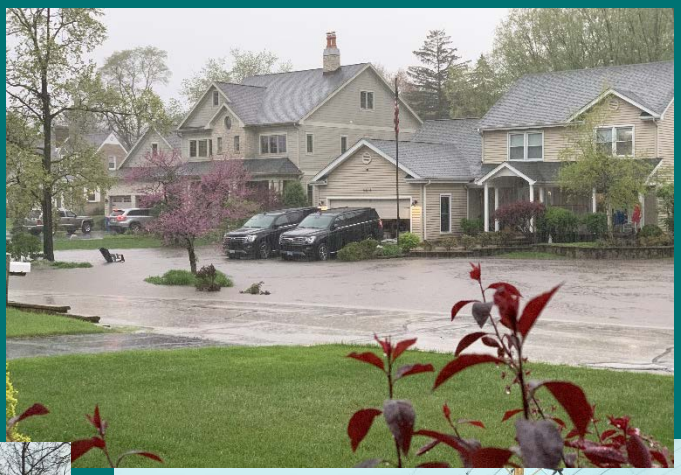
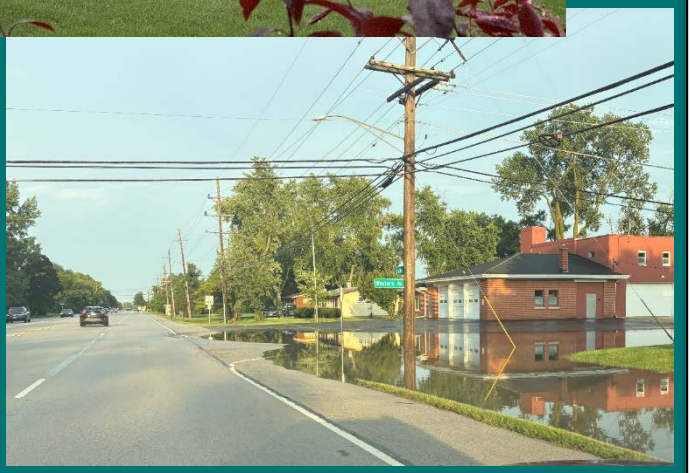
Village of Willowbrook

Stormwater Master Plan

September 2025





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Acre – Feet (ac-ft) – Flood volumes are typically quantified in acre-feet. One acre-foot is the volumetric equivalent of an acre of land that is flooded one foot deep.

Base Flood Elevation (BFE) – The BFE is the water surface elevation of the 1% annual chance flood.

Design Storm Event - The term "10-year storm" is used to define a rainfall event recurrence interval that statistically has the same 10% chance of occurring in any given year. **Table 1** shows the recurrence and statistical probability of a storm happening in a given year.

Recurrence Interval in Years	Probability of Occurrence in any Given Year	Percent Chance of Occurrence in any Given Year
100	1 in 100	1
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

Table 1. Design Storm Statistics

FIRM – Flood Insurance Rate Map is the official map of a community on which FEMA has delineated the special flood hazard areas, the base flood elevation, and the risk premium zones applicable to the community.

FSA – Flood Study Area

Hydraulic Grade Line (HGL) – The HGL is the surface or profile of water flowing in a storm sewer flowing partially full. The HGL represents the piezometric head (datum head + pressure head) of a flowing fluid. HGL can be obtained for open channel flow, as well as for pipe flow. If a pipe is under pressure, the hydraulic grade line is the elevation that the water rises to on the ground surface or the line that the water level would rise to in a small, vertical tube connected to the pipe.

I & I – Inflow and infiltration are terms used to describe the ways that groundwater and stormwater enter sanitary sewer systems.

Level of Flood Protection - This is design storm associated with the elevation at which a structure begins to flood.

Level of Service – For this study, the level of service or capacity of a drainage system (including, storm sewers, overland flow paths, drainage swales, open channels and detention basins) refers to the point at which the system begins to surcharge. The surcharged drainage system refers to the condition where stormwater begins to collect in the streets, side yards, overland flow paths and low areas. Storm sewers provide a level of service up to street flooding for a design storm.

LOMR – A Letter of Map Revision is FEMA's modification to an effective Flood Insurance Rate Map (FIRM). The LOMR is an official document which reflects changes in mapped areas for flood zones.

NRCS – Natural Resources Conservation Service; As the USDA's primary private lands conservation agency, the NRCS generates, manages, and shares the data, technology, and standards that enable partners and policymakers to make decisions informed by objective, reliable science.

RCBC – Reinforced Concrete Box Culvert

RCP – Reinforced Concrete Pipe

Stormwater Ordinance – An ordinance adopted by the Village to promote effective and equitable and acceptable stormwater management measures.

Structure Low Entry Elevation – The elevation equal to the elevation at which a structure begins to flood.

Tailwater – The water surface in the recioeving system downstream of an outlet pipe. Flow from the outlet pipe can decrease if the tailwater level exceeds the normal of the outlet.

Tc – Time of Concentration is the time required for runoff to travel from the hydraulically most distant point in the watershed to the outlet.

XPSWMM – XP-Software Stormwater and Wastewater Management Model (XPSWMM) is an unsteady flow, dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a storm sewer network (hydraulic mode).

Zone A – Special Flood Hazard Area – FEMA defines Zone A as a SFHA subject to inundation by the 1% annual chance flood with no defined elevation.

Zone AE – Special Flood Hazard Area – FEMA defines Zone AE as a SFHA subject to inundation by the 1% annual chance flood with a defined elevation.

Zone X – Other Flood Areas – A Zone X is defined as an area of 0.2% chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

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Appendix 4 – Area 4 – Ridgemoor East Exhibits

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Appendix 7 – Area 7 – Sawmill Creek Exhibits

Appendix 8 – Area 8 – Farmingdale Subdivision Exhibits

EXECUTIVE SUMMARY

The Village of Willowbrook (Village) has initiated the development of a Village-wide Stormwater Master Plan (Master Plan) to identify drainage problems, storm sewer bottlenecks, and develop concept flood reduction projects to reduce drainage problems throughout the Village. The methodology for analyzing the storm sewer system for the Master Plan included a comprehensive review of the storm sewer system, field reconnaissance, hydrologic and hydraulic modeling of the drainage system, identification of system limitations, and development of proposed drainage improvements. The proposed drainage improvements in this Master Plan can be incorporated into the Village's infrastructure projects, green infrastructure planning, and long-term capital improvement plan.

Christopher B. Burke Engineering, Ltd. (CBBEL) divided the Village into 8 Flood Study Areas (FSA) and developed a XPSWMM hydrologic and hydraulic model for each FSA.. The XPSWMM provides a detailed analysis of the storm sewers and drainage system. CBBEL calibrated the XPSWMM modeling for each FSA using best available information including flood reports, pictures, and known complaints from residents.

Rainfall depths adopted by DuPage County prior to 2020 are known as Bulletin 70 data. The data provides a depth of rain for a given time and recurrence interval. For example, the 100-year 24-hour rainfall depth for Bulletin 70 is 7.58 inches. Consequently, any infrastructure or developments constructed or permitted prior to 2020 used Bulletin 70 data. In January 2020, the change from Bulletin 70 to Bulletin 75 occurred and has been adopted by the DuPage County Countywide Stormwater and Floodplain Ordinance (Ordinance) to incorporate higher design rainfall depths based on more recent, higher intensity storm events occurring annually. Bulletin 75 rainfall depths are, on average, a 15-18% increase in total rainfall depending on the storm duration. For example, the 100-year 24-hour rainfall depth for Bulletin 75 is 8.57 inches.

CBBEL completed the modeling of the existing infrastructure utilizing Bulletin 75 rainfall and found many of the existing drainage systems have approximately a 10-year level of service before street flooding begins with other areas having slightly less than 10-year level of flood protection within the streets. CBBEL created existing condition inundation areas using 1-foot aerial topography for all FSAs showing the extent of the 10- and 100-year inundation areas.

CBBEL developed proposed drainage improvements to provide a minimum 10-year level of service with 6-inches of ponding in the street at the curb line and a minimum 100-year level of protection for residential structures, where best available data was known. Long term capital improvement projects include increasing storm sewer sizes, adding relief storm sewers and incorporating stormwater storage. A conceptual engineer's estimate of probable cost for each of the proposed drainage improvement projects was prepared and are summarized in Table 2.

The design criteria established to propose a project to reduce flooding was based on the criteria below:

1. Structure flooding for 100-year storm event.

2. Greater than 0.5 feet of street ponding for the 10-year storm event.

CHAPTER 1 PROJECT OVERVIEW

1.1 INTRODUCTION

The Village has historically experienced street and yard flooding throughout the residential areas of the Village resulting from a wide range of storm events with varying degrees of intensity and duration. To address the stormwater and flooding issues in the residential portions of the Village, CBBEL was retained by the Village to develop a Master Plan to identify and develop proposed flood reduction projects. This Master Plan presents the results of an extensive stormwater management investigation of the storm sewer system throughout the Village. The Village is located in both the Flagg Creek and the Sawmill Creek watersheds.

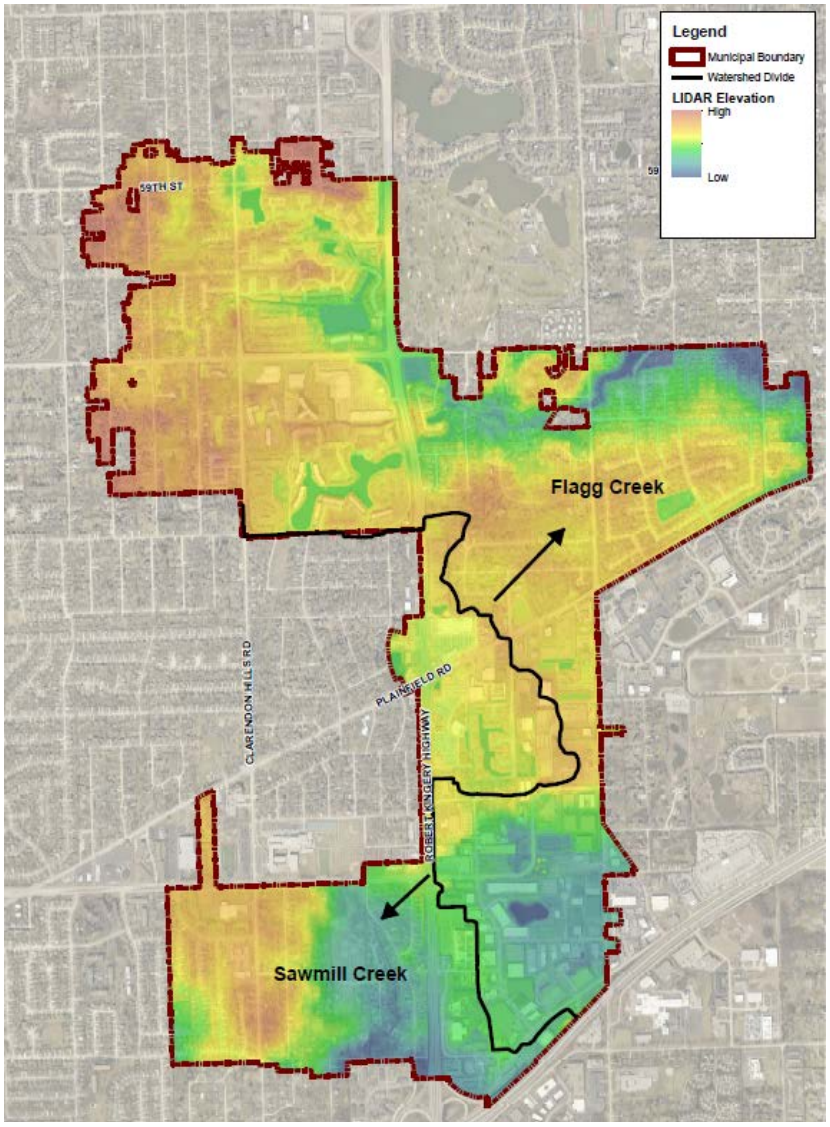


Figure 1. Village of Willowbrook Watercourses and Topography

The watershed divide runs through the middle of the Village, generally parallel to 67th Street in an east-west direction and along IL Route 83 in a north-south direction as seen in Figure 1. Runoff from the land south and west of the watershed divide flows to Sawmill Creek and runoff north and east of the watershed divide flows

to Flagg Creek. Sawmill Creek generally flows from north to south through the Village and Flagg Creek flows from west to east.

Many of the Village's residential subdivisions were constructed prior to the adoption of the Ordinance, which implemented release rate-based detention requirements and traditional stormwater management practices. These practices include the construction of stormwater detention storage basins, storm sewers and overland flow path preservation.

While newer areas throughout the Village only experience nuisance flooding; there are older areas of the Village that experience frequent yard and street flooding with some instances of localized surface flooding during moderate to heavy rain fall events. In the areas that experience flooding, there is limited stormwater storage, insufficient overland flow routes to receiving watercourses, and the storm sewer system that did not appear to be designed to any standards.

The Master Plan presents the results of an extensive stormwater management investigation including the hydrologic and hydraulic modeling of the storm sewer system for the Village.

1.2 PURPOSE AND SCOPE

The purpose of this Master Plan is to present the findings of detailed analyses and provide recommended improvements in a prioritized manner that will:

- Reduce existing flood/drainage problems, including structure and street flooding,
- Prevent an increase in existing flood/drainage problems as redevelopment occurs,
- Provide guidance for new development in the context of preventing flooding, and
- Help preserve and enhance stormwater quality.

This Master Plan includes detailed hydrologic and hydraulic modeling of specifically targeted study areas to identify flood damages and bottlenecks in the stormwater conveyance system. Detailed modeling was used to identify optimal locations and sizes for capital improvement projects. The scope of the Master Plan includes the identification of projects that provide a level of service in each of the targeted areas. The goal is a 10-year level of service (with an allowance of a maximum of 6-inches of ponding in the 100-year) and 100-year level of protection for structure flooding in each of the targeted areas. The 6-inches of depth is typically along the curb line, where a car can safely pass through 6-inches of standing water.

The outline of this Master Plan is such that all background discussion for the study development, assumptions, modeling techniques and proposed improvement development occurs in the front portion of the document. The background discussion is followed by detailed discussions with exhibits, modeling results, and proposed improvements for each study area as separate sections. The approach to each study area is similar and was developed using the methods outlined in this report.

CHAPTER 2 STUDY DEVELOPMENT

2.1 DATA COLLECTION

Participation from Village staff and decision-makers was essential to understanding the flooding and drainage issues throughout the Village. This input was necessary to identify the extent and type of flooding problems (overland flow, street flooding, yard flooding, seepage, etc.). The extent and nature of known stormwater conditions and concerns in the Village were identified through various means including discussions with the Village Engineering staff, Public Works staff, and review of the Village's drainage database.

2.1.1 Village Staff and Public Works Involvement

CBBEL met with Village staff to identify and discuss drainage issues throughout the Village. During the discussion, the Village's database highlighting drainage complaints from the last 10 years was reviewed. The database is used by the Village to track service requests and contains approximately 43 reports of drainage related concerns dating back to 2014. CBBEL was provided access to the database where all flood reports were sorted and compiled into a summary of drainage inquires prioritized according to structure flooding, sanitary backups, seepage, and yard flooding. The review of the reports in the database indicated drainage concerns relevant to the categories below:

- 19 – Rear Yard Flooding
- 10 – Front Yard Flooding
- 7 – Side Yard Flooding
- 7 – Street Flooding

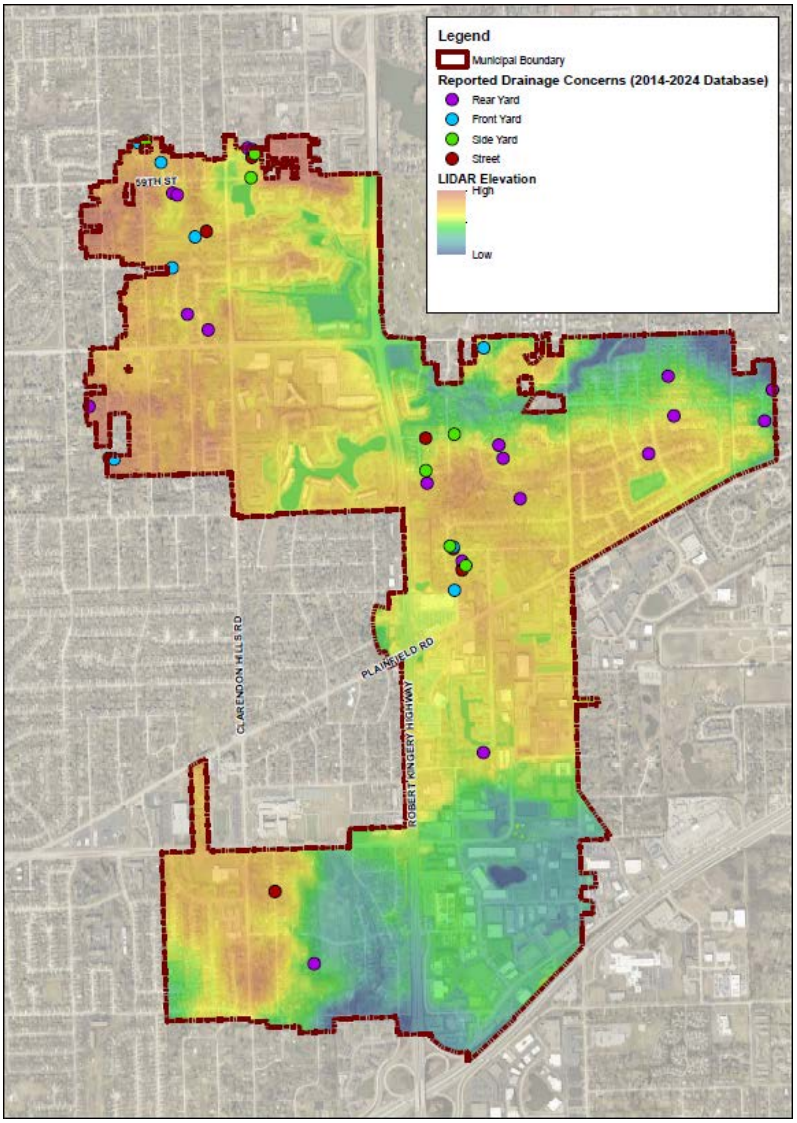


Figure 2. Drainage Concerns Database (representation)

CBBEL also reviewed accounts and photographs of flooding from Village staff and residents, as well as reviewed applicable Village plans, codes, GIS data, previous studies, and construction documents. The information shown in Figure 2 is a representation of the information compiled from the database. It is noted that flooding is widespread and not limited to only the information obtained from staff and resident accounts. As noted throughout this Master Plan, detailed consideration has been taken to quantify the full extent of the flooding problems throughout the Village.

2.1.2 Storm Sewer Data Collection

Plans for many of the areas constructed since 1990 were available. In addition to plan review, CBBEL collected field survey to supplement missing storm sewer information. This information was compiled and used for detailed model development. Additionally, the DuPage County Department of Transportation performed a study concurrently, and the survey along 63rd Street from Richmond Avenue to IL Route 83 was used for the model development.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels 189, 193 and 277, effective August 1, 2019 for DuPage County and Incorporated Areas, portions of the Village contain both Zone A and Zone AE Special Flood Hazard Areas (SFHA) associated with, most notably, Sawmill Creek and Flagg Creek (**Figure 3**). FEMA defines Zones A and AE as a SFHA subject to inundation by the 1% annual chance flood with a defined elevation (Zone AE) and without a defined elevation (Zone A).

While the 100-year floodplain associated with the Sawmill Creek is defined as Zone AE throughout the Village, which is the 100-year Base Floodplain Elevation (BFE) with a defined elevation, portions of the Flagg Creek watershed, which includes 63rd Street Ditch, are both Zone AE and Zone A, where Zone A floodplain is defined as an area where the Base Flood Elevation (BFE) was not determined (**Figure 3**). The Village is susceptible to overbank flooding in low areas along both watercourses. The Zone AE and Zone A SFHA shown on the FIRM for the areas along the banks of Sawmill Creek and Flagg Creek are primarily residential areas.

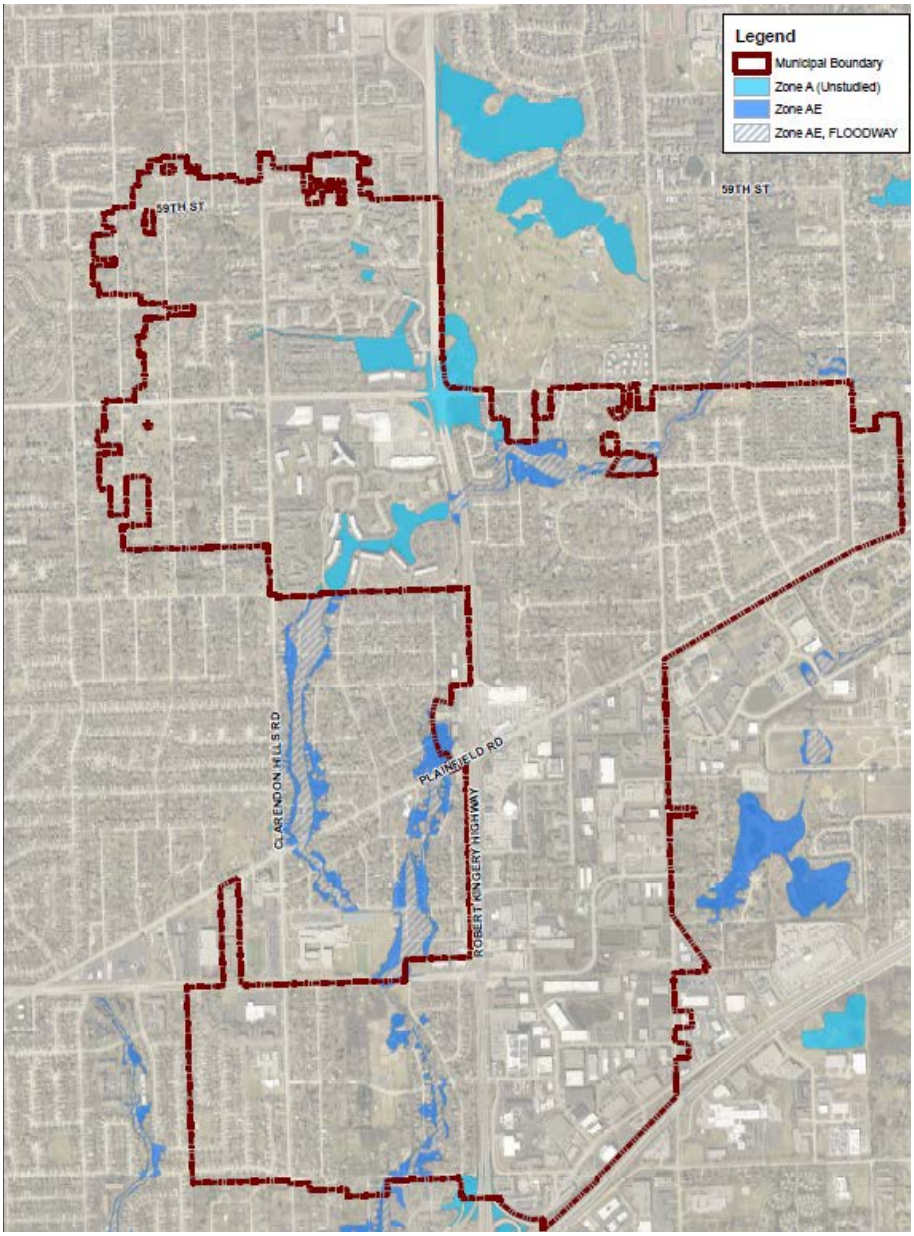


Figure 3. Adapted from the DuPage FEMA FIRM – Village of Willowbrook

2.1.3 Previous Studies

Multiple drainage studies have been conducted since the 1970s for various sections of the Village including:

- 1993 CBBEL report titled "Multi-Jurisdictional Drainage Study North Branch of Marion Hills Ditch"
- 1995 CBBEL report titled "The South Branch of Marion Hills Ditch and Lake Hinsdale Watersheds Study"
- 2020 CBBEL report titled "Village of Willowbrook Stormwater Master Plan for Executive Plaza"
- 2025 V3 memorandum titled "63rd Street Drainage Study & Alternatives Analysis"
- 2025 Baxter & Woodman memorandum titled "Madison Street Drainage Study & Alternatives Analysis Joliet Rd to 74th Street – Village of Willowbrook, Illinois"

The 1993 and 1995 CBBEL reports and the 2025 V3 report for 63rd Street both focused on residential areas, similar to this Master Plan. The 2020 CBBEL report and 2025 Baxter & Woodman report for Madison Street are in industrial areas and were not studied as part of this plan.

2025 V3 Stormwater Study for 63rd Street

CBBEL and Village staff met with the DuPage County Division of Transportation (DuDOT) to discuss the stormwater study for 63rd Street. It was noted by DuDOT that this a long-term planning project and will require cooperation from many entities. The analysis presented five alternatives for reducing flooding within the right-of-way of the 63rd Street corridor from Richmond Avenue to Knolls Lake. It is recommended that the Village continue discussions with DuDOT to optimize the drainage improvements from both a feasibility and financial approach. CBBEL did not replicate the proposed alternatives by DuDOT; however, independently we have identified similar areas for flood improvement projects, as discussed in Chapter 4.

2.2 IDENTIFICATION OF FLOOD STUDY AREAS

By combining the historically known flood problem areas with drainage database and the hydraulic analysis, CBBEL identified FSAs throughout the Village. The following study areas are based on the initial flood reduction project list provided by the Village, and information from a meeting between Village and CBBEL staff. The study focuses on residential portions of the Village and not industrial/commercial areas. These study areas have also been configured with respect to the existing stormwater management system and outfall serving each system. The FSAs are shown in **Figure 4** and listed below, per watershed, across the Village in no specific order.

- Area 1 → Northwest Area – generally bounded by 58th Street on the north, 67th Street on the south, Western Avenue on the west, and Clarendon Hills Road on the east.
- Area 2 → Ridgemoor West – generally bounded by Ridgemoor Drive on the north, Willow Lane on the south, IL Route 83 on the west and Quincy Street on the east
- Area 3 → Garfield – generally bounded by Flagg Creek on the north, Ridgefield Lane on the south, Garfield Avenue on the west and the municipal boundary on the east
- Area 4 → Ridgemoor East – generally bounded by Flagg Creek to the north, 67th Place to the south, Ridgemoor Drive to the west, and Madison Street to the east
- Area 5 → Willow Pond – generally bounded by 67th Street to the north, 69th Street to the south, IL Route 83 to the west and Madison Street to the east
- Area 6 → Waterford Subdivision – generally bounded by 63rd Street to the north, Plainfield Road to the south, Madison Street to the west, and Garfield Avenue to the east
- Area 7 → Sawmill Creek – generally bounded on the north by 75th Street, the south by 79th Street, the west by Clarendon Hills Road, and the east by IL Route 83
- Area 8 → Farmingdale Subdivision – generally bounded by 75th Street on the north, 79th Street on the south, the municipal boundary on the west, and Clarendon Hills Road on the east

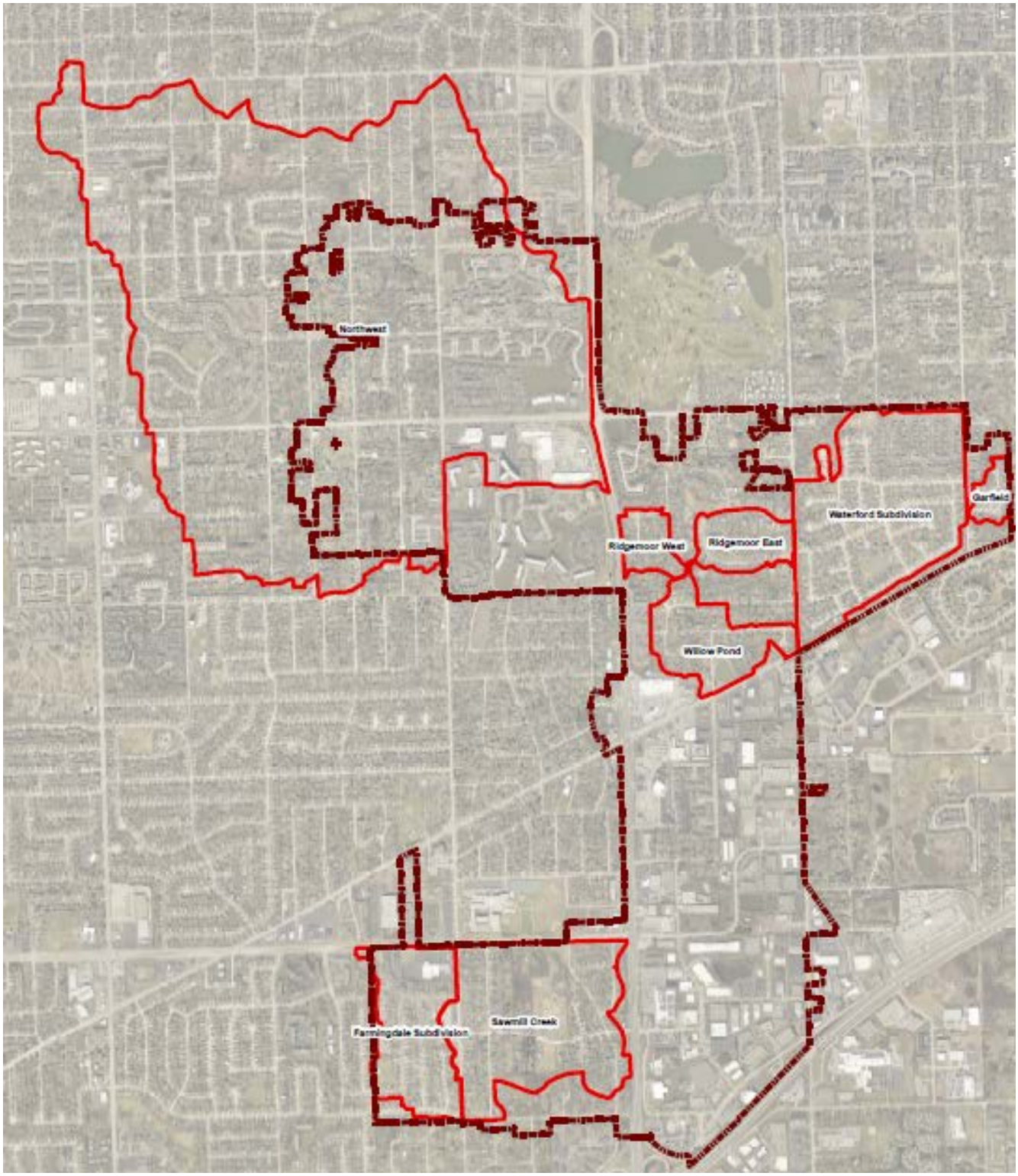


Figure 4. Flood Study Areas – Village of Willowbrook

The naming convention for FSAs are intended to be a general location description of the roadways that bound areas and should not be considered the limits of the detailed study for flood reduction measures. The methodology for analyzing the stormwater management system for each FSA follows a holistic approach to capture interactions with adjacent subbasins and the total tributary areas to areas of concern. This process included the collection of the storm sewer system plans, supplemental storm sewer survey collection, firsthand accounts, detailed hydrologic and hydraulic modeling of the existing drainage system, identification of system limitations and development of proposed drainage improvements.

