Appendix M

Dredged Material Management and Operations Report

Report

Dredged Material Placement and Operations Evaluation

Milwaukee Estuary AOC Dredged Material Management Facility

Project I.D.: 19W012

WEC Energy Group – Business Services
Milwaukee, Wisconsin

November 2020

Foth

Dredged Material Placement and Operations Evaluation
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Prepared for

WEC Energy Group – Business Services

Milwaukee, Wisconsin

Prepared by

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Dredged Material Placement and Operations Evaluation

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List of Abbreviations, Acronyms, and Symbols

AOC	Area of Concern
CDF	Confined Disposal Facility
cfs	cubic feet per second
cy	cubic yards
JI-DMDF	Jones Island-Dredged Material Disposal Facility
DMMF	Dredged Material Management Facility
Foth	Foth Infrastructure & Environment, LLC
GLLA	Great Lakes Legacy Act
HDPE	high-density polyethylene
Port	Port Milwaukee
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WDNR	Wisconsin Department of Natural Resources
WEC	WEC Energy Group – Business Services
Wis. Admin. Code	Wisconsin Administrative Code

1 Introduction

The Milwaukee Estuary Dredged Material Management Facility (DMMF) will be a newly constructed facility to manage dredged material within the Milwaukee Estuary Area of Concern (AOC). The project was proposed and is developed by a public-private partnership. Management of the dredged material is key to achieving the goals of the AOC by remediating contaminated sediments that will help remove Beneficial Use Impairments and eventually lead to the delisting of the AOC from the 1987 designation by the U.S. Environmental Protection Agency (USEPA). The DMMF project which will be a key component in addressing the management of 1.9 million cubic yards of dredged material from the AOC.

Foth Infrastructure & Environment, LLC (Foth) has been contracted by WEC Energy Group – Business Services (WEC) to perform Engineering and Design Services related to construction of the DMMF. As part of these services Foth has been tasked with evaluating the placement of dredged materials and methods for managing water within the facility. **This report addresses some of the items related to operation of the DMMF; however, due to the uncertainties associated with the precise physical and chemical composition of the dredged materials to be placed in the DMMF, a more general approach is necessary for some components. These specific items will be addressed by others, and subject to all necessary and required reviews and approvals by the appropriate permitting agencies at the local, state, and federal level, prior to the placement of dredged materials in the DMMF.**

1.1 Site Description

The DMMF will be located north of and adjacent to the U.S. Army Corps of Engineers (USACE) Milwaukee Dredged Material Disposal Facility (DMDF), as depicted on Figure 1, and located within the Port Milwaukee (Port) lake bed grant through Chapter 238 of 1909, Chapter 285 of 1923, and Chapter 381 of 1931 (see Appendix O). The facility will provide storage for environmentally impacted sediments dredged from within the Milwaukee Estuary AOC, as well as provide additional expansion capacity for the Port.

The purpose of the DMMF project is to design and construct a facility to manage a designed volume of 1.9 million cubic yards (cy) of impacted sediments which will be dredged from within the Milwaukee Estuary AOC. In addition to providing a facility to manage sediments, the DMMF will provide immediate expansion to the Port, with capacity for further expansion, which satisfies the Lake Bed Grant language. These new Port facilities will be designed to accommodate the range of commercial shipping vessels found on the Great Lakes, including berthing for vessels greater than 1,000 feet in length. Further, though not immediately addressed by this design report, the new facility may provide additional public access use opportunities along this portion of the Lake Michigan shoreline.

