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Wisconsin Department of Natural Resources  
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**WORK PLAN FOR PORTAGE CANAL  
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY**

Dear Mr. Inman:

Enclosed is the final Remedial Investigation and Feasibility Study Work Plan for the Portage Canal site in Portage, Wisconsin.

If you have any questions regarding this report, please contact us. Ramboll Environ appreciates the opportunity to provide our services to the Wisconsin Department of Natural Resources on this important project.

Yours sincerely,

  
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November 18, 2015

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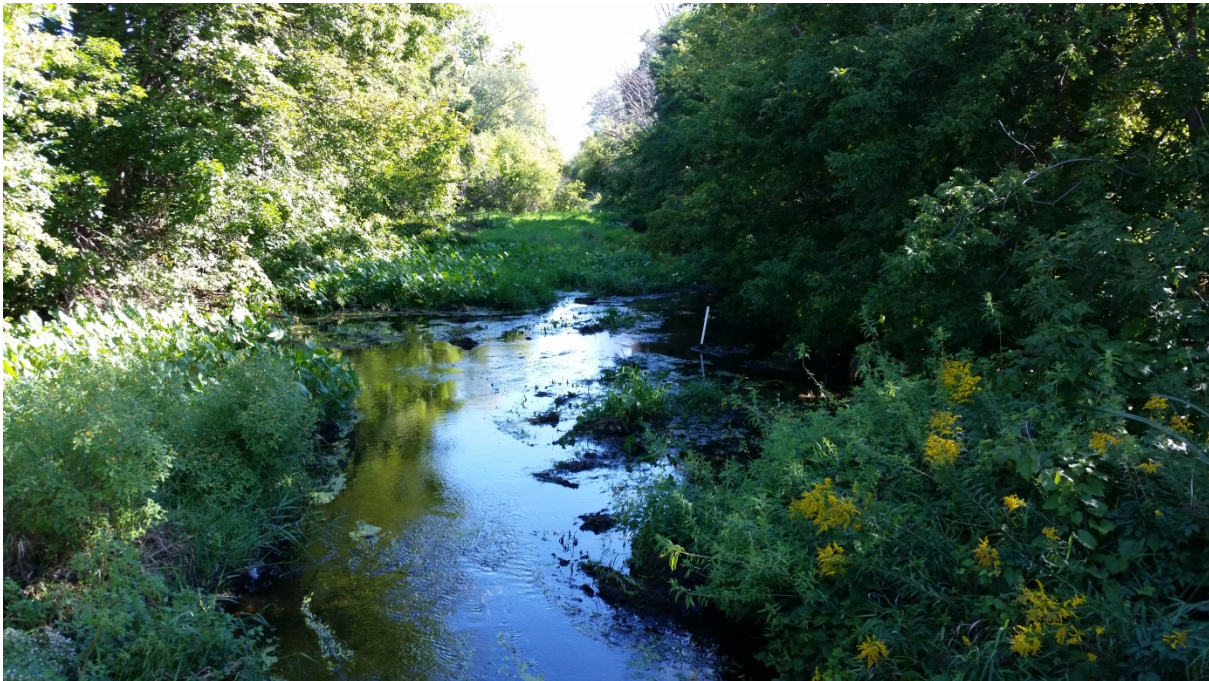
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# REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN PORTAGE CANAL, PORTAGE, WISCONSIN



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# 1. INTRODUCTION

Ramboll Environ US Corporation (Ramboll Environ) has prepared this Remedial Investigation and Feasibility Study (RI/FS) Work Plan on behalf of the Wisconsin Department of Natural Resources (WDNR) to describe the overall technical approach of the RI/FS at the Portage Canal (the "Canal") in Portage Wisconsin, including an outline of proposed activities, a time schedule, personnel, subcontractors, and the proposed budget with unit cost estimates. This work plan is intended to fulfill the tasks described in the Remedial Investigation and Feasibility Study Scope of Work for the Portage Canal, April 2015 (Scope of Work).

