THIRD FIVE-YEAR REVIEW REPORT FOR FOX RIVER NRDA/PCB RELEASES SUPERFUND SITE A.K.A. LOWER FOX RIVER AND GREEN BAY SUPERFUND SITE BROWN, DOOR, MARINETTE, OCONTO, OUTAGAMIE, KEWAUNEE, AND WINNEBAGO COUNTIES, WISCONSIN

Prepared by

U.S. Environmental Protection Agency
Region 5
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X _____ 11/25/19

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LIST OF ABBREVIATIONS & ACRONYMS

A/OT	Agencies/Oversight Team
ADS	Advanced Disposal Services Hickory Meadows Landfill
BMP	Baseline Monitoring Plan
BRRTS	Bureau for Remediation and Redevelopment Tracking System
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIL	Chemical Isolation Layer
COCs	Contaminants of Concern
CMMP	Cap Monitoring and Maintenance Plan
CCU	Cap Certification Unit
COMMP	Cap Operation Maintenance and Monitoring Plan
CWA	Clean Water Act
cy	cubic yards
DMUs	Dredge Management Units
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GAC	Granular Activated Carbon
gpm	gallons per minute
ICs	Institutional Controls
ICIAP	Institutional Controls Implementation and Assurance Plan
LFR	Lower Fox River
LLBdM	Little Lake Butte des Morts
LOAEC	Lowest Observed Adverse Effects Concentration
LTM	Long Term Monitoring
MGP	Manufactured Gas Plant
MNR	Monitored Natural Recovery
MOA	Memorandum of Agreement
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	North Focus Area
NPL	National Priorities List
NRDA	Natural Resources Damage Assessment
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PRPs	Potentially Responsible Parties
RAOs	Remedial Action Objectives
RAL	Remedial Action Level
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RP	Responsible Parties
SDDP	Sediment Desanding and Dewatering Plant
SFA	South Focus Area

Site	Fox River NRDA/PCB Releases Superfund Site (aka Lower Fox River and Green Bay Superfund Site)
SMU	Sediment Management Unit
SWAC	Surface Weighted Average Concentration
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UU/UE	Unlimited Use and Unrestricted Exposure
WDNR	Wisconsin Department of Natural Resources
WWTP	Waste Water Treatment Plant
YOY	Young of Year

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, and its review is consistent with the National Contingency Plan (NCP) at 40 C.F.R. Section 300.430(f)(4)(ii), and considers EPA policy.

This is the third FYR for the Fox River NRDA/PCB Releases Superfund Site also known as the Lower Fox River and Green Bay Superfund Site (the Site). The triggering action for this statutory review is the signature date of the previous FYR on July 17, 2014. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of 5 operable units (OUs), and all 5 OUs will be addressed in this FYR. The Site OUs are as follows:

- OU 1 - Little Lake Butte des Morts
- OU 2 - Appleton to Little Rapids
- OU 3 - Little Rapids to De Pere
- OU 4 - De Pere to Green Bay
- OU 5 - Green Bay

The FYR was led by Pablo N. Valentin, the Remedial Project Manager for EPA Region 5. Participants included Beth Olson and Gary Kincaid with the Wisconsin Department of Natural Resources (WDNR), George Berken with The Boldt Company, Susan Pastor, the Community Involvement Coordinator with EPA, Jeffrey T. Lawson with the Lower Fox River LLC, Michelle Miller the records manager with Tetra Tech, Cindy Jones the Health and Safety manager with Tetra Tech, and Joe Francis, the Waste Water Treatment Plant (WWTP) manager with Tetra Tech. The potentially responsible parties (PRPs) were notified of the initiation of the FYR. The review began on October 10, 2018.

Site Background

The Site comprises a 39-mile stretch of the Lower Fox River (LFR) as well as the bay of Green Bay. The river portion of the Site extends from the outlet of Lake Winnebago and continues downstream to the mouth of the river at Green Bay, Wisconsin. The bay portion of the Site includes all of Green Bay from the City of Green Bay to the point where Green Bay enters Lake Michigan. The Site has been divided into five discrete OUs by EPA and WDNR (the Response Agencies). An OU is a geographical area designated for the purpose of analyzing and implementing remedial actions, and is defined on the basis of similar features and characteristics (*e.g.,* physical and geographic properties). The river and the bay OUs are listed above and depicted in Figure 1.

The river and areas bordering the river include the following uses: recreational (with likely subsistence fishing), residential, commercial, agricultural, and industrial. Residential areas are concentrated upriver (Neenah/Menasha and Appleton areas) but are also present from De Pere to Green Bay. Industrial use is present in the Neenah/Menasha and Appleton area, and is scattered along the river up to and including Green Bay. Agricultural use is located mainly between Appleton and De Pere.

History of Contamination

For many years, a large number of paper production facilities have been and continue to be concentrated along the river. Some of the facilities manufactured and/or recycled carbonless copy paper containing Polychlorinated Biphenyls (PCBs) from 1954 to 1971. PCBs were released from the paper production facilities to the Fox River directly, or after passing through municipal wastewater treatment plants. PCBs were then transported within the river system, as PCBs have a tendency to sink and adhere to sediments in the river bottom. PCBs have contaminated areas in the 39-mile length of the Lower Fox River, and Green Bay.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Fox River NRDA/PCB Releases Superfund Site		
EPA ID: WID000195484I		
Region: 5	**State:** WI/MI	**City/County:** Brown, Door, Marinette, Oconto, Outagamie, Kewaunee, and Winnebago Counties, Wisconsin, and Delta and Menominee Counties, Michigan

SITE STATUS	
NPL Status: Proposed	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: State ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Pablo N Valentin
Author affiliation: EPA
Review period: 10/10/2018 - 5/17/2019
Date of site inspection: 5/7/2019
Type of review: Statutory
Review number: 3
Triggering action date: 7/17/2014
Due date *(five years after triggering action date)*: 7/17/2019

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

This is a contaminated sediment site. Groundwater is not a media of concern and was not investigated during the remedial investigation/feasibility study (RI/FS).

The Site is contaminated with PCBs, a hazardous substance and probable human carcinogen. Other contaminants of concern (COCs) include dioxins/furans, the pesticide DDT and its metabolites (DDD and DDE), the pesticide dieldrin and metals including arsenic, lead, and mercury. These non-PCB contaminants were found to present substantially less risk compared to PCBs. Additionally, some of the other contaminants identified in sediment have similar fate and transport properties, and are generally found with PCBs. For this reason, a remedy that effectively addresses PCB exposure will also address the other less toxic COCs in the sediment. EPA estimates that the 14 million cubic yards (cy) of contaminated river sediments contain over 65,000 pounds of PCBs, and at least several hundred million cy of sediments in Green Bay are contaminated with as much as 150,000 pounds of PCBs. Because fish and wildlife are contaminated with PCBs, people who eat contaminated fish or waterfowl may suffer adverse health effects. Fish consumption advisories for the Site were first issued in 1976 and 1977 by WDNR and the State of Michigan, respectively. The advisories are still in effect. The Site contamination has also adversely impacted wildlife.

In conjunction with the RI/FS, EPA approved the ecological risk and exposure assessment for the Site in December 2002. The results of the risk assessment are summarized in the 2002 and 2003 Records of Decision (RODs). The conclusions of the evaluations (which are still valid, since site conditions are relatively unchanged since the 2002 ROD) are:

- Human health and ecological receptors are at risk in each OU.
- Fish consumption is the exposure pathway representing the greatest level of risk for human and ecological receptors, other than the direct risks posed to benthic invertebrates via direct exposure to contaminated sediments.
- The primary COC is PCBs.

Response Actions

The Site was proposed for the National Priorities List (NPL) on July 28, 1998. EPA deferred placing the Site on the NPL, pending cooperation of the PRPs. The Response Agencies conducted extensive evaluations, particularly beginning in 1989 with the Green Bay Mass Balance Study, as well as demonstration projects in two discrete areas of the river (known as Deposit N/O and Sediment Management Unit (SMU) 56/57) from 1998 - 2000. Details of these projects are discussed in the 2003 ROD. In 2000, the SMU 56/57 project was completed as a time-critical removal action. A total of 90,000 cubic yards (cy) of PCB-contaminated sediments were removed and disposed off-site during these dredging projects.

In December 2002, the Response Agencies signed the ROD for OU 1 and OU 2 which called for active remediation in OU 1 and monitored natural recovery (MNR) in most of OU 2. In June 2003, the Response Agencies issued a ROD for OU 3, OU 4, and OU 5 which called for active remediation in OU 2 (deposit DD), OU 3, and OU 4, and MNR for OU 5. The Response Agencies subsequently modified

the remedies described in the 2002 and 2003 RODs. A ROD Amendment signed on June 26, 2007, modified certain aspects of the 2003 ROD for all or part of the following OUs: OU 2 (Deposit DD), OU 3, OU 4, and OU 5 (near the mouth of the river). A second ROD Amendment, signed on June 12, 2008, made changes to parts of the remedy described in the 2002 ROD for OU 1. In general, the ROD Amendments changed the selected remedies from all-dredging to a combination of dredging, capping, and covering.

The Response Agencies issued an Explanation of Significant Differences (ESD) on February 26, 2010, which addressed modifications to the monitoring requirements for OU 2, cap design modifications for OUs 2-5, and cost increases for OUs 2-5.

OU 1 (a.k.a. Little Lake Butte des Morts)

OU 1 consists of the first six upstream miles of the Lower Fox River, commonly known as Little Lake Butte des Morts (LLBdM). As modified by the 2008 ROD Amendment, the OU 1 remedy consists of the following actions for all sediments with PCB concentrations greater than 1 part per million (ppm).

- Dredging and off-site disposal.
- Minimum 7-inch thick engineered cap of sand (3-inches) and armor stone (4-inches).
- Minimum 3-inch thick sand cover for areas with PCB concentrations less than 2 ppm and where the contaminant interval is less than 6-inches in thickness.
- Minimum 6-inch-thick sand cover for areas with PCB concentrations less than 10 ppm and where the contaminant interval is less than 6-inches in thickness.
- Minimum 9-inch-thick sand cover for areas with PCB concentrations less than 15 ppm and where the contaminant interval is less than 6-inches in thickness.
- Long-term monitoring and maintenance. Monitoring will consist of monitoring fish and surface water, and cap integrity and containment effectiveness. If cap integrity is compromised, either cap repair or removal (along with removal of underlying contamination) will be conducted.

The Remedial Action Level (RAL) for the major COC, PCBs, is 1 ppm, with a goal for a PCB surface-weighted average concentration (SWAC) of 0.25 ppm. This compares to a pre-remediation SWAC of 3.7 ppm which represents a 93% reduction.

OU 2

The remedy for OU 2 consists of monitored natural recovery (MNR), including measuring PCB levels in water, sediment, and fish.

OU 2 (Deposit DDL), OU 3, OU 4, and OU 5 (river mouth)

Remedial actions for OUs 2-5 are currently underway. The remedy, as modified by the 2007 ROD Amendment and 2010 ESD, consists of the following actions for all sediments with PCB concentrations greater than 1 ppm:

- Dredging and off-site disposal.
- An engineered cap of sand and armor stone with a minimum thickness of 7 inches ("A Caps"), 10 inches ("B Caps"), or 21 inches ("C Caps"), depending on the level of PCB contamination and

location relative to the navigation channel, with "targeted" thicknesses of 13 inches, 16 inches, or 33 inches, respectively.
- A 6-inch-thick sand cover for areas with PCB concentrations less than 2 ppm, and where the contaminant interval is less than 6 inches in thickness.
- Long-term monitoring and maintenance. This will consist of monitoring fish, surface water, and cap integrity. If cap integrity is compromised, either cap repair or removal (with removal of underlying contamination) will be conducted.

The RAL for the major COC, PCBs, is 1 ppm. There is a post-remediation goal for a PCB SWAC of 0.28 ppm for OU 3 and 0.25 ppm for OU 4, compared to a pre-remediation SWAC of 2.0 ppm for OU 3 which represents an 86% reduction, and 3.2 ppm for OU 4 which represents a 92% reduction.

OU 5 (except near river mouth)

The selected remedy for OU 5 is MNR with institutional controls (ICs). Activities will include monitoring to confirm long-term recovery of Green Bay through reliance on natural processes, primarily dispersion. The pre-remediation SWAC for OU 5 is 0.25 ppm.

Remedial Action Objectives

The RODs, ROD Amendments, and ESD adopted the same site-wide remedial action objectives (RAOs). The following five RAOs were established for the site:

- RAO 1: Achieve, to the extent practicable, surface water quality criteria for PCBs throughout the Lower Fox River and Green Bay. This RAO is intended to reduce PCB concentrations in surface water as quickly as possible. The current water quality criteria for PCBs are 0.003 nanograms per liter (ng/L) for the protection of human health, and 0.012 ng/L for the protection of wild and domestic animals. Water quality criteria incorporate all routes of exposure assuming the maximum amount is ingested daily over a person's (or animal's) lifetime.

- RAO 2: Protect humans who consume fish from exposure to COCs that exceed protective levels. This RAO is intended to protect human health by targeting removal of fish consumption advisories as quickly as possible. The Response Agencies defined the expectation for the protection of human health as recreational and high-intake fish consumers being able to safely eat unlimited amounts of fish within 10 to 30 years, respectively, following remedy completion.

- RAO 3: Protect ecological receptors from exposure to COCs above protective levels. This RAO is intended to protect ecological receptors such as invertebrates, birds, fish, and mammals. The Response Agencies defined the ecological expectation of achieving safe ecological thresholds for fish-eating birds and mammals within 30 years following remedy completion. Although the Feasibility Study did not identify a specific time frame for evaluating ecological protection, the 30-year figure was used as a measurement tool.

- RAO 4: Reduce transport of PCBs from the Lower Fox River into Green Bay and Lake Michigan. The objective of this RAO is to reduce the transport of PCBs from the river into the Bay and Lake Michigan as quickly as possible. The Response Agencies defined the transport expectation as a reduction in PCB loading to Green Bay and Lake Michigan to levels comparable to the PCB loading from other Lake Michigan tributaries. This RAO applies to each OU.

- RAO 5: Minimize the downstream movement of PCBs during implementation of the remedy. This objective would minimize, as much as feasible, the release of contaminants during remedial activities such as dredging, capping, or placing sand covers.

Status of Implementation

Since 2004, the site RPs have performed dredging, capping, and covering remedial activities. Demonstration projects and a time-critical removal were completed previously. Tables 1 and 2 below summarize dredging, capping, and cover quantities addressed by the remedial action activities from 2009 through 2018. By the end of the 2018 dredging season, approximately 5.8 million cy of PCB-contaminated sediment were removed or contained. The construction of the remedial action is expected to be completed by the end of 2020. For additional detail on construction activities, the reader can reference the yearly Remedial Action reports for the Fox River NRDA/PCB Releases Superfund Site.

Lower Fox River (LFR) OU 1

The remedy selected in the LFR OU 1 ROD and 2008 ROD Amendment specifies the removal and landfill disposal of PCB-impacted sediment exceeding the RAL of 1.0 ppm PCBs. Dredging of PCB impacted sediment began in OU 1 in 2004 and was completed in 2009. Additionally, as authorized by the 2008 ROD Amendment, sand covers and engineered caps were placed in select areas. Sediment removal was accomplished using hydraulic dredges followed by sediment dewatering, water treatment, and off-site landfill disposal of the dewatered sediment. Engineered caps involved the placement of a sand layer covered with armor stone, where a post-cap water depth equal to or greater than 6.0 feet could be attained. Refer to Figures 2 through 4 for an overview of remedial alternative locations. Sand covers were placed in two specific applications: 1) to manage dredge residuals and 2) to cover areas of very low concentrations (less than 2 ppm PCBs) in locations that were not dredged, all consistent with the requirements set forth in the 2008 ROD Amendment. As required by the Consent Decree (CD) and the Amended CD, the Responsible Parties (RPs) prepare a Remedial Action (RA) Work Plan each calendar year specifying activities to be undertaken during the forthcoming construction season. Upon review and approval by the Response Agencies, the work is performed by qualified contractors with oversight by representatives of EPA and WDNR. These reports should be consulted for further detail regarding RA activities undertaken in any given year from 2004 through 2009. To summarize the OU 1 remedial activities completed in OU 1 from 2004 through 2009, the annual results for dredging, engineered cap placement, and sand cover placement are provided in Tables 5, 6, and 7. The costs for all response actions performed in OU 1 pursuant to the Amended CD are shown in Table 8. The costs presented in Table 8 include RD costs, RA costs, and Long-term Response Action costs.

LFR OUs 2 through 5

In 2014, remedial actions for OUs 2-5 included the recommissioning and testing of the Sediment Desanding and Dewatering Plant (SDDP) and WWTP process system equipment, piping, instrumentation, and all other ancillary equipment and building systems to enable re-start of full-scale remediation and processing operations. Dredging, desanding, and dewatering operations were performed from April to November 2014. Spreading operations for installing engineered caps, remedy, and residual sand covers, and residual caps were performed from May to November 2014. In addition to volumes shown in Table 2, 7,912 cy of sediment were removed by scour. Post-dredge confirmation sampling results were evaluated in collaboration with the Agencies/Oversight Team (A/OT) to determine final

primary remedy or residuals management requirements in accordance with the ROD and ROD Amendment. Resultant residual management for these areas is depicted in Figures 5 through 7. Residual dredging was performed on over 38.1 acres in dredge-only remedy areas. Debris removal consisted of resuming and completing removal of the shipwrecks just offshore of the LFR Processing Facility. Approximately 732 tons of debris from shipwrecks were removed from the river and disposed of at the Advanced Disposal Services Hickory Meadows Landfill (ADS). Sand generated from non-TSCA dredging during 2014 was beneficially used for two purposes: landfill construction at ADS and construction at the WDNR-approved Highways 29/41 reconstruction project in Green Bay.

For the 2015 construction season, dredging, desanding, and dewatering of non-TSCA and TSCA sediment from OU 4 were performed from March to November. Spreading operations for installing engineered caps, remedy and residual sand covers, and residual caps were performed from May to November. In addition to the volumes of material removed from OU 4 shown in Table 2, 7,300 cy of sediment were removed by natural scour. As in 2014, results of post-dredge confirmation sampling were used to identify the need for residual dredging that was performed on over 1.11 acres in dredge-only remedy areas. Resultant residual management for these areas is depicted in Figure 8. Debris removal consisted of removal of deteriorated sections of the wooden Wakefield wall, concrete, rock rubble, and wood pilings from adjacent uplands and in the river along the RGL property shoreline. Approximately 258 tons of debris were disposed of at ADS. An additional, 20.98 tons of debris that had been in contact with in-situ TSCA sediment were disposed of at the Waste Management Ridgeview Landfill in Whitelaw, Wisconsin. About 52,260.49 tons of separated sand generated from non-TSCA and TSCA dredging during 2015 was beneficially used for two purposes: landfill construction at ADS and road construction at the Interstate 43 and Highway 41 construction project in Green Bay.

For the 2016 construction season, dredging, desanding, and dewatering of non-TSCA and TSCA sediment from OU 4 were performed from April to November. Spreading operations for installing engineered caps, remedy and residual sand covers, and residual caps were performed from May to November. Dredging, desanding, dewatering, and disposing were conducted this season. In addition to the volumes of material removed from OU 4 shown in Table 2, 399 cy of sediment were removed from these DMUs by natural forces (scour). Post-dredge confirmation sampling results indicated the need for residual dredging that was performed on approximately 23.48 acres in dredge-only remedy areas. Resultant residual management for these areas is depicted in Figures 9 and 10. Debris removal consisted of removal of concrete and rock rubble from the river along the RGL property shoreline and C. Reiss property. Approximately 453 tons of debris were disposed of at ADS. Quarry spall and/or rip rap placement to complete engineered caps was completed on December 8, 2016. About 39,547.45 tons of separated sand generated from non-TSCA dredging during 2016 were used beneficially for two purposes: landfill construction at ADS and road construction at the Interstate 43 and Highway 41 construction project in Green Bay.