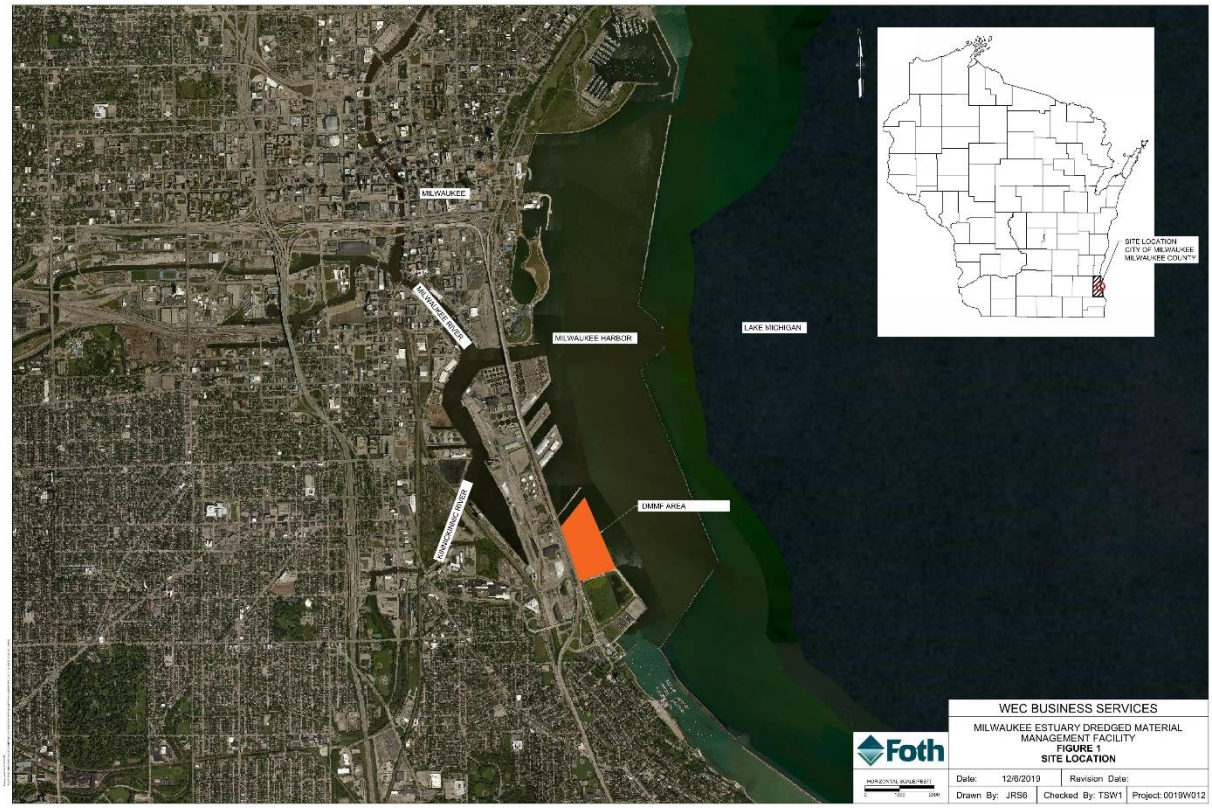

Figure 1 DMMF Project Location

1.2 Technical Basis for Design

Design of the DMMF to manage dredged material is based on the guidance presented by the USACE in the Engineer Manual 1110-2-5025 *Dredging and Dredged Material Management* (USACE, 2015). The guidance within the manual lays out the design methods for confined placement of dredged material. Such facilities are engineered structures for containment of dredged material, and are neither a conventional wastewater treatment plant nor a conventional solid waste disposal facility. USACE guidance emphasizes that "an effective CDF [DMMF] must therefore borrow features from the wastewater treatment facility and the waste disposal facility in a combination that is unlike either. The objectives inherent in design and operation of CDFs are to provide for adequate storage capacity for meeting dredging requirements and to maximize the efficiency in retaining the solids. CDFs are often considered as a disposal alternative for materials found to be unsuitable for open-water placement. Control of contaminant releases is a design and operation objective for these projects."

