401 certification, are not considered solid wastes for the purposes of Part 360 and only to the extent that both the excavation and disposal of the material are regulated by the dredging permit or 401 certification. Article 15 permitting applies to any project that (1) modifies or disturbs a protected

stream, (2) builds or repairs dams, (3) builds certain docks, wharfs, or piers, or (4) excavates or places fill in navigable waters. Article 24 permits are those permits that relate to the filling or extraction of freshwater wetlands. Article 25 permits apply to the same filling and extraction activities of Article 24 but in tidal wetlands. Article 34 applies to permits for activities in coastal erosion hazard zones. Dredged materials not covered under these permits, except for materials from manufacturing or industrial processes, are considered solid wastes and subject to regulation under New York's Solid Waste Management Facilities Regulations.

The NYSDEC has the authority to issue a special Research, Development, and Demonstration Permit to promote beneficial use under Subpart 360-1.15 (NYSDEC 2015b). This is a discretionary permit that requires the applicant to clearly demonstrate that the demonstrated use will protect public health and the environment.

In New York State, a Beneficial Use Determination (BUD) is made which includes the determination of the level of contamination in the dredged material. This determines whether the Part 360 solid waste management facilities regulations have jurisdiction. Once NYSDEC grants a BUD, the dredged material is not considered a solid waste, and compliance with 6 NYCRR Part 617 State Environmental Quality Review and 6 NYCRR Part 621 Uniform Procedures do not apply. Additionally, transporters of nonhazardous dredged material are exempt under 6NYCRR Part 364.

There are either predetermined BUDs or case-specific BUDs. A list of 16 categories are provided for predetermined BUDs; otherwise, a case-specific BUD is required from NYSDEC, which includes beneficial use projects using dredged materials either for proposed upland applications or aquatic placement. Dredged materials do not fall into one of the solid waste exceptions that would allow the owner of the material to use a generic BUD. The beneficial use proposal should be included in the earliest stages of the dredging plan submitted to NYSDEC.

The NYSDEC's Division of Water provides technical and operational guidance on beneficial use specific to in-water and riparian management of sediment and dredged material (NYSDEC 2004). The NYSDEC has specific rules relating to the use of dredged material in NYSDEC Region 3 (i.e., Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester Counties) which, although not in the Great Lakes watershed, provide transferable guidance. The use of dredged materials is subject to the same permitting requirements mentioned above. Samples of the materials must be tested first to determine the level of any contamination and, thus, their suitability for beneficial use projects. The 2004 *Technical & Operational Guidance Series Manual* provides sediment quality parameters and sampling requirements (NYSDEC 2004). The manual identifies when it is necessary to sample the dredged sediments, perform chemical analysis, and submit the results of analysis to NYSDEC for review.

The New York State Department of State manages the state's Coastal Zone Management Program (NYSDOS 1982). The program sets dredging windows as a general policy and encourages the use of a DMMP and beneficial use as general policies (Lukens 2000). Any project proposed for the designated state coastal zone or significant fish and wildlife habitat area must be consistent with approved New York State coastal zone policies.

3.1.2 Hudson Raritan Estuary

The process and activities associated with beneficial use of dredged material within the Hudson Raritan Estuary can be used as a case study for beneficial use in the Great Lakes region. In 1988, Congress recognized the New York-New Jersey Harbor as an estuary of national importance and accepted it into the National Estuary Program (NEP). Note that the NEP does not apply to the Great Lakes region. However, harbors that have benefitted by inclusion in the NEP are discussed here, so that Great Lakes harbors may realize the benefit of incorporating dredged material management into a regional framework. The Comprehensive Conservation and Management Plan and Management Conference mandates stipulated in the NEP are somewhat akin to the Lakewide Action and Management Plans (LAMPs) created under the Great Lakes Water Quality Agreement between the United States and Canada (see further description of LAMPs in Section 4.1).

The New York/New Jersey Harbor Estuary Program developed a *Comprehensive Conservation and Management Plan* in 1996. It involved 12 federal and state agencies, 14 academic and research foundations, and 27 nonprofit organizations. Effective local leadership was provided by the New York/New Jersey Harbor Estuary Program, the Port Authority of New York and New Jersey, Baykeeper, and other local organizations. These groups had recognized that 80 percent of wetlands were filled in the New York/ New Jersey Harbor, and nature features were dramatically altered to accommodate the demands of the largest urban area in the United States. Through local outreach, restoration opportunities were identified, including Big Egg Marsh in Jamaica Bay.

The USACE New York District, in partnership with its nonfederal local sponsor, the Port Authority of New York and New Jersey, joined the process and developed the Hudson Raritan Estuary Ecosystem Restoration Feasibility Study to evaluate the restoration opportunities identified in the plan. In 2005, workshops were held for local stakeholder input on guiding restoration by establishing goals and objectives to reflect "place-based" and "species-specific conservation" approaches.

Using Section 204 of WRDA 1992, as amended by Section 207 of WRDA 1996, (33 USC Section 2326) and as amended by Section 2037 Regional Sediment Management of WRDA 2007, $10.6 million was authorized, with a cost-share of 65 percent federal and 35 percent local sponsor. Following a 2008 engineering documentation report, even though beneficial use was not the least cost, it was

selected/justified as an environmental benefit to the estuary. In the case of Big Egg Marsh, Elders Point West, and Yellow Bar Hassock restoration using dredged materials, costs were between $350,000 and $500,000 per acre. Overall, the long-term restoration was estimated to cost between $3.3 and $10.8 billion (Great Lakes Commission 2010).

A lesson learned from this program is that financial planning is essential to a successful large restoration program. Funding was anticipated to come from multiple sources, including USACE funding under Section 206 of WRDA 1996 and 1135 of WRDA 1986, and other funding sources, including:

- USACE funding through Continuing Authorities Program, General Investigation study funds, and Construction general funds.
- USACE ERDC demonstration project funds
- U.S. EPA grants/NEP funds, Wetlands Program Development grants, Community Action for Renewed Environment, Environmental Justice Grant Program, and others.
- National Oceanic and Atmospheric Administration and U.S. Fish and Wildlife Service (USFWS) grants and funding programs.
- State programs: NYSDEC, state wildlife grants, New Jersey Department of Transportation/Office of Maritime Resources' two grant programs.
- Natural Resource Damage Assessment funds and mitigation funds, which set up restoration areas as mitigation banks (USACE 2009).

Raising funds will be through coordinated efforts with nongovernmental organizations, such as private partnerships with Coastal America's Corporation Wetlands Partnership.

3.1.3 Buffalo River

An example of environmental dredging that is leading the way to use cleaner dredged material for beneficial uses is the Buffalo River. The Buffalo River Restoration Partnership is a unique public-private-nonprofit partnership led by Buffalo Niagara Riverkeeper®[8], and includes the U.S. EPA, USACE, NYSDEC, and Honeywell Corporation. This partnership has worked collaboratively to clean up the river using both GLRI and GLLA funds under both USACE and U.S. EPA authorities. Additionally, the Trustees of the Buffalo River (i.e., NYSDEC, the Tuscarora Nation, and the U. S. Department of the Interior Fish and Wildlife Service), conducted a Natural Resource Damage Assessment, which documented injury to fish and groundwater in and near the Buffalo River. Great Lakes Restoration Initiative funds were used for strategic navigation dredging (i.e., within the designated federal navigation channel), while GLLA funds (in

[8] The Buffalo Niagara Riverkeeper® is the remedial action plan coordinator for the Buffalo River AOC.

partnership with Honeywell) were used for environmental dredging (i.e., areas outside the federal channel). These actions have helped to address a number of environmental problems affecting the Buffalo River, such as contaminated river sediments, poor water quality, a lack of safe public access, and insufficient fish and wildlife habitat. There were two major environmental dredging projects as well as habitat restoration projects associated with this effort.

In 2010, a remedial investigation/feasibility study summarized the results of multiple sediment sampling events and identified the contaminants, technical evaluations, and ecological information used to evaluate a range of cleanup alternatives for the contaminated sediments in the AOC. In 2011, the first phase of environmental dredging removed approximately 450,000 cubic yards (CY) of contaminated sediments from within and just below the federal navigation channel at an approximate cost of $4.61 million and was funded by the GLRI. Because this sediment in the navigation channel would not normally be removed under routine maintenance dredging, and because the USACE received permission to dredge 6 inches to 1 foot below the typical navigation channel prism to allow later infiltration of a buffer of clean sediment at the bottom of the navigation channel, it was considered strategic navigation dredging. The final phase of environmental dredging, outside the navigation channel, removed 480,000 CY of contaminated sediment from the river bottom (U.S. EPA 2015c). The U.S. EPA awarded $45 million from the GLLA for this environmental dredging (U.S. EPA 2015b). Honeywell provided additional funds to support the environmental dredging. These dredged sediments were all placed in the local CDF (Buffalo Dike 4). The ultimate goal of these combined environmental dredging efforts was to delist the BUIs associated with contaminated sediments in the Buffalo River AOC. One of these BUIs is “restrictions on dredging activities.” It was assumed that after this remedial dredging, the subsequent sediments dredged as part of routine maintenance of the federal navigation channel would be clean enough to use beneficially. This unique partnership, formed to address contaminated sediments in the Buffalo River, is paving the way for new beneficial use projects at this harbor.

In 2013, under Section 204 of USACE’s Continuing Authorities Program, a project to evaluate beneficial use of dredged material from the lower six miles of the Buffalo River, in conjunction with regional sediment management, was approved (USACE 2013a). Note that sediments dredged from the Buffalo River had been confined since 1967, but with the completion of the GLRI and GLLA environmental dredging, newer sediments dredged from the navigation channel for routine maintenance may now be clean enough (based on subsequent routine confirmatory testing) that confinement is no longer needed. This feasibility study addressed the nature of dredged sediments that might be used and set the stage for developing a project partnership agreement to outline cost-sharing and other responsibilities. Under WRDA 2007, the RSM study for a Section 204 project is 100 percent federally funded, and the federal construction limit is $5,000,000 for any one site. The incremental cost increase to undertake aquatic habitat restoration (instead of a disposal option costing the same as the Federal Standard)

would be cost-shared with a local sponsor. The proposal involves using 100,000 CY of dredged sediment to create approximately five acres of wetland habitat on Unity Island (Forgette 2014).