For the 2017 construction season, dredging, desanding, and dewatering of non-TSCA sediment from OU 4 was performed between March and November. Spreading operations for installing engineered caps, remedy, and residual sand covers were performed from August to November. Mechanical placement operations for quarry spall, buttress and berm installations and larger armor stone began in April. After sand spreading was completed, a limited amount of sand and quarry spall was placed mechanically for structural buttresses in the RGL Slip, and City Slip from November to December. In addition to the volumes of material removed from OU 4 shown in Table 2, 3,082 cy of sediment were removed from these DMUs by scour and 3,442 cy of sediment were accreted, resulting in a net accretion of 360 cy. About 346,953.22 tons of non-TSCA waste resulting from the 2017 operations season were

disposed of at ADS from December 2016 to December 2017. This waste consisted of filter cake, scalpings, a limited amount of separated sand with apparently high organic content, miscellaneous personal protective equipment, spent media (sand, gravel, and granular activated carbon (GAC)) from the multi-media WWTP sand filters and GAC vessels, filter press cloths, and other miscellaneous wastes from LFR Processing Facility. Approximately 1,400 tons of filter cake had a higher than normal moisture content and strength that was less than that required by the landfill for direct disposal. This filter cake was stored for drying over the winter in the LFR Processing Facility, and was disposed of in 2018. About 155,678.10 tons of separated sand generated from non-TSCA dredging during 2017 were used beneficially for construction at ADS and Georgia-Pacific's Green Bay West Landfill. Debris consisting of trees, other vegetation, and concrete and rock rubble from the river along the RGL property shoreline was removed. Concrete mats were removed from under the WWTP effluent diffuser pipe in dredge unit OU4-D78. A timber wall was removed from the south side of City Slip uplands in OU 4-D70 and in-river pilings were removed from several dredge areas near the Interstate Highway I-43 (I-43) bridge. Approximately 407 tons of debris was disposed of at ADS. About 4,057 cy of soil from behind the timber wall along the south side uplands at City Slip were removed. Soil was removed to maintain bank stability during wall removal, to allow dredging to the required dredge design elevation, and to facilitate room for an armor stone/quarry spall berm. A total of 3,684 tons of excavated soil were hauled off site to ADS. Throughout the season, project personnel communicated with affected riparian property owners, municipalities, and utility owners whenever they could be affected by remediation activities. Figures 11, 12, and 13 (showing areas from south to north) depict the DMUs closed in OU 4 in 2017.

For the 2018 construction season, dredging, desanding, and dewatering of non-TSCA sediment from OU 4 and OU 5 were performed from March to November. In addition to the volumes of material removed from OUs 4 and 5 shown in Table 2, 2,289 cy of sediment were removed from these DMUs by scour, and 11,371 cy of sediment were accreted, resulting in a net accretion of 9,082 cy. Spreading operations for engineered caps, remedy, and residual sand covers were performed from July to November. Mechanical placement operations for quarry spall, buttress, and berm installations and larger armor stone started on September 25, 2018. After sand spreading was completed, a limited amount of sand and armor stone was placed with the spreader for caps CC22 and CB58. A limited quantity of quarry spall was placed mechanically in cap CC22 on November 7, 2018. Armor stone was mechanically placed in special remediation area cap SRA-06 until November 15, 2018. Caps CB58 and SRA-06 were completed in 2018. Sand and armor stone placement were completed for CC22. Quarry spall placement in CC22 was started but not completed; therefore, cap CC22 is expected to be completed in 2019. A portion of the armor stone buttress at the C. Reiss Terminal dock in dredge area OU4-D68B-5 was temporarily removed to complete dredging in adjacent areas, then restored. Post-dredge confirmation sampling results were used by the A/OT to confirm the need for residual dredging which was performed on 24.63 acres in dredge-only remedy areas. About 318,541.65 tons of non-TSCA waste resulting from the 2018 dredging operations season were disposed of at ADS from January to December. This waste consisted of filter cake, scalpings, a limited amount of separated sand with apparently high organic content, miscellaneous personal protective equipment, spent media (sand, gravel, and GAC from the multi-media WWTP sand filters and GAC vessels, and other miscellaneous wastes from the LFR Processing Facility. About 114,767 tons of separated sand generated from non-TSCA dredging were beneficially used for construction at ADS and Georgia-Pacific's Green Bay West Landfill. Approximately 18,000 tons of sand eligible as beneficial reuse material remained stockpiled on site following the 2018 season. Throughout the season, communications with affected riparian property owners, municipalities, and utility owners continued to take place in instances where they could be affected by remediation activities. Figures 14, 15, and 16 (showing areas from south to north) depict the DMUs closed in OU 4 in 2018. No OU 5 management units were closed.

Green Bay MGP NAPL

In 2017, coordination efforts began in order to conduct remediation activities in OU 4 in the area near the confluence of the East River and the Fox River to address Manufactured Gas Plant (MGP) Non-Aqueous Phase Liquid (NAPL) and PCB contamination. Additional sampling was conducted in the area in order to determine the extent of MGP NAPL presence. Two areas were identified for remediation, the north focus area (NFA) and the south focus area (SFA).

Remedial action activities in the Green Bay MGP SFA were completed in the 2018 season. Information on remediation activities at the MGP SFA can be found in the Draft Remedial Action Summary Report submitted by Wisconsin Public Service to the Response Agencies on January 31, 2019. MGP text in this report is limited only to the PCB wastes treated at the LFR Treatment Facility and hauled to landfills that also may have contained MGP waste, including 35,746.65 tons of waste to ADS and 6,516.20 tons to the Waste Management Ridgeview Landfill in Whitelaw, Wisconsin. Coordination efforts continued through the 2018 construction season to develop the cleanup strategy for the NFA. Remediation work for the NFA is scheduled for the 2019 construction season.

During the ongoing cleanup, it was determined that the partially submerged hulls of two steam-powered tugboats - the Bob Teed and Satisfaction - and debris from what is believed to be three old barges needed to be removed from the river within OU 4 and disposed offsite. The tugboats and barges were located within contaminated sediment targeted for remedial action. The vessels were declared historical artifacts and cultural resources under the National Historic Preservation Act. A Memorandum of Agreement (MOA) among EPA, WDNR, the Wisconsin State Historical Preservation Office, the Neville Museum, and certain PRPs was finalized in September 2013, and removal of the shipwrecks started in November 2014. The MOA requires the creation of an interpretive display at Brown County's Neville Museum. The display was completed in December 2014 and explains the history of the vessels and other interesting facts about river commerce in the late 1800s and early 1900s. Shipwreck removal activities were completed on May 9, 2014.

For the MNR remedy at OU 2, baseline monitoring has been completed and long-term monitoring has begun.

The construction of an interim action identified as "Phase 1" was completed in 2007. This dredging project was located in OU 4 just downstream of the De Pere Dam, and removed 130,000 cy of PCB contaminated sediments, consistent with the 2003 ROD and 2007 ROD Amendment.

Table 1: Total Dredging, Capping, and Cover Quantities Completed from 2004 through 2018

Remedial Activity	**OU 1**	**OU 2**	**OU 3**	**OU 4/OU 5**	**2018[2]**	**Total**
Dredging (in situ cubic yards)[1]	371,600	3,009	235,858	4,809,025	585,841	6,005,333
Caps as the Primary Remedy (Types A, B or C) (acres)[3]	113.90	6.98	26.80	105.29	0.09	253.06
Sand Cover as the Primary Remedy (acres)[3]	107.10	0.29	61.96	35.71	2.10	207.16
Sand Cover over Dredge Residuals (acres)[3]	36.5	0	52.08	346.17	41.88	476.63
Engineered Cap over Dredge Residuals (acres)[3]	0	0	0	8.36	0	8.36

Remedial Activity	OU 1	OU 2	OU 3	OU 4/OU 5	2018[2]	Total
Shoreline Caps (acres)	0	0	0	0.54[4]	0	0.54
Special Remediation Area Caps (acres)	0	0	0	0.00	2.81	2.81
Buttress (acres)	0	0	0	4.50	0.42	4.92
Berm (acres)	0	0	0	1.90	0.00	1.90
Temporary Sand Covers (acres)	0	0	0	1.49	0.00	1.49

Notes:

1. Dredge volumes shown are total volume **dredged, desanded, and dewatered**, which include overcut volumes and Phase 1 area volumes dredged as part of the Phase 2B work (i.e., excluding Phase 1 dredging performed in 2007).
2. Volumes and areas shown for 2018 are from OU 4 and OU 5 only.
3. Previous years' cap and sand cover volumes changed based on 2019 review. The adjustments were to correctly identify which season the caps were completed and to correctly identify if the cap was a Primary or Residual. The net change is 1.52 acres.
4. Shoreline cap area reduced by 0.41 acres to remove cap acreage not completed in 2016.

Table 2: Annual Dredge Volumes from 2004 through 2018[1]

	Non-Toxic Substances Control Act (TSCA) Quantity Including Overcut (cy)						
	OU 1	OU 2	OU 3	OU 4/OU 5	Non-TSCA Total	OU4 TSCA Quantity (cy)	Total Quantity (cy)
2004	18,000	0	0	0	18,000	0	18,000
2005	88,200	0	0	0	88,200	0	88,200
2006	102,100	0	0	0	102,100	0	102,100
2007[3]	121,800	0	0	104,030	225,830	27,832	253,662
2008	41,500	0	0	0	41,500	0	41,500
2009	0	3,009	126,351	407,808	537,168	7,367	544,535
2010	0	0	45,576	685,441	731,017	0	731,017
2011	0	0	63,931	171,478	235,409	0	235,409
2012	0	0	0	637,471	637,471	21,809	659,280
2013	0	0	0	569,369[2]	569,369	19,907[2]	589,276
2014	0	0	0	546,475	546,475	0	546,475
2015	0	0	0	455,049	455,049	58,895	513,944
2016	0	0	0	530,353	530,353	7,371	537,724
2017	0	0	0	558,370	558,370	0	558,370
2018	0	0	0	585,841	585,841	0	585,841
Total	371,600	3,009	235,858	5,251,685	5,862,152	143,181	6,005,333

Notes:

1. Dredge volumes for 2004 through 2018 reflect total volumes **dredged, desanded, and dewatered**, which include the overcut volumes, and include **dredging, desanding, and dewatering** of 67,157 cy from the Phase 1 area in 2010.
2. Based on a 2019 review, the 2013 TSCA and non-TSCA dredge volumes are increased by 7 cy and 8,946 cy, respectively.
3. Dredge volumes for 2007 reflect total volumes dredged, de-sanded, and dewatered, which include the overcut volumes, and include dredging, de-sanding, and dewatering of 104,030 cy (non-TSCA) and 27,832 cy (TSCA) from Phase 1 area in 2007.

Institutional Controls

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OU 1 sediment caps	Yes	Yes	OU 1	Protect the caps (engineered remedy) and reduce potential exposure in areas where residual contamination will remain. Dredging in capped areas must be performed in a manner that does not remove or otherwise compromise capping material. Minimize potential for cap disturbance. Regulate activity, such as dredging or construction that could impact engineered cap integrity. Inform regulators and public of engineered cap locations. Implement monitoring and maintenance.	Chapter 30, Wisconsin Statutes (existing); Section 404 of the Clean Water Act (CWA), 33 U.S.C. §1344 (existing); Sections 9 and 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. §401 and 403 (existing); WDNR Bureau for Remediation and Redevelopment Tracking System (BRRTS) Registry (planned); Navigational Maps (planned); MOAs between Counties, municipalities, WDNR, and United States Army Corps of Engineers (USACE) (planned).
OU 1 Dams	Yes	Yes	OU 1	Assure long-term dam integrity	USACE/WDNR Maintenance (existing)
OUs 1, 2, 3, 4, and 5 Fish	Yes	Yes	OUs 1, 2, 3, 4, and 5	Reduce human exposure.	Fish advisories issued (in effect since 1976)

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OUs 2, 3, 4, and 5 Caps Constructed in Federal Navigation Channels	Yes	Yes	OUs 2, 3, 4, and 5	Ensure that USACE maintenance dredging does not extend more than 2 feet below the federally-authorized channel depth and that no other activity, such as dredging, impacts the integrity of the engineered caps.	MOA with Brown County and municipalities regarding mapping and communications (planned); MOA with EPA, USACE, and WDNR, and possibly Brown County Port Authority, regarding dredging requirements in federal navigational channel (planned); MOA with WDNR and USACE regarding regulatory programs (planned); WDNR BRRTS Registry (planned); WDNR and Brown County GIS Mapping System (planned); Governmental Notices such as fish advisories (in effect since 1976) and navigational maps (planned); WDNR Chapter 30 requirements (existing); Sections 10 and CWA 401/404 USACE permit

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
					requirements (existing)
OUs 2, 3, 4, and 5 Caps Constructed Outside of Federal Navigation Channels that are not Riparian Caps	Yes	Yes	OUs 2, 3, 4, and 5	Ensure that no activity such as dredging impacts engineered cap integrity.	MOA with Brown County and municipalities regarding mapping and communications (planned) MOA with WDNR and USACE regarding regulatory programs (planned) WDNR BRRTS Registry (planned) WDNR and Brown County GIS Mapping System (planned) Governmental Notices such as fish advisories (in effect since 1976) and navigational maps (planned) WDNR Chapter 30 requirements (existing) Sections 10 and CWA 401/404 USACE permit requirements (existing).

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OUs 2, 3, 4, and 5 Constructed Riparian Sediment Caps	Yes	Yes	OUs 2, 3, 4, and 5	Ensure that no activity, particularly Chapter 30 permit exempt activity, impacts the integrity of shoreline caps.	MOA with Brown County and municipalities regarding mapping and communications (planned); MOA with WDNR and USACE regarding regulatory programs (planned); WDNR BRRTS Registry (planned) WDNR and Brown County GIS Mapping System (planned); Governmental Notices such as fish advisories (in effect since 1976) and navigational maps (planned); Riparian Landowner Notifications and Consultations (ongoing); Utility notification (planned 2019); WDNR Chapter 30 requirements (existing); Sections 10 and CWA 401/404 USACE permit requirements (existing).

Maps showing the areas in which the ICs apply are included in Appendix D. Maps which depict the current conditions of the Site and areas which do not allow for UU/UE for the areas where remediation is ongoing will be developed as part of the IC follow-up actions discussed below.

Status of Access Restrictions and ICs:

OU 1

As one element of the OU 1 remediation, engineered caps were placed on 114 acres of the total of 1,365 acres of lakebed in LLBdM *(i.e.,* 7% of the lakebed in OU 1 has been capped) and, therefore, ICs are needed. The RPs developed an OU 1 Institutional Controls Implementation and Assurance Plan (ICIAP) in 2013 that was re-submitted to the Response Agencies in June 2017. The RPs developed engineered caps to isolate contamination left behind in the sediment, and placed the caps where sediment contained less than 10 ppm PCBs in the top 8 inches. The protection of engineered caps will, in turn, assure the long-term protectiveness of the remedy. From an ICs perspective, it is important to note that the RPs placed OU 1 engineered caps only in those areas of OU 1 where the water depth above the cap surface would equal 6 feet or more. Because of this requirement, the engineered caps were placed well beyond the shoreline, in the deeper areas of LLBdM. The minimum distance from the shoreline to any part of the engineered cap in OU 1 is more than 300 feet. Because LLBdM is an impoundment created by the Upper Appleton dam, its water level is relatively stable, meaning that short of a calamity, or unprecedented drought, this distance will be assured. Figure 2 is a map reflecting the location of areas with engineered caps for OU 1. Because capped areas retain some level of residual contamination, they do not qualify for "UU/UE" by public or private entities in the future. It is necessary to identify activities that might disrupt engineered caps and then to describe how the impact of such activities will be mitigated through design, location, monitoring and ICs. As defined in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA, 2005) and the 2008 ROD Amendment for OU 1, ICs are non-engineered instruments, such as administrative and legal controls, that 1) help minimize the potential for human health or ecological exposure to sediment contamination; and 2) ensure the long-term integrity of the remedy. The term "institutional control" generally refers to "non-engineered instruments, such as administrative and legal controls that help to minimize the potential for human exposure to contamination and protect the integrity of the remedy" (USEPA, 2004). In OU 1, ICs are required to protect the cap (engineered remedy) and to reduce potential exposure in areas where residual contamination remains. ICs applicable to OU 1 include the following:

- Governmental controls including permit conditions for future actions; and
- Informational devices including signage and fish consumption advisories that may be required until RAOs are met.

The actions the RPs will take, or have taken, to implement OU 1 ICs and communicate with both the Response Agencies and the public are enumerated below.

- Register the engineered caps on the WDNR Bureau of Remediation and Redevelopment Tracking System (BRRTS) GIS Registry - The RPs will submit, to WDNR, the documentation and database required to put the engineered cap areas on the WDNR's BRRTS GIS Registry, or an alternative system used by WDNR, within 30 days of approval of the ICIAP. The Response Agencies will be copied on the submittal to evidence that the action has been completed. The RPs submitted the locations of OU 1 caps in a format compatible with the BRRTS GIS

Registry. Once the WDNR has placed the OU 1 cap database on the GIS Registry, or an alternative system used by WDNR, it will be available to other regulators and the public by accessing the WDNR's website at: http://dnr.wi.gov/maps/gis/applist.html.

- Update and maintain the OU 1 website - In order to provide a second means of continued public notice of the areas that have been capped in LLBdM, the RPs will update and maintain the website located at www.littlelakecleanup.com, including maps of the capped areas in OU 1, applicable fish consumption advisories and contact information. This website will be maintained by the Respondent. The website will be updated within 60 days of approval of the ICIAP and will be reviewed annually to make sure it is up to date.

- Provide information to WDNR for Diggers Hotline - The RPs will contact WDNR to place the shape files, provided in Appendix A of the ICIAP, with the Diggers Hotline "One-Call System" established under Section 182.0175(1m), Wis. Stats. This contact will be made within 30 days of approval of the ICIAP.

- Provide information on OU 1 engineered cap locations to local municipalities and libraries - The RPs will provide information to local municipalities and libraries on how to access the OU 1 website and the WDNR BRRTS GIS system, as well as the location of OU 1 engineered caps in a format compatible with local municipalities' GIS databases', including Winnebago County, the City of Menasha, and the Village of Fox Crossing , and the libraries in Appleton, Menasha and Neenah. The information will be provided within 90 days of approval of the ICIAP. The RPs will also provide copies of the maps of the engineered cap locations. If requested, the RPs will also provide a copy of the database of the OU 1 engineered cap locations to any of the municipal entities.

- Provide information on fish advisories applicable to OU 1 - When WDNR/WDHS revise the fish advisories for OU 1, the RPs will update the OU 1 website with the new advisories. Note that WDNR/WDHS will themselves issue press releases on the change. The RPs will continue to update the OU 1 website until the PCB fish advisories have been lifted for OU 1.

- Prepare and submit Annual Certification Report on the OU 1 ICs - An annual report and certification regarding the status and effectiveness of ICs in OU 1 will be submitted to EPA and WDNR. The annual certification process will be evaluated as part of the CERCLA FYR process.

- Communications with local municipalities - The RPs have identified the municipalities that border on OU 1 or are otherwise affected by the ICs created pursuant to the ICIAP. These municipalities will be listed in the municipalities' MOA. The RPs will contact each of these governmental entities to determine an appropriate point of contact and will set up an email list to enable communication with them as a group. The RPs will utilize this email list to provide the municipalities with updates on the status of the ICs, on no less than an annual basis.

- Finalize the MOA with municipalities - The RPs will meet (in person or telephonically) with municipalities to discuss the terms of the municipal MOA. The first meeting or conference call will be scheduled within 120 days of the approval of the ICIAP. The goal will be to finalize the municipal MOA within 12 months of approval of the ICIAP.

OUs 2 through 5

The RPs developed an ICIAP to address ICs for OUs 2 through 5. In accordance with the ICIAP, an IC may be deemed to be already in place if another agency has responsibility for enforcing a prohibition on the activity that otherwise would need to be the subject of an IC (EPA 2005). Chapter 30 of the Wisconsin Statutes, Sections 401 and 404 of the CWA, and Sections 9 and 10 of the Rivers and Harbors Act give WDNR and USACE the authority and responsibility to enforce prohibitions on activities that would threaten the integrity of the engineered caps in OUs 2 through 5. The use of these existing regulatory authorities as ICs was confirmed through MOAs with Brown County, WDNR, and USACE. To the extent that existing regulatory authorities do not fully address potential risks to the constructed remedy, additional ICs will be implemented to address those potential risks. Table 9 provides a list of ICs that may be used. The list is organized by three distinct capping scenarios: 1) caps in the federal navigational channel; 2) caps outside of the navigational channel that are not shoreline caps, namely caps that maintain no less than 3 feet of navigable water above the top of the cap; and 3) shoreline caps, namely those caps that do not maintain 3 feet of navigable water above the top of the cap. The ICIAP for OUs 2-5 was approved by the Response Agencies on October 26, 2012**.**

Current Compliance: Currently, the caps finalized in OUs 1, 2, 3 and 4 are being maintained and have not been disturbed as evidenced by the monitoring done pursuant to the Cap Maintenance and Monitoring Plan (CMMP) in OU 1, as well as the Cap Operation Maintenance and Monitoring Plan (COMMP) in OUs 2-5. The ICIAP for OU 1 needs to be finalized and approved by the Response Agencies. The ICIAP for OUs 2 through 5 will begin to be implemented once construction has been finalized for OUs 4 and 5 as set forth in the agreements between the Response Agencies and the RPs.

IC Follow up Actions Needed: MOAs for the OU 1 ICIAP and the OUs 2 through 5 ICIAP need to be finalized for communication strategies between counties, municipalities, WDNR, and USACE. Annual certifications need to be performed once the ICIAPs are approved and construction has been finalized. The ICIAP for OU 1 needs to be finalized and approved. Caps need to be documented for each OU on the WDNR BRRTS GIS registry. Fish advisories will need to be re-evaluated based on results of fish tissue monitoring as deemed necessary. Maps depicting the current conditions of the site and areas which do not allow for UU/UE for the areas where remediation is ongoing will be developed once construction is completed for OUs 4 and 5.

