STS-406 Improvement Project

Part 3: Project Area 8—White Oaks

Prepared for
City of Edina

March 27, 2015

STS-406 Improvement Project

Part 3: Project Area 8—White Oaks

Prepared for
City of Edina

March 27, 2015

4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: 952.832.2600
Fax: 952.832.2601

STS-406 Improvement Project
Part 3: Project Area 8—White Oaks

March 27, 2015

Contents

1.0 Project Area Background 1

1.1 Problem Description 1

1.2 Wetland Characterization 2

1.2.1 Wetland MHN_1 3

1.2.2 Wetland MHN_65 3

1.2.3 Wetland MHN_66 3

1.2.4 Wetland MHN_11 4

2.0 Water Level Evaluation 5

2.1 Water Balance 5

2.1.1 2014 Precipitation 5

2.1.2 2014 Water Level Monitoring 6

2.1.3 Model Development and Calibration 7

2.2 100-year Flood Levels 9

2.3 Past Drainage Area Alteration 11

3.0 Improvement Options 13

3.1 Pumped Outlet and Wetland Connection 13

3.1.1 Description 13

3.1.2 Modeling Approach 14

3.1.3 Improvement Benefits 14

3.1.4 Costs 16

3.1.5 Water Quality Considerations 16

3.2 Stormwater Volume Reduction through Green Infrastructure 16

3.2.1 Description 16

3.2.2 Improvement Benefits 16

3.2.3 Costs 17

3.3 Other Considerations 17

3.3.1 Wetland Restoration 17

4.0 References 19

List of Tables

Table 2-1 Summary of precipitation for spring and summer of 2014 at the Minneapolis/St. Paul International Airport 5

Table 2-2 Water levels in the monitored wetlands (feet MSL) 6

Table 2-3 Calibrated water balance model inputs for each wetland 8

Table 2-4 Low entry survey elevations for lowest homes adjacent to MHN_1 and MHN_11 (lowest elevation in each watershed is shown in bold red) 10

Table 2-5 100-year frequency flood elevations in comparison with critical low entry elevations, by subwatershed 11

Table 3-1 Peak water levels in each wetland during 100-year events with and without the pumped outlet and wetland connection 15

Table 3-2 Summary of BMP Construction Cost Data 17

List of Figures

Figure 1-1 Project Study Area

Figure 2-1 Inundation Extents at Peak Observed Levels in the Monitored Wetlands

Figure 2-2 Wetland MHN_1 Comparison of Observed and Modeled Water Levels (R2 = 0.95)

Figure 2-3 Wetland MHN_11 Comparison of Observed and Modeled Water Levels (R2 = 0.99)

Figure 2-4 Wetland MHN_65 Comparison of Observed and Modeled Water Levels (R2 = 0.84)

Figure 2-5 Wetland MHN_66 Comparison of Observed and Modeled Water Levels (R2 = 0.96)

Figure 2-6 100 Year Inundation Areas

Figure 2-7 Drainage Alteration Inundation

Figure 2-8 Wetland MHN_1 Model Results of the 2014 Monitored Time Frame, With and Without the 3 acre Subwatershed MHN_40b

Figure 3-1 Pumped Outlet and Wetland Connection

Figure 3-2 100 Year Inundation Areas With Improvement Option

Figure 3-3 Wetland MHN_1 Water Level During the 2014 Season with Implementation of Green Infrastructure (removing the first half inch of precipitation before runoff is generated)

Figure 3-4 Wetland MHN_1 Water Level During the 2014 Season with Implementation of Green Infrastructure (removing the first one inch of precipitation before runoff is generated)

List of Appendices

Appendix A Wetland Delineation Report White Oaks Wetlands, June 2014

Appendix B Cost Estimate – Project Area 8 – White Oaks – Pumped Outlet and Wetland Connection

1.0 Project Area Background

In late 2013, the City of Edina commissioned a study to evaluate several areas throughout the city with flooding and/or drainage concerns. This larger study, identified by the City as the STS-406 Improvement Project, included evaluation of flooding and water level fluctuations in the White Oaks area (Project Area 8). The White Oaks study area is approximately bounded by Sunnyside Road, on the north, West 48th Street, on the south, France Avenue, on the east, and Arden Avenue, on the west (Figure 1-1). There are four wetlands located within this project area identified as MHN_1, MNH_11, MHN_65 and MHN_66 in the City's Comprehensive Water Resources Management Plan (CWRMP).

This report summarizes our analysis and potential improvement options for the White Oaks area, Project Area 8 of the STS-406 Improvement Project. All elevations included in this report reflect Mean Sea Level (MSL) elevations in feet using the NGVD 29 vertical datum.

1.1 Problem Description

The wetlands and low areas within the White Oaks area are land-locked, meaning there are no storm sewer system connections or gravity outlets that drain water from these wetlands or low areas when water levels rise. Under land-locked conditions, water level increases from rainfall or snowmelt can be more pronounced and longer lasting than waterbodies with gravity outlets, as the water can only be lost through evaporation or infiltration (seepage). Residents in the White Oaks area have expressed concern regarding extended high water levels in the nearby wetlands and the impacts on vegetation and wetland aesthetics. In addition, the White Oaks area has been identified as an area of concern for flood potential in the City's CWRMP due to the land-locked nature of the wetlands and low areas.

Water levels in land-locked wetlands can be heavily influenced by seasonal climatic conditions and fluctuations from year to year are likely. For example, a wet spring or significant snowmelt can result in long-lasting high water levels. Conversely, periods of drought can result in lower than normal water levels. In addition to climate variation, other primary factors that have affected water levels in the White Oaks wetlands are increases in impervious surface from new and re-development within the drainage area and a past City-sponsored drainage alteration that routed additional stormwater to wetland MHN_1 (described in more detail in Section 2.3).

Water quality is also a consideration, both the quality of water within these wetlands and potential impacts if this water is discharged downstream to Minnehaha Creek. Under current conditions, stormwater from nearby streets, driveways and other impervious surfaces is discharged to the wetlands without treatment to remove sediment and phosphorus, among other pollutants. Although this is not a practice that is unique to the White Oaks area, nor to the City of Edina, it is a practice that can result in nutrient enrichment of waterbodies and increased algal blooms. Minnehaha Creek, which would likely be the receiving water should a pumped system be installed, also suffers from excess nutrient enrichment, specifically phosphorus. Currently, the phosphorus load allocation identified by the Minnesota Pollution Control Agency (MPCA) as part of the draft Minnehaha Creek Total Maximum Daily Load (TMDL) and the relevant phosphorus load reductions required of the City do not consider the land-locked White Oaks

area as a contributing area. Therefore, additional discharge and associated phosphorus load to Minnehaha Creek from this area would require treatment (or equivalent treatment elsewhere within the watershed), which could come at a considerable cost.

The City held a stakeholder meeting on November 25th, 2013, attended by many residents of the White Oaks area. The objective of the meeting was to provide a listening session and discussion forum with interested residents regarding this flood protection and water quality study. The meeting began with a presentation that covered background of the study area including neighborhood flood risk, wetland water quality, uses of wetlands in the City, wetland health, objectives of this study, timeline for the study and potential improvements. The presentation was followed by both small group and large group discussions.

1.2 Wetland Characterization

An assessment of the four wetlands located within the White Oaks project area (MHN_1, MNH_11, MHN_65, and MHN_66) was conducted to gain a better understanding of the physical wetland characteristics and the current functions and values. The assessment included delineation of the wetland boundaries, classification of wetland type, and evaluation of wetland functions and values for determining management classifications. The detailed wetland delineation report is included as Appendix A.

The four wetlands, comprising a total of 5.2 acres in the wetland evaluation area, were delineated on May 28, 2014 in accordance with the *U.S. Army Corps of Engineers 1987 Wetland Delineation Manual* ("1987 Manual", USACE, 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010)* and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991. The wetlands were classified using the U.S. Fish and Wildlife Service (USFWS) Cowardin System (Cowardin et al., 1979), the USFWS Circular 39 system (Shaw and Fredine, 1956), and the Eggers and Reed Wetland Classification System (Eggers and Reed, 1977). The wetland classifications are summarized in Table 3 of Appendix A and described further in Section 1.2.1 through Section 1.2.4 of this report.

The Minnesota Routine Assessment Method (MNRAM 3.4) for Evaluating Wetland Functions and Values was used to evaluate the functions and values of the wetlands and assign management classifications. Using the MNRAM system, a wetland is classified into one of four categories: Preserve, Manage 1, Manage 2, or Manage 3. The following descriptions of these four categories are from the Management Classification Guide provided on the Minnesota Board of Water and Soil Resource's (BWSR's) website (http://www.bwsr.state.mn.us/wetlands/mnram):

- *The **Preserve** category is for exceptional and highest-functioning wetlands or those sensitive wetlands receiving conveyed storm water runoff that have yet retained a medium level of vegetative diversity/integrity. These wetlands are those that should be preserved in (or improved to) their most pristine or highest functional capacity with wide, natural buffers, in perpetuity.*
- *The **Manage 1** category are high-quality wetlands that should be protected from development and other pressures of increased use, including indirect effects. Maintaining natural buffers will help to retain the significant function these wetlands provide. In the event that impacts to these wetlands cannot be avoided, replacement ratios for mitigation should exceed the state-required minimums.*

- ***Manage 2*** *wetlands provide medium functional levels and the wetland extent should be maintained. These wetlands often provide optimal restoration opportunity.*
- ***Manage 3*** *wetlands have been substantially disturbed; replacement considerations can be minimized after proper sequencing.*

The wetland assessment information for each of the wetlands is summarized below. Additional information is provided in Appendix A.

1.2.1 Wetland MHN_1

Wetland MHN_1 is a 1.13-acre shallow marsh/floodplain forest wetland (Cowardin PEMC/PFO1A, Circular 39 Type 3/1) located in the northwest portion of the White Oaks area. The wetland is a depressional area surrounded by residential properties on the north and west sides and Townes Road on the east and south sides with a paved path at the south end. The shallow marsh portion of the wetland is dominated with narrowleaf cattail (*Typha angustifolia*). Dominant vegetation within the floodplain forest portion of the wetland is silver maple, boxelder, and green ash. The transition to upland is characterized by the presence of non-hydrophytes in the herbaceous layer including wild geranium, Virginia creeper, and white violet (*Viola canandensis*). The management classification for MHN_1 is Manage 1 based on the MNRAM functions and values assessment.

1.2.2 Wetland MHN_65

Wetland MHN_65 is a 0.19-acre floodplain forest wetland (Cowardin PF01A, Circular 39 Type 1) located in the northeastern portion of the White Oaks area. The wetland is a depressional area surrounded by residential properties. Stormwater is directed to the wetland through an open channel from Meadow Road. The wetland is dominated by silver maple, with some boxelder, elm, red-osier dogwood (*Cornus alba*), and common buckthorn is also present. The transition to upland is characterized by a slight upward slope in topography with the presence of ground ivy in the herbaceous layer. The management classification for MHN_65 is Manage 1 based on the MNRAM functions and values assessment.

1.2.3 Wetland MHN_66

Wetland MHN_66 is a 2.20-acre deep marsh/shallow marsh/fresh wet meadow wetland (Cowardin PEMF/C/B, Circular 39 Type 4/3/2) located in the central portion of the White Oaks area. The wetland is a depressional area surrounded by residential properties on the west side. White Oaks Road is at the north end, Meadow Road wraps around the east side, and West 48th Street is at the south end of the wetland. A catch basin and open asphalt drainage channel convey stormwater to the wetland from 48th Street. The immediate naturalized upland buffer surrounding the wetland is approximately 40-feet wide with trees along the residential properties and unmowed grasses between the wetland and the roads. The wetland is dominated by narrowleaf cattail and hybrid cattail (*Typha glauca*) in the central marsh portions with reed canary grass, green ash, silver maple, common buckthorn, and American elm (*Ulmus americana*) along the fringes. The transition to upland was characterized by the presence of white oak (*Quercus alba*) trees, honeysuckle shrubs, dense buckthorn and non-hydrophytes in the herbaceous layer including burdock, ground ivy, and thistle (*Cirsium spp.*). The management classification for MHN_66 is Manage 1 based on the MNRAM functions and values assessment.

1.2.4 Wetland MHN_11

Wetland MHN_11 is a 1.69-acre deep marsh/shallow marsh/floodplain forest wetland (Cowardin PEMF/C/FO1A, Circular 39 Type 4/3/1) located in the southern portion of the White Oaks area. The wetland is a depressional area surrounded by residential properties. A catch basin and storm sewer system collects stormwater from 48th Street and conveys it to the wetland. The wetland is dominated by narrowleaf cattail, common duckweed (*Lemna minor*), ivy-leaf duckweed (*Lemna trisulca*), and reed canary grass with a fringe of black willow (*Salix nigra*), boxelder, and peach-leaf willow (*Salix amygdaloides*). The transition to upland was characterized by the presence of white oak trees, and non-hydrophytes in the herbaceous layer including burdock, Virginia creeper, and wild geranium. The management classification for MHN_11 is Manage 2 based on the MNRAM functions and values assessment.

2.0 Water Level Evaluation

2.1 Water Balance

When evaluating the fluctuation of water levels in a water body, it is important to understand both the inflows and outflows of the system, often termed the water balance. Stormwater runoff is generally the primary inflow and can be estimated based on local precipitation records and watershed characteristics. In land-locked waterbodies, the primary losses (outflows) include evaporation and losses to groundwater through seepage. Evaporation can be estimated using literature values and/or local observations. Estimating the loss of water to groundwater is a much greater challenge, as it varies considerably based on site-specific conditions such as soils and localized groundwater characteristics.

To gain a better understanding of the stormwater runoff to and seepage characteristics of the White Oaks wetlands, the water levels were monitored during the 2014 growing season. The observed water levels were used to develop and calibrate a water balance model for predicting water level fluctuations in the White Oaks wetlands based on existing conditions. The calibrated model was then used to evaluate potential system modifications.

2.1.1 2014 Precipitation

Precipitation during the 2014 growing season was above average, with an especially wet spring and early-summer that included record-breaking rainfall during the month of June. The precipitation amount from April 9, 2014 through the end of September 2014 totaled 27.4 inches, with a maximum daily precipitation amount of 4.1 inches on June 19, 2014. Most of this precipitation (21.3 inches) fell between April and June. A summary of precipitation data collected at the Minneapolis/St. Paul International Airport (MSP), including precipitation amounts for significant storm events, is presented in Table 2-1.

Table 2-1 Summary of precipitation for spring and summer of 2014 at the Minneapolis/St. Paul International Airport

Timeframe	Precipitation Amount	Percent of Total Precipitation from April 9 – September 30
April 9 – September 30	27.4 inches	100%
June 19 (maximum daily amount)	4.1 inches	15%
April 1 – June 30	21.3 inches	78%
April 27 – April 29	3.1 inches	11%
May 19	2.3 inches	8%
May 31 – June 1	3.0 inches	11%
June 14 – June 16	2.6 inches	9%

The Minnesota Department of Natural Resources (MNDNR) provides monthly climate reports. The following paragraphs contain excerpts from the MNDNR's November 2014 climate report (*HydroClim Minnesota for Early November 2014*) which characterizes the climate conditions for 2014:

> *Despite a dry July-through-October period, seasonal precipitation totals since April 1 remained above historical averages nearly everywhere in Minnesota. For large portions of the state, season-to-date precipitation totals rank above the 75th percentile when compared with the historical database for the April-through-October time period. Below-normal rainfall during the late summer and autumn slowed the record-setting pace established earlier in the growing season.*
>
> *Numerous heavy rain events occurred during the month of June. In addition to record-breaking monthly precipitation totals, a number of locations recorded single-day rainfall records on various dates throughout the first three weeks of the month. The Twin Cities total of 11.36 inches fell just short of the June record of 11.67 inches set in 1874.*

2.1.2 2014 Water Level Monitoring

Water level monitoring was conducted in the four wetlands in the White Oaks area from April 9, 2014 to November 4, 2014. Water level sensors (Barotrolls) were installed to measure depth of water at 15-minute intervals. Water levels were also manually surveyed throughout the monitoring timeframe to verify the accuracy of the automatic water level sensors. Table 2-2 shows initial water levels and peak water levels observed during the monitoring timeframe. Figure 2-1 shows the extents of the inundation areas associated with the peak (maximum) observed water levels (observed in June) in the White Oaks wetlands during the 2014 monitoring period. Daily values of the monitored water level data are shown in Figure 2-2 through Figure 2-5, along with the calibrated modeling results. Model calibration was performed in early October; therefore, the monitoring data used for calibration and further modeling ranged from April 9, 2014 to September 30, 2014.

Table 2-2 Water levels in the monitored wetlands (feet MSL)

Time Period	MHN_1	MHN_11	MHN_65	MHN_66
Ice (i) / Ground (g) Level (March, 2014)	867.6 (i)	870.6 (i)	868.1 (g)	867.8 (i)
Initial Water Level (April, 2014)	868.5	870.6	869.6	868.6
Peak Water Level (June, 2014)	870.3	872.9	870.3	870.3

Three of the four wetlands—MHN_1, MHN_65, and MHN_66—exhibited very similar water level fluctuations during the monitoring season. Water levels in these three wetlands generally rose during rainfall events and fell between events due to losses to seepage and evapotranspiration. Following the large storm events in late June, 2014, the water level fell steadily until nearly September. In MHN_65, the water level fell enough that the wetland dried up at about an elevation of 868.2 feet.

The fourth wetland, MHN_11, responded differently than the other three wetlands throughout the 2014 season. MHN_11 showed a gradual and continual rise in water level from the beginning of April 2014 to early June 2014. Due to high water levels in this wetland, the City pumped water from MHN_11 to MHN_66 on three separate occasions in June and July 2014. The continual rise in water level observed in this wetland throughout the spring of 2014 raises questions about the lack of water losses from this wetland. However, during July and August 2014, the water level in the wetland gradually declined, similar to the other wetlands, confirming that water losses do in fact occur in MHN_11. Therefore, it appears that there was a regular addition of water to MHN_11 during the spring that is not accounted for solely within the precipitation data. The wetland may be receiving additional water from groundwater or some other anthropogenic source (e.g., pumping).

Groundwater was investigated as a possible source of the additional water observed in MHN_11. However, the bottom elevation of this wetland is actually higher than the neighboring wetlands. The wetland immediately to the north, MHN_66, did not show a similar addition of water. Therefore, groundwater is likely not the source of the additional water in MHN_11. Since precipitation amounts were high in the spring of 2014, one possible explanation is that the homes around the wetland in MHN_11 had sump pumps discharging into the wetland. If so, the sump pumps were likely working during the wet spring, regularly pumping water from the sumps to the wetland. Whether or not sump pumps (or another anthropogenic source of water) are contributing to the volume of water in MHN_11 is important because the starting water level in this closed wetland basin is important prior to a significant rainfall event. Regular additions of water to this wetland every spring from residential sump pumps can raise the water level prior to significant events that typically occur in late spring or early summer.

2.1.3 Model Development and Calibration

A water balance model was used to evaluate water level fluctuations in the White Oaks area. The water inflows accounted for in the water balance model(s) include watershed runoff and direct precipitation. The water outflows accounted for include seepage, evaporation, and transpiration from submergent vegetation (no surface outflow was considered due to land-locked conditions). Temporary pumping from MHN_11 to MHN_66 during portions of the summer, confirmed by City staff, was also accounted for in the water balance. Models were developed for each of the four wetlands using a daily time step.

The water balance models for each wetland were calibrated using the observed water levels. Model input parameters were adjusted until modeled water levels closely matched the daily averages of the observed water levels. The hydrologic parameters that were modified to calibrate the models were:

- Saturated hydraulic conductivity of the underlying soils based on soil type. The thickness of the soil (porous media) layer (2 feet) was also used as a calibration parameter
- Pan coefficient to adjust estimated pan evaporation rates for application to a waterbody surface (0.7)
- Monthly varying transpiration rates (April through September), specific to each of the wetlands
- Impervious area contributing to each of the wetlands

- For MHN_11, an additional time-varying water input was needed for calibration

The observed water levels were used to develop and calibrate water balance models for predicting water level fluctuations in the White Oaks wetlands based on existing conditions. The water balance models were then also used to model potential system modifications.

The calibrated water balance model inputs for each wetland are summarized in Table 2-3.

