MINNEHAHA CREEK WATERSHED DISTRICT
QUALITY OF WATER, QUALITY OF LIFE

Meeting: Board of Managers
Meeting date: 7/22/2021
Agenda Item #: 11.2
Request for Board Action

Title:	Authorization to Execute Contract for Assessment for the East Auburn Wetland Monitoring and Feasibility Support
Resolution number:	21-052
Prepared by:	Name: Brian Beck Phone: 952-471-8306 bbeck@minnehahacreek.org
Reviewed by:	Name/Title: Laura Domyancich-Lee/Planner Project Manager
Recommended action:	Approval of a contract with Stantec to conduct preliminary field visits, develop and execute a monitoring plan, and conduct feasibility level engineering design for the East Auburn Wetland
Schedule:	August 2021: Conduct site visit and develop monitoring plan October 2022: Complete wetland monitoring to inform engineering design December 2022: Develop feasibility report outlining potential wetland restoration options
Budget considerations:	Fund name and code: Research & Monitoring: Contract Services/5-5001-4320 Fund budget: $98,730 Expenditures to date: $225 Requested amount of funding: $48,550
Past Board action:	Res # 14-047 — Title: Identifying Six Mile Creek Subwatershed as a Priority Focus Area Res # 15-030 — Title: Authorization to Execute a Memorandum of Understanding with the City of Victoria

Summary:
In May 2014, the Minnehaha Creek Watershed District (MCWD) Board of Managers formally adopted the Six Mile Creek-Halsted Bay (SMCHB) subwatershed as a geography of strategic planning and implementation focus. In March 2015, the City of Victoria and MCWD executed a memorandum of understanding (MOU) which identifies the mutual value both agencies find in cooperative planning, coordination across agencies on priority water resource issues, and increasing regulatory coordination to support and foster integrated water and natural resources management. One of the priority water resource management areas identified for increased collaboration is Lake Wassermann, an impaired waterbody within the City of Victoria.

Since adoption of the 2017 Water Resources Management Plan (WRMP), MCWD has been working to implement high impact capital projects within the SMCHB subwatershed, with particular focus in the City of Victoria and Laketown Township, where current land use pressure presents a unique opportunity to implement high impact capital projects concurrent with development. Under this plan, MCWD has invested substantially in the restoration of Wassermann Lake through both watershed and in-lake management activities.

In January 2020, MCWD was awarded a Clean Water Fund grant from the Board of Water and Soil Resources (BWSR), positioning MCWD for an initial alum treatment of Wassermann Lake in spring 2021 and a subsequent treatment in fall 2022. This project, in addition to the recent upstream watershed projects, should result in Wassermann Lake meeting water quality standards and its removal from the Impaired Waters List.

The next logical step is to address impairments downstream of Wassermann Lake by identifying drivers of poor water quality in East Auburn Lake, which receives drainage from Steiger and Sunny Lake. The 2017 WRMP identifies that the impairments in East Auburn Lake are driven primarily by wetland phosphorus export. The WRMP also identifies the wetland that lies between Wassermann Lake and East Auburn Lake as a potential restoration opportunity.

MCWD staff analyzed historic water quality data to identify if, and to what extent, the wetland between Wassermann Lake and East Auburn Lake is exporting phosphorus. This analysis, provided as Attachment 2, revealed that the wetland is exporting 135 pounds of phosphorus per year to East Auburn Lake. In comparison, the total watershed load reduction needed for East Auburn Lake to meet water quality standards is 341 pounds of phosphorus per year in the Six Mile Creek Diagnostic Study. Therefore, a wetland restoration focused on phosphorus reduction could achieve nearly half of the total watershed load reduction needed for East Auburn Lake.

In 2019 and 2020, MCWD staff conducted more refined water quality sampling, hydrology and vegetation analysis, in cooperation with Stantec, in the wetland between Wassermann Lake and East Auburn Lake to identify if there was a specific area within the wetland responsible for the majority of the phosphorus export. The analyses by MCWD and Stantec in Attachment 2 and Attachment 3 indicated that a relatively small portion of the wetland was the primary driver of phosphorus export.

With a characterization of the location and magnitude of the phosphorus export, identifying an engineering solution to reduce export from this wetland is the next step. MCWD staff have worked with Stantec to develop a scope of work to support monitoring in 2021 and 2022 that will inform preliminary engineering design. This scope of work will not exceed $48,550 and will likely be reduced as preliminary data is gathered and the monitoring effort is streamlined. It is important to note that wetland restorations focused on phosphorus reduction are relatively novel endeavors, which is why Stantec's scope is divided into three gated sections. These phases of the scope of work include:

1. Conducting a field visit aimed at informing the extent of the monitoring effort, which will ultimately reduce the amount of monitoring required to inform engineering design
2. Executing the monitoring plan in cooperation with MCWD staff
3. Developing planning level design options that will outline potential project options, phosphorus load reductions, and project costs

Itemized costs for these services are provided in Attachment A of the draft scope of work.

Supporting documents (list attachments):

- Attachment 1: Draft scope of services
- Attachment 2: 2019 MCWD Phosphorus Assessment of the East Auburn Wetland
- Attachment 3: Wenck Associates East Auburn Wetland Assessment

MINNEHAHA CREEK
WATERSHED DISTRICT
QUALITY OF WATER, QUALITY OF LIFE

RESOLUTION

Resolution number: 21-052

Title: Authorization to Execute Contract for Assessment for the East Auburn Wetland Monitoring and Feasibility Support

WHEREAS, pursuant to Resolution 14-047, the MCWD Board of Managers has identified the Six Mile Creek-Halsted Bay subwatershed as a priority area for focusing District planning activities and coordination efforts with subwatershed partners;

WHEREAS, on March 26, 2015, the District to entered into a Memorandum of Understanding with the City of Victoria outlining opportunities to collaborate and integrate mutual efforts in the realms of local water and land use planning, assessment of specific water management issues, and coordinated regulatory review of water and land development;

WHEREAS, the District has developed a plan for the Six Mile Creek-Halsted Bay subwatershed that identifies implementation strategies to achieve the District's goals of protecting and improving water quality, water quantity, ecological integrity, and thriving communities through land use and water integration;

WHEREAS, the MCWD Watershed Management Plan identifies the wetland between East Auburn Lake and Wassermann Lake as a planned capital investment to reduce watershed nutrient loading to improve water clarity and create a more abundant and diverse aquatic vegetation community in East Auburn Lake;

WHEREAS, in 2019 and 2020, MCWD staff monitored the wetland that lies in between East Auburn Lake and Wassermann Lake, and this monitoring confirmed that the wetland is a major source of phosphorus to East Auburn Lake and identified the location of the phosphorus export within the wetland;

WHEREAS, District staff solicited a scope of services from Stantec based on Stantec's unique qualifications and its familiarity with the site from past monitoring for vegetation restoration opportunities.

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers authorizes the District Administrator, on advice of counsel, to execute a contract with Stantec for an amount not to exceed $48,550.

Resolution Number 21-052 was moved by Manager _____, seconded by Manager _____. Motion to adopt the resolution ___ ayes, ___ nays, ___abstentions. Date: 7/22/2021

_____ Date: _____
Secretary

Stantec Consulting Services Inc.
7500 Olson Memorial Highway, Golden Valley, MN 55427

July 15, 2021
File: Auburn Wetland Monitoring Assistance and Engineering Feasibility

Attention:
Brian Beck, Anna Brown, Laura Domyancich-Lee
Minnehaha Creek Watershed District
15320 Minnetonka Blvd.
Minnetonka, MN 55345

Dear Mr. Beck, Ms. Brown, and Ms. Domyancich-Lee

Reference: DRAFT Scope of Work for Auburn Wetland Monitoring Assistance and Engineering Feasibility

Thank you for the opportunity to continue to provide our services to the Minnehaha Creek Watershed District (District). As requested, Stantec has prepared this proposal to assist the District in developing a targeted hydrology and water quality monitoring plan for the Auburn Wetland system, execute the targeted monitoring plan, and then use the monitored data to evaluate potential engineering options to reduce dissolved phosphorus export from the wetland system. This letter defines Stantec's scope of work to complete the work.