Long-Term Stewardship: The draft ICIAP for OU 1 and the approved ICIAP for OUs 2 through 5 require annual certifications to be submitted to the Response Agencies providing evaluations of ICs for effectiveness and compliance by the RPs.

Systems Operations/Operation & Maintenance

After construction completion and verification that the 2007 and 2008 ROD Amendments' RAL and/or SWAC standards have been met, the Site will be monitored on a regular basis. For OU 1, the construction of the remedial action was approved in 2010 with the approval of the Lower Fox River Operable Unit 1, Remedial Action Certification of Completion Report. There will also be a final construction report for OUs 2-5 following completion of the construction work in those OUs.

A long-term monitoring (LTM) plan identifies the LTM activities to be conducted as long as PCBs are present at the Site. LTM has begun for OU 1, OU 2, and OU 3. Completion of the remedial action construction work in OUs 4-5 should complete cleanup work at the site. Following the completion of remedial action construction work, additional information to be obtained will consist of the following:

- Post-remediation sampling of residual sediments in dredged areas that do not have a cap or sand cover will be performed immediately after dredging. The LTM plan requires long-term sediment monitoring of the MNR areas only (OU 2 and OU 5). EPA's Field Environmental Decision Support Team performed post-remediation sediment sampling in OU 1 and OU 3 in only the soft sediment areas (not in capped areas).
- Post-construction monitoring to determine if caps are installed as designed.
- Long-term monitoring of caps to confirm their containment effectiveness. If necessary, additional maintenance of caps will be conducted.
- Long-term monitoring of surface water and fish tissue for confirmation of environmental improvements.

These same monitoring activities are also being conducted at OU 1, OU 2 and OU 3, post-construction monitoring began in 2010 at OU 1 and in 2012 at OU 2 and OU 3. Monitoring activities for remaining OUs are to follow. System operation and maintenance of an active treatment system is not required, as the remedy is dredging (*i.e.*, removal) and capping (containment). As discussed above, an LTM plan has been developed for sampling and analysis of surface water, fish tissue, and sediment and will be implemented as long as PCBs are present at the site above cleanup levels.

III. PROGRESS SINCE THE LAST REVIEW

The protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations are provided in Tables 4 and 5 below.

Table 4: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Not Protective	This FYR found that the remedy at OUs 1-5 is not protective of human health and the environment. While the remedy is currently being implemented and constructed in accordance with the requirements of the decision documents and design specifications, current levels of PCBs in fish tissue, sediments, and surface water indicate that the remedy is not protective. Although there are fish consumption advisories in place and warning signs posted along the river, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in fish, sediments and surface water. In order for the remedy to be protective, the following actions need to be taken: the remedy needs to be fully implemented; monitoring data needs to show that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents; and effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as

OU #	Protectiveness Determination	Protectiveness Statement
		maintaining the remedy components (*i.e.*, caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

Table 5: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1, 2, 3, 4, and 5	Current PCB concentrations in fish tissue, sediments, and surface water indicate that the remedy is not currently protective and RAOs have not been met.	Complete implementation of the remedy to address PCB-contaminated sediments and address ongoing unacceptable exposures	Ongoing	Remedial Action construction activities have been finalized for OUs 1 through 3. Remediation is currently ongoing in OU 4 and began in OU 5 in 2019. Remedial action for OUs 4 and 5 is expected to be completed in 2020. When OU 1 was completed in May 2009 it had achieved the RAO SWAC of 0.25 ppm for PCBs.	NA
1, 2, 3, 4, and 5	ICIAP has not been fully implemented	Implement the portions of the OUs 2 through 5 ICIAP that have not yet been implemented. Approve and implement OU 1 ICIAP.	Under Discussion	The responsible parties have submitted the draft ICIAP for OU 1 and it is currently under review. The ICIAP for OUs 2 through 5 was approved on 10/12/2012, however implementation has not begun since construction activities for OUs 2 through 5 have not been completed.	NA

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by a newspaper posting in the *Green Bay Press Gazette* on 11/21/2018, stating that there was a FYR underway and inviting the public to submit any comments to EPA. The results of the review and the report will be made available at the Site information repositories located at:

Appleton Public Library
225 N. Oneida St.
Appleton, WI
920-832-6173

Brown County Library
515 Pine St.
Green Bay, WI

Door County Library
107 S. Fourth Ave.
Sturgeon Bay, WI

Oneida Community Library
201 Elm St.
Oneida, WI

Oshkosh Public Library
106 Washington Ave.
Oshkosh, WI

Further information regarding recent site construction and remediation-related activities can be found at the following EPA Region 5 website: http:// www.epa.gov/superfund/fox-river

Additionally, the RPs currently doing work at OUs 4-5 post photos and site construction updates at the following website, maintained by the RPs: http://www.foxrivercleanup.com

Data Review

LONG-TERM MONITORING

The LTM program measures progress towards RAOs that are based on surface water and fish tissue PCB concentrations. The three RAOs considered in LTM include the following:

- Monitor reductions in surface water and fish tissue PCB concentrations;
- Monitor progress toward achieving human health risk reduction goals; and
- Monitor progress toward achieving ecological risk reduction goals.

Baseline Monitoring Program

Between August 2006 and June 2007, a coordinated baseline monitoring program of water column and fish tissue PCB concentrations was conducted by the RPs throughout the entire LFR, in accordance with the Baseline Monitoring Program (BMP). These data were to be used as a baseline to monitor future progress toward achieving agency-established RAOs for the LFR. The 2006-2007 baseline data were collected during active remediation of OU 1. To address concerns by stakeholders that baseline data might have been affected by remediation work and thus might not accurately reflect pre-remedial conditions, a statistical analysis of historical water and fish tissue PCB data was conducted by WDNR (*Project Effectiveness Evaluation - Fish, Water and Sediment Draft - Lower Fox River Little Lake Buttes des Morts/OU 1*, WDNR, 2011). The objective of the analysis was to evaluate the post-remediation data in the context of the historical record. Observations regarding the baseline data with the historical record were also made in the analysis.

Baseline Monitoring Water Data

The BMP required monthly water quality monitoring for all 12 calendar months. Subsequent data analysis showed that, in part, because of less desorption of PCBs in cold temperatures, the water quality

data to best conservatively estimate annual PCB water concentrations flowing through the LFR were those collected during the eight "warm" months of the year (April through November, inclusive). Further, ice conditions made sampling in the winter months dangerous. Water quality and field parameters (Total PCBs, Total Organic Carbon [TOC], Total Suspended Solids [TSS], temperature, turbidity, and flow) for these eight months were taken from the *Baseline Monitoring Report*.

The baseline range in water column blank-corrected total PCB concentrations was 0.07-0.75 nanogram per liter (ng/L) (median 0.14 ng/L) in Lake Winnebago, 1.35-10.45 ng/L (median 5.13 ng/L) in OU 1, 1.50-11.20 ng/L (median 4.68 ng/L) in OU 2A, 1.87-11.91 ng/L (median 5.66 ng/L) in OU 2B, 1.86-13.97 ng/L (median 5.15 ng/L) in OU 2C, and 2.05-12.32 ng/L (median 7.58 ng/L) in OU 3.

Baseline Monitoring PCB Correlations and Controlling Variables

Baseline monitoring conducted by the RPs demonstrated that temperature and TSS concentrations exert the greatest controlling influence on total PCB concentrations in the water column. The correlation with flow was much weaker, which was attributed to contradictory influences throughout the year. For example, low flows during late summer occur during the period of highest temperatures, leading to high PCB concentrations, whereas high flows during spring runoff can cause higher suspended sediment concentrations in the river and thereby contribute to higher PCB concentrations. In addition, higher flows can reduce concentrations by dilution. Whether the PCB inputs to the river are due to porewater flux or sediment resuspension will also affect the correlation. Thus, the relationship between flow and PCB concentration is complex.

Baseline Monitoring Fish Tissue Data

Fish tissue summary statistics comprise total PCB Aroclor concentrations, lipid content, fish length, and fish weight, sorted by location and species, and based on data from the *Baseline Monitoring Report*. As set forth in the report, the baseline ranges in fish tissue comprise the following total PCB concentrations:

- **Walleye:** <19-36 microgram per kilogram (µg/kg) (median 20 µg/kg) in Lake Winnebago and 21-340 µg/kg (median 140 µg/kg) in OU 1.
- **Smallmouth Bass:** <19-70 µg/kg (median 20 µg/kg) in Lake Winnebago and 20-540 µg/kg (median 160 µg/kg) in OU 1.
- **Carp:** 28-46 µg/kg (median 36 µg/kg) in Lake Winnebago and 300-3600 µg/kg (median 1,750 µg/kg) in OU 1.
- **Drum:** 110-250 µg/kg (median 170 µg/kg) in Lake Winnebago and 160-650 µg/kg (median 445 µg/kg) in OU 1.
- **Gizzard Shad:** <19-33 µg/kg (median 26 µg/kg) in Lake Winnebago and 790-1000 µg/kg (median 895 µg/kg) in OU 1.
- **Walleye:** <19-36 microgram per kilogram (µg/kg) (median 20 µg/kg) in Lake Winnebago, 97-800 µg/kg (median 300 µg/kg) in OU 2A, 21-480 µg/kg (median 130 µg/kg) in OU 2B, 130-1800 µg/kg (median 380 µg/kg) in OU 2C, and 250-2000 µg/kg (median 450 µg/kg) in OU 3.
- **Smallmouth Bass:** <19-70 µg/kg (median 20 µg/kg) in Lake Winnebago, 96-530 µg/kg (median 200 µg/kg) in OU 2A, 110-320 µg/kg (median 210 µg/kg) in OU 2B, 71-470 µg/kg (median 140 µg/kg) in OU 2C, and 66-370 µg/kg (median 190 µg/kg) in OU 3.
- **Carp:** 28-46 µg/kg (median 36 µg/kg) in Lake Winnebago, 2100-11000 µg/kg (median 2400 µg/kg) in OU 2A, 800-1500 µg/kg (median 1200 µg/kg) in OU 2B, 670-1500 µg/kg (median 930 µg/kg) in OU 2C, and 590-1600 µg/kg (median 970 µg/kg) in OU 3.

- **Drum:** 110-250 µg/kg (median 170 µg/kg) in Lake Winnebago, 770-2300 µg/kg (median 1100 µg/kg) in OU 2A, 310-1300 µg/kg (median 580 µg/kg) in OU 2B, 590-1700 µg/kg (median 1100 µg/kg) in OU 2C, and 460-2000 µg/kg (median 1400 µg/kg) in OU 3.
- **Gizzard Shad:** <19-33 µg/kg (median 26 µg/kg) in Lake Winnebago, 180-550 µg/kg (median 300 µg/kg) in OU 2A, 89-130 µg/kg (median 98 µg/kg) in OU 2B, <19-190 µg/kg (median 100 µg/kg) in OU 2C, and 190-870 µg/kg (median 400 µg/kg) in OU 3.

OU 1 LTM

Surface Water

Water quality results indicated that 2010 (year 0) concentrations in OU 1 significantly decreased from those observed during the 2006-2007 baseline. Statistical modeling determined that OU 1 2010 uncorrected PCB concentrations decreased approximately 52% to 87% (95% confidence interval) over baseline conditions. The decrease in OU 1 water column PCB concentration was consistent with the broader statistical analysis of historical data from water samples collected between 1989 and 2010. WDNR study showed water column PCB concentrations in 2010 for OU 1 were 30% lower than the expected trend. In 2012, water quality results indicated that PCB concentrations in OU 1 significantly decreased from those observed during the 2006-2007 baseline. Statistical modeling determined that OU 1 2012 uncorrected PCB concentrations have decreased approximately 71% to 85% (95% confidence interval) over baseline conditions. The decrease in OU 1 water column PCB concentration is consistent with the broader statistical analysis of historical data from water samples as provided by the WDNR study. An evaluation of the post-remedial recovery rate was estimated with an exponential decay function, comparing the recovery rate trend to SWAC-reduction goals and background conditions. The Fox River LTM plan exit criteria for water are comparisons to background concentrations and SWAC-reduction targets. The projected recovery rate trend line met these criteria in the year 2014. In addition, the projected recovery rate trend line meets Lake Winnebago background average results in March 2022. Therefore, the recovery rate exit criteria for water, assessed from evaluation of the exponential decay trend, are expected to be met well within a 30-year post-remediation period. Surface water quality results indicate that year 2018 concentrations significantly decreased from those observed during the 2006-2007 baseline. When considering method blank correction (for both the baseline and 2018 datasets), statistical modeling determined that year 2018 PCB concentrations are estimated to have decreased from baseline conditions (after accounting for fluctuations in the covariates) for OU 1, 90% and without blank correction, the respective surface water PCB concentration reductions were 85% for OU 1. While 2018 PCB concentrations in surface water illustrate a very significant decrease for the OUs, concentrations remain elevated over background conditions of Lake Winnebago. As a percentage difference over Lake Winnebago, PCB concentrations in 2018 remain approximately 160% higher for OU 1. Given the observed recovery rates and trends, PCB concentrations are at or near these criteria in OU 1.

Fish Tissue

An evaluation of the post-remedial recovery rate was performed for carp, gizzard shad and walleye, comparing the recovery rate trend to risk-based concentrations, SWAC-reduction goals, or background conditions. The recovery rate was estimated with an exponential decay function. The concentration trend for carp was below ecological target concentrations, but based on the recovery rate trend line, is not expected to achieve background conditions within a 30-year post-remedy time frame. However, there is a large amount of uncertainty with the projected trend line which was estimated from carp data that may

have had cumulative effects associated with the pre-remedial higher concentration environment. As younger carp which have not been subjected to these cumulating effects are sampled, the projected trend line may shift down substantially, implying carp recovery to background concentrations at an earlier time. Gizzard shad concentrations in 2012 met each of the Fox River LTM plan exit criteria with SWAC reduction goals and background conditions. The recovery rate trend line for walleye met human health target concentrations and background conditions within a 30-year post-remedy time frame. The post-remedial recovery rate trends which were observed make sense given the ecological niche of the species examined, with more quickly decreasing trends observed for gizzard shad, moderate decreasing trends observed for walleye and more slowly decreasing trends observed for carp. Gizzard shad, being collected as the young of year (YOY) species, reflected only the current conditions. Correspondingly, gizzard shad met SWAC reduction goals and were not statistically different than Lake Winnebago concentrations. Walleye reflected a species more on top of the food chain and subsequently reflected a more intermediate trend line than gizzard shad. Average walleye concentrations were below the human health risk goal and concentrations were projected to meet background criteria within the 30-year post-remedy time interval. Carp, being bottom feeders with relatively longer life spans, reflected a species still affected by any residual sediment PCBs and also were more directly affected by the higher pre-remedial sediment concentrations. As a result, the projected time length required to achieve the background criteria for carp in 2012 was beyond the 30-year post-remedy time interval. Although the surrogate parameter of length was included in the trend analysis, the longevity of carp may not be fully captured with carp being known to survive for many years. As a result, the correction for age may have been incomplete and the trend line as of 2012 overestimated the time length required to achieve the background criteria. Fish tissue concentrations also decreased between baseline and 2018, with reductions in PCB concentrations being dependent on the fish species. Estimated concentration decreases between baseline and 2018 for OU 1 were:

- Carp: 88%
- Drum: 17%
- Gizzard Shad: 98%
- Smallmouth Bass: 65%
- Walleye: 68%

The 2018 upper 95% confidence limits for carp (258 µg/kg for OU 1) was well below the 7,600 µg/kg Lowest Observed Adverse Effects Concentration (LOAEC) level established for protection of ecological health by the Lower Fox River Ecological Risk Assessment. Therefore, fish tissue PCB concentrations in OU 1 have achieved the ecological risk reduction goals. Similar to surface water quality results, while the 2018 PCB concentrations in fish illustrate a significant decrease over the baseline data, concentrations remain elevated over the 2018 background conditions of Lake Winnebago. Estimated concentration differences over Lake Winnebago for year 2018 for OU 1 are shown below:

- Carp: 360%
- Drum: 280%
- Gizzard Shad: 74%
- Smallmouth Bass: 390%
- Walleye: 260%

An evaluation of the post-remedial recovery rate was performed for walleye, comparing the recovery rate trend to risk-based concentrations, SWAC-reduction goals, or background conditions. The recovery rate was estimated with an exponential decay function. For walleye, the trend lines illustrated projected

concentrations dropping below both the human health target risk goal of 50 µg/kg and Lake Winnebago background average (updated to include LTM data through the current Year 2018 event) of 41 µg/kg for OU 1 prior to the next LTM event. Additional monitoring will determine whether these trend rates continue and whether the LTM program may warrant revision.

Capped Areas

The objective of the COMMP is to ensure that the engineered cap areas retain their physical integrity and protectiveness over time. Single- and multi-beam hydrographic surveys of test cap and cap placement areas of OU 1 performed after completion of the remedial action at OU 1 showed that cap consolidation is nearly complete, and that none of the CCUs experienced erosion of more than 5% of the CCU area. The 113.9-acre OU 1 cap placement areas, therefore, were found to be performing as designed.

OU 2 LTM

Surface Water

Water quality results indicated that Year 2012 (year 0) concentrations significantly decreased from those observed during the 2006-2007 baseline. Statistical modeling determined that Year 2012 uncorrected PCB concentrations are estimated to have decreased from baseline conditions approximately 74% for OU 2A, 66% for OU 2B, and 72% for OU 2C. While 2012 PCB concentrations in water illustrate a very significant decrease for OU 2, concentrations remain elevated over background conditions of Lake Winnebago. As a percentage difference over Lake Winnebago, PCB concentrations in 2012 remain approximately 580% higher for OU 2A, 930% for OU 2B, 690% for OU 2C. Water quality results indicate that both year 2014 and 2018 concentrations significantly decreased from those observed during the 2006-2007 baseline. Statistical modeling determined that year 2014 PCB concentrations are estimated to have decreased from baseline conditions by approximately 88% for OU 2A, 83% for OU 2B, and 85% for OU 2C. When considering method blank correction (for both the baseline and 2018 datasets), statistical modeling determined that year 2018 PCB concentrations are estimated to have decreased from baseline conditions (after accounting for fluctuations in the covariates) by 90% for OU 2A, 89% for OU 2B, and 89% for OU 2C. Without blank correction, the respective surface water PCB concentration reductions are 87% for OU 2A, 86% for OU 2B, and 85% for OU 2C. While 2018 PCB concentrations in surface water illustrated a very significant decrease for OU 2, concentrations remain elevated over background conditions of Lake Winnebago. As a percentage difference over Lake Winnebago, PCB concentrations in 2018 remained approximately 300% for OU 2A, 450% for OU 2B, and 390% for OU 2C (all values based on data not blank-corrected). An evaluation of the post-remedial recovery rate of surface water was estimated with an exponential decay function, comparing the recovery rate trend to SWAC-reduction goals and background conditions from Fox River LTM plan exit criteria. Given the observed recovery rates and trends, PCB concentrations are at or near these criteria in OU 2.

Fish Tissue

The 2014 upper 95% confidence limits for carp (2490 µg/kg for OU 2A, 701 µg/kg for OU 2B, and 676 µg/kg for OU 2C) were below the 7,600 µg/kg LOAEC level established for protection of ecological health by the Lower Fox River Ecological Risk Assessment. Therefore, fish tissue PCB concentrations in OU 2 have achieved the ecological risk reduction goals. Similar to water quality results, while the

2014 PCB concentrations in fish illustrate a significant decrease over the baseline data, concentrations remain elevated over the 2014 background conditions of Lake Winnebago. With the gizzard shad results, OU 2 showed strong progress towards achieving Lake Winnebago concentrations, with OU 2B having no statistical difference from Lake Winnebago. Estimated concentration differences over Lake Winnebago for year 2014 are shown below:

OU 2A:

- Carp: 610%
- Gizzard Shad: 120%

OU 2B:

- Carp: 340%
- Gizzard Shad: Not Statistically Different (with $\alpha = 0.05$)
- Walleye: 750%

OU 2C:

- Carp: 880%
- Gizzard Shad: 74%
- Walleye: 580%

No comparisons were made for walleye in OU 2A, as walleye were not present in OU 2A in 2014. No comparisons were made for smallmouth bass in OU 2A as smallmouth bass were not collected in Lake Winnebago in 2014. An evaluation of the post-remedial recovery rate was performed for carp, gizzard shad, smallmouth bass and walleye, comparing the recovery rate trend to risk-based concentrations, SWAC-reduction goals, or background conditions. The recovery rate was estimated with an exponential decay function. The concentration trend for carp was already below ecological target concentrations for OU 2 and was projected to reach Lake Winnebago average concentrations in approximately 30 years for OU 2A and approximately 20 years for OU 2B. The recovery rate trend line at the time was not projected to achieve background conditions within a 30-year post-remedy time frame for OU 2C. Similarly, the estimated decay trend line for carp was not projected to reach Lake Winnebago average concentrations within the 30-year post-remedy time interval. The variation in the sample datasets for carp in OU 2C and smallmouth bass in OU 2A precluded the ability, at the time, to project with statistical confidence, the time when background conditions would be met. However, additional long-term monitoring data from future events, along with the anticipated natural elimination of older fish from the population, should clarify the actual concentration trend. Gizzard shad concentrations in 2014 did not meet background criteria for OU 2B and based on the estimated recovery rate trends were projected to fall below this criterion for OU 2A and OU 2C before the next LTM event. For smallmouth bass in OU 2A, estimated recovery rate trends were not projected to reach the updated background average for Lake Winnebago within the 30-year post-remedy time interval. (No background criteria are given for smallmouth bass in the Fox River LTM plan.) Future monitoring data are necessary to determine whether the estimated concentration trend line will continue at the 2014 rate, or whether sharper concentration reductions are observed. The recovery rate trend line for walleye was projected to meet human health target concentrations and background conditions within 15 years for OU 2B and within 25 years for OU 2C.