## 1.1 Project Purpose and Scope

The purpose of the RI/FS Study is to assess the nature and extent of sediment contamination present in the Canal through information already gathered, develop and evaluate remedial alternatives to facilitate remediation planning and implementation, and assist the WDNR in acquiring funding for such actions. The overall goal is to develop remedial alternatives that are compatible with ancillary issues, such as historic preservation, existing uses, future development, water quality, habitat and aesthetics. The final remedial alternative for the Canal will be selected based on natural resource management, environmental regulations, historic preservation, functional value, further development and funding. While the RI is necessary to document and justify an action, the FS is where the majority of the time and resources will be spent.

The scope of the RI/FS Study consists of the following components which are discussed further herein:

### 1) *Remedial Investigation*

- a) describe the site location, surroundings, and physical conditions
- b) document previous investigations and work performed at the site
- c) develop a conceptual site model that discusses hydrology, topography, and sediment deposits
- d) document the degree and extent of contamination based on previous investigations
- e) document human health risks identified by the Department of Health (DHS, 2014)
- f) document the environmental risks associated with the contaminated sediment

### 2) *Feasibility Study*

- a) identify and screen remedial technologies
- b) develop a least-cost alternative that would address contaminated sediment deposits in the canal
- c) develop a range of alternatives to manage canal sediments in a manner that would be compatible with existing uses, future development plans, and would increase natural resource value
- d) estimate costs to design and implement remediation options
- e) comparatively evaluate the developed alternatives
- f) develop a summary of the RI/FS for public outreach, including artist rendering(s) of the recommended option

## 1.2 Work Plan Organization

This RI/FS Work Plan is organized into the following eight sections:

- Section 1 – Introduction
- Section 2 – Site Background and Setting
- Section 3 – Remedial Investigation and Feasibility Scope of Work
- Section 4 – Communications Plan
- Section 5 – Project Schedule
- Section 6 – Project Team and Resources
- Section 7 – Quality Assurance/Quality Control
- Section 8 – Budget Considerations

## 2. SITE BACKGROUND AND SETTING

### 2.1 Site Description

The 17-acre Portage Canal Site (the "Site") is located in the City of Portage in Columbia County, Wisconsin (the "City"). The Portage Canal was excavated in the 1800s a length of approximately 2.5 miles and width of 52 to 90 feet for the purpose of connecting the Wisconsin and Fox Rivers; it was not a natural drainage way. The Canal was used by recreational and commercial boats traveling between the Great Lakes and the Mississippi River. A lock within the Canal at the Wisconsin River was constructed by the United States Army Corps of Engineers (USACE) in 1926 to 1928. The Canal was last dredged by the USACE in 1927, and since that time, much of the Canal has filled with sediment, resulting in water depths generally ranging from 0 to 3 feet. The Wisconsin River lock was deactivated in 1959/1960, the same time the Fort Winnebago Lock at the Canal entrance to the Upper Fox River was dismantled. In 1998, the USACE completed construction of a levee system for flood control in Portage, which blocked off the Canal entrance at the Wisconsin River.

The State of Wisconsin assumed ownership of the Canal from the Federal Government upon decommissioning of the locks and construction of the levee system. The Canal was listed on the National Register of Historic Places in 1977. The Portage or Wisconsin River lock is located at the west end of the Canal and is incorporated into the Portage Levee which follows the east bank of the Wisconsin River in the City of Portage and in the towns of Lewiston to the northwest and Pacific to the southeast.

Water flow in the Canal is to the northeast toward the Upper Fox River, although the flow is nominal and often results in stagnant water. Water level and flow in the Canal are influenced by the regional groundwater level and to lesser extent rain events that drain the small urban watershed. The Wisconsin River was historically thought to influence water levels in the canal based on previous documents in the site file, but the earthen dam and more recent studies of the intake structure indicate that the Wisconsin River, has little, if any, influence on flow in the Canal. The Canal abuts a number of private residences, commercial businesses, and several historic sites. The Canal itself is listed on the National Register of Historic Places (DHS, 2014).