Background

The District monitored water quality and flow from upstream and downstream of the Auburn Wetland system from 2009 through 2015 and in 2020. In 2019 and 2020, District staff analyzed these data to determine if the Auburn Wetland is acting as a source of phosphorus to East Auburn Lake. This analysis produced the following conclusions (MCWD 2019):

- The Auburn Wetland removes particulate phosphorus, however dissolved phosphorus concentrations and loads increase from upstream to downstream through the system
- The wetland exports dissolved phosphorus to East Auburn Lake at an average rate of approximately 135 pounds per year
- The upstream-most cell (i.e. Wassermann Lake outlet to boardwalk across from Butternut Ct. (CSI12)) is responsible for the majority of the dissolved phosphorus export from the wetland system and therefore should be the focus of water quality restoration

Services Provided

The specific work to be performed by Stantec is described below. In general, Stantec will provide technical assistance to develop a targeted monitoring plan for the upstream cell of the Auburn Wetland (Task 1), execute the monitoring plan (Task 2), and evaluate potential engineering options to improve water quality (Task 3). At this time, we do not have enough information on the upstream cell of the wetland to evaluate

engineering options. Thus, an initial site visit will be conducted by Stantec staff to collect information that will be used to inform the development a targeted monitoring plan for the upstream cell, which is the primary deliverable for Task 1.

Task 2 will be execution of the targeted monitoring plan developed during Task 1. Subtasks and fees outlined below for Task 2 should be viewed as conservative estimates at this time and will be refined following completion of Task 1. The goal of the monitoring activities outlined in Task 2 are to answer the following questions: 1) what is the general hydrology and hydraulics of the wetland and the channel within the wetland; 2) how does wetland soil/sediment phosphorus content and redox condition change at different depths within the soil/sediment profile and at different locations throughout the wetland; and 3) under what hydrologic and hydraulic conditions is dissolved phosphorus released? It is anticipated monitoring will occur from April/May 2022 through October 2022. Following the completion of Task 2 and as the questions stated above are defined and answered, the project will move to Task 3 which will help define conceptual solutions to the release of the dissolved phosphorus.

- **Task 1 – Develop Targeted Monitoring Plan**
  - Field visit (2 Stantec staff, 1 MCWD staff) to assess wetland conditions in the upper cell of the Auburn Wetland system. Data collection will include flow measurements, surface and water level elevations (i.e. cross sections of water surface across the wetland), dissolved oxygen measurements, and soil borings from various locations to characterize the soil profile and spatial variability
  - Compile, review, and analyze historic monitoring data and data collected during the field visit
  - One meeting with Stantec and District staff to review data and draft monitoring plan
  - Develop final targeted monitoring plan

- **Task 2 – Execute Targeted Monitoring**
  - Install up to 26 wells/piezometers at up to 10 locations within the upstream wetland cell to evaluate water levels and collect water quality measurements (2 Stantec staff, 1 District staff, fall 2021).
  - Help install up to 10 pressure transducers and 4 dissolved oxygen sensors within the wells/piezometers (1 Stantec staff, 1 District staff, spring 2022). It is assumed that all monitoring equipment will be provided by the District.
  - Collect up to 20 soil/sediment samples at up to 10 locations within the upstream wetland cell to evaluate phosphorus conditions (2 Stantec staff, spring 2022). Samples will be transported to the University of Wisconsin – Stout Lab where they will be analyzed for moisture content-bulk density, loss-on-ignition organic matter, total phosphorus, total iron, total aluminum, and biologically-labile and refractory phosphorus. Additionally, sediment assays will be performed on up to 3 soil/sediment samples collected within the wetland system.
  - Measure travel time in channel during “critical conditions” (defined during Task 1 using historic monitoring data) for phosphorus release using dye tracer (1 Stantec staff, 1 District staff, summer 2022). It is assumed that the District will provide equipment (e.g. ISCO and/or fluorometer) to monitor dye at downstream location(s).
  - Conduct up to 10 monitoring events to collect water quality samples from the wells/piezometers. Up to 20 samples will be collected during each monitoring event and will be analyzed in the lab for total phosphorus, ortho-phosphorus, and total iron. It is assumed that Stantec staff will assist MCWD with the first two monitoring events (1 Stantec staff, 1

District staff, spring-fall 2022) and the District will cover the other eight events and all associated laboratory fees.
    - Two meetings with Stantec and District staff to 1) provide a check-in on monitoring activities after piezometers/wells and monitoring equipment has been installed; and 2) review monitoring results with staff at the completion of the monitoring season.

- **Task 3 – Evaluate Engineering Options**
    - Review and analyze historic data and data/information analyzed and collected during Tasks 1 & 2
    - Conduct conceptual engineering alternatives analysis and develop planning level costs and load reduction estimates
    - Two meetings with Stantec and District staff to 1) review preliminary engineering options; and 2) provide summary analysis and alternatives
    - Final memo summarizing data analysis, alternatives analysis, cost estimates, and estimated load reductions

Fee Estimate, Schedule & Deliverables

Fee Estimate

In exchange for Stantec performing the services presented in this scope of work, the District will pay Stantec a fee of up to $48,550 as described below. A more detailed breakdown of the fee estimate is included in Attachment A. This fee represents the total of all time and materials to complete each task in the scope of work at our most efficient discounted hourly rates that are currently used by the District. As discussed above, Task 2 fees should be viewed as conservative estimates at this time and will be refined following completion of Task 1. In the event that follow-up or out of scope items are identified or requested by the District, Stantec will work with the District to develop a scope and budget for the additional task(s) and will not proceed with identified task(s) without authorization from the District.

- Task 1 Estimated Fee: $7,100
- Task 2 Estimated Fee: $25,500
- Task 3 Estimated Fee: $16,250

Schedule

Stantec will begin work immediately upon receiving a Notice to Proceed from the District. The tentative schedule for completing each task is summarized below:

- Task 1 completed by August 31, 2021
- Task 2 completed by October 31, 2022
- Task 3 completed by December 31, 2022

Deliverables

- Task 1: Meeting with District staff and memo describing final targeted monitoring plan

Reference: **Auburn Wetland Monitoring Assistance and Engineering Feasibility**

- Task 2: Installation of piezometers/wells and monitoring equipment, sediment/soil sample collection and lab analysis, completed dye study, water sample monitoring assistance, and two meetings with District staff
- Task 3: Two meetings with District staff and final project memo/report

Project Team

The following Stantec staff have been selected to execute the Scope of Work. Other staff will participate as needed

- Project Manager: Jeff Strom
- Soil Scientist: Aaron Hyams
- Wetland Scientist: Wes Boll
- Hydrogeologist: Joel Thompson
- Project Engineer: Anne Wilkinson, EIT
- Senior Engineer Chris Meehan, PE

Regards,

Stantec Consulting Services Inc.