Fish tissue concentrations also decreased between baseline and 2018, with reductions in PCB concentrations being dependent on the fish species. Estimated concentration decreases between baseline and 2018 are:

OU 2A:

- Carp: 91%
- Drum: No Sample Data for OU 2A in 2018
- Gizzard Shad: 88%
- Smallmouth Bass: 58%
- Walleye: 79%

OU 2B:

- Carp: 85%
- Drum: 68%
- Gizzard Shad: 70%
- Smallmouth Bass: 59%
- Walleye: 28%

OU 2C:

- Carp: 72%
- Drum: 37%
- Gizzard Shad: 72%
- Smallmouth Bass: 51%
- Walleye: 65%

The 2018 upper 95% confidence limits for carp (1150 µg/kg for OU 2A, 411 µg/kg for OU 2B, and 646 µg/kg for OU 2C) are well below the 7,600 µg/kg LOAEC level established for protection of ecological health by the Lower Fox River Ecological Risk Assessment. Therefore, fish tissue PCB concentrations in OU 2 have achieved the ecological risk reduction goals. Similar to surface water quality results, while the 2018 PCB concentrations in fish illustrate a significant decrease over the baseline data, concentrations remain elevated over the 2018 background conditions of Lake Winnebago. Estimated concentration differences over Lake Winnebago for year 2018 are shown below:

OU 2A:

- Carp: 480%
- Drum: No Sample Data for OU 2A in 2018
- Gizzard Shad: 120%
- Smallmouth Bass: 370%
- Walleye: 270%

OU 2B:

- Carp: 430%
- Drum: 260%
- Gizzard Shad: 56%
- Smallmouth Bass: 390%
- Walleye: 360%

OU 2C:

- Carp: 750%
- Drum: 490%

- Gizzard Shad: 530%
- Smallmouth Bass: 510%
- Walleye: 430%

The 2018 monitoring of gizzard shad resulted in higher uncertainty due to smaller sample sizes in OU 2A and OU 2B, and higher than previously observed lipid values in OU 2A and OU 2C. Accurate estimates in the PCB percent increase over Lake Winnebago was difficult for gizzard shad, even though the regression analysis attempted to account for lipids as a covariate. An evaluation of the post-remedial recovery rate was performed for walleye, comparing the recovery rate trend to risk-based concentrations, SWAC-reduction goals, or background conditions. The recovery rate was estimated with an exponential decay function. For walleye, the trend lines illustrate projected concentrations dropping below both the human health target risk goal of 50 µg/kg and Lake Winnebago background average (updated to include LTM data through the current Year 2018 event) of 41 µg/kg for OU 2A prior to the next LTM event. The trends are projected to reach these levels within approximately 10 years for OU 2B and within approximately 15 years for OU 2C. Additional monitoring will determine whether these trend rates continue and whether the LTM program may warrant revision.

Monitored Natural Recovery Areas and Cap Chemical Isolation Layer

MNR area sampling in OU 2 during 2014 and 2018 indicated that, in all cases, surficial sediment samples collected during 2014 and 2018 at the same, or proximal locations collected in 1989/1990, were lower in PCB concentrations (total Aroclors) than the 1989/1990 data, supporting a conclusion that natural recovery of surface sediments is occurring in OU 2. To further support this conclusion, the majority of locations sampled indicated PCB concentrations have decreased both from 2012 to 2014 and from 2014 to 2018, with anticipated minor fluctuations occurring in the LTM data in all OUs due to slight changes in sample location, natural depositional/ erosional processes, and the low level of PCB concentrations being detected.

OU 3 LTM

Surface Water

Water quality results indicated that all Year 2012, 2014, and 2018 concentrations were significantly decreased from those observed during the 2006-2007 baseline. Statistical modeling determined that Year 2012 uncorrected PCB concentrations were estimated to have decreased from baseline conditions approximately 72% for OU 3 and that year 2014 PCB concentrations were estimated to have decreased by approximately 83%. When considering method blank correction (for both the baseline and 2018 datasets), statistical modeling determined that year 2018 PCB concentrations are estimated to have decreased from baseline conditions (after accounting for fluctuations in the covariates) by 88% for OU 3. While 2018 PCB concentrations in surface water illustrated a very significant decrease for OU 3, concentrations remain elevated over background conditions of Lake Winnebago. As a percentage difference over Lake Winnebago, PCB concentrations in 2018 remained approximately 480% for OU 3 (all values based on data not blank-corrected). An evaluation of the post-remedial recovery rate of surface water was estimated with an exponential decay function, comparing the recovery rate trend to SWAC-reduction goals and background conditions from Fox River LTM plan exit criteria. Given the observed recovery rates and trends, PCB concentrations are at or near these criteria in OU 3.

Fish Tissue

Significant explainable variation in the fish tissue PCB data is controlled for in the statistical analyses by identifying covariates that correlate with PCB concentrations. Fish length and lipid content were assessed as covariates and used in several models. As with the regression model development for water quality, an exponential model was chosen for the fish tissue data with the main factors of interest being sampling location and sampling event date. Fish tissue concentrations decreased between the baseline sampling and 2014, with reductions in PCB concentrations being dependent on the fish species. Estimated concentration decreases between baseline and 2014 for OU 3 were:

- Carp: 47%
- Gizzard Shad: 81%
- Walleye: No Statistically Significant Reduction

The 2014 upper 95% confidence limits for carp (1070 µg/kg for OU 3) were below the 7,600 µg/kg LOAEC level established for protection of ecological health by the Lower Fox River Ecological Risk Assessment. Therefore, fish tissue PCB concentrations in OU 2 have achieved the ecological risk reduction goals. An evaluation of the post-remedial recovery rate was performed for carp, gizzard shad, smallmouth bass and walleye, comparing the recovery rate trend to risk-based concentrations, SWAC-reduction goals, or background conditions. The recovery rate was estimated with an exponential decay function. The concentration trend for carp was below ecological target concentrations for OU 3. The 2014 recovery rate trend line did not achieve background conditions within a 30-year post-remedy time frame for OU 3. Similarly, the estimated decay trend line for carp did not reach Lake Winnebago average concentrations within the 30-year post-remedy time interval. The variation in the sample datasets for carp in OU 3 precluded the ability, at the time, to project with statistical confidence, the time when background conditions were to be met. However, additional long-term monitoring data from future events, along with the anticipated natural elimination of the older fish from the population, should clarify the actual concentration trend. Estimated recovery rate trends for gizzard shad were projected to fall below the criterion for OU 3 by the year 2017. The recovery rate trend line for walleye was projected to meet human health target concentrations and background conditions within 25 years for OU 3.

Fish tissue concentrations also decreased between baseline and 2018, with reductions in PCB concentrations being dependent on the fish species. Estimated concentration decreases between baseline and 2018 for OU 3 are:

- Carp: 57%
- Drum: 49%
- Gizzard Shad: 70%
- Smallmouth Bass: 68%
- Walleye: 77%

The 2018 upper 95% confidence limits for carp (788 µg/kg for OU 3) are well below the 7,600 µg/kg LOAEC level established for protection of ecological health by the Lower Fox River Ecological Risk Assessment. Therefore, fish tissue PCB concentrations in OU 3 have achieved the ecological risk reduction goals. Similar to surface water quality results, while the 2018 PCB concentrations in fish illustrate a significant decrease over the baseline data, concentrations remain elevated over the 2018

background conditions of Lake Winnebago. Estimated concentration differences over Lake Winnebago for year 2018 for OU 3 are shown below:

- Carp: 800%
- Drum: 400%
- Gizzard Shad: 1500%
- Smallmouth Bass: 420%
- Walleye: 190%

The 2018 monitoring of gizzard shad resulted in higher uncertainty due to higher than previously observed lipid values in OU 3. Accurate estimates in the PCB percent increase over Lake Winnebago was difficult for gizzard shad, even though the regression analysis attempted to account for lipids as a covariate. The trends for walleye reach these levels within approximately 10 years for OU 3. Additional monitoring will determine whether these trend rates continue and whether the LTM program may warrant revision.

Monitored Natural Recovery Areas and Cap Chemical Isolation Layer

Chemical Isolation Layer (CIL) sampling in three select Cap B areas in OU 3 in 2012, 2014, and 2018 indicated that measurable levels of PCBs in the 2-inch segment of the sand CIL analyzed at each location were not present. The results of this study supported a conclusion that the method of placement of the CIL and the methods used to sample the CIL for this study (diver assisted coring) have resulted in measurable conditions consistent with the requirements for chemical isolation of PCBs in Type B caps in OU 3. That is, a "clean" sand CIL of the required thickness is present above PCBs in the underlying sediment bed after being in place for up to 8 years.

COMMP

Long-term monitoring of engineered caps installed in OUs 1, and 3-5 will be performed to ensure their long-term integrity and protectiveness. However, sand covers (placed as the primary remedy or as a post-dredge residuals management technique) will not require long-term monitoring or maintenance, consistent with the ROD Amendment. Baseline cap conditions are to be established immediately following cap placement (*i.e.,* during the season in which they are installed and designated as year 0) using pre- and post-cap bathymetric surveys and physical cap material thickness measurements. The long-term monitoring of engineered caps includes bathymetric surveys (primarily using hydrographic methods supplemented with manual survey or poling, as necessary), of the cap surface to monitor the integrity and surface elevation of the caps, beginning in Year 2 following construction, continuing at Year 4, and then approximately every 5 years thereafter unless monitoring indicates a reduced frequency is appropriate. If an area appears to be disturbed, geophysical surveying and/or diver-assisted inspection may also be performed to better understand the mechanism(s) responsible for the disturbance and the extent of the disturbance. Given that completion of capping has spanned approximately 10 years (beginning in 2010 and continuing into 2019), the initial (*i.e.,* Year 2) monitoring has occurred and will occur independently within groups of cap certification units (CCUs) completed within the same year of construction. However, subject to adaptive management and the Response Agencies' approval, follow-up monitoring of CCUs completed in different years may potentially be combined to more efficiently monitor the caps. If post-construction monitoring or other information indicates that the cap in an area no longer meets its original performance criteria and that degradation of the cap may result in an actual or threatened release of PCBs exceeding the 1.0 ppm RAL

to the sediment surface, additional response activities, potentially including cap sampling where feasible, will be undertaken in the affected area. These additional response actions will be subject to collaborative workgroup discussion and the Response Agencies' approval.

OU 1 Caps

Assessment of cap integrity for OU 1 for Year 0 (2010) indicated, that for all CCUs, less than 5% of the area had failed due to erosion or other type of damage at a level detectable within the sensitivity of the hydrographic survey. All CCUs within the 2008 cap placement areas indicated that in over 95% of the area, survey differences were less than the expected vertical survey error of 0.4 feet as reported by the equipment manufacturers plus the single to multi-beam survey bias of 0.12 feet, plus the consolidation estimate of 0.5 feet (total of 0.57 feet). All CCUs within the 2009 cap placement areas indicated that in over 95% of the area, survey differences are less than the expected survey equipment error (0.4 feet), plus the single to multi-beam bias (0.12 feet), plus the observed 2009 consolidation estimate of 0.32 feet (total of 0.84 feet). Similarly, all of the 2007 cap test areas indicate that in over 95% of the area, survey differences are less than the expected survey error of 0.28 feet, plus the consolidation estimate of 0.09 feet (total of 0.37 feet).

For Year 1 (2011) of the OU 1 COMMP, the poling indicated cap armor was present at all poling locations. A lower statistical confidence limit on the poling data confirmed that a minimum 95% of the cap area maintained armor with 95% confidence. At least 95% of each CCU area retained its physical integrity as measured by the observed survey differences between the 5-year flow event (July 2011) and the Year Zero event (June 2010). In all cases, 95% of the observed differences did not exhibit a decrease of greater than the 0.39 foot differential accuracy between the two surveys. This included the 2007 pilot areas (CCUs 1A, 1B, and 2), the 2008 cap placement areas (CCUs 1 through 27) and the 2009 cap placement areas (CCUs 28 through 38). This finding confirmed that, within the framework established for performing the cap integrity assessment, none of the OU 1 capped areas has experienced more than 5% erosion or other damage. Therefore, there is no evidence to suggest that the cap is not functioning as designed following the 2011 5-year flow event. A general trend of decreasing elevations was observed between CCUs 25 through 37, indicating some consolidation likely occurred in these areas subsequent to the June 2010 survey. The 5-year flow event survey was completed in July 2011. The next routine cap monitoring survey for OU 1 was scheduled for 2012. However, due to the close proximity of these two dates, the Response Agencies agreed that the 2011 5-year flow event survey serves as both the event-based survey and the 2012 routine monitoring survey. Based on the previous conclusions and the requirements of the COMMP, the next event-based cap monitoring will occur following a 50-year flow event. Based on the COMMP schedule established by the Response Agencies, the next routine COMMP hydrographic survey took place in 2018.

OU 2 Caps

Caps constructed for OU 2 are located immediately upstream from OU 3 and did not require monitoring. These areas contained high quantities of debris and since the completion of cap construction at OU 2 have been turned into ecological habitat.

OU 3 Caps

The Year 0 (2011) survey work was completed to serve as the baseline post-construction survey for engineered caps in OU 3. The data indicated that when applying approved statistical procedures, the

minimum cap aggregate thicknesses were achieved in all cases. The hydrographic survey data collected for the Year 0 cap monitoring indicated that the cap material in place met the performance standards set forth in the *Lower Fox River Remedial Design 100% Design Report* and the COMMP, and no irregularities were identified. These surveys serve as the baseline for later surveys to assess long-term cap performance.

For Year 3 (2014) of the OU 3 COMMP, poling indicated cap armor was present at all 102 poling locations. This finding supported the conclusion that decreased elevations at CCUs between the 2014 and 2011 hydrographic surveys reflect settlement caused by consolidation of the soft sediments that underlie the cap rather than cap erosion. A lower statistical confidence limit on the poling data confirmed that a minimum 95% of the capped areas in OU 3 maintained armor with greater than 95% confidence. A direct comparison of the 2011 and 2014 hydrographic surveys indicated there were several CCUs for which greater than 5% of the area decreased in elevation, beyond the range of the combined survey vertical uncertainty level. This is the case for CB3A, CB3B, CB5, CA6, CA13A, CA13B, CA13C, CA13E, CA15, CA16A, CB31 and CA69. Of these CCUs, the largest average differences were observed for CB3A, CB3B, CA13A, CA13C, CA13E, CA15 and CA69. A comparison of the 2014 hydrographic survey data with the 2012 Warranty Survey data illustrated that between 2012 and 2014, with the exception of CA69, at least 95% of the area for all CCUs maintains settling levels of no greater magnitude than the combined survey vertical accuracy. As stated, poling conducted in 2014 indicates cap armor is present at all poling locations. This finding confirms that, within the framework established for performing the cap integrity assessment, none of the OU 3 capped areas has experienced more than 5% erosion or other damage and caps are performing as designed. The general settling for each CCU observed between 2012 and 2014 slowed considerably (consistent with the anticipated slowing rate of consolidation of the underlying soft sediments) from that observed between 2011 and 2012. After accounting for an estimated factor of bias between the 400 kHz survey (collected in 2014 and 2012) and the 200 kHz survey (collected in 2011 for all CCUs and in 2012 for CA69), the degree of settling between 2012 and 2014 was approximately 50% or less of the 2011 to 2012 values for all CCUs except CA6, CA13C and CA69. Based on the available flow data from the United States Geological Service (USGS) for the Fox River, OU 1 to OU 4, the responsible party was unable to confirm that the 20-year flow monitoring event was triggered in OU 3 between the Year 0 and Year 3 surveys. However, the limited data available suggested that the 20-year flow event was not triggered in OU 3. Because USGS discontinued monitoring at the Rapide Croche station in OU 3, the responsible party anticipates working collaboratively with the Response Agencies to develop an alternative method for determining flows in OU 3. The responsible party anticipates working collaboratively with the response agencies to establish sentinel cap areas to be monitored during flow-induced COMMP events. Implementation of the Year 0 to Year 3 cap monitoring in OU 3 indicated that the caps have performed consistent with their design. Following completion of the 2014 cap monitoring, there is no indication of need for additional investigation of the integrity of the caps or for repair.

OU 4 Caps

The Year 0 (2013-2014 Upper OU 4) survey work was completed to serve as the baseline post-construction survey for engineered caps in Upper OU 4 in years 2013 through 2014. The data indicated that when applying approved statistical procedures (i.e., summary statistics), the minimum cap aggregate thicknesses were achieved in all cases. The hydrographic survey data collected for the Year 0 cap monitoring indicated that the cap material in place met the performance standards set forth in the *Lower Fox River Remedial Design 100% Design Report* and the COMMP, and with the exception of CA27B no irregularities were identified. These surveys serve as the baseline for future surveys to assess long-term cap performance.

The subsequent routine post-cap monitoring event, required by the COMMP (Year 2), was completed in October and December 2016 over the 52.3 acres of engineered caps placed in the Upper OU 4 during 2013 and 2014, following nearly identical protocols for Year 0. Results of the comparison of the Year 0 (2013-2014) and Year 2 (2016) hydrographic surveys showed general cap settling, which resulted from consolidation of the underlying soft sediment, particularly in areas CC9, CB6-1-1, CB30, CB43, CB-33, CB45-1, CA23A-1, CA27AB, and CB89A. The poling/probing survey completed in all of these areas confirmed that the armor stone (quarry spall in the case of CC9) is present at all locations measured. The results of this survey provided high confidence (exceeding 95%) that the placed armored caps were present and performing as designed. Further, the identified settlement resulting from the consolidation of the underlying soft sediment for the Upper OU 4 caps is similar to the observed consolidation at the OU 3 site. Deposition (identified as an increase in top of cap elevation in 2016 over 2014) was noted in scattered areas throughout the cap regions, particularly in Cap Area CB39 and surrounding area in CB39-1-1. Deposition in this area is expected due to the decrease in river flow caused by the widening of the river channel downstream of the De Pere Dam. Less substantial deposition occurred in areas in which deposition would be expected, including along the shoreline, at the toe of slope, and in depressions. A direct comparison of the 2014 and 2016 hydrographic surveys indicated there are several CCUs for which greater than 5% of the area had decreased in elevation, beyond the range of the combined survey vertical uncertainty level. This was the case for CBD23-1, CB6-1-1, CC9, CB30, CAD118, CA80A-1, CA80B-1, CB43, CB33, CB45-1, CA23A-1, CB45-2, CB45-3, CA24B-2, CA24C, CA27AB, CB89A and CA89B. Physical poling/probing confirmed the armor stone was present. Settling of the top elevation of these caps was therefore attributed to consolidation of the underlying soft sediment. Implementation of the Year 0 to Year 2 cap monitoring in the Upper OU 4 indicated that the 52.3 acres of Upper OU 4 caps have remained in place, consistent with their design. Following completion of the 2016 cap monitoring, there is no indication of need for additional investigation of the integrity of the caps or for repair. Based on the available flow data from USGS for the Fox River, OU 4, it was concluded that both the 20-year and 100-year flow values occurred in 2015, triggering a flow-event assessment of caps in the Upper OU 4. The Year 2 evaluation confirmed that caps placed during 2013-2014 in the Upper OU 4 remained intact and are functioning as designed following these events. As stated in the COMMP, “If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a 100-year flow event (e.g., 25,500 cfs for OU 4).” The responsible party anticipates working collaboratively with the Response Agencies to establish sentinel cap areas to be monitored during flow-induced COMMP events. Since the caps placed in the Upper OU 4 during 2013-2014 have remained in place, consistent with their design, following occurrences of both 20 and 100-year flow events, the responsible parties will only perform future flow-event based monitoring of sentinel caps following 100-year flow events, consistent with COMMP requirements.