2.3 FACTORS CONTRIBUTING TO FLOODING

In general, a significant portion of the Village was developed with modern stormwater management practices in accordance with the Ordinance. However, some sections of the Village are either older or have been redeveloped and lack sufficient overland flow paths. There is significant amount of area that is tributary to both Sawmill Creek and Flagg Creek, that is conveyed by the Village's sewer and ditch network. Much of which is undersized for the volume of runoff from both local and upstream areas.

In general, except for notable areas, newer constructed areas of the Village have much fewer drainage problems. The drainage problems in the older sections consist of insufficient stormwater storage, overland flow routes, and/or undersized storm sewer conveyance.

The land use in the older sections of the Village is composed of high-density residential areas with small lot sizes and minimal open space. These conditions, which could result in significant flooding during severe storm events, also contribute to the difficulties in retrofitting the existing system to reduce the risk of future flooding. While there are areas where stormwater storage exists, there are very few additional open spaces where excess runoff can be directed and stored. In the areas that experience flooding, there is limited stormwater storage, insufficient overland flow routes and the storm sewer system was not designed based on current rainfall standards.

Conversely, the newer sections of the Village are composed of low-moderate density subdivisions with traditional stormwater management features including detention facilities, overland flow routes, and rear and side yard drainage swales. However, nuisance flooding in these areas is often the result of rear and side yard drainage being altered or blocked on private properties. The cases of nuisance flooding do not result in structure flooding and street flooding is reported to only last for a few hours.

2.4 STORMWATER AND SANITARY SEWER INFLOW AND INFILTRATION

Runoff in the Village is drained by a separate storm sewer system where stormwater is conveyed in a different system than the sanitary flow. Inflow and infiltration (I & I) are terms used to describe the ways that groundwater and stormwater enter into sanitary sewer systems. Dedicated wastewater or sanitary sewers are pipes located in the street or in easements that are designed strictly to transport sanitary wastewater from homes or places of business to a wastewater treatment plant.

Inflow is stormwater that enters into sanitary sewer systems at points of direct connection to the system including footing/foundation drains, roof drains, downspouts, drains from window wells, outdoor basement stairwells, drains from driveways, groundwater/basement sump pumps, etc. These sources are typically

improperly or illegally connected to sanitary sewer systems. Excessive standing water on the streets and yards can exacerbate the inflow into the sanitary system.

Infiltration is shallow groundwater from saturated soils that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes. Cracks or leaks in sanitary sewer pipes or sanitary manholes may be caused by age related deterioration, loose joints, poor design, installation or maintenance errors, damage or root infiltration (location 1 in **Figure 5**). Groundwater can enter these cracks or leaks when the soil above the sewer systems becomes saturated from excess runoff standing for prolonged periods (location 3 in **Figure 5**). Infiltration can also be compounded when sanitary and storm sewer lines have been constructed in the same trench. During extreme rainfall events, the storm sewer system can become surcharged and pressurized. The pressurized storm sewer can push water out of the storm sewers and into neighboring sanitary lines (location 2 **Figure 5**). When I & I enters the sanitary sewer, it takes up space that is required for the wastewater and can quickly cause an overloaded sanitary sewer system to back up during significant rain events. This issue may become more relevant as the Village becomes older, however the same I & I concept of saturated soil adjacent to structure foundations applies to sump and seepage types of flooding. The proposed improvements to improve capacity of the Village's existing storm sewer system will alleviate the potential for stormwater flooding to contribute to I & I. There is no indication of areas with I&I; however smoke testing may be an option if I & I is suspected.

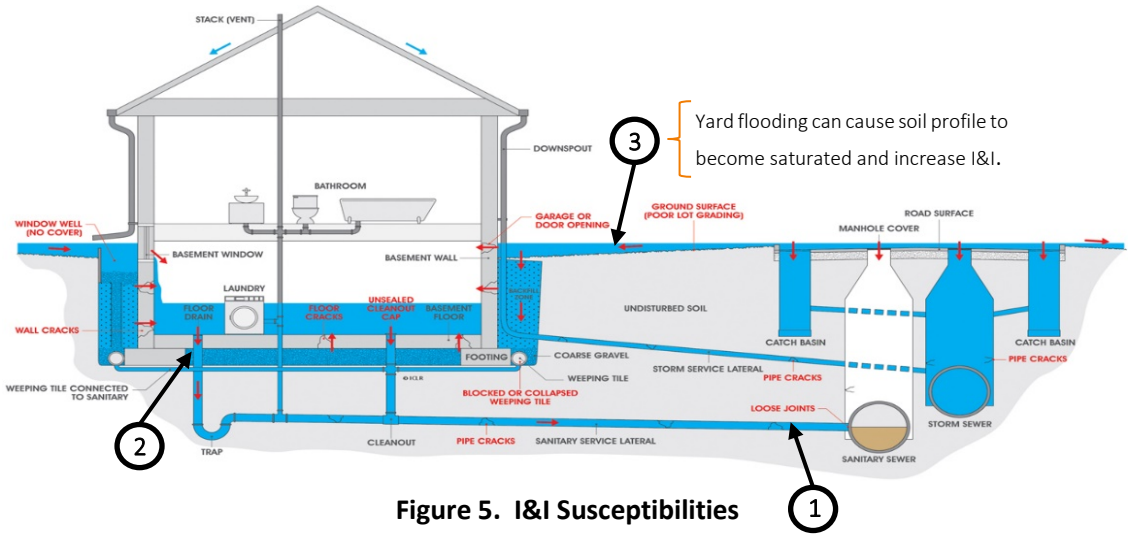


Figure 5. I&I Susceptibilities

CHAPTER 3 EXISTING CONDITION XPSWMM MODEL ANALYSIS

3.1 EXISTING CONDITION HYDROLOGIC AND HYDRAULIC MODEL DEVELOPMENT

An XP-Software Stormwater and Wastewater Management Model (XPSWMM) was created for each FSA. The XPSWMM software is a dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a storm sewer network (hydraulic mode). The XPSWMM software was chosen for the analyses for its ability to simulate overland flows and surface storage in combination with a storm sewer network to identify localized flooding problems.

3.1.1 Subbasin Delineation

The Village's development plan review information in addition to field survey was combined with the 2022 DuPage County 1-foot aerial topography in the GIS database. The tributary area in each of the FSA's were delineated and subdivided into subbasins ranging in size from 0.25 acres to 118 acres based on storm sewer data, land use and aerial topography. More specific detail was used in areas where drainage boundaries were required to capture known drainage problems identified by Village staff and residents on a block-by-block basis.

3.1.2 Land Use

Hydrologic parameters including area, impervious percentage, and subbasin slope were calculated based on topography and land use using the current aerial photography for each of the subbasins. The impervious percentage was calculated per subbasin using combined land use planimetric shapefile provided by DuPage County.

3.1.3 Data Entry

CBBEL entered the hydrologic parameters, trunk and lateral storm sewers (as-built) into the XPSWMM software. In addition to the storm sewer network, ditch networks, overland flow paths, stormwater storage facilities, and depressional storage areas were entered into the model using DuPage County 1-foot aerial topography and development plans. CBBEL also entered the appropriate tailwater elevation to represent the associated receiving waters, including the 10-year water surface elevations for Sawmill Creek and Flagg Creek.

3.1.4 Existing Condition Modeling Calibration

The purpose of the XPSWMM analysis is to simulate the storm sewer system, overland flow system, storage areas and the interactions between these components for various rainfall events to identify system bottlenecks and evaluate proposed drainage system improvements. Prior to completing these analyses, it is important that the model be calibrated to historical accounts. For this study and where available, firsthand accounts and photographs were used. Previous studies, including a CBBEL 1993 study for North Marion Hills, a 1995 study of South Marion Hills, and the DuDOT study of 63rd Street were reviewed and compared to computed high water levels. It was concluded that the computed water surface elevations at various locations within the study area correlated with modeling tolerance.

3.2 CRITICAL DURATION AND DESIGN STORMS

Following the calibration process, a critical duration analysis was completed using the XPSWMM model for each FSA. The critical duration was determined utilizing rainfall depths published in the Rainfall Frequency Atlas of the Midwest, by the Midwestern Climate Center and the Illinois State Water Survey (ISWS) Bulletin 75 and Huff rainfall distributions. The critical duration refers to the duration of a storm that produces maximum water surface elevations, flood depths or flow rates for each FSA. For example, the 100-year critical duration analysis included executing the XPSWMM model for the 1-hour through 48-hour duration storm events. The storm event producing the highest flood elevation is the critical duration storm event, and all proposed improvements are then designed for the critical duration storm. There are multiple FSAs for which

an XPSWMM analysis was completed, therefore each FSA is independent and has independent critical durations. This will be discussed further in the Master Plan for each FSA. Upon completion of the critical duration analysis, the XPSWMM model was run for the 10-year and 100-year return intervals for the critical duration storm events in each FSA.

CBBEL completed the modeling of the existing infrastructure which was originally designed using Bulletin 70 rainfall depths. Our modeling and inundation mapping uses Bulletin 75 rainfall depths, which is on average 15-18% increase in total rainfall depending on the storm duration. The rainfall depths published in Bulletin 75 for design storms are the design standards used throughout Northeast Illinois to design stormwater infrastructure and are now referenced in most local and county ordinances.

The rainfall data used in the statistical analysis to develop the rainfall depths in the original Bulletin 70 was based on measured rainfall data collected from 1901-1980 and did not include more recent storm events. Since the adoption of Bulletin 70 for stormwater management in 1989, the ISWS has updated Bulletin 70 due to the observed increases in frequency and amounts of heavy rainfall events occurring from 1985-2017. This recent trend of measured rainfall data suggests that higher intensity storm events are occurring more frequently, and this trend is anticipated to continue (Figure 6). When recent rainfall data (1985-2017) was included in the statistical analysis for design storm return intervals, rainfall depths used for design have increased. The ISWS released new rainfall depths in 2019, and adoption to the Ordinance occurred in 2019.

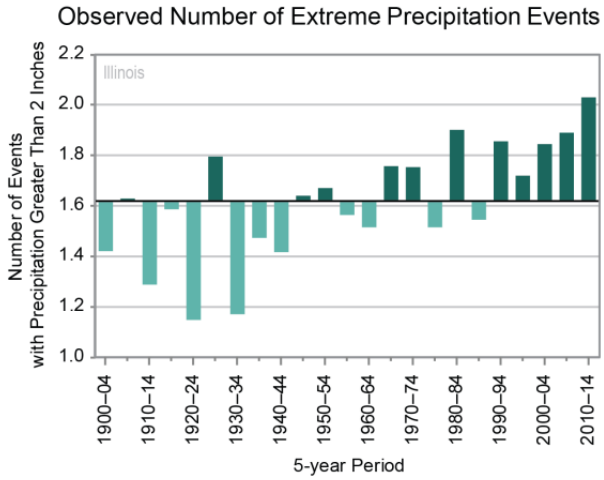


Figure 6. Observed Trends in Frequency of Heavy Storm in Illinois (Figure by ISWS)

3.3 MODEL RESULTS

Following model calibration and verification, CBBEL created existing condition inundation areas using 1-foot aerial topography for all FSAs showing the extent of the 10- and 100-year inundation areas. The majority of the existing drainage systems in the FSAs have approximately a 10-year level of service before street flooding begins. Because of this, we see street ponding in areas of the Village for the 10-year event. The storm sewer systems have approximately 10-year capacity except for the areas noted throughout this Master Plan. The major stormwater systems are mostly considered overland flow paths and according to the Ordinance, shall be sized to carry the storm with a one percent (1%) chance of occurrence in any one year (100-year storm

event) without causing additional flood damage. All FSAs have been evaluated for insufficient overland flow paths and/or minor stormwater systems.

A distinction has been made to define the **level of service** or capacity of the existing storm sewer system. Throughout this Master Plan, the level of service or capacity of a storm sewer refers to the point at which the systems begin to surcharge, which means stormwater begins to collect in the streets because the storm sewer is at capacity. Using this criteria, CBBEL determined that many of the storm sewers throughout the FSAs have a 10-year level of service.

CBBEL used the critical duration water surface elevations from the calibrated XPSWMM analysis to create existing condition inundation maps for the 10- and 100-year design storms for each of the FSAs. The inundation maps were combined with Village drainage concern maps to identify specific flooding impacts within each FSA. The existing condition inundation areas for each FSA is discussed further in the Master Plan.

3.3.1 Structures Vulnerable to Flooding

A structure is considered impacted by flooding when the water surface elevation of the surrounding water exceeds the lowest entry elevation of a structure and the water can enter the structure through a window well, low opening, front door, etc. The inundation maps prepared for each FSA shows structures that may be vulnerable if the inundation crosses the structure footprint. However, there have been no reports of structure flooding due to overland flow. Therefore, a detailed discussion of vulnerable structures is not provided. The inundation mapping was created using elevations derived from the DuPage County 1-foot aerial topography where the aerial topography was developed using LIDAR or Light Detection and Ranging technology.

CHAPTER 4 PROPOSED IMPROVEMENTS

Upon concurrence and verification of the existing condition inundation areas, CBBEL developed proposed drainage improvements that will allow the storm sewer system to provide a minimum 10-year level of service and strive to provide a level of protection up to the 100-year design storm event, where possible. The proposed 10-year level of service goal will reduce the hydraulic grade line in the storm sewer network below the street elevations for the 10-year critical duration design storm event, which is the current Ordinance standard. In study areas where the level of service is not achievable, CBBEL has identified the storage and conveyance requirements that would be needed. The proposed drainage improvements to achieve this goal include long-term drainage improvement projects and include significant improvements to the drainage system and volume of flood storage for some FSAs.

4.1 PROPOSED DESIGN CRITERIA AND PRIORITY

The design criteria with respect to introducing a proposed project to alleviate or reduce the potential of structure flooding versus inundation areas among yards or streets was based on the criteria below. Proposed projects developed to alleviate these issues were given priority where a project identified to alleviate structure flooding was listed as the highest priority (No. 1) and projects developed to alleviate nuisance flooding is listed No.4:

1. Structure flooding for 100-year storm event.
2. Greater than 1.0 feet of street ponding for the 100-year storm event.
3. Greater than 0.5 feet of street ponding for the 10-year storm event.
4. Clusters of rear yard drainage reports and ponding for either the 10- or 100-year storm event, (typically Village Staff Identified issues).

CBBEL reviewed the inundation mapping results for each FSA where specific attention was given to vulnerable structures and/or ponding in each FSA. If an area noted fell under the criteria above, a potential flood reduction project was introduced and modeled in a proposed condition XPSWMM analysis to determine if the proposed project met the desired conditions with the project.

4.2 DRAINAGE IMPROVEMENTS (CATEGORIES OF IMPROVEMENTS)

Due to the magnitude of vulnerable structures for some FSAs, CBBEL identified long term capital improvement projects that include increasing storm sewer sizes, adding relief storm sewers and incorporating stormwater storage to reduce flooding from the 10-year design storm below the street elevation and provide residential structure protection for larger events. These generally included expansion of existing stormwater storage basins, relief sewers and overland flow routes. A concept plan was prepared for each improvement alternative. These long-term improvements were analyzed with the XPSWMM model to determine the effect on peak water surface elevations and to verify that the proposed drainage projects did not negatively impact downstream areas while reducing water surface elevation in the affected areas. The proposed condition improvements can be seen in the detailed discussion for each of the FSAs. While long term capital improvement projects were identified in some FSAs, other FSAs exhibited only nuisance, yard and street flooding or areas susceptible to erosion due to stormwater conveyance.

4.2.1 Engineer's Estimate of Probable Cost

A conceptual engineer's estimate of probable cost for each of the proposed drainage improvement alternatives was prepared. There are many unknowns including soil conditions, utility conflicts and right-of-way limits that will affect the design and cost of the improvements. Because of this, the engineer's estimate of probable cost includes a 20% contingency. Construction engineering for each project has also been included in the estimates as a percentage of the total cost of the project. Property acquisition has not been included in the cost.

Figure 7. Typical Storm Sewer Construction

In preparation of the conceptual engineer's estimate of probable cost, CBBEL completed a unit price analysis utilizing recently submitted bid prices from awarded CBBEL projects in various municipalities in the Chicagoland area to develop applicable unit prices for the proposed improvements in the Village. These projects were used to develop estimated unit prices as they are similar in scope and size to the improvements identified for this Master Plan. These estimates will vary in future years.

Average unit prices were adjusted for inflation from each of the respective bid dates to 2025 equivalent values during calculation. Inflation values were based on monthly inflation rates retrieved from www.statbureau.org, which were calculated using the US Consumer Price Index.

4.3 RESIDENTIAL STRUCTURE FLOOD PROOFING

For vulnerable structures within the Village where a large capital improvement is not feasible, it is anticipated that the level of flood protection could also be increased through flood-proofing of residential structures by homeowners and this is strongly encouraged. Flood-proofing of residential structures is the single most cost-effective measure that can be completed to protect homes from flooding. A few of these measures include:

- Overhead sewer: This can greatly reduce the occurrence of sanitary sewer backup into a structure. An overhead sewer consists of an ejector pit, ejector pump and backflow valve. All plumbing drains in the basement are directed to the new ejector pit and pumped into the building drain. The overhead sewer system reconfigures the existing sanitary plumbing system inside a residence such that the lowest elevation that the main sanitary line leaving the structure is above the ground elevation or above the basement floor, typically along the basement ceiling which is overhead. In this system, the sanitary pit and pump are installed indoors so less maintenance is required, and there is nothing installed in the service line that has potential to get stuck or obstruct the line.
- Sanitary backflow valve: Valve that allows water to flow in one direction but automatically closes when the direction of flow is reversed. When the HGL in the sanitary sewer line exceeds the adjacent basement floor elevation, the check valve will engage preventing sanitary backup into the basement.
- Sump pump with battery backup: In the event of an electrical outage during a flood, a battery backup to provide power to the sump pump is recommended to prevent basement flooding.
- Directing downspouts away from structures: Downspouts that outlet near a structure allow stormwater to infiltrate and collect against the foundation resulting in seepage and/or additional strain on the sump pump. Directing downspouts away from the structure is a simple flood-proofing measure to help reduce the amount of water against the foundation.
- Raising window wells or other low entry points: Raising the window wells and low entry points increases the level of flood protection around a home by blocking overland flood access into the structure (Figure 8).

Figure 8. Window Well Elevation

Completing these flood-proofing measures in homes that are susceptible to flooding can provide a level of freeboard above the street flooding elevation that will significantly improve the effectiveness of the long-term capital improvement projects to be discussed in this report.

4.4 GREEN INFRASTRUCTURE

4.4.1 Green Infrastructure Improvements

Figure 9. Green Road

Over the last 20 years many communities throughout our region have increased sustainability by adding green infrastructure to their toolkit of approaches for the management of stormwater. Green infrastructure techniques include using vegetation to infiltrate stormwater, restoring wetlands to retain floodwater, installing permeable pavement to mimic natural hydrology, and using or capturing and re-using stormwater more efficiently on site. By attempting to mimic natural hydrologic functions, such as infiltration and evaporation, these approaches prevent stormwater from flowing into surface waters or storm sewer systems already under great stress using natural features. Green infrastructure is typically used to compliment or assist traditional stormwater management practices and is not meant to replace traditional grey stormwater management practices. Although green infrastructure practices cannot single-handedly mitigate the flooding during extreme storm events, they provide a reduction in stormwater runoff volumes and improve water quality. Green infrastructure should be an integral part of stormwater management strategies given the cost-effectiveness of green approaches across a variety of categories. On a national scale, policies that favor or stimulate the wider adoption of green infrastructure strategies have been gaining notoriety while providing opportunity and available financial resources.

The Village's commitment to green infrastructure has had a positive impact on stormwater management. While development of the Village has benefitted from traditional stormwater management practices, natural area preservation and best management practices can enhanced the Village's stormwater management system.

4.4.2 Green Infrastructure Limitations

Green infrastructure systems have a growing record of reducing runoff from smaller and more frequent rain events. However, these systems do not target low-frequency, high-volume rainfall events. Care should be taken to realize that while green infrastructure can be used to compliment a stormwater management system for frequent storm events, flooding may continue throughout the Village from extreme rainfall events due to the undersized storm sewer system. Many green infrastructure practices rely on high infiltration rates. Areas of predominantly high clay soil content make green infrastructure initiatives that rely on infiltration very difficult. It is important to understand the magnitude of the flooding problem in the Village, the capacity of the existing conveyance network and the relation of limitations of green infrastructure. In typical urban flood problem areas, the storage volumes required to reduce the flood depths to an acceptable level are significant. Flood volumes are typically quantified in acre-feet. One acre-foot is the equivalent of an acre of land that is flooded one foot deep. Comparing volumes provided by green infrastructure, the limitations of green infrastructure are apparent:

- Capacity limitations
    - 1 acre-ft of flood storage equals:

- 5,925 rain barrels (55 gallons each)
- 8,250 feet of green alleys (0.08 acre-feet per 660 ft block)
- 2,520 feet of roadway with pervious pavement

The construction of green infrastructure techniques like green streets and rain gardens also has a heavy reliance on the in-situ soils for infiltration. Soil amendments to achieve proper infiltration rates to meet performance stands can increase construction costs and are limited in effectiveness by the underlying soils.

CHAPTER 5 PROPOSED PROJECT DISCUSSION

This Master Plan identifies long term capital improvement projects for each of the FSAs. The recommended projects are described in the following sections.

5.1 AREA 1 – NORTHWEST AREA

5.1.1 Existing Conveyance & Storage System

The northwest area of the Village, located west of Clarendon Hills Road and north of 67th Street is located in the Flagg Creek Watershed (**Figure 10** and **Exhibit 1**). At approximately 1,003 acres, the northwest area can further be divided into two study areas: north of 61st Street and south of 61st Street, each discharging to Knolls Lake prior to discharging to 63rd Street Ditch.

North of 61st Street

There is approximately 390 acres of area tributary to the intersection of 59th Street and Clarendon Hills Road. Jurisdiction over this watershed includes the Villages of Clarendon Hills, Westmont, and Willowbrook, as well as Downers Grove Township. The watershed includes multi-family residential developments, single family neighborhoods, and large lot rural areas. The topography of the study area contains gently sloped hills and several low lying depressional areas which have very limited gravity outlets. While stormwater storage has been provided within the watershed due to development, because of the substantial volume of runoff from these areas, significant increases in the conveyance system will exacerbate the flooding at Clarendon Hills Road and 59th Street. To provide a 100-year level of flood protection, a large volume of stormwater storage is required.

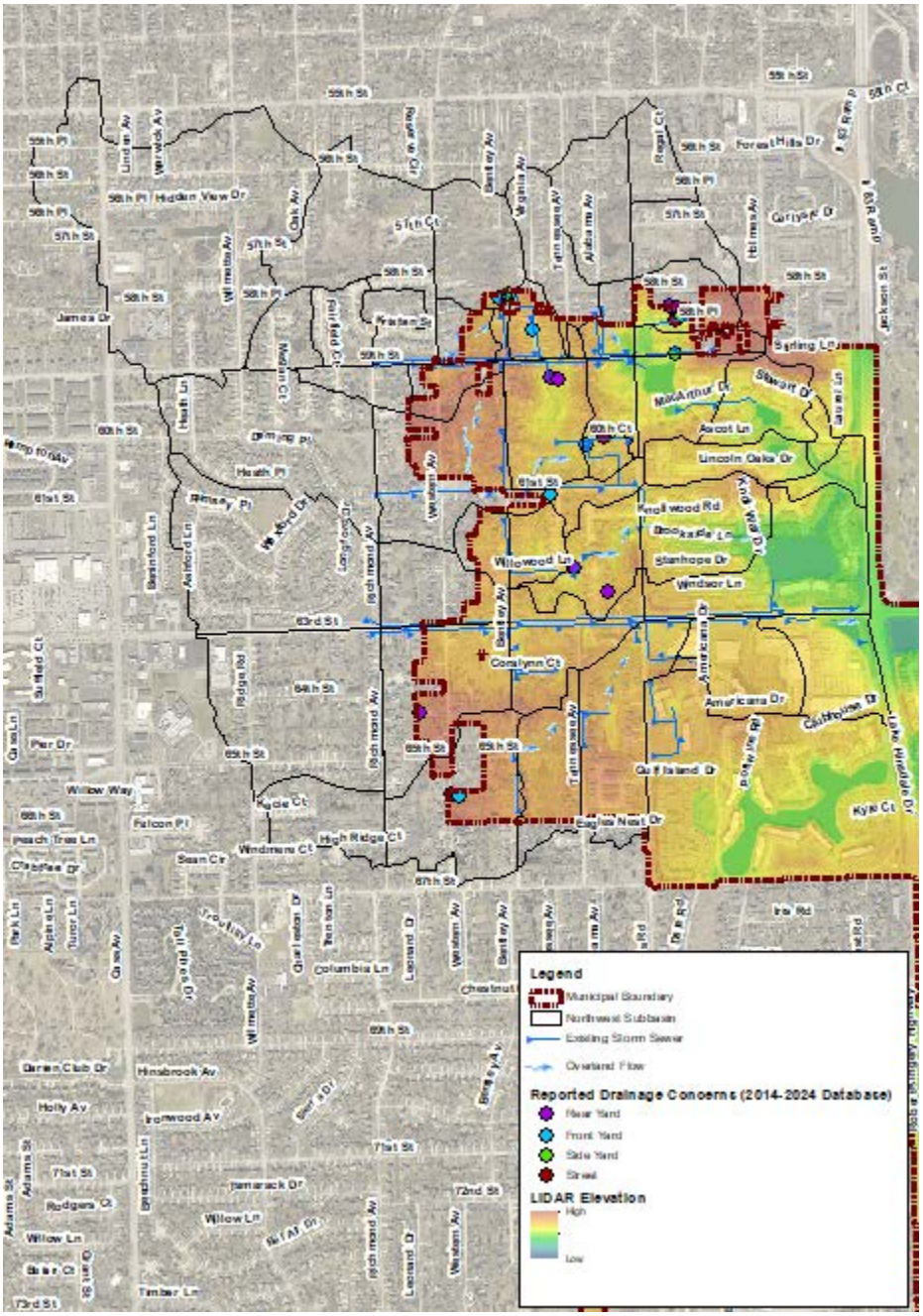


Figure 10. Northwest Area Drainage Patterns

CBBEL completed an XPSWMM analysis that included the overall tributary area, open ditches, and the storm sewer system as shown on Exhibit 1. The results of this analysis are shown on Exhibits 2a and 2b where the inundation areas for both the 10-year and 100-year 24-hour critical design storm events have been delineated. The existing level of service of the storm sewer system is generally a 10-year 24-hour critical design storm, with the exception of 59th Street and Clarendon Hills Road, and 59th Street between Virginia Avenue and Tennessee Avenue, and a portion of Bentley Avenue, north of 59th Street. There is minor encroachment into the curb lines of 59th Street at Western Avenue.

The XPSWMM analysis confirms the historical accounts of flooding at 59th and Western, the 5800 block of North Bentley, 59th and Virginia, the rear yards south of 59th Street, east of Tennessee, 58th Place, and flooding at Clarendon Hills Road and 59th Street. The drawdown time at Clarendon Hills Road and 59th Street has exceeded 3 days at times. Although there has been development in the area upstream of 59th Street and Western Avenue that has provided stormwater storage, there is approximately 89 acre-feet of stormwater runoff generated in the 100-year, 24-hour storm event from the upstream tributary using the revised rainfall data.

South of 61st Street/South Branch of Marion Hills Ditch

The area generally located south of 61st Street flows from west to east. Portions drain to 63rd Street and portions drain to a tributary to 63rd Street Ditch (South Branch Marion Hills Ditch (SBMHD)) that begins just upstream of Clarendon Hills Road and Chatelaine Court. Both of these areas and the North Branch of Marion Hills Ditch are routed through Knolls Lake prior to discharging at the northwest corner of 63rd Street and IL Route 83. Discharges from the lake flow under IL Route 83 into Ruth Lake Country Club continuing southeast/east through the Village, tying into the 63rd Street ditch and eventually exiting the Village northeast of Creekside Park. Knolls Lake has frequent and substantial fluctuations that have caused significant erosion to the shorelines. Additionally, during the 1995 CBBEL study, it was determined that the depth of Knolls Lake is shallow around the perimeter making it difficult to lower the lake without changing the aesthetics that exist today.

The existing level of service of the storm sewer system is generally a 10-year 24-hour critical design storm, with the exception of Wildwood Lane, south of 61st Street, 63rd and Western, 63rd and Bentley, Tennessee Avenue, south of 63rd Street, and Clarendon Hills Road, south of 63rd Street. There is larger scale flooding in the 100-year storm event at these locations, as expected with a larger volume of runoff. The XPSWMM analysis also confirms the historical accounts of flooding at 63rd and Western, 63rd and Clarendon Hills Road, Bentley Avenue and 65th Street, and Bentley Avenue between 61st Street and 63rd Street. In addition, the modeling matches well with the 2025 V3 model for 63rd Street and the 1995 CBBEL study for SBMHD. The approximate 140 acres of area tributary to the intersection of 63rd Street and Western Avenue generates approximately 72 acre-feet of runoff in the 100-year storm event. While some of this volume can be conveyed downstream and some volume is stored in the upstream watershed, to provide a 100-year level of service for the 63rd Street corridor, including Clarendon Hills Road and 63rd Street, approximately 57 acre-feet of stormwater storage is required in addition to the storm sewer installation to convey the water to the basin.

5.1.2 Northwest Area Proposed Improvements

North of 61st Street

While the system provides an adequate overall level of service and flood protection for most areas, the hydraulic connection of the detention ponds to the wetland complex causes sustained water surface elevations in the northern detention ponds.

The following assessments were determined during this investigation and XPSWMM analysis:

- The ponding at 58th Place is a result of being hydraulically connected to Prairie Trail Park.

- The four corners at the intersection of Clarendon Hills Road and 59th Street are hydraulically connected.
- The invert of the outlet at Prairie Trail Park is higher than the invert at the inflow sewers in the northwest corner of the park.
- The roadway surface of 59th Street and Virginia Avenue flood to depths above the road surface in the 10-year storm event. Approximately 220 acres are tributary to this point, and roadside ditches are shallow and provide only minimal potential for stormwater storage.