The DMMF will be located directly adjacent and north of the existing Jones Island Dredged Material Disposal Facility (JI-DMDF). The footprint of the DMMF is a primary constraint in the overall design and operational analysis of the facility. A traditional approach when developing diked disposal facilities for dredged material typically includes an initial evaluation of the amount of material that will be generated over the anticipated life of the facility, followed by a

search within a set distance of the source of the dredged material for a suitable location to accommodate the desired structure. That process usually reveals multiple candidate sites with some flexibility in the available space and configuration options for the facility (e.g., dike layout, dike height, construction approach, access from land or water, etc.). These options and flexibility can then be used in an iterative process to optimize the interconnected components of a DMMF.

The space available for the Milwaukee Estuary AOC DMMF is fixed by the Port Lake Bed Grant and adjacent structures. The layout selected for the DMMF encompasses approximately 42 acres, and the wall height is set based on the intended end use as a port facility (see discussions in the Main Text and Appendix A: Basis of Design Report). These dimensions (area and wall height) provide a critical constraint on the operational design evaluation of the DMMF, and eliminate some of the traditionally available methods for analysis of expected performance. This both simplifies and complicates the ability to fully evaluate the expected DMMF performance in this final design.

This evaluation follows the guidance suggested by USACE (2015), as summarized here:

1. Design aspects related to physical site capacity, such as sizing and retention of dredged material, are evaluated first because such evaluations can be conducted quickly and inexpensively.

2. In cases where evaluations of direct physical impacts, site capacity, or contaminant pathways indicate impacts will be unacceptable when conventional CDF disposal techniques are used, management actions and contaminant control measures may be considered. Such management actions or controls may include modification to the dredging operation or site; treatment of effluent, runoff, or leachate; treatment of dredged material solids or site controls such as surface covers or liners.

1.3 Regulatory Requirements

1.3.1 Applicable Environmental Regulations

The permits required for construction and operation, and the associated laws and regulatory agencies providing oversight, are detailed in Section 2 of the *Final Design Report* (Foth, 2020). The key provisions are listed here:

- Wisconsin Department of Natural Resources (WDNR)
  - Chapter 30 - with respect to the DMMF, will apply to dredging projects only.
  - NR 200 Water Quality Certification - applies to DMMF fill activities.
  - WPDES - one or more Wisconsin Pollutant Discharge Elimination System (WPDES) permits will be issued for the discharge from the temporary, on-site water treatment plant that will be designed by others. These permit limits are not available at this time and therefore are not directly addressed by this *Final Design Report* (Foth, 2020).

    - Low Hazard Exemption - There are no Wisconsin statutes or administrative code requirements that directly address the design and operation of a DMMF. Prior Wisconsin approvals for similar facilities were grants of low hazard waste exemption, and the same approach will be followed for the DMMF.

- USACE
    - Section 404 - A Section 404 review will be completed as part of the Individual Permit process by USACE to evaluate the placement of fill and anticipated placement of dredged material within the DMMF.
    - Section 408 - A Section 408 review will be completed by USACE to evaluate the impact to existing USACE facilities, in this case the Milwaukee DMDF.

- USEPA
    - USEPA may choose to exercise their authority designated under Section 401 of the Clean Water Act to evaluate the proposed facility for impacts after the review by the WDNR.

These regulatory requirements guide the evaluation of operation of the DMMF by providing limitations and expectations on what types of material may be placed in the facility and how the water generated from the facility will be handled. As described in Section 3.1 of the *Final Design Report* (Foth, 2020):

- The DMMF is required to meet water quality requirements set forth by the regulatory agencies through the various permits awarded to the facility. To achieve these requirements, the design must not discharge water or sediments with contaminant concentrations higher than calculated effluent limits as applied to the facility by WDNR. In addition, any decant water must be removed from the DMMF and treated prior to discharge to Lake Michigan. During active disposal operations into the DMMF, the design will allow for a volume of water greater than the volume of dredged material and carriage water placed into the DMMF to be removed.

- The DMMF will accept dredged material from throughout the Milwaukee Estuary AOC, said dredged material as defined in NR 500.03(71), Wisconsin Administrative Code (Wis. Admin. Code), any solid waste removed from the bed of any surface water. The dredged material will contain liquid.