In October and December 2017 and March 2017, (Year 0), multi-beam hydrographic surveys were completed over approximately 55.8 acres of engineered caps completed from 2015 through 2017 in Upper and Lower OU 4 to establish a baseline for future COMMP cap integrity assessments. A small portion of cap, CB28A, that lies on the upstream side of the Upper/Lower OU 4 division line is included in the Lower OU 4 evaluations. . Additionally, any potentially failing or damaged cap areas, based on a review of top of cap contours generated with hydrographic survey information, were further evaluated. Top of cap elevations indicating irregularities, such as gullies, slumping or differential settlement, were further evaluated by comparing the 2017 post-cap placement bathymetry to the most recent single-beam post-dredge or pre-cap bathymetry, as well as, in some cases, the single-beam 2016 post-cap bathymetry. Results showed that depression areas were a reflection of the river bottom topography, of

consolidation of underlying settlement, rather than the cap having been eroded, or having experienced significant differential settlement. Areas of uniform lowering of cap elevation, based on pre- and post-cap placement surveys several years apart, are to be expected due to consolidation of underlying sediment, typical of other caps placed in the LFR over areas with significant soft sediment thickness. Additionally, the use of two different methods (single and multi-beam) account for some of the discrepancy seen in top of cap elevations, and interpolation between single-beam survey lines can result in inaccuracies, especially on sloped surfaces. The hydrographic survey data collected for this Year 0 (2015-2017 Lower OU 4) Cap Integrity Assessment substantiates that the cap material in place meets the performance standards set forth in the *Lower Fox River Remedial Design 100 Percent Design Reports, Volumes 1 and 2* and the COMMP. The Year 0 (2015-2017 Lower OU 4) survey will serve as the baseline for future surveys to assess long-term performance of engineered caps completed in 2015 through 2017 in OU 4.

Site Inspection

The inspection of the Site was conducted on 5/7/2019. In attendance were Pablo N. Valentin with EPA, Rebecca Frey with EPA, Beth Olson with WDNR, Gary Kincaid with WDNR, George Berken with Boldt Co., Jeffrey T. Lawson with the Lower Fox River LLC, Michelle Miller the Records Manager with Tetra Tech, Cindy Jones the Health and Safety Manager with Tetra Tech, and Joe Francis the WWTP Manager with Tetra Tech. The purpose of the inspection was to assess the protectiveness and implementation of the remedy. The implementation of the remedy for the Site is still ongoing. Currently, the RPs are conducting remediation at OUs 4 and 5 and it is anticipated that the remedy implementation will be completed by the end of the 2019 calendar year.

During the Site inspection, EPA confirmed that the remedy continues to be implemented as planned. The site inspection checklist and site inspection pictures are included in Appendix B and Appendix C**.**

EPA discussed with Jeffrey T. Lawson, Beth Olson, and Gary Kincaid the finalization of the ICIAP for OU 1 and the implementation of the ICIAP for OUs 2 through 5. There is the need to finalize the documentation of the caps installed as part of the remedy in the WDNR BRRTS GIS registry, as well as the finalization of MOAs to establish communications protocols with the municipalities and with WDNR and USACE. EPA interviewed Michelle Miller about the project record keeping. Records are being maintained and are up to date. Records are being kept at Tetra Tech's offices located on Vernon Drive, Green Bay, Wisconsin and electronically on the site's SharePoint site. Health and Safety records and OSHA records are being maintained by Cindy Jones at the site's plant on State Street, Green Bay, Wisconsin. The WWTP is being managed by Joe Francis and continues to operate in compliance with the requirements of the project. The treatment system includes sand filtration, bag filtration, cartridge filtration (currently not being used), and GAC filtration. Multimedia filters are backwashed individually on a daily basis and GAC filters are backwashed on a weekly basis. Operational statistics for the WWTP are discussed on a weekly basis as part of the implementation process of the remedy. The WWTP was designed for a peak flow of 6,000 gallons per minute (gpm), an average flow of 4,500 of gpm, and a minimum flow of 3,000 gpm. Currently, only twenty of the twenty-four sand filters are being used. The four sand filters not being used are on standby in the event there is the need to use them. The PLC system automatically monitors the treatment process and in addition there are cameras at specific points for visual observations. The different components of the WWTP are properly labeled and the effluent automatic samplers are functioning as expected. Each annual work plan contains the permit equivalency documentation for the discharge parameters. The sediment dewatering plant is operating in accordance with the project requirements and operational statistics are discussed on a weekly basis as part of the

implementation of the remedy. The continuous monitoring PLC system and camera monitoring are fully operational and the equipment is properly labeled. The plant consists of coarse debris separation, coarse and fine sand separation for beneficial re-use, pre-thickening using flocculent material, water buffer storage (clarifiers), filter presses, and filter cake staging area with air treatment system.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Yes.

Question A Summary:

The remedy construction has not been finalized in all OUs; remedy implementation at OUs 4 and 5 is currently underway and is projected to be completed in 2020. Remedial action activities are being constructed in accordance with the requirements of the RODs, ROD Amendments, ESD, and design specifications. Current levels of PCBs still exceed remediation goals for fish tissue, sediments, and surface water, but monitoring performed to date shows decreases in PCB contamination in fish tissue, sediments, and surface water towards the achievement of RAOs established for the Site. Once the Response Agencies determine that the RAL performance standard (*i.e.*, SWAC goal) is achieved in an OU, construction of the remedy is deemed complete, although monitoring and maintenance requirements continue to apply. Only OU 1 is considered "construction complete" since at the time of completion of the work, OU 1 had achieved the SWAC RAO goal of 0.25 ppm. Remedial work for OUs 2 and 3 has been completed while work for OUs 4 and 5 continues. A construction completion determination for the entire Site will be made in conjunction with completion of OUs 2 through 5. Monitoring has begun for OUs 1-3. Upon completion of construction of all remedial actions, site-wide long-term monitoring will continue to be conducted. Fish consumption advisories are in place and will be re-evaluated as deemed appropriate by WDNR. ICs have been implemented to the extent feasible given that the remedy implementation is still underway. ICIAPs have been developed for OU 1 (draft) and for OUs 2 through 5 (final). In addition, full implementation of the OUs 2-5 ICIAP will begin upon completion of the construction of the remedy at the site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Yes.

Question B Summary:

The exposure assumptions, toxicity data, cleanup levels, and RAOs established in the RODs, ROD Amendments, and ESD remain valid. There are no new promulgated standards applicable to the site.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No.

Question C Summary:

At this time, no other information has come to light that would call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/ Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1, 2, 3, 4 and 5	**Issue Category:** Institutional Controls			
	Issue: ICIAP has not been fully implemented.			
	Recommendation: Implement the portions of the OUs 2 through 5 ICIAP that have not yet been implemented. Approve and implement OU 1 ICIAP.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	7/17/2020

OU(s): 4 and 5	**Issue Category:** Remedy Performance			
	Issue: Current PCB concentrations in fish tissue, sediments, and surface water indicate that the remedy is not currently protective and RAOs have not been met.			
	Recommendation: Complete implementation of the remedy to address PCB-contaminated sediments and address ongoing unacceptable exposures.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	7/17/2020

VII. PROTECTIVENESS STATEMENTS

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Not Protective

Protectiveness Statement: The remedy at OU 1 is not protective of human health and the environment. While the remedy construction for OU 1 has been implemented and constructed in accordance with the requirements of the decision documents and design specifications, the RAOs have not been achieved. Monitoring data shows that there have been improvements in PCB fish tissue concentrations for the indicator species. There are fish consumption advisories in place and warning signs posted along the river, however, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in fish, sediments and surface water. Monitoring data shows that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents. Effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as maintaining the remedy components (*i.e.*, caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

Protectiveness Statement(s)	
Operable Unit: 2	*Protectiveness Determination:* Not Protective

Protectiveness Statement: The remedy at OU 2 is not protective of human health and the environment. While the remedy construction for OU 2 has been implemented and constructed in accordance with the requirements of the decision documents and design specifications, the RAOs have not been achieved. Monitoring data shows that there have been improvements in PCB fish tissue concentrations for the indicator species. There are fish consumption advisories in place and warning signs posted along the river, however, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in fish, sediments and surface water. Monitoring data shows that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents. Effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as maintaining the remedy components (*i.e.*, caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

Protectiveness Statement(s)	
Operable Unit: 3	*Protectiveness Determination:* Not Protective

Protectiveness Statement: The remedy at OU 3 is not protective of human health and the environment. While the remedy construction for OU 3 has been implemented and constructed in accordance with the requirements of the decision documents and design specifications, the RAOs have not been achieved. Monitoring data shows that there have been improvements in PCB fish tissue concentrations for the indicator species. There are fish consumption advisories in place and warning signs posted along the river, however, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in

fish, sediments and surface water. Monitoring data shows that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents. Effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as maintaining the remedy components (*i.e*., caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

Protectiveness Statement(s)	
Operable Unit: 4	*Protectiveness Determination:* Not Protective

Protectiveness Statement: The remedy at OU 4 is not protective of human health and the environment. The OU 4 remedy is currently being implemented and constructed in accordance with the decision documents and the design specifications. In the areas of OU 4 where construction has been completed, ongoing PCB fish tissue monitoring of indicator species shows decreases towards achieving RAOs. There are fish consumption advisories in place and warning signs posted along the river, however, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in fish, sediments and surface water. In order for the remedy to be protective, the following actions need to be taken: the remedy needs to be fully implemented; monitoring data needs to show that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents; and effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as maintaining the remedy components (*i.e.*, caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

Protectiveness Statement(s)	
Operable Unit: 5	*Protectiveness Determination:* Not Protective

Protectiveness Statement: The remedy at OU 5 is not protective of human health and the environment. The OU 5 remedy is currently being implemented and constructed in accordance with the decision documents and the design specifications. There are fish consumption advisories in place and warning signs posted along the river, however, fishing has been observed and the Response Agencies believe that fish are being consumed. Ecological receptors are still exposed to unacceptable risks posed by PCB contamination in fish, sediments and surface water. In order for the remedy to be protective, the following actions need to be taken: the remedy needs to be fully implemented; monitoring data needs to show that PCB concentrations in sediments, surface water, and fish are decreasing to meet the RAOs as intended in the decision documents; and effective ICs need to be fully implemented. Compliance with ICs will be ensured by maintaining, monitoring, and enforcing ICs, as well as maintaining the remedy components (*i.e.*, caps) at the site. It will take some time following completion of the remedial activities to see the fish concentrations decrease to protective levels.

VIII. NEXT REVIEW

The next FYR report for the Fox River NRDA/PCB Releases Superfund Site is required five years from EPA's signature date of this review.

APPENDIX A – REFERENCE LIST

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APPENDIX B

Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Fox River NRDA / PCB releases	**Date of inspection:** May 7, 2019
Location and Region: Green Bay, WI Region 5	**EPA ID:**
Agency, office, or company leading the five-year review: EPA	**Weather/temperature:** Cloudy / 45°F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☑ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☑ Monitored natural attenuation (OU5 remedy was MNR (OU2 for MNA))
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☐ Other Sediment remediation,

Attachments: ☐ Inspection team roster attached ☐ Site map attached

Jeff Lawson 603-966-1614 (LLC)
George Berken (Boldt)
Rebecca Frey (EPA)
Michelle Miller (records)
Cindy Jones (HTS + osha records
Iron Mountain records (where records will be managed at end of project)
Gary Kincaid (WDNR)
Beth Olson (WDNR)
Joe Francis (WWTP records + operation)

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed ☐at site ☐at office ☐by phone Phone no. _____
   Problems, suggestions; ☐Report attached N/A
   _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed: ☐at site ☐at office ☐by phone Phone no. _____
   Problems, suggestions; ☐Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.
   Problems; suggestions; ☐Report attached _____
   _____

   Agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.
   Problems; suggestions; ☐Report attached _____
   _____

   Agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.
   Problems; suggestions; ☐Report attached _____
   _____

   Agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.
   Problems; suggestions; ☐Report attached _____
   _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☑ O&M manual — ☑ Readily available — ☐ Up to date — ☐ N/A
   - ☑ As-built drawings — ☑ Readily available — ☒ Up to date — ☐ N/A
   - ☑ Maintenance logs — ☑ Readily available — ☐ Up to date — ☐ N/A

   Remarks: O&M manuals are being maintained at the plant site.

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☑ Contingency plan/emergency response plan — ☑ Readily available — ☑ Up to date — ☐ N/A

   Remarks: maintained at plant site by Cindy Jones

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: available at plant site Cindy Jones H&S person handles the records at plant site.

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☑ Effluent discharge — ☑ Readily available — ☑ Up to date — ☐ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Other permits _____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: each annual work plan contains the permit equivalency documentation.

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: N/A

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: N/A

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: N/A

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: N/A

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks: _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☐ N/A

    Remarks: _____

→ Joe Francis - maintains the effluent discharge records.

Sharepoint site - public is informed of

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☑ PRP in-house ☑ Contractor for PRP (contractor + RP responsible for O+M)
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks N/A

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks There is Fish advisory signs along the river.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☑ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) There's an ICIAP for our and an ICIAP for ou's 2-5.
Frequency
Responsible party/agency our ICIAP needs approval by the agencies.
Contact
Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☑ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☑ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☑ N/A
Violations have been reported ☐ Yes ☐ No ☑ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☑ N/A
Remarks ICIAP for our needs to be finalized MOAs with municipalities need to be finalized.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks

2. **Land use changes on site** ☑ N/A
Remarks

3. **Land use changes off site** ☑ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ Roads adequate ☐ N/A
   Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent Depth
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths Widths Depths
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent Depth
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent Depth
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent Height
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent
- ☐ Ponding ☐ Location shown on site map Areal extent
- ☐ Seeps ☐ Location shown on site map Areal extent N/A
- ☐ Soft subgrade ☐ Location shown on site map Areal extent

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent
Remarks N/A

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks N/A

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent Depth
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type Areal extent
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent Depth
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent Depth
Remarks

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks N/A

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks N/A

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☒ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks N/A

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☑ Applicable ☐ N/A for Sediment dewatering Water

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☑ Carbon adsorbers
☑ Filters Sand and Cartridge
☐ Additive (*e.g.*, chelation agent, flocculent) flocculent
☐ Others
☑ Good condition ☐ Needs Maintenance
☑ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☐ Quantity of groundwater treated annually N/A
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☑ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☑ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☑ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☑ Good condition (esp. roof and doorways) ☐ Needs repair
☑ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy) N/A
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
☑ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained N/A ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy) N/A
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

implementation of the remedy continues at the site. Work is being conducted at OUs 4 and 5.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O+M is being performed in an adequate manner. Records are maintained. Cap operation monitoring and maintenance plan (COMMP) has been implemented in OUs 1, 2, and 3 and the portions of OU 4 that have been completed. Long-term monitoring for sediment, fish tissue, and surface water is being conducted.

C. Early Indicators of Potential Remedy Problems None

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

to date
over 6 million cubic yards of sediment have been dredged

975 acres of caps and sand covers have been put in place

approximately 3.3 million tons of sediment have been transported to landfill

approximately 9 billion gallons of sediment water have been treated and discharged to the river.

APPENDIX C

Site Inspection Photos

Dredging Operations in the Fox River

North Focus Area (PCB/MGP Dredge Work)

Influent Sediment Sludge (orange lines) and treated water effluent (black line)

PLC System Sediment Dewatering Plant

Sediment Dewatering Plant View

Flocculant Bags

Sediment Dewatering Plant Water Buffer Tanks (clarifiers)

Sludge Pre-Thickener and Sludge Holding Tanks

Debris and Sand Separation for beneficial re-use

Clean Sand Staging Area for use in Sand Covers

Sediment Filter Cake Staging Area

Filter Press in Operation Sediment Dewatering Plant

Filter Press Conveyor Belt Sediment Dewatering Plant

Air Treatment System for Sediment Cake Staging Area

Detail Water Buffer Tank (clarifier)

Sand Filters Waste Water Treatment Plant

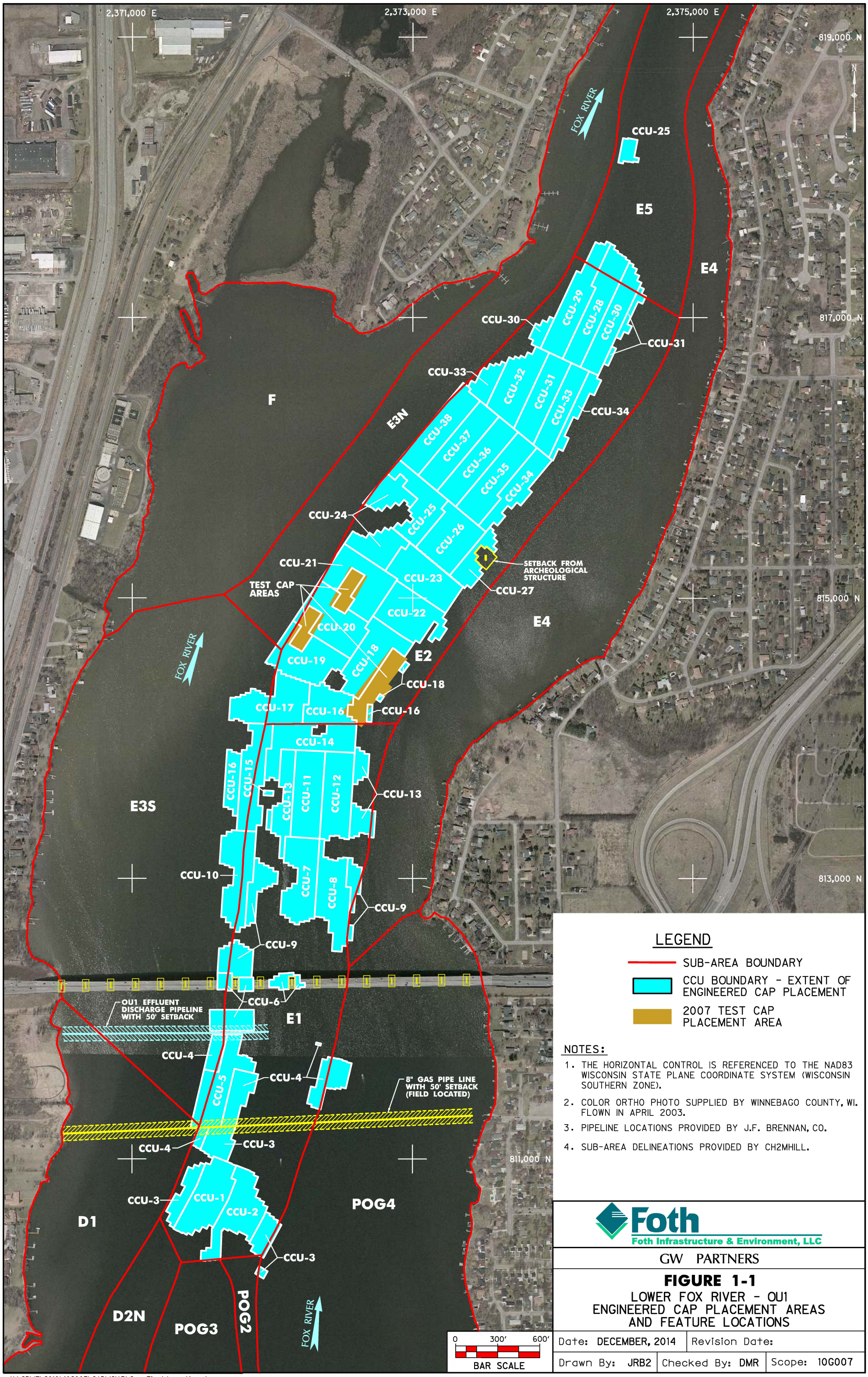
Bag Filters Waste Water Treatment Plant

Granular Activated Carbon Polishing Step Waste Water Treatment Plant

Automatic Effluent Sampler Waste Water Treatment Plant

APPENDIX D

Maps for Areas That Do
Not Allow UU/UE



LEGEND

- SUB-AREA BOUNDARY
- CCU BOUNDARY - EXTENT OF ENGINEERED CAP PLACEMENT
- 2007 TEST CAP PLACEMENT AREA

NOTES:

1. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN SOUTHERN ZONE).
2. COLOR ORTHO PHOTO SUPPLIED BY WINNEBAGO COUNTY, WI. FLOWN IN APRIL 2003.
3. PIPELINE LOCATIONS PROVIDED BY J.F. BRENNAN, CO.
4. SUB-AREA DELINEATIONS PROVIDED BY CH2MHILL.