To reduce the risk of flooding at Clarendon Hills Road and 59th Street, it is recommended to raise both Clarendon Hills Road and 59th Street until the road ties into an elevation above the 100-year WSEL. Because 58th Place is hydraulically connected to this intersection via the wetland in the northeast corner of 59th Street and Clarendon Hills Road, it is also recommended to raise the 58th Place roadway at this location. All storage lost due to the roadway will need to be compensated for by either stone under that pavement, oversized storm sewers, or by providing additional storage in the wetland basin in the northeast corner of Clarendon Hills Road and 59th Street, or by providing additional storage in Prairie Trail Park. In addition, to not increase flood elevations at this intersection by increasing the storm sewers from upstream areas, storage is required. For purposes of this Master Plan, it is assumed that storage will be provided for in underground storage at the northwest corner of Prairie Trail Park, by expanding the existing basin at the southwest corner of Clarendon Hills Road and 59th Street, or expansion of the wetland basin at the northeast corner of 59th Street and Clarendon Hills Road. Any permanent impact to a regulatory wetland in DuPage County requires mitigation at a ratio of 1.5:1. In addition to compensating for the lost roadway storage volume, an additional 2 acre-feet of storage is proposed in underground storage at Prairie Trail Park, northeast of the existing basin. This volume in addition to 0.5 ac-feet of additional storage in the southwest corner of Clarendon Hills Road and 59th Street is required to offset any increases in flood elevation due to conveyance improvements upstream.

A stormwater storage facility is also proposed at the north end of the 5800 block of North Bentley Avenue. It should be noted that at the north end of Bentley Avenue, the low spot between 5808 and 5814 Bentley Avenue is an existing stormwater basin that must be maintained. This is also the historical flow path for the upstream area to the North Branch of Marion Hills Ditch (NBMHD).

The proposed improvement projects are shown on **Exhibit 3** in Appendix 1 and include the following:

- 285’ of 4’x4’ RCBC equalizer pipes at 59th and Clarendon Hills Road
- Roadway raising by avg. of 1.5’ for 900 linear feet along Clarendon Hills Road and 59th Street
- Raise roadway for by avg of 2.0’ for 350’ along 58th Place
- 0.5 acre-feet above-ground storage at the southwest corner of 59th and Clarendon Hills Road
- 2.0 acre-feet underground storage in Prairie Trail Park
- 0.7 ac-ft of above ground storage (5’ deep) north of Willowood Avenue and 61st
- 140’ of 18-inch storm sewer connecting 60th Court to new basin
- 410’ of 27-inch storm sewer east of Western Avenue
- 360’ of 24-inch storm sewe from rear yards north of 59th Street
- 50’ of 24-RCP at North Bentley Avenue
- 0.5 acre-feet of storage at North Bentley Avenue

- 200’ of 12-inch storm sewer from new storage basin at North Bentley Avenue to Virginia Avenue

The engineers estimate of probable cost for these improvements is $5.5 Million in 2025 dollars. **Exhibits 1-3** are included in **Appendix 1**.

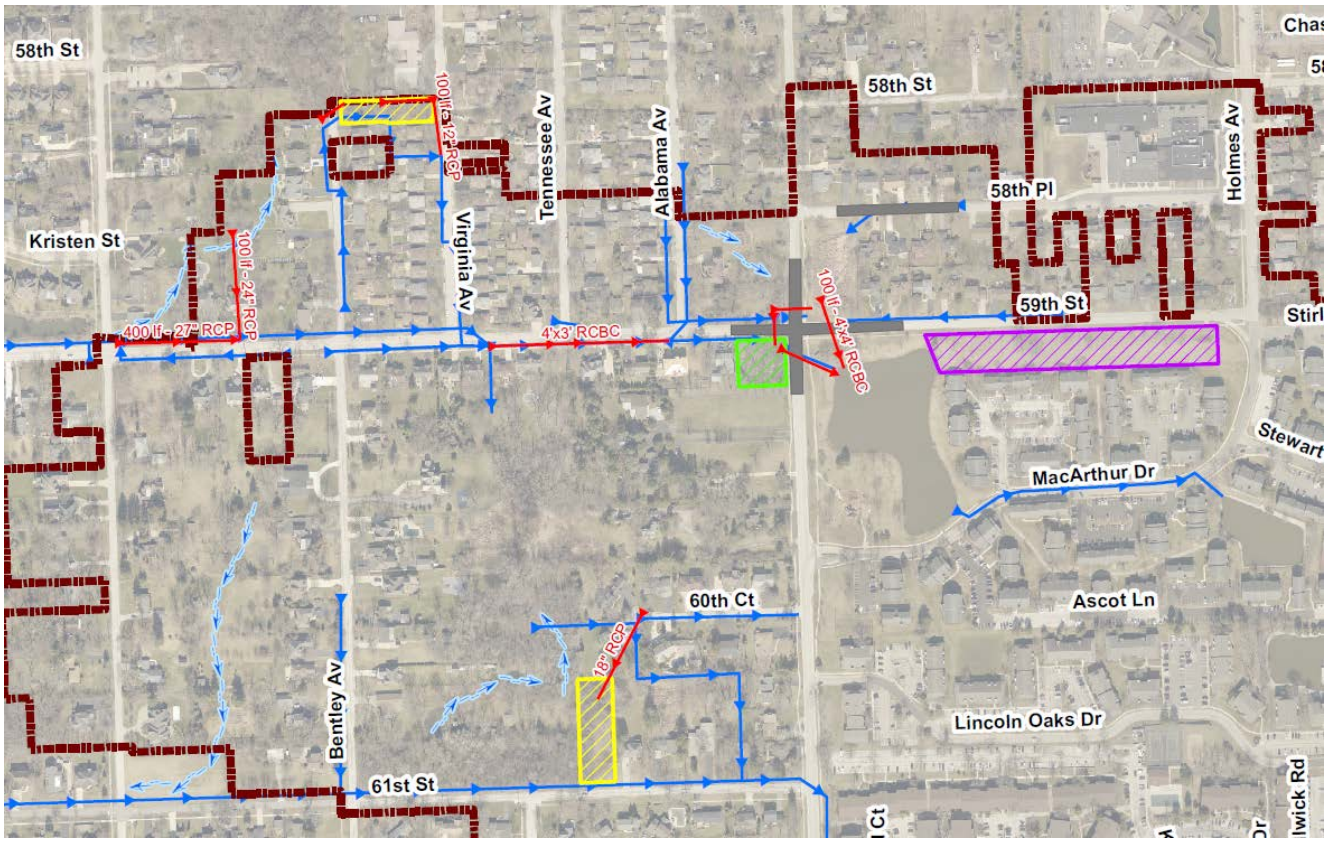


Figure 11a. Northwest Area – Proposed Conditions (North of 61st Street)

South of 61st Street

As stated in the 1995 CBBEL report, this area is tributary to Knolls Lake, careful consideration should be given to optimize its function to provide flood reduction benefits to upstream areas in storms less than the 100-year. Permitting difficulties are presented adding new storm sewer that increases the discharge rate of the receiving system. Detailed hydraulic modeling of the receiving system (in this case 63rd Street Ditch/South Branch Marion Hills Ditch (SBMHD) may be required using the DuPage County Full Equations Model (FEQ) to analyze downstream impacts. If it is determined that there are increases above the allowable tolerance (0.1’), flood easements must be obtained from all affected property owners. The analysis must also demonstrate a watershed benefit. The other option is to restrict the outlet to not cause increases or attenuate flows to offset increases by providing substantial upstream storage. While storage projects scattered throughout the corridor provide localized benefits, a large-scale reservoir would need to be constructed with infrastructure improvements to convey the water to the storage area to provide flood relief in storms up to and including the 100-year storm event. CBBEL has identified projects throughout this FSA as summarized below.

The following assessments were determined during this investigation and XPSWMM analysis:

- The ponding along 63rd Street at the intersections with Western Avenue and Bentley Avenue are the result of a large volume of runoff tributary to this intersection and a lack of conveyance capacity.
- The overtopping of Tennessee Avenue in the 6500 block is due to the tailwater impacts of the downstream ponding area that has a non-uniform overflow route to the southwest corner of Clarendon Hills Road and 63rd Street.
- The ponding in Clarendon Hills Road at 63rd Street is due to lack of conveyance capacity in the downstream sewer system.
- The ponding at Willowood Lane is due to a lack of conveyance in the non-uniform overflow route in the downstream conveyance system.

The proposed improvement projects are shown on **Exhibit 3** in **Appendix 1** and include the following:

63rd Street Storm Sewer Improvements

The 2025 V3 study of 63rd Street included survey information of the sewers from Richmond Avenue to IL Route 83. The survey shows storm sewer along both the north and south sides of 63rd Street. Flooding within the upstream areas tributary to 63rd Street will need to be conveyed to the 63rd Street drainage system. Adding flow into the storm sewer system will require increases to the storm sewer. As previously discussed, areas where stormwater storage can be constructed have been included to offset some of the increases. As projects are implemented, the overall system should be reevaluated since it is unknown the order in which stormwater projects will be implemented. Any increase in storm sewer without adequate stormwater storage to offset the discharges will need to be evaluated with the FEQ model to determine downstream impacts. Because a direct discharge into the basin at the southeast corner of IL Route 83 and 63rd Street is likely unfeasible, and FEQ modeling was not included as part this plan development, the storm sewer system has been designed, but the downstream impact analysis has not been performed. As previously noted, any increases above 0.1' to any areas will require an easement and it must be demonstrated that the project projects provide a watershed benefit.

Additionally, 63rd Street storm sewer improvements discharging into Knolls Lake have been evaluated as part of this study. This alternative combines a portion of the 2025 V3 study in addition to stormwater improvements identified by CBBEL and Village staff. CBBEL incorporated the proposed V3 drainage improvements, which include replacing the 18-inch storm sewer with a 36-inch storm sewer along 63rd Street from Clarendon Hills Road to Knolls Lake and lowering the lake normal water level (NWL) to gain additional storage.

Knolls Lake Optimization

This project was identified in both the 1995 CBBEL report and the 2025 V3 report. Knolls Lake has over 550 acres of tributary area. The outlet, which consists of an orifice/weir structure, serves as the control for the runoff that is conveyed through the Lake. This project focuses on optimizing the storage of Knolls Lake but also reducing erosion problems along the shoreline by reducing the pool fluctuation. As Knolls Lake is the

downstream end of the study area, this project would need to be constructed prior to conveying additional flow to the lake.

The outlet for Knolls Lake is an orifice/weir structure that discharges to the IL Route 83 ditch line to twin box culverts that convey flow east. To optimize the function of Knolls Lake, while not increasing discharges downstream (only evaluated with XP-SWMM modeling, not FEQ), the normal water level of Knolls Lake will need to be lowered. This will increase the storage available in the lake for the additional runoff from a new storm sewer. The new storm sewer described above was routed to Knolls Lake and restricted at the downstream end prior to discharging to the lake.

Storage Vault along Western Avenue South of 63rd Street

Western Avenue overtops with runoff across the road in storms less than the 2-year storm event. Providing underground storage vaults consisting of 250 linear feet of 10 feet x 4 feet reinforced concrete box culvert along Western Avenue south of 63rd Street increases the level of service to greater than a 5-year event.

Storage Basin SE of Bentley Avenue and 63rd Street

Approximately 10 acre-feet of stormwater storage can be provided at this location. It should be noted that this is not all additional storage. As shown on Exhibits 2a and 2b, this area is partially inundated under existing conditions. A portion of this 10 acre-feet is replacing existing storage volume at this location.

Storage Basin West of Squire Lane

Construction of approximately 1.5 acre-feet of storage at this location and directly connecting it the Willowood Lane storm sewer will reduce the flooding along Willowood Lane. It should be noted that this parcel is approximately 50% wetlands. Any modifications to wetlands are considered a permanent impact by DuPage County and must be mitigated at a 1.5:1 ratio. This project increases the level of protection from a 5-year to greater than a 10-year.

Bentley Avenue Storm Sewer

Construction of a new storm sewer from Bentley Avenue from north of Willowood Lane to the new 63rd Street storm sewer system will provide flood relief for the area at 61st Street and Bentley. This storm sewer would be directly connected to the 10-inch storm sewer that flows from west to east across Bentley Avenue, north of Willowood Lane. This storm sewer also provides relief to the Willowood Lane storm sewer.

Tennessee Avenue Storm Sewer

Installation of a 36-inch storm sewer from the 6500 block of Tennessee Avenue to the new 63rd Street storm sewer will reduce overtopping of Tennessee Avenue and provide relief to the downstream open channel that conveys flow from the rear yards of the homes between Clarendon Hills Road and Tennessee Avenue to the northwest corner of Clarendon Hills Road and 63rd Street.

Storage Basin SW Corner of Clarendon Hills Road and 63rd Street

Approximately 2.2 acre-foot is proposed at the southwest corner of Clarendon Hills Road and 63rd Street. This basin is hydraulically connected to the stormwater basins at Sunrise Senior Living. This basin is the

downstream end of channel improvements from the storage area in the rear yards of Tennessee Avenue. Channel modifications in this area will improve conveyance from the depressional area.

The improvements proposed south of 61st Street do not achieve a 100-year level of service with 6-inches of ponding in the roadway. The level of service is increased from less than a 5-year at repetitive flooding locations to between a 10- and 25-year event combining the projects listed above without causing downstream impacts. A significant volume of stormwater storage within the 63rd Street corridor is required (approximately 57 acre-feet) to provide a 100-year level of protection.

The engineers estimate of probable cost for these improvements is $9 Million in 2025 dollars. **Exhibits 1-3** are included in **Appendix 1**.

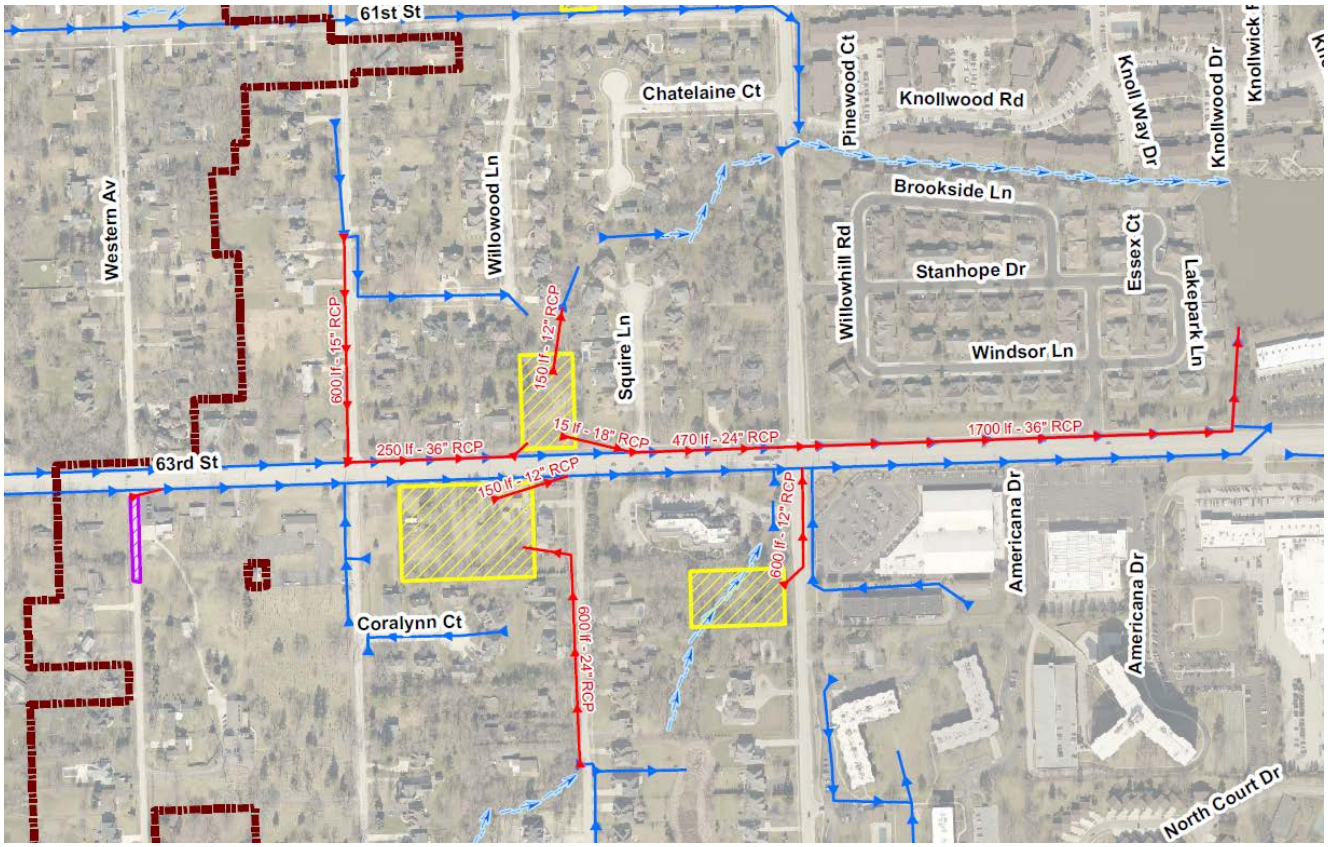


Figure 11b. Northwest Area – Proposed Conditions (South of 61st Street)

Permitting and coordination for the proposed project includes the following agencies:

- DuPage County Division of Transportation (DuDOT)
- Illinois Environmental Protection Agency (IEPA), NPDES permit
- DuPage County Stormwater Management
- US Army Corps of Engineers (ACOE)

5.2 AREA 2 – RIDGEMOOR WEST

5.2.1 Existing Conveyance and Storage System

The Ridgemoor West study area is approximately 17 acres is size and is located west of IL Route 83 and drains directly to Flagg Creek (**Figure 12** and **Exhibit 4**). This study area is primarily served by ditches. This area drains to the same location where the IL Route 83 sewer outlets to 63rd Street Ditch. Ditch improvements have been constructed in this area along the north side of Ridgemoor Drive to increase conveyance. The ditches in the area have a slope of approximately 1% slope, with the exception of the west side of Stough Street, which has a 0.3% slope. A 1% slope is generally adequate for drainage, provided there are no blockages, and they are well maintained.

CBBEL completed an XPSWMM analysis of the ditch network. The results of this analysis are shown on **Exhibits 5a** and **5b** where the inundation areas for both the 100-year and 10-year 1-hour critical design storm events have been delineated, respectively. The inundation mapping shown on **Exhibits 5a** and **5b** indicate that there is a minor level of rear yard and street ponding during the 10-year storm event, however there is no structure flooding. The existing level of service of the storm sewer system is a 10-year design storm, with the exception of Ridgemoor Avenue, west of Stough Ave, where the level of flood protection is a 5-year design storm event. The south side of Ridgemoor Drive relies on a 24-inch CMP to convey the flow from the upstream area to the north side of Ridgemoor Drive before discharging to 63rd Street Ditch. A review of the drainage database indicated 4 drainage reports in this area; however, one side yard report is located on the east side of Quincy Street and is not tributary to this study area.

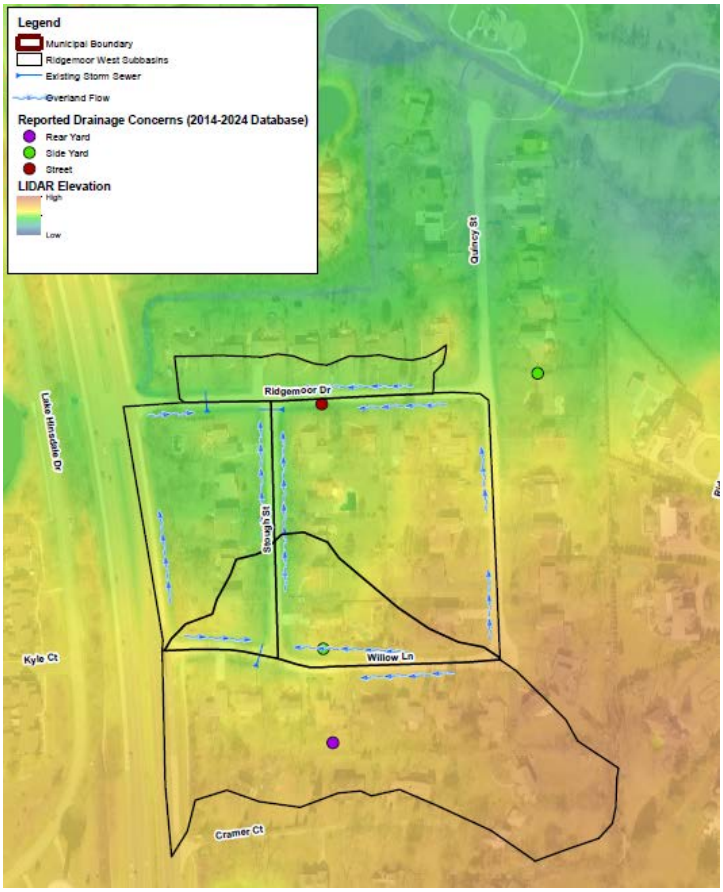


Figure 12. Ridgemoor West – Drainage Patterns

5.2.2 Ridgemoor West Proposed Improvements

Because of the proximity to 63rd Street Ditch, the drainage of the area is directly affected by the water elevations at 63rd Street Ditch. There is also a portion of IL Route 83 that is directly tributary to the southeast corner of IL Route 83 and Ridgemoor Drive. To increase conveyance in this area, the ditches can be enclosed in storm sewers. A wetland assessment of the roadside ditches may need to be performed prior to the construction/design of this project. The height is limited due because the invert elevation of the ditch is only 2-3' lower than the pavement elevation. Additionally, flows to 63rd Street Ditch cannot be increased above existing, therefore the pipe size must be restricted at the downstream end.

This proposed improvement includes:

- 491 linear feet of 4'x2' RCBC along the north side of W Ridgemoor Drive
- 272 linear feet of 4'x2' RCBC along the south side of W Ridgemoor Drive, east of S Stough Street
- 165 linear feet of 5'x2' RCBC along the south side of W Ridgemoor Dr, west of S Stough Street
- 978 linear feet of 4'x2' RCBC along the east and west sides of S Stough Street
- 239 linear feet of 4'x2' RCBC along the north side of Willow Lane, east of S Stough Street
- 159 linear feet of 4'x2' RCBC along the north side of Willow Lane, west of S Stough Street

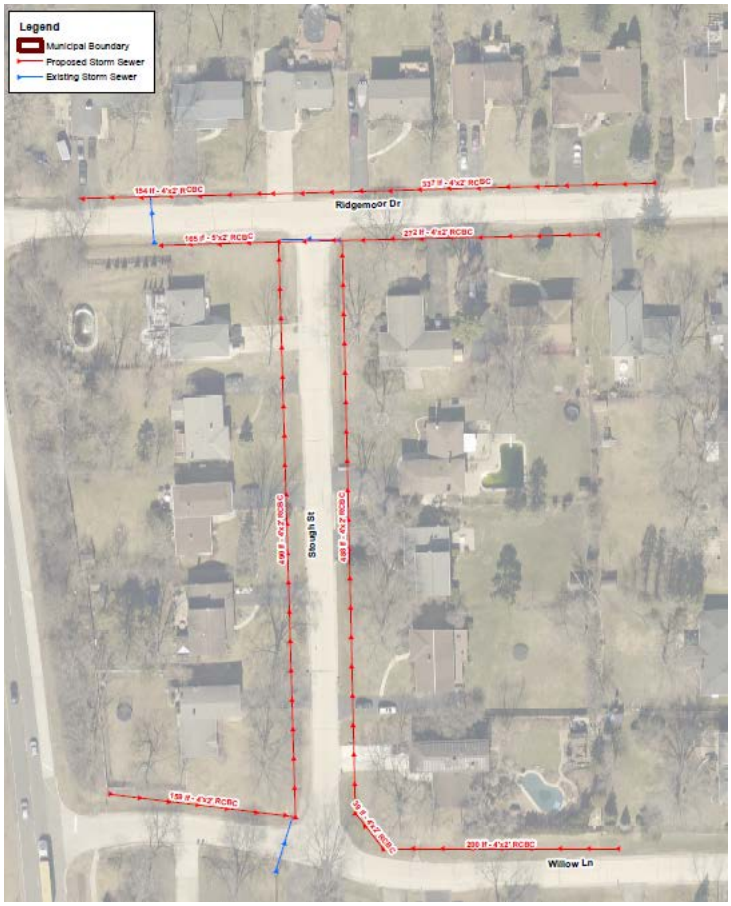


Figure 13. Ridgemoor West – Proposed Conditions

The engineers estimate of probable cost for these improvements is $3.75 million in 2025 dollars. **Exhibits 4-6** are included in **Appendix 2**.

Permitting and coordination for the proposed project includes the following agencies:

- Illinois Environmental Protection Agency (IEPA), NPDES permit
- DuPage County Stormwater Management (if impacts to 63rd Street Ditch)
- US Army Corps of Engineers (ACOE)

5.3 AREA 3 – GARFIELD

5.3.1 Existing Conveyance and Storage System

This FSA consists of a 19-acre drainage area with 2 separate outfalls to detention basins that outlet to 63rd Street Ditch (Flagg Creek Watershed) (**Figure 14** and **Exhibit 7**). The FSA consists of residential areas located between Garfield Avenue the municipal boundary, along the Garfield Ridge. The general direction of drainage in this FSA is from east to west and south to north towards the 63rd Street Ditch. Stormwater runoff is

collected in storm sewers and to detention ponds before outletting to 63rd Street Ditch. The existing drainage system consists of detention ponds at each outfall. A review of the drainage database indicated 2 drainage reports in this area, each adjacent to a stormwater facility.

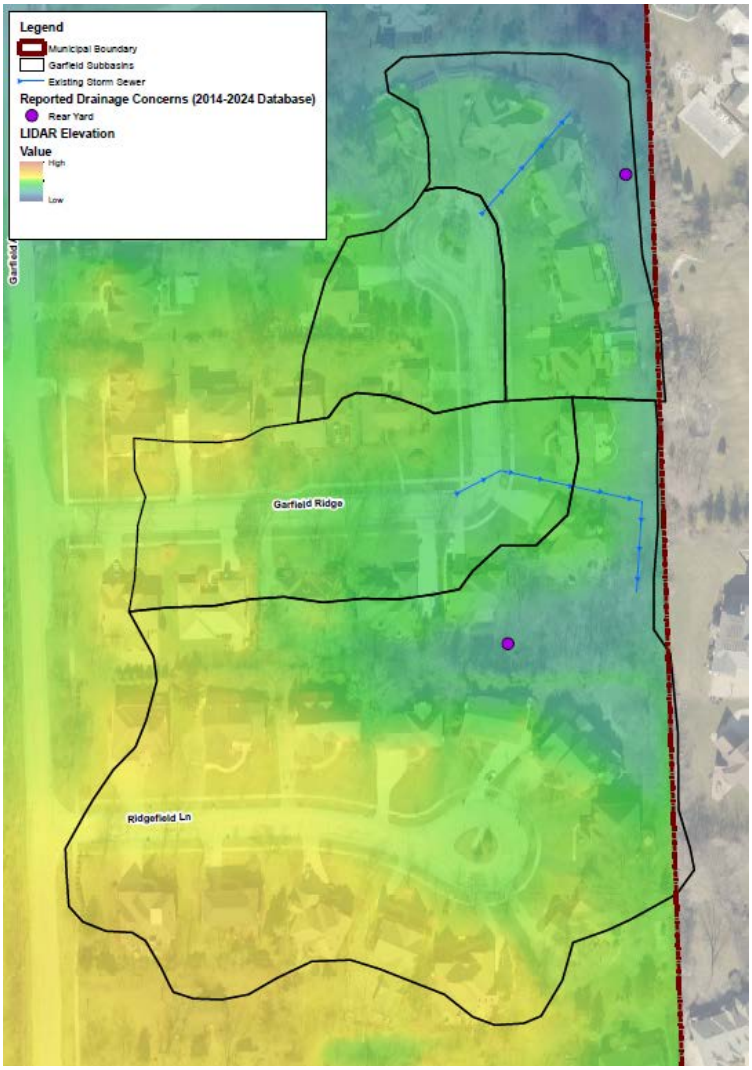


Figure 14. Garfield – Drainage Patterns

CBBEL completed an XPSWMM analysis that included the overall tributary area and storm sewer system as shown on Exhibit 7. The results of this analysis are shown on Exhibits 8a and 8b where the inundation areas for both the 100-year and 10-year, 1-hour critical design storm events are shown, respectively. The existing level of service of the storm sewer system is a 10-year design storm and the level of flood protection is a 100-year design storm event. The storm sewer system provides a level of service in accordance with the Ordinance. Therefore, there is no proposed improvement for this FSA. Exhibits 7-8b are included in Appendix 3.

5.4 AREA 4 – RIDGEMOOR EAST

5.4.1 Existing Conveyance and Storage System

The Ridgemoor East study area is approximately 28 acres of residential area located west of Madison Street. The subdivision is served by roadside ditches that flow generally from south to north, outletting to 63rd Street Ditch. In the center of the subdivision, overland flow is conveyed north through the rear yards via drain tile and overland flow path, before flowing north along Lane Court and discharging into 63rd Street Ditch (**Figure 15** and **Exhibit 10**). A review of the drainage database indicated 2 drainage reports in this area.

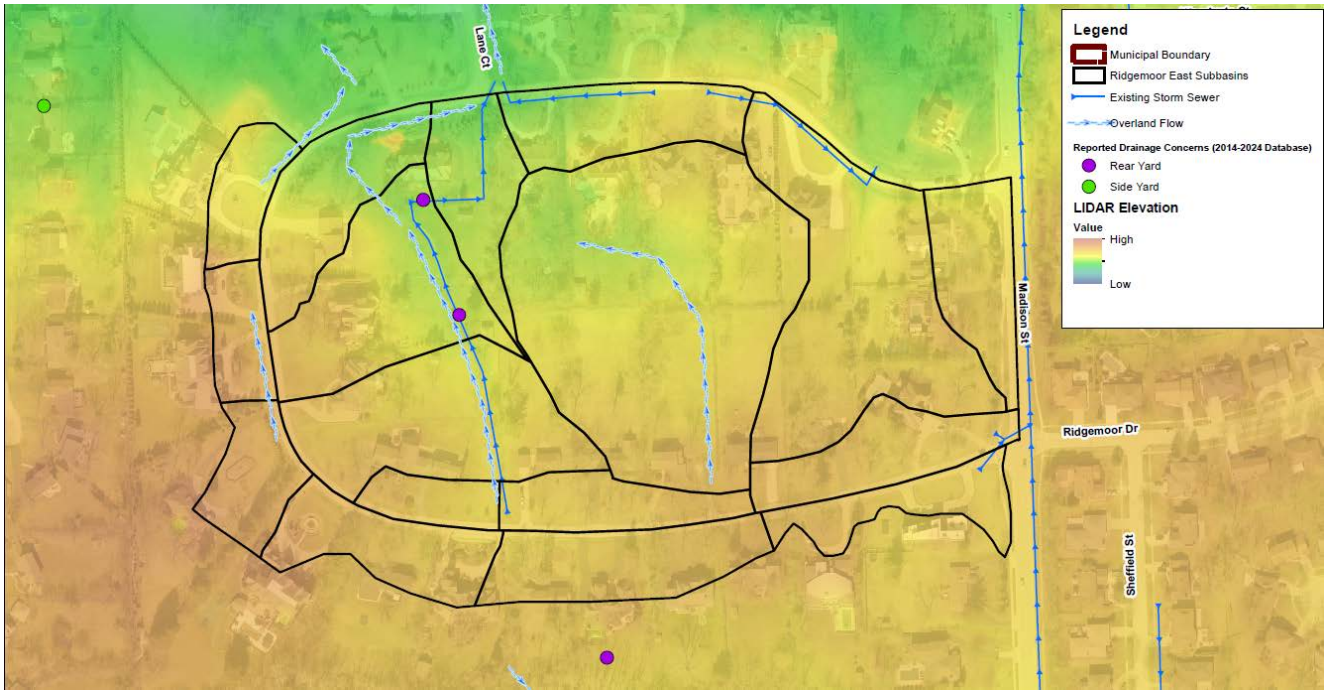


Figure 15. Ridgemoor East – Drainage Patterns

This portion of 63rd Street Ditch is studied Zone AE floodplain and floodway according to the regulatory effective FEMA FIRM.