The Canal is divided into four segments based on crossings. These segments are referred to herein as Segments 1 through 4. For purposes of this Study, the portion of Segment 1 from the Wisconsin River to Highway 51 is excluded as it does not contain sediment contamination. The following presents the segment descriptions and lengths to be used for the study:

- Segment 1 extends from Highway 51 to Adams Street (700 feet);
- Segment 2 extends from Adams Street to Canadian Pacific Railroad (CPR) Bridge (3,400 feet);
- Segment 3 extends from the CPR Bridge to STH 33 (1,750 feet); and
- Segment 4 extends from STH 33 to former Fort Winnebago Lock (4,650 feet).

## 2.2 Summary of Past Studies and Available Data

Sediment sampling was performed in 2003, 2004, 2009, and 2013 along the entire Canal (Figures 1 to 4). The understanding of sediment conditions in each of the four segments is based on the sampling results from these investigations.

The WDNR has indicated that mercury will be used as the driver for remediation of the Canal because the Department of Health determined that mercury poses a greater potential risk to human health from fish consumption than lead. Note that several other contaminants that are typically found in sediment are also found in the Canal, such as polychlorinated biphenyls, polynuclear aromatic hydrocarbons, other metals<sup>1</sup>, and petroleum type<sup>2</sup> materials. These other contaminants have been detected and exceed various standards, but are not as high nor as consistently present as mercury and lead. In addition, mercury and lead concentrations are collocated and correlated throughout this portion of the Canal, remediation of mercury in the Canal is expected to also address lead contamination, as well as all other contaminants<sup>3</sup>. For this reason, this proposed scope will focus primarily on mercury concentrations as the remedial cleanup driver.

In 2005, the WDNR calculated approximately 60,000 cubic yards of contaminated sediment in the Canal requires remediation. This volume was based on a simple volume calculation estimating 10,000 linear feet, an average contaminated sediment thickness of 2.15 feet, and an assumed canal width of 75 feet. Calculations made since 2005 using other methods resulted in a volume estimate of 55,000 to 83,000 cubic yards; the higher value including a 6-inch overdrudge.

## 2.3 Basis for Cleanup

According to the Department of Health Services (DHS), the levels of mercury in carp and game fish samples recently taken from the Canal are at elevated levels such that consuming fish from the Canal is a public health hazard. The sediments predominately contain levels of mercury and lead above current state standards.

Previous documentation indicates the WDNR has already established a target mercury cleanup value of 0.36 mg/kg based on the Consensus-Based Sediment Quality Guidelines, Interim Guidance (WDNR, December 2003), regional background mercury concentrations, and for consistency with other sites, such as Grubbers Grove. This target value is conservative, but simplifies the environmental approach to the site given the complicated nature of mercury geochemistry, the elusive understanding of methylmercury formation, and the even less well-characterized factors affecting inorganic mercury speciation and bioavailability to benthic invertebrates. The mercury target value is essentially a marker for the anthropogenic sediment that would address all of the collocated contaminants.

As discussed at the kickoff meeting, WDNR does not believe that further studies that would justify a less conservative approach to address localized hot spots and or limit the horizontal or vertical extent of remediation would be practical to implement for several reasons, such as the variable nature of

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<sup>1</sup> Arsenic, cadmium, chromium, copper, iron, manganese, nickel, and zinc.

<sup>2</sup> Oil and grease and diesel range organics.

<sup>3</sup> There currently are no known samples that exceed a sediment PEC or soil residential screening levels that do not also exceed 0.36 mg/kg mercury.



characterization and the excessive number of samples that would be necessary. In short, it is easiest to consider all of the sediment in the canal the same

#### **2.4 Adequacy of Existing RI Data**

Based on a review of the existing information, the WDNR has performed a number of sampling events to delineate the degree and extent of contamination, referencing sediment contamination to elevation, collecting flow information, collecting fish to assess bioaccumulation, and working with the Department of Health to assess the human health risks. It appears at this time that sufficient data has been collected to complete a RI and FS. While we recognize that some data has not been collected that is necessary, such as bank data, our technical approach is to develop a Conceptual Site Model (CSM) that will be sufficient to evaluate and select a remedy based on key assumptions. Any additional sampling will likely be remedy-specific as part of the remedial pre-design activities. As such, no sampling of sediment is planned as part of the scope of work.