Chris Meehan, PE (MN), CFM
Principal-in-Charge
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Jeff Strom
Project Manager
Phone: (952) 484-9083
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Stantec

ATTACHMENT A – DETAILED FEE ESTIMATE

Task	Subtask	Labor Cost	Lab, Equipment, Mileage Cost	Total Cost
Develop Targeted Monitoring Plan	Prep/planning and site visit	$3,400	$450	$3,850
	Data processing	$1,200	--	$1,200
	Meeting with District	$550	--	$550
	Develop final sample plan	$1,500	--	$1,500
			Task 1 Total	$7,100
Execute Targeted Monitoring	Install piezometers/wells	$4,450	$1,800	$6,250
	Install monitoring equipment	$1,150	--	$1,150
	Collect soil/sediment samples	$2,400	$9,250	$11,650
	Measure travel time	$2,500	$275	$2,775
	Assist with two monitoring events	$1,900	$75	$1,975
	Meetings with District (2)	$1,700	--	$1,700
			Task 2 Total	$25,500
Evaluate Engineering Options	Review and analyze data	$5,500	--	$5,500
	Engineering alternatives analysis	$4,350	--	$4,350
	Meetings with District (2)	$1,000	--	$1,000
	Final Memo	$5,400	--	$5,400
			Task 3 Total	$16,250

TECHNICAL MEMORANDUM

To: Anna Brown

From: Brian Beck

Date: November 18, 2019

Re: East Auburn Wetland Phosphorus Analysis

Purpose:

The purpose of this evaluation is to determine if the wetlands located between Wasserman Lake and East Auburn Lake (Auburn Wetland) are acting as a source of phosphorus. Furthermore, we want to develop a better understanding phosphorus release from specific areas within the wetland. Ultimately, phosphorus export information will inform potential management actions and land acquisitions.

Water Quality Analysis:

Minnehaha Creek Watershed District (MCWD) has historic water quality and flow data from upstream and downstream of the Auburn Wetland, which provides information about phosphorus cycling and hydrology (Figure 1). We primarily focus on dissolved phosphorus since it is typically the best metric for characterizing phosphorus export in wetlands. Particulate phosphorus concentrations can also be used to determine if more phosphorus is being captured or released by a wetland.

Typically, the first cut analysis is to determine if total phosphorus concentrations increase between the inlet and outlet of the Auburn wetland due to phosphorus release from wetland sediments. Total phosphorus concentrations at the outlet of the wetland are higher than the inlet, which indicate that the East Auburn Wetland is exporting phosphorus (Figure 2). Separating dissolved and particulate phosphorus show that the Auburn Wetland is exporting dissolved phosphorus, but has little impact on particulate phosphorus (Figure 2).

Figure 1. Overview of wetland complex located between Wasserman Lake and Auburn Lake. Yellow points represent historic monitoring locations and the brown monitoring point represents a monitoring location added in 2019.

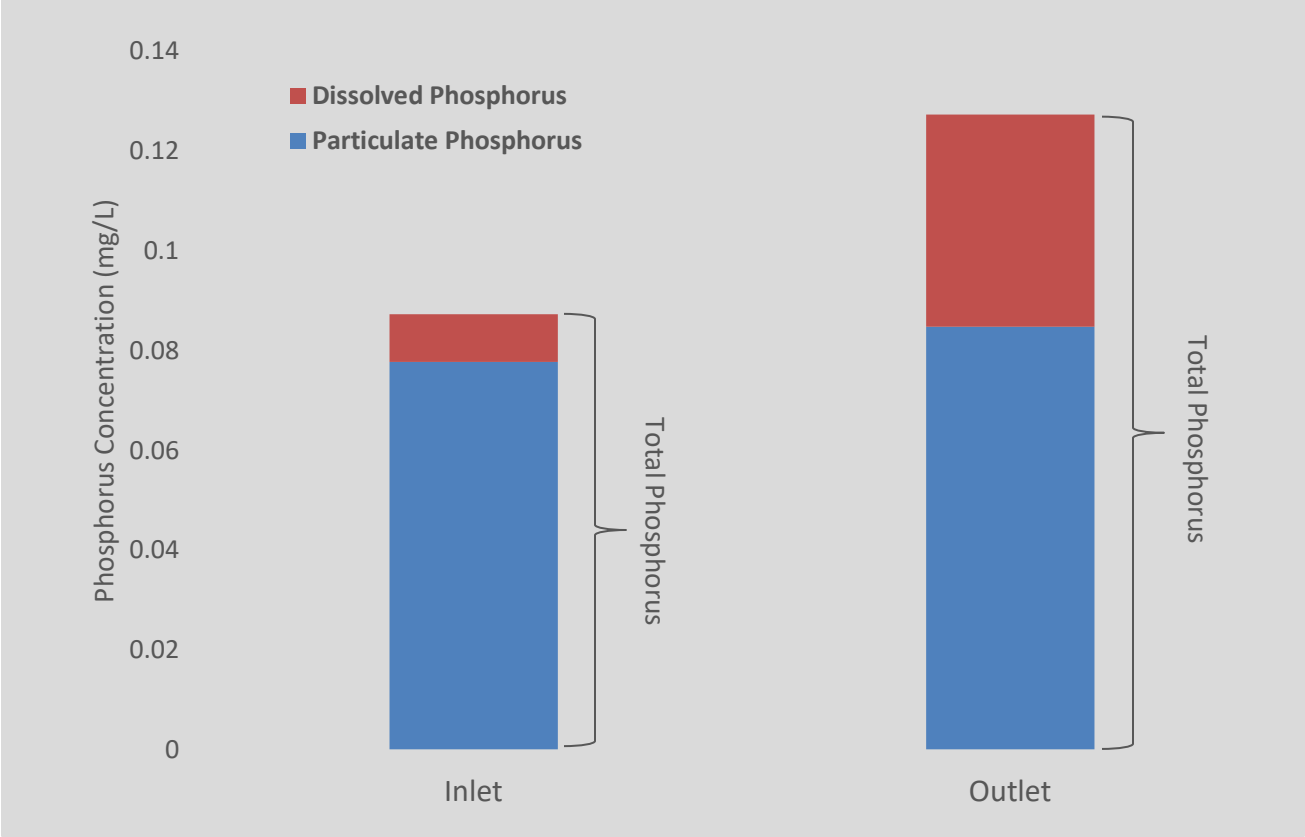


Figure 2. Total (blue) and dissolved (red) phosphorus concentrations at the inlet (left) and outlet (right) of the Auburn Wetland.

An initial assessment of the data clearly shows that the Auburn Wetland is exporting dissolved phosphorus. A secondary method to confirm wetland phosphorus export is characterizing seasonal dissolved phosphorus concentrations at the inlet and outlet of the wetland. Generally, microbial activity within wetland soils is the primary driver of legacy phosphorus export in wetlands. Microbial activity is typically regulated by temperature assuming all other factors are equal. Therefore, we would expect that phosphorus export in a wetland would be elevated during warm summer months and suppressed during cooler spring and winter months. The seasonal dissolved phosphorus concentrations further support the concept that the East Auburn Wetland is exporting phosphorus since the months with the greatest increase in dissolved phosphorus coincide with warmer summer months (June, July, August, and September; Figure 3).

