DRAFT FINAL

Warner Park and Cherokee Marsh Watershed Study Report

Prepared for
City of Madison
Madison, Wisconsin
February 13, 2026

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This is a draft and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report.

The City makes no representation about the accuracy of these records and shall not be liable for any damages.

Brown and Caldwell

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List of Abbreviations

1D	One-Dimensional
2D	Two-Dimensional
BC	Brown and Caldwell
cfs	cubic feet per second
CIP	Capital Improvement Plan
City	City of Madison
DCIA	Directly connected impervious area
ESRI	Environmental Systems Research Institute
ft	foot/feet
GeoTREE	University of Northern Iowa GeoInformatics Training, Research, Education, and Extension Center
GIS	Geographic Information System
H&H	hydrologic and hydraulic
HSG	hydrologic soil group
in.	inch/inches
LiDAR	light detecting and ranging
LOS	Level of Service
MSE	Midwest/Southeast states
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanographic and Atmospheric Administration
PIMs	Public Information Meetings
PWI	Public Works Improvement
SAS	storm access structure
SWMM	Storm Water Management Model
SWMP	stormwater management plan
TIN	triangular irregular network
USGS	United States Geological Survey
WWI	Wisconsin Wetland Inventory

Executive Summary

Background

The City of Madison (City) is conducting a multi-faceted approach to understand and address stormwater flooding. As one component of that approach, the City is developing comprehensive stormwater management studies for each watershed within the City. The studies are conducted in two phases. Throughout both phases, the City incorporates multiple opportunities for public involvement and interaction.

Phase 1: Development of a hydrologic/hydraulic stormwater runoff model representing the physical and drainage properties of the watershed under existing conditions. The model is then calibrated to measured runoff events and used to identify the areas of the watershed most likely to flood under various rain conditions.

Phase 2: Using the model, evaluate alternative methods and/or infrastructure improvements to eliminate or reduce flooding impacts from large rain events. It should be noted that the improvements documented in this report are not meant to be full design-level efforts; they are conceptual solutions that help the City's Engineering Division understand the magnitude of solutions needed in a given area to meet the targets. As projects are looked at further, and if they move to the point they are contemplated for programming, then projects will proceed into a more detailed design phase. This project phase collects detailed data needed for design and looks at refined design, permitting, and environmental issues associated with the particular project.

This document reports the methods, procedures, and results of the Warner Park and Cherokee Marsh Watershed Project. The project area covers approximately 3,912 acres (6.1 square miles) on the north side of Madison. Figure ES-1 shows the extent of the watershed.

City's Flood Mitigation Targets

The analyses conducted for the watershed studies referred to the City's flood mitigation targets to understand where targets were being met and where there is room for improvement. The City has the following flood mitigation targets that were the focus of this study. Please note, these targets may change in the future as more information becomes available.

1. No surcharging onto the street for up to the 10-year (10% chance event) design storm; what should be contained within the pipes and structures.
2. Centerline of street to remain passable during 25-year (4% chance event) design storm with no more than a 100-ft segment of roadway with 0.5ft of water at the centerline.
3. No home or business will be flooded during the 100-year (1% chance event) design storm. This is defined as no more than 0.5-feet of water at the 5-foot buffer around a house.
4. Greenway crossings at streets to be served to the 100-year (1% chance event) design storm, meaning all the water would pass under the street.
5. Provide flooding solutions that do not negatively impact downstream properties.

Existing Conditions and Proposed Solutions Results

The existing conditions analysis identified locations where the existing stormwater conveyance system did not meet the City's flood mitigation targets. Table ES-1 summarizes the how the system's performance compares to the targets. Figure ES-1 shows surface flooding locations under the 4%

chance storm event and how the performance of the stormwater conveyance system compares to the City's flood mitigation targets.

As the proposed solutions were being evaluated, they were compared to the flood mitigation targets. The proposed conditions modeling analysis, with all solutions implemented (see Figure 8-1), in comparison to the City's flood mitigation targets is also summarized in Table ES-1. There are still locations where the flood mitigation targets are not met. The targets cannot be met for various reasons including lack of physical space, topographic relief limitations, and land use change concerns. Detailed information can be found in Section 12 of this report. Figure ES-2 depicts the flood control summary within the watershed with the selected solutions implemented. It shows surface flooding locations under the 4% change storm event and how the performance of the improved stormwater conveyance system compares to City's flood mitigation targets with the selected solutions in place.

Table ES-1. Existing Conditions and Proposed Solutions Results Compared to Flood Mitigation Targets
Warner Park & Cherokee Marsh Watershed Study
City of Madison, WI

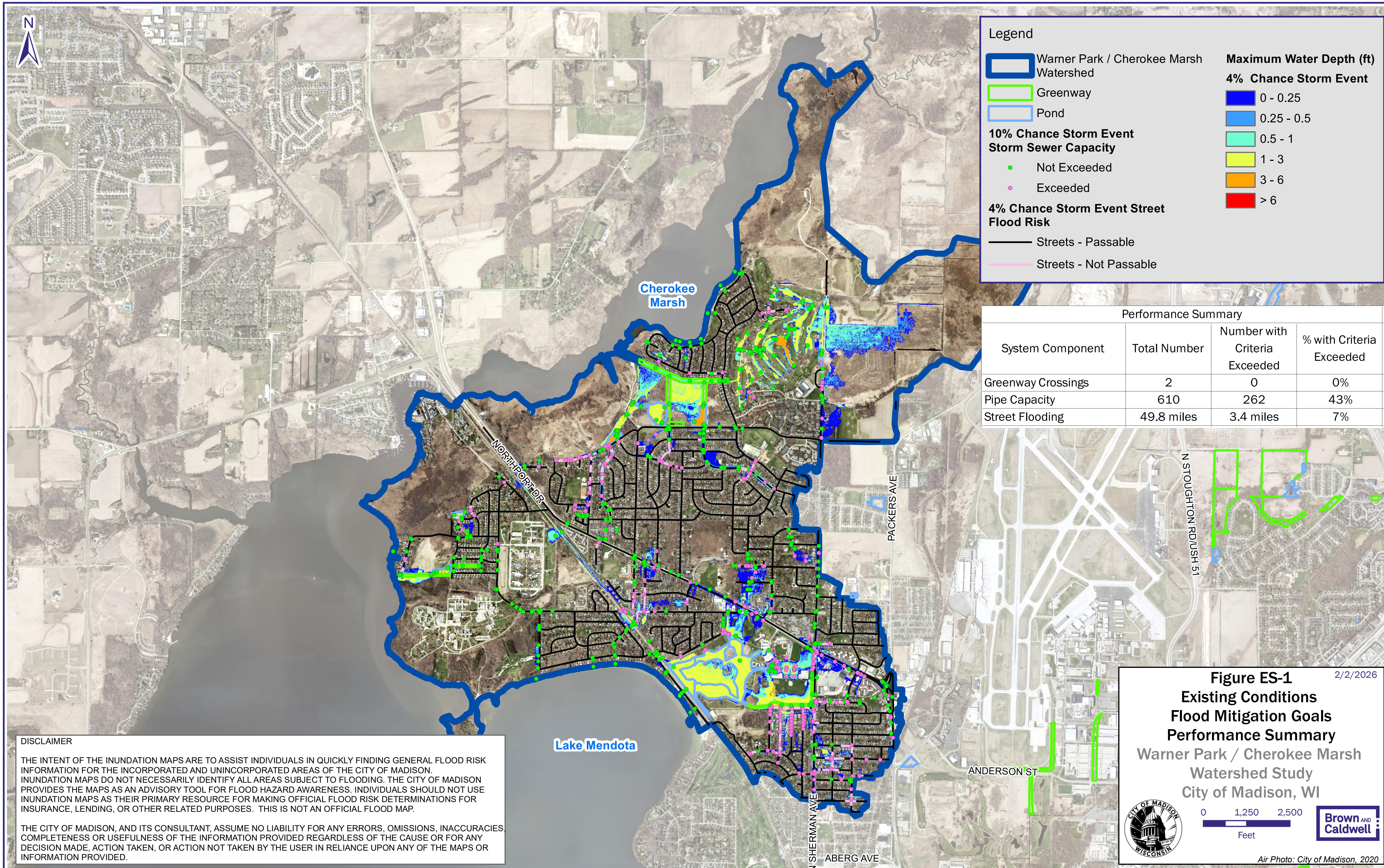
Design Storm Events	Target	Watershed-wide Metric	Existing Conditions	Proposed Solutions
10% Chance Event	No Surcharging onto the street	16.1 miles of storm sewer	43% of modeled storm sewers surcharge onto street	9% of modeled storm sewers surcharge onto street
4% Chance Event	Centerline of street remains passable	49.8 miles of road	7% of roads with more than 0.5-ft of water	<1% of roads with more than 0.5-ft of water
1% Chance Event	No structure flooding	5,659 structures	232 (4%) structures impacted	25 (<1%) structures impacted
	Greenway crossings overtopped	2 greenway crossings	0 (100%) greenway crossings overtopped	0 (100%) greenway crossings overtopped
0.2% Chance Event	Safely convey stormwater	5,659 structures	443 structures impacted	203 structures impacted

Proposed Solutions and Cost

Following the existing conditions analysis, an extensive process was conducted to brainstorm, evaluate, and ultimate identify solutions to meet the City's flood mitigation targets. The following table lists the solutions that were selected, along with estimated design and construction cost for each. It should be noted, that in addition to the stand-alone projects identified below there are proposed local storm sewer improvements throughout the study area. Figures depicting each solution can be found later in this report.

Table ES-2. Proposed Solutions Stand-Alone Project Cost Estimates
Warner Park & Cherokee Marsh Watershed Study
City of Madison, WI

Project	Estimated Construction Cost
Castle Creek Improvements	$2.51 million
Warner Park Relief Sewer	$3.87 million
Camino Del Sol Relief Sewer	$3.90 million
Lake View & Drewery Diversion Sewers	$1.81 million
Lake View Diversion Downstream Sewer	$4.43 million



Performance Summary

System Component	Total Number	Number with Criteria Exceeded	% with Criteria Exceeded
Greenway Crossings	2	0	0%
Pipe Capacity	610	262	43%
Street Flooding	49.8 miles	3.4 miles	7%

DISCLAIMER

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Figure ES-1
Existing Conditions
Flood Mitigation Goals
Performance Summary

2/2/2026

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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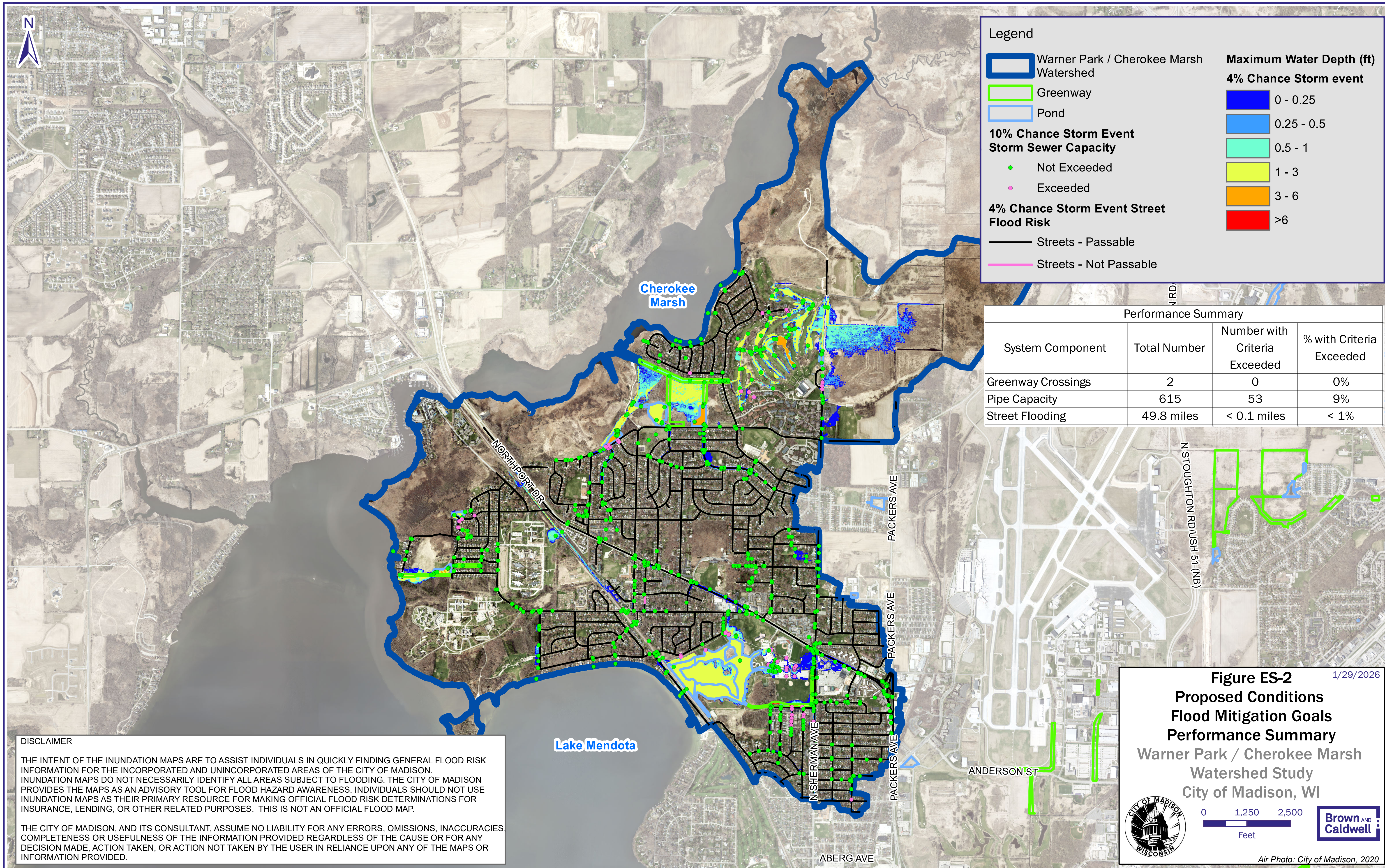

Performance Summary			
System Component	Total Number	Number with Criteria Exceeded	% with Criteria Exceeded
Greenway Crossings	2	0	0%
Pipe Capacity	615	53	9%
Street Flooding	49.8 miles	< 0.1 miles	< 1%

1/29/2026

Figure ES-2
Proposed Conditions Flood Mitigation Goals Performance Summary

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Air Photo: City of Madison, 2020

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Section 1

Introduction

1.1 Project Background and Purpose

The City has experienced increased frequency and intensity of rainfall events over the past ten to fifteen years. In August 2018, an unprecedented rainfall event occurred on the City's west side. A nearby United States Geological Survey (USGS) rain gauge recorded 10.5in. of rain over a 12-hour period. For reference, National Oceanographic and Atmospheric Administration (NOAA) Atlas 14 statistics show the average 12-hour, 0.1% chance event at 8.92in. for the Madison area. This event caused flash flooding, most significantly across the western half of Madison, and prompted the City to begin a comprehensive watershed planning process. This process began with watersheds hardest hit by 2018 flooding and subsequently expanded to additional areas within the City. In May 2022, the City contracted with Brown and Caldwell (BC) to conduct the Warner Park and Cherokee Marsh Watershed study.

The overall purpose of this study is to develop a comprehensive stormwater management plan (SWMP) for the Warner Park and Cherokee Marsh watershed that will guide the City in meeting its flood mitigation goals.

This document generally consists of two parts. The first part, including Sections 2 through 6, describes the first phase of the project, which was comprised of:

1. The development of input parameters for the watershed's hydrologic/hydraulic model.
2. Construction of the stormwater hydrologic and hydraulic (H&H) model.
3. The calibration process for that model.
4. The modeling results showing flooding under the watershed's existing physical conditions.

The second phase of the project involved:

1. The analyses of alternative flood mitigation measures.
2. The flood reductions that can be expected from those mitigation measures.
3. Specific recommendations for flood reduction actions.

Sections 9 through 15 of this report document the second phase of the project.

Figure 1-1 shows the location of the study area within the City. Figure 1-2 provides a more detailed view of the watershed.

1.2 Scope of Study

The project's scope of work included the tasks listed below:

1. Review existing data and provide support for field data collection
   - This task focused on analyzing existing information provided by the City and other agencies to use in the development of the H&H model. Additionally, a field survey was conducted for specific locations based on data gaps identified by BC.

2. Public engagement
   – BC assisted the City in conducting public engagement events. The events included three Public Information Meetings (PIMs) and community outreach and education at five events. The 3rd PIM also included focus groups using four breakout rooms associated with different proposed solutions. Section 7 and Appendix F contains additional information regarding these public engagement events.
3. Develop and calibrate existing conditions XPSWMM™ Model for the watershed
   – The process of model development was a core component of this project. A detailed explanation of the process is provided in Sections 4 and 5 of this document.
4. Execute existing conditions XPSWMM™ Model
   – The calibrated model was then used to model the watershed under its existing physical conditions for a series of rain events. The results of the model runs are documented in tabular and graphical formats and were presented at a Public Informational Meeting.
5. Evaluation of flood mitigation measures
   – Potential solutions to reduce flooding and meet the City's flood mitigation goals were developed and evaluated within the XPSWMM™ model. Solutions were developed in conjunction with City staff. Selected solutions were evaluated under a series of storm events, and the results were documented. The solutions were also presented at a PIM.

Each task is described in more detail in the remainder of this document.

1.3 Historic Flooding in Watershed

Within the Warner Park and Cherokee Marsh watershed there are several areas that have experienced repeated flooding in the past. Figure 1-3 depicts known flooding areas as provided by the City within the Warner Park and Cherokee Marsh watershed. The known flooding locations are based on reports from a variety of data sources, including resident reports, emergency services reports, City operations staff reports, and inlets with repetitive clogging history.

It should be noted that flooding was reported at several locations within the watershed as a result of storm events in the summers of 2024 and 2025, while this study was on-going. Reports were provided through the City's flood report portal and as part of outreach efforts in the watershed. Of particular note is flooding which occurred along Trailsway and Sherman Avenue, near and south of Warner Park, which resulted in stranded vehicles. Pictures were provided that show ponding covering the roadway during rainfall events.

This also correlates with conversations with residents the occurred during the outreach efforts. Approximately five residents along Trailsway reported experiencing flooding while living in the area. This includes not being able to access their residence with their vehicle, having water extend from the Castle Creek greenway into the road and approach buildings, and observing children playing in the flooded street. At the outreach events, multiple residents from outside the watershed, who travel through and into the watershed, also reported Sherman Avenue being impassable by vehicles during rain events.

1.4 Past Studies

Within the Warner Park and Cherokee Marsh watershed there have been numerous small scale, local stormwater studies conducted as part of private developments within the watershed. These studies were focused on meeting local and state stormwater regulations for the developments. In addition, the Warner Lagoon Water Quality Planning Report was completed in 2021, by the City of Madison Engineering Division, which included the Warner Lagoon Water Quality Analysis (MARS-EOR, June 2019). This report focused on the water quality in the Warner Lagoon and did not consider flooding. Additional information and the report can be found on the City's project webpage, https://www.cityofmadison.com/engineering/projects/warner-lagoon-water-quality-plan.

1.5 Flood Mitigation Goals

The City established consistent goals for stormwater management flood control (Level of Service or LOS) throughout the City. It is the City's policy to meet the LOS with reconstruction and new construction of its municipal stormwater conveyance system. Specifically, the LOS stormwater flood management goals are:

1. No home or business flooding during the 1%, 24-hour design storm event (6.6in.).
2. Eliminate flooding (surcharging of the storm sewer system onto the municipal streets) for up to the 10%, 24-hour design storm event (4.1in.), with the exception of road low-points.
3. Allow no more than 0.5ft of stormwater ponding above storm sewer inlet rim elevations at inlet-restricted low points for the 10%, 24-hour design storm event (4.1in.).
4. Maintain drivability of municipal streets (center of the street with no more than 0.5ft of water for more than 100ft) for the 4%, 24-hour design storm event (5.0in.).
5. Enclosed depressions should provide safe storage, or overflow, of stormwater during the 1%, 24-hour design storm event (6.6in.). Flooding should be contained within public lands (streets, greenways, easements, etc.).
6. Where greenways cross streets, there should be no road overtopping during the 1%, 24-hour design storm event (6.6in.).
7. Flooding solutions should not negatively impact downstream properties.

It should be noted that although the City strives to meet the above goals with each of its stormwater infrastructure projects, fully achieving these goals is not always feasible because of specific site conditions, or other factors which cannot be controlled.

Section 2

Water Resources Inventory

2.1 Study Setting

The Warner Park and Cherokee Marsh watershed is located on the northwest side of the City (see Figure 1-1) and covers approximately 3,912 acres. The majority of the watershed is within the City; however, portions are also within the Town of Burke and the Town of Westport. The extent of the watershed is shown on Figure 1-2. The watershed includes areas that drain north into Cherokee Marsh, and south into Lake Mendota.

The prominent drainage system features in this watershed are Warner Lagoon within Warner Park and open channels within Cherokee Park that are tributary to Cherokee Marsh. The northeastern portion of the watershed is generally open space / wetlands. Other areas of the watershed are mostly urbanized with a mixture of stormwater drainage infrastructure including storm sewer, open channels, and detention ponds.

2.2 Topography

The topographic data (provided by the City) was compiled from light detecting and ranging (LiDAR) data on the North American Vertical Datum of 1988 (NAVD88). It should be noted that some data available for the project (such as past construction drawings) are in the previously used City vertical datum. The conversion factor from the historical City datum to NAVD88 was to add 845.6 ft to the City datum elevation. Data provided included 2-ft contours and a digital elevation model (raster format).

Elevations in the watershed range between elevations 850ft and 1,016ft, approximately. The highest elevations are located in the center of the watershed and lowest elevations on the southern side near Warner Park and northwestern side of Cherokee Marsh.

2.3 Drainage System

The Warner Park and Cherokee Marsh drainage system generally consists of a mix of constructed urban and natural components. The constructed urban stormwater conveyance system including a mix of open-channels, storm sewers, and detention facilities.

2.3.1 Natural Drainage System and Wetlands

The natural drainage system includes Warner Lagoon within Warner Park and open channels within Cherokee Park. There are also areas within the watershed identified by the Wisconsin Wetland Inventory (WWI). The wetlands are primarily located along Lake Mendota, the Yahara River, and Cherokee Marsh, along with the northeast portions of the watershed. Figure 2-1 is a map showing the natural waterbodies and wetland mapping for the watershed based on the data available from the WDNR. It should be noted that this data is only a screening tool for the presence of wetlands and waterways. Field investigations would be required to confirm the presence or absence of these features.

2.3.2 Constructed Drainage System

The constructed drainage system includes open channels (greenways and roadside swales), detention ponds, storm sewers, and culverts. Within the watershed the City has seven defined greenway segments and eight public detention ponds.

There are approximately 16.1 miles of modeled storm sewer within the Warner Park and Cherokee Marsh watershed that range in size from 8-in. circular pipes to 3.5 by 7ft box culverts. Generally, all City-owned trunk line storm sewers were included within the model. Private storm sewers were not included as part of the model.

Figure 2-2 displays the existing drainage system within the Warner Park and Cherokee Marsh Watershed.

2.4 Runoff Conditions

Stormwater runoff generated from a land surface will vary depending upon several factors, including land use, imperious surfaces, soil types, and topography. The factors within the Warner Park and Cherokee Marsh watershed are discussed in this section.

2.4.1 Land Use

The Warner Park and Cherokee Marsh watershed includes a mix of land uses, with the largest category being residential. Land use data was provided by the City that categorized the areas within the City into 19 different land uses. Land use data was also obtained from Dane County for areas outside of the City of Madison. Table 2-1 provides a generalized breakdown of the land use within the watershed. A map of the generalized land use categories is shown on Figure 2-3.

Table 2-1. Existing Land Use
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Land Use Type	Area (acres)	Percent (%)
Residential	1,238	31%
Institutional	107	3%
Commercial/Industrial	279	7%
Agriculture	26	1%
Open Space/Parks	1,840	47%
Street Right-of-Way	422	11%
Total	3,912	100%

2.4.2 Impervious Area

Impervious area data for the watershed was provided by the City as part of the GIS data. The impervious area dataset was prepared by the University of Northern Iowa GeoInformatics Training, Research, Education, and Extension Center (GeoTREE). The impervious area dataset delineates all impervious areas within its coverage area including private parcels, public parcels, and right-of-way areas. These areas were used directly for hydrologic conditions. The impervious areas provided by the City were based on 2020 aerial photography. See Figure 2-4 for a map of the impervious areas provided by the City.

2.4.3 Soil Types

Soils in the Warner Park and Cherokee Marsh watershed are predominantly hydrologic soil group (HSG) B soils. The HSG classifications were used to estimate the infiltration parameters for pervious surfaces within the watershed (see Section 4.3.2.4). Table 2-2 shows the areas for each soil group in the watershed and the extent of soil group areas are shown on Figure 2-5. This data was obtained directly from the City and is based on the NRCS Soil Survey for Dane County.

Table 2-2. Hydrologic Soil Groups
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

HSG	Area (acres)	Percent (%)
A	32	0.8%
B	2,291	59%
C	221	6%
D	1,318	33%
Water	50	1.2%
Total	3,912	100%

Section 3

Guidance and Data Sources

3.1 City of Madison Modeling Guidance

As part of the City's watershed study program, a Modeling Guidance document was developed by the City. This document is used to define consistent modeling parameters across the various watersheds that are being analyzed. The Modeling Guidance was developed at the onset of the program and updated as needed. The version of the Modeling Guidance dated February 9, 2021, was utilized as part of this report. A copy of the Modeling Guidance as of the date of this report is included in Appendix A.

3.2 Data Sources

The Warner Park and Cherokee Marsh watershed study relies on a variety of data sources. A summary of the data sources is provided below.

Provided by City of Madison:

1. Various datasets from the City's Geographic Information System (GIS). GIS data includes land use, storm sewer (including associated structures), city limits, greenways and ponds, parcels, roads, and other pertinent datasets.
2. Construction plans provided by the City for existing ponds and greenways within the watershed.
3. As-built plans and narrative for the TPC Wisconsin golf course.
4. Monitoring data to support this study was collected by the City, in conjunction with the USGS. Monitoring data included rainfall and water level data at select locations. Additional information about the data collected and how the data was collected is provided in Section 4.2.2 for rainfall data and Section 5.1 for water level data.

Provided by Wisconsin Department of Administration

1. Storm sewer map for the Mendota Mental Health Institution.

Collected by Brown and Caldwell

1. Photographs of various drainage features were obtained from field investigations conducted by BC.
2. Field surveys of culverts with missing data within the watershed. As part of the model development process, survey locations were identified, and the data was collected by Burse Surveying and Engineering.

It should be noted that the City previously used a City vertical datum, and the City is in the process of transitioning all data into the NAVD88. The watershed study was conducted in NAVD88 and data that was in the City datum was converted to NAVD88. The City provided the appropriate conversion of adding 845.6 ft to the City datum.

The specific file name and date of the file is listed in Table 3-1.

Table 3-1. Source Files
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Data Type	File Name	File Date
Land Use	WinSLAMMLanduse.mdb	4/16/2019
Dane County Land Use	LandUse2020	5/9/2023
Building Footprints	Building_Footprints	1/10/2023
LiDAR	City_of_Madison_DEM_2022	10/19/2022
Aerial Imagery	2022_CITY_COLOR_2011	2022
Roads	Street_Centerlines_and_Pavement_Data	6/24/2022
Municipal Boundary	City_Limit	6/24/2022
Data_Updates_2023_02_24 Geodatabase Feature Classes		
Storm Sewer	Pipes_2023_02_24	2/24/2023
	Private_pipe_2023_02_24	2/24/2023
	Private_structures_2023_02_24	2/24/2023
	Sto_structures_2023_02_24	2/24/2023
2023 Watershed Studies Geodatabase Feature Classes		
Greenways	Pond_Greenway	11/2/2022
Planimetric Data	STO_Modeling_Impervious	11/2/2022

Section 4

Model Development

4.1 Modeling Software

To evaluate flooding and stormwater conveyance system capacity within the Warner Park and Cherokee Marsh watershed an XPSWMM™ version 2023.2 model was created to simulate the hydrology and hydraulics (H&H) within the watershed. XPSWMM™ is a proprietary software product of Innovyze® (see www.innovyze.com/en-us). The model created for the Warner Park and Cherokee Marsh watershed is a combination One-Dimensional (1D)/ Two-Dimensional (2D) H&H model.

4.2 Rainfall Events

The flooding analyses included an evaluation of both design storms and recorded rainfall events. A series of storm events were evaluated as part of this study to identify which event(s) result in flooding, and the severity of that flooding. Both theoretical “design storms”, as well as measured local storm events, were considered as part of the study. The rainfall events that were used in the analysis are described in the following sections.

4.2.1 Design Rain Events

The watershed flooding analysis included a series of different recurrence interval design storms (50, 20, 10, 4, 2, 1, and 0.2% chance events) with a 24-hour duration. The design storm events used rainfall depths from the NOAA Atlas 14. The Midwest/Southeast states (MSE) 4 rainfall distribution, developed by the NRCS, was used for the rainfall. Table 4-1 lists the rainfall depths that were used in the H&H modeling of this study.

Table 4-1. Design Rain Events
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Annual Storm Probability (24 hour)	Rainfall Depth* (inches)
50% chance	2.84
20% chance	3.45
10% chance	4.09
4% chance	5.02
2% chance	5.74
1% chance	6.66
0.2% chance	8.94

**as reported in the City’s Modelling Guidance document.*

4.2.2 Measured Rain Events

To support the watershed studies program, the City has established a rain gauge network across the City. The Warner Park and Cherokee Marsh watershed study utilized a rain gauge from this network, along with a USGS rain gage, within the watershed to characterize actual, measured rainfall events. Two rain gauges were used as part of the study and their locations are provided in Table 4-2. Figure 4-1 shows the locations of each station.

Table 4-2. Rain Gauge Locations
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Gauge Location
Meadow Ridge Park, north of stormwater pond (City gage)
Wheeler East, southeast corner of pond located north of intersection of Wheeler Road and Delaware Boulevard (USGS gage)

Rainfall data was obtained from the Trimble Unity website, the City's partner for providing the monitoring data. From the monitoring period, three measured rainfall events were selected to be utilized as part of the calibration process under this study. The events selected are provided in Table 4-3. A graph of each event's rainfall distribution at the Wheeler East location is provided in Appendix D as Figures D-1 through D-3. These events are the largest rain events that were successfully measured and had good corresponding water surface elevation measurements at the monitoring stations (see Sections 5.1 and 5.2).

Table 4-3. Rain Events Selected for Calibration Process
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Event Date	Rain Depth (inches)*	Rain Duration	Approximate Annual Exceedance Probability
July 4-5, 2022	3.3	37 hours	10%, 1-hr
August 24-25, 2022	1.8	6 hours	50%, 2-hr
July 28, 2023	1.2 – 1.5	1 hour	100%, 1-hr

** rain depth varied by station*

The July 2022 storm event was the largest event in 2022-2023 at the relevant rain gauges. The event (total rain depth and duration) falls in the range of a 10% chance event based on NOAA Atlas 14, Volume 8, Version 2 data. The August event (total rain depth/duration and peak intensity) is approximately a 50% recurrence interval. The July 2023 event is approximately a 100% chance event in terms of total rain depth and intensity.

4.3 Hydrologic Model Development

This section describes the steps taken to generate the hydrologic factors used in the XPSWMM™ model.

4.3.1 SWMM Runoff Description

Hydrologic calculations were performed in the XPSWMM™ model using Storm Water Management Model (SWMM) runoff methodology, which is consistent with the Modeling Guidance document. SWMM hydrology uses a combination of drainage area size and shape, slope, land cover (pervious, impervious not connected, impervious connected), and soil infiltration parameters to generate runoff from a rain event.

The calculations were performed for each subwatershed that was delineated within the watershed. The model simulates rainfall on each subwatershed and generates runoff, accounting for initial abstraction and infiltration in determining the surface runoff. The model developed a runoff hydrograph based on the input parameters and this is entered by the model into the hydraulic portion of the software at a node.

4.3.2 Subwatershed Input Data

The Warner Park and Cherokee Marsh watershed was divided into 282 subwatersheds. The subwatersheds are shown on Figure 4-2. Subwatersheds were delineated based on the storm sewer maps, drainage features (such as open channel versus storm sewer), land use, and topography. For each subwatershed, hydrologic input parameters were calculated. Each subwatershed included three subcatchments based on the land use within the subwatershed. The subcatchments were defined as:

1. Directly connected impervious area (DCIA): impervious areas that drain directly to the conveyance system
2. Indirectly connected impervious area: impervious areas that drain over a pervious surface prior to entering the conveyance system
3. Pervious area: vegetated land surfaces or areas with no impervious surface

The input parameters and calculation methodology for hydrologic input parameters are described below. The XPSWMM™ model input parameters for each subwatershed are listed in Table B-2.

4.3.2.1 Subwatershed and Subcatchment Areas

The area for each subwatershed was calculated using the GIS data developed for the project. Subsequently, for each subwatershed, the areas for each of the three subcatchments were calculated. Subcatchment areas were calculated using the impervious area information provided by the City (see Section 2.4.2). How each subcatchment area was calculated is described below.

1. The total impervious area for each subwatershed was calculated based on the impervious area data from the City.
    a. The DCIA was estimated using WinSLAMM Standard Land Use (SLU) files. The SLU files estimate the source areas for typical land cover conditions for a variety of land uses. As part of the source area data, the SLU files identified whether a source area was directly or indirectly connected to the municipal stormwater conveyance system. For each land use, the percentage of DCIA was calculated (see Table B-1). Based on the land use present in a subwatershed, the total DCIA was calculated.
    b. Indirectly connected impervious area was calculated by subtracting the DCIA from the total impervious area in a subwatershed.

2. Pervious area was calculated by subtracting the total impervious area from the subwatershed area.

It should be noted that the WinSLAMM SLU files incorporate the street right-of-way as part of the land use category. For example, Medium Density Single Family Residential (No Alleys) SLU data includes the impervious areas of the associated streets and sidewalks. The City's GIS land use coverage did not include street right-of-ways under a land use category and treated street right-of-ways as a separate "land use". This meant that the calculated directly connected and disconnected impervious areas for each land use had to account for this difference between the WinSLAMM and City's GIS land use categories. As such, the street areas were subtracted from the DCIA and total impervious area in the SLU files. The percentage of DCIA was calculated based on the impervious areas outside of the street areas.

Within XPSWMM™ the indirectly connected impervious area was routed onto the pervious area within each subwatershed.

4.3.2.2 Subwatershed and Subcatchment Width

In SWMM hydrology, "width" refers to the general shape of a hydrologic unit (subwatershed) and the relationship of the surface flow path to the shape of the subwatershed. A line was drawn to represent the longest typical flow path for each subwatershed. The length of this line was calculated and the subwatershed area was divided by the flow path length to calculate the overall width.

4.3.2.3 Slope

A slope for the flow path described under in Section 4.3.2.2 was calculated. The elevation at the upstream and downstream end of the flow path was assigned based on the topographic data provided by the City. The elevations were used with the flow path length to calculate the slope.

4.3.2.4 Soils and Infiltration

Soils within the watershed are classified by the HSG. The soils conditions of the watershed are represented in the hydrologic calculations through the infiltration parameters selected for the study.

The Horton soil infiltration methodology was used within XPSWMM™, and this approach is consistent with the City's Modeling Guidance. This methodology establishes a maximum infiltration rate, a minimum infiltration rate, and the decay rate of infiltration for each HSG. Input parameters were developed for each of HSG and Table 4-4 provides the infiltration values. These values are utilized for urban areas. In accordance with the City Modeling Guidance the maximum and minimum infiltration rates were adjusted for farmland and forest areas. The adjustments are listed in Table 4-4. Figure 4-3 identifies the locations of the different land uses in the watershed that had the infiltration parameters adjusted.

Table 4-4. Horton Infiltration Parameters
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

HSG[1]	Maximum Infiltration Rate (inches/hour)	Minimum Infiltration Rate (inches/hour)	Decay Rate (1/hour)	Dry Days
A	4.0	1.0	4.0	3.1
B	2.0	0.5	4.0	4.4
C	1.0	0.2	4.0	7.0

Table 4-4. Horton Infiltration Parameters
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

HSG[1]	Maximum Infiltration Rate (inches/hour)	Minimum Infiltration Rate (inches/hour)	Decay Rate (1/hour)	Dry Days
D	0.5	0.1	4.0	9.9
Water	0	0	0	0

[1]Where soils are classified as A/D, B/D, or C/D an HSG D was assumed.

Forest Land Use: Maximum and minimum infiltration rates multiplied by 2.

The pervious area within each subwatershed was classified by HSG. For each subwatershed composite, infiltration parameters were developed by area-weighting by each parameter based on the amount of each HSG within a subwatershed. For example, if a pervious portion of a subwatershed is 50-percent HSG A and 50-percent HSB B, the maximum infiltration rate would be 3.0in./hour.

It should be noted that the values shown in Table 4-4 are the “base conditions” values. Infiltration rates that were used as a calibration parameter may be modified to better represent actual conditions. See Section 5 for modifications that were made to develop the “calibrated existing conditions” model.

4.3.2.5 Antecedent Moisture Conditions

The antecedent moisture condition represents whether there are saturated or exceptionally dry soil conditions at the start of a storm event. In saturated conditions, the maximum infiltration rate of soils would be decreased and the depressional storage may be reduced. In dry conditions, the maximum infiltration rate may be higher than typical. For this analysis, typical antecedent moisture conditions were used and are represented by the parameters listed in Table 4-4.

4.3.2.6 Depressional Storage

Within a subwatershed, there are surface depressions that collect runoff (puddles) and reduce the amount of runoff generated from a rainfall. Depressional storage is incorporated into the runoff calculations to account for these areas. For each subwatershed, a depression storage of 0.05in. for impervious areas and 0.15in. for pervious areas was included. These values meet the criteria defined in the City’s Modeling Guidance.

4.3.3 Runoff Routing

The runoff hydrograph generated by the hydrologic portion of the model is then routed into the hydraulic portion of the model. Within areas of the watershed where storm sewer is present, the runoff is routed directly into the 1D storm sewer system. Within other areas the runoff is routed onto the 2D surface. Examples of where the runoff is routed onto the 2D surface are the TPC Wisconsin golf course pond system and the Castle Creek greenway.

4.3.4 Internally Drained Areas

Within the Warner Park and Cherokee Marsh watershed, there are several internally drained areas that were identified and delineated. These areas are enclosed depressions with no known storm sewer, or defined open channel, outlet. For each of these areas, a subwatershed was delineated, hydrologic parameters were developed, and the runoff was incorporated into the XPSWMM™ model. The internally drained areas were part of the 2D model. Runoff was allowed to pond in the internally drained areas and overland flow either into or out of the areas was allowed. Figure 4-4 identifies the locations of the internally drained areas. The internally drained areas are summarized below.

1. Southwest of the intersection of Barnett Street and Harvey Road: A small depression is located the backyards of residential properties and collects runoff before it overtops and sheet flows to the north towards Harvey Road.
2. There are two depressions within residential backyards in the Cherokee Park neighborhood north of Menomonie Lane, south of Burning Wood Way, and west of Namekagon Lane. These areas collect runoff from adjacent properties before overtopping and sheet flowing onto adjacent streets.

There are additional depressional areas that do not have internally drained subwatersheds delineated. These areas may consist of backyards or other small, local depressions. These depressions are accounted for in the hydrology calculations through the depressional storage parameters described in Section 4.3.2.6. It is possible that small depressions not incorporated may have localized flooding conditions (such as individual back yards); however, the scope of this study did not allow for the evaluation of each individual area.

4.4 1D Hydraulic Model Development

The 1D hydraulic portion of the XPSWMM™ model represents the storm sewers, culverts, and detention basin outlet structures within the drainage system within the Warner Park and Cherokee Marsh watershed. The hydraulic input parameters required by XPSWMM™ vary depending on the different parts of the drainage system. The source data used to compile the hydraulic model input data is summarized below. Table C-1 (pipes), C-2 (orifices), C-3 (weirs) and C-4 (nodes) in Appendix C provides hydraulic input parameters for links and nodes from the XPSWMM™ model. Figure C-1 in Appendix C shows a layout of the model network.

4.4.1 Storm Sewers

City-owned storm sewer mains and storm access structures were included in the XPSWMM™ model, per the project's scope of work. Additionally, inlet lead storm sewers and inlets were included to collect overland flow from the 2D model. Inlet capacity was not considered as part of the analysis. Accurate analysis of inlet capacity required additional data regarding the number and type of inlets within the study area. Further there are limitations regarding modeling of inlets in the 2D portion of the XPSWMM™ software. Thus, it was beyond the scope of this analysis to consider inlet capacity.

Each storm sewer "link" requires upstream and downstream invert elevations, pipe length, and Manning's n (roughness). Additionally, hydraulic minor losses were added to the model.

The source of the closed conduit conveyance system data for the model included GIS data provided by the City and information from, construction plans, and field surveys at select locations. Where missing data remained, assumptions were developed to fill data gaps. The assumptions made are listed below.

1. Missing invert elevations were obtained by interpolating between the nearest upstream and downstream invert elevations. Where known bounding inverts were unavailable (as in the uppermost reaches of the storm sewer), the next downstream slope was continued upstream.
2. Where pipe sizes were unknown, the size of the nearest upstream pipe was used.
3. Missing pipe material was assumed to be the same as the nearest upstream pipe.

Entrance and exit losses (minor losses) were added to storm sewers and culverts based on the Modeling Guidance document. Losses were applied to the entry pipe(s) and exit pipe at a storm access structure (SAS). For example, at a 90-degree SAS, a loss of 0.5 was assigned to the influent and effluent pipes. At a tee, or cross SAS structures, a loss of 0.5 was applied to each pipe.

4.4.2 Culverts / Bridges

There are culverts present within and bordering the TPC Wisconsin Golf Course in the northeast portion of the study area. Culverts were incorporated into the model based on the City's GIS data (Comanche Way culvert), information from the as-built plans for the TPC Wisconsin Golf Course obtained for the project (culverts within the golf course), and survey data. Survey data was obtained for the culvert under north Sherman Avenue on the east side of the golf course.

Culverts and bridges are also present within Warner Park, along the Castle Creek Greenway near Sherman Avenue and Trailsway. The bridge near the outfall of Castle Creek Greenway into Warner Lagoon was incorporated into the model as part of the 2D topography (see Section 4.5 below). Other bridges across Castle Creek were excluded from the model. These bridges were originally included, however, instability in the model was identified in the links representing these bridges. In general, the bridges are small and during the events considered they are not able to convey all of the flow beneath them. Substantial flow was going around the bridges in floodplain areas. When the bridges were removed from the model the stability improved and the overall results were not impacted.

4.4.3 Pond Outlet Structures

City-owned stormwater ponds were incorporated into the model. A total of eight ponds are incorporated. Outlet structures for ponds were represented as part of the 1D hydraulic model utilizing orifices, weirs, and conduits as appropriate based on the outlet structure configuration. Pond outlet structure information was obtained from City GIS data for storm sewer pipes and from construction/as-built plans for special structures.

There are other smaller, privately-owned detention facilities that may serve a single property within the watershed. The smaller detention ponds have minimal effect on the stormwater flooding conditions which are the focus of this project.

4.5 2D Hydraulic Model Development

The 2D portion of the hydraulic model is utilized to represent the overland flow across the land's surface. The 2D model uses topographic data to simulate the overland flow which may occur throughout the watershed in areas, such as within open channels or creeks, within detention basins, along streets, between buildings, or over undeveloped lands. All areas of the Warner Park and Cherokee Marsh watershed are modeled in 2D. The 2D model is connected to the 1D model to allow runoff to pass from the 1D elements in the model into the 2D part of the model and vice-versa. The components of the 2D model are further described in the sections below.

4.5.1 Topographic Data

A triangular irregular network (TIN) was created within XPSWMM™ to represent the topography within the study area. The City-provided elevation raster (City_of_Madison_DEM_2022) was used as the basis for the TIN creation. This raster file was clipped to the approximate project extents. It was converted to an Environmental Systems Research Institute (ESRI) grid format and imported into the XPSWMM™ model.

Within the Warner Park and Cherokee Marsh watershed, there are two situations where the TIN surface created by XPSWMM™ was modified.

1. The existing weir used for the Meadow Ridge Park pond outlet structure is not depicted by the topographic data used to generate the TIN. The weir controls outflow from the pond and is hydraulically important to the model. Within XPSWMM™, a ridge breakline was used to add the weir walls. Aerial photography was used to digitize the weir. The weir is then represented as a 1D link.
2. Within the TPC Wisconsin Golf Course the excavation and construction of the existing ponds were on-going during the LiDAR flight that generated the elevation raster. Fills areas were used to simulate the completed permanent pool of water that would be present in the full build-out condition.

4.5.2 2D Grid

XPSWMM™ uses a grid comprised of squares to complete the 2D model calculations. Water enters the grid and is transferred between grid cells. Elevations are assigned to the vertices and center of each grid cell from the topographic data. The grid size for this project is 10 by 10ft. The 2D grid covers the entire project area.

4.5.3 2D Land Use and Roughness Values

As part of the 2D model, the land cover is defined, and each land use is assigned a Manning's n. This factor represents the roughness of the land's surface and ability to impede flow. For Warner Park and Cherokee Marsh watershed, the land cover was divided into nine categories and each category was assigned a unique Manning's n value. The land cover was imported to XPSWMM™ from GIS data developed for the watershed.

The land cover categories were selected based on available data. For areas with impervious area delineations the data was used to classify land use as either impervious or pervious and a Manning's n was assigned. Due to the size and complexity of the watershed, the impervious area could not be imported as 2D land use shapes into the model. Attempts to import the impervious data resulted in the model crashing. To simplify the land use right-of-way areas were given a composite roughness and the pervious and impervious areas within the right-of-way were not imported.

For areas within the study area that do not have impervious areas delineated the impervious percentage associated with the WinSLAMM SLU for that land use was utilized to develop a composite Manning's n. The Manning's n was initially selected based on the standard values in the City's Modeling Guidance. These standard values are based on sheet flow conditions.

The Manning's n corresponding to each land use is provided in Table 4-5. The land use for the 2D roughness is shown in Figure 4-5.

Table 4-5. 2D Manning's Roughness
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Land Use	Manning's n	Land Use	Manning's n
Commercial	0.18	Right-of-Way	0.16
Impervious	0.1	Water	0.01
Open Space	0.24	Wetland	0.15
Pervious	0.24	Wooded	0.4
Residential	0.2		

4.5.4 Inactive Areas

Inactive areas are defined as areas where surface water cannot flow because of physical barriers (such as buildings). Inactive areas were identified and added to the 2D model to represent building footprints. These are areas where the 2D modeled flow will not occur. Building footprints were imported from the Dane County GIS data.

4.5.5 1D/2D Interface

The 1D and 2D models interfaced at model nodes. Runoff can be transferred from the 1D storm sewer network onto the 2D grids at selected nodes within the model. Runoff from the subwatersheds are entered directly into the 1D system (at nodes). The runoff is passed from the 1D model into the 2D portion of the model when capacity of the 1D system is exceeded, or where the 1D system discharges into portions of the drainage system that are modeled in 2D, such as ponds and open channels. Nodes representing inlets or sewer access structures are connected to the 2D grid at the rim elevation. Nodes represent apron end walls or culvert ends are connected to the 2D grid at the invert elevation.

4.6 Boundary Conditions

The model includes various outlets into Lake Mendota and the Yahara River / Cherokee Marsh. There are two primary outlets through which the majority of the watershed discharges.

1. The Menomonie Channel that discharges inlet Cherokee Marsh. The channel begins at the culvert (2 – 43 by 68in. horizontal elliptical pipes) under Comanche Way on the east and flows west, parallel to Menomonie Drive.
2. The outlet culvert (72in. diameter) from Warner Lagoon underneath Woodward Drive and inlet Lake Mendota.

Additionally, there are approximately seven smaller storm sewers that discharge into Lake Mendota at various locations along the south and western sides of the study area. There are also eight smaller storm sewers that discharge into Cherokee Marsh from the Cherokee Marsh neighborhood on the north side of the study area. A fixed tailwater elevation of 850.1, which is equal to the target summer maximum water level for Lake Mendota was used as the boundary condition for each outfall. It should be noted that the lake level fluctuates. Changes in the lake level can impact the model results.

4.6.1 2D Boundary Conditions

The boundary of the 2D model—the perimeter of the 2D grid defined for the study—is created in the model to be closed and acts as a vertical wall. The model results were reviewed, and overland flow outfalls were added (termed by XPSWMM™ as "head boundaries") at locations where water ponded along the "edge" of the model. These are locations where overland flow leaves the study area and enters an adjacent watershed. Overland flow outfalls are listed below.

1. Along the edge of Cherokee Marsh, parallel to Burning Wood Way.
2. Along the west side of Wheeler Road, between Northport Drive and School Road.
3. Northwest of the Sauthoff Pond.
4. Along the edge of Lake Mendota, west of Veith Avenue.
5. Along the west side of Harper Road.
6. Along Heath Avenue, east of Huxley Drive.

Each overland flow outfall was assumed to be a free outfall (no tailwater). It was also assumed that there is not overland flow that enters from any adjacent areas.

Section 5

Model Calibration

The scope of work for the calibration effort as specified in the project's contract is identified below.

> Calibration will be attempted for no more than three (3) 2022-2023-monitored storm events. The three (3) events will be selected by the City and BC. For purposes of this project, the model will be considered to be calibrated if the overall average model bias for water surface elevations is within +/- 5% with reasonable effort made to minimize the largest absolute error while at the same time balancing that effort with the relative importance of the model results at each monitoring site location. The largest absolute error at each monitored location is defined as +/- 25 percent. It is understood that there may be some circumstances where calibration cannot be accomplished. If calibration cannot be accomplished, BC and the City will discuss and decide on an acceptable course of action.

The calibration process focused on identifying consistent model input parameters that would provide reasonably comparable results for each of the three storm events. However, it is understood that the hydrologic conditions, and how runoff is generated from the land surface will vary from storm to storm. Also, it is commonly found that hydrologic factors that best represent larger rain events may not be appropriate for use in smaller rain events. The storm events during the monitoring period did not result in any known flooding within the watershed.

5.1 Monitoring Data

There were ten monitoring locations within the Warner Park and Cherokee Marsh watershed that could be used in the calibration process. All of the monitoring data was collected by the City or the USGS and BC obtained the data from the Trimble Unity website (City data) or via email (USGS data). The monitoring locations are listed below and shown in Figure 5-1.

1. Sherman Avenue at Manley Street: City gage that monitored water level in a 36-in. storm sewer located underneath Sherman Avenue, just north of the intersection with Manley Street. The drainage area to this gage is approximately 102 acres, is fully developed, and is predominantly residential land use.
2. Sherman Avenue at Northport Drive: City gage that monitored water level and flow in a 42-in. storm sewer, with a 119-acre drainage area, located underneath Sherman Avenue, just north of the intersection with Northport Drive. This pipe has a steep slope (approximately 10-percent) and the flow data collected was not useable.
3. Warner Lagoon: City gage that monitored water level within Warner Lagoon. The gage was located on the northeast side of the lagoon, within Warner Park. The lagoon has a drainage area of approximately 1,035 acres of mixed-use land. There are also several other gages upstream of the lagoon, including Sherman Avenue at Manley Street, Sherman Avenue at Northport Drive, Camino Del Sol, and the Trailsway Storm Sewer Outfall.
4. Camino Del Sol: City gage that monitored water level in a 48-in. storm sewer that runs southeast, parallel to railroad tracks, at the southern end of the Camino Del Sol cul-de-sac. This storm sewer has a drainage area of approximately 186 acres of single family residential, multi-family residential, and school areas.

5. Bonner Lane: City gage that monitored water level and flow in a 36-in. diameter storm sewer located underneath Bonner Lane at the intersection with Elgar Lane. This storm sewer has a drainage area of approximately 109 acres of single family residential, multi-family residential, and school areas.
6. Cherokee West Inlet and Outlet: USGS gages monitoring flow and water level at the inlets (36-in. and 3.5 by 7ft box culvert) and outlet weir of the wet detention pond located north of the intersection of Wheeler Road and Delaware Boulevard, within Cherokee Park. The pond has a drainage area of approximately 104 acres of mixed use land.
7. Cherokee East Inlet and Outlet: USGS gages monitoring flow and water level at the inlets (two 48-in. storm sewers) and 36-in. outlet pipe of the wet detention pond located northwest of the intersection of Wheeler Road and Ilene Lane, within Cherokee Park. The pond has a drainage area of approximately 224 acres of mixed use land.
8. Trailsway Storm Sewer Outfall: USGS gage monitoring water level at the outfall of a 42-in. storm sewer into the Caste Creek greenway, northwest of the intersection of Sherman Avenue and Trailsway. This gage has a 365-acre drainage area of fully developed mixed-use land. It should be noted that, the Sherman Avenue at Manley Street and Sherman Avenue at Northport Drive gages are located upstream of this location.

5.2 Selected Runoff Events

The rain events selected for the calibration process are defined in Section 4.2.2. The events were selected based on the completeness of recorded data and the severity of the rain event. The July 4-5, 2022 event was the largest rain (3.3in. over approximately 37 hours with a peak intensity of 2.0in. in an hour). This event (based on peak hourly intensity) falls within the range of a 10% recurrence interval based on NOAA Atlas 14, Volume 8, Version 2 data.

There are no known flooding reports that occurred as a result of this rainfall event. However, a site visit was made by BC during a rainfall event on July 12, 2023 and ponding within Trailsway, along the Castle Creek greenway was observed. This storm event had approximately 1.5in. of rain in 6 hours and was of a lower intensity than the calibration events selected.

5.3 Selected Gages

The scope of work includes calibration at up to six gages. The information collected by the gages for the calibration events was reviewed to determine which gages to utilize as part of the calibration process. The Sherman Avenue at Northport gage did not collect data during the 2022 monitoring season and the flow data collected in 2023 was not useable for calibration as the flow values collected were small and inconsistent. Additionally, the Trailsway Storm Sewer outfall gage was installed in 2023, and thus data was not available from the 2022 monitoring season, which included two of the selected calibration events. This gage was also eliminated from consideration for use in calibration. The Bonner Lane gage did not include data for the July 2022 storm event, and the August 2022 event included questionable flow data. As a result, other gages were prioritized. The monitoring at the Cherokee ponds included inlet and outlet monitoring. The monitoring of the inlets was determined to be of more interest for this study. The outlets from these ponds are downstream of developed areas of the City. Thus, monitoring at the inlets to the pond, and calibration to these results, has a more direct impact on the area of interest for this study. The remaining gages were used for calibration.

5.4 Calibration Process

An extensive calibration process was conducted on the Warner Park and Cherokee Marsh watershed using the three selected measured rain events. The process is fully documented below.

Initially, the monitoring data was compared to the uncalibrated, base, model results. These results showed that the model over-predicted water surface elevations and flow rates at each of the monitoring locations for all storm events. The observed error ranged from 2- to 150-percent at the various locations and overall error was 71-percent.

As a result of these initial results, the calibration process focused on modifying parameters to reduce the runoff volume and peak runoff rates. The parameters that the analysis focused on were maximum and minimum infiltration rates and the percentage of directly connected impervious area. These parameters were found to have the largest impact in moving results toward an acceptable calibration. Other factors that were also considered were updated drainage areas and the infiltration decay rate.

During the consideration of various calibration factors, the rainfall for the calibration events was also investigated. Inconsistencies were observed in monitoring responses during two of the storm events. During the July 5, 2022 event, there was significant variability in the rainfall reports at three of the rain gages near the project area. The USGS rain gage located at the Cherokee East Pond, located within the study area, reported 2.63ins. of rainfall. The Dane County Regional Airport rain gage, located just northeast of the study area, reported 1.7in. The Sycamore Park city rain gage, located southeast of the study area, reported 1.6in. of rainfall. Based on the variation in rainfall, and the different responses observed in the monitoring data, it is believed that the rainfall amount collected by the USGS rain gage was not representative of the entire study area. Only the monitoring locations closest to this gage (the Cherokee East and Cherokee West ponds) were considered as part of this calibration event.

Another inconsistency with rainfall and monitoring data occurred during the August 25, 2022 storm for the Sherman Avenue at Manley Street gage. The rainfall data for this event showed a distinct second rainfall peak, that was of greater intensity than the first peak in the rainfall event. The Sherman Avenue at Manley Street gage data showed a smaller second peak. Thus, this gage was ignored during this storm event.

The calibration factors that were ultimately selected are listed below.

- Increased the maximum and minimum infiltration rates by 50 percent for the entire watershed.
- Reduced the directly connected percentage by 50 percent for the entire watershed.
- Adjusted the drainage basin boundary for the area draining to the Cherokee East Pond.

These factors produced the best balance of results to meet the goals of the project. With these adjustments the overall observed error was reduced to 3 percent.

5.5 Calibration Results

Calibration results are provided in Appendix D. As a summary, Tables 5-1 through 5-7 provide an overall summary of the calibration performance and show the calibration results in comparison to the measured results.

The model results generally compare favorably in terms of the shape of hydrographs and the timing of peaks and troughs. Additionally, the percent error is within the acceptable range (+/- 25-percent) except for two gages during the July 28, 2023 event (Warner Lagoon and Sherman Road at Manley Street). However, the overall error for this event is still within the acceptable range.

Table 5-1. Overall Calibration Summary Warner Park and Cherokee Marsh Watershed Study City of Madison, WI	
Event	Average Percent Difference
7/5/2022	-5%
8/25/2022	14%
7/28/2023	-2%
All Events	3%

Table 5-2. Warner Lagoon Calibration Results – Storm Sewer Level (ft) Warner Park and Cherokee Marsh Watershed Study City of Madison, WI			
	Peak Sewer Level (ft)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Level	849.6	849.6	849.6
Gauge Peak Water Level	850.5	850.2	850.1
Modeled Peak Water Level	850.8	850.2	849.9
Absolute Difference (ft)	0.3	0.0	-0.2
% Difference (calculated based on increase in water level)	44%*	10%	-32%

*Not used for calibration

Table 5-3. Sherman and Manley Calibration Results – Storm Sewer Level (ft) Warner Park and Cherokee Marsh Watershed Study City of Madison, WI			
	Peak Sewer Level (ft)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Level	857.0	857.0	857.0
Gauge Peak Water Level	860.4	860.0	860.3
Modeled Peak Water Level	862.7	862.3	861.8
Absolute Difference (ft)	2.3	2.3	1.5
% Difference (calculated based on increase in water level)	69%*	77%*	49%

*Not used for calibration

Table 5-4. Camino Del Sol Calibration Results – Storm Sewer Level (ft) Warner Park and Cherokee Marsh Watershed Study City of Madison, WI			
	Peak Sewer Level (ft)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Level	862.7	862.7	862.7
Gauge Peak Water Level	866.8	865.2	866.0
Modeled Peak Water Level	869.4	865.5	866.1
Absolute Difference (ft)	2.6	0.3	0.1
% Difference (calculated based on increase in water level)	66%	11%	3%

*Not used for calibration

Table 5-5. Cherokee East Pond Box Culvert Inlet Calibration Results – Storm Sewer Flow (ft) Warner Park and Cherokee Marsh Watershed Study City of Madison, WI			
	Peak Flow Rate (cfs)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Flow Rate	0	0	0
Gauge Peak Flow Rate	148	59	86
Modeled Peak Flow Rate	130	73	65
Absolute Difference (cfs)	-18	14	-21
% Difference (calculated based on increase in flow)	-12%	25%	-24%

Table 5-6. Cherokee East Pond Pipe Inlet Calibration Results – Storm Sewer Flow (ft) Warner Park and Cherokee Marsh Watershed Study City of Madison, WI			
	Peak Flow Rate (cfs)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Flow Rate	0	0	0
Gauge Peak Flow Rate	32	14	18
Modeled Peak Flow Rate	34	17	17
Absolute Difference (cfs)	2	3	-1

Table 5-6. Cherokee East Pond Pipe Inlet Calibration Results – Storm Sewer Flow (ft)
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

	Peak Flow Rate (cfs)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
% Difference (calculated based on increase in flow)	5%	25%	-6%

Table 5-7. Cherokee East Pond Calibration Results Pond Level (ft)
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

	Peak Pond Level (ft)		
	7/5/2022 Storm	8/25/2022 Storm	7/28/2023 Storm
Starting Level	852.3	852.3	No Data
Gauge Peak Water Level	853.1	853.4	No Data
Modeled Peak Water Level	853.9	853.4	No Data
Absolute Difference (ft)	-0.2	0.0	No Data
% Difference (calculated based on increase in water level)	-9%	-1%	

Section 6

Model Results

6.1 Evaluation of Design Storm Model Results

The calibrated XPSWMM™ model executed for each of the design storms. Table E-1 in Appendix E summarizes the peak water surface elevation at selected locations throughout the Warner Park and Cherokee Marsh watershed. Figure 6-1 provides the location of each of the reporting locations in Table E-1.

The Existing "Maximum Water Depth" maps for each modeled event are found in Figures 6-2 through 6-8 (rain events from the 50% chance event to the 0.2% chance event). As expected, widespread surface flooding is shown for the larger rain events (2, 1, and 0.2% chance events). It should also be noted that presence of shallow water (0 – 0.25ft) in the street right-of-way under the smallest modeled event (50% chance event), does not necessarily indicate "flooding" or a stormwater conveyance capacity problem. Runoff water is expected in the streets during this event as streets, and their curblines, are a part of the City's stormwater conveyance network.

6.2 Model Results Evaluation

By reviewing the 20% and 10% chance events, the most flood-prone areas can begin to be identified. Flooding depths greater than 0.5ft in the 20% and 10% chance events are indications of flood-prone areas. The areas that appear to be most flood-prone, based on a review of the 10% chance event, include:

1. Trailsway from Sherman Avenue to Monterrey Drive.
2. Brentwood Parkway and Calypso Road south of Trailsway.
3. The intersection of Schlimgen Avenue and Huxley Street.
4. The intersection of Melrose Street and Huxley Street.
5. The intersection of Vahlen Street and Ruskin Street.
6. Sherman Avenue from Northport Drive to Manley Street.
7. Lakeview Avenue and Drewery Lane, west of Hanover Street.
8. Delaware Boulevard, west of Dakota Drive.
9. Bonner Land, between Claremont Lane and Wheeler Road.
10. Camino Del Sol, south of Troy Drive.
11. The intersection of Troy Drive and Toban Drive.

Several conditions can influence the flooding including inlet capacity, storm sewer capacity, overland flow from other sources, or a combination of all of these conditions. During Phase 2 of the project, these areas will be further evaluated to assess the causes and develop mitigation measures.

6.2.1 Comparison to City Flood Control Goals

The existing conditions flooding results were compared to the City's flood control goals to quantify the performance of the stormwater conveyance system in the Warner Park and Cherokee Marsh watershed. The performance of the system relative to greenway crossings, pipe capacity, and street flooding were considered.

6.2.1.1 Greenway Crossings

At locations where a greenway crosses under a street, the City's goal is to safely pass the 1% chance event without overtopping the street. The crossing was determined to be overtopped if the elevation at the upstream side of the culvert is above the street crossing elevation. Within the Warner Park and Cherokee Marsh watershed there are two greenway crossings. The performance, whether the street is overtopped, at these locations is summarized in Table 6-1.

Table 6-1. Greenway Crossing Performance
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Location	1%, 24-hr Design Storm Performance	Notes
Comanche Way	Meets Criteria	Ponding observed on street from local storm sewer
Meadow Valley Drive	Meets Criteria	Ponding observed on street from local storm sewer

6.2.1.2 Pipe Capacity

The City's goal is to eliminate surcharging from the storm sewer system onto city streets for up to the 10% chance event. The pipe capacity was determined to be exceeded if the peak water surface elevation at the upstream end of the pipe was above the ground surface elevation. Within the XPSWMM™ model, there are a total of 610 pipes, of which 262 are surcharged at the upstream end during the 10% chance event. This equates to 43 percent of the pipes not meeting the pipe capacity goal. Figure 6-9 graphically displays the pipes that have their capacity exceeded.

The 610 pipes result in a total pipe length of 84,888ft, of which 39,557ft are surcharged during the 10% chance event. This equates to 47 percent of the pipe length not meeting the capacity goal.

6.2.1.3 Street Flooding

Within streets, the City's goal is to maintain drivability of municipal streets for the 4% chance event. Drivability is defined as having no more than a 100-ft segment of roadway with 0.5ft, or more, of flooding at the center of the street. Within the watershed there are a total of 49.8 miles of streets, of which 3.4 miles have a water depth of more than 0.5ft at the street centerline, for a length of more than 100-ft during the 4% chance event. This equates to 7 percent of the streets not meeting the drivability goal. Street areas where the flood mitigation goal is not met are identified on Figure 6-10.

6.2.1.4 Structure Flooding

For structures (buildings), the City's goal is to prevent structure flooding for up to and including the 1% chance event. Structure flooding is defined as having 0.5ft of more water within 5ft of a building. To assess structure flooding the model results for maximum flooding depth were intersected with the buildings (including a 5-ft buffer) to determine if the maximum water depth is exceeded. Under the existing conditions for the 1% chance event there are 232 structures impacted by flooding.

6.2.2 Comparison to Known Flooding in Watershed

There are various areas of known flooding within the watershed (see Section 1-3). The modeling results were reviewed and reflect consistency with the reported flooding. In particular, flood reports along Trailsway and in the area southeast of Warner Park are consistent with flooding observed in the model. A number of flood reports are also present along Wheeler Road and Delaware Boulevard, which is also reflected in the modeling. Flood reports are also present in various other areas of the study, and the modeling displays inundation in these areas.

6.2.3 Comparison to Focus Group Flooding Reports

As part of the public engagement effort for this project, PIM #2 shared model results with residents. The meeting included a presentation that shared inundation mapping results. After PIM #2, and in advance of PIM #3, there were various outreach efforts in the watershed. As part of these efforts, described in Section 7.3, BC met with residents at five events in the watershed. At these events, inundation mapping results were shared and BC staff discussed the experience residences had with flooding. The flooding described by residents during these meetings is similar to what is depicted on the flood inundation mapping.

6.3 Discussion of Long Duration, Back-to-Back Model Results

An additional design storm model run was conducted to represent the extreme condition of "back-to-back" 1% chance events occurring. Figure 6-11 is a hyetograph of the rain event showing the peak rain intensities occurring 12 hours apart. Another way to describe this condition would be having two 6.6-in. rain events occurring within 36 hours. The modeled results of the maximum water depth map for this event is shown on Figure 6-12 and tabular results are shown in Table E-1. Under this event, the results are similar to the 1% chance and 0.2% chance storm events. Results are more similar to the 0.2% chance storm event where the overall volume of runoff is the driving factor in flooding depth and extents. Where the peak runoff rate is the driving factor, the results are similar to the 1% chance storm event.

6.4 Menominee Channel Additional Investigation

The Menominee Channel was the subject of additional investigation and modeling as a result of questions raised regarding the drainage channel from nearby residents as part of PIM #2. The channel is directly connected to the Yahara River and Cherokee Marsh meaning that there is no culvert, bridge, or other restriction separating the channel from the river/marsh. Because of its location, the sensitivity to changes in modeling inputs from the modeling guidance document may be increased.

As part of the standard model set-up the model ended near the west end of the greenway, where the channel would enter the Yahara River / Cherokee Marsh. A fixed tailwater level of 850.1 was used as the boundary condition (see Section 4.6), which is consistent with the summer target water level for Lake Mendota. The channel outlet is located upstream of Lake Mendota, and upstream of the STH 113 bridge. As a result, it was desired to understand the potential impacts of a higher tailwater level, which could be caused by flow being restricted by the bridge. The FEMA floodplain mapping and Flood Insurance Study Dane County, Wisconsin (June, 2016) were reviewed. At the outfall from the Menominee Channel, FEMA reports a flood elevation of 851.7 for the 10-percent chance flood event and 853.5 for the 1-percent flood event.

The Menominee Channel is also classified as open water as part of the land use mapping. Open water utilizes a low manning's roughness (0.01). Site visits to the channel have shown vegetation growth within the channel and heavy vegetation on portions of the banks. These conditions would warrant a higher roughness value. The range of expected values would be from approximately 0.05 for a channel with dense weeds as high as the flow depth to 0.1 for a channel with dense brush.

To understand the sensitivity of channel water surface elevations to changes in model parameters three scenarios were evaluated with modified manning's roughness within the channel. Each scenario used an elevated tailwater level equal to the 10-percent chance flood event as reported by the FEMA Flood Insurance Study (elevation 851.7). The results are summarized in Table 6-2.

Table 6-2. Menominee Channel Sensitivity Analysis – 1% Chance Storm Event
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Tailwater Elevation	Manning's Roughness	Peak Water Surface Elevation at Chinook Ln Extended (1% Chance Storm Event)	Peak Water Surface Elevation at Downstream Side of Comanche Way Culvert (1% Chance Storm Event)
850.1	0.01	850.8	851.1
851.7	0.05	852.3	852.5
851.7	0.08	852.6	852.8
851.7	0.1	852.7	852.9

The FEMA estimated 100-year flood (1% chance) elevation is 853.5-feet. The different scenarios for the 1% chance storm event show the water surface elevation is lower than the FEMA 1% chance flood elevation, indicating that the channel is still functioning to convey water even with increased vegetation.

6.5 Model Uncertainty

In general, all models are approximations, and as such, there is a certain amount of uncertainty in the results. This uncertainty is due to approximations in the input data, simplification of the methods used to calculate flow and level, uncertainty in the measured flow and level data, etc. This model is built following the City's Modeling Guidance document and is calibrated to monitored storm events as described in previous sections. The model was constructed at the watershed-level and is intended to identify flooding problems at that scale. It can be used to determine if the City's flood control goals are met within the watershed. Caution should be exercised when evaluating flooding problems at finer scales, additional refinement of model input parameters may be required.

The model calibration was focused on developing a single set of input parameters that would represent large storm events. Additionally, only a limited amount of calibration data was available for this study. The number of field monitoring locations and the length of the monitoring period were limited. The largest calibration event used in this project was less than a 10-year storm event. There is uncertainty with how model input parameters and the results associated with them project to larger design storm events, such as the 1% chance event. It is believed that the calibrated model accurately depicts the impacts of flooding from storm events because the input parameters are within accepted ranges and the model results correlate to anecdotal flooding information from both City staff and residents.

The model includes a fixed tailwater level to represent the boundary condition for Lake Mendota. This water level varies and can impact flooding associated with a given storm event. An event that occurs during a period of higher lake level would result in increased flooding. The impact of the lake level will also vary throughout the watershed. In general, the closer an area is in elevation to the lake level, the more significant the influence of lake level will be.

As part of the design and implementation of flood mitigation solutions, the City may wish to further evaluate the model uncertainty and consider how mitigation solutions could be impacted.

1. **Design flexibility.** To address model uncertainty, as well as uncertainty associated with changing future conditions, design flexibility could be considered. An example of design flexibility is to consider increases (or decreases) in pipe sizes as part of a storm sewer improvement flood mitigation measure. For instance, a 48-in. diameter storm sewer may be identified as the required size to provide the desired LOS (elimination of surcharging from the 10% chance event). Increased pipe sizes could be considered to determine the added LOS that is provided (i.e., is surcharging prevented in the 4% chance event?). This can then be evaluated to determine if it provides a cost-effective factor of safety/increase in LOS.
2. **Sensitivity analysis.** A sensitivity analysis could be conducted to determine how changes to model input parameters impact the model results and performance of mitigation measures. If changes to input parameters result in only limited impacts, the level of uncertainty associated with the model would be decreased.

Section 7

Public Engagement

As part of the Warner Park and Cherokee Marsh watershed study, the City carried out an extensive public information effort with assistance from BC. In addition to various social media and web-based communication methods, public meetings were held as summarized below. Additional information regarding the public engagement is included in Appendix F.

7.1 Public Information Meeting #1

An initial PIM was held on July 20, 2023, as a virtual meeting via Zoom. The purpose of this meeting was to inform the public of the initiation of the study, provide an overview of what will be accomplished during the study, and to collect feedback from residents on flooding experienced. Additional information, including a copy of the presentation and a recoding of the meeting, are provided on the City's project website: https://www.cityofmadison.com/engineering/projects/warner-park-and-cherokee-marsh-watershed-study.

7.2 Public Information Meeting #2

A second PIM was held on October 21, 2024. This meeting was held virtually and presented an update on the status of the study. The purpose of the meeting was to provide an overview of the work conducted to date, and to display flood inundation mapping for the watershed. The PIM included a presentation and a questions and answer session. Flood inundation mapping for the 10%, 1%, and August 2018 storm events were shared at the meeting. A copy of the presentation and a recording of the meeting are available on the City's project website listed above. In addition, posters showing the flood inundation mapping, and advertising the meeting, were displayed at the Lakeview Library and Warner Park Community Center in advance of the meeting.

7.3 Public Information Meeting #3 & Outreach

The third PIM was held on September 23, 2025. In advance of the meeting a number of outreach activities were undertaken to publicize the forthcoming meeting. The outreach activities were focused on trying to meet residents at community events to share information about the project, gather feedback regarding inundation mapping and past flooding, and to spread awareness for the public meeting. At each of these events a poster was displayed showing the existing conditions flood inundation results. Flyers were also distributed with the inundation results, flood resources, and pertinent information for the public meeting. The events attended were:

- Pizza nights on August 7 and 28 hosted by the Rooted community group at the Troy Farm gardens.
- Parks Alive, hosted by the City's parks department, at Warner Park near Trailsway on August 13.
- Northside Farmer's Market at the Northside Town Center east of Sherman Avenue on August 24 and September 7.

In addition to the community events, the City mailed postcards to residents that lived nearby the existing flood mapping results informing them that the watershed study predicted flooding in their area, in order to share flood risk information directly without residents needing to attend the public meeting, or view the project webpage. The north and east sides of Madison haven't experienced as large of storms as the west side, therefore part of the intent of the outreach was to let neighbors know what areas are at risk of flooding during large storms. Additionally, similar to the second PIM, the City displayed posters showing the flood extents, and advertising the third PIM at the Warner Park Community Center, and Lakeview Library in advance of the meeting. Fliers were available that had additional information and resources about how to prepare for flooding.

At the public meeting, a presentation was provided that summarized existing conditions inundation mapping and provided information regarding proposed flood mitigation measures. The meeting was followed by a general question and answer session. Focus group meetings were then held in breakout rooms to discuss the various proposed mitigation measures. A copy of the presentation and recording of the meeting is available on the City's project website listed above.

Section 8

Proposed Solutions Development

8.1 Overall Evaluation Process Methodology

The process utilized to evaluate potential solutions, and ultimately to select solutions proposed for implementation, is described in the following sections. This section (Section 8.1) includes the process used for solution development. Section 8.2 describes various processes considered, for solutions that were selected and solutions that were not selected.

8.1.1 Data Review

To commence the solutions development process, the existing conditions results were further reviewed to identify constriction points within the watershed. Constriction points were identified by considering existing flooding conditions and identifying the cause, or causes, of flooding at individual areas. Constriction points identified included the following types of areas: where a larger storm sewer discharges into a smaller sewer, a storm sewer that is undersized, and/or the lack of an overland flow path.

8.1.2 Solution Brainstorming

Following the initial data review, discussions were held as part of monthly project update meetings with City Engineering Staff and BC to consider various constriction points across the watershed, discuss conceptual scenarios, and identify potential opportunities for flood mitigation measures. Generally, the evaluation of potential solutions was conducted iteratively, within various areas of the watershed.

8.1.3 Evaluation of Potential Solutions

Following the solutions brainstorming, BC evaluated various potential solutions to flooding. The calibrated existing conditions XPSWMM™ model developed as part of this study was utilized to evaluate the flood control performance of the various potential solutions. Within the XPSWMM™ model, the hydraulic input parameters for various components of the storm water conveyance system were modified to simulate potential improvements. The evaluation of various potential solutions is described below.

1. **Local Storm Sewers:** Throughout the Warner Park and Cherokee Marsh watershed there is also flooding caused by insufficient storm sewer capacity. An initial step of the evaluation of potential solutions was to identify proposed "local" storm sewer improvements. Improvements to these storm sewers can have an impact on the sizing of other mitigation measures such as greenway and relief sewer improvements. To determine potential improvements to these areas the following steps were taken.
    a. Based on the layout of the storm sewer system within the watershed, individual sections of storm sewer were isolated and evaluated for improvements.
    b. Improvements were incorporated into the isolated section of storm sewer with a target of meeting the City's 10% chance event level of service goal.
    c. After the 10% chance event target was met, the 1% chance event was executed in the XPSWMM™ model, and the results were reviewed. Additional storm sewer enhancements

were made until the 1% chance event goal, of maintaining flooding within the right-of-way was met. In cases, where the 1% chance event could not be maintained within the right-of-way an alternative goal of preventing structure flooding was considered.

d. Subsequent sections of the storm sewer system were then evaluated until all areas of local storm sewer were evaluated.

e. The local storm sewer improvements were consolidated into an overall watershed XPSWMM™ model the impacts of the local improvements in conjunction with regional improvements were considered. Local storm sewer were then modified iteratively with regional improvements.

2. **Castle Creek Greenway**: Various modifications to the Castle Creek greenway were considered. Improvements considered included creation of relief sewers, expansion of the greenway, removal and/or expansion of bridges, and conversion of the area to a wet pond.
3. **Regional Stormwater Detention Improvements:** The addition of new detention areas were considered. However, the Warner Park and Cherokee Marsh watershed is nearly fully developed and open space for the creation of detention areas is limited. Open space areas that were identified were deemed to not be suitable for regional stormwater detention because of topography or site usage, such as being existing park space. As a result of these constraints there were no regional detention areas evaluated within the model.
4. **Relief Sewer Improvements:** At several locations around the watershed relief sewers were considered to address existing deficiencies in the drainage system. These relief sewers are generally located within the City ROW in alignments where there are not existing mainline storm sewers.

8.1.4 Discussion of Potential Solutions with City Engineering Staff

During the course of the evaluation of potential solutions various update meetings were held with City Engineering Staff. Ultimately, all areas within the watershed were discussed and consensus reached with City staff prior to, or during, a meeting on April 16, 2025.

8.1.5 Convergence on Solutions

As the evaluation progressed, a set of solutions (described below) were determined to provide the most viable path towards meeting the flood control goals for the project. This convergence of solutions was based upon performance of the solutions, technical feasibility, and the input from City Engineering Staff.

8.1.6 City Agency Meetings

Following the convergence on solutions for the Warner Park and Cherokee Marsh Watershed, City Engineering Staff met with various City of Madison agencies to discuss the potential solutions and challenges/obstacles to implementation of those solutions. A meeting was held with the Public Works Improvement (PWI) team on July 1, 2025, which includes the Mayor’s Office, Water Utility, Operations Department, Streets/Forestry, Transportation Engineering, and Streets Design Division. The attendees of the meeting were supportive of the improvements. The potential solutions, with a focus on proposed improvements within Warner Park were shared with the Parks Commission at a meeting on July 8, 2025.

8.1.7 Other Stakeholder Meetings

City Engineering Staff invited stakeholders who were previously involved in the development of the 2021 Warner Lagoon Water Quality Planning Report to discuss flood mitigation solutions that overlapped both studies. Wild Warner Park, the Yahara Fishing Club, the engineering consultant that assisted in the development of the Warner Lagoon Water Quality Planning Report, and the District 12 Alder attended a meeting held on July 23, 2025. These stakeholders indicated they were supportive of infrastructure improvements. Wild Warner Park offered specific design elements to be considered during detailed design of projects around Warner Park, and a general request was for all the flood mitigation improvement projects to include design elements to enhance sediment trapping, which would be consistent with the prior water quality planning report. The City plans to thoughtfully incorporate water quality elements into the design of all proposed projects during the detailed design phase of each project.

8.1.8 Finalization of Solutions

The solutions developed as part of the discussions with City Engineering staff were deemed feasible and acceptable by other City agencies and the Parks Commission. The meetings did not result in any revisions to the solutions developed and thus, the solutions were finalized.

8.2 Description of Solutions Considered

Stormwater control measures were considered in various locations across the Warner Park and Cherokee Marsh watershed. Ultimately, a variety of solutions were selected for implementation, and there were a number of solutions that were reviewed but not selected. The following sections provide information about all solutions that were considered.

8.2.1 Solutions Reviewed – Not Selected

The following flood mitigation measures were considered as part of the evaluation process; however, they were not selected for implementation. It should be noted that the potential solutions which were reviewed but eliminated from consideration were not evaluated in as much detail as the selected solutions. It may be possible that if the selected solutions cannot be implemented, these solutions could be implemented instead. However, there may be barriers to implementation that were not identified due to the less-thorough evaluation.

8.2.1.1 Trailsway Relief Sewer

1. **Conceptual Project Description:** Install a relief sewer (4-ft by 10-ft box culvert) along Trailsway and continuing west to Warner Lagoon to supplement the capacity of the Castle Creek greenway.
2. **Reason for Exclusion:** Improvements to the greenway would still be required to meet flood mitigation goals. Due to limited elevation difference between Trailsway and the Warner Lagoon elevation, the size of the relief sewer is limited and adequate capacity could not be achieved.