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FIGURE 1-1

LOWER FOX RIVER - OU1
ENGINEERED CAP PLACEMENT AREAS
AND FEATURE LOCATIONS

Date: DECEMBER, 2014	Revision Date:	
Drawn By: JRB2	Checked By: DMR	Scope: 10G007

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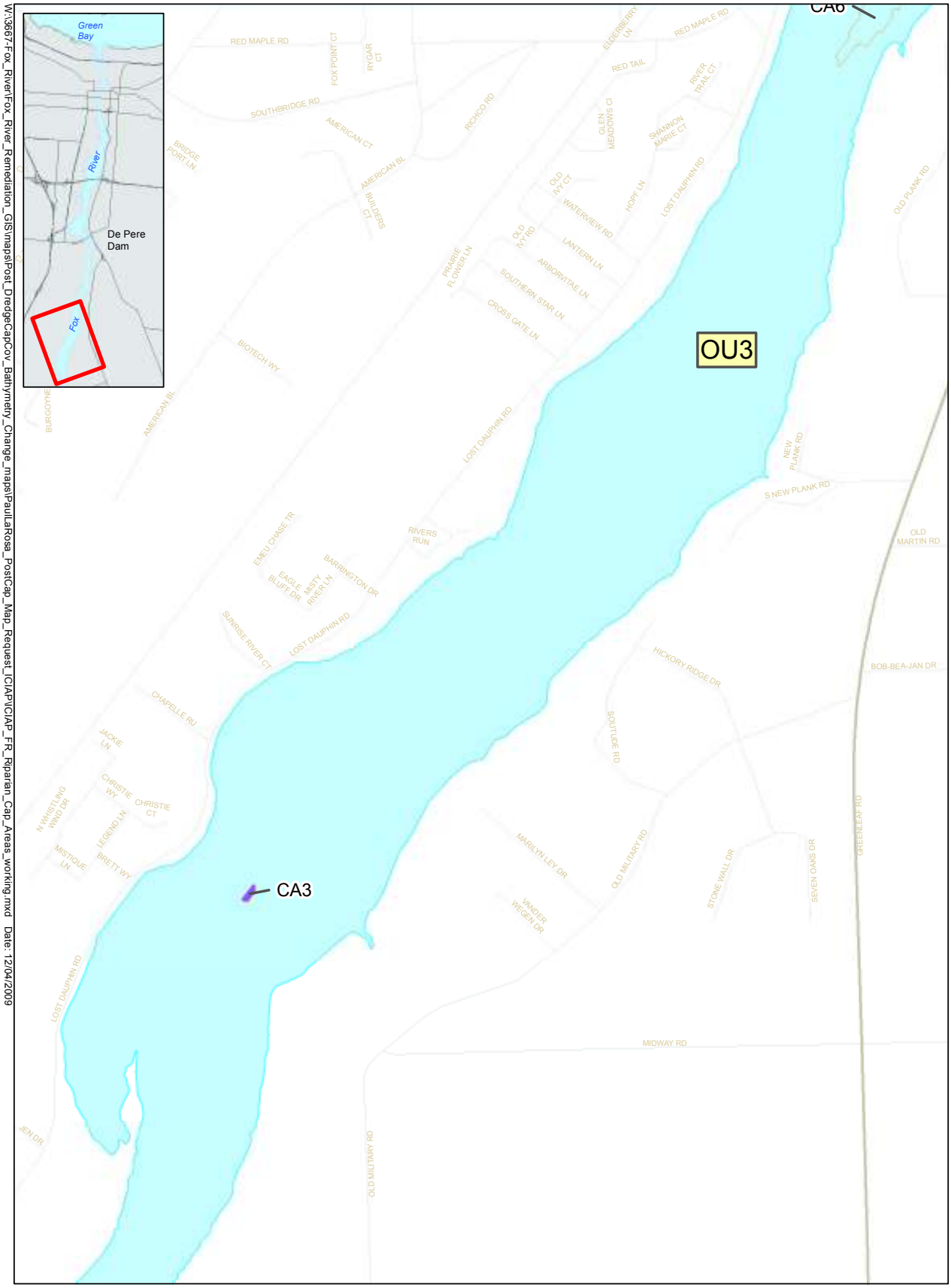
12/5/2014 Jrb2



Fox River Shoreline
Major Road
Minor Road
Shoreline Cap
Cap A, B or C
Cap Area in Less Than 5 Feet of Water
Area Within 300 feet of the OU 4B Shoreline
Fox River

Figure 2-1A

Fox River OU 3
Riparian Cap Areas

Brown County, Wisconsin, USA

TETRA TECH
ANCHOR QEA

N
W E
S

0 500 1,000
Feet

W:\3667-Fox_River\Fox_River_Remediation_GIS\maps\Post_DredgeCapCov_Bathymetry_Change_maps\PaulLaRosa_PostCap_Map_Request_ICIAP\ICIAP_FR_Riparian_Cap_Areas_working.mxd Date: 12/04/2009

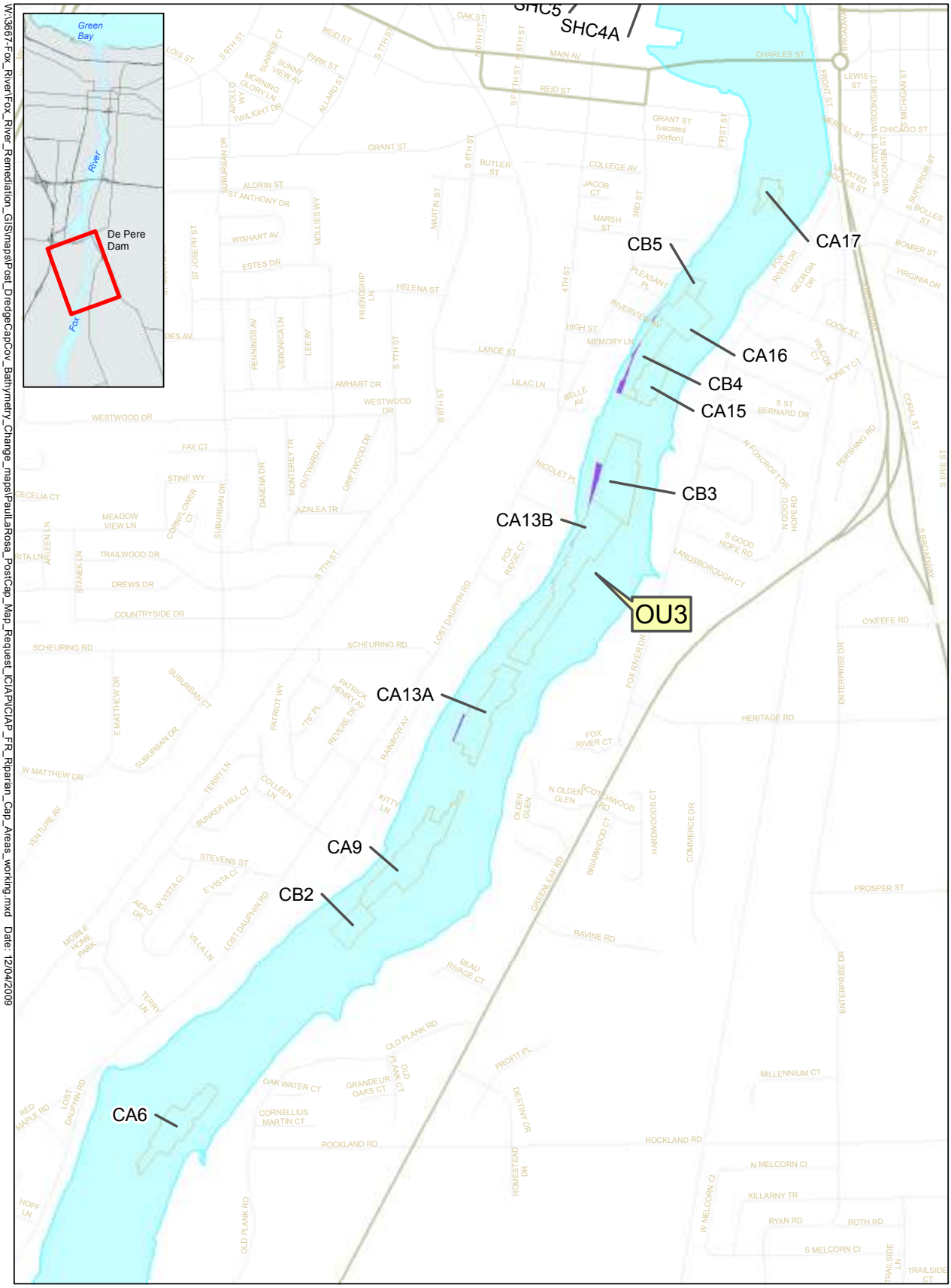


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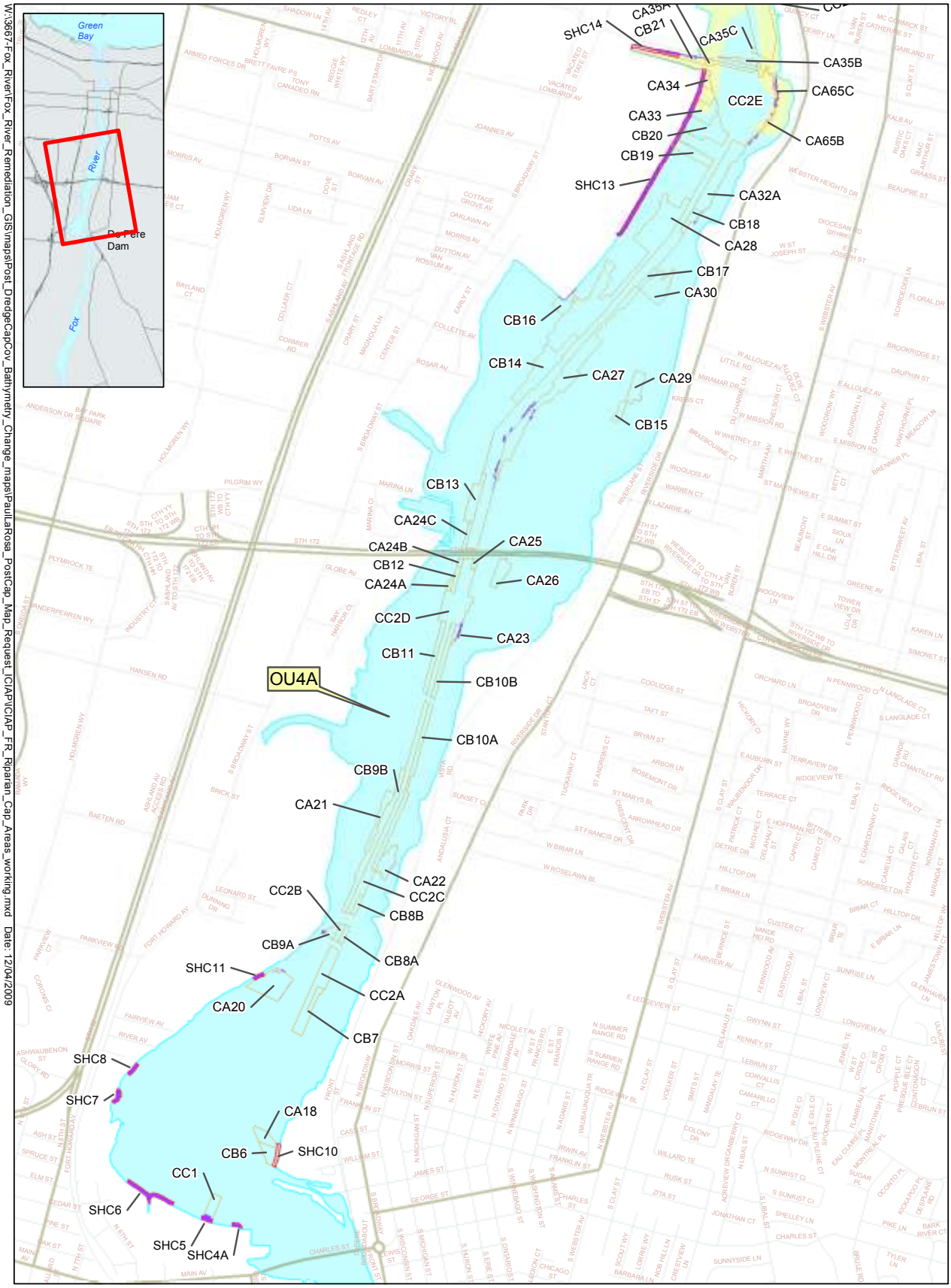
Figure 2-1B

Fox River OU 3
Riparian Cap Areas

Brown County, Wisconsin, USA

TETRA TECH
ANCHOR QEA



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Fox River Shoreline
Major Road
Minor Road
Shoreline Cap
Cap A, B or C
Cap Area in Less Than 5 Feet of Water
Area Within 300 feet of the OU 4B Shoreline
Fox River

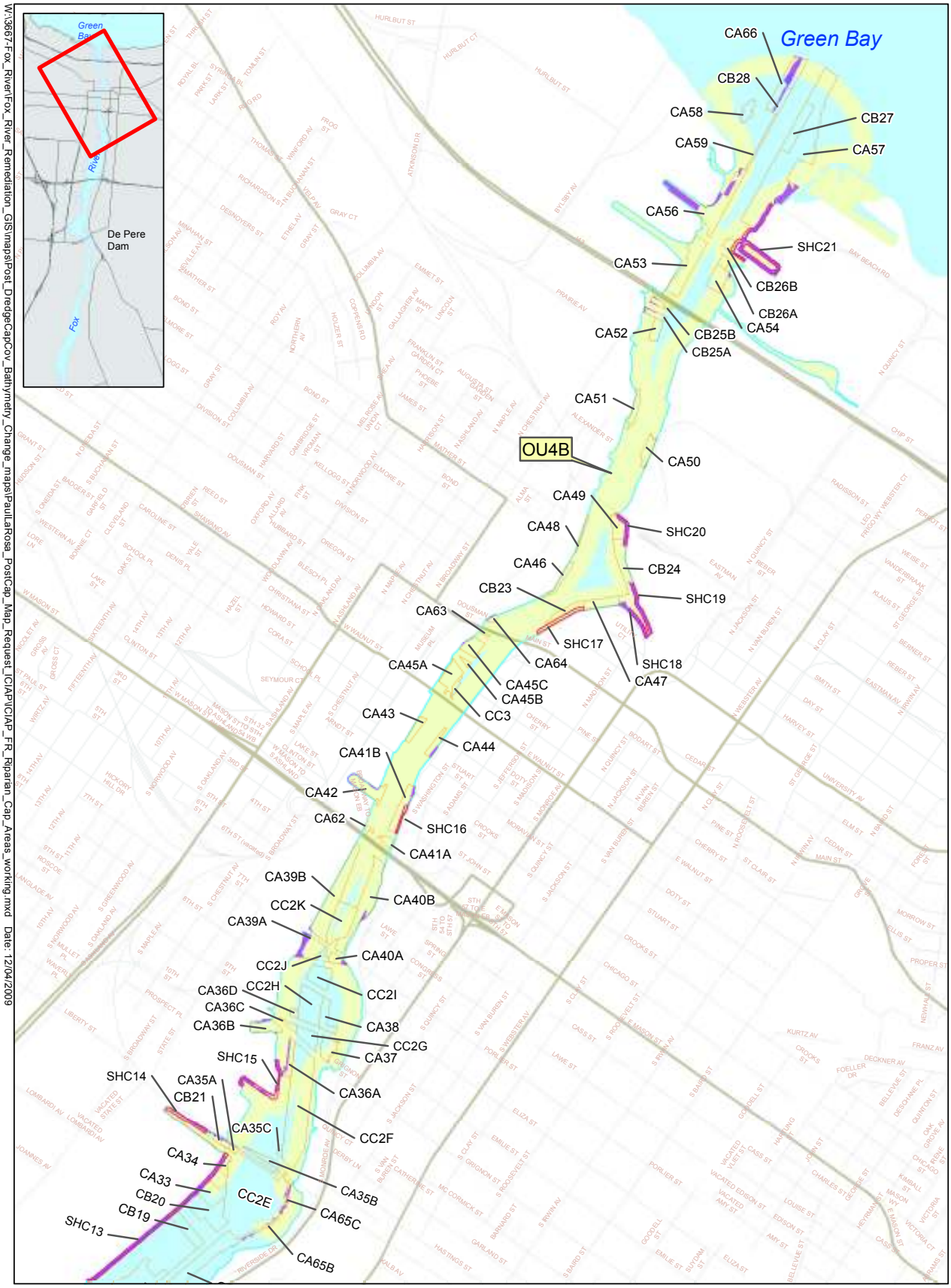
Figure 2-2A

Fox River OU 4 and
OU 5 Riparian Cap Areas

Brown County, Wisconsin, USA

TETRA TECH
ANCHOR QEA

0 500 1,000
Feet



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Fox River Shoreline
Major Road
Minor Road
Shoreline Cap
Cap A, B or C
Cap Area in Less Than 5 Feet of Water
Area Within 300 feet of the OU 4B Shoreline
Fox River

Figure 2-2B

Fox River OU 4 and OU 5 Riparian Cap Areas

Brown County, Wisconsin, USA

TETRA TECH
ANCHOR QEA

0 500 1,000
Feet

APPENDIX E

Additional Tables

Table ~~E-1~~ E-1
Media, Remedy Components, and Areas Requiring Institutional Controls

	Caps Constructed in Federal Navigation Channels	Caps Constructed Outside of Federal Navigation Channels that are not Riparian Caps	Constructed Riparian Sediment Caps
Objectives of Institutional Control	Ensure that USACE maintenance dredging does not extend more than 2 feet below the federally-authorized channel depth and that no other activity, such as dredging, impacts the integrity of the engineered caps.	Ensure that no activity such as dredging impacts engineered cap integrity	Ensure that no activity, particularly Chapter 30 permit exempt activity, impacts the integrity of shoreline caps
Enforcement and Permit Devices	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with USEPA, USACE, and WDNR, and possibly Brown County Port Authority, regarding dredging requirements in federal navigational channel ▪ MOA with WDNR and USACE regarding regulatory programs ▪ USEPA Administrative Order for RA	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with WDNR and USACE regarding regulatory programs ▪ USEPA Administrative Order for RA	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with WDNR and USACE regarding regulatory programs ▪ USEPA Administrative Order for RA
Informational Devices	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with USEPA, USACE, and WDNR, and possibly Brown County Port Authority, regarding dredging requirements in federal navigational channel ▪ MOA with WDNR and USACE regarding regulatory programs ▪ WDNR BRRTS Registry ▪ WDNR and Brown County GIS Mapping System ▪ Governmental Notices such as fish advisories and navigational maps ▪ Utility notification ▪ Diggers Hotline	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with WDNR and USACE regarding regulatory programs ▪ WDNR BRRTS Registry ▪ WDNR and Brown County GIS Mapping System ▪ Governmental Notices such as fish advisories and navigational maps ▪ Utility notification ▪ Diggers Hotline	▪ MOA with Brown County and municipalities regarding mapping and communications ▪ MOA with WDNR and USACE regarding regulatory programs ▪ WDNR BRRTS Registry ▪ WDNR and Brown County GIS Mapping System ▪ Governmental Notices such as fish advisories and navigational maps ▪ Riparian Landowner Notifications and Consultations ▪ Utility notification ▪ Diggers Hotline
Governmental Controls	▪ WDNR Chapter 30 requirements ▪ Sections 10 and 401/404 USACE permit requirements	▪ WDNR Chapter 30 requirements ▪ Sections 10 and 401/404 USACE permit requirements	▪ WDNR Chapter 30 requirements ▪ Sections 10 and 401/404 USACE permit requirements
Proprietary Controls	None anticipated	None anticipated	None anticipated

Table E-2

OU1 RA Dredging Summary Including Re-dredge and Overcut Allowance

Year	Surface Area Dredged (ac)[1]	Volume Dredged to 1.0 ppm PCB Target (cy)[2]	Volume Dredged Including Overcut (cy)
2004	6.8	12,300	18,000[3]
2005	57.0	53,700	88,200
2006	69.6	85,400	102,100
2007	94.0	84,900	121,800
2008	29.6	32,700	41,500
2009	--	--	--
TOTAL	257.0	269,000	371,600

1. Total area dredged includes all re-dredge and residual dredge areas.
2. Total volume dredged to the 1.0 ppm PCB target. PCB target includes all volume removed from re-dredge and residual dredge areas.
3. Volume includes approximately 2,400 cubic yards (cy) of native clay removed for the installation of the water treatment plant (WTP) effluent discharge line.

Table E-3

OU1 RA Engineered Cap Placement Summary

Year	Total Acreage Covered
2007	4.0
2008	77.7
~~2009~~	~~32.2~~
TOTAL	113.9

Prepared by: TAG
Checked by: SGL

Table E-4

OU1 RA Sand Cover Placement Summary

Year	5" Sand Cover (ac)	6" Sand Cover (ac)	6" Residual Sand Cover (ac)	9" Residual Sand Cover (ac)
2007			5.4	
2008	56.8	43.9	26.6	4.5
2009	3.7	2.7		
TOTAL	60.5	46.6	32.0	4.5

Prepared by: TAG
Checked by: SGL

Table E-5

OU1 Response Action Costs by Category

Remedial Design Costs	
Design costs paid by OU1 Escrow Account	$2,000,000
Design cost paid directly by WTM I Company	$1,820,014
Total Remedial Design Costs	$3,820,014
Remedial Action Costs	
Upland Infrastructure - incl. purchase of staging area properties	$14,273,016
Dredging	$15,326,923
Dredging - TSCA	$176,867
Dewatering	$6,510,826
Water Treatment	$3,846,925
Loading & Transportation (non-TSCA)	$4,345,492
Disposal (non-TSCA)	$13,383,609
Loading & Transportation & Disposal (TSCA)	$632,818
QA Verification - Dredge	$4,790,573
Cap Sand (material & delivery)	$1,642,613
Cap Sand (placement)	$2,775,983
Stone (material & delivery)	$1,733,472
Stone (placement)	$3,341,080
QA Verification - Cap	$498,425
Sand cover (material & delivery)	$2,372,757
Sand cover (placement)	$4,193,219
QA Verification - Sand Cover	$450,969
Site Restoration	$1,087,629
Alternative Engineering Analyses	$1,274,723
Taxes, Insurance & Miscellaneous Charges	$1,309,588
Communications	$442,075
Project Management & Agency Oversight	$4,490,449
Post-10/2010 RA Closeout Costs	$103,572
Total Remedial Action Costs	$89,003,603
Long-term Response Costs	
Fish & Water Monitoring (estimated through 2010)	$349,000
Engineered Cap Monitoring & Maintenance (estimated through 2010)	$70,000
Post-2010 Fish & Water Monitoring (estimated)	$1,353,000
Post-2010 Engineered Cap Monitoring & Maintenance (estimated)	$1,894,000
Total Long-term Response Costs	$3,666,000
Total OU1 Costs	$96,489,617

APPENDIX F

Newspaper Ad

Thanksgiving restaurants serving in Green Bay

Jeff Bollier Green Bay Press-Gazette
USA TODAY NETWORK - WISCONSIN

GREEN BAY - Not everyone wants to work over a hot stove in the hopes their Thanksgiving turkey, stuffing and pumpkin pie come out just right.