Table 2-3 Calibrated water balance model inputs for each wetland

Model Parameter	MHN_1	MHN_11	MHN_65	MHN_66
Watershed Area (acres)	31	6.5	14	34
Contributing Impervious Area (acres) / %	3.3 / 11%	0.4/ 6%	0.2 / 1%	4.8 / 14%
Hydraulic Conductivity (in/day)	0.18	0.05	0.55	0.2
Transpiration Rates (in/day)				
April	0.4	0.3	0.2	0.3
May	0.6	0.6	0.3	0.3
June	0.6	0.5	0.7	0.5
July	0.2	0.3	0.4	0.3
August	0.2	0.2	0.2	0.2
September	0.15	0.15	0.15	0.15
October	0.05	0.05	0.05	0.05

Contributing watershed areas were delineated and measured in GIS (Geographic Information System). Runoff to each wetland was estimated for the 2014 monitoring season by applying runoff coefficients of 0.9 and 0.05 to contributing impervious and pervious areas, respectively (Stormwater Manager's Resource Center). Evaporation from open water in each wetland was estimated by applying a pan coefficient (0.7) to weekly evaporation rates observed by the Minnesota Climatology Working Group at St. Paul (location UMNM5). Transpiration rates were estimated to account for additional observed loss rates from each of the wetlands. The transpiration rates account for the losses from submergent vegetation within the wetlands, and vary by month to account for different seasons, particularly the spring/summer growing season.

Seepage rates from the wetlands were estimated on a daily time step, assumed to be governed by Darcy's Law for porous media (Equation 1). Seepage rates can increase and decrease as water levels increase and decrease in the model using this methodology. In Equation 1, *S* is the seepage rate (in/day), *K* is the saturated hydraulic conductivity (in/day), *i* is the hydraulic gradient, *H* is the water depth of a given day (feet), and *d* is the assumed soil layer thickness (feet).

$$S = K * i = K\left(\frac{H + d}{d}\right) \qquad \text{Equation 1}$$

Storage in the wetlands was accounted for by calculating stage-area-volume curves for each of the wetlands from the MNDNR 2011 LiDAR elevation data set.

The additional volume of water necessary for the model to match observed water levels in MHN_11 was met by assuming an additional input of water (e.g., sump pumps adding water to the wetland). An assumption was made that 20 homes around the wetland were operating sump pumps between 1 and 12 hours per day at a rate of 5 gallons per minute (gpm) for each pump. The duration of pump operation each day of the simulation was used as a calibration parameter. Calibrated model results are shown in Figure 2-2 through Figure 2-5.

2.2 100-year Flood Levels

As identified in the CWRMP, it is the City of Edina's policy to provide stormwater management that meets a 100-year level of protection, when feasible. A 100-year level of protection indicates that the municipal drainage system has sufficient capacity to prevent property damage and assure a reasonable degree of public safety following a 100-year frequency runoff event.

To assess whether the current stormwater management system is providing a 100-year level of protection, City staff surveyed the low entry elevations for the lowest homes and structures in subwatersheds MHN_1 and MHN_11 along Townes Road, Sunnyside Road, West 48th Street, and West 49th Street. The survey was conducted on November 14, 2014 and the results are shown in Table 2-4. The survey helped identify the lowest, most critical elevations where flood water would start impacting residential structures.

Table 2-4 Low entry survey elevations for lowest homes adjacent to MHN_1 and MHN_11 (lowest elevation in each watershed is shown in bold red)

Address	Low Entry Elevation (ft)
Subwatershed MHN_1	
4009 W. 48th St	879.9
4813 Townes Rd	No low entry (shed)
4821 Townes Rd	877.6
4825 Townes Rd	876.4
4829 Townes Rd	877.2 (shed)
4833 Townes Rd	**874.8**
4837 Townes Rd	876.1
3938 W. 49th St	877.0 (shed)
3940 W. 49th St	880.1
Subwatershed MHN_11	
4081 Sunnyside Rd	884.2
4600 Townes Rd	**879.2 (garage)**
4701 Townes Rd	880.7

The 100-year frequency flood elevations for the land-locked wetlands were determined using the 100-year frequency, 10-day snowmelt/runoff event of 7.2 inches. In the case of land-locked basins with no significant outlet allowing for water to quickly pass through the system, storms that generate the largest *volume of runoff* will generally result in the highest water elevation. When an outlet is added to the system, the *rate of runoff* also becomes important, in addition to the total *volume of runoff*. As it currently exists, *runoff volume* is the most important contributing factor to high water levels in the White Oaks area. Therefore, the highest or "peak" water levels for the 100-year event are driven by the longer-duration, 10-day snowmelt/runoff event, rather than the more intense 24-hour precipitation event which is estimated as 7.5 inches of rainfall in 24 hours.

Table 2-5 shows the 100-year frequency flood elevations resulting from the 100-year, 10-day snowmelt event. Comparison of the flood elevations with the lowest structure within each subwatershed indicates that flood elevations do not exceed the low structure elevations but do exceed the road elevations. This can also be seen in Figure 2-2. The maximum water levels in the wetlands after a 100-year, 24-hour precipitation event are also included in Table 2-5. As for the modeling of the 100-year, 10-day snowmelt/runoff event, the wetlands were assumed to be dry prior to the event.

Table 2-5 100-year frequency flood elevations in comparison with critical low entry elevations, by subwatershed

	MHN_1	MHN_11	MHN_65	MHN_66
Critical surveyed low entry elevation	879.2 (4600 Townes Rd.)	874.8 (4833 Townes Rd.)	--	--
Lowest road elevation adjacent to wetland, based on 2011 LiDAR elevation data	873.5	--	874.3	873.5
Peak flood elevation for the 100-year 10-day snowmelt/runoff event (assumes wetlands start dry)	878.2	873.0	878.1	876.3
Peak flood elevation for the 100-year, 24-hour precipitation event (assumes wetlands start dry)	876.0	872.6*	876.7	874.6

The inundation area associated with the 100-year, 10-day snowmelt/runoff event is shown in Figure 2-6. This figure shows that water levels during such an event will overtop roads (up to nearly 4 feet of water depth in the low point along Meadow Road in MHN_65) and the inundation areas will extend onto private property, particularly in MHN_1 and MHN_11. However, the predicted inundation areas for this 100-year event do not extend far enough to impact home or garage structures. Because roads are impacted during both of the 100-year events, improvement options were assessed so that access to the homes around these wetlands can be maintained during such events.

An important consideration however, particularly for MHN_11, is the actual initial water level in each wetland prior to a 100-year event. As discussed in Section 2.1, the observed water level in MHN_11 during the 2014 monitoring period showed that MHN_11 may be receiving additional water. Because of the unique hydrologic conditions of this wetland, the water level at the beginning of June was approximately 2-feet higher than what it otherwise could have been without receiving additional water.

2.3 Past Drainage Area Alteration

A past City-sponsored drainage alteration has increased the hydrologic loading to the MHN_1 wetland, contributing to a change in the character of the wetland that has been of special concern to nearby residents. Subwatershed MHN_40b, shown in Figure 2-7, was rerouted to discharge to wetland MHN_1 via additional storm sewer pipe as part of a city project implemented in 2000 to improve a flooding problem on Arden Avenue. The area of subwatershed MHN_40b is approximately 3 acres. This area appears, based on aerial photography, to contain more impervious area (as a percentage of its total area) than the other areas contributing to the MHN_1 wetland (e.g., compared to subwatersheds MHN_1 and MHN_68).

The water balance model was modified to quantify the impacts of this drainage area alteration on water levels in MHN_1. The contributing drainage area and total amount of impervious area were adjusted to reflect conditions prior to the addition of this redirected subwatershed. The total contributing drainage

area was changed from 31 acres to 28 acres (removing the 3-acre MHN_40b subwatershed). In addition to adjusting the drainage area, different scenarios were modeled using two different impervious area estimates to perform a quasi-sensitivity analysis to the impervious area estimate (i.e., to determine how sensitive this area is to changes in percent imperviousness). For the two modeled scenarios, the impervious area was reduced from about 3.3 acres (see Table 2-3) to 2.3 acres (representing a low estimate of imperviousness) and 2.6 acres (representing a high estimate of imperviousness). These two imperviousness scenarios result in a total impervious area percentage ranging from 8.2% to 9.3%, respectively (compared to 10.6%, under existing conditions, as shown in Table 2-3.)

Figure 2-8 shows the predicted water level (using 2014 precipitation inputs) under existing conditions, and also shows a low estimate and a high estimate of the predicted water level without the redirected subwatershed (i.e., pre-drainage area alteration conditions). Modeling results showed that redirecting this subwatershed area impacts the water level on the wetland in MHN_1 anywhere from about 2.5 inches to 6.0 inches (when using 2014 precipitation input data). Figure 2-8 shows that the greatest impact on the water level in the wetland would likely have been about 6 inches (0.5 feet), particularly after the large rainfall event near the end of June 2014. Earlier in the spring, the difference is a couple of inches.

Figure 2-7 shows the mapped inundation area of the peak water level during the 2014 monitored time frame (870.3 feet) and the peak water level of the same time frame, but without the redirected watershed.

3.0 Improvement Options

One of the primary objectives of this study was to evaluate flooding potential in the land-locked White Oaks area. Comparison of predicted 100-year frequency flood elevations with surveyed low structures adjacent to the wetlands indicates that no homes will be inundated. However, water levels overtop roadways in subwatersheds MHN_1 (Townes Road), MHN_65 (up to nearly 4 feet of water depth in the low point along Meadow Road), and MHN_66 (Meadow Road) and the inundation areas extend onto private property, particularly in MHN_1 and MHN_11. Due to the land-locked nature of these areas, there is the potential for water levels to remain high for longer durations, in comparison to waterbodies with an outlet.

Beyond issues related to flooding potential, residents in the White Oaks area have expressed concern regarding extended high water levels in the nearby wetlands and the impacts on vegetation and wetland aesthetics. More frequent and prolonged high water levels in recent years have resulted in adverse impacts to trees and unsightly conditions along the wetland perimeters.

Several options to decrease flooding potential and/or reduce the duration of high water levels were considered. These options are described further in the following sections.

3.1 Pumped Outlet and Wetland Connection

3.1.1 Description

To lower the flood potential and moderate water level fluctuations in the White Oaks wetlands, installation of a pumped outlet and connection of several of the wetlands via gravity storm sewer was evaluated.

This improvement option includes the following project components (also shown in Figure 3-1):

- Connecting MHN_11 to MHN_66 via a 12-inch gravity storm sewer with a control elevation of 872.0 feet MSL.
- Connecting MHN_66 to MHN_1 via a 12-inch gravity storm sewer with a control elevation of 872.0 feet, MSL.
- Installation of a lift station (1,500 gpm) and storm sewer system that pumps and conveys water from MHN_1 to the existing storm sewer system on Arden Avenue. This existing storm sewer system ultimately discharges to Minnehaha Creek.

With implementation of this improvement alternative, wetlands MHN_11, MHN_66, and MHN_1 are no longer a group of disconnected, land-locked basins, but instead a hydraulically-connected system with a controlled outlet. This improvement option does not include connections for the MHN_65 subwatershed, as installation of storm sewer is not feasible without significant disruption to nearby homes. If inundation occurs in the low area of MHN_65 along Meadow Road, temporary pumping may be required to reduce the depth of ponding on the roadway.

Our analysis and cost estimate assumed that the pumped outlet would tie into the existing storm sewer system on Arden Avenue, which eventually discharges into Minnehaha Creek within the City of Edina. There are existing localized flooding issues in the low area along the Arden Avenue. Accordingly, final design of a lift station and forcemain from the White Oaks area should include consideration of timing, so as not to exacerbate the existing flooding problem.

An alternative to tying into the Arden Avenue system would be to connect a forcemain to the storm sewer system in Minneapolis east of France Avenue between 46th Street West and 48th Street West. However, there are a few areas hydraulically connected to this storm sewer system that are already prone to flooding, particularly the areas referred to by the City of Minneapolis as Flood Areas 29, 30, and 31. If these areas were to receive additional water pumped from MHN_1, especially during larger storm events when water would likely need to be pumped, flooding in these areas could be exacerbated.

3.1.2 Modeling Approach

Runoff from each contributing subwatershed area for the Atlas 14 100-year, 24-hour rainfall event (7.5 inches) was estimated using XP-SWMM. The average runoff depth during the described 7.5-inch rainfall event in these watersheds is about 5.4 inches. The calibrated water balance models were used to estimate the water levels in the wetlands given the volume of runoff expected during such an event. The 2014 rainfall record was used for the modeling, with the 100-year, 24-hour event runoff depth imposed on one particular day (June 1). The peak water level during an event in closed basins like this is highly dependent on the water level prior to the event (i.e., the starting water level). For the modeling of the 24-hour rainfall event, the initial water levels in MHN_1, MHN_11, and MHN_66 were 868.3 feet, 872.1 feet, and 868.8 feet, respectively. These water levels are approximately the same as the water level at the beginning of the 2014 monitoring timeframe (which is nearly dry) with the exception of MHN_11. The modeling of MHN_11 still included the additional unknown source of water that was included for the calibration, along with an outlet pipe at 872.0 feet. Based on the observed 2014 water level record, the wetlands in MHN_1, MHN_65, and MHN_66 all behave in a way that it is reasonable to assume low water levels or dry conditions in the wetlands prior to major events. However, in MHN_11, there is significant uncertainty regarding the unknown source of water contributing to the wetland. The impact of this uncertain source of water also causes significant uncertainty in the actual maximum water level of the 100-year, 24-hour precipitation event in this wetland. The modeling of the 24-hour precipitation event, assuming it occurred during the 2014 historical record, shows that homes would not be impacted around MHN_11. However, in a different year, the assumed sump pumps could add more or less (or none) water to the wetland, changing the system. Additionally, if City staff had not pumped water out of MHN_11 on multiple occasions in 2014, the water levels would have been higher, and water levels from a 24-hour precipitation event could have impacted homes. The pumping associated with MHN_11 (sump pumps and City pumping) play a significant role in the water level in MHN_11, and therefore, play a significant role in the determination of the actual 100-year water level.

3.1.3 Improvement Benefits

Table 3-1 summarizes the reductions in flood elevations achieved by providing gravity outlets from wetlands MHN_66 and MHN_11 to MHN_1 and installation of a pumped outlet from MHN_1. As shown in

Table 3-1, flood elevations are reduced significantly for the 100-year, 10-day snowmelt/runoff event. In fact, with the improvements, the water levels in the overall system become driven by stormwater inflow rates, rather than total runoff volumes, and the 100-year, 24-hour rainfall event becomes the "critical" event with higher flood elevations.

During the 100-year, 24-hour rainfall event, the connected wetland system is controlled by the pumped outlet from MHN_1. The proposed pipes connecting MHN_11 to MHN_66 and MHN_66 to MHN_1 are not limited by the capacity of the pipes, but rather by the water level in MHN_1 and the ability of the pump station to remove water. Pumping water out of MHN_1 at a rate of approximately 1,500 gpm would keep the roadways in MHN_1 and MHN_66 from being inundated during both the 100-year, 10-day snowmelt/runoff event and the 24-hour rainfall event (see Figure 3-2).

In addition to reduced flood potential, installation of gravity outlets from MHN_11 and MHN_66 and a pumped outlet from MHN_1 would provide more regulation of water levels in the White Oaks area. Pump on/off elevations would be established to maintain more acceptable water levels throughout the growing season, based on wetland vegetation characteristics and aesthetics. The proposed pump in MHN_1, intended to pump water out of MHN_1 into the Minnehaha Creek storm sewer system, was assumed to be automatically triggered on when the water level reaches elevation 869.5 MSL and turn back off at elevation 869.0 MSL. However, final design would require coordination with the Minnehaha Creek Watershed District (MCWD), as balancing the benefits of lower flood elevations in MHN_1 with potentially higher elevations along Minnehaha Creek would be important.

Table 3-1 Peak water levels in each wetland during 100-year events with and without the pumped outlet and wetland connection

Scenario	MHN_1	MHN_11	MHN_66
Surveyed Low Entry Elevation	879.2 (4600 Townes Rd.)	874.8 (4833 Townes Rd.)	--
Lowest Road Elevation around the wetland, based off of 2011 LiDAR elevation data	873.5	--	873.5
Peak 100-year, 24-hour flood elevation without pumped outlet	876.6	874.3[1]	874.8
Peak 100-year, 24-hour flood elevation with pumped outlet and wetland connections	873.4	873.4[1]	873.4
Peak 100-year, 10-day flood elevation without pumped outlet and wetland connections	878.2	873.5	876.3
Peak 100-year, 10-day flood elevation with pumped outlet and wetland connections	869.5	872.8	872.8

[1] Reported flood elevations reflect an initial water level of 872.1 feet MSL, which was the observed water elevation on June 1, 2014. It is noteworthy that the June 1, 2014 water level in MHN_11 was approximately 1.5 feet higher than the water level at the beginning of the monitoring season and reflects additional volume that was not accounted for by surface precipitation/runoff during the model calibration. The source of additional water volume is unknown, but may be related to inflows from sump pumps. For this reason, the maximum water levels shown here are higher than those shown in Table 2-5.

3.1.4 Costs

A planning level engineer's opinion of probable cost was prepared for the pumped outlet and wetland connection improvement option. The opinion of probable cost is $810,000 (rounded to the nearest $10,000), and is based on our experience on similar construction projects and the level of information available to determine cost for the proposed project. Given that the cost is based on planning-level design, a contingency of 30% was applied to the estimated construction cost. See Appendix B for a detailed summary of the estimated cost.

3.1.5 Water Quality Considerations

This improvement option assumes that water pumped from wetland MHN_1 would ultimately be conveyed to Minnehaha Creek, which suffers from excess nutrient enrichment, specifically phosphorus. Currently, the phosphorus load allocation identified by the Minnesota Pollution Control Agency as part of the draft Minnehaha Creek Total Maximum Daily Load (TMDL) and the relevant phosphorus load reductions required of the City do not consider the land-locked White Oaks area as a contributing area. Therefore, additional discharge and associated phosphorus load to Minnehaha Creek from this area may require treatment (or equivalent treatment elsewhere within the watershed), which could come at a considerable cost.

3.2 Stormwater Volume Reduction through Green Infrastructure

3.2.1 Description

An alternative method to reduce flood elevations and/or prolonged high water levels in the White Oaks area is to reduce the volume of stormwater runoff through implementation of green infrastructure. Green infrastructure can take many forms, but on a neighborhood scale, green infrastructure often refers to use of stormwater management techniques that mimic nature by infiltrating and/or storing water and reducing runoff.

A 2016 street reconstruction project is anticipated for a portion of the drainage area tributary to wetland MHN_1 (Townes Road and Berkeley Heights neighborhoods). Since the City is already planning street reconstruction projects within portions of the White Oaks drainage area (see Figure 3-1), incorporation of green infrastructure is recommended to reduce runoff. Green infrastructure techniques for consideration within the street right-of-way include stormwater planters or tree trenches, rainwater gardens, biofiltration, underground storage and infiltration, permeable pavements, or impervious surface reduction, among others.

3.2.2 Improvement Benefits

The calibrated water balance models were used to estimate the effects of implementing green infrastructure techniques within the proposed street reconstruction area on water levels in wetland MHN_1. The 2014 modeling timeframe was used to analyze the impacts for the following two scenarios: (1) capture runoff from impervious surfaces from the first half inch of precipitation, and (2) capture runoff from impervious surfaces from the first 1 inch of precipitation. Figure 3-3 and Figure 3-4 show how the water levels in MHN_1 would have responded differently during the 2014 season if green infrastructure were used to capture runoff from the first half inch and 1 inch of precipitation in the reconstructed areas, respectively. Under both scenarios shown in Figure 3-3 and Figure 3-4, water levels in MHN_1 would have been between ½- to 1-foot lower than observed water levels following significant rainfall events.

3.2.3 Costs

The costs for implementing green infrastructure within the street right-of-way can vary significantly depending on the type of Best Management Practice (BMP) implemented. Table 3-2 is an excerpt from the *Best Management Practices Construction Costs, Maintenance Costs, and Land Requirements* report prepared for the Minnesota Pollution Control Agency (MPCA) in June of 2011 as part of their Minimal Impact Design Standards (MIDS) project (Barr, 2011). The table summarizes average construction costs per volume of runoff captured, in cubic feet, based on a review of BMPs constructed in the Midwestern states. For example, an infiltration trench designed to capture and infiltrate 1,000 cubic feet of runoff would cost $11,000 to construct, on average. Table 3-2 also provides estimated costs for constructing BMPs to capture and infiltrate runoff from the impervious surfaces within subwatershed MHN_1 from a ½-inch and 1-inch precipitation event, based on the average costs presented in the MIDS study. While the costs presented in Table 3-2 represent average costs based on a relatively small sample set of projects within the Midwestern states, they provide a general sense for the costs of implementing stormwater volume reduction practices as part of future street reconstruction within the White Oaks area.