8.2.1.2 Castle Creek Wet Pond

1. **Conceptual Project Description:** Create a wet pond to maximize storage within the Castle Creek greenway along Trailsway. This concept had a larger footprint than the selected solution and resulted in a greater impact to the park, including greater tree loss.
2. **Reason for Exclusion:** Concern regarding permitting, tree loss, and public acceptability.

8.2.2 Solutions Reviewed – Selected

This section provides a brief description of solutions that are selected for implementation as flood mitigation measures in the Warner Park and Cherokee Marsh watershed. The locations of the various solutions are displayed on Figure 8-1. Further detail for each of the proposed solutions is provided in Section 9. The selected solutions generally fall into two categories 1) local storm sewer improvements that are dispersed across the watershed and will be implemented as part of street reconstruction projects, and 2) stand-alone solutions that will be implemented as individual Capital Improvement Plan (CIP) projects.

8.2.2.1 Local Storm Sewer Improvements

1. **Conceptual Project Description:** Improve storm sewers along various streets throughout the watershed. Improvements include increasing pipe size and/or modifying pipe elevations/slopes.
2. **Iterations Considered:** Various pipe sizes were considered.

8.2.2.2 Castle Creek Greenway Improvements

1. **Conceptual Project Description:** Remove concrete cunnette and expand/lower greenway. Remove and replace existing bridges.
2. **Iterations Considered:** Various sizes and configurations of channels and ponds.

8.2.2.3 Warner Park Relief Sewer

1. **Conceptual Project Description:** Construct a 10 by 4ft box culvert to divert runoff west to Warner Lagoon from Sherman Avenue, immediately south of the Warner Park entrance. This project diverts runoff away from the Castle Creek greenway.
2. **Iterations Considered:** Various sizes of the relief sewer were considered in conjunction with improvements to the Castle Creek greenway improvements.

8.2.2.4 Camino Del Sol Relief Sewer

1. **Conceptual Project Description:** Enlarge the existing 48-in. storm sewer to 84in. located parallel to the existing railroad tracks from the intersection of Troy Drive and Camino Del Sol to the Warner Park Lagoon.
2. **Iterations Considered:** Various storm sewer sizes were considered.

8.2.2.5 Lake View Avenue and Drewery Lane Diversion Sewers

1. **Conceptual Project Description:** Install new storm sewers to direct runoff east along Lake View Avenue and Drewery Lane to Hanover Street, where it flows south within improved storm sewers to Warner Lagoon. Existing storm sewers located within private property between Lake View Avenue and Northport Drive are abandoned.
2. **Iterations Considered:** Various storm sewer sizes were considered.

Section 9

Selected Solutions

The selected solutions were introduced in Section 8 of this report. Figure 8-1 shows an overall proposed improvement map for the Warner Park and Cherokee Marsh watershed.

In the following sections, the proposed improvements for the watershed are described in detail. Included is pertinent information regarding the nature of the proposed solutions, the flood reduction benefits, and other considerations. It should be noted that the improvements documented in this report are not meant to be full design-level efforts; they are conceptual solutions that help the City's Engineering Division understand the magnitude of solution needed in a given area to meet the targets. As projects are looked at further, and if they move to the point they are contemplated for programming, projects will then go into a more detailed design phase. The design phase collects detailed data needed and looks at refined design, permitting, and environmental issues associated with the particular project

9.1 Local Storm Sewer Improvements

Detailed Project Description

During this study, BC determined that many of the existing flooding issues in the Warner Park and Cherokee Marsh watershed are a result of undersized local storm sewers that are incapable of conveying peak flows during intense rainfall events. During these events, the undersized pipes operate in a surcharged condition, which pushes stormwater to the ground surface and results in overland flow and flood impacts.

To better understand and ultimately address these issues, BC split the existing conditions XPSWMM™ model for the watershed into smaller sections consisting of relatively independent stretches of storm sewer. These sections were each run separately for the 10% chance event with the model's 2D engine inactive. BC assumed each separate model was drained by a free outfall at the downstream end. Pipes were then upsized iteratively until the 10% chance event met the City's design goal of no surface flooding. Pipes were also lowered, and slopes were modified as needed to meet the flood control goals.

The individual models were then incorporated into the overall watershed model which was run with the 2D engine active. After verifying the proposed pipes continued to meet the 10% chance event goal of no street surcharging in the combined model, BC ran the model for the 4% and 1% chance event. Where the proposed pipes did not meet the 4% and 1% chance event goals, they were further modified until City goals were met, where feasible. It should be noted that there are some locations where goals were not met. These are described in further detail in Section 11.1.

Locations of local storm sewer improvements are shown on Figure 9-1.

Associated Flood Reduction Benefits

As a result of the local storm sewer improvements, the City's flood control goals will be met in various locations throughout the watershed. In general, the benefits associated with local storm sewer improvements occurs in close proximity to where the improvements are proposed.

Project Constraints/Considerations

Because local storm sewer improvements involve the replacement of storm sewer in its existing alignment, there are relatively few project constraints. Work will be contained within City-owned right-of-way and will not impact privately owned property.

Potential conflicts with existing utilities may occur in some locations where upsized pipes must be lowered to maintain cover requirements. As part of this, there are likely to be conflicts with existing water mains and water laterals, which would need to be lowered. There were no sanitary sewer conflicts identified as clearance between storm sewer improvements and sanitary sewer was attempted to be maintained. However, it is anticipated that there will likely be sanitary sewer conflicts that are encountered due to the widespread nature of the local storm sewer improvements. Conflicts encountered can be resolved by lowering sanitary sewer, if feasible, or installing a sanitary sewer siphon.

Water Quality Benefits

Local storm sewer improvements will not provide water quality benefits but during street reconstruction projects, opportunities to install easily maintainable catch basins to capture sediment would be assessed during the design process.

Anticipated Permits

Local storm sewer projects will generally be implemented as part of street reconstruction projects. The location and scale of these projects will vary, and thus, the permits associated with these projects may vary. The following permit requirements are expected;

- City of Madison Erosion Control (any project).
- WDNR/USACE Outfall Permit (potentially applicable for storm sewers discharges to Warner Lagoon, Lake Mendota, or Cherokee Marsh).
- WDNR Construction Site Stormwater NOI (potentially applicable based on size of project).

Additional Notes/Information

Local storm sewer improvements will increase peak flows to downstream discharge locations. The impact of these increased flows should be considered as projects are implemented.

9.2 Castle Creek Greenway Improvements

Detailed Project Description

An existing channel exists on the south side of Warner Park extending from the intersection of Sherman Avenue and Trailsway west into Warner Lagoon. The western portion of the greenway, between Monterrey Drive extended and Warner Lagoon, has a concrete lined bottom. The portion of the greenway adjacent to Trailsway is vegetated, however, it is shallow, with less than three feet of elevation drop between Trailsway and the channel bottom. This section previously had a concrete lined bottom, which was removed and replaced with riprap and vegetation in the early 2010's. This section currently captures sediment, but there is not a way for the City to maintain it and remove the sediment.

The proposed project would remove the concrete channel, widen the channel, and lower the bottom of the channel to create an additional 5.4 ac-ft of storage volume, while allowing the channel to convey higher flows within its banks. Existing bridges would be removed and replaced with new bridges or culverts to increase flow capacity. Within the model culverts were included near the downstream end of the greenway, where the greenway discharges into Warner Lagoon, and at and existing bridge near the intersection of Calypso Road and Trailsway.

The project would include a wet pool within the main channel, along with vernal pools on floodplain benches adjacent to the main channel. A sediment trap would be included at the upstream end. The sediment trap and wet pool within the main channel are easier for the City to perform maintenance and remove accumulated sediment as it aggregates in the channel, before it is washed downstream into the lagoon. Native vegetation would be used to restore and stabilize the channel. Figure 9-2 shows the concept for this project.

Associated Flood Reduction Benefits

The Castle Creek Greenway Improvements would contain runoff within the greenway corridor and reduce flooding of Trailsway and Sherman Avenue. Additionally, building flooding within the Brentwood Neighborhood south of Trailsway would be reduced. It should be noted that these flood reduction benefits are achieved in conjunction with the Warner Park Relief Sewer and Local Storm Sewer improvements within the area.

Project Constraints/Considerations

The project will be located within Warner Park and existing trails, bridges, and athletics fields are present within, or near, the project corridor. The conceptual improvements would be located within the same corridor as the current greenway (i.e. the width is not expanded). Any changes or expansion of the corridor would impact existing and planned park uses and further consideration would be needed. The concept also includes provisions for maintaining trails and connectivity with bridges or culvert crossings. Subsequent design phases should consider trails and connectivity to verify it is incorporated into the design adequately.

A tree survey for the area was conducted by the City as part of a separate planning effort in the area. The results of the tree survey were used to inform the extents and location of the channel improvements. Any improvements in the channel would require tree removal. The planning efforts aimed to avoid impacts on healthy, native trees. Further consideration should be given to tree removal and protection as the project advances.

Parallel to Trailsway the existing channel is shallow with less than 3 ft of elevation difference between the channel bottom and the road. Lowering of the channel is needed to provide the desired level of flood relief and also allow for upstream local storm sewer improvements.

This project will require WDNR wetland and waterway permitting. WDNR mapping identifies the area as a stream and there are wetland indicators present.

Water Quality Benefits

The planned project includes removal of the existing concrete channel, creation of a natural cross section, and inclusion of vernal pools, and a sediment trap. These measures will provide for water quality improvements by trapping sediments and preventing them from reaching Warner Lagoon by creating a more maintainable channel.

Anticipated Permits

The Castle Creek Greenway Improvements will include work within the existing greenway, which is also identified as a stream by WDNR mapping. Substantial permitting requirements are expected based on this designation and the nature of the work. The following permit requirements are expected;

- City of Madison Erosion Control.

- WDNR Construction Site Stormwater NOI.
- WDNR Culvert / Bridge.
- WDNR / USACE Stream Realignment, Dredging, Outfall, and Wetland disturbance.

Additional Notes/Information

The greenway improvements should be implemented prior to upstream local storm sewer improvements to allow those sewers to function properly.

The Warner Park Relief Sewer (See Section 9.3) will divert runoff away from the Castle Creek Greenway. Changes in flows that will result from implementation of that project should be considered. This project assumed all upstream projects were implemented in conjunction with the Castle Creek Greenway Improvements, including local storm sewers and the relief sewer. The existing flows that reach the greenway as compared to future flows may need to be considered as part of the design.

The greenway is located immediately upstream of Warner Lagoon. Generally, the water level of the lagoon is equal to the level of Lake Mendota. Fluctuations in lake level will impact the greenway. Periods of high water will result in backwater into the greenway and elevated water levels. This will impact the flood control performance of the greenway improvements. It may also impact the aesthetics and survival rate of vegetation in the channel and should be considered in any restoration plan.

9.3 Warner Park Relief Sewer

Detailed Project Description

Under existing conditions a storm sewer flowing south along Sherman Avenue discharges into the upstream end of the Castle Creek Greenway just south of the entrance into Warner Park from Sherman Avenue. The Warner Park Relief Sewer would connect to the existing storm sewer and divert flow west to Warner Lagoon. The relief sewer would be a box culvert ranging in size from 8 by 4ft to 10 by 4ft and be approximately 1,600ft long. The conceptual route for the relief sewer is located south along the south edge of the parking lot. Figure 9-3 shows the concept for this project.

Associated Flood Reduction Benefits

The project works in conjunction with upstream local storm sewer improvements to meet the City's level of service goals for areas upstream of the relief sewer, particularly to reduce flooding along Sherman Avenue and Northport Drive. Additionally, the project will divert runoff away from the Castle Creek Greenway. This will work in conjunction with improvements to the greenway near Trailsway to reduce flooding south of Warner Park.

Project Constraints/Considerations

The relief sewer route used for this project would run along the southern edge of the existing parking lot. This route would reduce impacts to the parking lot and avoid existing storm sewer and ponds associated with the parking lot. The current project layout would create a new outfall into Warner Lagoon. This may require a WDNR outfall permit. An alternative route could run through the parking lot and become integrated with the private storm sewer and ponds within the parking lot. This may assist in reducing flooding within the parking lot and eliminate the need for a permit.

The project also diverts runoff from the Castle Creek greenway. The storm sewer being diverted is the primary contributor of flow to the portion of the greenway that is parallel to Sherman Avenue. Diversion of this runoff will change the characteristics of the flow in this part of the greenway.

Smaller storm sewers along Sherman Avenue would continue to discharge into the greenway. The impact of the diversion should be considered on the greenway.

Water Quality Benefits

While there are not water quality benefits from the relief sewer itself, the City would investigate ways to treat the stormwater either with the diversion pipe project, and/or with storm sewer upgrades upstream.

Anticipated Permits

Associated with the Warner Park Relief Sewer the following permit requirements are expected;

- City of Madison Erosion Control.
- WDNR/USACE Outfall Permit.
- WDNR Construction Site Stormwater NOI.

Additional Notes/Information

The relief sewer should be installed prior to upstream local storm sewer improvements.

9.4 Camino Del Sol Relief Sewer

Detailed Project Description

Existing storm sewer along Wisconsin Southern Railroad extending from Troy Drive, past the southern end of Camino Del Sol, and to the southeast to Warner Lagoon would be replaced. An existing 48-in. storm sewer would be enlarged to 84in. from Camino Del Sol to Warner Lagoon. From Troy Drive to Camino Del Sol a 7 by 5ft box culvert would be installed to replace the existing storm sewer. Figure 9-4 shows the concept for this project.

Associated Flood Reduction Benefits

The project would prevent structure flooding for the 1-percent chance storm event along Camino Del Sol and surrounding areas. The City's 10-percent chance storm event level of service goal would also be met.

Project Constraints/Considerations

The project will be located adjacent to an existing railroad. Coordination with Wisconsin Southern railroad will be required. The project will likely be required to obtain permits from the railroad. It is anticipated that archaeological impacts will need to be investigated.

Water Quality Benefits

While there are not water quality benefits from the relief sewer itself, the City would investigate ways to treat the stormwater either with the diversion pipe project, and/or with storm sewer upgrades upstream.

Anticipated Permits

Associated with the Camino Del Sol Relief Sewer the following permit requirements are expected;

- City of Madison Erosion Control.
- WDNR/USACE Outfall Permit.
- WDNR Construction Site Stormwater NOI.
- Wisconsin Southern Railroad permit for work within railroad right-of-way.

Additional Notes/Information

The relief sewer should be installed prior to upstream local storm sewer improvements.

9.5 Lake View Avenue and Drewery Lane Diversion Sewers

Detailed Project Description

West of Hanover Street, Lake View Avenue and Drewery Street are unimproved roadway without curb and gutter. The existing drainage system along these roads consists of a mix of storm sewers, culverts, and roadside swales. In some locations runoff can flow directly to the south off the roadways and onto private property. Storm sewer in the area runs north-south through private property and easements. The poorly defined drainage system and undersized storm sewer and culverts contribute to flooding in the area.

The proposed project would install storm sewer to convey runoff to the east along both Lake View Avenue and Drewery Lane to Hanover Street. At Hanover Street existing storm sewer would be replaced to convey runoff to the south. Improvements would continue along Troy Drive, and within the northwest corner of Warner Park prior to discharging to Warner Lagoon.

Storm sewer sizes along Lake View Drive and Drewery Lane range in size from 18in. to 29in. by 45-in. HERCP. The Hanover Street storm sewer would start as a 36-in. pipe and increase in size up to an 8 by 4ft box culvert within Warner Park. As part of the project the existing storm sewer running north-south through private property between Lake View Avenue and Northport Drive would be abandoned, or disconnected from the main line pipe and only provide very localized drainage for the properties adjacent to it. Figure 9-5A and 9-5B show the concept for this project.

Associated Flood Reduction Benefits

The project would prevent overland flow through private property to the south from Lake View Avenue and Drewery Avenue. Under existing conditions overland flow through private property impacts various structures south of Lake View Avenue and north of Northport Drive. The proposed storm sewer would prevent this overland flow for the 1-percent chance storm event.

Project Constraints/Considerations

Urbanization of Lake View Avenue and Drewery Lane was assumed as part of the project to collect runoff and direct it into the proposed storm sewer. The analysis showed that curb and gutter is needed to allow water to be collected. Without curb and gutter runoff from portions of Lake View Avenue and Drewery Lane flows directly south onto private property.

The project proposes to abandon, or disconnect existing storm sewer from the main line. Private connections will remain in place to serve properties from the interior of the block. These storm sewers will need to be further reviewed to understand if there are private connections that need to be considered as part of pipe abandonment.

Portions of the storm sewer within Lake View Avenue, Hanover Street, and Drewery Lane are more than 15 ft deep and as much as 22 ft deep within Drewery Lane. This will create challenges with construction. The use of trenchless construction methodology may be desirable. Additionally, sanitary sewer conflicts existing within both Lake View Avenue and Drewery Lane. The City plans to reconstruct the sanitary sewer system in addition to the storm sewer. These plans would need to resolve conflicts.

Water Quality Benefits

There would be no water quality benefits associated with the diversion sewers but opportunities to install easily maintainable catch basins to capture sediment would be assessed during the design process.

Anticipated Permits

Associated with the Lake View Avenue and Drewery Lane Diversion Sewers the following permit requirements are expected;

- City of Madison Erosion Control.
- WDNR/USACE Outfall Permit.
- WDNR Construction Site Stormwater NOI.

Section 10

Evaluation of Model Results with Selected Solutions Implemented

The XPSWMM™ model that included all of the selected solutions ("Proposed Conditions") was executed for each of the design storms. Table E-2 in Appendix E summarizes the peak water surface elevation at selected locations throughout the Warner Park and Cherokee Marsh watershed. Figure 6-1 provides the location of each of the reporting locations in Table E-2. The "Maximum Water Depth" with the selected solutions implemented maps for each modeled event are found on Figures 10-1 through 10-7 (rain events from the 50% chance to the 0.2% chance events).

10.1 Comparison to City Flood Control Goals with Selected Solutions

The proposed conditions flooding results were compared to the City's flood control goals to quantify the performance of the selected solutions in the Warner Park and Cherokee Marsh watershed. The performance of the system relative to greenway crossings, pipe capacity, and street flooding were considered.

10.1.1 Greenway Crossings

At locations where a greenway crosses under a street the City's goal is to safely pass the 1% chance event without overtopping the street. The crossing was determined to be overtopped if the elevation at the upstream side of the culvert is above the street crossing elevation. Within the Warner Park and Cherokee Marsh watershed there are two greenway crossings. The existing and proposed conditions performance, whether the street is overtopped, at these locations is summarized in Table 10-1.

Table 10-1. Greenway Crossing Performance
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Location	Existing 1% Chance Event Performance	Proposed 1%Chance Event Performance
Comanche Way	Meets Criteria	Meets Criteria
Meadow Valley Drive	Meets Criteria	Meets Criteria

10.1.2 Pipe Capacity

The City's goal is to eliminate surcharging from the storm sewer system onto city streets for up to the 10% chance event. The pipe capacity was determined to be exceeded if the peak water surface elevation at the upstream end of the pipe was above the ground surface elevation. Under existing conditions there are 43 percent of the pipes and 47 percent of the pipe length that do not meet the pipe capacity goal (See Section 6.2.1.3).

Within the proposed conditions XPSWMM™ model, there are a total of 615 pipes, of which 53 are surcharged at the upstream end during the 10% chance event. This equates to 8.6 percent of the pipes not meeting the pipe capacity goal. The 615 pipes result in a total pipe length of 87,800ft, of which 6,600ft are surcharged during the 10% chance event. This equates to 7.5 percent of the pipe length not meeting the capacity goal. This is an improvement in the length of pipe meeting the capacity goal of 40 percent.

10.1.3 Street Flooding

Within streets, the City's goal is to maintain drivability of municipal streets for the 4% chance event. Drivability is defined as having no more than a 100-ft segment of roadway with 0.5ft, or more, of flooding at the center of the street. Within the watershed there are a total of 49.8 miles of streets. Under existing conditions, 3.4 miles (7 percent) of the streets do not meet the goal.

With the selected solutions implemented, the length of streets that do not meet the street flooding goal is reduced to 0.04 miles (less than 1 percent). This is a 7 percent increase in the length of streets meeting this target.

10.1.4 Structure Flooding

The City's goal is to eliminate structure flooding during the 1% chance event. Structure flooding is defined as having 0.5ft or more water within 5ft of a building. Under existing conditions, structure flooding is identified at 232 structures.

In proposed conditions, this is reduced to 25 structures. Of this total, 16 are accessory structures such as sheds or detached garages. It is believed that the majority of structures that are flagged to be impacted under proposed conditions are a result of nuances of the XPSWMM™ model. The locations where structure flooding was identified under the selected solutions were evaluated in further detail. The analysis conducted is described in Section 11.3.

10.2 Improvements to Known Flooding in Watershed from Selected Solutions

In Section 1-3, known flooding areas in the watershed were identified. The areas that were identified are shown on Figure 1-3. The selected solutions were generally targeted at meeting the City's flood control goals throughout the watershed. Known flooding locations were also considered as part of the process. The following text summarizes how known flooding locations are impacted by selected solutions for four distinct areas.

1. Trailsway & Sherman Avenue
    a. Solutions that Benefit Area: The Warner Park Relief sewer diverts runoff away from this area and the Castle Creek Greenway improvements provide direct flood relief by containing runoff within the greenway area. Local storm sewer improvements assist in providing proper conveyance through the area to the greenway.
    b. Flood Reductions Observed: In the 10% chance event, street flooding is greatly reduced, with minor flooding remaining due to the low elevation of the roads in comparison to the greenway and Lake Mendota. All streets meet the criteria for the 4% chance storm sewer. In the 1% chance event structure flooding in the area is reduced to a single accessory building.
2. Southeast of Warner Park (east of Sherman Avenue and south of Windom Way)
    a. Solutions that Benefit Area: Local storm sewer improvements reduce the impact of flooding at this location. The Castle Creek Greenway improvement reduce downstream tailwater levels to aide in the performance of the local sewer improvements.

   b. **Flood Reductions Observed**: The 10% chance event storm sewer capacity goal and the 4% chance event street drivability goals are fully met in this area and structure flooding in the 1% chance event is reduced.

3. **Delaware Boulevard**
   a. **Solutions that Benefit Area**: Local storm sewer improvements reduce the impact of flooding along Delaware Boulevard.
   b. **Flood Reductions Observed**: Delaware Boulevard (and adjacent streets) meet the road drivability criteria for the 4% chance storm event and the pipe capacity goal for the 10% chance event. Structure flooding is also eliminated in the area for the 1% chance event.
4. **Troy Drive / Camino Del Sol**
   a. **Solutions that Benefit Area**: The Camino Del Sol relief sewer and adjacent local storm sewer improvements benefit this area.
   b. **Flood Reductions Observed**: Troy Drive and Camino Del Sol meet the meet the road drivability criteria for the 4% chance storm event and the pipe capacity goal for the 10% chance event. Building flooding is also reduced such that there is only one primary structure and four accessory structures identified as impacted by the 1% chance event.

10.3 Discussion of Long Duration, Back-to-Back Model Results

As with the existing conditions, an additional design storm model run was conducted to represent the extreme condition of "back-to-back" 1% chance events occurring (See Section 6.3). The XPSWMM™ model with the selected solutions was executed for this back-to-back storm. The modeled results of the maximum water depth map for this event is shown on Figure 10-8 and tabular results are shown in Table E-2. Under the selected solutions scenario, the flooding depth and extents during the back-to-back storm event scenario is reduced. The largest reductions in flooding are observed in upstream areas where the conveyance capacity is improved as a result of the selected solutions.

Section 11

Areas Where Flood Control Goals are Not Met

In most of the Warner Park and Cherokee Marsh watershed, the City's flood control goals are met. In limited locations, there are cases where the goals are not met. Further consideration of areas not meeting the LOS goals are provided in this section. Additionally, an analysis was conducted to determine added infrastructure improvements that would be required to prevent structure flooding for the 0.2% chance event (see Section 12).

11.1 10% Chance Storm Event

As part of the selected solutions scenario, 53 sewers are flagged as not meeting the pipe capacity LOS target. As observed on the proposed conditions inundation mapping, the inundation depths associated with these storm sewers are generally shallow. Refinement of the model during subsequent planning, design and implementation phases for solutions can verify pipe sizing and confirm whether the LOS is met. Refining the model could include revising topographic data (such as supplementing LiDAR data with survey data), decreasing the grid size in specific locations of interest, splitting subwatersheds, and/or adding additional storm sewer such as inlets, inlet leads, or smaller storm sewer. In these locations the storm sewer improvements could be refined, and sizes potentially increased to provide a greater level of flood protection. The general locations of storm sewers not meeting the criteria are described below.

- A number of storm sewers within Warner Park and adjacent to Warner Lagoon are flagged as not meeting the 10% chance event LOS criteria. Improvements to the storm sewer within the parking lot were not considered as part of this analysis.
- Storm sewers on Calypso Road, Fremont Avenue, and Sherman Avenue that are near Trailsway and the Castle Creek greenway are flagged. At the downstream end of these sewers, the elevation of Castle Creek and the Lake Mendota water surface impact these sewers. There is limited elevation difference between the street and the normal water level of Lake Mendota / Castle Creek. This backwater impact extends upstream.
- Adjacent to existing ponds along Wheeler Road and Knutson Drive where backwater from the ponds impact the pipes.

11.2 4% Chance Storm Event

A single location does not meet the LOS criteria in the 4% chance event. This is Toban Drive, between Troy Drive and Blaine Drive. This street is upstream of the Camino Del Sol relief sewer and includes local storm sewer improvements. The model results show this location meets the 10% chance goal for storm sewer capacity and flood depths of approximately 0.6ft for the 4% chance event. In this location there are challenges with sanitary sewer mains and pipe cover. Box culvert is proposed downstream of Toban Drive and elliptical pipes are proposed on Toban Drive. Refinements during subsequent planning and design can verify these pipe sizes and determine if the sewer improvements could be modified to meet the 4% chance event target at this location.

11.3 1% Chance Storm Event

As noted in Section 10.1.4, there are 25 structures that were identified as flooded under the selected solutions scenario. Each of these structures were evaluated in greater detail to determine the nature of the flooding and the additional capacity needed to eliminate the flooding. It is believed that, for the majority of these structures, the identification that they are flooded is due to specific topographic conditions within the XPSWMM™ model.

To attempt to quantify the additional drainage system capacity that would be required to prevent flooding, the following methodology was followed. Within the XPSWMM™ model, a new node was added to collect runoff from near the flooded structure. This node was connected to a hypothetical pipe that was given a free outfall, meaning that any runoff collected by the node was discharged directly from the model. The added pipes were given a 5-ft diameter and a 1% slope to allow free passage and discharge of runoff. This was a theoretical analysis and not representative of the exact size of improvements needed. The volume and peak runoff rate discharged through the outfall was measured to quantify the extent of additional capacity needed to resolve flooding. The model was then executed for the 1% chance event. Based on the review of the structures impacted by flooding, the following observations were made.

- Sixteen of the impacted structures (7 primary and 9 secondary) are associated with local storm sewer improvements. In general, these locations are associated with a small amount of runoff. The maximum volume discharged through the added outfall is 0.4 ac-ft. The detailed nuances of the modeling described above are identified as occurring in the vicinity of the various local storm sewer impacted structures.
    - The majority of these flooding locations are triggered by limitations of the XPSWMM™ 2D model. The results were observed to show that shallow overland flow becomes trapped against a building and results in triggering the flooding criteria. The 2D model uses a 10-ft grid system to simulate overland flow. The grid size is reflective of a watershed study of this nature. However, it does not have the ability to capture, and simulate, all of the nuances within an urban area. For instance, the detailed grading surrounding a building may not be captured by the grid, or the 6-in. curb depth of a road might not be fully captured.
    - In some locations there may be private storm sewer present that is not incorporated into the model. The private storm sewer may prevent flooding if accounted for in the model.
    - Refinement of the model during subsequent planning, design and implementation phases for solutions can verify pipe sizing and confirm whether structures are flooded or not. Refining the model could include revising topographic data (such as supplementing LiDAR data with survey data), decreasing the grid size in specific locations of interest, splitting subwatersheds, and/or adding additional storm sewer such as inlets, inlet leads, smaller storm sewer, or private storm sewer. Additionally, further structure elevation data (such as first floor or low opening elevations) could be obtained to verify where the structure would be flooded.
    - A final possibility in these locations is that the storm sewer improvements could be refined, and sizes potentially increased to provide a greater level of flood protection.
- Five of the structures (1 primary structure and 4 secondary structures) are near the Camino Del Sol Relief Sewer. The added outfalls show a total volume of 0.4 ac-ft impacting these structures and a peak flow rate of 18cfs. The primary residence is flagged as inundated based on the back corner of the structure being impacted. Based on LiDAR data, this back corner is approximately 3ft lower than the front of the house. It is not clear whether the structure is impacted or if there is simply insufficient model resolution in this area. In this area there are challenges with sanitary

sewer mains and pipe cover. Box culvert and elliptical pipes are proposed. Refinements during subsequent planning and design can verify these pipe sizes and determine if the sewer improvements could be modified to meet the 4% chance event target at this location. During final design, a more detailed survey should be conducted in this area, and the model should be refined to verify whether the structures will be impacted.

- One secondary structure near the intersection of Trailsway and Sherman Avenue is impacted by flooding. This is at the upstream end of the Castle Creek Greenway Improvements and also in the proximity of local storm sewer improvements. The structure is identified as flooding due to runoff exceeding the capacity of local storm sewer improvements and flowing across a parking lot towards Castle Creek. Detail elevation information for curbs and potential private storm sewer may impact this area. As part of detailed design, additional information should be collected, and the model can be refined. The storm sewer design can also be evaluated and optimized to attempt to further lower peak water surface elevations if needed.
- One structure is a residential property located adjacent to the TPC Wisconsin golf course. The rear of the structure is identified as being impacted by one of the private ponds within the golf course. There is significant elevation change across the property (approximately 7ft). It is not clear whether the structure is impacted or if there is simply insufficient model resolution in this area. Improvements within the golf course were not considered as the property is privately owned and was recently redeveloped.
- One structure is a secondary building located within TPC Wisconsin golf course. This structure is adjacent to one of the private ponds within the golf course. Improvements within the golf course were not considered as the property is privately owned and was recently redeveloped.
- One structure is a secondary building located west of Vera Court, adjacent to railroad tracks. There is a lack of stormwater infrastructure and a poorly defined swale along the railroad tracks. Runoff from the railroad tracks is shown to flow through properties along Vera Court. The added outfall in this area discharges 0.2 ac-ft of runoff. More detailed evaluation and consideration for potential private storm sewers or culverts to understand the flooding in this area and determine if additional improvements are needed.

Section 12

Climate Resiliency Analysis

An additional piece of this study was to consider the potential to provide additional flood relief for larger storm events. This analysis focused on the 0.2% chance event and preventing structure flooding for this event. This would represent increasing the level of service for structure flooding from the City's current goal of the 1% chance event to the larger, 0.2% chance event. This would provide an increased level of resiliency within the stormwater management system.

Under existing conditions, there are 443 structures within the Warner Park and Cherokee Marsh Watershed impacted by flooding in the 0.2% chance event. With the implementation of the selected solutions, the number is reduced to 203 structures impacted. The study considered the level of effort needed to prevent structure impacts from the 0.2% chance event. To consider this evaluation the sizes of the selected solutions were modified to prevent structure flooding during this storm event. The selected solutions XPSWMM™ model was utilized as the starting point for the 0.2% chance event improvement scenario. The model was updated to reflect the increased infrastructure size required to prevent structure flooding for the 0.2% chance event. Below is a summary of the changes to the selected solutions. As a result of these improvements the number of structures impacted by during the 0.2% chance event is reduced to 23 structures.

- Throughout the watershed, the sizes of local storm sewer and relief sewer improvements were increased. This included increases to storm sewers that were included as part of the selected improvements and enlargements of additional sewer that were previously not identified for improvement. The enlargement of storm sewers was conceptual in nature. Generally, the storm sewer was evaluated as a box culvert or elliptical pipe. An example would be where previously a circular storm sewer was planned it was changed to an elliptical pipe with a similar height. The elliptical pipe has a greater width, and thus an increased capacity. Where box culverts were previously proposed the width was increased.
- The outfall from Warner Lagoon was increased to be a box culvert. This improvement was required to prevent backwater from the lagoon impacting structures.

Figure 12-1 provides a graphical depiction of the improvements included as part of this scenario. Table G-1 in Appendix G provides the pipe size increases included in the 0.2% chance event enhancement scenario. This table identifies the existing pipe size and peak flow rate, the pipe size and peak flow rate in the selected scenario, and the pipe size and peak flow rate in the enhanced scenario. The analysis was completed to assist in determining whether additional capacity could reasonably be added to provide a higher level of protection. The pipe sizes were not optimized, and flooding may be "over solved" in some areas. The pipe sizes along with the flow rates included in the table provide insight into the relative increase needed to provide flood protection for the 0.2% chance event.

Section 13

Cost Estimating

During the course of this study, planning level cost estimates were prepared for each of the stand-alone solutions described in Section 10. The following paragraphs describe the methodology used for estimating costs. Cost estimates were not prepared for local storm sewer improvements. In general, these improvements will be implemented in conjunction with street reconstruction projects. The costs associated with these storm sewer improvements will be developed by the City as they are scheduled for implementation in the City's five-year CIP.

To prepare the cost estimates, estimated quantities were developed for the project. The City of Madison provided average units costs for typical bid items included as part of storm water improvement projects. The standard unit costs were adjusted by BC based on specific project conditions that may result in higher, or lower, than average unit costs.

The total estimated cost for each of the stand-alone projects is provided in Table 13-1. Detailed breakdowns of the cost estimates for each project are included in Appendix H.

Table 13-1. Stand-Alone Project Cost Estimates
Warner Park and Cherokee Marsh Watershed Study
City of Madison, WI

Project	Estimated Cost
Castle Creek Improvements	$2.51 million
Warner Park Relief Sewer	$3.87 million
Camino Del Sol Relief Sewer	$3.90 million
Lake View & Drewery Diversion Sewers	$1.81 million
Lake View Diversion Downstream Sewer	$4.43 million

Section 14

Implementation Sequence

14.1 Watershed Specific Implementation Requirements

Implementation of individual selected solutions in the watershed can impact other parts of the watershed. For instance, implementing a conveyance improvement project could have a negative impact on a downstream area by increasing peak flows to the downstream area. Within the Warner Park and Cherokee Marsh watershed there is some flexibility with implementing the various selected solutions. The following guidelines for implementation are provided.

1. Storm sewer improvements, including local storm sewer and relief sewers, should generally be implemented from downstream to upstream to prevent increased downstream flooding. However, these improvements will typically be implemented with road reconstruction projects. A variety of other factors contribute to the scheduling road reconstruction projects. These factors may dictate that projects are implemented outside of the preferred sequence. As part of this approach, the specific improvements can be reviewed as part of the design process to determine if any temporary measures, such as bulkheads or restriction plates, are needed to offset downstream concerns.
2. The Castle Creek Greenway improvements should be implemented prior to local storm sewer improvements located upstream.
3. The Warner Park Relief Sewer will divert runoff away from the Castle Creek Greenway. This will ultimately improve the flood reduction achieved by the greenway improvements. Local storm sewer improvements upstream of the greenway will also result in increased flows to the greenway. The complexity of how flows to the greenway will change as various improvements are implemented was not evaluated as part of this study. Implementation of the greenway improvements are expected to have an immediate benefit to flooding in the area; however, additional evaluation would be needed to understand the impact and how it may change with implementation of additional projects.

14.2 Citywide Implementation Prioritization

The City is conducting similar watershed studies for all the watersheds in the City. All watersheds are expected to have numerous recommendations resulting from the studies. As part of the overall program management for the watershed studies program, the City has developed a process to rank and prioritize the order in which the solutions might be implemented if and when funding and public support are obtained. The development of this process included public outreach to identify factors important to the public in ranking of solutions. Various factors are considered including flood reduction, impact to emergency service access, vulnerability of the area impacted, project cost, and water quality benefits. The prioritization process is reviewed and updated annually as new studies are completed and the City undertakes updates to the five-year capital improvement plan.

Section 15

Next Steps

As part of the process to complete the watershed study this report will go through the following process.

1. The report will be posted for a 30-day public comment period. Following which public comments will be addressed.
2. The report will be presented for approval at a meeting of the Board of Parks Commissioners.
3. The report will be presented for approval at a meeting of the Board of Public Works.

Following these steps the report will be finalized. The report will then be shared internally with City design staff that may implement, or be impacted by, solutions included within this study. The report will also be shared internally with the Common Council and other City agencies. External outreach will also continue with the report being shared with various project stakeholders, such as, those involved in the Warner Lagoon Water Quality Plan.

Section 16

Limitations

This document was prepared solely for City of Madison (City) in accordance with professional standards at the time the services were performed and in accordance with the contract between the City and Brown and Caldwell (BC) dated February 6, 2023. This document is governed by the specific scope of work authorized by the City; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Further, BC makes no warranties, express or implied, with respect to this document, except for those, if any, contained in the agreement pursuant to which the document was prepared. All data, drawings, documents, or information contained this report have been prepared exclusively for the person or entity to whom it was addressed and may not be relied upon by any other person or entity without the prior written consent of BC unless otherwise provided by the Agreement pursuant to which these services were provided.

Section 17

References

Section 3.2 describes the specific files and data sources used in the development of the XPSWMM™ model. Below is a list of additional sources of information consulted or referenced during this study.

Dane County Land & Water Resources Department. Lake Levels and Information. https://lwrd.countyofdane.com/Lake-Levels

City of Madison Engineering Division & City of Madison Parks Division. 2021. *Warner Lagoon Water Quality Planning Report*.

United States Department of Agriculture, Natural Resources Conservation Service. Web Soil Survey. https://websoilsurvey.nrcs.usda.gov/app/

Wisconsin Department of Natural Resources. Surface Water Data Viewer. https://dnr.wi.gov/topic/surfacewater/swdv/

Figures

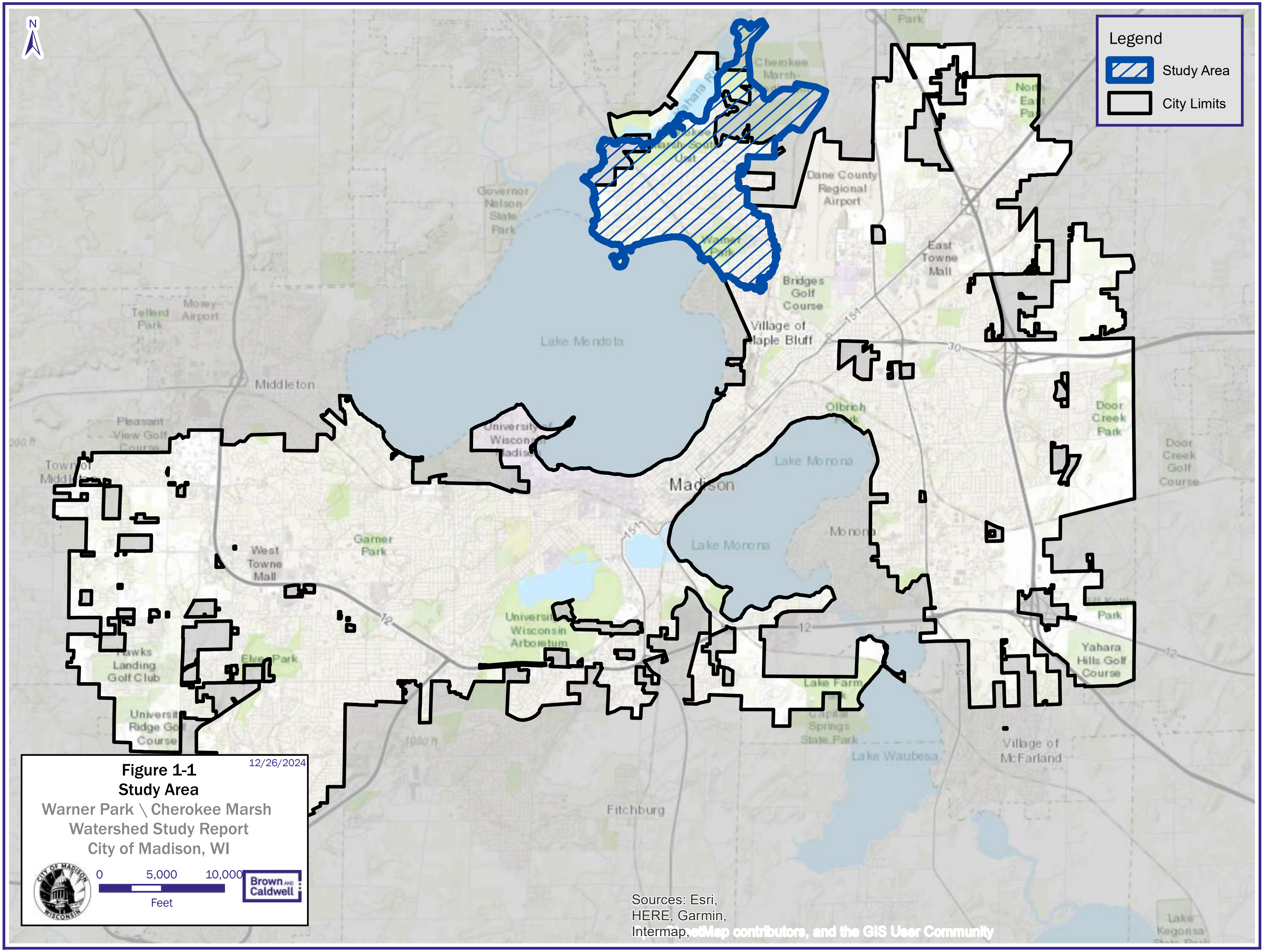

Figure 1-1
Study Area

Warner Park \ Cherokee Marsh
Watershed Study Report
City of Madison, WI

12/26/2024

0 5,000 10,000
Feet

Brown AND Caldwell

Path: V:\159753-Madison_WarnerParkWatershedStudy_GIS_MXDs\ReportFigures\Fig1-1-LocationMap.mxd

4/16/2024

Figure 1-2
Watershed Map
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Air Photo: City of Madison, 2020

Path: V:\159753-Madison_WarnerParkWatershedStudy_GIS_MXDs\ReportFigures\Fig1-2-Watershed.mxd

1/29/2026

Figure 1-3
Flood Report Data
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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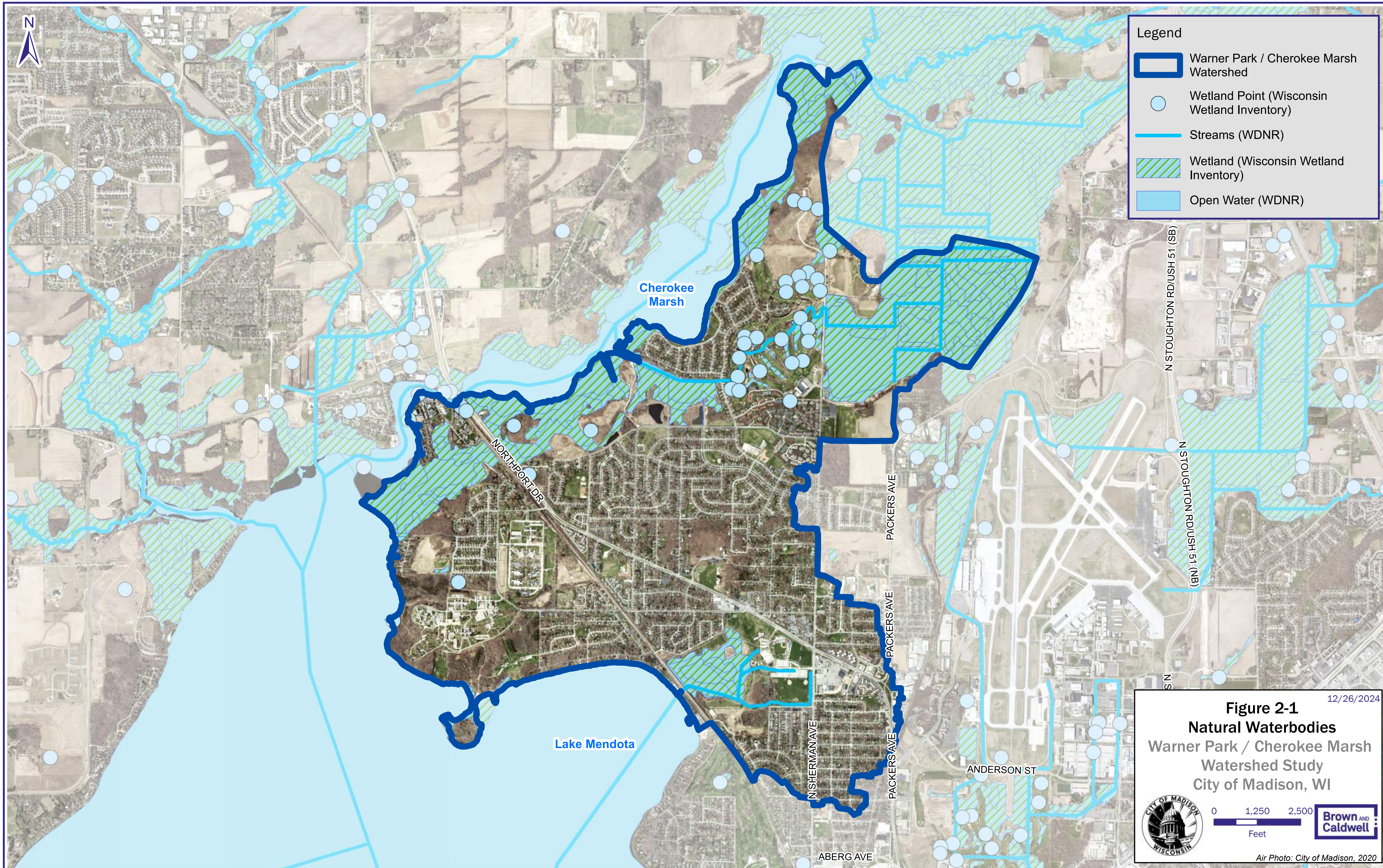

Figure 2-1
Natural Waterbodies
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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1/29/2026

Figure 2-2
Existing Drainage System
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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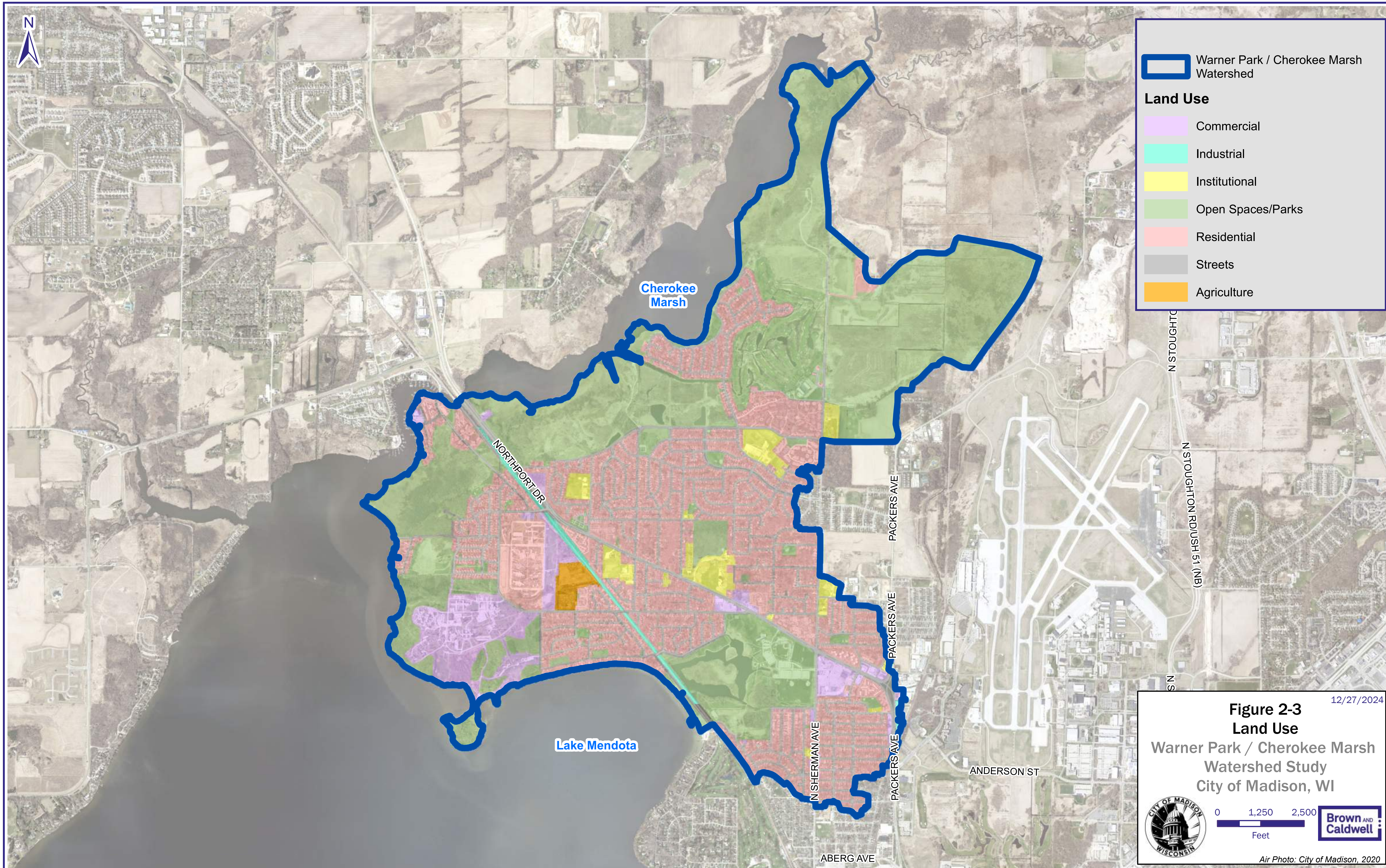

12/27/2024

Figure 2-3
Land Use
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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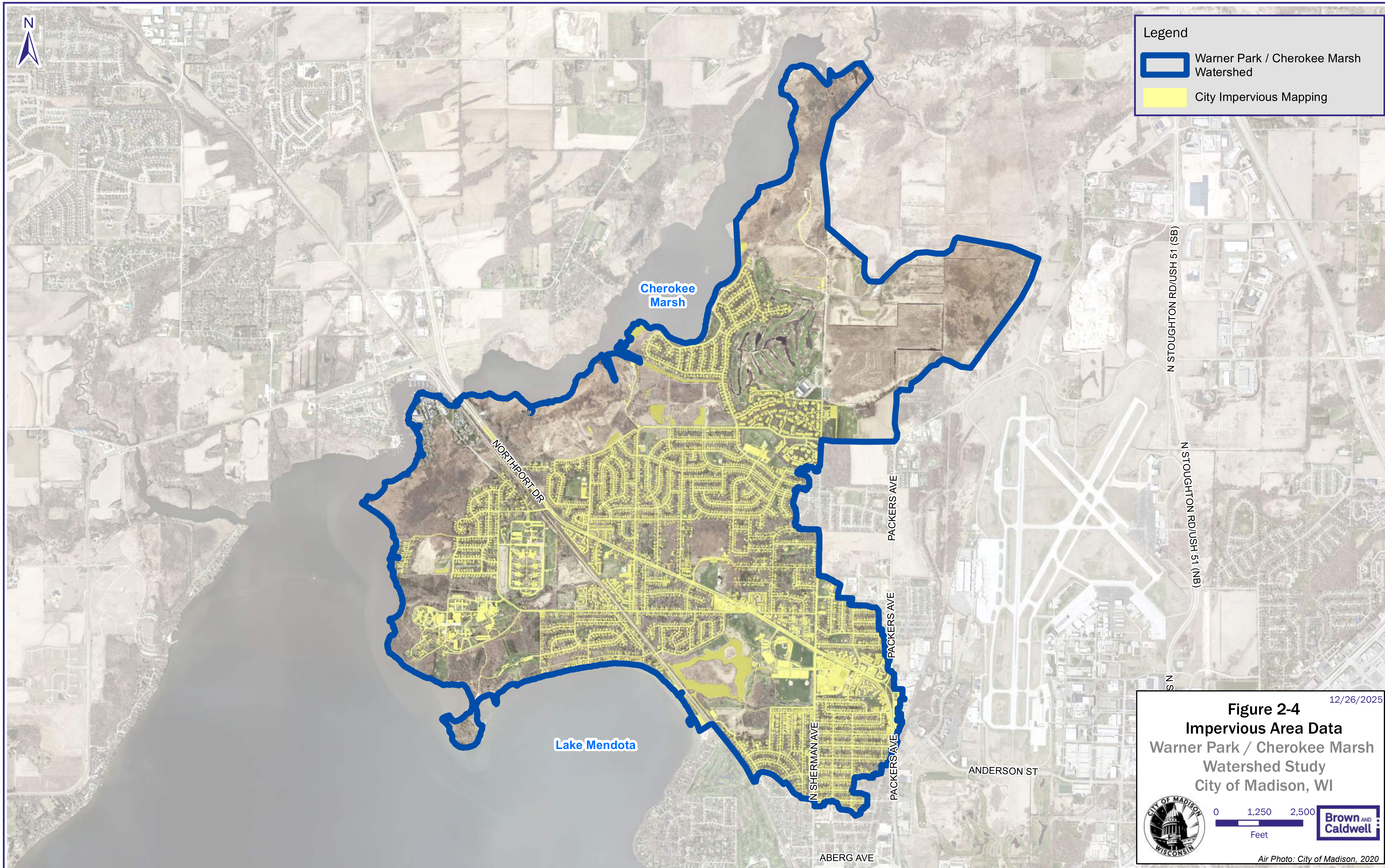
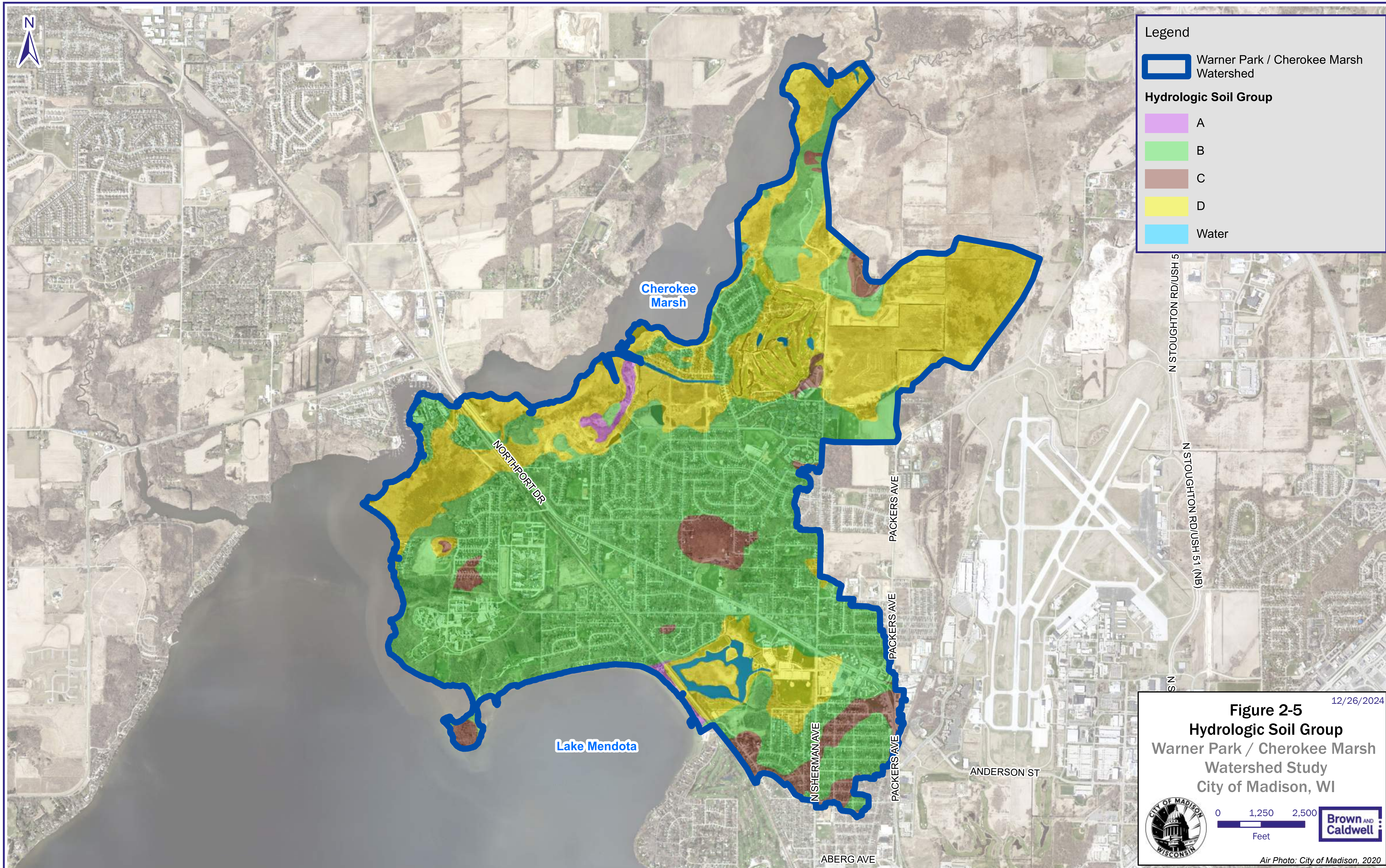


12/26/2025

Figure 2-4
Impervious Area Data
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI



12/26/2024

Figure 2-5
Hydrologic Soil Group
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

12/26/2024

Figure 4-1
Rain Gage Locations
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Path: V:\159753-Madison_WarnerParkWatershedStudy_GIS_MXDs\ReportFigures\Fig4-1 Rain Gage Locations.mxd

12/26/2025

Figure 4-2
Subwatersheds Map
Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

12/26/2024
Figure 4-3
Horton Infiltration Adjustments
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI
Air Photo: City of Madison, 2020

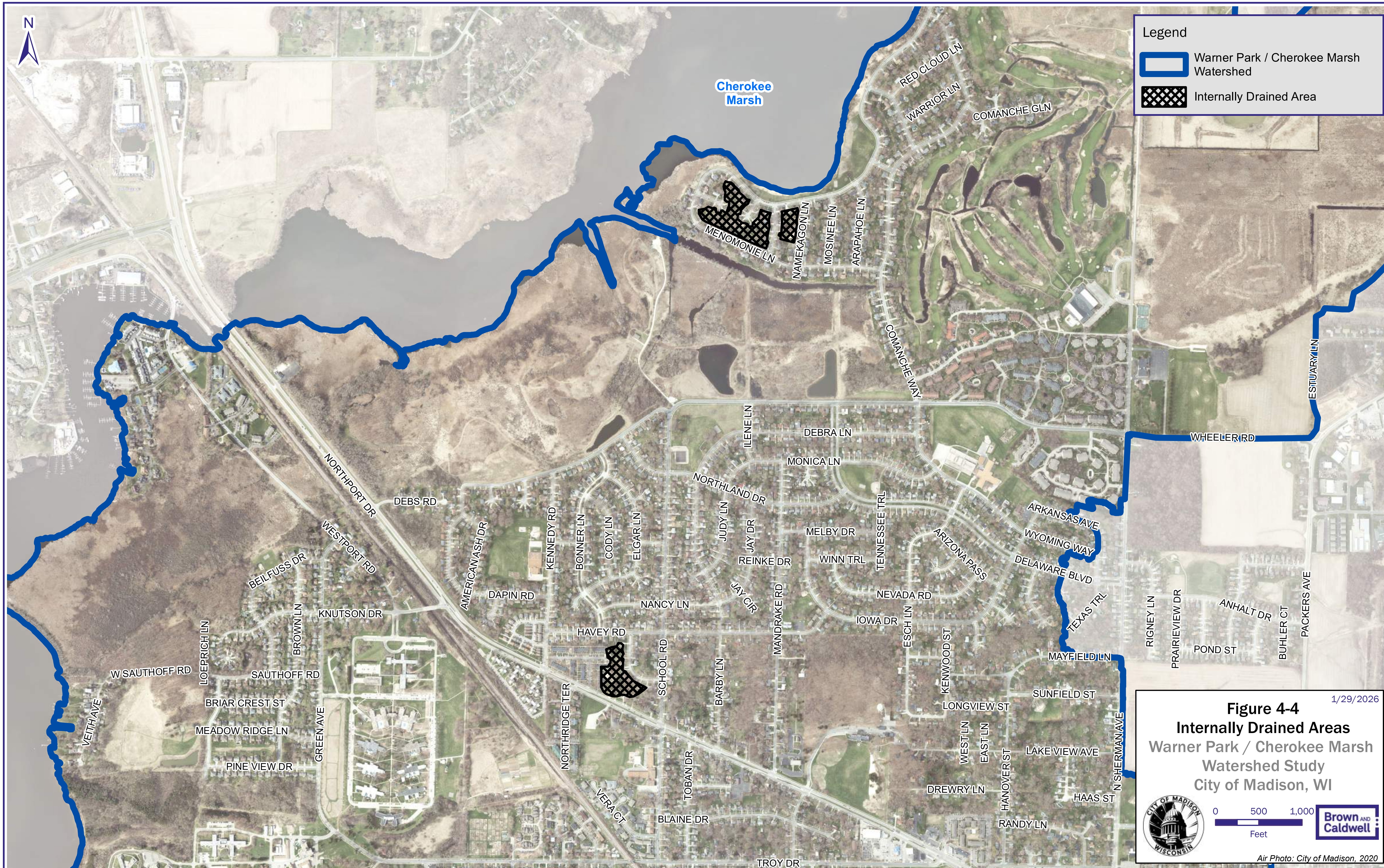


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Figure 4-4
Internally Drained Areas
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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12/27/2024

Figure 4-5
2D Roughness
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Path: V:\159753-Madison_WarnerParkWatershedStudy_GIS_MXDs\ReportFigures\Fig4-5-2D Roughness.mxd

Figure 5-1
Callibration Locations

Path: V:\159753-Madison_WarnerParkWatershedStudy_GIS_MXDs\ReportFigures\Fig5-1 Calibration Locations.mxd

9/15/2025

Figure 6-1
Results Reporting Locations
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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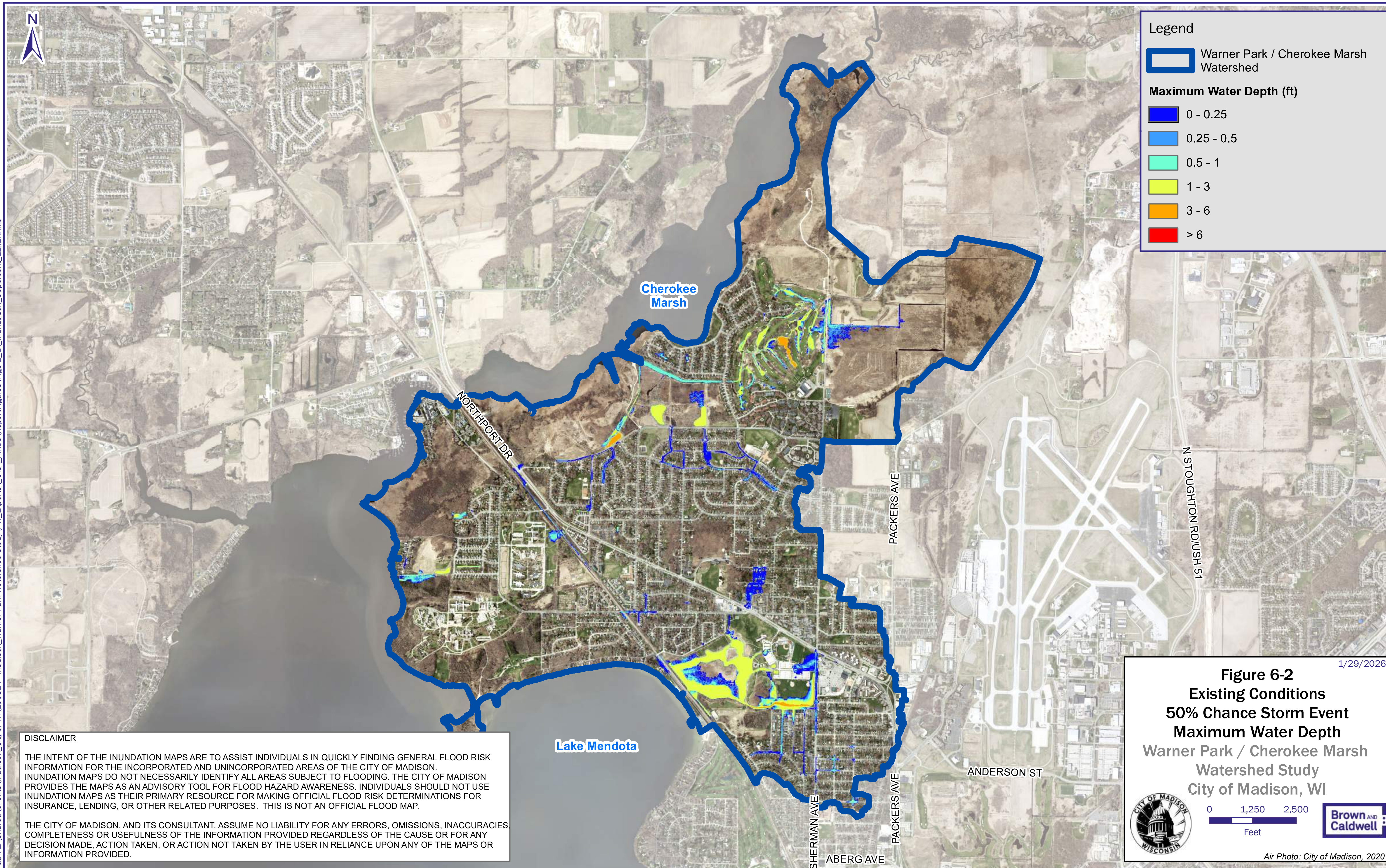

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Figure 6-2
Existing Conditions
50% Chance Storm Event
Maximum Water Depth
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Air Photo: City of Madison, 2020

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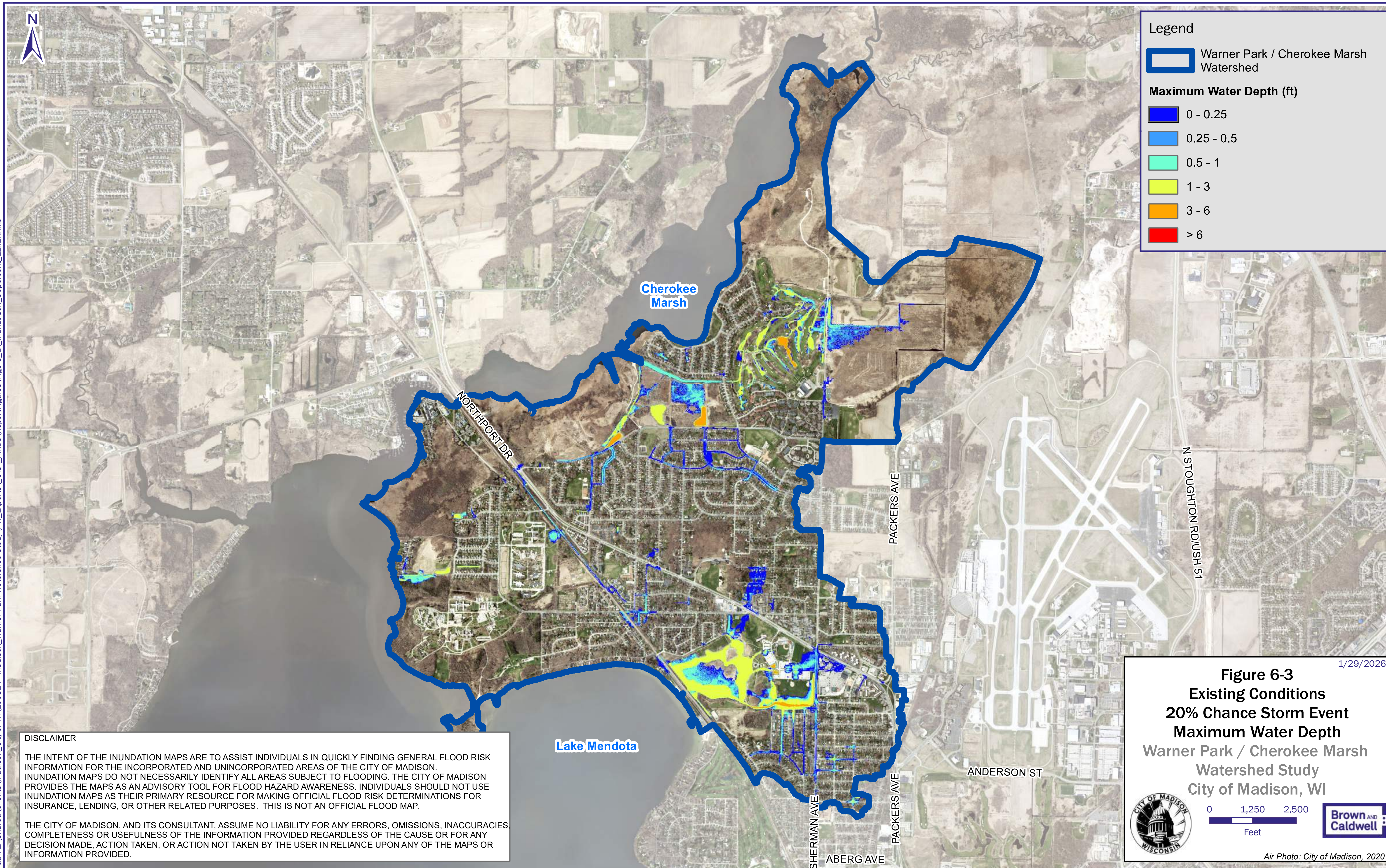

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Figure 6-3
Existing Conditions
20% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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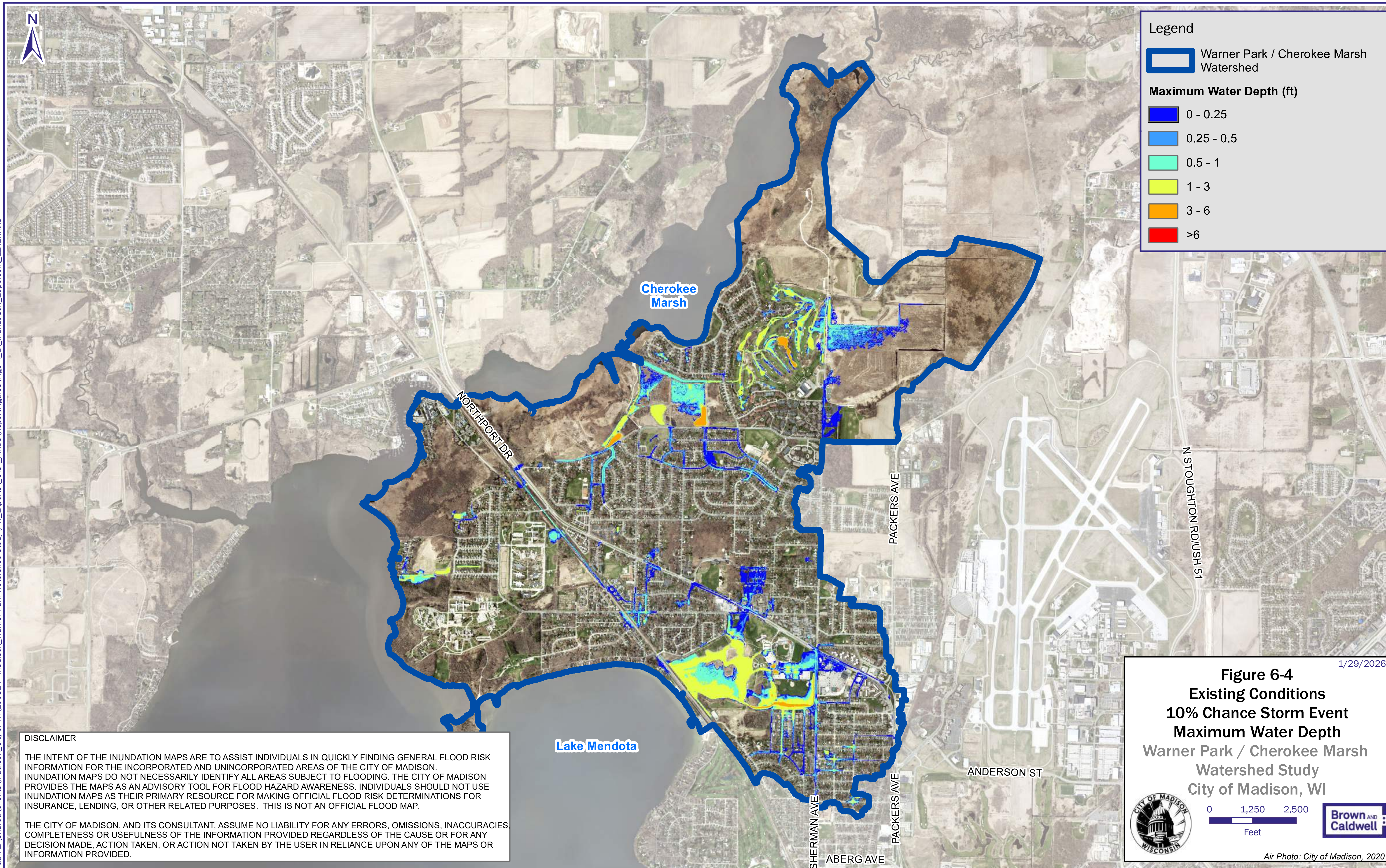

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Figure 6-4
Existing Conditions
10% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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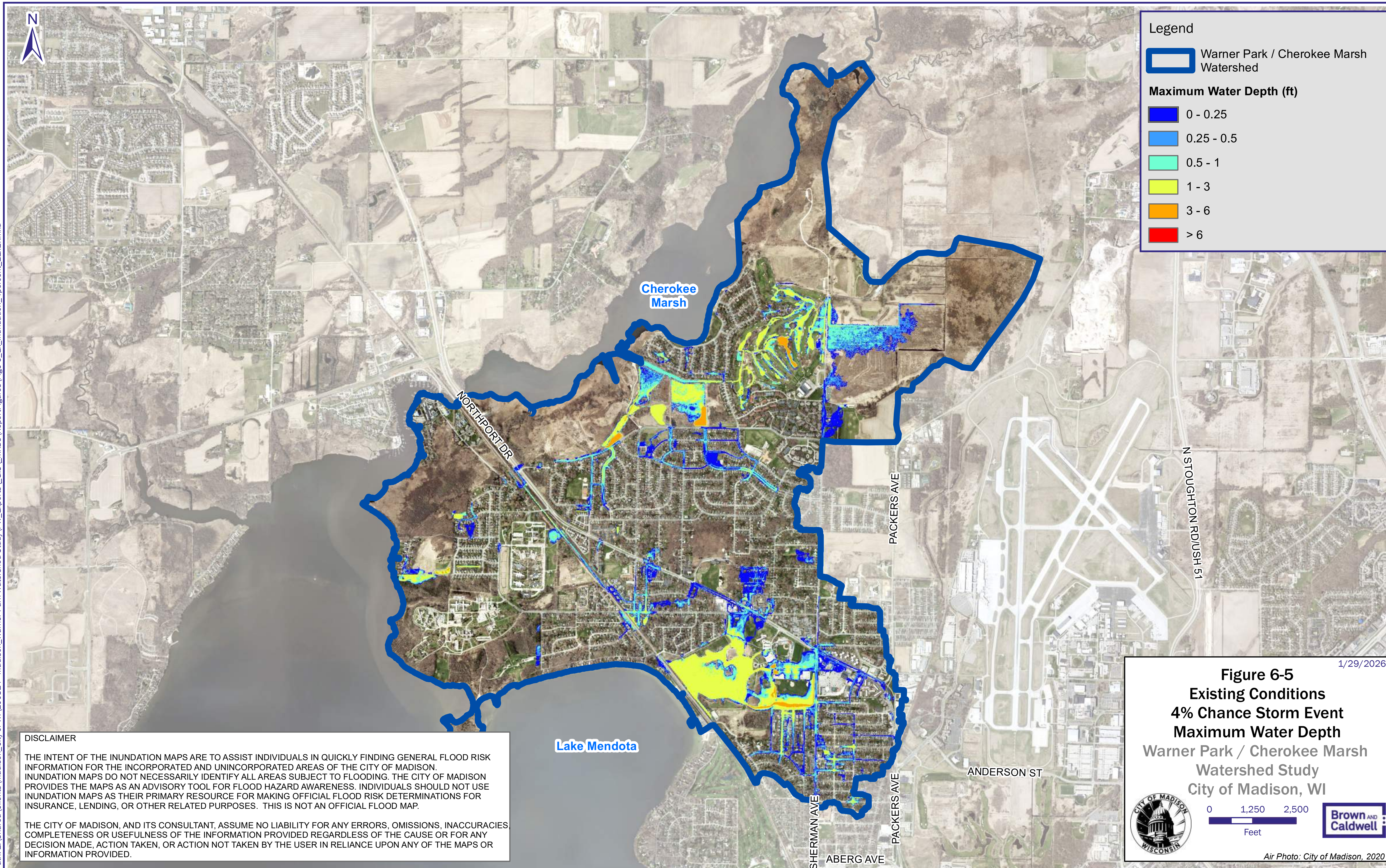

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Figure 6-5
Existing Conditions
4% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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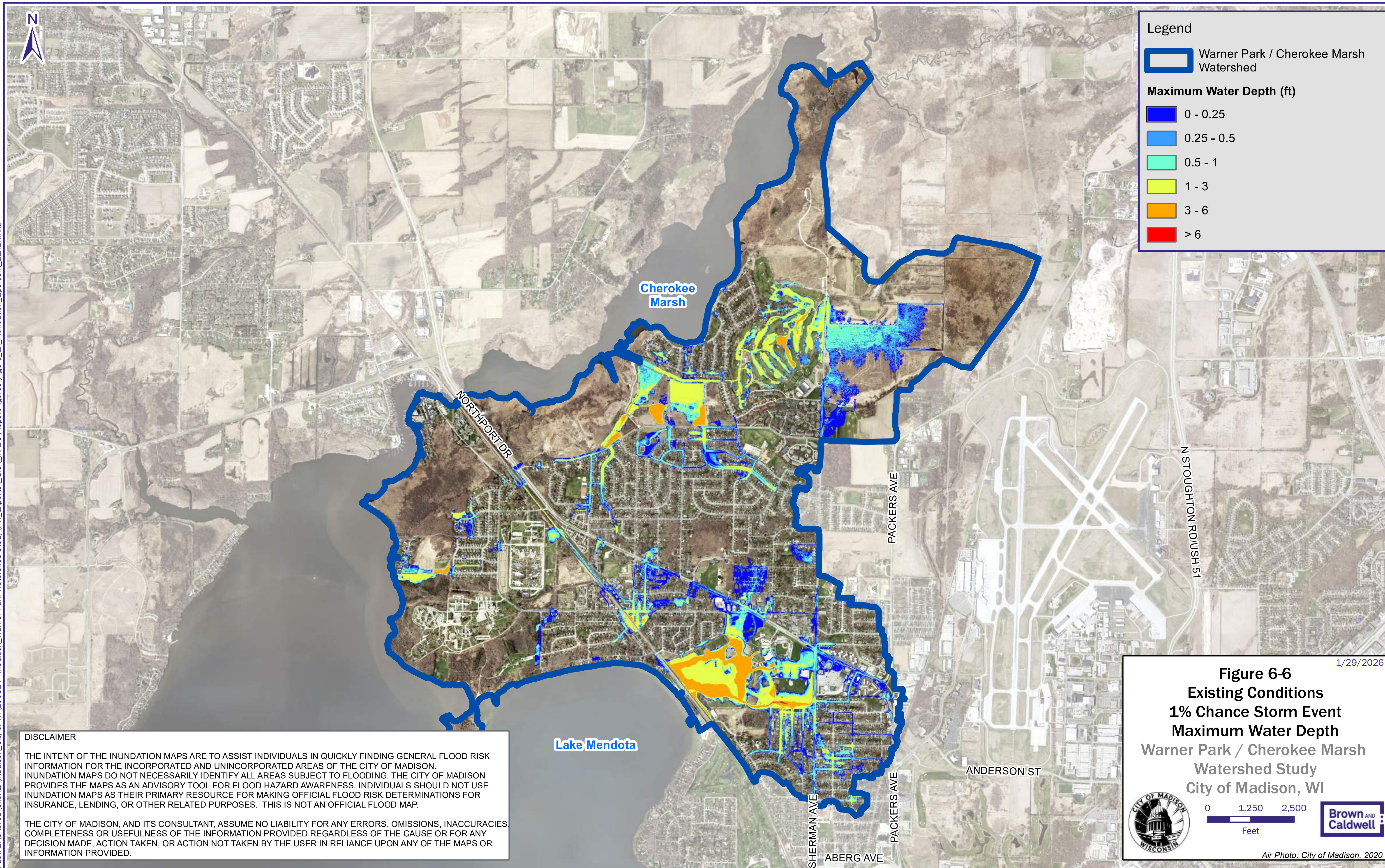