Most restaurants close for Thanksgiving, but some open their doors for those who don't want to cook, fail at holiday dinner or just prefer when someone else handles all the arrangements. With that in mind, here's a look at Green Bay-area options available.

One piece of advice: Make a reservation right now. Staff at several restaurants said space is filling up fast.

1951 West

Address: 1951 Bond St., Howard
Details: Thanksgiving brunch buffet from 9:30 a.m.-2 p.m.. Price is $19.99 for adults, $8.99 for children younger than 10.
More information: Call 920-405-1951 to make a reservation, which is strongly encouraged.

Hagemeister Park

Address: 325 N. Washington St., Green Bay
Details: Thanksgiving dinner buffet from 2-6 p.m. features traditional holiday fare as well as prime rib, salad bar and more. Cost is $20 for adults, $10 for children, free for children age 4 and younger.
More information: Call 920-884-9909 to make a reservation.

River's Bend Supper Club

Address: 792 Riverview Drive, Howard
Details: Thanksgiving buffet served from 11 a.m.-4 p.m. for $21.95 per person.
More information: Call 920-544-9860 for more information or to make a reservation.

EPA Begins Review of
Lower Fox River/Green Bay Site
Brown County, Wisconsin

U.S. Environmental Protection Agency is conducting a five-year review of the 39-mile-long Lower Fox River/Green Bay site, from Appleton to Green Bay. The Superfund law requires regular checkups of sites that have been cleaned up – with waste managed on-site – to make sure the cleanup continues to protect people and the environment. This is the third review of the site.

In 2004, EPA began cleaning up PCB contamination in the sediment. The cleanup consists of dredging sediment with higher levels of PCBs and placing caps and sand covers over sediment with lower levels. The last review showed the cleanup was not protecting people and the environment because PCB levels had not yet dropped to safe levels. While work in Little Lake Butte des Morts was finished in 2009, the cleanup in the remainder of the river is continuing and is expected to be finished in 2019.

More information is available at the Brown County Library, Appleton Public Library, Door County Library, Oneida Community Library and Oshkosh Public Library and at www.epa.gov/superfund/fox-river. The review should be completed by July 2019.

The five-year review is an opportunity for you to tell EPA about site conditions and any concerns you have. Contact:

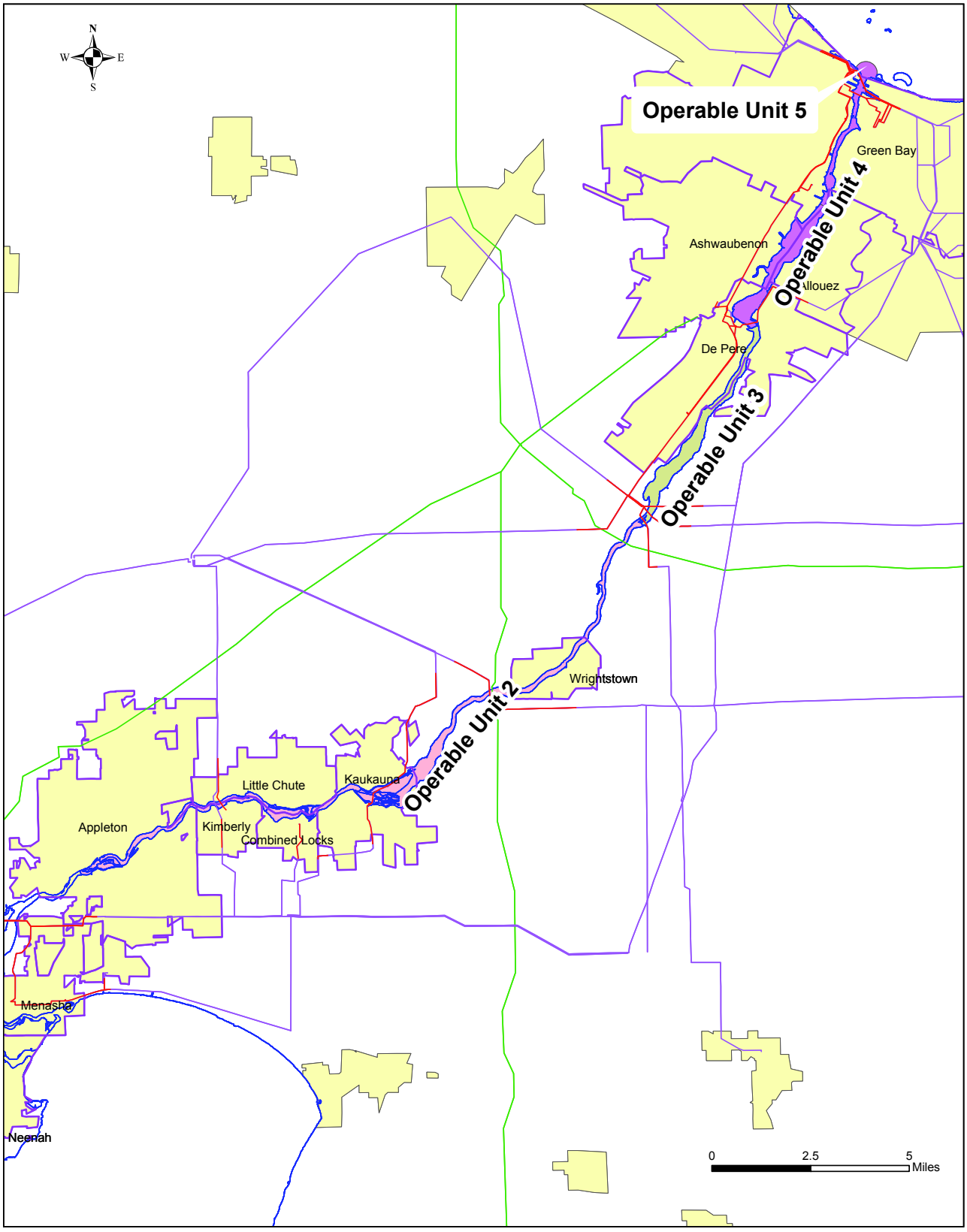
Susan Pastor
Community Involvement Coordinator
312-353-1325
pastor.susan@epa.gov

Pablo Valentin
Remedial Project Manager
312-353-2886
valentin.pablo@epa.gov

You may also call EPA toll-free at 800-621-8431, 8:30 a.m. to 4:30 p.m., weekdays.

WI-5002233921

FIGURES



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Legend

- USACE Channel Definition
- American Transmission Company Line
- Transmission System
- Natural Gas Pipeline
- Fox River Boundary
- Municipal Boundary

Operable Unit Number

- 2
- 3
- 4

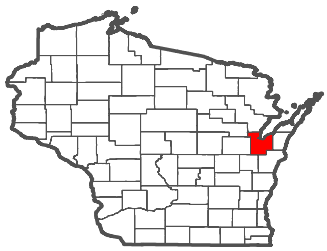
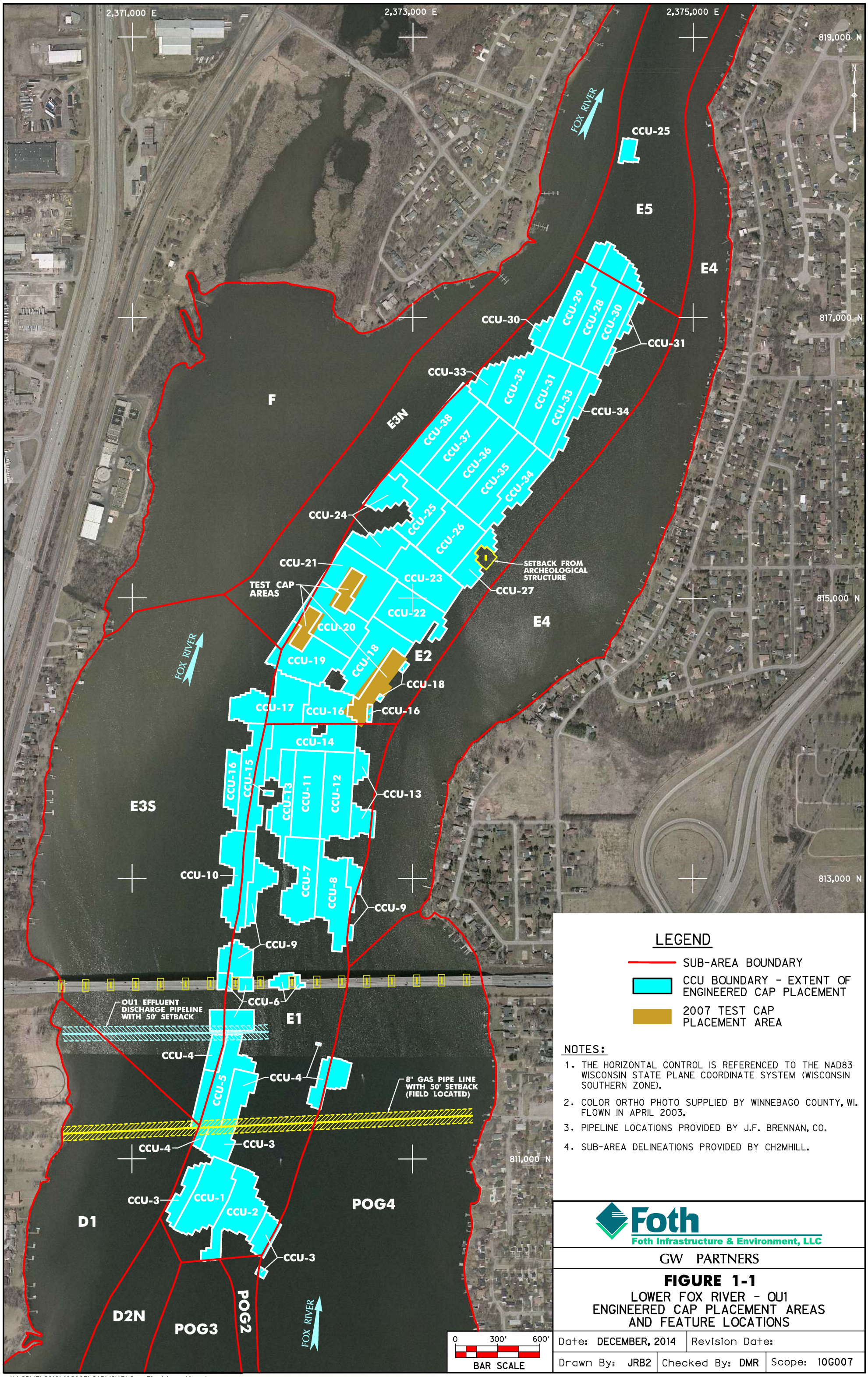


Figure 1-1
Lower Fox River
Area Location Map

Lower Fox River OU 2-OU 5

TETRA TECH

ANCHOR QEA



LEGEND

- SUB-AREA BOUNDARY
- CCU BOUNDARY - EXTENT OF ENGINEERED CAP PLACEMENT
- 2007 TEST CAP PLACEMENT AREA

NOTES:

1. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN SOUTHERN ZONE).
2. COLOR ORTHO PHOTO SUPPLIED BY WINNEBAGO COUNTY, WI. FLOWN IN APRIL 2003.
3. PIPELINE LOCATIONS PROVIDED BY J.F. BRENNAN, CO.
4. SUB-AREA DELINEATIONS PROVIDED BY CH2MHILL.

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Foth Infrastructure & Environment, LLC

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FIGURE 1-1

LOWER FOX RIVER - OU1
ENGINEERED CAP PLACEMENT AREAS
AND FEATURE LOCATIONS

Date: DECEMBER, 2014	Revision Date:	
Drawn By: JRB2	Checked By: DMR	Scope: 10G007

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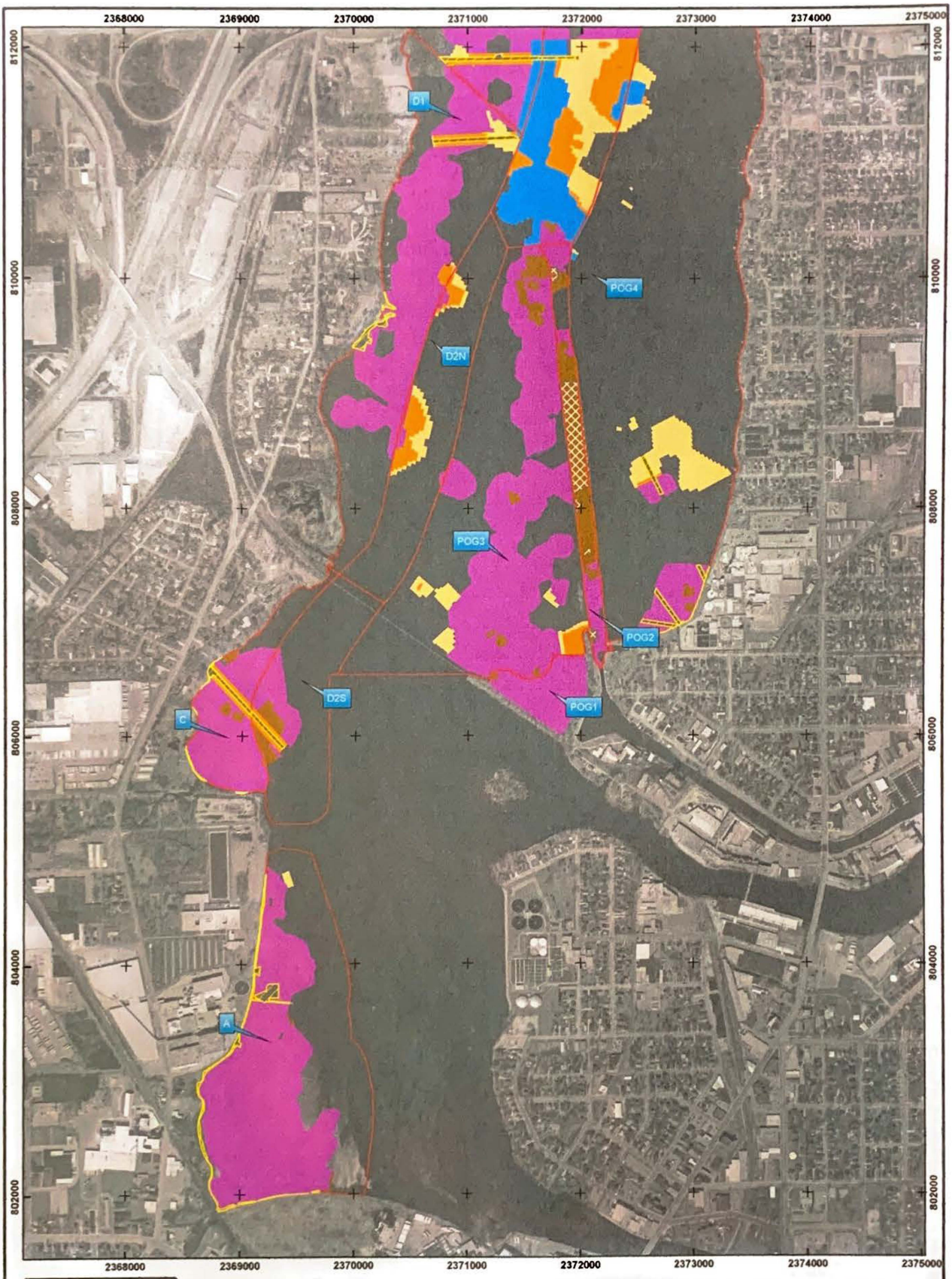
12/5/2014 Jrb2



Legend

- Shoreline, Pipeline, Artifacts

Remedial Alternatives

- Engineered Cap
- 3 Inch Sand Cover
- 6 Inch Sand Cover
- 6 Inch Residual Sand Cover
- 9 Inch Residual Sand Cover
- Completed Dredge Areas
- Sub-area/DMU Boundaries

Notes:

1. All areas presented depict as-constructed conditions.
2. Orthophoto provided by Winnebago County, WI.
3. The horizontal control is referenced to the NAD83 Wisconsin State Plane Coordinate System (Wisconsin Southern Zone).

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FIGURE 1-2
LOWER FOX RIVER OU1
LOCATION OF REMEDIAL ALTERNATIVES (SOUTH)

Scale: 0 400 800 Feet	Date: AUGUST, 2010	
Drawn By: DAT	Checked By: NRA	Scope: 08G007

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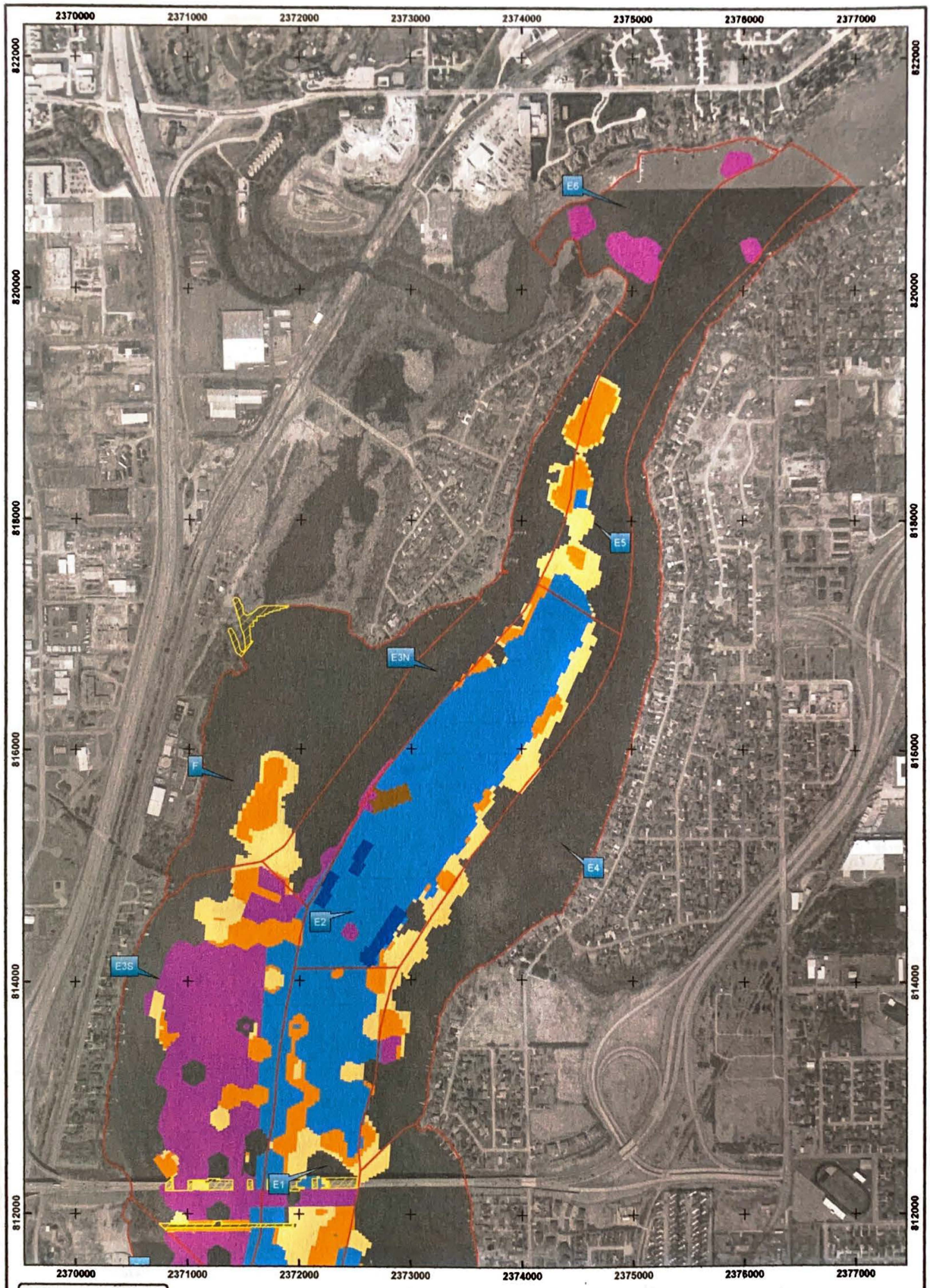