### **3. REMEDIAL INVESTIGATION AND FEASIBILITY SCOPE OF WORK**

Based on recent meetings, it was determined that a combined RI/FS will be completed to streamline work efforts. The RI/FS will be used to characterize physical, chemical, and biological conditions in the canal, and to develop and evaluate a number of remediation alternatives to address muddy deposits in the canal to achieve site-specific Remedial Action Options (RAOs). This process lays the groundwork for proposing a selected remedy that best eliminates, reduces, or controls risks to human health and the environment. The four main tasks to be completed are outlined below.

#### **3.1 Task 1 - RI Preparation**

Ramboll Environ will prepare the RI portion of the combined RI/FS Report (consistent with Wisconsin Administrative Code (WAC) NR 712 and NR 716 and the most recent version of the Guidance for Conducting Environmental Response Actions, WDNR, PUBL SW-57-92) that focuses on identifying the nature and extent of sediment requiring remediation, and determining the chemical and/or physical factors driving the impairments. The RI will present a summary of the site risk assessment description/summary for human health and major ecological receptors. Human health risk will be based on the Department of Health's consultation. Ecological risk will be based on literature values and state guidance values.

Prior to completing the RI portion of the RI/FS Report, Ramboll Environ will prepare a technical memorandum describing preliminary findings and summarizing the chemical and physical factors that will be documented in the RI, the analyses to be performed, and the interpretive criteria to be applied to the evaluation of available ecological and environmental data. Specifically, the technical memorandum will include the following:

- Existing Data
- Nature and Extent of Contamination
- Fate and Transport of Contaminants
- Human Health and Ecological Baseline Risks as documented by WDNR
- Conceptual Site Model
- Conclusions and Recommendations

The goal of the RI task is to ensure that the previously collected data are sufficient in quality and quantity to meet the goals of the RI and support the FS. If additional data needs are identified as

part of the RI, these data needs will be recommended as part of a Pre-design data collection phase. After WDNR review, Ramboll Environ will obtain agreement with WDNR on the proposed RI approach. The RI will be incorporated into a combined RI/FS Report.

### **3.2 Task 2 - Remedial Alternatives Development & Feasibility Study**

Ramboll Environ will develop and screen remediation alternatives, in consultation with the WDNR. The Alternatives Analysis will include the following components.

#### **3.2.1 Identification of Remedial Action Options (RAOs)**

RAOs provide general descriptions of what the cleanup is expected to accomplish. In accordance with WAC NR 722, an initial screening of remedial technologies shall be conducted to identify remedial action options for further evaluation which are reasonably likely to be feasible for the Portage Canal Site. Appropriate remedial action options that have been identified for further evaluation based on the hazardous substances present, media contaminated and site characteristics shall be further evaluated as described in 3.2.2. This evaluation process shall be used to determine which remedial action option constitutes the most appropriate technology or combination of technologies to restore the environment, to the extent practicable, within a reasonable period of time and to minimize the harmful effects of the contamination to the air, land, or waters of the state, to address the exposure pathways of concern, and effectively and efficiently address the source of the contamination.

#### **3.2.2 Establish Remedial Action Objectives and General Response Actions**

Based on the available data, site-specific remedial action objectives to protect human health and the environment will be developed. The objectives will specify the contaminant(s) and media of concern, the exposure routes and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals or PRGs). The PRGs are used to define the extent of cleanup needed to achieve RAOs. Typically, PRGs involve chemical remedial action levels that define site-specific criteria, such as chemical concentrations in surface sediments (e.g., upper 10 or 15 cm), surface-weighted area average concentrations, or other such criteria. PRGs are used to delineate remediation footprints. Consistent with RAOs, PRGs may be expressed as performance-based goals that will address chemical concentrations in sediments.