- The DMMF will **not** accept the following materials for disposal:
    - Dredged material containing mobile non-aqueous phase liquid
    - Dredged material containing polychlorinated biphenyls at concentrations greater than or equal to 50 milligrams per kilogram dry weight (as defined by the Toxic Substances Control Act)
    - Municipal Solid Waste as defined in NR 500.03(150), Wis. Admin. Code
    - Hazardous Waste as defined in NR 660.10(52), Wis. Admin. Code
        - Characteristic Hazardous Wastes described in NR 661 Wis. Admin. Code Subchapter C

    - Listed Hazardous Waste described in NR 661 Wis. Admin. Code Subchapter D
- Infectious waste as defined in 287.07(7)(c)1.c., Wis. Admin. Code
- Household Waste as defined in NR 500.03(105), Wis. Admin. Code
- Commercial solid waste as defined in NR 500.03(41), Wis. Admin. Code
- Medical waste as defined in s. 287.07(7)(c)1.c., Wis. Admin. Code
- Construction and Demolition waste as defined in NR 500.03(50), Wis. Admin. Code
- Tires, as defined in s. 289.55(1)(c), Stats.

2 Dredged Material Operations and Management

2.1 Dredged Material Sources and Material Types

The DMMF will be filled with dredged material from a variety of environmental and navigation maintenance projects throughout the Milwaukee Estuary AOC. The January 2020 Great Lakes Legacy Act (GLLA) Project Agreement describes the types of projects anticipated for development and design that will generate the dredged material for environmental projects. Other non-federal sponsors such as Port Milwaukee and the Milwaukee Metropolitan Sewer District also will generate dredged material for disposal at the DMMF.

2.1.1 Dredged Material Characteristics

The DMMF is designed to handle management of sediments dredged throughout the Milwaukee Estuary. As described earlier, the materials accepted for disposal will exclusively be dredged material as defined in NR 500.03(71), Wis. Admin. Code. Based on the anticipated locations of the dredging within the Milwaukee Estuary AOC (as discussed in Appendix E - Milwaukee Estuary AOC Sediment Data Report), the dredged material to be placed in the DMMF is expected to consist mostly of fine grained sediments. It is assumed these sediments will be predominantly silts and clay and will exhibit flocculent settling behavior.

Sequencing of dredged areas and placement within the DMMF will be established by the proponents of each of the dredging projects generating material and is not precisely known at this time. The exact placement of dredged materials within the DMMF is also not known at this time and will be established as those individual projects are developed and a comprehensive consideration of the expected sources and volumes of materials become evident. For purposes of this evaluation, it is assumed that the GLLA Project Agreement will be the primary vehicle for coordinating and planning the details of the dredged material placement sequence into the DMMF. Said sequence and plans will be developed through that overarching planning effort that will include the necessary advancement of the dredged material and water handling procedures discussed here. **These specific items will be addressed by others, and subject to all necessary and required reviews and approvals by the appropriate permitting agencies at the local, state, and federal level, prior to the placement of dredged materials in the DMMF.**

2.2 Dredged Material Offloading and Placement

The DMMF is designed to provide flexible options for offloading and placement of dredged material. Dredging within the Milwaukee Estuary AOC is planned to be accomplished by both mechanical and hydraulic dredging methods, with the majority of dredging performed under the GLLA Project Agreement being done hydraulically (approximately 1.4 million cubic yards of the 1.9 million cubic yard total).

2.2.1 Hydraulic Offloading and Placement

To design the DMMF water collection systems to accommodate the delivery of hydraulically dredged material to the DMMF, an assumed average dredge rate must be developed. The

assumed hydraulic dredging rate was developed based on the anticipated yearly dredging rate of GLLA projects within the Milwaukee Estuary AOC. Through the discussions within the Design Technical Work Group, it was determined that an assumption of 500,000 cy of dredged material placed in the DMMF per year should be used for design of the DMMF. This target rate is based on the stated goal to complete sediment remediation within the Milwaukee Estuary AOC in the first three years after construction of the DMMF. This target rate is believed to be optimistically high and unlikely to be exceeded during the operating life of the DMMF, making the subsequent analysis and calculations conservative for sizing water handling equipment.

