REMEDIAL ACTION COMPLETION REPORT
FINAL

GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE

Great Lakes National Program
Office Cleanup Services (GLNPOCS)
Contract No. EP-R5-11-04
Task Order No. 0005

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LISTS OF ACROYMS AND ABBREVIATIONS

AOC	Area Of Concern
BMP	Best Management Practice
CD-ROM	compact disk - read only memory
CCQAPP	Construction Contractor Quality Assurance Project Plan
CQCP	Construction Quality Control Plan
CQC	construction quality control
CFR	code of federal regulations
CY	cubic yards
DMU	dredge management units
DQCSR	daily quality construction summary reports
ECCS	Environmental Chemistry Consulting Services
EQM	Environmental Quality Management, Inc.
EPA	Environmental Protection Agency
ft	feet
FTP	file transfer protocol
GAC	granulated activated carbon
GLLA	Great Lakes
GLNPO	Great Lakes National Program Office
GLNPOCS	Great Lakes National Program Office Cleanup Services
GPS	global positioning system
HDPE	high-density polyethylene
KK	KK Integrated Logistics
mg/kg	milligram per kilogram
MSDS	Material Safety Data Sheet
NTP	notice to proceed
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RACR	Remedial Action Completion Report
RAO	remedial action objectives
REA	request for equitable adjustment
RFTOP	request for task order proposal
RG	remedial goals
RTK	real-time kinematic
SCM	semi-consolidated materials
SES	Sevenson Environmental Services, Inc.
SOP	standard operating procedure
SOW	scope of work
sq. ft.	square feet
SY	square yard
T&D	transportation and disposal

LIST OF ACROYMS (CONTINUED)

TCLP	toxicity characteristic leaching procedure
TOCOR	task order contracting officer's representative
Tyco	Tyco Fire Products LP
US	United States
USACE	United States Army Corps of Engineer
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System
WWTP	waste water treatment plant

1. INTRODUCTION

Environmental Quality Management, Inc. (EQM) has prepared this Remedial Action Completion Report (RACR) for the environmental remediation work conducted at the Lower Menominee River Sediment Removal Project, Marinette, Wisconsin. The EQM Team conducted this Great Lakes Legacy Act (GLLA) contaminated sediment cleanup project for the U.S. Environmental Protection Agency (EPA) and its project partners, Tyco Fire Products LP (Tyco) and Wisconsin Department of Natural Resources (WDNR). This was a betterment remediation project to accelerate the achievement of lower arsenic levels in the Lower Menominee River. Figure 1 presents a location map for the Lower Menominee River Area of Concern.

1.1 Project and Scope

This project was performed for the EPA under EQM's Great Lakes National Program Office Cleanup Services (GLNPOCS) contract (Contract No. EP-R5-11-04). The project was awarded to EQM on August 27, 2014 as Task Order 0005 (Menominee River Sediment Removal Project, Marinette, Wisconsin). EQM Team subcontractor Sevenson Environmental Services, Inc. (SES) (Niagara Falls, NY) performed various marine and landside work tasks under this project. Work was performed along areas of the Lower Menominee River adjacent to and near the Tyco manufacturing operation. The Menominee/Tyco project site is an active manufacturing facility in the City of Marinette in northeastern Wisconsin, adjacent to the south shore of the Menominee River. The property is bordered by the Menominee River to the north; the 6th Street Slip and City of Marinette property to the east; Water Street, City of Marinette property, Marinette School District property, and residential properties to the south; and Stanton Street and Marinette Marine Corporation to the west. The facility consists of approximately 63 acres, including a manufacturing area on the western part of the property and an undeveloped area to the east, referred to as the “wetlands area.” A fence surrounds both parts of the facility, and access is restricted.

EQM's work activities consisted of dredging, surveying, materials handling (processing, stabilization, debris shredding), loading and transportation of processed sediment and debris, subaqueous cover placement, vegetative invasive species removal, rip rap construction, site restoration, and related mobilization and demobilization activities. Work was performed in accordance with the applicable EQM task order Scope of Work (SOW), the project specifications, the Tyco Hazardous Waste Variance permit, the Tyco Site Access Agreement, and the associated Project Work Plans developed for the project site. Work and mobilization of equipment and materials to the site began in September 2014, with the in-water remediation work (i.e., dredging) occurring between early September and late November 2014. Decontamination and demobilization of most of the marine equipment was performed in late November 2014 following the completion of dredging. Decontamination of the staging area was required to be performed prior to the winter shutdown per the Hazardous Waste Remediation Variance. Subaqueous cover placement and site restoration began in April 2015 and was completed in June 2015.

Vegetative invasive species removal work, specifically for Phragmites, was added to the project SOW in May of 2015, and involved the treatment, cutting, and removal of the invasive species in selected areas of the project site. The invasive species control work began in August 2015 and final cutting and removal was completed in late November. Additional repairs and restoration of the Tyco sediment processing pad was also added to the SOW and this work was completed between August and September 2015. The general site restoration and final demobilization was completed in September 2015, with the exception of final cutting and removal of the treated invasive species grasses.

All work activities were conducted in compliance with applicable Federal, State of Wisconsin, and local laws and requirements, including compliance with 49 CFR and State of Wisconsin and Michigan requirements for highway transportation.

1.2 Project Objectives

EQM was tasked to complete work associated with contaminated sediment cleanup and habitat restoration along the Lower Menominee River in Marinette, Wisconsin. Work was performed in accordance with the applicable EQM task order SOW, the project specifications, and

the associated Project Work Plans developed for the project site. EQM's primary work activities are listed below:

- Mobilization and site setup.
- Implementation of erosion control and sediment re-suspension control measures including monitoring, as necessary.
- Operation and maintenance of a temporary sediment staging/stabilization area.
- Bathymetric and land surveys of areas to be dredged or disturbed prior to starting work and after completion of each phase of work.
- Mechanically dredging arsenic contaminated sediment from the Lower Menominee River (engineering estimate of 44,777 cubic yards (CY), including 37,070 CY neat line plus 7,770 CY over-dredge allowance.)
- Transportation of dredged materials to the stabilization/staging area.
- Pumping water from dredge scows to the Water Treatment Facility.
- Off-loading of dredge materials at the soil stabilization area.
- Stabilization and handling of material from dredging activities.
- If necessary, re-stabilizing of previously stabilized material that failed to meet criteria for disposal at the off-site landfill.
- Assisting the Tyco representative with collection of various samples for analysis.
- Loading and transportation of the stabilized sediment material from the site to an off-site licensed landfill disposal facility (Waste Management, Menominee, MI).
- Placement of in situ, subaqueous cover material in the Turning Basin and Transition Area.
- Restoration of portions of the site impacted by remedial activities, including the water treatment area at the 6th Street slip and the Tyco asphalt pad.
- Control/Removal of vegetative invasive species (*Phragmites*).
- Cleanup and demobilization from site.

1.3 Project Organization

Implementing the Lower Menominee River Sediment Removal Project in Marinette, Wisconsin involved collaboration among several organizations. The primary organizations that participated in this remedial action are listed below:

- United States (US) EPA Great Lakes National Program Office (GLNPO)—Lead Federal agency responsible for funding and managing the Lower Menominee River Sediment Removal Project

- Wisconsin Department of Natural Resources—GLLA nonfederal partner and project stakeholder responsible for oversight of remediation and construction work, particularly regarding compliance with state regulations and permit requirements
- Tyco—GLLA nonfederal partner for the Lower Menominee River Sediment Removal Project
- City of Marinette—Lead City agency and Project Stakeholder
- CH2M Hill—Engineer of Record and construction oversite contractor for Tyco
- Environmental Chemistry Consulting Services (ECCS)—Tyco on-site laboratory subcontractor
- EQM—Prime contractor to USEPA under EPA GLNPOCS I contract, responsible for overall project and on-site management, reporting, construction quality control (CQC), health and safety, procurement, cost and schedule control, and off-site transportation and disposal of waste materials
- SES—Team subcontractor to EQM under the EPA GLNPOCS I contract, responsible for dredging/excavation, debris removal and disposal, and site setup and related construction support activities
- Luedtke Engineering Company, Inc. (Luedtke) (Frankfort, MI)—Subcontractor to SES, performed deep-area sediment re-dredging of the Turning Basin.

As noted above, EQM was supported on this project by SES, one of EQM's GLNPOCS Team subcontractors. As the prime contractor, EQM was responsible for: project and on-site management, preparation of project preconstruction plans and documents, reporting, CQC and Health & Safety, bathymetric surveying, delivery of the Portland cement stabilization reagent, off-site T&D of the solidified sediment and debris materials, invasive species control efforts, restoration of the Tyco asphalt processing pad, and cost and schedule control. SES was responsible for: site preparation and maintenance of temporary facilities, debris removal and dredging/excavation of all contaminated sediment, transportation of debris and sediment to the processing pad, sediment processing and solidification, and load-out of solidified sediment for off-site transportation and disposal.

Tyco, as EPA's nonfederal partner, was responsible for providing the sediment treatment agents (ferric sulfate), operating the on-site wastewater treatment plant, environmental monitoring, and post-dredge confirmatory sampling and analysis. Tyco's On-site Engineer, CH2M Hill, was assisting Tyco in the performance of these various tasks. EQM and SES provided support and assistance to Tyco and CH2M Hill in the execution of their various project work tasks.

1.4 Report Organization

This RACR is organized in the following sections:

- Section 1 – Introduction
- Section 2 – Background
- Section 3 – Construction Activities
- Section 4 – Performance Standards and Construction Quality Control
- Section 5 – Final Inspection
- Section 6 – Operation and Maintenance Activities
- Section 7 – Contact Information
- Section 8 – References
- Appendix A – Figures
- Appendix B – Photographs
- Appendix C – Permits
- Appendix D – Sediment Volume Calculation Data
- Appendix E – Bathymetric Survey Data
- Appendix F – Debris Calculations
- Appendix G – Invasive Species Control Project Report
- Appendix H – Daily Reports
- Appendix I – Inspection
- Appendix J – Punch-list

2. BACKGROUND

2.1 Site Information

This section provides a description of the Menominee project site and a summary of historical work at the site. Figure 1 presents the Lower Menominee River Area of Concern, and Figure 2 presents the Tyco facility and GLLA project area. Note that all figures are presented in Appendix A.

2.1.1 Description

Work was performed along areas of the Lower Menominee River adjacent to and near the Tyco manufacturing operation. The Menominee/Tyco project site is an active manufacturing facility in the City of Marinette in northeastern Wisconsin, adjacent to the south shore of the Menominee River. The property is bordered by the Menominee River to the north; the 6th Street Slip and City of Marinette property to the east; Water Street, City of Marinette property, Marinette School District property, and residential properties to the south; and Stanton Street and Marinette Marine Corporation to the west.

The facility consists of approximately 63 acres, including a manufacturing area on the western part of the property and an undeveloped area to the east, referred to as the "wetlands area." A fence surrounds both parts of the facility, and access is restricted. Figure 3 presents the existing Site Plan.

A total final volume of 41,010 CY of soft sediment and semi-consolidated materials (SCM) contaminated with arsenic greater than 20 milligrams per kilogram (mg/kg) were mechanically removed from the work area in the Menominee River. The thickness of the soft sediments mechanically dredged ranged from less than 1 foot to a maximum of 8 feet. The SCM ranged from a depth of 6 to 27 feet. Six (6) inches of over-dredge allowance was included in the total volumes for soft sediment (in areas not underlain with SCM targeted for removal) and SCM. The estimated volume of sediment associated with the 6-inch over-dredge from the original project design was 7,770 CY. The actual final quantity of sediment associated with the over-dredge allowance was 6,725 CY.

Note that all photographs depicting site activities described throughout the report are presented in Appendix B.

2.1.2 Historical Site Arsenic Storage

The facility began operations in 1915 to produce cattle feed, refrigerants, and specialty chemicals. Arsenic-based agricultural herbicides were manufactured at the facility between 1957 and 1977. A byproduct of the manufacturing of this herbicide was a salt that contained approximately 2 percent arsenic by weight and was stockpiled at several locations on the property. Some of this arsenic subsequently entered the site's soil, water and river sediments. By 1978, the facility ceased production of arsenic-based herbicides, and since 1983 has produced only fire extinguishers and fire-suppression systems.

2.1.3 Historical Dredging Activities

Prior sediment remediation work was conducted at the Menominee project site under a separate contract procured and managed directly by Tyco. The primary environmental/construction activities preformed during 2012 and 2013 are described below.

2012 Work Activities:

- Site preparation for dredging, processing, and disposal operations.
- Installation of temporary water treatment system at the 6th Street Slip area.
- Installation of turbidity controls and monitoring equipment.
- Bathymetric survey to document pre-dredging sediment elevations.
- Mechanical dredging, stabilization, and disposal of soft sediments in Turning Basin.
- Collection and treatment of wastewater through the temporary water treatment system.
- Ongoing monitoring activities consisting of monitoring turbidity and arsenic concentrations in the river, arsenic concentrations at two nearby drinking water plant intakes, arsenic concentrations in the water treatment system effluent, and stabilized sediment disposal parameters (mainly, total and toxicity characteristic leaching procedure (TCLP) for arsenic, paint filter, and field soil strength testing).
- Bathymetric survey to document the subsurface elevations at the end of the 2012 work season.

- Installation of the wastewater stabilization support system through 2012/2013 winter months to prepare for 2013 dredge season.

2013 Work Activities:

- Completed installation of wastewater stabilization support system.
- Re-paved entire former Salt Vault area for use as a staging pad. Original asphalt was removed during the wastewater stabilization structure installation.
- Modifications to the site layout for the 2013 dredge season to more efficiently manage the sediment following treatment and allow for more storage capacity.
- Start-up activities for the temporary water treatment system in the 6th Street Slip area.
- Bathymetric survey to document pre-dredging sediment elevations.
- Re-Installation of turbidity control devices (such as silt curtains) in the river.
- Mechanical dredging, stabilization, and disposal of soft sediments and SCM in Turning Basin, Transition Areas, and South Channel.
- Collection and treatment of wastewater through the temporary water treatment system.
- Ongoing monitoring activities consisting of monitoring turbidity and arsenic concentrations in the river, arsenic concentrations at two nearby drinking water plant intakes, arsenic concentrations in the water treatment system effluent, and stabilized sediment disposal parameters (mainly, total and TCLP arsenic, paint filter, and field soil strength testing).
- Installation of bedding stone and rip-rap for long-term support of vertical barrier wall.
- Decontamination of site and equipment following dredging activities as weather permitted.
- Shutdown of site in December 2013. Partial decontamination, restoration, and demobilization activities resumed as weather allowed in spring 2014. Full demobilization was not completed as the Legacy Project (EQM contracted) commenced September 4, 2014.

2.2 Summary of Remedial Action Objectives (RAOs)

As stated in Section 1.2, the objective of the Lower Menominee River AOC Sediment Removal Project was to remediate the Menominee River by a combination of sediment removal, cover placement, and habitat restoration. The Remedial Action Objectives (RAOs) for the GLLA Lower Menominee River AOC Remediation Tyco Site project were as follows:

- RAO 1: Reduce human exposures for direct sediment contact from the Lower Menominee River by reducing the availability and/or concentration of arsenic in sediment.
- RAO 2: Reduce the exposure of wildlife populations and the aquatic community to sediment arsenic concentrations that are above 20 mg/kg.