General Response Actions (GRAs) are broad categories of conceptual sediment remediation. GRAs will be developed for each medium of interest defining containment, treatment, excavation, pumping, or other actions, singly or in combination to satisfy remedial action objectives. Based on initial discussions and review of site conditions, the following GRAs may include but are not limited to:

- No action, which serves as a basis for comparison to other effective and implementable technologies.
- Institutional controls, which include instruments such as administrative and legal controls to minimize the potential for exposure and can be used to ensure the long-term remedy integrity.
- Monitored Natural Recovery (MNR) to document the effectiveness of natural physical, chemical, or biological processes in reducing contaminant concentrations to achieve RAOs.
- Thin-cover placement such as sand, soil, or previously dredged sediment to enhance the process of natural recovery by placing the material on the sediment bed surface.
- Sediment capping to isolate contaminants from the water column and biological receptors by placing clean material on the sediment bed surface and armoring the cap as needed to withstand erosive forces.



- Sediment removal via dredging or excavation, often followed by placement of a clean backfill layer, and subsequent material management, such as dewatering and disposal of the excavated sediment.
- Channel filling for all or part of Segments 2 through 4.
- *In situ* sediment amendments, such as activated carbon or apatite, to sequester contaminants of concern and reduce bioavailability and risk.

### 3.2.3 Identification and Screening of Alternatives

The first evaluation step identifies an array of possible remedial technologies and evaluates these technologies based on technical effectiveness, implementability, and cost. Technologies and process options that: 1) have clearly not been demonstrated as effective in addressing similar conditions at other sediment sites, 2) cannot be implemented due to site-specific conditions, or 3) do not meet the RAOs will be eliminated from further consideration. The initial screening will include environmental protection, environmental effects, costs, ability to implement and reliability, and site compatibility. An Alternatives Array will be developed on a segment specific basis, or for combined segments (e.g., Segments 3 and 4 are likely to be combined), based on the results of the above screening analysis and the meeting with the WDNR. The alternatives array will be submitted to the WDNR for review before incorporating it into the FS. A minimum of 3 restoration alternatives, beyond no action, will be retained for further analysis for each segment or combined segments.

### 3.3 Task 3 - Detailed Analysis of Alternatives

As part of the plan to provide a more focused FS, Ramboll Environ will perform a planning level analysis of at least three restoration alternatives per segment or combined segments, and will provide a recommendation for a preferred alternative, in consultation with the WDNR.

A mechanism will be established to evaluate and rank alternatives, using criteria developed with WDNR in compliance with the requirements of WAC NR 722.07. The feasibility of appropriate remedial action options will be evaluated using the following criteria as specified in the Request for Proposal (RFP) and Scope of Work, consistent with WAC NR 722.07(4):

1. Long-term effectiveness
2. Short-term effectiveness
3. Implementability
4. Restoration time frame
5. Economic feasibility (capital, initial, operation and maintenance and potential future liability costs)
6. Natural resource value
7. Impact on the Environment

The FS will focus on remedial alternatives that manage the potential risks associated with the presence of elevated concentrations of COCs in sediments in a cost-effective manner while minimizing, to the extent practicable, the incidental impacts of remediation on the existing ecosystem. Screening and evaluation are conducted to ensure protection of human health and in accordance with criteria that weigh long-term risk reduction from the COCs against the risks of habitat/ecosystem harm from potential remedies. The selection of a Remedial Option will be conducted in accordance with WAC NR 722.09.

### **3.4 Task 4 - Preparation of the RI/FS Report**

The results of the FS will be included with those of the RI to present one combined RI/FS Report. The RI portion of the report will be completed in accordance with NR 716 and the FS portion of the report will be prepared in accordance with NR 722.13. Other deliverables will be submitted in accordance with the Scope of Work. A Draft RI/FS Report will be prepared that documents the RI findings and conclusions and presents the FS analysis, including the evaluation criteria, the alternatives identified, and the recommended alternative. An opinion of probable cost for the selected alternative will be included. The Draft RI/FS will be provided to the WDNR for comment, followed by Draft Pre-Final RI/FS, incorporating the WDNR's comments. A Final RI/FS Report incorporating the WDNR's comments will be prepared after meeting with the WDNR to discuss the report results.

## **4. COMMUNICATIONS PLAN**

### **4.1 Project Management, Progress Reports and Meetings**

Project management will be performed throughout the project and includes close coordination with the WDNR, monthly conference call progress meetings with WDNR staff and monthly progress reports plus preparation of meeting minutes following meetings. Meeting minutes will clearly identify the conclusions of the meeting and assignments. Progress reports will be submitted monthly with each invoice.