3.2 Pennsylvania

3.2.1 Commonwealth Regulations/Policies

The Pennsylvania Department of Environmental Protection (PADEP) oversees permitting of dredge and fill activities in the State of Pennsylvania under a State Programmatic General Permit No. 3 (PADEP 2006). Commercial dredging of sand and gravel is regulated under the Commercial Dredging regulations (PADEP 2014). Pennsylvania considers dredged material "residual waste," and its use and disposal are governed by the following permits that relate to the processing and beneficial use of dredged material for specific applications (PADEP 2015):

- WMGR046—Use of dredged material for manufactured soil or soil amendments
- WMGR072—Use of dredged material for roadway construction
- WMGR083—Use of dredged material for roadway construction material; soil amendment; landscaping soil; higher-grade topsoil; lightweight aggregate in concrete; stream bank stabilization; or a cover, cap, or other component of a remediation project
- WMGR085—Use of dredged material in mine reclamation
- WMGR093—Processing of dredged material as a blend in commercial projects or other waste-derived materials

Each general permit establishes testing requirements and acceptable chemical concentration levels for the dredged material intended for beneficial use. The testing of dredged materials must follow U.S. EPA Method SW-846, "Test Methods for Evaluating Solid Waste."

Any transportation of dredged material, before and after the dewatering process, must not violate Pennsylvania's Storage and Transportation of Residual Waste Law. Transporters may face liability for harming the public health and safety, or creating a nuisance if they fail to meet those requirements.

The PADEP used Section 1135 of WRDA 1986 to support development of a long-term beneficial use plan for dredged material in the Fort Mifflin CDF associated with the Delaware River, Philadelphia to the Sea, and the Schuylkill River projects (Great Lakes Commission 2010). Dredged material was harvested from this CDF to restore 300 acres of mined land, thus addressing the mine, acid mine drainage, and ecosystem restoration simultaneously. The state had also realized that the CDF occupied valuable riparian land, reduced the tax base, and disturbed adjacent properties. By harvesting dredged material from the CDF and

using it beneficially, the state was also gaining capacity to support continued maintenance on these two navigation channels.

3.2.2 Delaware Estuary Regional Sediment Management Plan

Although not within the Great Lakes watershed, this plan was created under the auspices of the Partnership for the Delaware Estuary (the Partnership) and is relevant as an example of a partnership that increased beneficial use of dredged material. This regional nonprofit was created under the NEP described in Section 3.1. The Partnership is designed to bring stakeholders together to address issues in the Delaware Estuary region. These stakeholders include federal agencies and the state governments within the Delaware Estuary: Delaware, New Jersey, and Pennsylvania. In 2013, the Partnership published the *Delaware Estuary Regional Sediment Management Plan* (Delaware Estuary Regional Sediment Management Plan Work Group 2013).

The Partnership recommended streamlining the planning and funding of dredging products to ensure a budget sufficient for beneficial use projects. The Partnership also recommended beneficial uses specific to the needs of the Delaware Estuary's health. These recommendations included the beneficial use of dredged materials for:

- Large-scale wetland restoration, especially tidal marshland.
- Shoreline restoration, including beach nourishment.
- Coal mine reclamation.
- Erosion repair and control.

The USACE Philadelphia District has adopted the RSM Plan and has started to implement its recommendations.

The RSM Plan recognized that to increase beneficial use of dredged material, data on sediment quality and quantity and the role sediments play in ecosystem health were needed. Beside this data, the RSM Plan also recognized the lack of a sustainable program to facilitate cooperation among programs responsible for major sediment sources (watershed), sinks (dredging), and needs (tidal wetlands and shorelines). The plan also identified a need for new sources of funding, or creative uses of existing funding mechanisms that would allow dredged material to be used for environmental restoration.

In the USACE Philadelphia District, over the past 30 years, over 3.5 million CY of dredged material previously placed in CDFs has been removed for beneficial use. The RSM Plan recognizes that this amount is less than the annual dredging from the Delaware Estuary system, so promotion of more beneficial use is a requirement (Delaware 2013). However, the lack of coordinated interest in promoting beneficial use is partly due to sufficient CDF capacity to date.

In order to implement more beneficial use projects in the Delaware Estuary System, innovative funding strategies and financial partners are needed to overcome the cost-share requirements for beneficial use placements that are more costly than the Federal Standard.

3.3 Ohio

3.3.1 State Regulations/Policies

The Ohio Department of Natural Resources (ODNR) shares regulatory jurisdiction with the Ohio Environmental Protection Agency (Ohio EPA) over dredging and/or the discharge of dredged material into Lake Erie and its ports and harbors. All activities occurring within the designated coastal zone of Lake Erie must be consistent with Ohio's approved coastal zone management policies (i.e., http://coastal.ohiodnr.gov/ocmp). Additionally, any proposed discharge of dredged or fill material into waters of the state, including wetlands, must receive a WQC from Ohio EPA (i.e., http://www.epa.ohio.gov/dsw/401/permitting.aspx).

There are policy limitations to reusing sand and gravel. The ODNR has a standing policy, supported by Ohio code, that recommends sand and gravel dredged from Lake Erie be used in the littoral zone associated with the dredging project. The goal of this policy is to restore and nourish Lake Erie's beaches and help reverse erosion. This regulation only applies to dredging activities for the maintenance or construction of channels, jetties, docks, etc. However, there may be times when the cost of such nearshore placement exceeds the amount USACE may spend on dredged sediment placement because of shallow-water conditions and the need for special equipment and/or handling. In this case, a non-USACE partner would be required to pay for any placement costs that exceed the Federal Standard of open-lake placement.

In April 2015, Governor John Kasich signed Senate Bill 1. This bill "enacts section 6111.32 of the Revised Code […] to establish requirements governing dredged material." It will restrict the placement of dredged material after July 2020 to beneficial use projects (e.g. beach nourishment, placement in littoral drift, habitat restoration) but will include some exceptions approved by the director of environmental protection (e.g., Maumee River, Maumee Bay federal navigation channel, Toledo Harbor). The ODNR director will also have to approve the location of disposal of dredged material. The goal to eliminate open-lake placement of dredged material could affect USACE dredged material placement options for open-lake disposal and may affect beneficial use of dredged material as a result.

3.3.2 Port of Cleveland and Cleveland Harbor

Recognizing that the existing Cleveland Harbor CDFs are at or nearing capacity, the USACE held a dredging summit in 2010 to bring together stakeholders

affected by the operation and maintenance of the federal navigation channel in an effort to identify sustainable dredged material management options for the city of Cleveland. At that time, it also helped create a Cleveland Dredged Material Task Force,[9] which met on several occasions since 2010 to develop solutions. One of the efforts of the task force was to identify possible beneficial use placement sites for dredged sediment. The task force identified over 16 potential placement sites for beneficial use scenarios, including mine land reclamation, brownfield and urban construction projects, landfills in need of capping or fill material, and beaches where dredged material could be used for nourishment. The USACE Engineer Research and Development Center evaluated the suitability of the dredged sediment for placement at these sites (USACE 2011). It found that all of the sediment was suitable for most upland placement scenarios (except possibly for residential use). It also found that some of the sediment from the upper Cuyahoga River federal navigation channel was suitable for aquatic beneficial use options. None of these potential beneficial uses have yet been implemented.

The City of Cleveland is developing a beneficial use plan and plans on extending capacity at its CDF (i.e., CDF 12) by stacking sediment in the CDFs and handling it as a commodity. The port intends to promote the use of dredged sediment from its CDF for beneficial uses by using the sand, silt, clay, and gravel from dredging activities for the following:

- Brownfield restoration
- Landfill cover
- Fill for basements at abandoned and demolished buildings (working with the land bank)
- Highway construction material
- Repair or creation of habitat areas or beaches

The USACE sampled and analyzed sediment in 2013 and 2016 and concluded that sediments from the upper portion of the Cuyahoga River federal navigation channel were suitable for open-lake placement (USACE 2014b; Cleveland-Cuyahoga County Port Authority 2014). Accordingly, open-lake placement has been established as the Federal Standard for this upper navigation channel sediment while for sediment dredged from the lower navigation channel, the Federal Standard remains CDF placement for now. With sediment from the upper navigation channel having been found suitable for open-lake placement, its suitability for most beneficial uses, including aquatic ecosystem restoration, is confirmed.

[9] Cleveland Dredged Material Task Force members include the Port of Cleveland, USACE, the City of Cleveland, the Cuyahoga AOC Remedial Action Plan Coordinator, Arcelor Mittal Steel, Ohio EPA, Ohio DNR, members of Congress representing the Cleveland area, and other representatives of private industry.

3.3.4 Toledo Harbor

Toledo Harbor stakeholders are actively looking to change how dredged sediment is handled within its waters (Hull & Associates, Inc., 2012). Presently, the majority of dredged sediment at Toledo Harbor is managed through open-lake placement. The Ohio Lake Erie Commission received a $250,000 U.S. EPA GLRI grant that was subgranted to the Toledo-Lucas County Port Authority to assist the Toledo Harbor Task Force with developing a Toledo Harbor sediment management and use plan. This plan identifies interim and long-term dredge sediment management and beneficial use options to help reduce reliance on open-lake placement of dredged sediment. The plan includes an evaluation of opportunities and costs of managing one million cubic yards of sediment each year over the next 30 years. The plan recommends a combination of beneficial use options, including in-water and upland wetland restoration and shoreline protection areas, placement of dredged sediment onto improved agricultural fields, and development of products for landscaping or nonstructural fill.

The Toledo-Lucas County Port Authority secured Ohio Healthy Lake Erie funds (coadministered by ODNR and Ohio EPA) in 2014 to advance the beneficial use projects recommended in the plan. One resulting project is the design and construction of the Great Lakes Dredged Material Center of Innovation, to be built on a former CDF owned by the City of Toledo along the Maumee River. The intent of the project is to explore options for the beneficial use of dredged material for agricultural purposes. The agricultural field improvement project at the Dredged Material Center of Innovation is intended to help local leaders evaluate material placement, dewatering, whether using interim cover crops or amendments to improve soil is a viable option, and other operations and maintenance activities needed for planning full-scale implementation of the beneficial use of sediments for agricultural purposes. This facility is set to begin operations during the summer of 2016.