- RAO 3: Implement a remedy that was compatible with the Menominee River Remedial Action Plan's goal of protecting and restoring habitat and supporting wildlife.

2.3 Summary of Planned Remedial Design Work Activities

The planned approach was based on the EPA Request for Task Order Proposal (RFTOP) specifications and the specific Menominee River RAOs and Remedial Goals (RGs) developed by EPA and its partners. The planned means, methods, and equipment for successfully completing the planned remedial design consisted of six major project tasks: 1) dredging an engineering estimate of 44,777 CY of sediment contaminated with arsenic above 20 mg/kg (37,007 Neat Line and 7,770 overdredge allowance); 2) dewatering, processing, and stabilizing the arsenic-contaminated sediment and debris as required for off-site disposal at a licensed non-hazardous waste landfill; 3) loading and transporting the processed sediments and debris to a licensed non-hazardous waste landfill; 4) option for disposal of stabilized sediments at a licensed landfill; 5) option for in situ cover placement of approximately 2-3 acres of exposed glacial till with arsenic concentrations > 20 mg/kg; and 6) site restoration.

During the course of performing the project work in 2013 under the Tyco/SES contract, the City of Grand Haven shipwreck was located in the project area. The schooner was originally abandoned at the moorings near the foot of 6th Street and left to decay. Historically in 2013, the shipwreck area was dredged and remnants of the ship were recovered. Remnants from the shipwreck were saved and an attraction is on display at the Marinette County Historical Society Museum. Prior to starting the 2014 EPA GLLA remediation project (the EQM contract), the national historic society was notified by CH2M Hill regarding the performance of activities in the area of ship wreck. No shipwreck debris was encountered during the dredging activities under the EPA GLLA 2014 project.

2.4 Modifications to Remedial Design

During the course of the remedial activities, several minor design and operational modifications were implemented. All modifications were approved by USEPA GLNPO prior to implementation. During the performance of this project, a total of 10 task order modifications were issued by EPA. Table 2-1 presents these modifications. The primary purpose of these modifica-

tions was to reconcile work quantities, add or move funding between the various work line items, and add additional scope of work items.

Table 2-1. Modifications

Mod. No.	Description	Date
001	Added Delivery of Type II Portland Cement	10/17/2014
002	Add Subaqueous Cover Placement	3/30/2015
003	Line item funds transfer	4/9/2015
004	Alter Dredging/Redredging CY & Materials Handling/Shredding Tons, Cement Delay / Shortage	4/21/2015
005	Additional Site Restoration at the Tyco Asphalt Pad	6/4/2015
006	Line item funds transfer	8/13/2015
007	Line item funds transfer	8/25/2015
008	Line item funds transfer	9/4/2015
009	Adjust Line Item Quantities and Adjust Line Item Funding	9/10/2015
010	Add Invasive Species Control / Removal, and Line item funds transfer	9/28/2015

A brief description of the modifications that involved changes to the scope of work and required services is provided below.

On October 17, 2014 EPA awarded Modification 001 to the task order, which required EQM to supply and deliver the Type II Portland cement stabilization agent for use in the sediment stabilization operations.

During March 2015, EPA awarded Modification 002 to the task order which required the placement of a subaqueous cap within the Turning Basin and Transition Area. In early March 2015, Tyco received the Section 408 final approval from the U.S. Army Corps of Engineers (USACE) for installation of the subaqueous cover. This delayed approval for the cover placement work resulted in installation of the cover materials in the spring/early summer of 2015, rather than following the completion of dredging at the end of the 2014 construction season.. A Request for Equitable Adjustment (REA) was submitted to EPA including revisions after receipt of the cover placement mod due to the aforementioned delay of this work. A subaqueous cover core sampling effort was conducted in June 2015 to evaluate and confirm the thickness of the subaqueous cover that was placed by SES, and to collect other pertinent information related to the cover placement work. EPA, their project partners Tyco and the WDNR, and the Tyco project engineer CH2M Hill developed a diver-assisted core sampling program to collect the desired data in an effort to verify the thickness of the cover material that was previously placed.

EPA issued Modification 003 and 004 which allocated/transferred funds for the final quantity of Portland cement delivered to the site and for the related REA that was required due to

an unavoidable temporary delay in the delivery of Portland during a portion of the project work. The delay REA was due to adequate supplies of the Portland agent not being available on October 23, 2014 and October 28, 2014 due to circumstances beyond the control of EQM and SES. As a result of the shortage of available Portland cement, certain on-site operations (sediment processing on the dewatering/processing pad, sediment off-loading from the scows, and sediment dredging) were temporarily impacted (i.e., the production rates for these operations were decreased on some days, resulting in the operating time being substantially reduced; on other days, the operations were completely shut down due solely to the lack of available Portland).

During June 2015, EPA awarded Modification 005, Asphalt Pad Repair & Restoration which was related to the SOW for Task Order Line Item 16, Demobilization and Site Restoration. This modification included direction to perform additional repair and paving work on the Tyco sediment processing pad. The modification also included de-scoping of several restoration items that were included with the original project SOW and budget. The firm selected for the pad restoration and repair work was Peshtigo Paving. Peshtigo began work in late July 2015 and completed all work in September 2015.

Modifications 006, 007, and 008 involved allocation/transfer of funds among various line items. The EPA issued modification 009 to alter the funding for the stabilizing materials and additional cover placement work.

During fall of 2015 the EPA issued modification 010 which added the control of the invasive species Giant Reed Grass (*Phragmites australis*) to the task order. The invasive species work included chemical treatment and cutting of the invasive species grass, and removal and disposal of the cut grass from some of the areas treated.

3. CONSTRUCTION ACTIVITIES

The environmental construction and related activities performed under the EPA GLLA project are described in this section.

3.1 Preconstruction Activities and Mobilization

This section presents a summary of the preconstruction activities.

3.1.1 Pre-Construction Meetings

USEPA GLNPO awarded the Lower Menominee River AOC Sediment Removal Project, Marinette, Wisconsin to EQM under Contract EP-R5-11-04, Task Order 0005, on August 27, 2014.

A project kick-off meeting was held on September 3, 2014. The meeting was convened at the USEPA GLNPO office in Chicago, Illinois. Representatives from USEPA GLNPO, EQM, SES, Tyco, and CH2M Hill attended the meeting. Key topics discussed during the meeting included the work SOW, planned schedule, roles of the various interested parties, access agreement, and project submittals. The key submittals discussed during the meeting included the CQC Plan, Health Safety & Emergency Response Plan, Dredging Operations Plan, and Schedule of Submittals.

3.1.2 Pre-Construction Plans

The project RFTOP and specifications required preparation of a number of pre-construction plans and other submittals. The primary required project plans and documents are listed in Table 3-1. A first draft of all of the plans was prepared and submitted for each required submittal in September, with the exception of the Environmental Control and Stormwater Pollution Prevention Plan, which was submitted on October 6, 2014. Comments were received from EPA and other involved parties (e.g., Tyco and WDNR) during the September reporting period (with the exception of the Environmental and Stormwater Pollution Prevention Plan). All submittals were revised in response to the comments received and resubmitted to EPA with the ex-

ception of the Erosion Control and Stormwater Pollution Prevention Plan (no comments were received on the draft plan). These plans were further revised and resubmitted to EPA if deemed necessary and as directed by the EPA.

Table 3-1 Project submittal tracking summary list.

Table 3-1. Menominee Project Submittals Status and Tracking

Plan Number & Title	Original Submittal Date	Comments Received	Resubmittal Date
1. Schedule of Submittals	9/04/14	N	10/11/14
2. Schedule of Values	9/04/14	Y	With monthly
3. Construction Progress Schedule	9/04/14	Y	10/08; monthly
4. HSERP	9/04/14	Y	9/23/14
5. CQCP	9/04/14	Y	9/23/14
6. Dredging/Operations Plan	9/05/14	Y	9/20/14
7. Survey Plan	9/05/14	Y	9/20/14
8. Turbidity & Resuspension Plan	9/04/14	Y	9/20/14
9. Waste Management Plan	9/05/14	Y	9/30/14
10. Material Stabilization Plan	9/05/14	Y	9/30/14
11. Traffic Routing & Control Plan	9/05/14	Y	9/30/14
12. Contingency Plan	9/06/14	Y	10/08/14
13. Onsite Fueling & Spill Containment Plan	9/06/14	Y	10/07/14
14. Dust Control & Monitoring Plan	9/06/14	Y	10/12/14
15. Environmental Spill Response Plan	9/18/14	Y	10/07/14
16. Erosion Control and Storm Water Management Plan	10/06/14	N	TBD
17. Cover Placement Work Plan	04/20/15	Y	4/28/15
18. Sand Cover Material Testing Results	04/30/15	N	Not Required
19. Granulated Activated Carbon Manufacturer Specifications & MSDS	04/20/15	Y	Not Required

Copies of all final plans were maintained at the project site for reference by EQM project Team members, EPA, Tyco, and WDNR. As work progressed, plans were modified and resubmitted if necessary due to any possible changes in site conditions, work operations, or the project scope of work.

3.1.3 Licenses, Permits, and Other Submittals

All necessary federal, state, and local permits were either already acquired or were acquired by others for this contract. The EQM project operations abided by all terms and special conditions contained in those permits, and as described in detail in Specification 31 20 25.23. EQM prepared submittals required by the permitting process immediately upon notice of award, and supported EPA and Tyco with data and information requirements for all construction, environmental, and marine permits. Permits for this project included the following:

- WPDES Wastewater Permit
- Ch. 30 Dredging Permit
- NR 216 Construction Site Storm Water Discharge Permit
- NR 107 Chemical Aquatic Plant Management Control Permit
- USACE Section 404 Dredging Permit
- USACE Section 408 Subaqueous Cover Approval
- City of Marinette Erosion & Storm Water Management per Ordinance
- WDNR Hazardous Waste Remediation variance

During the EPA GLNPO GLLA contract, the hazardous waste remediation variance expired. This remediation variance was renewed or extended after the opportunity for a public hearing. Due to the expiration date of Tyco's Site Waste Variance (12-31-14), a Modification Request letter was submitted by Tyco's consultant CH2M Hill on November 25, 2015 to the Wisconsin Department of Natural Resources for extension of the Water Variance permit to December 31, 2015. On December 10, 2014 the WDNR replied, approving the extension request with a contingency that all decontamination activities must be completed by June 15, 2015. Appendix C presents the variance permit and extension.

Other submittals that were part of the project included the Tyco Site Access Agreement, Subaqueous Cover Placement Plan, Sand Cover Material Testing Results, and the Granulated Activated Carbon Manufacturer Specifications and MSDS. As part of the implementation of Remedial Action and Restoration of portions of the Lower Menominee River, the Tyco Site Access Agreement granted access to EQM and its personnel, employees, agents, contractors, and consultants, to enter the property for the purpose of performing remediation and restoration activities as described in GLNPOCS Task Order. This agreement was signed September 5, 2014. The other required preconstruction submittals were for the cover placement work and included a Cover Placement Work Plan and specification/testing procedures for the cover materials. The Draft Cover Plan was submitted to EPA on April 20, 2015. EPA provided comments to the Draft plan on April 21, 2015, and a revised plan and response to comments were submitted to EPA on April 28, 2015. Cover material specification and testing information were provided to EPA in April. The revised Cover Plan and cover material information were acceptable to EPA, and therefore final cover material ordering and placement work proceeded accordingly.

EPA added a new element of work to this task order that involved the control of invasive vegetative species. The field work for this effort was performed from early September through late November 2015.

3.2 Site Preparation and Temporary Facilities

EQM received the official Notice to Proceed (NTP) from EPA on September 4, 2014, and mobilization of project resources began on September 5, with equipment and materials delivery beginning on September 6, 2014, and continued throughout early September. Upon arriving on site in early September, office trailers, guard trailers, on-site sediment handling and processing facilities, and site controls were restored and put into service. Site general cleanup and maintenance was also performed to ready all operations for startup. Some equipment modification work and retrofitting were performed to meet work task requirements. Mobilization of all primary equipment, personnel, and materials was completed by mid-September. Minor equipment and personnel adjustments were made on an as-needed basis as work activity fluctuated. Specific tasks completed to support startup of site operations included the following:

- Pugmills and process pad equipment were set up and put back into service.
- Dredging equipment was set up and positioned.
- Standing water was removed from sediment bins and the bins were cleaned.
- Following cleaning, sediment bins were sealed with foam.
- Turbidity curtain/controls were installed and positioned.
- The sediment pad was repaired and sealed.
- Maintenance and repair of silt fencing was performed.
- Coal Dock loading platform was prepared to support dry ferric delivery operations.
- Crane mats were placed along the South Channel to create a platform for dredging.
- Additional stone was added to the temporary S Channel Road so that vehicles could access high water areas without risk of contamination to the waterway.

A derrick crane type dredge plant was mobilized to the project site from Luedtke Marine in November to perform the required re-dredge of the deeper areas of the river. Some minor improvements and adjustments/refinements of the infrastructure were made, and regular maintenance of the temporary facilities was performed to keep all facilities in good operating order. Photograph 1 depicts the mobilization of the dredging barge. Note that all photographs are presented in Appendix B.

Some site preparation was required during the remobe back to the site in the spring of 2015 for performing the cover placement work and remaining site restoration work. EQM mobilized personnel, equipment, and materials to the site for the cover placement work in the spring of 2015 after receipt of the modification from EPA for this work. Minor equipment and person-

nel adjustments were made on an as-needed basis as the cover placement work activity progressed and fluctuated. Figure 4 presents the Overall Conceptual Temporary Facilities.

3.3 Operation and Maintenance of Temporary Facilities

3.3.1 Standard Operations of Temporary Facilities

Personnel, equipment, and materials were made available throughout the project to support the operation of all temporary facilities (sediment handling/transport, sediment treatment pad, Portland and ferric storage operations, pug mills, curing bins, wastewater treatment plant, scales, sediment off-loading operations, site controls, etc.). Procedures and tracking logs were maintained for inspection and maintenance of all temporary operations. Monitoring, tracking, and documenting the Quality Control of all temporary operations continued during the project. Some minor improvements and adjustments/refinements of the infrastructure were made, and regular maintenance of the temporary facilities was performed to keep all facilities in good operating order.

Decontamination and demobilization of dredging and sediment processing equipment was performed in November and December 2014. Following completion of dredging activities on November 17, decontamination and dismantling of some of the temporary facilities were initiated. On November 20, the extreme cold weather conditions caused major problems with decontamination efforts. Because of the below-freezing temperatures, the use of water for a decontamination agent was no longer an option. The EQM/SES field team utilized the best available techniques to decontaminate the facility (including shifting to dry techniques); however, the decontamination of the entire site was not complete at the end of the 2014 construction period. On April 15, 2015 the field crew and equipment were re-mobilized to the site, and crews began the task of decontaminating the items that were not completed in 2014 due to the below-freezing temperatures. Site restoration activities were also started in mid-April. A security trailer at the 6th Street Slip was demobilized as part of the final site restoration/demobe for that area. Other tasks performed included final decontamination of the process pad and sediment bin walls, demobilization of equipment that was no longer required, placement of subaqueous cover material, removal of the temporary S Channel Road, removal of material on the Haul Road between 6th & 8th Street to pre-construction condition and general site restoration.