At a minimum, the following WDNR meetings will be held to discuss the following:

1. Kick off meeting to discuss the proposed scope of the project and schedule for the RI/FS;
2. Interim meeting to discuss the RI Technical Memorandum and Alternatives Array, and
3. Meeting to discuss the RI/FS Report.

### **4.2 Public/Stakeholder Meetings**

One of the benefits of stakeholder meetings is the sharing of ideas from people of all backgrounds and all interests. Some participants will be more knowledgeable than others, and they can share their expertise. This knowledge base may be in many different forms, whether recreational, cultural, or historical. The WDNR plans on three public meetings. Ramboll Environ will coordinate the project information to be submitted to the various stakeholder groups (i.e., affected property owners, locally elected officials, and the general public).

### **4.3 RI/FS Public Summary and Rendering**

After the approval of the Final RI/ FS Report, Ramboll Environ will prepare a brief public outreach summary which describes the findings of the RI/FS, reviews the alternatives considered and estimated costs, the recommended alternative(s), and an artist rendering of the selected option that is suitable to support public meetings.

## 5. PROJECT SCHEDULE

The following table presents a proposed project schedule.

Timeframe	Task Description
August 21, 2015	Notice to Proceed (NTP)
September 11, 2015	Project Kick-off Meeting
October 15, 2015	Submittal of Work Plan
December 1, 2015	Submittal of RI Memorandum of Findings
December 15, 2015	Meet with WDNR to discuss Alternatives to be Included in Detailed Analysis
February 1, 2015	Submit Alternatives Array to the WDNR
March 30, 2016	Submittal of Draft RI/FS Report
April 15, 2016	Public Meeting
May 15, 2016	Submittal of Final RI/FS Report
June 1, 2016	Public Summary and Rendering
June 30, 2016	Public Meeting Presentation

## 6. PROJECT TEAM AND RESOURCES

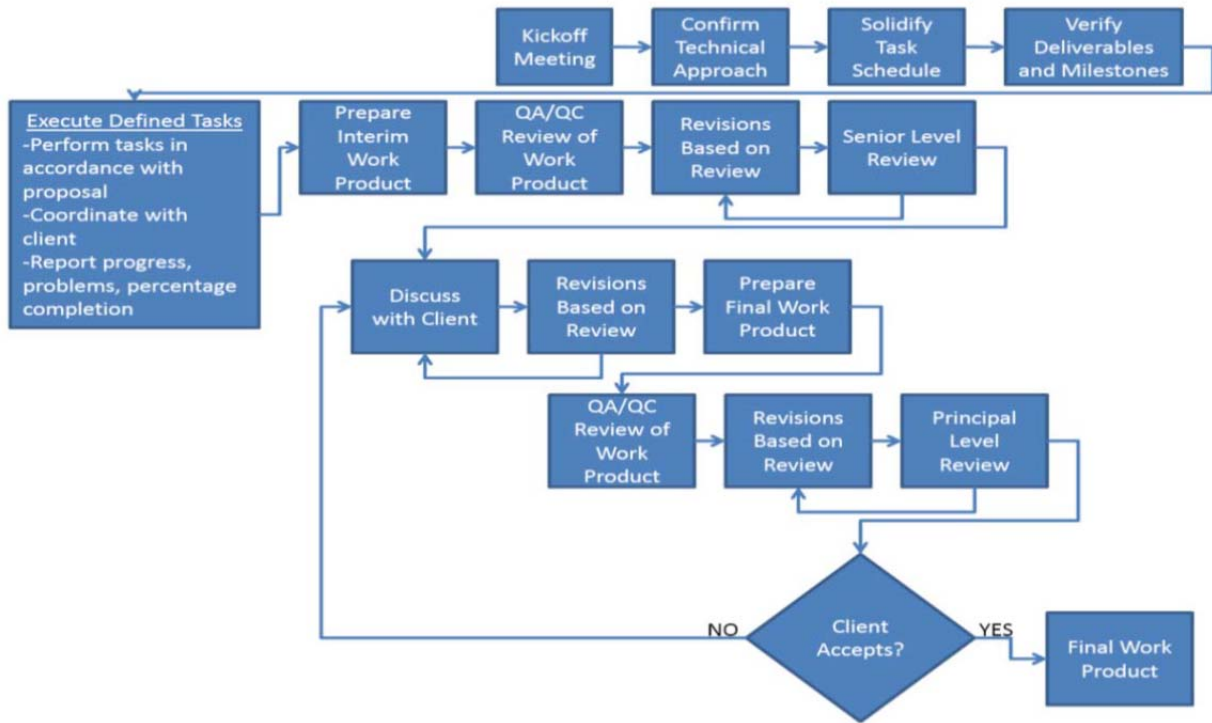
Ramboll Environ is the Prime Consultant for the work. Ramboll Environ will be supported by Stormwater Solutions Engineering LLC; a women owned business and, K. Singh & Associates Inc. (KSA) a minority small business enterprise. Environmental Monitoring and Technologies Inc. (EMT), a Service-Disabled Veteran-Owned Small Business was originally part of the project team; however, because no RI sampling and analysis is proposed, it is unlikely that these services will be required.