3.4 Michigan

3.4.1 State Regulations/Policies

The Michigan Department of Environmental Quality (MDEQ) oversees permitting for all dredging and fill activities that occur in state waters. Non-USACE dredging activities in Michigan waters may require permits from the USACE and permits or WQCs from MDEQ. To streamline the application process, the two agencies developed a joint permit application. It allows the applicant to submit the same application to USACE and MDEQ. The form is available at http://www.michigan.gov/deq/0,4561,7-135-3313_71520---,00.html

As part of the dredging governance program stipulated in State Rules Part 301, Inland Lakes and Streams; Part 325, Great Lakes Submerged Lands; and Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection

Act, 1994 PA 451, Michigan can require testing of dredged sediment (MDEQ 2013). Whether it imposes this requirement depends on the intended disposal plan (MDEQ 2014). Sediment disposed of "on-site" (i.e., at an upland location contiguous to the waterbody being dredged) does not need to be tested; however, the material must include a restrictive covenant limiting future use of the dredged material. This requirement is primarily for contaminated dredged sediment. Dredged sediment testing may also be waived if the sediment is intended for a licensed solid waste landfill or USACE CDF.

Dredged sediment consisting of 90 percent or more of sand is assumed to be uncontaminated based on the carrying nature of this material. As a result, Michigan requires no additional testing unless the sediment is located in a designated Dioxins and Furans Test Area. This is a pass/fail test, with failure requiring additional testing to evaluate the contaminants. This more specific testing would determine restricted placement options or may require the material be regulated as solid waste (managed in a landfill) or dredged sediment (managed in a CDF). If the dredged sediment passes the test, the MDEQ may designate it as "inert," thus requiring no additional evaluation, and it can be used unrestricted for upland use.

State governance over the disposition of sediment depends on the results of the dredged sediment sampling and analysis. Sediments that do not violate the state contamination limits are considered clean, and the applicant is free to use them for any application, so long as the use does not conflict with another state statute. Sediments that fail to meet the standards under Rule 118 are considered contaminated and subject to MDEQ approval for final use. These contaminated sediments may not be used for open-water disposal (MDEQ 2013). Sediments with slight contamination are often used as landfill cover.

As mentioned above, the MDEQ assumes that sandy dredged sediment is not contaminated; thus, it may be used without MDEQ oversight or testing. The preferred use for this sediment is beach rehabilitation.

3.4.2 Grand Haven Harbor

Beginning in the 1990s, the MDEQ, USACE, and local Grand Haven businesses worked together to find an alternative disposal mechanism for the material dredged from the Grand Haven Harbor. The CDFs used by the harbor were filled to capacity. Without adequate disposal capacity of channel maintenance material, vessels calling on the port had to lighten their loads, particularly in low-water conditions. One local stakeholder, the Board of Power and Light, which relied on shipping coal into the port, saw an additional $3 million in costs via alternative rail or trucking means. A group headed by the Grand Haven Chamber of Commerce worked with MDEQ and the USACE to identify a successful strategy to deal with dredged material. After reviewing their options, the stakeholders developed an alternative beneficial use for the dredged material (Knight 2005). The group treated the material as a commodity and began to mix it with local

municipal yard waste/compost. The USACE Dredging Operations and Environmental Research (DOER) Program provided the research and testing, and USACE ERDC supported a demonstration project. The U.S. EPA's Great Lakes National Program Office provided additional funding (ERDC 2005). The resulting mixture was high-quality topsoil. Verplank Trucking & Dock Company, experienced in recycling crushed cement rubble, asphalt, and foundry sand, began marketing "Earth Renewed." This topsoil has since been used locally for a variety of construction, municipal, and other projects. This project is also an example of successful intergovernmental and public/private partnerships.

3.5 Indiana

The Indiana Department of Natural Resources (InDNR) and the offices of Water Quality and Land Quality in the Indiana Department of Environmental Management (DEM) have overlapping jurisdiction of dredging and associated fill activities in the State of Indiana. Depending on the dredging project, these two departments are responsible for the Coastal Zone Management and Water Quality Certification Programs, respectively.

The Indiana DEM Office of Water Quality oversees permitting for dredged sediment fill activities that may affect the health of Indiana waters (Indiana DEM 2014). Before any discharge of fill associated with dredging, the Office of Water Quality will issue a Section 401 WQC. Permits from USACE may also be required for non-USACE dredging projects.

The Indiana DEM Office of Land Quality oversees the disposal of solid and hazardous waste, including dredged sediment considered "special waste" if it is contaminated. As a matter of policy, uncontaminated sediments are not restricted and are available for any use. Slightly contaminated sediments may also be used for upland fill, landfill cover, or as aggregates to other materials. The use of slightly contaminated sediments depends on the nature of the contamination and the proposed use. The Indiana DEM Office of Land Quality must approve such beneficial use and makes that determination on a case-by-case basis, although the general approach is a risk-based evaluation similar to the process used in the Risk Integrated System of Closure (RISC) program for brownfield sites. The statutory basis for regulating upland beneficial use of dredged material is found in Indiana Administrative Code (IAC) 13-12-3-2 and 13-25-5-8.5.

The IAC also focuses its beneficial use provisions on beach nourishment projects (InDNR 2014). Under the IAC, individuals extracting sand, gravel, or stone from the bed of navigable waterways must be licensed/permitted by the InDNR's Division of Water before starting the dredging process, as per IAC 14-29-3, the Sand and Gravel Permits Act. The permit application will include details of the dredge site and the proposed receiving site among other information. Before starting the project, the InDNR Division of Water must inspect both site locations. Depending on the results of the site inspections, the InDNR Division of Water will issue a notice to proceed for the project. The Indiana DEM Office of Land

Quality's policy is to allow in situ placement of materials because the risks associated with placement in the same or nearby locations are minimal.

3.6 Illinois

3.6.1 State Regulations/Policies

Non-USACE dredging activities in Illinois waters require a permit from the USACE, Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) and a WQC from the Illinois Environmental Protection Agency (IEPA). To streamline the application process, a joint permit application was developed. This allows the applicant to submit the same form to the USACE, IDNR/OWR, and the IEPA.

All federal and nonfederal activities within the boundaries of the Illinois Coastal Management Program (ICMP) that require a federal permit require an ICMP Federal Consistency Determination. The boundaries of the ICMP include all of Illinois' portion of Lake Michigan and sections of other inland Illinois' waterways connected to Lake Michigan. Information is available at http://www.dnr.illinois.gov/cmp/Pages/default.aspx.

The IDNR/OWR uses its Part 3704 Rules "Regulation of Public Waters" to review applications for dredging in Lake Michigan. These rules implement and are authorized by the Rivers, Lakes, and Streams Act (615 ILCS 5). For dredging projects on Lake Michigan, the IDNR/OWR and the IEPA issue a joint permit (615 ILCS 5/18). The IDNR/OWR encourages that all sediment dredged from Lake Michigan suitable for open-water placement be placed as close to the shore as possible to replenish the littoral drift. For maintenance dredging projects in Lake Michigan marinas and harbors, the IDNR/OWR and the IEPA may issue a ten-year maintenance dredging permit.

Although there is no specific beneficial use policy in the state, the IEPA indicated that several strategies are employed in the state to deal with dredged material, including the use of dredged material as a soil supplement for cropland and pastureland (Illinois EPA 1998).

3.6.2 *Mud to Parks*

Illinois DNR has sponsored numerous sediment beneficial use projects under the general program title *Mud to Parks*. Funding came from various sources, including an $8M bond fund and supplemental environmental project penalty sources. The projects were coordinated by the Illinois Sustainable Technology Center at the University of Illinois.

Several projects used mechanical and hydraulic dredging and wet as well as dried sediment. Reclaimed topsoil has been used at old strip mines, landfills, parks, urban redevelopment areas, and in general landscaping.

The largest project involved moving over 200,000 tons of wet mud 165 miles from East Peoria, Illinois, to the former U.S. Steel South Works site on Lake Michigan for use as topsoil in a park. The project required considerable coordination between state and federal agencies and local entities, including the City of Chicago, Chicago Park District, U.S. Steel, Fon du Lac Park District, and the City of East Peoria. Additionally, several companies provided in kind support.

Before use, the sediment was extensively tested for contaminants. Soil fertility and other physical properties were determined. Chicago sponsored a risk assessment before the first deliveries occurred. The dredged material was delivered by barge and then loaded on trucks for placement. It dried rapidly and was vegetated within two months.

Information on *Mud to Parks* including videos, publications, and photos are available at http://istc.illinois.edu/special_projects/il_river/. While this project is not currently funded, it is a concept that can be used elsewhere.

3.7 Wisconsin

3.7.1 State Regulations/Policies

The Wisconsin Department of Natural Resources (WDNR) is the primary state agency responsible for the dredging permit process and requires compliance with a number of state statutes, including Section 30.20 (http://docs.legis.wisconsin.gov/document/statutes/30.pdf), which regulates dredging. Information is available at http://dnr.wi.gov/topic/water.html. Nonfederal dredging and associated sediment placement activities are also regulated by the USACE under Section 404 of the CWQ and Section 10 of the Rivers and Harbors Act. Information is available at http://www.mvp.usace.army.mil/Missions/Regulatory.aspx

Dredging also requires a Wisconsin Pollution Discharge Elimination System permit in compliance with Section 401 of the CWA and a Federal Consistency Certification from the state. A WDNR watershed management specialist reviews the permit application to determine if dredge volume is less than or greater than 50 CY and whether there are contaminants. If the dredge volume is greater than 50 CY and/or there are known contaminants, the WDNR determines sampling requirements, and the permits are approved based on Chapter 30 requirements (WDNR 2003). Wisconsin has not set formal levels for contamination of dredged material.

Dredged material is defined as “any solid waste removed from the bed of any surface water” and regulated under Chapter NR 500.03(71) of Wisconsin Administrative Code and can be determined to be exempt or not exempt from solid waste regulation. The transportation and disposal of dredged material as

solid waste is subject to strict landfill requirements and contaminant control regulations. The WDNR evaluates each project on a case-by-case basis to decide if it can be beneficially used. Wisconsin has not published a formal guide on dredged materials and reuse, but it has introduced a new approach to permitting for beneficial reuse. Wisconsin has a policy to encourage beneficial use according to NR 347.01 (2). The WDNR uses sections of the Wisconsin Administrative Code pertaining to other forms of solid waste to evaluate if dredged material is safe for beneficial use. These sections include NR 347, sediment sampling and monitoring protocols for dredging projects; NR 538, industrial byproducts; NR 528, sediment evaluation; and NR 720, solid waste cleanup standards. The administrative code contains sections NR 500.03 (19) and NR 538 regarding beneficial use of industrial byproducts that sets standards for specific constituents to determine levels of contamination and suitability for beneficial use. The USACE projects within federally authorized project areas require a water quality certificate under Section 401 and NR 299 of Wisconsin Administrative Code.

