Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

TASK PRODUCT MEMORANDUM
Analysis for Newburgh Lake Sediment Demonstration Activities

RPO-NPS-TPM20

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MISSION STATEMENT

The mission of the Rouge River National Wet Weather Demonstration Program is to restore the water quality in the Rouge River as necessary to:

•provide a safe and healthy environment for ourselves and future generations,
•protect downriver water resources such as the Detroit River and Lake Erie, and
•re-establish a healthy and diverse ecosystem within the Rouge River watershed.

This will be accomplished through the development, implementation, and financial integration of a technical, social, and institutional framework leading to cost efficient, and innovative, watershed based solutions to control the wet weather problems in the Rouge River watershed.

PREFACE

The Rouge River has historically suffered and continues to suffer from the combined stress of pollutant loadings from various sources. The vast majority of continuous point sources have been eliminated through the issuance and enforcement of National Pollutant Discharge Elimination System (NPDES) permits for municipal and industrial dischargers. Yet, as established in the Rouge River Remedial Action Plan (RAP), the river remains polluted primarily because of sources associated with wet weather flow.

The Rouge River National Wet Weather Demonstration Program (RRNWWDP) is intended to evaluate each of the various sources of wet weather pollution; implement alternative remedial measures; investigate wet weather waste load allocations; establish associated pollutant load reductions; examine the financial and institutional impediments to wet weather pollution control; and recommend a plan and procedure for watershed wide pollution control which is "implementable" in the Rouge and can be readily transferred to similar urban watersheds throughout the country.

The effort is not being conducted in isolation. The Rouge RAP provides a baseline from which RRNWWDP efforts have begun. In fact, the RRNWWDP can be viewed as the key component of the initial implementation of the RAP. In addition, ongoing regulatory efforts aimed at controlling Combined Sewer Overflow (CSO) discharge have also been integrated into the RRNWWDP and all construction facilities will be in accordance to NPDES permits.

It is widely recognized, and reinforced by RAP recommendations, that CSO control by itself will not be sufficient to restore water quality to acceptable levels in the Rouge River and other similar urban rivers. The project has established a watershed wide concept as its focus. Within the Rouge River watershed, a range of pollution sources have been identified. They include: traditional urban runoff, illicit connections to drainage facilities, abandoned dumps within the river flood plain, wet fall and dry fall air deposition, and contaminated sediments within the river channel and impounded lakes.

The RRNWWDP has incorporated efforts to develop analysis tools, organize existing and future data, conduct field surveys, collect and analyze water quality samples, develop and implement water quality models, design and test structural and nonstructural best management practices (BMPs), and establish loadings from nontraditional wet weather sources. Additionally, it includes components that will involve watershed residents in pollution control planning, and will study the institutional structure and financial capabilities of those entities responsible for long term implementation of the recommended watershed plan.

To efficiently manage an effort with diverse objectives, the project has been divided into ten program elements. Each of these has a specifically defined technical or operational purpose. Within each of these elements, work plans are developed to define specific activities to be performed as part of the project. These work plans define the tasks and level of effort.

The program elements that have been established are as follows:

Geographic Information System (GIS) and Mapping
Data Collection and Management
Sampling and Analytical Program
Modeling and Decision Support System (DSS)
Nonpoint Source Best Management Practices (BMPs)
Combined Sewer Overflow (CSO) Design, Build and Test
Value Engineering
Public Information and Involvement
Financial and Institutional
Project Management, Coordination and Reporting

This document has been generated under the Nonpoint Source Program Element, NPS Work Plan 4, Task 4, to provide an analysis of different disposal methods associated with sediment activities.

ABSTRACT

The effects of different techniques for the collection, treatment, and disposal of contaminated sediment will each have an inherent potential liability associated with them. This is particularly true with the final disposal process. This analysis is based on the assumption that removal and transportation liabilities will be similar regardless of the recommended disposal method. Therefore, this document focuses on disposal methods and projects a summary of the intended demonstration activities for Newburgh Lake. As discussions and meetings with Wayne County, the Michigan Department of Natural Resources (MDNR) and the Environmental Protection Agency (EPA) continue, the scope of the demonstration will become more focused. The scope is presented in the document to allow for a strategy point for all activities.

TABLE OF CONTENTS

APPENDICES

1.0INTRODUCTION. Contaminated sediments, historically the result of both point and non-point sources of pollution, have accumulated in the river and impoundments (lakes) of the Rouge River watershed. Large amounts of sediment have collected in the impoundments where slow velocities allow settling to occur. As a result of improved environmental regulations, pollutant loadings from both point and nonpoint sources have been reduced, however, this historic accumulation of contaminated sediment and its interaction with the water column continue to degrade the water quality within and downstream from the impoundments. Generally, contamination found in sediments are affixed to the sediment particles, therefore, disposal methods which effectively contain the sediment will aid in containing much of the contaminants. Unfortunately, a disposal alternative that is completely without environmental risk does not exist; therefore, many disposal methods must be examined and site specific conditions identified before a specific decision can be made.