3.3.2 Winter Shutdown and Operation/Maintenance of Temporary Facilities

On December 10, demobilization was completed and the Winter Shutdown phase of the project started. Since the wastewater treatment plant (WWTP) was removed, alternate operations were implemented to handle the water collected inside the process pad area. All water collected in that area was pumped into a vacuum truck and transported to Tyco's on-site WWTP. This included snow and rain water resulting from weather events. Snow removal outside of the process pad was also started to comply with Tyco's site emergency procedures. EQM completely removed all sediment waste material from all scows and deconned the scows. In addition, EQM:

- Finished processing all sediment waste material and cleaned the pug mills.
- Completed off-site disposal of all sediment waste material and geotextile tubes from the WWTP.
- Removed equipment and those temporary facilities that had been properly decontaminated.
- Shut down, dismantled, and removed the WWTP.

During February through the first part of April 2015, resources were provided to monitor and manage contact water associated with the treatment pad, which could not be removed at the end of the 2014 season due to cold weather and the inability to properly decon the pad. As needed, contact water was removed from the sump/collection areas and temporarily stored in frac tanks. The collected water was then transferred to the Tyco on-site WWTP for treatment. Water management and treatment activities were closely coordinated with the appropriate Tyco representatives. A total of 80,000 gallons of contact water was collected and sent to the Tyco WWTP during the winter shutdown period.

3.4 Dredging Activities

An engineering estimated total volume of approximately 44,777 CY (37,070 CY Neat Line plus the 7,770 CY over-dredge allowance) of soft sediment and SCM contaminated with arsenic greater than 20 mg/kg were to be mechanically removed from the work area in the Menominee River. An actual total volume of 41,010 CY of soft and SCM contaminated sediment was dredged during this project, including 6,725 CY of over-dredge allowance. The total dredge

quantity of 41,010 consisted of 36,713 CY initially dredged sediment and 4,297 CY of re-dredged sediment. (See Figures 5a, b, and c, Dredge Elevations.)

Daily operations for dredging work and material disposal at the landfill were controlled by several interrelated factors including: the specific tasks being performed (debris removal, dredging, dewatering/solidification, etc.), the specific Dredge Management Units (DMUs) being dredged, time of year, local weather and river conditions, and the proximity of work activities to sensitive structures and local business operations activities.

The project work schedule during the 2014 season was generally 24/6 (two 12-hour shifts Monday to Saturday, 7 am - 7 pm and 7 pm - 7 am). Routine maintenance was scheduled throughout the work week, with major planned maintenance work performed on Sundays. Sundays were also used as makeup days for dredging and other work activities to meet schedule requirements (i.e., dredging operations were conducted 7 days a week during the 2014 construction season when necessary to maximize weekly production).

Dredging operations began on September 10 in the South Channel, and dredging was then initiated in the Turning Basin and the Transition area. Photograph 2 depicts dredging at night along the South Channel. Photographs 3 and 4 illustrate other dredging activities. Dredging ended in November 2014, and the final quantities were reported to EPA as follows:

- 100% of all dredging to contract design depths was completed on November 17.
- Initially total volume of dredged sediment claimed in the November reporting period was considered an “interim” volume, prior to final post-dredging survey results and final volume approval of survey results and quantity calculations by the Tyco project engineer and the EPA TOCOR.
- The final quantities for dredging (36,713 CY) and re-dredging (4,297 CY) reflected final approvals and agreements reached between EPA and EQM concerning the “over-dredging” matter.

Table 3-2 presents the final approved quantities for dredging and re-dredging activities. Appendix D presents the Sediment Volume Calculations.

Table 3-2. Summary of Sediment Dredge Volumes by Area and Material Type

Dredge Area	Sediment Type	Dredge Volumes (CY)		
		Initial	Redredge	Total
Transition Area & Turning Basin	Soft Sediment & SCM	31,976	4,297	36,273
South Channel	Soft Sediment	4,737	0	4,737
Total	Soft and SCM	36,713	4,297	41,010*

*(includes the 6,725 CY over-dredge allowance)

3.5 Re-Dredging Activities

Re-dredging was performed in DMUs as necessary based on the post-dredge survey results and sampling/analysis results. The re-dredging work performed is summarized below:

- On November 10, 2014 the results from post-dredging confirmation sampling showed contamination below design depths in DMUs L8C, L8D, L10C, L10C, L11A, and L11D. The interim reported volume of sediment removed during re-dredging in these DMUs was 2,057 CY.
- On November 11, the results from the post-dredge confirmation sampling showed contamination below design depths in DMUs L12B and L12C. The interim reported volume of sediment removed during re-dredging in these DMUs was 890 CY.
- On November 13, the results from confirmation sampling showed contamination below design depths in DMU L14A. The interim reported volume of sediment removed during re-dredging in this DMU was 475 CY.
- All re-dredging was completed on November 17. Based on the confirmation sampling results and the bathymetric survey, it was determined that a total of 4,297 CY was dredged.
- Re-dredging in L8 is represented in Photograph 5, and the Confirmation Sampling Crew is shown in Photograph 6.

3.6 Bathymetric Surveys

Pre-dredge surveys were completed for the South Channel, Turning Basin, and Transition areas by independent surveying professionals. Hydrographics Consultants, Ltd (Hydrographics) conducted the pre-dredge surveys in the Turing Basin and Transition Area. Affiliated, Inc. conducted the pre-dredge surveys in the South Channel area. Progress/check surveys were conducted on a daily basis by a SES survey crew as dredging operations progressed. Plans and schedules were established for conducting post-survey events as sub DMUs were completed.. Hydrographics conducted all post surveys and was responsible for producing all survey results packages, QC reports, maps, and volume calculations.

Following completion of the initial dredging activities on November 14, and the required re-dredging of selected DMUs which was completed on November 17, the final project post-dredge bathymetric survey was conducted in the Transition Area and Turning Basin on November 18. The final surveying package for the Phase I-V areas and the re-dig was provided for EPA and Tyco review on November 24.

Hydrographics finalized all survey data packages, maps, and volume calculations for the 2014 construction season, and this information was uploaded to the project FTP site. Final survey results and related calculations were approved by EPA, and final adjustments were made to the quantities for dredging and sediment loading, transport, and disposal. All bathymetric surveys, presentation of results, and volume calculations were performed in accordance with the EPA approved Dredging and Operations plan. Appendix E presents the final survey packages. Photographs 7 and 8 depict post-dredging survey operations.

A pre- and post-cover placement bathymetric survey was also performed to verify cover placement. The pan and bathymetric survey measurements of cover thickness were not the only method of confirming cover thickness. The placement bathymetric survey was used as a general guide to identify areas where the cover was possibly thin, but potential errors associated with bathymetry surveys precluded its sole use to determine cover thickness. More details are provided for subaqueous cover placement and verification in section 3.13 of this report.

3.7 Relocation of Equipment for Other Use of the Turning Basin

During the project, no ships needed to use the Turning Basin and therefore there was no interruption of operations (i.e., no work was performed or billed on this task).

3.8 Dredge Material Handling and Stabilization

The in-water sediment remediation work (i.e., dredging) was performed between early September and late November 2014. The dredged contaminated sediment materials were staged, sampled, decanted, off-loaded, and then transported to the processing pad for stabilization with Portland cement, dry ferric sulfate, and liquid ferric sulfate. The procedures used to process and stabilize the contaminated sediment are discussed in the following subsections.

3.8.1 Dredge Material Offloading and Handling

Loaded sediment barges were staged at the sediment barge unloading station for decanting water and off-loading the sediment. Prior to off-loading the Tyco project representative (CH2M Hill) sampled the barges, with the assistance of EQM and SES, for dredged material water content and constituents. Unloading was performed using a material handling excavator with a clamshell bucket located on shore. This off-loading processing is illustrated in Photograph 9. As material was unloaded, CH2M Hill representatives took samples directly from the excavator bucket. The project representative then advised the EPA TOCOR and EQM on the appropriate dosage of reagents (Portland cement and Ferric Sulfate) to mix with the dredged material following laboratory testing of the samples and analysis of the sampling results.

A trash pump was used to decant/remove water from the sediment barge, and the decant water was pumped to frac tanks for settling and treatment by the WWTP at 6th Street. Both the SCM and Soft Materials were unloaded from the barges using this equipment and approach. Materials were placed onto a Warrior power screen type system to remove debris. Sediment fell through the Warrior screens and into a feed pit. Photographs 10 and 11 represent off-loading to the Warrior screens and separating of debris into piles.

All work was completed in compliance with the project Hazardous Waste Remediation Variance.

3.8.2 Dredge Material Stabilization

The sediment material stabilization operations are described in the following subsections.

Processing/Stabilization

Screened material was loaded into the pug mill feed hopper using an excavator. As material entered into the hopper, it was weighed to determine appropriate reagent dosages. The appropriate dosage of reagents was added to the materials as mixing began. Two RapidMix 400CW pug mills (supplied by Tyco) were operated and maintained by SES to stabilize all excavated sediments. One of the pug mills served as a standby system if the other malfunctioned or became clogged with debris. The strategic use of the pug mills was based on the overall sediment dredging and handling operations, particularly the dredging production rate and the availability of one or both pug mill units. The two processing trains were set up to provide redundancy

protection against regularly scheduled maintenance shutdowns and unexpected breakdowns. Proper maintenance and the strategic operations of the two trains minimized the impact of any shutdowns.

As noted previously, the contaminated sediment was solidified using proper dosages of Portland cement, dry ferric sulfate, and liquid ferric sulfate. Both pug mill systems had two bulk silos that held the Portland cement reagent. Each pug mill system also had chemical feed pumps for ferric sulfate solution dosing. Upon completion of pug mill usage, the pug mills were fully restored to pre-legacy season working order at no cost to Tyco and turned over to Tyco for sale and recovery of market value. The projects teams' familiarity with the proper and effective operation of pug mills at the Tyco site and other similar sediment processing sites ensured that the sediment processing operation and general project schedule was not adversely impacted by this critical operation.

Storage tanks (pigs) were used to provide additional Portland cement storage capacity. A 2-day supply of Portland cement was kept on site to minimize any disruption of operations due to availability of cement deliveries. Seven 21,000-gallon frac tanks were installed on the processing pad adjacent to the pug mills with enough capacity for a 5-day supply of liquid ferric sulfate to minimize any potential disruptions to on-site operations due to the required chemical usage rates and/or the timely delivery of the cement and chemical treatment agents. The delivery, stockpiling, and use of the cement and ferric sulfate additives were dependent on the mix design required for each barge. EQM closely monitored the dosage rates and adjusted the delivery, storage equipment and capacity, and use of reagents accordingly. A daily materials management meeting was held to review reagent usage, inventory, and projected needs in order to keep Tyco informed of the need to purchase reagents. The available storage of reagents on site was based on the projected production rates and originally estimated dredge volumes identified in Table 3-3. These production rates were based on previous dredging operations at the Menominee/Tyco Site.

Table 3-3. Projected Production Rates

Sediment Material Type	Total Proposed Volume, CY	Projected Daily Production Rate, CY/day
Soft Sediment	12,852	1,600
SCM – outside previously dredged areas	6,242	1,200
SCM – within previously dredged areas	16,735	800
South Channel Soft Sediment	4,866	400 (single shift)

*Projected values were based on previous dredging operations at the Menominee/Tyco Site

Actual production rates for this project depended on the depth and characteristics of sediment material encountered. Photograph 12 and 13 show dry ferric being loaded into the hopper, and Photographs 14 depicts the liquid ferric offloading operations.

Quantity of Reagents Used

The total quantities of reagents used consisted of 3,866.87 tons of Portland cement, 478,045 gallons of liquid ferric sulfate, and 2,508.11 tons of dry ferric. All sediment handling and processing were performed in accordance with the Tyco waste variance permit and all applicable project plans.

Curing, Sampling, and Testing

Processed sediment material was stockpiled at the end of the pug mill conveyor where a Komatsu 450 front-end loader transported the materials from the pug mill discharge to the curing bins. Ten (10) curing bins were operated for the processed sediment material and one bin was dedicated to temporary debris storage and process area access, as shown on the contract drawings and detailed in the Hazardous Waste Variance. The bins were approximately 8 feet tall and were contained on 3 sides. The entrance had a wide curb to contain any wet materials and was open for the loaders to deliver the treated sediment. The bins were regularly inspected, sealed, and repaired as necessary to ensure proper containment of the processed sediment. Photographs 15 and 16 show processed sediment being loaded into a bin and the first load of sediment processed.

Stabilized materials were segregated into bins based on the individual treatment recipes (one bin per recipe) and allowed to cure prior to testing. Additional material was not added to any bins that had been sampled and were awaiting final analysis results and approval for off-site

disposal. All treated material samples met the performance criteria for non-hazardous disposal, and therefore retreatment was not necessary. Based on experience at the Tyco site and similar sites, it was determined that a curing time of ½ to 4 days was required to complete the stabilization reaction and to meet the Hazardous Waste Variance and landfill disposal requirements. The materials in the bins were tracked on a white board within the on-site trailer and on a spreadsheet that was updated with the Daily Work Reports. CH2M Hill used the information on the board and in the Daily Reports to provide EPA and Tyco with an independent spreadsheet form for tracking the materials in the bins. This information was reviewed daily by on-site personnel during the daily work meetings. Photographs 17 and 18 demonstrate the curing process. The final quantities of processed sediment material that were transported and disposed of at the Menominee Waste Management offsite disposal landfill are provided in section 3.11.

3.9 Debris Material Shredding, Loading, and Disposal

Debris was removed from materials as the sediment fell through screens and into a feed pit. Oversized materials not passing through the Warrior screen were deposited on the process pad and stockpiled for later shredding using a crusher and/or tub grinder. The shredded material was either reintroduced with sediments that were processed through the pug mill or decontaminated and staged for off-site disposal. The debris stockpile was managed to ensure that the debris pile never exceeded 400 CY. The debris consisted mostly of wood with some rocks/cobble stone. All debris was sized and processed with the sediment to meet all requirements for disposal of the material in the same licensed landfill that received the processed sediment waste (Waste Management Menominee Landfill). The shredded debris material was reintroduced with sediments that were processed through the pug mill or decontaminated and staged for off-site disposal. Following the required testing and documentation, a total of 38 loads, containing 567 tons of debris, were disposed of. See Appendix F for Debris Calculations.

A considerable amount of wire debris was recovered during dredging operations. The EPA and WDNR determined that this wire material did not need to be shredded, but the material was tested to determine proper disposal. Material that was below the specified regulatory limits did not require treatment and was disposed of accordingly, but any debris above the specified limits was treated and retested before disposal.

3.10 Water Treatment Geotextile Tube Handling and Stabilization

The WWTP included a series of processes to treat water including pretreatment using co-agulation/filtration in geotextile tube filters. The geotextile tubes from the WWTP were handled and stabilized during this project. After the geotextile tube was confirmed as non-hazardous, it was processed through the pug mill for disposal with the processed sediment at the Waste Management Menominee Landfill. Due to the extreme cold weather during November, the WWTP had been placed out of service and demobilization was started. The geotextile tube material was disposed of at the completion of all dredging in November 2014, which was a part of the wastewater treatment system decontamination and dismantling process.