Beneficial use can vary from upland placement to in-water placement for varying purposes (i.e., cap landfills to marsh creation or beach nourishment). In upland placement projects, the dredged material is evaluated as a waste and regulated through WDNR's Division of Air and Waste Bureau of Waste Management for approvals. Under NR 500.08(5) (a), an exemption from solid waste regulations is obtained to use 3,000 CY or less of "nonhazardous" dredged material and if greater than 3,000 CY, upland disposal can be approved under section 289.43(8) as a one-time upland disposal/placement. The WDNR has a contaminated-sediment program with a contaminated-sediments advisory committee and a PCB soil criteria group that reviews proposed beneficial use projects.

In-water placement for beach nourishment can be approved under Section 30.12(3) (a), and the permit is issued through WDNR's Bureau of Fisheries and Habitat Protection. For use in the littoral zone, dredged material must be evaluated following protocols of NR 347 for sediment analysis parameters; it must meet a standard of "the average percentage of silt plus clay passing a #200 sieve or less than 0.74 mm diameter must not exceed the average in situ beach material by 15%," and color cannot be significantly different. Beach nourishment and island creation projects require establishment of a "bulkhead line" and a lease from the Board of Commissioners of Public Land since all natural lake water bottoms are owned by the state. The bulkhead line and lease are obtained through WDNR's Division of Waters, Bureau of Fisheries and Habitat Protection. On a case-by-case basis, when the state is not the riparian property owner, either specific legislation must be enacted to authorize placement of structures and island fill, or the riparian property owner would be part of the project.

Both Wisconsin and Minnesota have a process for removing material from a CDF, which transfers ownership of the material; for example, from the Port Authority. The USACE provides authorization to operate machinery in the CDF. The WDNR may issue a blank permit for a specified reuse of sediment from the

CDF and any special conditions (i.e., control of invasive species). Permitting and contamination rarely affect the feasibility of beneficial use; the prohibitive factor is typically cost.

3.7.2 Cat Island Restoration Project

The Cat Island Restoration Project involved reconstruction of the Cat Islands and protection and restoration of approximately 1,225 acres of shallow water and wetland habitat. It entailed the construction of a 2.5-mile-long wave barrier along the remnant Cat Island shoals (GLDT 2015b). The wave barrier will protect and restore shallow water while allowing for wetland habitat restoration and provides the base for constructing three islands, which will be built from dredged material from the outer navigation channel. The project is a partnership formed by the Port of Green Bay, Brown County, USACE, U.S. EPA, USFWS, Wisconsin Departments of Transportation and Natural Resources, Lower Fox River/Green Bay Natural Resources Trustee Council, UW Sea-Grant, UW-Green Bay, and 14 port terminal operators. The project was identified as a top priority for restoration in the 1988 Lower Green Bay Remedial Action Plan for the Lower Green Bay and Fox River AOC. Site survey work and a review of historical aerial images documented the erosion of the islands over time. From this, concept design and illustrations were made that allowed the public to see what was being proposed to restore the islands. As three islands are restored, a total of 2.35 MCY of material is needed and would come from clean dredged material over the next 30 to 50 years (Port of Green Bay 2016). A total of 272 acres of island habitat would result, providing critical habitat for birds, fish, and mammals as well as sustaining local jobs, industries, and the economic outputs of the Port (Port of Green Bay).

In acting as a cheerleader for the project, the Port of Green Bay indicated, “This is a great example of how dredging material can be repurposed for the benefit of the environment and keep our port economically viable at the same time.”

3.8 Minnesota

3.8.1 State Regulations/Policies

Minnesota’s Water Pollution Control Act defines dredged sediment as “other waste” over which the Minnesota Pollution Control Agency (MPCA) has jurisdiction. The MPCA has published a guide called *Managing Dredged Materials* and established best management practices over the use of dredged sediment in the state for land-based applications (MPCA 2014a, 2014b). Similarly, the State of Minnesota has provided guidance when seeking approval through the environmental review process to beneficially use dredge material in water for aquatic habitat restoration projects (MPCA and MNDNR 2015a). Nonfederal dredging and associated sediment placement activities are also regulated by the USACE under Section 404 of the CWQ and Section 10 of the Rivers and Harbors Act. Information is available at http://www.mvp.usace.army.mil/Missions/Regulatory.aspx

In-water placement guidance for projects in Minnesota defines the expectations regarding quality assurance of work plans, data collection, and data formats recommended when performing operations in the Duluth/Superior Harbor (section 3.7.3 below). The document describes the specific testing required to approve material for placement (MPCA and MNDNR 2015b), as well as outlining an overall approach for using lines of evidence when evaluating current site conditions and determining overall restoration success (MPCA and MNDNR 2015c). Permitting requirements and information for MDNR are available at http://dnr.mo.gov/env/wpp/permits/index.html.

Dredged material for land-based application is categorized into three management levels. The state provides best management practices for sediment management. The state also utilizes a state disposal system (SDS) permitting program in conjunction with certain dredged materials (MPCA 2012).

This permitting program may apply to dredged materials originating from pollution remediation projects or dredged for navigation purposes (Stewart and Mokashi 2013). Information is available at http://www.mda.state.mn.us/animals/feedlots/feedlot-dmt/feedlot-permits/sds-permit.aspx. The SDS programming applies to dredged material originating from:

- Mississippi River downstream of river mile 857.6.
- Minnesota River downstream of river mile 27.
- St. Croix River downstream of river mile 26.
- St. Louis River downstream of State Highway 23 crossing.
- St. Louis Bay or Duluth/Superior Harbor.
- Out-of-state projects.

At present, there is no general permitting method under the SDS program; all projects must receive an individual permit. Individual permits must include a description of the dredge project, the dredge project site, and the pollutants in the dredged material.

The characterization of pollutants in the dredged sediment must take place before dredging. This consists of two parts. First, the analysis must determine if the sediment qualifies as sand. Sediment “retained on a #200 sieve” does not require additional testing barring historical evidence showing that pollutants are likely to be present at the site. Second, samples from the dredge site must be tested and results compared to the Soil Reference Values (SRVs). These SRVs have been developed for over 40 elements and compounds. This comparison determines the management level of the sediment.

Minnesota divides dredged sediment into three management levels, which determine the reuse possibilities for the sediment. Level 1 sediment is suitable for use on residential or recreational land. This sediment has the most restrictive SRV limits. Level 2 sediment is suitable for industrial use. Level 3 sediment may not be reused without prior treatment. This sediment may be subject to Resource Conservation and Recovery Act or Toxic Substances Control Act regulations. Test results on samples must be at or below the concentrations listed on the state SRV tables to qualify for a particular level. Any results exceeding the set concentration level will cause all dredged material related to that sample to be placed in the next category.

3.8.2 Port of Duluth-Superior

The Duluth-Superior Harbor Technical Advisory Committee (HTAC) serves as a successful model of collaborative harbor planning. The HTAC was created as an advisory committee to the Metropolitan Interstate Council, which is the federally designated metropolitan planning organization for the Duluth-Superior area. The HTAC is a 31-member committee that meets quarterly to advise the Metropolitan Interstate Council on harbor-related issues (McDonald and Sharrow, 2014). Its stakeholder membership groups include governmental agencies (local, regional, state, and federal), citizens (environmental groups), and industry sectors (major industry and trade groups). Its technical advisers include USS Great Lakes Fleet, the Western Great Lakes Pilots Association, and U.S. EPA Region 5. By bringing together this large and diverse group of stakeholders, the HTAC is able to discuss and formulate recommendations addressing several interconnected issues relevant to the Duluth-Superior Harbor. Current topics being considered include dredged material management, environmental restoration and enhancement activities, open-water mitigation strategies, and port area land use in the St. Louis River bay and estuary (HTAC 2016). The HTAC is responsible for the successful implementation of beneficial use of dredged material projects discussed below (Erie Pier and 21st Avenue West). It accomplishes these goals via collaboration with subcommittees that take on the charge to find common ground among all stakeholders and then develop work products they all can support.

3.8.2.1 Erie Pier

Originally intended to be a CDF for dredged material, the Erie Pier is now a processing and reuse facility that treats materials dredged from Port of Duluth-Superior and converts them to commodities certified by the States of Wisconsin and Minnesota for resale. Dredged material deposited into Erie Pier is hydraulically separated into coarse and fine portions. The course material (sand) is roughly 25 percent of material brought to Erie Pier. Reuse of coarse material in area construction projects consumes 100 percent of that material. The hydraulically separated fines are similar to topsoil and have good future potential for remediating brownfield sites and in mine land reclamation projects on the Minnesota Iron Range, but reuse to date falls greatly short of the annual supply (only approximately 20–30 percent of all material placed into Erie Pier gets

harvested every year). The fine material meets MPCA current residential standards for reuse. The projects in which the material has been used include road construction, aquatic habitat restoration, island restoration, beach nourishment, and topsoil enhancements.

3.8.2.2 Embayment of the 21st Avenue West Channel

A series of action steps in the 2013 St. Louis River Remedial Action Plan involve the restoration of shallow sheltered bays throughout the estuary (MPCA and WDNR 2103). Construction of aquatic habitat features in an estimated 1,700-acre work area is dependent on approving materials dredged from the federal navigation channel for aquatic placement. To demonstrate the feasibility of using dredge materials from the Duluth-Superior Harbor, the USACE Detroit District prepared an environmental assessment for a pilot project to beneficially use the dredged material for aquatic restoration at an embayment of 21st Avenue West Channel (USACE Detroit District 2015). The 21st Avenue Pilot Project received nearly all dredged materials during the 2013, 2014, and 2015 dredging seasons, totaling over 300,000 cubic yards. With the recent approval of an environmental assessment for full restoration of the entire site, this project is expected to continue past 2015, along with other projects in the AOC. Mining of material from Erie Pier may happen during this period to speed up the restoration and delisting effort within the harbor. Use of dredged material will enable the BUI delisting of the AOC by creating and restoring aquatic and wetland habitat along the St. Louis River AOC.

This project provided an opportunity to reuse 100 percent of the material dredged annually for maintenance of the federal navigation channel. Therefore, the best option for dredged material management in Duluth-Superior currently is aquatic beneficial use placement for habitat restoration. The impetus for this is BUI delisting of the AOC. Note that this option is only possible because the dredged material from the federal navigation channel is suitable for aquatic placement (dredged material placement complies with the CWA).

4 Trends in Beneficial Use

Disposal site selection is one of the most important and challenging parts of dredged sediment management. Disposal in CDFs accounts for approximately 80 percent of dredged material handling in the United States. However, the correct perspective is to view dredged sediment as a resource and not a waste (Olin-Estes 2000). Nationally, only 15–20 percent of dredged sediment is used beneficially (USACE 2014a).