The effects of different techniques for the collection, treatment, and disposal of contaminated sediment will each have an inherent potential liability associated with them. This is particularly true with the final disposal process. Among the various options, some may have lower initial costs associated with them but have a potential for future liability. The following analysis is based on the assumption that removal and transportation liabilities will be similar regardless of the recommended disposal method. Therefore, this analysis focuses on disposal methods and is intended to present a starting point for discussions with the Environmental Protection Agency (EPA) and the Michigan Department of Natural Resources (MDNR).

2.0DISPOSAL OPTIONS. There are several contaminated sediment disposal options including confined disposal facilities (CDF), landfill disposal, open water disposal, capping and marsh development. In addition, there is the "no-action alternative" in which the sediment remains undisturbed in its current environment. This section offers a description of each disposal method as well as the advantages and disadvantages of utilizing these methods.

2.1CONFINED DISPOSAL FACILITY. Confined disposal facilities can be upland or in-water structures designed to contain contaminated dredged materials. (Averett et. al., 1990, A143). Upland facilities are generally constructed of earthen dikes or existing pits or depressions, while in-water CDFs consist of dikes similar to breakwater structures. CDF designs may consist of a large cell for material disposal and adjoining cells for retention and decantation of turbid water. To prevent seepage through the dike walls, linings such as clay or bentonite-cement slurries are utilized. (Voskuil et. al., 1991, p. 43). The exact size and shape of a CDF is often determined by site specific conditions and the predicted sediments to be accepted by the facility. CDF sizes range from a few to several hundred acres.

The selected CDF must be designed to retain a high percentage of the anticipated sediment particles, since contaminants tend to bind to the fine particles. CDFs that accept hydraulically dredged sediments will require detention times for settling and must be able to treat and drain large volumes of water. While a CDF that accepts mechanically dredged sediments requires little settling capabilities and needs to be able to drain approximately one fifth the volume of water for a hydraulically dredged design (Averett et. al., 1990, A146). Consequently, CDFs allow for the potential of contaminant migration into groundwater, surface drainage of contaminated water, and uptake of contaminants by plants and animals. (Voskuil et. al., 1991, p. 43).

The Point Mouillee CDF located on Lake Erie, south of South Rockwood, Michigan (and the Erie Metro Park) is the only CDF within a reasonable distance to the project site.

2.2LANDFILL DISPOSAL. Landfills are typically designed for the disposal of solid wastes on land. Consequently, the potential high water contents resulting from the dredging processes

may decrease the practicality of landfill disposal. Pretreatment options, such as dewatering or drying of the sediments, may resolve this problem. Dewatering reduces the volume of waste, thereby reducing the costs of disposal and making the wastes acceptable to the landfill facility. (Voskuil et. al., 1991, p. 43).

Sanitary landfills are designed to accept non-hazardous and household wastes. They are typically comprised of cells in which the wastes are emptied, spread, compacted, and covered daily. Generally, six inches of soil are used as daily cover, however, other materials such as dewatered sediments may be substituted. State regulations vary regarding the acceptance of contaminated sediments for disposal or use as cover. (Averett et. al., 1990, A147, A148). Landfills in the area that may accept sediment include: Woodland Meadows, Canton, Michigan; Browning Ferris Industries, Northville, Michigan; and E.G. Treatment Services, Van Buren Township, Michigan.

Contaminated Sediments, as defined by Resource Conservation and Recovery Act (RCRA) or Toxic Substance Control Act (TSCA) may be disposed of in a hazardous landfill. However, due to the restrictive requirements for properly licensed hazardous landfill facilities, the costs may dramatically increase by selecting this method of disposal. Regarding contaminant constituents and levels, the landfill facility must be properly designed and permitted under either RCRA (40 CFR Part 264) or TSCA (40 CFR Part 761) for the acceptance of the contaminated wastes. Requirements include lining the sides and bottom of the site, a leachate collection system, and a leachate detection system. (Averett et. al., 1990, A148, A149). Landfills in the region that accept TSCA wastes include: CWM, inc., Emelle, Alabama; US PCI, Kansas City, Missouri; and US PCI, Twinsburg, Ohio.

2.3OPEN WATER DISPOSAL. Although open water disposal has been widely used in the past, current legislation is underway to amend the Federal Water Pollution Control Act to prohibit open water disposal. The following conditions regarding open water disposal were set forth in H.R. 2651 in the House of Representatives, July 15, 1993, to amend the Federal Water Pollution Control Act to provide for confined spoil disposal facilities, and for other purposes:

"(d) SEDIMENT MANAGEMENT.