3.11 Non-Hazardous Stabilized Material Loading, Transportation and Offsite Disposal

Following final approval of the stabilized sediment for disposal, the bin was scheduled for load-out and off-site transportation and disposal at the Waste Management Menominee landfill. The Waste Management Plan and the Dredging and Operations Plan provided additional information on load-out operations and off-site T&D of the solidified sediment.

Off-site transport and disposal of processed sediment that met the project and landfill disposal criteria began in mid-September of 2014 and continued on a daily basis. The number of loads transported off site to the Waste Management Menominee Landfill ranged between 3 and 105 truckloads per day. Additional cleaning and decontaminating of the sediment processing pad created additional material that was loaded and transported to the landfill. The material was transported to the Waste Management Menominee Landfill under a current profile from the previous year. The geotextile tubes from the WWTP were stabilized with the dredged sediments as tubes were changed out during this project. After the geotextile tube materials were confirmed as non-hazardous, the tubes were processed through the pug mill for disposal with the processed sediment at the Waste Management Menominee Landfill. During the site restoration efforts, the sand used for the excavator pad where the treated sediment was loaded from the bins into the trucks for off-site disposal was tested, and based on the testing results the WDNR determined that this material must be removed and transported to off-site disposal. The sand was loaded and transported to the Waste Management Menominee Landfill along with the processed sediment.

During a WDNR site inspection on December 1, the inspector requested that a final collection of processed sediment residue from the bins and pad be performed, which was agreed to by the EPA and Tyco. This material was collected, and the stabilized sediment residue was transported off site to the disposal facility.

Photographs 19, 20, and 21 show the loading of processed sediment for transport to the Waste Management Menominee offsite landfill facility, which is located in Menominee, MI.

A total of 68,672.05 tons of processed sediment and other related project materials were disposed of at the Waste Management Menominee landfill. This included the processed contaminated sediment material, processed sediment residue removed during the final 2015 site restoration work, debris that was removed during the dredging operations (566.52 tons), and the material from the WWTP geotextile tubes. The quantities of the various reagents used during the processing/stabilization operations (Portland cement, liquid ferric sulfate, and dry ferric sulfate) are also included in this quantity. A total of 2,804.57 tons of sand from the sediment offloading pad that was removed during the 2015 restoration operations was also disposed of in the Waste Management landfill. The total quantity of all materials disposed of at the Waste Management facility was 71,043.10 tons. Table 3-4 provides a summary of the quantities of all materials disposed of offsite during this project.

Table 3-4. Quantities of Materials Disposed Offsite

Material Type	Quantity (Tons)
Processed Sediment & Other Materials*	67,672.05*
Processed and Cleaned Debris	566.52
Subtotal	68,238.57
Sand from Processed Sediment Load-Out Pad	2,804.53
Grand Total	71,043.10

*Includes processed contaminated sediments, materials from geotextile tubes, and reagents

3.12 Repair and Restored 6th Street Dock and Landing

The boat launch designed by SES and Beihl Brothers Contracting was submitted to EPA, Tyco, and CH2M Hill for an engineering review. Following their approval, the final design was submitted to the City of Marinette for review and approval. The 6th Street dock and landing was completely restored and repaired based on the approved design. A final inspection was conducted by a Tyco Representative and a representative from the City of Marinette. Both parties con-

firmed the work was performed in accordance with the approved design, and the repair work was approved.

3.13 Placement of Subaqueous Cover Material

In March of 2015 EPA amended the Menominee River AOC Remediation project SOW with modification 002, which required placement of a subaqueous cover in selected portions of the river. Modification 002 required placement of subaqueous cover material in the turning basin and transition area over those areas of glacial till that exceeded post dredging arsenic concentrations of >20ppm. The subaqueous cover placement work was completed between May 12 and June 25, 2015. Cover material preparation (i.e., blending), placement, and verification were all performed in accordance with the project specifications and the approved cover placement work plan. The subaqueous cover consisted of a sand/activated carbon mixture. The following subsections describe the cover material requirements and procedures used for blending, placement, and verification of the cover materials.

3.13.1 Cover Placement Requirements

The design cover required a minimum placement of 10 inches of sand cover (average of 12 inches thick) with 0.77 pound per square foot of activated carbon. As detailed in the EQM Cover Placement Work Plan, an alternative material that was more readily available and less expensive than the AquaGate + PAC (10%) was used. The alternate material, Granulated Activated Carbon (GAC) supplied by Calgon Carbon, met the objectives and specifications for the cover placement effort [Specification Section 11 54 00, Part 1.02B]. (See Figure 6, Cover Elevations in Appendix A.)

3.13.2 Turbidity Control, Monitoring, and Contingency BMPs

Our proposed environmental protection procedures related to the cover placement operations were compliant with contract requirements, and they were designed to minimize the migration of cover materials outside of the cover placement area. Our project management team, Site Environmental Controls Manager, and cover placement equipment operators developed Best Management Practices (BMPs) for the Menominee River cover placement operation to control

turbidity levels and to protect local water quality and the local flora and fauna. EQM also employed monitoring procedures to observe turbidity levels and the migration of the turbidity/cover materials during installation, and developed specific contingencies that were employed if turbidity became an issue. Turbidity was created in the water column during cover placement operations due to introduction of the cover material into the water column. The objective of our BMPs was two-fold: 1) minimize the level of turbidity in the water column at any given time to the greatest degree practical, and 2) minimize migration of the cover materials outside of the cover placement work areas. See Photograph 22 - Deploying turbidity curtain.

The primary BMP for containing the migration of cover materials during the placement operation was the use of a mobile turbidity barrier (also referred to as a "Moon Pool") that was designed and constructed specifically for the Menominee cover placement operation. The turbidity barrier was attached to the front of the working barge and also to the side of the material scow for stability. Cover materials were placed over the surface of the river within the perimeter of the barrier. The final turbidity barrier design, size, and attachment strategy was developed to maximize turbidity control without inhibiting either the cover placement operation (i.e., the desired casting and fanning out effect of spreading the sand) or the cover performance results (i.e., the desired cover thickness). EQM and SES used this Moon Pool structure approach to control turbidity levels as seen in Photographs 23 and 24, Moon Pool.

The primary design, construction, and operational features of the turbidity barrier/moon pool were as follows:

- The mobile barrier was secured to a rigid 16-in. HDPE pipe to create a 40-ft-wide by 30-ft-long "Moon Pool."
- The barrier was deployed to fully contain the cover placement work area extending through the top 1/3 to 1/2 of the water column to promote cover material settling and to minimize downstream migration of cover materials. The turbidity barrier length was adjustable to extend to a depth between 10 and 15 feet in the water column.
- Cover material was placed only from inside the Moon Pool.
- The Moon Pool was maintained in place for the duration of the cover placement operation within the specific area where the cover was placed, and the barrier was not relocated to the next work area until the cover material was sufficiently settled to the river bottom and water quality returned to background levels.

The turbidity barrier material was constructed of a Type 3 impermeable heavy-duty fabric. Other barrier fabric specifics were as follows:

- 22-oz PVC-coated polyester fabric membrane
- Dual 5/16-in. coated top tension cable
- 12-in.-dia. EPS foam floatation
- Reinforced anchor points for post anchoring
- 3/8-in. upper ballast chain installed 2 ft above lower ballast chain
- 3/8-in. lower ballast chain
- Reefing lines
- Tool-free aluminum top-end connectors/lacing skirt
- Adjustable length between 10 and 15 feet with 2 ft sandbag tail per WDNR specifications.

In addition to the mobile turbidity barrier BMP, several operational BMPs were also used to control turbidity levels and migration. These include the following:

- Release material only over the intended cover placement zone and within the perimeter of the turbidity barrier structure described above.
- Avoid overloading the clam bucket when taking cover material from the material barge.
- Use controlled swings of the clam bucket to eliminate unnecessary spillage.
- Release the cover material near the water surface (approximately 1 ft or less) to minimize splashing and to maximize faster settling of the cover material through the water column. (This approach allowed the excavator operator to make clear visual observations of the placement process and turbidity levels.)
- The operator controls the speed of the material entering the water by slowly opening the bucket and releasing the material.
- Cover material was not placed during heavy thunderstorms or high wind events because these events and related changes in river conditions (i.e., flow rate and volume) may increase turbidity levels and the migration of cover materials outside of the cover placement work area.

3.13.3 Cover Material Delivery, Blending, and Placement

Three basic operations were performed in connection with the cover placement task: 1) cover material delivery and staging; 2) cover material blending; and 3) loading, transport and placement of the blended cover material.

Cover Material Delivery and Staging—Prior to beginning cover blending and placement operations, the cover sand material was sampled and tested, and results were provided to EPA for review. Material specifications were also provided for the sand and GAC materials. Testing results and specification data were approved and the sand and GAC materials were ordered. Sand and granular activated carbon were delivered to the coal dock located on Tyco's property. The procedures and restrictions described in the Menominee project Traffic Route and Control Plan were followed for all deliveries. The GAC was delivered and placed into large totes, and soaked

with water for 1-2 hours. Mixing bins were constructed at the coal dock. Prior to starting the actual cover placement operations, the mixing pad and bin were sized based on a batch test. Results of the batch test were used to refine the blending operations and to ensure the specified sand and carbon ratio requirements were met.

Material Blending—The sand and GAC materials were blended to the proper design mix ratios and other specifications using a long-reach excavator at the staging area located at the Tyco coal dock. Two (2) mixing bins were used, each holding 250 CY of sand. Based on a conversion factor of 1.6 for sand, each bin was loaded with 400 tons of sand. Then 2 supersacks or 4,000 lbs GAC was added to each bin and mixed with the long-reach excavator. This was based on 10 pounds of GAC per ton of sand. Once the sand and GAC were blended together, the mixture became a single-phase granular product. Then the initial (pre-specified) mat of sand was placed within the confines of the bin. The saturated GAC from the totes were added on top of the initial mat of sand. The remaining sand was added to maintain the required material ratios. The contents of the bin were mixed with a loader and consolidated into a larger pile. The Site QA Manager and the blending and placement operators made continuous visual observations during the blending, transport, and placement operations to ensure that the blended material possessed the desired homogeneity at all steps in the operation. If any materials were observed not to be homogeneous, those materials were not placed, but returned to the mixing operation for re-blending.

Loading/Transport and Placement—The blended cover material was mechanically loaded into hopper scows. The two 100-CY scows were transported by tug to the cover placement barge. A 2.5-CY clamshell bucket mounted on a long-reach excavator was positioned on a 60-ft by 40-ft spud barge. The sand scow was positioned for placement, and then the long-reach excavator was used to remove the blended cover material from the scow and mechanically place the cover material The barge-mounted excavator was guided by a real-time kinematic (RTK) GPS system to place the cover material.

The positioning system for the excavator was the Hypack Dredgepack system with a few modifications. The position and heading of the excavator was determined by RTK GPS. An RTK base station was established at the project site in order to provide consistent corrections for the various equipment and survey vessels on the project. The total positional accuracy of the en-

tire system at the clam bucket lip was capable of being achieved to within approximately 3-6 centimeters.

During the cover placement process the operator conducted a visual inspection to ensure the mixture was uniform throughout the barge. Cover materials were released at the water surface so the operator could visually see how much material was coming out of the bucket at one time. The operator slowly opened the bucket to release the materials, and then gently swung the bucket to distribute the material over a small area. See Photographs 25 and 26 for cover placement.

3.13.4 Cover Placement Verification - Pan Testing and Pre-/Post-Cover Bathymetric Surveys

Cover thickness was verified using a variety of methods, including the initial "pan" method, which was to be the primary cover placement verification method. Pans were 2 ft by 2 ft by 1 ft in dimension, and were placed on the bottom of the area to receive cover material (pans were weighted so they would sink through the water column). After placement of the material, the pans were retrieved using a cable to verify the thickness of material placed. A minimum of two pan checks were performed per 5,000 sq. ft. of cover placed. If a pan was retrieved and results indicated that the required thickness specification (minimum thickness of 10 inches) had not been met, then the entire 5,000-sq. ft. area represented by the pan was assumed to be deficient by the observed shortage. After verification of cover shortages, the additional cover material was placed in the general location of the pan check. (See Figures 27a, b, and c, Pan Testing.)

Interim bathymetric survey results from surveys performed on May 18 and 19 revealed that the pan verification method was not providing accurate consistent results and alternate methods (e.g., bathymetric surveys) were used to provide additional verification information.

The extent and thickness of the final cover was further verified by comparing the pre-placement bathymetric survey and the post-placement bathymetric survey results and correlating these results to the pan method results. The pre-cover bathymetric survey was completed by Hydrographics. As noted above, actual cover placement work began in early May, and continued through early June. Interim surveys were taken by SES in May 2015. Initial cover placement was completed in early June and a post placement survey was conducted on 6/2/15 by SES. All bathymetric survey data and the data from the supplemental thickness measurement techniques

were transmitted to the EPA electronically. When applicable, data was provided in raw and processed formats. Survey field notes were scanned and also provided electronically.

Due to potential issues in verifying the thickness of the initially placed cover in early June, EPA required that additional cover material be added. Additional cover material was placed in those areas that EPA did not approve as completed. Verification testing continued to be performed during June, and results were provided to EPA for approval. SES performed daily surveys on the additional cover placement effort between 6/17/15 and 6/25/15. The final cover placement work was completed on June 24, and the thickness verification results were provided to EPA.

The pan and bathymetric survey measurements of cover thickness were not the only method of confirming cover thickness. The placement bathymetric survey was used as a general guide to identify areas where the cover was potentially thin, but possible errors associated with bathymetry surveys precluded its sole use to determine cover thickness. The thickness of the cover layer was also verified by analyzing weight tickets and density estimates for the GAC and sand materials.

In addition to the cover placement confirmatory testing procedures described above, Specification 11 54 00-7, 3.03 required the collection of core samples from the placed cover to confirm that the vertical and horizontal tolerance requirements had been met. Following considerable discussion related to the cover placement information provided by EQM and SES, EPA decided to perform diver-assisted core sampling to verify cover placement thickness; based on these results, EPA identified certain areas where it asserted that the minimum cover thickness specification (10 inches) was not met.

The delay in cover placement from the end of the 2014 construction season to the late spring of 2015 appeared to have created several circumstances that affected the placement and verification of the cover material. The second effort (or additional placement of cover material) was performed with daily bathymetric survey support verifying the required cover thickness was present. Daily bathymetric survey support during the second effort was a major change from the cover placement operation approved by the EPA in the EQM/SES Cover Placement Operation Plan.

Final post-placement bathymetric survey results and other cover thickness verification data (material balance data and pan test results) were submitted on a daily basis during the

placement of additional cover material as work progressed. Final cover placement work was completed on June 25, 2015, and the final survey results and material quantity data were provided to EPA. EPA accepted the final cover placement work on June 26, and the final approved quantity reported was 12,867 SY.

3.13.5 Decontaminate and Demobilization

At the completion of the cover placement work, the specific equipment used during activities was decontaminated and demobed in accordance with project specifications and all applicable project plans. All landside equipment used for the preparation and loading of the cover material and all marine equipment used in the placement of the cover material were properly decontaminated. Following inspection and approval of the decontaminated equipment, all items were immediately demobed from the project site.