As mentioned earlier, CDFs have long been the placement option relied on to contain contaminated sediment. In the Great Lakes, they are now reaching capacity, and USACE and stakeholders are seeking alternatives to CDF disposal (e.g., Duluth and Grand Haven; see Section 3). The USACE expects that more CDFs will reach capacity in the coming years. Some harbors, such as Calumet, appear to have less than five years capacity remaining (USACE Detroit District 2016). In some harbors, capacity has already been reached or will be within the next year. This will require USACE, ports, harbors, states, local agencies, and other stakeholders to work together to develop alternative disposal methods that comply with federal policies and integrate dredged sediment handling into a more regional sediment management approach.

Beneficial use is becoming more common due to the following factors: (1) CDFs are reaching their capacity, (2) sediment is recognized as a resource, (3) removal of clean sediments from the aquatic ecosystem may have negative environmental impacts, and (4) sediments are getting cleaner.

Challenges to increased beneficial use, as identified in the *Delaware Estuary RSM Plan*, can be divided into the following categories:

- Regulatory and policy issues
- Funding limitations, such as caps on federal funding or the need for local cost-share dollars
- Programmatic and regional regulatory issues, such as overlapping federal, state, county, and local jurisdictions and required coordination
- Operational management concerns (i.e., coordination between dredging and restoration programs)
- Education and outreach
- Science and research needs

Additionally, in-water placement of clean dredged material at traditional open-water placement areas could also, in some cases, be considered a beneficial use. This is especially the case where clean material would be placed on top of historic (pre-Clean Water Act) sediment already at the bottom of the water body from

over 45 years ago. Such clean cover may serve to better isolate benthic organisms from the more contaminated existing sediment and thereby reduce any adverse toxicological effect on the aquatic food chain.

4.1 Beneficial Use Trends Within the Great Lakes

In the Great Lakes region, as in other areas of the Nation, years of erosion have compromised, and in some cases destroyed, valuable habitat and coastal features (e.g., islands, beaches, and marshlands). Coastal erosion also often poses a threat to coastal communities and other economically important lands and facilities (CH2MHill 2011). As the states face ecological and economic costs from coastal land and habitat damages, they have begun making beneficial use of dredged sediment a tool to help prevent, repair, replace, and in some cases, create healthier coastal habitats. Examples of this trend were discussed in Section 3 and include the ecologically and economically important areas of Green Bay's Cat Island project in Wisconsin and Michigan's beach nourishment projects.

Within the Great Lakes basin, regional sediment management issues are considered part of a Lakewide Action and Management Plan (U.S. EPA 2016b). There are five Great Lakes LAMPs, which are plans of action to assess, restore, protect, and monitor ecosystem health for each Great Lake and its connecting river systems. Each LAMP coordinates the work of all the government and nongovernment partners working to improve the lake's ecosystem. The LAMP includes a public consultation process to ensure it is addressing the public's concerns. More information is available at https://www.epa.gov/greatlakes/lakewide-action-and-management-plans

The GLDT is a partnership of federal and state agencies created to help ensure that dredging of U.S. harbors and channels throughout the Great Lakes is conducted in a timely and cost-effective manner while meeting environmental protection, restoration, and enhancement goals. The GLDT is the regional representative of the National Dredging Team and is currently organized into three committees; two of those committees (outreach and technical) are actively working to promote beneficial use of dredged sediment throughout the Great Lakes.

In 2012, the USACE Great Lakes and Ohio River Division worked with the three USACE districts in the Great Lakes (i.e., Detroit, Chicago, and Buffalo) to update its *Great Lakes System Dredged Material Management Long-Term Strategic Plan.* The plan stressed partnerships with agencies and stakeholders as a means to increase beneficial use and thus extend the useful life of existing dredged material disposal facilities (USACE 2012). Within the limits of existing authorities, the USACE Great Lakes districts actively promote beneficial use of dredged sediment, highlighting dredged sediment as a resource that has a variety of beneficial uses. This is also in alignment with the 2013 EWN initiative (USACE 2015).

Lastly, states are beginning to see dredged sediment not as solid waste but as a potential aid in repairing the legacy of industrial pollution and mineral extraction that has occurred in the region over the last century. Pennsylvania and Minnesota have begun experimenting with dredged sediment in reclaiming mine land with the goal of reducing toxic runoff and stabilizing sites left unstable by years of extraction (Maher et al. 2013, McDonald and Sharrow, 2014).

4.2 Beneficial Use Trends Outside the Great Lakes

Section 3 provided an overview of policies and projects related to beneficial use of dredged sediment in the eight Great Lakes states. Some of examples from states were actually not located in the Great Lakes watershed (e.g., Section 3.1.2 Hudson Raritan Estuary, Section 3.2.2 Delaware Estuary, Section 3.6.2, *Mud to Parks* in Illinois). This section provides further examples of successful projects located outside of the Great Lakes watershed.

4.2.1 Port Authority of New York and New Jersey

The Port Authority of New York and New Jersey (Port Authority), while not a Great Lakes harbor, provides relevant information for promoting beneficial use in the Great Lakes. The Port Authority is an interstate agency that oversees the port district in New York Harbor and the surrounding 1,500 square miles encompassing portions of both states (New Jersey Department of Environmental Protection [NJDEP] 1997). Formed in the 1920s to develop and modernize the port district, the Port Authority was granted oversight of many of the area's bridges, tunnels, and airports. Additionally, it oversees shipping channels in conjunction with the USACE. Therefore, the Port Authority is the local sponsor, along with the USACE, on new work and maintenance dredging in the Port Authority's district.

In August 1997, the U.S. EPA promulgated a final rule to terminate the use of the New York Bight Dredged Material Disposal Site and simultaneously designate it as the Historic Area Remediation Site (HARS). The HARS is an area of the Atlantic Ocean where historic dredged material from maintenance of the Port of New York had been placed. Some of the material placed there may have been contaminated since it was placed there before the enactment of the Clean Water Act. Sediments in and around cities and industrial areas are often contaminated with a variety of pollutants (U.S. EPA 2015).

Criteria have been set to determine eligibility of dredged material for unrestricted ocean placement. Dredged materials are assessed to see if they contain unacceptable concentrations of contaminants, which would preclude placement at the HARS. The port district annually generates 2.3 MCY of dredged material unsuitable for HARS placement and 1.4 MCY of dredged material that may be placed at the HARS. With anticipated deepening projects and future maintenance, the long-term 40-year DMMP through 2040 was planning for 80.5

MCY of HARS-unsuitable materials and 45.7 MCY of HARS-suitable materials. The HARS remediation is expected to require at least 40 MCY of HARS-suitable materials (USACE 1999c). Areas of lakebed sediments around the Great Lakes may also be contaminated from various sources and may benefit from the addition of clean dredged material (e.g., 21st Avenue West embayment in Duluth harbor).

Due to past and present pollution, managing dredged material from many areas of the port district in recent years has posed both challenges and opportunities. There is also a movement away from ocean disposal to be consistent with the Marine Protection Research and Sanctuaries Act of 1969. To address either a lack of management options or the higher cost of the limited number of management options available, the USACE New York District prepared a DMMP for the port district and an accompanying draft programmatic environmental impact statement (PEIS) in September 1999 (USACE 1999c, 1999d). The USACE New York District completed a summary update report to the DMMP, as well as the finalized 1999 PEIS, dated August 2008 (USACE 2008). The DMMP is a document that has identified a wide array of both primary and contingency management options to meet the dredging requirements of the port district through the year 2065. That includes contaminant reduction, sediment reduction, CDFs, and contained aquatic disposal facilities. A key element for success was placing special emphasis on beneficial uses of the dredged material to maintain efficient waterborne transportation into and out of the port district, specifically at the HARS and other sites, for habitat creation, enhancement, and restoration, as well as land remediation of old quarries. This plan updated the procedures used to handle material dredged from the ongoing deepening projects in the Port Authority's jurisdiction. The DMMP has a preference toward beneficial use of dredged material in lieu of open water disposal and lists several potential beneficial uses including:

- Upland landfill remediation.
- Upland fill or construction.
- Wetland habitat restoration.
- Mudflat or shallow water habitat restoration.
- Beach nourishment/restoration.

The beneficial uses listed in the DMMP mirror the policy preferences listed in other USACE documents. In addition to these public projects, the DMMP allows for dredged material to be stockpiled and sold to private companies for future use.

The Port Authority has applied this policy preference. With materials from the ongoing port deepening project, the port's materials have been used to restore two Jamaica Bay marsh islands; for restoration in Lincoln Park, New Jersey; and as cap material in landfills.

In September 2009, the Port Authority signed a project cooperation agreement with the USACE for the construction of the New York and New Jersey Harbor Deepening Project. Under Section 204 of WRDA 1992 and Section 207 of WRDA 1996 and Section 2037 of WRDA 2007, the agreement specified beneficial use and cost-sharing and allowed for regional sediment management and ecosystem restoration through dredged material placement (USACE New York District 2009). This is an example of an agreement between the USACE and a port for beneficial use of dredged material. The federal government and the Port Authority split the funding for the $1.6M project.

4.2.2 New Jersey Dredged Material Policy

New Jersey considers dredged material to be a resource that should be beneficially used whenever possible. The New York/New Jersey Harbor Regional Dredging Team DMMP contains many specific details, but it can be summarized as follows:

1. Reduce the need to dredge.
2. Reduce sediment contamination.
3. Beneficially use as much dredged material as possible.
4. Only dispose of dredged material that cannot be beneficially used.

New Jersey adopted this four-point policy for dredged material management from the harbor in the mid-1990s and has implemented it throughout the state. It actively promotes beneficial use of dredged material, even from CDFs (http://www.nj.gov/transportation/airwater/maritime/pdf/douglas.pdf). The State of New Jersey addressed the top ten myths and misconceptions about dredged material, which are:

- All dredged material is contaminated.
- Dredged material is a solid waste.
- Dredged material does not meet New Jersey Department of Transportation (NJDOT) specifications.
- Dredged material can only be used as nonstructural fill.
- NJDOT will not sign a contract if dredged materials are used.
- New Jersey Department of Environmental Protection will slow the permitting process if dredged materials are used.
- There must be water access for receipt of dredged materials.
- Materials will need to be amended before they can be used.
- Dredged materials from a river are “useless spoils.”
- All dredged material is black mayonnaise.