(1) In general. - After December 31, 1994, it shall be unlawful to dump or otherwise dispose of dredge spoil at any location in the waters of the Great Lakes, other than at a confined spoil disposal facility, unless -

(A) the Administrator has concurred in writing with the decision of the Secretary of the Army (referred to in the subsection as the 'Secretary') to allow the disposal (either with or without conditions), if the concurrence is based on a determination that the proposed disposal is consistent with the guidelines developed pursuant to paragraph (2); or

(B) 45 days (or 90 days, in a case in which the Administrator has requested an extension from the Secretary in writing) have elapsed since the date on which the Administrator received from the Secretary all material necessary to evaluate the proposed disposal, and-

(i) the Administrator has not issued an opinion regarding the project; and
(ii) the Secretary has found that the disposal is consistent with the guidelines developed pursuant to paragraph (2)."

If open water disposal has been approved under the Federal Water Pollution Control Act, other factors inhibiting this alternative must also be assessed. Considerations for open water disposal include currents (velocity and structure), average water depths, salinity/temperature stratifications, bathymetry (bottom contours), dispersion and mixing, and navigation and positioning (e.g., location/distance, surface sea state, etc.). (Voskuil et. al., 1991, p. 41). Open water disposal would not be a viable alternative for the restoration activities at Newburgh Lake.

2.4CAPPING. In capping, a clean cap or cover is placed over the contaminated sediment preventing the dispersion of contaminants into the water and uptake by aquatic organisms. Options for capping include level-bottom capping, contained aquatic disposal (CAD), and

capping in place. To reduce the long-term environmental effects resulting from open water disposal activities, a "cap" of clean dredged material or sand may be placed over the contaminated material.

2.4.1 LEVEL-BOTTOM CAPPING. During level bottom capping, sediments are deposited in a mound, then covered with sand or clean sediment. Several layers of sand or clean sediment are deposited over the contaminated sediment in order to provide sufficient coverage. (Voskuil et. al., 1991, p. 41).

2.4.2CONTAINED AQUATIC DISPOSAL CAPPING. In contained aquatic disposal, the sediments are deposited into an existing depression, excavation, or submerged diked area and then capped with clean sand or sediment. As in level-bottom capping, several layers of cover are used to ensure effective cover. (Voskuil et. al., 1991, p. 41).

2.4.3IN-PLACE CAPPING. In-place capping is designed to cover sediments in their original location with clean sand or other materials to prevent the spread of contamination. Allowing contaminated sediment to remain in the original location provides for stable geochemical and geohydrologic conditions, minimizing the release of contaminants to surface water, groundwater, and air during dredging processes. (Voskuil et. al., 1991, p. 41). Sediments may be capped in-place, however, conflicting navigational or recreational uses may impede this alternative. (Southerland et. al., 1993, p. 3-24).

2.5MARSH DEVELOPMENT. The development of marshes from sediments is generally an appealing alternative to the public, costs are low, and marshes may provide desirable biological communities. Marshes are often easily developed in the sandy/silty sediment base and dredged material marshes are relatively maintenance free.

Contaminant uptake by plants and animals must be considered during marsh development. Metals and chlorinated hydrocarbon compounds may be transferred to marsh plants from the air, water, or marsh substrate. Additional considerations such as the loss of the current habitat and locating an appropriate site for construction may contribute to difficulties. (*Beneficial Uses of Dredged Material*, 1987, P. 5-1, 5-2).

2.6SOLID PHASE BIOLOGICAL TREATMENT. Sediments contaminated with pesticides, fuels, creosote, PCP, PCBs, some halogenated volatile organics, non-halogenated organics such as gasoline, aliphatics, aromatics, chlorinated aromatic organic compounds can be treated using conventional soil/solid treatments. A treatment bed, lined with clean sand over a high-density liner, is used. Nutrients, including nitrogen and phosphorous, are added to the materials and tilled to promote oxygen transport. Materials are mixed to an approximate depth of six to twelve inches. The effectiveness of the process relies on the presence of suitable microorganisms for contaminants, concentration of nutrients to promote biochemical reactions, and the contaminant's affect on the microbial population. Residuals may include the treated solids, process water, and air emissions. (Southerland et. al., 1993, p. 3-40).

2.7NO-ACTION ALTERNATIVE. The no-action alternative allows the contaminated sediments to remain in place. Although the undisturbed contaminated sediments may or may not continue to contribute to environmental degradation, the disturbance of contaminated sediments through the dredging processes may be more damaging. The no-action alternative may be appropriate when operation of the source of the contaminants has ceased. Natural biological processes, such as the integration of non-contaminated sediments with contaminated sediments through dispersion, natural degradation, and burial of contaminated sediments by further sedimentation from the drainage basin allow contaminated sediments to remain in place. Advantages to the no-action alternative include the limited risk of contaminant spread and low cost. The sediments should continue to be monitored to observe any increase or decrease in the levels of contamination in the sediments or until a reasonable remedial action can be implemented. (Southerland et. al., 1993, p. 3-24). Disadvantages to the no-action alternative include not improving the use in Newburgh Lake or expanding its recreational opportunities. The sediments will continue to provide a source of water quality degradation to the Rouge River.