CBBEL completed an XPSWMM analysis that included the overall tributary area, ditch network, and drain tile, as shown on **Exhibit 10**. The results of this analysis are shown on **Exhibits 11a** and **11b** where the inundation areas for both the 100-year and 10-year, 1-hour critical design storm events are shown, respectively. The existing level of service of the drainage system is a 10-year design storm, and the level of flood protection is a 100-year design storm event.

5.4.1 Ridgemoor East Proposed Improvements

To provide a 100-year level of service, storm sewer will need to be constructed around the perimeter of Ridgemoor Drive to convey stormwater to 63rd Street Ditch. Although there is a low-lying area in the center-

area of Ridgemoor Drive, it is on private property and therefore no improvements are proposed in this area; however, construction of a conveyance system will reduce the ponding in the rear yards.

This proposed improvement includes:

- 192 linear feet of 18-inch storm sewer along south side of Ridgemoor Drive
- 1,811 linear feet of 24-inch storm sewer along west/south side of Ridgemoor Drive/Lane Court with new outlet to Flagg Creek
- 52 linear feet of 12-inch storm sewer from south side of Ridgemoor Drive to north side of Ridgemoor Drive
- 80 linear feet of 15-inch storm sewer along north side of Ridgemoor Drive

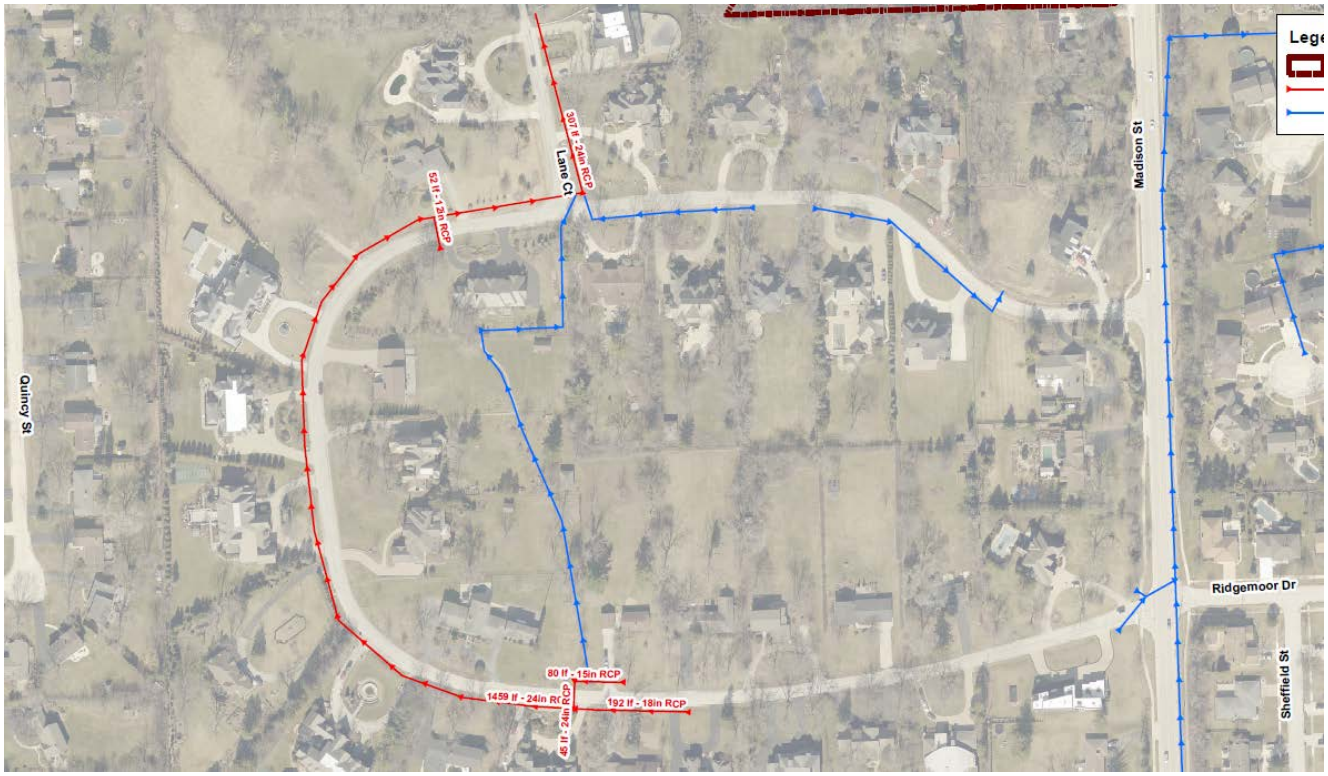


Figure 16. Ridgemoor East – Proposed Conditions

The engineers estimate of probable cost for these improvements is $1.25 million in 2025 dollars. Exhibits 4-6 are included in Appendix 4.

Permitting and coordination for the proposed project includes the following agencies:

- Illinois Environmental Protection Agency (IEPA), NPDES permit
- DuPage County Stormwater Management (if impacts to 63rd Street Ditch)

5.5 AREA 5 – WILLOW POND

5.5.1 Existing Conveyance and Storage System

The Willow Pond study area consists of approximately 28 acres of residential area located north of Plainfield Road. Portions of the developed area are tributary to Willow Pond, which ultimately outlets to Plainfield Road. Areas not drained by storm sewer are tributary to a depressional area north of 68th Place and east of Quincy Street. This depressional area has over 5 acres of direct tributary area (**Figure 17** and **Exhibit 13)**. Once the depressional area overtops, it flows towards the southeast corner of Quincy Street and 68th Street. From this point it is conveyed westerly, until it discharges to IL Route 83 right-of-way. Historically the depressional area did not have an outlet, however the Village installed a 12-inch drain tile that conveys flow to the Quincy Street sewer. While this provides some relief in smaller storm events, the system relies on the IL Route 83 right-of-way being clear for free discharge. A review of the drainage database indicated 10 drainage reports in this area.

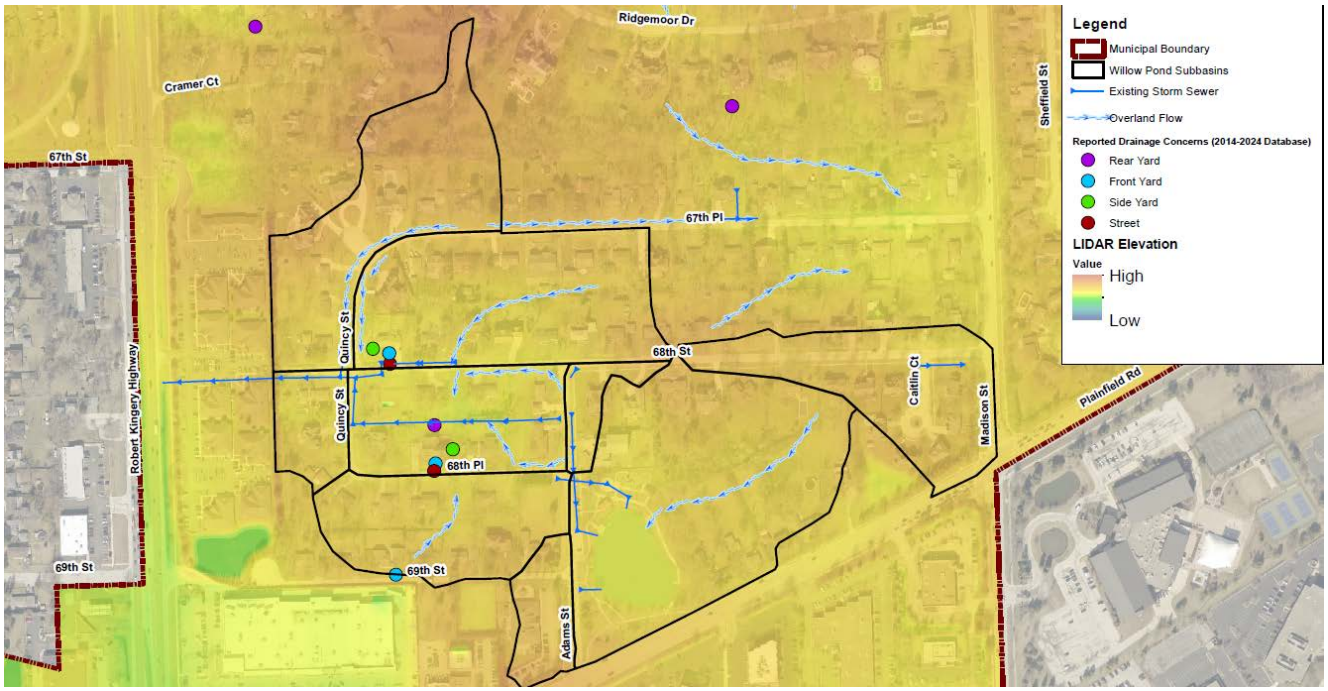


Figure 17. Willow Pond – Drainage Patterns

CBBEL completed an XPSWMM analysis that included the overall tributary area and conveyance system as shown on **Exhibit 13**. The results of this analysis are shown on **Exhibits 14a** and **14b**, where the inundation areas for both the 100-year and 10-year, 3-hour critical design storm events have been delineated, respectively. The existing level of service of the conveyance system is a 10-year design storm; however, the flooding in the depressional area gets within 35' of the residential structures at storms less than the 5-year event. Additionally, residents in the area have reported that the roadside ditches hold water for an extended period of time following a rain event.

During the development of the Master Plan, the Village staff requested an alternatives analysis to further reduce flooding in this area. This memorandum is included in Appendix 5.

5.5.2 Willow Pond Proposed Conditions

The proposed improvements for this FSA include three alternatives to provide stormwater storage and additional conveyance for up to the 100-year storm event. Alternative 3 is the only one of these that provides a 100-year level of service, meaning that the elevations in the rear yards are more than 1 foot below the estimated low entry elevation. In addition to the improvement identified in Alternative 3, the open drainage system is proposed to be enclosed in storm sewers in the parkway. It is recommended that an overflow path/ditch flow be maintained above the conveyance system and that the depressional storage at the intersections be maintained.

As noted, this improvement project assumes that the storm sewer is located in the parkway that will be graded to promote overland flow. Some of the benefits of installing the conveyance system in the parkway versus a roadway with curb and gutter include a lower cost and the lack of need for roadway reconstruction. However, when a conveyance system is located in the parkway, it has a higher likelihood of clogged inlets due to such things as grass clippings, leaves, etc., in addition to an inlet being required between every driveway. Both scenarios will require utility relocations, however construction in the roadway will usually allow for more flexibility due to the wider work area. Installation of a curb and gutter may require grading on private property to adequately drain over the curb into the drainage system. The cost difference between these two alternatives is approximately $250,000.

The proposed Alternative 3 improvement includes:

- 3.3 acre-feet of underground storage at the southwest corner of 68th Place and Adams Street
- Dewatering pump station for underground storage area
- 570 linear feet of 12-inch storm sewer along 68th Place conveying flow into the underground storage area
- 350 linear feet of 24-inch storm sewer conveying flow from the rear yard depression to the underground vault
- 1,125 linear feet of 15-inch storms sewer along Quincy Street/67th Street
- 390 linear feet of 12-inch storm sewer along Quincy Street, south of 68th Street
- 750 linear feet of 12-inch storm sewer along 67th Street
- 1,340 linear feet of 12-inch storm sewer along 68th Street
- 85 linear feet of 18-inch storm sewer along 68th Street
- 300 linear feet of 12-inch storm sewer along 69th Street

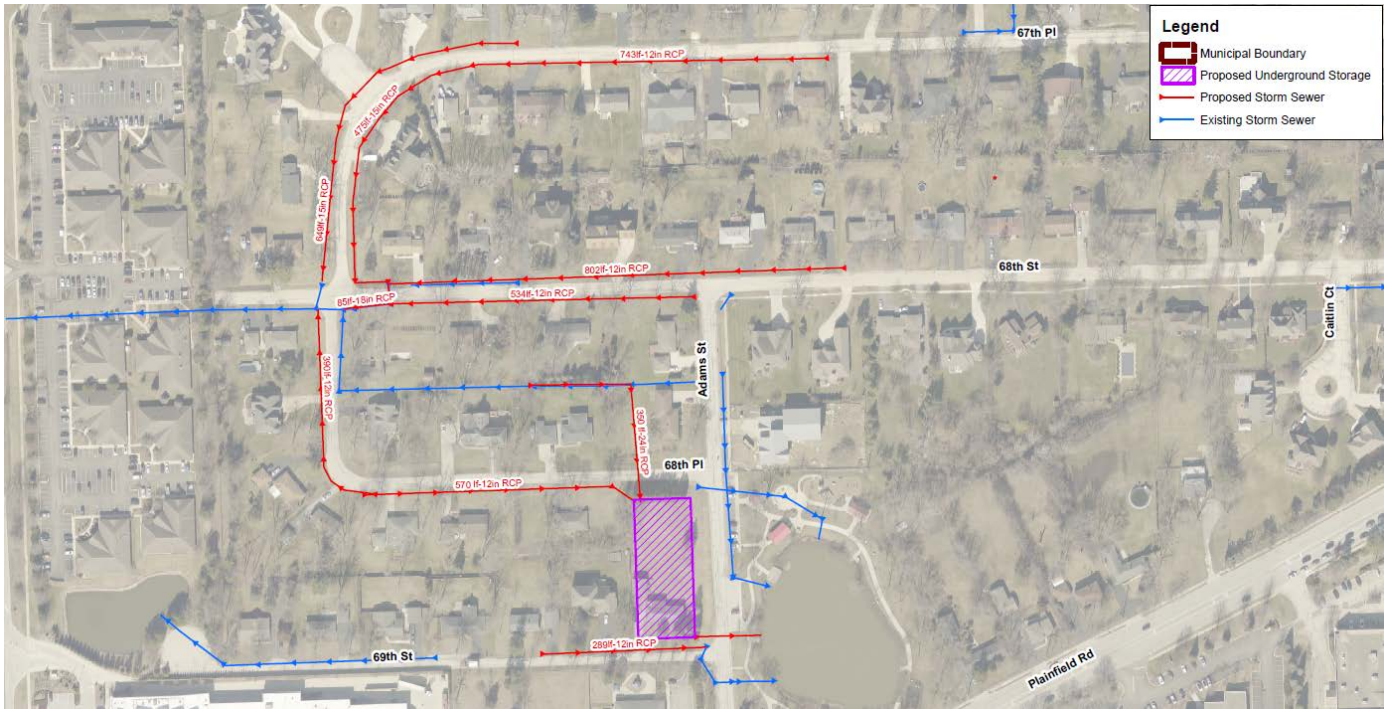


Figure 18. Willow Pond – Proposed Conditions

The engineers estimate of probable cost for this improvement is $4.4 million in 2025 dollars. Exhibits 13-15 and the engineers estimate of probable cost for this alternative in this FSA are included in Appendix 5. Permitting and coordination for the proposed project includes the following agencies:

- Illinois Environmental Protection Agency (IEPA), NPDES permit

5.6 AREA 6 – WATERFORD SUBDIVISION

5.6.1 Existing Conveyance and Storage System

The Waterford Subdivision was constructed in the 1970s with both storm sewer and detention storage. Of the 155 acres, a portion of the subdivision drains northeast towards Garfield Avenue, a portion drains northwest towards Creekside Park and to the 63rd Street Ditch, and a portion is tributary to Waterford Park, which acts as a recreational park and stormwater facility. The existing drainage map in this study area are shown on Figure 19 and Exhibit 16.

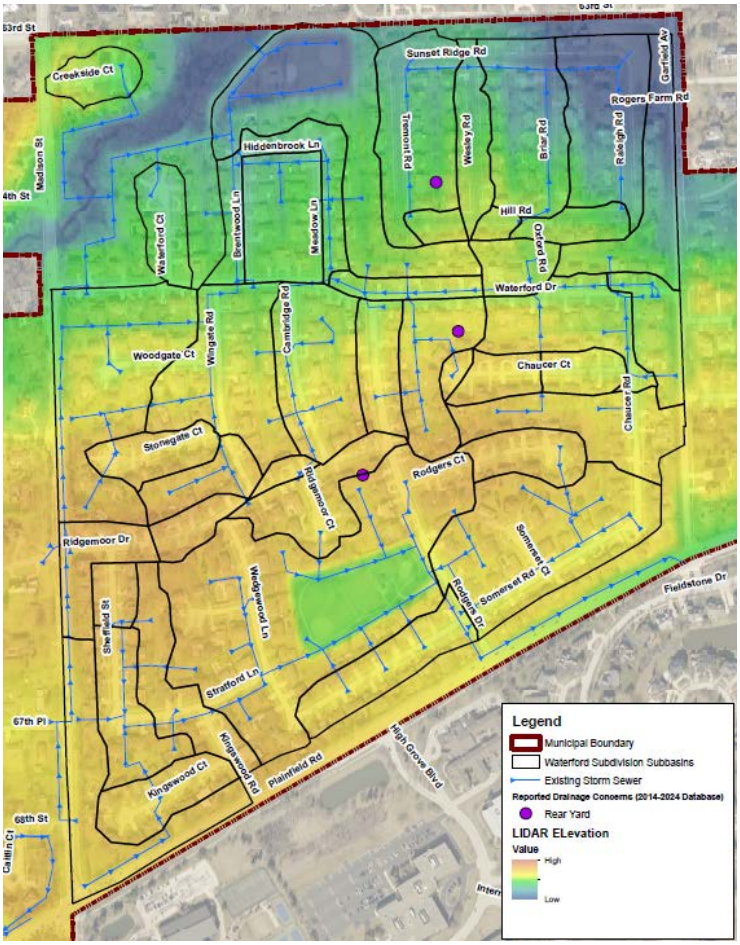


Figure 19. Waterford Subdivision – Drainage Patterns

A review of the drainage database indicated 3 drainage reports of rear yard flooding in this area. Two of the drainage reports are in overland flow paths, and one has an existing 6-inch sewer.

CBBEL completed an XPSWMM analysis that included the overall tributary area and storm sewer system as shown on Exhibit 16. The results of this analysis are shown on Exhibits 17a and 17b where the inundation areas for both the 100-year and 10-year, 1-hour critical design storm events have been delineated. The existing level of service of the conveyance system is primarily a 10-year design storm; however, there are isolated areas of street flooding. This inundation is likely due to the rainfall depths used in this analysis are greater than the design standard in the 1970s.

5.6.2 Waterford Subdivision Proposed Improvements

The proposed improvements for this FSA include conveyance improvements to the detention basins, which have adequate capacity. These improvements provide a 100-year level of service.

This proposed improvement includes:

- 304 linear feet of 36-inch storm sewer from 67th Place to Madison Street
- 548 linear feet of 24-inch storm sewer RCP from Kingswood Court to Stratford Lane

- 197 linear feet of 21-inch storm sewer from Ridgemoor Court to Waterford Park
- 349 linear feet of 24-inch storm sewer from Rodgers Court to Somerset Road
- 217 linear feet of 24-inch storm sewer RCP along Somerset Road
- 293 linear feet of 36-inch storm sewer RCP along Rodgers Court from Somerset Road to Waterford Park
- 29 linear feet of 12-inch storm sewer connecting Creekside Court to 63rd Street Ditch Creek
- Replace 445 linear feet of 21-inch storm sewer with 24-inch storm sewer to a new 54-inch storm sewer that outlets to Creekside Park
- 528 linear feet of 36-inch storm sewer from Waterford Court to a new 54-inch storm sewer that outlets to Creekside Park
- 337 linear feet of 54-inch storm sewer from Hiddenbrook Lane to Creekside Park
- 54 linear feet of 24-inch storm sewer connecting intersection of Sunset Ridge Road and Tremont Street to existing storm sewer along Sunset Ridge Road
- 380 linear feet of 18-inch storm sewer connecting intersection of Sunset Ridge Road and Tremont Street to Creekside Park
- 553 linear feet of 24-inch storm sewer along Chaucer Street connecting to existing storm sewer along Waterford Drive
- 304 linear feet of 36-inch storm sewer along 67th Street connecting to the Madison Street storm sewer

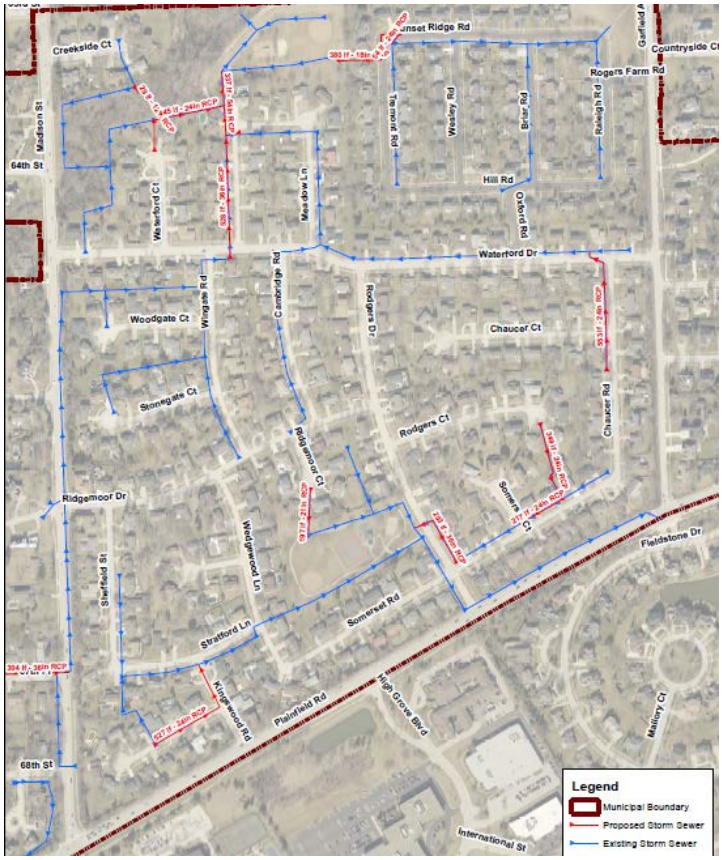


Figure 20. Waterford Subdivision – Proposed Conditions

The engineers estimate of probable cost for this improvement is $3.25 million in 2025 dollars. **Exhibits 16-18** are included in **Appendix 6**.

Permitting and coordination for the proposed project includes the following agencies:

- Illinois Environmental Protection Agency (IEPA), NPDES permit
- DuPage County Division of Transportation (DuDOT)

5.7 AREA 7 – SAWMILL CREEK

5.7.1 Existing Conveyance and Storage System

The Sawmill Creek study area is split into north and south areas (**Figure 21**). The study area is bisected by Midway Drive and is adjacent to both Midway Park and Borse Park. The tributary area from the west flows to Sawmill Creek via a storm sewer system along Midway Drive. There is a low flow pipe under the creek, south of Midway Drive.

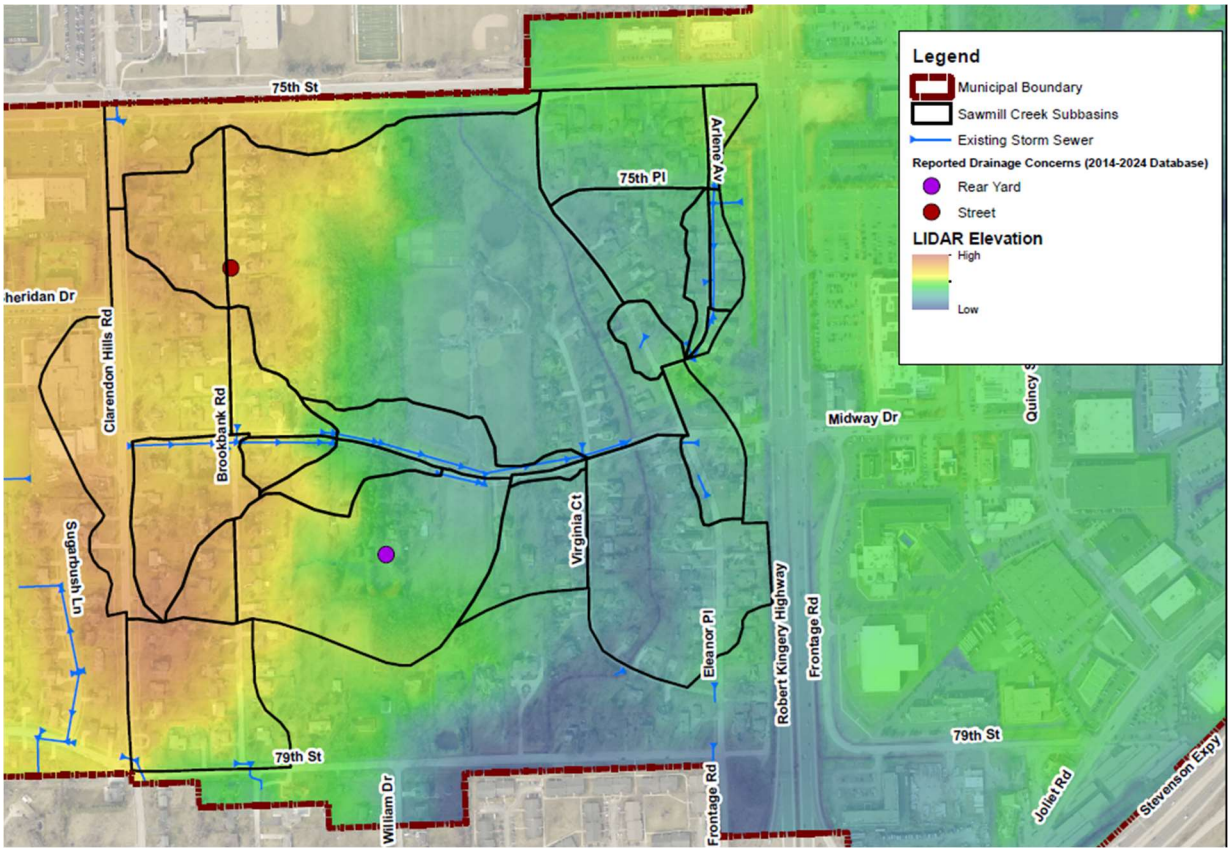


Figure 21. Sawmill Creek – Drainage Patterns

An XPSWMM analysis was completed for this conveyance network, as shown on **Exhibit 19**, but it should be noted that watercourses were not analyzed. A proposed analysis was, therefore, not performed, due to the proximity to Sawmill Creek (**Exhibit 25**). The existing level of service of the upstream storm sewer system is a 10-year design storm. The storm sewer system provides a level of service in accordance with the Ordinance;

however, the residences south of Midway Drive between Eleanor Place and Virginia Court, are a known drainage concern since Sawmill Creek is in the rear yards of these residences. A review of the drainage database indicated 2 drainage reports in this area; Village staff indicated that there have been several reports of flooding in this corridor, primarily south of Midway Drive.

In 1993, CBBEL performed a drainage study of Sawmill Creek between Midway Drive and 79th Street in titled "Virginia Court Flood Impact Study" in response to concerns by the property owners following a June 1993 storm. The purpose of this study was to investigate the existing conditions and explore potential flood reduction measures. During the study, it was determined that at three of the residential properties have a low entry below the 100-year flood elevation: 7729 ,7727, and 7723 Virginia Court. The parcel boundaries include the creek area on private property, not Village-owned property. Although the Village maintains an easement within the creek, it is limited to allowing the Village to keep stormwater infrastructure functional and clear to obstructions that block Village-owned facilities. It does not transfer ownership of the land from the homeowner to the Village, nor does it grant the Village unlimited authority to alter the watercourse.

Any work within the regulatory floodway and modifications of the watercourse are strictly regulated by both the Illinois Department of Natural Resources and the Illinois Environmental Protection Agency as follows:

- Illinois Department of Natural Resources (IDNR): Any work in or adjacent to a mapped floodway requires approval from IDNR. Only very minor activities are exempt, and channel deepening is not typically exempt.
- Illinois Environmental Protection Agency (IEPA): Modifying a watercourse—such as deepening, widening, or relocating a stream requires approval from the IEPA Water Quality Permit, particularly if more than 300 linear feet of stream would be affected or if there are risks of erosion, sedimentation, or water quality changes.

Because of these regulations, the Village cannot deepen or reconstruct the creek for purposes of providing flood relief to the residences in this study area. Because there is limited upstream areas within the Village to provide stormwater improvements for a watercourse, a regional flood protection project needs to be considered. Because this is a Village-wide Master Plan, improvement projects for this area were not evaluated. Exhibits 19-21 and 25 are included in Appendix 8. Due to its proximity to the creek, structures with the risk of flooding are candidates for floodproofing, as discussed in Section 4.3.

It should be noted that the 1996 Sawmill Creek Watershed Plan (Watershed Plan) includes a 1999 Addendum with a focused study on the Marion Hills area, which is bounded on the north by 67th Street, the south by 75th Street, the west by Clarendon Hills Road, and the east by IL Route 83. It noted that prior to the area being developed, overbank flooding occurred about once every 2 to 3 years; however, it now occurs several times per year due to development. The Watershed Plan evaluated alternatives for Sawmill Creek, which is the watercourse in the rear yards. The staff recommendation was buyouts and floodproofing above construction of stormwater storage as it was the most cost effective. In 2025, DuPage County Stormwater Management issued a Request for Qualifications for firms to submit for restudy of the Sawmill Creek Watershed. It is recommended that during this study, any drainage concerns be addressed as part of the larger-scale study that is multi-jurisdictional.

5.8 AREA 8 – FARMINGDALE SUBDIVISION

5.8.1 Existing Conveyance and Storage System

The Farmingdale subdivision is located on the southwest side of the Village. The 68-acre drainage area is served by a storm sewer network that outlets to Sawmill Creek Tributary No. 3 (**Figure 22**). While majority of the northern portion of the FSA is residential, there is a small commercial area along 75th Street with stormwater storage that outlets to a 24-inch pipe that flows south along Sawyer Road. A review of the drainage database indicated no drainage reports in this area.