The NJDOT and NJDEP have been working together since 1996 to implement a dredged material management policy that promotes the beneficial use of dredged material without compromising economic development or environmental protection. Dredging project managers at both state agencies have been charged with finding beneficial use opportunities that encourage the sustainable use of dredged material and/or remediate contaminated properties.

In 2000, New Jersey created a new state agency, the Office of Maritime Resources, to assist in identifying beneficial use dredged material management options. In 2009, this office was permanently housed in the New Jersey Department of Transportation. In addition, watershed managers in the NJDEP have been working to limit soil erosion by implementing innovative stormwater best-management practices and rigorous coastal zone management regulations. Those NJDEP programs that protect the state's surface waters are also fully involved in the fight to cleanup contaminated sediments and to keep the sediments clean. The result has been a remarkable reduction in the use of open-water and other dredged material disposal techniques. Before 1996, no dredged material was beneficially used in New York/New Jersey Harbor. Today, all of the dredged material from the harbor is beneficially used. The state's goal is to beneficially use 100 percent of the dredged material generated throughout New Jersey.

Several examples of beneficial use in New Jersey include use of 2 MCY of dredged material at the Bayonne Golf Course and 190,000 CY at the RiverWinds Golf Course in West Deptford (Craig Vogt Inc. 2010). In the case of Prologis Port Reading Business Park, 130,000 CY were used for fill to create 1 million square feet of warehouse space.

New Jersey has realized two opportunities from the material harvested from CDFs: it is a resource for construction materials and for future dredged material management; it is free and readily available. Several notable beneficial use projects in New Jersey include Tweeter Center fill, Palmyra Cove Beneficial Use Technology Campus, Harrison Avenue Landfill cover, RiverWinds Golf Course development, Philadelphia Airport fill, and numerous road construction fills. A notable beneficial use is mine restoration where 550,000 CY have been used to restore a coal strip mine in Tamaqua, Pennsylvania.

The dredged material provides a valuable cover to prevent further contamination. New Jersey has been active using dredged material for landfill cover at Overpeck Landfill (250,000 CY), Elizabeth Landfill (800,000 CY), and six landfills in the Meadowlands District (Great Lakes Commission 2010). In New Jersey, the state actively encourages beneficial use and, through the NJDOT, assists the public with using it in a wide range of projects across the state.

4.2.3 Gulf Coast Projects

There are three areas in the Gulf Coast region with successfully implemented beneficial use projects: the Houston-Galveston Ship Channels Project, island creation in the Atchafalaya River, and thin-layer placement in Mobile Bay. The latter two projects are EWN projects.

4.2.3.1 Houston-Galveston Ship Channels Project—Galveston Bay, Texas

This is a project with a precedent-setting approach to one of the largest federal deep-draft navigation projects. The elements of the approach, taken individually, were not innovative; rather, it was their combination that made this project unique and set the trend for those that followed. In the Great Lakes, this project can be seen as an example of how combining multiple efforts can solve a larger problem.

In 1989, the Texas Legislature gave the Port of Houston Authority (PHA) permission to vote on issuing $130 million in bonds to finance its share of a widening and deepening project of Houston-Galveston Ship Channel. The channel had been dredged since 1912, and dredged material had been merely side-cast back into the bay, a placement method that became the standard practice. Local stakeholders objected to the initial USACE/Port plan of open-bay disposal due to concerns about salinity and toxicity of the dredged material. This latest round of ship channel widening and deepening, initially authorized by Congress in 1996, became the world's largest beneficial use of dredged material project when the practice of open-bay placement was no longer acceptable to local environmental groups. As a result of strong local leadership, a team of eight agencies brought together by the USACE Galveston District and the local project sponsor, PHA, to beneficially use the dredged material. An interagency coordinating team (ICT) of 12 federal and state agencies was formed to address all concerns: bay salinity and circulation, oysters and safety, beneficial use, and to develop a detailed plan for the project.

Everyone involved was committed to finding a way to make things work, and work better, while protecting the bay and maintaining the shipping channel. The ICT addressed how to manage placement and a filling process for successful habitat outcomes. Together, this team gained experience on how to use dredged material beneficially to benefit Galveston Bay, resolve capacity needs, and meet habitat restoration needs.

A 200-acre demonstration marsh was initially constructed from dredged material, and as shown by National Marine Fisheries Service, all populations of shrimp and crab were substantially higher (12 to 154 times) in the beneficial use marsh than could have been expected in the open water the marsh replaced. The demonstration marsh is laced with canoe and kayak trails and set the path forward for 4,250 acres of additional beneficial use marsh in Galveston Bay. The project also constructed bird island habitats and oyster reefs.

Lessons learned from this project include:

- Respond to a need.
- Engage stakeholders early.
- Form a team.
- Identify local issues.
- Assemble technical/social/economic experts.
- Meet monthly as an overall team.
- Meet weekly as subcommittees.
- Establish goals, objectives, and performance criteria.
- Develop a regional (bay-wide) plan.
- Develop detailed habitat creation plans and supporting engineering and placement plans.
- Undertake site surveys, sediment characterization studies, and settlement predictions.
- Undertake construction and be adaptable to changes.
- Undertake monitoring and reporting.

For a beneficial use project to have USACE participation, a project must have a local project sponsor and federal costs approved and funded by Congress. Congressional approval requires an economic benefit to the federal government and local economy. This project's economic analysis demonstrated that for every $1 spent, $2 to $3 of benefit would result. Local cost-share was through county voter-approved bonds for the initial construction. County residents saw benefits and passed the bonds by a 2-to-1 margin. To support continued funding, a local delegation of citizens, senators, and Texas congressional representatives is educated on the project merits on at least annually. The project's long-term success highlights the importance of continued local communication and financial planning.

4.2.3.2 Island Creation in the Atchafalaya River

As placement sites continue to become exhausted, USACE is pursuing more creative placement alternatives in the Gulf Coast region. A demonstration project is underway at the USACE New Orleans District to investigate the impacts of mid-river placement on shoaling trends downriver of the site (Suedel et al. 2014). Beginning in 2002, strategic placement of the sediment dredged from Horseshoe Bend occurred at the mid-river open-water placement area. Placement of between .5 and 1.8 million cubic yards of sediment occurred every one to three years, which influenced and contributed to the development of an approximately 35-hectare island mid-river. Strategically placing dredged sediments upriver of a

naturally occurring island was to aid the island's growth and produce greater environmental benefits that would otherwise be impossible using more conventional placement practices (Berkowitz et al. 2015).

4.2.3.3 Thin Layer Placement of Sediment in Mobile Bay

The USACE Mobile District is demonstrating thin-layer placement of sediment as a regional sediment management implementation strategy in Mobile Bay, Alabama. The RSM strategy involves the use of pipeline dredging equipment for thin-layer, open-water placement on adjacent Mobile Bay bottoms for the upper and lower Mobile Bay channel sections. The study areas range from approximately 6 to 10 feet mean lower low water, with placement to be as thin as possible and not to exceed a 12-inch thickness (USACE 2013b). This placement option adds an environmentally acceptable alternative for managing dredged material from the Mobile Bay navigation channel. Furthermore, thin-layer placement allows sufficient time for bay-bottom benthic community recovery and has a smaller lasting impact on benthic ecology (Parson et al. 2015). The USACE Philadelphia District has been successful with similar efforts in the New Jersey area.

4.2.4 Sonoma Baylands Restoration—San Francisco Bay, California

During the 1980s, existing disposal capacity was exceeded and alternative disposal options were needed. A congressionally authorized project to deepen the Oakland Harbor channel could not proceed due to a lack of an environmentally acceptable and economically feasible plan for dredged material handling. Simultaneously, Sonoma Land Trust and the California State Coastal Conservancy developed a Sonoma Baylands restoration plan and sought the use of dredged material to restore subsided salt marsh. A partnership of the San Francisco Bay Conservation and Development Commission, California Department of Fish and Game, the Trust Conservancy, Port of Oakland, the USACE, local environmental and labor organizations, and the maritime industry was able to obtain funding and use 2 MCY of dredged material to restore the Baylands. In 1992, the Coastal America Program was used to initiate a 39-acre pilot project for 207,000 CY of dredged material from the Petalama River navigation channel and 1.7 MCY from Oakland Harbor deepening.

5 Suggestions and Conclusions

Both nationally and in the Great Lakes, USACE and its partners are making advances addressing barriers to beneficial use of dredged sediment, as evidenced by the examples included in Sections 3 and 4. This section provides suggestions for potential courses of action to make further progress with beneficial use and also provides overall conclusions.

5.1 Future Opportunities

At all levels of government, prioritizing and encouraging beneficial use of dredged sediment in the Great Lakes could achieve the following:

- Creation of policy, regional guidance, and/or memoranda of understanding among the appropriate federal and state agencies in accordance with appropriate legal authorities that identifies dredged sediment as a resource and that the preferred method of dredged sediment management can often be through beneficial use. The Great Lakes Commission encourages states and local governments to identify, develop, and expand the demand for the beneficial use of dredged material from Great Lakes harbors to make beneficial use a viable and cost-effective solution.
- Broaden the view that coastal resiliency is a Great Lakes priority. Coastal resilience is defined as the use of natural solutions in climate, development, and disaster risk planning. This may include utilizing the principles of EWN to guide development of dredged sediment placement options.
- Develop DMMPs, where appropriate, as part of an integrated regional approach for long-term ecosystem planning, comparable to examples from Chesapeake Bay and the Hudson Raritan Estuary.
- Define the chemical, physical, and biological properties that indicate dredged sediment may be suitable for a range of beneficial uses, based either on risk-based evaluations and/or on numerical chemical concentrations. This could also allow some states the ability in advance to adjust their water quality certification programs to better accommodate such projects in the aquatic environment.
- Outline for other stakeholders the capabilities and limitations of applicable USACE authorities regarding beneficial use of dredged sediment to better align mutual expectations.
- Encourage the development of state and local policies or programs that help to identify and/or fund beneficial use projects.

- Address or provide guidance regarding issues of dredged sediment ownership and potential future USACE liability from beneficial use projects, if applicable.