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Figure 6-6
Existing Conditions
1% Chance Storm Event
Maximum Water Depth
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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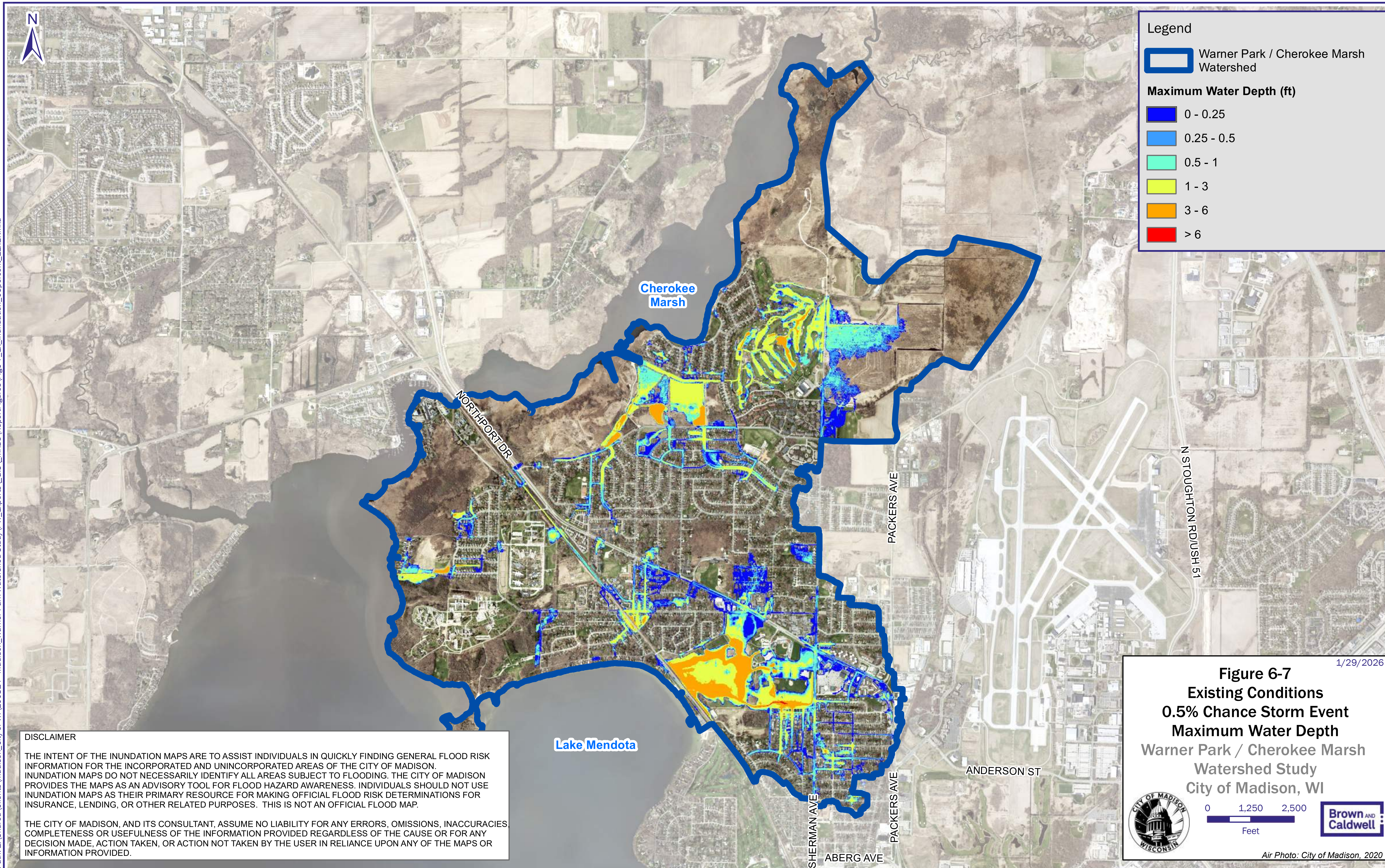

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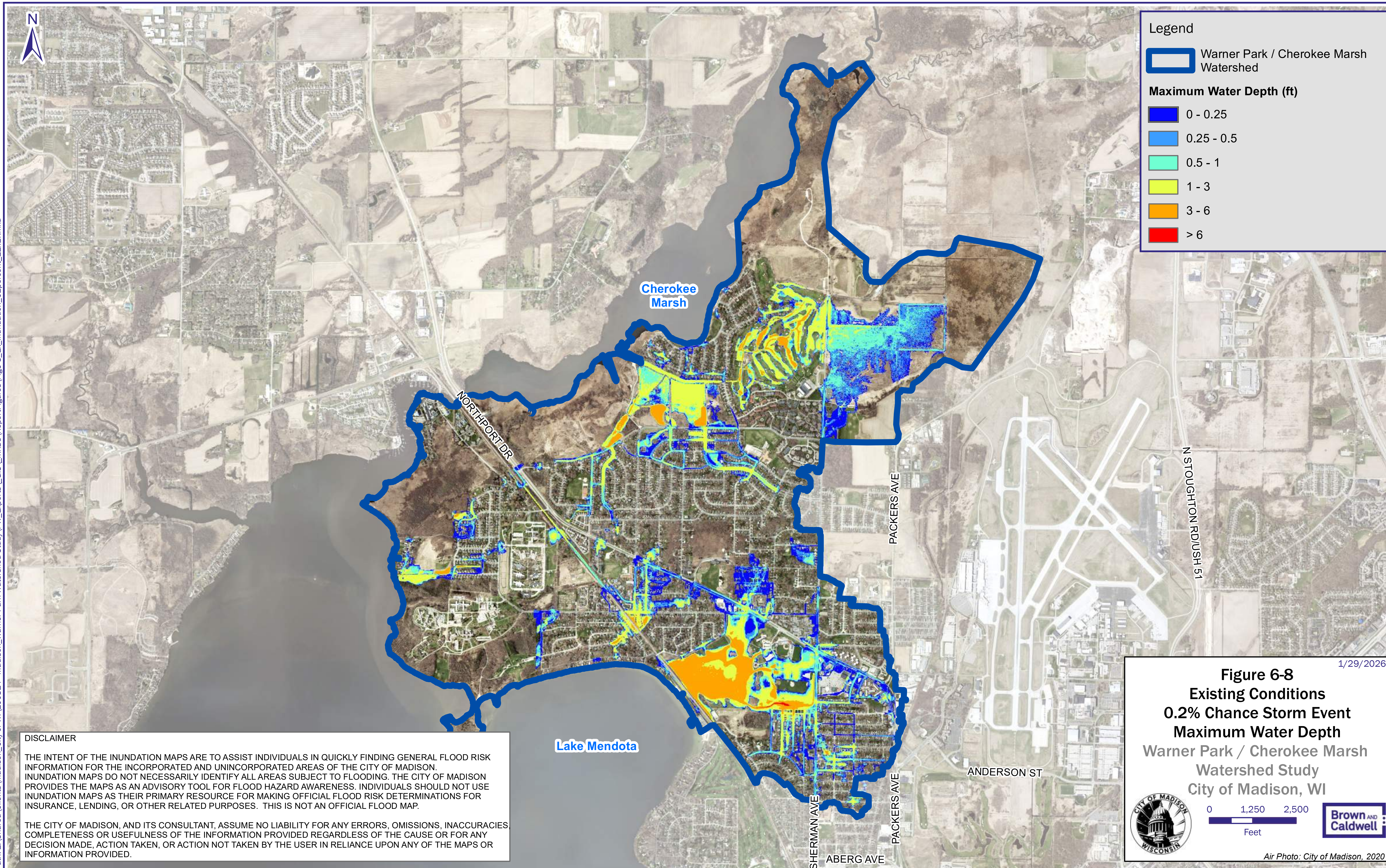

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Figure 6-8
Existing Conditions
0.2% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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Figure 6-9
Existing Conditions Storm Sewer Capacity (10% Chance Storm Event)
Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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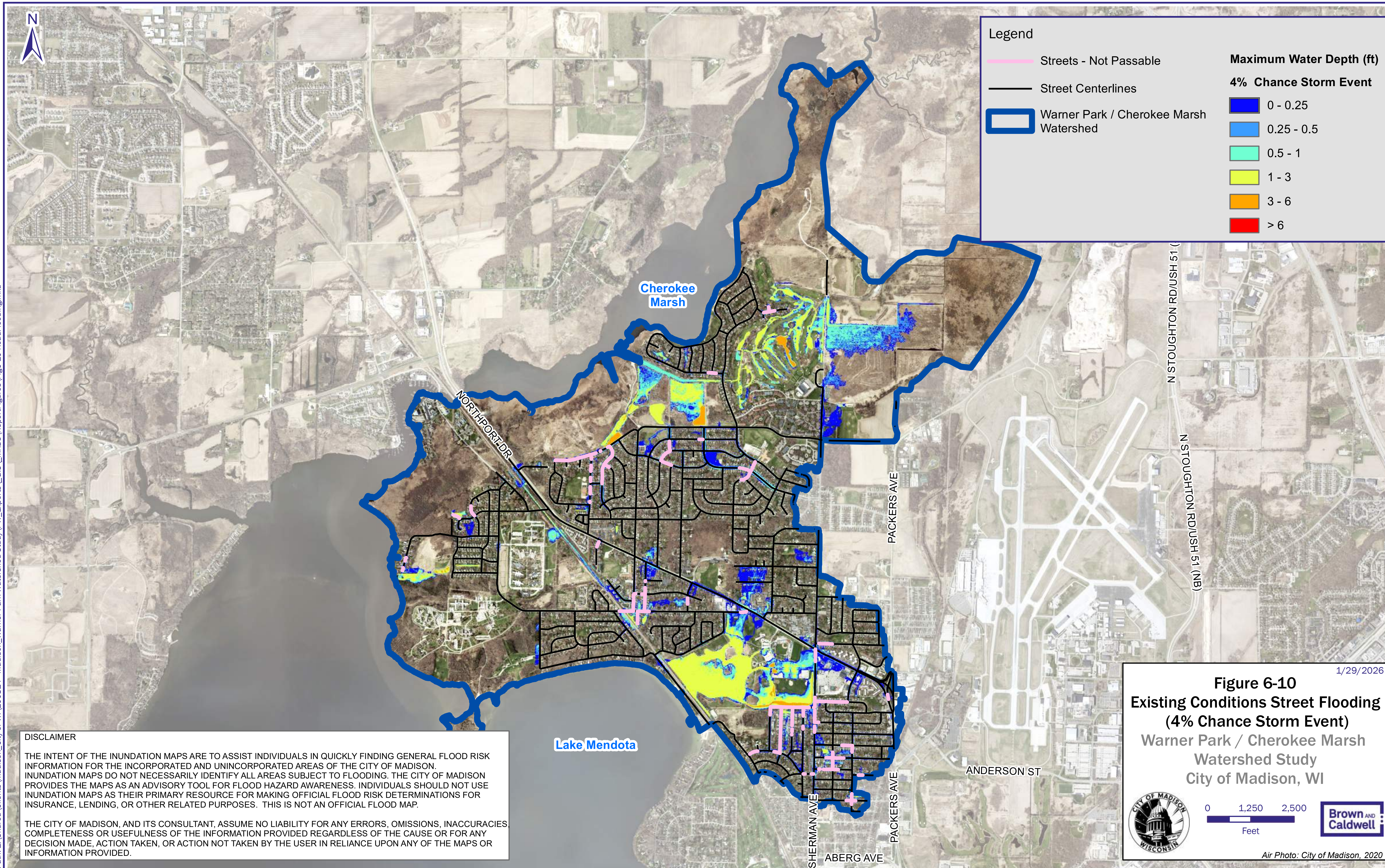

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Figure 6-10
Existing Conditions Street Flooding (4% Chance Storm Event)

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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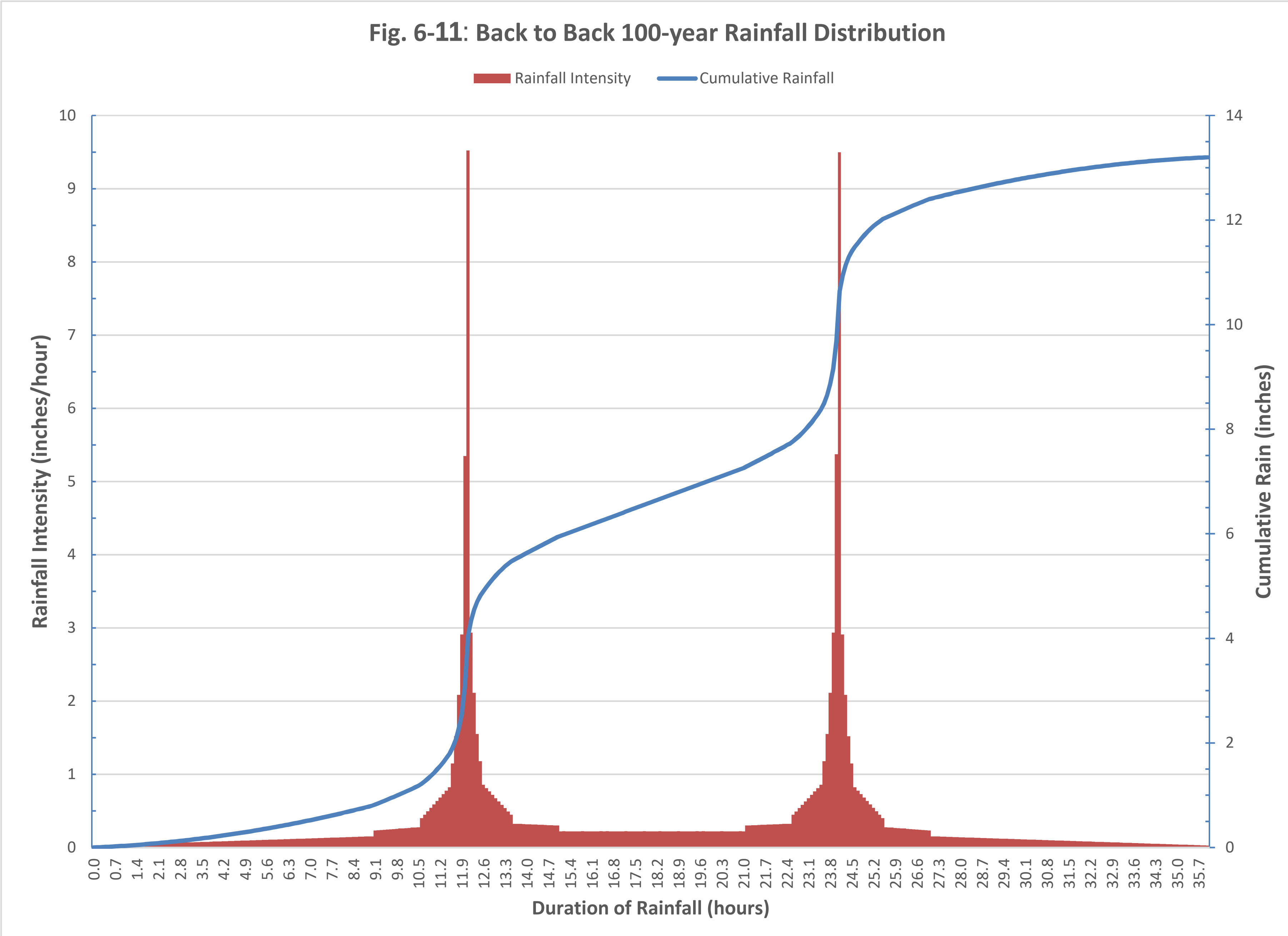
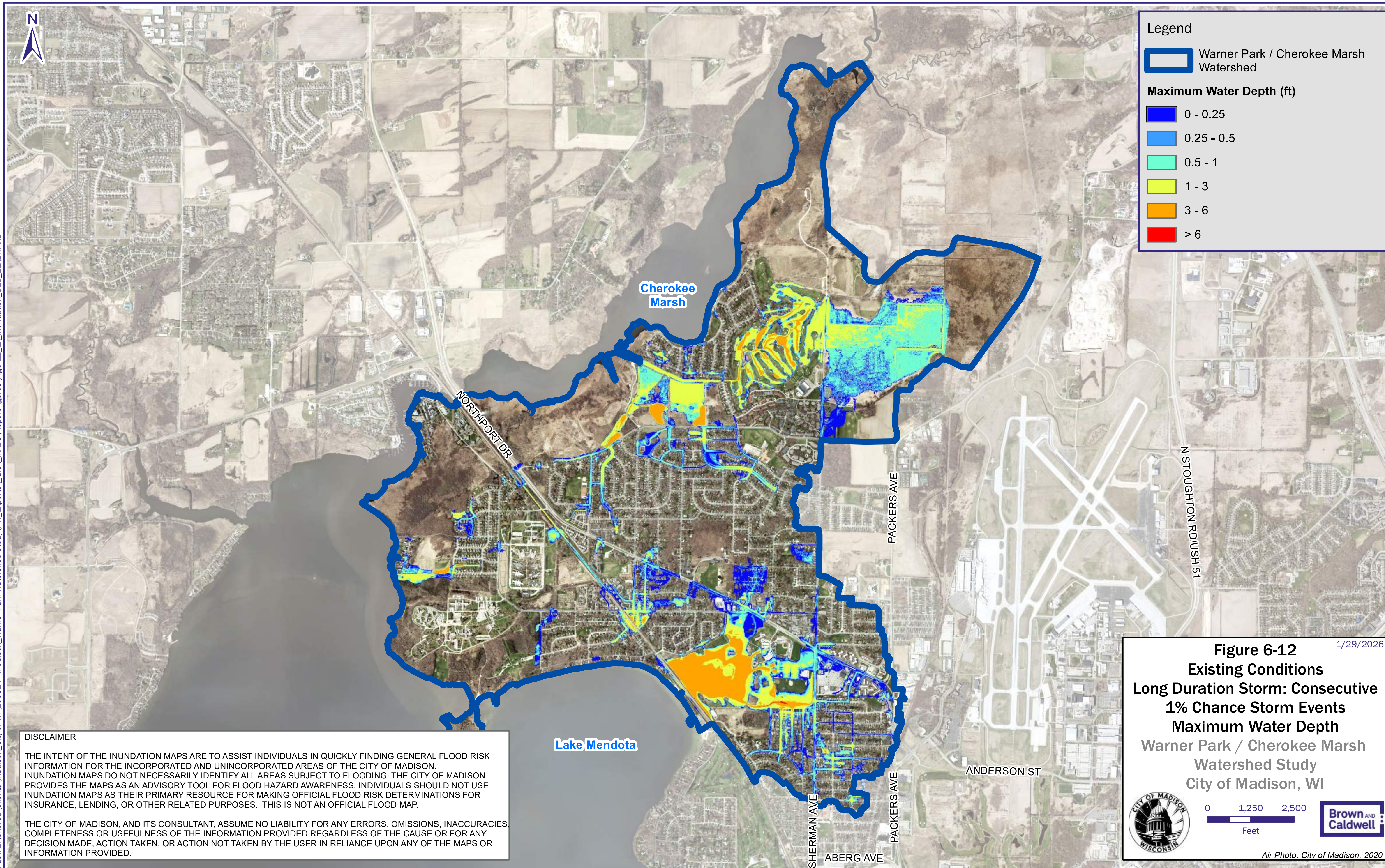


Fig. 6-11: Back to Back 100-year Rainfall Distribution
Rainfall Intensity
Cumulative Rainfall
Rainfall Intensity (inches/hour)
Cumulative Rain (inches)
Duration of Rainfall (hours)
0
1
2
3
4
5
6
7
8
9
10
0
2
4
6
8
10
12
14
0.0
0.7
1.4
2.1
2.8
3.5
4.2
4.9
5.6
6.3
7.0
7.7
8.4
9.1
9.8
10.5
11.2
11.9
12.6
13.3
14.0
14.7
15.4
16.1
16.8
17.5
18.2
18.9
19.6
20.3
21.0
21.7
22.4
23.1
23.8
24.5
25.2
25.9
26.6
27.3
28.0
28.7
29.4
30.1
30.8
31.5
32.2
32.9
33.6
34.3
35.0
35.7



1/29/2026

Figure 6-12
Existing Conditions
Long Duration Storm: Consecutive 1% Chance Storm Events
Maximum Water Depth

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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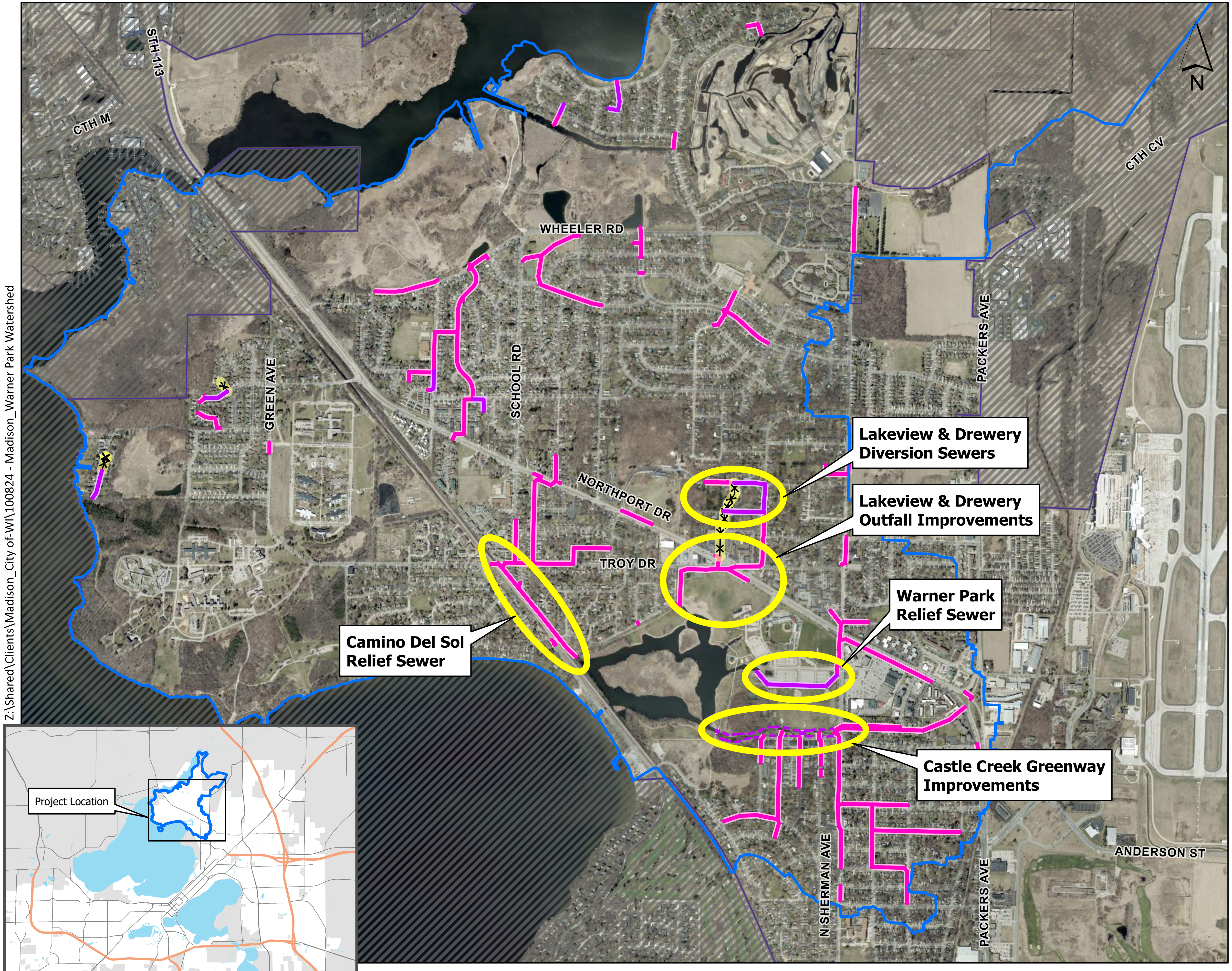
Date: 2/11/2026 User Name: mwegner

Figure 8-1 Proposed Improvements

Project Overview

Warner / Cherokee Watershed
City of Madison



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Legend

Proposed Solutions

- Berm
- Channel
- Floodwall
- Other
- Pond
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe
- Municipal Limits
- Out Of City Area
- Warner / Cherokee Watershed

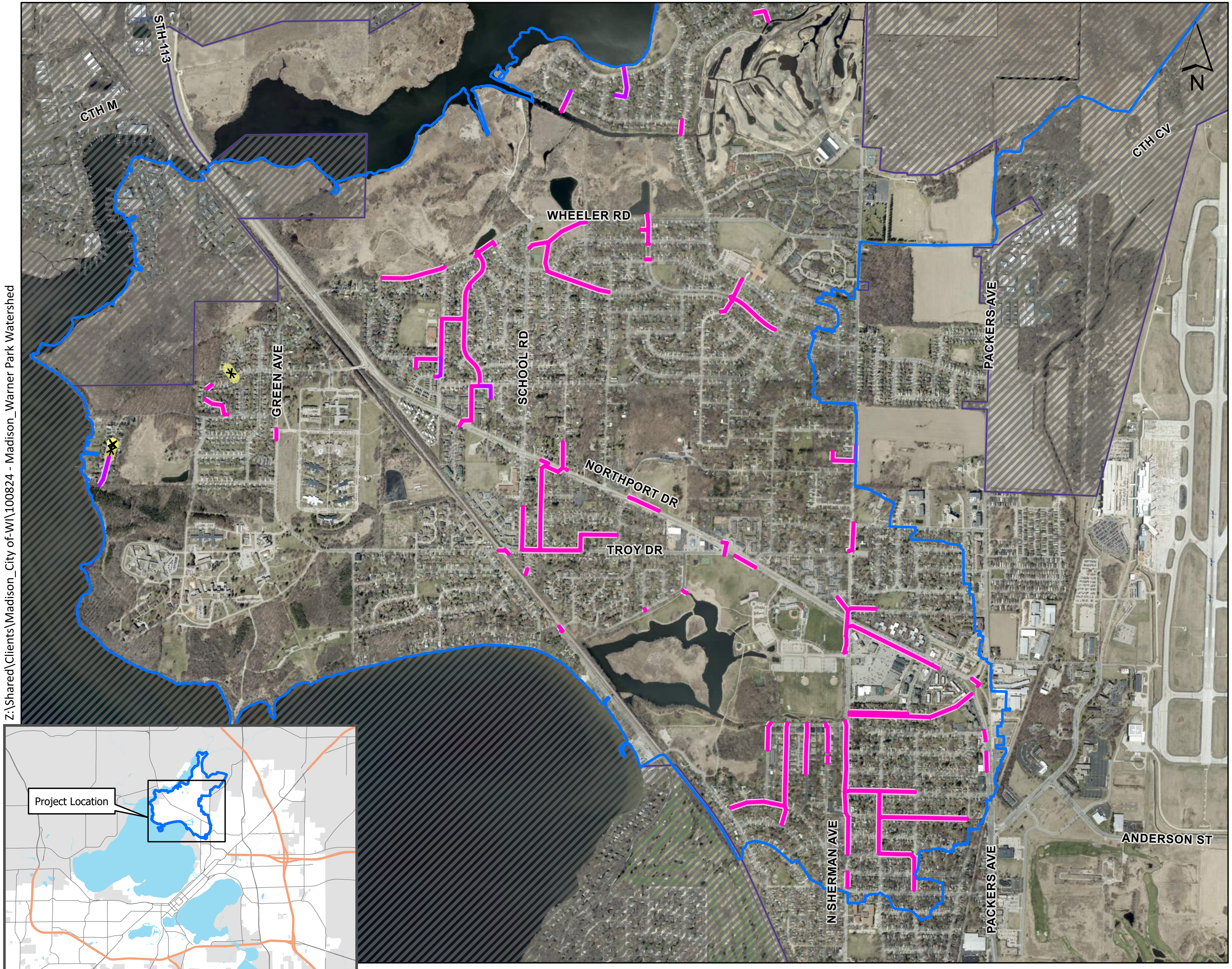
0 500 1,000 2,000 Feet

Date: 2/11/2026 User Name: mwegner

Figure 9-1
Proposed Local Storm Sewer Improvements

Project Overview

Warner / Cherokee Watershed
City of Madison



Legend

Proposed Pipes

- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe
- Municipal Limits
- Out Of City Area
- Warner / Cherokee Watershed

0 500 1,000 2,000 Feet

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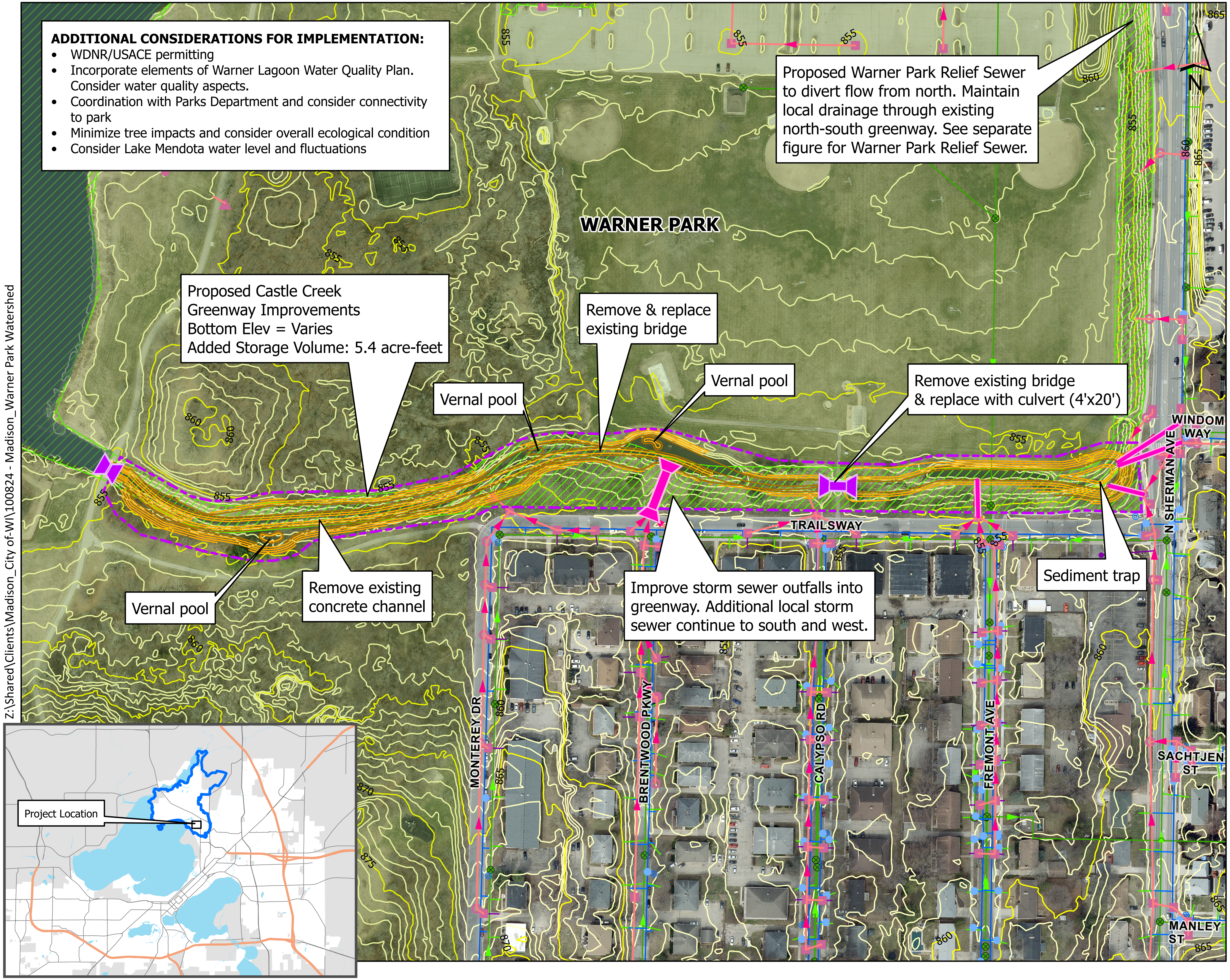
Figure 9-2
Castle Creek Greenway Improvements

Project Details

Warner / Cherokee Watershed
City of Madison



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Legend

Proposed Pipes
- New Box
- Parallel Box
- Upsize Box
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe

Proposed Solutions
- Berm
- Channel
- Floodwall
- Other
- Pond
- Pr. 1' Contours
- Pr. 5' Contours

City Greenspace
- City of Madison Ponds/ Greenways
- Parks
- Lakes & Rivers
- Ex 5' Contour
- Ex 1' Contour

- Municipal Limits
- Out Of City Area

Existing Utilities
- Abandoned or Removed Storm Pipe
- Storm Pipe
- Inlet
- Headwall
- Other Storm Structure
- Apron End
- Access Structures
- Storm Lift Station
- Private Stormwater Structures (Approx)
- Private Stormwater Pipes (Approx)
- Water Valve
- Water Main
- Water Service
- Water Hydrant
- SAS
- Sanitary Mains
- Sanitary Laterals
- MMSD SAS
- MMSD Mains

0 60 120 240 Feet

CITY OF MADISON ENGINEERING

Date: 2/11/2026 User Name: mwegner

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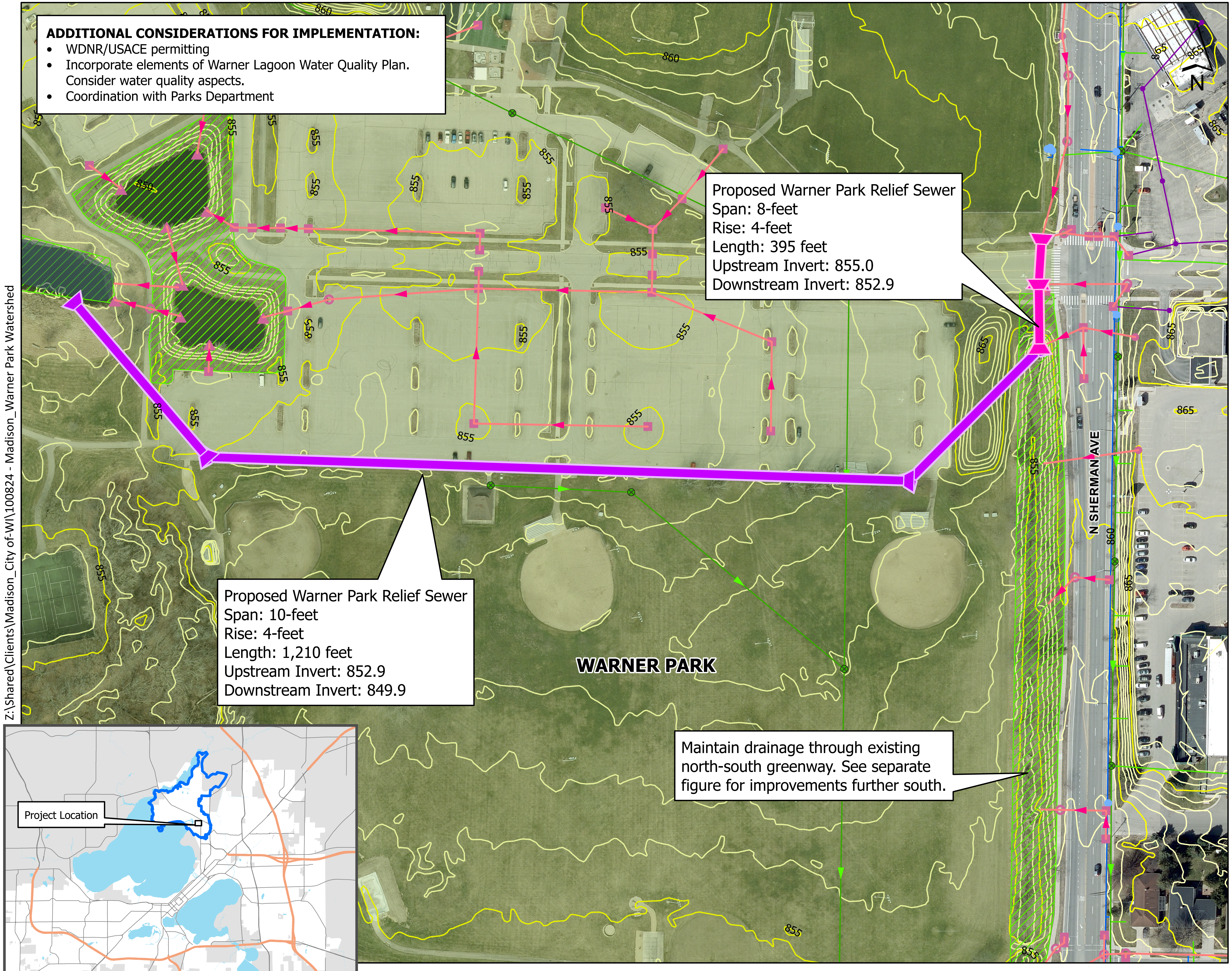

Figure 9-3
Warner Park Relief Sewer
Project Details
Warner / Cherokee Watershed
City of Madison

Legend

Proposed Pipes
- New Box
- Parallel Box
- Upsize Box
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe

Proposed Solutions
- Berm
- Channel
- Floodwall
- Other
- Pond

City Greenspace
- City of Madison Ponds/ Greenways
- Parks
- Lakes & Rivers
- Ex 5' Contour
- Ex 1' Contour
- Municipal Limits

- Out Of City Area

Existing Utilities
- Abandoned or Removed Storm Pipe
- Storm Pipe
- Inlet
- Headwall
- Other Storm Structure
- Apron End
- Access Structures
- Storm Lift Station
- Private Stormwater Structures (Approx)
- Private Stormwater Pipes (Approx)
- Water Valve
- Water Main
- Water Service
- Water Hydrant
- SAS
- Sanitary Mains
- Sanitary Laterals
- MMSD SAS
- MMSD Mains

0 40 80 160 Feet

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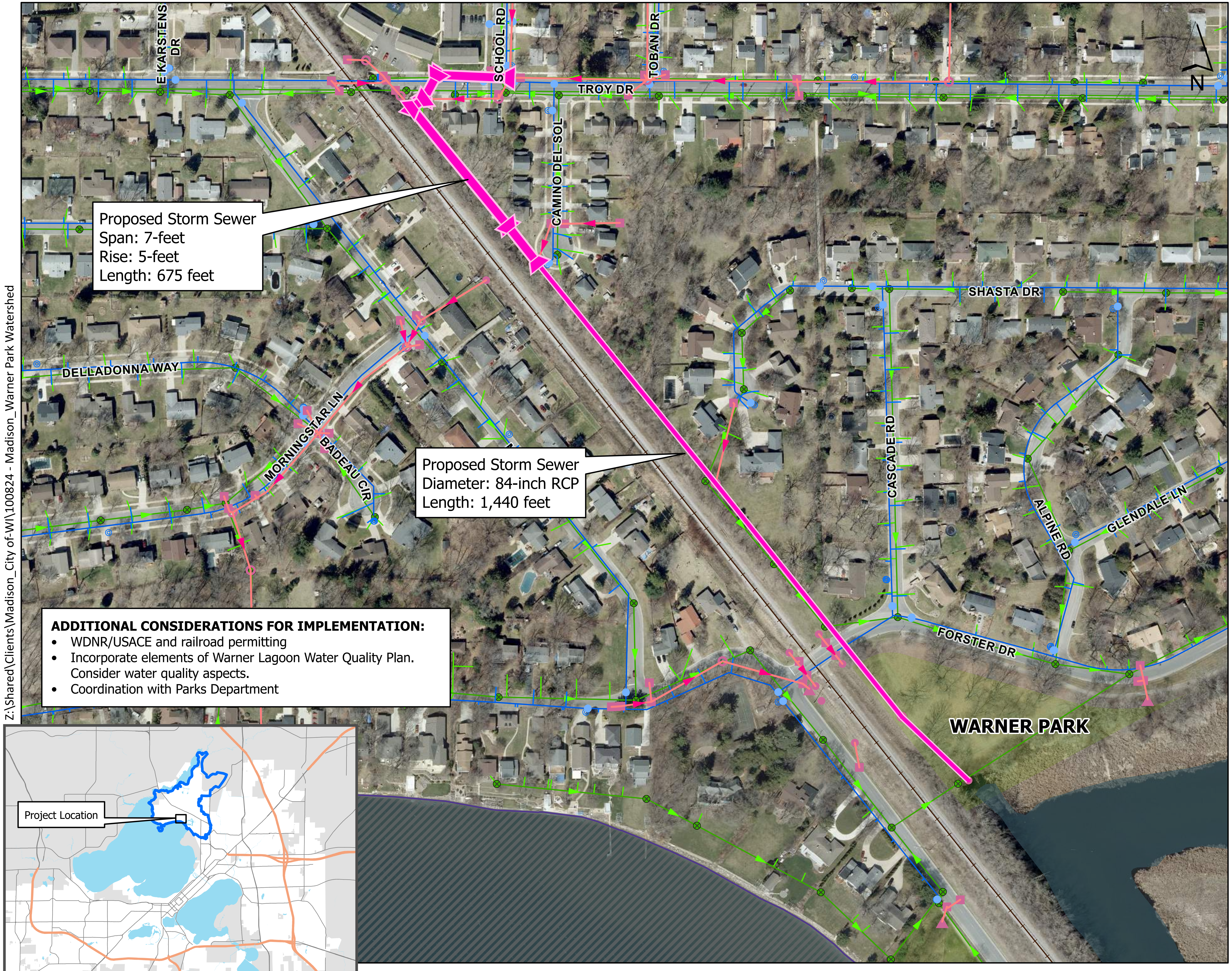
Figure 9-4
Camino Del Sol Storm Sewer Improvements

Project Details

Warner / Cherokee Watershed
City of Madison



Legend

Proposed Pipes
- New Box
- Parallel Box
- Upsize Box
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe

Proposed Solutions
- Berm
- Channel
- Floodwall
- Other
- Pond

City Greenspace
- City of Madison Ponds/ Greenways
- Parks
- Lakes & Rivers
- Municipal Limits
- Out Of City Area

Existing Utilities
- Abandoned or Removed Storm Pipe
- Storm Pipe
- Inlet
- Headwall
- Other Storm Structure
- Apron End
- Access Structures
- Storm Lift Station
- Private Stormwater Structures (Approx)
- Private Stormwater Pipes (Approx)
- Water Valve
- Water Main
- Water Service
- Water Hydrant
- SAS
- Sanitary Mains
- Sanitary Laterals
- MMSD SAS
- MMSD Mains

0 70 140 280 Feet

CITY OF MADISON ENGINEERING

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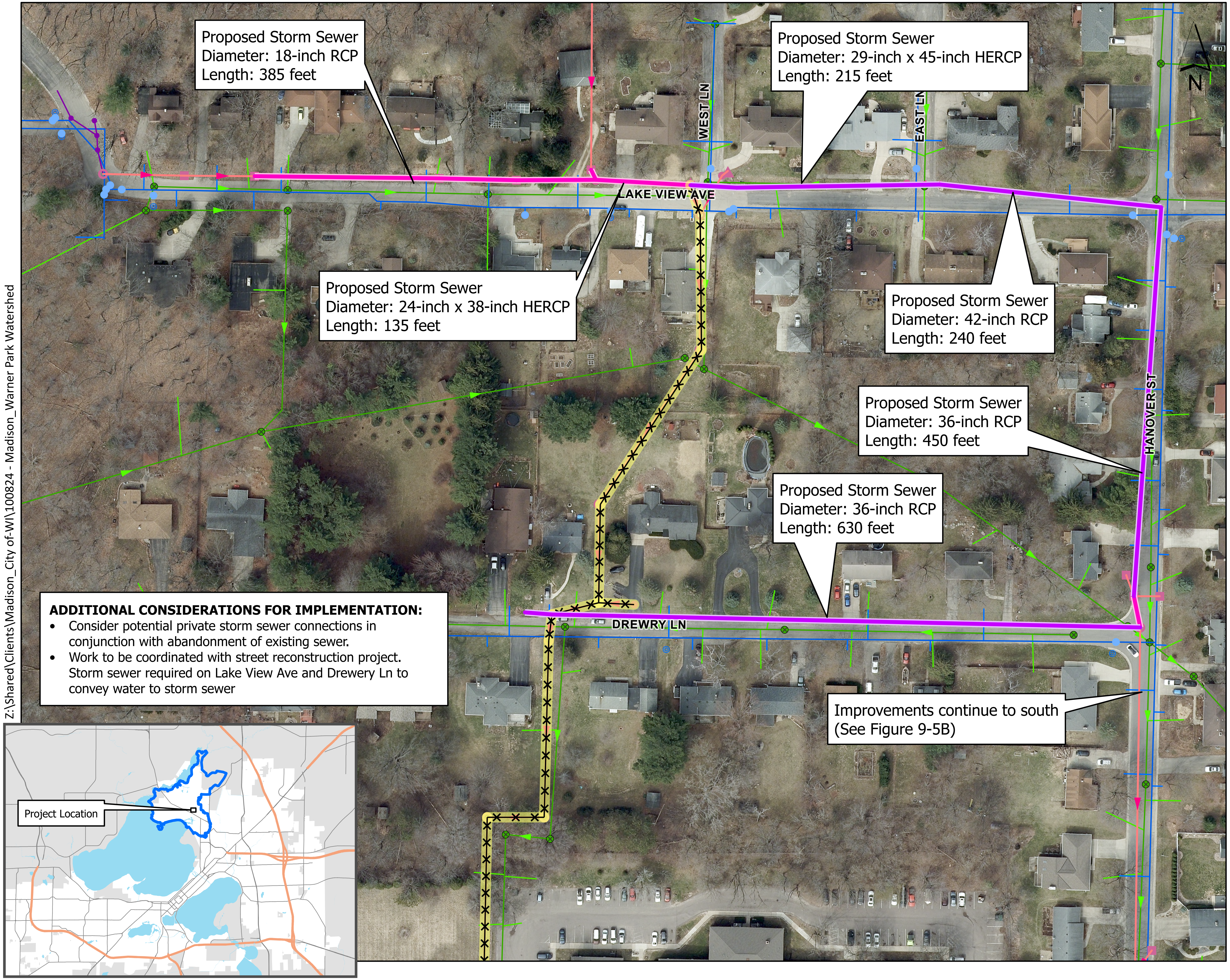
Date: 2/11/2026 User Name: mwegner

Figure 9-5A
Lake View & Drewery Diversion Sewers
Project Details
Warner / Cherokee Watershed
City of Madison



ADDITIONAL CONSIDERATIONS FOR IMPLEMENTATION:

- Consider potential private storm sewer connections in conjunction with abandonment of existing sewer.
- Work to be coordinated with street reconstruction project. Storm sewer required on Lake View Ave and Drewery Ln to convey water to storm sewer

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Legend

Proposed Pipes
- New Box
- Parallel Box
- Upsize Box
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe

Proposed Solutions
- Berm
- Channel
- Floodwall
- Other
- Pond

City Greenspace
- City of Madison Ponds/ Greenways
- Parks
- Lakes & Rivers
- Municipal Limits
- Out Of City Area

Existing Utilities
- Abandoned or Removed Storm Pipe
- Storm Pipe
- Inlet
- Headwall
- Other Storm Structure
- Apron End
- Access Structures
- Storm Lift Station
- Private Stormwater Structures (Approx)
- Private Stormwater Pipes (Approx)
- Water Valve
- Water Main
- Water Service
- Water Hydrant
- SAS
- Sanitary Mains
- Sanitary Laterals
- MMSD SAS
- MMSD Mains

0 30 60 120 Feet

CITY OF MADISON ENGINEERING

Date: 2/11/2026 User Name: mwegner

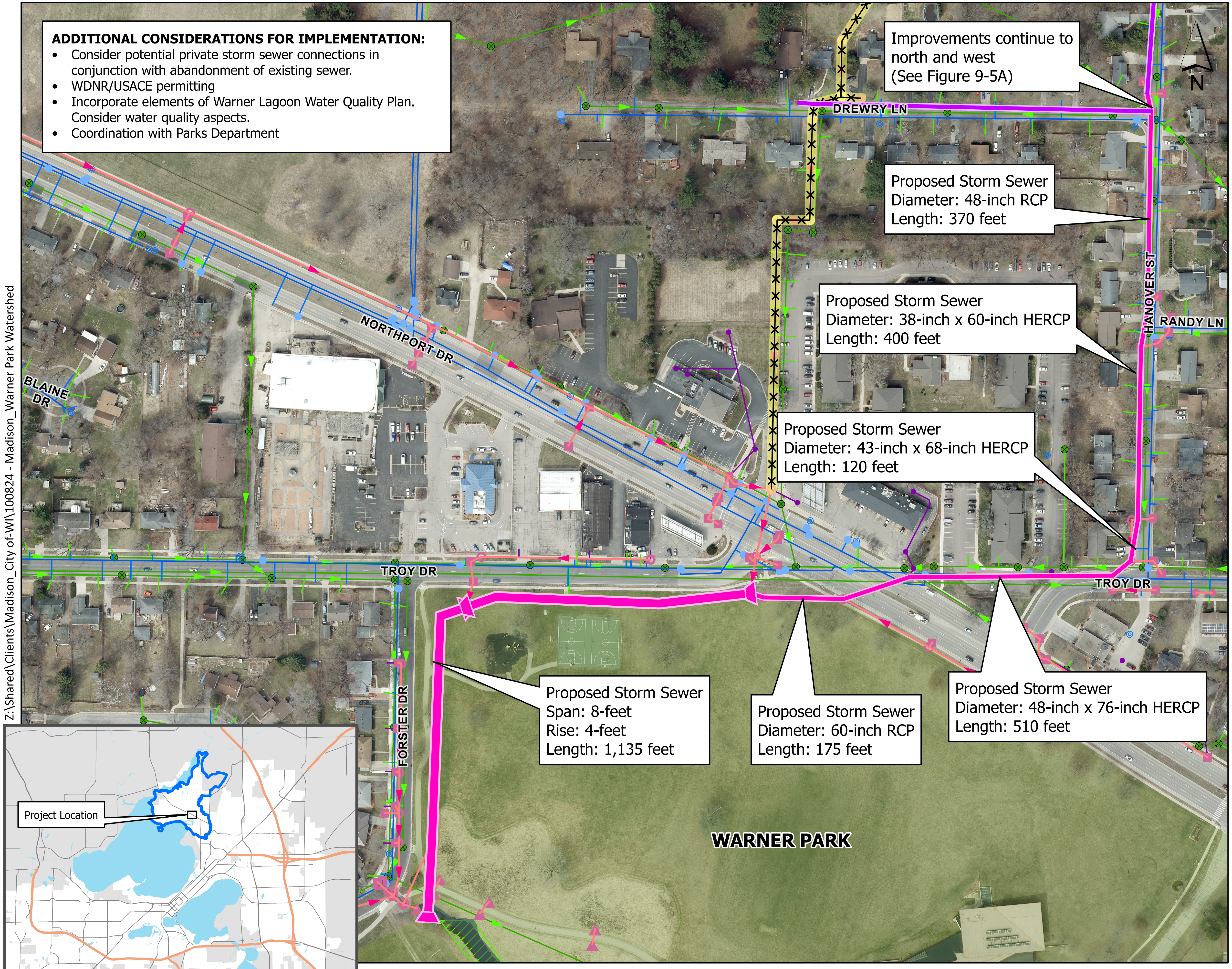

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Figure 9-5B
Lake View Diversion Downstream Sewers

Project Details

Warner / Cherokee Watershed
City of Madison

Legend

Proposed Pipes
- New Box
- Parallel Box
- Upsize Box
- New Pipe
- Parallel Pipe
- Removal Pipe
- Special Pipe
- Upsize Pipe

Proposed Solutions
- Berm
- Channel
- Floodwall
- Other
- Pond

City Greenspace
- City of Madison Ponds/ Greenways
- Parks
- Lakes & Rivers
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Existing Utilities
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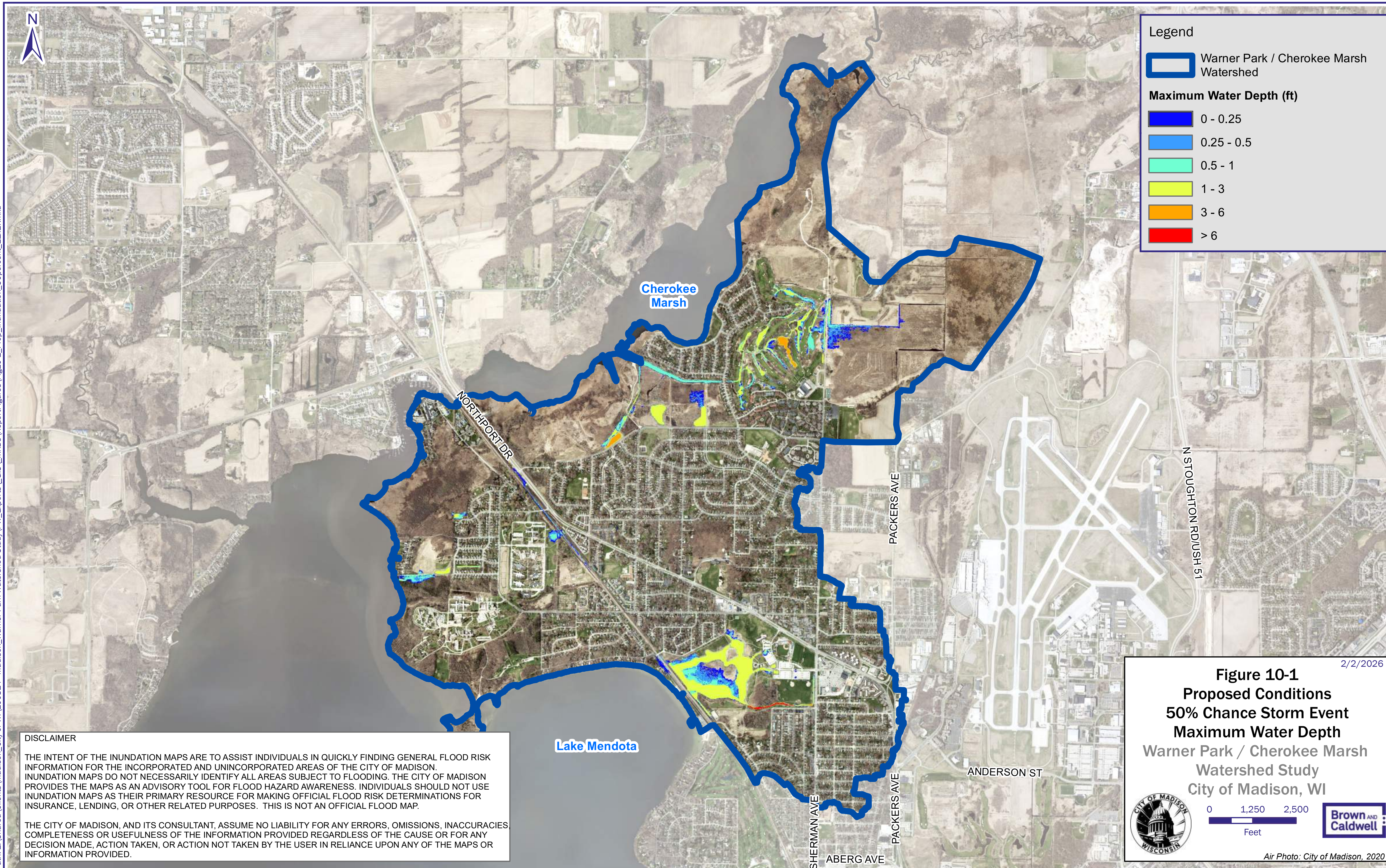
- Private Stormwater Structures (Approx)
- Private Stormwater Pipes (Approx)
- Water Valve
- Water Main
- Water Service
- Water Hydrant
- SAS
- Sanitary Mains
- Sanitary Laterals
- MMSD SAS
- MMSD Mains

0 60 120 240 Feet

CITY OF MADISON ENGINEERING



2/2/2026

Figure 10-1
Proposed Conditions
50% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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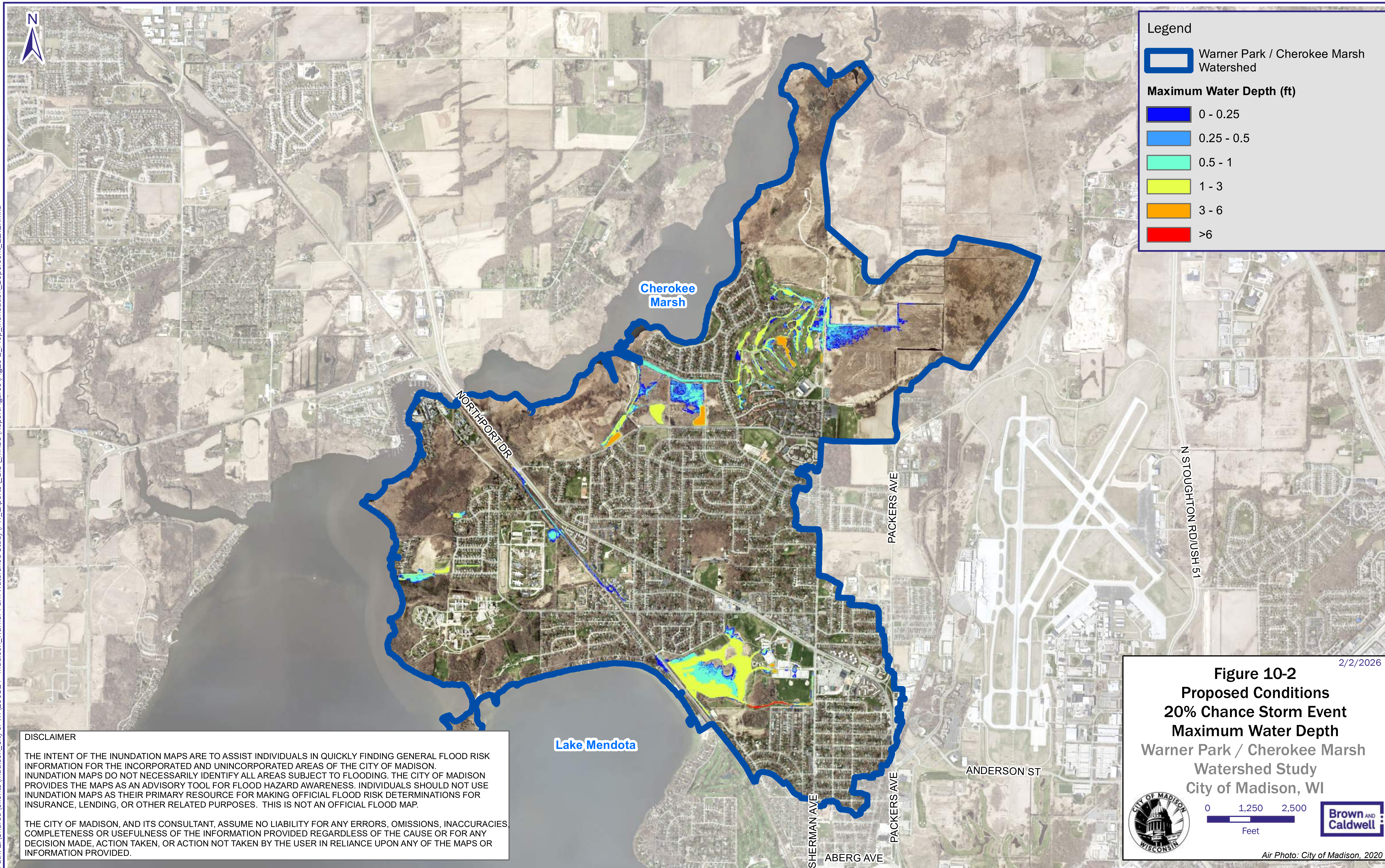

2/2/2026

Figure 10-2
Proposed Conditions
20% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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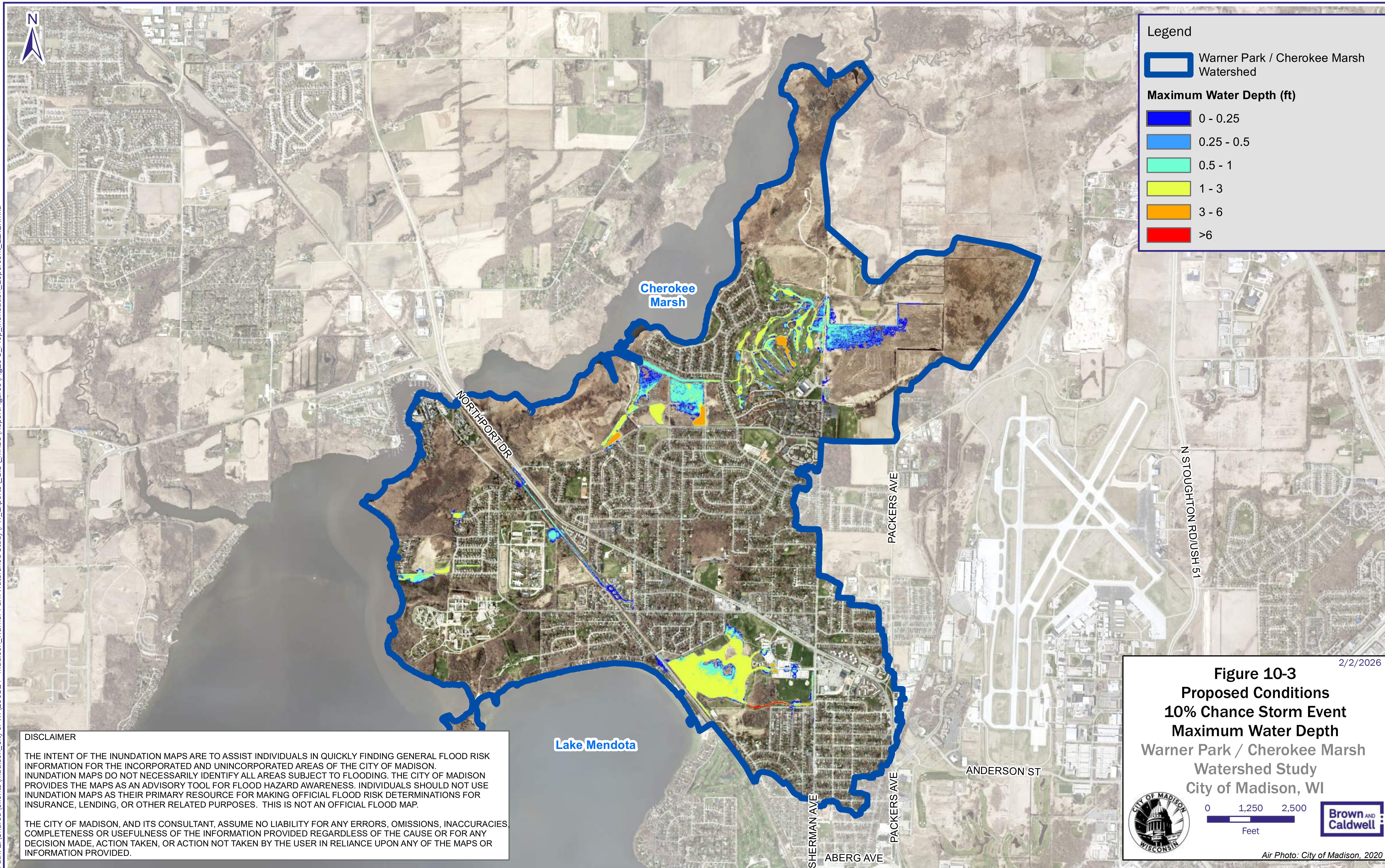

2/2/2026

Figure 10-3
Proposed Conditions
10% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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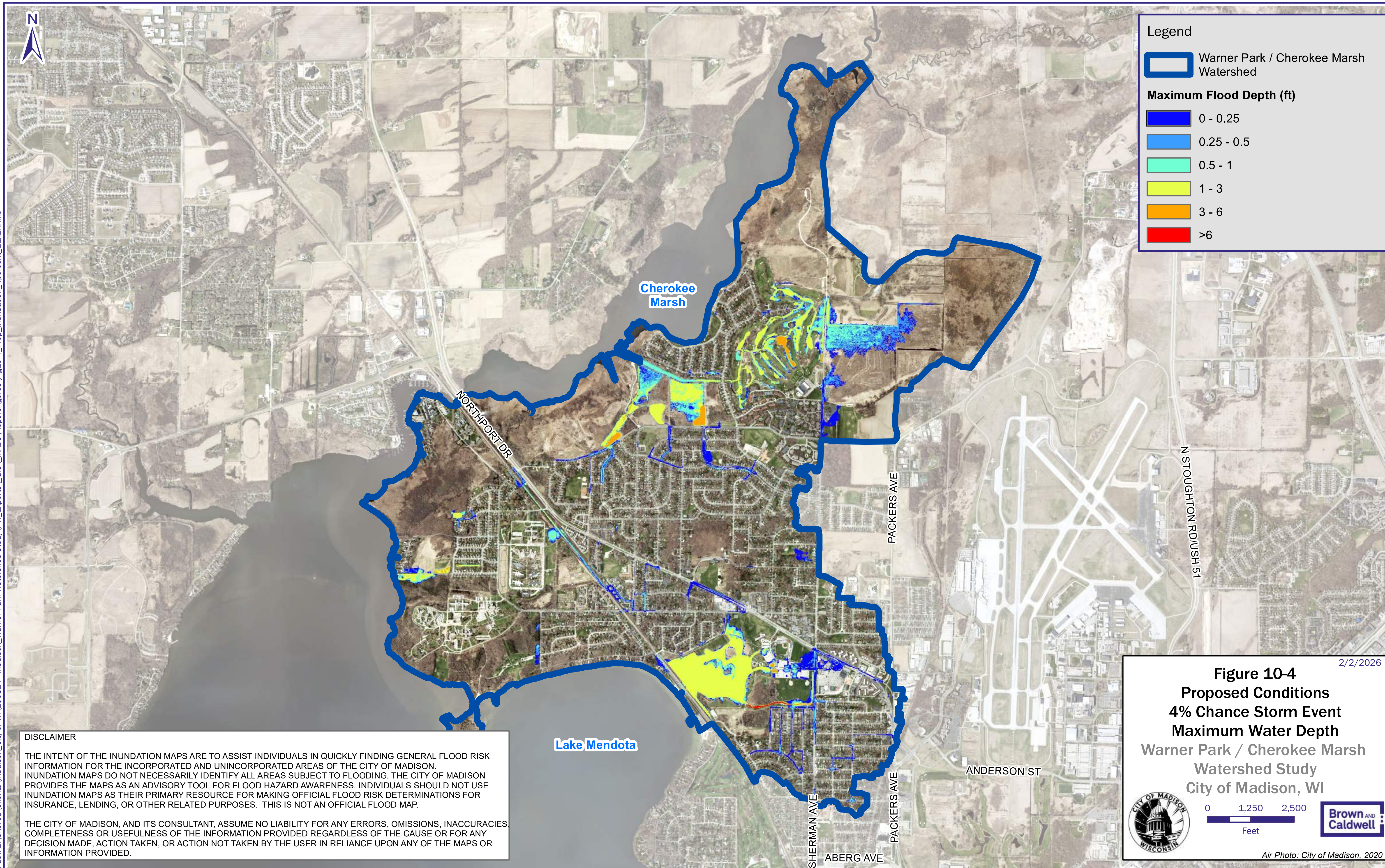

2/2/2026

Figure 10-4
Proposed Conditions
4% Chance Storm Event
Maximum Water Depth
Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

Air Photo: City of Madison, 2020

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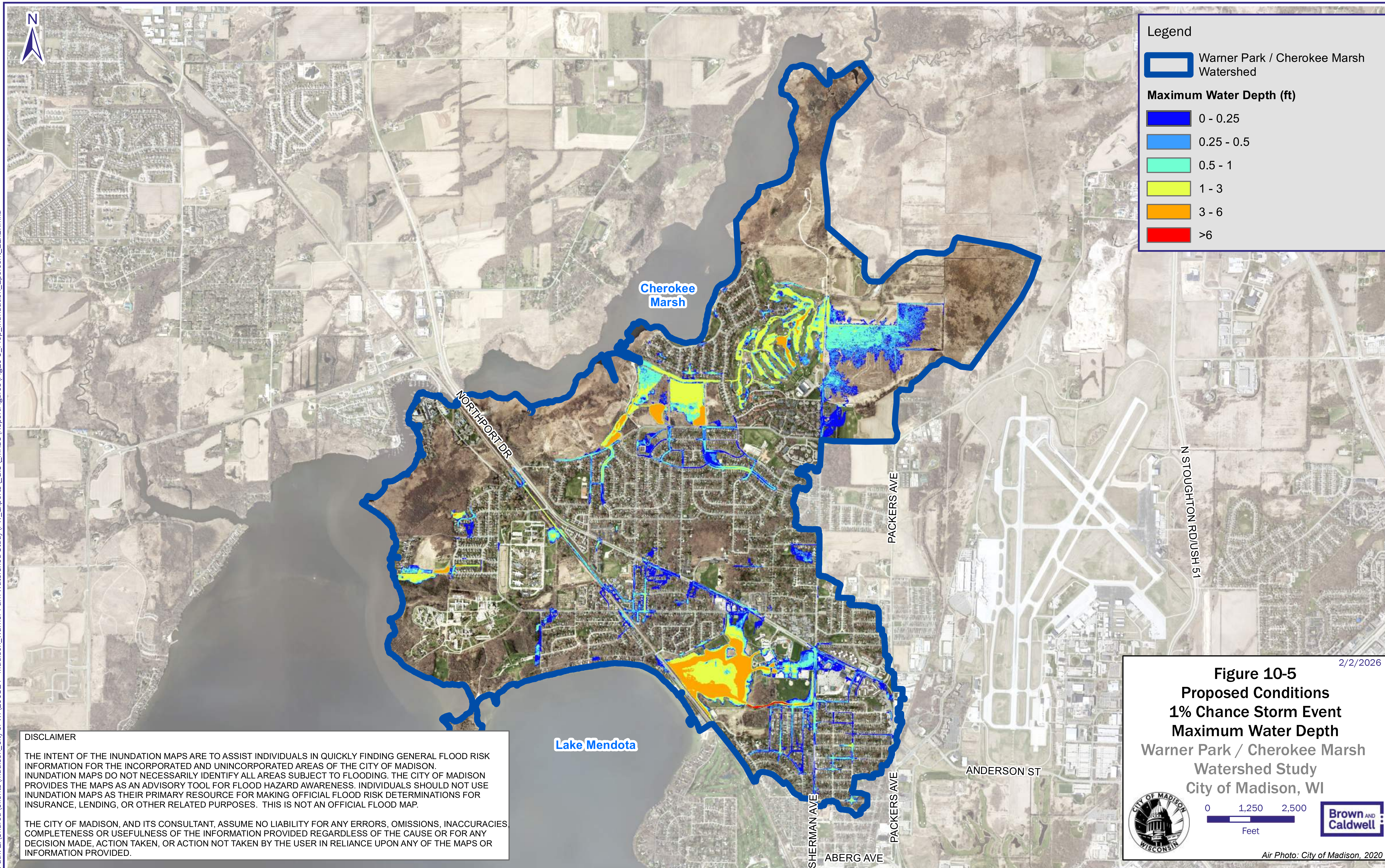

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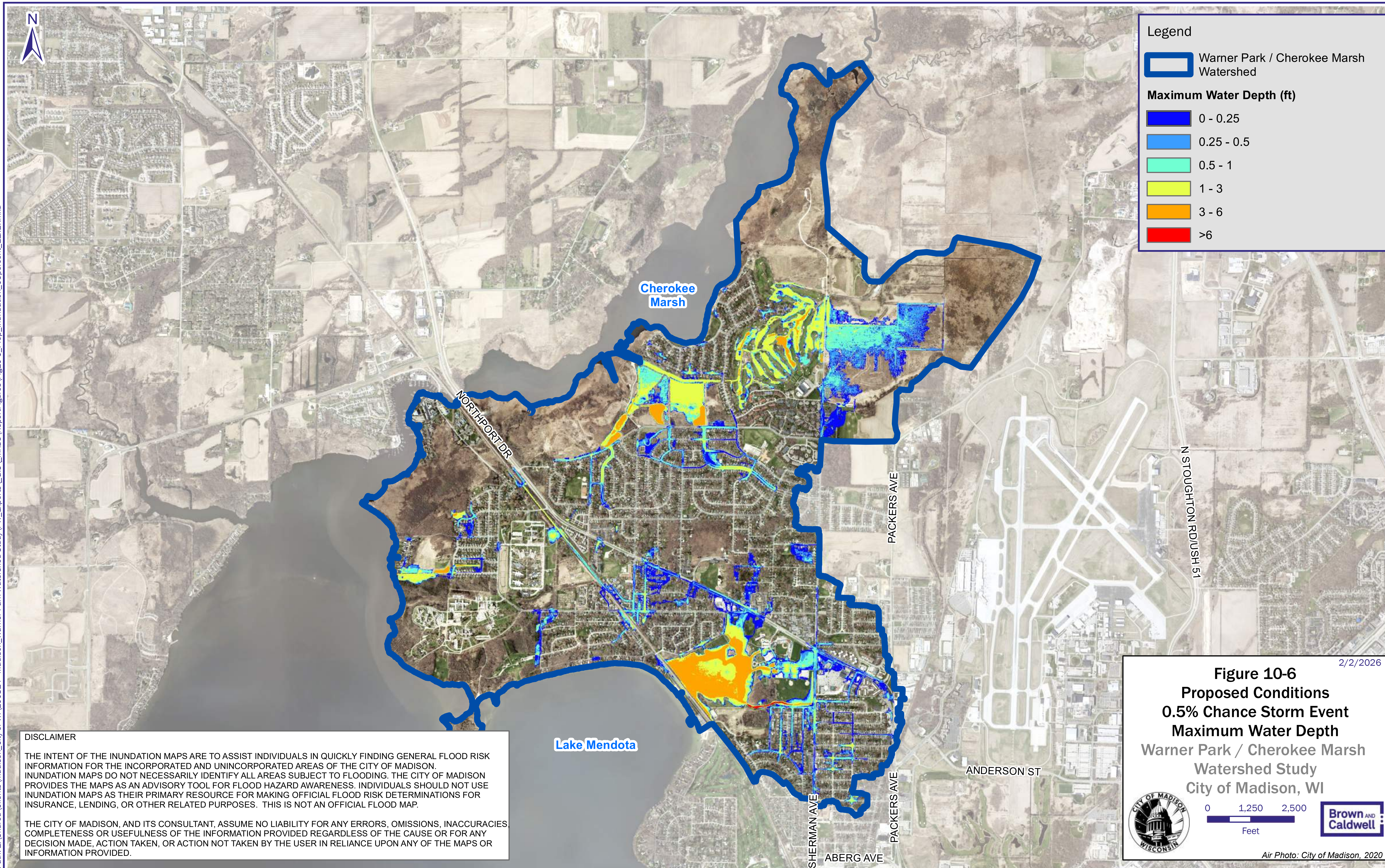

2/2/2026

Figure 10-6
Proposed Conditions
0.5% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI

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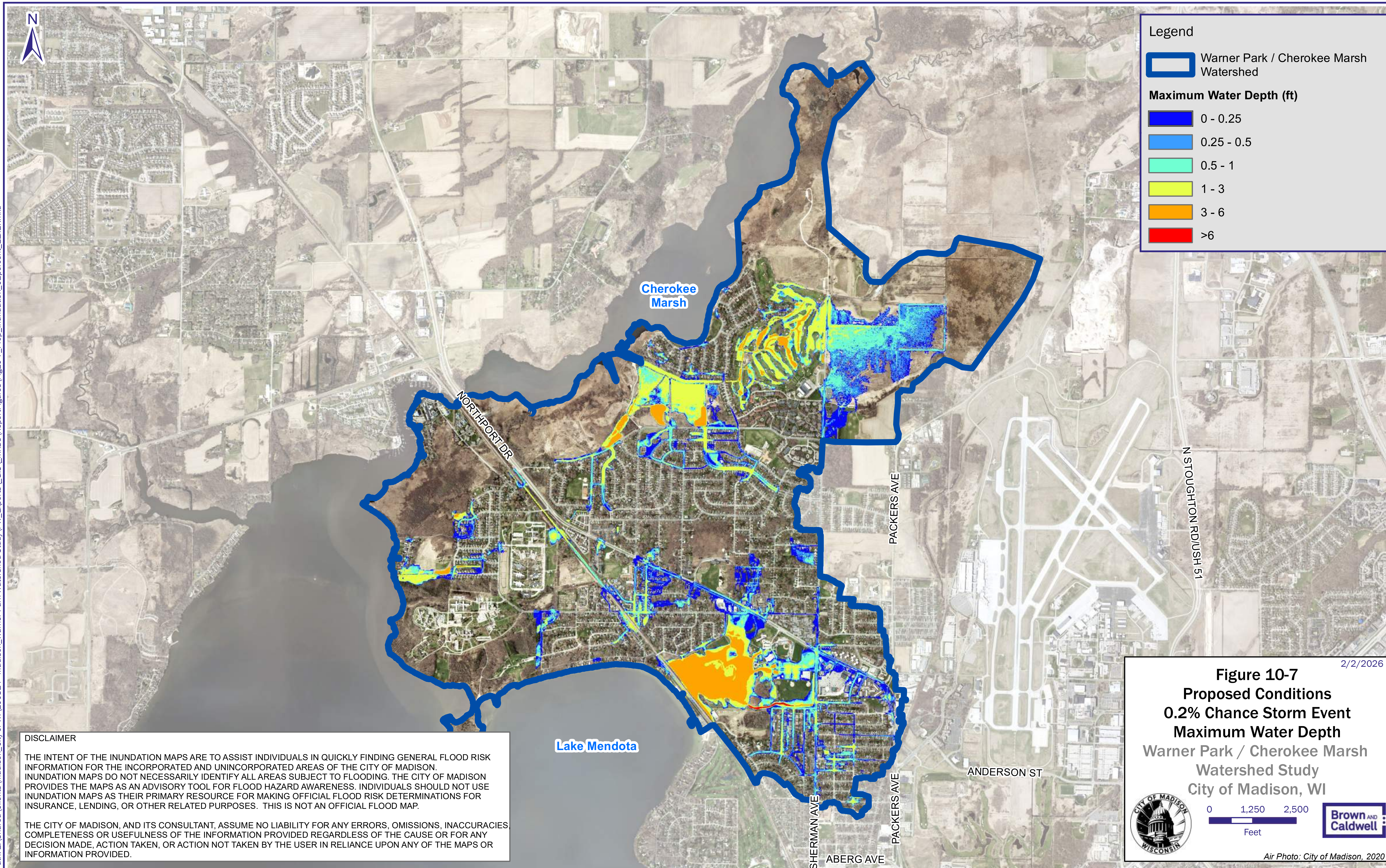

2/2/2026

Figure 10-7
Proposed Conditions
0.2% Chance Storm Event
Maximum Water Depth

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

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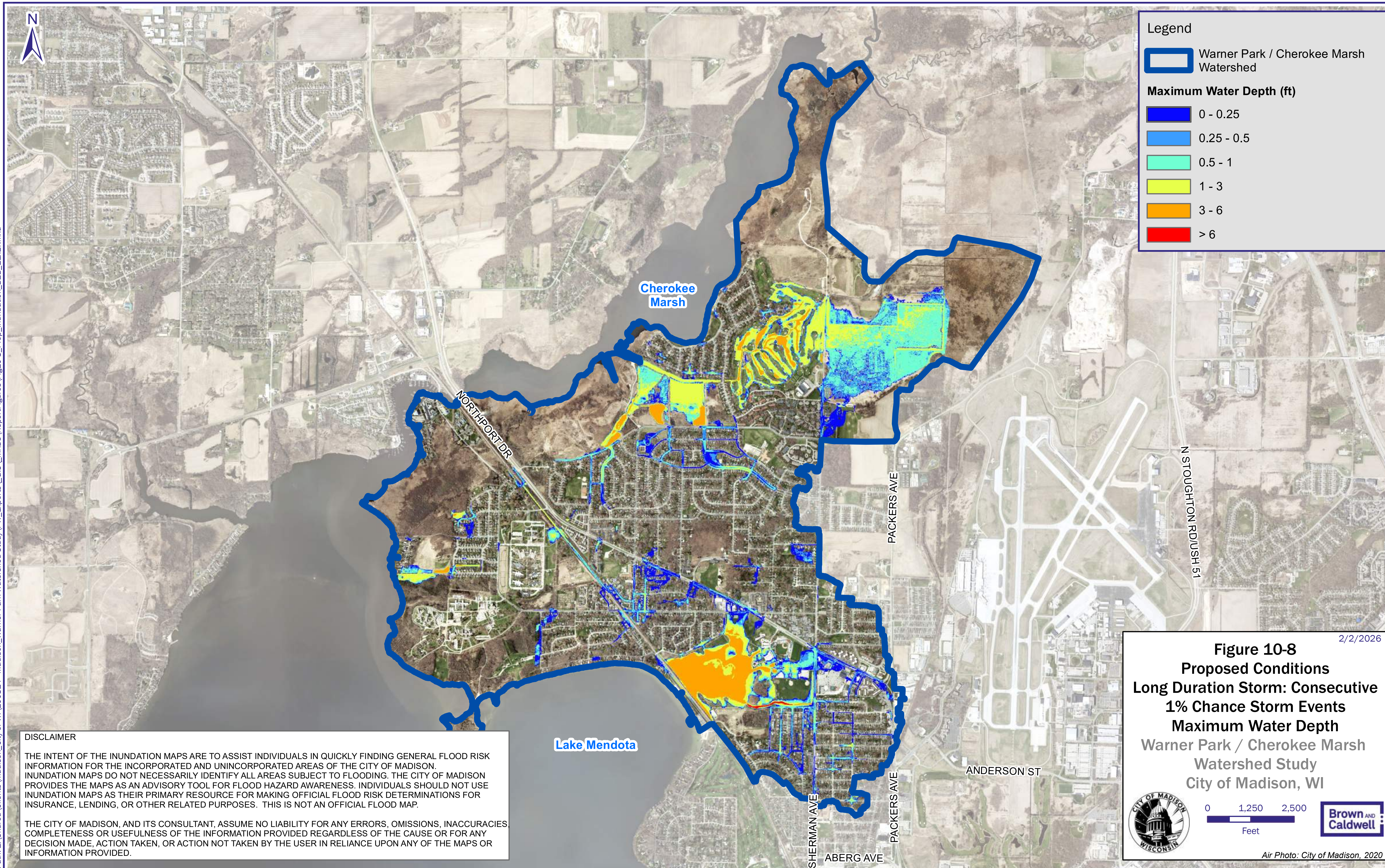

2/2/2026

Figure 10-8
Proposed Conditions
Long Duration Storm: Consecutive 1% Chance Storm Events
Maximum Water Depth

Warner Park / Cherokee Marsh Watershed Study
City of Madison, WI

Brown AND Caldwell

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Date: 2/13/2026 User Name: mwegner

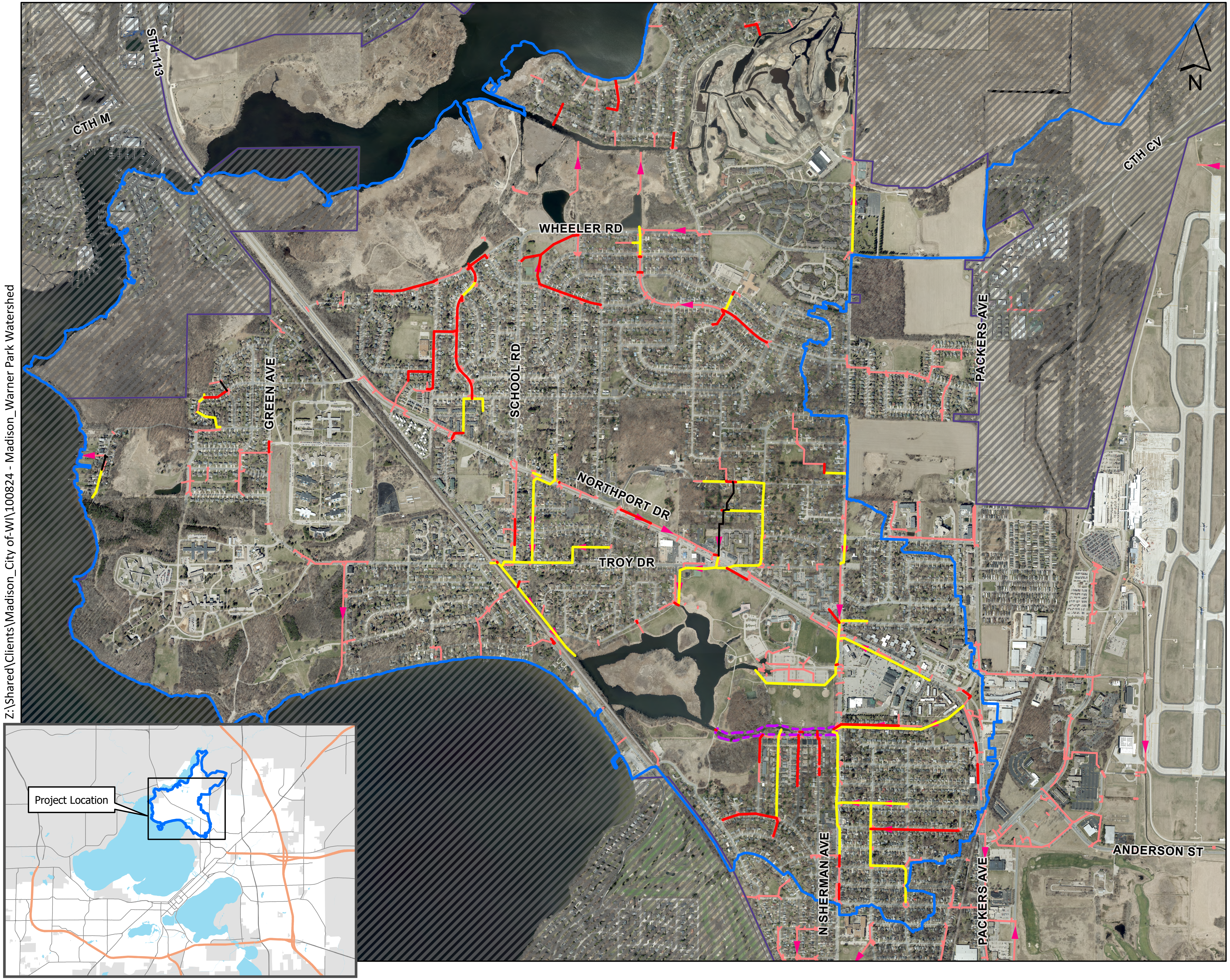


Figure 12-1
0.2% Chance Storm Enhancement Scenario

Warner / Cherokee Watershed
City of Madison

Legend

- 0.2% Chance Storm Sewer Enhancements
- Storm Sewer Improvements
- Abandon Ex. Storm Sewer
- Pond
- Existing Storm Sewer
- Municipal Limits
- Out Of City Area
- Warner / Cherokee Watershed

Appendix A: Modeling Guidance

MODELING GUIDANCE

Version 2022_05_17 (DRAFT)

Round 4, 5, and 6 Watershed Studies

The City recognizes that an important aspect of modeling is professional judgement; and it will be up to the Consultant to appropriately define parameters, variables, and methodology. However, it is in the City's best interest to have relative uniformity amongst City models. This guidance document was developed to provide uniformity. Where inputs and assumptions differ from those outlined in this document, the Consultant will be expected to justify and document the differences and reasons for the differences.