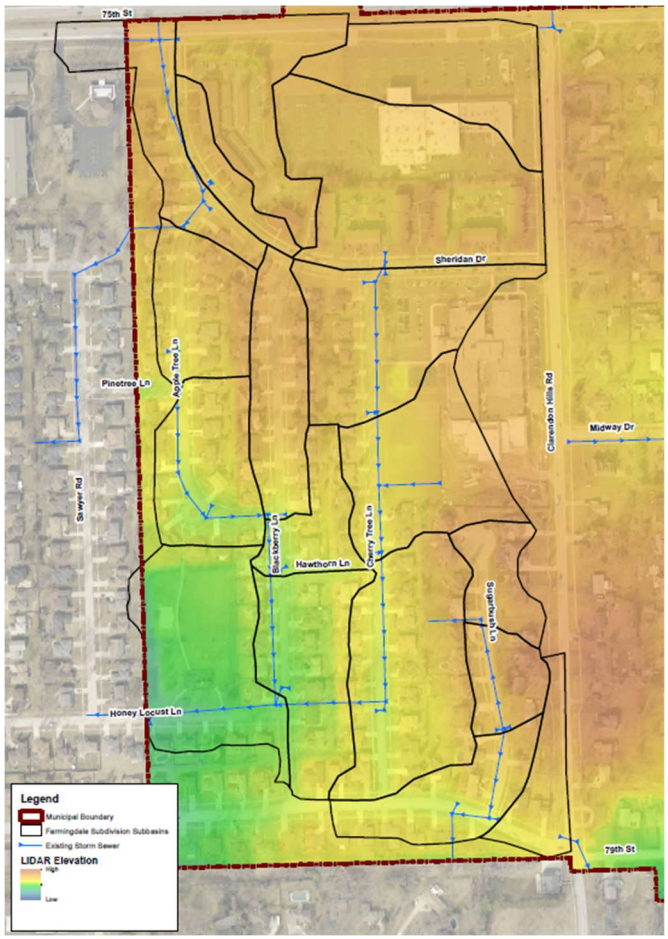


Figure 22. Farmingdale Subdivision – Drainage Patterns

CBBEL completed an XPSWMM analysis that included the 68-acre tributary area and storm sewer system as shown on **Exhibit 22**. The results of this analysis are shown on **Exhibits 23a** and **23b** where the inundation areas for both the 100-year and 10-year, 1-hour critical design storm events are shown. The existing level of service of the storm sewer system is greater than a 10-year design storm for most areas, with two smaller areas of street ponding in storm events less than the 5-year event. A review of the drainage database indicated no drainage reports in this area.

5.8.2 Farmingdale Subdivision Proposed Improvements

The proposed improvement for this FSA includes an underground storage facility at Gower School in the playground area at the southwest corner of the property. This provides relief to the Cherry Tree Lane storm sewer system that is tributary to the Honey Locust Lane storm sewer system that serves as the outlet for this FSA, allowing for increased storm sewers upstream to provide relief to low-lying areas. Above-ground storage is also proposed by expanding the storage area at the southwest corner of Farmingdale Terrace Park. Additional storage will offset any increases in the Honey Locust Lane sewer system. The proposed improvements for this FSA include:

- 1.7 ac-ft of underground storage at Gower School
- 0.5 ac-ft of above-ground storage at Farmingdale Terrace Park
- 850 linear feet of 24-inch storm sewer from 79th Street west of Sugarbush Lane to Honey Locust Lane
- 190 linear feet of 24-inch storm sewer from Apple Tree Lane cul-de-sac to Blackberry Lane
- 190 linear feet of 27-inch storm sewer from Apple Tree land to Hawthorn Lane
- 400 linear feet of 30-inch storm sewer from Hawthorn Lane to Honey Locust Lane

The engineers estimate of probable cost for this improvement is $2.75M in 2025 dollars. **Exhibits 22-24** are included in **Appendix 8**.

Permitting and coordination for the proposed project includes the following agencies:

- Illinois Environmental Protection Agency (IEPA), NPDES permit
- Community Consolidated School District 62

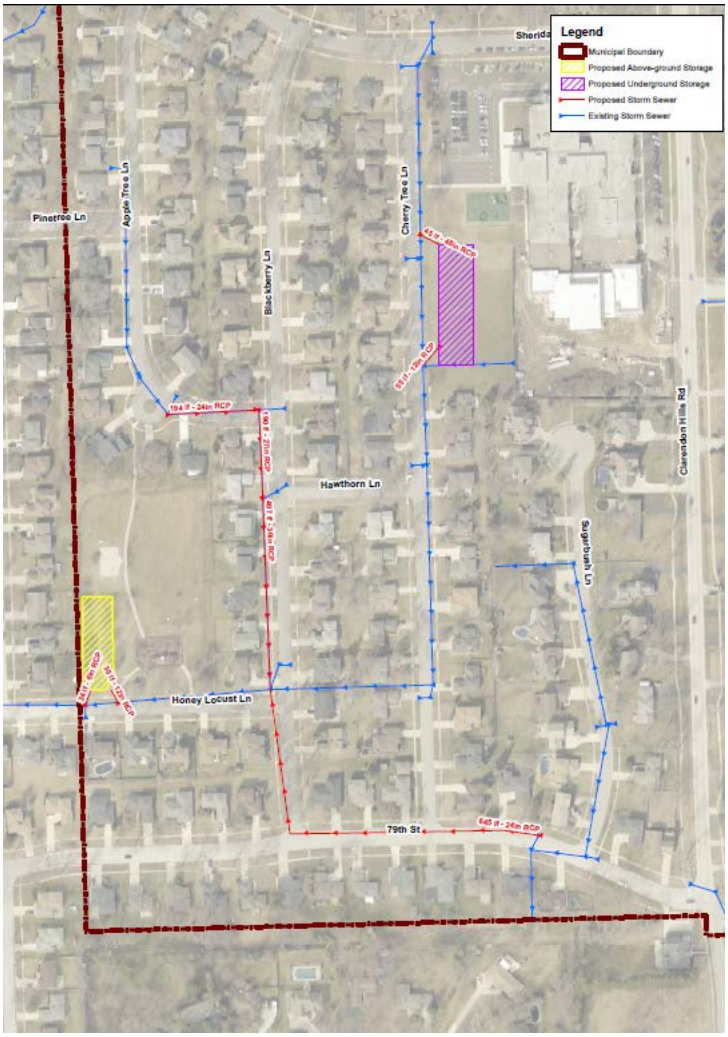


Figure 23. Farmingdale Subdivision – Proposed Conditions

CHAPTER 6 SUMMARY OF PROJECTS

The following is a summary of projects and costs for the 8 FSAs.

- Area 1 → Northwest Area – the proposed projects are shown on **Exhibit 3**.

  North of 61st Street

  - 285' of 4'x4' RCBC equalizer pipes at 59th Street and Clarendon Hills Road
  - Roadway raising by avg. of 1.5' for 900 linear feet along Clarendon Hills Road and 59th Street
  - Raise roadway for by avg of 2.0' for 350' along 58th Place
  - 0.5 acre-feet above-ground storage at the southwest corner of 59th and Clarendon Hills Road
  - 2.0 acre-feet underground storage in Prairie Trail Park
  - 0.7 ac-ft of above ground storage (5' deep) north of Willowood Avenue and 61st
  - 140' of 18-inch storm sewer connecting 60th Court to new basin
  - 410' of 27-inch storm sewer east of Western Avenue
  - 360' of 24-inch storm sewer from rear yards north of 59th Street
  - 50' of 24-inch storm sewer at North Bentley Avenue
  - 0.5 acre-feet of storage at North Bentley Avenue
  - 200' of 12-inch storm sewer from new storage basin at North Bentley Avenue to Virginia Avenue
  - The improvements proposed increase the level of service to between a 10- and 25-year event combining the projects listed above without causing downstream impacts.

  The engineers estimate of probable cost for these improvements is $5.5 Million in 2025 dollars. Note this cost does not include any additional volume required for replacement of existing storage by raising the roadway.

  South of 61st Street

  - 250 linear feet of 10'x4' RCBC at Western Avenue and 63rd Street
  - 600' of 15-inch storm sewer at 63rd Street & Bentley Avenue
  - 1700' 36-inch storm sewer along north side of 63rd Street from Clarendon Hills Road to Knolls Lake
  - 470' of 24-inch storm sewer from Squire Lane to 63rd Street
  - 15' of 18-inch storm sewer west of Squire Lane
  - 18 acre-feet of storage southwest corner of 63rd Street and Tennessee Avenue
  - 250' 36-inch storm sewer from Bentley Avenue to new basin
  - 600' of 24-inch storm sewer from 6400 Tennessee to new basin
  - 150' of 12-inch storm sewer pipe for new basin outlet
  - 4.5 acre-feet of storage southwest of Clarendon Hills Road and 63rd Street

- 600' of 12-storm sewer from new basin to Clarendon Hills Road
- Reconstruct the outfall structure of Knolls Lake
- The improvements proposed increase the level of service to between a 10- and 25-year event combining the projects listed above without causing downstream impacts, with the exception of Western Avenue and 63rd Street.

The engineers estimate of probable cost for these improvements is $9 Million in 2025 dollars.

- Area 2 → Ridgemoor West – the proposed projects are shown on **Exhibit 6**.

- 491 linear feet of 4'x2' RCBC along the north side of W Ridgemoor Drive
- 272 linear feet of 4'x2' RCBC along the south side of W Ridgemoor Drive, east of S Stough Street
- 165 linear feet of 5'x2' RCBC along the south side of W Ridgemoor Dr, west of S Stough Street
- 978 linear feet of 4'x2' RCBC along the east and west sides of S Stough Street
- 239 linear feet of 4'x2' RCBC along the north side of Willow Lane, east of S Stough Street
- 159 linear feet of 4'x2' RCBC along the north side of Willow Lane, west of S Stough Street
- Converting the open drainage system to a closed drainage system provides a 100-year level of service.

The engineers estimate of probable cost for these improvements is $3.75 million in 2025 dollars.

- Area 3 → Garfield – There are **no proposed improvements** for this FSA as the existing level of service of the storm sewer system is a 10-year design storm and the level of flood protection is a 100-year design storm event.

- Area 4 → Ridgemoor East – the proposed projects are shown on **Exhibit 12.**

- 192 linear feet of 18-inch storm sewer along south side of Ridgemoor Drive
- 1,811 linear feet of 24-inch storm sewer along west/south side of Ridgemoor Drive/Lane Court with new outlet to Flagg Creek
- 52 linear feet of 12-inch storm sewer from south side of Ridgemoor Drive to north side of Ridgemoor Drive
- 80 linear feet of 15-inch storm sewer along north side of Ridgemoor Drive
- Converting the open drainage system to a closed drainage system provides a 100-year level of service within the roadways and reduces the flooding in the rear yards of the homes along Ridgemoor Drive.

The engineers estimate of probable cost for these improvements is $1.25 million in 2025 dollars.

- Area 5 → Willow Pond – the proposed projects are shown on **Exhibit 15**.

- 3.3 acre-feet of underground storage at the southwest corner of 68th Place and Adams Street
- Dewatering pump station for underground storage area

- 570 linear feet of 12-inch storm sewer along 68th Place conveying flow into the underground storage area
- 350 linear feet of 24-inch storm sewer conveying flow from the rear yard depression to the underground vault
- The proposed stormwater improvements reduce flood elevations in the rear yards as summarized in the previously prepared memo in Appendix 5.

The engineers estimate of probable cost for these improvements is $4.4 million in 2025 dollars.

- Area 6 → Waterford Subdivision – the proposed projects are shown on **Exhibit 18**.
  - 304 linear feet of 36-inch storm sewer from 67th Place to Madison Street
  - 548 linear feet of 24-inch storm sewer from Kingswood Court to Stratford Lane
  - 197 linear feet of 21-inch storm sewer from Ridgemoor Court to Waterford Park
  - 349 linear feet of 24-inch storm sewer from Rodgers Court to Somerset Road
  - 217 linear feet of 24-inch storm sewer along Somerset Road
  - 293 linear feet of 36-inch storm sewer along Rodgers Court from Somerset Road to Waterford Park
  - 29 linear feet of 12-inch storm sewer connecting Creekside Court to 63rd Street Ditch Creek
  - Replace 445 linear feet of 21-inch storm sewer with 24-inch storm sewer to a new 54-inch storm sewer that outlets to Creekside Park
  - 528 linear feet of 36-inch storm sewer from Waterford Court to a new 54-inch storm sewer that outlets to Creekside Park
  - 337 linear feet of 54-inch storm sewer from Hiddenbrook Lane to Creekside Park
  - 54 linear feet of 24-inch storm sewer connecting intersection of Sunset Ridge Road and Tremont Street to existing storm sewer along Sunset Ridge Road
  - 380 linear feet of 18-inch storm sewer connecting intersection of Sunset Ridge Road and Tremont Street to Creekside Park
  - 553 linear feet of 24-inch storm sewer along Chaucer Street connecting to existing storm sewer along Waterford Drive
  - 304 linear feet of 36-inch storm sewer along 67th Street connecting to the Madison Street storm sewer
  - The proposed stormwater improvements provide a 100-year level of service.

The engineers estimate of probable cost for these improvements is $3.25 million in 2025 dollars.

- Area 7 → Sawmill Creek – There are **no proposed improvements** for this FSA as it should be evaluated as part of a regional flood reduction project.

- Area 8 → Farmingdale Subdivision – the proposed projects are shown on **Exhibit 24**.
  - 0.7 ac-ft of underground storage at Gower School
  - 0.5 ac-ft of above-ground storage at Farmingdale Terrace Park
  - 850 linear feet of 24-inch storm sewer from 79th Street west of Sugarbush Lane to Honey Locust Lane

- 190 linear feet of 24-inch storm sewer from Apple Tree Lane cul-de-sac to Blackberry Lane
- 190 linear feet of 27-inch storm sewer from Apple Tree land to Hawthorn Lane
- 400 linear feet of 30-inch storm sewer from Hawthorn Lane to Honey Locust Lane
- The proposed stormwater improvements provide a 100-year level of service.

The engineers estimate of probable cost for these improvements is $2.75 million in 2025 dollars.

The total cost for stormwater improvements range from $1.25 million to $9 million dollars with a total cost for all improvements $29.9 million in 2025 dollars.

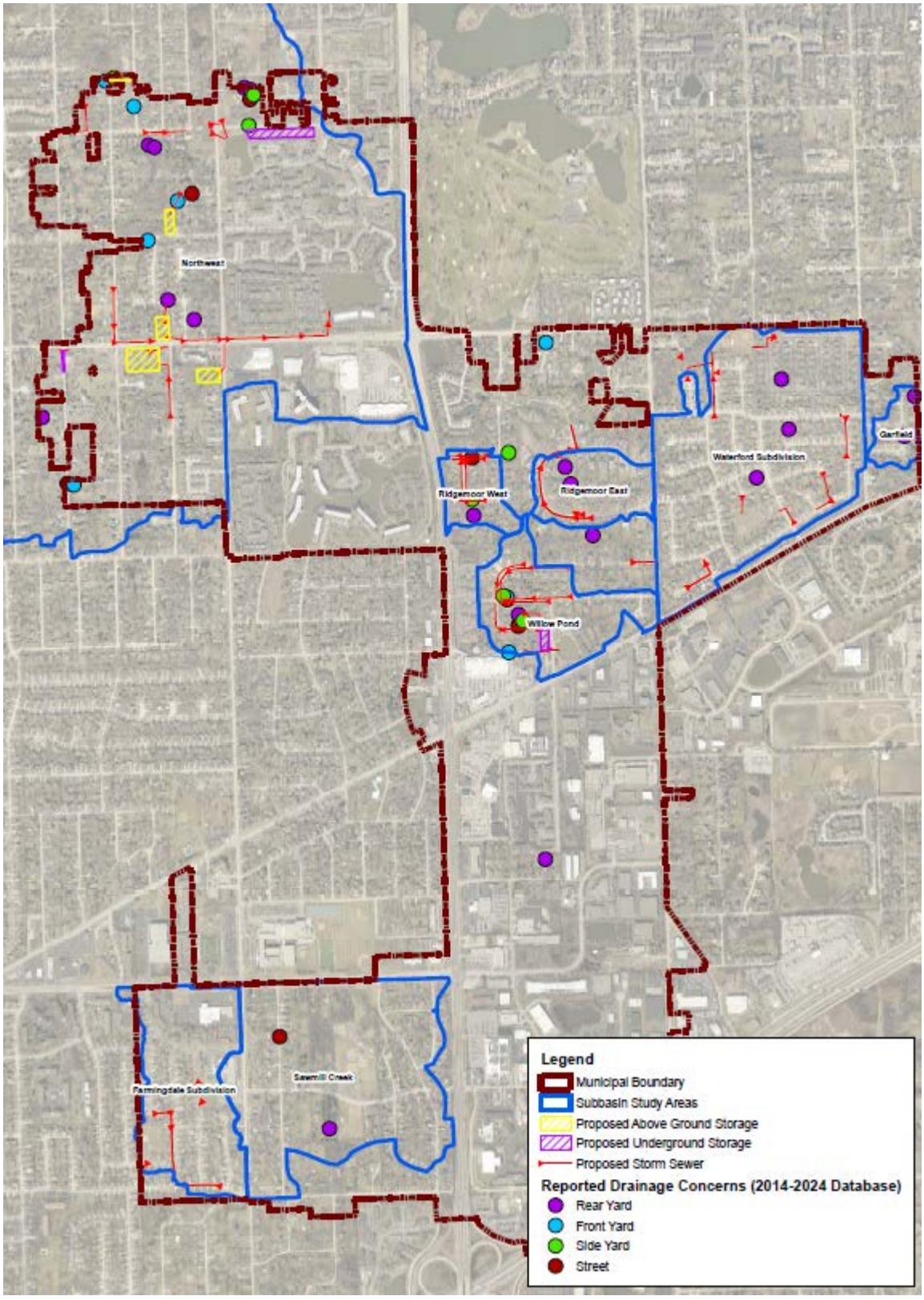


Figure 24. Summary of Projects by Study Area

CHAPTER 7 FUNDING OF CAPITAL PROJECTS

The long-term capital improvement projects require significant capital expenditures. The following funding sources have been used in other communities to fund infrastructure projects.

7.1 PAY-AS-YOU-GO CAPITAL FUNDING

The Village could dedicate a portion of the Capital Planning Budget each year to construct a portion of the selected project. The phasing and portion of the project constructed each year would depend on the budget that can be allocated to the stormwater improvements.

7.2 MUNICIPAL BOND

A municipal bond is a bond issued by a local government, or their agencies. The Village could issue bonds to cover all or part of the projects. This would allow a greater portion of the project to be completed in a shorter period of time.

7.3 SPECIAL SERVICE AREA (SSA)

A Special Service Area (SSA) is a taxing mechanism that can be used to fund a wide range of special or additional services and/or physical improvements in a defined geographic area within the Village. The Village could develop a SSA that places a levy on the properties within the Separate Storm Sewer area. The revenues from the SSA could be used to fund drainage projects and repay Municipal Bonds.

7.4 OUTSIDE FUNDING SOURCES

Federal, State and County funding of stormwater projects has been successfully used by communities. However, these outside funding sources are limited and the competition for the resources is fierce. The application process can be rigorous and take months or years to complete. Given the flooding problems and potential improvement projects, the following two outside funding sources are most suitable.

7.4.1 FEMA Hazard Mitigation Grant Program (HMGP)

This program provides grants to states and local governments to implement long term hazard mitigation measures after a major disaster declaration. The program will pay for 75% of mitigation projects that meet a minimum benefit/cost ratio of 1.0,. A cost benefit analysis of each project will need to be performed prior to applying for this funding. The event must be declared by the governor or president as a disaster to qualify for funding. Based on our research, the governor issued a disaster proclamation for the August 16-192025 storm events, however we do not think this was declared by the President. If a major disaster for the State is declared in the future, it is our recommendation that the Village then apply for this grant. The funding available is only a portion of the total losses for a particular disaster, which makes this a very competitive grant with an application process that can take up to 24 months. There have been no presidential disaster declarations in 2025.

7.4.2 FEMA Pre-Disaster Mitigation Grant Program (PDM)

The goal of this program is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters. This program awards planning and project grants and provides opportunities for raising public awareness about reducing future losses before disaster strikes. Mitigation planning is a key process used to break the cycle of disaster damage, reconstruction, and repeated damage. PDM grants are funded annually by Congressional appropriations and are awarded on a nationally competitive basis. These funds are typically allocated to repetitive loss properties and buy-outs.

7.4.3 Flood Mitigation Assistance (FMA)

This nationwide FEMA program provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis. Unlike the HMGP program, this is a nationwide competition that focuses on Repetitive Loss properties as defined under the National Flood Insurance Program (NFIP). The program will pay for a percentage of mitigation projects that meet a minimum benefit/cost ratio of 1.0, in which none of the proposed flood reduction projects qualify. The competition for this grant is nation-wide and is very competitive.

7.5 STORMWATER UTILITY FEE

The concept of the stormwater utility fee is to collect from both residents and businesses within the entire Village based on the amount of impervious area on the property. The impervious area is directly related to the amount of stormwater runoff contributing to the storm sewer system. An equivalent residential unit (ERU) is the basis for the amount paid to the utility fee on a monthly basis and can be included on or water bills. Impervious areas for businesses and industries in the Village should be calculated to determine the number of ERUs within a specific non-residential parcel. This could be applied to new developments where a fee is applied to percentage of increase of impervious aera as well. The Stormwater Utility could be used to fund drainage projects and repay Municipal Bonds. The utility fee per ERU would be set based on the cost of the project, length of time for repayment and additional reserves needed for maintenance, etc.

CHAPTER 8 SEPARATE STORM SEWER SYSTEM FACTS, SPECIFICS AND REALITIES

The final chapter of this Master Plan for the Village is intended to highlight facts, answer common questions and dispel myths about the Village's storm sewer network. The following statements have been provided to help the general public understand why flooding occurs throughout the Village and understand what the Village is doing to address the issues through the proposed improvements outlined in this Master Plan.

8.1.1 Will my street continue to flood if the project is constructed?

A large scale capital project will reduce frequency, depth and duration of street flooding. However, given the flat topography of some subdivision in the western portion of the Village, during the most extreme storm events there will likely still be street flooding.

8.1.2 What are the benefits of spending millions of dollars on a capital improvement project?

The benefits of a large scale capital improvement project include reduction in the frequency, depth and duration of flooding of streets, yards and homes. It will also reduce the likelihood of inflow and infiltration to the sanitary sewer system.

8.1.3 Can the Village solve the flooding problems using only green infrastructure, i.e. rain barrels and rain gardens?

While we strongly recommend the implementation of green infrastructure, it will not significantly reduce flooding by itself.

8.1.4 If water comes up through my floor drain during a flood event, how will these capital improvements reduce that risk? Is it valuable to install either an overhead plumbing system or a back-flow preventer?

Yes, we recommend that all residents flood proof their homes to the maximum extent practicable. Flood proofing measurements include the conversion to an overhead plumbing system, and if this is cost prohibitive, then a back-flow valve on the sanitary lateral.

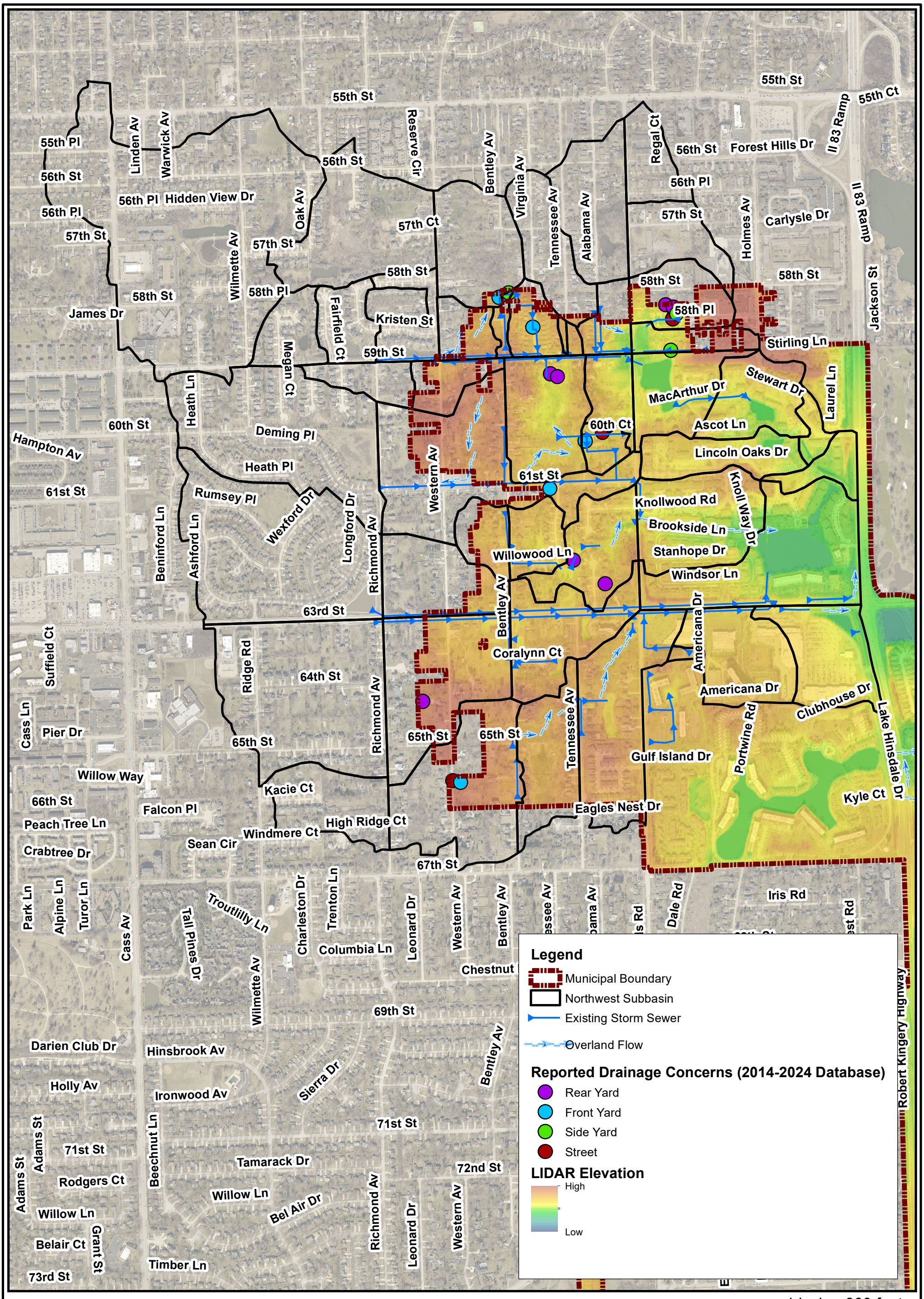
8.1.5 What can I do on my property to help drainage?

Property owners should direct stormwater runoff away from the structure by extending downspouts and establishing positive drainage away from the structure. If the soil around the foundation of a structure is pitched towards the structure, it's recommended that material is added or removed until the slope moves away from the house (this is known as "grading"). This material should be dense- preferably clay soil. Sump pumps with a battery back-up will also ensure footing and perimeter drains are working properly to direct runoff away from the structure foundations.