Table 3-2 Summary of BMP Construction Cost Data

BMP Type	Average cost[1] ($) per Captured Runoff Volume (ft^3)	Total Cost for BMP(s) to Capture Runoff From a ½-inch Rainfall Event[2]	Total Cost for BMP(s) to Capture Runoff From a 1-inch Rainfall Event[3]
Bioretention Basins	15	$80,000	$160,000
Biofiltration Basins	58	$310,000	$620,000
Infiltration Trenches	11	$60,000	$120,000
Infiltration Basins	21	$115,000	$225,000
Underground Infiltration	213	$1,140,000	$2,280,000
Pervious Pavement	16	$85,000	$170,000

[1] *Best Management Practices Construction Costs, Maintenance Costs, and Land Requirements* report prepared for the Minnesota Pollution Control Agency (MPCA)

[2] Costs based on constructing BMPs to capture 5,360 ft^3 of runoff from impervious surfaces of MHN_1, rounded to the nearest $5,000

[3] Costs based on constructing BMPs to capture 10,720 ft^3 of runoff from impervious surfaces of MHN_1, rounded to the nearest $5,000

3.3 Other Considerations

3.3.1 Wetland Restoration

The wetland assessment conducted as part of this project assigned MHN_1, MHN_65, and MHN_66 wetlands with a management classification of Manage 1, while wetland MHN_11 was assigned a management classification of Manage 2. The Minnesota Board of Water and Soil Resources defines the Manage 1 classification as "*high-quality wetlands that should be protected from development and other pressures of increased use, including indirect effects.* The Manage 2 classification is defined as *"wetlands*

that provide medium functional levels and the wetland extent should be maintained. These wetlands often provide optimal restoration opportunity."

Although all of the wetlands within the White Oaks area have been impacted by stormwater inflows on some level, among other impacts, there are opportunities to protect these wetlands from further stormwater impacts and enhance their functions and values. Specific opportunities include establishing, maintaining, and/or expanding natural buffers around the wetlands, vegetation management and/or enhancement, and protecting the wetlands from construction-related stormwater impacts. Additional information provided in Appendix A regarding current functions and values of each of the White Oaks wetland can be used to help identify additional restoration activities.

The upcoming 2016 street reconstruction project presents an opportunity to enhance the buffer of the MHN_1 wetland within the street right-of-way along Townes Road. Enhancements could include planting additional trees or other vegetative buffer, removal of nuisance vegetation, and streetscaping to improve aesthetics along the roadway.

Much of the MHN_1 wetland is located on City-owned property. If City-sponsored wetland restoration or protection efforts are not feasible due to staff and/or budget constraints, interested residents may want to consider partnering with the City to gain permission to conduct vegetation management and/or restoration activities on the publicly-owned land.

4.0 References

Barr Engineering Co. June 2011. *Best Management Practices Construction Costs, Maintenance Costs, and Land Requirements;* prepared for the Minnesota Pollution Control Agency (MPCA).

Cowardin, L.M., V. Carter, F.C. Golet, and R.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, FWS/OBS079/3.

Eggers, S.D. and Reed, D.M. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*.

Minnesota Board of Water and Soil Resource. *Management Classification Guide*. (http://www.bwsr.state.mn.us/wetlands/mnram)

Minnesota Climatology Working Group. (http://climate.umn.edu/)

Minnesota Department of Natural Resources. 2014. *HydroClim Minnesota for Early November 2014*. (http://www.dnr.state.mn.us/hydroclim/hc1411.html)

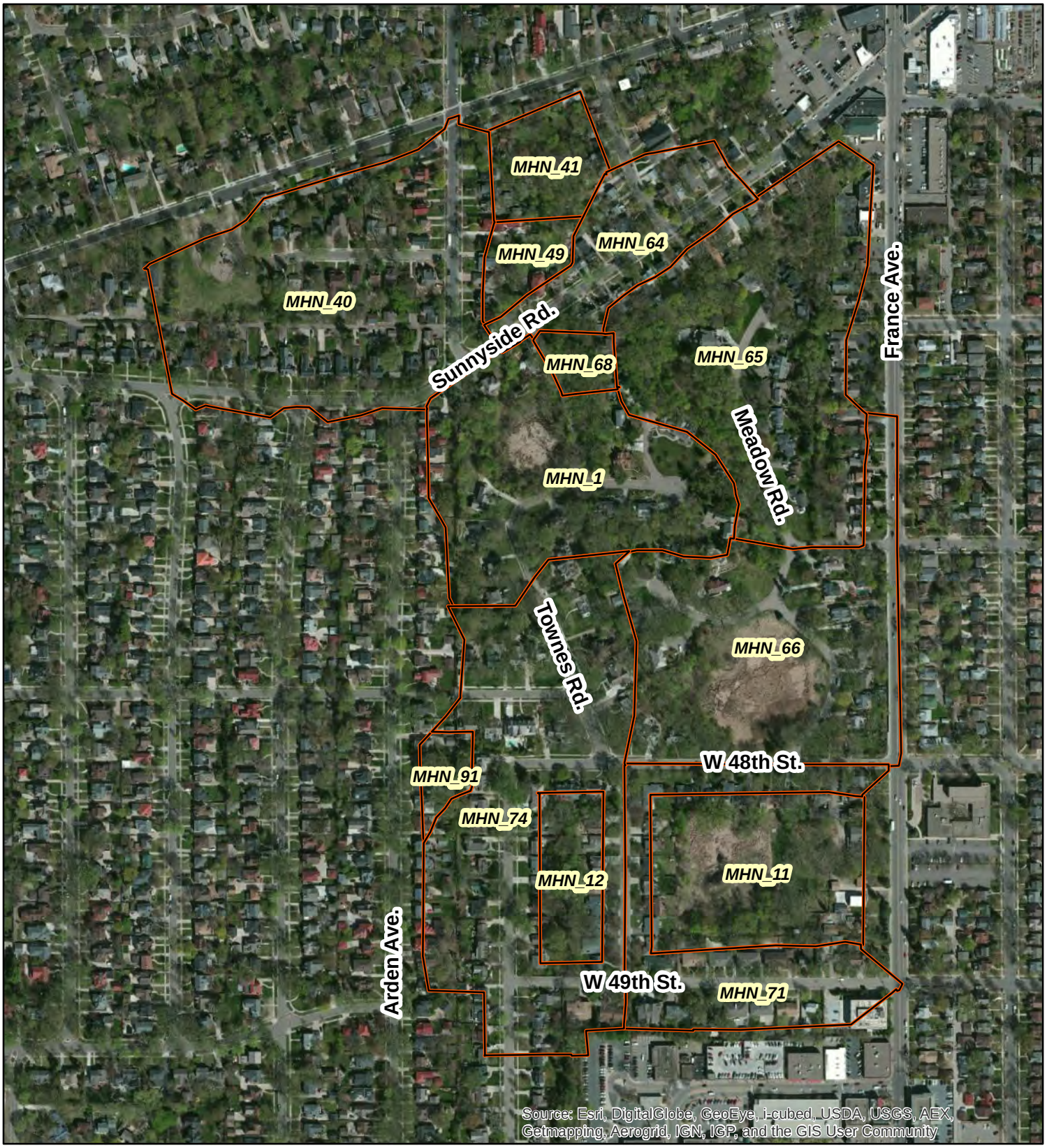
Shaw, C.P. and C.G. Fredine. 1956. *Wetlands of the United States – their extent and their value to waterfowl and other wildlife*. U.S. Department of Interior, Washington, D.C. Circular 39.

Stormwater Manager's Resource Center. *The Simple Method to Calculate Urban Stormwater Loads*. (http://www.stormwatercenter.net/monitoring%20and%20assessment/simple%20meth/simple.htm)

U.S. Army Corps of Engineers. 1987. *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*. Wetlands Research Program Technical Report Y-87-1 (on-line edition). Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region*. Wetlands Regulatory Assistance Program.

Figures



Barr Footer: ArcGIS 10.2.1, 2015-02-20 13:32 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig1-1 - Project Area.mxd User: cda

Project Area 8 Watersheds

Subwatershed ID

N

Feet

400 0 400 800

BARR

Figure 1-1

PROJECT STUDY AREA
White Oaks Area
City of Edina
Edina, Minnesota

Barr Footer: ArcGIS 10.2.1, 2015-02-20 13:42 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig2-1 - 2014 Inundation.mxd User: cda

Inundation at Maximum Observed 2014 Water Level

Wetland ID, Maximum 2014 Water Level

N

Feet

250 0 250 500

BARR

Figure 2-1

INUNDATION EXTENTS AT PEAK OBSERVED LEVELS IN THE MONITORED WETLANDS
White Oaks Area
City of Edina
Edina, Minnesota

Figure 2-2
Wetland MHN_1
Comparison of Observed and Modeled Water Levels (R^2 = 0.95)

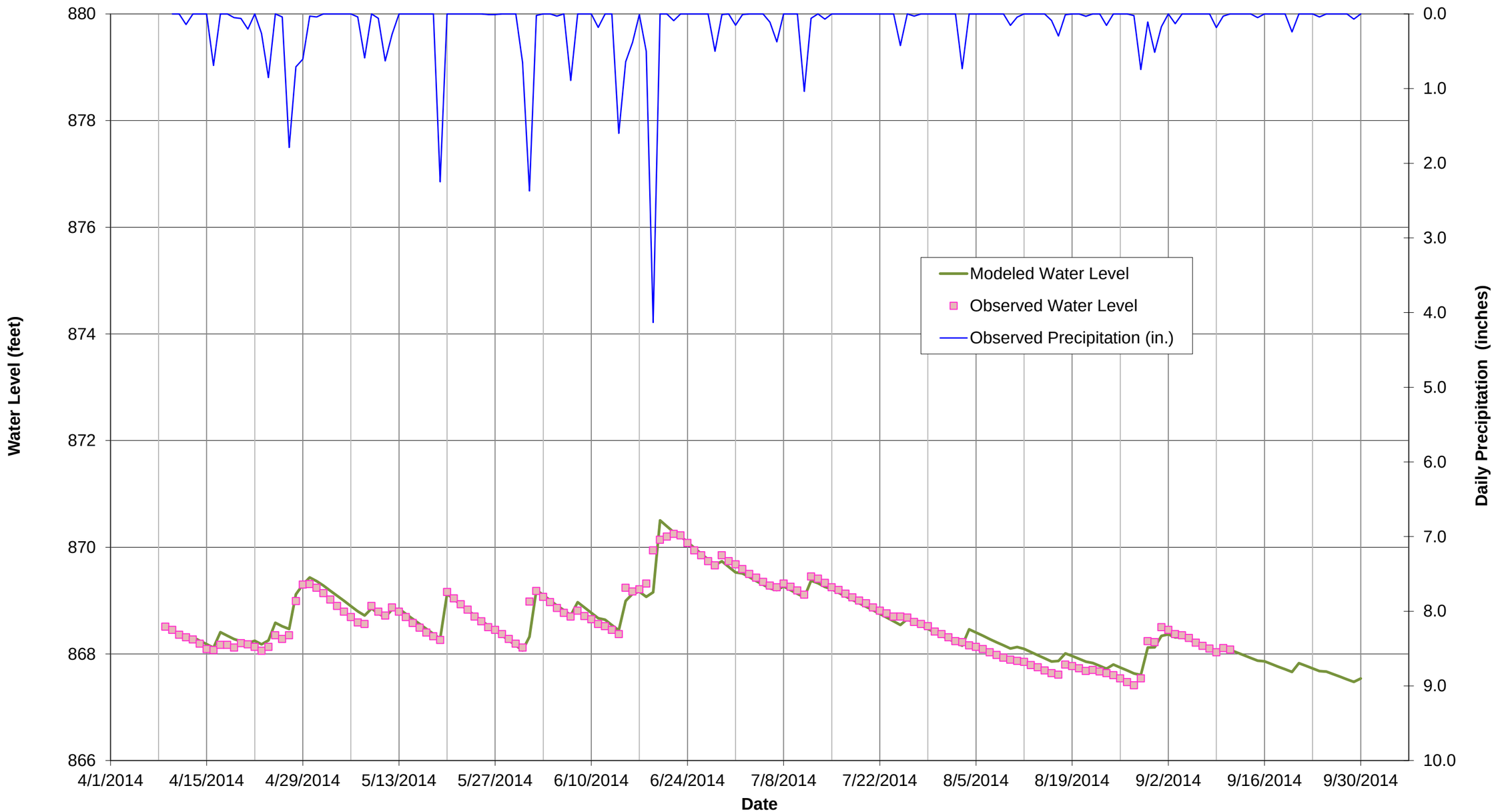


Figure 2-3
Wetland MHN_11
Comparison of Observed and Modeled Water Levels (R^2 = 0.99)

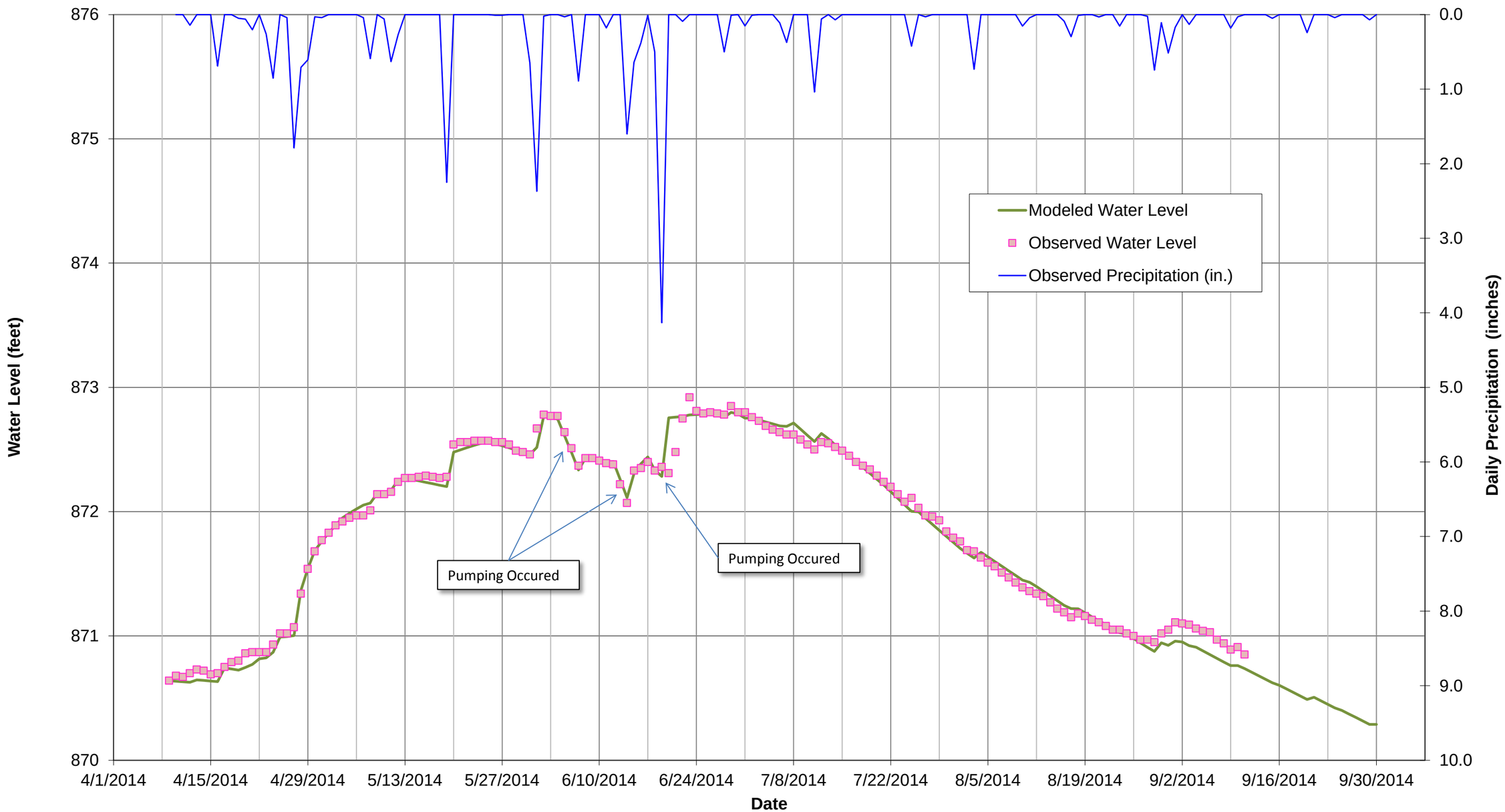


Figure 2-4
Wetland MHN_65
Comparison of Observed and Modeled Water Levels (R^2 = 0.84)

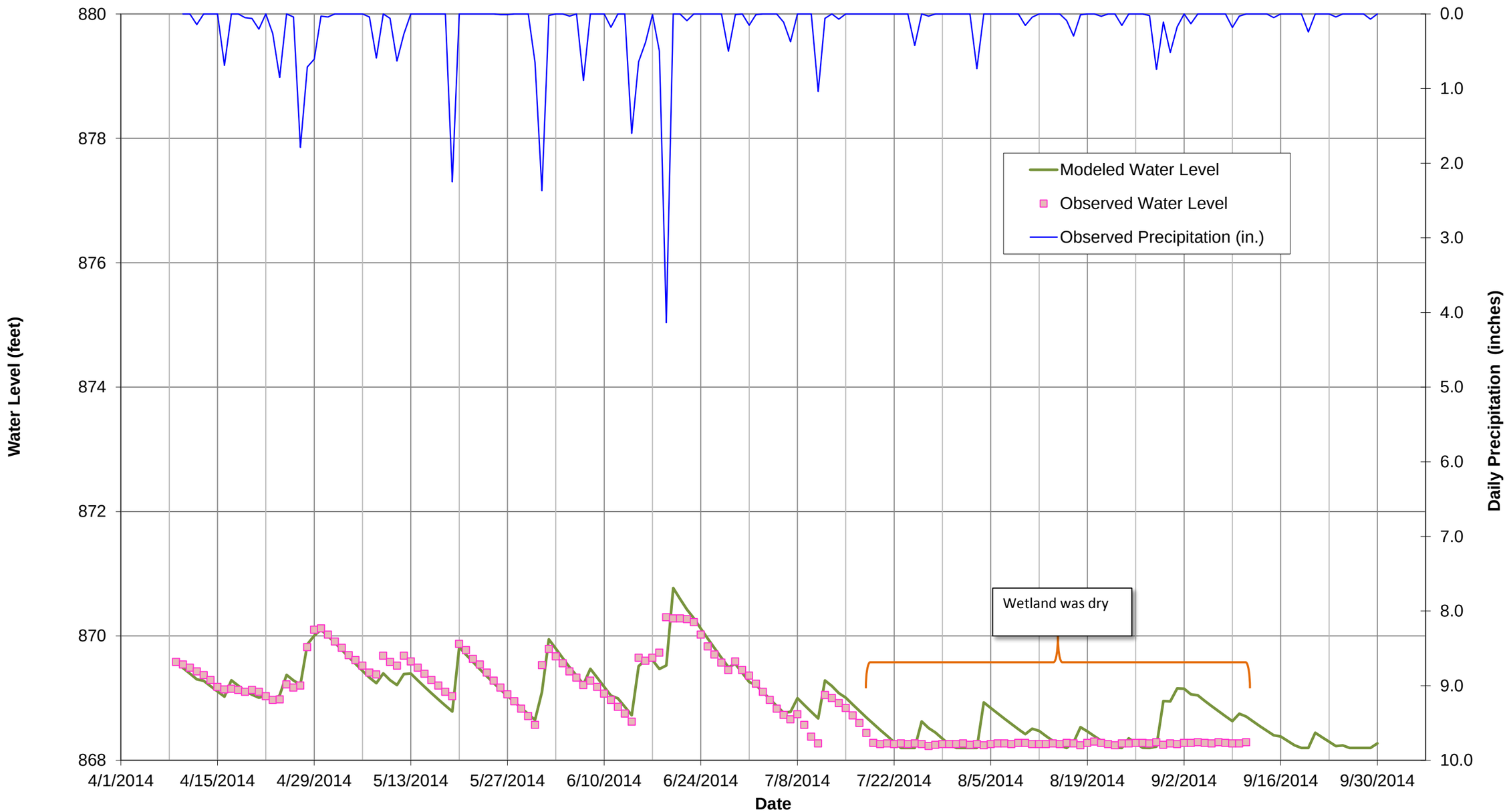
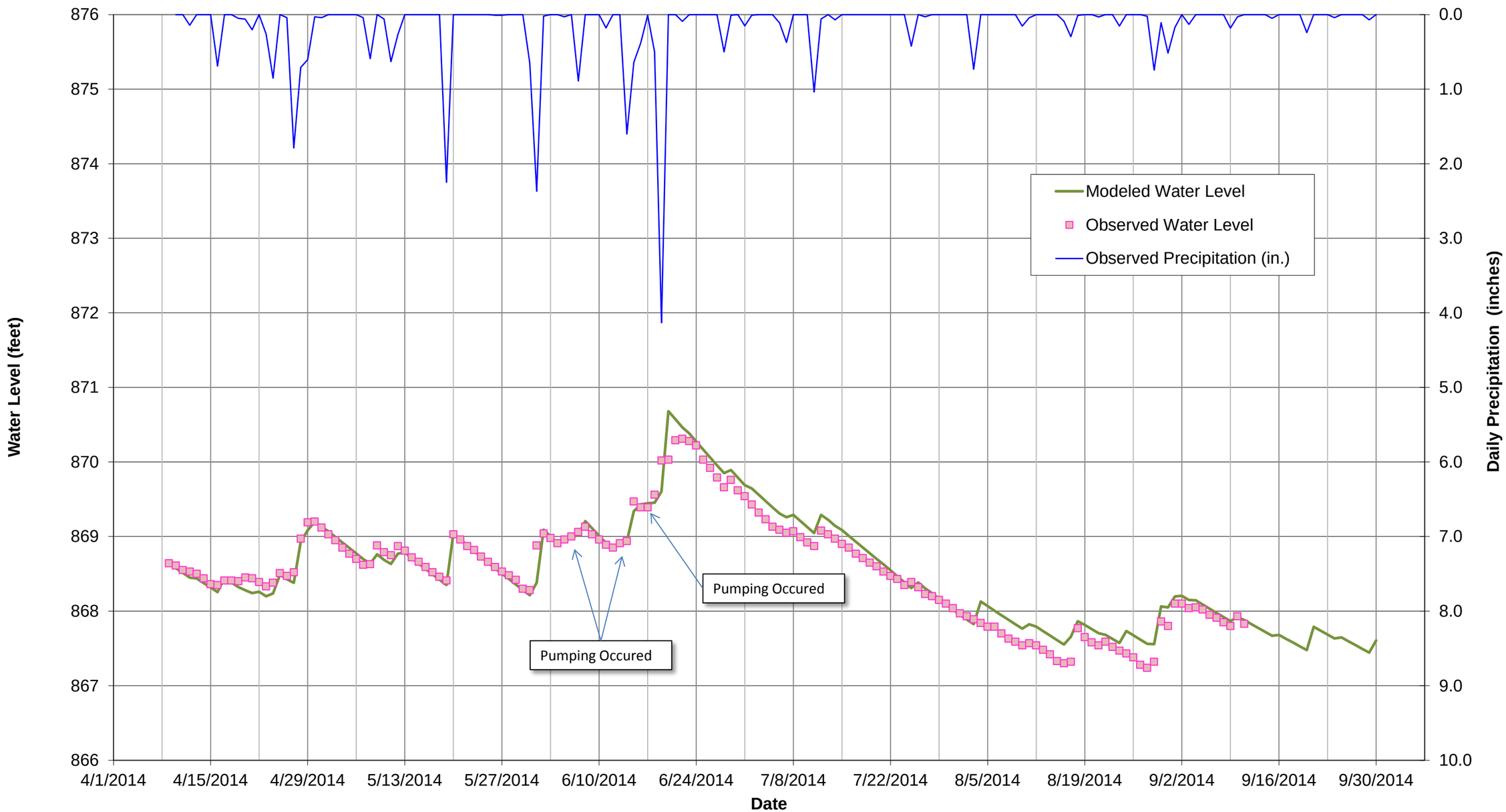