## 7. QUALITY ASSURANCE/QUALITY CONTROL

Successful task monitoring will be conducted to ensure milestones, budget, and schedule are met. These elements will serve as a baseline against which Ms. Jeanne Tarvin (the Project Manager) will monitor the progress of the project. The Ramboll Environ Project Team is committed to meeting all milestones and deliverable dates and completing all proposed tasks within budget estimates. The Project Team is organized such that there is a Project Manager, who is responsible for overseeing the entire project; task leaders who oversee the technical and functional responsibilities of each individual task and who are directly below and report to the Project Manager; and staff who support the task leaders with the technical details for each task. The Project Principal is responsible for overall quality control and assurance.

The Project Team's task initiation, planning, and QA/performance process is summarized in the following flow chart. This process will be followed for each individual task specified in the proposal. Monthly, the Ramboll Environ Project Team will compare project progress to the proposed schedule and budget. When there is a significant variation, the Project Team will take immediate steps to remediate the delay and/or provide a revised task plan to the WDNR if necessary. For this project, the Project Manager is committed to frequent and cost effective communications on issues before they create possible problems for the project.

The Project Manager and Principal will also support the project by providing peer review on key documents and data based on their experience on other RI/FS projects.



## 8. BUDGET CONSIDERATIONS

Ramboll Environ will prepare all plans and reports on a time and materials basis as detailed in the cost table below from our previous proposal by task.

Task Description	Estimated Cost
Work Plan Preparation	\$6,400
Remedial Investigation	\$27,100
Remedial Alternative Development	\$18,600
Detailed Analysis of Alternatives and RI/FS Report	\$41,200
Progress Reports and Payment	\$11,500
Public Meetings	\$9,300
RI/FS Public Summary and Rendering	\$8,300
<b>Subtotal</b>	\$122,400
Contingency	\$12,240
<b>TOTAL</b>	<b>\$134,640</b>

Ramboll Environ has included a 10% contingency fee for out-of-scope items in our cost estimate to cover potential out-of-scope items that may develop during execution of the scope of services that were not contemplated during preparation of the scope of work including preparation for and discussions with the WDNR or other stakeholders and/or additional site investigation not anticipated at this time. If tasks beyond the Scope of Work provided in this proposal are identified and requested by the WDNR, Ramboll Environ will complete such tasks on a time and materials basis in accordance with the contract Terms and Conditions.

A change order will be developed by Ramboll Environ for any out-of-scope work requested by the WDNR. Ramboll Environ will obtain written approval from the WDNR of the change order scope and amount prior to performing any out-of-scope tasks. Ramboll Environ will not incur additional costs without the WDNR's pre-approval of the change order scope of services and cost estimate.