APPENDIX 1

AREA 1 – NORTHWEST AREA

EXHIBITS



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 1_Northwest Area Subbasins.mxd

1 inch = 900 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

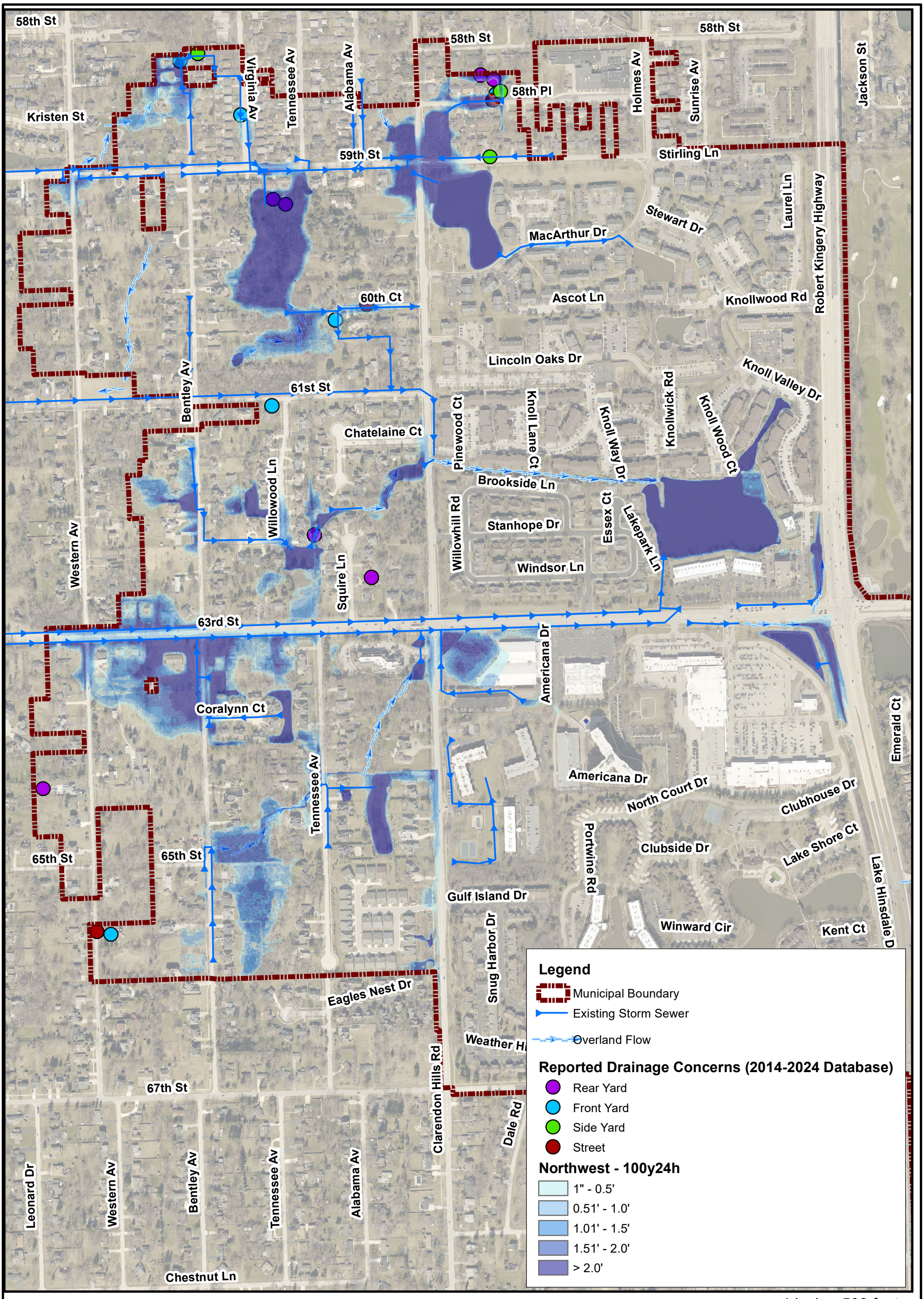
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Drainage Pattern & Subbasin Map**
Northwest Study Area

DATE: 09/11/25

EXHIBIT 1



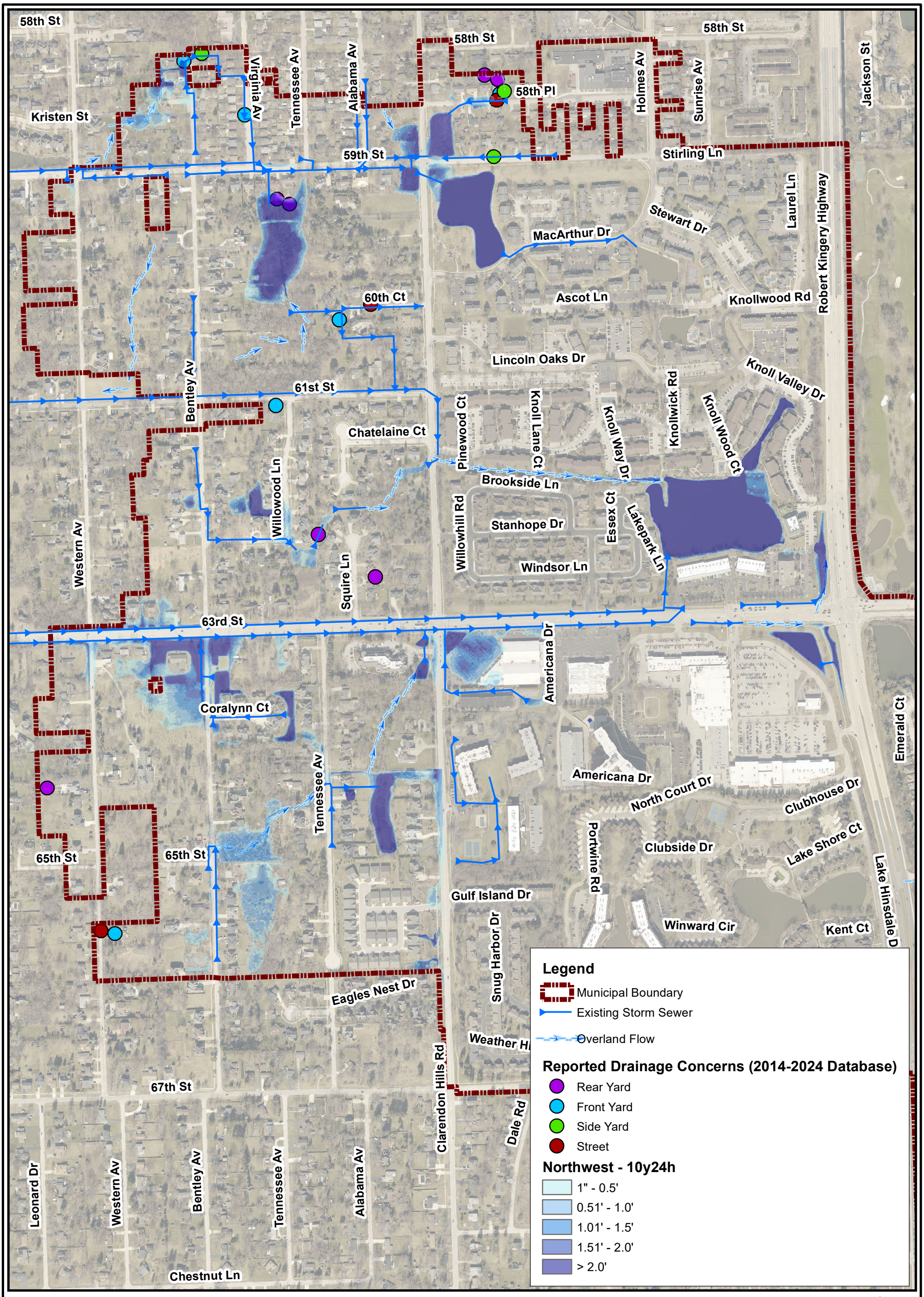
N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 2_Northwest Area Inundation.mxd

1 inch = 500 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE	**DATE**	
100-year, 24-hour Inundation Area Northwest Study Area	09/11/25	
	EXHIBIT 2a	



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 2_Northwest Area Inundation.mxd

1 inch = 500 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **10-year, 24-hour Inundation Area Northwest Study Area**

DATE: 09/11/25

EXHIBIT 2b

58th St
Chase Dr
58th St
58th St
Holmes Av
Sunrise Av
58th Pl
Tennessee Av
Alabama Av
Virginia Av
Kristen St
100 lf - 12" RCP
100 lf - 24" RCP
400 lf - 27" RCP
4'x3' RCBC
100 lf - 4'x4' RCBC
59th St
Stirling Ln
Stewart Dr
MacArthur Dr
Ascot Ln
60th Ct
18" RCP
Bentley Av
Lincoln Oaks Dr
61st St
Pinewood Ct
Knollwood Rd
Knoll Way Dr
Knollwood Dr
Knollwick Rd
Knoll Wood Ct
Chatelaine Ct
Brookside Ln
Western Av
Willowood Ln
Willowhill Rd
Stanhope Dr
Essex Ct
Lakepark Ln
Windsor Ln
600 lf - 15" RCP
150 lf - 12" RCP
Squire Ln
15 lf - 18" RCP
470 lf - 24" RCP
1700 lf - 36" RCP
250 lf - 36" RCP
63rd St
150 lf - 12" RCP
600 lf - 12" RCP
Americana Dr
Americana Dr
Coralynn Ct
600 lf - 24" RCP
North Court Dr
65th St
65th St
Tennessee Av
Clarendon Hills Rd
Gulf Islan
East St
Eagles Nest Dr

Legend

- Municipal Boundary
- Proposed Above Ground Storage
- Proposed Above Ground Storage Expansion
- Proposed Underground Storage
- Roadway Modfication
- Proposed Pipes
- Existing Storm Sewer
- Overland Flow

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 3_Northwest Area Subbasins Improvement Projects.mxd

1 inch = 400 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO. 24-0485

TITLE: **Proposed Improvement Projects Northwest Study Area**

DATE 09/12/25

EXHIBIT 3

APPENDIX 2

AREA 2 – RIDGEMOOR WEST

EXHIBITS

Legend

- Municipal Boundary
- Ridgemoor West Subbasins
- Existing Storm Sewer
- Overland Flow

Reported Drainage Concerns (2014-2024 Database)

- Rear Yard
- Side Yard
- Street

LIDAR Elevation

High

Low

Quincy St

Ridgemoor Dr

Lake Hinsdale Dr

Stough St

Ridgemoor Dr

Kyle Ct

Willow Ln

Cramer Ct

67th St

67th Pl

1 inch = 150 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

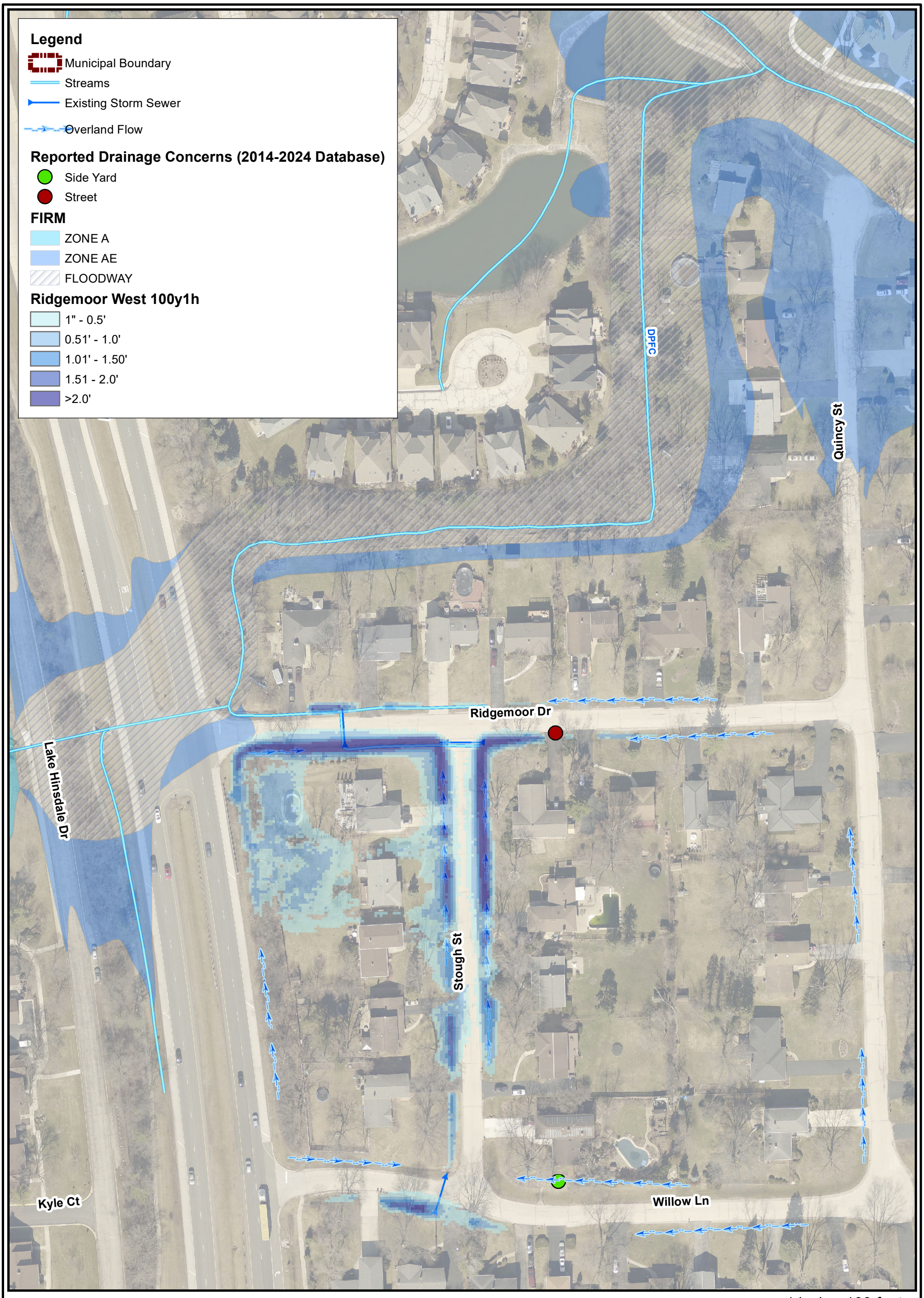
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Drainage Pattern & Subbasin Map**
Ridgemoor West Study Area

DATE: 09/11/25

EXHIBIT 4



1 inch = 100 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **100-year, 1-hour Inundation Map Ridgemoor West Study Area**

DATE: 09/11/25

EXHIBIT 5a

Legend

- Municipal Boundary
- Streams
- Existing Storm Sewer
- Overland Flow

Reported Drainage Concerns (2014-2024 Database)

- Side Yard
- Street

FIRM

- ZONE A
- ZONE AE
- FLOODWAY

Ridgemoor West 10y1h

- 1" - 0.5'
- 0.51' - 1.0'
- 1.01' - 1.50'
- 1.51 - 2.0'
- >2.0'

DPFC
Quincy St
Ridgemoor Dr
Lake Hinsdale Dr
Stough St
Kyle Ct
Willow Ln

1 inch = 100 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

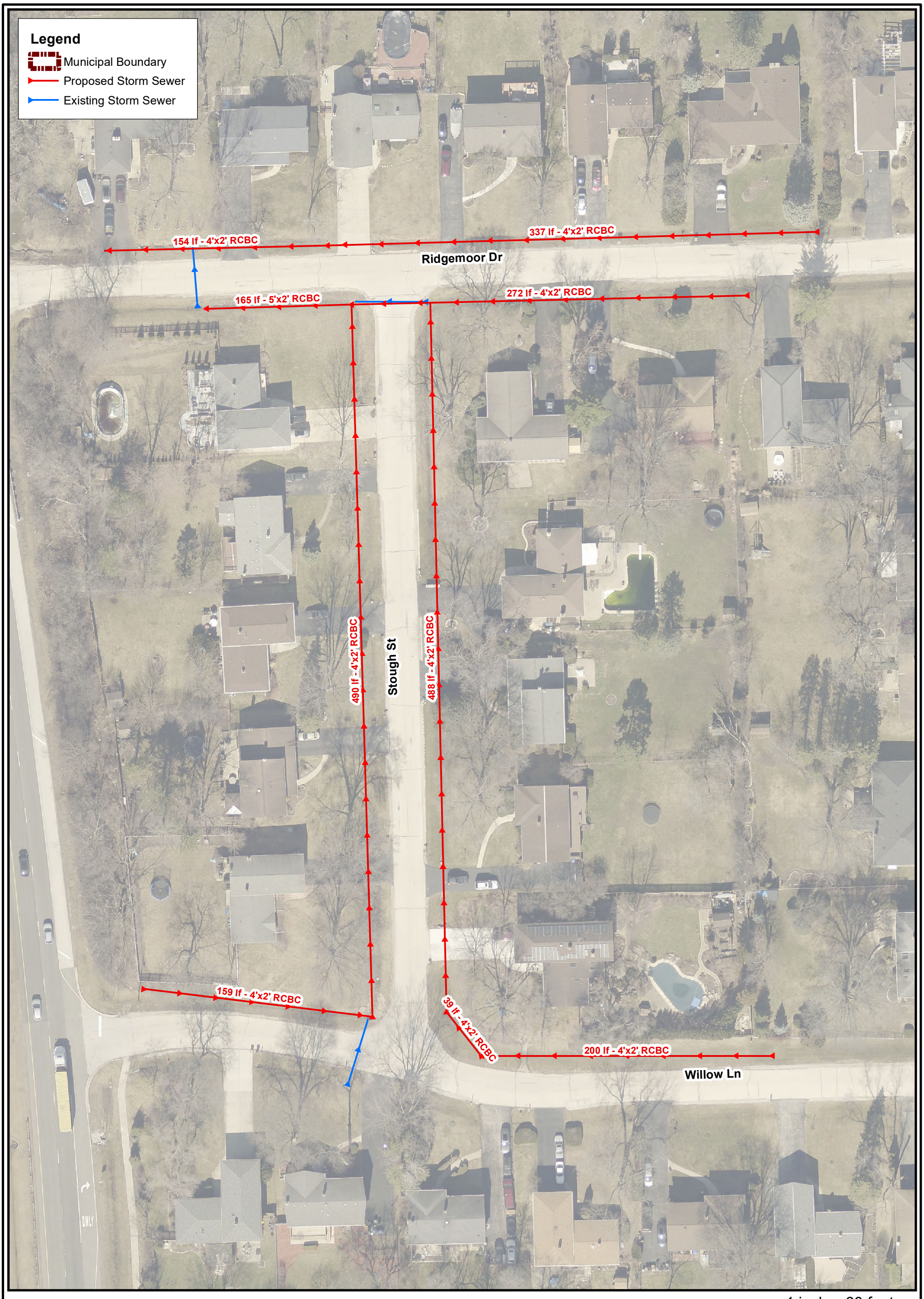
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **10-year, 1-hour Inundation Map Ridgemoor West Study Area**

DATE: 09/11/25

EXHIBIT 5b



1 inch = 60 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects**
Ridgemoor West Study Area

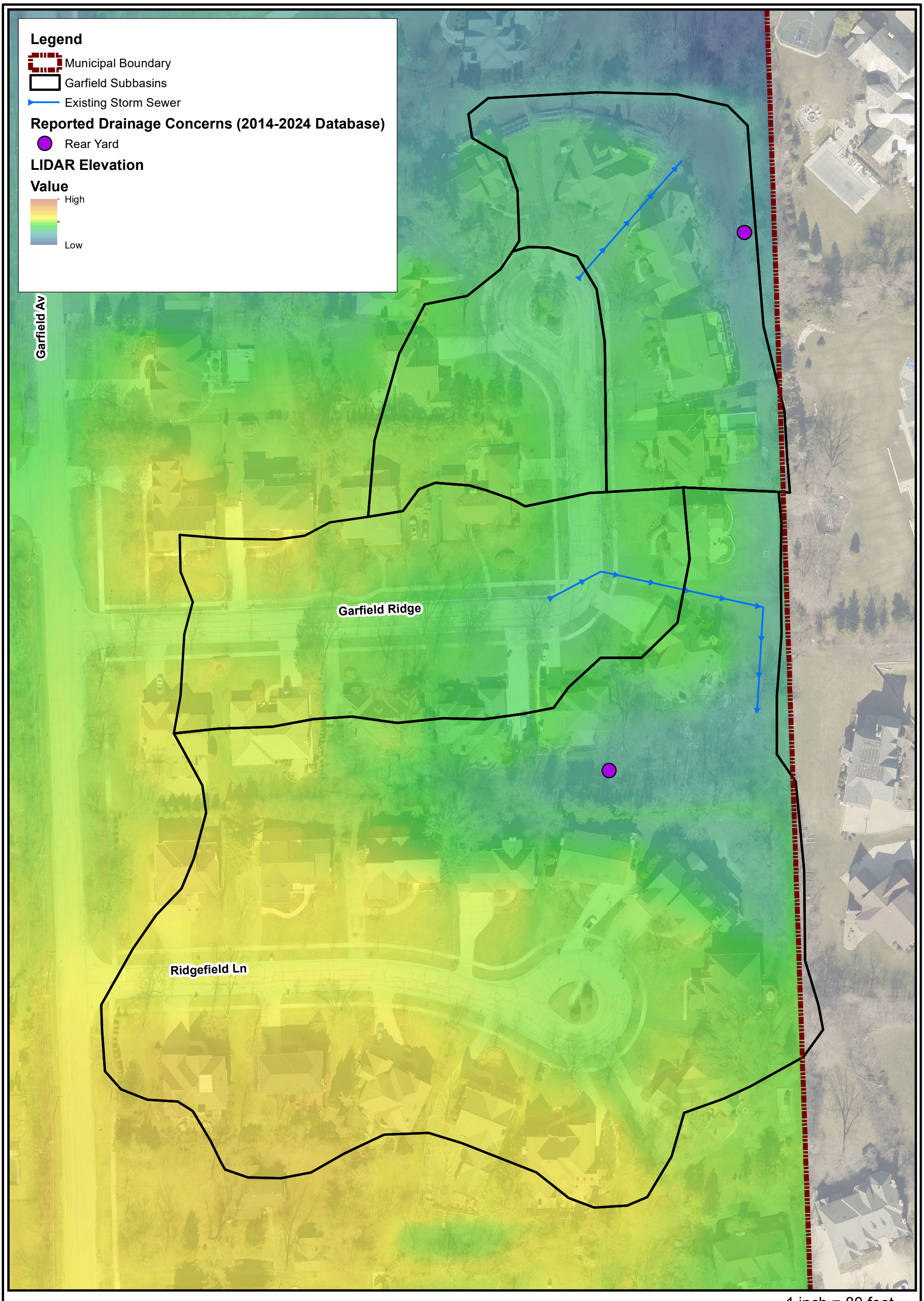
DATE: 09/11/25

EXHIBIT 6

APPENDIX 3

AREA 3 - GARFIELD

EXHIBITS



1 inch = 80 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

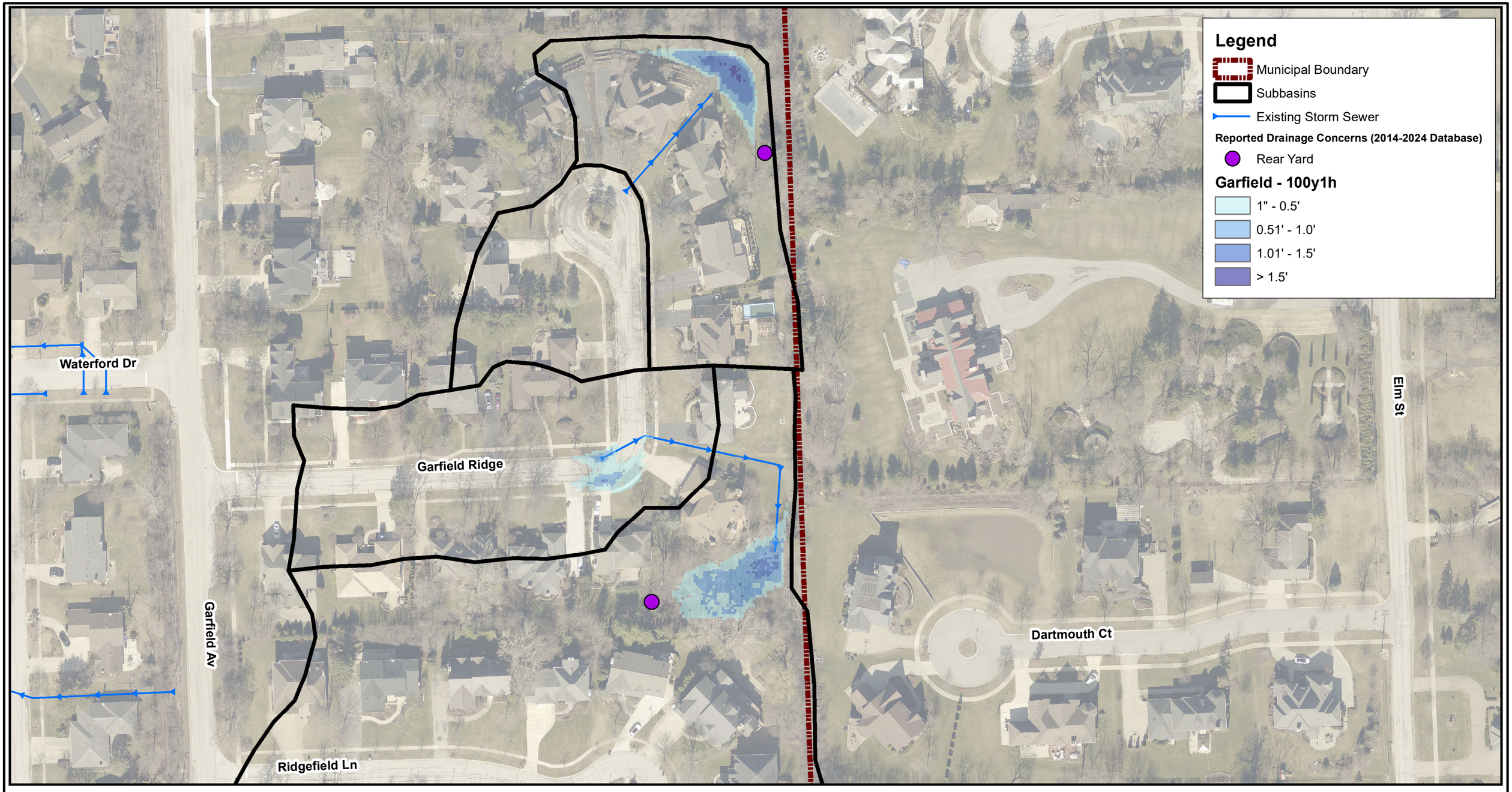
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Drainage Pattern & Subbasin Map**
Garfield Study Area

DATE: 09/11/25

EXHIBIT 7



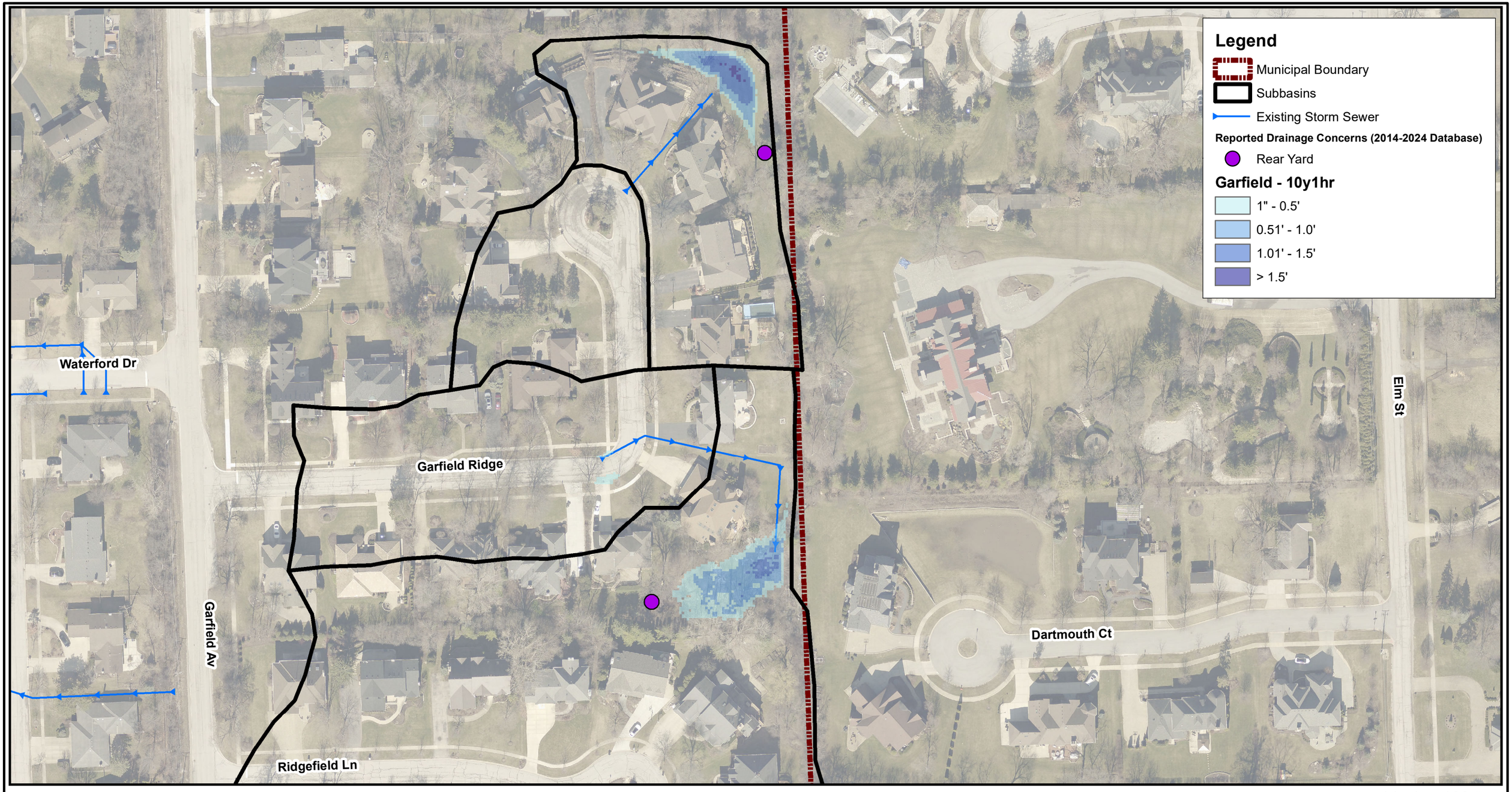
1 inch = 100 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 8_Garfield Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	
TITLE: **Drainage Pattern and Subbasin Map Ridgemoor East 100-year, 1-hour Inundation Area**		DATE: 09/11/25 EXHIBIT 8a



1 inch = 100 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 8_Garfield Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	
TITLE: **Drainage Pattern and Subbasin Map Ridgemoor East 10-year, 1-hour Inundation Area**		DATE: 09/11/25 EXHIBIT 8b

Legend

Municipal Boundary

Garfield Subbasins

Existing Storm Sewer

Reported Drainage Concerns (2014-2024 Database)

Rear Yard

LIDAR Elevation

Value

High

Low

Garfield Ave

Ridgefield Ln

No Proposed Improvements for the Garfield Study Area

1 inch = 77 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects Garfield Study Area**

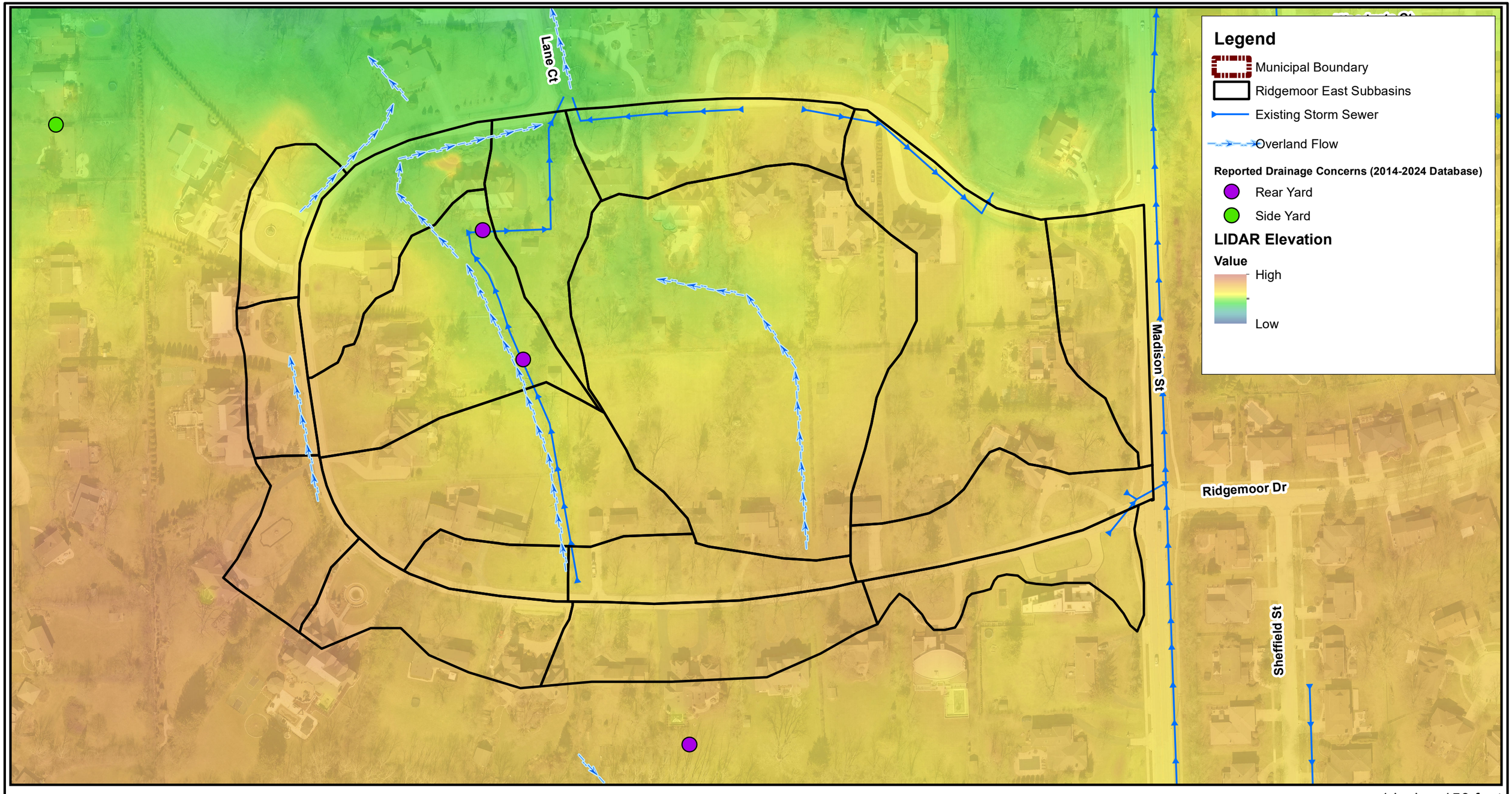
DATE: 09/11/25

EXHIBIT 9

APPENDIX 4

AREA 4 – RIDGEMOOR EAST

EXHIBITS



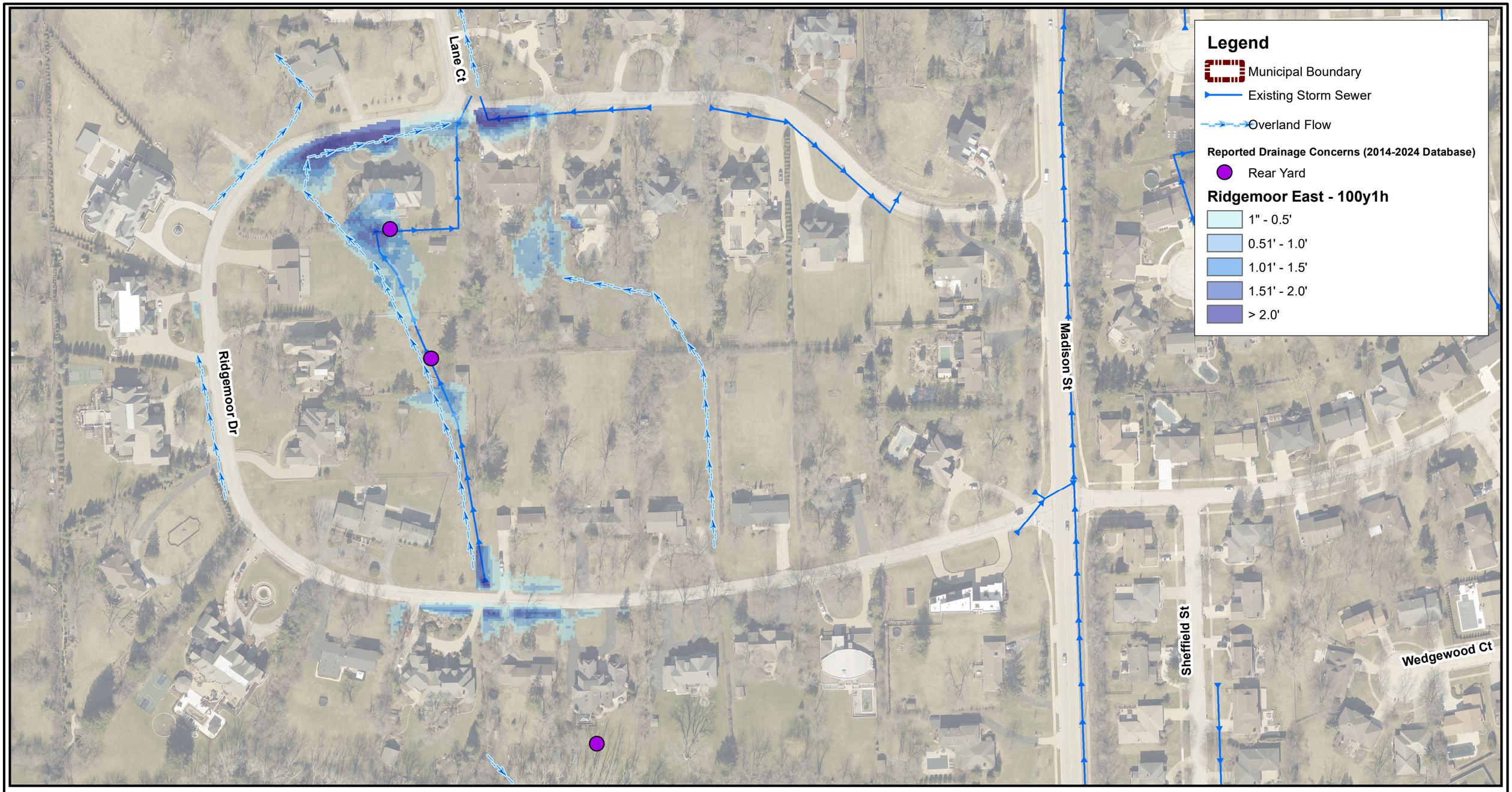
1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 10_Ridgemoor East Drainage Pattern.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N / W / E / S
TITLE: **Drainage Pattern and Subbasin Map Ridgemoor East Study Area**	DATE: 09/11/25	
	EXHIBIT 10	