For the purposes of this evaluation, a dredge season was chosen to be nine months or 274 working days. Based on an assumed 7% solids content of the dredge slurry, this equates to a discharge rate at the DMMF of 8 cubic feet per second (cfs) to achieve this goal. Discharge of dredged material to the DMMF by hydraulic methods will be accommodated either through direct pipeline discharge from the dredge, and/or through a 12-inch pipe and manifold system to be incorporated into the perimeter of the DMMF. The DMMF is designed to accommodate inflows of up to 26 cfs from either dredge source. This is to accommodate the potential for multiple dredging projects operating concurrently at a dredging rate in excess of the average rate.

To assist with hydraulic placement, a 12-inch high-density polyethylene (HDPE) pipeline is placed around the northern and eastern perimeter cellular walls of the DMMF with 8 manifolds spaced to provide varying discharge locations of the dredge slurry into the ponded area of the DMMF, as shown on Drawing S27 in Appendix J of the *Final Design Report* (Foth, 2020). Portable HDPE piping could also be connected to these discharge locations on a project-specific basis to further increase the ability to discharge dredged material slurry throughout the DMMF. This approach could be used to accommodate methods such as sub aqueous placement using a tremie pipe and/or diffuser, to meet the needs of each individual dredge project. These methods would be project dependent and would rely on the individual dredge project proponent for design and implementation.

2.2.2 Mechanical Barge Offloading and Placement

The DMMF is designed to also handle mechanically dredged sediment, through offloading at a designed offloading platform located on the eastern side of the DMMF (Drawings S16 through S23). From this location the dredged material can be placed by excavator either into dump vehicles and hauled to the placement areas that are accessible by the portions of the exterior structure of the DMMF capable of supporting the loads of haul trucks or it can be sluiced into the DMMF interior with a mechanical chute. Mechanically dredged material that arrives at the DMMF in scows could also be reslurried for pumping into the DMMF, utilizing the offloading platform and perimeter piping system.

3 DMMF Water Management

Management of the water within the ponded area of the DMMF during the filling portion of its operational life will be accomplished through the use of two pump out weir structures located on the western side of the basin (Drawings S27 and S28). During filling of the dredged material into the DMMF, an inward hydraulic gradient will be maintained when possible as an added layer of protection, and as water is pumped out, it will be treated at an on-site water treatment plant to meet water quality limits under a WPDES permit. **Design of the water treatment facility, with specifications to meet the associated permit, will be determined by others as the details of the individual projects intending to dispose of dredged material within the DMMF are developed. Insufficient data about the specific individual dredging operations that will generate this dredged material is available at this time, precluding the ability to specify or speculate about water treatment unit operations.** However, the evaluation of anticipated concentrations of COCs in the sediments to be dredged and disposed of in the DMMF, as described in Appendix E of the *Final Design Report* (Foth, 2020), present no particular treatment design difficulties for the associated carriage water (the reader is also referred to the list of materials in Section 1.3.1 that will categorically not be allowed to be disposed in the DMMF as further confirmation of the expectation that the subsequent water treatment system design will not pose unwarranted challenges. The water treatment system will be required to meet the design flow capacity discussed below.

3.1 Design Water Management Capacity

The design water management capacity for the weir pumps and the Water Treatment Facility was determined based on the following evaluations:

- Expected average discharge rate per hydraulic dredging season
- Maximum discharge rate from the 12-inch pipe discharge system
- Possible maximum discharge from multiple dredges (three 8-inch dredges operating simultaneously)
- Precipitation prior to DMMF closure