Figure 2-5
Wetland MHN_66
Comparison of Observed and Modeled Water Levels (R^2 = 0.96)



Barr Footer: ArcGIS 10.2.1, 2015-03-26 18:57 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig2-6 - 100YR_10DAY Inundation.mxd User: cda

Inundation Level

Wetland ID, Water Level

Note: Inundation areas are based on the 100-year, 10-day snowmelt/runoff event.

N

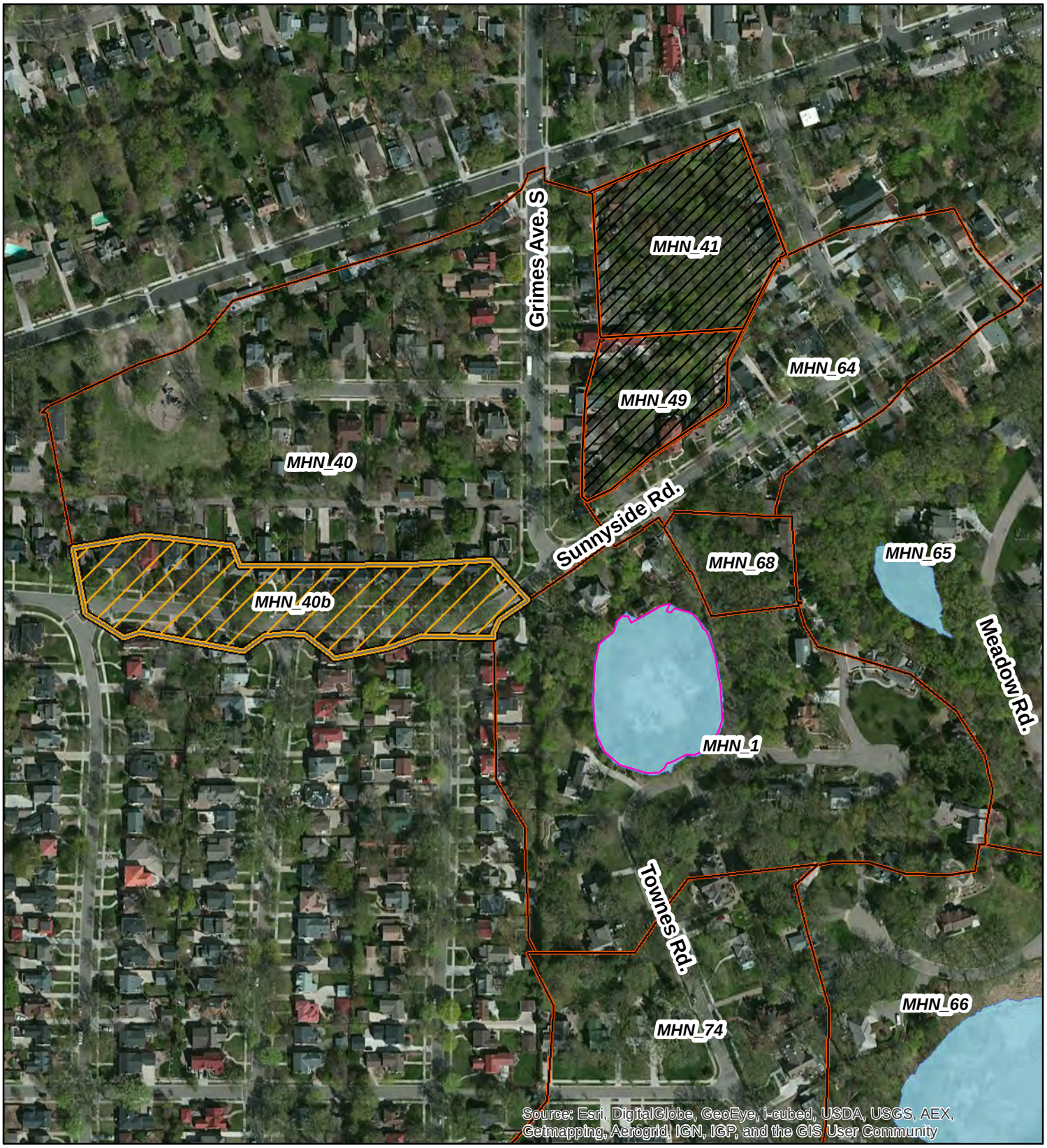
Feet

250 0 250 500

BARR

Figure 2-6

100-YEAR INUNDATION AREAS
White Oaks Area
City of Edina
Edina, Minnesota



Barr Footer: ArcGIS 10.2.1, 2015-02-20 13:43 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig2-7 - Drainage Alteration Inundation.mxd User: cda

Project Area 8 Watersheds

Non-contributing Area in 2014

Redirected Area (MHN_40b)

2014 Inundation less MHN_40b

2014 Maximum Inundation

N

Feet

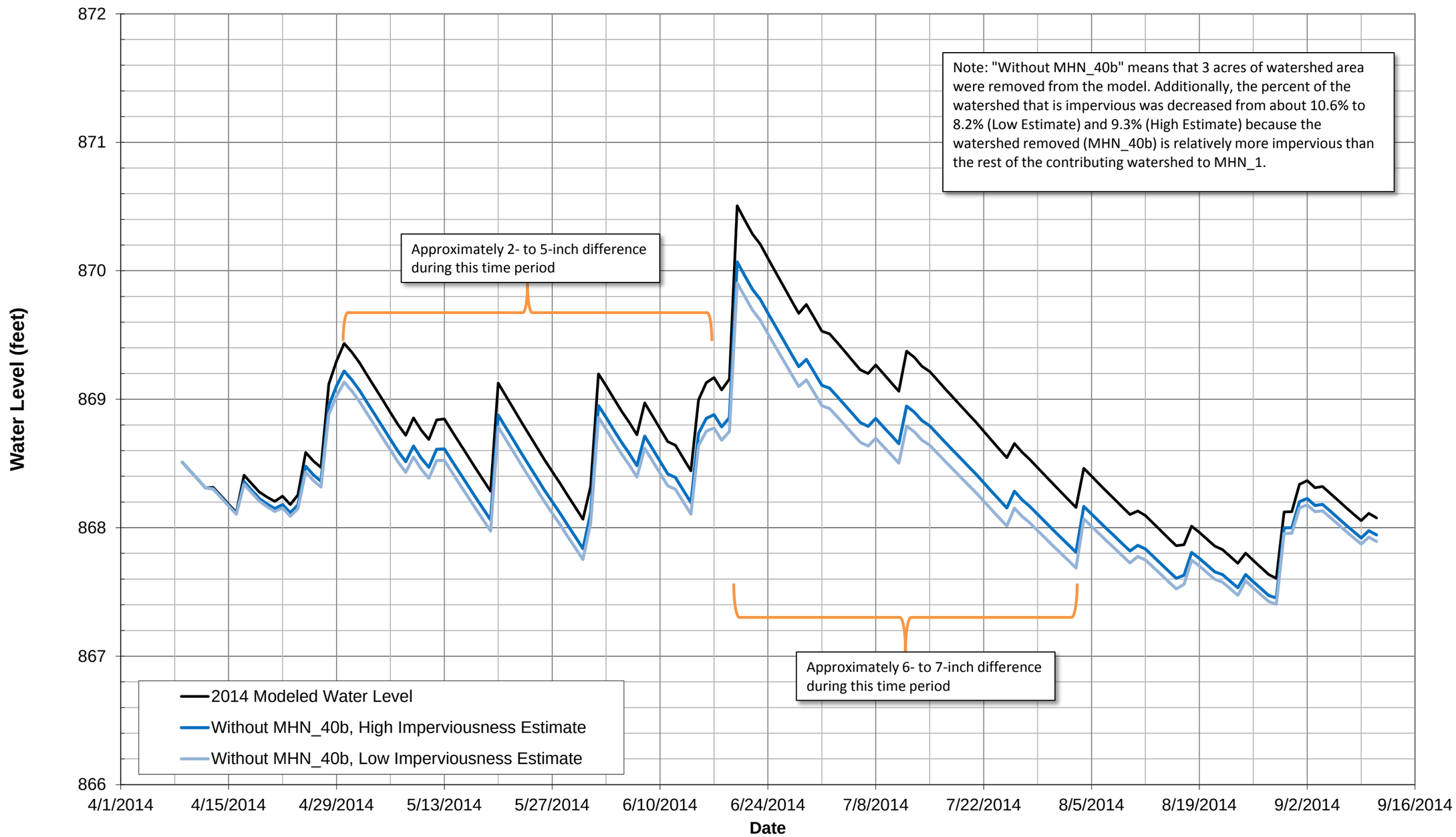
250 0 250 500

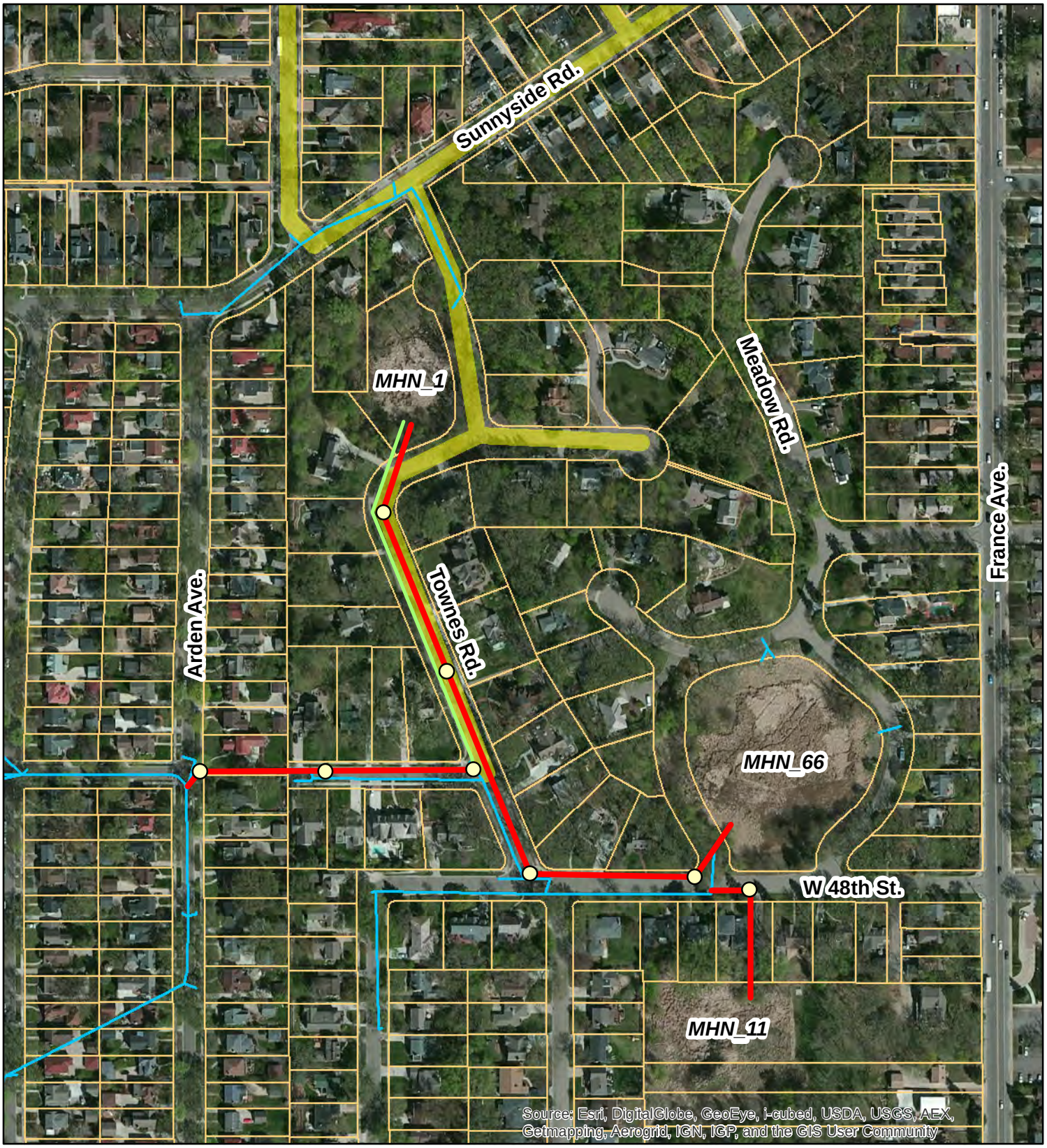
BARR

Figure 2-7

DRAINAGE ALTERATION
INUNDATION
White Oaks Area
City of Edina
Edina, Minnesota

Figure 2-8
Wetland MHN_1
Model Results of the 2014 Monitored Time Frame, With and Without the 3 acre Subwatershed MHN_40b





Barr Footer: ArcGIS 10.2.1, 2015-02-20 14:35 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig3-1 - Imp Option A.mxd User: cda

Existing Storm Sewer

Parcels

2016 Street Reconstruction (White Oaks Area)

Proposed Manhole

Proposed Storm Sewer

Proposed Forcemain

N

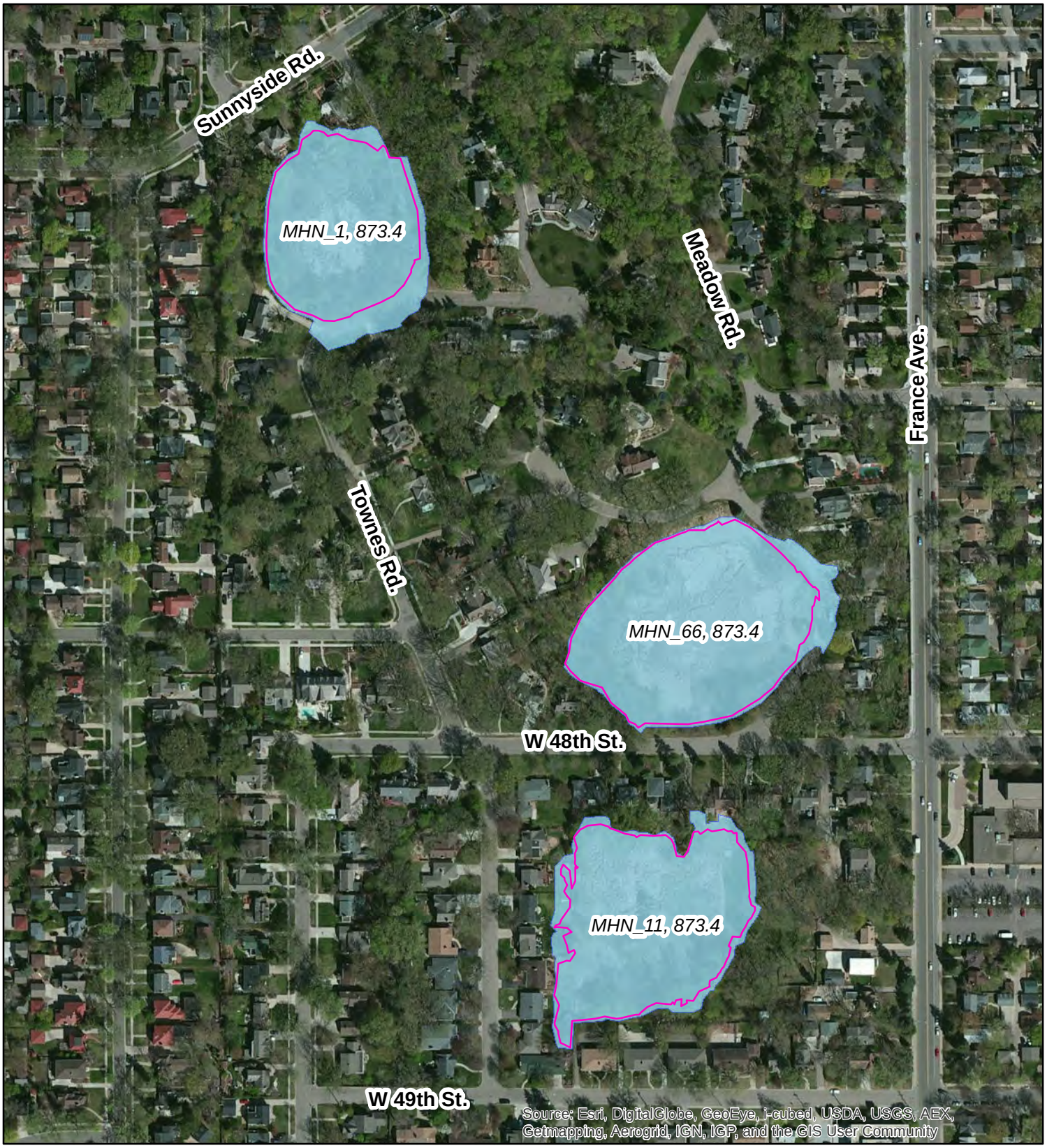
Feet

250 0 250 500

BARR

Figure 3-1

PUMPED OUTLET AND WETLAND CONNECTION
White Oaks Area
City of Edina
Edina, Minnesota



Barr Footer: ArcGIS 10.2.1, 2015-03-26 19:02 File: I:\Client\Edina\Projects\STS406\Maps\Reports\Draft_Memo_PA8\Fig3-2 - Improvement Option A Inundation.mxd User: cda

Inundation Level with Improvement Option

Inundation Level, Existing Conditions

Wetland ID, Water Level with pumped outlet and wetland connections

Note: Inundation areas are based on the 100-year, 24-hour precipitation event.