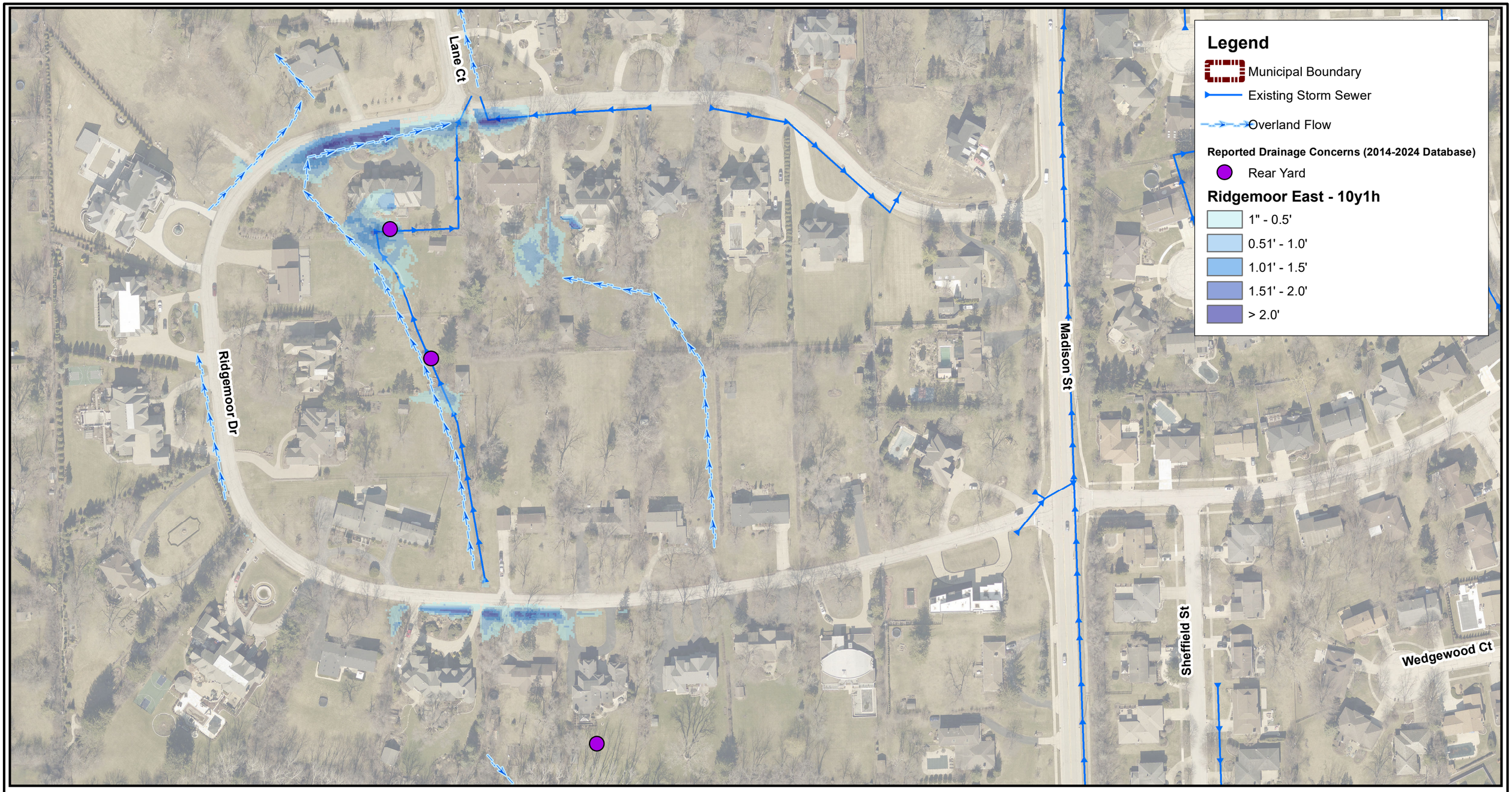
1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 11_Ridgemoor East Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE		DATE
Drainage Pattern and Subbasin Map Ridgemoor East 100-year, 1-hour Inundation Area		09/11/25
		EXHIBIT 11a



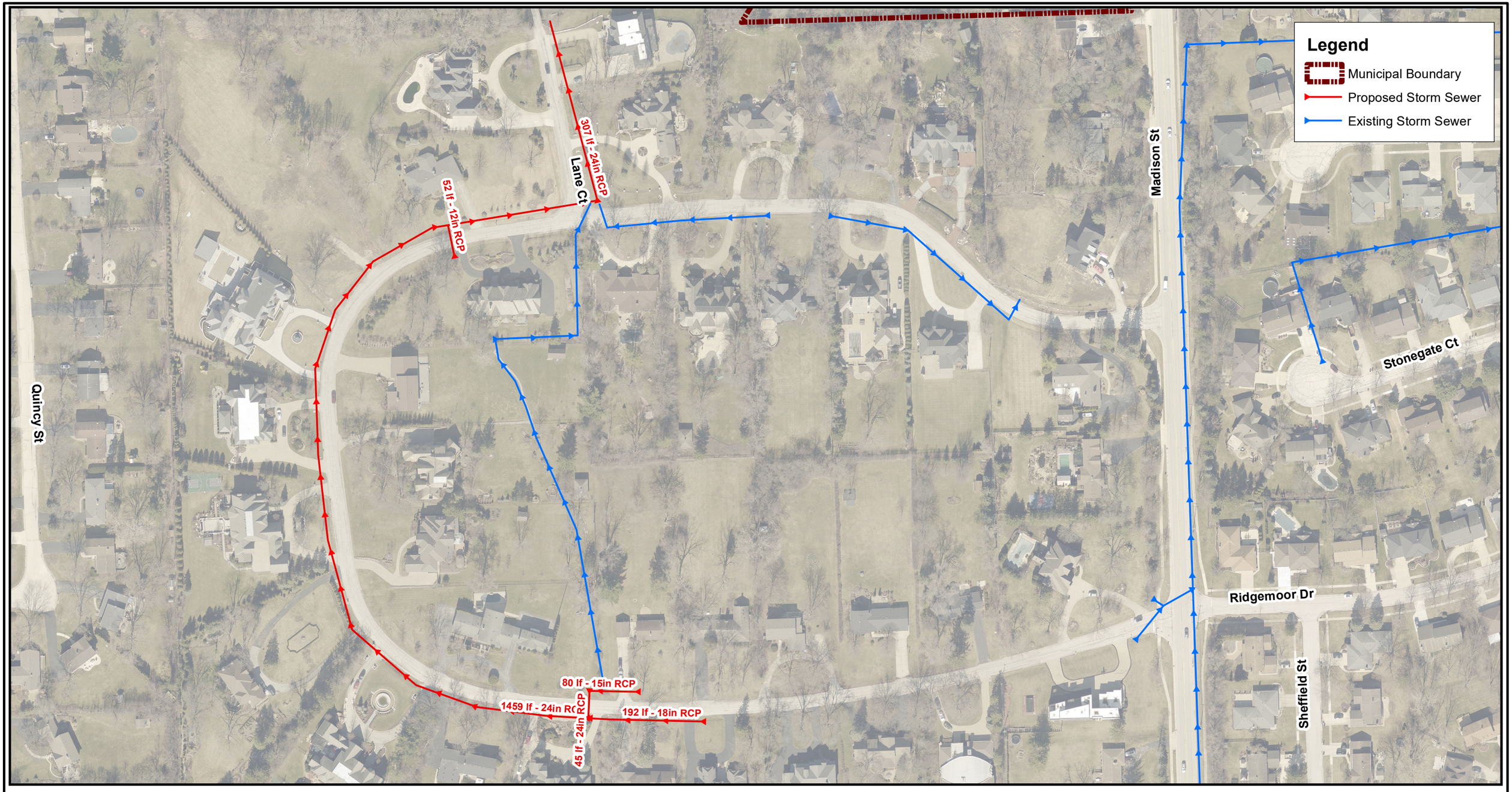
1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 11b_Ridgemoor East Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE		**DATE**
10-year, 1-hour Inundation Area **Ridgemoor East Study Area**		09/11/25
		EXHIBIT 11b



1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 12_Ridgemoor East Proposed Improvement Projects.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: **Village of Willowbrook**

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects**
Ridgemoor East Study Area

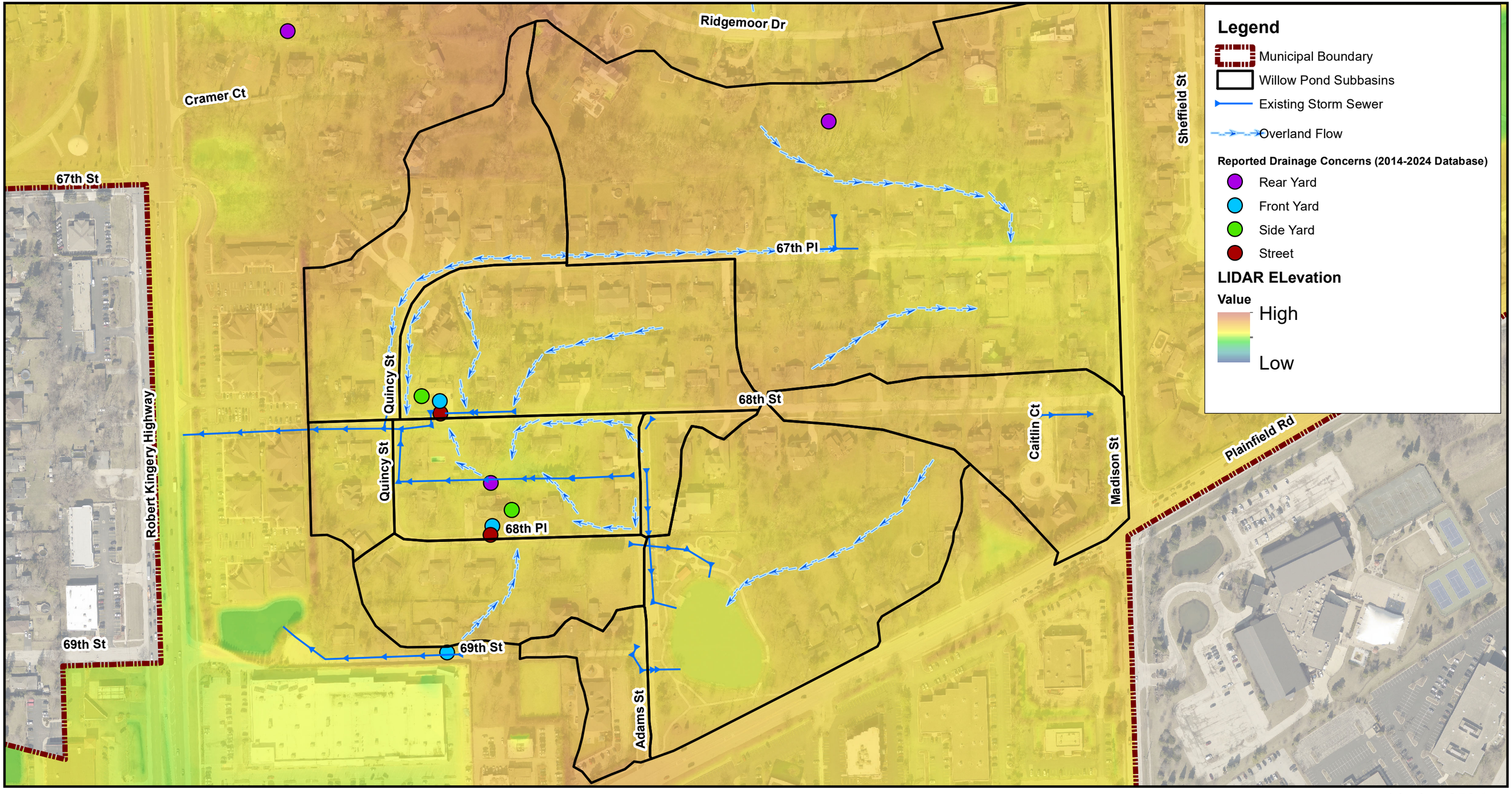
DATE: 09/11/25

EXHIBIT 12

APPENDIX 5

AREA 5 – WILLOW POND

EXHIBITS AND CBBEL SUMMARY MEMO



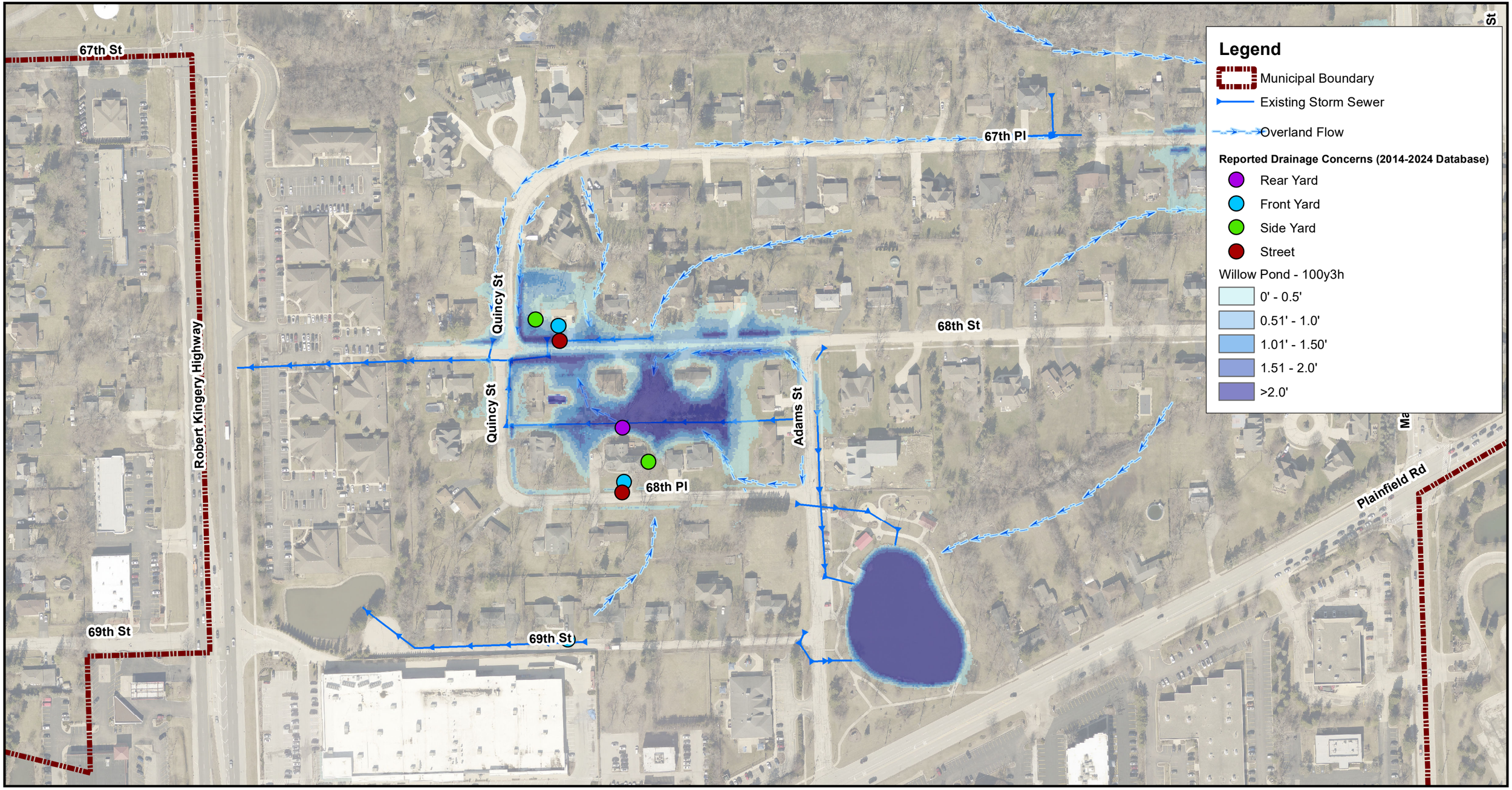
1 inch = 250 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 13_Willow Pond Drainage Pattern.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE		**DATE** 09/17/25
Drainage Pattern and Subbasin Map **Willow Pond Study Area**		EXHIBIT 13



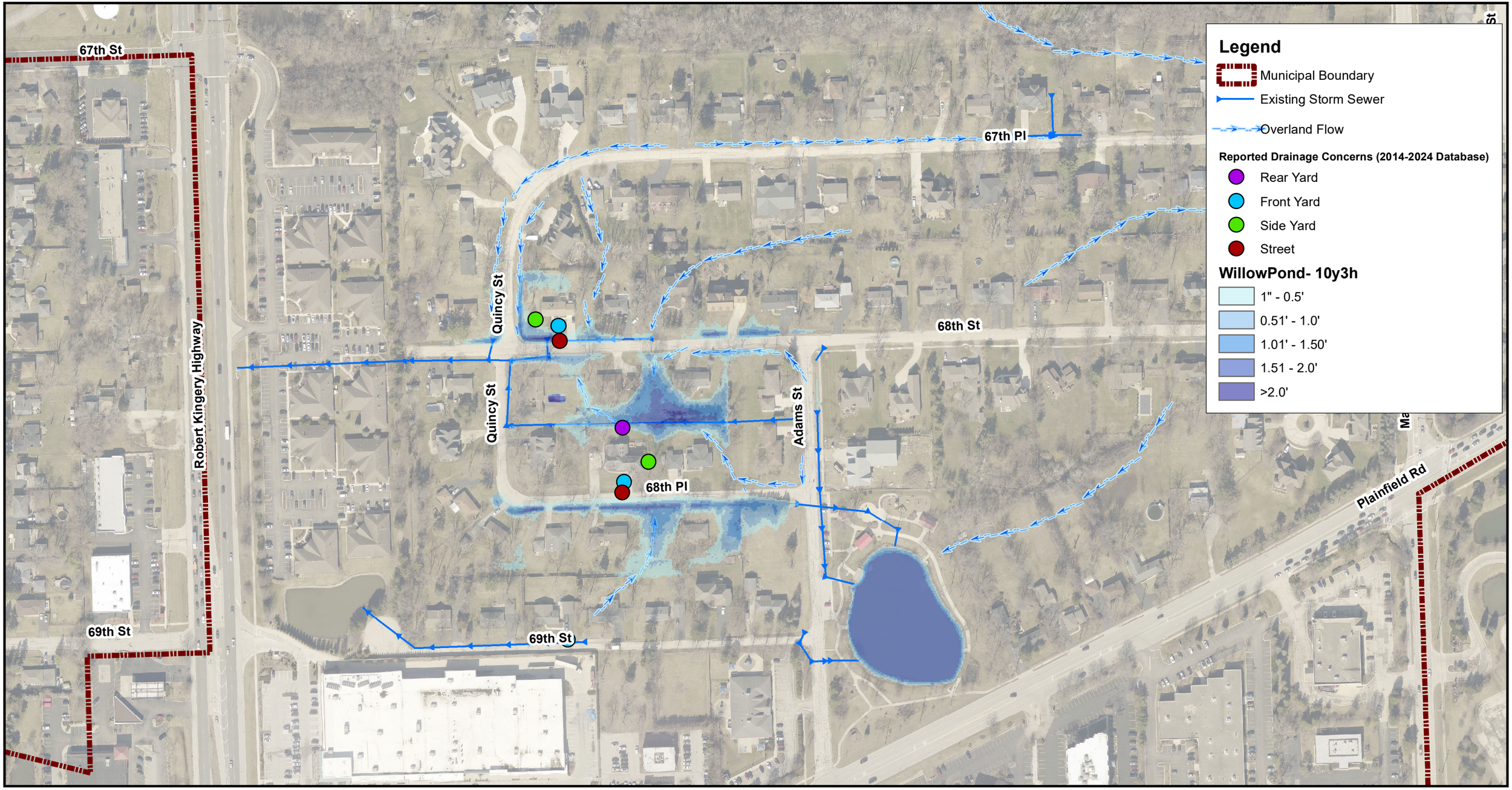
1 inch = 200 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 14_Willow Pond Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE		DATE
Existing 100-year, 3-hour Inundation Willow Pond Study Area		09/19/25
		EXHIBIT 14a



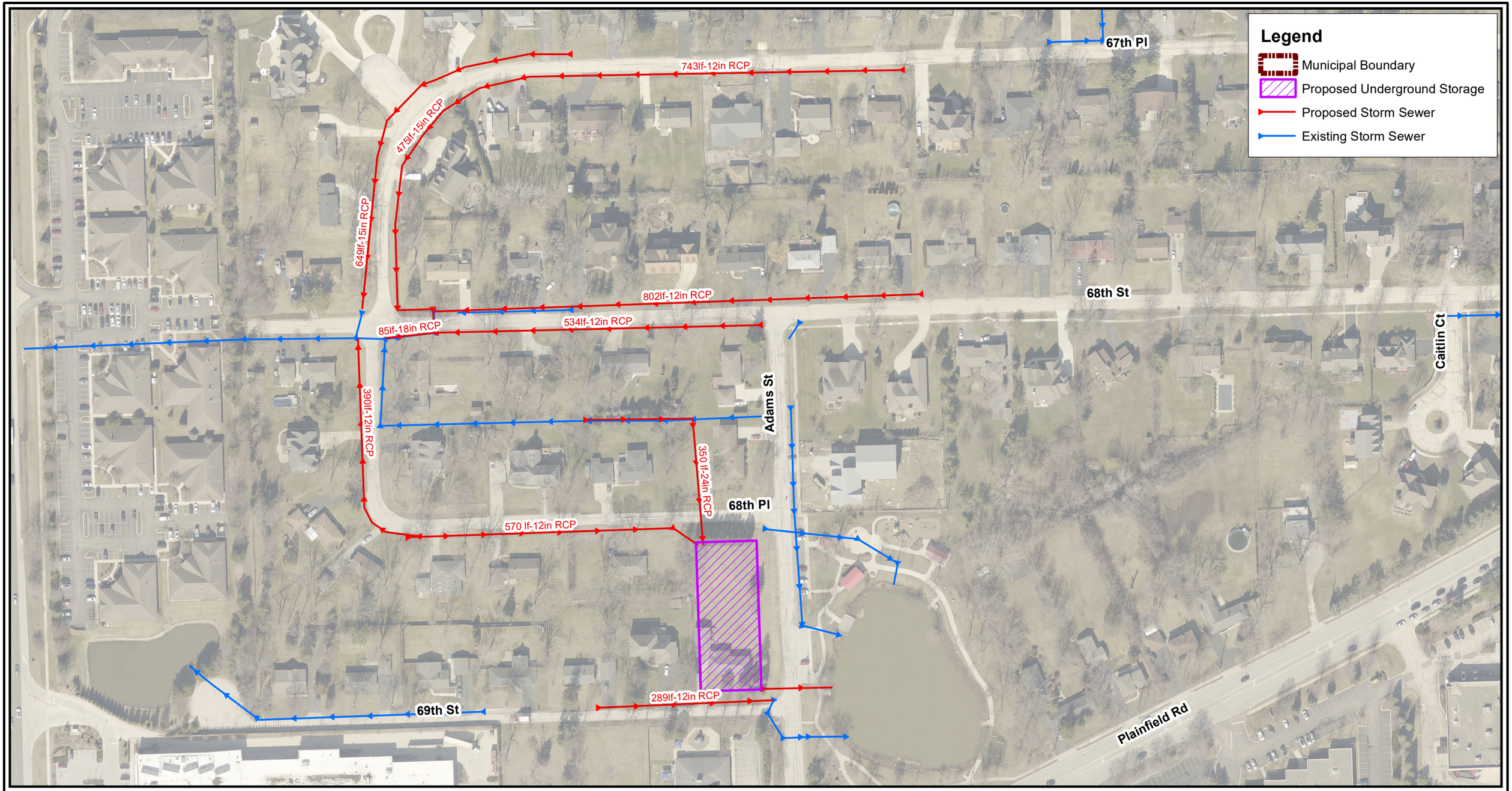
1 inch = 200 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 14_Willow Pond Inundation.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE: **Existing 10-year, 3-hour Inundation Willow Pond Study Area**		DATE: 09/19/25
		EXHIBIT 14b



1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 15_Willow Pond Proposed Improvement Projects.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE		DATE
Proposed Improvement Projects **Willow Pond Study Area**		09/17/25
		EXHIBIT 15

CHRISTOPHER B. BURKE ENGINEERING, LTD. (CBBEL)
9575 W Higgins Road, Suite 600, Rosemont, Illinois 60018-4920 | (847) 823-0500 | cbbel.com

MEMORANDUM

Subject: Willow Pond – NE Corner of Plainfield Road and Adams Street

Date: 8/22/2025

To: Rick Valent, PE
Sean Halloran
Alex Arteaga

From: Jeana Gowin, PE
Orion Galey, PE

In 2024, the Village of Willowbrook (Village) contracted Christopher B. Burke Engineering, Ltd. (CBBEL) to create a Village-wide stormwater master plan (SWMP). The SWMP focused on residential areas and localized flooding. The purpose of this study was to identify flood-prone areas within the Village and provide stormwater solutions that could be implemented by the Village, independent of other governing agencies, to mitigate the flooding. The evaluation was split into two sections: west of Clarendon Hills Road and north of 67th Street (NW Area) was completed in December 2024 and the remaining areas were completed in June 2025. Areas located within the floodplain were not evaluated for improvements since that level of effort is extensive and relies on the cooperation of many governmental entities.

The most-recently completed study included the area north of Plainfield Road and west of Madison Street (Exhibit 1). The area around and northwest of Willow Pond has experienced repetitive flooding. There is a low-lying depressional area between 68th Place and 68th Street that is inundated frequently since it is the lowest portion of this subarea.

Existing Conditions

There are approximately 15.3 acres tributary to Willow Pond, via overland flow and small diameter storm sewer. Willow Pond outlets in the southeast corner of the pond to the Plainfield Road storm sewer system. The rear yards of the homes between 68th Place and 68th Street have 5.1 acres of direct tributary area. It is drained by a 12” drain tile that the Village installed, with multiple inlets in the rear yards. The 12” tile ties into the storm sewer at the southwest corner of the intersection of Quincy Street and 68th Street. There is an additional 22.8 acres tributary to the intersection of 68th Street and Quincy Street (Exhibit 2). The 27.9 total acres tributary to this intersection is then conveyed west via an 18” storm sewer, with an ultimate outlet to the IL 83 right-of-way (ROW) ditch. The discharge at the ditch is regularly impeded as a result of lack of maintenance, thus exasperating the flooding in the vicinity of Willow Pond/Quincy Street area. Once the capacity of the 18” storm sewer is exceeded, water backs up into the ditch of 68th Street and flows back into the rear yards. The tributary area map is included as Exhibit 2.

CBBEL performed a hydrologic and hydraulic analysis of the Willow Pond/Quincy Street area (Exhibit 1). Generally, the 100-year, 1-hour storm event is the critical storm, meaning that this storm event results in the highest flood elevations within the Village; however, in this specific study area, the 100-year, 3-hour is the critical storm. Exhibit 3 shows the maximum flooding extends associated with this storm event. The rear yards alone store approximately 3.0 acre-feet of stormwater.