3.14 Control/Removal of Vegetative Invasive Species

On May 12, 2015, EPA informed EQM that it intended to add additional work to the Menominee project that involved the treatment, cutting, and removal of vegetative invasive species. EQM submitted a technical and cost proposal for this new work on June 23, 2015. Revisions 1 and 2 to our proposal were submitted on July 23, 2015 (added removal and disposal of the cut grasses in certain areas) and August 13, 2015 (updated cost proposal to include specific bid pricing provide by EQM's specialty vendor), respectively.

Preliminary work performed included the development of Technical and Cost proposal (including related revised proposals), specialty vendors selections, project team and property owner coordination, community involvement and right-to-know, and obtaining the WDNR WPDES Permit. The planning and preconstruction efforts for the invasive species work continued during early September. Initial treatment of the invasive species grasses began the week of September 21, 2015. The spraying of herbicide chemical treatment on the undesirable grass was completed in 8 work days. The chemical treatment effort was followed by mechanical cutting of the sprayed vegetation in November. Removal of cut grasses was completed on November 23, 2015.

The vegetation control work was performed in designated areas within the 32-acre wetland and riparian areas of the project site. Any other invasive species co-occurring with the Giant Reed Grass (*Phragmites australis*) in the designated control area was also targeted for spot chemical treatment. The invasive species were removed/controlled within the designated management areas with the goal of eradicating the identified populations to provide long-term control and removal of populations of the species.

Per the technical specifications, a final report summarizing the invasive species work performed was prepared and is included as Appendix G of this RACR.

3.15 Installation of Rip Rap

During operations in the Turning Basin, parts of the toe supporting the vertical barrier wall were removed. Rip rap was placed to maintain the support of the vertical barrier wall in areas where sediment was removed. The rip rap stone was procured based on the specifications listed in the Tyco composite Specs Section 31 23 23, Part 2.05, Rip Rap. Rip rap was placed in two phases. The first phase was completed by stockpiling the stone on the process pad and placing the stone with a long-reach excavator from the edge of the process pad area. The second phase was completed by loading the rip rap into a scow and placing the stone from a working barge with a long-reach excavator from the water. Placement of the rip rap elevations was verified by the actual placement of each excavator bucket. The rip rap placement met the objectives and specifications for the placement effort [Specification Section 31 23 23, Part 2.05]. Figure 7 presents the Rip Rap Placement Elevation Final Map for the approved final design.

3.16 Demobilization and Site Restoration

Planning for the initial November 2014 decontamination and demobilization was conducted during October 2014. Equipment activities for the 2014 construction season were performed in November and December 2014. Following completion of dredging activities on November 17, decontamination and dismantling efforts were initiated for some of the temporary facilities. On November 20, the extreme cold weather conditions caused major problems with decontamination efforts.

During January 2015, the remaining equipment and personnel were demobilized for the 2014 construction season, except the pugmills which remained onsite. All of the equipment used during the dredging and sediment processing operations and the water treatment operations was decontaminated, tested and demobed from the site. Because of the below-freezing temperatures, the water could no longer be used as a decontamination agent. The EQM/SES field team utilized the best available techniques to decontaminate the facility (including shifting to dry techniques); however, personnel were not able to completely decontaminate the entire site at the end of the 2014 construction period. The decontamination of the remaining bin walls and the asphalt pad was completed in 2015, when weather conditions improved. Photograph 28 shows truck decontamination during the loading-out process. Photograph 29 shows the decontamination of bin walls.

Final decontamination and site restoration resumed in mid-April 2015 following remobilization back to the site. The site restoration plan is included as Figure 8 in Appendix A. Upon arriving on site, crews immediately started to decontaminate bin walls, Jersey barriers, equipment, and the process pad. After the items were cleaned, they were staged for testing. Tyco's engineer collected wipe samples on all items scheduled to leave the site. As soon as testing results were received and the items were cleared to be removed, items were transported off site. The following provides a summary of site restoration and demobe work performed:

- Jersey Barriers (approximately 500) - 33% tested and removed from the site
- Bin Walls (approximately 10+) - 100% tested and removed
- Water containment structures and catch basins - 100% tested and removed
- Truck Scale, Tire Wash, and Scale House Building - 100% tested and removed
- Haul Road between 6th & 8th Street - 100% tested and removed
- 6th Street Guard Building and Temporary Fencing - 100% tested and removed
- Water Treatment Plant Pipeline - 100% tested and removed
- Process Pad and Truck Turnaround Area - 100% cleaned and tested
- Frac Tanks and Conex Boxes -100% tested and removed
- Heavy Equipment (not needed for cover placement work) - 100% tested and removed
- Bin Walls (25+) - tested and removed
- Storage Boxes -100% tested and removed
- Temporary Fencing (8th Street Entrance) - 100% tested and removed
- Permanent Fencing (6th Street Entrance) - 100% tested and removed
- Asphalt Ramps on Process Pad - 100% tested and removed
- 6th Street Guard House - removed
- 6th Street Area -
  - Filled in sumps and paved over with asphalt

  - Removed curbing along west end of parking lot and graded toward river bed to support water drainage
  - Removed transformer and electrical wiring
  - Removed silt fence
  - Graded and seeded areas on west, north, and southwest of parking lot, see Photograph 30
  - Patched and filled cracks in asphalt paving in areas needing repair as outlined by the City of Marinette
  - Restored the launch
  - Installed shipwreck display
  - Removed silt fence
  - Added paint markings for parking spaces
  - Demobilized guard trailer

- 8th Street Site-
  - Removed three site trailers
  - Started the asphalt paving and repairs on the process pad and associated areas
  - Demobilized barges, boats, and other heavy equipment utilized for the cover placement operations

- Coal Dock Area
  - Removed excess cover sand
  - Removed blocks and mats, and cleaned area
  - Restored storm water outfall at coal dock

- Repaired fencing along 8th Street Haul Road and Building 59 parking lot
- Repaired wetlands area including grading and hydroseeding, see Photograph 31
- Installed fencing along sea wall (wetlands, truck turnaround, and salt vault riverfront area)
- Removed turbidity curtain in South Channel at Odgen St
- Repaired Coal Dock Haul road
- Restored "No Anchoring" signs at Coal Dock and 8th Street Slip
- Removed all contractor signs at Stanton St, 8th & 6th Street
- General site cleanup
- Cleaned base of Ship Wreck sign on 6th Street (removed hydroseeding overspray)
- Cleaned asphalt from well covers on processing pad
- Repaired two damaged tie rods at sea wall
- Continued crack filling on coal dock area and truck turnaround area

Decontamination was completed in all work zone areas including the processing pad, and all equipment not scheduled to be utilized for remaining work tasks has been demobilized from the site. The EPA Legacy Project Team members inspected these areas, and all work and areas have been approved. Final site restoration and demobilization was completed during September 2015, with the exception of the Control/Removal of Vegetative Invasive Species. Following the final site inspection, any punch-list items were addressed in the September.

3.17 Repair and Site Restoration of Tyco Sediment Processing Asphalt Pad

As noted previously, EPA added additional repair and restoration work for the Tyco asphalt processing pad site under Modification 005. This modification specified the final repair and restoration requirements for the asphalt processing pad located at the Tyco project property site. This pad was an existing asphalt structure on the Tyco property, which had been used for the staging, treatment (solidification), and load-out of the sediment dredged from the Menominee River. No repairs were performed on the pad following completion of the Tyco/SES remediation contract work at the end of the 2013 construction season.

The field work for this portion of the project began after all dredging, sediment processing, and off-site disposal of the processed sediment were complete. This restoration and repair work was performed from July 2015 to September 2015. Work was performed in accordance with the Asphalt Paving Repair and Restoration Plan submitted to EPA. The primary work tasks included: work planning and coordination with EPA and Tyco; removal of overlayment asphalt (i.e., asphalt stripping) in selected areas of the pad that had been placed in the area of the processed sediment storage bins; asphalt patching and crack repairs; milling the surface of the pad to prepare it for the surface top coat layer; placement of the asphalt top coat layer; and work inspection and approval. The means and methods employed to complete these work tasks are described below.

3.17.1 Work Planning and Coordination Activities

Work planning and coordination activities included:

- meetings and conference calls with EPA, WDNR and Tyco to review the work scope and areas, work schedule and working hours, site access requirements and compliance with Tyco health and safety requirements, etc.;
- solicitation of a qualified asphalt vendor; and,
- coordination with the Tyco engineer in regards to review and approval of work performed.

Once work began daily meetings were held with Tyco and Tyco's engineer to review completed and planned work, the schedule, and any issues that may have arisen. Work progress was documented in Daily Work Reports and included photographic documentation.

3.17.2 Removal of Asphalt Overlayment

All asphalt overlayment that was placed during site preparation activities was stripped from the pad using hand tools and where necessary a skid steer with forks. The removed material was stockpiled onsite and eventually combined with the material removed during the milling process and then transported to an offsite recycling facility.

3.17.3 Asphalt Patching and Crack Repairs

There were 12 areas within the processing pad area and related project work areas which required patching and crack repairs as outlined in the attachment A drawing provided with the EPA task order modification.

All areas requiring asphalt repair prior to milling had the edges saw cut to provide a clean and fully adhered asphalt joint. Areas of substantial cracking and damage were removed to at least the top of the gravel or paving sub base of the original asphalt surface. Exposure of the sub base was necessary to assess the integrity and determine if sub base removal and replacement was also required. All removed areas were saw-cut to provide a straight edge for repair.

Areas with minor cracking and damage outside the process pad area (e.g., the truck turna-round area, coal dock area, Building 59 parking lot, and the 8th Street Slip area) were patched and sealed in accordance with project specification 32 12 16, paragraph 3.0.

3.17.4 Milling of process pad surface

The process pad area was milled to a minimum of 1.5 inches. A commercial grade milling machine was used for this process. The milled material was trucked offsite to a local asphalt recycling facility (Northeast Asphalt Plant).

The process pad consists of 3 distinct areas (salt vault, 8th street slip and seawall apron), and each of these areas have specific slopes requirements to allow for proper water drainage from all areas. The milling process was conducted so that when the top coat was applied these critical slopes were maintained. In the salt vault area the slope was maintained to drain to the west into the existing outfall drain. Care was taken to insure the 8th street slip area was sloped to the east into the river. The sea wall apron area slope was maintained to insure drainage to the north into the river.

3.17.5 Top Coat Surface

A new top coat layer minimum of 1.5 inches thick was placed over the entire outlined area in accordance with asphalt paving specifications 32 12 1. The asphalt top coat was applied to produce a smooth surface and to prevent water pooling in uneven areas. A tack coat and sealing of edges was also required. The area requiring new asphalt was approximately 275,000 square feet as determined by the project engineer. The new top coat was applied to the height of the sea wall so water can drain directly into the river. Some areas needed to be filled before applying the top coat to maintain proper slopes and drainage. A total of 2,010.25 tons were placed during the top coating operation.

3.17.6 Work Inspection and Approval

Prior to beginning work, a site walk was conducted to review the work areas, scope, schedule and the work performance requirements and expectations. All phases of work were inspected daily by EQM, Tyco and the project engineer prior to the start of the next stage of work. Work progress and work quality were reviewed with EPA during regularly scheduled conference calls. Written and photographic documentation of work was provided with the Daily Project Reports and Monthly Project Reports. A final site walk and inspection was conducted with EPA, WDNR, and Tyco, and the final asphalt repair and restoration work was approved by all involved parties.

4. PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROLS

This section presents a summary of the performance standards and construction quality control results.

4.1 Construction Quality Assurance/Quality Control Program

The Construction Quality Assurance/Quality Control (QA/QC) program used throughout the remedial action was defined in the approved Contractor Construction Quality Assurance Project Plan (CCQAPP) and Construction Quality Control Plan (CQCP). Specific quality control procedures are outlined in Section 4.3 of this RACR. In order to ensure collected data was of known and acceptable quality, the EQM Team prepared a project-specific CCQAPP. The CCQAPP provided: guidelines to be followed by the EQM Team to complete the remedial action by describing samples that the EQM Team was to collect during the remedial action: how the samples were to be analyzed; and how the results were to be evaluated. The CCQAPP also defined the QA/QC measures that would be applied to ensure that the data obtained were of the type and quality needed to meet remedial action objectives.

Several items were used to obtain quality objectives including, but not limited to: Inspection Lists (preparatory, initial, follow-up), Check Lists, Daily Reports, and daily reports of quality control activities.

4.2 Summary of Sediment Excavations

A summary of sediment dredge volumes is presented in section 3.4. As indicated, actual quantities removed varied from the estimated quantities presented in the engineering estimate. The total volume of "approved" sediment removed was 41,010 CY [36,713 CY initially dredged and 4,297 CY re-dredged (including the 6,725 CY over-dredge allowance)] of soft sediment and SCM contaminated material was removed during the project. Dredge volumes were calculated in accordance with the site-specific SOP included in the CQCP and the specifications referenced

in the Dredging and Operations Plan and presented in Appendix D. Dredge performance was evaluated in accordance with the applicable EQM task order SOW, the project specifications, and the associated Project Work Plans developed for the project site. The summary of the sediment volumes is listed in Table 4-1.

Table 4-1. Summary of Sediment Dredge Volumes by Area and Material Type

Dredge Area	Sediment Type	Dredge Volumes (CY)		
		Initial	Redredge	Total
Transition Area & Turning Basin	Soft Sediment & SCM	31,976	4,297	36,273
South Channel	Soft Sediment	4,737	0	4,737
Total	Soft and SCM	36,713	4,297	41,010*

*(including the 6,725 CY over-dredge allowance)

4.3 Quality Control Procedures

Operations were performed in accordance with the approved CQCP. The on-site EQM Team monitored operations for compliance with the approved CCQAPP and CQCP. Daily checks were performed to ensure that control activities were providing continued compliance with contractual requirements and were recorded daily. The EQM Team prepared a Daily Report including the Daily Quality Control Summary Report (DQCSR) for each day work was performed. (For mobilization and demobilization periods, reports were reduced to weekly with USACE and EPA concurrence.) The DQCSRs were submitted to the on-site EPA Representative for review and concurrence. Copies were also posted on the project ShareFile site. See Appendix H for daily reports including DQCSRs.

4.3.1 Sediment Dredging

Sediment dredging work activities associated with the handling, stabilization, staging, testing, and offsite transportation and disposal of mechanically dredged materials were completed according to the requirements identified in the Specifications. Quality control procedures for quantifying dredged material consisted of daily dredging progress monitoring. Dredging was monitored with onboard dredge positioning systems. All marine and landside heavy equipment used for sediment off-loading and transport were inspected on a regular basis, and required maintenance was performed to keep all equipment in a safe and effective operating condition. The Site Superintendent and Site Foreman performed daily inspections of the silt curtain and oil

boom around the dredge plant. The dredge plant equipment and other major equipment were also inspected on a daily basis, and various scheduled and unscheduled maintenance was performed as required. All marine vessels (tugs, work/push boats, etc.) and scows were inspected regularly, and maintenance and repairs were performed as required.

4.3.2 Bathymetric Surveys

Bathymetric surveys were performed for pre- and post- dredging in addition to pre-cover placement by Hyrdographics. Additional surveys were completed by SES to confirm data. All surveys were done in accordance with the Section 31 20 25.23 of the specifications and the site-specific Standard Operating Procedure (SOP) included in the CQCP. The surveyors confirmed survey control points at the project site, to within < 0.05' accuracies, using RTK-GPS survey equipment. The survey control points were utilized to provide positioning and surveying QA/QC during the project and as otherwise needed. To further assure RTK-GPS accuracy and reliability, the team utilized a "base station", which transmitted continuous, highly accurate RTK-GPS corrections to the survey grade RTK-GPS rover onboard the survey vessel.