N

Feet

250 0 250 500

BARR

Figure 3-2

100-YEAR INUNDATION AREAS WITH IMPROVEMENT OPTION
White Oaks Area
City of Edina
Edina, Minnesota

Figure 3-3
Wetland MHN_1
Water Level During the 2014 Season with Implementation of Green Infrastructure
(removing the first half inch of precipitation before runoff is generated)

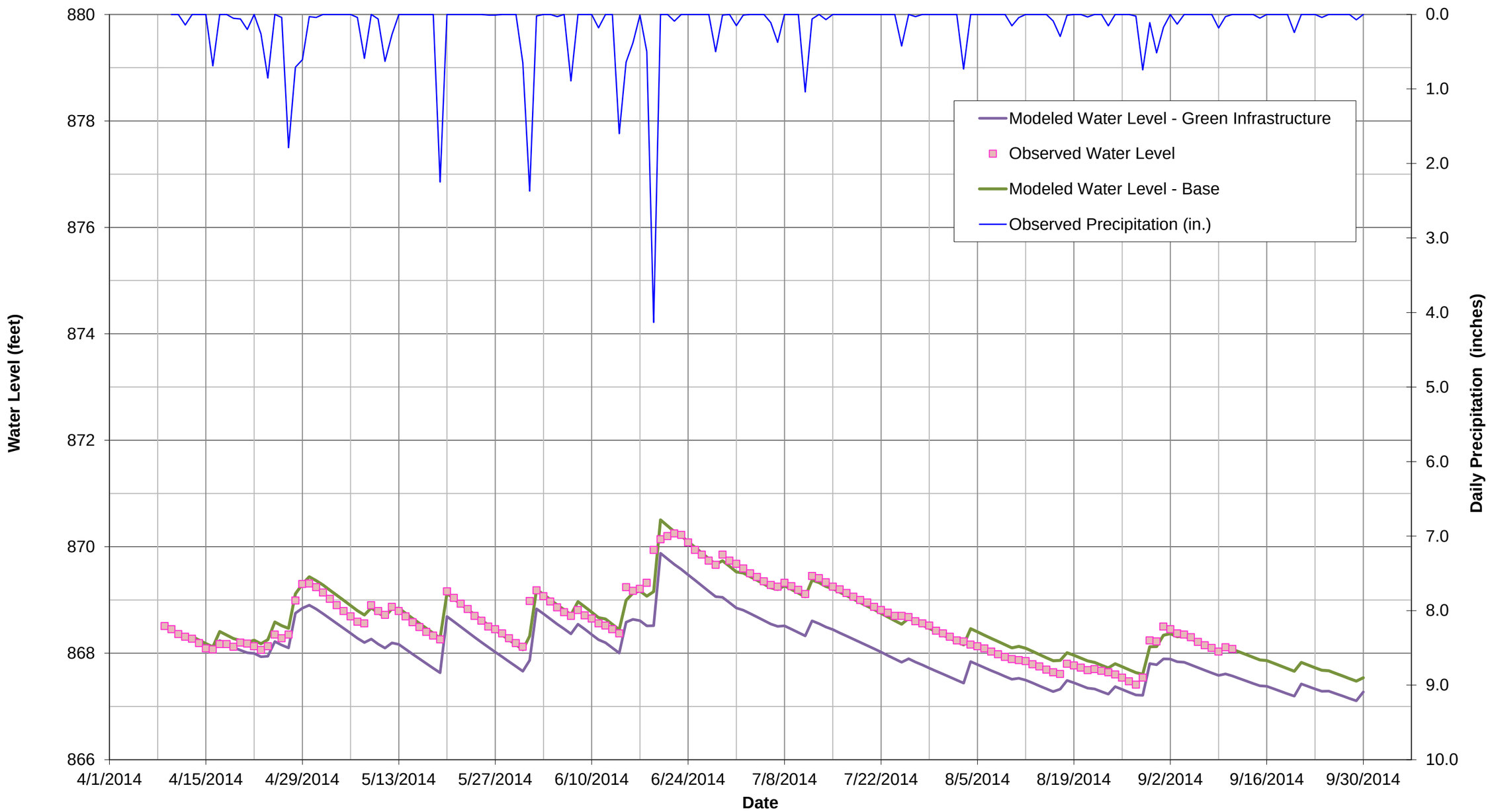
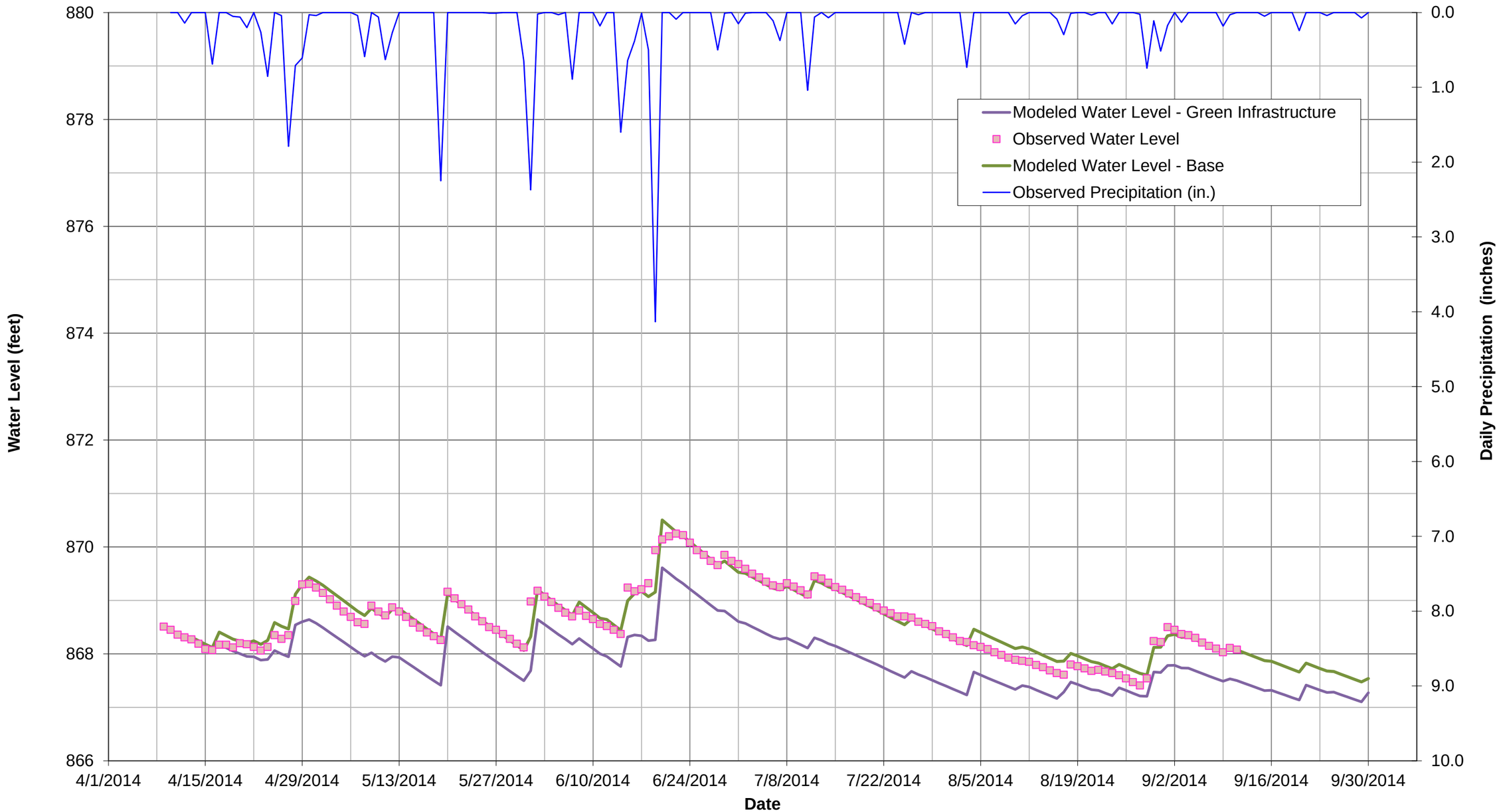


Figure 3-4
Wetland MHN_1
Water Level During the 2014 Season with Implementation of Green Infrastructure
(removing the first one inch of precipitation before runoff is generated)



Appendices

Appendix A

Wetland Delineation Report

Wetland Delineation Report

White Oaks Wetlands

Prepared for:
City of Edina

June 2014

BARR

4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: (952) 832-2600
Fax: (952) 832-2601

Wetland Delineation Report
White Oaks Wetlands – Edina

June 2014

Table of Contents

1.0 INTRODUCTION 1

2.0 GENERAL ENVIRONMENTAL SETTING 2

2.1 SITE DESCRIPTION 2
2.2 NATIONAL WETLAND INVENTORY 2
2.3 VEGETATION 2
2.4 SOIL RESOURCES 3
2.5 WATER RESOURCES 3
2.6 PRECIPITATION 3

3.0 WETLAND DELINEATION 4

3.1 WETLAND DELINEATION AND CLASSIFICATION METHODS 4
3.2 WETLAND FUNCTIONAL ASSESSMENT METHODS 4
3.3 WETLAND DESCRIPTIONS 5

4.0 REGULATORY OVERVIEW 9

5.0 REFERENCES 10

List of Tables

Table 1 Antecedent Moisture Conditions Prior to May 28, 2014 Site Visit

Table 2 Precipitation in Comparison to WETS Data

Table 3 Wetland Summary Table

List of Figures

Figure 1 Site Location Map

Figure 2 Wetland Delineation Map

Figure 3 National Wetland Inventory

Figure 4 Hennepin County Soil Survey Map

Figure 5 Public Water Inventory and Watershed Boundary Map

Figure 6 Surface Topography

List of Attachments

Attachment A Wetland Data Forms

Attachment B Site Photos

Attachment C MNRAM Summary

1.0 Introduction

This report has been prepared by Barr Engineering Co. (Barr) on behalf of the City of Edina in support of a proposed project to evaluate stormwater inputs into wetlands within the White Oaks neighborhood in the City of Edina, Minnesota. The report describes wetland resources located within wetland the evaluation area for the project. The site is located within Hennepin County, Minnesota in the NE quarter of Section 18, Township 28 North, Range 24 West (**Figure 1**).

Four wetlands were delineated on May 28, 2014, comprising a total of 5.21 acres in the wetland evaluation area, as shown in the wetland delineation map in **Figure 2**.

This Wetland Delineation Report has been prepared in accordance with the *U.S. Army Corps of Engineers 1987 Wetland Delineation Manual* ("1987 Manual", USACE, 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010)* and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991. Barr delineated the wetland boundaries and determined wetland types in the wetland evaluation area on May 28, 2014. In addition, the wetlands were assessed using the Minnesota Routine Assessment Method (MNRAM 3.4) for Evaluating Wetland Functions and Values.

This report includes general environmental information (Section 2.0), descriptions of the delineated wetlands (Section 3.0) and a discussion of regulations and the administering authorities (Section 4.0). **Attachment A** includes Wetland Data Forms and site photographs are included in **Attachment B**. MNRAM summaries are provided in **Attachment C**.

2.0 General Environmental Setting

2.1 Site Description

The wetland evaluation area is located west of France Avenue between Sunnyside Road and 48th St in the City of Edina. Storm water is conveyed into wetlands in this area through catch basins and open asphalt channels. The wetlands do not have outlets and are not connected to other water bodies.

Four wetlands were delineated within the evaluation area. The wetland evaluation area is within private ownership within a residential neighborhood located within the Minnehaha Creek Watershed District. The majority of the evaluation area is sloped upward toward residential lots with moderate slopes down toward each of the wetlands.

2.2 National Wetland Inventory

The National Wetland Inventory (NWI) Map identifies three wetlands within the evaluation area. The NWI classifies the wetland community types within this area as: PEM1A, PEM1C, PEM1F, and PUBF according to the Cowardin Classification System (Cowardin et al., 1979). The NWI map is provided in **Figure 3**.

2.3 Vegetation

The wetland plant communities characterized during the May 28, 2014 field assessment were identified as shallow and deep marsh, fresh wet meadow, and floodplain forest communities. The shallow and deep marsh communities are dominated by cattails (*Typha spp*.) and duckweed (*Lemna spp*.), the fresh wet meadow communities are dominated by reed canary grass (*Phalaris arundinacea*), and the floodplain forest communities are dominated by silver maple (*Acer saccharinum*), boxelder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), and willows (*Salix spp*.).

Adjacent upland areas are primarily forested areas dominated by oaks (*Quercus spp*.), honeysuckle (*Lonicera spp*), common buckthorn (*Rhamnus cathartica*), cottonwood (*Populus deltoides*), burdock (*Arctium minus*), Virginia creeper (*Parthenocissus quinquefolia*), wild geranium (*Geranium maculatum*), ground ivy (*Glechoma hederacea*), jack in the pulpit (*Arisaema triphyllum*), violets, (*Viola spp*.), garlic mustard (*Allaria petiolata*), and Shawnee-salad (*Hydrophyllum virginianum*). Small portions of the adjacent upland include un-mowed grasses, mowed turf grass and roadways.

2.4 Soil Resources

Soil information for the wetland evaluation area was obtained from the *Soil Survey of Hennepin County, Minnesota* (USDA, 2004). The majority of the wetland areas are mapped as Urban land-Udorthents wet substratum complex, 0 to 2 percent slopes, which is classified as not hydric. Soils surrounding the wetlands are Urban land-Malardi complex, 0 to 8 percent and 8 to 18 percent slopes, which are also classified as not hydric (**Figure 4**).

2.5 Water Resources

The project site is located in the Mississippi River major watershed #20 and the Minnehaha Creek from Lake Harriet minor watershed. The Minnesota Department of Natural Resources (MDNR) Public Waters Inventory (PWI) has identified Minnehaha Creek as a public watercourse and Lake Harriet as a public water basin (**Figure 5**).

2.6 Precipitation

Recent precipitation data were compared to historic data for evaluating annual and monthly deviations from normal conditions. Simulated precipitation data were obtained from the Minnesota Climatology Working Group, Wetland Delineation Precipitation Data Retrieval from a Gridded Database (http://climate.umn.edu/gridded_data/precip/wetland/wetland.asp) for wetlands in Hennepin County, Township 28 North, Range 24 West, Section 18 (**Table 1**). Using the NRCS WETS analysis tool for the nearest climate station, antecedent moisture conditions were above the normal range based on precipitation for the three months prior to the delineation. The 2013 water year (October 2012 through September 2013) was wetter than the normal range (**Table 2**). The water year for 2012 was within the normal range, the 2011 and 2010 water years were wetter than the normal range, and 2009 was drier than the normal range.

3.0 Wetland Delineation

3.1 Wetland Delineation and Classification Methods

Wetlands within the evaluation area were delineated on May 28, 2014. The wetland delineations were established according to the Routine On-Site Determination Method specified in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (1987 Edition) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010).*

The wetlands within the wetland evaluation area were identified as shown in **Figure 2**. The delineated wetland boundaries and sample points were surveyed using a Global Positioning System (GPS) with sub-meter accuracy.

The wetlands were classified using the U.S. Fish and Wildlife Service (USFWS) Cowardin System (Cowardin et al., 1979), the USFWS Circular 39 system (Shaw and Fredine, 1956), and the Eggers and Reed Wetland Classification System (Eggers and Reed, 1977). Section 4.3 below provides a description and classification for the delineated wetlands in the wetland evaluation area.

Soil borings were placed in and around the wetlands, to a depth of at least 20 inches below the ground surface. Representative soil samples from each boring were examined for the presence of hydric soil indicators using the Natural Resources Conservation Service (NRCS) hydric soil indicators (Version 7.0). Soil colors (e.g. 7.5YR 4/2, etc.) were determined using a Munsell® soil color chart and noted on the Wetland Data Forms (**Attachment A**).

Hydrologic conditions were evaluated at each soil boring, and this information was also noted on the Wetland Data Forms. The dominant plant species were identified, and the corresponding wetland indicator status of each plant species was determined and noted on the Wetland Data Forms as well (**Attachment A**). Photographs are provided in **Attachment B**.

3.2 Wetland Functional Assessment Methods

The Minnesota Routine Assessment Method (MNRAM 3.4) for Evaluating Wetland Functions and Values was used to assess wetlands in the evaluation area. The MNRAM was developed as a way to evaluate wetlands based on functions and values. The MNRAM is used assess wetlands based on the answers to 72 questions to determine how well the functions and values are performed within each wetland. During the field wetland delineations, data were collected to assess the functions and values of each wetland within the wetland evaluation areas. However, some of the data concerning the site

was obtained using a Geographic Information System (GIS). The wetland functions and values that were evaluated are listed below.

- Maintenance of characteristic vegetative diversity/integrity
- Maintenance of hydrologic regime
- Flood/stormwater attenuation
- Downstream water quality
- Maintenance of wetland water quality
- Shoreline protection
- Maintenance of characteristic wildlife habitat structure
- Maintenance of characteristic fish habitat
- Maintenance of characteristic amphibian habitat
- Aesthetics/recreation/education/cultural
- Ground water interaction

Additional evaluation information includes:

- Sensitivity to stormwater & urban development
- Wetland restoration potential
- Additional stormwater treatment needs

Numeric scores are computed for each wetland function and value based on established formulas in the methodology. Those numeric scores are then converted to quality ratings – exceptional, high, moderate, and low– which can be used to determine an overall rating for wetland management classifications.

See **Attachment C** for the wetland functional assessment summary tables created for each of the wetlands delineated within the wetland evaluation area.

3.3 Wetland Descriptions

Four wetlands were delineated within the wetland evaluation area. The wetland summary table is provided in **Table 3**. A brief description of each wetland is provided below, with representative photographs of the wetland and surrounding area in **Attachment B**.

Wetland MHN-1

Wetland MHN-1 is a 1.13 acre Type 3/1 (PEMC/PFO1A) shallow marsh/floodplain forest wetland located in the northwest portion of the evaluation area. The wetland is a depressional area (**Figure 6**)

surrounded by residential properties on the north and west sides and Townes Road on the east and south sides with a paved path at the south end. The shallow marsh portion of the wetland is dominated with narrowleaf cattail (*Typha angustifolia*). Dominant vegetation within the floodplain forest portion of the wetland is silver maple, boxelder, and green ash.

The transition to upland is characterized by the presence of non-hydrophytes in the herbaceous layer including wild geranium, Virginia creeper, and white violet (*Viola canandensis*) as well as a lack of hydrology and hydric soil indicators.

Soils in the wetland are mapped as Urban land, Udorthents, wet substratum complex, 0 to 2 percent slopes. Soils observed within the wetland are black (10YR 2/1) muck above at least 25 inches of black (10YR 2/1) loam with ten percent light brownish gray (10YR 6/2) and two percent brownish yellow (10YR 6/6) redox features beginning at two inches below the surface. Soils were saturated at the surface and the majority of the wetland was inundated with approximately two feet of water during the site visit (**Figure 2**).

MHN-1 was classified as Manage 1 for a high maintenance of hydrologic regime rating and a moderate vegetative diversity rating according to the default BWSR overall wetland management classification in the MNRAM analysis. The wetland also rated high for flood and stormwater attenuation (**Attachment C**).

Wetland MHN-65

Wetland MHN-65 is a 0.19 acre Type 1 (PFO1A) floodplain forest wetland located in the northeastern portion of the evaluation area. The wetland is a depressional area surrounded by residential properties. Stormwater is directed to the wetland through an open channel from Meadow Road. The wetland is dominated by silver maple, with some boxelder, elm, red-osier dogwood (*Cornus alba*), and common buckthorn also present.

The transition to upland was characterized by a slight upward slope in topography with the presence of ground ivy in the herbaceous layer and a lack of hydrology and hydric soil indicators.

Soils in the wetland are mapped as Urban land, Udorthents, wet substratum complex, 0 to 2 percent slopes. Soils observations in the wetland indicate hydric soils with black (10YR 2/1) muck at the surface above a depleted dark gray (10YR 4/1) loam matrix with ten percent dark yellowish brown (10YR 4/4) redox features starting six inches below the surface. Soils were saturated at the surface

and the majority of the wetland was inundated with one to six of water at the time of the site visit (**Figure 2**).

MHN-65 was classified as Manage 1 for a moderate amphibian habitat rating according to the default BWSR overall wetland management classification in the MNRAM analysis. The wetland also rated high for maintenance of hydrologic regime (**Attachment C**).