Legend

- Shoreline, Pipeline, Artifacts

Remedial Alternatives

- Cap Placement Test Area
- Engineered Cap
- 3 Inch Sand Cover
- 6 Inch Sand Cover
- 6 Inch Residual Sand Cover
- 9 Inch Residual Sand Cover
- Completed Dredge Areas
- Sub-area/DMU Boundaries

Notes:

1. All areas presented depict as-constructed conditions.
2. Orthophoto provided by Winnebago County, WI.
3. The horizontal control is referenced to the NAD83 Wisconsin State Plane Coordinate System (Wisconsin Southern Zone)

N

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FIGURE 1-3
LOWER FOX RIVER OU1
LOCATION OF REMEDIAL ALTERNATIVES (NORTH)

Scale: 0 400 800 Feet	Date: AUGUST, 2010	
Drawn By: DAT	Checked By: NRA	Scope: 08G007

X:\GB\IE\2008\08G007\GIS\mxd\RACR\RecharacterizationNorth.mxd

Figure ES-1. OU4 2014 Progress (D118, D26A, D26B-D61, D26C, D27A-H)

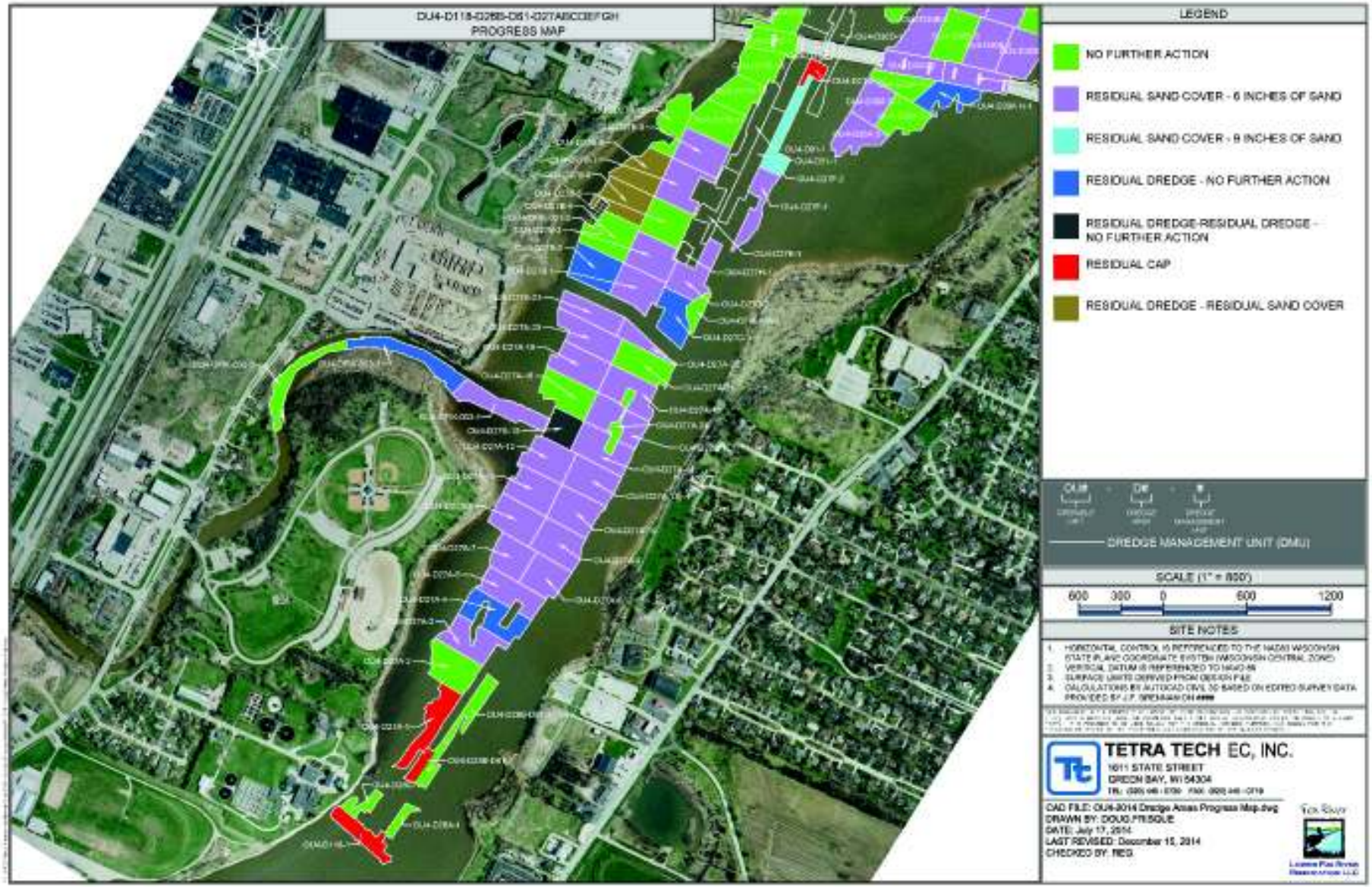

Figure ES-2. OU4 2014 Progress (D30B-D30E)

Figure ES-3. OU4 2014 Progress (D30B-NORTH, D32-NORTH, D34, D144, D148, D149, D163)

Figure ES-1. OU4 Dredge Management Units Closed in 2015 (D34, D35A, D35U South, D145, and D150)

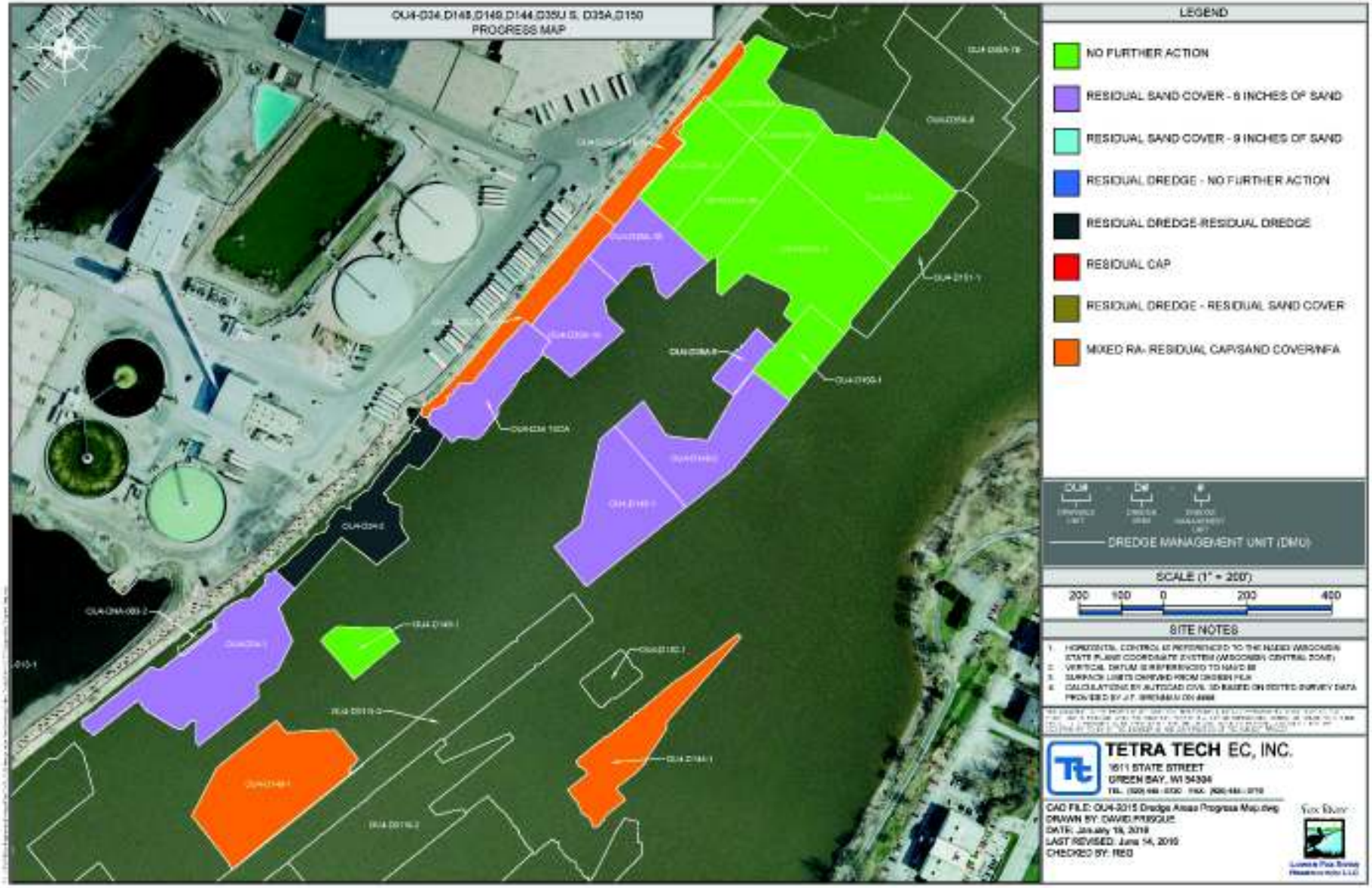

Figure ES-1. OU4 Dredge Management Units Closed in 2016 (D34 and D35A)

Figure ES-2. OU4 Dredge Management Units Closed in 2016 (D35A and D35W)

Figure ES-1. OU4 Dredge Management Units Closed in 2017

Figure ES-2. OU4 Dredge Management Units Closed in 2017

Figure ES-3. OU4 Dredge Management Units Closed in 2017

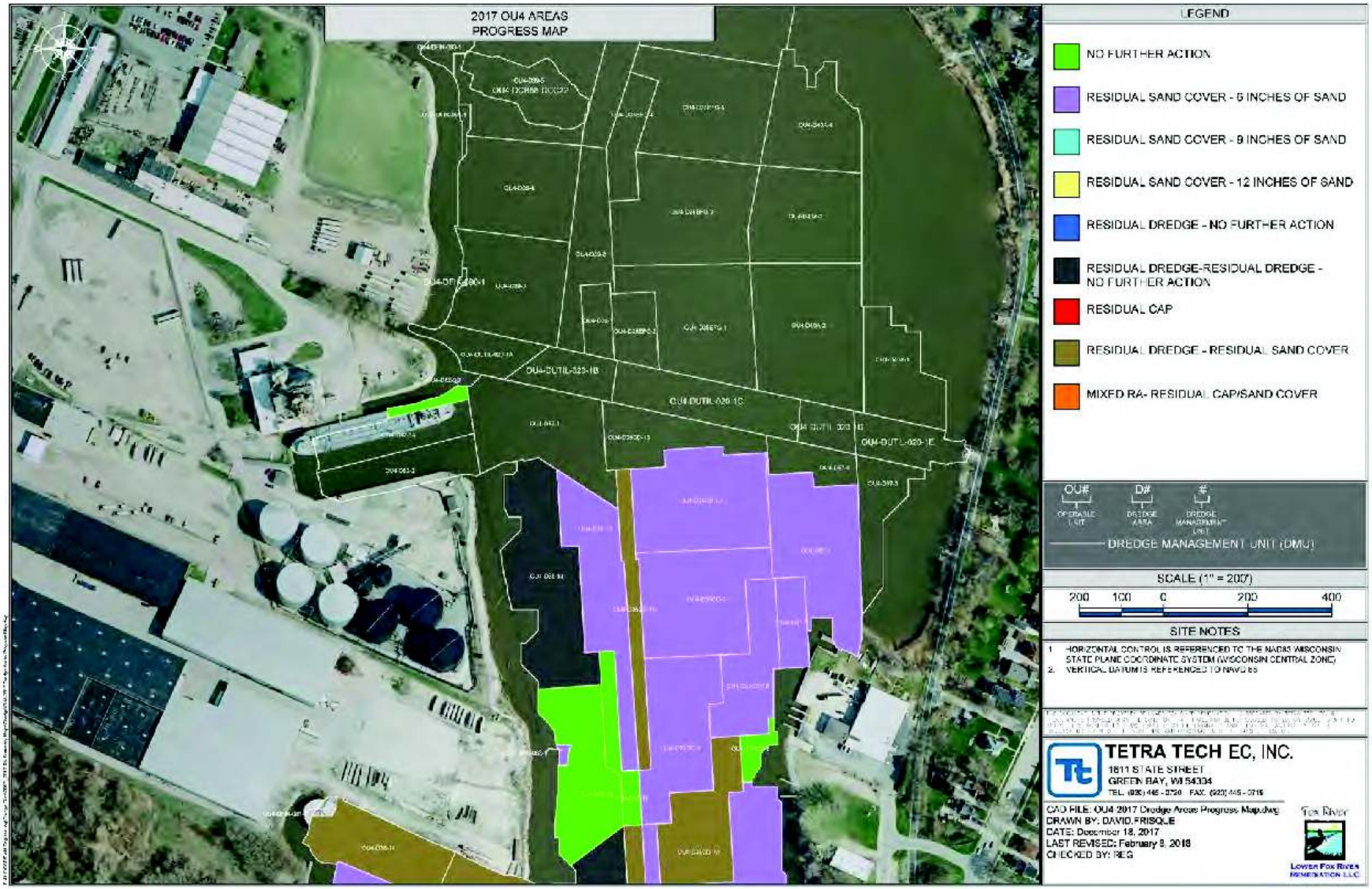

Figure 14. OU4 Dredge Management Units Closed in 2018

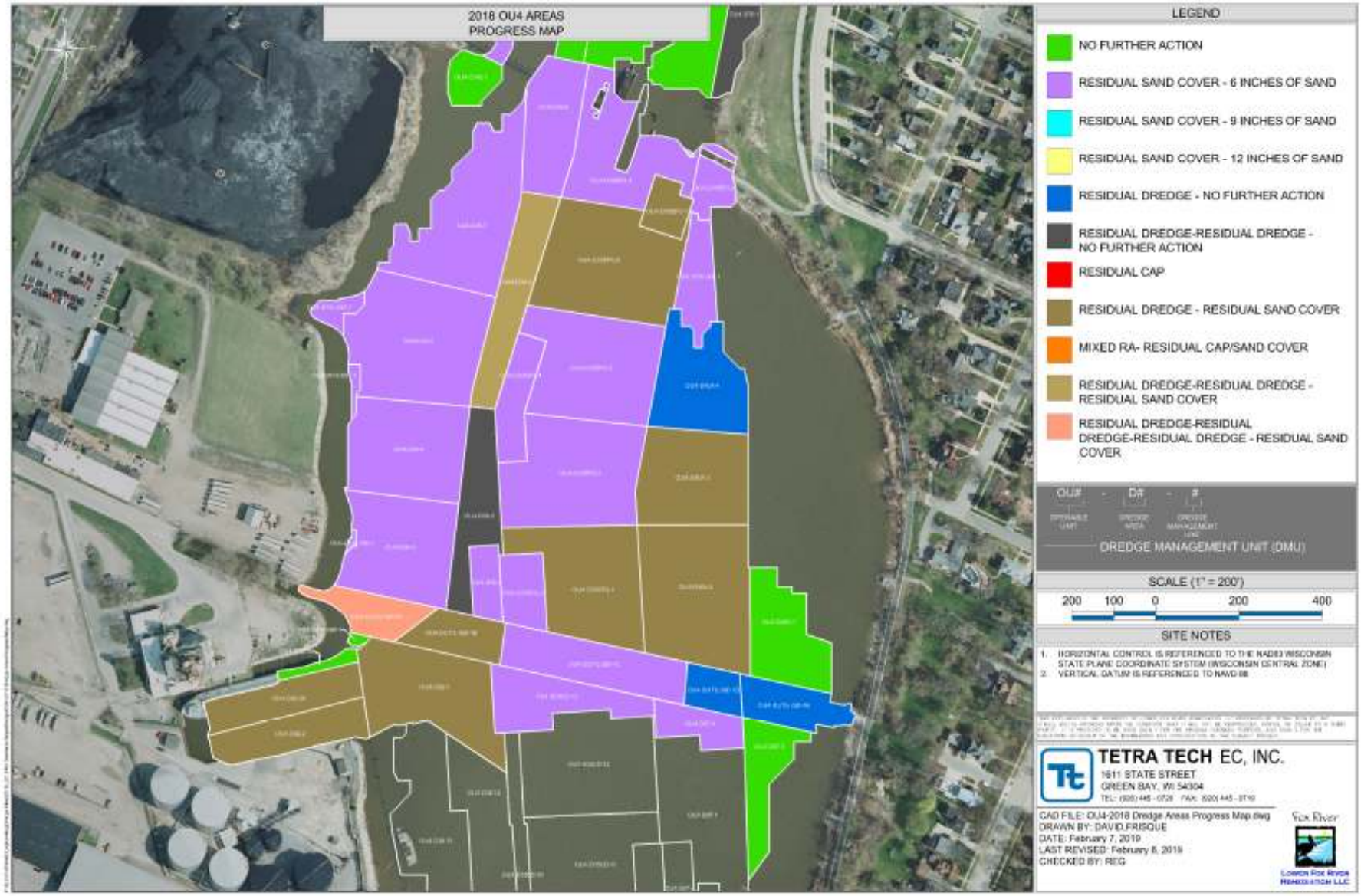

Figure 15. OU4 Dredge Management Units Closed in 2018 (2)

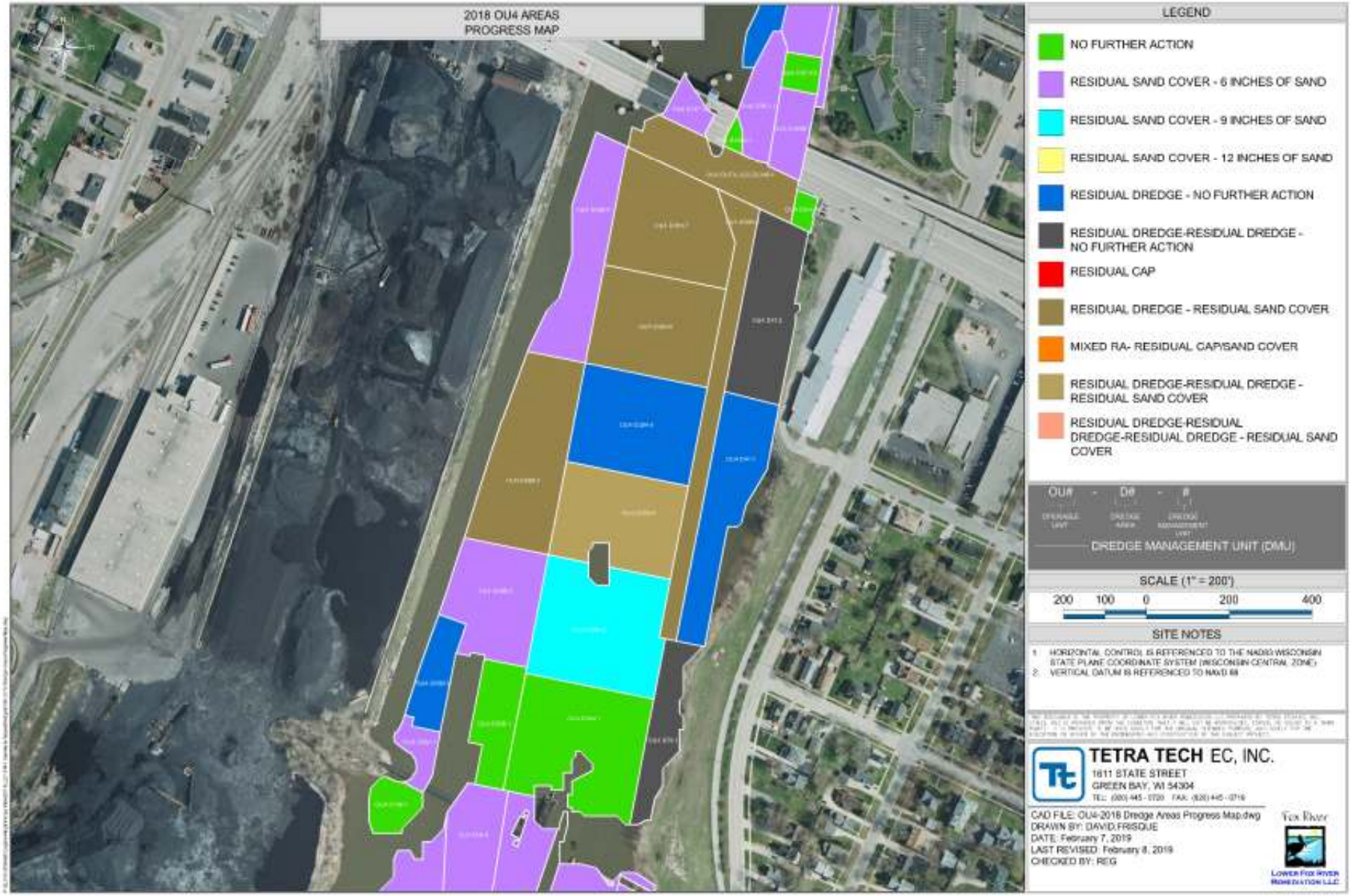

Figure 16. OU4 Dredge Management Units Closed in 2018 (3)