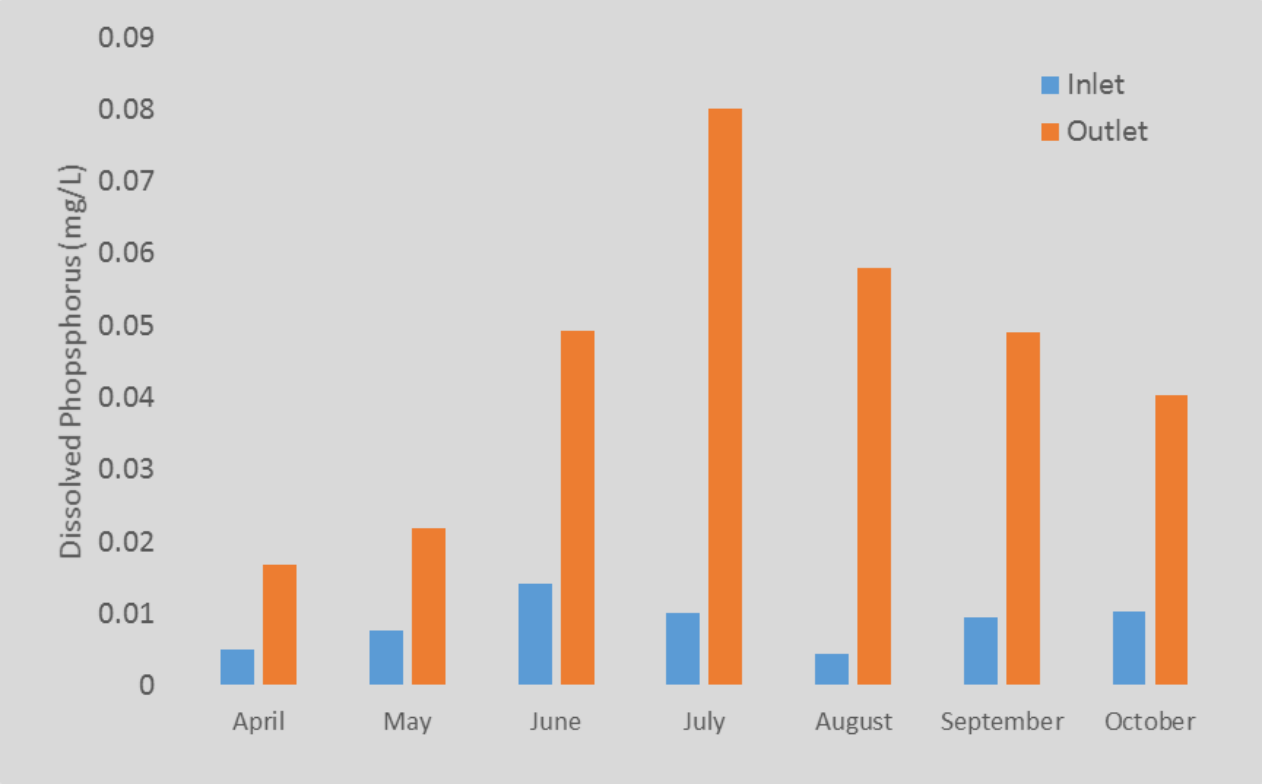


Figure 3. Monthly inlet and outlet phosphorus concentrations measured in the Auburn Wetland.

Quantifying the phosphorus load is a critical next step because concentration does not tell the entire story. We also need to characterize dissolved phosphorus load from the Auburn Wetland, which represents the mass of phosphorus that is impacting downstream water bodies (Figure 4). Based on this analysis the Auburn Wetland exports 135 pounds of dissolved phosphorus per year to East Auburn Lake.

We can put the Auburn Wetland phosphorus export in context of the total phosphorus load reductions necessary to meet water quality standards. The phosphorus watershed load reductions necessary to meet water quality standards are 341 pounds of phosphorus per year (Wenck, 2013). Therefore, we have the potential to meet nearly half of the total watershed phosphorus load reduction for East Auburn Lake by reducing the phosphorus export from the Auburn Wetland.

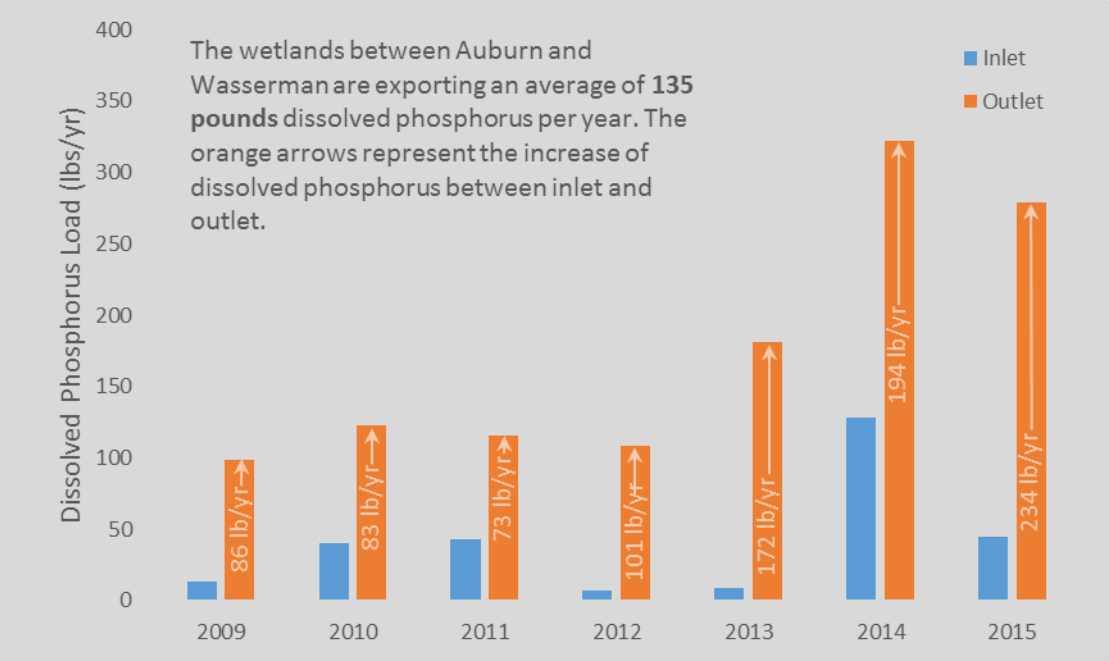


Figure 4. Dissolved phosphorus loading at the inlet (blue) and the outlet (orange) of the Auburn Wetland. The light orange arrows and loading numbers represent the net dissolved phosphorus release from the Auburn Wetland, which can be attributed to phosphorus release from sediments.

In 2019, water quality samples were collected at the inlet, midpoint, and outlet of the East Auburn Wetland to identify if the upstream or downstream wetland locations have a disproportionately large impact phosphorus export in the East Auburn Wetland (Figure 1).

Water quality samples collected in 2019 at the inlet, midpoint, and outlet of the East Auburn Wetland indicate that dissolved phosphorus concentrations increase by an order of magnitude (+600%) between the inlet of the wetland and the midpoint (Figure 5). Conversely, the average increase of dissolved phosphorus between the midpoint and outlet is relatively small (+20% increase).

These findings make sense in context of historic phosphorus loading from Wassermann Lake. Over the last century, Wassermann Lake has had poor water quality due to elevated watershed loading, which has exceeded Wassermann Lake's ability to assimilate the phosphorus. The excess phosphorus that Wassermann Lake could not assimilate was exported to the East Auburn Wetland.

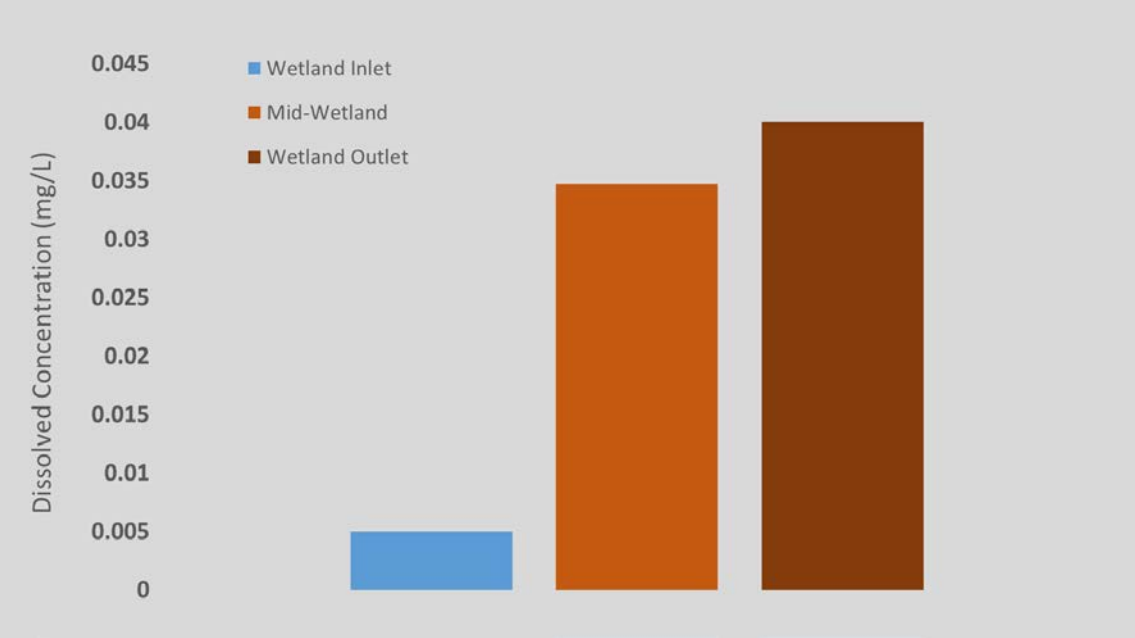


Figure 5. Dissolved phosphorus loading at the inlet (blue), midpoint (light orange), and outlet (dark orange) of the East Auburn Wetland.