Wetland MHN-66

Wetland MHN-66 is a 2.20 acre Type 4/3/2 (PEMF/C/B) deep marsh/shallow marsh/fresh wet meadow wetland located in the central portion of the evaluation area. The wetland is a depressional area surrounded by residential properties on the west side. White Oaks Road is at the north end, Meadow Road wraps around the east side, and West 48th Street is at the south end of the wetland. A catch basin and open asphalt drainage channel provides stormwater into the wetland from 48th Street. The immediate naturalized upland buffer surrounding the wetland is approximately forty feet wide with trees along the residential properties and unmowed grasses between the wetland and the roads. The wetland is dominated by narrowleaf cattail and hybrid cattail (*Typha glauca*) in the central marsh portions with reed canary grass, green ash, silver maple, common buckthorn, and American elm (*Ulmus americana*) along the fringes.

The transition to upland was characterized by an upward slope in topography lacking hydrology indicators along with the presence of white oak (*Quercus alba*) trees, honeysuckle shrubs, dense buckthorn and non-hydrophytes in the herbaceous layer including burdock, ground ivy, and thistle (*Cirsium spp.*).

Soils in the wetland are mapped as Urban land, Udorthents, wet substratum complex, 0 to 2 percent slopes. Soils observations in the wetland indicate hydric soils with black (10YR 2/1) muck above ten inches of very dark gray (10YR 3/1) loam with two percent pale brown (10YR 6/3) and two percent dark yellowish brown (10YR 4/4) redox features beginning at two inches below the surface. Soils were saturated at the surface and the majority of the wetland was inundated with one inch to approximately two feet of water at the time of the site visit (**Figure 2**).

MHN-66 was classified as Manage 1 for a high maintenance of hydrologic regime rating and a moderate vegetative diversity rating according to the default BWSR overall wetland management classification in the MNRAM analysis. The wetland also rated high for flood and stormwater attenuation (**Attachment C**).

Wetland MHN-11

Wetland MHN-11 is a 1.69 acre Type 4/3/1 (PEMF/C/FO1A) deep marsh/shallow marsh/floodplain forest wetland located in the southern portion of the evaluation area. The wetland is a depressional area surrounded by residential properties. A catch basin provides stormwater into the wetland from 48th Street. The wetland is dominated by narrowleaf cattail, common duckweed (*Lemna minor*), ivy-leaf duckweed (*Lemna trisulca*), and reed canary grass with a fringe of black willow (*Salix nigra*), boxelder, and peach-leaf willow (*Salix amygdaloides*).

The transition to upland was characterized by an upward slope in topography with the presence of white oak trees, and non-hydrophytes in the herbaceous layer including burdock, Virginia creeper, and wild geranium.

Soils in the wetland are mapped as Urban land, Udorthents, wet substratum complex, 0 to 2 percent slopes. Soils observations in the wetland indicate hydric soils with black (10YR 2/1) loam and ten percent yellowish brown (10YR 5/6) redox features starting at the surface. Soils were saturated at the surface and the wetland was inundated with three inches to approximately three feet of water at the time of the site visit (**Figure 2**).

MHN-11 was classified as Manage 2 for a low vegetative diversity rating according to the default BWSR overall wetland management classification in the MNRAM analysis. The wetland also rated high for flood and stormwater attenuation (**Attachment C**).

4.0 Regulatory Overview

The United States Army Corps of Engineers (USACE) regulates the placement of dredge or fill materials into wetlands that are located adjacent to or are hydraulically connected to interstate or navigable waters under the authority of Section 404 of the Clean Water Act.

Filling, excavating, and draining wetlands are also regulated by the Wetland Conservation Act (WCA), which is administered by the Minnehaha Creek Watershed District (MCWD).

The USACE and the MCWD should be contacted before altering any wetlands on the site.

5.0 References

Cowardin, L.M., V. Carter, F.C. Golet, and R.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, FWS/OBS079/3.

Eggers, S.D. and Reed, D.M. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W. N. Kirchner. 2014. *The National Wetland Plant List*. 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42. U.S. Army Corps of Engineers 2014. National Wetland Plant List, version 3.2. http://wetland_plants.usace.army.mil/ U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2004. *Soil Survey of Hennepin County, Minnesota*. Washington, D.C.

U. S. Department of Agriculture, Natural Resources Conservation Service. 2010. *Field Indicators of Hydric Soils in the United States, Version 7.0.* G.W. Hurt and L.M. Vasilas (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

U.S. Army Corps of Engineers. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region*. August 2010. Wetlands Regulatory Assistance Program.

U.S. Army Corps of Engineers. 1987. *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*. Wetlands Research Program Technical Report Y-87-1 (on-line edition). Waterways Experiment Station, Vicksburg, Mississippi.

Shaw, C.P. and C.G. Fredine. 1956. *Wetlands of the United States – their extent and their value to waterfowl and other wildlife*. U.S. Department of Interior, Washington, D.C. Circular 39.

Tables

Table 1
Antecedent Moisture Conditions Prior to May 28, 2014 Site Visit

Precipitation data for target wetland location:

county: **Hennepin**
township name: **Edina**
nearest community: **Saint Louis Park**

township number: **28N**
range number: **24W**
section number: **18**

Aerial photograph or site visit date:
Wednesday, May 28, 2014

Score using 1971-2000 normal period

(values are in inches)	first prior month: **May-14**	second prior month: **Apr-14**	third prior month: **Mar-14**
estimated precipitation total for this location:	**4.46**	**6.78**	**0.65**
there is a 30% chance this location will have less than: *	2.63	1.46	1.32
there is a 30% chance this location will have more than: *	4.04	2.93	2.32
type of month: dry normal wet	wet	wet	dry
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**16 (Wet)**		

Score using 1981-2010 normal period

(values are in inches)	first prior month: **May-14**	second prior month: **Apr-14**	third prior month: **Mar-14**
estimated precipitation total for this location:	**4.46**	**6.78**	**0.65**
there is a 30% chance this location will have less than: *	2.52	1.74	1.36
there is a 30% chance this location will have more than: *	4.25	3.29	2.32
type of month: dry normal wet	wet	wet	dry
monthly score	**3 * 3 = 9**	**2 * 3 = 6**	**1 * 1 = 1**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)	**16 (Wet)**		

Table 2
Precipitation in Comparison to WETS Data

Precipitation data for target wetland location:

county: **Hennepin** | township number: **28N**
township name: **Edina** | range number: **24W**
nearest community: **Saint Louis Park** | section number: **18**

precipitation totals are in inches

color key:
total is in lowest 30th percentile of the period-of-record distribution
total is => 30th and <= 70th percentile
total is in highest 30th percentile of the period-of-record distribution

multi-month totals:
WARM = warm season (May thru September)
ANN = calendar year (January thru December)
WAT = water year (Oct. previous year thru Sep. present year)

Period-of-Record Summary Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.51	0.49	1.14	1.45	2.54	3.08	2.24	2.47	1.78	1.14	0.67	0.50	15.74	25.57	25.88
70%	1.03	1.07	2.02	2.69	4.27	5.49	4.48	4.49	3.81	2.54	1.76	1.30	20.68	31.64	31.69
mean	0.87	0.87	1.66	2.31	3.56	4.34	3.75	3.59	2.99	2.15	1.48	1.00	18.24	28.59	28.67

1971-2000 Summary Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.71	0.40	1.36	1.37	2.52	3.35	2.83	3.58	2.19	1.09	1.13	0.60	17.67	30.25	28.17
70%	1.24	0.98	2.31	2.78	4.00	5.52	4.67	5.01	3.42	2.90	2.41	1.28	22.44	34.30	34.50
mean	1.06	0.79	1.94	2.42	3.47	4.54	4.57	4.22	3.06	2.24	2.04	1.02	19.86	31.36	31.47

1981-2010 Summary Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
30%	0.55	0.45	1.43	2.23	2.59	3.31	2.67	3.38	2.35	1.28	1.06	0.75	18.31	30.41	28.17
70%	1.20	1.03	2.23	3.00	4.33	5.48	4.63	5.23	4.27	3.57	2.10	1.45	22.44	35.05	36.27
mean	0.90	0.80	1.95	2.73	3.58	4.50	4.46	4.36	3.44	2.57	1.88	1.23	20.33	32.39	32.21

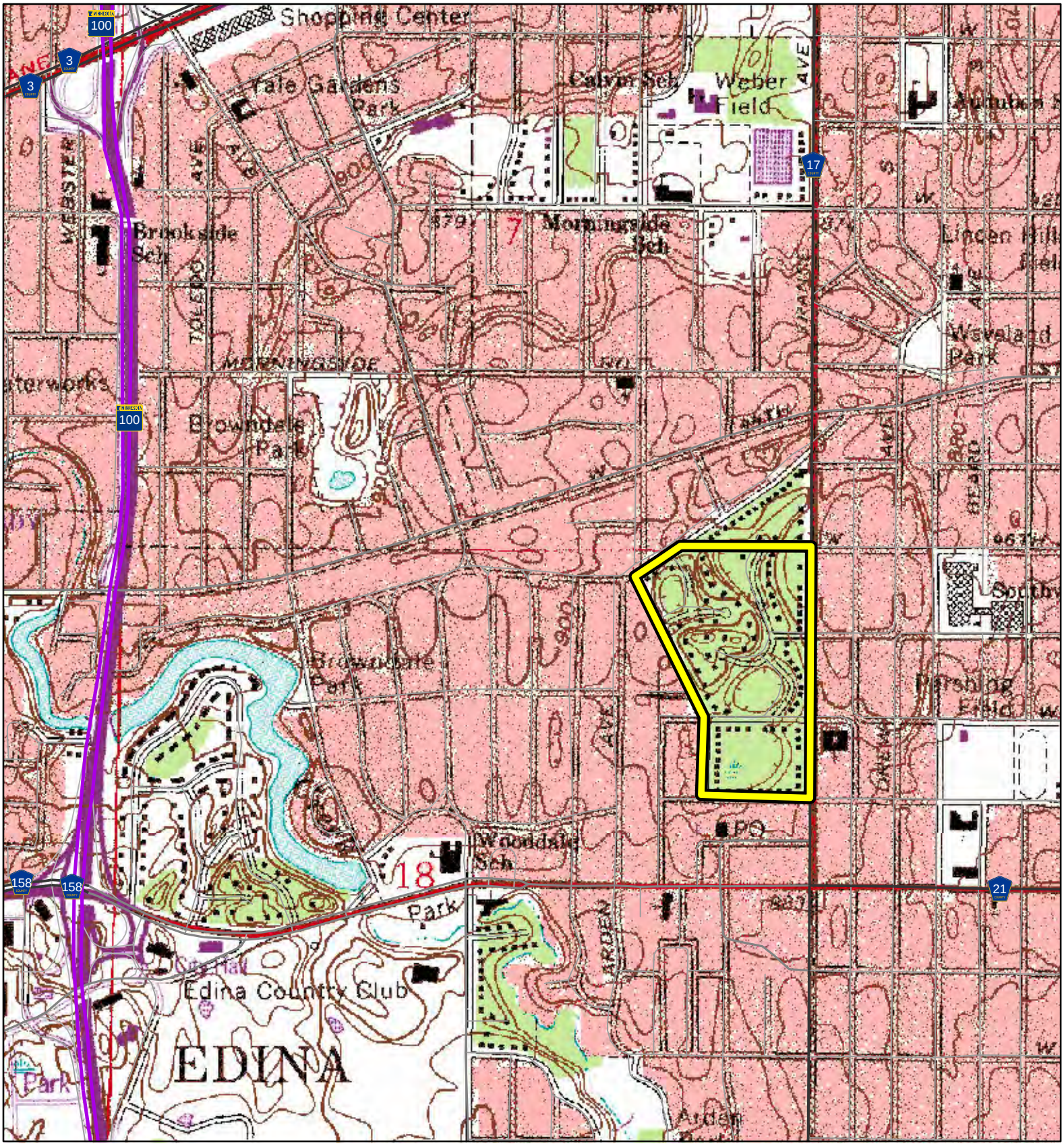
Year-to-Year Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WARM	ANN	WAT
2014	1.30	1.20	0.65	6.78	4.46	10.33									
2013	0.81	1.22	2.02	4.64	5.73	6.35	4.69	1.93	1.33	3.76	0.56	1.51	20.03	34.55	32.40
2012	0.47	1.94	1.47	3.03	9.33	4.00	4.13	1.65	0.40	1.26	0.83	1.59	19.51	30.10	28.51
2011	1.00	1.10	2.30	3.09	4.95	4.66	5.61	3.40	0.44	0.91	0.23	0.95	19.06	28.64	33.59
2010	0.59	0.82	0.93	2.48	2.64	5.86	4.09	5.98	5.68	1.98	1.98	3.08	24.25	36.11	37.56
2009	0.52	1.11	1.67	1.36	0.42	3.30	1.27	7.32	0.62	5.84	0.51	2.14	12.93	26.08	21.93
2008	0.15	0.50	2.18	3.65	2.33	3.25	2.73	2.98	2.17	1.72	1.28	1.34	13.46	24.28	26.71
2007	0.75	1.43	3.68	1.89	2.75	2.03	2.47	7.71	5.70	4.89	0.11	1.77	20.66	35.18	32.36
2006	0.81	0.36	1.71	3.45	2.88	3.39	1.95	6.79	3.32	0.61	1.03	2.31	18.33	28.61	32.78
2005	1.26	1.04	1.26	2.68	3.43	5.15	2.96	4.23	6.46	5.16	1.66	1.30	22.23	36.59	33.27
2004	0.48	1.43	2.30	2.68	5.49	4.35	3.49	1.78	4.34	3.18	1.12	0.50	19.45	31.14	29.30
2003	0.31	1.03	1.66	2.56	6.29	6.16	2.00	0.66	1.96	0.85	1.07	1.04	17.07	25.59	27.15

Table 3
Wetland Summary Table
White Oaks Wetlands
City of Edina

Wetland ID	Cowardin Classification	Circular 39 Classification	Eggers & Reed Community Type	Wetland Size (ac.)
MHN-1	PEMC/PFO1A	3/1	shallow marsh/floodplain forest	1.13
MHN-65	PFO1A	1	floodplain forest	0.19
MHN-66	PEMF/C/B	4/3/2	deep marsh/shallow marsh/fresh wet meadow	2.20
MHN-11	PEMF/C/PFO1A	4/3/1	deep marsh/shallow marsh/floodplain forest	1.69
			total	5.21