In Section 2.2.1, the average expected dredging rate was calculated to be 8 cfs, based on the expected maximum discharge rate for a single 8-inch dredge moving 500,000 cy of in situ sediment over a 274-day construction season. Similar calculations show the maximum expected discharge rate for a 12-inch dredge (and the 12-inch discharge system) is 20 cfs. In order to expedite the completion of specific dredging projects, the simultaneous use of multiple hydraulic dredges was considered. Therefore, a system utilizing three 8-inch dredges was evaluated and the maximum expected discharge rate calculated at 25 cfs. While the average daily rate is not expected to be that high for sustained periods of time, the possibility must be considered, and the discharge rate dictating the capacity at the pump out weirs and the to-be-designed Water Treatment Facility. The final design water management capacity rate includes the addition of a

factor of safety to account for unanticipated discharges and precipitation into the DMMF. This factor of safety was chosen to be 1.3, which results in a design capacity of 33 cfs.

Each weir box was designed to accommodate the design water management capacity while minimizing surface area required in the DMMF, and will be steel in construction utilizing bolt on steel sheets to accommodate height increases in the weir crest elevation. Utilizing the USACE-developed Automated Dredging and Disposal Alternatives Modeling System suite of computational software, the weir length required to accommodate a 33 cfs dredged slurry inflow rate was calculated to be 86 feet. This weir length is related to the ability for the DMMF to settle out solids while maximizing residence time. Due to the geometry of the DMMF and the locations of the weir box, it is assumed that only three sides of the weir box should count toward the weir length. Therefore, the weir boxes were designed to be 60 foot by 20 foot boxes, located along the existing Jones Island bulkhead wall. The existing bulkhead will provide one side of the weir box and will allow for piping and pump access to the weir box. Each weir box will be connected to the Water Treatment Facility through a pump and piping system, capable of a maximum 33 cfs as indicated in the design water management capacity. This pump and piping system, along with the water treatment facility, will be designed by others as part of the greater AOC Legacy Act Project. The initial top of weir elevation will be +8 feet IGLD 85, and can be increased to +11.5 feet IGLD85 through the addition of welded steel sheets.

The location of the weir boxes at the maximum distance from the eastern wall of the DMMF puts them as far from the expected dredged material slurry discharge locations as possible. This will maximize retention times in the DMMF and maximize settling of solids. The weir box locations can be used independently or together as different discharge requirements dictate. Their design can be further modified during operations of the DMMF as required by the needs of the specific dredging project and unique material characteristics of the dredged material being managed. This basic approach was purposefully incorporated into the design for the water handling system to provide flexibility for the anticipated range of disposal operations that will utilize the DMMF.

3.2 Long-Term Water Management

Upon completion of placement of dredged material in the DMMF, and pumping out of the last of the ponded water, the DMMF will transition to long-term management of consolidation and water handling. The long-term process will focus on managing water to aid in consolidation of the dredged material, and managing any precipitation run off on the site. To handle those water sources, design and implementation of collection structures will need to be completed based upon the final grades and material properties of the placed dredged material.

Management of the expressed pore water from consolidation of the dredged material will be handled using the following methods, but is not limited to:

- Wick drains
- Drainage tile
- Sumps

Trenching through mechanical means may also be employed to add in the conveyance and discharge of water to sumps and/or the weir boxes for pumping to the Water Treatment Facility. Due to the potential contaminants within the expressed pore water and surface water runoff, all water managed until site closure and capping will be required to be treated at the Water Treatment Facility. The Water Treatment Facility will likely be able to be operated at a reduced capacity from that when operating during placement of the dredged material. The detailed design of the post-closure, long-term water handling and treatment systems will be performed by others (expected to be the site owner and operator). **These specific items will be addressed by others, and subject to all necessary and required reviews and approvals by the appropriate permitting agencies at the local, state, and federal level, prior to the final placement of dredged materials in the DMMF.**

4 References

Foth Infrastructure & Environment, LLC, 2020. *Final Design Report* – Milwaukee Estuary DMMF. November 2020.

U.S. Army Corps of Engineers, 2015. "Dredging and Dredged Material Management, Engineer Manual 1110-2-5025," Office, Chief of Engineers, Washington DC.