Bathymetric surveys were generally performed without USACE oversight. The bathymetric surveyor reported any deviations or concerns noted during surveying activity. The EQM/SES On-site CQC Officer provided daily monitoring and documentation for EPA review and QA/QC verification. All survey-related data was transferred to the TOCOR for sediment volume verification. A calculation check was performed by the onsite engineer, CH2M Hill. EQM's independent surveyor and Project CQC Officer were available to EPA to review, discuss, and reconcile all data related to cover thickness measurements. Details regarding the bathymetric surveys were discussed previously in sections 3.6 and 3.13. Photographs 34 and 35 illustrate the QC surveys.

4.3.3 Phase Inspections

Preparatory, Initial, and Follow-up Phase Inspections were performed for major work operations. Preparatory inspections were performed prior to beginning any fieldwork, including with the approved project documents. Initial inspections were performed for each definable feature of work after the preparatory inspection and immediately following the start of the work. Observations were made during the early phases of the field work and continued until a repre-

sentative portion of the activities were accomplished. Follow-up inspections were performed continuously by the on-site EQM Team, with oversight and review performed by the EPA On-site Representative. See Appendix I for inspections.

5. FINAL INSPECTION

All final site decontamination, restoration, and demobilization were conducted in accordance with the requirements contained in the project specifications and plans. Following completion of all required restoration activities, project equipment was removed and work sites were inspected. This section provides a summary of final site inspection and approval activities.

5.1 Punch-List Development

The EPA/WDNR/Tyco On-site Representative and the EQM Team established various punch lists for final site restoration and demobilization activities near the conclusion of the 2015 dredging activities. Progress on the various restoration and punch-list activities was tracked via daily discussion, inspections of completed work (as necessary), and weekly progress meetings. The EQM team completed the punch-list items prior to final demobilization from the various project work sites. The following summarizes the process:

- The On-site Representative and the EQM Team established various punch lists.
- A list of deficiencies was included, and by an estimated date the deficiencies were corrected.
- A second inspection was completed to assert that all deficiencies had been corrected.

Appendix J presents the final punch-list.

5.2 Site Work Inspections and H&S Audits

Site inspections were conducted on a regular basis throughout the performance of project work. Inspections were conducted during the major initial mobilization efforts in 2014 and 2015. Prior to the start of work on any new tasks or before work was initiated in a new area, inspections were conducted. Major equipment such as the dredge plants, sediment transport, and turbidity curtains were inspected on a daily basis. Inspection activities and results were documented in the field files. The EQM site specific Health and Safety Audit was completed in November 2014. No major issues or health and safety violations were observed during this audit.

5.3 Final Close-Out Inspections

After each major task, a Final Inspection was conducted by EQM's Quality Control Inspection personnel plus the EQM Site Superintendent and the GLNPO TOCOR. A Pre-Final Punch List was developed as a result of the Pre-Final Inspection. Following the final site inspection, any punch-list items remaining were addressed during the next reporting period. During November the final site inspection and punch-list was completed. (See Appendix J).

6. OPERATION AND MAINTENANCE ACTIVITIES

No warranties or operation and maintenance activities were required under the EQM Lower Menominee River Remediation project. EPA, GLNPOCS, WDNR, and others will track results under the GLNPOCS contracts and Tyco site efforts.

7. CONTACT INFORMATION

Table 7-1 lists the primary project contacts and their contact information.

Table 7-1. Primary Project Contact Information

EPA GLNPOCS Menominee Project Contacts List		
USEPA		
Heather Williams, TOCOR	312-886-5993	williams.heather@epa.gov
Brenda Jones, Alternate TOCOR	312-886-7188	jones.brenda@epa.gov
Sheila Dolan, Contracting Officer	312-886-1521	dolan.sheila@epa.gov
Tyco		
Guard Shack	715-735-3888	
Larry Wilson	561-479-9744	larwilson@simplexgrinnell.com
WDNR		
Cheryl Bougie	920-662-5170	cheryl.bougie@wisconsin.gov
Kristin Dufresne	920-662-5443	kristin.dufresne@wisconsin.gov
James Killian	608-264-6123	james.killian@wisconsin.gov
City of Marinette		
Brian Miller	715-732-5132	bmiller@marinette.wi.us
Environmental Quality Management, Inc.		
Gary Acquaro, Site Superintendent	315-368-7687	gary.acquaro@gmail.com
Brian Deskins, H&S Technician	513-926-1955	bdeskins@eqm.com
Jack Greber, Program/Project Manager	513-659-2509	jgreber@eqm.com
John Kominsky, GLNPOCS H&S Coordinator	513-310-4473	jkominsky@eqm.com
Lee Foley – Corporate H&S Officer	910-850-8315	lfoley@eqm.com
Jackie Doan – Corporate and GLNPOCS QAQC	513-673-4210	jdoan@eqm.com
Sevenson Environmental Services, Inc.		
Paul Jung – Safety and Health Manager	716-284-0431(o)	pjung@sevenson.com
Michael Crystal – Program Manager	716-284-0431 (o)	mdcrystal@sevenson.com
Mark Schmitt – Project Manager	716-923-5638 (cell)	mschmitt@sevenson.com
Dan Dragonette – Site Superintendent	716-609-0571 (cell)	ddragonette@sevenson.com
Steven Wilson – Site Safety Officer	716-609-2521 (cell)	swilson@sevenson.com
Tim Donegan – Project Engineer	443-928-7813	tdonegan@sevenson.com
Engineer, CH2M		
George Hicks	812-946-1669	George.Hicks@CH2M.com
Heather Ziegelbauer	262-644-6167	Heather.Ziegelbauer@CH2M.com
Jeff Danko	414-847-0386	jeff.danko1@ch2m.com
Other		
US Coast Guard, Sturgeon Bay, WI	920-743-3367	NA
Wisconsin DNR Spill Hotline	800-943-0003	NA
National Response Center	800-424-8802	NA
Public Utility Locator, WI One-call center	811 or 800-242-8511	NA
CHEMTREC	800-424-9300	NA

8. REFERENCES

CH2M Hill 2014. Tyco Composite Specifications, July 2014

CH2M Hill 2014. Sediment Construction Completion Report, March 2014

EQM 2014. Environmental Quality Management, Inc. Health, Safety, and Environmental Response Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised September 2014).

EQM 2014. Environmental Quality Management, Inc. Construction Quality Control Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised September 2014).

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EQM 2014. Environmental Quality Management, Inc. Survey Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised September 2014).

EQM 2014. Environmental Quality Management, Inc. Turbidity & Resuspension Management Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised September 2014).

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EQM 2014. Environmental Quality Management, Inc. Traffic Routing & Control Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised September 2014).

EQM 2014. Environmental Quality Management, Inc. Contingency Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised October 2014).

EQM 2014. Environmental Quality Management, Inc. Onsite Fueling & Spill Containment Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised October 2014).

EQM 2014. Environmental Quality Management, Inc. Dust Control & Monitoring Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised October 2014).

EQM 2014. Environmental Quality Management, Inc. Environmental Spill Response Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised October 2014).

EQM 2014. Environmental Quality Management, Inc. Erosion Control and Storm Water Management Plan, Lower Menominee River Tyco Site, Wisconsin. (October 2014).

EQM 2014. Environmental Quality Management, Inc. Cover Placement Work Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised April 2015).

EQM 2014. Environmental Quality Management, Inc. Cover Placement Work Plan, Lower Menominee River Tyco Site, Wisconsin. (Revised April 2015).

Tyco Fire Products LP, Site Access Agreement, Tyco Site. Signed September 5, 2014.

USEPA 2014. GLNPOCS, Contract No. EP-R5-11-04 Task Order 005. August 27, 2014

USEPA 2014. Request for Task Order Proposal SOL-R5-14-00008, July 14, 2014

WDNR 2012. Hazardous Waste Variance. July 3, 2012

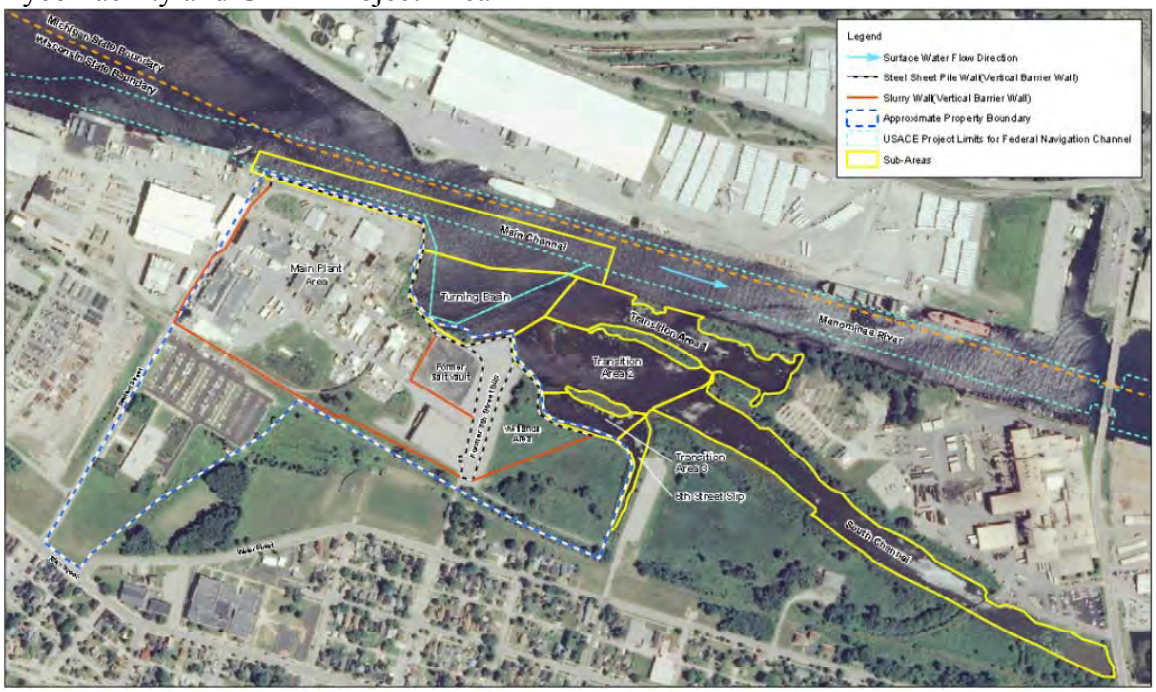
WDNR 2014. Hazardous Waste Variance, Modification Extension. Signed January 24, 2014

APPENDIX A

FIGURES

FIGURE 1
Lower Menominee River Area of Concern

FIGURE 2
Tyco Facility and GLLA Project Area



GENERAL SHEET NOTES

1. SURVEY CONTROL AND BENCH MARK DATA IS AVAILABLE FROM THE DETROIT DISTRICT OF US ARMY CORP OF ENGINEERS,ENGINEERING & TECHNICAL SERVICES, OPERATIONSTECHNICAL SUPPORT BRANCH, KEWAUNEE AREA OFFICE.
2. THE COORDINATE GRID SYSTEM SHOWN IS REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM, LAMBERT PROJECTION, CENTRAL ZONE (4802), NORTH AMERICAN DATUM 1983 (NAD83), US FOOT.

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DSGN	R TRAVER	DR	G BOWLES	CHK	G HICKS	APVD	R STRYKER

GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE
SEDIMENT REMOVAL PROJECT
US EPA GLNPO, TYCO FIRE PROD AND WDNR
MARINETTE, WISCONSIN

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CIVIL
FIGURE 3
EXISTING SITE PLAN

1"=150'
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2014/05/14
PROJ	473274
DWG	FIG 3
SHEET	of

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GENERAL SHEET NOTES

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2. THE COORDINATE GRID SYSTEM SHOWN IS REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM, LAMBERT PROJECTION, CENTRAL ZONE (4802), NORTH AMERICAN DATUM 1983 (NAD83), US FOOT.
3. ALL SOUNDINGS ARE IN FEET AND ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88)
4. MAXIMUM EXTENT OF CONTRACTORS SOUTH SHORELINE WORK AREA.
5. BASED ON THE 2013 LAYOUT.

NO.	DATE	REVISION	BY	APVD

DSGN R TRAVER | DR G BOWLES | CHK G HICKS | APVD R STRYKER

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LOWER MENOMINEE RIVER TYCO SITE
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FIGURE 4
OVERALL CONCEPTUAL TEMPORARY FACILITIES ACCESS ROADWAYS PLAN

1"=150'
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2014/05/14
PROJ	473274
DWG	FIG 4
SHEET	of

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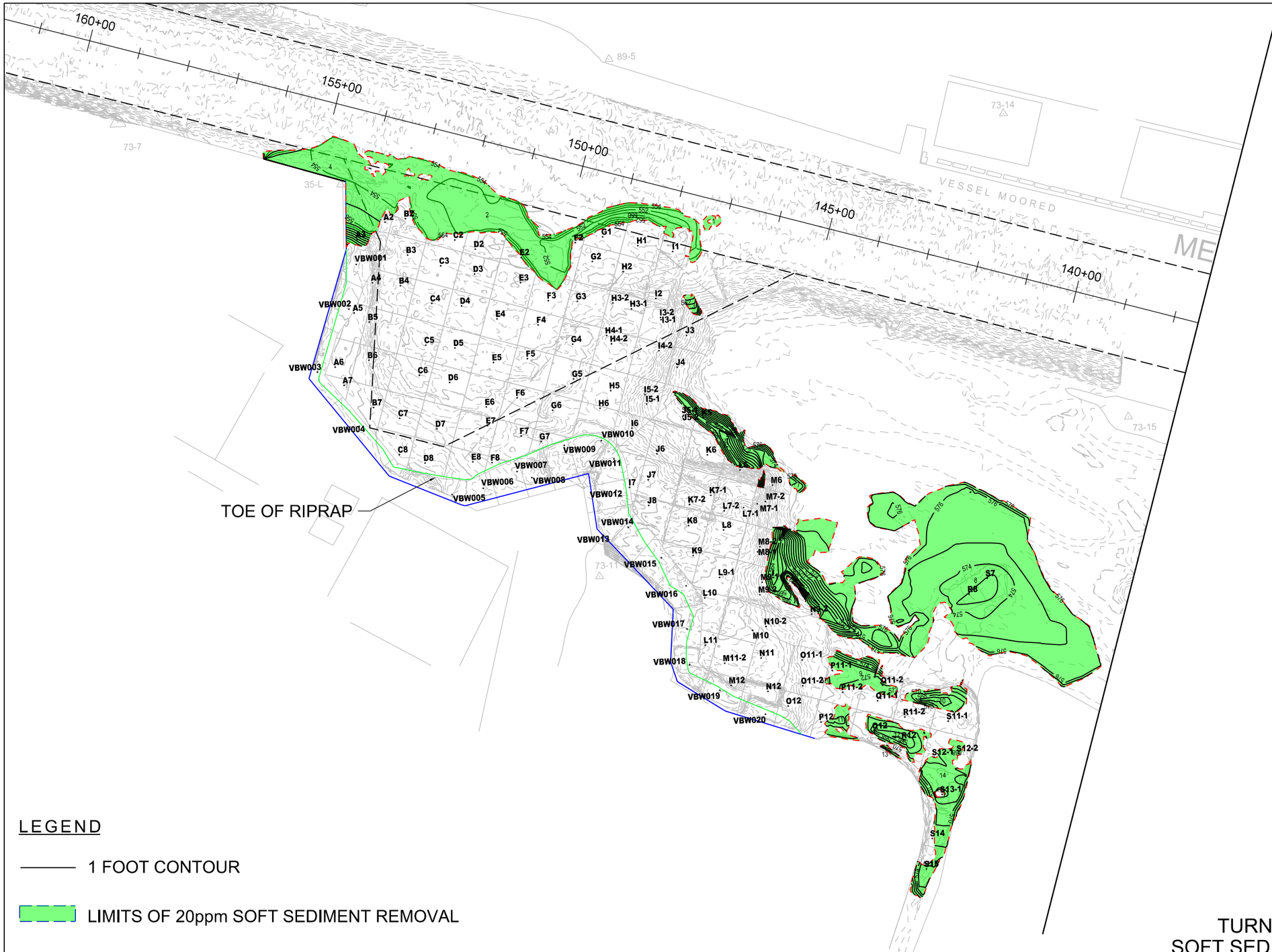

N

0 200 400 600
Scale In Feet

LEGEND

1 FOOT CONTOUR

LIMITS OF 20ppm SOFT SEDIMENT REMOVAL

NAVIGATIONAL CHANNEL / TURNING BASIN

BULKHEAD

NOTE:
FIGURES ARE REFERENCED HORIZONTALLY TO THE NORTH AMERICAN DATUM OF 1983 (NAD83) AND PROJECTED ON THE WISCONSIN STATE PLANE COORDINATED SYSTEM (CENTRAL ZONE).
VERTICAL REFERENCE IS TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88).