Interestingly, the East Auburn Wetland is split into two cells by a trail, but is still hydrologically connected by a 36" culvert. Both wetland cells continue to remove phosphorus at a similar rate (Figure 6). However, the upstream cell has likely accumulated a greater amount of particulate phosphorus, which is driving greater phosphorus export (Figure 5).

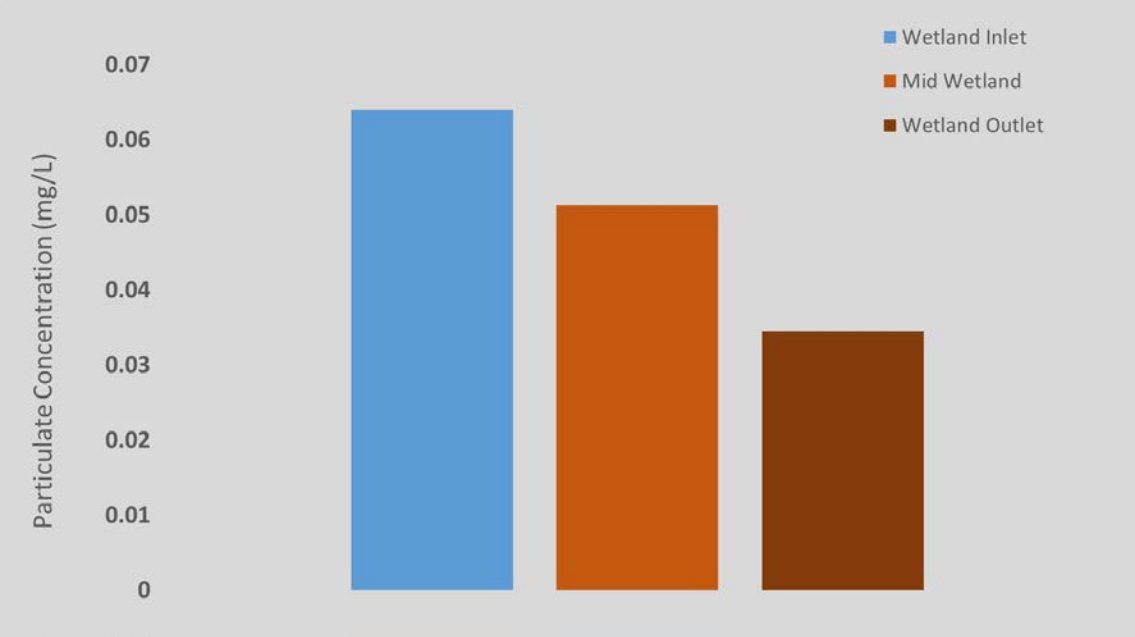


Figure 6. Particulate phosphorus loading at the inlet (blue), midpoint (light orange), and outlet (dark orange) of the East Auburn Wetland.

Conclusions

This analysis revealed several important details about the magnitude and location of phosphorus export within the East Auburn Wetland. These items include:

1. The annual load from the Auburn Wetland to East Auburn Lake is 135 pounds per year.
2. The Auburn Wetland is a source of total and dissolved phosphorus to East Auburn Lake.
    a. The upstream cell is responsible for the majority of phosphorus export in the East Auburn Wetland.
    b. Both cells remove particulate phosphorus at a similar rate, however, dissolved phosphorus release from the upstream wetland cell overwhelms the wetlands overall ability to remove phosphorus
3. The focus of water quality restoration should be on the upstream cell since it is the driver of phosphorus release from the wetland.

Technical Memo

WENCK
Responsive partner.
Exceptional outcomes.

To: Brian Beck, MCWD

From: Wes Boll, Wenck Associates, Inc.

Date: December 4, 2019

Subject: East Auburn Wetland Assessment

Introduction

Wenck was contracted by MCWD to assess the wetland basin identified as "East Auburn Wetland" by MCWD (See Figure 1). The East Auburn Wetland, which is located along Six Mile Creek between Wasserman Lake and Lake Auburn, was identified as a potential location for a restoration or water quality improvement project by MCWD. Wenck's specific tasks in this assessment are to summarize the previously completed off-site assessment of existing and historical wetland conditions, assess the hydrology and vegetation of the wetland to supplement MCWD's assessment of the nutrient cycling and feasibility of a project in this location.

This memo provides a summary of the assessment of the existing hydrology of the site and the characterization of existing vegetation communities on the site.

Methodology

The scope of work for this assessment included the desktop review of available information that was completed in an earlier project (aerial photographs, LIDAR, NWI, soil survey, MCWD Functional Assessment of Wetlands (FAW)/McRAM). The scope of work also included the installation of monitoring wells, the assessment of data collected in the wells, and a field vegetation assessment.

Results

Off-Site Information Review

Review of aerial photographs, soil survey, and NWI that was conducted as part of a previous investigation indicates that the wetland complex contains a shallow open water basin fringed by shallow/deep marsh with shallow marsh and shrub swamp communities present in the eastern portion of the wetland. Six Mile Creek flows through the wetland and a constructed ditch draining to the creek channel from the east was also observed in aerial photographs dating back to 1963. It also appears that the natural Six Mile Creek channel was historically straightened or altered through this reach. Other disturbances observed on aerial photographs include what appears to be constructed crossings and fill along the northeast edge of the wetland. Aerial photographs from the previous investigation on the site are in Appendix A.

The wetland appears to have been a drier hydrologic regime (wet meadow) in 1940. It appears that the wetland shifted to a wetter hydrologic regime (shallow marsh) during the time period from 1940 to 1963, which corresponds to water levels also apparently

increasing in Lake Auburn to the north. It is possible that this apparent change was due to climactic conditions or a change to water level controls in Lake Auburn downstream that may have occurred during this time period. The hydrology conditions do not appear to have changed significantly from 1963 to the existing conditions, as surface water is observed in ditches to a similar extent in aerial photographs from 1963 to 2016. It does not appear that Six Mile Creek or the constructed ditch significantly altered the hydrology of the wetland or converted it to non-wetland historically, based on review of aerial photographs.

The MCWD FAW identified the vegetation communities in the wetland as low quality.

Based on the observations of wetland signatures and vegetation communities in aerial photographs, it does not appear that the existing wetland extent or hydrologic regime is significantly different from what was present dating back to 1963. However, it is likely that the ditching present in the wetland has resulted in some minor alterations to hydrology and how water flows through the wetland, which could have potentially contributed to the degradation of some wetland functions and the quality of the vegetation community.

Hydrology

Wenck and MCWD staff installed two monitoring wells on August 7, 2019 (see locations in Figure 2). MCWD staff installed pressure transducers to collect continuous water level data at these two locations from mid-August to early October 2019. While this is typically the driest portion of the growing season, when water levels would be expected to be lower, precipitation was above average during nearly the entire monitoring period in 2019.