The purpose of the watershed modeling is to construct planning-level models of the watershed to identify locations with significant conveyance system deficiencies. The identified solutions will be conceptual solutions, not design-level solutions.

City of Madison Flooding Level of Service Goals

1. 10-year design storm event:
    a. No surcharging onto the street for up to the 10-year design storm; water shall be contained within the pipes and structures.
        i. When using rain-on-grid hydrology, the goal is met if there is less than 0.25' of curb depth using the FHA method.
    b. There are locations within the City where low points exist that pond water; these low points are excluded from this goal and will be addressed as streets are redesigned.
    c. For locations limited by known inlet capacity, allow no more than 0.5 feet of water above storm sewer inlet rim.
2. 25-year design storm event:
    a. Street to remain passable for emergency vehicles during 25-year design storm.
        i. This is defined as no more than 0.5 feet of water on the centerline of the street for a length of 100-feet using the depth raster.
        ii. To define the centerline of street, the County's centerline data (Dane County SDE – GISdw.DCL.RoadCenterline) should be used.
    b. Note that the Watershed Study modeling approach will not explicitly account for cross flow conditions where more gutter flow on one side of the street can overtop the crown.
3. 100-year design storm event:
    a. No home or business will be flooded during the 100-year design storm.
        i. This is defined as no more than 0.5 feet of water at the 5-foot buffer around a structure.
    b. Enclosed depressions to be served to the 100-year design storm (which can include safe overland flow within street, easements, greenways or other public lands).
        i. For purposes of the watershed studies, enclosed depressions are defined as depressions in public right-of-way where stormwater needs to reach private property to overflow from the depression.
        ii. Solutions will also be developed for enclosed depressions where the stormwater collected is solely from private property. In these cases, the solutions may be implemented thru public-private cooperation or solely by the private property owners.
    c. Greenway crossings at streets to be served to the 100-year design storm.
4. 500-year design storm event:
    a. Safely convey stormwater; i.e. limited impact on private property.
    b. Limited impact is defined as no more than 0.5 feet of water at the 5-foot buffer around a structure.
5. Provide flooding solutions that do not negatively impact downstream properties.

Due to the inherent variability and complexity of stormwater conveyance systems, it is understand it may not be practical to meet the above level of service goals in all areas of the City.

Guidance for Solutions

1. For the purpose of the watershed studies "deficiencies" in the system shall be defined as existing infrastructure, drainage capacity, or system limitations that fail to meet the goals stated in 1-5 above.
2. Watershed deficiencies will be reviewed, and solutions will be provided up to, the 100-yr design storm.
3. In areas where flooding occurs in events exceeding the 100-year storm, those areas will not be prioritized for engineering solutions, but will be identified in existing conditions model for 500-year event storms.
4. Proposed solutions will be identified for only the publicly owned drainage system.
5. Drainage issues that are private (water from the public infrastructure such as streets, greenways, ponds and/or easements is not the cause of the drainage issue) will not require modeling solutions but should be noted, where possible, in the existing conditions analysis so staff may work with property owners if necessary. (See Also Hydraulics section of Modeling Guidance for discussion on private system existing conditions modeling.)

Emergency Vehicle Allowable Flood Depths (email from Fleet on 5/12/2020)

1. SUVs – up to 6-inches
2. Large Trucks – up to 3-feet
3. Ambulances, vans, and pick-up trucks – between 6-inches and 3-feet

MODELING PARAMETERS:

Initial model parameters are the following items:

1. Include storm sewers and culvert segments for the trunk line drainage system and major conveyance to that system. Additional conveyance components may be included if felt necessary by the modeler to understand the conveyance system drainage.
2. Inlet capacity will not be included in the model. It is assumed that sufficient inlets are present accommodate stormwater. In areas where there is known chronic flooding that has been reported to Engineering, additional detail may be requested.
3. Incorporate significant existing storm water management facilities (public and private) into the model.
4. Subdivide provided outfall basins into smaller watersheds as needed in order to properly execute the model.
5. Coordinate System and Vertical Datum
    a. Horizontal Coordinate System: NAD 1983 HARN WISCRS Dane County Feet (WKID 103412).
    b. Vertical Datum: NAVD88 (pre 2007 adjustment) ft (City of Madison Datum + 845.6)
    c. Various data sources have different horizontal and vertical datums, check datum for each data source prior to use.
    d. When setting up PC-SWMM Models, the default coordinate system that looks like it matches the City's preferred coordinate system is not the same. PC-SWMM's default coordinate system is State Plane and the exact coordinate system the City uses is not in PC-SWMM's database. To create a PC-SWMM model with the same coordinate system:
        i. Open up a new, blank model.
        ii. Add one of the City's shapefiles with the preferred coordinate system.
        iii. Then, in PC-SWMM, select that coordinate system as the default.
6. Monitoring Data Time Zone: Different sources of monitoring data use different time zones. Also, some adjust for daylight savings time whereas others do not. When using the monitoring data, check both the time zone and if the data is adjusted for daylight savings time.
7. Monitoring Data Review: Familiarize yourself with the location of the monitoring gage at each site. Also, visit the monitoring site following a rain event to review the site conditions for things that would

impact the measurements. For example, is there debris clogging anything?

8. Naming convention
    a. Names are limited to 20 characters where possible. Both PC-SWMM and XP-SWMM can take lengthy names but both indicate shorter is better for avoiding truncating names.
    b. Subcatchments:
        i. Begin with Subcatchments naming convention provided by the City in the Outfall Basin feature class.
            1. Add a three-digit designator to the end of the name, beginning with 000
            2. As subcatchments are subdivided, increase the added designator by 1.
            3. Example: ME04-A-0014-H *(Provided by City)* → ME04-A-0014-H-MAD-C-000 *(For the original basin)* → ME04-A-0014-H-001 *(For first subdivision)*
        ii. Final outfall basin feature class file, including supporting files used to compute runoff timing and volume parameters shall be part of the deliverables provided to the City of Madison.
        iii. Note first downstream stormwater control practice as attribute in subcatchment feature class.
    c. Structures and Junctions:
        i. Node (Junction/Storage/Outfall) names for existing structures shall retain the asset identification provided by the City.
        ii. Proposed Structure names are to be determined by the Consultant but shall be given a “logical” name that reflects general location, function, or other.
        iii. For junctions that need to be added that are storm sewer tees as constructed, use the downstream manhole / structure with “_01” added in increasing order moving from downstream to upstream. For example, the first junction added for a tee upstream of MI3350-001 would be MI3350-001_01
    d. Pipes:
        i. Conduit names for existing pipes shall retain the asset identification provided by the City, except that:
            1. The first two letters (i.e AE, IN, etc) can be removed
            2. Leads with an asset ID that takes up all 20 characters can be shortened to the corresponding assigned ID. For example, IN3350-032_AS3350-007_3350-001 can be changed to 3350-032_3350-001_001
        ii. Proposed Pipe names are to be determined by the Consultant but shall be named in a manner similar to the City pipe naming convention, which includes the upstream and downstream structure names.
    e. Channel/Street Flow Segments:
        i. Conduit names for drainage-ways shall be named in a manner that identifies the greenway segment it represents by Greenway Node Number and the distance from the upstream end. Example: GR7541-062_125 would represent a channel segment that begins 125 feet into the North Door Creek Greenway – Sprecher Road Section.
        ii. Conduit names for streets shall be named with “Rd_”[US_Node_Name]_[DS_Node_Name] and remove the first two letters in the node name similar to how pipes are named.
    f. Natural Channels:
        i. Natural channel transects shall be named with the same ID as the conduit name.
        ii. Street models as natural channels shall be named in a manner that is easily identifiable for the street or street type it represents.
        iii. A shapefile shall be created documenting where natural channel transects are cut.
    g. Other SWMM Features (Weirs, orifices, etc)
        i. Other SWMM features shall have readily identifiable names corresponding to the type of feature they are trying to model. For example, an orifice for a detention pond should have an ID that is “<Detention Pond ID>_ORIF_01”, keeping within a 20 character limit.
    h. Ponds
        i. Use the pond name identifier from GT-Viewer combined with a common name.

For example, the ponds at Odana Hills Golf Course would be "PD3461-001_OdanaHills"

    ii. Use abbreviation of name if unofficial full name creates a model name longer than 20 characters.

i. Non-City owned infrastructure

    i. Consultant may choose name if consistent naming convention is not created by entity that owns infrastructure
    ii. If Consultant chooses name, all infrastructure owned by another entity shall start with the same few characters. For example, DOT infrastructure could all start with "DOT-" or Fitchburg owned infrastructure could start with "Fit-"

9. Data Notation

The GIS data describing the conveyance system is not complete. In some instances the modeler will be able to make assumptions based on available data. In other locations, the data will require survey. The City is tracking the accuracy of the data with the ultimate goal of having a complete record.

When the modeling is creating the GIS data describing the structures and pipes, they shall create a new attribute in their GIS data and categorize the data as the following:

a. Structures:
    - Source_IE
    - Source_Rim
b. Pipes:
    - Source_ToIE
    - Source_FromIE
c. Private:
    - Notes
d. Source –enter Number and text in bold in attribute
    0. **Converted:** legacy EI's taken from the structure, all EI's received the structures outgoing EI by default when converted in 2020. *This does not mean this data is ****better***** than the survey data, if it looks suspect, you should investigate and try to clarify the source (especially for pre-2005 data, or structures/pipes within ponds/gwys)*
    1. **Survey:** Survey data (current)
    2. **AsBuilt >2004:** As-Builts (2005-present) since City used GPS-Survey Grade to set control improving consistency citywide
    3. **AsBuilt pre-2005:** As-Builts (pre-2005)
    4. **ConstPlan**: Construction plans
    5. **GTV**: GTV in-line text, no plans to support
    6. **Interpolate:** interpolated (saddled structure had inverts on either side and interpolated—should eventually be surveyed)
    7. **Inferred:** best guess, (can't get survey now or is pulled from LiDAR, but should eventually be surveyed)
    8. **No data:** Needs survey (searched and unable to find—should eventually be surveyed, but a higher priority)
e. When creating a model, Engineers will verify/update:
    i. Structures:
        - Source_IE
        - Source_Rim
        - Project_No
    ii. Pipes:
        - Source_ToIE
        - Source_FromIE
        - Project_No
    iii. Private:
        - Notes
            - PLP_address
            - GTV

- Survey (survey will need to confirm all fields)

10. Rainfall
    a. MSE4 24-hour Distribution and NOAA Atlas 14 Depths

Recurrence Interval (years)	Rainfall Depth (inches)
1	2.49
2	2.84
5	3.45
10	4.09
25	5.02
50	5.74
100	6.66
200	7.53
500	8.94

    b. Long-Duration Storm – Two 24-hour, 100-year MSE4 storm events with the time between peak rainfalls shorted from 24 hours to 12 hours.

11. Hydrology (SWMM Method with Horton Infiltration) (References: A, B, C, J, L)
    - Parameters listed are default parameters and may need to be adjusted based on calibration data.

    a. Subcatchment Detail for Street Drainage
        i. Contributing area to the existing storm sewer system that is to be modeled (Determined on a watershed by watershed basis)
    b. SWMM Routing Parameters (if calibration is not available to adjust parameters)
        i. Percent Impervious:
            1. In areas where impervious areas are delineated:
                a. Use impervious/Pervious areas from City provided feature class.
            2. In areas where Impervious areas are not delineated:
                a. Use City provided WinSLAMM land use file and the "HowTo_CalculateCN" Document.
                b. Areas not delineated in City Provided WinSLAMM land use file shall defer to Dane County Land Use Map.
                c. Match WinSLAMM land uses with Dane County Land Use.
            3. Note: The City had a set of surface cover data built off the 2018 ortho image. The deliverables from Task 4 are the easiest to utilize in models. The impervious type is defined in a domain and to use it you may need to "Export a table to include domain descriptions and coded values"
        ii. DCIA
            1. In areas where impervious areas are delineated:
                a. Use impervious/Pervious areas from City provided feature class.
            2. In areas where Impervious areas are not delineated:
                a. Reference WinSLAMM Standard Land Use DCIA Spreadsheet
        iii. Width – Estimated based on subcatchment shape. Estimation methodology shall be documented.
            A single width shall be calculated for the entire subcatchment and used for all three sub-areas.
            It is expected Width is one of the first calibration parameters for peak flow.
        iv. Slope – Computed manually or estimated based on LiDAR. Computation or estimation methodology shall be documented.
        v. In XP-SWMM, each subcatchment is to be split into area of (1) DCIA, (2) non-DCIA, and (3) pervious area. Within the model, the non-DCIA shall be routed to the pervious area.

vi. In PC-SWMM, indicate the percent being routed to pervious in the subcatchment attribute.

c. Horton Infiltration

i. For typical urban pervious area (Based on range of values for different soil types, moisture conditions, and vegetation conditions found in Reference A):

HSG Group[a]	Max Infil. Rate (in/hr)	Min Infil. Rate (in/hr)	Decay Rate (1/hr)	Dry Days[b]	Maximum Infiltration Volume (in)
A	4.0	1.0	4.0	3.1	
B	2.0	0.5	4.0	4.4	
C	1.0	0.2	4.0	7.0	
D	0.5	0.1	4.0	9.9	
Water	0	0	0	0	

[a]For HSG listed as A/D, B/D, C/D, the default approach will be to assume the HSG associated with the lower infiltration rate (HSG D).

[b]Use equation 4-12, pg 99, SWMM Reference Manual Volume 1 – Hydrology (Revised), January 2016

ii. Impervious Manning's n – 0.016

iii. Pervious Manning's n – 0.20

iv. Depression Storage for Impervious – 0.05 inches

v. Depression Storage for Pervious – 0.15 inches

vi. Zero Depression Storage – 25 percent

vii. Factors for adjusting (L)

1. Forest – Multiply max and min infiltration rates by 2.
2. Farmland (row crops) – Multiply max and min infiltration rates by 1.2.
3. Farmland (close crops) - Multiply max and min infiltration rates by 1.8.
4. Other land uses – discuss with City staff

viii. Area-weight the Horton Infiltration parameters for each subcatchment based on the area of each soil type within a subcatchment. Remove impervious area from area-weighting.

ix. It is understood the NRCS/SCS updates the soil mapping at various times. The project teams will identify a date the soils data will be downloaded and that will be the data used for the duration of the project.

d. Evaporation: Turn off evaporation from calibration and design storm event runs.

12. Hydrology (SCS CN Hydrology – ONLY USE WHERE DESIGNATED BY CITY) (References B, K)

a. Runoff Curve number, Percent Impervious, Directly Connected impervious Area

i. In areas where impervious areas are delineated:

1. Use impervious/Pervious areas from City provided shapefile.
2. Impervious areas shall use a runoff curve number of 98.
3. Urban pervious areas that are mowed and maintained can assume the area is Open Space in good condition listed in Table 4-9 of Reference B.
4. All other pervious land uses shall match descriptions listed in Table 4-9 of Reference B.
5. Create a composite subbasin runoff curve number that incorporates both impervious and pervious areas.

ii. In areas where Impervious areas are not delineated:

1. Use City provided WinSLAMM land use file and the "HowTo_CalculateCN" Document.
2. Areas not delineated in City Provided WinSLAMM land use file shall defer to Dane County Land Use Map.
3. Match WinSLAMM land uses with Dane County Land Use and repeat item "i." of this section.
4. Impervious areas shall use a runoff curve number of 98.
5. Urban pervious areas that are mowed and maintained can assume Open Space in good condition listed in Table 4-9 of Reference B.

6. All other pervious land uses shall match descriptions listed in Table 4-9 of Reference B.
7. Create a composite subbasin runoff curve number that incorporates both impervious and pervious areas.

b. Routing Parameters
   i. Width - In PC-SWMM only, Estimated based on subbasin shape. Estimation methodology shall be documented. It is expected that width is one of the first calibration parameters to be adjust for peak flow.
   ii. Slope - In PC-SWMM only, computed manually or estimated based on LiDAR. Computation or estimation methodology shall be documented.
   iii. Time of Concentration - In XP-SWMM only, calculate each watershed time of concentration based on equations listed in SCS Urban Hydrology for Small Watershed, 2nd Ed., (TR-55), June 1986 (Reference K). The max flow length for sheet flow is 75 feet in urban areas and 150 feet in agricultural/natural areas.
   iv. In XP-SWMM and PC-SWMM, the percent impervious shall be zero and the composite runoff curve number shall incorporate impervious and pervious areas.

13. 1D Hydraulics (References: A, B, D, E, F, G)
- Dynamic mode with constant / variable timestep sufficient to model system accurately.
- Conduit lengthening shall not be used unless prior approval from City on reason.
- Parameters are default parameters and may need to be adjusted based on calibration data.
- This list is not intended to be exhaustive.

a. System to be Modeled
   i. Public
      1. Standard: Trunk line and major conveyance components to trunk line.
      2. Process for Exceptions: Provide justification for conveyance components not included.
      3. Use engineering judgement for inclusion of additional detail beyond this standard.
   ii. Private
      1. Standard: Not included
      2. Process for requiring inclusion of private pipes:
         a. Stormwater management detention facilities providing significant detention
         b. When necessary to understand the functioning of the public system. For example, the West Towne Mall parking lot drainage system.
   iii. Greenways and major surface drainages
   iv. Significant stormwater detention facilities (public and private).
      1. Private systems may be simplified if serving a single site.
      2. Provide justification for detention facilities not included.

b. Loss Coefficients (see drawing at end of document)
   i. Entry
      1. Culverts – Select Inlet Type based on the Help File or HEC-RAS Hydraulic Reference Manual
      2. Storm Sewer (internal at MHs) = 0.05
      3. Storm Drainage Structures (MH) at 45 degree bend = 0.25
      4. Storm Drainage Structures (MH) at 90 degree bend = 0.5
      5. For culverts and entrances to storm sewer from an open channel or pond, both the energy loss coefficient and the inlet control (culvert code) shall be used.
   ii. Exit
      1. Culverts –
         a. Exit closed conduit to open channel = 0.5
         b. Exit closed conduit to lake or pond = 1.0
      2. Storm Sewer (internal at MHs) = 0.05

3. Storm Drainage Structures (MH) at 45 degree bend = 0.25
4. Storm Drainage Structures (MH) at 90 degree bend = 0.5

c. Coefficient of Discharge
   i. Weirs
      1. Sharp Crested – 3.0
      2. Roadway embankment – 2.6
      3. Flatter overflow – Use engineering judgment
   ii. Orifices
      1. 0.6

d. Manning's n
   i. Pipes
      1. Concrete Pipe: 0.013
      2. Other n values shall be chosen within generally acceptable ranges.
   ii. Channels
      1. Use Chow's Open Channel Hydraulics, Reference E
   iii. Bank Flow, including developed urban areas
      1. Use Chow's Open Channel Hydraulics, Reference E

e. Transect Placement and Modifiers
   i. Splitting long open channels
      1. Changes in cross section
      2. Significant changes in slope and roughness
      3. Overflow points
   ii. Segment Lengths
   iii. Channel Geometry
   iv. Provide shapefile where natural channel transects are selected along with XS Identifier

f. Tailwater Conditions:
   i. Lake Mendota: one foot over Summer Maximum – 851.10
   ii. Lake Monona: TBD
   iii. Lake Wingra (100-year WSE): 848.0
   iv. Yahara River between Lakes Mendota and Monona: TBD

g. Inlet Clogging Factors
   i. Continuous Slopes
      1. Street slope < 1% - 25% Clogging
      2. Street slope >= 1% - No Clogging
   ii. Sags – 50% Clogging

14. 2D Data (References: A, G, H, I)

a. Surface Roughness – The average Manning's n may vary by land cover / land use. Referencing TR-55, the following roughness can be used for sheet flow conditions. Choose based on professional judgement and document in the report.
   i. Impervious areas - 0.1
   ii. Turf grass areas - 0.24
   iii. Wooded – 0.4
   iv. Prairie – 0.15
   v. Other – reference TR-55

b. Channel Roughness - Where the 2D surface experiences channel flow, rather than sheet flow, utilize the Manning's n values for open channels

c. Impervious Area/Inactive Areas - The City had a set of surface cover data built off the 2018 ortho image. The deliverables from Task 4 are the easiest to utilize in models. The impervious type is defined in a domain and to use it you may need to "Export a table to include domain descriptions and coded values"
   i. Average the roughness within the ROW based impervious and pervious area.

d. Blocked Obstructions – enter roofs as Inactive Areas in XP-SWMM and Obstructions in PC-SWMM
   i. Non-residential – use City impervious area data for roofs

ii. Residential – use Dane County roof layer

e. Grid cell/mesh size: Use size that balances model run time and sufficient 2D overland flow detail.

f. Grid/mesh orientation: Where possible, align grid/mesh with major channel flow direction. If not practical, then use orientation that minimizes run time.

15. Rain-on-Grid Analysis (Do not use without discussion with City)

a. Hydrology

For a full study area Rain-on-Grid model, no nodes or pipes should be active within the Runoff Mode.

i. Rainfall - All runoff is generated using Rainfall / Flow Area layers. Individual layers shall be created for each rainfall event, with only the applicable one active during each scenario. Rainfall distributions stated above in Section 9 shall be used.

ii. Landuse – Layers for the following land uses must be created: Buildings, Impervious, Turf Grass, Wooded, Prairie, Water and any other applicable layers. Land use layers for Turf Grass, Wooded, Prairie, and any other pervious land coverage, shall be additionally divided up into Hydrologic Soil Groups A, B, C, and D. These layers should cover the entire study area. Under the Land use data tab, inputs for Manning's Roughness, Rainfall Abstraction, and Infiltration must be completed.

1. Manning's Roughness:

a. Buildings – Variable roughness must be used. A Depth-Roughness relationship as follows is appropriate:

Depth (ft)	Roughness
0.00	0.01
0.30	0.01
0.31	0.1
10.0	0.3

b. Impervious – A constant roughness of 0.016

c. Turf Grass, Prairie, Wooded, and other Pervious – Variable roughness must be used to account for sheet flow at low flow depths. The consultant shall use roughness coefficients stated above in Sections 10.c and 12.a to develop these roughness curves.

d. Water – A constant roughness of 0.01.

2. Rainfall Abstraction:

a. Buildings and Impervious – Initial Abstraction of 0.04 inches (XP-SWMM Default). Continuing loss should remain 0.0.

b. Pervious - This shall remain unchecked, as Initial and Continuing losses will be accounted for via the Horton Infiltration parameters.

3. Infiltration:

a. Buildings and Impervious – This shall remain unchecked

b. Pervious – Horton Infiltration as described above in Section 10.c shall be created for each pervious land use layer.

b. 2D Model Settings

i. Grid extent shall cover the entire study area.

ii. Default area type shall be set to Active Area. There should not be any inactive areas within the model.

iii. Default land use should be set to one of the pervious layers (suggested to use layer with largest total area). However, this should not have any impact on the modeling if there is full coverage of land use layers.

iv. Head boundaries shall be set anywhere where surface flow is able to leave the study area.

c. 1D Model Network
    i. The 1D storm sewer network shall be extensive enough to include enough inlets throughout the watershed so that surface water can adequately pass from the 2D surface into the 1D model. Multiple inlets at the same location may be combined to a single node. Inlets either side of the street shall remain separate nodes.
    ii. Each inlet node must have Link Spill Crest to 2D checked. Each culvert inlet/outlet must have Link Invert to 2D checked. If calibration shows not enough flow is entering each inlet node, Spill Crest elevations may be lowered below the 2D cell elevation (0.5 ft is an acceptable initial lowering value)

d. 1D/2D Interface Lines at Intersections
    i. In steeper watersheds, the water on the grid may not enter the pipe due to the limitations of the xp2d grid module. Pipes should be reviewed after a simulation for this occurrence. Where this occurs, add 1D/2D interface lines to connect the flow at appropriate intersections to the 1D node.

16. Suggested Proposed Solutions Organization
    a. The Proposed Solutions simulations should be set up in the following way (unless discussed with City staff first). The purpose is to have a model with just the proposed storm sewer improvements, just the regional improvements, and then both.
        i. Add the proposed storm sewer to the Existing Conditions Model as a Scenario.
        ii. Once complete, save the model file with a new name. Add the regional solutions in the Base Scenario, keeping the proposed storm sewer as a scenario.

17. Non-Modeling Data
    a. When utilizing XP-SWMM, provide attributed describing the source of data in the representative GIS feature classes
    b. When utilizing PC-SWMM, also add attributes to the entities describing their data sources.

18. Solutions
    a. Analysis – what are the underlying causes of flooding in:
        i. Areas reported in the “Flood Download” from City staff
        ii. Other flooded areas in the modeling not identified in the “Flood Download”
            1. If more than 10 total areas, work with City staff to prioritize locations to evaluate
        iii. City to identify suggested solutions and provide to Consultant for consideration
        iv. Consultant to identify solutions independently and take lead on overall solutions for watershed
    b. Prioritize Solutions
        i. Property Damage
        ii. Major arterials where emergency vehicles cannot get through
        iii. More criteria - TBD
    c. Displaying solutions/Order of solutions
        i. Show each solution independently and then combined
        ii. Order
            1. Property/pipe owned by Stormwater Utility
            2. Pipe size needed to solve remainder of issues
            3. Other public properties
                a. Janet will provide areas where there are non-starters in Parks
            4. Private properties
        iii. Show structures removed from the 100-yr event
            1. Intersect the flood raster with the building outlines
            2. Buffer buildings by 5-feet to account for in accuracies of building footprint layer
            3. Any building outline that intersects the buildings is considered “flooded” if depth of intersection is 6 inches or greater.
    d. In SWU-owned land all proposed grading must have the following conditions for

maintenance access:

i. be offset from the property line on 1 side by 15 feet (parallel to channel flow, from Pond access to pond outlet)

1. Shall be extended to reach all priority inlets or sanitary access structures within greenway

ii. All proposed berms must be 10 feet wide @ top of berm

iii. Slopes no steeper than 4:1

e. Overlay TIP map with inundation mapping to understand where immediate future project opportunities are

f. Freeboard – City does not have a minimum freeboard requirement

g. Properties adjacent to greenway and new greenway crossings – Current ordinance states property low building opening must be 4' above invert of downstream greenway street structure crossing. Therefore, may need to make structures wider, instead of deeper, to not flood upstream properties

19. Water that overflows Watershed Study Boundaries

a. There may be locations along a watershed study boundary where water overflows that boundary and enters an adjacent watershed. When this occurs

i. 2D outflow boundaries should be drawn in the locations to allow the water to leave the model as it would normally.

ii. A 2D flow recording line should be added in this location, just upstream of the 2D outflow boundary.

iii. The model should be run for all design storm events.

1. If flow is found to be significant, hydrographs should be exported from the model and provided to the City Project Manager so they can be inserted into the adjacent watershed study model.

2. If flow is not found to be significant, the flow can be ignored.

iv. The watershed should report should include a section showing the locations of the overflow. Text and tables in the report should briefly describe the magnitude of the overflow and the duration.

REFERENCES

A. Model Help Files and User Forums

B. Storm Water Management Model version 5.1 User's Manual. (Available at: https://www.epa.gov/water-research/storm-water-management-model-swmm-version-51-users-manual)

C. SWMM reference manual volume I – hydrology (Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NYRA.txt)

D. SWMM reference manual volume volume II – hydraulics (Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100S9AS.PDF?Dockey=P100S9AS.PDF)

E. Chow, Open Channel Hydraulics, 1959

F. HEC-RAS Hydraulic Reference Manual. (Available at: https://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS%205.0%20Reference%20Manual.pdf)

G. ASCE Two-Dimensional Modeling Using HEC-RAS, Lecture 8 – Troubleshooting and Reviewing, Page 31; 2017.

H. Australian Rainfall & Runoff Revision Projects, Project 15: Two Dimensional Modeling in Urban and Rural Floodplains, November 2012.

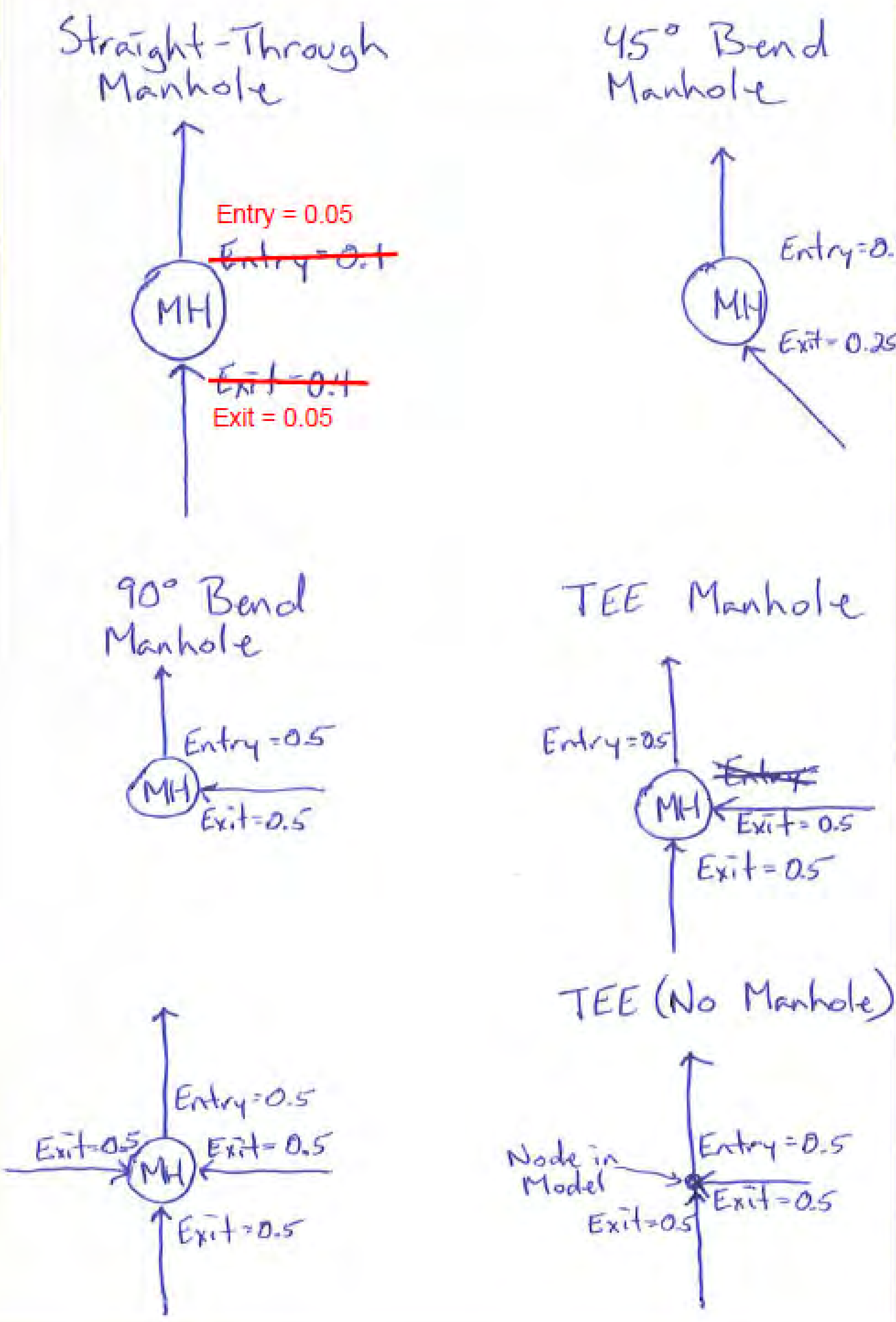
I. FLO-2D Reference Manual, FLO-2D Software, 2012.

J. ASCE Manual of Engineering Practice No 28.

K. SCS Urban Hydrology for Small Watershed, 2nd Ed., (TR-55), June 1986

L. Found during calibration in the Pheasant Branch Watershed. Area underlain with Prairie du Chein geology. Areas with other geology will need to select appropriate multipliers.

References/Notes



Appendix B: Hydrology Input Parameters

Table B-1 DCIA by Land Use Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI			
Land Use	Land Use Abbreviation	Area (acres)	DCIA Percentage
Duplex	DUPLEX	29.3	53.3%
High Density Residential No Alleys	HDRNA	26.0	66.8%
High Rise Residential	HRR	56.7	97.4%
Institutional	INST	57.4	93.0%
Low Density Residential	LDR	105.3	41.4%
Light Industrial	LI	30.1	87.2%
Medium Density Residential No Alleys	MDRNA	783.9	45.8%
Multi-Family Residential	MFR	223.6	83.9%
Office Park	OFFPARK	186.6	70.0%
Open Space	OPEN	868.9	100.0%
Park	PARK	884.8	64.5%
School	SCH	49.7	35.0%
Shopping Center	SHOPCENT	26.9	91.0%
Strip Commercial	STRIPCOM	30.4	98.1%
Street	STREET	422.0	100.0%
Subburban	SUBR	13.2	28.6%
Water	WATER	86.5	100.0%
Total		3881	

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-U-0243-K-MAD-C	IN5416-002	1	0.20	100	229	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5416-002	2	0.38	100	229	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5416-002	3	0.63	0	229	0.009	IN5416-002	0.75	0.15
UY01-U-0243-K-MAD-C	IN5316-003	1	2.58	100	598	0.011	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5316-003	2	4.65	100	598	0.011	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5316-003	3	10.29	0	598	0.011	IN5316-003	2.9	0.723
UY01-U-0243-K-MAD-C	AS5316-005	1	0.55	100	376	0.007	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	AS5316-005	2	0.94	100	376	0.007	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	AS5316-005	3	1.66	0	376	0.007	AS5316-005	0.75	0.15
UY01-U-0243-K-MAD-C	IN5216-003	1	1.52	100	395	0.012	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5216-003	2	2.60	100	395	0.012	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5216-003	3	5.97	0	395	0.012	IN5216-003	3	0.75
UY01-U-0243-K-MAD-C	IN5215-003	1	0.40	100	256	0.023	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5215-003	2	0.69	100	256	0.023	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5215-003	3	1.90	0	256	0.023	IN5215-003	3	0.75
UY01-U-0243-K-MAD-C	IN5218-010	1	1.09	100	399	0.004	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-010	2	2.05	100	399	0.004	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-010	3	4.49	0	399	0.004	IN5218-010	1.121	0.249
UY01-U-0243-K-MAD-C	IN5218-012	1	1.19	100	404	0.007	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-012	2	2.32	100	404	0.007	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-012	3	5.68	0	404	0.007	IN5218-012	2.272	0.556
UY01-E-0244-K-MAD-C	AS5219-004	1	0.88	100	158	0.015	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5219-004	2	1.04	100	158	0.015	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5219-004	3	1.08	0	158	0.015	AS5219-004	2.763	0.687
UY01-U-0243-K-MAD-C	IN5117-013	1	0.82	100	356	0.01	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5117-013	2	1.31	100	356	0.01	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5117-013	3	1.60	0	356	0.01	IN5117-013	1.161	0.26
UY01-D-0257-K-MAD-C	AS5421-004	1	6.37	100	960	0.037	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	AS5421-004	2	11.74	100	960	0.037	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	AS5421-004	3	33.18	0	960	0.037	AS5421-004	2.788	0.687
UY01-D-0257-K-MAD-C	IN5321-001	1	0.59	100	420	0.024	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-001	2	1.01	100	420	0.024	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-001	3	1.66	0	420	0.024	IN5321-001	3	0.75
UY01-D-0257-K-MAD-C	IN5321-010	1	1.36	100	437	0.036	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-010	2	2.51	100	437	0.036	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-010	3	5.28	0	437	0.036	IN5321-010	3	0.75
UY01-D-0257-K-MAD-C	AS5321-020	1	0.37	100	225	0.034	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	AS5321-020	2	0.68	100	225	0.034	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	AS5321-020	3	1.46	0	225	0.034	AS5321-020	3	0.75
UY01-E-0244-K-MAD-C	AS5320-003	1	2.91	100	512	0.033	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5320-003	2	3.47	100	512	0.033	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5320-003	3	18.44	0	512	0.033	AS5320-003	3	0.75
UY01-E-0244-K-MAD-C	AS5320-004	1	1.57	100	291	0.029	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5320-004	2	2.17	100	291	0.029	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	AS5320-004	3	4.54	0	291	0.029	AS5320-004	2.985	0.746
UY01-D-0257-K-MAD-C	IN5220-007	1	0.15	100	58	0.041	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-007	2	0.15	100	58	0.041	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-007	3	0.22	0	58	0.041	IN5220-007	3	0.75
UY01-D-0257-K-MAD-C	IN5220-012	1	0.67	100	279	0.037	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-012	2	1.30	100	279	0.037	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-012	3	2.87	0	279	0.037	IN5220-012	3	0.75
UY01-D-0257-K-MAD-C	IN5220-013	1	1.25	100	353	0.021	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-013	2	2.40	100	353	0.021	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-013	3	8.03	0	353	0.021	IN5220-013	3	0.75
UY01-D-0257-K-MAD-C	IN5220-014	1	1.87	100	510	0.029	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-014	2	3.57	100	510	0.029	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-014	3	7.73	0	510	0.029	IN5220-014	3	0.75
UY01-E-0244-K-MAD-C	IN5220-021	1	0.66	100	240	0.022	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	IN5220-021	2	1.19	100	240	0.022	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	IN5220-021	3	3.63	0	240	0.022	IN5220-021	2.787	0.693
UY01-D-0257-K-MAD-C	IN5221-002	1	3.76	100	678	0.042	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5221-002	2	7.23	100	678	0.042	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5221-002	3	18.15	0	678	0.042	IN5221-002	3	0.75

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-D-0257-K-MAD-C	IN5221-013	1	0.69	100	275	0.029	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5221-013	2	1.38	100	275	0.029	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5221-013	3	2.97	0	275	0.029	IN5221-013	3	0.75
UY01-C-0242-H-MAD-C	AS5120-010	1	1.00	100	253	0.017	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5120-010	2	1.27	100	253	0.017	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5120-010	3	2.35	0	253	0.017	AS5120-010	2.773	0.69
UY01-C-0242-H-MAD-C	IN5120-016	1	0.22	100	537	0.017	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-016	2	0.40	100	537	0.017	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-016	3	9.55	0	537	0.017	IN5120-016	2.914	0.728
UY01-C-0242-H-MAD-C	AS5120-018	1	2.22	100	637	0.032	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5120-018	2	3.93	100	637	0.032	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5120-018	3	9.01	0	637	0.032	AS5120-018	3	0.75
UY01-A-0240-K-MAD-C	AS5022-001	1	0.30	100	117	0.017	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-001	2	0.40	100	117	0.017	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-001	3	0.62	0	117	0.017	AS5022-001	3	0.75
UY01-A-0240-K-MAD-C	AS5022-007	1	0.32	100	267	0.058	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-007	2	0.56	100	267	0.058	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-007	3	1.53	0	267	0.058	AS5022-007	3	0.75
UY01-A-0240-K-MAD-C	AS5022-008	1	0.47	100	189	0.025	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-008	2	0.92	100	189	0.025	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-008	3	2.32	0	189	0.025	AS5022-008	3	0.75
UY01-A-0240-K-MAD-C	AS5022-016	1	0.84	100	242	0.017	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-016	2	1.56	100	242	0.017	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5022-016	3	2.99	0	242	0.017	AS5022-016	3	0.75
UY01-A-0240-K-MAD-C	IN5022-020	1	0.10	100	86	0.065	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5022-020	2	0.13	100	86	0.065	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5022-020	3	0.22	0	86	0.065	IN5022-020	3	0.75
UY01-A-0240-K-MAD-C	AS5021-005	1	1.24	100	357	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-005	2	2.61	100	357	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-005	3	5.23	0	357	0.024	AS5021-005	3	0.75
UY01-A-0240-K-MAD-C	AS5021-006	1	0.29	100	126	0.018	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-006	2	0.48	100	126	0.018	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-006	3	0.95	0	126	0.018	AS5021-006	3	0.75
UY01-A-0240-K-MAD-C	AS5021-012	1	0.22	100	195	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-012	2	0.38	100	195	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-012	3	0.82	0	195	0.024	AS5021-012	3	0.75
UY01-A-0240-K-MAD-C	AS5021-017	1	0.76	100	245	0.027	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-017	2	1.38	100	245	0.027	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5021-017	3	3.76	0	245	0.027	AS5021-017	3	0.75
UY01-A-0240-K-MAD-C	AS5020-010	1	0.20	100	126	0.025	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5020-010	2	0.27	100	126	0.025	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5020-010	3	0.32	0	126	0.025	AS5020-010	3	0.75
UY01-A-0240-K-MAD-C	IN5020-012	1	1.97	100	417	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5020-012	2	3.85	100	417	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5020-012	3	8.80	0	417	0.026	IN5020-012	3	0.75
UY01-B-0241-K-MAD-C	IN4920-007	1	1.42	100	391	0.022	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	IN4920-007	2	2.18	100	391	0.022	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	IN4920-007	3	12.01	0	391	0.022	IN4920-007	3	0.75
UY01-A-0240-K-MAD-C	AS4922-005	1	0.14	100	201	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-005	2	0.27	100	201	0.024	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-005	3	2.25	0	201	0.024	AS4922-005	3	0.75
UY01-A-0240-K-MAD-C	AS4922-006	1	0.51	100	210	0.028	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-006	2	0.89	100	210	0.028	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-006	3	2.07	0	210	0.028	AS4922-006	3	0.75
UY01-A-0240-K-MAD-C	AS4922-007	1	0.59	100	198	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-007	2	0.90	100	198	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-007	3	1.80	0	198	0.026	AS4922-007	3	0.75
UY01-A-0240-K-MAD-C	AS4922-013	1	1.23	100	222	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-013	2	1.83	100	222	0.026	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4922-013	3	2.84	0	222	0.026	AS4922-013	3	0.75
ME06-U-0045-A-MAD-C	IN4821-002	1	1.33	100	502	0.052	Impervious	0.001	0.001
ME06-U-0045-A-MAD-C	IN4821-002	2	2.33	100	502	0.052	Impervious	0.001	0.001
ME06-U-0045-A-MAD-C	IN4821-002	3	8.71	0	502	0.052	IN4821-002	3	0.75

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-U-0573-A-MAD-C	AS4722-008	1	1.78	100	296	0.016	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4722-008	2	2.96	100	296	0.016	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4722-008	3	6.27	0	296	0.016	AS4722-008	3	0.75
ME06-U-0573-A-MAD-C	IN4723-007	1	0.29	100	248	0.091	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4723-007	2	0.42	100	248	0.091	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4723-007	3	1.74	0	248	0.091	IN4723-007	1.373	0.294
ME06-U-0573-A-MAD-C	IN4723-013	1	0.78	100	347	0.02	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4723-013	2	1.29	100	347	0.02	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4723-013	3	3.22	0	347	0.02	IN4723-013	3	0.75
ME06-U-0573-A-MAD-C	AS4723-016	1	0.21	100	218	0.072	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4723-016	2	0.40	100	218	0.072	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4723-016	3	1.16	0	218	0.072	AS4723-016	3	0.75
ME06-G-0371-H-MAD-C	AS4724-001	1	0.77	100	247	0.014	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-001	2	1.22	100	247	0.014	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-001	3	1.88	0	247	0.014	AS4724-001	3	0.75
ME06-G-0371-H-MAD-C	IN4724-009	1	0.67	100	359	0.018	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-009	2	1.24	100	359	0.018	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-009	3	4.97	0	359	0.018	IN4724-009	2.998	0.75
ME06-G-0371-H-MAD-C	IN4724-019	1	0.74	100	443	0.028	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-019	2	1.45	100	443	0.028	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-019	3	3.35	0	443	0.028	IN4724-019	2.697	0.66
ME06-G-0371-H-MAD-C	AS4724-022	1	1.00	100	217	0.027	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-022	2	1.50	100	217	0.027	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-022	3	1.98	0	217	0.027	AS4724-022	2.037	0.461
ME06-G-0371-H-MAD-C	AE4724-023	1	0.13	100	253	0.035	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AE4724-023	2	0.41	100	253	0.035	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AE4724-023	3	3.40	0	253	0.035	AE4724-023	2.163	0.498
ME06-G-0371-H-MAD-C	IN4724-024	1	0.17	100	77	0.056	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-024	2	0.19	100	77	0.056	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-024	3	0.19	0	77	0.056	IN4724-024	3	0.75
ME06-G-0371-H-MAD-C	IN4825-003	1	0.18	100	192	0.009	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4825-003	2	0.18	100	192	0.009	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4825-003	3	1.36	0	192	0.009	IN4825-003	3.014	0.753
ME06-F-0372-H-MAD-C	IN4825-004	1	0.16	100	97	0.017	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-004	2	0.16	100	97	0.017	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-004	3	0.21	0	97	0.017	IN4825-004	3	0.75
ME06-F-0372-H-MAD-C	IN4825-009	1	0.14	100	113	0.059	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-009	2	0.14	100	113	0.059	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-009	3	0.41	0	113	0.059	IN4825-009	3	0.75
ME06-F-0372-H-MAD-C	IN4825-010	1	0.24	100	198	0.042	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-010	2	0.30	100	198	0.042	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	IN4825-010	3	3.22	0	198	0.042	IN4825-010	3.724	0.931
ME06-G-0371-H-MAD-C	AS4824-009	1	0.29	100	165	0.023	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4824-009	2	0.29	100	165	0.023	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4824-009	3	1.47	0	165	0.023	AS4824-009	3.09	0.772
ME06-G-0371-H-MAD-C	IN4823-006	1	1.97	100	459	0.018	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4823-006	2	2.69	100	459	0.018	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4823-006	3	10.54	0	459	0.018	IN4823-006	3	0.75
ME06-F-0372-H-MAD-C	AS4925-001	1	0.96	100	554	0.018	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	AS4925-001	2	1.07	100	554	0.018	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	AS4925-001	3	24.15	0	554	0.018	AS4925-001	3.237	0.81
ME06-D-0007-H-MAD-C	AS5025-003	1	0.71	100	125	0.017	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5025-003	2	0.85	100	125	0.017	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5025-003	3	4.85	0	125	0.017	AS5025-003	3	0.75
UY01-A-0240-K-MAD-C	AS5023-020	1	1.12	100	439	0.008	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-020	2	1.18	100	439	0.008	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-020	3	1.94	0	439	0.008	AS5023-020	3	0.75
UY01-A-0240-K-MAD-C	AS5023-021	1	1.77	100	472	0.028	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-021	2	2.80	100	472	0.028	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-021	3	6.88	0	472	0.028	AS5023-021	3	0.75
ME06-D-0007-H-MAD-C	IN5124-002	1	0.36	100	173	0.071	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-002	2	0.52	100	173	0.071	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-002	3	1.11	0	173	0.071	IN5124-002	3	0.75

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-D-0007-H-MAD-C	AS5124-004	1	0.44	100	156	0.018	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-004	2	0.52	100	156	0.018	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-004	3	0.65	0	156	0.018	AS5124-004	3	0.75
ME06-D-0007-H-MAD-C	IN5124-007	1	0.28	100	163	0.055	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-007	2	0.49	100	163	0.055	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-007	3	1.02	0	163	0.055	IN5124-007	3	0.75
ME06-D-0007-H-MAD-C	AS5124-027	1	1.80	100	523	0.044	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-027	2	3.70	100	523	0.044	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-027	3	24.39	0	523	0.044	AS5124-027	2.723	0.637
ME06-D-0007-H-MAD-C	AS5124-037	1	0.49	100	474	0.03	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-037	2	1.10	100	474	0.03	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-037	3	3.55	0	474	0.03	AS5124-037	3	0.75
ME06-D-0007-H-MAD-C	AS5125-001	1	2.35	100	331	0.016	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-001	2	3.01	100	331	0.016	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-001	3	4.74	0	331	0.016	AS5125-001	3	0.75
ME06-D-0007-H-MAD-C	AS5125-005	1	1.95	100	491	0.035	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-005	2	2.42	100	491	0.035	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-005	3	12.02	0	491	0.035	AS5125-005	3	0.75
ME06-D-0007-H-MAD-C	AS5125-012	1	1.73	100	459	0.028	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-012	2	3.08	100	459	0.028	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-012	3	8.14	0	459	0.028	AS5125-012	3	0.75
ME06-D-0007-H-MAD-C	AS5125-017	1	1.88	100	632	0.024	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-017	2	3.74	100	632	0.024	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-017	3	16.24	0	632	0.024	AS5125-017	3	0.75
ME06-D-0007-H-MAD-C	AS5125-022	1	0.21	100	78	0.015	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-022	2	0.30	100	78	0.015	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5125-022	3	0.46	0	78	0.015	AS5125-022	3	0.75
ME06-C-0006-H-MAD-C	AS5325-004	1	3.67	100	481	0.069	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5325-004	2	4.38	100	481	0.069	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5325-004	3	15.83	0	481	0.069	AS5325-004	2.876	0.699
ME06-C-0006-H-MAD-C	IN5324-002	1	0.42	100	207	0.061	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5324-002	2	0.76	100	207	0.061	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5324-002	3	1.54	0	207	0.061	IN5324-002	2.019	0.456
ME06-C-0006-H-MAD-C	AS5324-008	1	0.13	100	219	0.099	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-008	2	0.33	100	219	0.099	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-008	3	1.88	0	219	0.099	AS5324-008	2.892	0.717
ME06-C-0006-H-MAD-C	AS5324-013	1	0.51	100	186	0.087	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-013	2	0.65	100	186	0.087	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-013	3	1.68	0	186	0.087	AS5324-013	1.638	0.327
ME06-C-0006-H-MAD-C	AS5324-015	1	0.41	100	366	0.083	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-015	2	0.77	100	366	0.083	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5324-015	3	2.94	0	366	0.083	AS5324-015	2.993	0.749
ME06-A-0004-H-MAD-C	AS5423-002	1	0.41	100	250	0.029	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5423-002	2	0.76	100	250	0.029	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5423-002	3	1.78	0	250	0.029	AS5423-002	3	0.75
ME06-A-0004-H-MAD-C	AS5423-010	1	0.58	100	316	0.035	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5423-010	2	1.06	100	316	0.035	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5423-010	3	4.10	0	316	0.035	AS5423-010	3	0.75
ME06-A-0004-H-MAD-C	IN5424-004	1	0.89	100	561	0.018	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5424-004	2	2.10	100	561	0.018	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5424-004	3	14.23	0	561	0.018	IN5424-004	2.708	0.672
ME06-A-0004-H-MAD-C	AS5424-007	1	0.47	100	238	0.03	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5424-007	2	0.79	100	238	0.03	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5424-007	3	2.86	0	238	0.03	AS5424-007	2.436	0.6
ME06-C-0006-H-MAD-C	IN5425-007	1	1.03	100	585	0.061	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5425-007	2	2.21	100	585	0.061	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5425-007	3	11.39	0	585	0.061	IN5425-007	3	0.75
ME06-A-0004-H-MAD-C	AS5425-010	1	0.53	100	191	0.01	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5425-010	2	0.62	100	191	0.01	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5425-010	3	1.57	0	191	0.01	AS5425-010	3	0.75
ME06-A-0004-H-MAD-C	AS5426-007	1	0.61	100	133	0.034	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5426-007	2	0.73	100	133	0.034	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5426-007	3	0.85	0	133	0.034	AS5426-007	3	0.75

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-A-0004-H-MAD-C	AS5427-006	1	0.19	100	66	0.051	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5427-006	2	0.20	100	66	0.051	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5427-006	3	0.30	0	66	0.051	AS5427-006	3	0.75
ME06-C-0006-H-MAD-C	AS5326-002	1	3.27	100	452	0.029	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5326-002	2	3.76	100	452	0.029	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5326-002	3	4.78	0	452	0.029	AS5326-002	2.985	0.746
M306-C-0488-B-MAD-C	AS5226-001	1	1.95	100	514	0.031	Impervious	0.001	0.001
M306-C-0488-B-MAD-C	AS5226-001	2	3.30	100	514	0.031	Impervious	0.001	0.001
M306-C-0488-B-MAD-C	AS5226-001	3	9.33	0	514	0.031	AS5226-001	2.825	0.704
ME06-E-0009-A-MAD-C	AS5127-008	1	0.17	100	123	0.014	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5127-008	2	0.24	100	123	0.014	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5127-008	3	0.29	0	123	0.014	AS5127-008	3	0.75
ME06-C-0487-B-MAD-C	IN5127-009	1	0.31	100	92	0.039	Impervious	0.001	0.001
ME06-C-0487-B-MAD-C	IN5127-009	2	0.45	100	92	0.039	Impervious	0.001	0.001
ME06-C-0487-B-MAD-C	IN5127-009	3	0.90	0	92	0.039	IN5127-009	2.787	0.685
ME06-D-0007-H-MAD-C	AS5126-004	1	0.49	100	300	0.037	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5126-004	2	0.97	100	300	0.037	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5126-004	3	2.68	0	300	0.037	AS5126-004	2.981	0.744
ME06-D-0007-H-MAD-C	AS5026-004	1	0.39	100	236	0.015	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5026-004	2	0.41	100	236	0.015	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5026-004	3	0.86	0	236	0.015	AS5026-004	3	0.75
ME06-E-0009-A-MAD-C	AS5026-006	1	2.18	100	477	0.022	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5026-006	2	4.06	100	477	0.022	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5026-006	3	9.52	0	477	0.022	AS5026-006	3	0.75
ME06-E-0009-A-MAD-C	AS5026-014	1	2.14	100	371	0.013	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5026-014	2	3.74	100	371	0.013	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	AS5026-014	3	8.02	0	371	0.013	AS5026-014	3	0.75
ME06-F-0010-A-MAD-C	AS5027-002	1	0.36	100	250	0.063	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS5027-002	2	0.56	100	250	0.063	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS5027-002	3	1.69	0	250	0.063	AS5027-002	3	0.75
ME06-F-0010-A-MAD-C	AS4826-012	1	0.60	100	316	0.019	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4826-012	2	1.10	100	316	0.019	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4826-012	3	4.39	0	316	0.019	AS4826-012	3.051	0.763
ME06-F-0010-A-MAD-C	AS4826-013	1	0.65	100	221	0.019	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4826-013	2	1.14	100	221	0.019	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4826-013	3	3.44	0	221	0.019	AS4826-013	3.002	0.75
ME06-F-0010-A-MAD-C	AS4827-002	1	2.69	100	712	0.021	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4827-002	2	4.96	100	712	0.021	Impervious	0.001	0.001
ME06-F-0010-A-MAD-C	AS4827-002	3	20.91	0	712	0.021	AS4827-002	3.195	0.799
ME06-A-0001-H-MAD-C	AS5429-019	1	2.25	100	269	0.014	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-019	2	4.09	100	269	0.014	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-019	3	8.21	0	269	0.014	AS5429-019	2.433	0.581
ME06-A-0001-H-MAD-C	AS5430-001	1	0.84	100	184	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5430-001	2	0.88	100	184	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5430-001	3	0.32	0	184	0.011	AS5430-001	1.53	0.309
ME06-A-0001-H-MAD-C	AS5431-020	1	0.38	100	279	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5431-020	2	0.74	100	279	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5431-020	3	3.01	0	279	0.02	AS5431-020	1.504	0.301
ME06-D-0007-H-MAD-C	AS5225-001	1	1.40	100	626	0.037	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5225-001	2	2.45	100	626	0.037	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5225-001	3	7.62	0	626	0.037	AS5225-001	3	0.75
ME06-G-0371-H-MAD-C	AS4724-026	1	3.24	100	636	0.016	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-026	2	4.38	100	636	0.016	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	AS4724-026	3	16.82	0	636	0.016	AS4724-026	3	0.75
ME06-U-0573-A-MAD-C	AS4723-024	1	0.47	100	307	0.04	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4723-024	2	0.94	100	307	0.04	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	AS4723-024	3	3.68	0	307	0.04	AS4723-024	3	0.75
ME06-F-0372-H-MAD-C	AS4925-004	1	1.73	100	500	0.025	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	AS4925-004	2	2.23	100	500	0.025	Impervious	0.001	0.001
ME06-F-0372-H-MAD-C	AS4925-004	3	16.43	0	500	0.025	AS4925-004	3.825	0.957
ME06-C-0486-B-MAD-C	IN5229-001	1	0.42	100	189	0.005	Impervious	0.001	0.001
ME06-C-0486-B-MAD-C	IN5229-001	2	0.49	100	189	0.005	Impervious	0.001	0.001
ME06-C-0486-B-MAD-C	IN5229-001	3	1.46	0	189	0.005	IN5229-001	1.405	0.323

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-C-0006-H-MAD-C	AS5325-026	1	0.37	100	347	0.053	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5325-026	2	0.95	100	347	0.053	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5325-026	3	4.82	0	347	0.053	AS5325-026	3	0.75
ME06-C-0006-H-MAD-C	AS5425-017	1	2.07	100	368	0.027	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5425-017	2	3.83	100	368	0.027	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5425-017	3	9.88	0	368	0.027	AS5425-017	3	0.75
ME06-G-0371-H-MAD-C	IN4724-029	1	0.39	100	198	0.059	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-029	2	0.58	100	198	0.059	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	IN4724-029	3	1.35	0	198	0.059	IN4724-029	3.081	0.769
ME06-D-0007-H-MAD-C	IN5126-007	1	0.39	100	359	0.046	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5126-007	2	0.70	100	359	0.046	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5126-007	3	4.49	0	359	0.046	IN5126-007	3	0.75
ME06-D-0007-H-MAD-C	AS5126-009	1	0.11	100	180	0.014	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5126-009	2	0.21	100	180	0.014	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5126-009	3	1.10	0	180	0.014	AS5126-009	3	0.75
UY01-U-0243-K-MAD-C	AE4821-008	1	0.13	100	174	0.095	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	AE4821-008	2	0.14	100	174	0.095	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	AE4821-008	3	0.61	0	174	0.095	AE4821-008	3	0.75
UY01-U-0243-K-MAD-C	IN4821-012	1	1.04	100	510	0.059	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN4821-012	2	1.55	100	510	0.059	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN4821-012	3	9.30	0	510	0.059	IN4821-012	3	0.75
UY01-A-0240-K-MAD-C	IN4922-017	1	1.23	100	350	0.021	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN4922-017	2	1.35	100	350	0.021	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN4922-017	3	1.92	0	350	0.021	IN4922-017	3	0.75
ME06-C-0487-B-MAD-C	IN5227-023	1	2.42	100	488	0.042	Impervious	0.001	0.001
ME06-C-0487-B-MAD-C	IN5227-023	2	4.33	100	488	0.042	Impervious	0.001	0.001
ME06-C-0487-B-MAD-C	IN5227-023	3	9.75	0	488	0.042	IN5227-023	2.859	0.708
ME06-C-0006-H-MAD-C	IN5324-023	1	0.12	100	196	0.114	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5324-023	2	0.30	100	196	0.114	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5324-023	3	1.59	0	196	0.114	IN5324-023	1.615	0.335
ME06-A-0001-H-MAD-C	IN5429-024	1	1.35	100	316	0.021	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-024	2	2.42	100	316	0.021	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-024	3	4.66	0	316	0.021	IN5429-024	2.207	0.511
ME06-A-0001-H-MAD-C	CB5428-017	1	0.59	100	150	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	CB5428-017	2	0.62	100	150	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	CB5428-017	3	0.30	0	150	0.011	CB5428-017	2.539	0.627
ME06-A-0004-H-MAD-C	CB5427-028	1	3.18	100	413	0.015	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	CB5427-028	2	3.25	100	413	0.015	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	CB5427-028	3	1.54	0	413	0.015	CB5427-028	1.24	0.281
ME06-B-0004-H-MAD-C	IN5327-001	1	0.16	100	125	0.011	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5327-001	2	0.34	100	125	0.011	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5327-001	3	0.09	0	125	0.011	IN5327-001	0.75	0.15
ME06-B-0004-H-MAD-C	IN5427-042	1	0.26	100	197	0.012	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-042	2	0.54	100	197	0.012	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-042	3	1.56	0	197	0.012	IN5427-042	0.75	0.15
ME06-B-0004-H-MAD-C	IN5427-045	1	0.47	100	315	0.031	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-045	2	0.99	100	315	0.031	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-045	3	2.97	0	315	0.031	IN5427-045	1.381	0.318
ME06-B-0004-H-MAD-C	IN5427-051	1	0.27	100	198	0.034	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-051	2	0.57	100	198	0.034	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-051	3	0.59	0	198	0.034	IN5427-051	0.75	0.15
ME06-B-0004-H-MAD-C	IN5427-052	1	0.42	100	218	0.018	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-052	2	0.88	100	218	0.018	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	IN5427-052	3	0.69	0	218	0.018	IN5427-052	0.75	0.15
ME06-B-0005-H-MAD-C	IN5427-063	1	0.50	100	353	0.01	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-063	2	1.05	100	353	0.01	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-063	3	2.21	0	353	0.01	IN5427-063	0.804	0.161
ME06-B-0005-H-MAD-C	IN5428-027	1	0.16	100	255	0.015	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5428-027	2	0.33	100	255	0.015	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5428-027	3	1.39	0	255	0.015	IN5428-027	0.75	0.15
ME06-B-0005-H-MAD-C	IN5427-065	1	0.91	100	363	0.017	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-065	2	1.91	100	363	0.017	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-065	3	1.48	0	363	0.017	IN5427-065	0.75	0.15

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-B-0005-H-MAD-C	IN5427-070	1	0.23	100	497	0.025	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-070	2	0.48	100	497	0.025	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	IN5427-070	3	6.66	0	497	0.025	IN5427-070	1.49	0.348
UY01-E-0244-K-MAD-C	IN5321-024	1	1.79	100	328	0.046	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	IN5321-024	2	2.51	100	328	0.046	Impervious	0.001	0.001
UY01-E-0244-K-MAD-C	IN5321-024	3	6.33	0	328	0.046	IN5321-024	2.841	0.702
UY01-D-0257-K-MAD-C	IN5220-025	1	0.09	100	223	0.011	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-025	2	0.30	100	223	0.011	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5220-025	3	1.90	0	223	0.011	IN5220-025	2.946	0.735
ME06-A-0004-H-MAD-C	AS5427-080	1	1.15	100	210	0.019	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5427-080	2	1.29	100	210	0.019	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5427-080	3	1.56	0	210	0.019	AS5427-080	3	0.75
ME06-C-0006-H-MAD-C	IN5325-027	1	1.65	100	325	0.022	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5325-027	2	1.85	100	325	0.022	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5325-027	3	2.78	0	325	0.022	IN5325-027	3	0.75
ME06-C-0006-H-MAD-C	AS5225-022	1	0.57	100	396	0.104	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5225-022	2	0.60	100	396	0.104	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5225-022	3	6.96	0	396	0.104	AS5225-022	2.946	0.734
ME06-C-0006-H-MAD-C	AS5225-027	1	1.01	100	248	0.106	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5225-027	2	1.14	100	248	0.106	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5225-027	3	3.93	0	248	0.106	AS5225-027	2.716	0.608
ME06-C-0006-H-MAD-C	IN5225-031	1	0.33	100	52	0.02	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5225-031	3	0.09	0	52	0.02	IN5225-031	3	0.75
ME06-D-0007-H-MAD-C	AS5124-041	1	1.21	100	381	0.081	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-041	2	1.64	100	381	0.081	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-041	3	8.58	0	381	0.081	AS5124-041	2.541	0.556
ME06-D-0007-H-MAD-C	AS5124-046	1	0.11	100	191	0.074	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-046	2	0.14	100	191	0.074	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-046	3	0.59	0	191	0.074	AS5124-046	3	0.75
ME06-D-0007-H-MAD-C	IN5124-051	1	0.32	100	246	0.077	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-051	2	0.84	100	246	0.077	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-051	3	3.47	0	246	0.077	IN5124-051	3	0.75
ME06-D-0007-H-MAD-C	IN5124-054	1	0.36	100	65	0.025	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-054	2	0.36	100	65	0.025	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-054	3	0.27	0	65	0.025	IN5124-054	3	0.75
ME06-D-0007-H-MAD-C	AS5124-059	1	0.12	100	100	0.076	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-059	2	0.17	100	100	0.076	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-059	3	0.47	0	100	0.076	AS5124-059	3	0.75
ME06-D-0007-H-MAD-C	IN5124-064	1	0.20	100	265	0.043	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-064	2	0.47	100	265	0.043	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-064	3	5.79	0	265	0.043	IN5124-064	3	0.75
ME06-D-0007-H-MAD-C	AS5124-066	1	0.21	100	69	0.014	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-066	2	0.21	100	69	0.014	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	AS5124-066	3	0.13	0	69	0.014	AS5124-066	3	0.75
ME06-D-0007-H-MAD-C	IN5124-069	1	0.17	100	67	0.033	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-069	2	0.18	100	67	0.033	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-069	3	0.14	0	67	0.033	IN5124-069	3	0.75
ME06-D-0007-H-MAD-C	IN5124-073	1	0.38	100	236	0.063	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-073	2	0.74	100	236	0.063	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5124-073	3	2.26	0	236	0.063	IN5124-073	3	0.75
ME06-D-0007-H-MAD-C	IN5024-014	1	0.48	100	201	0.054	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5024-014	2	0.63	100	201	0.054	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	IN5024-014	3	1.50	0	201	0.054	IN5024-014	3	0.75
UY01-A-0240-K-MAD-C	AS5023-023	1	0.54	100	152	0.033	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-023	2	0.59	100	152	0.033	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-023	3	0.79	0	152	0.033	AS5023-023	3	0.75
UY01-A-0240-K-MAD-C	AS5023-028	1	1.96	100	594	0.019	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-028	2	2.29	100	594	0.019	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-028	3	6.02	0	594	0.019	AS5023-028	3	0.75
UY01-A-0240-K-MAD-C	AS5023-030	1	1.66	100	312	0.009	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-030	2	1.78	100	312	0.009	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5023-030	3	3.37	0	312	0.009	AS5023-030	3	0.75
UY01-U-0243-K-MAD-C	AE5119-010	1	0.09	100	344	0.035	Impervious	0.001	0.001

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-U-0243-K-MAD-C	AE5119-010	2	0.13	100	344	0.035	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	AE5119-010	3	6.18	0	344	0.035	AE5119-010	2.496	0.615
ME06-C-0006-H-MAD-C	IN5424-008	1	0.43	100	148	0.044	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5424-008	2	0.75	100	148	0.044	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5424-008	3	1.66	0	148	0.044	IN5424-008	3	0.75
ME06-C-0006-H-MAD-C	IN5325-044	1	0.52	100	380	0.092	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5325-044	2	0.54	100	380	0.092	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5325-044	3	9.06	0	380	0.092	IN5325-044	2.929	0.729
UY01-A-0240-K-MAD-C	AS5020-019	1	0.38	100	239	0.03	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5020-019	2	0.64	100	239	0.03	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS5020-019	3	1.40	0	239	0.03	AS5020-019	2.997	0.749
UY01-A-0037-K-WES-T	IN5519-002	1	0.79	100	222	0.052	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5519-002	2	0.98	100	222	0.052	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5519-002	3	1.28	0	222	0.052	IN5519-002	3	0.75
UY01-U-0239-D-MAD-C	IN5520-002	1	2.81	100	501	0.034	Impervious	0.001	0.001
UY01-U-0239-D-MAD-C	IN5520-002	2	3.64	100	501	0.034	Impervious	0.001	0.001
UY01-U-0239-D-MAD-C	IN5520-002	3	7.56	0	501	0.034	IN5520-002	2.814	0.695
ME06-A-0004-H-MAD-C	AS5524-002	1	0.25	100	34	0.017	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5524-002	3	0.10	0	34	0.017	AS5524-002	1.901	0.456
ME06-A-0004-H-MAD-C	AS5524-005	1	0.86	100	338	0.041	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5524-005	2	1.35	100	338	0.041	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5524-005	3	4.36	0	338	0.041	AS5524-005	3	0.75
ME06-A-0004-H-MAD-C	AS5525-001	1	0.78	100	255	0.032	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-001	2	1.25	100	255	0.032	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-001	3	2.94	0	255	0.032	AS5525-001	2.997	0.75
ME06-A-0004-H-MAD-C	AS5525-003	1	0.12	100	36	0.009	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-003	2	0.12	100	36	0.009	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-003	3	0.10	0	36	0.009	AS5525-003	0.75	0.15
ME06-A-0004-H-MAD-C	AS5525-004	1	0.87	100	409	0.05	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-004	2	0.90	100	409	0.05	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5525-004	3	5.72	0	409	0.05	AS5525-004	2.469	0.609
ME06-A-0004-H-MAD-C	AS5527-001	1	6.67	100	751	0.02	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-001	2	11.95	100	751	0.02	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-001	3	24.52	0	751	0.02	AS5527-001	3	0.75
ME06-A-0004-H-MAD-C	AS5527-004	1	0.24	100	237	0.025	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-004	2	0.50	100	237	0.025	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-004	3	3.91	0	237	0.025	AS5527-004	3	0.75
ME06-A-0004-H-MAD-C	AS5527-012	1	0.62	100	188	0.039	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-012	2	1.08	100	188	0.039	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-012	3	4.13	0	188	0.039	AS5527-012	3	0.75
ME06-A-0004-H-MAD-C	IN5527-018	1	0.82	100	100	0.013	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5527-018	2	0.82	100	100	0.013	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5527-018	3	0.34	0	100	0.013	IN5527-018	1.713	0.406
ME06-A-0003-H-MAD-C	AS5628-002	1	1.16	100	329	0.011	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5628-002	2	1.25	100	329	0.011	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5628-002	3	3.90	0	329	0.011	AS5628-002	2.403	0.572
ME06-A-0003-H-MAD-C	IN5628-003	1	0.22	100	194	0.015	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-003	2	0.23	100	194	0.015	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-003	3	1.39	0	194	0.015	IN5628-003	1.5	0.3
ME06-A-0001-H-MAD-C	AS5630-002	1	0.49	100	236	0.01	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5630-002	2	0.85	100	236	0.01	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5630-002	3	2.29	0	236	0.01	AS5630-002	2.522	0.606
ME06-A-0001-H-MAD-C	AS5530-004	1	2.12	100	515	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-004	2	3.80	100	515	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-004	3	8.39	0	515	0.011	AS5530-004	2.997	0.749
ME06-A-0001-H-MAD-C	AS5530-009	1	1.36	100	681	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-009	2	2.35	100	681	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-009	3	4.52	0	681	0.008	AS5530-009	2.971	0.741
ME06-A-0001-H-MAD-C	AS5530-019	1	1.32	100	451	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-019	2	2.36	100	451	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5530-019	3	6.76	0	451	0.008	AS5530-019	2.925	0.728
ME06-A-0003-H-MAD-C	AS5529-008	1	0.23	100	136	0.024	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5529-008	2	0.40	100	136	0.024	Impervious	0.001	0.001

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-A-0003-H-MAD-C	AS5529-008	3	0.44	0	136	0.024	AS5529-008	1.504	0.301
ME06-A-0003-H-MAD-C	AS5528-005	1	0.24	100	49	0.019	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5528-005	2	0.24	100	49	0.019	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5528-005	3	0.25	0	49	0.019	AS5528-005	3	0.75
ME06-A-0001-H-MAD-C	AS5631-001	1	0.36	100	177	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5631-001	2	0.53	100	177	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5631-001	3	0.73	0	177	0.011	AS5631-001	2.966	0.74
ME06-A-0001-H-MAD-C	AS5532-019	1	0.72	100	254	0.024	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5532-019	2	0.84	100	254	0.024	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5532-019	3	1.42	0	254	0.024	AS5532-019	1.818	0.396
ME06-A-0001-H-MAD-C	AS5531-001	1	0.71	100	257	0.009	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-001	2	1.04	100	257	0.009	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-001	3	1.78	0	257	0.009	AS5531-001	1.542	0.312
ME06-A-0001-H-MAD-C	AS5531-006	1	1.37	100	495	0.012	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-006	2	2.07	100	495	0.012	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-006	3	3.91	0	495	0.012	AS5531-006	2.97	0.741
ME06-A-0001-H-MAD-C	AS5531-023	1	1.50	100	337	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-023	2	2.34	100	337	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-023	3	4.16	0	337	0.02	AS5531-023	2.595	0.628
ME06-A-0001-H-MAD-C	AS5531-027	1	1.02	100	297	0.017	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-027	2	1.64	100	297	0.017	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-027	3	3.81	0	297	0.017	AS5531-027	1.716	0.364
ME06-A-0001-H-MAD-C	AS5529-018	1	0.48	100	238	0.013	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5529-018	2	1.01	100	238	0.013	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5529-018	3	2.50	0	238	0.013	AS5529-018	2.957	0.738
ME06-A-0003-H-MAD-C	AS5529-019	1	3.16	100	461	0.016	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5529-019	2	5.78	100	461	0.016	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5529-019	3	11.11	0	461	0.016	AS5529-019	2.269	0.531
ME06-A-0003-H-MAD-C	AS5629-011	1	0.58	100	174	0.019	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5629-011	2	0.67	100	174	0.019	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	AS5629-011	3	1.51	0	174	0.019	AS5629-011	1.533	0.31
ME06-A-0004-H-MAD-C	IN5527-030	1	1.01	100	208	0.017	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5527-030	2	1.01	100	208	0.017	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5527-030	3	0.35	0	208	0.017	IN5527-030	3	0.75
ME06-A-0001-H-MAD-C	IN5530-037	1	1.18	100	343	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5530-037	2	1.98	100	343	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5530-037	3	4.65	0	343	0.008	IN5530-037	2.61	0.633
ME06-A-0004-H-MAD-C	IN5528-026	1	1.41	100	250	0.021	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5528-026	2	1.41	100	250	0.021	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	IN5528-026	3	0.79	0	250	0.021	IN5528-026	1.627	0.384
ME06-A-0003-H-MAD-C	CB5528-028	1	2.22	100	268	0.012	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	CB5528-028	2	2.73	100	268	0.012	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	CB5528-028	3	3.71	0	268	0.012	CB5528-028	2.49	0.614
ST02-U-0260-D-MAD-C	IN5628-035	1	1.81	100	416	0.016	Impervious	0.001	0.001
ST02-U-0260-D-MAD-C	IN5628-035	2	1.99	100	416	0.016	Impervious	0.001	0.001
ST02-U-0260-D-MAD-C	IN5628-035	3	1.65	0	416	0.016	IN5628-035	2.112	0.484
ME06-A-0003-H-MAD-C	IN5628-041	1	0.53	100	204	0.011	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-041	3	1.27	0	204	0.011	IN5628-041	1.609	0.333
ME06-A-0003-H-MAD-C	IN5628-042	1	0.16	100	148	0.018	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-042	2	0.16	100	148	0.018	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-042	3	0.56	0	148	0.018	IN5628-042	2.811	0.693
ME06-A-0003-H-MAD-C	IN5628-043	1	1.26	100	177	0.008	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-043	2	1.33	100	177	0.008	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-043	3	0.79	0	177	0.008	IN5628-043	1.5	0.3
ME06-A-0003-H-MAD-C	IN5628-077	1	0.78	100	247	0.031	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-077	2	0.80	100	247	0.031	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	IN5628-077	3	1.18	0	247	0.031	IN5628-077	2.971	0.741
ME06-A-0004-H-MAD-C	AS5628-080	1	1.11	100	234	0.024	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5628-080	2	1.14	100	234	0.024	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5628-080	3	0.73	0	234	0.024	AS5628-080	3	0.75
ME06-A-0004-H-MAD-C	AS5628-085	1	3.13	100	406	0.018	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5628-085	2	3.42	100	406	0.018	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5628-085	3	5.43	0	406	0.018	AS5628-085	3	0.75