Figures



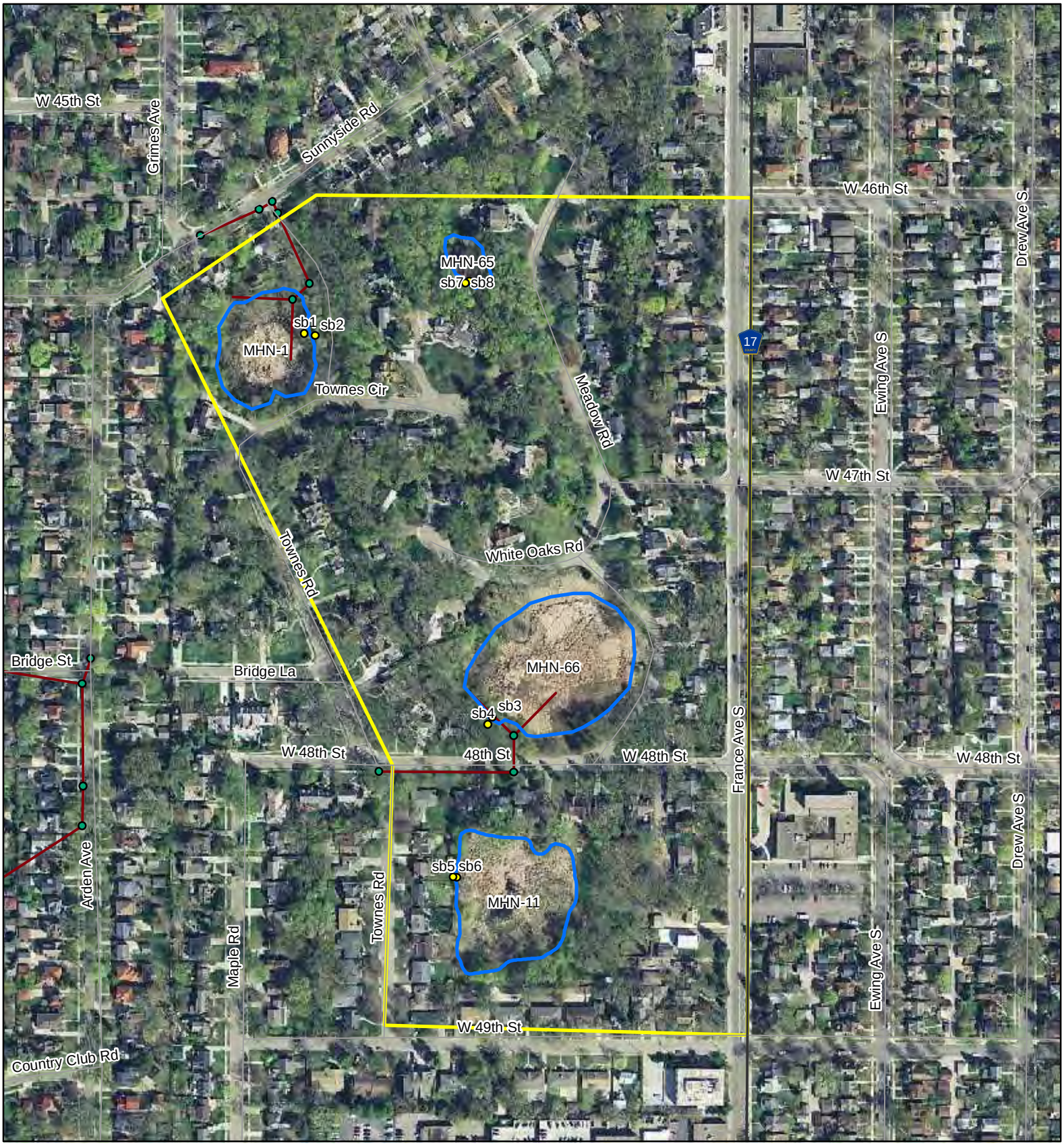
N
W E
S

Figure 1

Wetland Evaluation Area

1,000 500 0 1,000
Feet

SITE LOCATION MAP
White Oaks Wetlands
Edina, MN



Sampling Location

Wetland Delineation Boundary

Wetland Evaluation Area

Manhole Locations

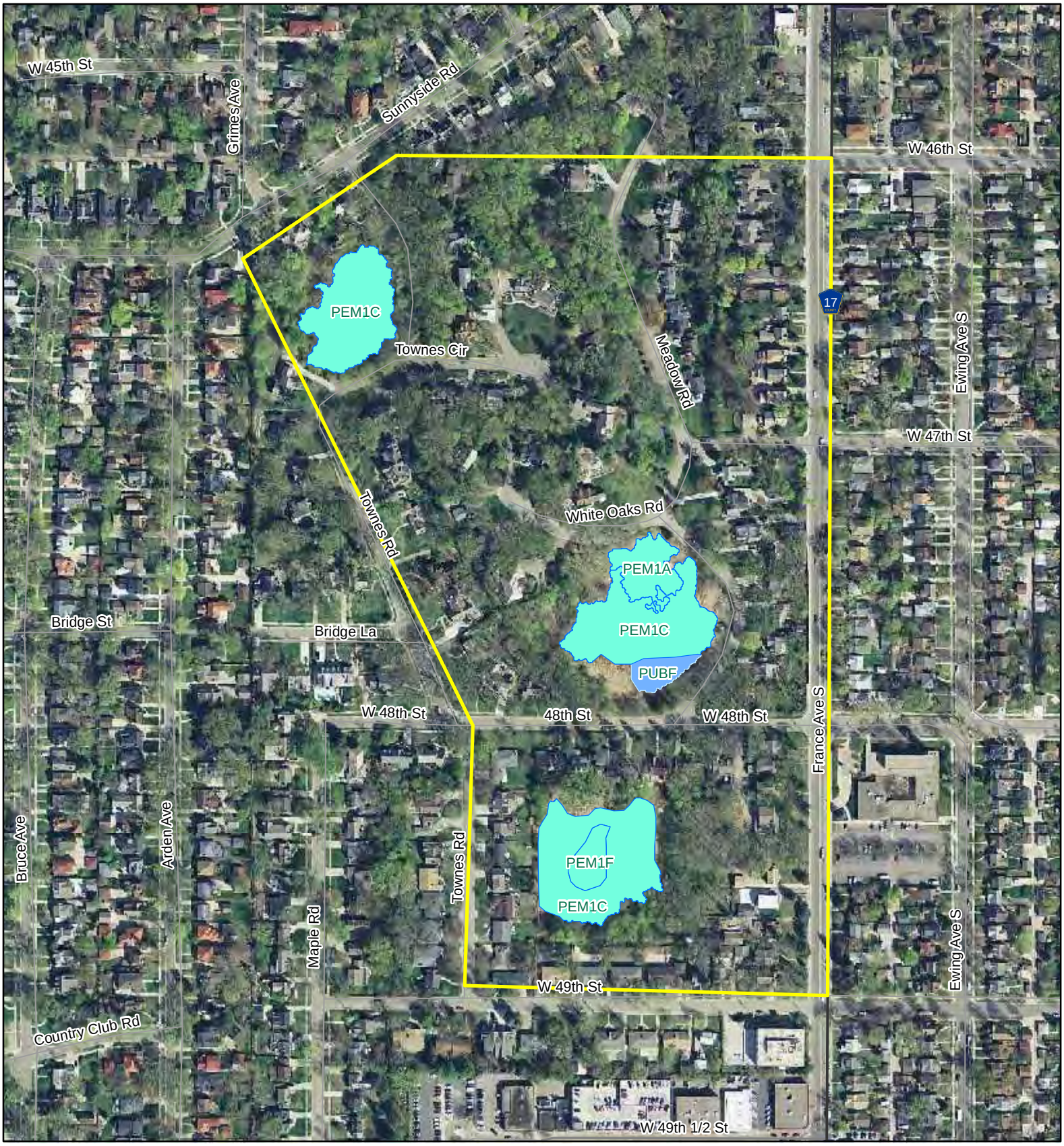
Pipe Alignments

N
W E
S

300 150 0 300
Feet

Figure 2

WETLAND DELINEATION MAP
White Oaks Wetlands
Edina, MN



Wetland Evaluation Area

National Wetland Inventory

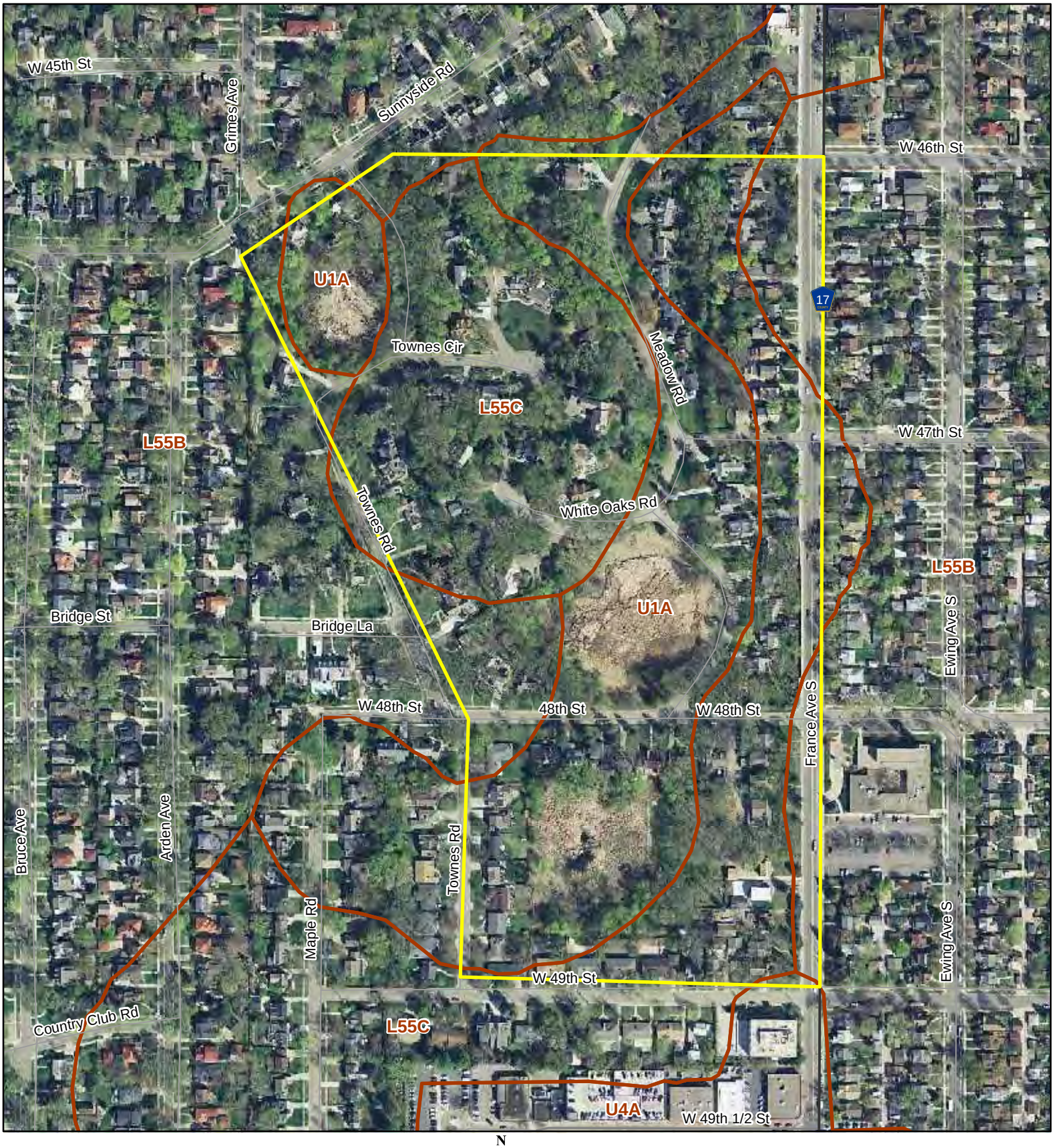
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

N
W E
S

300 150 0 300
Feet

Figure 3

NATIONAL WETLAND INVENTORY
White Oaks Wetlands
Edina, MN



N
W E
S

Wetland Evaluation Area

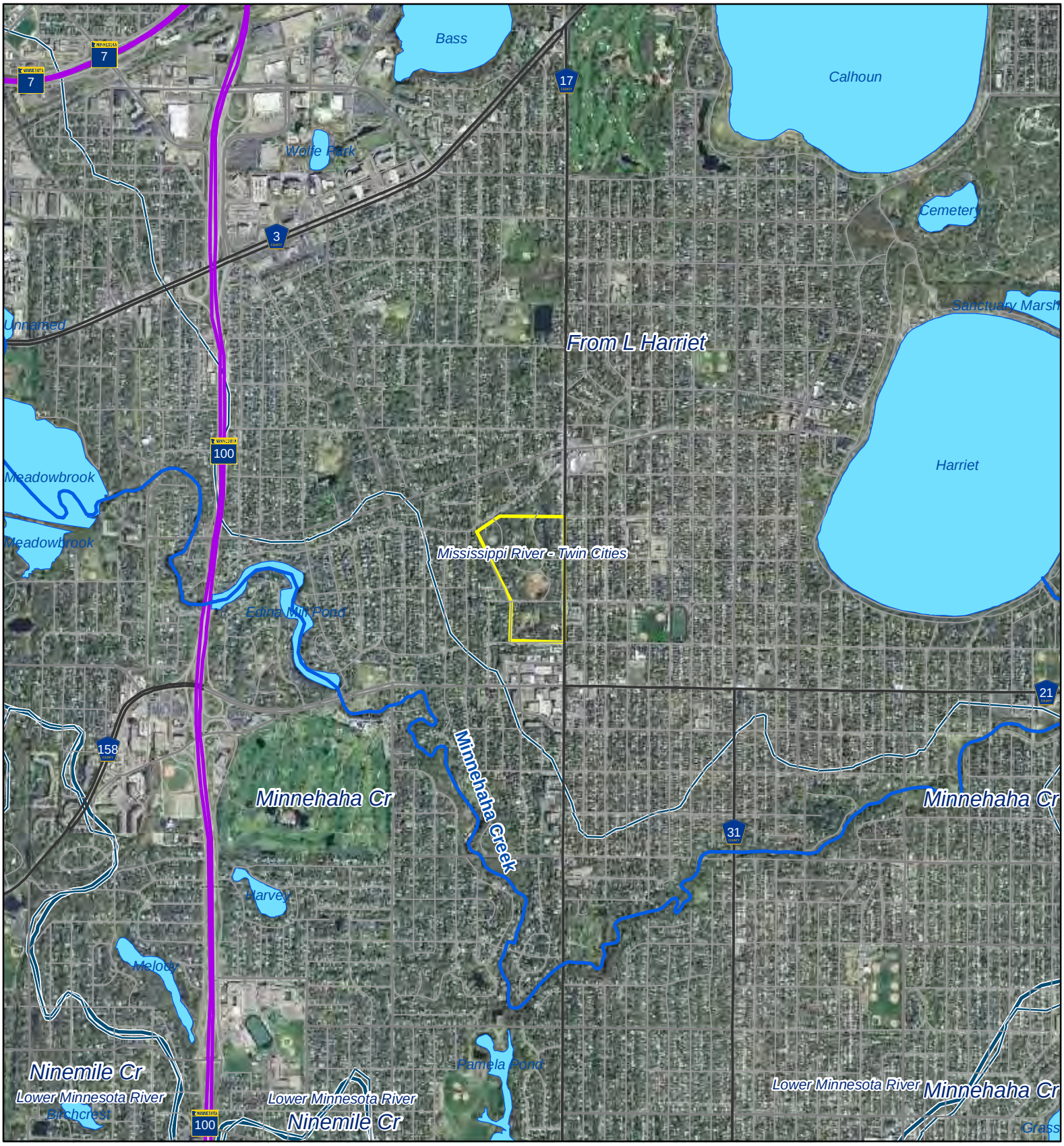
Statewide SSURGO Data

300 150 0 300 Feet

Figure 4

HENNEPIN COUNTY SOIL SURVEY
White Oaks Wetlands
Edina, MN

U1A = Urban land-Udorthents, wet substratum, complex, 0 to 2 percent slopes, not hydric
L55B = Urban land-Malardi copmlex, 0 to 8 percent slopes, not hydric
L55C = Urban land-Malardi complex, 8 to 18 percent slopes, not hydric



Public Water Inventory Watercourse

Wetland Evaluation Area

Minor Watershed Boundaries

Major Watershed Boundaries

Public Water Inventory Basins

N
W E
S

2,000 1,000 0 2,000
Feet

Figure 5

PUBLIC WATER INVENTORY
AND WATERSHED BOUNDARIES
White Oaks Wetlands
Edina, MN

Wetland Evaluation Area

2 Foot Contours, Hennepin County, 2011

10-Foot Contour

2-Foot Contour

200 100 0 200 Feet

N W E S

Figure 6

SURFACE TOPOGRAPHY
White Oaks Wetlands
Edina, MN

Attachment A

Wetland Data Forms

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-1

Land Form: Depression | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Urban land, Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4973990 | Longitude: 473719 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: PEMC/PFO1A | Circular 39 Classification: 3/1 | Mapped NWI Classification: PEM1C

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Shallow Marsh
Eggers & Reed (secondary): Floodplain Forest
Eggers & Reed (tertiary):
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID: MHN-1

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	50	Yes	FACW
2. Fraxinus pennsylvanica	5	No	FACW
3. Salix nigra	20	Yes	OBL
4.	0		
Total Cover:	75		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1. Ulmus americana	2	No	FACW
2. Acer negundo	3	No	FAC
3. Acer saccharinum	5	Yes	FACW
4. Fraxinus pennsylvanica	5	Yes	FACW
5.	0		
Total Cover:	15		

Herb Stratum (Plot Size: 5 ft)			
1. Acer saccharinum	30	Yes	FACW
2. Fraxinus pennsylvanica	10	Yes	FACW
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	40		

Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 60 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	15	37.5
Sapling/Shrub Stratum	3	7.5
Herb Stratum	8	20
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	6	(A)
Total Number of Dominant Species Across All Strata:	6	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL Species	20	X 1	20	
FACW Species	107	X 2	214	
FAC Species	3	X 3	9	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	130	(A)	243	(B)

Prevalence Index = B/A = 1.87

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
Yes	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 2	10YR 2/1	100					muck	
2.	2 - 27	10YR 2/1	88	10YR 6/2	10			loam	
3.	2 - 27			10YR 6/6	2			loam	
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☑ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☑ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-2

Land Form: Toeslope | Local Relief: Convex | Slope %: 5 | Soil Map Unit Name: Urban land, Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4973988 | Longitude: 473727 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? No
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.	Acer negundo	30	Yes	FAC
2.	Acer saccharinum	20	Yes	FACW
3.	Salix nigra	5	No	OBL
4.		0		
	Total Cover:	55		

Sapling/Shrub Stratum (Plot Size: 15 ft)

1.	Acer saccharinum	5	Yes	FACW
2.	Cornus alternifolia	5	Yes	FAC
3.	Fraxinus pennsylvanica	5	Yes	FACW
4.		0		
5.		0		
	Total Cover:	15		

Herb Stratum (Plot Size: 5 ft)

1.	Geranium maculatum	10	Yes	FACU
2.	Hydrophyllum virginianum	30	Yes	FAC
3.	Impatiens capensis	2	No	FACW
4.	Viola canadensis	2	No	FACU
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	44		

Woody Vine Stratum (Plot Size: 30 ft)

1.	Vitis riparia	5	Yes	FACW
2.	Parthenocissus quinquefolia	5	Yes	FACU
	Total Cover:	10		

% Bare Ground in Herb Stratum: 46 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	11	27.5
Sapling/Shrub Stratum	3	7.5
Herb Stratum	8.8	22
Woody Vine Stratum	2	5

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	7	(A)
Total Number of Dominant Species Across All Strata:	9	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	77.78%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	5	X 1	5	
FACW Species	37	X 2	74	
FAC Species	65	X 3	195	
FACU Species	17	X 4	68	
UPL Species	0	X 5	0	
Column Totals:	124	(A)	342	(B)
Prevalence Index = B/A =			2.76	

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
Yes	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 14	10YR 2/1	100					loam	
2.	14 - 18	10YR 3/2	50	10YR 5/8	10			loam	
3.	14 - 18	10YR 4/2	40					loam	
4.	18 - 24	10YR 2/1	95	10YR 4/2	5			loam	
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	18
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	18

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks: water in pit at 18" after 10 minutes

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-3

Land Form: Depression | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Urban land, Malardi complex, 0-8% slopes

Subregion (LRR): M | Latitude: 4973719 | Longitude: 473852 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: PEMF/C/B | Circular 39 Classification: 4/3/2 | Mapped NWI Classification: PUBF/PEM1A/C

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Deep Marsh
Eggers & Reed (secondary): Shallow Marsh
Eggers & Reed (tertiary): Fresh (Wet) Meadow
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID: MHN-66

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	5	No	FACW
2. Fraxinus pennsylvanica	30	Yes	FACW
3. Acer saccharinum	20	Yes	FACW
4. Quercus alba	5	No	FACU
Total Cover:	60		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1. Fraxinus pennsylvanica	10	Yes	FACW
2. Rhamnus cathartica	1	No	FAC
3.	0		
4.	0		
5.	0		
Total Cover:	11		

Herb Stratum (Plot Size: 5 ft)			
1. Phalaris arundinacea	5	Yes	FACW
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	5		

Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 95 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	12	30
Sapling/Shrub Stratum	2.2	5.5
Herb Stratum	1	2.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW or FAC: 100.00% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL Species	0	X 1	0
FACW Species	70	X 2	140
FAC Species	1	X 3	3
FACU Species	5	X 4	20
UPL Species	0	X 5	0
Column Totals:	76 (A)		163 (B)

Prevalence Index = B/A = 2.14

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- Yes — Dominance Test is >50%
- Yes — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 2	10YR 2/1	100					muck	
2.	2 - 12	10YR 3/1	96	10YR 6/3	2			loam	
3.	2 - 12			10YR 4/4	2			loam	
4.	12 - 24	10YR 4/1	95	10YR 4/4	5			loam	
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☑ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	8
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-4

Land Form: Hillslope | Local Relief: Convex | Slope %: 10 | Soil Map Unit Name: Urban land, Malardi complex, 0-8% slopes

Subregion (LRR): M | Latitude: 4973714 | Longitude: 473849 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? No
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)

		Absolute % Cover	Dominant Species?	Indicator Status
1.	Acer negundo	20	Yes	FAC
2.	Fraxinus pennsylvanica	20	Yes	FACW
3.	Quercus alba	40	Yes	FACU
4.		0		
	Total Cover:	80		

Sapling/Shrub Stratum (Plot Size: 15 ft)

1.	Rhamnus cathartica	50	Yes	FAC
2.		0		
3.		0		
4.		0		
5.		0		
	Total Cover:	50		

Herb Stratum (Plot Size: 5 ft)

1.	Rhamnus cathartica	10	Yes	FAC
2.		0		
3.		0		
4.		0		
5.		0		
6.		0		
7.		0		
8.		0		
	Total Cover:	10		

Woody Vine Stratum (Plot Size: 30 ft)

1.		0		
2.		0		
	Total Cover:	0		

% Bare Ground in Herb Stratum: 90 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	16	40
Sapling/Shrub Stratum	10	25
Herb Stratum	2	5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	80.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL Species	0	X 1	0	
FACW Species	20	X 2	40	
FAC Species	80	X 3	240	
FACU Species	40	X 4	160	
UPL Species	0	X 5	0	
Column Totals:	140	(A)	440	(B)

Prevalence Index = B/A = 3.14

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
No	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 13	10YR 2/1	100					loam	
2.	13 - 22	10YR 4/2	99	10YR 5/6	1			coarse sandy loam	
3.	22 - 26	10YR 4/2	60					coarse sand	
4.	22 - 26	2.5Y 6/3	40					coarse sand	
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☑ **Saturation Depth (inches):** 26

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-5

Land Form: Depression | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Urban land-Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4973605 | Longitude: 473827 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: PEMF/C/PFO1A | Circular 39 Classification: 4/3/1 | Mapped NWI Classification: PEM1C/F

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks)

Eggers & Reed (primary): Deep Marsh
Eggers & Reed (secondary): Shallow Marsh
Eggers & Reed (tertiary): Floodplain Forest
Eggers & Reed (quaternary):

Are vegetation No Soil No Hydrology No significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation No Soil No Hydrology No naturally problematic?