Water surface elevations at the two monitored locations and elevations of other site features are shown in Exhibit 1. For the purposes of this assessment, the water surface elevation data is used to assess the hydrologic regime of the wetland in order to determine the extent and duration of wetland hydrology in the wetland and whether the hydrology appears to have been altered. Water surface elevations were observed to be approximately 0.7 ft higher at the upstream end of the wetland (CSI19).

The elevation of the culverts upstream and downstream of the wetland were also surveyed and the elevation of the downstream culvert is shown in Exhibit 1. The elevation of the downstream culvert (940.2 ft) is approximately 1.5 feet to 2 feet lower than the water levels observed at the downstream end of the wetland. Based on the observations of hydrology in 2019, this indicates that hydrology in the wetland is not significantly affected by the ditch through the wetland, as the ditch is not capable of removing hydrology if water levels in the ditch are similar to the adjacent wetland and higher than the ditch bottom. The observation of water levels that are consistently higher than the outlet also may be an indication that water levels in Lake Auburn downstream influence water levels in the wetland under most conditions.

Data from the monitoring location at the upstream end of the wetland (CSI19) demonstrates that water levels were near or above the observed ground surface of the adjacent wetland for the entire time the wetland was monitored.

Data from the downstream end of the wetland (CSI05) demonstrates that a slightly wetter hydrologic regime is present as water levels were above the ground surface (to a depth of approximately 0.75 feet) for the entire monitored period.

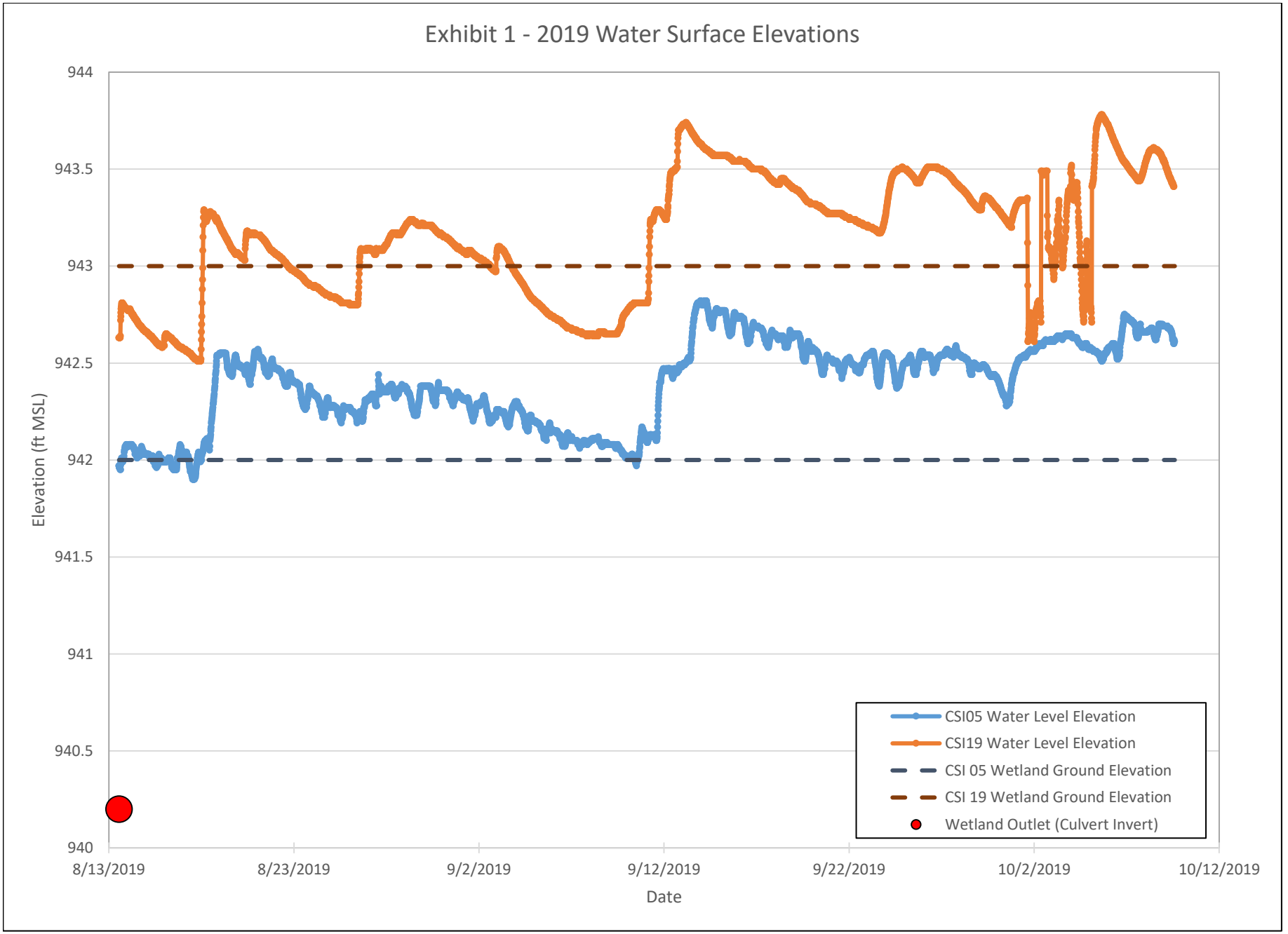


Exhibit 1 - 2019 Water Surface Elevations
944
943.5
943
942.5
942
941.5
941
940.5
940
Elevation (ft MSL)
8/13/2019
8/23/2019
9/2/2019
9/12/2019
9/22/2019
10/2/2019
10/12/2019
Date
CSI05 Water Level Elevation
CSI19 Water Level Elevation
CSI 05 Wetland Ground Elevation
CSI 19 Wetland Ground Elevation
Wetland Outlet (Culvert Invert)

The hydrologic regime demonstrated by the monitoring data is typical for the shallow marsh vegetation community that comprises the majority of the wetland. The observation that water levels remain relatively stable and do not fluctuate significantly in a short period of time also demonstrates that wetland hydrology is not removed or significantly altered by the ditch. Options to raise water level elevations higher than they are under the existing condition in the wetland would be limited by the adjacent properties to the northeast that have buildings near the existing wetland and water level elevations.

Vegetation

Wenck and MCWD staff completed an assessment of the vegetation communities in the wetland on August 28, 2019. Since access to the entire wetland was not possible, observations were made from trails and other access points on the perimeter of the wetland. Figure 3 shows the estimated boundaries of the different vegetation communities observed in the wetland. Overall, the wetland communities were determined to be dominated by invasive narrow leaf cattail, phragmites, and reed canary grass. The list of species observed in the wetland communities is shown in Table 1. As demonstrated by this table, several native species were observed at low densities in each wetland vegetation community.

As demonstrated by Figure 3, the majority of the wetland is a shallow marsh that is dominated by invasive cattail, with several other species present at low densities. Pockets of shrub swamp/floodplain forest with more diversity of native species were observed along the northern and southern edge of the wetland. Invasive buckthorn was also observed to be prevalent in this community. A wet meadow community was observed along the northern edge of the wetland. The wet meadow was dominated by reed canary grass, with several native species present in low densities. The western portion of wetland complex contains a shallow open water basin fringed with invasive cattail and phragmites. The monitoring well data demonstrates that the hydrology of the wetland is similar to what would be expected in the vegetation communities observed on the site.

Since it was determined that the wetland was dominated by invasive cover (>90% cover) and a meandering survey was not conducted, a complete RFQA survey was not completed. Based on the observation and assessment of vegetation communities from available access points, the vegetation communities currently present in the wetland would score in the lowest category of the RFQA and are low in quality, as previously characterized by the MCWD FAW.