5.2 Financial Considerations

Since USACE must identify the environmentally acceptable and least costly dredged sediment placement option that is consistent with sound engineering practices (e.g., the Federal Standard), placement options that provide additional environmental and/or economic benefits to the locality are not always readily implementable due to fiscal constraints on USACE. The requirements for additional funds (above the Federal Standard) from a cost-sharing partner to implement a beneficial use project[10] may be met by taking the following steps or others:

- Evaluate costs associated with beneficial use when USACE determines environmentally acceptable placement options as part of the DMMP process. Determine incremental costs above the Federal Standard.
- Analyze possible cost duplications between and within programs. Determine if there is a cost savings between funds allocated for coastal resilience planning, flood risk reduction, and ecosystem restoration for beneficial use. This may need a collaborative effort between districts and the division, as well as the national navigation center maintaining portions of the data.
- Identify outside (non-USACE) sources of funding for beneficial use or locally preferred dredged material placement options. One source of funds currently available to the Great Lakes region is the GLRI; the GLRI Action Plan II runs through federal fiscal year 2019.
- Create a state dredging trust program whereby funds will be set aside to cover any increased cost of a beneficial use project over the established Federal Standard for managing sediment in a particular harbor. (Ohio has implemented a state trust fund program.)

5.3 Programmatic and Operational Considerations

Programmatic and operational aspects of dredged sediment management could place greater emphasis on placement options that incorporate beneficial uses. Specifically, the following actions may be considered:

[10] Costs for 3 different beneficial use projects within the Great Lakes are provided in Table C-1 of Appendix C. Table C-2 provides some loading and delivery costs for mining and transporting dredged material from a CDF for beneficial use.

- Develop a beneficial use program that engages and recruits partners that can contribute funding, project concepts, options, and ideas for innovation and holistic solutions toward the related maintenance, economic viability, and environmental restoration of Great Lakes harbors. Interagency coordination teams, task forces and/or partnerships could be formed, consistent with applicable legal authority, for specific harbors, to assist in identifying and refining opportunities that could then be raised to the appropriate decision-makers. The Duluth-Superior HTAC described in Section 3.8.2 is an excellent example of this. Note that cooperative agreements are allowable under 33 USC Section 2326b.

- Establish an active outreach component to the interagency team to engage communities and agencies in identifying suitable placement areas, brownfield redevelopment needs, or ecosystem restoration opportunities for dredged sediment. Enable them to see that the use of dredged sediment has economic and environmental benefits to the community and region.
- Identify suitable and specific locations near each commercial harbor where dredged sediment could be used beneficially to restore/create habitats, nourish shorelines, enhance aquaculture, and/or undertake upland land rehabilitation, and incorporate these targeted locations into the Great Lakes regional sediment management activities and DMMPs.
- For example, part of the success of the Houston-Galveston Ship Channels Project in Texas, described in Section 4, was credited to a public outreach campaign that allowed the public to identify specific locations where dredged sediment could benefit Galveston Bay.
- Integrate beneficial use into storm resiliency and flood protection planning, thereby establishing a tighter link between beneficial use and ecosystem restoration, as authorized under WRDA of 1986 (Section 1135), which provides the authority to modify existing USACE projects to restore the environment and construct new projects to restore areas degraded by USACE projects.

5.4 Research and Further Study

Additional research and further studies associated with beneficial use of dredged sediment in the Great Lakes region are summarized below:

- Preparation of a comprehensive sediment testing manual to provide guidance and appropriate protocols for determining the suitability of dredged sediment for a range of beneficial uses. While still in effect, current sediment testing manuals (e.g., Inland Testing Manual and Great Lakes Testing Manual, U.S. EPA/USACE 1998a, b) only address aquatic placement of dredged material. The USACE draft is a regional guidance

manual that addresses both upland and aquatic beneficial use placement options. It should be available for GLDT review and input in 2016.

- Development of a list of potential partners who may benefit from using dredged sediment. Active engagement of these partners in dredged sediment management planning sessions needs to begin as appropriate. The Nature Conservancy, for example, could be a partner that helps identify placement sites for ecosystem restoration. In New Jersey, the state Department of Transportation became an active partner and user of dredged material.

5.5 Conclusions and Overcoming Challenges

Beneficial use of dredged sediment is one of the keys to sustainable sediment management at commercial harbors. It repurposes what was previously merely dredged sediment into a resource for a myriad of potential improvements in the Great Lakes (e.g., ecosystem restoration, beach nourishment, brownfield redevelopment). While support for beneficial use has been increasing recently, there are still challenges to implementing a broad project that becomes a meaningful component of a harbor's DMMP. These challenges fall into several categories: financial, programmatic, and operational.

A more holistic approach that considers economic viability and environmental protection and restoration in the surrounding region must account for beneficial use in order for realistic DMMPs to be developed and implemented. Policy and programmatic approaches that take this holistic and regional approach are needed to creatively solve the challenges associated with dredged material management. These holistic approaches are best addressed through partnerships consisting of a wide range of federal, state, and local agencies and other stakeholders, such as academia, community groups, and industry.

Since USACE cannot always bear the full cost of implementing a locally preferred dredged sediment placement option that may include beneficial use, additional sources of funding must be identified and secured. The importance of local leadership and stakeholder engagement in this regard cannot be understated. Dredged sediment management is a shared responsibility between USACE and harbor stakeholders.

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B Applicable Federal Statutes and Regulations

Applicable federal statutes and regulations are described as follows:

- **Rivers and Harbors Act of 1826**. This federal act provided for improving certain harbors and channels for navigation and, as amended overtime, provides the authority for USACE to dredge harbors and rivers and dates back to the original authority for constructing a navigation project. See http://planning.usace.army.mil/toolbox/guidance.cfm?Option=WRDALaw&Side=No&Type=River%20and%20Harbor%20Acts for further information in the Planning Community Toolbox.
- **Clean Water Act.** Dredging programs of navigable waters require permitting under the CWA, also known as the Federal Water Pollution Control Act, Public Law 92-500; 33 USC 1251, et seq. The USACE and the U.S. EPA share jurisdiction over such permits (Ryan 2011). The CWA, Section 404, gives USACE the authority to regulate the discharge of dredged or fill material into all waters of the United States, including wetlands. The USACE carries out this role through a permitting program, which provides dredging permits subject to a possible U.S. EPA veto or restriction. Section 404 permitting requires dredging project applicants to include the disposition of the dredged or fill material as part of the application. Discharge into navigable waters is subject to notice and public hearings before the issuance of the permit.

  Section 404 of the CWA focuses on open-water disposal of the dredged material; however, U.S. EPA regulations require applicants to evaluate nonopen-water discharge alternatives to dredged materials. Permit applicants for a nongeneral permit must consider alternatives to aquatic discharge. Permits allowing aquatic discharge will not be issued if a practicable alternative exists to aquatic discharge, which would have less of an adverse environmental impact. Effective implementation of water quality-based controls requires an integrated and cooperative partnership between the U.S. EPA and the states. The main responsibility for water quality management has been delegated to the states; specifically, the implementation of water quality standards, the administration of the National Pollutant Discharge Elimination System program (if the state has received U.S. EPA approval), and the management of nonpoint sources of pollution. Water quality certificates under Section 401 of CWA are obtained through each individual state.
- **Water Resources Development Act.** The USACE's jurisdiction over dredging, and by implication the disposal of dredged material, dates back almost 200 years. The 1824 General Survey Act allocated authority over civil

works projects of a commercial or military importance to the USACE. At present, many USACE projects are authorized by Congress under Water Resources Development Acts or, most recently, the Water Resources Reform and Development Act. These acts are approved by Congress on a regular basis and provide project authorization and applicable policy guidance to USACE.

- In 1986, Congress authorized USACE participation with ecosystem restoration in Section 1135, "Project Modifications for Improvement of the Environment."
- Starting with the WRDA 1990 authorization, Congress placed an increased emphasis on environmental considerations relating to USACE dredging activities. With this authorization under Section 312, Congress permitted dredging for strictly environmental purposes stating that USACE could "remove contaminated sediments…for the purpose of environmental enhancement and water quality improvement" if the requesting nonfederal sponsor agreed to pay 50 percent of the removal costs (USACE 1999a).
- The 1992 WRDA authorization expanded this mandate with Section 204, Beneficial Use of Dredged Material, by encouraging the beneficial use of dredged material. The act allowed the USACE to undertake reuse with dredged material programs where the beneficial reuse of the dredged material would be cost-effective and the project would not cause environmental degradation.
- In 1996, Section 206, "Aquatic Ecosystem Restoration," emphasized additional opportunities for ecosystem restoration focusing on aquatic systems. The current version of legislation requires cost sharing with local jurisdictions, but it gives the USACE some flexibility in pursuing beneficial use. In the latest legislation, Congress called for the USACE to reduce costs by pursuing beneficial use alternatives for dredged materials. This act formally allows the USACE to pursue disposal projects for dredged material even if the reuse is not the lowest cost option. The USACE must first determine that the increased costs relating to the reuse are reasonable when balanced against the environmental benefits. Congressional direction through the WRDA and its amendments resulted in a USACE policy outlined in ER 1165-2-501 where ecosystem restoration is one of the primary missions of the civil works program (USACE 1999a).
- In 2000, Section 506 provided authority for restoration of the Great Lakes fishery and ecosystem and specified cost-sharing arrangements as the Great Lakes Fishery and Ecosystem Restoration Program. Costs for planning, design, construction, and evaluation of restoration projects are cost shared at 65 percent federal and 35 percent nonfederal. The nonfederal cost may be contributed 100 percent in the form of services, materials, supplies, or other in-kind contributions, such as land, easements, and rights-of-way for dredged material placement.

- Section 2037, of WRDA 2007 significantly furthered USACE's position on beneficial use, expanded the Regional Sediment Management program and the types of projects USACE will partner in for beneficially using dredged material. The implementation guidance for Section 2037, WRDA 2007 can be found online at http://planning.usace.army.mil/toolbox/library/WRDA/wrda07sec2037.pdf

- **National Environmental Policy Act of 1969**. This act, as amended, Public Law 91-190; 42 USC 4321, et seq. requires that any significant federal project consider the adverse environmental impacts of the action. This analysis includes a review of alternatives to the proposed action, including an alternative of no action. For the beneficial use of dredged material, this means that NEPA requires the USACE to review multiple uses of dredged material, including open water discharge and beneficial use actions.

- **Endangered Species Act.** The Endangered Species Act of 1973, as amended, Public Law 93-205; 16 USC 1531, et seq. requires that federal agencies consider the impact of major actions on threatened and endangered species whose habitat is in the project area. This means that coordination with U.S. Fish and Wildlife Service (USFWS) and a review must be conducted resulting in a "finding of no significant impact" for the project to go forward without further review. Endangered and/or threatened species impacts are considered part of the NEPA process, including documentation in an environmental assessment or environmental impact statement.