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? Yes
Indicators of wetland hydrology present? Yes
Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID: MHN-11

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	30	Yes	FAC
2.	0		
3.	0		
4.	0		
Total Cover:	30		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)			
1. Phalaris arundinacea	30	Yes	FACW
2. Alliaria petiolata	5	No	FAC
3. Lemna minor	5	No	OBL
4. Lemna trisulca	10	Yes	OBL
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	50		

Woody Vine Stratum (Plot Size: 30 ft)			
1. Vitis riparia	5	Yes	FACW
2.	0		
Total Cover:	5		

% Bare Ground in Herb Stratum: _____ % Sphagnum Moss Cover: _____

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	6	15
Sapling/Shrub Stratum	0	0
Herb Stratum	10	25
Woody Vine Stratum	1	2.5

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	4	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL Species	15	X 1	15	
FACW Species	35	X 2	70	
FAC Species	35	X 3	105	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	85	(A)	190	(B)

Prevalence Index = B/A = 2.24

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
Yes	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 16	10YR 2/1	90	10YR 5/6	10			loam	
2.	-								
3.	-								
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☑	Surface Water Depth (inches):	3
Water table present?	☐	Water Table Depth (inches):	
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-6

Land Form: Hillslope | Local Relief: Convex | Slope %: 5 | Soil Map Unit Name: Urban land-Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4973606 | Longitude: 473825 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? No

Hydric soil present? No

Indicators of wetland hydrology present? No

Is the sampled area within a wetland? No

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	30	Yes	FAC
2.	0		
3.	0		
4.	0		
Total Cover:	30		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)			
1. Arctium minus	20	Yes	FACU
2. Alliaria petiolata	10	Yes	FAC
3. Rhamnus cathartica	2	No	FAC
4. Geranium maculatum	5	No	FACU
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	37		

Woody Vine Stratum (Plot Size: 30 ft)			
1. Parthenocissus quinquefolia	20	Yes	FACU
2.	0		
Total Cover:	20		

% Bare Ground in Herb Stratum: 43 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	6	15
Sapling/Shrub Stratum	0	0
Herb Stratum	7.4	18.5
Woody Vine Stratum	4	10

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL Species	0	X 1	0	
FACW Species	0	X 2	0	
FAC Species	42	X 3	126	
FACU Species	45	X 4	180	
UPL Species	0	X 5	0	
Column Totals:	87	(A)	306	(B)
Prevalence Index = B/A =			3.52	

Hydrophytic Vegetation Indicators:

- No — Rapid Test for Hydrophytic Vegetation
- No — Dominance Test is >50%
- No — Prevalence Index ≤ 3.0 [1]
- No — Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
- No — Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? No

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 12	10YR 3/1	100					loam	
2.	12 - 20	10YR 3/2	60					sandy loam	
3.	12 - 20	10YR 4/3	40					sandy loam	
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	18
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	14

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-7

Land Form: Depression | Local Relief: Concave | Slope %: 2 | Soil Map Unit Name: Urban land-Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4974027 | Longitude: 473836 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: PFO1A | Circular 39 Classification: 1 | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) | Eggers & Reed (primary): Floodplain Forest

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes

Hydric soil present? Yes

Indicators of wetland hydrology present? Yes

Is the sampled area within a wetland? Yes

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID: MHN-65

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	90	Yes	FACW
2. Acer negundo	1	No	FAC
3. Ulmus americana	1	No	FACW
4.	0		
Total Cover:	92		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1. Cornus alba	1	No	FACW
2. Rhamnus cathartica	1	No	FAC
3.	0		
4.	0		
5.	0		
Total Cover:	2		

Herb Stratum (Plot Size: 5 ft)			
1. Ulmus americana	1	No	FACW
2.	0		
3.	0		
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	1		

Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 99 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	18.4	46
Sapling/Shrub Stratum	0.4	1
Herb Stratum	0.2	0.5
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	100.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	93	X 2	186	
FAC Species	2	X 3	6	
FACU Species	0	X 4	0	
UPL Species	0	X 5	0	
Column Totals:	95	(A)	192	(B)
Prevalence Index = B/A =			2.02	

Hydrophytic Vegetation Indicators:

Yes	Rapid Test for Hydrophytic Vegetation
Yes	Dominance Test is >50%
Yes	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 6	10YR 2/1	100					muck	
2.	6 - 18	10YR 4/1	90	10YR 4/4	10			loam	
3.	-								
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☑ 2 cm Muck (A10)
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? Yes

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	☐	Surface Water Depth (inches):	
Water table present?	☑	Water Table Depth (inches):	0
Saturation present? (includes capillary fringe)	☑	Saturation Depth (inches):	0

Indicators of wetland hydrology present? Yes

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: White Oaks | Applicant/Owner: City of Edina | City/County: Edina/Hennepin | State: MN | Sampling Date: 05/28/14

Investigator(s): KSW | Section: 18 | Township: 28 | Range: 24 | Sampling Point: SB-8

Land Form: Toeslope | Local Relief: Convex | Slope %: 2 | Soil Map Unit Name: Urban land-Udorthents, wet substratum

Subregion (LRR): M | Latitude: 4974025 | Longitude: 473833 | Datum: UTM Nad83 Zone 15N

Cowardin Classification: Upland | Circular 39 Classification: Upland | Mapped NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? No (If no, explain in remarks) | Eggers & Reed (primary): Upland

Are vegetation No Soil No Hydrology No significantly disturbed? | Are "normal circumstances" present? Yes | Eggers & Reed (secondary):

Eggers & Reed (tertiary):

Are vegetation No Soil No Hydrology No naturally problematic? | Eggers & Reed (quaternary):

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Yes
Hydric soil present? No
Indicators of wetland hydrology present? No
Is the sampled area within a wetland? No

General Remarks (explain any answers if needed): Antecedent moisture conditions were above normal range during the prior three months.

If yes, optional Wetland Site ID:

VEGETATION

Tree Stratum (Plot Size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	80	Yes	FACW
2.	0		
3.	0		
4.	0		
Total Cover:	80		

Sapling/Shrub Stratum (Plot Size: 15 ft)			
1.	0		
2.	0		
3.	0		
4.	0		
5.	0		
Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)			
1. Glechoma hederacea	50	Yes	FACU
2. Impatiens capensis	1	No	FACW
3. Arisaema triphyllum	1	No	FACW
4.	0		
5.	0		
6.	0		
7.	0		
8.	0		
Total Cover:	52		

Woody Vine Stratum (Plot Size: 30 ft)			
1.	0		
2.	0		
Total Cover:	0		

% Bare Ground in Herb Stratum: 48 | % Sphagnum Moss Cover:

Vegetation Remarks: (include photo numbers here or on a separate sheet)

50/20 Thresholds:	20%	50%
Tree Stratum	16	40
Sapling/Shrub Stratum	0	0
Herb Stratum	10.4	26
Woody Vine Stratum	0	0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW or FAC:	50.00%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL Species	0	X 1	0	
FACW Species	82	X 2	164	
FAC Species	0	X 3	0	
FACU Species	50	X 4	200	
UPL Species	0	X 5	0	
Column Totals:	132	(A)	364	(B)
Prevalence Index = B/A =			2.76	

Hydrophytic Vegetation Indicators:

No	Rapid Test for Hydrophytic Vegetation
No	Dominance Test is >50%
Yes	Prevalence Index ≤ 3.0 [1]
No	Morphological Adaptations [1] (provide supporting data in vegetation remarks or on a separate sheet)
No	Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil & wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic vegetation present? Yes

WETLAND DETERMINATION DATA FORM - Midwest Region

SOIL

Sampling Point: SB-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the abscence of indicators).

	Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type [1]	Loc [2]	Texture	Remarks
1.	0 - 24	10YR 3/1	60					loam	
2.	0 - 24	10YR 5/3	40					loam	
3.	-								
4.	-								
5.	-								
6.	-								

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (applicable to all LRRs, unless otherwise noted)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ 5 cm Mucky Peat or Peat (S3)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils [3]:

- ☐ Coast Prairie Redox (A16)
- ☐ Dark Surface (S7)
- ☐ Iron-Manganese Masses (F12)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (explain in soil remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present): Type: _____ Depth (inches): _____

Hydric soil present? No

Soil Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Gauge or Well Data (D9)
- ☐ Other (explain in remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☑ FAC-Neutral Test (D5)

Field Observations:

Surface water present? ☐ **Surface Water Depth (inches):** _____

Water table present? ☐ **Water Table Depth (inches):** _____

Saturation present? (includes capillary fringe) ☐ **Saturation Depth (inches):** _____

Indicators of wetland hydrology present? No

Describe Recorded Data:

Recorded Data: ☐ Aerial Photo ☐ Monitoring Well ☐ Stream Gauge ☐ Previous Inspections

Hydrology Remarks:

Attachment B

Site Photos

Wetland MHN-1

Wetland MHN-65

Open asphalt channel “inlet” to MHN-66

Wetland MHN-66

Wetland MHN-11

Attachment C

MNRAM Summary

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland MHN-1	Depressional/(inlet, but no outlet)	0.75	0.68	0.61	0.34	0.00
		High	High	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland MHN-1	0.38	0.31	0.30	0.36	0.00	Exceptional Recharge	0.00	0.50	0.34
	Moderate	Low	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Community: Circular 39	Community: Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland MHN-1	27-028-24-18-001-A	PEMC	Type 3	Shallow Marsh	90	0.1	0.50	0.30	0.14	
							Moderate	Low	Low	
		PFO1A	Type 1	Floodplain Forest	10	0.5	0.50	0.30	0.14	
							Moderate	Low	Low	
					100		0.50	0.30	0.14	☐

☑ *Denotes incomplete calculation data.*

Management Classification Report for Wetland MHN-1 **White Oaks**

ID: 149

HENNEPIN County
Mississippi (Metro) Watershed, #20
Corps Bank Service Area 7

Based on the MnRAM data input from field and office review and using the classification settings as shown below, this wetland is classified as Manage 1

Functional rank of this wetland based on MnRAM data	Functional Category	Self-defined classification value settings for this management level
Low	Vegetative Diversity/Integrity	High
Moderate	Habitat Structure (wildlife)	High
Low	Amphibian Habitat	Moderate
Low	Fish Habitat	High
Not Applicable	Shoreline Protection	Moderate
Moderate	Aesthetic/Cultural/Rec/Ed and Habitat	High / Moderate
Moderate	Stormwater/Urban Sensitivity and Vegetative Diversity	High / Moderate
Moderate	Wetland Water Quality and Vegetative Diversity	High / Moderate
High	Characteristic Hydrology and Vegetative Diversity	High / Moderate
High	Flood/Stormwater Attenuation*	-
Not Applicable	Commericial use*	High
Moderate	Downstream Water Quality*	-

The critical function that caused this wetland to rank as **Manage 1** was
Maintenance of Hydrologic Regime & Vegetative Diversity

Details of the formula for this action are shown below:

Maintenance of Hydrologic Regime **(Q13+Q14+Q15+Q20R)/4**

Question	*Value*	*Description*
13	1	Outlet: hydrologic regime
14	0.5	Upland land use
15	1	Soil condition (wetland)
20	0.5	Stormwater runoff

Vegetative Diversity **NA**

Question	*Value*	*Description*
NA	NA	NA

This report was printed on: Monday, June 30, 2014

* The classification value settings for these functions are not adjustable

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland MHN-65	Depressional/(inlet, but no outlet)	0.75	0.65	0.64	0.55	0.00
		High	Moderate	Moderate	Moderate	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland MHN-65	0.58	0.00	0.42	0.36	0.00	Exceptional Recharge	0.00	0.50	0.55
	Moderate	Not Applicable	Moderate	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Community: Circular 39	Community: Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland MHN-65	27-028-24-18-002-A	PFO1A	Type 1	Floodplain Forest	100	0.5	0.50	0.50	0.50	
							Moderate	Moderate	Moderate	
					100		0.50	0.50	0.50	☐

☑ *Denotes incomplete calculation data.*

Management Classification Report for Wetland MHN-65 **White Oaks**

ID: 150

HENNEPIN County
Mississippi (Metro) Watershed, #20
Corps Bank Service Area 7

Based on the MnRAM data input from field and office review and using the classification settings as shown below, this wetland is classified as Manage 1

Functional rank of this wetland based on MnRAM data	Functional Category	Self-defined classification value settings for this management level
Moderate	Vegetative Diversity/Integrity	High
Moderate	Habitat Structure (wildlife)	High
Moderate	Amphibian Habitat	Moderate
Not Applicable	Fish Habitat	High
Not Applicable	Shoreline Protection	Moderate
Moderate	Aesthetic/Cultural/Rec/Ed and Habitat	High / Moderate
Moderate	Stormwater/Urban Sensitivity and Vegetative Diversity	High / Moderate
Moderate	Wetland Water Quality and Vegetative Diversity	High / Moderate
High	Characteristic Hydrology and Vegetative Diversity	High / Moderate
Moderate	Flood/Stormwater Attenuation*	-
Not Applicable	Commericial use*	High
Moderate	Downstream Water Quality*	-

The critical function that caused this wetland to rank as **Manage 1** was
Maintenance of Characteristic Amphibian Habitat

Details of the formula for this action are shown below:

Maintenance of Characteristic Amphibian Habitat (Q43) * [(Q44 + 2*Q23wildlife + Q14 +Q 41 + Q20 reversed)/6]

Question	*Value*	*Description*
14	0.5	Upland land use
20	0.5	Stormwater runoff
23	0.5	Buffer width
41	0.5	Wildlife barriers
43	1	Amphib breeding potential--fish presence
44	0	Amphib & reptile overwintering habitat

This report was printed on: Monday, June 30, 2014

* The classification value settings for these functions are not adjustable

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland MHN-66	Depressional/(inlet, but no outlet)	0.75	0.68	0.63	0.37	0.00
		High	High	Moderate	Moderate	Not Applicable

							Additional Information		
Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Wetland Restoration Potential	Wetland Sensitivity to Stormwater and Urban Development	Additional Stormwater Treatment Needs
Wetland MHN-66	0.41	0.37	0.30	0.36	0.00	Exceptional Recharge	0.00	0.50	0.37
	Moderate	Moderate	Low	Moderate	Not Applicable		Not Applicable	Moderate	Moderate

Wetland Community Summary

		Vegetative Diversity/Integrity								
		Community								
Wetland Name	Location	Cowardin Classification	Circular 39	Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland MHN-66	27-028-24-18-003-A	PEMF	Type 4	Deep Marsh	20	0.5	0.50	0.23	0.18	
							Moderate	Low	Low	
		PEMC	Type 3	Shallow Marsh	70	0.1	0.50	0.23	0.18	
							Moderate	Low	Low	
		PEM1B	Type 2	Fresh (Wet) Meadow	10	0.1	0.50	0.23	0.18	
							Moderate	Low	Low	
					100		0.50	0.23	0.18	☐

☑ *Denotes incomplete calculation data.*

Management Classification Report for Wetland MHN-66 **White Oaks**

ID: 151

HENNEPIN County
Mississippi (Metro) Watershed, #20
Corps Bank Service Area 7

Based on the MnRAM data input from field and office review and using the classification settings as shown below, this wetland is classified as Manage 1

Functional rank of this wetland based on MnRAM data	Functional Category	Self-defined classification value settings for this management level
Low	Vegetative Diversity/Integrity	High
Moderate	Habitat Structure (wildlife)	High
Low	Amphibian Habitat	Moderate
Moderate	Fish Habitat	High
Not Applicable	Shoreline Protection	Moderate
Moderate	Aesthetic/Cultural/Rec/Ed and Habitat	High / Moderate
Moderate	Stormwater/Urban Sensitivity and Vegetative Diversity	High / Moderate
Moderate	Wetland Water Quality and Vegetative Diversity	High / Moderate
High	Characteristic Hydrology and Vegetative Diversity	High / Moderate
High	Flood/Stormwater Attenuation*	-
Not Applicable	Commericial use*	High
Moderate	Downstream Water Quality*	-

The critical function that caused this wetland to rank as **Manage 1** was
Maintenance of Hydrologic Regime & Vegetative Diversity

Details of the formula for this action are shown below:

Maintenance of Hydrologic Regime **(Q13+Q14+Q15+Q20R)/4**

Question	*Value*	*Description*
13	1	Outlet: hydrologic regime
14	0.5	Upland land use
15	1	Soil condition (wetland)
20	0.5	Stormwater runoff

Vegetative Diversity **NA**

Question	*Value*	*Description*
NA	NA	NA

This report was printed on: Monday, June 30, 2014

* The classification value settings for these functions are not adjustable

Wetland Functional Assessment Summary

Wetland Name	Hydrogeomorphology	Maintenance of Hydrologic Regime	Flood/ Stormwater/ Attenuation	Downstream Water Quality	Maintenance of Wetland Water Quality	Shoreline Protection
Wetland MHN-11	Depressional/(inlet, but no outlet)	0.65	0.73	0.66	0.29	0.00
		Moderate	High	High	Low	Not Applicable

Wetland Name	Maintenance of Characteristic Wildlife Habitat Structure	Maintenance of Characteristic Fish Habitat	Maintenance of Characteristic Amphibian Habitat	Aesthetics/ Recreation/ Education/ Cultural	Commercial Uses	Ground-Water Interaction	Additional Information: Wetland Restoration Potential	Additional Information: Wetland Sensitivity to Stormwater and Urban Development	Additional Information: Additional Stormwater Treatment Needs
Wetland MHN-11	0.44	0.24	0.30	0.31	0.00	Exceptional Recharge	0.00	0.50	0.29
	Moderate	Low	Low	Low	Not Applicable		Not Applicable	Moderate	Low

Wetland Community Summary

Wetland Name	Location	Vegetative Diversity/Integrity: Community: Cowardin Classification	Community: Circular 39	Community: Plant Community	Wetland Proportion	Individual Community Rating	Highest Wetland Rating	Average Wetland Rating	Weighted Average Wetland Rating	
Wetland MHN-11	27-028-24-18-004-A	PEMF	Type 4	Deep Marsh	20	0.5	0.50	0.37	0.22	
							Moderate	Moderate	Low	
		PEMC	Type 3	Shallow Marsh	70	0.1	0.50	0.37	0.22	
							Moderate	Moderate	Low	
		PFO1A	Type 1	Floodplain Forest	10	0.5	0.50	0.37	0.22	
							Moderate	Moderate	Low	
					100		0.50	0.37	0.22	☐

☑ *Denotes incomplete calculation data.*

Management Classification Report for Wetland MHN-11 **White Oaks**

ID: 152

HENNEPIN County
Mississippi (Metro) Watershed, #20
Corps Bank Service Area 7

Based on the MnRAM data input from field and office review and using the classification settings as shown below, this wetland is classified as Manage 2

Functional rank of this wetland based on MnRAM data	Functional Category	Self-defined classification value settings for this management level
Low	Vegetative Diversity/Integrity	Moderate
Moderate	Habitat Structure (wildlife)	Moderate
Low	Amphibian Habitat	Low
Low	Fish Habitat	Moderate
Not Applicable	Shoreline Protection	Low
Low	Aesthetic/Cultural/Rec/Ed and Habitat	Moderate / Low
Moderate	Stormwater/Urban Sensitivity and Vegetative Diversity	- / -
Low	Wetland Water Quality and Vegetative Diversity	- / -
Moderate	Characteristic Hydrology and Vegetative Diversity	- / -
High	Flood/Stormwater Attenuation*	-
Not Applicable	Commericial use*	-
High	Downstream Water Quality*	-

The critical function that caused this wetland to rank as **Manage 2** was **Vegetative Diversity**

Details of the formula for this action are shown below:

Vegetative Diversity **NA**

Question	*Value*	*Description*
NA	NA	NA

This report was printed on: Monday, June 30, 2014

* The classification value settings for these functions are not adjustable

Appendix B

Cost Estimate

Project Area 8—White Oaks—Pumped Outlet and Wetland Connection

ENGINEER'S OPINION OF PROBABLE COST: White Oaks
PUMPED OUTLET AND WETLAND CONNECTION
February 20, 2014

ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL COST
MOBILIZATION/DEMOBILIZATION	LS	1	$ 66,000.00	$ 66,000.00
TRAFFIC CONTROL	LS	1	$ 3,500.00	$ 3,500.00
EROSION CONTROL	LS	1	$ 5,000.00	$ 5,000.00
REMOVALS				
SAW CUT BITUMINOUS PAVEMENT	LN FT	2030	$ 3.50	$ 7,105.00
REMOVE BITUMINOUS PAVEMENT	SQ YD	2710	$ 2.00	$ 5,420.00
REMOVE CONC. CURB & GUTTER (B-618)	LN FT	1830	$ 5.00	$ 9,150.00
UTILITY CONFLICTS	LS	1	$ 10,000.00	$ 10,000.00
STORM SEWER				
12" CPEP STORM SEWER, 3' to 12' deep	LN FT	895	$ 20.00	$ 17,900.00
12" CPEP STORM SEWER, 12' to 16' deep	LN FT	170	$ 33.50	$ 5,695.00
12" CPEP STORM SEWER, 16' to 24' deep	LN FT	480	$ 44.50	$ 21,360.00
15" CPEP STORM SEWER, 4' to 12' deep	LN FT	560	$ 25.00	$ 14,000.00
48" DIA. RC MANHOLE	LN FT	73	$ 325.00	$ 23,725.00
2-35 HP PUMPS AND VALVES	LS	1	$ 125,000.00	$ 125,000.00
84" DIA. WETWELL, 12' DEPTH	EACH	1	$ 15,000.00	$ 15,000.00
72" DIA. VALVE VAULT, 8' DEPTH	EACH	1	$ 9,000.00	$ 9,000.00
ELECTRICAL/CONTROLS	LS	1	$ 50,000.00	$ 50,000.00
8" HDPE FORCEMAIN	LN FT	686	$ 28.00	$ 19,208.00
STREET PAVEMENT				
8" AGGREGATE BASE CLASS 5	CU YD	604	$ 34.00	$ 20,552.62
TOP SOIL BORROW	CU YD	134	$ 20.00	$ 2,688.89
REPLACE B618 CONC. CURB & GUTTER	LN FT	1830	$ 13.50	$ 24,705.00
2" BITUMINOUS BASE COURSE	SQ YD	2707	$ 7.50	$ 20,300.00
2" BITUMINOUS WEARING COURSE W/TACK	SQ YD	2707	$ 8.50	$ 23,006.67
SEEDING TURF GRASSES	AC	0.3	$ 12,500.00	$ 3,156.57
SITE RESTORATION	LS	1	$ 7,000.00	$ 7,000.00
SUB TOTAL				**$ 508,472.74**
OTHER				
CONTINGENCY			30%	$ 152,541.82
ENGINEERING AND DESIGN			15%	$ 99,152.18
CONSTRUCTION ADMINISTRATION AND OBSERVATION			7%	$ 46,271.02
PA8 - WHITE OAKS TOTAL COST				**$ 806,437.77**