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-A-0004-H-MAD-C	AS5527-048	1	2.59	100	329	0.017	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-048	2	3.00	100	329	0.017	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	AS5527-048	3	5.10	0	329	0.017	AS5527-048	2.898	0.723
ST02-U-0260-D-MAD-C	IN5629-018	1	1.74	100	370	0.007	Impervious	0.001	0.001
ST02-U-0260-D-MAD-C	IN5629-018	2	2.02	100	370	0.007	Impervious	0.001	0.001
ST02-U-0260-D-MAD-C	IN5629-018	3	1.32	0	370	0.007	IN5629-018	1.853	0.406
ME06-A-0001-H-MAD-C	IN5630-032	1	0.55	100	192	0.007	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5630-032	2	0.56	100	192	0.007	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5630-032	3	0.39	0	192	0.007	IN5630-032	1.508	0.303
UY01-B-0241-K-MAD-C	IN5020-030	1	0.53	100	230	0.014	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	IN5020-030	2	1.05	100	230	0.014	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	IN5020-030	3	2.76	0	230	0.014	IN5020-030	2.764	0.687
UY01-A-0240-K-MAD-C	IN5020-041	1	1.30	100	293	0.018	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5020-041	2	2.25	100	293	0.018	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	IN5020-041	3	4.75	0	293	0.018	IN5020-041	2.994	0.749
UY01-C-0242-H-MAD-C	IN5120-030	1	1.48	100	306	0.023	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-030	2	2.74	100	306	0.023	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-030	3	5.03	0	306	0.023	IN5120-030	3	0.75
ME06-B-0002-H-MAD-C	IN5429-027	1	0.42	100	165	0.007	Impervious	0.001	0.001
ME06-B-0002-H-MAD-C	IN5429-027	2	0.51	100	165	0.007	Impervious	0.001	0.001
ME06-B-0002-H-MAD-C	IN5429-027	3	0.61	0	165	0.007	IN5429-027	0.903	0.184
ME06-A-0001-H-MAD-C	IN5429-039	1	0.69	100	190	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-039	2	0.89	100	190	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-039	3	0.81	0	190	0.008	IN5429-039	0.781	0.159
ME06-A-0001-H-MAD-C	IN5429-048	1	0.69	100	267	0.024	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-048	2	0.86	100	267	0.024	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-048	3	1.46	0	267	0.024	IN5429-048	2.844	0.708
ME06-A-0001-H-MAD-C	IN5429-051	1	0.53	100	305	0.009	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-051	2	0.95	100	305	0.009	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-051	3	2.55	0	305	0.009	IN5429-051	3	0.75
ME06-A-0001-H-MAD-C	IN5430-013	1	1.26	100	801	0.032	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5430-013	2	2.19	100	801	0.032	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5430-013	3	5.67	0	801	0.032	IN5430-013	2.228	0.517
ME06-A-0001-H-MAD-C	IN5330-002	1	0.52	100	239	0.037	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5330-002	2	0.95	100	239	0.037	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5330-002	3	2.06	0	239	0.037	IN5330-002	1.94	0.432
ME06-A-0001-H-MAD-C	IN5330-007	1	1.20	100	556	0.027	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5330-007	2	2.15	100	556	0.027	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5330-007	3	6.49	0	556	0.027	IN5330-007	1.5	0.3
ME06-A-0001-H-MAD-C	IN5429-052	1	2.12	100	330	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-052	2	2.92	100	330	0.008	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-052	3	3.95	0	330	0.008	IN5429-052	1.774	0.423
ME06-A-0001-H-MAD-C	IN5429-060	1	1.03	100	224	0.012	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-060	2	1.37	100	224	0.012	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-060	3	2.98	0	224	0.012	IN5429-060	2.577	0.637
UY01-D-0257-K-MAD-C	IN5321-031	1	3.68	100	662	0.05	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-031	2	7.19	100	662	0.05	Impervious	0.001	0.001
UY01-D-0257-K-MAD-C	IN5321-031	3	24.34	0	662	0.05	IN5321-031	2.876	0.66
UY01-C-0242-H-MAD-C	IN5120-033	1	3.28	100	359	0.019	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-033	2	6.03	100	359	0.019	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	IN5120-033	3	13.17	0	359	0.019	IN5120-033	3	0.75
UY01-U-0243-K-MAD-C	IN5218-025	1	1.19	100	174	0.02	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-025	2	1.71	100	174	0.02	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-025	3	2.41	0	174	0.02	IN5218-025	2.062	0.499
UY01-U-0243-K-MAD-C	IN5218-028	1	1.06	100	206	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-028	2	1.83	100	206	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5218-028	3	2.11	0	206	0.009	IN5218-028	2.814	0.701
UY01-U-0243-K-MAD-C	CB5117-017	1	0.77	100	309	0.006	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-017	2	1.28	100	309	0.006	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-017	3	2.10	0	309	0.006	CB5117-017	2.381	0.585
UY01-U-0243-K-MAD-C	CB5117-018	1	0.35	100	154	0.013	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-018	2	0.52	100	154	0.013	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-018	3	0.68	0	154	0.013	CB5117-018	1.743	0.415

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-U-0243-K-MAD-C	CB5117-019	1	0.48	100	262	0.011	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-019	2	0.71	100	262	0.011	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5117-019	3	1.06	0	262	0.011	CB5117-019	2.463	0.608
UY01-U-0243-K-MAD-C	CB5217-009	1	0.50	100	220	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5217-009	2	0.75	100	220	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	CB5217-009	3	0.93	0	220	0.009	CB5217-009	1.565	0.367
UY01-U-0243-K-MAD-C	IN5217-010	1	1.41	100	461	0.014	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5217-010	2	2.31	100	461	0.014	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	IN5217-010	3	4.02	0	461	0.014	IN5217-010	2.365	0.581
UY01-A-0037-K-WES-T	IN5518-004	1	0.64	100	433	0.016	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5518-004	2	0.90	100	433	0.016	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5518-004	3	7.17	0	433	0.016	IN5518-004	2.326	0.556
UY01-A-0037-K-WES-T	IN5518-006	1	0.19	100	171	0.036	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5518-006	2	0.19	100	171	0.036	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	IN5518-006	3	0.98	0	171	0.036	IN5518-006	1.28	0.257
ME06-U-0484-A-MAD-C	IN4524-004	1	0.61	100	442	0.062	Impervious	0.001	0.001
ME06-U-0484-A-MAD-C	IN4524-004	2	1.26	100	442	0.062	Impervious	0.001	0.001
ME06-U-0484-A-MAD-C	IN4524-004	3	10.63	0	442	0.062	IN4524-004	2.817	0.692
ME06-U-0573-A-MAD-C	IN4722-015	1	2.19	100	553	0.046	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4722-015	2	3.70	100	553	0.046	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	IN4722-015	3	11.02	0	553	0.046	IN4722-015	3	0.75
UY01-B-0241-K-MAD-C	AS4921-003	1	0.53	100	292	0.034	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	AS4921-003	2	0.95	100	292	0.034	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	AS4921-003	3	4.48	0	292	0.034	AS4921-003	3	0.75
UY01-B-0241-K-MAD-C	AS4921-010	1	0.39	100	222	0.039	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	AS4921-010	2	0.71	100	222	0.039	Impervious	0.001	0.001
UY01-B-0241-K-MAD-C	AS4921-010	3	1.79	0	222	0.039	AS4921-010	2.971	0.743
UY01-A-0240-K-MAD-C	AS4921-014	1	1.87	100	321	0.038	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4921-014	2	3.14	100	321	0.038	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	AS4921-014	3	5.65	0	321	0.038	AS4921-014	3	0.75
UY01-C-0242-H-MAD-C	AS5121-005	1	1.64	100	255	0.02	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-005	2	3.16	100	255	0.02	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-005	3	6.57	0	255	0.02	AS5121-005	3	0.75
UY01-C-0242-H-MAD-C	AS5121-013	1	1.82	100	339	0.03	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-013	2	3.44	100	339	0.03	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-013	3	7.55	0	339	0.03	AS5121-013	3	0.75
UY01-C-0242-H-MAD-C	AS5121-019	1	2.08	100	351	0.039	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-019	2	3.30	100	351	0.039	Impervious	0.001	0.001
UY01-C-0242-H-MAD-C	AS5121-019	3	12.57	0	351	0.039	AS5121-019	2.766	0.643
ME06-A-0001-H-MAD-C	AS5429-033	1	0.47	100	222	0.028	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-033	2	0.60	100	222	0.028	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-033	3	4.96	0	222	0.028	AS5429-033	2.486	0.587
ME06-A-0001-H-MAD-C	AS5429-037	1	0.40	100	326	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-037	2	0.68	100	326	0.011	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5429-037	3	2.53	0	326	0.011	AS5429-037	2.986	0.746
ME06-A-0001-H-MAD-C	AS5430-007	1	1.06	100	472	0.03	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5430-007	2	1.92	100	472	0.03	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5430-007	3	5.23	0	472	0.03	AS5430-007	2.856	0.707
UY01-A-0037-K-WES-T	CB5519-011	1	1.94	100	291	0.036	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	CB5519-011	2	2.47	100	291	0.036	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	CB5519-011	3	4.64	0	291	0.036	CB5519-011	2.971	0.743
ME06-C-0006-H-MAD-C	AS5326-023	1	1.90	100	299	0.022	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5326-023	2	2.17	100	299	0.022	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5326-023	3	2.89	0	299	0.022	AS5326-023	3	0.75
ME06-A-0001-H-MAD-C	AS5531-040	1	0.99	100	361	0.034	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-040	2	1.51	100	361	0.034	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	AS5531-040	3	3.21	0	361	0.034	AS5531-040	2.01	0.453
ME06-A-0001-H-MAD-C	CB5532-026	1	1.59	100	536	0.03	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	CB5532-026	2	2.29	100	536	0.03	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	CB5532-026	3	3.73	0	536	0.03	CB5532-026	2.396	0.569
UY01-A-0037-K-WES-T	DT5416-007	1	1.68	100	1142	0.008	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5416-007	2	2.16	100	1142	0.008	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5416-007	3	10.84	0	1142	0.008	DT5416-007	0.75	0.15

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-A-0037-K-WES-T	DT5316-009	1	1.32	100	1378	0.022	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5316-009	2	2.21	100	1378	0.022	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5316-009	3	11.91	0	1378	0.022	DT5316-009	1.282	0.292
UY01-A-0037-K-WES-T	DT5315-003	1	3.60	100	1329	0.015	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5315-003	2	5.49	100	1329	0.015	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5315-003	3	44.75	0	1329	0.015	DT5315-003	1.355	0.312
UY01-A-0037-K-WES-T	DT5417-001	1	1.44	100	1334	0.028	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5417-001	2	1.78	100	1334	0.028	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5417-001	3	7.50	0	1334	0.028	DT5417-001	0.744	0.148
UY01-A-0037-K-WES-T	DT5417-006	1	3.18	100	1396	0.023	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5417-006	2	4.09	100	1396	0.023	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5417-006	3	21.54	0	1396	0.023	DT5417-006	0.889	0.178
UY01-A-0037-K-WES-T	DT5318-001	1	0.86	100	659	0.019	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-001	2	1.10	100	659	0.019	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-001	3	5.22	0	659	0.019	DT5318-001	1.538	0.36
UY01-A-0037-K-WES-T	DT5318-003	1	1.84	100	932	0.027	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-003	2	2.33	100	932	0.027	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-003	3	9.12	0	932	0.027	DT5318-003	1.01	0.219
UY01-A-0037-K-WES-T	DT5318-005	1	4.36	100	581	0.029	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-005	2	5.86	100	581	0.029	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5318-005	3	21.05	0	581	0.029	DT5318-005	2.042	0.492
UY01-A-0037-K-WES-T	DT5317-006	1	1.12	100	520	0.013	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5317-006	2	1.60	100	520	0.013	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5317-006	3	10.75	0	520	0.013	DT5317-006	0.828	0.165
UY01-A-0037-K-WES-T	DT5317-011	1	1.03	100	716	0.01	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5317-011	2	1.25	100	716	0.01	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	DT5317-011	3	4.98	0	716	0.01	DT5317-011	0.741	0.148
UY01-A-0037-K-WES-T	GR5218-016	1	0.59	100	533	0.016	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	GR5218-016	2	1.15	100	533	0.016	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	GR5218-016	3	6.22	0	533	0.016	GR5218-016	1.824	0.436
ME06-D-0007-H-MAD-C	DT5127-019	1	0.05	100	69	0.027	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	DT5127-019	2	0.07	100	69	0.027	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	DT5127-019	3	0.32	0	69	0.027	DT5127-019	3	0.75
ME06-D-0007-H-MAD-C	DT5127-020	1	0.12	100	179	0.046	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	DT5127-020	2	0.36	100	179	0.046	Impervious	0.001	0.001
ME06-D-0007-H-MAD-C	DT5127-020	3	2.61	0	179	0.046	DT5127-020	2.985	0.746
ME06-C-0486-B-MAD-C	DT5127-024	1	0.16	100	86	0.039	Impervious	0.001	0.001
ME06-C-0486-B-MAD-C	DT5127-024	2	0.20	100	86	0.039	Impervious	0.001	0.001
ME06-C-0486-B-MAD-C	DT5127-024	3	0.37	0	86	0.039	DT5127-024	3.014	0.753
ME06-E-0009-A-MAD-C	DT5026-022	1	0.27	100	334	0.008	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	DT5026-022	2	0.59	100	334	0.008	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	DT5026-022	3	2.98	0	334	0.008	DT5026-022	3	0.75
UY01-U-0243-K-MAD-C	DT4821-007	1	1.04	100	63	0.041	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	DT4821-007	3	0.67	0	63	0.041	DT4821-007	3	0.75
ME06-U-0484-A-MAD-C	DT4623-002	1	0.41	100	242	0.063	Impervious	0.001	0.001
ME06-U-0484-A-MAD-C	DT4623-002	2	0.66	100	242	0.063	Impervious	0.001	0.001
ME06-U-0484-A-MAD-C	DT4623-002	3	5.72	0	242	0.063	DT4623-002	2.886	0.701
ME06-A-0004-H-MAD-C	DT5528-020	1	3.06	100	508	0.014	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	DT5528-020	2	3.07	100	508	0.014	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	DT5528-020	3	0.74	0	508	0.014	DT5528-020	1.008	0.219
ME06-C-0006-H-MAD-C	TD 5324-026	1	1.05	100	308	0.04	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	TD 5324-026	2	1.98	100	308	0.04	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	TD 5324-026	3	6.08	0	308	0.04	TD_5324-026	3	0.75
ME06-E-0009-A-MAD-C	MI5027-013	1	0.79	100	527	0.013	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	MI5027-013	2	1.87	100	527	0.013	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	MI5027-013	3	6.91	0	527	0.013	MI5027-013	3	0.75
UY01-A-0240-K-MAD-C	MI4923-031	1	1.73	100	501	0.007	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	MI4923-031	2	1.77	100	501	0.007	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	MI4923-031	3	4.02	0	501	0.007	MI4923-031	3	0.75
ME06-E-0009-A-MAD-C	TP5025-014	1	4.05	100	553	0.021	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	TP5025-014	2	5.63	100	553	0.021	Impervious	0.001	0.001
ME06-E-0009-A-MAD-C	TP5025-014	3	15.44	0	553	0.021	TP5025-014	3.046	0.762
ME06-A-0003-H-MAD-C	TP5528-004	1	2.05	100	254	0.015	Impervious	0.001	0.001

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
ME06-A-0003-H-MAD-C	TP5528-004	2	2.22	100	254	0.015	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	TP5528-004	3	2.67	0	254	0.015	TP5528-004	2.852	0.705
ME06-A-0003-H-MAD-C	MI5628-068	1	0.49	100	102	0.022	Impervious	0.001	0.001
ME06-A-0003-H-MAD-C	MI5628-068	3	0.45	0	102	0.022	MI5628-068	2.793	0.689
ME06-A-0001-H-MAD-C	IN5429-078	1	1.27	100	321	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-078	2	2.26	100	321	0.02	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-078	3	5.83	0	321	0.02	IN5429-078	2.651	0.645
ME06-A-0001-H-MAD-C	IN5429-091	1	1.13	100	286	0.034	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-091	2	1.54	100	286	0.034	Impervious	0.001	0.001
ME06-A-0001-H-MAD-C	IN5429-091	3	2.29	0	286	0.034	IN5429-091	2.99	0.747
ME06-C-0006-H-MAD-C	AS5226-062	1	0.32	100	84	0.045	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5226-062	2	0.46	100	84	0.045	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	AS5226-062	3	0.88	0	84	0.045	AS5226-062	2.974	0.743
ME06-C-0006-H-MAD-C	IN5226-081	1	0.54	100	297	0.034	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5226-081	2	0.93	100	297	0.034	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	IN5226-081	3	3.48	0	297	0.034	IN5226-081	2.115	0.514
UY01-U-0243-K-MAD-C	Menomonie_Yard	1	0.24	100	378	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	Menomonie_Yard	2	0.79	100	378	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	Menomonie_Yard	3	4.64	0	378	0.009	Menomonie_Yard	1.989	0.48
UY01-U-0243-K-MAD-C	PD_5219-011	1	2.29	100	2083	0.022	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	PD_5219-011	2	4.81	100	2083	0.022	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	PD_5219-011	3	12.98	0	2083	0.022	PD_5219-011	1.518	0.354
UY01-U-0243-K-MAD-C	PD_5020-054	1	0.48	100	459	0.038	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	PD_5020-054	2	0.98	100	459	0.038	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	PD_5020-054	3	6.37	0	459	0.038	PD_5020-054	3.029	0.74
UY01-U-0243-K-MAD-C	OpenChannel1	1	0.05	100	650	0.046	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	OpenChannel1	2	0.10	100	650	0.046	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	OpenChannel1	3	8.59	0	650	0.046	OpenChannel1	2.926	0.719
UY01-U-0243-K-MAD-C	OpenChannel2	1	0.03	100	148	0.024	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	OpenChannel2	2	0.06	100	148	0.024	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	OpenChannel2	3	0.92	0	148	0.024	OpenChannel2	0.75	0.15
ME06-C-0006-H-MAD-C	Drewry_Ditch	1	0.19	100	257	0.085	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	Drewry_Ditch	2	0.51	100	257	0.085	Impervious	0.001	0.001
ME06-C-0006-H-MAD-C	Drewry_Ditch	3	3.83	0	257	0.085	Drewry_Ditch	2.912	0.723
ME06-B-0004-H-MAD-C	WarnerPark1	1	0.63	100	298	0.035	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	WarnerPark1	2	1.32	100	298	0.035	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	WarnerPark1	3	3.05	0	298	0.035	WarnerPark1	2.336	0.573
UY01-A-0240-K-MAD-C	Barnett_Yard	1	0.21	100	313	0.051	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	Barnett_Yard	2	0.41	100	313	0.051	Impervious	0.001	0.001
UY01-A-0240-K-MAD-C	Barnett_Yard	3	3.15	0	313	0.051	Barnett_Yard	3	0.75
ME06-U-0485-A-MAD-C	PD_4624-011	1	0.96	100	423	0.096	Impervious	0.001	0.001
ME06-U-0485-A-MAD-C	PD_4624-011	3	1.62	0	423	0.096	PD_4624-011	3	0.75
ME06-G-0371-H-MAD-C	Depression1	1	3.49	100	1248	0.013	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	Depression1	2	4.39	100	1248	0.013	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	Depression1	3	30.99	0	1248	0.013	Depression1	3	0.75
ME06-B-0005-H-MAD-C	PD_5427-061	1	0.43	100	415	0.03	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	PD_5427-061	2	0.89	100	415	0.03	Impervious	0.001	0.001
ME06-B-0005-H-MAD-C	PD_5427-061	3	0.77	0	415	0.03	PD_5427-061	0.75	0.15
ME06-B-0004-H-MAD-C	PD_5427-061_2	1	0.09	100	378	0.066	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	PD_5427-061_2	2	0.20	100	378	0.066	Impervious	0.001	0.001
ME06-B-0004-H-MAD-C	PD_5427-061_2	3	0.35	0	378	0.066	PD_5427-061_2	0.75	0.15
ME06-U-0573-A-MAD-C	PD_4722-014	1	0.03	100	208	0.018	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	PD_4722-014	2	0.11	100	208	0.018	Impervious	0.001	0.001
ME06-U-0573-A-MAD-C	PD_4722-014	3	2.04	0	208	0.018	PD_4722-014	3	0.75
UY01-A-0032-K-BUR-T	ShermanCulv	1	21.07	100	3397	0.001	Impervious	0.001	0.001
UY01-A-0032-K-BUR-T	ShermanCulv	2	23.78	100	3397	0.001	Impervious	0.001	0.001
UY01-A-0032-K-BUR-T	ShermanCulv	3	452.21	0	3397	0.001	ShermanCulv	1.101	0.241
UY01-A-0037-K-WES-T	GolfPond1	1	0.42	100	309	0.004	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	GolfPond1	2	0.70	100	309	0.004	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	GolfPond1	3	6.14	0	309	0.004	GolfPond1	0.75	0.15
UY01-A-0037-K-WES-T	Private1	1	0.31	100	219	0.043	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private1	2	0.43	100	219	0.043	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private1	3	0.97	0	219	0.043	Private1	1.748	0.415

Table B-2 Existing Sub-Watershed Hydrologic Parameters Warner Park & Cherokee Marsh Watershed Study Report, City of Madison, WI									
Sub-Watershed Name	SWMM Node Name	Subcatchment Number	Area (acres)	Impervious Percentage (%)	Width (ft)	Slope (ft/ft)	Infiltration Reference	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
UY01-A-0037-K-WES-T	Private2	1	0.45	100	419	0.055	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private2	2	0.62	100	419	0.055	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private2	3	1.73	0	419	0.055	Private2	1.351	0.31
UY01-A-0037-K-WES-T	Private3	1	2.77	100	965	0.058	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private3	2	3.84	100	965	0.058	Impervious	0.001	0.001
UY01-A-0037-K-WES-T	Private3	3	9.22	0	965	0.058	Private3	2.974	0.743
ME06-A-0004-H-MAD-C	Private4	1	1.96	100	478	0.037	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	Private4	2	2.71	100	478	0.037	Impervious	0.001	0.001
ME06-A-0004-H-MAD-C	Private4	3	4.96	0	478	0.037	Private4	3	0.75
UY01-U-0243-K-MAD-C	Namekagon_Yard	1	0.08	100	280	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	Namekagon_Yard	2	0.28	100	280	0.009	Impervious	0.001	0.001
UY01-U-0243-K-MAD-C	Namekagon_Yard	3	1.07	0	280	0.009	Namekagon_Yard	2.143	0.522
ME06-G-0371-H-MAD-C	Depression2	1	0.16	100	270	0.035	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	Depression2	2	0.21	100	270	0.035	Impervious	0.001	0.001
ME06-G-0371-H-MAD-C	Depression2	3	2.45	0	270	0.035	Depression2	3	0.75
ME06-B-0002-H-MAD-C	PD_5227-002	1	20.12	100	7540	0.02	Impervious	0.001	0.001
ME06-B-0002-H-MAD-C	PD_5227-002	2	23.30	100	7540	0.02	Impervious	0.001	0.001
ME06-B-0002-H-MAD-C	PD_5227-002	3	140.41	0	7540	0.02	PD_5227-002	1.883	0.444

Appendix C: Hydraulic Input Parameters


N
Legend
Node
Runoff Node
Storm Sewer
Orifice
Weir
Greenway
Pond
Buildings
Subcatchments
Warner / Cherokee Watershed
9/15/2025
Figure C-1
XPSWMM Model Layout
Warner Park / Cherokee Marsh
Watershed Study
City of Madison, WI
0 500 1,000
Feet
Brown AND Caldwell
Air Photo: City of Madison, 2022
Path: Z:\Shared\Clients\Madison_City of\WI\100824 - Madison_Warner Park Watershed Study\PW_Exports_GIS_MXDs\ReportFigures\FigC-1_WarnerPark_ModelLayout.mxd

Table C-1
Existing XPSWMM Model Storm Sewer Inputs
Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI

Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
IN5416-002_AE5416-001	IN5416-002	853.06	AE5416-001	850.6	124.92	1.97%	Circular	12	0.013	0.05	0.5
IN5316-003_AS5316-005	IN5316-003	852	AS5316-005	851.443	181.02	0.31%	Circular	18	0.013	0.05	0.5
AS5316-005_IN5316-006	AS5316-005	851.443	IN5316-006	851.41	10.65	0.31%	Circular	21	0.013	0.5	0.05
IN5316-006_AE5316-001	IN5316-006	851.41	AE5316-001	849.6	169.02	1.07%	Circular	21	0.013	0.05	1
IN5315-001_IN5314-003	IN5315-001	858.4	IN5314-003	857.76	27.45	2.33%	Circular	15	0.013	0.25	0.05
IN5314-001_IN5314-002	IN5314-001	859.47	IN5314-002	859.27	28.8	0.69%	Circular	12	0.013	0.05	0.05
IN5314-002_IN5315-001	IN5314-002	859.27	IN5315-001	858.4	58.88	1.48%	Circular	12	0.013	0.05	0.25
IN5314-003_AE5314-004	IN5314-003	857.76	AE5314-004	849.6	159.02	5.13%	Circular	15	0.013	0.05	1
IN5216-001_AE5216-002	IN5216-001	854.67	AE5216-002	849.6	206.41	2.46%	Circular	18	0.013	0.05	1
IN5216-003_IN5216-001	IN5216-003	855.88	IN5216-001	854.67	29.05	4.17%	Circular	15	0.013	0.05	0.05
IN5215-002_AE5215-001	IN5215-002	858.35	AE5215-001	849.6	175.02	5.00%	Circular	12	0.013	0.05	1
IN5215-003_IN5215-002	IN5215-003	858.51	IN5215-002	858.35	27.23	0.59%	Circular	12	0.013	0.05	0.05
IN5218-010_AE5218-007	IN5218-010	852.45	AE5218-007	850.6	169.86	1.09%	Circular	18	0.013	0.05	1
IN5218-012_AE5218-015	IN5218-012	851.7	AE5218-015	850.6	186.02	0.59%	Circular	24	0.013	0.05	1
AS5219-002_AS5219-004	AS5219-002	858.72	AS5219-004	854.22	399.37	1.13%	Circular	30	0.013	0.05	0.05
AS5219-004_GR5219-009	AS5219-004	854.22	GR5219-009	853.4	55.07	1.49%	Circular	36	0.013	0.05	0.5
IN5117-013_AE5118-001	IN5117-013	851.45	AE5118-001	850.6	159.02	0.53%	Circular	18	0.013	0.05	1
AS5319-001_AS5219-002	AS5319-001	871.52	AS5219-002	858.72	438.4	2.92%	Circular	30	0.013	0.25	0.05
AS5421-004_AS5321-020	AS5421-004	910.1	AS5321-020	905.6	317.34	1.42%	Circular	18	0.013	0.05	0.05
IN5321-001_IN5221-006	IN5321-001	886.669	IN5221-006	883.639	419.15	0.72%	Rectangular	3x7	0.013	0.05	0.05
IN5321-002_IN5321-001	IN5321-002	886.424	IN5321-001	886.231	19.27	1.00%	Circular	12	0.013	0.05	0.05
IN5321-003_IN5321-001	IN5321-003	886.602	IN5321-001	886.231	37.14	1.00%	Circular	12	0.013	0.05	0.05
IN5321-004_IN5321-001	IN5321-004	886.395	IN5321-001	886.231	16.45	1.00%	Circular	12	0.013	0.05	0.05
IN5321-005_IN5321-001	IN5321-005	886.579	IN5321-001	886.231	34.81	1.00%	Circular	12	0.013	0.05	0.05
IN5321-006_IN5321-010	IN5321-006	887.744	IN5321-010	887.41	33.4	1.00%	Circular	12	0.013	0.05	0.05
IN5321-009_IN5321-010	IN5321-009	887.821	IN5321-010	887.41	41.08	1.00%	Circular	12	0.013	0.05	0.05
IN5321-010_IN5321-001	IN5321-010	887.41	IN5321-001	886.669	319.91	0.23%	Rectangular	3x7	0.013	0.5	0.05
IN5321-011_IN5321-010	IN5321-011	893.6	IN5321-010	887.41	234.57	2.64%	Circular	18	0.013	0.05	0.5
AS5321-020_IN5321-011	AS5321-020	905.6	IN5321-011	893.6	339.02	3.54%	Circular	18	0.013	0.05	0.05
AS5320-003_AS5319-001	AS5320-003	873.5	AS5319-001	871.52	70.79	2.80%	Circular	30	0.013	0.25	0.25
AS5320-004_AS5320-003	AS5320-004	883.2	AS5320-003	873.5	182.97	5.30%	Circular	30	0.013	0.05	0.25
IN5220-007_ND5220-022	IN5220-007	865.198	ND5220-022	860.912	78.6	5.45%	Rectangular	3.5x7	0.013	0.05	0.5
Link7891	IN5220-012	863.317	ND5220-022	860.912	37.47	6.42%	Circular	12	0.013	0.05	0.5
Link7890	IN5220-013	863.3	ND5220-022	860.912	39.11	6.11%	Circular	12	0.013	0.05	0.5
IN5220-014_ND5220-023	IN5220-014	856.416	ND5220-023	855.422	78.04	1.27%	Rectangular	3.5x7	0.013	0.5	0.05
IN5220-019_IN5220-014	IN5220-019	857.746	IN5220-014	856.416	17.46	7.62%	Circular	12	0.013	0.05	0.5
IN5220-020_IN5220-014	IN5220-020	857.665	IN5220-014	856.416	17.15	7.28%	Circular	12	0.013	0.05	0.5
IN5220-021_GR5219-008	IN5220-021	853.6	GR5219-008	853.4	106.64	0.19%	Rectangular	3.5x7	0.013	0.05	0.5
Link7888	IN5221-002	884.73	ND5221-017	881.585	39.96	7.87%	Circular	12	0.013	0.05	0.5
IN5221-003_IN5221-006	IN5221-003	883.732	IN5221-006	883.539	19.29	1.00%	Circular	12	0.013	0.05	0.05
IN5221-004_IN5221-006	IN5221-004	883.684	IN5221-006	883.539	14.47	1.00%	Circular	12	0.013	0.05	0.05
IN5221-006_ND5221-017	IN5221-006	883.539	ND5221-017	881.585	75.85	2.58%	Rectangular	3.5x7	0.013	0.05	0.5
Link7889	IN5221-013	880.54	IN5221-016	879.23	53.78	2.44%	Circular	12	0.013	0.05	0.5
IN5221-016_ND5221-018	IN5221-016	879.23	ND5221-018	872.257	76.29	9.14%	Rectangular	3.5x7	0.013	0.5	0.05
AS5120-010_TP5120-015	AS5120-010	854.8	TP5120-015	852.88	33.28	5.77%	Circular	24	0.013	0.05	0.25
AS5120-013_TP5120-015	AS5120-013	853.34	TP5120-015	852.88	41.56	1.11%	Rectangular	3.5x7	0.013	0.5	0.25
IN5120-016_AS5120-013	IN5120-016	854.1	AS5120-013	853.34	91.58	0.83%	Special	38x60	0.022	0.05	0.5
AS5120-018_AS5120-013	AS5120-018	855.4	AS5120-013	853.34	292.86	0.70%	Special	38x60	0.022	0.05	0.5
AS5022-001_AS5021-017	AS5022-001	873	AS5021-017	865.2	405.15	1.93%	Circular	36	0.013	0.05	0.5
AS5022-006_AS5022-001	AS5022-006	879.1	AS5022-001	873	189.48	3.22%	Circular	36	0.013	0.5	0.05
AS5022-007_AS5022-006	AS5022-007	881.1	AS5022-006	879.1	60.75	3.29%	Circular	18	0.013	0.05	0.5
AS5022-008_AS5022-006	AS5022-008	880.6	AS5022-006	879.1	67.53	2.22%	Circular	18	0.013	0.05	0.5
AS5022-015_AS5022-006	AS5022-015	888.6	AS5022-006	879.1	272.9	3.48%	Circular	36	0.013	0.5	0.5
AS5022-016_AS5022-015	AS5022-016	889.9	AS5022-015	888.6	49.89	2.61%	Circular	18	0.013	0.05	0.5
IN5022-020_AS5022-015	IN5022-020	889.297	AS5022-015	888.6	34.87	2.00%	Circular	12	0.013	0.05	0.5
AS5022-021_AS5022-015	AS5022-021	897.7	AS5022-015	888.6	244.98	3.71%	Circular	36	0.013	0.05	0.5
AS5021-005_AS5021-006	AS5021-005	860.1	AS5021-006	859.1	69.57	1.44%	Circular	18	0.013	0.05	0.25
AS5021-006_AS5020-010	AS5021-006	859.1	AS5020-010	855.8	238.33	1.38%	Circular	36	0.013	0.5	0.05
AS5021-012_AS5021-006	AS5021-012	862.6	AS5021-006	859.1	338.63	1.03%	Circular	36	0.013	0.05	0.25
AS5021-017_AS5021-012	AS5021-017	865.2	AS5021-012	862.6	219.9	1.18%	Circular	36	0.013	0.5	0.05
AS5020-006_AS5020-019	AS5020-006	855.1	AS5020-019	853.07	221.77	0.92%	Circular	36	0.013	0.05	0.05
AS5020-008_AS5020-029	AS5020-008	853.3	AS5020-029	852.15	36.94	3.11%	Circular	15	0.013	0.25	0.25
AS5020-009_AS5020-044	AS5020-009	853.5	AS5020-044	850.92	116.57	2.21%	Circular	36	0.013	0.05	0.05
AS5020-010_AS5020-006	AS5020-010	855.8	AS5020-006	855.1	91.05	0.77%	Circular	36	0.013	0.05	0.05
IN4920-006_AS4920-008	IN4920-006	856.3	AS4920-008	854.3	39.22	5.10%	Circular	18	0.013	0.05	0.5
IN4920-007_AS4920-008	IN4920-007	855.77	AS4920-008	854.3	10.2	14.41%	Circular	18	0.013	0.05	0.5
AS4920-008_AS5020-009	AS4920-008	854.3	AS5020-009	853.5	275.92	0.29%	Circular	36	0.013	0.5	0.05
AS4921-001_AS5021-017	AS4921-001	869.16	AS5021-017	865.2	369.46	1.07%	Circular	24	0.013	0.5	0.05
AS4922-005_AS4922-006	AS4922-005	889.25	AS4922-006	887.79	147.37	0.99%	Circular	21	0.013	0.25	0.5
AS4922-006_AS4922-008	AS4922-006	887.79	AS4922-008	882.4	369.67	1.46%	Circular	21	0.013	0.5	0.25
AS4922-007_AS4922-013	AS4922-007	880.68	AS4922-013	873.14	339.6	2.22%	Circular	24	0.013	0.25	0.05
AS4922-008_AS4922-007	AS4922-008	882.4	AS4922-007	880.68	37.89	4.54%	Circular	21	0.013	0.25	0.25
AS4922-013_AS4921-001	AS4922-013	873.14	AS4921-001	869.16	283.22	1.41%	Circular	24	0.013	0.05	0.5
IN4821-002_DT4821-001	IN4821-002	873.78	DT4821-001	867.6	236.47	2.61%	Circular	18	0.022	0.05	0.5
IN4722-004_AE4722-002	IN4722-004	861.9	AE4722-002	861.4	157.87	0.32%	Circular	30	0.013	0.05	0.5
AS4722-008_IN4722-004	AS4722-008	862.55	IN4722-004	861.9	15.22	4.27%	Circular	24	0.013	0.5	0.05
Link7898	IN4624-002	851.01	Node4856	843.073	396.81	2.00%	Circular	12	0.013	0.5	0.05
IN4723-007_AS4723-008	IN4723-007	897.32	AS4723-008	897.17	29.03	0.52%	Circular	18	0.013	0.05	0.25
Link7896	AS4723-008	897.17	IN4723-025	890.9	238.62	2.63%	Circular	18	0.013	0.25	0.05
AS4723-010_AS4723-014	AS4723-010	882.2	AS4723-014	875.75	154.99	4.16%	Circular	18	0.013	0.5	0.5
AS4723-011_AS4723-010	AS4723-011	883.24	AS4723-010	882.2	53.01	1.96%	Circular	18	0.013	0.5	0.5
IN4723-012_AS4723-011	IN4723-012	886.34	AS4723-011	883.24	15.29	20.27%	Circular	18	0.013	0.05	0.5
IN4723-013_IN4723-012	IN4723-013	887.15	IN4723-012	886.34	27.73	2.92%	Circular	18	0.013	0.5	0.05
AS4723-014_AS4723-015	AS4723-014	875.75	AS4723-015	870.15	158.33	3.54%	Circular	18	0.013	0.5	0.05

Table C-1
Existing XPSWMM Model Storm Sewer Inputs
Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI

Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
AS4723-015_AS4723-016	AS4723-015	870.15	AS4723-016	863.85	140.7	4.48%	Circular	18	0.013	0.05	0.5
AS4723-016_IN4723-019	AS4723-016	863.85	IN4723-019	861.6	172.69	1.30%	Circular	24	0.013	0.5	0.25
IN4723-019_AS4723-024	IN4723-019	861.6	AS4723-024	861.1	100.08	0.50%	Circular	24	0.013	0.25	0.25
AS4724-001_AS4724-008	AS4724-001	887.56	AS4724-008	885.13	189.12	1.28%	Circular	54	0.013	0.5	0.05
AS4724-008_IN4724-009	AS4724-008	885.13	IN4724-009	884.74	101.12	0.39%	Circular	54	0.013	0.05	0.05
IN4724-009_AS4724-015	IN4724-009	884.74	AS4724-015	884.06	173.3	0.39%	Circular	54	0.013	0.05	0.5
AS4724-015_AE4724-016	AS4724-015	884.06	AE4724-016	883.87	45.64	0.42%	Circular	54	0.013	0.5	0.5
IN4724-019_AE4724-021	IN4724-019	878.1	AE4724-021	875.35	189.36	1.45%	Circular	21	0.013	0.05	0.5
AS4724-022_AE4624-001	AS4724-022	859.9	AE4624-001	858.6	138.84	0.94%	Circular	54	0.013	0.5	1
AE4724-023_AS4724-022	AE4724-023	871.87	AS4724-022	859.9	55.01	21.76%	Circular	54	0.013	0.5	0.5
IN4724-024_AS4724-022	IN4724-024	887.46	AS4724-022	859.9	237.48	11.61%	Circular	15	0.013	0.05	0.5
IN4825-003_AE4725-001	IN4825-003	930.09	AE4725-001	929.92	36.38	0.47%	Circular	18	0.013	0.05	0.5
IN4825-004_IN4825-006	IN4825-004	926.88	IN4825-006	920.02	152.64	4.49%	Circular	15	0.013	0.05	0.05
IN4825-006_IN4825-009	IN4825-006	920.02	IN4825-009	909.92	135.8	7.44%	Circular	18	0.013	0.05	0.05
IN4825-009_AS4826-002	IN4825-009	909.92	AS4826-002	906.04	105.65	3.67%	Circular	18	0.013	0.05	0.25
IN4825-010_IN4825-011	IN4825-010	898.1	IN4825-011	892.85	154.07	3.41%	Circular	18	0.013	0.25	0.05
IN4825-011_AS4925-004	IN4825-011	892.85	AS4925-004	883.47	68.76	13.64%	Circular	18	0.013	0.05	0.5
AS4824-001_AS4724-026	AS4824-001	900.4	AS4724-026	894.37	56.68	10.64%	Circular	24	0.013	0.25	0.25
AS4824-004_AS4824-001	AS4824-004	904.4	AS4824-001	900.4	267.39	1.50%	Circular	24	0.013	0.05	0.25
AS4824-009_AS4824-004	AS4824-009	915.89	AS4824-004	904.4	273.62	4.20%	Circular	18	0.013	0.05	0.05
IN4823-003_AS4724-026	IN4823-003	899.89	AS4724-026	894.37	26.74	20.64%	Circular	24	0.013	0.25	0.25
IN4823-004_IN4823-003	IN4823-004	899.996	IN4823-003	899.89	9.64	1.10%	Circular	18	0.013	0.05	0.25
IN4823-006_IN4823-004	IN4823-006	901.75	IN4823-004	899.996	158.76	1.10%	Circular	18	0.013	0.05	0.05
AS4923-016_AS4922-005	AS4923-016	901.665	AS4922-005	889.25	410.92	3.02%	Circular	18	0.013	0.05	0.25
AS4925-001_AS4925-004	AS4925-001	885.15	AS4925-004	883.47	331.41	0.51%	Circular	30	0.013	0.05	0.5
IN5025-002_IN5025-005	IN5025-002	868.614	IN5025-005	867.91	11.22	6.27%	Circular	10	0.011	0.05	0.5
AS5025-003_IN5025-002	AS5025-003	870.587	IN5025-002	868.614	49.69	3.97%	Circular	10	0.011	0.05	0.05
IN5025-005_IN5026-024	IN5025-005	867.46	IN5026-024	867.413	29.13	0.16%	Circular	12	0.013	0.05	0.05
AS5025-007_AS5125-001	AS5025-007	866.7	AS5125-001	868.1	155.87	-0.90%	Circular	30	0.013	0.05	0.5
AS5025-007_AS5026-004	AS5025-007	866.7	AS5026-004	864.95	58.72	2.98%	Circular	12	0.013	0.25	0.25
AS5023-002_AS5023-021	AS5023-002	899.15	AS5023-021	898.45	133.69	0.52%	Circular	36	0.013	0.5	0.5
AS5023-015_AS5023-016	AS5023-015	903.18	AS5023-016	901.89	125.41	1.03%	Circular	36	0.013	0.05	0.5
AS5023-016_AS5023-020	AS5023-016	901.89	AS5023-020	900.35	275.54	0.56%	Circular	36	0.013	0.5	0.05
AS5023-020_AS5023-002	AS5023-020	900.35	AS5023-002	899.15	273.03	0.44%	Circular	36	0.013	0.05	0.5
AS5023-021_AS5022-021	AS5023-021	898.45	AS5022-021	897.7	62.27	1.20%	Circular	36	0.013	0.5	0.05
IN5124-002_AS5124-077	IN5124-002	889.83	AS5124-077	889.59	12	2.00%	Circular	12	0.013	0.05	0.05
AS5124-003_AS5124-006	AS5124-003	888.1	AS5124-006	882.6	216.78	2.54%	Circular	24	0.013	0.5	0.05
AS5124-004_CB5125-025	AS5124-004	876.4	CB5125-025	874.26	116.38	1.84%	Circular	24	0.013	0.05	0.05
AS5124-006_AS5124-004	AS5124-006	882.6	AS5124-004	876.4	413.2	1.50%	Circular	24	0.013	0.05	0.05
IN5124-007_AS5124-006	IN5124-007	882.804	AS5124-006	882.6	10.19	2.00%	Circular	12	0.013	0.05	0.5
AS5124-008_AS5124-037	AS5124-008	881.1	AS5124-037	871.91	415.88	2.21%	Circular	30	0.013	0.5	0.05
AS5124-027_AS5124-059	AS5124-027	890.1	AS5124-059	888.67	407.39	0.35%	Circular	24	0.013	0.05	0.25
AS5124-037_AS5125-012	AS5124-037	871.91	AS5125-012	870.31	416.74	0.38%	Circular	36	0.013	0.05	0.05
AS5125-001_AS5026-020	AS5125-001	868.1	AS5026-020	866	50.06	4.19%	Circular	48	0.013	0.5	0.25
AS5125-004_AS5125-001	AS5125-004	868.95	AS5125-001	868.1	278.93	0.30%	Circular	30	0.013	0.05	0.05
AS5125-005_AS5125-004	AS5125-005	869.85	AS5125-004	868.95	208.72	0.43%	Circular	30	0.013	0.05	0.05
AS5125-012_AS5125-017	AS5125-012	870.31	AS5125-017	868.35	479.92	0.41%	Circular	36	0.013	0.05	0.05
AS5125-017_AS5125-001	AS5125-017	868.35	AS5125-001	868.1	292.79	0.09%	Circular	36	0.013	0.5	0.5
AS5125-021_AS5125-017	AS5125-021	871.2	AS5125-017	868.35	320.12	0.89%	Circular	18	0.013	0.05	0.5
AS5125-022_AS5125-021	AS5125-022	876.6	AS5125-021	871.2	323.8	1.67%	Circular	18	0.013	0.5	0.05
AS5325-001_AS5325-002	AS5325-001	882.6	AS5325-002	872.6	188.92	5.29%	Circular	30	0.013	0.05	0.5
AS5325-002_AS5325-003	AS5325-002	872.6	AS5325-003	869.6	60.89	4.93%	Circular	30	0.013	0.5	0.5
AS5325-003_AS5325-004	AS5325-003	869.6	AS5325-004	860.02	502.93	1.90%	Circular	30	0.013	0.5	0.5
AS5325-004_AS5325-015	AS5325-004	860.02	AS5325-015	859.39	129.06	0.49%	Circular	42	0.013	0.5	0.05
AS5325-021_IN5325-022	AS5325-021	853.905	IN5325-022	853.516	22.05	1.76%	Circular	12	0.013	0.05	0.5
IN5325-022_IN5326-006	IN5325-022	853.516	IN5326-006	852.847	37.95	1.76%	Rectangular	2x2	0.013	0.5	0.05
AS5325-023_AS5325-021	AS5325-023	859.467	AS5325-021	853.905	315.46	1.76%	Circular	12	0.013	0.05	0.05
AS5325-025_IN5325-027	AS5325-025	869.71	IN5325-027	863.11	379.8	1.74%	Circular	30	0.013	0.25	0.05
IN5324-002_AS5324-004	IN5324-002	966.6	AS5324-004	959.1	37.69	19.90%	Circular	15	0.013	0.05	0.05
AS5324-004_AS5324-005	AS5324-004	959.1	AS5324-005	948.1	119.76	9.19%	Circular	15	0.013	0.05	0.5
AS5324-005_AS5324-006	AS5324-005	948.1	AS5324-006	942.6	102.85	5.35%	Circular	15	0.013	0.5	0.5
AS5324-006_IN5324-007	AS5324-006	942.6	IN5324-007	926.8	192.63	8.20%	Circular	15	0.013	0.5	0.05
IN5324-007_AS5324-008	IN5324-007	926.8	AS5324-008	926.82	11.81	-0.17%	Circular	15	0.013	0.05	0.5
AS5324-008_IN5324-014	AS5324-008	926.77	IN5324-014	925.705	101.24	1.05%	Circular	18	0.013	0.5	0.5
AS5324-013_IN5324-022	AS5324-013	949.91	IN5324-022	946.11	86.78	4.38%	Circular	15	0.013	0.05	0.05
IN5324-014_AS5324-015	IN5324-014	925.605	AS5324-015	923.933	33.43	5.00%	Circular	18	0.013	0.5	0.05
AS5324-015_AS5324-016	AS5324-015	923.933	AS5324-016	907.1	144.32	11.66%	Circular	21	0.022	0.05	0.25
AS5324-016_AS5324-017	AS5324-016	907.1	AS5324-017	892.6	197.09	7.36%	Circular	15	0.013	0.25	0.25
AS5324-017_AS5324-019	AS5324-017	892.6	AS5324-019	884.4	105.09	7.80%	Circular	15	0.013	0.25	0.5
AS5423-002_AS5423-003	AS5423-002	960.36	AS5423-003	949.6	202.43	5.32%	Circular	21	0.013	0.05	0.5
AS5423-003_AS5423-004	AS5423-003	949.6	AS5423-004	947.6	89.59	2.23%	Special	19x30	0.022	0.5	0.5
AS5423-004_AS5423-005	AS5423-004	947.6	AS5423-005	940.2	184.16	4.02%	Special	19x30	0.022	0.5	0.05
AS5423-005_AS5423-010	AS5423-005	940.2	AS5423-010	938.6	57.79	2.77%	Circular	21	0.013	0.05	0.25
AS5423-010_AS5423-011	AS5423-010	938.6	AS5423-011	930.2	149.09	5.63%	Special	19x30	0.022	0.25	0.25
AS5423-011_AS5424-001	AS5423-011	930.2	AS5424-001	924.15	209.43	2.89%	Special	19x30	0.022	0.25	0.5
AS5424-001_AS5424-002	AS5424-001	924.15	AS5424-002	922.5	332.78	0.50%	Circular	24	0.013	0.5	0.5
AS5424-002_AS5424-003	AS5424-002	922.5	AS5424-003	921.8	143.47	0.49%	Circular	24	0.013	0.5	0.5
AS5424-003_IN5424-004	AS5424-003	921.8	IN5424-004	920.2	316.53	0.51%	Circular	24	0.013	0.5	0.05
IN5424-004_AS5524-002	IN5424-004	920.2	AS5524-002	920.1	50.61	0.20%	Circular	24	0.013	0.05	0.5
AS5424-007_AS5524-003	AS5424-007	920.047	AS5524-003	919.1	47.36	2.00%	Circular	12	0.013	0.05	0.5
AS5425-001_AS5425-017	AS5425-001	871.6	AS5425-017	870.53	76.4	1.40%	Circular	24	0.013	0.5	0.25
IN5425-005_AS5425-001	IN5425-005	871.65	AS5425-001	871.6	11.34	0.44%	Circular	18	0.013	0.5	0.5
IN5425-007_IN5425-005	IN5425-007	879.1	IN5425-005	871.65	321.93	2.31%	Circular	18	0.013	0.05	0.5
AS5425-010_AS5426-010	AS5425-010	912.6	AS5426-010	899.6	349.54	3.72%	Circular	36	0.013	0.5	0.05

Table C-1
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Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
AS5426-007_AS5427-027	AS5426-007	895.1	AS5427-027	873.37	483.76	4.49%	Circular	36	0.013	0.05	0.25
AS5426-010_AS5426-007	AS5426-010	899.6	AS5426-007	895.1	112.49	4.00%	Circular	36	0.013	0.05	0.05
AS5427-001_AS5427-002	AS5427-001	862.41	AS5427-002	862.02	48.23	0.81%	Circular	42	0.013	0.5	0.5
AS5427-002_MI5427-034	AS5427-002	862.02	MI5427-034	859.429	148.38	1.75%	Circular	42	0.013	0.5	0.05
AS5427-006_IN5427-073	AS5427-006	871.1	IN5427-073	865.44	61.89	9.15%	Circular	42	0.013	0.5	0.05
AS5427-009_AS5427-010	AS5427-009	857	AS5427-010	855.82	134.67	0.88%	Circular	42	0.013	0.05	0.05
AS5427-010_AS5427-031	AS5427-010	855.82	AS5427-031	855.26	60.49	0.93%	Circular	42	0.013	0.05	0.05
AS5326-002_AS5226-076	AS5326-002	851.98	AS5226-076	847.68	600.35	0.72%	Circular	48	0.013	0.05	0.5
IN5326-006_AS5326-002	IN5326-006	852.847	AS5326-002	851.98	49.18	1.76%	Circular	18	0.013	0.05	0.5
AS5226-001_IN5227-026	AS5226-001	850.7	IN5227-026	849.66	29.16	3.57%	Circular	12	0.013	0.05	0.05
IN5127-001_IN5127-002	IN5127-001	851.25	IN5127-002	850.65	34.27	1.75%	Circular	12	0.013	0.05	0.05
IN5127-002_AE5127-003	IN5127-002	850.65	AE5127-003	850.51	33.06	0.42%	Circular	15	0.013	0.05	0.5
AS5127-008_IN5127-013	AS5127-008	870.82	IN5127-013	870.36	177.69	0.26%	Circular	18	0.013	0.05	0.05
DT5127-020_DT5127-021.1	IN5127-009	868.281	DT5127-021	865.749	57.3	4.42%	Circular	36	0.013	0.05	0.5
IN5127-013_AE5127-014	IN5127-013	870.36	AE5127-014	870.3	17.5	0.34%	Circular	18	0.013	0.05	0.5
AS5127-016_DT5127-018	AS5127-016	854.84	DT5127-018	849.6	196.61	2.67%	Circular	48	0.013	0.05	0.5
AS5126-001_AS5126-009	AS5126-001	862.76	AS5126-009	862.72	101.12	0.04%	Circular	48	0.013	0.05	0.25
AS5126-004_AS5127-016	AS5126-004	859.6	AS5127-016	854.84	637.14	0.75%	Circular	48	0.013	0.05	0.05
AS5026-002_AS5026-003	AS5026-002	867.164	AS5026-003	864.715	35	7.00%	Circular	18	0.013	0.05	0.5
AS5026-003_AS5126-001	AS5026-003	864.565	AS5126-001	862.76	324.76	0.56%	Circular	48	0.013	0.5	0.05
AS5026-004_AS5026-003	AS5026-004	864.806	AS5026-003	864.565	32.26	0.75%	Circular	48	0.013	0.5	0.5
AS5026-006_AS5027-009	AS5026-006	858.05	AS5027-009	856.992	129.06	0.82%	Circular	36	0.013	0.5	0.05
AS5026-009_AS5026-006	AS5026-009	861.5	AS5026-006	858.05	252.38	1.37%	Circular	30	0.013	0.05	0.5
AS5026-014_AS5026-009	AS5026-014	864.6	AS5026-009	861.5	264.89	1.17%	Circular	30	0.013	0.05	0.05
AS5026-015_AS5026-014	AS5026-015	865.1	AS5026-014	864.6	63.72	0.78%	Circular	30	0.013	0.05	0.05
Link7902	AS5027-001	867.25	Node4858	845	202.72	10.98%	Circular	15	0.013	0.05	1
AS5027-002_AS5027-001	AS5027-002	867.95	AS5027-001	867.25	51.78	1.35%	Circular	15	0.022	0.05	0.05
AS5027-008_MI5027-013	AS5027-008	855.507	MI5027-013	855.293	8.23	2.60%	Circular	48	0.022	0.05	0.05
AS5027-009_AS5027-008	AS5027-009	856.992	AS5027-008	855.512	210.02	0.70%	Circular	48	0.022	0.05	0.05
AS4826-002_IN4826-003	AS4826-002	906.04	IN4826-003	898.96	250.44	2.83%	Circular	18	0.013	0.25	0.25
IN4826-003_IN4825-010	IN4826-003	898.96	IN4825-010	898.1	51.33	1.68%	Circular	18	0.013	0.25	0.25
AS4826-005_AS4826-008	AS4826-005	880.2	AS4826-008	872.82	369.97	1.99%	Circular	30	0.013	0.25	0.05
AS4826-008_AS4826-012	AS4826-008	872.82	AS4826-012	872.45	40.86	0.91%	Circular	30	0.013	0.05	0.05
AS4826-012_AS4826-013	AS4826-012	872.45	AS4826-013	870.9	81.41	1.90%	Circular	30	0.013	0.05	0.05
AS4826-013_AS4827-001	AS4826-013	870.9	AS4827-001	859.55	449.96	2.52%	Circular	30	0.013	0.05	0.05
AS4827-001_AS4827-002	AS4827-001	859.55	AS4827-002	857.75	296.71	0.61%	Circular	36	0.013	0.05	0.05
AS4827-002_AS4827-004	AS4827-002	857.75	AS4827-004	856.1	158.79	1.04%	Circular	36	0.013	0.05	0.05
AS4827-004_AS4827-005	AS4827-004	856.1	AS4827-005	853.35	201.3	1.37%	Circular	36	0.013	0.05	0.05
Link7899	AS4827-005	853.35	Node4857	847.049	315.07	2.00%	Circular	36	0.013	0.05	1
AS5429-002_AS5429-003	AS5429-002	855.3	AS5429-003	854.1	86.74	1.38%	Special	29x45	0.013	0.05	0.05
AS5429-003_CB5428-017	AS5429-003	854.1	CB5428-017	853.12	76.59	1.28%	Circular	36	0.013	0.05	0.5
AS5429-019_AS5429-002	AS5429-019	855.95	AS5429-002	855.3	302.86	0.21%	Circular	36	0.013	0.05	0.05
AS5430-001_AS5430-003	AS5430-001	876.6	AS5430-003	868.32	337.32	2.45%	Circular	24	0.013	0.25	0.5
Link7909	AS5430-003	868.32	IN5429-024	857.03	369.83	3.05%	Circular	36	0.013	0.5	0.05
AS5431-020_AS5431-025	AS5431-020	881.9	AS5431-025	881.39	123.91	0.41%	Circular	18	0.013	0.05	0.05
AS5431-025_AS5431-026	AS5431-025	881.39	AS5431-026	880.76	252.03	0.25%	Circular	18	0.013	0.05	0.05
AS5431-026_AS5531-027	AS5431-026	880.76	AS5531-027	880.6	61.73	0.26%	Circular	18	0.013	0.05	0.5
AS5427-027_AS5427-006	AS5427-027	873.37	AS5427-006	871.1	17.93	12.66%	Circular	42	0.013	0.5	0.25
AS5225-001_AS5125-022	AS5225-001	879.54	AS5125-022	876.6	830.59	0.35%	Circular	18	0.013	0.05	0.5
AS4724-026_MI4724-003	AS4724-026	894.37	MI4724-003	890.046	277.06	1.56%	Circular	48	0.013	0.5	0.05
AS4723-024_AE4722-001	AS4723-024	861.1	AE4722-001	860.85	48.26	0.52%	Special	24x38	0.013	0.25	0.5
AS4925-004_AS4826-005	AS4925-004	883.47	AS4826-005	880.2	77.76	4.21%	Circular	30	0.013	0.5	0.25
AS5026-020_AS5026-004	AS5026-020	866	AS5026-004	864.806	159.56	0.75%	Circular	48	0.013	0.25	0.25
IN5229-001_AE5229-002	IN5229-001	849.9	AE5229-002	849.6	164.15	0.18%	Circular	15	0.013	0.05	1
AS5324-019_AS5325-026	AS5324-019	884.4	AS5325-026	884.1	51.43	0.58%	Circular	30	0.013	0.5	0.5
AS5325-026_AS5325-001	AS5325-026	884.1	AS5325-001	882.6	28.05	5.35%	Circular	30	0.013	0.5	0.05
AS5425-017_AS5325-025	AS5425-017	870.53	AS5325-025	869.71	43.39	1.89%	Circular	21	0.013	0.25	0.25
IN4724-029_AS4724-015	IN4724-029	894.63	AS4724-015	884.06	151.37	6.98%	Circular	15	0.013	0.05	0.5
AS4724-034_AS4724-022	AS4724-034	867.07	AS4724-022	859.9	166.65	4.30%	Circular	21	0.013	0.05	0.05
IN5126-007_AS5126-009	IN5126-007	863.34	AS5126-009	862.72	89.39	0.69%	Circular	15	0.013	0.05	0.25
AS5126-009_AS5126-004	AS5126-009	862.72	AS5126-004	859.6	604.22	0.52%	Circular	48	0.013	0.5	0.05
Link7897	IN4723-025	890.9	IN4723-013	887.15	117.02	3.20%	Circular	18	0.013	0.05	0.5
AE4821-008_AE4821-009	AE4821-008	859.85	AE4821-009	857	45.01	6.33%	Circular	24	0.013	0.05	0.5
IN4821-012_MI4821-015	IN4821-012	855.56	MI4821-015	855.401	7.93	2.01%	Circular	18	0.013	0.05	0.05
IN4922-015_IN4922-017	IN4922-015	892.85	IN4922-017	892.64	28.02	0.75%	Circular	21	0.013	0.05	0.05
IN4922-016_IN4922-015	IN4922-016	893.12	IN4922-015	892.85	50.67	0.53%	Circular	15	0.013	0.05	0.05
IN4922-017_AE4922-024	IN4922-017	892.64	AE4922-024	891.6	108.01	0.96%	Circular	21	0.013	0.05	0.05
AS4922-018_IN4922-015	AS4922-018	893.91	IN4922-015	892.85	53.01	2.00%	Circular	18	0.013	0.05	0.05
IN4922-019_AS4922-018	IN4922-019	896.89	AS4922-018	893.91	120.94	2.46%	Circular	15	0.013	0.05	0.05
IN4922-020_IN4922-019	IN4922-020	897.82	IN4922-019	896.89	44.44	2.09%	Circular	12	0.013	0.05	0.05
IN4922-021_AS4922-018	IN4922-021	894.61	AS4922-018	893.91	22.9	3.06%	Circular	15	0.013	0.05	0.05
IN4922-022_IN4922-021	IN4922-022	895.06	IN4922-021	894.61	15.52	2.90%	Circular	15	0.013	0.05	0.05
IN4922-023_IN4922-017	IN4922-023	892.91	IN4922-017	892.64	50.46	0.54%	Circular	12	0.013	0.05	0.05
IN5227-023_AE5227-025	IN5227-023	850.9	AE5227-025	850.7	41.54	0.48%	Special	24x38	0.013	0.05	0.5
Link7903	IN5027-011	854.172	Node4859	846.673	219.55	3.42%	Circular	42	0.013	0.05	1
IN5324-022_IN5324-023	IN5324-022	946.06	IN5324-023	941.933	75.14	5.49%	Circular	15	0.013	0.05	0.05
IN5324-023_IN5324-024	IN5324-023	941.863	IN5324-024	934.408	197.18	3.78%	Circular	15	0.013	0.05	0.05
IN5324-024_IN5324-025	IN5324-024	934.358	IN5324-025	930.402	82.56	4.79%	Circular	15	0.013	0.05	0.05
IN5324-025_AS5324-008	IN5324-025	930.322	AS5324-008	926.82	84.82	4.13%	Circular	15	0.013	0.05	0.5
IN5429-024_AS5429-019	IN5429-024	857.03	AS5429-019	855.95	302.32	0.36%	Circular	36	0.013	0.05	0.05
AS5125-024_AS5125-005	AS5125-024	873.26	AS5125-005	869.85	201.21	1.69%	Circular	24	0.013	0.05	0.05
CB5125-025_AS5125-024	CB5125-025	874.26	AS5125-024	873.26	64.24	1.56%	Circular	24	0.013	0.05	0.05
Link7908	CB5428-017	853.12	Node4864	851.625	74.76	2.00%	Circular	42	0.013	0.5	0.5
Link7923	CB5428-024	853.44	Node4872	852.92	26	2.00%	Circular	30	0.013	0.05	0.5

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Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
CB5427-028_AS5427-010	CB5427-028	856.95	AS5427-010	855.82	30.93	3.65%	Circular	12	0.013	0.05	0.5
Link7905	AS5427-031	855.26	Node4861	853.535	86.24	2.00%	Circular	42	0.013	0.05	0.5
AS5427-033_AS5427-009	AS5427-033	858.5	AS5427-009	857	87.78	1.71%	Circular	42	0.013	0.05	0.05
AE5427-037_AE5427-038	AE5427-037	848	AE5427-038	848	80.12	0.00%	Circular	27	0.013	0.5	1
IN5327-001_AE5427-039	IN5327-001	850	AE5427-039	849	52.01	1.92%	Circular	12	0.013	0.05	1
IN5427-040_AE5427-041	IN5427-040	848.36	AE5427-041	848	77.42	0.46%	Circular	24	0.013	0.25	1
IN5427-042_IN5427-040	IN5427-042	848.51	IN5427-040	848.36	30.83	0.49%	Circular	24	0.013	0.05	0.25
IN5427-043_IN5427-042	IN5427-043	848.63	IN5427-042	848.51	21.08	0.57%	Circular	24	0.013	0.5	0.05
IN5427-044_IN5427-043	IN5427-044	848.98	IN5427-043	848.63	71.67	0.49%	Circular	24	0.013	0.25	0.5
IN5427-045_IN5427-044	IN5427-045	850.38	IN5427-044	848.98	278.97	0.50%	Circular	21	0.013	0.05	0.25
IN5427-046_AE5427-048	IN5427-046	848.2	AE5427-048	848	43.01	0.47%	Circular	21	0.013	0.25	1
IN5427-049_IN5427-046	IN5427-049	848.29	IN5427-046	848.2	23.77	0.38%	Circular	21	0.013	0.05	0.25
IN5427-050_IN5427-049	IN5427-050	848.44	IN5427-049	848.29	38	0.39%	Circular	21	0.013	0.05	0.05
IN5427-051_IN5427-050	IN5427-051	848.59	IN5427-050	848.44	37.01	0.41%	Circular	18	0.013	0.05	0.05
IN5427-052_IN5427-051	IN5427-052	849.5	IN5427-051	848.59	229.03	0.40%	Circular	18	0.013	0.05	0.05
AS5427-055_AE5427-054	AS5427-055	848	AE5427-054	848	48.47	0.00%	Circular	24	0.013	0.05	1
AE5427-056_AS5427-055	AE5427-056	846	AS5427-055	848	41.4	-4.83%	Circular	24	0.013	0.5	0.05
IN5427-059_AE5427-060	IN5427-059	848.14	AE5427-060	848	34	0.41%	Circular	27	0.013	0.05	1
CB5427-062_IN5427-059	CB5427-062	848.33	IN5427-059	848.14	57.01	0.33%	Circular	27	0.013	0.05	0.05
IN5427-063_CB5427-062	IN5427-063	849	CB5427-062	848.33	199.9	0.34%	Circular	27	0.013	0.5	0.05
IN5428-026_IN5427-063	IN5428-026	850.02	IN5427-063	849	180.02	0.57%	Circular	15	0.013	0.5	0.5
IN5428-027_IN5428-026	IN5428-027	851.25	IN5428-026	850.02	232.03	0.53%	Circular	12	0.013	0.05	0.5
IN5427-065_IN5427-063	IN5427-065	849.68	IN5427-063	849	231.03	0.29%	Circular	24	0.013	0.05	0.5
IN5427-067_IN5427-065	IN5427-067	849.85	IN5427-065	849.68	23	0.74%	Circular	21	0.013	0.05	0.5
IN5427-068_IN5427-067	IN5427-068	849.98	IN5427-067	849.85	28	0.46%	Circular	21	0.013	0.05	0.05
IN5427-069_IN5427-068	IN5427-069	850.15	IN5427-068	849.98	33	0.52%	Circular	21	0.013	0.25	0.05
IN5427-070_IN5427-069	IN5427-070	850.44	IN5427-069	850.15	56.36	0.51%	Circular	18	0.013	0.05	0.25
AS5321-021_IN5321-010	AS5321-021	889.15	IN5321-010	887.41	63.26	2.75%	Circular	12	0.013	0.25	0.25
AS5321-022_AS5321-021	AS5321-022	892.77	AS5321-021	889.15	251.03	1.44%	Circular	12	0.013	0.05	0.25
IN5321-024_AS5321-022	IN5321-024	893.65	AS5321-022	892.77	48.85	1.80%	Circular	12	0.013	0.05	0.05
Link7892	AS5220-024	853.6	IN5220-021	853.6	118.91	0.00%	Rectangular	3x7	0.013	0.5	0.05
IN5220-025_AS5220-024	IN5220-025	855.17	AS5220-024	854.31	118.54	0.73%	Circular	12	0.013	0.05	0.5
IN5427-073_AS5427-074	IN5427-073	865.44	AS5427-074	864.5	46.92	2.00%	Circular	42	0.013	0.05	0.05
AS5427-074_AS5427-001	AS5427-074	864.5	AS5427-001	862.41	83.62	2.50%	Circular	42	0.013	0.05	0.5
AS5427-076_AS5427-077	AS5427-076	863.53	AS5427-077	863.18	64.95	0.54%	Circular	30	0.013	0.25	0.05
AS5427-077_AS5427-002	AS5427-077	863.18	AS5427-002	862.02	78.05	1.49%	Circular	30	0.013	0.05	0.25
AS5427-080_AS5427-076	AS5427-080	864.21	AS5427-076	863.53	121.92	0.56%	Circular	30	0.013	0.05	0.25
IN5325-027_AS5326-005	IN5325-027	863.11	AS5326-005	859.92	128.35	2.49%	Circular	30	0.013	0.05	0.25
IN5325-033_AS5325-004	IN5325-033	861.159	AS5325-004	860.02	72.53	1.57%	Circular	36	0.013	0.25	0.5
IN5325-039_IN5325-034	IN5325-039	862.55	IN5325-034	861.4	291.07	0.40%	Circular	36	0.013	0.05	0.25
AS5225-022_IN5325-044	AS5225-022	881.64	IN5325-044	869.15	501.78	2.49%	Circular	21	0.013	0.05	0.05
AS5225-023_AS5225-022	AS5225-023	894.82	AS5225-022	881.64	422.19	3.12%	Circular	15	0.013	0.05	0.05
AS5225-027_AS5225-023	AS5225-027	897.12	AS5225-023	894.82	101.89	2.26%	Circular	15	0.013	0.05	0.05
IN5224-008_AS5225-027	IN5224-008	898.55	AS5225-027	897.12	60.1	2.38%	Circular	15	0.013	0.5	0.05
IN5225-028_IN5224-008	IN5225-028	899.24	IN5224-008	898.55	31.86	2.17%	Circular	12	0.013	0.05	0.5
IN5225-031_IN5225-028	IN5225-031	899.3	IN5225-028	899.24	10.2	0.59%	Circular	12	0.013	0.05	0.05
AS5124-041_MI5124-042	AS5124-041	906.6	MI5124-042	906.069	17	3.12%	Circular	24	0.013	0.05	0.05
AS5124-046_AS5124-050	AS5124-046	898.94	AS5124-050	890.58	382.72	2.18%	Circular	24	0.013	0.05	0.5
AS5124-050_MI5124-049	AS5124-050	890.58	MI5124-049	890.12	19.32	2.38%	Circular	24	0.013	0.5	0.05
IN5124-051_AS5124-050	IN5124-051	890.66	AS5124-050	890.58	5.23	1.53%	Circular	18	0.013	0.05	0.5
IN5124-052_IN5124-051	IN5124-052	890.83	IN5124-051	890.66	39.06	0.44%	Circular	18	0.013	0.05	0.05
IN5124-054_IN5124-052	IN5124-054	890.91	IN5124-052	890.83	15.01	0.53%	Circular	18	0.013	0.05	0.05
AS5124-058_AS5124-059	AS5124-058	888.831	AS5124-059	888.67	6.77	2.38%	Circular	24	0.013	0.05	0.25
AS5124-059_AS5124-060	AS5124-059	888.67	AS5124-060	886.66	100.01	2.01%	Special	24x38	0.013	0.5	0.25
AS5124-060_AS5124-061	AS5124-060	886.66	AS5124-061	883.38	195.09	1.68%	Circular	24	0.013	0.25	0.05
AS5124-061_AS5124-066	AS5124-061	883.38	AS5124-066	882.68	33.83	2.07%	Circular	24	0.013	0.05	0.25
IN5124-064_IN5124-073	IN5124-064	885.02	IN5124-073	883.74	126.01	1.02%	Circular	12	0.013	0.05	0.5
AS5124-066_AS5124-008	AS5124-066	882.68	AS5124-008	881.1	64.52	2.45%	Circular	24	0.013	0.25	0.25
IN5124-069_IN5124-079	IN5124-069	883.35	IN5124-079	883.14	30.36	0.69%	Circular	24	0.013	0.5	0.25
CB5124-072_IN5124-070	CB5124-072	883.74	IN5124-070	883.74	14.12	0.00%	Circular	24	0.013	0.05	0.05
IN5124-073_CB5124-072	IN5124-073	883.74	CB5124-072	883.74	10.88	0.00%	Circular	24	0.013	0.5	0.05
AS5024-013_AS5124-003	AS5024-013	888.26	AS5124-003	888.1	56.54	0.28%	Circular	18	0.013	0.25	0.5
IN5024-014_AS5024-013	IN5024-014	888.41	AS5024-013	888.26	16.92	0.89%	Circular	18	0.013	0.05	0.25
AS5124-077_AS5124-003	AS5124-077	889.59	AS5124-003	888.1	102.55	1.45%	Circular	21	0.013	0.25	0.5
IN5023-022_AS5023-023	IN5023-022	902.54	AS5023-023	902.41	7.24	1.80%	Circular	24	0.013	0.05	0.5
AS5023-023_AS5023-015	AS5023-023	902.41	AS5023-015	903.18	16.97	-4.54%	Circular	30	0.013	0.5	0.05
AS5023-025_IN5023-022	AS5023-025	902.62	IN5023-022	902.54	38.33	0.21%	Circular	24	0.013	0.05	0.05
AS5023-028_AS5023-025	AS5023-028	902.77	AS5023-025	902.62	50.01	0.30%	Circular	24	0.013	0.05	0.05
AS5023-030_AS5023-023	AS5023-030	903.11	AS5023-023	902.41	70.37	0.99%	Circular	24	0.013	0.05	0.5
IN4923-028_AS4923-029	IN4923-028	903.05	AS4923-029	902.55	12.75	3.92%	Circular	24	0.013	0.05	0.05
AS4923-029_AS4923-016	AS4923-029	902.55	AS4923-016	901.665	29.29	3.02%	Circular	36	0.013	0.05	0.05
AE5119-010_AE5019-001	AE5119-010	851.5	AE5019-001	849	263.46	0.95%	Circular	36	0.013	0.5	0.5
AE5119-011_AE5019-002	AE5119-011	851.5	AE5019-002	849	272.24	0.92%	Circular	36	0.013	0.5	0.5
AE5119-012_AE5019-003	AE5119-012	851.5	AE5019-003	849	281.99	0.89%	Circular	36	0.013	0.5	0.5
IN5119-013_AE5119-014	IN5119-013	852.31	AE5119-014	850.5	148.02	1.22%	Circular	48	0.013	0.25	0.5
IN5119-013_AE5119-015	IN5119-013	852.31	AE5119-015	850.5	149.91	1.21%	Circular	48	0.013	0.25	0.5
AE5119-018_AS5119-019	AE5119-018	851.5	AS5119-019	849	111	2.25%	Circular	36	0.013	0.05	0.05
AS5119-019_AE5118-002	AS5119-019	849	AE5118-002	848	775.09	0.13%	Circular	36	0.013	0.05	1
AS5219-012_AE5218-019	AS5219-012	849	AE5218-019	848	595.07	0.17%	Circular	36	0.013	0.05	1
AE5219-013_AS5219-012	AE5219-013	850	AS5219-012	849	93	1.08%	Circular	36	0.013	0.05	0.05
AE5228-004_AE5228-005	AE5228-004	847.55	AE5228-005	845.82	92	1.88%	Circular	72	0.013	0.5	1
AS5425-028_IN5425-007	AS5425-028	880.9	IN5425-007	879.1	71.53	2.52%	Circular	15	0.013	0.05	0.05
AS5425-029_AS5425-028	AS5425-029	903.81	AS5425-028	880.9	370.04	6.19%	Circular	15	0.013	0.05	0.05
IN5424-008_AS5425-029	IN5424-008	906.2	AS5425-029	903.81	34.09	7.01%	Circular	15	0.013	0.05	0.05

Table C-1
Existing XPSWMM Model Storm Sewer Inputs
Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI

Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
IN5325-044_IN5325-039	IN5325-044	869.15	IN5325-039	862.55	331.54	1.99%	Circular	30	0.013	0.05	0.05
IN5124-079_MI5124-068	IN5124-079	883.14	MI5124-068	882.905	7.67	3.06%	Circular	24	0.013	0.25	0.05
IN5325-034_IN5325-033	IN5325-034	861.4	IN5325-033	861.159	15.38	1.57%	Circular	36	0.013	0.25	0.25
AS5020-019_CB5020-036	AS5020-019	853.07	CB5020-036	850.37	45.55	5.93%	Circular	36	0.013	0.05	0.5
IN5124-070_MI5124-071	IN5124-070	883.74	MI5124-071	883.648	6	1.53%	Circular	24	0.013	0.05	0.05
IN5519-002_IN5519-006	IN5519-002	886.08	IN5519-006	862.865	462.61	5.02%	Circular	18	0.013	0.05	0.05
IN5520-002_IN5520-003	IN5520-002	911.97	IN5520-003	900.87	262.43	4.23%	Circular	18	0.013	0.05	0.05
IN5520-003_IN5519-002	IN5520-003	900.87	IN5519-002	886.08	290.3	5.09%	Circular	18	0.013	0.05	0.05
AS5524-001_AS5524-002	AS5524-001	921.6	AS5524-002	920.1	247.4	0.61%	Circular	18	0.013	0.05	0.5
AS5524-002_AS5524-003	AS5524-002	920.1	AS5524-003	919.1	205.7	0.49%	Circular	36	0.013	0.5	0.5
AS5524-003_AS5525-003	AS5524-003	919.1	AS5525-003	918.26	220.22	0.38%	Circular	36	0.013	0.5	0.05
AS5524-005_AS5524-001	AS5524-005	928.6	AS5524-001	921.6	202.67	3.45%	Circular	18	0.013	0.05	0.05
AS5525-001_AS5525-004	AS5525-001	917.06	AS5525-004	916	266.06	0.40%	Circular	36	0.013	0.05	0.05
AS5525-003_AS5525-001	AS5525-003	918.26	AS5525-001	917.06	301.07	0.40%	Circular	36	0.013	0.05	0.05
AS5525-004_AS5526-001	AS5525-004	916	AS5526-001	913.8	432.24	0.51%	Circular	36	0.013	0.05	0.5
AS5526-001_AS5425-010	AS5526-001	913.8	AS5425-010	912.6	63.72	1.88%	Circular	36	0.013	0.5	0.5
AS5527-001_AS5527-004	AS5527-001	876.83	AS5527-004	875.06	285.59	0.62%	Circular	30	0.013	0.05	0.05
AS5527-004_AS5527-011	AS5527-004	875.06	AS5527-011	874.35	111.72	0.64%	Circular	30	0.013	0.05	0.25
AS5527-011_AS5427-027	AS5527-011	874.35	AS5427-027	873.37	57.99	1.69%	Special	24x38	0.013	0.25	0.25
AS5527-012_AS5427-006	AS5527-012	874.6	AS5427-006	871.1	52.6	6.65%	Circular	21	0.013	0.05	0.25
IN5527-013_IN5527-018	IN5527-013	868.046	IN5527-018	864.907	426.26	0.74%	Circular	30	0.013	0.05	0.05
IN5527-018_AS5527-044	IN5527-018	864.907	AS5527-044	863.83	146.32	0.74%	Circular	30	0.013	0.05	0.25
AS5628-002_TP5528-004	AS5628-002	871.6	TP5528-004	866.481	364.33	1.41%	Circular	24	0.013	0.05	0.5
IN5628-003_AS5629-011	IN5628-003	876.38	AS5629-011	873.49	461.4	0.63%	Circular	36	0.013	0.05	0.25
IN5628-018_IN5628-091	IN5628-018	887.75	IN5628-091	887.721	14.27	0.20%	Circular	15	0.013	0.5	0.05
AS5630-001_AS5530-019	AS5630-001	880.6	AS5530-019	878.1	415.55	0.60%	Circular	15	0.013	0.05	0.05
AS5630-002_AS5630-001	AS5630-002	883.6	AS5630-001	880.6	405.27	0.74%	Circular	15	0.013	0.05	0.05
IN5630-008_IN5629-012	IN5630-008	888.357	IN5629-012	887.55	80.7	1.00%	Circular	15	0.013	0.05	0.05
IN5630-009_IN5630-008	IN5630-009	888.496	IN5630-008	888.357	17.65	0.79%	Circular	15	0.013	0.25	0.05
AS5530-001_AS5530-027	AS5530-001	874.1	AS5530-027	871	471.77	0.66%	Circular	24	0.013	0.5	0.05
AS5530-004_AS5530-001	AS5530-004	876.9	AS5530-001	874.1	571.21	0.49%	Circular	15	0.013	0.05	0.5
AS5530-009_AS5530-001	AS5530-009	874.9	AS5530-001	874.1	376.76	0.21%	Circular	24	0.013	0.05	0.5
AS5530-010_AS5530-009	AS5530-010	875.01	AS5530-009	874.9	37.5	0.29%	Circular	18	0.013	0.5	0.05
AS5530-019_AS5530-010	AS5530-019	878.1	AS5530-010	875.01	585.98	0.53%	Circular	18	0.013	0.05	0.5
AS5530-023_AS5430-001	AS5530-023	877.2	AS5430-001	876.6	79.29	0.76%	Circular	24	0.013	0.25	0.25
AS5530-027_AS5430-003	AS5530-027	871	AS5430-003	868.32	85.65	3.13%	Circular	24	0.013	0.05	0.5
Link7907	AS5529-008	865.74	AS5529-020	861.48	323.24	1.32%	Circular	36	0.013	0.05	0.05
AS5528-001_AS5529-018	AS5528-001	853.6	AS5529-018	853.37	38.85	0.59%	Circular	12	0.013	0.5	0.5
Link7924	AS5528-001	853.6	Node4873	851.2	120	2.00%	Circular	24	0.013	0.25	0.5
AS5528-005_TP5528-004	AS5528-005	869.97	TP5528-004	866.481	174.43	2.00%	Circular	18	0.013	0.05	0.5
AS5631-001_AS5631-013	AS5631-001	883.36	AS5631-013	882.55	172.1	0.47%	Circular	15	0.013	0.05	0.25
AS5532-019_AS5531-019	AS5532-019	883.495	AS5531-019	882.31	237.1	0.50%	Circular	15	0.013	0.05	0.05
AS5531-001_AS5531-006	AS5531-001	880.1	AS5531-006	875.9	286.23	1.47%	Circular	18	0.013	0.5	0.05
AS5531-002_AS5531-001	AS5531-002	881.26	AS5531-001	880.1	287.37	0.40%	Circular	18	0.013	0.05	0.5
AS5531-005_AS5531-002	AS5531-005	881.82	AS5531-002	881.26	238.1	0.24%	Circular	15	0.013	0.5	0.05
AS5531-006_AS5530-010	AS5531-006	875.9	AS5530-010	875.01	300.49	0.30%	Circular	18	0.013	0.05	0.5
AS5531-019_AS5531-023	AS5531-019	882.31	AS5531-023	881.52	285.57	0.28%	Circular	18	0.013	0.05	0.05
AS5531-023_AS5531-027	AS5531-023	881.52	AS5531-027	880.6	172.85	0.53%	Circular	21	0.013	0.05	0.5
AS5531-027_AS5531-028	AS5531-027	880.6	AS5531-028	879.6	60.17	1.66%	Circular	21	0.013	0.5	0.05
AS5531-028_AS5530-023	AS5531-028	879.6	AS5530-023	877.2	364.81	0.66%	Circular	21	0.013	0.05	0.25
AS5529-018_CB5428-017	AS5529-018	853.37	CB5428-017	853.12	118.61	0.21%	Circular	21	0.013	0.5	0.05
Link7964	AS5529-018	853.37	Node4935	851.2	110	1.97%	Special	29x45	0.013	0.5	0.5
AS5529-019_CB5529-031	AS5529-019	856.9	CB5529-031	853.61	228.76	1.44%	Circular	36	0.013	0.05	0.05
AS5529-020_AS5529-019	AS5529-020	861.48	AS5529-019	856.9	353.63	1.30%	Circular	36	0.013	0.05	0.05
AS5629-011_AS5529-008	AS5629-011	873.49	AS5529-008	865.74	350.98	2.21%	Circular	36	0.013	0.25	0.05
AS5528-011_AS5528-012	AS5528-011	865.58	AS5528-012	859.55	421.42	1.43%	Circular	24	0.013	0.05	0.05
AS5528-012_CB5528-028	AS5528-012	859.55	CB5528-028	853.37	409	1.51%	Circular	24	0.013	0.05	0.05
IN5527-030_IN5527-013	IN5527-030	873.163	IN5527-013	868.046	287.1	1.78%	Circular	24	0.013	0.05	0.05
IN5527-032_IN5527-030	IN5527-032	874.929	IN5527-030	873.163	162.67	1.09%	Circular	24	0.013	0.05	0.05
IN5530-037_AS5530-027	IN5530-037	871.62	AS5530-027	871	10.36	5.98%	Circular	12	0.013	0.05	0.05
IN5528-026_CB5428-024	IN5528-026	853.86	CB5428-024	853.44	61.11	0.69%	Circular	30	0.013	0.05	0.05
CB5529-031_MI5529-034	CB5529-031	853.61	MI5529-034	853.508	13	0.78%	Special	29x45	0.013	0.05	0.05
CB5528-028_AS5528-001	CB5528-028	853.37	AS5528-001	853.6	29.01	-0.79%	Circular	24	0.013	0.05	0.5
IN5629-012_MI5629-017	IN5629-012	887.55	MI5629-017	887.635	6	-1.42%	Circular	15	0.013	0.05	0.05
AS5629-016_IN5628-044	AS5629-016	880.91	IN5628-044	878.828	351.03	0.59%	Circular	27	0.013	0.05	0.25
IN5628-035_IN5628-040	IN5628-035	883.063	IN5628-040	880.84	111.16	2.00%	Circular	27	0.013	0.05	0.25
IN5628-040_IN5628-046	IN5628-040	880.84	IN5628-046	880.66	24.66	0.73%	Circular	27	0.013	0.25	0.05
IN5628-041_IN5628-088	IN5628-041	880.4	IN5628-088	879.91	53.7	0.91%	Circular	27	0.013	0.5	0.05
IN5628-042_IN5628-003	IN5628-042	878.252	IN5628-003	876.38	315.71	0.59%	Circular	36	0.013	0.5	0.05
IN5628-043_IN5628-042	IN5628-043	878.683	IN5628-042	878.252	72.67	0.59%	Circular	36	0.013	0.05	0.5
IN5628-044_IN5628-043	IN5628-044	878.828	IN5628-043	878.683	24.55	0.59%	Circular	36	0.013	0.5	0.05
IN5628-046_IN5628-041	IN5628-046	880.66	IN5628-041	880.4	25.09	1.04%	Circular	27	0.013	0.05	0.5
IN5628-070_IN5628-018	IN5628-070	888	IN5628-018	887.75	12.58	1.99%	Circular	15	0.013	0.05	0.5
IN5628-071_IN5628-070	IN5628-071	888.14	IN5628-070	888	26.16	0.54%	Circular	15	0.013	0.05	0.05
AS5628-072_IN5628-071	AS5628-072	888.17	IN5628-071	888.14	10.3	0.29%	Circular	15	0.013	0.05	0.05
IN5628-075_MI5628-076	IN5628-075	888.67	MI5628-076	888.623	10	0.47%	Circular	15	0.013	0.05	0.05
IN5628-077_MI5628-078	IN5628-077	889.1	MI5628-078	888.893	15	1.38%	Circular	15	0.013	0.05	0.05
AS5628-080_IN5628-084	AS5628-080	881.87	IN5628-084	880.9	110.02	0.88%	Circular	15	0.013	0.05	0.05
IN5628-084_AS5628-085	IN5628-084	880.9	AS5628-085	878.27	83.28	3.16%	Circular	15	0.013	0.05	0.05
AS5628-085_MI5628-086	AS5628-085	878.27	MI5628-086	877.933	31	1.09%	Circular	24	0.013	0.05	0.05
AS5527-044_AS5427-002	AS5527-044	863.83	AS5427-002	862.02	100.52	1.80%	Circular	30	0.013	0.25	0.25
AS5527-048_AS5427-001	AS5527-048	864.41	AS5427-001	862.41	89.14	2.24%	Circular	24	0.013	0.05	0.5
Link7910	IN5629-018	886.332	Node4865	885.905	159.84	0.27%	Circular	24	0.013	0.05	0.05
IN5629-019_IN5629-018	IN5629-019	886.395	IN5629-018	886.332	23.83	0.26%	Circular	18	0.013	0.05	0.05

Table C-1
Existing XPSWMM Model Storm Sewer Inputs
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Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
IN5629-021_IN5629-019	IN5629-021	886.836	IN5629-019	886.395	165.02	0.27%	Circular	18	0.013	0.05	0.05
Link7913	IN5630-031	889.231	IN5630-009	888.496	36.75	2.00%	Circular	15	0.013	0.25	0.25
IN5630-032_IN5630-031	IN5630-032	889.313	IN5630-031	889.231	8.11	1.01%	Circular	15	0.013	0.05	0.25
IN5628-088_IN5628-044	IN5628-088	879.91	IN5628-044	878.828	46.84	2.31%	Circular	27	0.013	0.05	0.25
IN5628-091_MI5628-069	IN5628-091	887.721	MI5628-069	887.689	16.17	0.20%	Circular	15	0.013	0.05	0.05
AS5631-013_IN5531-035	AS5631-013	882.55	IN5531-035	882.506	13.05	0.34%	Circular	18	0.013	0.25	0.5
AE5326-026_AE5326-027	AE5326-026	850.8	AE5326-027	850.2	29	2.07%	Circular	8	0.011	0.05	0.5
AE5326-028_AE5326-029	AE5326-028	849.9	AE5326-029	849.55	28	1.25%	Circular	8	0.011	0.05	0.5
AE5326-030_AE5326-031	AE5326-030	850.7	AE5326-031	850.66	29.7	0.13%	Circular	8	0.011	0.05	0.5
Link7885	AE5218-021	848.8	IN5218-025	848.186	30.72	2.00%	Special	43x68	0.013	0.5	0.05
Link7883	AE5218-023	848.8	IN5218-026	847.482	65.91	2.00%	Special	43x68	0.013	0.5	0.5
Link7932	AE5020-047	853.1	Node4883	853	40	0.25%	Circular	15	0.013	0.5	0.5
Link7933	AE5020-049	852.5	Node4884	852.4	40	0.25%	Circular	15	0.013	0.5	0.5
AE5020-051_AS5020-052	AE5020-051	852	AS5020-052	851.9	19	0.53%	Special	43x68	0.013	0.05	0.5
IN5026-024_AS5026-002	IN5026-024	867.363	AS5026-002	867.264	16.04	0.62%	Circular	12	0.013	0.05	0.05
IN4920-009_IN4920-006	IN4920-009	856.176	IN4920-006	856.3	15.28	-0.81%	Circular	18	0.013	0.5	0.05
IN5020-030_AS5020-008	IN5020-030	853.74	AS5020-008	853.3	21.99	2.00%	Circular	12	0.013	0.05	0.25
Link7894	CB5020-036	850.37	Node4854	850.082	14.39	2.00%	Circular	54	0.013	0.5	1
IN5020-040_AS5020-037	IN5020-040	855.33	AS5020-037	853.68	281.19	0.59%	Circular	15	0.013	0.5	0.05
IN5020-041_IN5020-040	IN5020-041	856.48	IN5020-040	855.33	56.75	2.03%	Circular	12	0.013	0.05	0.5
IN5120-030_IN5120-036	IN5120-030	873.7	IN5120-036	873.137	17.77	3.17%	Circular	21	0.013	0.5	0.25
IN5429-027_AE5428-029	IN5429-027	850.99	AE5428-029	850.54	42	1.07%	Circular	21	0.013	0.5	0.05
Link7922	IN5429-039	850.11	Node4871	848.75	68	2.00%	Special	19x30	0.013	0.05	1
IN5429-043_IN5429-039	IN5429-043	850.17	IN5429-039	850.11	60.67	0.10%	Special	19x30	0.013	0.05	0.05
IN5429-045_IN5429-043	IN5429-045	850.96	IN5429-043	850.17	160.09	0.49%	Special	19x30	0.013	0.05	0.05
IN5429-048_IN5429-045	IN5429-048	851.32	IN5429-045	850.96	77.22	0.47%	Special	19x30	0.013	0.05	0.05
IN5429-050_IN5429-048	IN5429-050	851.64	IN5429-048	851.32	83.66	0.38%	Circular	24	0.013	0.05	0.05
IN5429-051_IN5429-050	IN5429-051	853.43	IN5429-050	851.64	336.96	0.53%	Circular	24	0.013	0.05	0.05
IN5430-006_IN5429-051	IN5430-006	855.26	IN5429-051	853.43	365.65	0.50%	Circular	24	0.013	0.05	0.05
IN5430-011_AS5430-007	IN5430-011	858.23	AS5430-007	856.48	64.15	2.73%	Circular	15	0.013	0.25	0.5
IN5430-013_IN5430-011	IN5430-013	869.07	IN5430-011	858.23	236.79	4.58%	Circular	15	0.013	0.05	0.25
IN5330-002_AS5430-016	IN5330-002	868.208	AS5430-016	861.43	163.97	4.13%	Circular	18	0.013	0.05	0.05
IN5330-007_AS5330-003	IN5330-007	887.97	AS5330-003	879.37	271.05	3.17%	Circular	12	0.013	0.05	0.05
Link7921	IN5429-052	850.051	Node4870	849.251	40	2.00%	Special	19x30	0.013	0.25	1
Link7920	IN5429-060	851.04	Node4869	850.02	51	2.00%	Circular	21	0.013	0.05	1
IN5429-061_IN5429-060	IN5429-061	851.55	IN5429-060	851.04	50.83	1.00%	Circular	18	0.013	0.5	0.05
IN5321-023_IN5321-010	IN5321-028	889.77	IN5321-010	887.41	78.7	3.00%	Circular	12	0.013	0.25	0.5
IN5321-030_AS5321-029	IN5321-030	892.53	AS5321-029	889.85	176.98	1.51%	Circular	12	0.013	0.25	0.05
IN5321-031_IN5321-030	IN5321-031	893.47	IN5321-030	892.53	71.25	1.32%	Circular	12	0.013	0.05	0.25
IN5120-033_AS5120-034	IN5120-033	858.01	AS5120-034	858.71	332.13	-0.21%	Circular	30	0.013	0.05	0.25
IN5120-036_AS5120-034	IN5120-036	873.137	AS5120-034	858.71	455.76	3.17%	Circular	24	0.013	0.25	0.25
Link7886	IN5218-025	848.186	Node4851	846.715	73.54	2.00%	Special	43x68	0.013	0.05	1
Link7884	IN5218-026	847.482	Node4852	846.699	39.15	2.00%	Special	43x68	0.013	0.5	1
IN5218-028_IN5218-026	IN5218-028	854.06	IN5218-026	847.482	236.65	2.78%	Circular	12	0.013	0.05	0.5
CB5117-017_MI5117-014	CB5117-017	854.952	MI5117-014	854.647	30.5	1.00%	Circular	15	0.013	0.05	0.05
CB5117-018_AE5117-007	CB5117-018	855.35	AE5117-007	850.2	163.21	3.16%	Circular	18	0.013	0.05	1
CB5117-019_AE5117-011	CB5117-019	854.33	AE5117-011	850.2	185	2.23%	Circular	18	0.013	0.05	1
CB5217-009_AE5217-001	CB5217-009	853.05	AE5217-001	850.2	108.01	2.64%	Circular	18	0.013	0.05	1
IN5217-010_AE5217-008	IN5217-010	852	AE5217-008	849.273	136.33	2.00%	Circular	21	0.013	0.05	1
IN5418-006_IN5418-008	IN5418-006	853.9	IN5418-008	853.38	94.59	0.55%	Special	34x53	0.013	0.05	0.05
IN5418-008_IN5518-004	IN5418-008	853.38	IN5518-004	853.13	102.18	0.24%	Special	34x53	0.013	0.05	0.05
IN5518-004_IN5518-006	IN5518-004	853.13	IN5518-006	851.75	399.15	0.35%	Special	34x53	0.013	0.05	0.05
Link7887	IN5518-006	851.75	Node4853	850	169.37	1.03%	Special	34x53	0.013	0.05	1
IN5227-026_AE5227-028	IN5227-026	849.66	AE5227-028	846.06	180.01	2.00%	Circular	24	0.011	0.05	1
IN4524-004_IN4624-002	IN4524-004	853.447	IN4624-002	851.01	243.75	1.00%	Circular	12	0.011	0.05	0.5
IN4722-015_AS4722-008	IN4722-015	863.1	AS4722-008	862.55	183.3	0.30%	Circular	24	0.013	0.05	0.5
IN5531-035_IN5531-037	IN5531-035	882.506	IN5531-037	882.119	115.6	0.33%	Circular	18	0.013	0.5	0.05
IN5531-037_AS5531-038	IN5531-037	882.119	AS5531-038	881.95	50.25	0.34%	Circular	18	0.013	0.05	0.5
IN5531-039_AS5531-038	IN5531-039	881.988	AS5531-038	881.95	41.65	0.09%	Circular	21	0.013	0.25	0.5
IN5519-006_IN5519-007	IN5519-006	862.865	IN5519-007	861.567	28.28	4.59%	Circular	24	0.013	0.05	0.05
IN5519-007_IN5519-008	IN5519-007	861.567	IN5519-008	860.851	59.26	1.21%	Special	19x30	0.013	0.05	0.05
IN5519-008_IN5519-009	IN5519-008	860.851	IN5519-009	857.371	75.89	4.59%	Circular	24	0.013	0.05	0.25
IN5519-009_IN5519-010	IN5519-009	857.371	IN5519-010	855.669	37.1	4.59%	Special	27x42	0.013	0.25	0.05
IN5519-010_CB5519-011	IN5519-010	855.669	CB5519-011	854.75	20.05	4.58%	Special	29x45	0.013	0.05	0.25
AS4920-011_IN4920-009	AS4920-011	856.12	IN4920-009	856.176	6.85	-0.82%	Circular	18	0.013	0.5	0.5
AS4920-012_AS4920-011	AS4920-012	857.25	AS4920-011	856.12	258.05	0.44%	Circular	18	0.013	0.05	0.5
AS4921-003_AS4920-012	AS4921-003	857.55	AS4920-012	857.25	60	0.50%	Circular	18	0.013	0.05	0.05
AS4921-007_AS4921-003	AS4921-007	858.62	AS4921-003	857.55	214.01	0.50%	Circular	18	0.013	0.05	0.05
AS4921-008_AS4921-007	AS4921-008	859.19	AS4921-007	858.62	114	0.50%	Circular	18	0.013	0.05	0.05
AS4921-010_AS4921-008	AS4921-010	859.49	AS4921-008	859.19	60	0.50%	Circular	18	0.013	0.05	0.05
AS4921-014_AS4921-010	AS4921-014	861.08	AS4921-010	859.49	266.01	0.60%	Circular	15	0.013	0.05	0.05
AS5020-029_CB5020-036	AS5020-029	852.15	CB5020-036	850.37	14.33	12.42%	Circular	36	0.013	0.25	0.5
AS5020-037_CB5020-036	AS5020-037	853.68	CB5020-036	850.37	19.14	17.29%	Circular	18	0.013	0.05	0.5
AS5120-029_IN5120-030	AS5120-029	875.74	IN5120-030	873.7	79.37	2.57%	Circular	21	0.013	0.05	0.5
AS5121-005_AS5120-029	AS5121-005	881.1	AS5120-029	875.74	278.01	1.93%	Circular	18	0.013	0.05	0.05
AS5121-010_AS5121-005	AS5121-010	881.76	AS5121-005	881.1	81	0.81%	Circular	18	0.013	0.05	0.05
AS5121-013_AS5121-010	AS5121-013	885.798	AS5121-010	881.76	268.01	1.51%	Circular	15	0.013	0.05	0.05
AS5121-018_AS5121-013	AS5121-018	888.48	AS5121-013	885.798	178.01	1.51%	Circular	12	0.013	0.05	0.05
AS5121-019_AS5121-018	AS5121-019	891.9	AS5121-018	888.48	158.29	2.16%	Circular	12	0.013	0.05	0.05
AS5429-028_IN5429-027	AS5429-028	851.75	IN5429-027	850.99	71	1.07%	Circular	15	0.013	0.25	0.5
AS5429-031_AS5429-028	AS5429-031	852.16	AS5429-028	851.75	81	0.51%	Circular	15	0.013	0.05	0.25
AS5429-033_AS5429-031	AS5429-033	852.62	AS5429-031	852.16	94	0.49%	Circular	15	0.013	0.05	0.05
AS5429-035_AS5429-033	AS5429-035	856.12	AS5429-033	852.62	203.01	1.72%	Circular	12	0.013	0.05	0.05
AS5429-037_AS5429-035	AS5429-037	863.35	AS5429-035	856.12	309.01	2.34%	Circular	12	0.013	0.05	0.05

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Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
AS5430-007_IN5430-006	AS5430-007	856.48	IN5430-006	855.26	244.01	0.50%	Circular	24	0.013	0.5	0.05
AS5430-016_AS5430-007	AS5430-016	861.43	AS5430-007	856.48	180.01	2.75%	Circular	18	0.013	0.05	0.5
AS5330-003_IN5330-002	AS5330-003	879.37	IN5330-002	868.208	270.01	4.13%	Circular	18	0.013	0.05	0.05
AS5429-053_IN5429-052	AS5429-053	851.12	IN5429-052	850.051	53.47	2.00%	Circular	18	0.013	0.05	0.05
AS5321-029_IN5321-028	AS5321-029	889.85	IN5321-028	889.77	18.83	0.42%	Circular	12	0.013	0.05	0.5
AS5120-034_AS5120-035	AS5120-034	858.71	AS5120-035	856.26	262.41	0.93%	Circular	30	0.013	0.5	0.05
AS5120-035_IN5120-016	AS5120-035	856.26	IN5120-016	854.1	335.63	0.64%	Circular	30	0.013	0.05	0.05
CB5519-011_IN5418-006	CB5519-011	854.75	IN5418-006	853.9	185.41	0.46%	Special	34x53	0.013	0.25	0.05
Link7895	AS5020-044	850.92	Node4855	849.87	52.49	2.00%	Circular	36	0.013	0.05	1
AS5326-005_AS5326-004	AS5326-005	859.92	AS5326-004	858.4	150.46	1.01%	Circular	30	0.013	0.5	0.05
AS5326-004_AS5326-003	AS5326-004	858.4	AS5326-003	855.72	25.32	10.58%	Circular	30	0.013	0.05	0.5
AS5326-003_AS5326-002	AS5326-003	855.72	AS5326-002	851.98	535.67	0.70%	Circular	48	0.013	0.5	0.5
AS5325-015_AS5326-003	AS5325-015	859.39	AS5326-003	855.72	68.46	5.36%	Circular	42	0.013	0.05	0.4
AS5326-023_AS5326-007	AS5326-023	863.96	AS5326-007	861.93	185.2	1.10%	Circular	24	0.013	0.05	0.05
AS5326-007_AS5326-005	AS5326-007	861.93	AS5326-005	859.92	182.71	1.10%	Circular	24	0.013	0.05	0.25
AS5531-038_AS5531-005	AS5531-038	881.95	AS5531-005	881.82	28.99	0.45%	Circular	21	0.013	0.5	0.5
AS5531-040_IN5531-039	AS5531-040	882.19	IN5531-039	881.988	218.1	0.09%	Circular	21	0.013	0.05	0.25
CB5532-026_AS5531-040	CB5532-026	882.48	AS5531-040	882.19	294.61	0.10%	Circular	21	0.013	0.05	0.05
DT5127-019_DT5127-022	DT5127-019	869.565	DT5127-022	870.167	90.64	-0.66%	Circular	36	0.013	0.5	0.5
DT5127-020_DT5127-021	DT5127-020	869.327	IN5127-009	868.281	23.66	4.42%	Circular	36	0.013	0.5	0.05
DT5026-022_AS5026-015	DT5026-022	868.102	AS5026-015	865.1	163.98	1.83%	Circular	24	0.022	0.5	0.05
ND5220-022_IN5220-014	ND5220-022	860.912	IN5220-014	856.516	250.16	1.76%	Rectangular	3x7	0.013	0.5	0.5
ND5220-023_IN5220-021	ND5220-023	855.422	AS5220-024	853.6	143.01	1.27%	Rectangular	3x7	0.013	0.05	0.5
ND5221-017_IN5221-016	ND5221-017	881.585	IN5221-016	879.23	400.07	0.59%	Rectangular	3x7	0.013	0.5	0.5
ND5221-018_IN5220-007	ND5221-018	872.257	IN5220-007	865.248	288.72	2.43%	Rectangular	3x7	0.013	0.05	0.05
Link7954	DT4821-007	871.25	DT4821-006	869.85	70	2.00%	Circular	18	0.024	0.5	0.5
DT4623-002_DT4623-001	DT4623-002	853.888	DT4623-001	853.036	42.8	1.99%	Circular	18	0.022	0.05	0.5
Link7919	DT5528-020	861.094	Node4868	855.955	127.005	4.05%	Circular	30	0.013	0.05	0.5
MI4724-003_AS4724-001	MI4724-003	890.046	AS4724-001	887.56	159.34	1.56%	Circular	48	0.013	0.05	0.5
MI4821-015_AE4821-016	MI4821-015	855.401	AE4821-016	851.809	179.6	2.00%	Circular	18	0.022	0.05	0.5
MI5117-014_MI5117-015	MI5117-014	854.647	MI5117-015	853.721	46.32	2.00%	Circular	24	0.013	0.05	0.05
MI5117-015_AE5117-016	MI5117-015	853.721	AE5117-016	848.8	82.01	6.00%	Circular	24	0.013	0.05	0.5
MI5027-012_IN5027-011	MI5027-012	854.38	IN5027-011	854.172	8	2.60%	Circular	42	0.013	0.05	0.05
MI5027-013_MI5027-012	MI5027-013	855.293	MI5027-012	854.38	35.15	2.60%	Rectangular	4x5	0.013	0.05	0.05
MI5427-034_AS5427-033	MI5427-034	859.429	AS5427-033	858.5	53.2	1.75%	Circular	42	0.013	0.05	0.05
MI5124-042_AS5124-046	MI5124-042	906.069	AS5124-046	898.94	228.45	3.12%	Circular	24	0.013	0.05	0.05
Link7901	MI5124-049	890.12	AS5124-058	888.831	54.14	2.38%	Circular	24	0.013	0.05	0.05
MI5124-068_AS5124-008	MI5124-068	882.905	AS5124-008	881.1	58.9	3.06%	Circular	24	0.013	0.05	0.25
MI5124-071_IN5124-069	MI5124-071	883.648	IN5124-069	883.35	19.51	1.53%	Circular	24	0.013	0.05	0.5
MI4923-031_IN4923-028	MI4923-031	903.49	IN4923-028	903.05	22	2.00%	Circular	24	0.013	0.05	0.05
TP5025-014_IN5025-005	TP5025-014	867.139	IN5025-005	867.51	113.12	-0.33%	Circular	10	0.011	0.05	0.5
MI5628-069_MI5628-068	MI5628-069	887.689	MI5628-068	887.664	11.99	0.21%	Circular	15	0.013	0.05	0.05
MI5628-076_AS5628-072	MI5628-076	888.623	AS5628-072	888.17	96.85	0.47%	Circular	15	0.013	0.05	0.05
MI5628-078_IN5628-075	MI5628-078	888.893	IN5628-075	888.67	16.12	1.38%	Circular	15	0.013	0.05	0.05
MI5629-017_IN5629-021	MI5629-017	887.635	IN5629-021	886.836	299.22	0.27%	Circular	15	0.013	0.05	0.05
MI5628-086_IN5527-032	MI5628-086	877.933	IN5527-032	874.929	276.78	1.09%	Circular	24	0.013	0.05	0.05
TP5120-015_IN5119-013	TP5120-015	852.88	IN5119-013	852.31	51.54	1.11%	Rectangular	3.5x7	0.013	0.5	0.25
TP5528-004_AS5528-011	TP5528-004	866.481	AS5528-011	865.58	64.13	1.40%	Circular	24	0.013	0.5	0.05
MI5529-034_AS5529-018	MI5529-034	853.508	AS5529-018	853.37	17.66	0.78%	Special	29x45	0.013	0.05	0.5
MI5628-068_IN5628-042	MI5628-068	887.664	IN5628-042	878.252	155.88	6.04%	Circular	15	0.013	0.05	0.5
AS5429-065_AS5429-053	AS5429-065	851.44	AS5429-053	851.03	168	0.24%	Special	14x23	0.013	0.05	0.05
IN5429-068_AS5429-065	IN5429-068	851.7	AS5429-065	851.44	103.1	0.25%	Special	14x23	0.013	0.05	0.05
IN5429-070_IN5429-068	IN5429-070	852	IN5429-068	851.7	87	0.34%	Special	14x23	0.013	0.05	0.05
IN5429-072_IN5429-070	IN5429-072	852.54	IN5429-070	852	108	0.50%	Special	14x23	0.013	0.05	0.05
IN5429-074_IN5429-072	IN5429-074	852.97	IN5429-072	852.54	85	0.51%	Special	14x23	0.013	0.05	0.05
IN5429-076_IN5429-074	IN5429-076	853.46	IN5429-074	852.97	97.1	0.50%	Circular	15	0.013	0.05	0.05
IN5429-078_IN5429-076	IN5429-078	853.9	IN5429-076	853.46	87.6	0.50%	Circular	15	0.013	0.05	0.05
AS5429-080_IN5429-061	AS5429-080	851.52	IN5429-061	851.42	20.3	0.49%	Circular	18	0.013	0.5	0.5
IN5429-081_AS5429-080	IN5429-081	852.31	AS5429-080	851.52	157.7	0.50%	Circular	18	0.013	0.05	0.5
IN5429-083_IN5429-081	IN5429-083	852.75	IN5429-081	852.31	87	0.51%	Circular	18	0.013	0.05	0.05
IN5429-085_IN5429-083	IN5429-085	853.15	IN5429-083	852.75	79	0.51%	Circular	18	0.013	0.05	0.05
IN5429-087_IN5429-085	IN5429-087	853.49	IN5429-085	853.15	67	0.51%	Circular	18	0.013	0.05	0.05
IN5429-089_IN5429-087	IN5429-089	853.85	IN5429-087	853.49	72	0.50%	Circular	18	0.013	0.05	0.05
IN5429-091_IN5429-089	IN5429-091	854.59	IN5429-089	854.1	98	0.50%	Circular	15	0.013	0.05	0.05
AS5226-062_AS5226-064	AS5226-062	853.8	AS5226-064	851.76	122.52	1.67%	Circular	12	0.013	0.05	0.05
AS5226-064_AS5226-066	AS5226-064	851.51	AS5226-066	851.13	81.49	0.47%	Circular	15	0.013	0.05	0.05
AS5226-066_AS5226-073	AS5226-066	851.13	AS5226-073	850.76	75.74	0.49%	Circular	15	0.013	0.05	0.05
AS5226-073_CB5226-075	AS5226-073	850.51	CB5226-075	850.25	54.16	0.48%	Circular	18	0.013	0.05	0.05
CB5226-075_IN5226-081	CB5226-075	850.25	IN5226-081	849.77	101.79	0.47%	Circular	18	0.013	0.05	0.5
AS5226-076_AE5326-001	AS5226-076	848.65	AE5326-001	847.38	26.82	4.74%	Circular	54	0.013	0.5	1
IN5226-081_AS5226-076	IN5226-081	848.85	AS5226-076	848.65	23.75	0.84%	Special	29x42	0.013	0.5	0.5
CherPath	OpenChannel1	851.353	Node4921	851	33	1.07%	Special	40x65	0.024	0.5	0.5
Link7928	WarnerPark1	849.552	Node4878	848.852	70	1.00%	Circular	24	0.013	0.05	0.5
Link7915	ShermanCulv	850.211	DT5415-004	850.056	106	0.15%	Circular	24	0.022	0.5	0.5
Link7916	Private2	853.928	Node4866	849.981	197.332	2.00%	Circular	18	0.013	0.05	0.25
Link7918	Private4	878.75	AS5427-027	873.37	269	2.00%	Circular	18	0.013	0.05	0.5
Link7911	Node4865	885.905	AS5629-016	880.91	171.88	2.91%	Circular	27	0.013	0.05	0.05
Link7917	Node4866	849.981	Node4867	845.781	210	2.00%	Circular	18	0.013	0.25	1
Link7927	Node4877	849	AE5228-004	847.55	50	2.90%	Special	81x123	0.013	0.5	0.5
Link7963	Node4880	859.769	Node4934	858.869	33	2.73%	Rectangular	10x6	0.013	0	0
Link7934	Node4885	870	Node4891	869.961	78.5	0.05%	Rectangular	3.333x4	0.013	0.5	0.5
Link7939	Node4893	847.99	Node4894	847.54	24	1.88%	Rectangular	3.5x6	0.013	0.5	0.5
Link7941	Node4897	849.25	Node4898	849.23	20	0.10%	Circular	36	0.013	0.5	0.5
Link7942	Node4899	850.5	Node4900	850.36	20	0.70%	Circular	24	0.013	0.5	0.5

Table C-1 Existing XPSWMM Model Storm Sewer Inputs Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI											
Link Name	Upstream Node Name	Upstream Invert Elevation	Downstream Node Name	Downstream Invert Elevation	Length (ft)	Slope	Pipe Shape	Size	Manning's n	Entrance Loss	Exit Loss
Link7943	Node4901	850.01	Node4902	849.98	20	0.15%	Circular	24	0.013	0.5	0.5
13043.1	Node4903	849.27	Node4904	849.22	24	0.21%	Circular	60	0.013	0.5	0.5
13043.2	Node4903	848.52	Node4904	848.27	24	1.04%	Circular	48	0.013	0.5	0.5
Link7945	Node4905	849.27	Node4906	849.138	30	0.44%	Circular	36	0.013	0.5	0.5
Link7946	Node4907	848.97	Node4908	848.906	40	0.16%	Circular	36	0.013	0.5	0.5
Link7947	Node4909	849.77	Node4910	849.212	30	1.86%	Circular	24	0.013	0.5	0.5
Link7948	Node4911	849.89	Node4912	849.692	33	0.60%	Circular	24	0.013	0.5	0.5
Link7950	Node4915	849.93	Node4916	849.798	30	0.44%	Circular	36	0.013	0.5	0.5
Link7952	Node4918	852.06	Node4919	851.06	100	1.00%	Circular	24	0.013	0.5	1
Link7956	Node4922	850.13	Node4923	849.85	33	0.85%	Circular	18	0.013	0.5	0.5
Link7957	Node4924	850.28	Node4925	850.168	33	0.34%	Circular	36	0.013	0.5	0.5
Link7958	Node4926	850.01	Node4927	849.71	33	0.91%	Circular	36	0.013	0.5	0.5
Link7959	Node4928	851	Node4929	850.9	33	0.30%	Rectangular	3x30	0.013	0	0
Link7960	Node4930	850.6	Node4931	850.6	33	0.00%	Rectangular	3.4x30	0.013	0	0
Link7961	Node4932	852.1	Node4882	852.1	33	0.00%	Special	43x68	0.013	0	0
Link7962	Node4933	859.869	Node4879	859.869	33	0.00%	Rectangular	10x6	0.013	0	0
Link7965	Node4936	850.9	Node4937	850.5	48.17	0.83%	Special	29x45	0.013	0.5	0.5

Table C-2 Existing XPSWMM Model Orifice Inputs Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI								
Name	Upstream Node Name	Downstream Node Name	Orifice Name	Orifice Type	Orifice Shape	Orifice Height (ft)	Orifice Area (sq ft)	Orifice Discharge Coeff
6in_orif	Node4917	Node4918	6in_orif	Side Outlet	Circular	0	0.196	0.6
24in_orif	Node4920	Node4918	24in_orif	Bottom Outlet	Circular	0	3.142	0.6

Table C-3 Existing XPSWMM Model Weir Inputs Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI							
Name	Upstream Node Name	Downstream Node Name	Weir Name	Weir Type	Weir Crest Elevation (ft)	Weir Length (ft)	Weir Discharge Coefficient
EastPondWeir	Node4881	AE5219-013	EastPondWeir	Transverse weir	851	6	3

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AE5416-001	Link Invert to 2D	850.60	852.79
IN5416-002	Link Spill Crest to 2D	853.06	855.40
AE5316-001	Link Invert to 2D	849.60	859.60
IN5316-003	Link Spill Crest to 2D	852.00	856.88
AS5316-005	Link Spill Crest to 2D	851.44	856.11
IN5316-006	Link Spill Crest to 2D	851.41	855.64
IN5315-001	Link Spill Crest to 2D	858.40	861.29
IN5314-001	Link Spill Crest to 2D	859.47	861.97
IN5314-002	Link Spill Crest to 2D	859.27	861.66
IN5314-003	Link Spill Crest to 2D	857.76	861.33
AE5314-004	None	849.60	859.60
IN5216-001	Link Spill Crest to 2D	854.67	858.86
AE5216-002	None	849.60	859.60
IN5216-003	Link Spill Crest to 2D	855.88	858.85
AE5215-001	None	849.60	859.60
IN5215-002	Link Spill Crest to 2D	858.35	861.06
IN5215-003	Link Spill Crest to 2D	858.51	860.95
AE5217-001	None	850.20	860.20
AE5217-008	None	849.27	852.73
AE5218-007	Link Invert to 2D	850.60	860.60
IN5218-010	Link Spill Crest to 2D	852.45	855.62
IN5218-012	Link Spill Crest to 2D	851.70	855.72
AE5218-015	Link Invert to 2D	850.60	860.60
AS5219-002	Link Spill Crest to 2D	858.72	863.73
AS5219-004	Link Spill Crest to 2D	854.22	859.43
AE5118-001	Link Invert to 2D	850.60	860.60
AE5117-007	None	850.20	860.20
AE5117-011	None	850.20	860.20
IN5117-013	Link Spill Crest to 2D	851.45	854.79
AS5319-001	Link Spill Crest to 2D	871.52	876.70
AS5421-004	Link Spill Crest to 2D	910.10	915.07
IN5321-001	Link Spill Crest to 2D	886.23	890.28
IN5321-002	Link Spill Crest to 2D	886.42	890.39
IN5321-003	Link Spill Crest to 2D	886.60	890.50
IN5321-004	Link Spill Crest to 2D	886.40	890.56
IN5321-005	Link Spill Crest to 2D	886.58	890.33
IN5321-006	Link Spill Crest to 2D	887.74	892.39
IN5321-009	Link Spill Crest to 2D	887.82	892.25
IN5321-010	Link Spill Crest to 2D	887.41	892.88
IN5321-011	Link Spill Crest to 2D	893.60	899.22
AS5321-020	Link Spill Crest to 2D	905.60	910.18
AS5320-003	Link Spill Crest to 2D	873.50	878.53
AS5320-004	Link Spill Crest to 2D	883.20	890.87
IN5220-007	Link Spill Crest to 2D	865.20	868.85
IN5220-012	Link Spill Crest to 2D	863.32	866.33
IN5220-013	Link Spill Crest to 2D	863.30	866.29
IN5220-014	Link Spill Crest to 2D	856.42	860.02
IN5220-019	Link Spill Crest to 2D	857.75	860.75
IN5220-020	Link Spill Crest to 2D	857.67	860.67
IN5220-021	Link Spill Crest to 2D	853.60	858.19
IN5221-002	Link Spill Crest to 2D	884.73	888.23
IN5221-003	Link Spill Crest to 2D	883.73	888.44

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
IN5221-004	Link Spill Crest to 2D	883.68	888.58
IN5221-006	Link Spill Crest to 2D	883.54	888.34
IN5221-013	Link Spill Crest to 2D	880.54	883.89
IN5221-016	Link Spill Crest to 2D	879.23	884.03
AS5120-010	Link Spill Crest to 2D	854.80	858.67
AS5120-013	Link Spill Crest to 2D	853.34	858.26
IN5120-016	Link Spill Crest to 2D	854.10	857.30
AS5120-018	Link Spill Crest to 2D	855.40	860.87
AS5022-001	Link Spill Crest to 2D	873.00	878.87
AS5022-006	Link Spill Crest to 2D	879.10	883.94
AS5022-007	Link Spill Crest to 2D	881.10	884.99
AS5022-008	Link Spill Crest to 2D	880.60	885.03
AS5022-015	Link Spill Crest to 2D	888.60	893.61
AS5022-016	Link Spill Crest to 2D	889.90	893.94
IN5022-020	Link Spill Crest to 2D	889.30	892.64
AS5022-021	Link Spill Crest to 2D	897.70	902.81
AS5021-005	Link Spill Crest to 2D	860.10	864.41
AS5021-006	Link Spill Crest to 2D	859.10	864.47
AS5021-012	Link Spill Crest to 2D	862.60	867.90
AS5021-017	Link Spill Crest to 2D	865.20	870.46
AS5020-006	Link Spill Crest to 2D	855.10	860.49
AS5020-008	Link Spill Crest to 2D	853.30	856.95
AS5020-009	Link Spill Crest to 2D	853.50	858.58
AS5020-010	Link Spill Crest to 2D	855.80	861.41
IN4920-006	Link Spill Crest to 2D	856.30	859.41
IN4920-007	Link Spill Crest to 2D	855.77	859.12
AS4920-008	Link Spill Crest to 2D	854.30	860.15
AS4921-001	Link Spill Crest to 2D	869.16	873.98
AS4922-005	Link Spill Crest to 2D	889.25	895.46
AS4922-006	Link Spill Crest to 2D	887.79	893.34
AS4922-007	Link Spill Crest to 2D	880.68	886.01
AS4922-008	Link Spill Crest to 2D	882.40	886.89
AS4922-013	Link Spill Crest to 2D	873.14	878.76
IN4821-002	Link Spill Crest to 2D	873.78	876.75
AE4722-001	Link Invert to 2D	860.85	870.85
AE4722-002	Link Invert to 2D	861.40	865.04
IN4722-004	Link Spill Crest to 2D	861.90	865.42
AS4722-008	Link Spill Crest to 2D	862.55	865.79
AE4624-001	Link Invert to 2D	858.60	868.60
IN4624-002	Link Spill Crest to 2D	851.01	857.92
IN4723-007	Link Spill Crest to 2D	897.32	900.03
AS4723-008	Link Spill Crest to 2D	897.17	900.84
AS4723-010	Link Spill Crest to 2D	882.20	890.33
AS4723-011	Link Spill Crest to 2D	883.24	891.66
IN4723-012	Link Spill Crest to 2D	886.34	892.73
IN4723-013	Link Spill Crest to 2D	887.15	892.39
AS4723-014	Link Spill Crest to 2D	875.75	880.23
AS4723-015	Link Spill Crest to 2D	870.15	873.06
AS4723-016	Link Spill Crest to 2D	863.85	868.23
IN4723-019	Link Spill Crest to 2D	861.60	865.17
AS4724-001	Link Spill Crest to 2D	887.56	895.31
AS4724-008	Link Spill Crest to 2D	885.13	892.06

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
IN4724-009	Link Spill Crest to 2D	884.74	893.17
AS4724-015	Link Spill Crest to 2D	884.06	897.70
AE4724-016	Link Invert to 2D	883.87	893.87
IN4724-019	Link Spill Crest to 2D	878.10	883.36
AE4724-021	Link Invert to 2D	875.35	885.35
AS4724-022	Link Spill Crest to 2D	859.90	876.65
AE4724-023	Link Spill Crest to 2D	871.87	881.87
IN4724-024	Link Spill Crest to 2D	887.46	891.05
AE4725-001	None	929.92	939.92
IN4825-003	Link Spill Crest to 2D	930.09	932.31
IN4825-004	Link Spill Crest to 2D	926.88	930.13
IN4825-006	Link Spill Crest to 2D	920.02	923.04
IN4825-009	Link Spill Crest to 2D	909.92	915.10
IN4825-010	Link Spill Crest to 2D	898.10	899.60
IN4825-011	Link Spill Crest to 2D	892.85	895.60
AS4824-001	Link Spill Crest to 2D	900.40	904.81
AS4824-004	Link Spill Crest to 2D	904.40	909.34
AS4824-009	Link Spill Crest to 2D	915.89	920.23
IN4823-003	Link Spill Crest to 2D	899.89	904.21
IN4823-004	Link Spill Crest to 2D	900.00	904.36
IN4823-006	Link Spill Crest to 2D	901.75	905.63
AS4923-016	Link Spill Crest to 2D	901.67	906.54
AS4925-001	Link Spill Crest to 2D	885.15	889.10
IN5025-002	Link Spill Crest to 2D	868.61	871.16
AS5025-003	Link Spill Crest to 2D	870.59	873.79
IN5025-005	Link Spill Crest to 2D	867.46	871.06
AS5025-007	Link Spill Crest to 2D	866.70	870.94
AS5023-002	Link Spill Crest to 2D	899.15	908.88
AS5023-015	Link Spill Crest to 2D	903.18	907.54
AS5023-016	Link Spill Crest to 2D	901.89	907.90
AS5023-020	Link Spill Crest to 2D	900.35	907.00
AS5023-021	Link Spill Crest to 2D	898.45	904.04
IN5124-002	Link Spill Crest to 2D	889.83	899.10
AS5124-003	Link Spill Crest to 2D	888.10	895.70
AS5124-004	Link Spill Crest to 2D	876.40	881.59
AS5124-006	Link Spill Crest to 2D	882.60	887.85
IN5124-007	Link Spill Crest to 2D	882.80	886.90
AS5124-008	Link Spill Crest to 2D	881.10	886.33
AS5124-027	Link Spill Crest to 2D	890.10	893.97
AS5124-037	Link Spill Crest to 2D	871.91	879.14
AS5125-001	Link Spill Crest to 2D	868.10	872.10
AS5125-004	Link Spill Crest to 2D	868.95	873.71
AS5125-005	Link Spill Crest to 2D	869.85	874.72
AS5125-012	Link Spill Crest to 2D	870.31	875.38
AS5125-017	Link Spill Crest to 2D	868.35	872.49
AS5125-021	Link Spill Crest to 2D	871.20	874.95
AS5125-022	Link Spill Crest to 2D	876.60	883.49
AS5325-001	Link Spill Crest to 2D	882.60	888.94
AS5325-002	Link Spill Crest to 2D	872.60	878.09
AS5325-003	Link Spill Crest to 2D	869.60	878.14
AS5325-004	Link Spill Crest to 2D	860.02	866.02
AS5325-021	Link Spill Crest to 2D	853.91	862.09

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
IN5325-022	Link Spill Crest to 2D	853.52	861.08
AS5325-023	Link Spill Crest to 2D	859.47	863.47
AS5325-025	Link Spill Crest to 2D	869.71	874.76
IN5324-002	Link Spill Crest to 2D	966.60	970.63
AS5324-004	Link Spill Crest to 2D	959.10	968.09
AS5324-005	Link Spill Crest to 2D	948.10	953.68
AS5324-006	Link Spill Crest to 2D	942.60	950.63
IN5324-007	Link Spill Crest to 2D	926.80	932.78
AS5324-008	Link Spill Crest to 2D	926.77	930.48
AS5324-013	Link Spill Crest to 2D	949.91	955.11
IN5324-014	Link Spill Crest to 2D	925.61	928.16
AS5324-015	Link Spill Crest to 2D	923.93	927.79
AS5324-016	Link Spill Crest to 2D	907.10	911.43
AS5324-017	Link Spill Crest to 2D	892.60	897.33
AS5423-002	Link Spill Crest to 2D	960.36	963.77
AS5423-003	Link Spill Crest to 2D	949.60	952.25
AS5423-004	Link Spill Crest to 2D	947.60	952.18
AS5423-005	Link Spill Crest to 2D	940.20	944.79
AS5423-010	Link Spill Crest to 2D	938.60	943.71
AS5423-011	Link Spill Crest to 2D	930.20	933.69
AS5424-001	Link Spill Crest to 2D	924.15	928.17
AS5424-002	Link Spill Crest to 2D	922.50	926.00
AS5424-003	Link Spill Crest to 2D	921.80	925.55
IN5424-004	Link Spill Crest to 2D	920.20	925.07
AS5424-007	Link Spill Crest to 2D	920.05	926.37
AS5425-001	Link Spill Crest to 2D	871.60	875.35
IN5425-005	Link Spill Crest to 2D	871.65	874.96
IN5425-007	Link Spill Crest to 2D	879.10	882.64
AS5425-010	Link Spill Crest to 2D	912.60	917.96
AS5426-007	Link Spill Crest to 2D	895.10	901.75
AS5426-010	Link Spill Crest to 2D	899.60	905.93
AS5427-001	Link Spill Crest to 2D	862.41	868.52
AS5427-002	Link Spill Crest to 2D	862.02	868.19
AS5427-006	Link Spill Crest to 2D	871.10	876.61
AS5427-009	Link Spill Crest to 2D	857.00	862.55
AS5427-010	Link Spill Crest to 2D	855.82	861.71
AE5326-001	Link Invert to 2D	847.38	857.38
AS5326-002	Link Spill Crest to 2D	851.98	857.59
IN5326-006	Link Spill Crest to 2D	852.85	860.57
AS5226-001	Link Spill Crest to 2D	850.70	854.19
IN5127-001	Link Spill Crest to 2D	851.25	853.09
IN5127-002	Link Spill Crest to 2D	850.65	853.13
AE5127-003	Link Invert to 2D	850.51	853.26
AS5127-008	Link Spill Crest to 2D	870.82	877.12
IN5127-009	Link Spill Crest to 2D	868.28	874.50
IN5127-013	Link Spill Crest to 2D	870.36	873.34
AE5127-014	Link Invert to 2D	870.30	873.13
AS5127-016	Link Spill Crest to 2D	854.84	865.63
AS5126-001	Link Spill Crest to 2D	862.76	868.61
AS5126-004	Link Spill Crest to 2D	859.60	883.30
AS5026-002	Link Spill Crest to 2D	867.16	871.16
AS5026-003	Link Spill Crest to 2D	864.57	869.77

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AS5026-004	Link Spill Crest to 2D	864.81	871.44
AS5026-006	Link Spill Crest to 2D	858.05	866.37
AS5026-009	Link Spill Crest to 2D	861.50	867.00
AS5026-014	Link Spill Crest to 2D	864.60	868.79
AS5026-015	Link Spill Crest to 2D	865.10	868.85
AS5027-001	Link Spill Crest to 2D	867.25	872.22
AS5027-002	Link Spill Crest to 2D	867.95	874.44
AS5027-008	Link Spill Crest to 2D	855.51	862.81
AS5027-009	Link Spill Crest to 2D	856.99	865.36
AS4826-002	Link Spill Crest to 2D	906.04	910.42
IN4826-003	Link Spill Crest to 2D	898.96	900.46
AS4826-005	Link Spill Crest to 2D	880.20	892.57
AS4826-008	Link Spill Crest to 2D	872.82	875.70
AS4826-012	Link Spill Crest to 2D	872.45	876.48
AS4826-013	Link Spill Crest to 2D	870.90	875.61
AS4827-001	Link Spill Crest to 2D	859.55	862.81
AS4827-002	Link Spill Crest to 2D	857.75	861.47
AS4827-004	Link Spill Crest to 2D	856.10	859.10
AS4827-005	Link Spill Crest to 2D	853.35	858.24
AS5429-002	Link Spill Crest to 2D	855.30	858.78
AS5429-003	Link Spill Crest to 2D	854.10	858.24
AS5429-019	Link Spill Crest to 2D	855.95	860.35
AS5430-001	Link Spill Crest to 2D	876.60	881.04
AS5430-003	Link Spill Crest to 2D	868.32	874.98
AS5431-020	Link Spill Crest to 2D	881.90	885.43
AS5431-025	Link Spill Crest to 2D	881.39	885.25
AS5431-026	Link Spill Crest to 2D	880.76	885.06
AS5427-027	Link Spill Crest to 2D	873.37	877.79
AS5225-001	Link Spill Crest to 2D	879.54	883.99
AS4724-026	Link Spill Crest to 2D	894.37	904.97
AS4723-024	Link Spill Crest to 2D	861.10	864.73
AS4925-004	Link Spill Crest to 2D	883.47	894.61
AS5026-020	Link Spill Crest to 2D	866.00	871.32
IN5229-001	Link Spill Crest to 2D	849.90	854.05
AE5229-002	None	849.60	859.60
AS5324-019	Link Spill Crest to 2D	884.40	889.09
AS5325-026	Link Spill Crest to 2D	884.10	889.32
AS5425-017	Link Spill Crest to 2D	870.53	876.01
IN4724-029	Link Spill Crest to 2D	894.63	898.13
AS4724-034	Link Spill Crest to 2D	867.07	872.10
IN5126-007	Link Spill Crest to 2D	863.34	870.13
AS5126-009	Link Spill Crest to 2D	862.72	870.29
IN4723-025	Link Spill Crest to 2D	890.90	895.03
AE4821-008	Link Spill Crest to 2D	859.85	863.06
AE4821-009	None	857.00	859.89
IN4821-012	Link Spill Crest to 2D	855.56	859.47
AE4821-016	None	851.81	861.81
IN4922-015	Link Spill Crest to 2D	892.85	897.80
IN4922-016	Link Spill Crest to 2D	893.12	896.90
IN4922-017	Link Spill Crest to 2D	892.64	897.80
AS4922-018	Link Spill Crest to 2D	893.91	899.39
IN4922-019	Link Spill Crest to 2D	896.89	901.48

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
IN4922-020	Link Spill Crest to 2D	897.82	901.68
IN4922-021	Link Spill Crest to 2D	894.61	899.43
IN4922-022	Link Spill Crest to 2D	895.06	899.37
IN4922-023	Link Spill Crest to 2D	892.91	896.87
AE4922-024	Link Spill Crest to 2D	891.60	894.09
IN5227-023	Link Spill Crest to 2D	850.90	853.82
AE5227-025	Link Invert to 2D	850.70	852.98
AE5117-016	Link Invert to 2D	848.80	851.94
IN5027-011	Link Spill Crest to 2D	854.17	860.82
IN5324-022	Link Spill Crest to 2D	946.06	950.51
IN5324-023	Link Spill Crest to 2D	941.86	945.71
IN5324-024	Link Spill Crest to 2D	934.36	937.61
IN5324-025	Link Spill Crest to 2D	930.32	934.12
IN5429-024	Link Spill Crest to 2D	857.03	861.86
AS5125-024	Link Spill Crest to 2D	873.26	877.12
CB5125-025	Link Spill Crest to 2D	874.26	878.61
CB5428-017	Link Spill Crest to 2D	853.12	858.16
CB5428-024	Link Spill Crest to 2D	853.44	858.44
CB5427-028	Link Spill Crest to 2D	856.95	861.96
AS5427-031	Link Spill Crest to 2D	855.26	861.35
AS5427-033	Link Spill Crest to 2D	858.50	863.11
AE5427-037	Link Invert to 2D	848.00	858.00
AE5427-038	Link Invert to 2D	848.00	858.00
IN5327-001	Link Spill Crest to 2D	850.00	853.18
AE5427-039	Link Invert to 2D	849.00	859.00
IN5427-040	Link Spill Crest to 2D	848.36	853.26
AE5427-041	Link Invert to 2D	848.00	858.00
IN5427-042	Link Spill Crest to 2D	848.51	853.77
IN5427-043	Link Spill Crest to 2D	848.63	853.81
IN5427-044	Link Spill Crest to 2D	848.98	853.72
IN5427-045	Link Spill Crest to 2D	850.38	855.31
IN5427-046	Link Spill Crest to 2D	848.20	853.78
AE5427-048	Link Invert to 2D	848.00	858.00
IN5427-049	Link Spill Crest to 2D	848.29	854.15
IN5427-050	Link Spill Crest to 2D	848.44	853.97
IN5427-051	Link Spill Crest to 2D	848.59	854.56
IN5427-052	Link Spill Crest to 2D	849.50	853.87
AE5427-054	Link Invert to 2D	848.00	858.00
AS5427-055	Link Spill Crest to 2D	848.00	853.64
AE5427-056	Link Invert to 2D	846.00	856.00
IN5427-059	Link Spill Crest to 2D	848.14	853.69
AE5427-060	Link Invert to 2D	848.00	858.00
CB5427-062	Link Spill Crest to 2D	848.33	854.42
IN5427-063	Link Spill Crest to 2D	849.00	853.83
IN5428-026	Link Spill Crest to 2D	850.02	854.71
IN5428-027	Link Spill Crest to 2D	851.25	854.40
IN5427-065	Link Spill Crest to 2D	849.68	854.51
IN5427-067	Link Spill Crest to 2D	849.85	854.25
IN5427-068	Link Spill Crest to 2D	849.98	854.34
IN5427-069	Link Spill Crest to 2D	850.15	854.61
IN5427-070	Link Spill Crest to 2D	850.44	855.04
AS5321-021	Link Spill Crest to 2D	889.15	893.37

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AS5321-022	Link Spill Crest to 2D	892.77	896.72
IN5321-024	Link Spill Crest to 2D	893.65	897.32
AS5220-024	Link Spill Crest to 2D	853.60	859.29
IN5220-025	Link Spill Crest to 2D	855.17	859.07
IN5427-073	Link Spill Crest to 2D	865.44	872.32
AS5427-074	Link Spill Crest to 2D	864.50	870.45
AS5427-076	Link Spill Crest to 2D	863.53	869.57
AS5427-077	Link Spill Crest to 2D	863.18	869.57
AS5427-080	Link Spill Crest to 2D	864.21	870.36
IN5325-027	Link Spill Crest to 2D	863.11	867.59
IN5325-033	Link Spill Crest to 2D	861.16	865.60
IN5325-039	Link Spill Crest to 2D	862.55	867.55
AS5225-022	Link Spill Crest to 2D	881.64	888.03
AS5225-023	Link Spill Crest to 2D	894.82	900.20
AS5225-027	Link Spill Crest to 2D	897.12	903.65
IN5224-008	Link Spill Crest to 2D	898.55	904.73
IN5225-028	Link Spill Crest to 2D	899.24	904.62
IN5225-031	Link Spill Crest to 2D	899.30	904.21
AS5124-041	Link Spill Crest to 2D	906.60	911.25
AS5124-046	Link Spill Crest to 2D	898.94	904.82
AS5124-050	Link Spill Crest to 2D	890.58	894.79
IN5124-051	Link Spill Crest to 2D	890.66	894.40
IN5124-052	Link Spill Crest to 2D	890.83	894.06
IN5124-054	Link Spill Crest to 2D	890.91	893.69
AS5124-058	Link Spill Crest to 2D	888.83	893.40
AS5124-059	Link Spill Crest to 2D	888.67	893.33
AS5124-060	Link Spill Crest to 2D	886.66	891.95
AS5124-061	Link Spill Crest to 2D	883.38	889.65
IN5124-064	Link Spill Crest to 2D	885.02	889.88
AS5124-066	Link Spill Crest to 2D	882.68	888.64
IN5124-069	Link Spill Crest to 2D	883.35	888.19
CB5124-072	Link Spill Crest to 2D	883.74	888.84
IN5124-073	Link Spill Crest to 2D	883.74	888.50
AS5024-013	Link Spill Crest to 2D	888.26	898.98
IN5024-014	Link Spill Crest to 2D	888.41	899.61
AS5124-077	Link Spill Crest to 2D	889.59	899.10
IN5023-022	Link Spill Crest to 2D	902.54	906.54
AS5023-023	Link Spill Crest to 2D	902.41	907.09
AS5023-025	Link Spill Crest to 2D	902.62	907.27
AS5023-028	Link Spill Crest to 2D	902.77	906.50
AS5023-030	Link Spill Crest to 2D	903.11	907.56
IN4923-028	Link Spill Crest to 2D	903.05	912.55
AS4923-029	Link Spill Crest to 2D	902.55	912.96
AE5019-001	Link Invert to 2D	849.00	859.00
AE5119-010	Link Invert to 2D	851.50	861.50
AE5119-011	Link Invert to 2D	851.50	861.50
AE5019-002	Link Invert to 2D	849.00	859.00
AE5119-012	Link Invert to 2D	851.50	861.50
AE5019-003	Link Invert to 2D	849.00	859.00
IN5119-013	Link Spill Crest to 2D	852.31	857.76
AE5119-014	Link Invert to 2D	850.50	856.05
AE5119-015	Link Invert to 2D	850.50	855.97

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AE5119-018	Link Invert to 2D	851.50	861.50
AS5119-019	Link Spill Crest to 2D	849.00	854.62
AE5118-002	Link Invert to 2D	848.00	852.76
AS5219-012	Link Spill Crest to 2D	849.00	854.74
AE5219-013	None	850.00	860.00
AE5218-019	Link Invert to 2D	848.00	851.75
AE5228-004	Link Invert to 2D	847.55	857.55
AE5228-005	None	845.82	855.82
AS5425-028	Link Spill Crest to 2D	880.90	886.44
AS5425-029	Link Spill Crest to 2D	903.81	908.93
IN5424-008	Link Spill Crest to 2D	906.20	910.84
IN5325-044	Link Spill Crest to 2D	869.15	874.60
IN5124-079	Link Spill Crest to 2D	883.14	888.20
IN5325-034	Link Spill Crest to 2D	861.40	866.11
AS5020-019	Link Spill Crest to 2D	853.07	857.26
IN5124-070	Link Spill Crest to 2D	883.74	888.59
IN5519-002	Link Spill Crest to 2D	886.08	889.33
IN5520-002	Link Spill Crest to 2D	911.97	915.14
IN5520-003	Link Spill Crest to 2D	900.87	904.18
AS5524-001	Link Spill Crest to 2D	921.60	926.94
AS5524-002	Link Spill Crest to 2D	920.10	925.36
AS5524-003	Link Spill Crest to 2D	919.10	927.03
AS5524-005	Link Spill Crest to 2D	928.60	932.81
AS5525-001	Link Spill Crest to 2D	917.06	923.34
AS5525-003	Link Spill Crest to 2D	918.26	928.58
AS5525-004	Link Spill Crest to 2D	916.00	921.37
AS5526-001	Link Spill Crest to 2D	913.80	918.71
AS5527-001	Link Spill Crest to 2D	876.83	881.03
AS5527-004	Link Spill Crest to 2D	875.06	879.69
AS5527-011	Link Spill Crest to 2D	874.35	879.90
AS5527-012	Link Spill Crest to 2D	874.60	879.08
IN5527-013	Link Spill Crest to 2D	868.05	871.66
IN5527-018	Link Spill Crest to 2D	864.91	869.42
AS5628-002	Link Spill Crest to 2D	871.60	879.90
IN5628-003	Link Spill Crest to 2D	876.38	884.39
IN5628-018	Link Spill Crest to 2D	887.75	892.34
AS5630-001	Link Spill Crest to 2D	880.60	885.62
AS5630-002	Link Spill Crest to 2D	883.60	888.68
IN5630-008	Link Spill Crest to 2D	888.36	891.95
IN5630-009	Link Spill Crest to 2D	888.50	892.02
AS5530-001	Link Spill Crest to 2D	874.10	882.74
AS5530-004	Link Spill Crest to 2D	876.90	881.28
AS5530-009	Link Spill Crest to 2D	874.90	878.99
AS5530-010	Link Spill Crest to 2D	875.01	879.82
AS5530-019	Link Spill Crest to 2D	878.10	883.28
AS5530-023	Link Spill Crest to 2D	877.20	881.74
AS5530-027	Link Spill Crest to 2D	871.00	876.32
AS5529-008	Link Spill Crest to 2D	865.74	871.73
AS5528-001	Link Spill Crest to 2D	853.60	857.05
AS5528-005	Link Spill Crest to 2D	869.97	872.67
AS5631-001	Link Spill Crest to 2D	883.36	887.17
AS5532-019	Link Spill Crest to 2D	883.50	888.88

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AS5531-001	Link Spill Crest to 2D	880.10	887.77
AS5531-002	Link Spill Crest to 2D	881.26	886.20
AS5531-005	Link Spill Crest to 2D	881.82	890.34
AS5531-006	Link Spill Crest to 2D	875.90	880.02
AS5531-019	Link Spill Crest to 2D	882.31	886.52
AS5531-023	Link Spill Crest to 2D	881.52	885.36
AS5531-027	Link Spill Crest to 2D	880.60	884.66
AS5531-028	Link Spill Crest to 2D	879.60	884.26
AS5529-018	Link Spill Crest to 2D	853.37	857.33
AS5529-019	Link Spill Crest to 2D	856.90	862.40
AS5529-020	Link Spill Crest to 2D	861.48	867.31
AS5629-011	Link Spill Crest to 2D	873.49	879.99
AS5528-011	Link Spill Crest to 2D	865.58	870.91
AS5528-012	Link Spill Crest to 2D	859.55	865.26
IN5527-030	Link Spill Crest to 2D	873.16	877.41
IN5527-032	Link Spill Crest to 2D	874.93	881.47
IN5530-037	Link Spill Crest to 2D	871.62	875.53
IN5528-026	Link Spill Crest to 2D	853.86	857.66
CB5529-031	Link Spill Crest to 2D	853.61	858.02
CB5528-028	Link Spill Crest to 2D	853.37	857.98
IN5629-012	Link Spill Crest to 2D	887.55	892.21
AS5629-016	Link Spill Crest to 2D	880.91	890.73
IN5628-035	Link Spill Crest to 2D	883.06	889.06
IN5628-040	Link Spill Crest to 2D	880.84	887.81
IN5628-041	Link Spill Crest to 2D	880.40	888.03
IN5628-042	Link Spill Crest to 2D	878.25	887.52
IN5628-043	Link Spill Crest to 2D	878.68	887.11
IN5628-044	Link Spill Crest to 2D	878.83	887.19
IN5628-046	Link Spill Crest to 2D	880.66	887.88
IN5628-070	Link Spill Crest to 2D	888.00	892.34
IN5628-071	Link Spill Crest to 2D	888.14	892.88
AS5628-072	Link Spill Crest to 2D	888.17	893.02
IN5628-075	Link Spill Crest to 2D	888.67	892.83
IN5628-077	Link Spill Crest to 2D	889.10	892.93
AS5628-080	Link Spill Crest to 2D	881.87	887.78
IN5628-084	Link Spill Crest to 2D	880.90	886.37
AS5628-085	Link Spill Crest to 2D	878.27	886.21
AS5527-044	Link Spill Crest to 2D	863.83	868.99
AS5527-048	Link Spill Crest to 2D	864.41	869.70
IN5629-018	Link Spill Crest to 2D	886.33	890.62
IN5629-019	Link Spill Crest to 2D	886.40	890.69
IN5629-021	Link Spill Crest to 2D	886.84	891.83
IN5630-031	Link Spill Crest to 2D	889.23	892.65
IN5630-032	Link Spill Crest to 2D	889.31	892.93
IN5628-088	Link Spill Crest to 2D	879.91	888.12
IN5628-091	Link Spill Crest to 2D	887.72	892.02
AS5631-013	Link Spill Crest to 2D	882.55	888.41
AE5428-029	Link Invert to 2D	850.54	860.54
AE5326-026	Link Invert to 2D	850.80	860.80
AE5326-028	Link Invert to 2D	849.90	850.67
AE5326-030	Link Invert to 2D	850.70	851.73
AE5218-021	Link Invert to 2D	848.80	853.88

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
AE5218-023	Link Invert to 2D	848.80	853.95
AE5020-047	Link Invert to 2D	853.10	863.10
AE5020-049	Link Invert to 2D	852.50	862.50
AE5020-051	None	852.00	862.00
IN5026-024	Link Spill Crest to 2D	867.36	871.06
IN4920-009	Link Spill Crest to 2D	856.18	859.55
IN5020-030	Link Spill Crest to 2D	853.74	856.67
IN5020-033	Link Spill Crest to 2D	852.39	856.58
CB5020-036	Link Spill Crest to 2D	850.37	857.07
IN5020-040	Link Spill Crest to 2D	855.33	859.35
IN5020-041	Link Spill Crest to 2D	856.48	859.60
IN5120-030	Link Spill Crest to 2D	873.70	877.58
IN5429-027	Link Spill Crest to 2D	850.99	854.78
IN5429-039	Link Spill Crest to 2D	850.11	853.19
IN5429-043	Link Spill Crest to 2D	850.17	853.28
IN5429-045	Link Spill Crest to 2D	850.96	854.09
IN5429-048	Link Spill Crest to 2D	851.32	854.86
IN5429-050	Link Spill Crest to 2D	851.64	855.41
IN5429-051	Link Spill Crest to 2D	853.43	857.35
IN5430-006	Link Spill Crest to 2D	855.26	859.57
IN5430-011	Link Spill Crest to 2D	858.23	862.22
IN5430-013	Link Spill Crest to 2D	869.07	873.04
IN5330-002	Link Spill Crest to 2D	868.21	872.66
IN5330-007	Link Spill Crest to 2D	887.97	890.99
IN5429-052	Link Spill Crest to 2D	850.05	853.00
IN5429-060	Link Spill Crest to 2D	851.04	854.50
IN5429-061	Link Spill Crest to 2D	851.42	854.45
IN5321-028	Link Spill Crest to 2D	889.77	893.07
IN5321-030	Link Spill Crest to 2D	892.53	896.81
IN5321-031	Link Spill Crest to 2D	893.47	897.93
IN5120-033	Link Spill Crest to 2D	858.01	865.75
IN5120-036	Link Spill Crest to 2D	873.14	878.61
IN5218-025	Link Spill Crest to 2D	848.19	855.43
IN5218-026	Link Spill Crest to 2D	847.48	855.49
IN5218-028	Link Spill Crest to 2D	854.06	856.83
CB5117-017	Link Spill Crest to 2D	854.00	857.47
CB5117-018	Link Spill Crest to 2D	855.35	858.18
CB5117-019	Link Spill Crest to 2D	854.33	857.12
CB5217-009	Link Spill Crest to 2D	853.05	855.61
IN5217-010	Link Spill Crest to 2D	852.00	855.70
IN5418-006	Link Spill Crest to 2D	853.90	858.49
IN5418-008	Link Spill Crest to 2D	853.38	857.95
IN5518-004	Link Spill Crest to 2D	853.13	857.53
IN5518-005	Link Spill Crest to 2D	857.95	859.08
IN5518-006	Link Spill Crest to 2D	851.75	860.01
IN5227-026	Link Spill Crest to 2D	849.66	853.42
IN4524-004	Link Spill Crest to 2D	853.45	857.45
IN4722-015	Link Spill Crest to 2D	863.10	867.01
IN5531-035	Link Spill Crest to 2D	882.51	887.43
IN5531-037	Link Spill Crest to 2D	882.12	890.33
IN5531-039	Link Spill Crest to 2D	881.99	891.15
IN5519-006	Link Spill Crest to 2D	862.87	865.53

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
IN5519-007	Link Spill Crest to 2D	861.57	864.66
IN5519-008	Link Spill Crest to 2D	860.85	863.02
IN5519-009	Link Spill Crest to 2D	857.37	860.21
IN5519-010	Link Spill Crest to 2D	855.67	859.80
AS4920-011	Link Spill Crest to 2D	856.12	859.75
AS4920-012	Link Spill Crest to 2D	857.25	860.97
AS4921-003	Link Spill Crest to 2D	857.55	861.38
AS4921-007	Link Spill Crest to 2D	858.62	862.23
AS4921-008	Link Spill Crest to 2D	859.19	862.97
AS4921-010	Link Spill Crest to 2D	859.49	863.29
AS4921-014	Link Spill Crest to 2D	861.08	864.52
AS5020-029	Link Spill Crest to 2D	852.15	857.14
AS5020-037	Link Spill Crest to 2D	853.68	857.36
AS5120-029	Link Spill Crest to 2D	875.74	879.86
AS5121-005	Link Spill Crest to 2D	881.10	884.44
AS5121-010	Link Spill Crest to 2D	881.76	885.08
AS5121-013	Link Spill Crest to 2D	885.80	889.35
AS5121-018	Link Spill Crest to 2D	888.48	892.37
AS5121-019	Link Spill Crest to 2D	891.90	895.24
AS5429-028	Link Spill Crest to 2D	851.75	855.39
AS5429-031	Link Spill Crest to 2D	852.16	855.76
AS5429-033	Link Spill Crest to 2D	852.62	856.16
AS5429-035	Link Spill Crest to 2D	856.12	860.57
AS5429-037	Link Spill Crest to 2D	863.35	867.30
AS5430-007	Link Spill Crest to 2D	856.48	861.27
AS5430-016	Link Spill Crest to 2D	861.43	865.85
AS5330-003	Link Spill Crest to 2D	879.37	883.16
AS5429-053	Link Spill Crest to 2D	851.03	853.61
AS5321-029	Link Spill Crest to 2D	889.85	893.35
AS5120-034	Link Spill Crest to 2D	858.71	865.44
AS5120-035	Link Spill Crest to 2D	856.26	861.09
CB5519-011	Link Spill Crest to 2D	854.75	860.05
AS5020-044	Link Spill Crest to 2D	850.92	858.16
AS5020-052	Link Spill Crest to 2D	851.90	857.08
AS5326-005	Link Spill Crest to 2D	859.92	867.49
AS5326-004	Link Spill Crest to 2D	858.40	864.01
AS5326-003	Link Spill Crest to 2D	855.72	864.15
AS5325-015	Link Spill Crest to 2D	859.39	865.86
AS5326-023	Link Spill Crest to 2D	863.96	869.95
AS5326-007	Link Spill Crest to 2D	861.93	868.94
AS5531-038	Link Spill Crest to 2D	881.95	890.37
AS5531-040	Link Spill Crest to 2D	882.19	887.81
CB5532-026	Link Spill Crest to 2D	882.48	885.84
DT5415-004	Link Invert to 2D	850.06	860.06
DT5416-007	Link Invert to 2D	850.61	860.61
DT5416-008	Link Invert to 2D	851.03	861.03
DT5316-009	Link Invert to 2D	849.80	859.80
DT5315-002	Link Invert to 2D	852.08	862.08
DT5315-003	Link Invert to 2D	852.20	862.20
DT5417-001	Link Invert to 2D	848.83	858.83
DT5417-006	Link Invert to 2D	851.93	861.93
DT5318-001	Link Invert to 2D	851.29	861.29

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
DT5318-003	Link Invert to 2D	850.37	860.37
DT5318-005	Link Invert to 2D	850.88	860.88
DT5317-001	Link Invert to 2D	850.69	860.69
DT5317-002	Link Invert to 2D	849.80	859.80
DT5317-003	Link Invert to 2D	849.80	859.80
DT5317-004	Link Invert to 2D	849.80	859.80
DT5317-005	Link Invert to 2D	851.74	861.74
DT5317-006	Link Invert to 2D	850.94	860.94
DT5317-007	Link Invert to 2D	850.69	860.69
DT5317-008	Link Invert to 2D	850.69	860.69
DT5317-009	Link Invert to 2D	850.69	860.69
DT5317-011	Link Invert to 2D	850.69	860.69
GR5218-016	Link Invert to 2D	849.64	859.64
DT5127-018	Link Invert to 2D	849.60	859.60
DT5127-019	Link Invert to 2D	869.57	879.57
DT5127-020	Link Invert to 2D	869.33	879.33
DT5127-021	Link Invert to 2D	865.75	875.75
DT5127-022	Link Invert to 2D	870.17	880.17
DT5127-024	Link Invert to 2D	865.95	875.95
DT5026-022	Link Invert to 2D	868.10	878.10
GR5219-008	Link Invert to 2D	850.00	863.40
GR5219-009	Link Invert to 2D	850.00	863.40
ND5220-022	Link Spill Crest to 2D	860.91	866.38
ND5220-023	Link Spill Crest to 2D	855.42	860.39
ND5221-017	Link Spill Crest to 2D	881.59	888.23
ND5221-018	Link Spill Crest to 2D	872.26	882.26
DT4821-001	None	867.60	877.60
DT4821-006	Link Spill Crest to 2D	869.85	872.10
DT4821-007	Link Spill Crest to 2D	871.25	881.25
DT4623-001	None	853.04	857.04
DT4623-002	Link Spill Crest to 2D	853.89	857.89
DT5528-020	Link Spill Crest to 2D	861.09	865.09
DT5324-027	Link Spill Crest to 2D	927.10	928.83
TD 5324-026	Link Spill Crest to 2D	927.17	929.18
MI4724-003	Link Spill Crest to 2D	890.05	896.66
MI4821-015	Link Spill Crest to 2D	855.40	859.27
MI5117-014	Link Spill Crest to 2D	854.65	858.90
MI5117-015	Link Spill Crest to 2D	853.72	858.71
MI5027-012	Link Spill Crest to 2D	854.38	861.36
MI5027-013	Link Spill Crest to 2D	855.29	862.55
MI5427-034	Link Spill Crest to 2D	859.43	864.17
MI5124-042	Link Spill Crest to 2D	906.07	910.79
MI5124-049	Link Spill Crest to 2D	890.12	894.59
MI5124-068	Link Spill Crest to 2D	882.91	888.50
MI5124-071	Link Spill Crest to 2D	883.65	888.51
MI4923-031	Link Spill Crest to 2D	903.49	913.26
TP5025-014	Link Spill Crest to 2D	867.14	871.53
MI5628-069	Link Spill Crest to 2D	887.69	891.42
MI5628-076	Link Spill Crest to 2D	888.62	893.02
MI5628-078	Link Spill Crest to 2D	888.89	893.24
MI5629-017	Link Spill Crest to 2D	887.64	892.26
MI5628-086	Link Spill Crest to 2D	877.93	885.58

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
TP5120-015	Link Spill Crest to 2D	852.88	858.48
TP5528-004	Link Spill Crest to 2D	866.48	870.98
MI5529-034	Link Spill Crest to 2D	853.51	857.84
MI5628-068	Link Spill Crest to 2D	887.66	891.09
AS5429-065	Link Spill Crest to 2D	851.44	854.18
IN5429-068	Link Spill Crest to 2D	851.70	854.29
IN5429-070	Link Spill Crest to 2D	852.00	854.95
IN5429-072	Link Spill Crest to 2D	852.54	855.42
IN5429-074	Link Spill Crest to 2D	852.97	856.02
IN5429-076	Link Spill Crest to 2D	853.46	856.42
IN5429-078	Link Spill Crest to 2D	853.90	856.72
AS5429-080	Link Spill Crest to 2D	851.52	854.98
IN5429-081	Link Spill Crest to 2D	852.31	855.52
IN5429-083	Link Spill Crest to 2D	852.75	855.84
IN5429-085	Link Spill Crest to 2D	853.15	856.34
IN5429-087	Link Spill Crest to 2D	853.46	856.63
IN5429-089	Link Spill Crest to 2D	853.85	856.92
IN5429-091	Link Spill Crest to 2D	854.59	857.54
AS5226-062	Link Spill Crest to 2D	853.80	857.54
AS5226-064	Link Spill Crest to 2D	851.51	855.52
AS5226-066	Link Spill Crest to 2D	851.13	854.83
AS5226-073	Link Spill Crest to 2D	850.51	854.36
CB5226-075	Link Spill Crest to 2D	850.25	854.02
AS5226-076	Link Spill Crest to 2D	847.41	854.35
IN5226-081	Link Spill Crest to 2D	848.85	853.57
AE5227-028	Link Invert to 2D	846.06	850.68
AE5326-031	Link Invert to 2D	850.66	851.42
AE5326-029	Link Invert to 2D	849.55	851.31
AE5326-027	Link Invert to 2D	850.20	860.20
Menomonie_Yard	Link Invert to 2D	855.56	865.56
PD_5219-011	Link Invert to 2D	850.66	860.66
PD_5119-009	Link Invert to 2D	851.29	861.29
PD_5020-054	Link Invert to 2D	852.24	862.24
OpenChannel1	Link Invert to 2D	851.35	861.35
OpenChannel2	Link Invert to 2D	850.03	860.03
Drewry_Ditch	Link Invert to 2D	888.84	898.84
WarnerPark1	Link Spill Crest to 2D	849.55	853.55
Barnett_Yard	Link Invert to 2D	903.84	913.84
PD_4624-011	Link Invert to 2D	859.87	869.87
Depression1	Link Invert to 2D	909.79	919.79
PD_5427-061	Link Invert to 2D	849.83	859.83
PD_5427-061_2	Link Invert to 2D	849.78	859.78
PD_4722-014	Link Invert to 2D	859.79	869.79
ShermanCulv	Link Invert to 2D	850.21	860.21
GolfPond1	Link Invert to 2D	850.88	860.88
Private1	Link Invert to 2D	855.10	865.10
Private2	Link Spill Crest to 2D	853.93	857.93
Private3	Link Invert to 2D	861.10	871.10
Private4	Link Spill Crest to 2D	878.75	884.45
Namekagon_Yard	Link Invert to 2D	857.39	867.39
Depression2	Link Invert to 2D	903.30	913.30
PD_5227-002	Link Invert to 2D	849.49	859.49