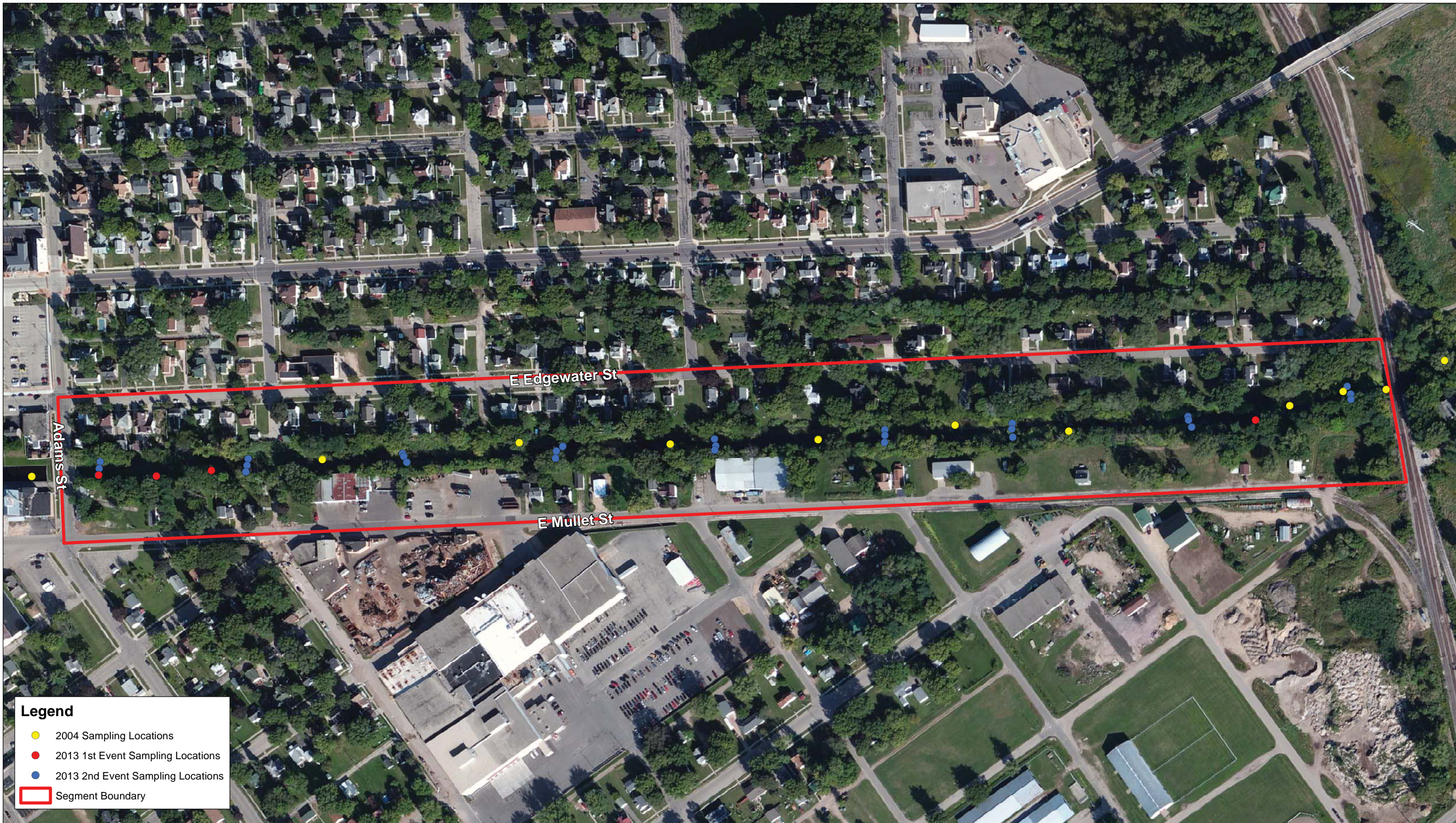
## FIGURES





# Portage Canal Segment 1



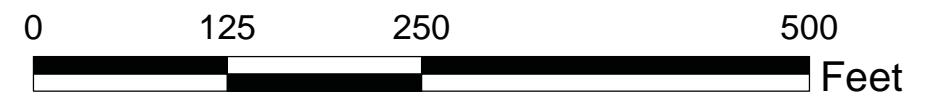


# Portage Canal Segment 2





# Portage Canal Segment 3







# Portage Canal Segment 4