FIGURE 5A
TURNING BASIN AND TRANSITION AREAS
SOFT SEDIMENT 20ppm DREDGE ELEVATIONS
GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE

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LEGEND

1 FOOT CONTOUR

LIMITS OF 20ppm SOFT SEDIMENT REMOVAL

NAVIGATIONAL CHANNEL / TURNING BASIN

NOTE:
FIGURES ARE REFERENCED HORIZONTALLY TO THE NORTH AMERICAN DATUM OF 1983 (NAD83) AND PROJECTED ON THE WISCONSIN STATE PLANE COORDINATED SYSTEM (CENTRAL ZONE). VERTICAL REFERENCE IS TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88).

FIGURE 5B
SOUTH CHANNEL AREA
SOFT SEDIMENT 20ppm DREDGE ELEVATIONS
GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE

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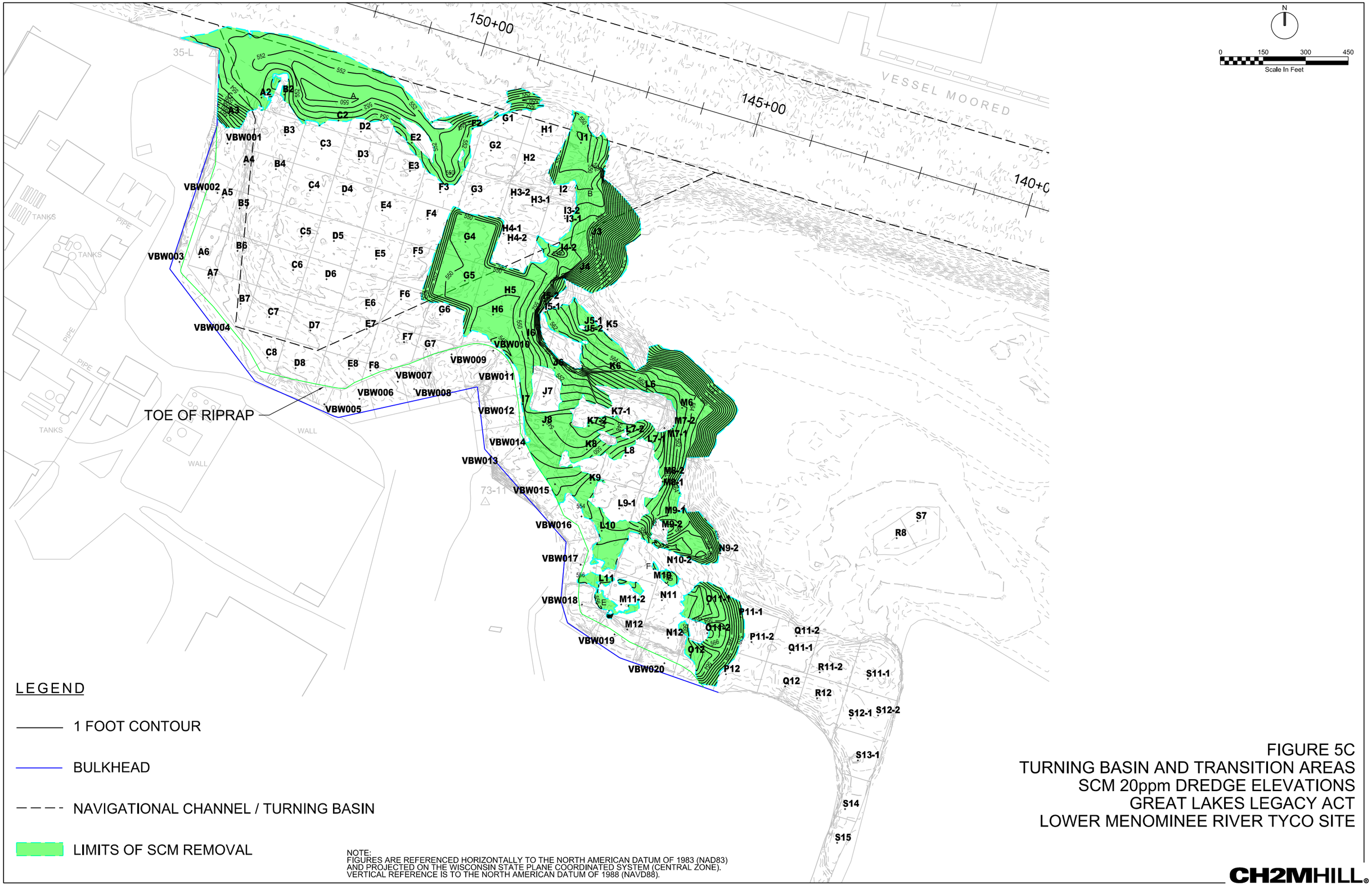

NOTE:
FIGURES ARE REFERENCED HORIZONTALLY TO THE NORTH AMERICAN DATUM OF 1983 (NAD83) AND PROJECTED ON THE WISCONSIN STATE PLANE COORDINATED SYSTEM (CENTRAL ZONE). VERTICAL REFERENCE IS TO THE NORTH AMERICAN DATUM OF 1988 (NAVD88).

FIGURE 5C
TURNING BASIN AND TRANSITION AREAS
SCM 20ppm DREDGE ELEVATIONS
GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE

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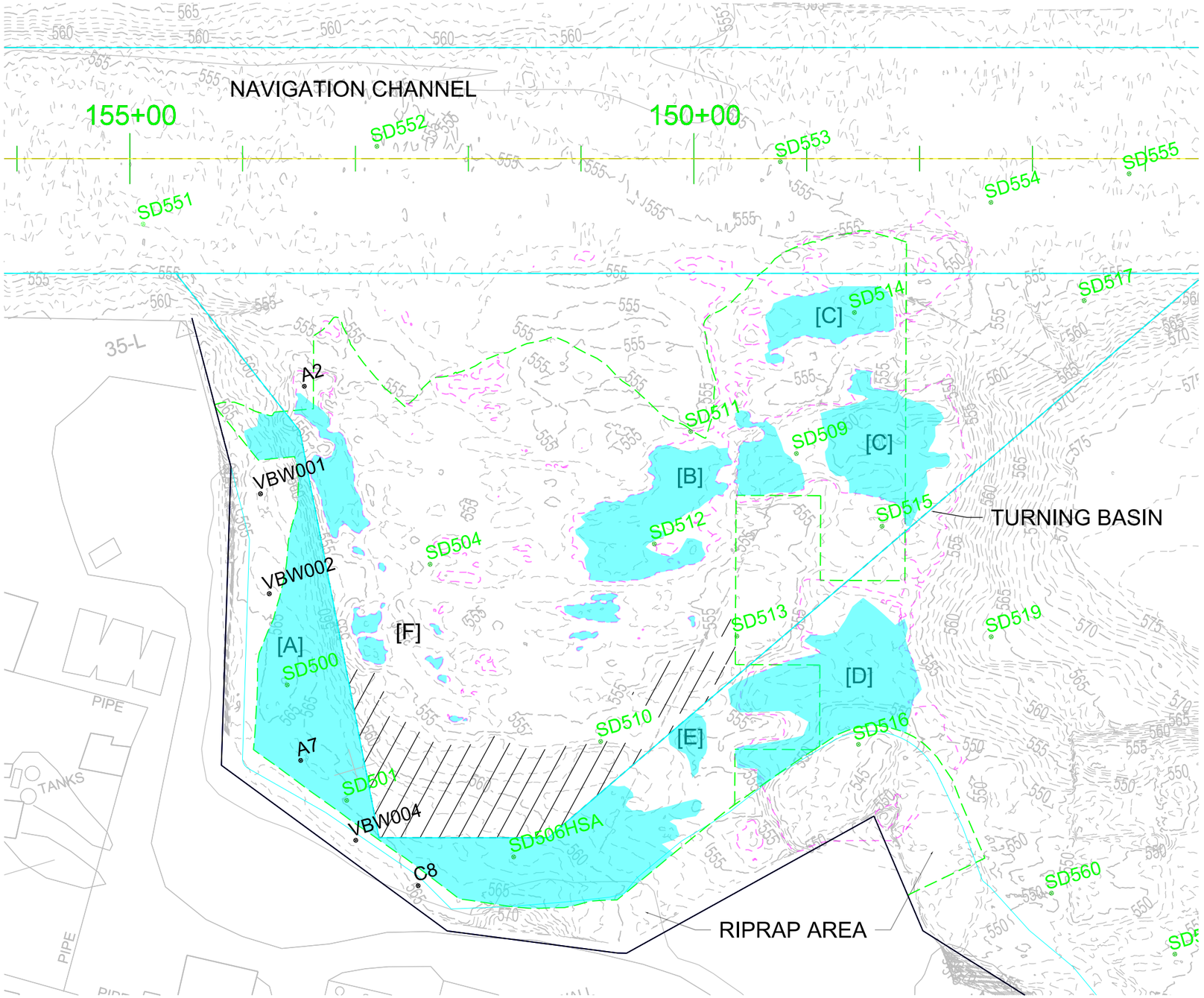

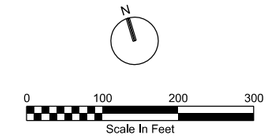

Till Arsenic Concentration Data - 2010 RI Sampling & 2013 EPA Samples

Sample Location ID	Arsenic Concentration (mg/kg)	Easting	Northing	Top of Till Elevation
A2	14	2585053.81	470338.03	551.17
A7	53	2584956.52	470021.17	568.76
C8	52	2585024.84	469885.19	564.73
SD500	28.2	2584964.07	470088.66	565.3
SD501	139	2584985.55	469975.68	565.6
SD504	2.6	2585115.89	470155.21	552.9
SD506HSA	160	2585113.19	469885.64	562.3
SD509	4.1	2585455.01	470157.00	549.1
SD510	111	2585216.18	469961.77	554.9
SD511	2.7	2585370.72	470202.26	549.7
SD512	182	2585311.45	470115.99	551.7
SD513	95.7	2585358.49	470016.81	550.1
SD514	144	2585539.85	470262.17	548.8
SD515	94.6	2585509.51	470073.67	550.9
SD516	28.6	2585434.50	469894.27	548.4
SD517	2.6	2585738.01	470214.26	545.5
SD519	1.8	2585574.42	469952.31	547.6
SD523HSA	2.6	2585978.09	470080.24	546.4
SD551	2.1	2584957.61	470516.38	550.2
SD552	1.6	2585175.91	470523.56	547.9
SD553	1.9	2585514.79	470408.82	549.6
SD554	2.1	2585683.59	470321.32	548.0
SD555	2.1	2585808.19	470310.80	542.1
SD556	2.4	2585925.78	470176.67	545.9
SD560	2.9	2585561.14	469719.36	543.9
SD561	2.7	2585681.73	469481.92	540.7
SD562	1.6	2585826.11	469408.57	544.1
SD564	14.7	2584124.74	470735.78	547.3
SD565	2.2	2584515.79	470659.98	545.6
SD574	3.1	2585650.58	469636.48	546.7
SD576	3.3	2585938.39	469558.52	544.3
VBW001	12	2584989.49	470257.76	564.59
VBW002	0.82	2584971.8	470170.68	563.64
VBW004	41	2584983.22	469939.47	566.43

TABLE LIST ONLY ARSENIC CONCENTRATIONS FOR THE TOP (SURFACE) 12"OF TILL SAMPLE.

TOTAL ARSENIC DATA PRESENTED WITHIN THE ADJACENT TABLE WAS LINEARLY INTERPOLATED USING GEOPAK CAD SOFTWARE TO DETERMINE THE 20PPM CONCENTRATION CONTOUR. ONCE THE 20PPM EXTENT WAS DETERMINED IT WAS CLIPPED TO THE "TOE-BOUNDARY"AND THE 553.5 ELEVATION CONTOUR WITHIN THE FEDERALLY AUTORIZED NAVIGATIONAL CHANNEL. NEW CHANNEL DEPTH BASED ON NLW.