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
Node4851	Link Invert to 2D	846.72	856.72
Node4852	Link Invert to 2D	846.70	856.70
Node4853	Link Invert to 2D	850.00	856.94
Node4854	Link Invert to 2D	850.08	855.43
Node4855	Link Invert to 2D	849.87	855.36
Node4856	None	843.07	851.88
Node4857	None	847.05	857.05
Node4858	None	845.00	855.00
Node4859	None	846.67	856.67
Node4861	Link Invert to 2D	853.54	863.54
Node4864	Link Invert to 2D	851.63	861.63
Node4865	Link Spill Crest to 2D	885.91	891.42
Node4866	Link Spill Crest to 2D	849.98	855.68
Node4867	Link Invert to 2D	845.78	852.14
Node4868	Link Invert to 2D	855.96	865.96
Node4869	Link Invert to 2D	850.02	860.02
Node4870	Link Invert to 2D	849.25	859.25
Node4871	Link Invert to 2D	848.75	858.75
Node4872	Link Invert to 2D	852.92	862.92
Node4873	Link Invert to 2D	851.20	861.20
Node4877	Link Invert to 2D	849.00	859.00
Node4878	Link Invert to 2D	848.85	858.85
Node4879	None	859.87	869.87
Node4880	None	859.77	869.77
Node4881	Link Invert to 2D	851.00	861.00
Node4882	None	852.10	862.00
Node4883	Link Invert to 2D	853.00	863.10
Node4884	Link Invert to 2D	852.40	862.40
Node4885	Link Invert to 2D	870.00	880.00
Node4891	Link Invert to 2D	869.96	879.96
Node4893	Link Invert to 2D	847.99	859.64
Node4894	Link Invert to 2D	847.54	859.64
Node4897	Link Invert to 2D	849.25	859.64
Node4898	Link Invert to 2D	849.23	859.64
Node4899	Link Invert to 2D	849.64	859.64
Node4900	Link Invert to 2D	849.64	859.64
Node4901	Link Invert to 2D	850.01	859.64
Node4902	Link Invert to 2D	849.64	859.64
Node4903	Link Invert to 2D	848.52	859.64
Node4904	Link Invert to 2D	848.27	859.64
Node4905	Link Invert to 2D	849.27	859.64
Node4906	Link Invert to 2D	849.14	859.64
Node4907	Link Invert to 2D	848.97	859.64
Node4908	Link Invert to 2D	848.91	859.64
Node4909	Link Invert to 2D	849.64	859.64
Node4910	Link Invert to 2D	849.21	859.64
Node4911	Link Invert to 2D	849.89	859.64
Node4912	Link Invert to 2D	849.64	859.64
Node4915	Link Invert to 2D	849.64	859.64
Node4916	Link Invert to 2D	849.64	859.64
Node4917	Link Invert to 2D	855.06	866.06
Node4918	None	852.06	865.06

Table C-4 Existing XPSWMM Model Node Inputs Warner Park and Cherokee Park Watershed Study Report, City of Madison, WI			
Name	Ponding Type	Invert Elevation	Rim Elevation
Node4919	Link Invert to 2D	851.06	861.06
Node4920	Link Invert to 2D	855.98	865.98
Node4921	Link Invert to 2D	851.00	861.00
Node4922	Link Invert to 2D	850.13	860.13
Node4923	Link Invert to 2D	849.85	859.85
Node4924	Link Invert to 2D	850.28	860.28
Node4925	Link Invert to 2D	850.17	860.17
Node4926	Link Invert to 2D	850.01	860.01
Node4927	Link Invert to 2D	849.71	859.71
Node4928	Link Invert to 2D	851.00	861.00
Node4929	Link Invert to 2D	850.90	860.90
Node4930	Link Invert to 2D	850.60	860.60
Node4931	Link Invert to 2D	850.60	860.60
Node4932	Link Invert to 2D	852.10	862.10
Node4933	Link Invert to 2D	859.87	869.87
Node4934	Link Invert to 2D	858.87	868.87
Node4935	Link Invert to 2D	851.20	861.20
Node4936	Link Invert to 2D	850.90	860.90
Node4937	Link Invert to 2D	850.50	860.50

Appendix D: Calibration Information

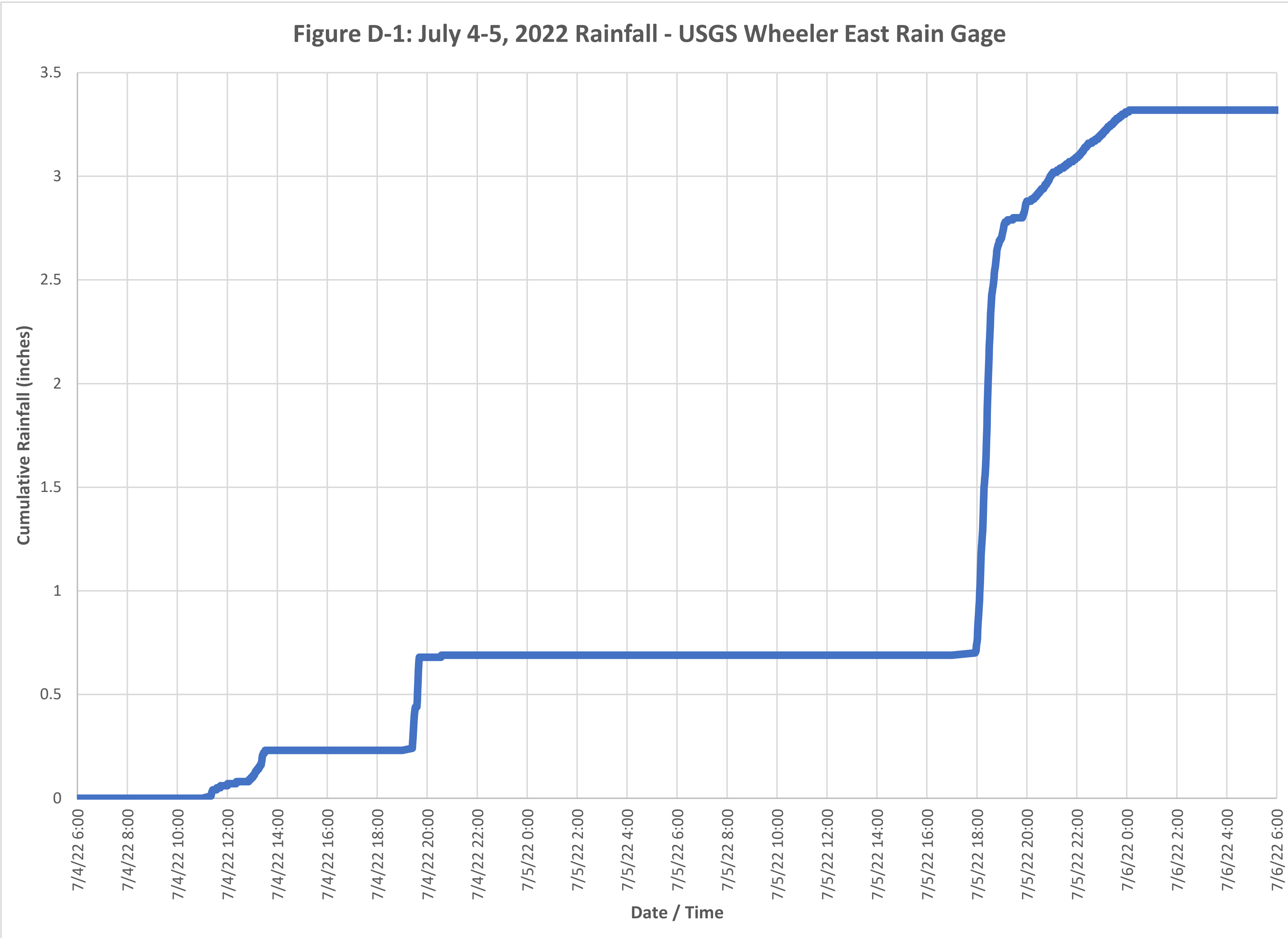

Figure D-1: July 4-5, 2022 Rainfall - USGS Wheeler East Rain Gage
Cumulative Rainfall (inches)
3.5
3
2.5
2
1.5
1
0.5
0
7/4/22 6:00
7/4/22 8:00
7/4/22 10:00
7/4/22 12:00
7/4/22 14:00
7/4/22 16:00
7/4/22 18:00
7/4/22 20:00
7/4/22 22:00
7/5/22 0:00
7/5/22 2:00
7/5/22 4:00
7/5/22 6:00
7/5/22 8:00
7/5/22 10:00
7/5/22 12:00
7/5/22 14:00
7/5/22 16:00
7/5/22 18:00
7/5/22 20:00
7/5/22 22:00
7/6/22 0:00
7/6/22 2:00
7/6/22 4:00
7/6/22 6:00
Date / Time

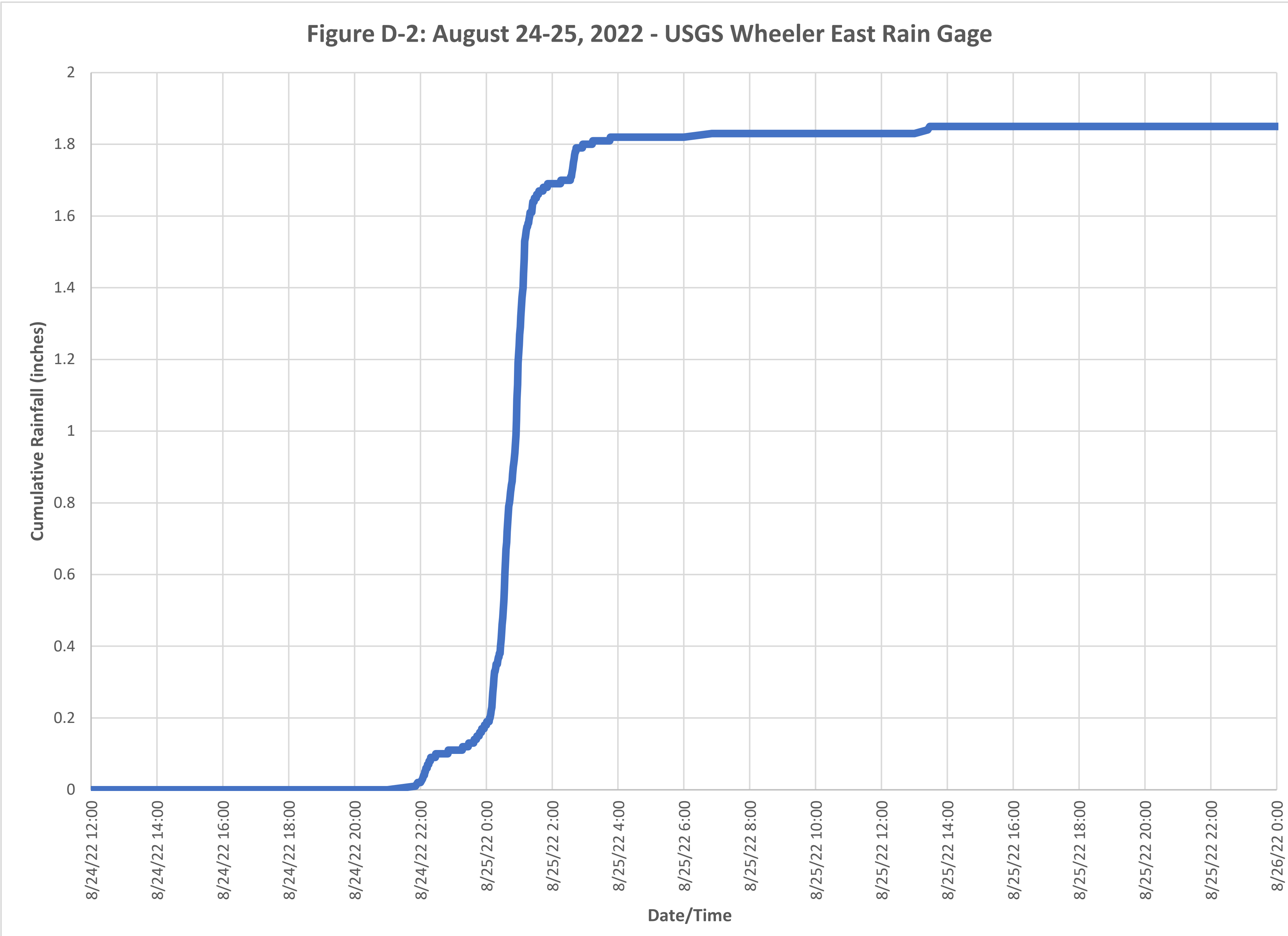

Figure D-2: August 24-25, 2022 - USGS Wheeler East Rain Gage
Cumulative Rainfall (inches)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
8/24/22 12:00
8/24/22 14:00
8/24/22 16:00
8/24/22 18:00
8/24/22 20:00
8/24/22 22:00
8/25/22 0:00
8/25/22 2:00
8/25/22 4:00
8/25/22 6:00
8/25/22 8:00
8/25/22 10:00
8/25/22 12:00
8/25/22 14:00
8/25/22 16:00
8/25/22 18:00
8/25/22 20:00
8/25/22 22:00
8/26/22 0:00
Date/Time

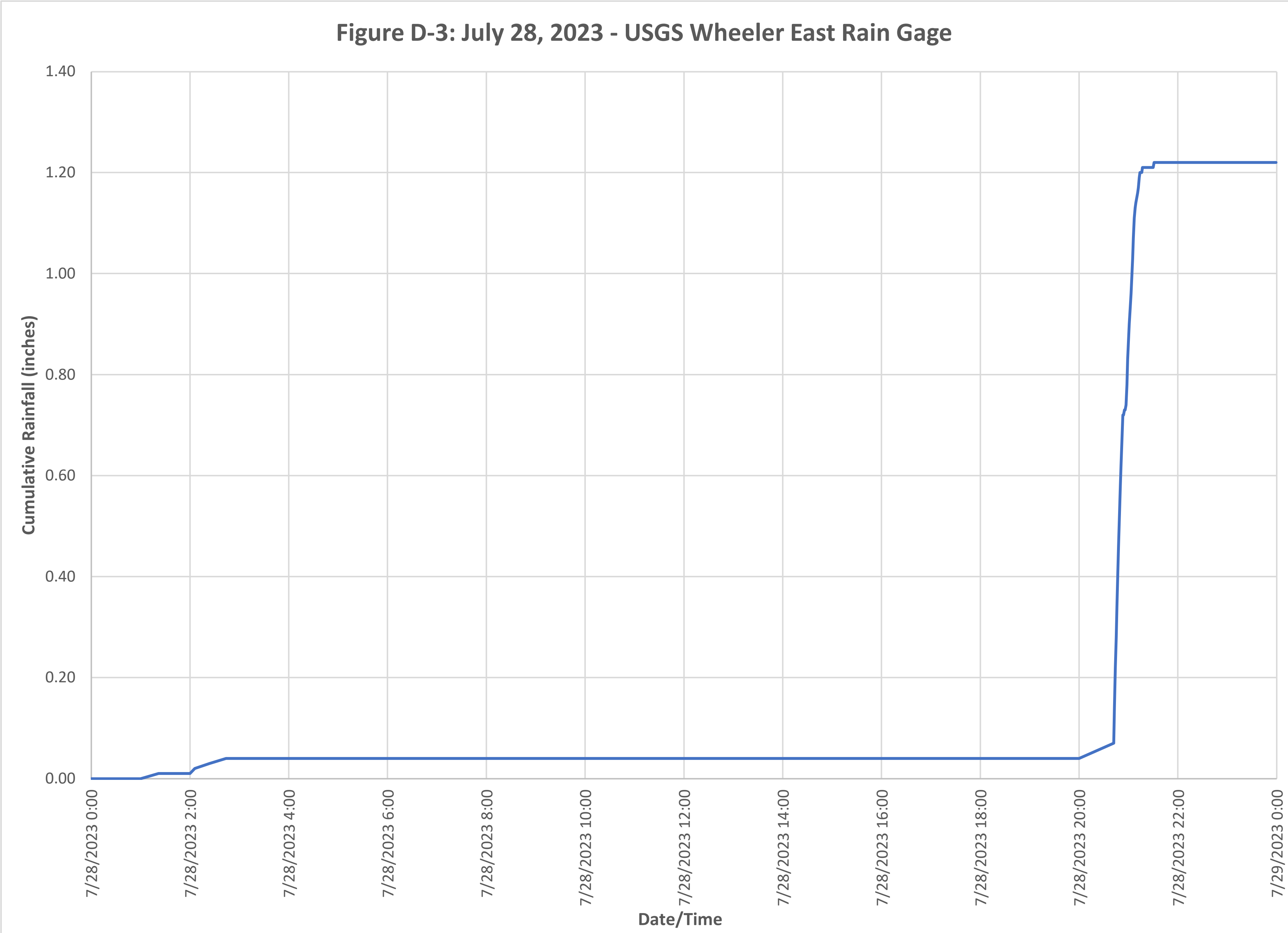
Figure D-3: July 28, 2023 - USGS Wheeler East Rain Gage
Cumulative Rainfall (inches)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
7/28/2023 0:00
7/28/2023 2:00
7/28/2023 4:00
7/28/2023 6:00
7/28/2023 8:00
7/28/2023 10:00
7/28/2023 12:00
7/28/2023 14:00
7/28/2023 16:00
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7/28/2023 22:00
7/29/2023 0:00
Date/Time

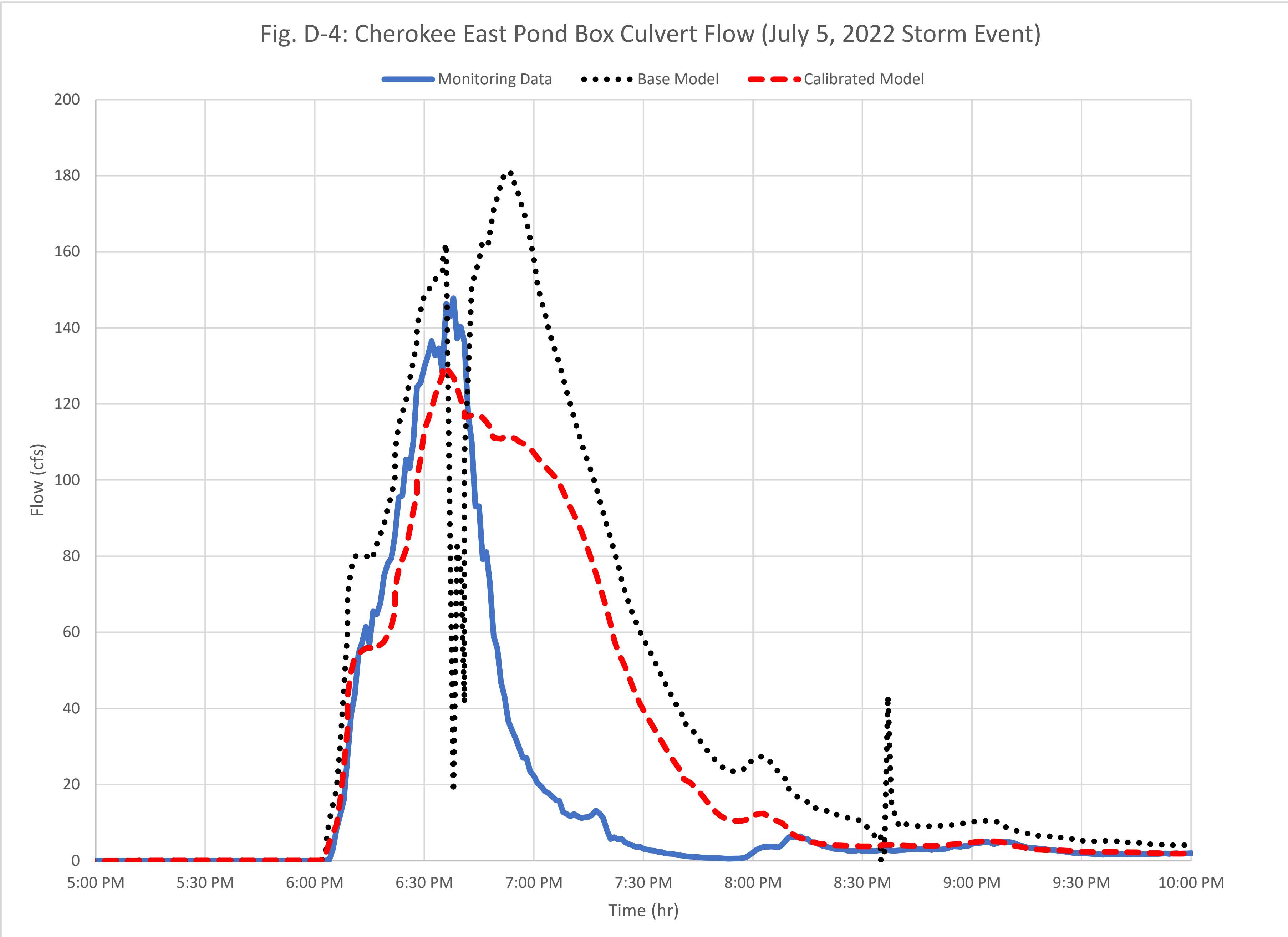

Fig. D-4: Cherokee East Pond Box Culvert Flow (July 5, 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
Flow (cfs)
0
20
40
60
80
100
120
140
160
180
200
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
Time (hr)

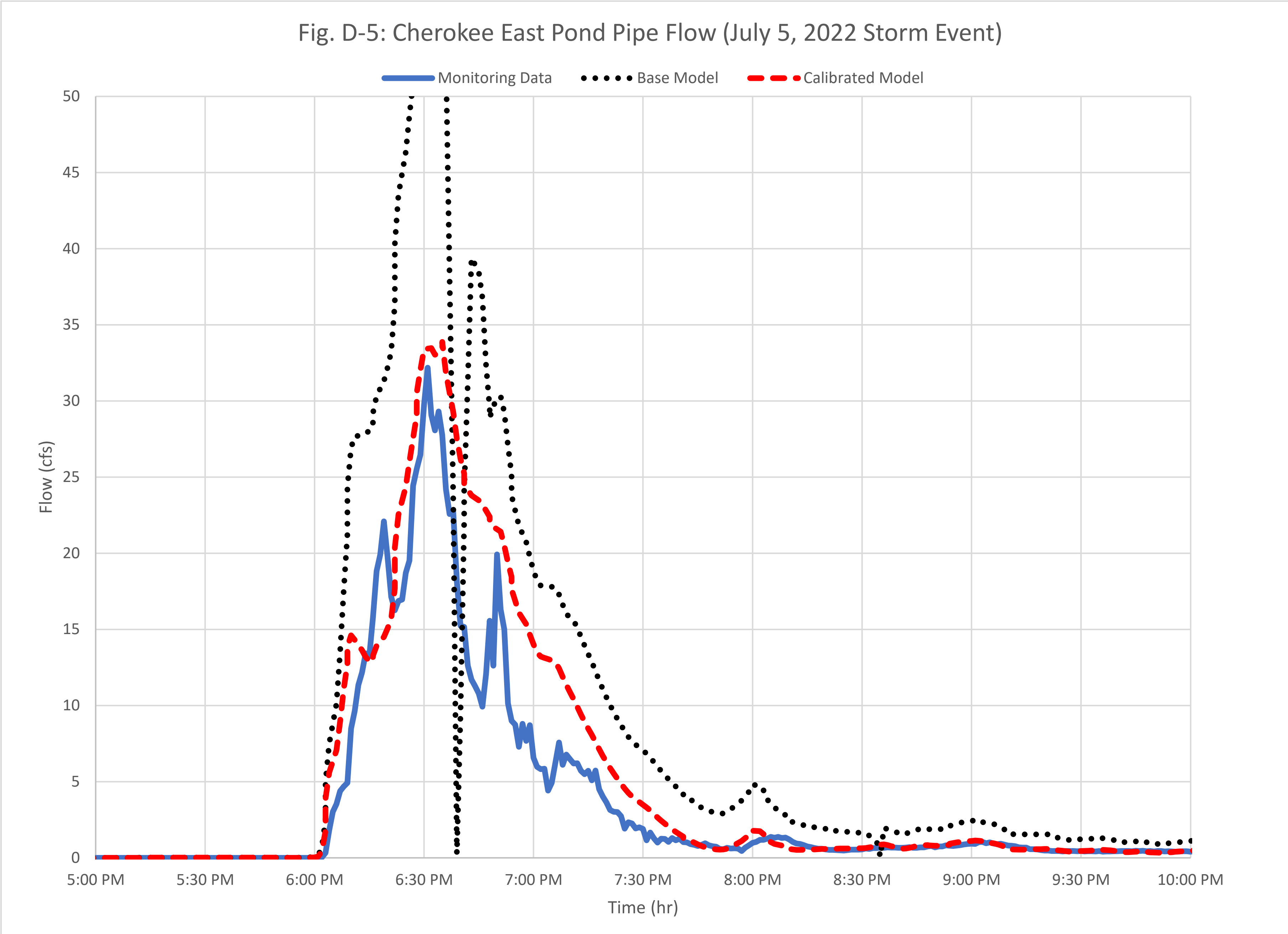
Fig. D-5: Cherokee East Pond Pipe Flow (July 5, 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
Flow (cfs)
50
45
40
35
30
25
20
15
10
5
0
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
Time (hr)

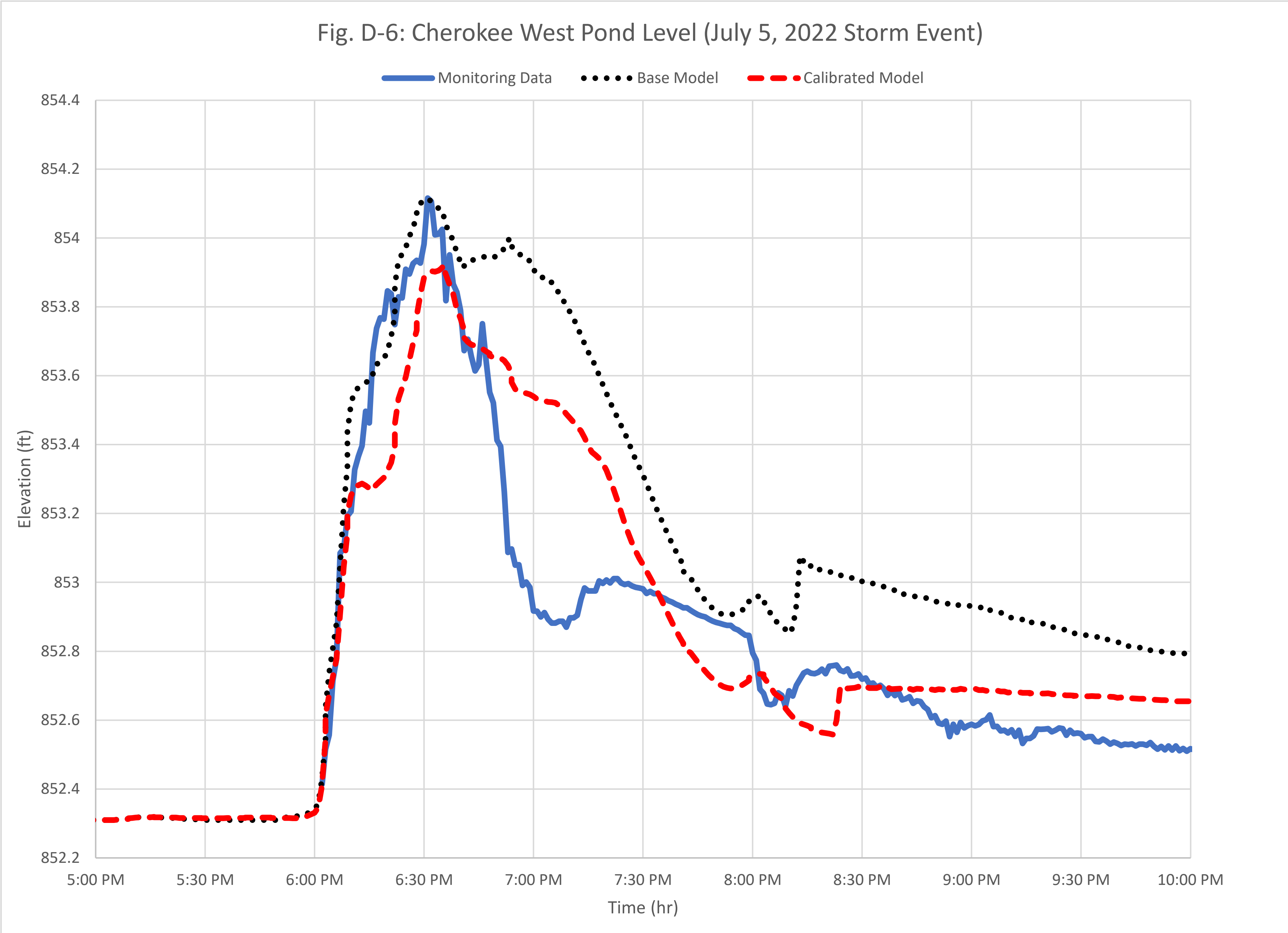

Fig. D-6: Cherokee West Pond Level (July 5, 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
854.4
854.2
854
853.8
853.6
853.4
853.2
853
852.8
852.6
852.4
852.2
Elevation (ft)
5:00 PM
5:30 PM
6:00 PM
6:30 PM
7:00 PM
7:30 PM
8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
Time (hr)

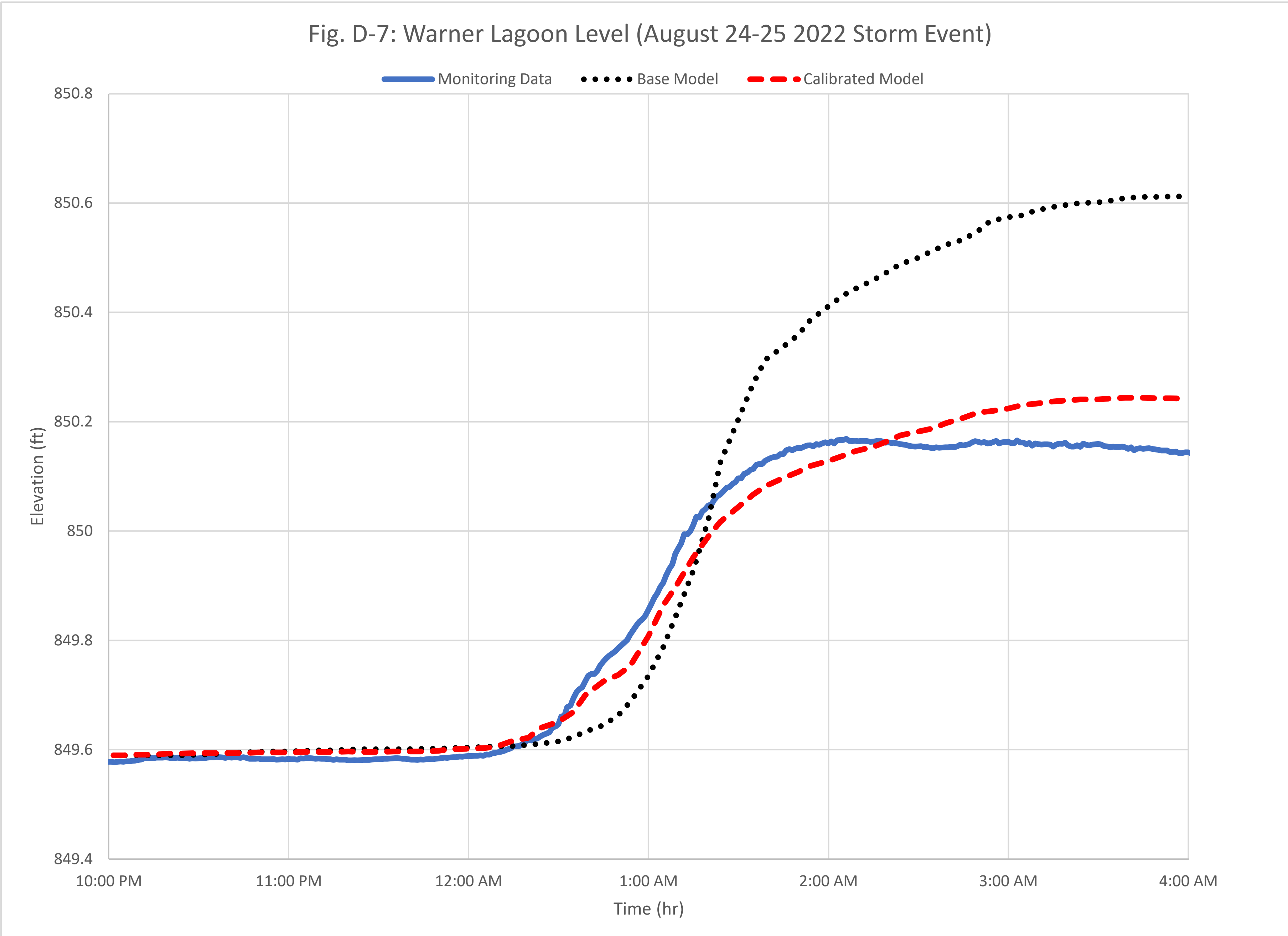

Fig. D-7: Warner Lagoon Level (August 24-25 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
850.8
850.6
850.4
850.2
850
849.8
849.6
849.4
Elevation (ft)
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
Time (hr)

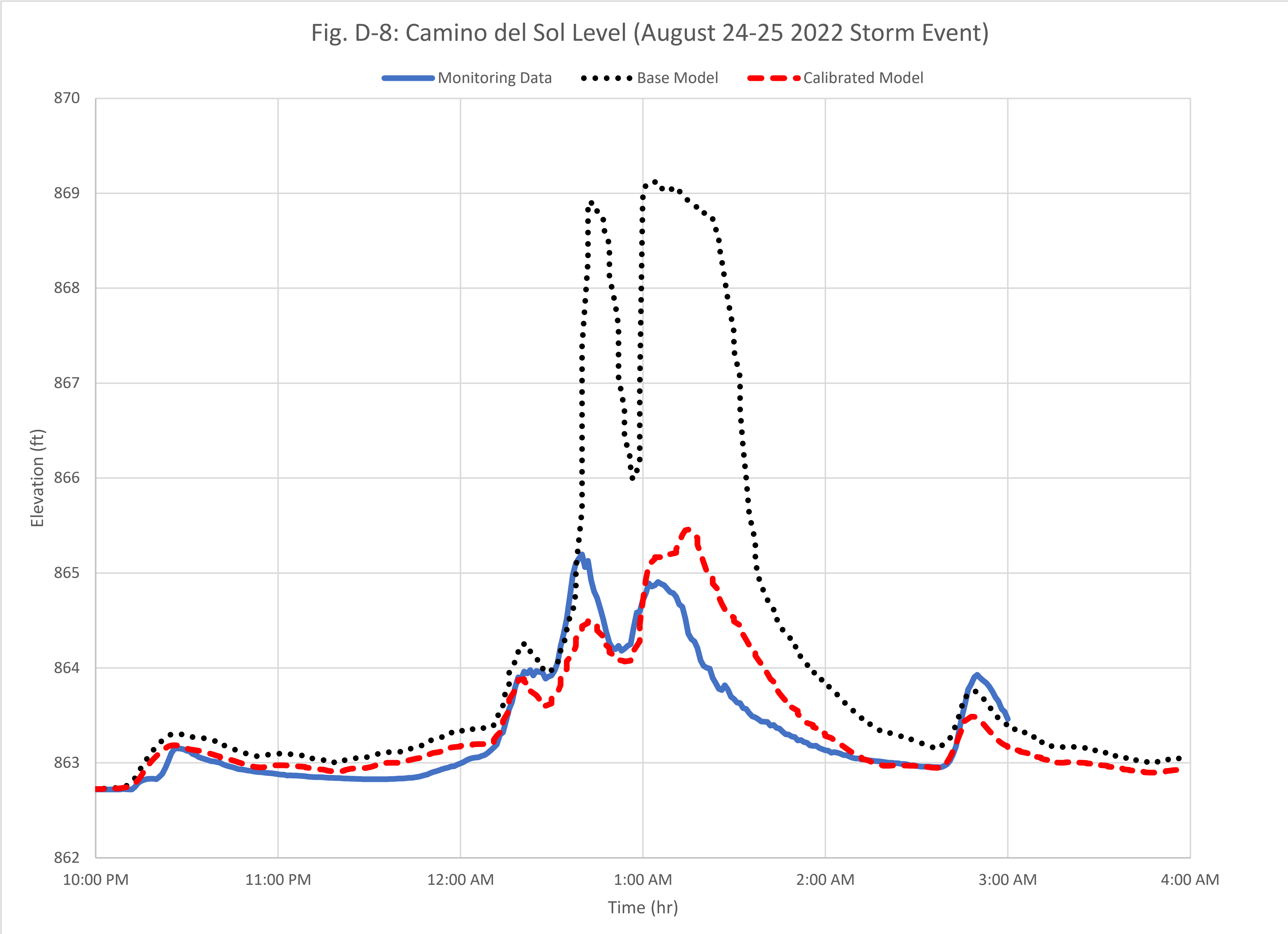

Fig. D-8: Camino del Sol Level (August 24-25 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
Elevation (ft)
870
869
868
867
866
865
864
863
862
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
Time (hr)

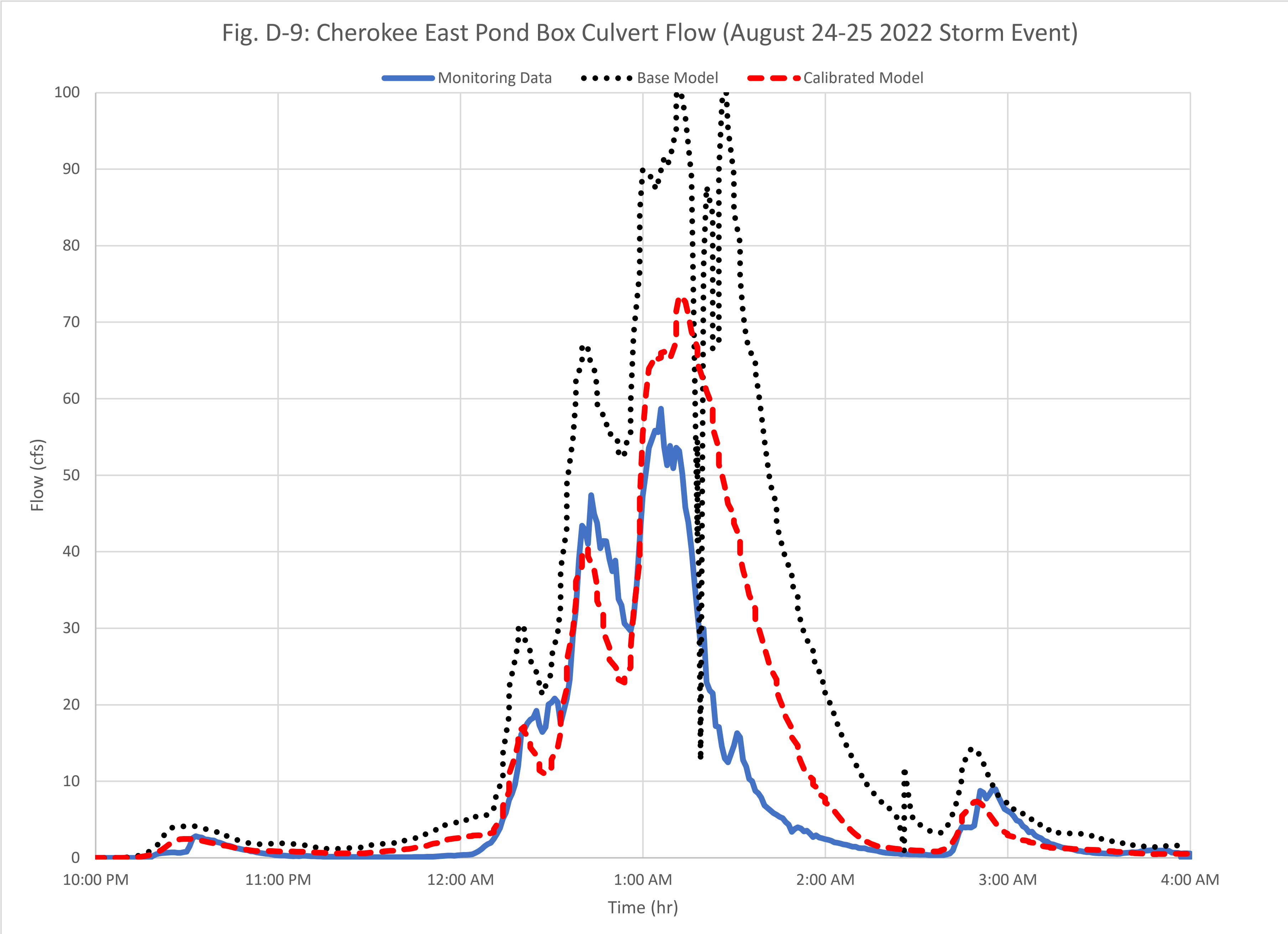
Fig. D-9: Cherokee East Pond Box Culvert Flow (August 24-25 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
Flow (cfs)
0
10
20
30
40
50
60
70
80
90
100
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
Time (hr)

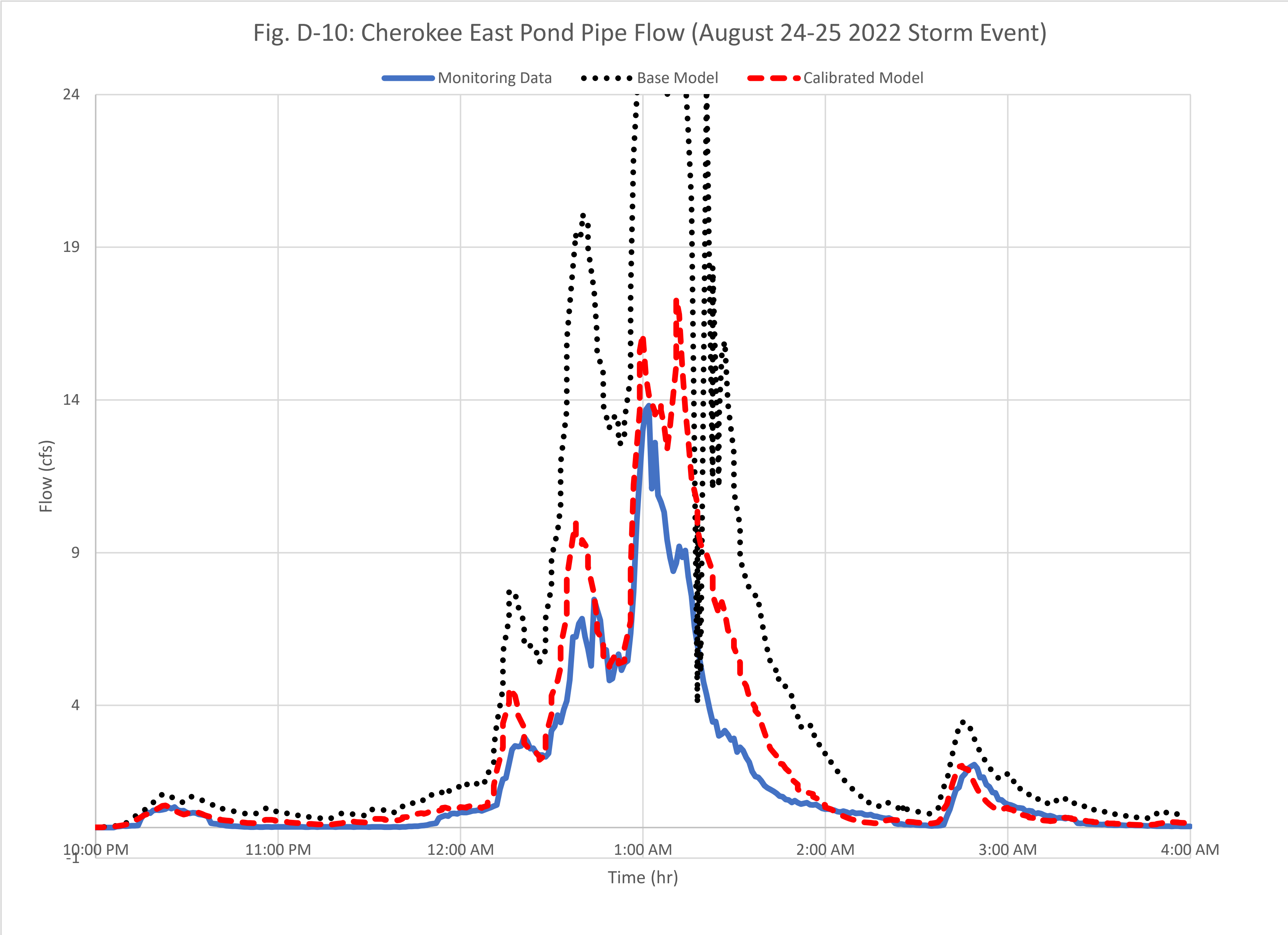

Fig. D-10: Cherokee East Pond Pipe Flow (August 24-25 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
24
19
14
9
4
-1
Flow (cfs)
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
Time (hr)

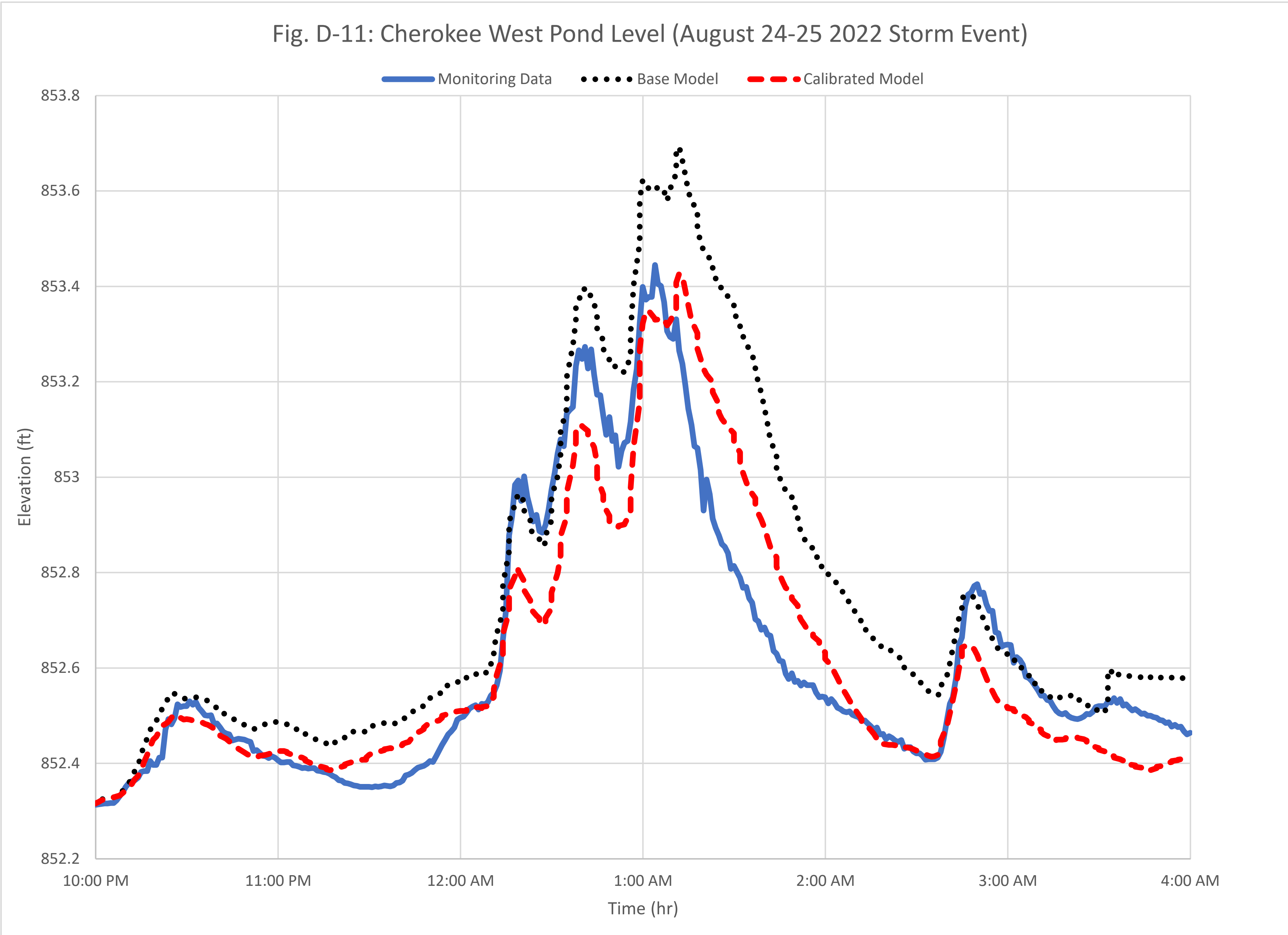
Fig. D-11: Cherokee West Pond Level (August 24-25 2022 Storm Event)
Monitoring Data
Base Model
Calibrated Model
853.8
853.6
853.4
853.2
853
852.8
852.6
852.4
852.2
Elevation (ft)
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
Time (hr)

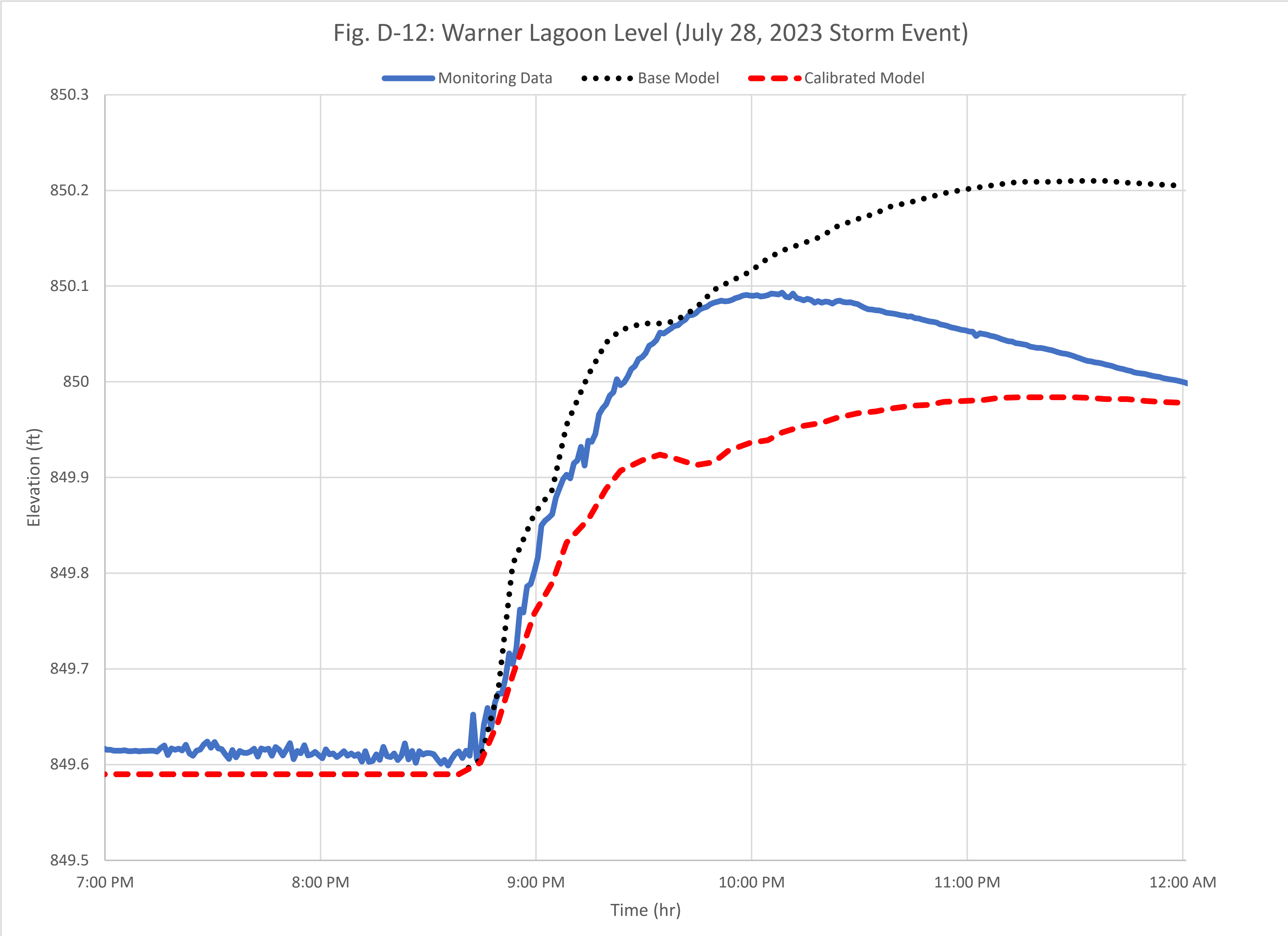
Fig. D-12: Warner Lagoon Level (July 28, 2023 Storm Event)
Monitoring Data
Base Model
Calibrated Model
850.3
850.2
850.1
850
849.9
849.8
849.7
849.6
849.5
Elevation (ft)
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
Time (hr)

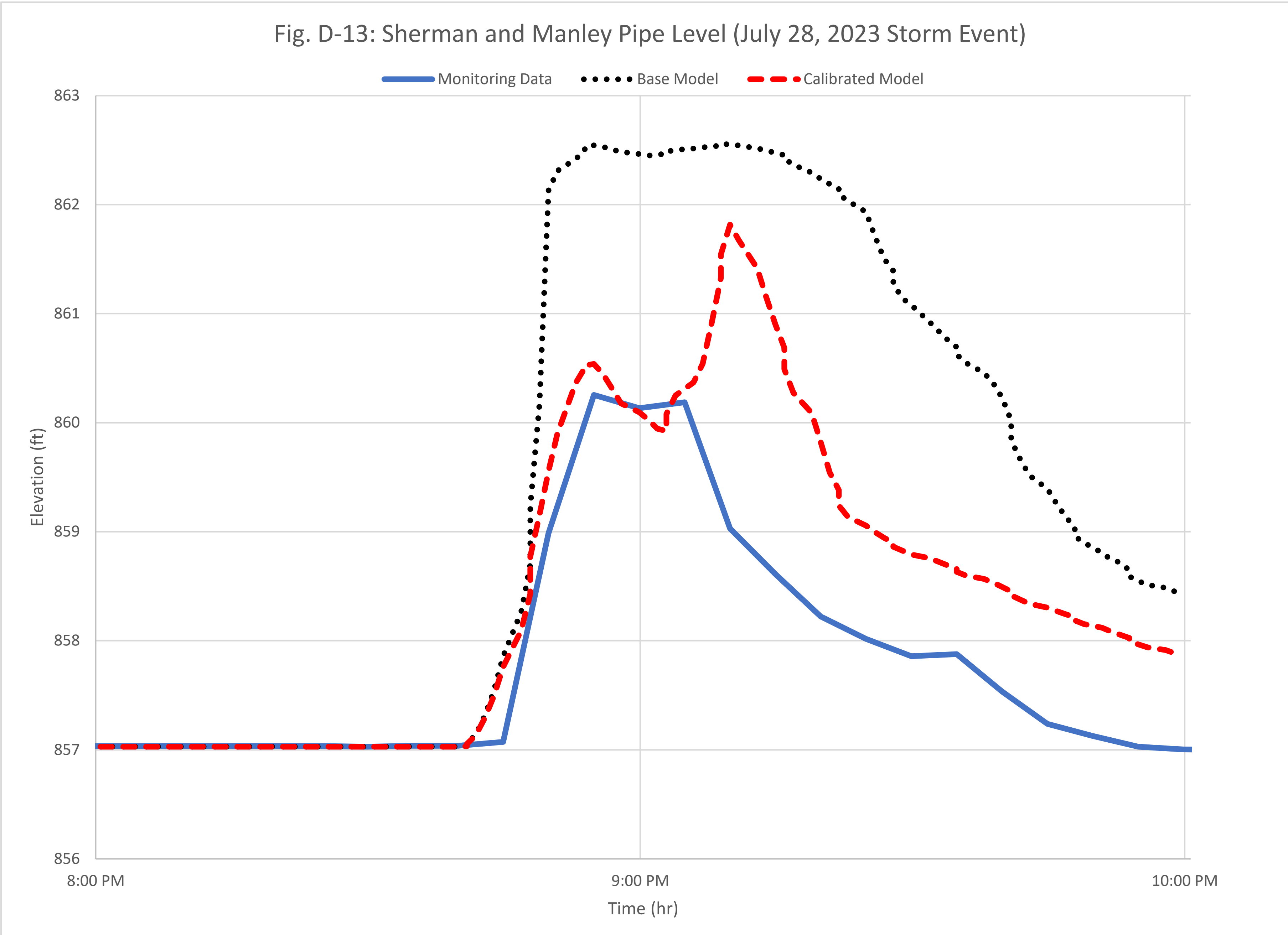
Fig. D-13: Sherman and Manley Pipe Level (July 28, 2023 Storm Event)
Monitoring Data
Base Model
Calibrated Model
863
862
861
860
859
858
857
856
Elevation (ft)
8:00 PM
9:00 PM
10:00 PM
Time (hr)

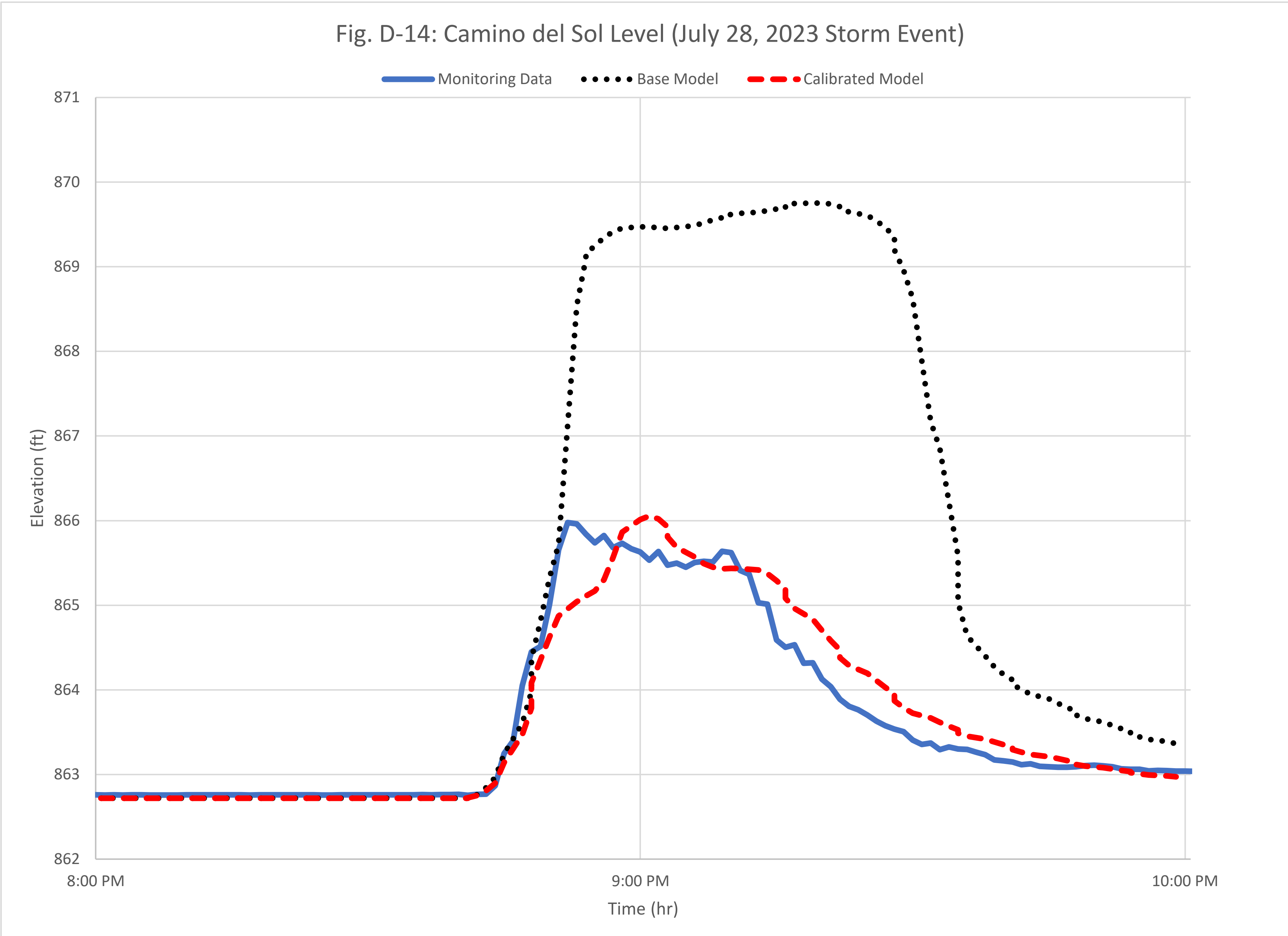
Fig. D-14: Camino del Sol Level (July 28, 2023 Storm Event)
Monitoring Data
Base Model
Calibrated Model
871
870
869
868
867
866
865
864
863
862
Elevation (ft)
8:00 PM
9:00 PM
10:00 PM
Time (hr)

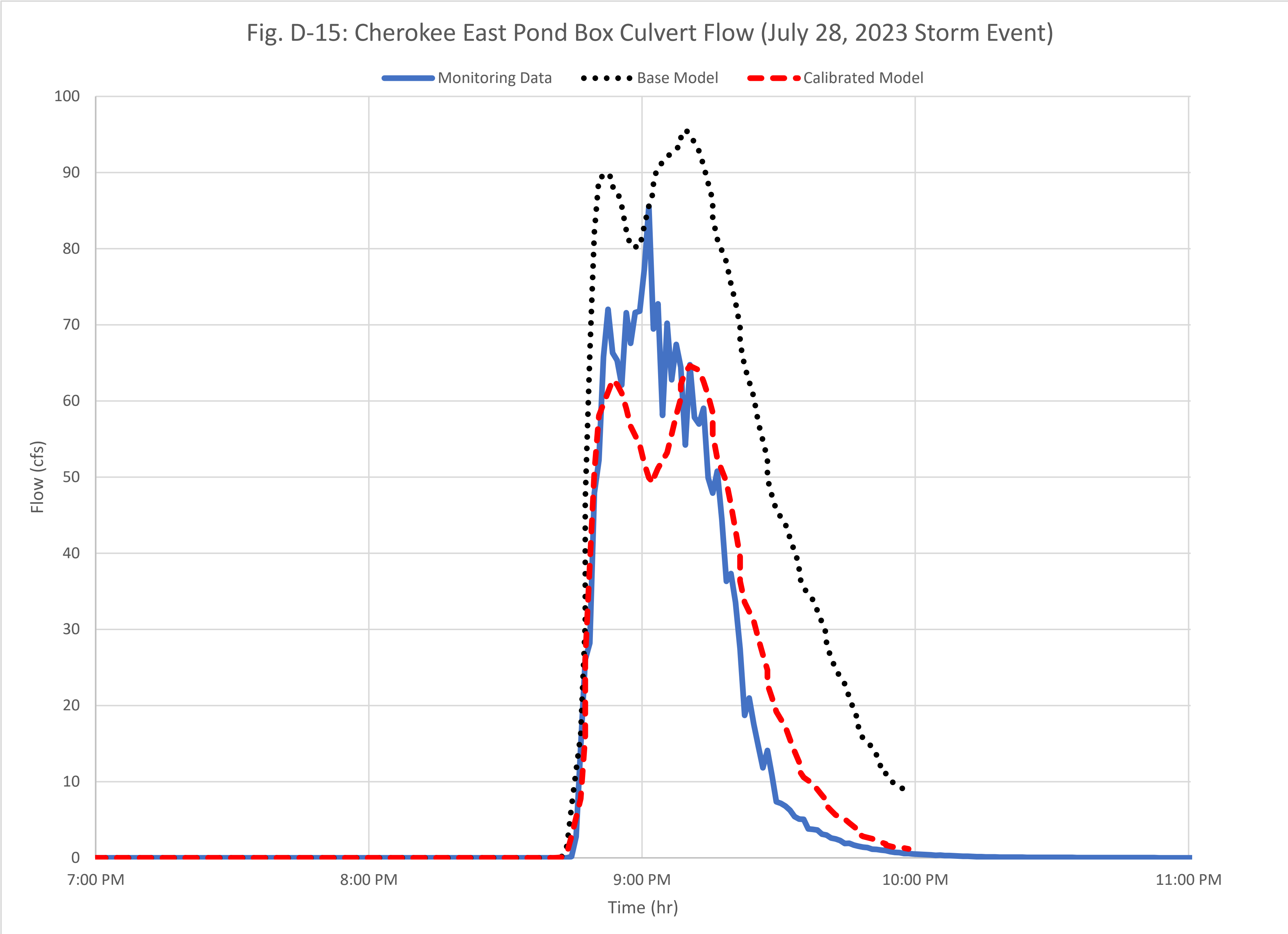

Fig. D-15: Cherokee East Pond Box Culvert Flow (July 28, 2023 Storm Event)
Monitoring Data
Base Model
Calibrated Model
100
90
80
70
60
50
40
30
20
10
0
Flow (cfs)
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time (hr)

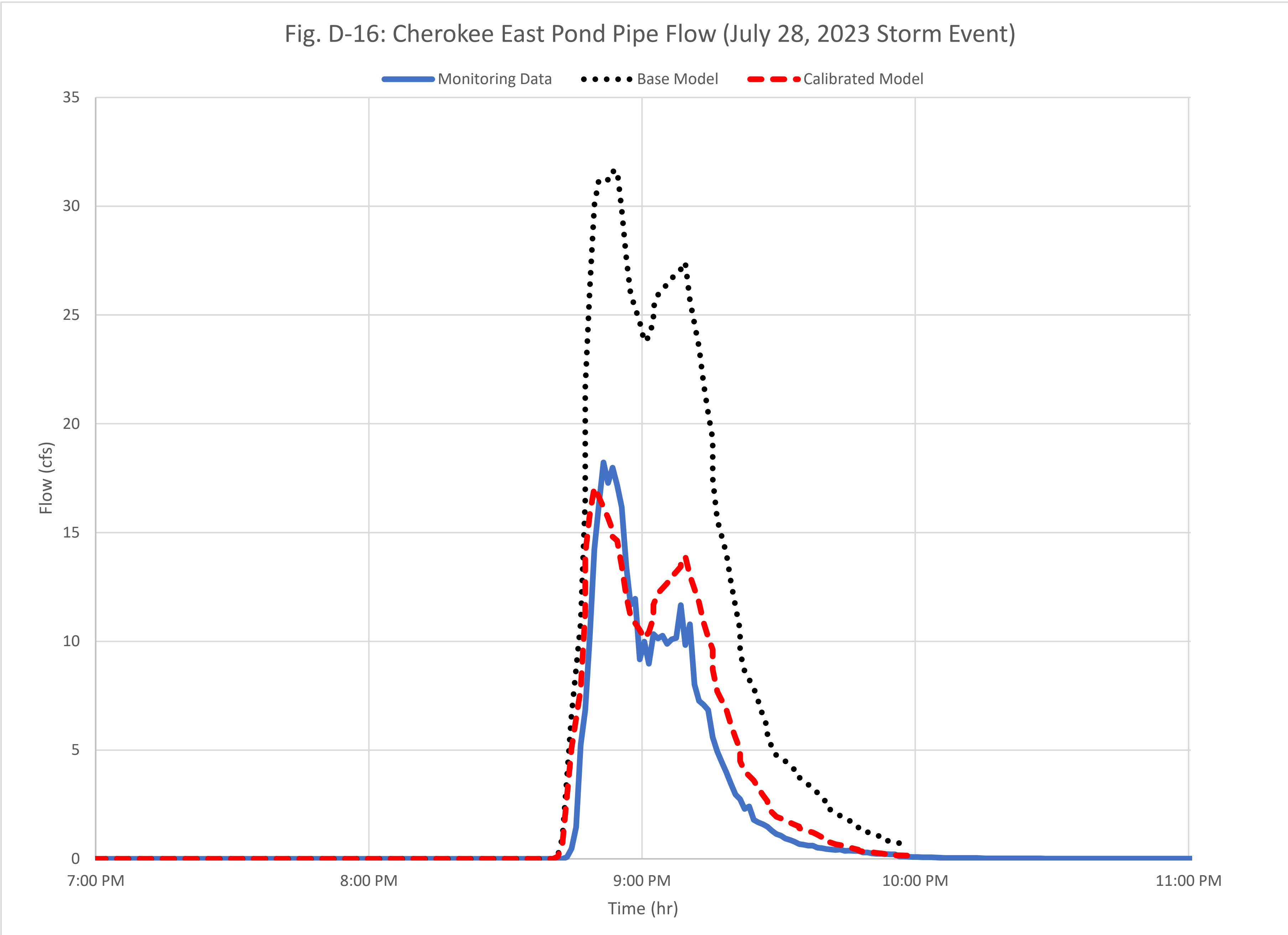
Fig. D-16: Cherokee East Pond Pipe Flow (July 28, 2023 Storm Event)
Monitoring Data
Base Model
Calibrated Model
Flow (cfs)
35
30
25
20
15
10
5
0
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time (hr)

Appendix E: Flooding Depth Results

Table E-1
Existing Conditions (Calibrated) Flooding Results
Warner Park and Cherokee Marsh Watershed Study, City of Madison, WI

Point	XP-SWMM Node	Location	Flood Elevation	50% Chance Storm		20% Chance Storm		10% Chance Storm		4% Chance Storm		1% Chance Storm		0.5% Chance Storm		0.2% Chance Storm		Long Duration Event	
				Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)	Peak WSE	Flood Depth (feet)
1	PD_5227-002	Warner Lagoon	852.00	851.3	-0.7	851.1	-0.9	851.4	-0.6	851.9	-0.1	852.8	0.8	853.3	1.3	853.9	1.9	854.2	2.2
2	AS5429-053	Intersection of Trailsway and Calypso Rd	853.61	855.8	2.2	856.0	2.4	856.2	2.6	856.4	2.8	856.9	3.2	857.1	3.5	857.3	3.7	856.9	3.3
3	AS5529-018	Intersection of Sherman Ave and Windom Way	857.33	858.7	1.4	858.1	0.8	858.3	1.0	858.6	1.2	858.8	1.5	858.9	1.6	859.1	1.7	858.8	1.5
4	AS5427-074	Intersection of Northport Dr and Sherman Ave	870.45	871.0	0.5	871.1	0.7	871.3	0.8	871.4	0.9	871.5	1.1	871.6	1.1	871.7	1.2	871.5	1.1
5	MI5628-086	Intersection of Northport Dr and Dryden Dr	885.58	885.1	-0.5	885.0	-0.6	885.8	0.2	886.0	0.4	886.2	0.7	886.3	0.7	886.4	0.8	886.2	0.7
6	AS5430-007	Intersection of Wyldewood Dr and Brentwood Pkwy	861.27	861.8	0.5	862.0	0.7	862.2	0.9	862.4	1.2	862.8	1.5	863.0	1.7	863.2	1.9	862.8	1.6
7	AS5530-009	Intersection of Vahlen St and Ruskin St	878.99	880.7	1.7	880.9	1.9	881.1	2.1	881.3	2.3	881.5	2.5	881.6	2.6	881.7	2.8	881.5	2.6
8	CB5532-026	Intersection of Schlimgen Ave and Huxley St	885.84	887.0	1.2	887.1	1.3	887.2	1.4	887.3	1.5	887.5	1.7	887.6	1.7	887.7	1.8	887.5	1.7
9	AS5325-004	Intersection of Northport Dr and Troy Dr	866.02	865.7	-0.3	865.8	-0.2	866.8	0.8	867.2	1.2	867.5	1.5	867.7	1.7	867.9	1.9	867.6	1.5
10	IN5324-014	Intersection of Lakeview Ave and West Ln	928.15	926.9	-1.2	927.1	-1.0	927.7	-0.5	928.8	0.6	928.8	0.7	928.9	0.7	928.9	0.7	928.8	0.7
11	IN5126-007	South end of Camino Del Sol	870.13	868.0	-2.1	870.8	0.7	871.2	1.1	871.4	1.3	872.2	2.1	872.7	2.6	873.3	3.2	872.5	2.4
12	AS5125-012	Intersection of Toban Dr and Blaine Dr	875.38	875.9	0.5	876.0	0.6	876.1	0.7	876.2	0.8	876.5	1.1	876.7	1.3	876.9	1.5	876.5	1.2
13	AS4925-004	Intersection of Troy Dr and Harper Rd	894.61	884.8	-9.8	884.7	-10.0	884.9	-9.7	885.5	-9.2	890.1	-4.5	890.4	-4.2	891.5	-3.2	890.1	-4.5
14	AS4724-034	Intersection of Meadow Valley Rd and Pine View Dr	872.10	0.0	-872.1	867.8	-4.3	867.8	-4.3	867.8	-4.3	867.9	-4.2	868.0	-4.1	868.0	-4.1	867.9	-4.2
15	IN4524-004	Veith Ave	857.45	857.9	0.4	857.9	0.5	858.1	0.6	858.2	0.8	858.4	1.0	858.5	1.1	858.7	1.3	858.4	1.0
16	IN4722-015	Intersection of Heffernan Dr and Knutson Dr	867.01	867.4	0.4	867.4	0.4	867.6	0.6	867.8	0.7	868.0	1.0	868.2	1.2	868.4	1.4	868.1	1.0
17	AS5021-017	Intersection of Bonner Ln and Claremont Ln	870.46	870.9	0.4	871.1	0.6	871.2	0.7	871.2	0.8	871.4	0.9	871.5	1.1	871.6	1.2	871.4	0.9
18	AS4922-008	Intersection of Kennedy Rd and Dapin Rd	886.89	884.9	-2.0	885.2	-1.7	887.2	0.3	887.5	0.6	887.7	0.8	887.8	0.9	887.9	1.0	887.7	0.8
19	AS5023-028	Intersection of Northridge Ter and Northport Dr	906.50	906.6	0.1	906.5	0.0	906.9	0.4	907.3	0.8	907.9	1.4	908.2	1.7	908.5	2.0	907.9	1.4
20	AS5121-010	Intersection of Northland Dr and Monica Ln	885.08	885.5	0.4	885.5	0.4	885.6	0.5	885.8	0.7	886.0	0.9	886.1	1.0	886.3	1.2	886.0	0.9
21	AS5220-024	Delaware Blvd - Between Debra Ln and Wheeler Rd	859.29	857.1	-2.2	856.8	-2.5	857.6	-1.7	859.0	-0.3	860.7	1.4	861.1	1.8	861.2	1.9	861.2	1.9
22	IN5321-010	Intersection of Delaware Blvd and Esch Ln	892.88	888.8	-4.1	889.1	-3.8	889.3	-3.6	889.5	-3.4	889.9	-2.9	892.4	-0.4	894.5	1.6	890.0	-2.8
23	AE5218-007	Menomonie Ln Channel at Namekagon Ln outfall	852.00	851.7	-0.3	850.6	-1.4	850.6	-1.4	850.6	-1.4	851.0	-1.0	851.3	-0.7	851.7	-0.3	851.4	-0.6
24	GR5218-016	TPC Wisconsin Golf Course Ponds - Upstream of Comanche Way Culvert	856.00	851.1	-4.9	850.8	-5.2	850.9	-5.1	851.1	-4.9	851.5	-4.5	851.7	-4.3	852.1	-3.9	852.2	-3.8
25	AS5524-002	Sherman Ave north of Lakeview Ave	925.36	922.4	-3.0	922.3	-3.0	924.9	-0.4	925.4	0.0	925.6	0.3	925.7	0.4	925.8	0.4	925.7	0.3

Table E-2
Proposed Conditions Flooding Results
Warner Park and Cherokee Marsh Watershed Study, City of Madison, WI

Point	XP-SWMM Node	Location	Flood Elevation	50% Chance Storm Peak WSE	50% Chance Storm Flood Depth (feet)	20% Chance Storm Peak WSE	20% Chance Storm Flood Depth (feet)	10% Chance Storm Peak WSE	10% Chance Storm Flood Depth (feet)	4% Chance Storm Peak WSE	4% Chance Storm Flood Depth (feet)	1% Chance Storm Peak WSE	1% Chance Storm Flood Depth (feet)	0.5% Chance Storm Peak WSE	0.5% Chance Storm Flood Depth (feet)	0.2% Chance Storm Peak WSE	0.2% Chance Storm Flood Depth (feet)	Long Duration Event Peak WSE	Long Duration Event Flood Depth (feet)
1	PD_5227-002	Warner Lagoon	852.00	851.0	-1.0	851.3	-0.7	851.7	-0.3	852.3	0.3	853.2	1.2	853.7	1.7	854.4	2.4	854.5	2.5
2	AS5429-053	Intersection of Trailsway and Calypso Rd	853.61	853.0	-0.6	853.8	0.1	853.9	0.3	854.2	0.6	854.5	0.9	854.6	1.0	854.8	1.2	854.6	1.0
3	AS5529-018	Intersection of Sherman Ave and Windom Way	857.33	855.4	-1.9	855.4	-1.9	856.6	-0.7	857.5	0.2	858.1	0.8	858.4	1.1	858.7	1.3	858.1	0.8
4	AS5427-074	Intersection of Northport Dr and Sherman Ave	870.45	864.3	-6.1	864.9	-5.5	865.8	-4.6	870.8	0.4	871.5	1.1	871.6	1.2	871.8	1.3	871.5	1.1
5	MI5628-086	Intersection of Northport Dr and Dryden Dr	885.58	879.3	-6.3	879.6	-6.0	879.9	-5.6	885.3	-0.3	886.0	0.5	886.2	0.6	886.3	0.7	886.0	0.5
6	AS5430-007	Intersection of Wyldewood Dr and Brentwood Pkwy	861.27	856.1	-5.2	856.5	-4.8	857.3	-4.0	861.2	0.0	862.2	0.9	862.4	1.1	862.7	1.5	862.2	0.9
7	AS5530-009	Intersection of Vahlen St and Ruskin St	878.99	874.7	-4.3	875.6	-3.3	877.9	-1.1	879.4	0.5	880.4	1.4	880.9	1.9	881.3	2.3	880.4	1.5
8	CB5532-026	Intersection of Schlimgen Ave and Huxley St	885.84	883.1	-2.7	884.3	-1.6	885.9	0.1	886.7	0.8	887.1	1.3	887.3	1.5	887.5	1.7	887.2	1.3
9	AS5325-004	Intersection of Northport Dr and Troy Dr	866.02	860.6	-5.4	861.0	-5.0	861.4	-4.6	863.2	-2.8	866.3	0.2	866.9	0.9	867.3	1.3	866.3	0.3
10	IN5324-014	Intersection of Lakeview Ave and West Ln	928.15	925.5	-2.6	925.8	-2.4	926.1	-2.0	928.0	-0.2	928.9	0.8	929.1	1.0	929.3	1.1	928.9	0.8
11	IN5126-007	South end of Camino Del Sol	870.13	864.0	-6.2	864.6	-5.6	865.3	-4.8	866.4	-3.8	866.9	-3.2	867.4	-2.8	868.2	-1.9	866.9	-3.3
12	AS5125-012	Intersection of Toban Dr and Blaine Dr	875.38	871.8	-3.6	872.2	-3.2	873.0	-2.4	876.1	0.7	876.5	1.1	876.6	1.2	876.8	1.4	876.5	1.1
13	AS4925-004	Intersection of Troy Dr and Harper Rd	894.61	884.4	-10.2	884.6	-10.0	884.9	-9.7	885.5	-9.1	890.1	-4.5	890.4	-4.2	891.6	-3.0	890.1	-4.5
14	AS4724-034	Intersection of Meadow Valley Rd and Pine View Dr	872.10	867.1	-5.0	867.1	-5.0	867.1	-5.0	867.1	-5.0	868.0	-4.1	868.3	-3.8	868.9	-3.2	868.0	-4.1
15	IN4524-004	Veith Ave	857.45	854.1	-3.4	854.2	-3.2	854.4	-3.1	854.7	-2.8	857.5	0.0	858.0	0.5	858.3	0.8	857.5	0.1
16	IN4722-015	Intersection of Heffernan Dr and Knutson Dr	867.01	864.3	-2.7	865.4	-1.6	867.0	0.0	867.5	0.5	867.9	0.9	868.0	1.0	868.3	1.2	867.9	0.9
17	AS5021-017	Intersection of Bonner Ln and Claremont Ln	870.46	866.8	-3.7	867.2	-3.2	867.8	-2.7	871.1	0.7	871.4	1.0	871.5	1.0	871.7	1.2	871.4	1.0
18	AS4922-008	Intersection of Kennedy Rd and Dapin Rd	886.89	882.4	-4.5	882.7	-4.2	882.9	-4.0	883.5	-3.4	886.9	0.0	887.2	0.3	887.5	0.6	886.9	0.0
19	AS5023-028	Intersection of Northridge Ter and Northport Dr	906.50	904.5	-2.0	905.0	-1.5	905.6	-0.9	906.8	0.3	907.4	0.9	907.7	1.2	908.1	1.6	907.4	0.9
20	AS5121-010	Intersection of Northland Dr and Monica Ln	885.08	883.2	-1.9	883.5	-1.6	884.2	-0.9	885.6	0.5	885.9	0.8	886.0	0.9	886.2	1.1	885.9	0.8
21	AS5220-024	Delaware Blvd - Between Debra Ln and Wheeler Rd	859.29	853.9	-5.4	854.6	-4.7	855.2	-4.1	856.1	-3.1	857.2	-2.1	857.6	-1.7	858.1	-1.2	857.2	-2.1
22	IN5321-010	Intersection of Delaware Blvd and Esch Ln	892.88	889.4	-3.5	889.9	-3.0	890.7	-2.1	893.0	0.1	893.7	0.8	894.1	1.2	894.6	1.7	893.7	0.8
23	AE5218-007	Menomonie Ln Channel at Namekagon Ln outfall	852.00	850.6	-1.4	850.6	-1.4	850.6	-1.4	850.6	-1.4	851.0	-1.0	851.4	-0.6	851.8	-0.2	851.5	-0.5
24	GR5218-016	TPC Wisconsin Golf Course Ponds - Upstream of Comanche Way Culvert	856.00	850.5	-5.5	850.7	-5.3	850.9	-5.1	851.1	-4.9	851.5	-4.5	851.8	-4.2	852.3	-3.7	852.2	-3.8
25	AS5524-002	Sherman Ave north of Lakeview Ave	925.36	921.7	-3.6	922.3	-3.1	924.3	-1.1	925.6	0.2	925.8	0.4	925.9	0.5	925.9	0.6	925.8	0.4

Appendix F: Public Engagement and Focus Group Summary

Warner Park & Cherokee Marsh Watershed Study
Public Information Meeting #1
7/20/2023 – 6:00 PM

BC Attendees: Mike Wegner, Doug Joachim
City of Madison Attendees: Jojo O'Brien, Janet Schmidt, Hannah Mohelnitzky, Ryan Stenjem, Alder Myadze
Number of Public Attendees: 21
Meeting Recording:
https://media.cityofmadison.com/Mediasite/Play/22a67e4e1084405e8d3ec030e2dbeaf11d

Meeting Presentation:
https://www.cityofmadison.com/engineering/documents/projects/WarnerCherokee_PIM1.pdf

Questions & Answers

1. **What can we do to urge the Mayor and the City of Madison to place the Warner Park Renovation on the city budget? It was approved a couple years ago by the City Parks Board of Supervisors? It is a crucial part of our Northside watershed. It is important to note that our Mayor has stated that this is "not one of my priorities", as this has been placed in the 2032 budget at the earliest. despite its approval by the Board of Supervisors a couple years ago.**
   The Warner Lagoon dredging is scheduled for 2027, however, the project requires additional outside funding. The City is working on obtaining funding, such as grants, from state and federal agencies. If an additional funding source is identified, it could move earlier in the CIP. However, due to cost escalation, it may require additional City funding which will delay the project. The City is ready to start work on the project if funding is obtained. To put the project in context, it was estimated in the Warner Lagoon water quality plan as a $4.5 million project. The total stormwater budget is $7.3 million for six years. Outside funding is necessary to move the project forward.