- **Coastal Zone Management Act**. Coastal zone programs are not to make "more stringent controls" on dredging; rather, the intent is to manage the coastal area as a whole unit with a broad consideration for long-term impacts of coastal activities, from multiple perspectives (natural, cultural, social). Section 307 of the Coastal Zone Management Act of 1972, as amended, Public Law 92-583; 16 USC 1451, et seq. gives states a voice in the dredging approval process since it allows states with "federally approved coastal management programs, the authority to review" all federal activities that affect any land or water use or natural resource of the coastal zone for consistency with the state coastal zone management plan's enforceable policies.(Lukens 2000). This allows states to manage permitted activities in their coastal zones. State coastal zone management policies, and specifically policies relating to dredging and beneficial use, vary (Lukens 2000). Policies can be specific (i.e., enforceable and legally binding under state statute, regulation, or memorandum of understanding) or general (i.e., an encouragement and not legally enforceable).

A description of applicable USACE policies, planning guidance, and procedures follows:

- **Development of Dredged Material Management Plan.** Planning Guidance Notebook, Engineering Regulation 1105-2-100, Appendix E-15, states that "All Federally maintained navigation projects must demonstrate that there is sufficient dredged material disposal capacity for a minimum of 20 years. A preliminary assessment is required for all Federal navigation projects to document the continued viability of the project and the availability of dredged

material disposal capacity sufficient to accommodate 20 years of maintenance dredging. If the preliminary assessment determines that there is not sufficient capacity to accommodate maintenance dredging for the next 20 years, then a dredged material management study must be performed " (USACE 2000). The need for a 20-year plan may make it difficult to implement beneficial use projects because beneficial use requires partnerships and nonfederal cost sponsors, and those do not often come with a 20-year guarantee.

- **Environmental Operating Principles**. Applicable USACE policies affecting beneficial use include the environmental operating principles introduced in 2002 to ensure that USACE missions include totally integrated sustainable environmental practices and are integrated into USACE regulations as ER 200-1-5 (USACE 2002, USACE 2003). The principles require a recommitment to environmental stewardship, consideration of environmental consequences, and natural resources management and environmental restoration through a systems approach. The environmental operating principles refer to the "four pillars" of the Army's environmental strategy, which are summarized as follows:
  - Gives immediate priority attention to sustained compliance with environmental laws and regulations
  - Continues to restore previously contaminated or impaired sites both in the defense complex and for our civil customers, as expeditiously and fully as resources permit
  - Focuses on preventing pollution and natural resources damage
  - Conserves, preserves, and restores natural and cultural resources

Application of Watershed Perspective. In 1999, the USACE had established Policy Guidance Letter No. 61, "Application of Watershed Perspective to Corps of Engineers Civil Works Programs and Activities," to provide a policy of applying a watershed perspective to water resources management programs and initiatives (USACE 1999e). The USACE has a historic understanding of the concept of watersheds. In 1999, there was a growing recognition that locally perceived water resource problems had regional dimensions and were areas of concern to numerous, diverse interest groups. Application of a watershed approach applies to all civil works programs through planning, design, construction, operation, maintenance, restoration, rehabilitation, and regulatory activities. This policy states that the USACE will explore and identify opportunities where joint watershed resource management efforts can be pursued to improve the efficiency and effectiveness of civil works programs. This policy includes using water resources in a sustainable manner; coordinating between responsible federal, tribal, state, and local governments; and leveraging resources and integrating programs and activities in and among civil works programs to improve consistency and cost-effectiveness. The policy provides the foundation for a Great Lakes watershed approach and regional sediment management strategy, which would include dredged material handling.

- **Long-Term Management Strategies for Sediment Control**—In 1997, the USACE, through Planning Guidance Letter No. 97-02, provided guidance on Section 516 (a) (b) (c) of the WRDA of 1996. This guidance gave the

USACE permission to enter into cooperation agreements with nonfederal interests/appropriate entities for the development of long-term management strategies for controlling sediments at navigation projects (USACE 1997). Each strategy would include assessments of sediment rates and composition, sediment reduction options, dredging practices, long-term management of any dredged material disposal facilities, remediation of such facilities, and alternative disposal and reuse options.

- **Evaluating Environmental Effects of Dredged Material Management Alternatives—A Technical Framework**—This provided the framework for the broad guidance on dredged material management, including testing and evaluation to site-specific guidance determination rather than a "one size fits all" (U.S. EPA and USACE 2004).
- **Continuing Authorities for Aquatic Ecosystem Restoration**—Under Planning Guidance Letter 97-5, the USACE provided guidance on aquatic ecosystem restoration, which is applicable to beneficial use of dredged material. The WRDA of 2000 Section 506 established the GLFER Program, which provides authority for restoration of the Great Lakes fishery and ecosystem. Costs for the planning, design, construction, and evaluation of restoration projects are cost-shared at 65 percent federal and 35 percent nonfederal; nonfederal interest may contribute up to 100 percent in the form of services, materials, supplies, or other in-kind contributions including land, easements, and rights-of-way needed for project construction.
- **Environmental Stewardship Operations and Maintenance Policies**—ER 1130-2-540 provides guidance on shoreline management, wetlands, fish and wildlife, and soils/sediments, and would also be an applicable policy on dredging, sediment management, and beneficial use in nearshore placement areas (USACE 1996).
- **Civil Works Review Policy**—EC 1165-2-209 establishes an accountable, comprehensive, life-cycle review strategy for civil works projects by providing a seamless process for reviewing all civil works projects from initial planning through design; construction; and operation, maintenance, repair, replacement, and rehabilitation.
- **Civil Works Ecosystem Restoration Policy**—ER 1165-2-501 (USACE 1999a) and EP 1165-2-502 (USACE 1999b) provide ecosystem restoration supporting policy information applicable to beneficial use, specifically for environmental improvement and ecosystem restoration projects.
- **Dredging and Dredged Material Disposal**—EM 1110-2-5025 from 1983 provides information of dredging equipment and disposal techniques, including open-water, confined facilities, and habitat development (USACE 1983, USACE 2004).
- **Beneficial Uses of Dredged Material**—EM 1110-2-5026 is an early USACE document regarding beneficial use of dredged material and provides guidance for planning, designing, developing, and managing dredged material for beneficial uses; it incorporates ecological concepts and engineering designs with biological, economical, and social feasibility (USACE 1987a).

- **Hazardous, Toxic, and Radioactive Waste (HTRW)**— ER 1165-2-132, Guidance for Civil Works Projects, explains that "Dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal action or a remedial action) under CERCLA, or if they are a part of a National Priority List (NPL) site under CERCLA. Dredged material and sediments beneath the navigable waters proposed for dredging shall be tested and evaluated for their suitability for disposal in accordance with the appropriate guidelines and criteria adopted pursuant to Section 404 of the Clean Water Act and/or Section 103 of the MPRSA and supplemented by the Corps of Engineers Management Strategy for Disposal of Dredged Material: Containment Testing and Controls (or its appropriate updated version) as cited in Title 33 Code of Federal Regulations, Section 336.1" (USACE 1992). This indicates that the Corps should not be liable for contamination due to placing material dredged as part of maintenance of a federally navigable waterway in the Great Lakes (with a possible exception if it is part of an AOC).

C Examples of Some Costs Associated with Beneficially Using Dredged Material

APPENDIX C Cost Information for Beneficial Use Projects

Table C-1: Summary of costs and cost-sharing requirements for projects involving beneficial use placements of dredged material

Year Built	Harbor, State	Project Name	Beneficial Use	Incremental Costs for BU Placement	Total Project Cost	Volume of DM (CY)	Non-USACE Sponsor/Partner	Cost-Sharing Requirement	Source Funding
2014	Green Bay, WI	Cat Island	Aquatic ecosystem restoration	Lower than Federal Standard (*cost-sharing requirement to build the DMDF*)	$17.2	2.35 M (decades' worth of capacity)	Brown County, WDNR, WDOT, USFWS, U.S. EPA, UW-Sea Grant, US-Green Bay, Port of Green Bay, Fox River group of paper mills	Overall: 65 percent Federal: 35 percent Brown County (construction was 75 percent federal, 25 percent nonfederal. After construction, Brown County pays 10 percent cash over 30 years)	USACE: GLRI grants, Energy and Water funding Brown County: reimbursable grants
2015	Waukegan IL	Waukegan Outer Harbor	Upland general fill material (clean cover over remediated Superfund site)	Dredging, including upland placement = $15.48/CY; there were additional costs for erosion control, seeding, etc.	$2.02 M[11]	85,000	U.S. EPA	None. Work was performed under Economy Act for Superfund-related work.	U.S. EPA GLRI (harbor and site are part of an AOC). (USACE O&M funding was not allowed to be used for dredging due to potential HTRW-liability concerns at the placement site.)
2016	Buffalo, NY	Unity Island	Aquatic ecosystem restoration	$29.63	$3M	100K	City of Buffalo	Federal: 65 percent Nonfederal: 35 percent of incremental costs	USACE: Energy and Water App Act

[11] Waukegan Outer Harbor work is not complete, so a final cost isn't available yet. The work included other site activities such as closing wells, grading and seeding, demolishing a few minor structures on-site. The estimated total dredging volume is 85k CY; the survey was just done, and the quantities aren't in yet.

APPENDIX C Cost Information for Beneficial Use Projects

Table C-2: Summary of costs and cost-sharing requirements for projects involving beneficial uses of dredged material: CDF mining

Year of DM removal	Harbor, State	Project Name	Beneficial Use	One-Way Distance to BU Location	Loading & Delivery Cost ($/CY)+	Total Cost Loading & Delivery	Volume of DM Removed (CY)	Source of Nonfederal Funding for Cost-Share
2010	Cleveland, OH	Cuyahoga Valley Industrial Center	Brownfield redevelopment	?	?	~ $7,000,000	300,000	Funded by 2010 ARRA funds
2011	Duluth, MN	Moccasin Mike Landfill, WI	Turf restoration	13 miles	$ 6.00	$ 6,600	1,100	
2011	Duluth, MN	Atlas	Storm water treatment pond for brownfield redevelopment	6.5 miles	$ 8.85	$17,700	2,000	
2011	Duluth, MN	Northland CC	Golf course repairs	8 miles	$ 8.00	$ 4,000	500	
2013	Duluth, MN	Hibtac	Mine land borrow pit revegetation	85 miles	$21.55	$80,942	3,756	
2014	Duluth, MN	Regional Landfill, Virginia, MN	Biomass growth support	66.5 miles	$13.20	$25,872	1,960	
2015	Duluth, MN	Regional Landfill, Virginia, MN	Biomass growth support **(Non-COE funding)**	66.5 miles	$13.75	$34,746	2,527	