Table 1 – Observed Species in Wetland Vegetation Communities

Wet Meadow	Shallow Marsh	Shrub Swamp/ Floodplain Forest	Shallow Open Water
Reed canary grass	Reed canary grass	Basswood	Duckweed
Lake sedge	Phragmites	Green ash	Water lily
Blue joint	Cattail	American elm	Arrowhead
Bugleweed	Softstem bulrush	Boxelder	Cattail
Boneset	Hemlock	Buckthorn	Phragmites
Verbena	Woolgrass	Dogwood	
Phragmites		Silver maple	
Jewelweed		Sensitive fern	
Joe pye		Hog peanut	
Smartweed		Grapevine	
Equisetum			
Rice cut grass			

Conclusion

Assessment of the East Auburn Wetland was conducted to document existing hydrologic conditions and vegetation community composition and condition to guide the feasibility evaluation of potential improvement projects by MCWD.

Hydrology monitoring data demonstrates that the hydrologic regime in the wetland meets wetland hydrology criteria and also matches what would be expected for the vegetation communities observed in the wetland. The monitoring data and survey information also indicates that water levels in the wetland are likely influenced by downstream water bodies. Assessment of this data indicates that wetland hydrology is not significantly altered by the ditches in the wetland. Options to manipulate water levels in the wetland by altering the outlet control of the wetland would likely be limited by the elevations of adjacent properties that are near the existing water levels in the wetland. Other potential methods of restoring wetland functions without manipulating water levels may be possible on the site, but additional investigation would be needed to ensure that the proposed methods would meet regulatory requirements and not cause issues on adjacent properties.

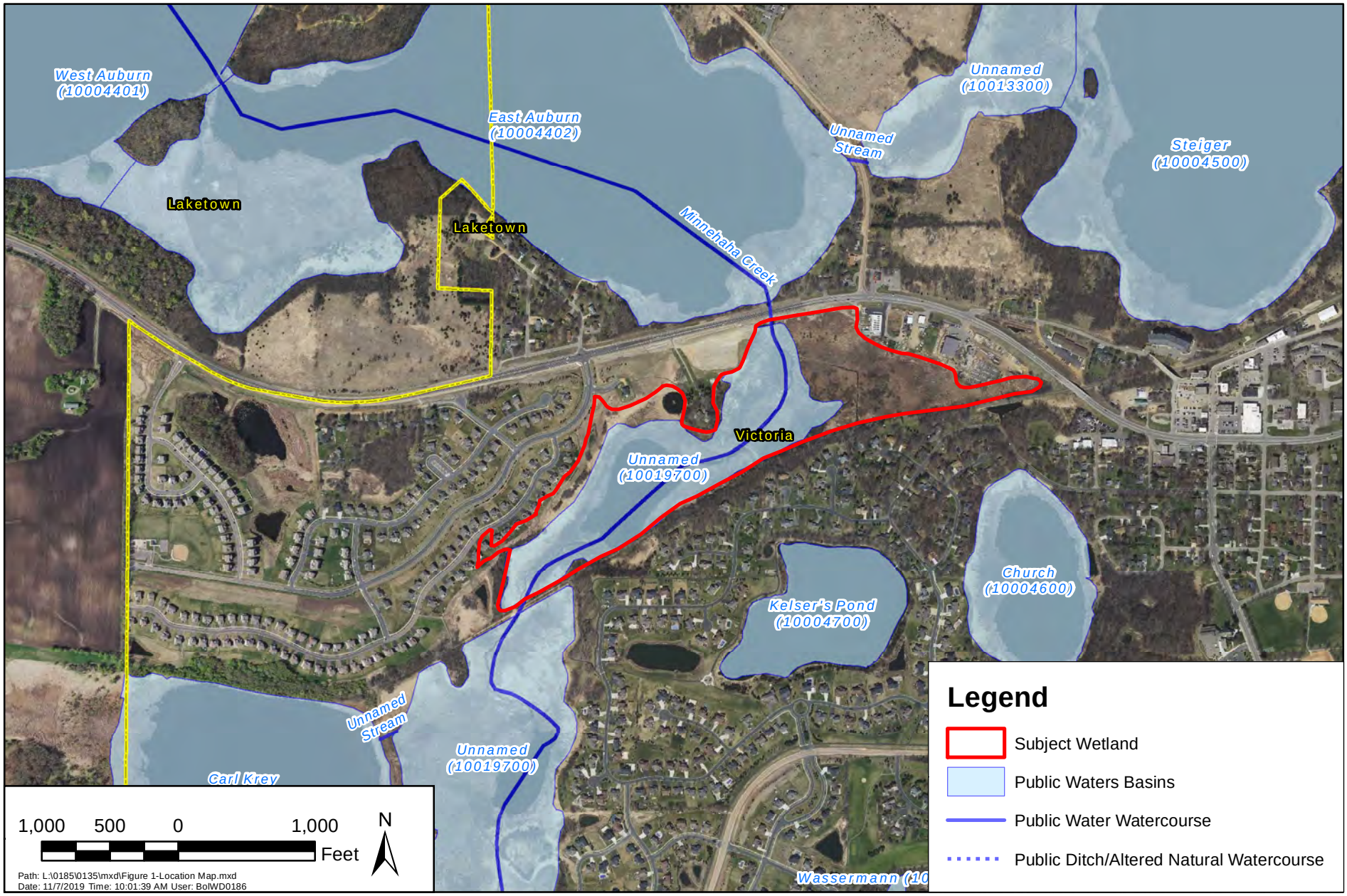
The assessment of vegetation communities in the wetland identified several types of wetland communities. The assessment also confirms earlier observations that the communities are dominated by invasive species with low densities of favorable native species. Management and improvement of the vegetation communities would be difficult

and costly due to the high density of invasives and lack of ability to manipulate water levels in the wetland.

Attachments:

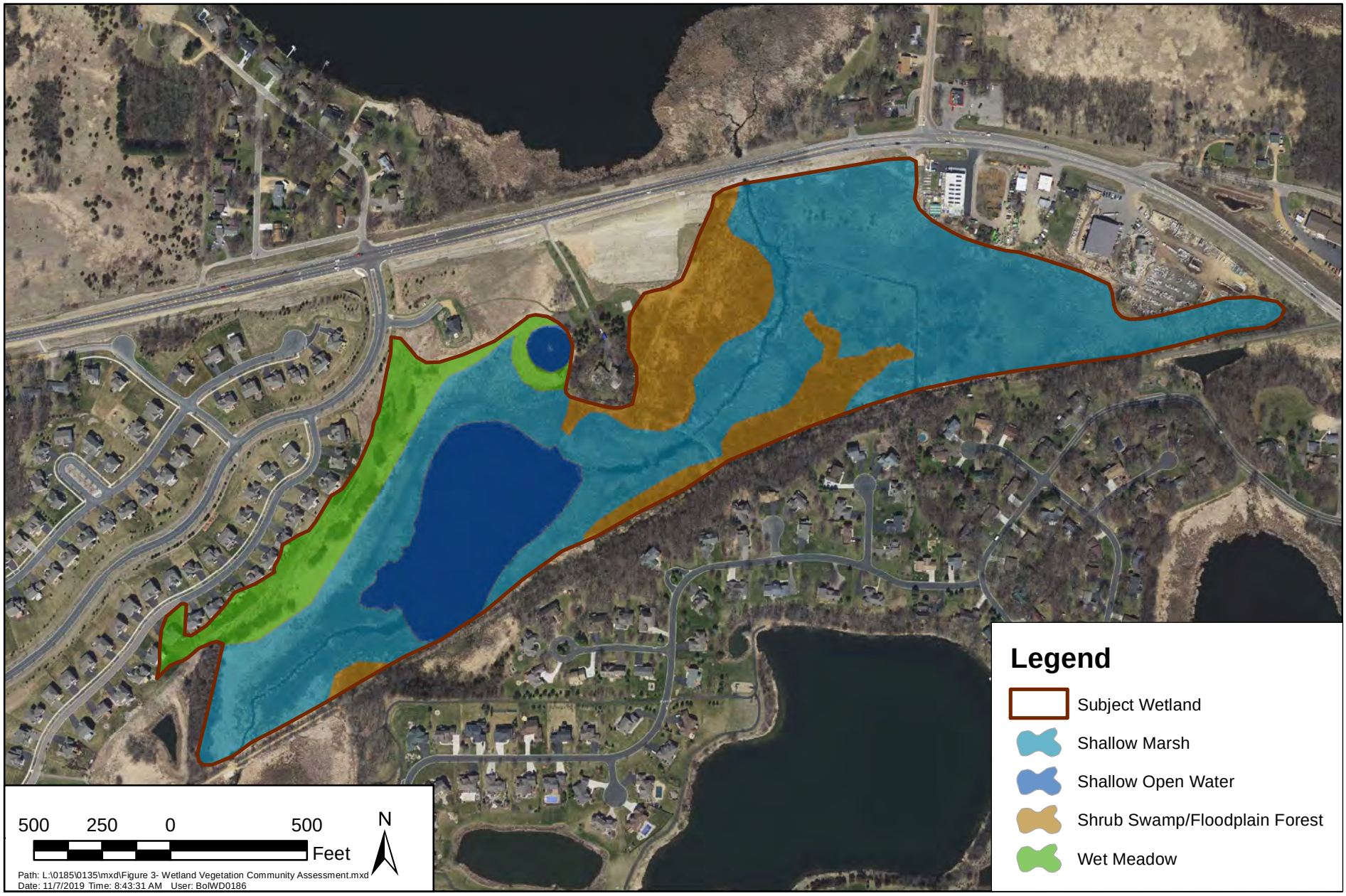
1. Figure 1 – Site Location Map
2. Figure 2 – National Wetland Inventory
3. Figure 3 – MCWD McRAM
4. Exhibit 1 – 2019 Continuous Water Level Elevation Data
5. Appendix A – Historical Aerial Photographs

Figures



MCWD	WENCK Responsive partner. Exceptional outcomes.	OCT 2019
East Auburn Wetland Location		Figure 1

MCWD Monitoring Well Locations	WENCK Responsive partner. Exceptional outcomes.	OCT 2019 Figure 2



MCWD

East Auburn Wetland Vegetation Communities

WENCK
Responsive partner. Exceptional outcomes.

OCT 2019

Figure 3

Appendix A

Historical Aerial Photographs

1937 Aerial Photograph (Source: MHAPO)

N

650 325 0 650

Feet

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Legend

East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT

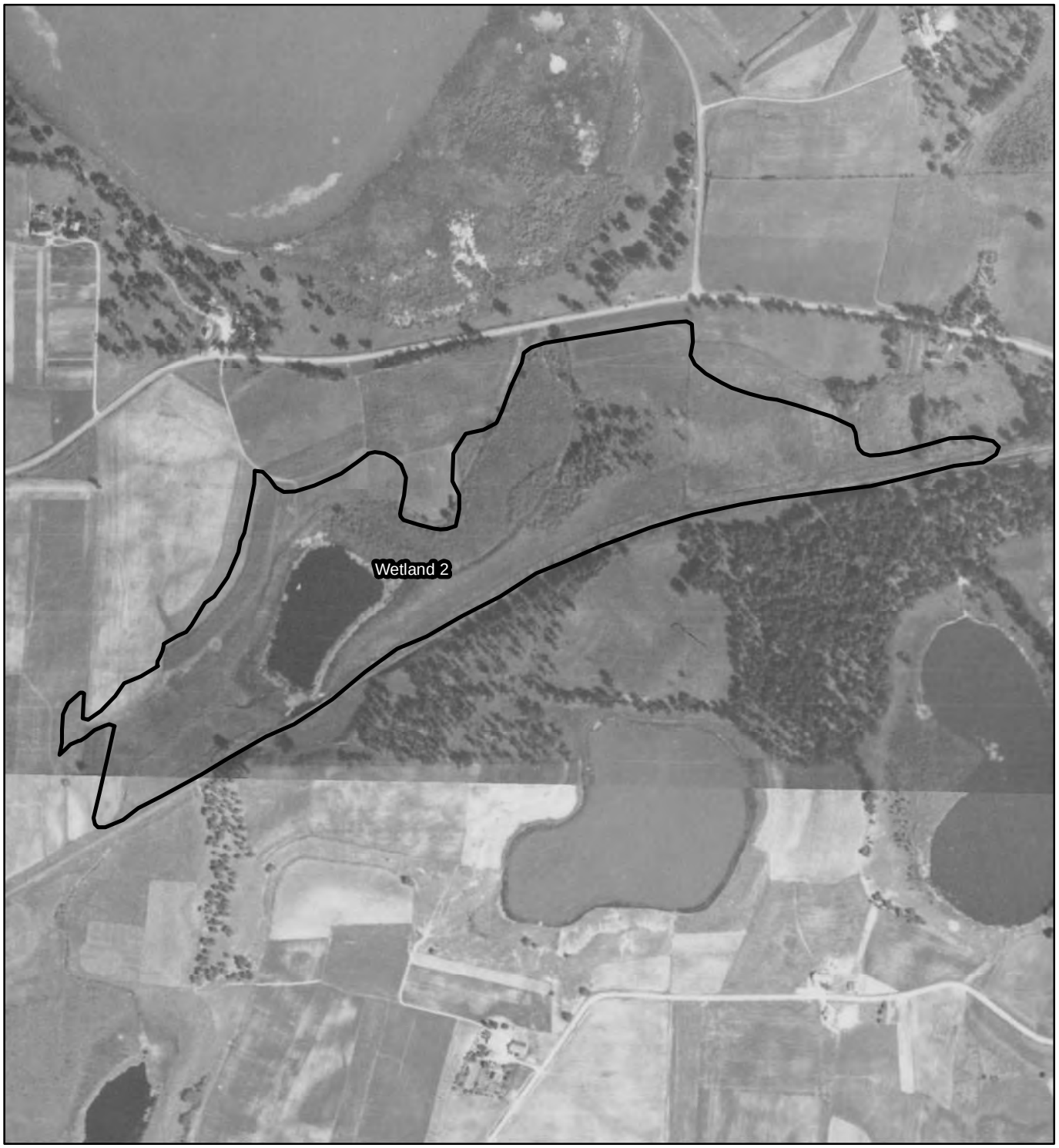
Wetland 2 Historical Aerials - 1937

WENCK

Responsive partner. Exceptional outcomes.

FEB 2019

APP A



1940 Aerial Photograph (Source: MHAPO)

N

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT

Wetland 2 Historical Aerials - 1940

WENCK
Responsive partner. Exceptional outcomes.

FEB 2019

APP A

1963 Aerial Photograph (Source: MHAPO)

N

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 1963		APP A

1979 Aerial Photograph (Source: FSA)

N

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Feet

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 1979		APP A

1985 Aerial Photograph (Source: FSA)

N

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 1985		APP A

1991 Aerial Photograph (Source: MN GEO)

N

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Feet

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 1991		APP A

2000 Aerial Photograph (Source: MN GEO)

N

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Feet

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 2000		APP A

2010 Aerial Photograph (Source: MN GEO)

N

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Feet

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East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 2010		APP A

2016 Aerial Photograph (Source: MN GEO)

N

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Feet

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Legend

East Auburn Wetland Sites

MINNEHAHA CREEK WATERSHED DISTRICT	WENCK Responsive partner. Exceptional outcomes.	FEB 2019
Wetland 2 Historical Aerials - 2016		APP A