3.0DEMONSTRATION ACTIVITIES. The restoration of Newburgh Lake will require the removal of sediment from within the lake to improve the water quality, increase habitat, reduce vegetative growth and increase the recreational use. The sediment is of both a contaminated and non-contaminated nature, with the top 2-3 feet of the sediment considered to be potentially contaminated. Contaminated sediment across the entire lake will be contained or removed, while "clean" sediment will be removed from areas where the limited depth deters the recreational use of the lake and contributes to the large vegetation blooms each year.

While multiple dredging techniques were evaluated, the following alternative was chosen for the demonstration effort. The area to be excavated during the demonstration activities is located along the shoreline at the west end of Newburgh Lake in approximately 4 feet of water. This area is moderately contaminated, but does not exceed TSCA or RCRA levels. Approximately 2 feet of bottom sediment within this area will be dredged. Prior to any dredging removal activity, a 4-foot tall silt fence will be installed along the perimeter of the excavation area. The silt curtain will be anchored by 8-foot posts, spaced 15 feet apart. The silt curtain will help to prevent the migration of any resuspended sediments during demonstration activities.

A modified clamshell crane will be used for the removal of sediments. Roll-off boxes will be positioned behind the crane to accept sediment from the cable arm clam bucket. The contaminated sediment will then go through separation and washing processes. The "clean" sediment removed under the lake restoration process will only require dewatering. Additional roll-off boxes will be positioned at the roadway for final transport. Once the sediment has been processed it will ultimately be landfilled for final disposal. However, the processed sediment will be evaluated to determine if portions could be used as cleanfill and/or capping material.

As discussions and meetings with Wayne County, MDNR, and EPA officials continue to take place, the scope of this demonstration will become more focused and/or change. However, the scope presented in this document allows for a starting point for all restoration activities.

4.0DISPOSAL REASONING. Landfilling and the use of the clean and treated sediment material as fill were chosen as the disposal methods for activities associated with Newburgh Lake. Disposal options will continue to be investigated in view of the ever changing environmental and regulatory environment. The following presents the reasoning for the choices:

•Excavation of contaminated sediment, as well as the clean sediment found below, must be performed at the western end of the lake in order to improve water quality and recreational use and increase habitat. Therefore, the capping option cannot be utilized at the western end of the lake if it is to continue to function as a lake. As an alternative, the western end of the lake could be fully contained and filled. This latter alternative is counter to the stated goals of the project.

•It is possible to use some of the clean sediment removed from the western end of the lake to cap the contaminated sediment at the eastern end. The eastern end of the lake depths range from approximately 6 to 18 feet, thereby allowing additional cover without interfering with the recreational use.

•If it is determined that the contaminated sediment at the eastern end of the lake must be removed, clean sediment excavated from the western end may be deposited in its place.

•Clean sediment that is removed from below the potentially contaminated sediment will not require any "confinement" in its disposal. The sediment can be used as fill on Wayne County land.

•Soil washing will assist in separating the contaminates from the sediment thereby reducing the volume of sediment requiring regulated disposal. This will allow for more beneficial use of the materials and possibly a reduction in overall cost.

•Landfill disposal is recommended for contaminated sediments removed from the lake. Landfills are well designed and regulated to control the escape of contaminants.

Confined disposal facilities (CDF) are expensive to design and build, unless the projected volume makes the economies of scale more feasible. Presently, under the current environmental regulations it is difficult to obtain a permit for a CDF.

•The available space in currently permitted CDFs is decreasing rapidly.

•The only CDF in the vicinity is the United States Army Corps of Engineers (USACOE) facility at Point Mouillee. Use of this facility would require an Environmental Impact Report (EIR) or an EIR addendum since the acceptance of the contaminated sediment would be beyond the scope of the facility's present EIR.

•Future liability for the use of CDFs is currently unknown. Current legislation addressing CDFs may require environmental assessments and development of a remedial action plan if a problem is identified.

5.0 REFERENCES.

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APPENDIX A

LIST OF ACRONYMS

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BMP	Best Management Practice
CAD	Confined Aquatic Disposal
CDF	Confined Disposal Facility
CFR	Code of Federal Regulations
CSO	Combined Sewer Overflow
EPA	Environmental Protection Agency
GIS	Geographic Information System
MDNR	Michigan Department of Natural Resources
NPS	Nonpoint Source
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RPO	Rouge Program Office
TSCA	Toxic Substance Control Act
USACOE	United States Army Corps of Engineers