COVER POLYGON	AREA (Ac.)	AREA (SF)
[A]	0.99	43,180
[B]	0.30	13,146
[C]	0.31	13,364
[D]	0.32	13,858
[E]	0.02	1,088
[F]	0.10	4,322
TOTAL	2.04	88,957

LEGEND

- DREDGE CONTOUR (2' INTERVAL) (SURVEY DATE 10/26/2013)
- VERIFIED EXPOSED GLACIAL TILL
- LIMITS OF TILL COVER AREA OF SAND COVER
- ELEVATION 553.50
- SD560 — SAMPLE LOCATION (2010)
- VBW001 — SAMPLE LOCATION (2013)
- NAVIGATION CHANNEL / TURNING BASIN
- VBW WALL
- LIMITS OF POST DREDGE SURVEY
- EXPOSED GLACIAL TILL ABOVE AUTHORIZED DEPTH IN NAVIGATIONAL CHANNEL (NO COVER 92,493 SF / 2.12 AC)

FIGURE 6
NAV CHANNEL / TURNING BASIN
COVER ELEVATION 553.50
POTENTIAL GLACIAL TILL
COVER AREA (20ppm)
GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE

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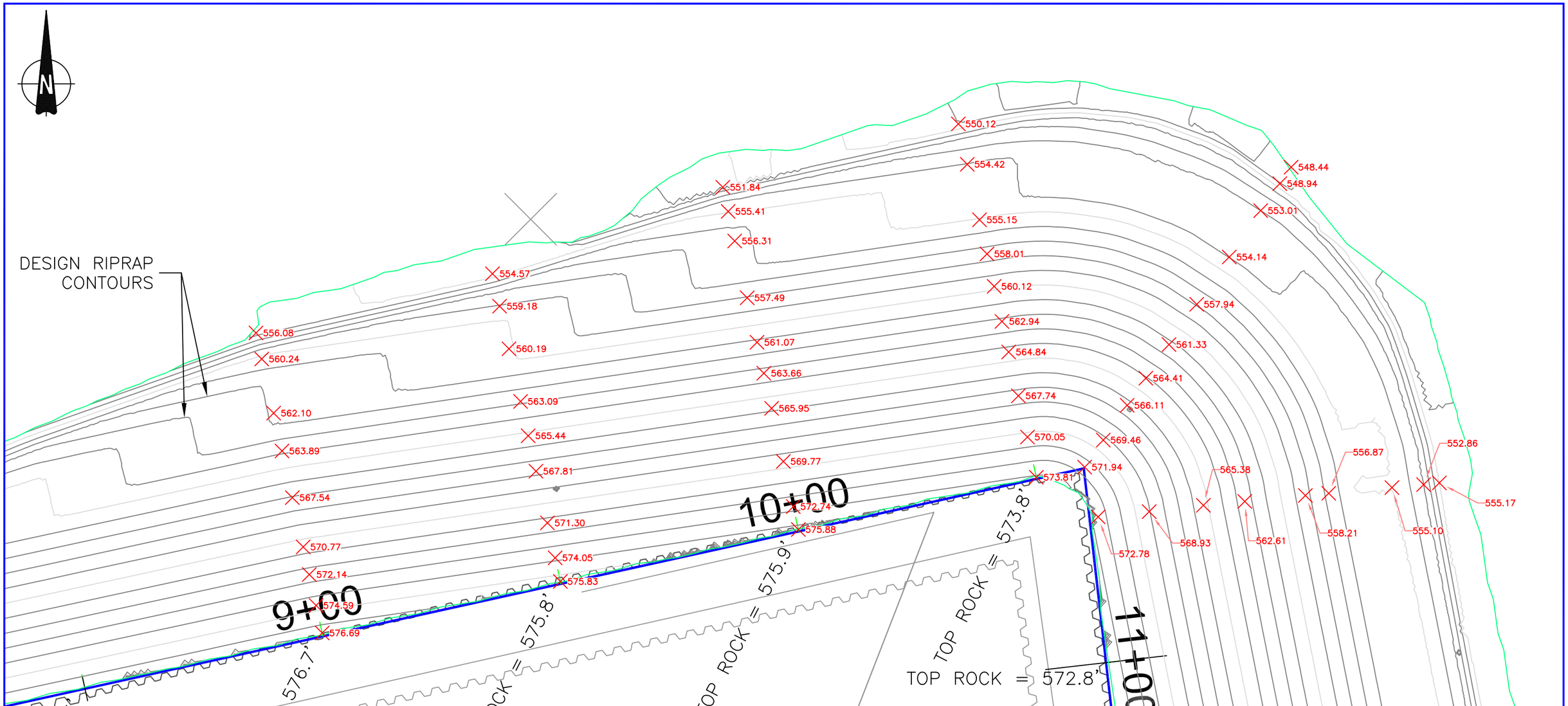


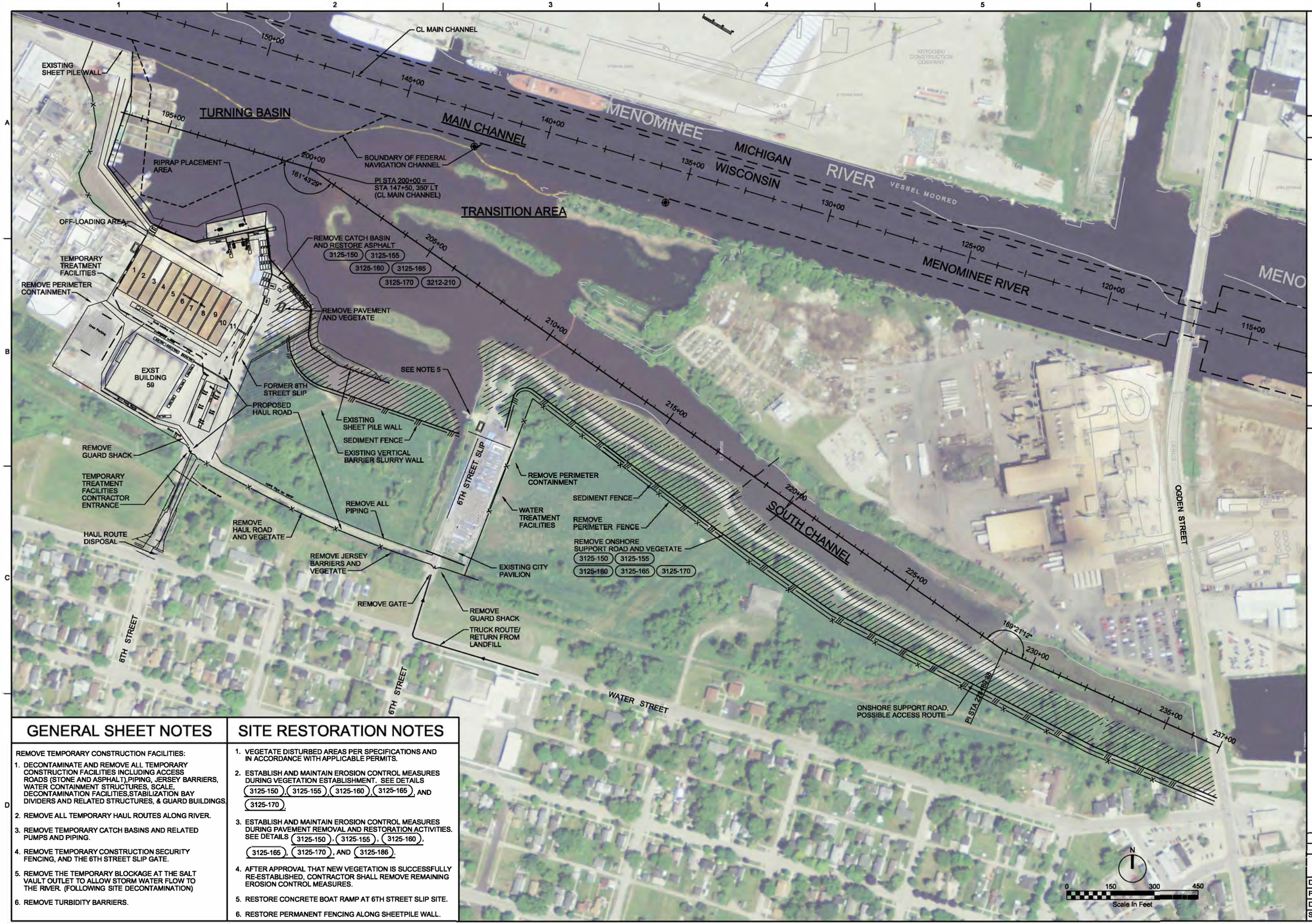
2015 RIP RAP PLACEMENT
TOP OF ROCK ELEVATIONS

GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER – TYCO SITE
1083
MARINETTE, WISCONSIN

SEVENSON ENVIRONMENTAL SERVICES, INC.

DRAWING		
	DATE:	08/04/2015
	DRAWN BY:	KDH
	CHECKED BY:	MS
	CAD FILE:	1083_RRAP ELEVATION–1.DWG
	SCALE:	AS SHOWN

Figure 7. Rip Rap Placement



GENERAL SHEET NOTES

REMOVE TEMPORARY CONSTRUCTION FACILITIES:

1. DECONTAMINATE AND REMOVE ALL TEMPORARY CONSTRUCTION FACILITIES INCLUDING ACCESS ROADS (STONE AND ASPHALT),PIPING, JERSEY BARRIERS, WATER CONTAINMENT STRUCTURES, SCALE, DECONTAMINATION FACILITIES,STABILIZATION BAY DIVIDERS AND RELATED STRUCTURES, & GUARD BUILDINGS.
2. REMOVE ALL TEMPORARY HAUL ROUTES ALONG RIVER.
3. REMOVE TEMPORARY CATCH BASINS AND RELATED PUMPS AND PIPING.
4. REMOVE TEMPORARY CONSTRUCTION SECURITY FENCING, AND THE 6TH STREET SLIP GATE.
5. REMOVE THE TEMPORARY BLOCKAGE AT THE SALT VAULT OUTLET TO ALLOW STORM WATER FLOW TO THE RIVER. (FOLLOWING SITE DECONTAMINATION)
6. REMOVE TURBIDITY BARRIERS.

SITE RESTORATION NOTES

1. VEGETATE DISTURBED AREAS PER SPECIFICATIONS AND IN ACCORDANCE WITH APPLICABLE PERMITS.
2. ESTABLISH AND MAINTAIN EROSION CONTROL MEASURES DURING VEGETATION ESTABLISHMENT. SEE DETAILS 3125-150, 3125-155, 3125-160, 3125-165, AND 3125-170.
3. ESTABLISH AND MAINTAIN EROSION CONTROL MEASURES DURING PAVEMENT REMOVAL AND RESTORATION ACTIVITIES. SEE DETAILS 3125-150, 3125-155, 3125-160, 3125-165, 3125-170, AND 3125-186.
4. AFTER APPROVAL THAT NEW VEGETATION IS SUCCESSFULLY RE-ESTABLISHED, CONTRACTOR SHALL REMOVE REMAINING EROSION CONTROL MEASURES.
5. RESTORE CONCRETE BOAT RAMP AT 6TH STREET SLIP SITE.
6. RESTORE PERMANENT FENCING ALONG SHEETPILE WALL.

NO.	DATE	REVISION	BY	APVD

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GREAT LAKES LEGACY ACT
LOWER MENOMINEE RIVER TYCO SITE
SEDIMENT REMOVAL PROJECT
US EPA GLNPO, TYCO FIRE PROD AND WDNR
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FIGURE 7
SITE RESTORATION PLAN

1"=150'
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	2014/05/14
PROJ	473274
DWG	FIG 7
SHEET	of

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Figure 8. Site Restoration Plan

APPENDIX B

PHOTOGRAPHS

Photo 1. Mobilization of the dredging barge

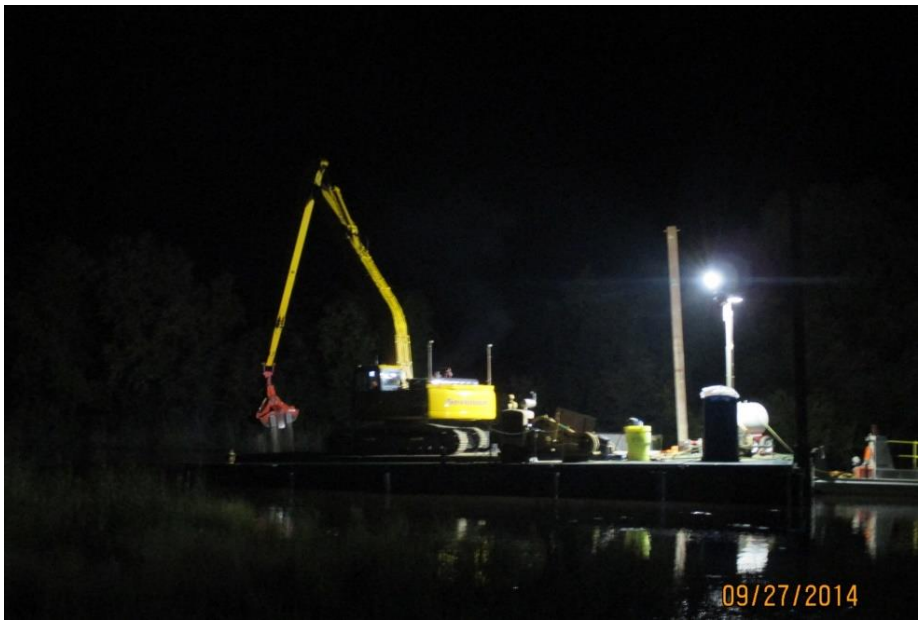

Photo 2. Dredging at night along the South Channel

Photo 3. Dredging

Photo 4. Dredging

Photo 5. Re-dredging in L8

Photo 6. Post Dredge Confirmation Sampling Crew

Photo 7. Post-Dredging Survey

Photo 8. Post-Dredging Survey

Photo 9. Off-loading Sediment

Photo 10. Off-loading and screening of sediment

Photo 11. Separating into debris pile

Photo 12. Dry ferric being loaded into the hopper

Photo 13. Loading Dry Ferric

Photo 14. Offloading Liquid Ferric

Photo 15. Processing sediment to bin

Photo 16. First load of sediment processed

Photo 17. Curing Process

Photo 18. Curing Process

Photo 19. Loading processed sediment for disposal

Photo 20. Loading processed sediment for disposal

Photo 21. Weighing processed material for disposal

Photo 22. Deploying turbidity curtain for cover placement

Photo 23. Moon Pool used during cover placement

Photo 24. Moon Pool used during cover placement

Photo 25. Cover Placement

Photo 26. Cover Placement activity in Moon Pool

Photo 27a, 27b, 27c. Pan Testing

Photo 28. Truck decontamination during the loading out process

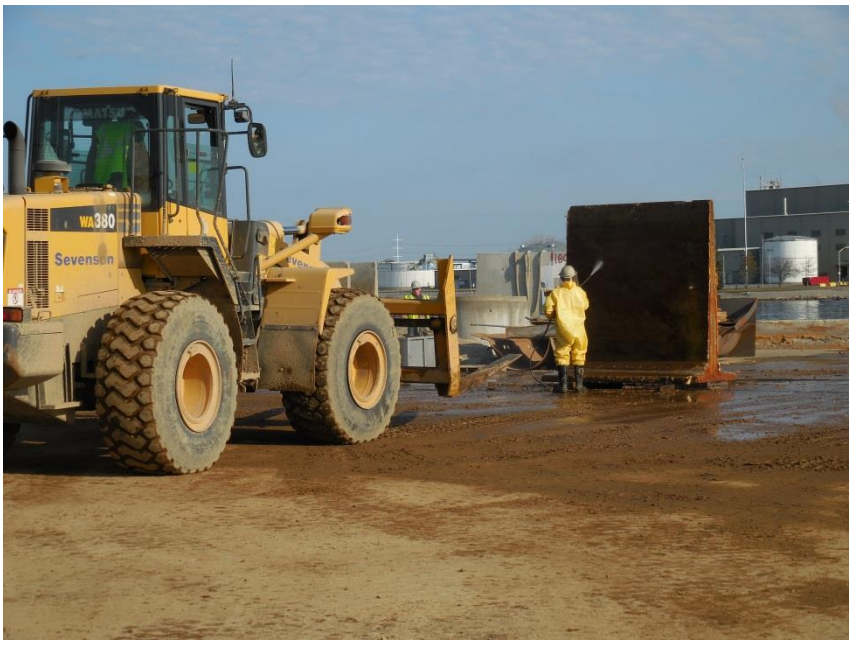

Photo 29. Decontamination of Bin walls

Photo 30. Site Restoration: Hydroseeding at 6th Street

Photo 31. Site Restoration: Wetlands Hydroseeding

Photo 32. Milling Process Pad

Photo 33. Asphalt Paving Complete

Photo 34. QC Survey

Photo 35. QC Survey