2. **Sedimentation from runoff in existing water collection ponds is a big issue, how will this remediation be implemented?**
   The City has stormwater ponds that are used to capture sediment. The intent is to have sediment be captured in ponds as that is their job. Once the sediment level accumulates within a pond that it no longer functions, the City will dredge the pond of sediment. As explained previously, dredging is challenging. The City checks ponds every five years to measure sediment depth and has an overall dredging plan. The ponds are designed so the sediment settles near the outfall where it is easier to remove.

3. **Can you please explain the benefits that will go into the cost-benefits analysis and how those are monetized?**
   For flood mitigation efforts, the City looks at a variety of criteria that is put into an analysis. Some of the factors that are considered include emergency services, flood level of service targets, racial equity/social justice, cost, how many homes no longer flooded, among other factors. When a solution is developed from a study, the estimated cost and feasibility is used

with the various factors to try to rank projects for completion moving forward. There is a challenge with some projects being very expensive.

4. **Do curbs and sidewalks help water flow to directly where it needs to go?**
   Yes, curbs funnel water towards inlets, where it is supposed to go. From there it enters the storm sewer system. Sidewalks are more for safety which is why they are behind the curb. Sidewalks are designed to allow water to drain across them.

5. **Is any consideration being given in the study to the redevelopment on northside where land that can absorb rainfall is replaced by concrete/housing?**
   The City revised Chapter 37, regarding stormwater, of General Ordinances a few years ago. For a redevelopment the ordinance requires flood mitigation measures. The revisions also included heightened requirements for new development (i.e. open field that is developed). The requirements are more stringent than the prior ordinance version, to help navigate the impacts of climate change and ensure resilience.

6. **Did the City of Madison core sampling and analysis show heavy metal contamination in Warner Lagoon? If not, then the plan to spread that Warner lagoon sediment (as suggested by the DNR) can take place on the existing athletic fields. If so, the cost of the Warner Park Lagoon renovation would be substantially reduced (at least 10X less cost according to the Kurt Welke, past DNR fisheries biologist for Dane County.**

   The City did have core sampling done. Additional testing is needed. The City has been sampling at the lagoon for a while. The results do not indicate heavy metals, however, the City has run into issues in other locations in the city with PFAS in the sediment. This is not believed to be an issue here, but more sampling is needed before the project launches in earnest. This will help to inform future project costs.

7. **How do giant parking lots and golf courses affect flooding events (ie is there low hanging fruit)?**

   Large parking lots are treated as an impervious area in the model. These areas generate significant amounts of runoff, which is accounted for in the model and this results in increased flooding. From a modeling perspective, golf courses can be tricky in how much runoff is generated. They are generally open space and grassed, but they do have irrigation and drainage systems. They do absorb more water than parking lots.

8. **Is the City of Madison pursuing any federal grant dollars specific to resiliency (if there are any to pursue)?**

   Yes, the City is always looking to apply for federal money when possible, and there is funding related to resiliency. There is a project on the west side, within the Pheasant Branch watershed, where the road had been destroyed on Deming Way. The City has been awarded funding from the FEMA Building Resilient Infrastructure and Communities grant program. The City continues to pursue funding of this type whenever possible. Every year the City requests funding from the federal government as part of appropriations, but it is very competitive and the City hasn't had success. The City does have a consultant to assist with grant applications and will continue pursuing grants as much as possible.

9. **Is the City working with Sustain Dane to enhance sustainability efforts related to stormwater flooding?**
   The City has not worked with Sustain Dane on flooding related issues. However, the City will explore a potential partnership on this topic.

10. **When should we expect the recording from this meeting to be available on the project website?**
    The recording will probably be available in 24 hours.

11. **For all the property taxes we pay, it sure seems that the Northside is being neglected.**
    As the watershed studies are being completed, each year the City reviews budget needs and shifts projects. Just because something is programmed on the west side currently, doesn't mean we won't move northside projects up if it makes sense from a cost-benefit perspective.

Warner Park & Cherokee Marsh Watershed Study
Public Information Meeting #2
10/21/2024 – 6:30 PM

BC Attendees: Mike Wegner, Cara Hiler
City of Madison Attendees: Jojo O'Brien (City), Hannah Mohelnitzky (City), Ryan Stenjem (City), Greg Fries (City), Janet Schmidt (City), Aliana Baker (City)
Number of Public Attendees: 47
Meeting Recording:
https://media.cityofmadison.com/Mediasite/Play/2bfbef44abb0438587ecff9cf89a9b6e1d
Meeting Presentation:
https://www.cityofmadison.com/engineering/documents/projects/2024-10-21-WarnerCherokee_PIM_2.pdf

<u>Question & Answers</u>

Q1. Milwaukee's deep tunnel system allows sanitary sewer overflow to go into the stormwater system in catastrophic situations. Is the same true for Madison?

A. No, Madison's sewer system is different from the Milwaukee system. Madison has separate stormwater and sewer systems, so there isn't any crossover of flows.

Q2. How and where can residents make flood reports?

A. Go to this website: www.cityofmadison.com/flooding and click the "Report Flooding" button.

Q3. How does the hydrology of having drinking water Well 13 at Wheeler Road and Well 7 at North Sherman Avenue and Schlimgen Avenue running affect your stormwater modeling? Specifically, if a catastrophic event forced the shutdown of well 13 and well 7 and thus shut off the pumps that pull up water from the aquifer, would inundation increase?

A. The modeling discussed in this meeting relates to surface water. Groundwater impacts are not covered in this modeling. Additionally, the deep aquifer does not impact stormwater runoff.

Q4. How would the planned new development on the Raemisch farm field between North Sherman Avenue and Packers Avenue--meaning much more impervious surface--affect your modeling?

A. That site is on the border between two different watersheds (the Warner/Cherokee and Starkweather Creek watersheds). Water from this site will be contained to either watershed and not have any flow crossing into the other. The City has ordinances in place on how a property must detain water. This includes keeping the water on site for 100-yr and 200-yr storm events and limiting the peak discharge rate. Modeling to consider routing of the water is required, during storm events the water needs to be contained in the public right of way and in large events no flooding of homes is allowed.

Q5. What is the impact to flooding risk with invasive species in the watershed such as cattails?

A. Native vegetation helps infiltrate stormwater with its roots and can help in smaller storm events. During larger events, which cause flooding, it does not have a significant impact on flooding as compared to invasive species.

Q6. What is the uncertainty in the inundation maps?

A. There isn't a specific depth range or percentage of uncertainty within the models. Each model represents a specific set of conditions, including representing a specific rainfall event, including the rainfall rate at which rainfall falls and the total amount over a day. The model assumes a constant rainfall across the entire watershed which differs from real life.

Q7. Does the model account for future climate change predictions?

A. Not specifically. The model uses current rainfall data and considers a variety of storm event. Designing for the 100-yr storm event helps make the City more resilient to climate change. We model different storm events (such as the 200-yr and 500-yr) to look at the impact and areas of overflow and see where the City can upsize solutions to mitigate impacts of larger storm events.

Q8. What studies are available to help us understand groundwater levels mentioned but not included in this study?

A. More information can be found here: Groundwater Impacts | Flooding | City of Madison, WI

Q9. Any possibility to lower lake levels a foot to alleviate flooding citywide?

A. WDNR set the orders governing lake level control for Lake Mendota and the entire Yahara chain of lakes. Dane County has adopted a formal resolution on how the lakes will be managed and how they will try to reduce the flooding which has involved a dredging project that Dane County commenced in 2020. They have been implementing this for 4 years and have made solid progress. Dane County has had resolutions on the matter, but ultimately the WDNR has the final say. No agreement on a modified approach to lake level management has been reached and WDNR has maintained the prior resolution on lake levels. Additional information can be found on-line regarding past discussions regarding lake level management by searching for YLAG 1 and YLAG 2.

Q10. What is the funding forecast for addressing whatever your recommendations will be?

A. Brown and Caldwell are currently looking at possible solutions on what fixes we can come up with to help alleviate flooding. All stormwater improvement projects are funded out of the stormwater utility rates that are apart of your municipal bills. If the City has to borrow more money to do more projects, those utility rates would increase. The City is looking for grant opportunities or capitalizing on big projects to have large solutions that do not have as big of an impact on the ratepayers. An example of this is University Avenue where the City got federal funding for some big storm sewer improvements. Money is always going to be an issue and these projects will most likely take decades to complete. The City is trying to tackle them one by one.

Q11. What does upsizing solutions mean?

A. It can mean a variety of things such as increasing the size of a pipe to prevent flooding in larger storms. The City is looking to maximize the size of pipes that can fit under the street or can fit within existing infrastructure. A lot of times there is not the option to upsize pipes. Other things than can be upsized would be channels or ponds to increase the capacity of water to prevent flooding upstream.

Q12. Has there been any updates on the improvements to Warner Park Lagoon?

A. Yes, the project is still in place for the 2027 construction budget and work has been started to collect more information. These improvements are mostly related to water quality instead of flood mitigation. The improvements include doing a bit of work over on Castle Creek and cleaning out the channel to provide some water quality benefits before the water enters the lagoon.

Q13. Wouldn't dredging the existing water channels be beneficial to water overflow?

A. Dredging does not have a significant impact on water overflowing and is done for water quality purposes. The top of the water surface is generally what controls the water movement. For a channel, dredging doesn't impact the water surface and area that is able to move water out of the outlet where the channel meets the marsh.

Q14. Is there a plan to dredge the Cherokee Creek (greenway located south of Menomonie Lane), where the three detention ponds and the golf course flow into?

Q15. Will there be any dredging in the Cherokee Creek where the canal from the country club runs along Menomonie and drains out to the marsh?

A. There is no plan for the City to dredge the greenway as maintenance of the greenway is not the responsibility of the City. There are disagreements about who's responsibility it is to maintain Cherokee Creek. The current understanding is that maintenance of this channel is not the responsibility of the City of Madison, but rather the neighborhood association unless the channel is unable to convey stormwater effectively. It is identified as a navigable water of the state, a wetland, and a floodplain. This means it would require getting permits from FEMA, WDNR, and the US Army Corps of Engineers to do any work to this channel. There are no plans from the City to dredge this channel until it is determined that the channel has insufficient capacity, and there is an issue with stormwater conveyance.

Q16. Does this study map the flow of water through the creek from the golf course to the Yahara River?

A. Yes, the greenway is included in the model.

Q17. Who dredged the Menomonie Lane waterway in 1993?

A. The City did not perform dredging and does not know if the channel was dredged, and if so, who dredged the channel. As mentioned in the answer for Q5., the answer is not clear at the moment, but the City is investigating the legal issues further.

Q18. Who are the staff we can contact regarding the legal team who have evaluated the Menomonie Channel responsibilities?

A. Email's can be sent to District 18 and Alder Myadze who is further investigating this issue.

Warner Park & Cherokee Marsh Watershed Study
Public Information Meeting #3
9/23/2025 – 6:30 PM

BC Attendees: Mike Wegner
City of Madison Attendees: Hannah Mohelnitzky, Ryan Stenjem, Greg Fries, Janet Schmidt, Aliana Baker
Number of Public Attendees: 22
Meeting Recording:
https://media.cityofmadison.com/Mediasite/Play/539cd007127e43169820b330069ae9621d

Meeting Presentation: https://www.cityofmadison.com/engineering/documents/projects/2025-09-23%20Warner-Cherokee%20PIM%203%20FINAL.pdf

Question & Answers

Q1. What are the lime green areas?

A. Green shaded areas on the mapping identifies potential areas inundated during the various storm events.

Q2. The Menomonie Channel is full of fallen trees and cattails. Why doesn't the City clear the fallen trees?

A. The analysis completed as part of the study shows that the channel currently has adequate capacity. Access to the channel is challenging and would disturb additional areas.

Q3. Is the City working with the County and upstream communities to mitigate flash flooding coming from upstream? There are several large construction projects planned upstream in other townships and villages that could greatly increase paved surfaces and stormwater runoff into the upper Yahara and Token Creek?

A. The City promotes proper stormwater management and enforces their stormwater ordinance in land under its jurisdiction to help prevent impacts from flash flooding. The City does not have jurisdiction over lands in other communities. Those communities have stormwater ordinances similar to the City and they enforce those requirements.

Q4. Have you considered beaver impacts?

A. The City has taken action to control beavers if problems are occurring. This is done based on inspections of the City's properties. Any beaver control is done in accordance with WDNR requirements.

Breakout Groups

Breakout groups were held following the question and answer period. Breakout groups were divided geographically and included 1) Menominee Channel, 2) Castle Creek, 3) local sewer project areas, and 4) Warner Park drainage areas including the Lake View and Drewery Diversion Sewers and Camino Del Sol Relief Sewer. The number of attendees varied by group and BC and City staff answered questions and discussed issues in those areas. Additional notes relevant to those areas are provided below.

1. Menominee Channel Focus Group: Residents were primarily interested in discussing channel conditions. They did not offer much comment on the watershed study itself.
    a. There was discussion regarding the potential to dredge the channel. The City intends to dredge the channel when there is insufficient capacity. The current study shows capacity is adequate.
    b. Residents were interested in what they may be able to do on their own to clear trees and other debris. The agreement with the home-owners association places responsibility for routine maintenance on the association. The City is open to residents performing work provided proper agreements and waivers are in place.
2. Castle Creek Focus Group: The residents and Alders representing the area discussed an overview of the proposed project. There was interest in how the project can be implemented and what the potential timeframe for implementation would be. Grant opportunities are being explored. Coordination with parks is ongoing and needs to continue. The project is not budgeted for 2026, thus it likely would not occur before 2027.
3. Local Sewer Project Area Focus Group: No residents attended this focus group.

Warner Park & Cherokee Marsh Watershed Study
PIM #3 Community Outreach Event Summary

Outreach activities were undertaken to publicize PIM #3. The outreach activities were focused on trying to meet residents at community events to share information about the project, gather feedback regarding inundation mapping and past flooding, and to spread awareness for PIM #3. The events attempted to meet residents or other stakeholders in the community at events they were already attending, rather than trying to gain attendance to a separate event. It was an effort to meet residents who do not typically engage as part of prior public information efforts. The following provides a summary of each event.

1. **<u>August 7, 2025, 4pm – 7pm: Pizza Night, hosted by Rooted community group at Troy Farm Gardens</u>**
   This event was hosted by a community group within the Troy Farm Gardens in the watershed. Attendees can buy pizza, buy produce, and listen to local music. Table / poster with watershed study information was set-up near entrance to event. Attendees varied in age and included residents of the watershed and surrounding areas. Conversations at the event discussed the watershed study, flooding experienced by residents, and potential flood mitigation measures, along with water quality. Approximately 20 people engaged in conversation regarding watershed study.

2. **<u>August 13, 2025, 5pm – 7pm: Parks Alive, hosted by City Parks Department at Warner Park near Trailsway</u>**
   This event was a part of a series of events hosted by the City Parks Department at various parks within the City. Multiple Parks Alive events are hosted in Warner Park annually. The focus is on engaging children and young families within public spaces. The event included a DJ and community groups that provided activities to engage with children. The theme of the event was Arts & Crafts. Table / poster with watershed study information was set-up and legos were provided for a bridge building activity with children along with coloring sheets. Conversations with various families focused on flooding within the Trailsway area near the event location as several residents from this area were present. Also discussed were potential improvements being considered to mitigate flooding within the area. Approximately 10 families were engaged in discussions regarding the study, additionally, approximately 20 other children engaged with the activities.

3. **<u>August 24, 2025, 8:30am – 12:30pm: Northside Farmer's Market at the Northside Town Center</u>**
   Event occurs weekly within the Northside Town Center parking lot near Sherman Avenue. Event included various vendors and entertainment. Attendees varied in age and included residents of the watershed and surrounding areas. Conversations at the event discussed the watershed study, flooding experienced by residents, and potential flood mitigation measures, along with water quality. Approximately 50 people engaged in conversation regarding watershed study.

4. **<u>August 28, 2025, 4pm – 7pm: Pizza Night, hosted by Rooted community group at Troy Farm Gardens</u>**
   This event was hosted by a community group within the Troy Farm Gardens in the watershed. Attendees can buy pizza, buy produce, and listen to local music. Table / poster with watershed study information was set-up near entrance to event. Attendees included varied in age and included

residents of the watershed and surrounding areas. Conversations at the event discussed the watershed study, flooding experienced by residents, and potential flood mitigation measures, along with water quality. Approximately 12 people engaged in conversation regarding watershed study.

5. **September 7, 8:30am – 12:30pm, 2025: Northside Farmer's Market at the Northside Town Center**
   Event occurs weekly within the Northside Town Center parking lot near Sherman Avenue. Event included various vendors and entertainment. Attendees varied in age and included residents of the watershed and surrounding areas. Conversations at the event discussed the watershed study, flooding experienced by residents, and potential flood mitigation measures, along with water quality. Approximately 30 people engaged in conversation regarding watershed study.

Appendix G: 0.2% Chance Storm Event Pipe Enlargement Summary

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5423-002_AS5423-003	21	25.2	21	25.7	21	25.7
AS5423-003_AS5423-004	19x30	21.9	19x30	21.9	19x30	23.0
AS5423-004_AS5423-005	19x30	21.8	19x30	21.9	19x30	22.6
AS5423-005_AS5423-010	21	15.6	21	15.3	21	22.8
AS5423-010_AS5423-011	19x30	35.1	19x30	35.2	24x38	58.7
AS5423-011_AS5424-001	19x30	20.2	19x30	20.5	24x38	36.0
AS5424-001_AS5424-002	24	17.8	24	18.4	24x38	32.0
AS5424-002_AS5424-003	24	13.1	30	16.1	30	28.4
AS5424-003_IN5424-004	24	18.6	30	19.7	29x45	30.2
IN5424-004_AS5524-002	24	33.5	30	38.8	29x45	70.1
AS5424-007_AS5524-003	12	8.0	12	8.9	12	10.4
AS5425-010_AS5426-010	36	88.5	36	114.3	43x68	186.8
AS5426-007_AS5427-027	36	108.9	36	135.2	43x68	209.5
AS5426-010_AS5426-007	36	88.5	36	114.1	43x68	187.3
AS5427-001_AS5427-002	42	91.4	48x76	218.9	4x8	379.7
AS5427-002_MI5427-034	42	128.0	48x76	297.0	4x10	533.6
AS5427-006_IN5427-073	42	161.9	48x76	330.2	4x8	502.9
AS5427-009_AS5427-010	42	87.8	48x76	282.2	4x10	444.2
AS5427-010_AS5427-031	42	93.5	4x8	323.5	4x10	447.1
AS5427-027_AS5427-006	42	129.0	48x76	287.5	4x8	460.4
CB5427-028_AS5427-010	12	8.3	30	45.4	30	44.7
Link8000	N/A	N/A	4x8	323.9	4x10	446.0
AS5427-033_AS5427-009	42	89.3	48x76	282.1	4x10	466.4
AE5427-037_AE5427-038	27	-12.6	27	-12.3	27	-14.3
IN5327-001_AE5427-039	12	3.4	12	3.2	12	3.2
IN5427-040_AE5427-041	24	16.8	24	15.9	24	15.9
IN5427-042_IN5427-040	24	17.3	24	16.7	24	16.7
IN5427-043_IN5427-042	24	10.5	24	9.9	24	9.9
IN5427-044_IN5427-043	24	15.1	24	14.2	24	14.3
IN5427-045_IN5427-044	21	13.0	21	13.0	21	13.0
IN5427-046_AE5427-048	21	12.5	21	11.6	21	11.5
IN5427-049_IN5427-046	21	11.6	21	11.2	21	11.2
IN5427-050_IN5427-049	21	13.8	21	13.2	21	13.2
IN5427-051_IN5427-050	18	12.1	18	11.7	18	11.7
IN5427-052_IN5427-051	18	6.7	18	6.4	18	6.5
AS5427-055_AE5427-054	24	32.4	24	23.0	24	22.9
AE5427-056_AS5427-055	24	26.0	24	21.2	24	20.4
IN5427-059_AE5427-060	27	23.0	27	20.4	27	20.4
CB5427-062_IN5427-059	27	23.7	27	21.9	27	20.6
IN5427-063_CB5427-062	27	21.2	27	20.5	27	20.5
IN5428-026_IN5427-063	15	2.3	15	2.3	15	2.3
IN5428-027_IN5428-026	12	2.4	12	2.4	12	2.4
IN5427-065_IN5427-063	24	13.0	24	12.3	24	12.3
IN5427-067_IN5427-065	21	5.9	21	5.7	21	5.1

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
IN5427-068_IN5427-067	21	5.6	21	5.5	21	5.5
IN5427-069_IN5427-068	21	8.8	21	8.4	21	7.8
IN5427-070_IN5427-069	18	9.3	18	9.1	18	9.1
IN5427-073_AS5427-074	42	137.8	48x76	308.0	4x8	477.3
AS5427-074_AS5427-001	42	98.5	48x76	236.8	4x8	392.6
AS5427-076_AS5427-077	30	33.8	30	35.0	30	38.6
AS5427-077_AS5427-002	30	39.1	30	39.8	30	43.0
AS5427-080_AS5427-076	30	28.2	30	29.6	30	34.1
AS5524-001_AS5524-002	18	11.9	24	16.5	24	20.5
AS5524-002_AS5524-003	36	38.6	36	44.4	38x60	86.4
AS5524-003_AS5525-003	36	42.1	36	49.0	38x60	95.0
AS5524-005_AS5524-001	18	17.6	18	17.9	18	20.6
AS5525-001_AS5525-004	36	53.8	36	59.7	38x60	114.8
AS5525-003_AS5525-001	36	42.5	36	49.2	38x60	96.9
AS5525-004_AS5526-001	36	69.1	42	95.2	43x68	168.4
AS5526-001_AS5425-010	36	70.8	42	95.2	43x68	168.3
AS5527-001_AS5527-004	30	39.2	48	112.4	48x76	178.0
AS5527-004_AS5527-011	30	43.7	48	124.7	48x76	188.1
AS5527-011_AS5427-027	24x38	46.2	42	124.8	48x76	188.0
AS5527-012_AS5427-006	21	29.1	21	31.1	21	31.1
IN5527-013_IN5527-018	30	28.0	36	47.9	48	102.0
IN5527-018_AS5527-044	30	30.9	36	56.0	48	115.2
IN5527-030_IN5527-013	24	32.7	30	58.9	42	122.1
IN5527-032_IN5527-030	24	31.9	30	55.4	36	95.1
AS5628-080_IN5628-084	15	8.3	21	16.6	24	26.4
IN5628-084_AS5628-085	15	8.1	21	14.2	24	25.6
AS5628-085_MI5628-086	24	34.3	30	57.9	36	93.7
AS5527-044_AS5427-002	30	32.8	36	56.4	48	123.7
AS5527-048_AS5427-001	24	17.5	24	26.2	24	37.3
MI5427-034_AS5427-033	42	111.4	48x76	282.9	4x10	514.1
MI5628-086_IN5527-032	24	30.9	30	55.1	36	95.0
Link7928	24	18.6	24	18.8	24	18.8
Link7918	18	17.7	36	81.5	36	81.5
Link8001	N/A	N/A	4x8	324.1	4x12	446.0
Link8002	N/A	N/A	4x10	314.5	4x12	425.2
Link8003	N/A	N/A	4x10	311.0	4x12	399.7
IN5416-002_AE5416-001	12	6.7	12	5.9	12	5.9
IN5316-003_AS5316-005	18	10.6	24	24.7	24	24.7
AS5316-005_IN5316-006	21	18.4	24	43.7	24	43.7
IN5316-006_AE5316-001	21	24.1	29x45	59.7	29x45	59.7
IN5315-001_IN5314-003	15	0.0	15	0.0	15	0.0
IN5314-001_IN5314-002	12	0.0	12	0.0	12	0.0
IN5314-002_IN5315-001	12	0.0	12	0.0	12	0.0
IN5314-003_AE5314-004	15	0.0	15	0.0	15	0.0

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
IN5216-001_AE5216-002	18	19.2	18	19.2	18	19.2
IN5216-003_IN5216-001	15	16.2	15	16.6	15	16.6
IN5215-002_AE5215-001	12	8.4	12	8.4	12	8.4
IN5215-003_IN5215-002	12	8.0	12	7.9	12	7.9
IN5218-010_AE5218-007	18	15.7	18	16.1	18	16.2
IN5218-012_AE5218-015	24	25.9	24	27.0	24	28.1
IN5117-013_AE5118-001	18	13.0	19x30	28.3	19x30	28.3
IN5519-002_IN5519-006	18	25.1	24	51.8	24x38	96.1
IN5520-002_IN5520-003	18	23.0	21	35.9	24x38	91.6
IN5520-003_IN5519-002	18	23.6	21	37.4	24x38	90.3
Link7885	43x68	47.7	43x68	51.9	43x68	51.1
Link7883	43x68	45.6	43x68	42.2	43x68	42.2
Link7886	43x68	71.6	43x68	70.1	43x68	70.1
Link7884	43x68	58.5	43x68	60.7	43x68	60.7
IN5218-028_IN5218-026	12	6.0	24	32.3	24	32.3
CB5117-017_MI5117-014	15	17.7	15	17.8	15	17.8
CB5117-018_AE5117-007	18	14.8	18	15.1	18	15.1
CB5117-019_AE5117-011	18	16.8	18	16.9	18	16.9
CB5217-009_AE5217-001	18	17.6	24	30.3	24	30.3
IN5217-010_AE5217-008	21	26.8	21	26.9	21	26.9
IN5418-006_IN5418-008	34x53	64.3	34x53	64.9	34x53	67.7
IN5418-008_IN5518-004	34x53	49.1	34x53	53.9	34x53	54.6
IN5518-004_IN5518-006	34x53	45.2	34x53	58.2	34x53	58.3
Link7887	34x53	55.1	34x53	63.2	34x53	63.3
IN5519-006_IN5519-007	24	27.7	24	38.2	24x38	70.8
IN5519-007_IN5519-008	19x30	27.7	19x30	38.1	24x38	65.6
IN5519-008_IN5519-009	24	27.7	24	38.2	24x38	59.5
IN5519-009_IN5519-010	27x42	39.0	27x42	41.1	27x42	47.1
IN5519-010_CB5519-011	29x45	41.1	29x45	43.1	29x45	42.9
CB5519-011_IN5418-006	34x53	77.2	34x53	80.2	34x53	84.2
MI5117-014_MI5117-015	24	17.7	24	17.8	24	17.8
MI5117-015_AE5117-016	24	17.7	24	17.8	24	17.8
Link8100	N/A	N/A	18	14.4	18	13.4
Link7915	24	14.0	24	14.1	24	14.1
Link7916	18	15.0	18	15.0	18	15.0
Link8102	N/A	N/A	18	11.0	18	11.0
Link7917	18	11.8	18	11.7	18	11.7
Link7939	3.5x6	23.0	3.5x6	23.0	3.5x6	23.0
Link7941	36	33.4	36	31.8	36	31.8
Link7942	24	14.1	24	13.8	24	13.8
Link7943	2-24	8.6	2-24	8.8	2-24	8.7
Link7944	60	27.9	60	22.8	60	22.8
Link7944	48	18.7	48	15.6	48	15.6
Link7945	36	-17.0	36	-16.8	36	-16.9

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
Link7946	36	27.2	36	27.6	36	26.7
Link7947	24	10.7	24	-10.8	24	-10.8
Link7948	24	19.2	24	18.9	24	18.9
Link7950	36	44.0	36	43.9	36	43.9
Link7952	24	21.1	24	22.7	24	22.7
Link7956	18	-5.4	18	-5.4	18	-5.4
Link7957	36	-5.7	36	-5.8	36	-5.8
Link7958	36	-15.2	36	-14.9	36	-15.0
Link7959	3x30	41.0	3x30	39.5	3x30	39.5
Link7960	3.4x30	32.7	3.4x30	33.0	3.4x30	33.0
Link8101	N/A	N/A	24	11.1	24	11.1
AS5219-002_AS5219-004	30	54.4	30	54.4	36	77.3
AS5219-004_GR5219-009	36	79.0	36	79.4	36	101.5
AS5319-001_AS5219-002	30	67.6	30	67.7	36	105.1
AS5421-004_AS5321-020	18	17.4	36	99.6	36	100.2
IN5321-001_IN5221-006	3x7	208.3	3x7	192.9	4x8	342.5
IN5321-002_IN5321-001	12	12.4	12	5.0	12	11.4
IN5321-003_IN5321-001	12	9.4	12	5.9	12	9.0
IN5321-004_IN5321-001	12	13.2	12	5.8	12	12.1
IN5321-005_IN5321-001	12	9.4	12	4.7	12	8.6
IN5321-006_IN5321-010	12	12.2	12	3.8	12	10.1
IN5321-009_IN5321-010	12	11.3	12	6.4	12	10.5
IN5321-010_IN5321-001	3x7	165.8	3x7	182.3	4x8	290.8
IN5321-011_IN5321-010	18	20.5	36	97.8	36	113.5
AS5321-020_IN5321-011	18	19.9	36	114.7	36	115.3
AS5320-003_AS5319-001	30	66.7	30	66.7	36	105.1
AS5320-004_AS5320-003	30	55.1	30	56.3	30	56.4
IN5220-007_ND5220-022	3.5x7	287.4	3.5x7	300.5	3.5x8	449.4
Link7891	12	9.7	18	17.4	18	23.4
Link7890	12	9.9	18	23.6	18	25.3
IN5220-014_ND5220-023	3.5x7	199.3	4x6	327.6	5x8	464.9
IN5220-019_IN5220-014	12	4.6	18	9.9	18	-6.6
IN5220-020_IN5220-014	12	5.1	18	10.5	18	7.2
IN5220-021_GR5219-008	3.5x7	336.2	4x10	396.3	5x10	525.8
Link7888	12	11.4	30	53.7	30	80.4
IN5221-003_IN5221-006	12	12.6	12	9.0	12	11.4
IN5221-004_IN5221-006	12	12.5	12	5.7	12	6.7
IN5221-006_ND5221-017	3.5x7	213.9	3.5x7	192.5	4x8	346.0
Link7889	12	8.7	18	21.4	18	19.8
IN5221-016_ND5221-018	3.5x7	274.3	3.5x7	291.3	3.5x8	442.3
AS5120-010_TP5120-015	24	35.6	24	35.8	24	35.8
AS5120-013_TP5120-015	3.5x7	172.4	3.5x7	217.6	3.5x7	217.6
IN5120-016_AS5120-013	38x60	110.8	3x7	139.6	3x7	139.2
AS5120-018_AS5120-013	38x60	94.1	38x60	83.5	38x60	83.5

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5022-001_AS5021-017	36	86.8	38x60	180.0	38x60	180.8
AS5022-006_AS5022-001	36	94.9	38x60	190.9	38x60	192.3
AS5022-007_AS5022-006	18	10.8	18	14.1	18	12.8
AS5022-008_AS5022-006	18	11.2	18	14.8	18	13.0
AS5022-015_AS5022-006	36	101.0	38x60	187.3	38x60	197.3
AS5022-016_AS5022-015	18	13.7	18	21.3	18	20.9
IN5022-020_AS5022-015	12	-4.1	12	5.1	12	4.3
AS5022-021_AS5022-015	36	103.4	38x60	165.6	38x60	183.7
AS5021-005_AS5021-006	18	7.7	24	22.9	24	33.4
AS5021-006_AS5020-010	36	70.1	3x6	217.0	4x6	271.8
AS5021-012_AS5021-006	36	65.1	3x6	198.4	3x6	218.8
AS5021-017_AS5021-012	36	67.3	3x6	200.9	3x6	208.3
AS5020-006_AS5020-019	36	69.4	4x6	252.1	4x6	275.9
AS5020-008_AS5020-029	15	7.0	18	7.2	18	7.4
AS5020-009_AS5020-044	36	41.4	36	45.5	36	45.1
AS5020-010_AS5020-006	36	69.5	3x6	231.5	4x6	277.0
IN4920-006_AS4920-008	18	14.8	36	31.5	36	31.4
IN4920-007_AS4920-008	18	22.2	18	15.7	18	15.8
AS4920-008_AS5020-009	36	39.8	36	47.5	36	47.9
AS4921-001_AS5021-017	24	21.1	42	80.2	42	81.1
AS4922-005_AS4922-006	21	17.7	30	35.6	30	49.2
AS4922-006_AS4922-008	21	19.8	36	62.4	36	72.5
AS4922-007_AS4922-013	24	32.4	36	92.4	36	93.0
AS4922-008_AS4922-007	21	21.0	36	51.8	36	56.0
AS4922-013_AS4921-001	24	29.1	36	83.1	36	83.2
AS4923-016_AS4922-005	18	17.9	18	21.0	24	37.6
AS5023-002_AS5023-021	36	54.3	42	82.4	38x60	95.4
AS5023-015_AS5023-016	36	49.1	42	64.4	42	73.9
AS5023-016_AS5023-020	36	49.1	42	64.5	38x60	74.3
AS5023-020_AS5023-002	36	54.3	42	82.6	38x60	95.5
AS5023-021_AS5022-021	36	103.6	38x60	166.5	38x60	184.5
IN4922-015_IN4922-017	21	-7.7	21	1.4	21	1.4
IN4922-016_IN4922-015	15	-5.9	15	-0.2	15	-0.2
AS4922-018_IN4922-015	18	-0.9	18	1.2	18	1.2
IN4922-019_AS4922-018	15	-0.6	15	0.0	15	0.0
IN4922-020_IN4922-019	12	0.2	12	0.0	12	0.0
IN4922-021_AS4922-018	15	-0.3	15	0.7	15	0.7
IN4922-022_IN4922-021	15	-0.2	15	0.3	15	0.3
IN4922-023_IN4922-017	12	-4.3	24	-43.6	24	-43.6
Link8400	N/A	N/A	30	43.3	30	43.3
AS5321-021_IN5321-010	12	8.7	24	26.0	36	57.6
AS5321-022_AS5321-021	12	5.6	24	26.1	36	55.4
IN5321-024_AS5321-022	12	6.1	24	34.1	24	55.6
Link7892	3x7	213.8	4x10	365.5	5x10	488.4

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
IN5220-025_AS5220-024	12	6.4	18	14.2	24x38	13.2
IN5023-022_AS5023-023	24	31.8	36	46.8	36	47.0
AS5023-023_AS5023-015	30	43.0	42	64.1	42	73.8
AS5023-025_IN5023-022	24	27.4	30	43.2	30	44.5
AS5023-028_AS5023-025	24	25.0	30	42.1	30	43.6
AS5023-030_AS5023-023	24	17.6	24	21.9	24	26.0
IN4923-028_AS4923-029	24	51.5	24	52.6	24	52.6
AS4923-029_AS4923-016	36	51.4	36	52.6	36	52.5
AE5119-010_AE5019-001	36	13.1	36	14.6	36	14.7
AE5119-011_AE5019-002	36	12.6	36	14.1	36	14.1
AE5119-012_AE5019-003	36	11.2	36	12.8	36	12.8
IN5119-013_AE5119-014	48	109.9	48	134.1	48	132.3
IN5119-013_AE5119-015	48	109.9	48	133.8	48	132.0
AE5119-018_AS5119-019	36	34.6	36	35.8	36	35.8
AS5119-019_AE5118-002	36	34.6	36	35.8	36	35.8
AS5219-012_AE5218-019	36	47.3	36	47.7	36	48.8
AE5219-013_AS5219-012	36	48.7	36	49.2	36	51.4
AS5020-019_CB5020-036	36	68.8	4x6	180.9	4x6	185.3
Link7932	15	8.4	15	8.6	15	8.6
Link7933	15	8.4	15	8.6	15	8.7
AE5020-051_AS5020-052	43x68	65.5	43x68	88.4	43x68	88.7
IN4920-009_IN4920-006	18	11.9	36	29.5	36	29.4
IN5020-030_AS5020-008	12	3.2	15	-4.1	15	-4.2
Link7894	54	91.4	4x6	157.8	4x6	162.2
IN5020-040_AS5020-037	15	5.6	21	12.1	21	11.8
IN5020-041_IN5020-040	12	5.2	21	14.5	21	14.5
IN5120-030_IN5120-036	21	33.0	36	95.4	36	95.4
IN5321-023_IN5321-010	12	8.0	30	44.6	30	62.1
IN5321-030_AS5321-029	12	6.0	30	55.3	30	58.2
IN5321-031_IN5321-030	12	5.8	30	51.4	30	53.9
IN5120-033_AS5120-034	30	26.4	30	34.0	30	34.0
IN5120-036_AS5120-034	24	33.5	36	95.3	36	95.3
AS4920-011_IN4920-009	18	11.8	36	28.3	36	28.3
AS4920-012_AS4920-011	18	10.1	36	41.6	36	41.6
AS4921-003_AS4920-012	18	10.4	30	37.3	30	37.2
AS4921-007_AS4921-003	18	7.3	30	27.0	30	27.0
AS4921-008_AS4921-007	18	8.5	30	30.4	30	30.4
AS4921-010_AS4921-008	18	9.0	30	32.3	30	32.3
AS4921-014_AS4921-010	15	6.0	30	30.8	30	30.8
AS5020-029_CB5020-036	36	11.4	36	-12.9	36	-14.0
AS5020-037_CB5020-036	18	8.9	18	9.1	18	9.1
AS5120-029_IN5120-030	21	22.0	30	61.7	30	61.7
AS5121-005_AS5120-029	18	17.0	30	55.6	30	55.6
AS5121-010_AS5121-005	18	11.9	30	40.7	30	40.7

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5121-013_AS5121-010	15	10.1	30	53.0	30	53.0
AS5121-018_AS5121-013	12	5.5	24	28.8	24	28.8
AS5121-019_AS5121-018	12	5.2	24	31.1	24	31.1
AS5321-029_IN5321-028	12	6.7	30	45.0	30	52.8
AS5120-034_AS5120-035	30	49.0	34x53	112.7	34x53	112.7
AS5120-035_IN5120-016	30	48.8	34x53	107.0	34x53	107.0
Link7895	36	41.8	36	45.4	36	45.0
ND5220-022_IN5220-014	3x7	248.0	3x8	298.2	5x8	476.2
ND5220-023_IN5220-021	3x7	197.8	4x8	337.9	5x8	472.2
ND5221-017_IN5221-016	3x7	257.2	3x7	262.5	4x10	419.1
ND5221-018_IN5220-007	3x7	277.6	3x7	293.8	3.5x8	445.9
MI4923-031_IN4923-028	24	51.5	24	52.7	24	52.6
TP5120-015_IN5119-013	3.5x7	205.6	3.5x7	243.0	3.5x7	256.5
Link7966	N/A	N/A	18	11.2	24	18.6
Link7961	43x68	65.5	43x68	88.4	43x68	88.7
IN4825-004_IN4825-006	15	6.0	15	6.1	15	6.1
IN4825-006_IN4825-009	18	6.0	18	6.1	18	6.1
IN4825-009_AS4826-002	18	13.5	18	13.7	18	13.7
IN4825-010_IN4825-011	18	19.2	18	19.0	18	19.2
IN4825-011_AS4925-004	18	24.2	18	24.1	18	26.7
AS4925-001_AS4925-004	30	31.9	30	32.1	34x53	49.5
IN5025-002_IN5025-005	10	2.2	18	8.8	18	12.3
AS5025-003_IN5025-002	10	5.7	9.996	7.5	9.996	8.2
IN5025-005_IN5026-024	12	7.1	30	46.0	34x53	102.2
AS5025-007_AS5026-004	12	5.9	5x7	283.9	5x12	511.4
IN5025-008_AS5125-001	12	0.0	12	8.2	12	8.7
IN5124-002_AS5124-077	12	16.4	12	16.6	12	16.6
AS5124-003_AS5124-006	24	37.7	24	37.9	24	37.9
AS5124-004_CB5125-025	24	35.5	24	36.3	24	37.0
AS5124-006_AS5124-004	24	27.9	24	28.0	24	28.0
IN5124-007_AS5124-006	12	7.5	12	7.8	12	8.1
AS5124-008_AS5124-037	30	51.9	34x53	127.1	4x6	258.5
AS5124-027_AS5124-059	24	18.8	29x45	54.7	38x60	95.5
AS5124-037_AS5125-012	36	59.1	38x60	125.6	4x6	263.8
AS5025-007_AS5125-001	30	-18.5	5x6	270.2	5x10	508.7
IN5125-003_AS5125-001	12	0.0	12	13.7	12	15.3
AS5125-004_AS5125-001	30	32.3	29x45	60.0	38x60	87.4
AS5125-005_AS5125-004	30	38.5	29x45	62.3	29x45	88.1
AS5125-012_AS5125-017	36	47.7	38x60	122.6	4x6	249.7
AS5125-017_AS5125-001	36	51.7	4x6	192.7	5x10	385.6
AS5125-021_AS5125-017	18	8.2	30	31.2	29x45	52.8
AS5125-022_AS5125-021	18	14.6	30	40.8	29x45	63.8
IN5127-001_IN5127-002	12	1.8	12	1.8	12	1.8
IN5127-002_AE5127-003	15	5.8	15	5.8	15	5.8

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5127-008_IN5127-013	18	7.6	18	7.7	18	7.7
DT5127-020_DT5127-021.1	36	32.1	36	32.9	36	32.9
IN5127-013_AE5127-014	18	7.2	14x23	7.3	14x23	7.3
AS5127-016_DT5127-018	48	154.3	84	421.2	6x10	701.5
AS5126-001_AS5126-009	48	141.5	5x7	363.1	5x12	615.2
AS5126-004_AS5127-016	48	154.0	84	419.6	6x10	701.7
AS5026-002_AS5026-003	18	13.1	30	52.4	34x53	107.2
AS5026-003_AS5126-001	48	101.3	5x7	348.2	5x12	615.2
AS5026-004_AS5026-003	48	90.6	5x7	295.8	5x12	516.3
AS5026-006_AS5027-009	36	102.7	36	102.7	36	102.7
AS5026-009_AS5026-006	30	55.2	30	44.2	30	42.1
AS5026-014_AS5026-009	30	36.9	30	38.8	30	37.6
AS5026-015_AS5026-014	30	24.2	30	22.0	30	15.2
Link7902	15	15.5	15	15.6	15	15.6
AS5027-002_AS5027-001	15	13.8	15	13.8	15	13.8
AS5027-008_MI5027-013	48	107.9	48	102.3	48	102.3
AS5027-009_AS5027-008	48	102.0	48	102.0	48	102.0
AS4826-002_IN4826-003	18	13.4	18	13.6	18	13.6
IN4826-003_IN4825-010	18	11.4	18	11.4	18	11.6
AS4826-005_AS4826-008	30	66.2	30	66.6	34x53	133.9
AS4826-008_AS4826-012	30	49.3	30	49.4	34x53	114.8
AS4826-012_AS4826-013	30	57.2	30	57.2	34x53	136.6
AS4826-013_AS4827-001	30	67.5	30	67.6	34x53	160.4
AS4827-001_AS4827-002	36	51.7	36	51.8	34x53	87.3
AS4827-002_AS4827-004	36	92.1	36	92.4	34x53	144.3
AS4827-004_AS4827-005	36	80.3	36	79.5	34x53	121.5
Link7899	36	78.7	36	78.7	34x53	120.2
AS5225-001_AS5125-022	18	9.0	30	33.4	29x45	55.9
AS4925-004_AS4826-005	30	66.3	30	66.7	34x53	135.6
IN5126-006_IN5126-007	12	0.0	12	13.6	12	5.6
IN5126-007_AS5126-009	15	12.8	30	41.0	30	38.1
IN5126-008_IN5126-006	12	0.0	12	7.6	12	1.3
AS5126-009_AS5126-004	48	150.3	84	411.7	6x10	665.3
Link7903	42	148.2	42	148.9	42	148.9
AS5125-024_AS5125-005	24	23.1	24x38	35.6	24x38	37.1
CB5125-025_AS5125-024	24	29.8	24	35.5	24	37.1
AS5124-041_MI5124-042	24	35.5	24	35.5	24x38	75.1
AS5124-046_AS5124-050	24	35.2	24	36.1	29x45	82.5
AS5124-050_MI5124-049	24	23.3	30	44.3	29x45	85.3
IN5124-051_AS5124-050	18	7.3	24	13.5	24	24.8
IN5124-052_IN5124-051	18	-11.7	18	-11.2	18	-10.9
IN5124-054_IN5124-052	18	-5.7	18	-4.9	18	6.2
AS5124-058_AS5124-059	24	20.0	30	44.3	29x45	87.1
AS5124-059_AS5124-060	24x38	33.7	34x53	99.6	43x68	189.7

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5124-060_AS5124-061	24	33.2	34x53	100.9	43x68	193.0
AS5124-061_AS5124-066	24	33.1	34x53	103.1	43x68	193.2
IN5124-064_IN5124-073	12	5.5	18	11.0	24	26.9
AS5124-066_AS5124-008	24	35.2	34x53	113.0	43x68	198.9
IN5124-069_IN5124-079	24	24.3	24	32.6	36	59.1
CB5124-072_IN5124-070	24	25.6	24	28.5	36	53.4
IN5124-073_CB5124-072	24	19.2	24	28.0	36	53.4
IN5124-074_IN5124-073	24	0.0	24	18.4	24	1.9
IN5124-075_IN5124-074	12	0.0	12	3.1	12	0.9
IN5124-076_IN5124-074	12	0.0	12	2.3	12	0.5
AS5024-013_AS5124-003	18	20.5	18	20.6	18	20.6
IN5024-014_AS5024-013	18	20.6	18	20.6	18	20.6
AS5124-077_AS5124-003	21	17.3	21	17.4	21	17.4
IN5124-079_MI5124-068	24	29.0	24	35.5	36	59.0
IN5124-070_MI5124-071	24	22.7	24	28.6	36	53.3
IN5026-024_AS5026-002	12	11.8	30	50.0	34x53	107.2
IN5124-080_IN5124-074	18	0.0	18	9.2	18	-1.0
DT5127-019_DT5127-022	36	3.9	38x60	4.0	38x60	4.0
DT5127-020_DT5127-021	36	18.2	36	18.7	36	18.7
DT5026-022_AS5026-015	24	19.6	24	20.1	24	14.7
MI5027-012_IN5027-011	42	148.2	42	149.0	42	149.0
MI5027-013_MI5027-012	4x5	148.4	4x5	149.3	4x5	149.3
MI5124-042_AS5124-046	24	36.2	24	36.2	24x38	73.8
Link7901	24	26.5	24	44.3	29x45	87.0
MI5124-068_AS5124-008	24	33.4	24	35.9	36	58.7
MI5124-071_IN5124-069	24	23.6	24	29.3	36	53.3
TP5025-014_IN5025-005	10	3.8	27	39.0	34x53	91.1
Link7934	3.333x4	65.6	3.333x4	9.7	3.333x4	-0.3
IN4722-004_AE4722-002	30	45.4	30	46.9	30	46.8
AS4722-008_IN4722-004	24	22.4	29x45	34.9	29x45	34.6
Link7898	12	4.5	12	0.0	12	0.0
IN4723-007_AS4723-008	18	14.5	18	14.5	19x30	25.4
Link7896	18	15.8	18	15.8	19x30	24.7
AS4723-010_AS4723-014	18	20.3	24	32.3	24x38	62.6
AS4723-011_AS4723-010	18	20.3	24	32.3	24x38	63.3
IN4723-012_AS4723-011	18	20.6	18	32.3	24x38	63.4
IN4723-013_IN4723-012	18	20.3	18	27.7	24x38	63.6
AS4723-014_AS4723-015	18	20.2	24	32.3	24x38	62.4
AS4723-015_AS4723-016	18	18.5	24	32.4	24x38	61.7
AS4723-016_IN4723-019	24	25.0	24	26.0	24x38	46.4
IN4723-019_AS4723-024	24	21.6	24x38	23.7	29x45	38.6
AS4724-001_AS4724-008	54	158.3	54	159.5	54	181.6
AS4724-008_IN4724-009	54	135.1	54	138.2	54	181.8
IN4724-009_AS4724-015	54	162.7	54	164.0	58x91	218.1

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS4724-015_AE4724-016	54	177.1	54	178.3	58x91	233.1
IN4724-019_AE4724-021	21	25.9	21	26.9	21	26.4
AS4724-022_AE4624-001	54	87.5	54	187.7	54	196.2
AE4724-023_AS4724-022	54	24.3	54	146.1	54	150.7
IN4724-024_AS4724-022	15	6.5	15	6.6	15	6.6
IN4825-003_AE4725-001	18	10.6	18	10.8	18	10.8
AS4824-001_AS4724-026	24	15.9	24	15.2	24	17.6
AS4824-004_AS4824-001	24	14.5	24	14.8	24	15.6
AS4824-009_AS4824-004	18	14.6	18	15.0	18	15.0
IN4823-003_AS4724-026	24	35.8	24	45.9	24	47.0
IN4823-004_IN4823-003	18	26.1	24	40.7	24	42.1
IN4823-006_IN4823-004	18	17.3	24	35.8	24	36.6
AS4724-026_MI4724-003	48	140.5	48	147.6	48	151.3
AS4723-024_AE4722-001	24x38	53.5	29x45	76.9	34x53	100.8
IN4724-029_AS4724-015	15	15.0	15	14.7	15	15.5
AS4724-034_AS4724-022	21	14.1	21	11.6	21	12.3
Link7897	18	11.8	18	12.7	19x30	25.1
Link9000	N/A	N/A	24x38	39.7	34x53	62.9
Link9303	N/A	N/A	24x38	31.9	24x38	32.8
DT4623-002_DT4623-001	18	17.4	18	17.5	18	17.5
MI4724-003_AS4724-001	48	128.7	48	129.2	54	151.9
Link7963	10x6	208.6	10x6	215.0	10x6	225.7
Link7962	10x6	208.6	10x6	215.0	10x6	225.7
Link7965	3-29x45	69.9	3-29x45	64.4	3-29x45	64.2
AS5325-004_AS5325-015	42	95.1	48	148.4	48x76	180.4
AS5325-021_IN5325-022	12	4.1	12	2.6	12	-4.5
IN5325-022_IN5326-006	2x2	5.1	2x2	2.9	2x2	-4.2
AS5325-023_AS5325-021	12	4.1	12	2.6	12	0.0
AS5325-025_IN5325-027	30	40.3	48x76	246.2	4x8	404.7
IN5324-002_AS5324-004	15	20.2	15	20.4	15	20.4
AS5324-004_AS5324-005	15	20.2	15	20.3	15	20.3
AS5324-005_AS5324-006	15	15.9	15	16.7	15	16.9
AS5324-006_IN5324-007	15	15.7	15	16.0	15	16.2
IN5324-007_AS5324-008	15	13.3	14x23	18.2	14x23	18.6
AS5324-008_IN5324-014	18	16.9	24x38	48.7	24x38	66.8
AS5324-013_IN5324-022	15	15.8	15	15.9	24	28.6
IN5324-014_AS5324-015	18	18.8	24x38	42.7	24x38	69.1
Link8200	N/A	N/A	29x45	61.6	3x6	104.8
AS5425-001_AS5425-017	24	14.2	43x68	189.1	4x8	337.4
IN5425-007_IN5425-005	18	15.9	38x60	213.2	4x8	337.9
AS5326-002_AS5226-076	48	118.9	4x8	360.7	4x12	551.4
IN5326-006_AS5326-002	18	11.9	18	7.4	18	4.9
AS5226-001_IN5227-026	12	11.8	18	22.7	18	22.6
Link8204	N/A	N/A	36	44.9	34x53	74.2

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5425-017_AS5325-025	21	37.6	43x68	246.3	4x8	404.7
IN5227-023_AE5227-025	24x38	44.5	24x38	44.5	29x45	92.5
IN5324-022_IN5324-023	15	14.2	15	14.6	24	28.2
IN5324-023_IN5324-024	15	14.2	18	22.7	24	46.4
IN5324-024_IN5324-025	15	13.4	18	21.9	24	44.6
IN5324-025_AS5324-008	15	11.2	18	20.5	24	36.7
IN5325-027_AS5326-005	30	39.0	48x76	224.5	4x10	427.0
IN5325-033_AS5325-004	36	41.7	38x60	97.7	38x60	95.6
IN5325-039_IN5325-034	36	37.7	36	56.7	36	69.1
AS5225-022_IN5325-044	21	28.7	21	30.0	21	30.0
AS5225-023_AS5225-022	15	12.9	18	17.8	18	17.8
AS5225-027_AS5225-023	15	13.2	18	20.9	18	20.9
IN5224-008_AS5225-027	15	1.7	15	2.0	15	2.0
IN5225-028_IN5224-008	12	1.7	12	2.1	12	2.1
IN5225-031_IN5225-028	12	1.7	12	2.1	12	2.1
AS5425-028_IN5425-007	15	12.4	38x60	154.3	4x8	256.0
AS5425-029_AS5425-028	15	16.0	48	154.3	4x8	253.6
IN5424-008_AS5425-029	15	16.1	36	127.6	3x6	177.8
IN5325-044_IN5325-039	30	60.3	30	61.4	30	63.0
IN5325-034_IN5325-033	36	29.4	36	64.0	36	79.2
IN5227-026_AE5227-028	24	32.6	24	30.7	24	30.3
AS5326-005_AS5326-004	30	50.9	60	254.1	4x10	463.0
AS5326-004_AS5326-003	30	48.7	60	223.0	4x10	397.1
AS5326-003_AS5326-002	48	130.3	4x8	352.0	4x12	559.3
AS5325-015_AS5326-003	42	108.2	48	149.3	48x76	181.1
AS5326-023_AS5326-007	24	21.3	30	36.3	30	47.0
AS5326-007_AS5326-005	24	19.7	30	34.1	30	45.6
Link8201	N/A	N/A	42	105.4	3x6	156.8
AS5226-062_AS5226-064	12	5.2	12	5.2	12	5.2
AS5226-064_AS5226-066	15	5.8	15	5.9	15	5.9
AS5226-066_AS5226-073	15	5.2	15	5.5	15	5.2
AS5226-073_CB5226-075	18	5.5	18	6.1	18	5.4
CB5226-075_IN5226-081	18	3.2	18	5.0	18	5.0
AS5226-076_AE5326-001	54	134.2	60	26.7	60	18.8
IN5226-081_AS5226-076	29x42	14.6	24x38	26.7	24x38	18.9
Link8203	N/A	N/A	24	18.5	24	31.4
Link8202	N/A	N/A	36	105.2	3x6	156.4
AS5429-002_AS5429-003	29x45	57.3	48x76	213.3	4x10	395.2
AS5429-003_CB5428-017	36	58.2	48x76	216.6	4x10	385.4
AS5429-019_AS5429-002	36	55.4	48x76	216.2	4x10	408.4
AS5430-001_AS5430-003	24	37.4	36	82.4	38x60	132.6
Link7909	36	77.9	48	211.0	4x6	370.0
AS5431-020_AS5431-025	18	7.0	18	9.5	18	9.9
AS5431-025_AS5431-026	18	3.6	18	9.5	18	9.9

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5431-026_AS5531-027	18	-4.6	18	9.4	18	9.9
IN5429-024_AS5429-019	36	52.1	48x76	204.0	4x8	367.3
Link7908	42	71.5	48x76	225.4	4x10	394.8
Link7923	30	31.7	30	40.3	30	40.2
AE5228-004_AE5228-005	72	197.4	72	216.0	6x12	402.8
AS5628-002_TP5528-004	24	31.5	24	32.1	24	32.2
IN5628-003_AS5629-011	36	71.4	42	100.6	43x68	144.2
IN5628-018_IN5628-091	15	7.7	18	10.0	18	11.4
AS5630-001_AS5530-019	15	4.6	24	14.9	24	15.0
AS5630-002_AS5630-001	15	6.3	24	19.9	24	19.9
IN5630-008_IN5629-012	15	5.2	15	6.4	15	6.5
IN5630-009_IN5630-008	15	5.4	15	6.7	15	6.7
AS5530-001_AS5530-027	24	24.0	48	129.9	48x76	221.4
AS5530-004_AS5530-001	15	6.9	24	24.5	24x38	44.3
AS5530-009_AS5530-001	24	18.3	48	109.2	48x76	183.1
AS5530-010_AS5530-009	18	11.6	48	77.1	48x76	132.8
AS5530-019_AS5530-010	18	8.0	24	18.3	24	24.1
AS5530-023_AS5430-001	24	23.5	36	68.7	38x60	109.9
AS5530-027_AS5430-003	24	40.5	48	142.6	48x76	238.8
Link7907	36	80.2	42	119.4	43x68	180.5
AS5528-001_AS5529-018	12	-1.5	12	3.4	12	5.7
Link7924	24	21.4	24x38	53.9	24x38	48.0
AS5528-005_TP5528-004	18	6.4	18	6.2	18	6.4
AS5631-001_AS5631-013	15	2.7	15	5.5	15	7.9
AS5532-019_AS5531-019	15	6.7	18	11.2	18	14.9
AS5531-001_AS5531-006	18	15.1	36	62.9	43x68	112.7
AS5531-002_AS5531-001	18	-6.8	36	37.7	43x68	84.8
AS5531-005_AS5531-002	15	6.5	36	43.4	38x60	92.6
AS5531-006_AS5530-010	18	9.0	42	59.3	43x68	115.5
AS5531-019_AS5531-023	18	6.6	18	12.4	24	19.1
AS5531-023_AS5531-027	21	10.4	30	34.5	30	57.7
AS5531-027_AS5531-028	21	18.1	36	64.9	38x60	110.5
AS5531-028_AS5530-023	21	19.5	36	68.3	38x60	110.0
AS5529-018_CB5428-017	21	9.9	21	14.6	21	-12.5
Link7964	29x45	57.7	38x60	147.1	4x8	291.3
AS5529-019_CB5529-031	36	89.5	42	136.7	4x6	273.2
AS5529-020_AS5529-019	36	75.2	42	111.9	43x68	181.2
AS5629-011_AS5529-008	36	89.8	42	123.8	43x68	166.5
AS5528-011_AS5528-012	24	27.4	24x38	50.3	24x38	49.7
AS5528-012_CB5528-028	24	28.7	24x38	52.4	24x38	50.9
IN5530-037_AS5530-027	12	15.4	12	15.1	12	18.8
IN5528-026_CB5428-024	30	31.7	30	40.3	30	40.2
CB5529-031_MI5529-034	29x45	59.4	38x60	123.4	4x6	224.1
CB5528-028_AS5528-001	24	20.5	24x38	49.1	24x38	51.5

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
IN5629-012_MI5629-017	15	4.9	15	6.2	15	6.4
AS5629-016_IN5628-044	27	25.4	27	32.1	27	32.9
IN5628-035_IN5628-040	27	28.1	27	29.9	27	32.3
IN5628-040_IN5628-046	27	19.4	27	25.8	27	29.3
IN5628-041_IN5628-088	27	26.7	27	36.8	27	42.4
IN5628-042_IN5628-003	36	65.9	42	92.2	43x68	129.6
IN5628-043_IN5628-042	36	57.4	36	77.3	36	100.2
IN5628-044_IN5628-043	36	51.3	36	68.0	36	73.8
IN5628-046_IN5628-041	27	21.7	27	29.1	27	31.9
IN5628-070_IN5628-018	15	7.7	18	10.1	18	11.4
IN5628-071_IN5628-070	15	7.7	18	10.2	18	11.3
AS5628-072_IN5628-071	15	7.8	18	10.3	18	11.3
IN5628-075_MI5628-076	15	8.0	15	10.7	15	11.3
IN5628-077_MI5628-078	15	8.2	15	10.9	15	11.2
Link7910	24	22.8	27	30.3	27	31.7
IN5629-019_IN5629-018	18	9.0	18	9.5	18	9.5
IN5629-021_IN5629-019	18	4.8	18	6.2	18	6.8
Link7913	15	6.1	15	6.9	15	7.0
IN5630-032_IN5630-031	15	8.8	15	8.8	15	8.8
IN5628-088_IN5628-044	27	26.7	27	36.9	27	42.4
IN5628-091_MI5628-069	15	7.6	18	9.8	18	11.4
AS5631-013_IN5531-035	18	2.7	18	5.4	18	7.9
IN5429-027_AE5428-029	21	15.8	21	28.4	21	27.6
Link5903	N/A	N/A	3x6	143.5	3x8	186.8
IN5429-043_IN5429-039	19x30	5.4	3x6	121.9	3x8	167.2
IN5429-045_IN5429-043	19x30	12.2	3x6	124.8	3x8	176.9
IN5429-048_IN5429-045	19x30	15.8	3x6	131.1	3x8	182.6
IN5429-050_IN5429-048	24	16.6	3x6	125.2	3x8	158.2
IN5429-051_IN5429-050	24	19.5	34x53	105.8	3x6	158.5
IN5430-006_IN5429-051	24	18.4	34x53	91.6	3x6	136.7
IN5430-011_AS5430-007	15	6.9	24	29.7	24	42.1
IN5430-013_IN5430-011	15	13.7	24	46.1	24	46.6
IN5330-002_AS5430-016	18	22.3	24	46.8	24	47.1
IN5330-007_AS5330-003	12	7.7	21	30.2	21	30.5
Link7921	19x30	5.2	19x30	26.1	19x30	25.8
Link7920	21	-3.5	24x38	28.0	24x38	25.3
IN5429-061_IN5429-060	18	-3.0	24x38	17.8	24x38	13.5
IN5531-035_IN5531-037	18	-2.8	18	5.4	18	8.2
IN5531-037_AS5531-038	18	-2.8	18	5.4	18	8.8
IN5531-039_AS5531-038	21	7.0	36	42.6	38x60	87.1
AS5429-028_IN5429-027	15	5.2	21	16.1	21	14.7
AS5429-031_AS5429-028	15	5.2	21	14.7	21	14.7
AS5429-033_AS5429-031	15	5.3	21	14.7	21	14.7
AS5429-035_AS5429-033	12	5.1	18	10.7	18	10.7

Table G-1 0.2% Chance Event Pipe Enhancement Summary Warner Park and Cherokee Marsh Watershed Study Report, City of Madison, WI						
	Existing Conditions		Proposed Conditions		0.2% Chance Enhanced Conditions	
Link Name	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event	Size	Peak Flow Rate - 0.2% Chance Storm Event
AS5429-037_AS5429-035	12	5.5	12	6.6	12	6.6
AS5430-007_IN5430-006	24	18.5	34x53	86.5	3x6	135.2
AS5430-016_AS5430-007	18	14.9	24	36.3	24	42.2
AS5330-003_IN5330-002	18	17.2	21	30.8	21	30.8
AS5429-053_IN5429-052	18	-2.2	19x30	12.2	19x30	11.4
AS5531-038_AS5531-005	21	6.6	36	45.1	38x60	94.5
AS5531-040_IN5531-039	21	7.0	36	43.0	38x60	87.2
CB5532-026_AS5531-040	21	-9.3	24x38	24.4	34x53	50.1
Link7919	30	73.3	30	79.0	30	79.0
MI5628-069_MI5628-068	15	7.5	18	9.6	18	11.4
MI5628-076_AS5628-072	15	7.8	18	10.5	18	11.3
MI5628-078_IN5628-075	15	8.1	15	10.8	15	11.4
MI5629-017_IN5629-021	15	4.7	18	6.1	18	6.6
TP5528-004_AS5528-011	24	26.7	24x38	49.1	24x38	49.4
MI5529-034_AS5529-018	29x45	52.0	38x60	121.9	4x6	229.0
MI5628-068_IN5628-042	15	10.6	15	13.6	24	21.3
AS5429-065_AS5429-053	14x23	1.4	19x30	12.5	19x30	12.5
IN5429-068_AS5429-065	14x23	3.4	19x30	14.6	19x30	13.6
IN5429-070_IN5429-068	14x23	5.5	19x30	18.5	19x30	17.9
IN5429-072_IN5429-070	14x23	7.8	19x30	19.3	19x30	19.2
IN5429-074_IN5429-072	14x23	8.5	19x30	19.3	19x30	19.3
IN5429-076_IN5429-074	15	6.2	19x30	19.2	19x30	19.2
IN5429-078_IN5429-076	15	5.8	19x30	20.0	19x30	20.0
AS5429-080_IN5429-061	18	2.4	19x30	13.7	19x30	13.8
IN5429-081_AS5429-080	18	5.1	19x30	14.2	19x30	14.3
IN5429-083_IN5429-081	18	6.8	19x30	17.1	19x30	16.7
IN5429-085_IN5429-083	18	8.4	19x30	18.4	19x30	18.2
IN5429-087_IN5429-085	18	8.6	19x30	18.7	19x30	18.7
IN5429-089_IN5429-087	18	8.4	19x30	19.1	19x30	19.1
IN5429-091_IN5429-089	15	6.3	19x30	19.9	19x30	19.9
Link7911	27	24.4	27	31.8	27	32.8
Link7927	81x123	198.5	81x123	218.3	81x123	403.8
Link5904	N/A	N/A	4x20	447.0	4x20	509.4
Link8900	N/A	N/A	4x32	862.8	4x32	1038.5

Appendix H: Cost Estimates

Conceptual Cost Estimate - Castle Creek Improvements
v2025_06_23

Item #	Item	Quantity	Unit	"Average" Unit Cost provided by City	Adjusted Unit Cost (if used)	Total Item Cost
10701	TRAFFIC CONTROL	1	LUMP SUM	$ 7,000.00	N/A	$ 7,000
10911	MOBILIZATION	1	LUMP SUM	$ 80,000.00	N/A	$ 80,000
20101	EXCAVATION CUT	8,740	C.Y.	$ 26.00	$ 40	$ 349,600
20221	TOPSOIL	28,830	S.Y.	$ 7.00	N/A	$ 201,810
20235	HEAVY RIPRAP - GLACIAL FIELD STONE	84	C.Y.	$ 178.00	N/A	$ 14,952
20705	DETENTION BASIN SEEDING	21,590	S.Y.	$ 4.60	N/A	$ 99,314
21073	EROSION MATTING, CLASS II, TYPE C - ORGANIC	21,590	S.Y.	$ 6.50	N/A	$ 140,335
40381	REMOVE AND REPLACE CONCRETE CURB & GUTTER, MACHINE PLACED - RESURFACING	80	L.F.	$ 17.50	N/A	$ 1,400
50226	UTILITY TRENCH PATCH TYPE III	1,090	S.Y.	$ 100.00	N/A	$ 109,000
50420	24 INCH X 38 INCH TYPE I HERCP STORM SEWER PIPE	210	L.F.	$ 160.00	N/A	$ 33,600
50423	38 INCH X 60 INCH TYPE I HERCP STORM SEWER PIPE	125	L.F.	$ 350.00	N/A	$ 43,750
50425	48 INCH X 76 INCH TYPE I HERCP STORM SEWER PIPE	65	L.F.	$ 440.00	N/A	$ 28,600
50483	24 INCH X 38 INCH HERCP AE	2	EACH	$ 2,900.00	N/A	$ 5,800
50486	38 INCH X 60 INCH HERCP AE	1	EACH	$ 4,100.00	N/A	$ 4,100
50488	48 INCH X 76 INCH HERCP AE	1	EACH	$ 5,200.00	N/A	$ 5,200
50726	6'X6' STORM SAS	1	EACH	$ 12,500.00	N/A	$ 12,500
WC1	EROSION CONTROL ALLOWANCE	1	LUMP SUM	$ 30,000.00	N/A	$ 30,000
WC2	SITE DEWATERING / STORM CONTROL ALLOWANCE	1	LUMP SUM	$ 25,000.00	N/A	$ 25,000
WC3	6' x 3' RCB CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	95	L.F.	$ 600.00	N/A	$ 57,000
WC18	6' x 3' RCB CULVERT WINGWALL & RAILING	1	EACH	$ 20,000.00	N/A	$ 20,000
WC7	2-10' X 4' RCP CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	50	L.F.	$ 2,920.00	N/A	$ 146,000
WC9	2-10' X 4' RCP CULVERT WINGWALL & RAILING	2	EACH	$ 56,250.00	N/A	$ 112,500
WC12	STORM SEWER JUNCTION STRUCTURE	1	EACH	$ 35,000.00	N/A	$ 35,000
WC13	MISCELLANEOUS STORM SEWER CONNECTION ALLOWANCE	11	EACH	$ 5,500.00	N/A	$ 60,500
WC15	CHANNEL DEMOLITION	950	L.F.	$ 39.00	N/A	$ 37,050
WC16	PLANT PLUGS	7,970	EACH	$ 6.00	N/A	$ 47,820
WC17	REMOVE & REPLACE EXISTING BRIDGE	1	EACH	$ 155,000.00	N/A	$ 155,000
				Subtotal		**$ 1,862,831**
				Contingency	**25%**	**$ 465,708**
				Design	**10%**	**$ 186,283**
				Total		**$ 2,514,822**
				Land Acquisition	**0**	**$ -**
				Wetland Mitigation	**0.000**	**$ -**
				Total Total		**$ 2,514,822**

Conceptual Cost Estimate - Warner Park Relief Sewer

v2025_06_23

Item #	Item	Quantity	Unit	"Average" Unit Cost provided by City	Adjusted Unit Cost (if used)	Total Item Cost
10701	TRAFFIC CONTROL	1	LUMP SUM	$ 7,000.00	N/A	$ 7,000
10911	MOBILIZATION	1	LUMP SUM	$ 80,000.00	N/A	$ 80,000
21092	TERRACE RESTORATION	4,460	S.Y.	$ 5.20	N/A	$ 23,192
20235	HEAVY RIPRAP - GLACIAL FIELD STONE	30	C.Y.	$ 178.00	N/A	$ 5,340
40381	REMOVE AND REPLACE CONCRETE CURB & GUTTER, MACHINE PLACED - RESURFACING	1,605	L.F.	$ 17.50	N/A	$ 28,088
50226	UTILITY TRENCH PATCH TYPE III	2,410	S.Y.	$ 100.00	N/A	$ 241,000
WC1	EROSION CONTROL ALLOWANCE	1	LUMP SUM	$ 30,000.00	N/A	$ 30,000
WC2	SITE DEWATERING / STORM CONTROL ALLOWANCE	1	LUMP SUM	$ 25,000.00	N/A	$ 25,000
WC4	8' x 4' RCB CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	395	L.F.	$ 1,250.00	N/A	$ 493,750
WC5	10' x 4' RCB CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	1,210	L.F.	$ 1,460.00	N/A	$ 1,766,600
WC8	10' x 4' RCB CULVERT WINGWALL & RAILING	1	EACH	$ 37,500.00	N/A	$ 37,500
WC12	STORM SEWER JUNCTION STRUCTURE	3	EACH	$ 35,000.00	N/A	$ 105,000
WC13	MISCELLANEOUS STORM SEWER CONNECTION ALLOWANCE	4	EACH	$ 5,500.00	N/A	$ 22,000
				Subtotal		**$ 2,864,470**
				Contingency	**25%**	**$ 716,117**
				Design	**10%**	**$ 286,447**
				Total		**$ 3,867,034**
				Land Acquisition	**0**	**$ -**
				Wetland Mitigation	**0.000**	**$ -**
				Total Total		**$ 3,867,034**

Conceptual Cost Estimate - Camino Del Sol Storm Sewer Improvements

v2025_06_23

Item #	Item	Quantity	Unit	"Average" Unit Cost provided by City	Adjusted Unit Cost (if used)	Total Item Cost
10701	TRAFFIC CONTROL	1	LUMP SUM	$ 7,000.00	N/A	$ 7,000
10911	MOBILIZATION	1	LUMP SUM	$ 80,000.00	N/A	$ 80,000
20235	HEAVY RIPRAP - GLACIAL FIELD STONE	16	C.Y.	$ 178.00	N/A	$ 2,848
21092	TERRACE RESTORATION	11,750	S.Y.	$ 5.20	N/A	$ 61,100
40381	REMOVE AND REPLACE CONCRETE CURB & GUTTER, MACHINE PLACED - RESURFACING	240	L.F.	$ 17.50	N/A	$ 4,200
50226	UTILITY TRENCH PATCH TYPE III	260	S.Y.	$ 100.00	N/A	$ 26,000
50403	18 INCH TYPE I RCP STORM SEWER PIPE	128	L.F.	$ 115.00	N/A	$ 14,720
50417	84 INCH TYPE I RCP STORM SEWER PIPE	1,440	L.F.	$ 775.00	$ 1,000	$ 1,440,000
50476	84 INCH RCP AE	1	EACH	$ 8,000.00	N/A	$ 8,000
50741	TYPE "H" INLET	8	EACH	$ 3,600.00	N/A	$ 28,800
WC1	EROSION CONTROL ALLOWANCE	1	LUMP SUM	$ 30,000.00	N/A	$ 30,000
WC2	SITE DEWATERING / STORM CONTROL ALLOWANCE	1	LUMP SUM	$ 25,000.00	N/A	$ 25,000
WC6	7' X 5' RCB CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	675	L.F.	$ 1,355.00	N/A	$ 914,625
WC12	STORM SEWER JUNCTION STRUCTURE	6	EACH	$ 35,000.00	N/A	$ 210,000
WC13	MISCELLANEOUS STORM SEWER CONNECTION ALLOWANCE	5	EACH	$ 5,500.00	N/A	$ 27,500
WC14	UTILITY CONFLICT ALLOWANCE	3	EACH	$ 4,000.00	N/A	$ 12,000
				Subtotal		**$ 2,891,793**
				Contingency	**25%**	**$ 722,948**
				Design	**10%**	**$ 289,179**
				Total		**$ 3,903,921**
				Land Acquisition	**0**	**$ -**
				Wetland Mitigation	**0.000**	**$ -**
				Total Total		**$ 3,903,921**

Conceptual Cost Estimate - Lakeview Diversion Downstream Sewers
v2025_06_23

Item #	Item	Quantity	Unit	"Average" Unit Cost provided by City	Adjusted Unit Cost (if used)	Total Item Cost
10701	TRAFFIC CONTROL	1	LUMP SUM	$ 7,000.00	N/A	$ 7,000
10911	MOBILIZATION	1	LUMP SUM	$ 80,000.00	N/A	$ 80,000
21092	TERRACE RESTORATION	4,460	S.Y.	$ 5.20	N/A	$ 23,192
40391	REMOVE AND REPLACE 5 INCH CONCRETE SIDEWALK - RESURFACING	5,675	S.F.	$ 13.00	N/A	$ 73,775
50226	UTILITY TRENCH PATCH TYPE III	2,030	S.Y.	$ 100.00	N/A	$ 203,000
50403	18 INCH TYPE I RCP STORM SEWER PIPE	577	L.F.	$ 115.00	N/A	$ 66,355
50413	60 INCH TYPE I RCP STORM SEWER PIPE	175	L.F.	$ 310.00	N/A	$ 54,250
50423	38 INCH X 60 INCH TYPE I HERCP STORM SEWER PIPE	400	L.F.	$ 350.00	N/A	$ 140,000
50424	43 INCH X 68 INCH TYPE I HERCP STORM SEWER PIPE	120	L.F.	$ 405.00	N/A	$ 48,600
50425	48 INCH X 76 INCH TYPE I HERCP STORM SEWER PIPE	510	L.F.	$ 440.00	N/A	$ 224,400
50726	6'X6' STORM SAS	8	EACH	$ 12,500.00	N/A	$ 100,000
50741	TYPE "H" INLET	12	EACH	$ 3,600.00	N/A	$ 43,200
WC1	EROSION CONTROL ALLOWANCE	1	LUMP SUM	$ 30,000.00	N/A	$ 30,000
WC2	SITE DEWATERING / STORM CONTROL ALLOWANCE	1	LUMP SUM	$ 25,000.00	N/A	$ 25,000
WC4	8' x 4' RCB CULVERT, EXCAVATION, BACKFILL & JOINT SEALING	1,135	L.F.	$ 1,250.00	N/A	$ 1,418,750
WC11	48" STORM SEWER - TRENCHLESS INSTALLATION	370	L.F.	$ 1,375.00	N/A	$ 508,750
WC12	STORM SEWER JUNCTION STRUCTURE	3	EACH	$ 35,000.00	N/A	$ 105,000
WC13	MISCELLANEOUS STORM SEWER CONNECTION ALLOWANCE	4	EACH	$ 5,500.00	N/A	$ 22,000
WC14	UTILITY CONFLICT ALLOWANCE	18	EACH	$ 4,000.00	N/A	$ 72,000
WC19	8' x 4' RCB CULVERT WINGWALL & RAILING	1	EACH	$ 35,000.00	N/A	$ 35,000
				Subtotal		**$ 3,280,272**
				Contingency	**25%**	**$ 820,068**
				Design	**10%**	**$ 328,027**
				Total		**$ 4,428,367**
				Land Acquisition	**0**	**$ -**
				Wetland Mitigation	**0.000**	**$ -**
				Total Total		**$ 4,428,367**

Conceptual Cost Estimate - Lakeview & Drewery Storm Sewer Improvements
v2025_06_23

Item #	Item	Quantity	Unit	"Average" Unit Cost provided by City	Adjusted Unit Cost (if used)	Total Item Cost
10701	TRAFFIC CONTROL	1	LUMP SUM	$ 7,000.00	N/A	$ 7,000
10911	MOBILIZATION	1	LUMP SUM	$ 80,000.00	N/A	$ 80,000
21092	TERRACE RESTORATION	1,130	S.Y.	$ 5.20	N/A	$ 5,876
50226	UTILITY TRENCH PATCH TYPE III	1,330	S.Y.	$ 100.00	N/A	$ 133,000
50403	18 INCH TYPE I RCP STORM SEWER PIPE	673	L.F.	$ 115.00	N/A	$ 77,395
50409	36 INCH TYPE I RCP STORM SEWER PIPE	765	L.F.	$ 200.00	$ 250	$ 191,250
50410	42 INCH TYPE I RCP STORM SEWER PIPE	240	L.F.	$ 235.00	$ 300	$ 72,000
50420	24 INCH X 38 INCH TYPE I HERCP STORM SEWER PIPE	135	L.F.	$ 160.00	N/A	$ 21,600
50421	29 INCH X 45 INCH TYPE I HERCP STORM SEWER PIPE	215	L.F.	$ 275.00	N/A	$ 59,125
50726	6'X6' STORM SAS	8	EACH	$ 12,500.00	N/A	$ 100,000
50741	TYPE "H" INLET	18	EACH	$ 3,600.00	N/A	$ 64,800
WC1	EROSION CONTROL ALLOWANCE	1	LUMP SUM	$ 30,000.00	N/A	$ 30,000
WC2	SITE DEWATERING / STORM CONTROL ALLOWANCE	1	LUMP SUM	$ 25,000.00	N/A	$ 25,000
WC10	36" STORM SEWER - TRENCHLESS INSTALLATION	315	L.F.	$ 1,175.00	N/A	$ 370,125
WC13	MISCELLANEOUS STORM SEWER CONNECTION ALLOWANCE	3	EACH	$ 5,500.00	N/A	$ 16,500
WC14	UTILITY CONFLICT ALLOWANCE	22	EACH	$ 4,000.00	N/A	$ 88,000
				Subtotal		**$ 1,341,671**
				Contingency	**25%**	**$ 335,418**
				Design	**10%**	**$ 134,167**
				Total		**$ 1,811,256**
				Land Acquisition	**0**	**$ -**
				Wetland Mitigation	**0.000**	**$ -**
				Total Total		**$ 1,811,256**