Based on discussions with Village staff, the Village is interested in potentially purchasing the lot at 708 69th Street to provide additional parking as well as provide a stormwater benefit. The 0.73 acre-site currently consists of a single-family home and open space. The parcel generally slopes from south to north with the ground elevation between 730 and 731 (NAVD88). The ground elevation is approximately 4 feet higher than the low spot in the depressional area between 68th Place and 68th Street. In addition, the invert normal water level (NWL) of Willow Pond is approximately the same elevation as the ground elevation of the depression.

Proposed Conditions

CBBEL evaluated the following alternatives associated with providing stormwater storage within the parcel to reduce the risk of flooding within the Quincy Street/Willow Pond area, as listed below:

1. Above-ground storage achieved with grading only;
2. Above-ground storage with retaining walls on the northern property boundary and partial retaining walls along the west and east property boundaries;
3. Underground storage vaults

Option 1 – Above-ground Storage

As noted in the Existing Conditions summary, the ground elevation is approximately 731.0. Because the ground elevation is higher than the ground elevation of the depressional area and the invert of the drain tile, conveying the runoff from this area to an above-ground storage area will require significant excavation of the parcel to provide storage. Approximately 1.3 acre-feet of storage can be provided with a gravity outlet. To access this storage, a storm sewer will need to be connected from the depressional area to the storage area. This alternative assumes that depressional area will be directly connected to the pond via storm sewer, the existing 12” drain tile remains in place, and the pond will discharge to a new 10” storm sewer along 68th Place, north along Quincy Street to the intersection of Quincy Street and 68th Street, where it will connect to the existing manhole. Along this route, it is recommended to install a drainage structure to convey the runoff from south of 68th Place.

Benefits in the depressional area are realized up to and including the 10-year storm event; however, for storm events larger than the 10-year, the benefits are 0.5’ or less. Note that the alternative does not provide any benefits for the intersection of 68th Street and Quincy Street. Table 1 summarizes the existing and proposed high water elevation (HWL) at the

depressional area and at the northeast corner of Quincy Street and 68th Street. The proposed concept plan for Option 2 is shown on Exhibit 4. The estimated cost of construction and engineering is $700,000.

Storm Event	Existing WSEL	Proposed WSEL	Difference (PR-EX)	Proposed Depth of Ponding (ft)
Rear Yard Depression (Ground Elevation = 725.9)				
2-year	726.8	724.8	-2.0	0.0
5-year	727.4	726.4	-1.0	0.5
10-year	727.8	727.1	-0.7	1.2
25-year	728.4	727.9	-0.5	2.0
50-year	728.8	728.3	-0.5	2.4
100-year	729.2	728.8	-0.4	2.9
NE Corner of Quincy Street and 68th Street (Ditch Invert Elevation = 726.3)				
2-year	728.2	728.2	0.0	1.9
5-year	728.4	728.4	0.0	2.1
10-year	728.7	728.6	-0.1	2.3
25-year	729.0	729.0	0.0	2.7
50-year	729.2	729.2	0.0	2.9
100-year	729.4	729.4	0.0	3.1

Table 1 – Summary of Option 1 Benefits

Option 2 – Above-ground Storage with Box Culverts along 68th Place/Quincy Street

Using Option 1 as a baseline, Option 2 consists of an above-ground stormwater basin with an oversized twin 6' (W) x 3' (H) reinforced concrete box culvert (RCBC) from basin to the intersection of Quincy and 68th Street. The downstream end of the RCBC needs to be restricted to not increase ponding at this intersection. The RCBC would provide additional 0.4 acre-feet of stormwater storage that the basin is lacking. As shown in Table 2, although additional storage is provided in the twin RCBC, stormwater benefits are 0.5' or less for storms greater than the 10-year event in the depressional area. Note that the alternative does not provide any benefits for the northeast corner of the intersection of 68th Street and Quincy Street. The proposed concept plan for Option 2 is shown on Exhibit 5. The estimated cost of construction and engineering is $2.12 millon.

Storm Event	Existing WSEL	Proposed WSEL	Difference (PR-EX)	Proposed Depth of Ponding (ft)
Rear Yard Depression (Ground Elevation = 725.9)				
2-year	726.8	725.1	-1.7	0.0
5-year	727.4	725.8	-1.6	0.0
10-year	727.8	726.6	-1.2	0.7
25-year	728.4	727.8	-0.6	1.9
50-year	728.8	728.3	-0.5	2.4
100-year	729.2	728.7	-0.5	2.8
NE Corner of Quincy Street and 68th Street (Ditch Invert Elevation = 726.3)				
2-year	728.2	728.2	0.0	1.9
5-year	728.4	728.4	0.0	2.1
10-year	728.7	728.6	-0.1	2.3
25-year	729.0	728.9	-0.1	2.6
50-year	729.2	729.2	0.0	2.9
100-year	729.4	729.4	0.0	3.1

Table 2 – Summary of Option 2 Benefits

Option 3 – Underground Storage with Pump Discharge to Willow Pond

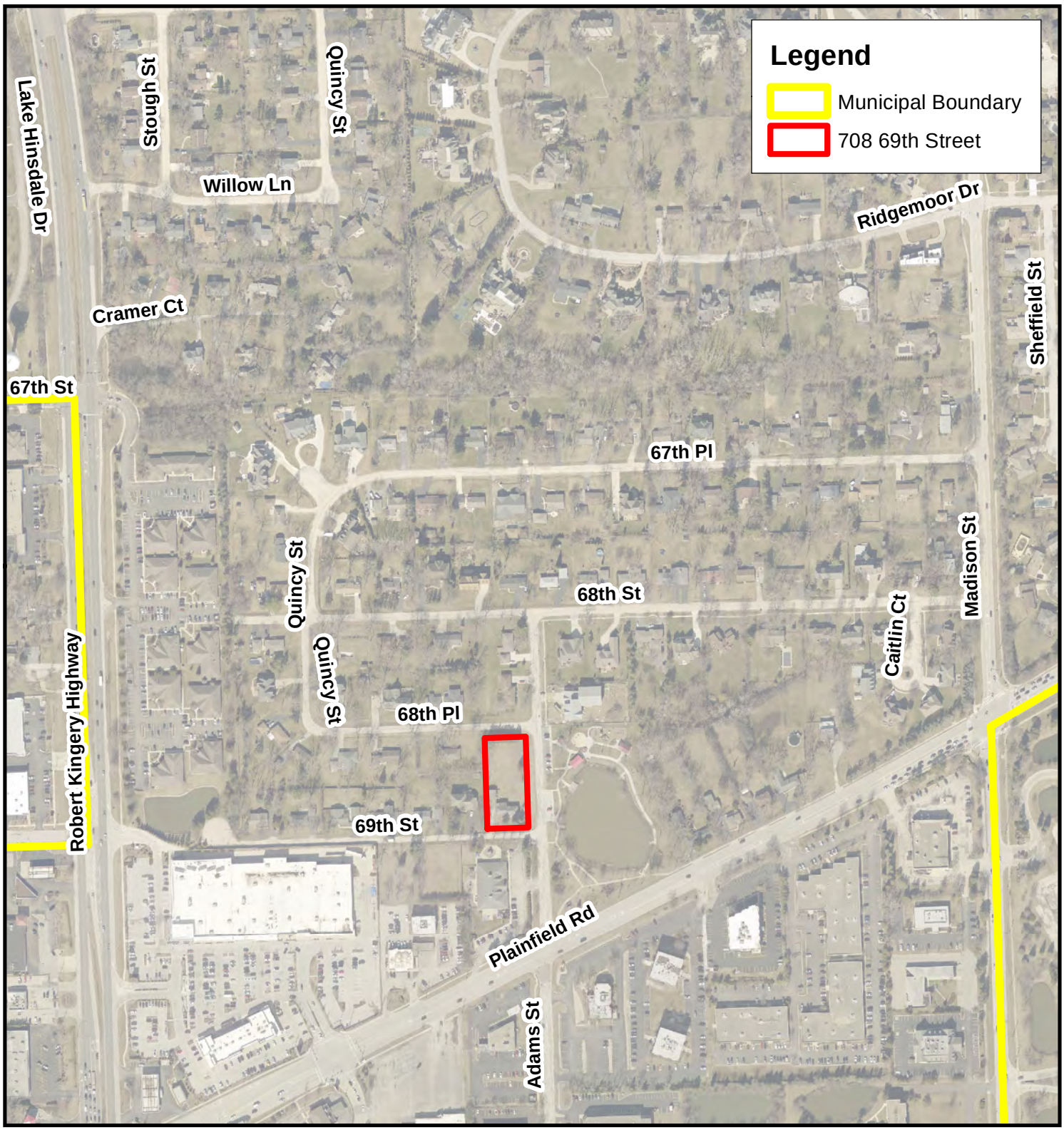
Option 3 consists of the installation of underground storage at 708 69th Street with a dewatering pump discharging to Willow Pond. Willow Pond discharges to the Plainfield Road ROW, therefore the underground storage facility will need to be dewatered once Willow Pond has capacity. A downstream drainage analysis may be required to verify that discharges to the Plainfield Road storm sewer are not increased as a result of this alternative. Approximately 3.3 acre-feet of stormwater storage can be provided in underground vaults within the parcel boundaries and the drain down time in the 100-year storm is 10 hours. Similar to Options 1 and 2, a direct connection to the depressional area is proposed to convey water to the basin and away from the intersection of Quincy Street and 68th Street. The proposed concept plan for Option 2 is shown on Exhibit 6. The estimated cost of construction and engineering is $3.36 million.

Storm Event	Existing WSEL	Proposed WSEL	Difference (PR-EX)	Proposed Depth of Ponding (ft)
Rear Yard Depression (Ground Elevation = 725.9)				
2-year	726.8	723.7	-3.1	0.0
5-year	727.4	724.1	-3.3	0.0
10-year	727.8	724.9	-2.9	0.0
25-year	728.4	726.3	-2.1	0.4
50-year	728.8	727.2	-1.6	1.3
100-year	729.2	727.9	-1.3	2.0
NE Corner of Quincy Street and 68th Street (Ditch Invert Elevation = 726.3)				
2-year	728.2	728.2	0.0	1.9
5-year	728.4	728.4	0.0	2.1
10-year	728.7	728.6	-0.1	2.3
25-year	729.0	729.0	0.0	2.7
50-year	729.2	729.2	0.0	2.9
100-year	729.4	729.4	0.0	3.1

Table 3 – Summary of Option 3 Benefits

Conclusions

CBBEL analyzed three alternatives to provide stormwater storage at 708 69th Street. While all three options provide benefits for the rear yard flooding between 68th Street and 68th Place, the area will still be inundated for larger storm events. The drain down time of each alternative is reduced significantly in the rear yard depression. Because of the large area tributary to Quincy Street and 68th Street, any storage provided at 708 69th Street does not reduce flooding at this intersection. A separate project in the immediate vicinity will need to be evaluated. Note the outlet for this low-lying area is ultimately within the IDOT ROW. Any proposed improvements that increase discharge to the ROW would need to be permitted by IDOT.



"NOT TO SCALE"

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
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Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

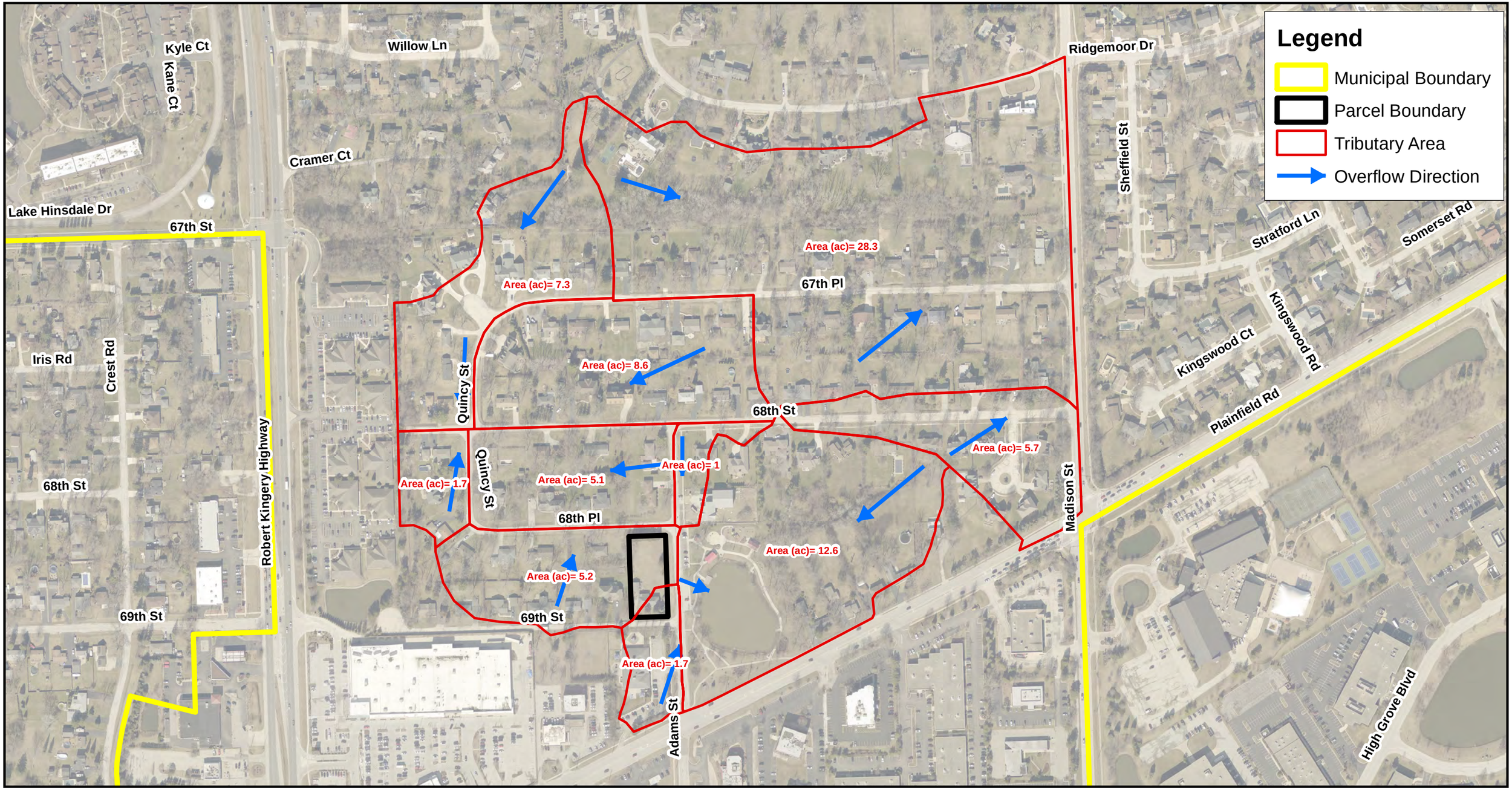
CLIENT: Village of Willowbrook

JOB#: 24-0485

TITLE: **LOCATION MAP**
708 69th Street

DATE: 08/20/25

EXHIBIT 1



1 inch = 300 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Proposed Conditions\Willow Pond\Watershed Boundary Map.mxd

DSGN.		CHKD.	

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Rosemont, IL 60018
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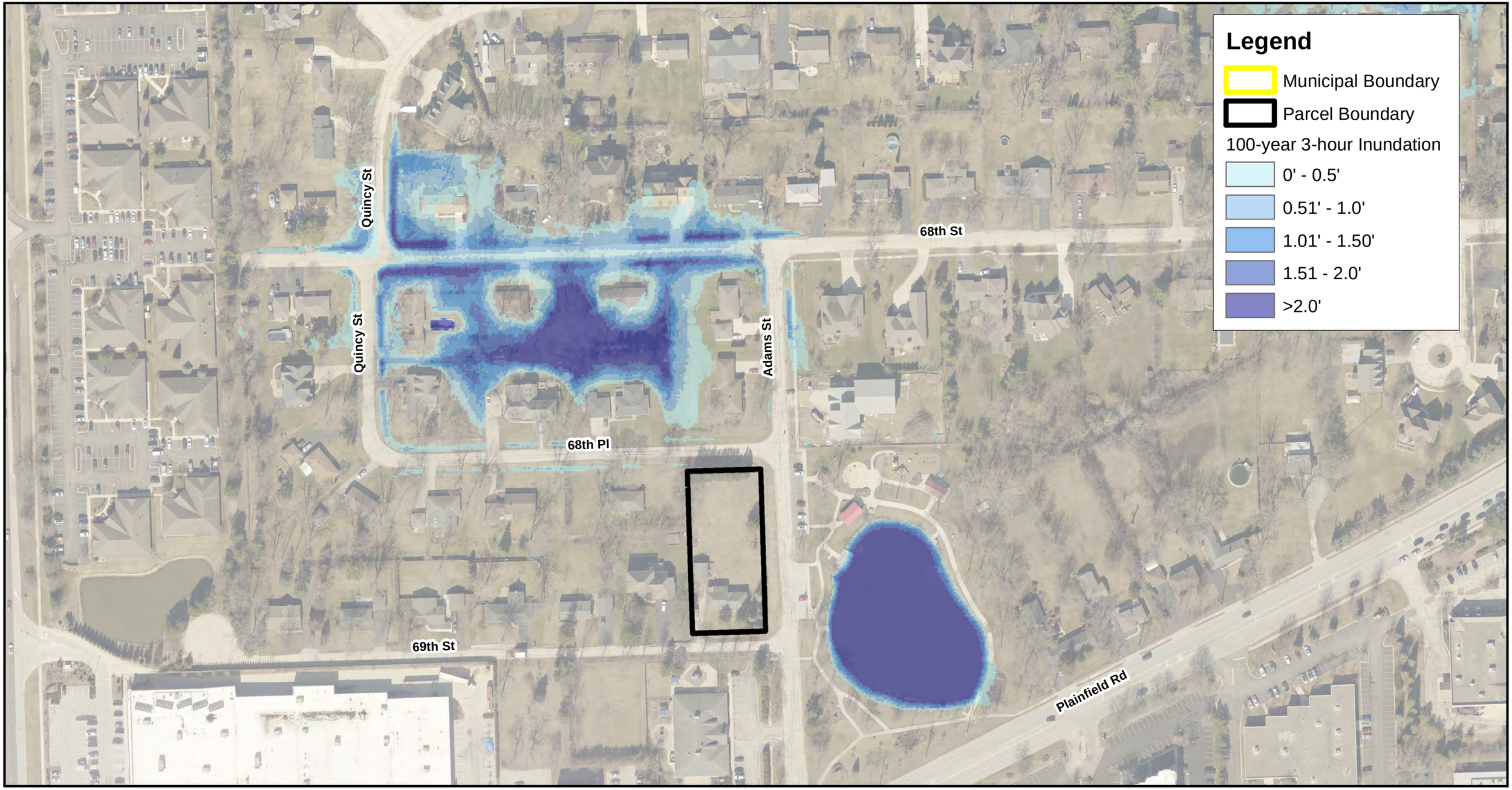
CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N W E S
TITLE: **Tributary Area Map**	DATE: 08/20/25	
	EXHIBIT 2	



1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Proposed Conditions\Willow Pond\Existing Inundation Map.mxd

DSGN.		CHKD.	

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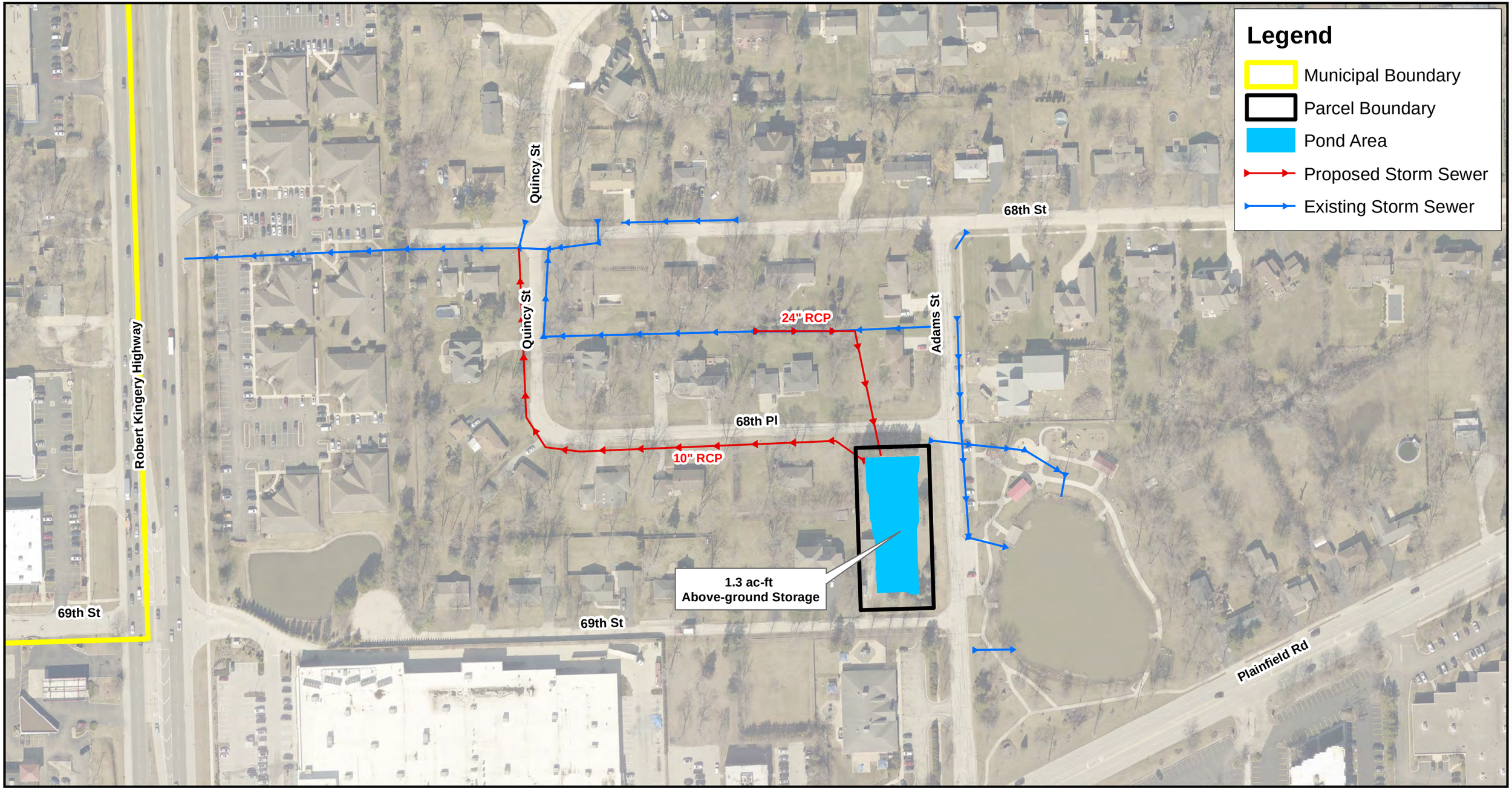
CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N W E S
TITLE: **Existing 100-year Inundation**	DATE: 08/20/25	EXHIBIT 3



1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Proposed Conditions\Willow Pond\Alternative 1.mxd

DSGN.		CHKD.	

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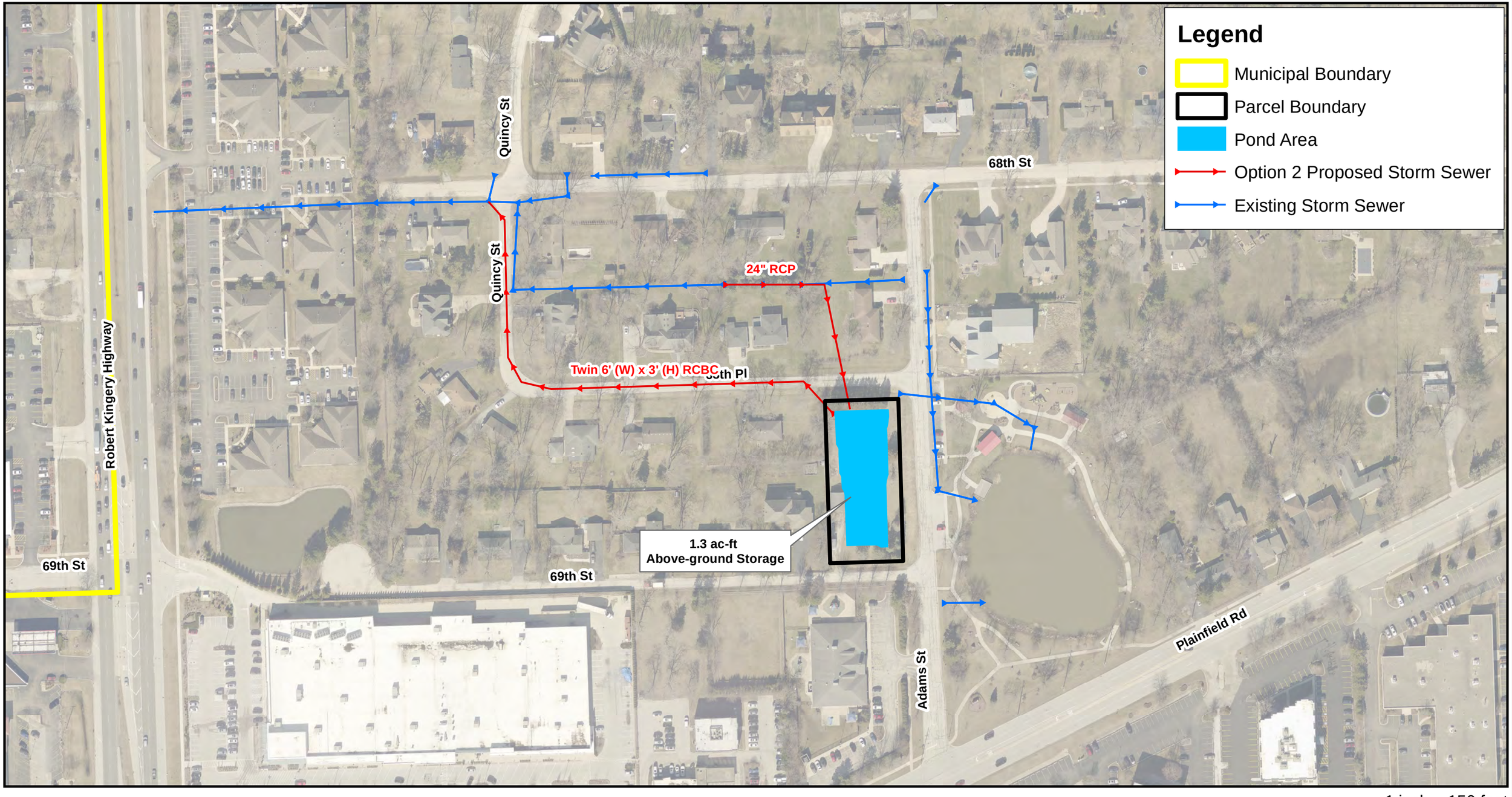
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N W E S
TITLE: **Proposed Option 1**	DATE: 08/20/25	
	EXHIBIT 4	



1 inch = 150 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Proposed Conditions\Willow Pond\Alternative 2.mxd

DSGN.		CHKD.	

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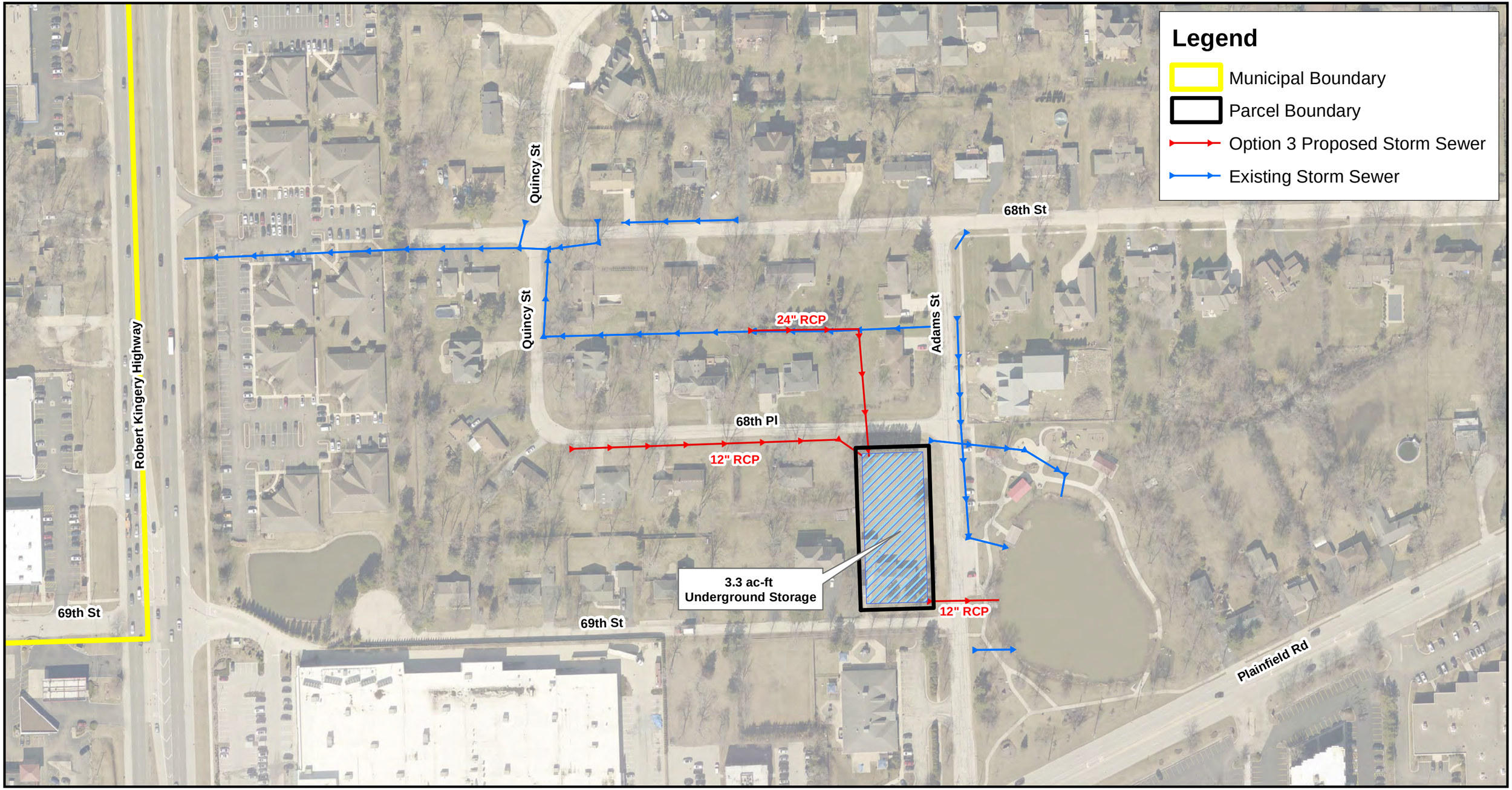
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N W E S
TITLE: **Proposed Option 2**	DATE: 08/20/25	
	EXHIBIT 5	



1 inch = 150 feet

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DSGN.		CHKD.	

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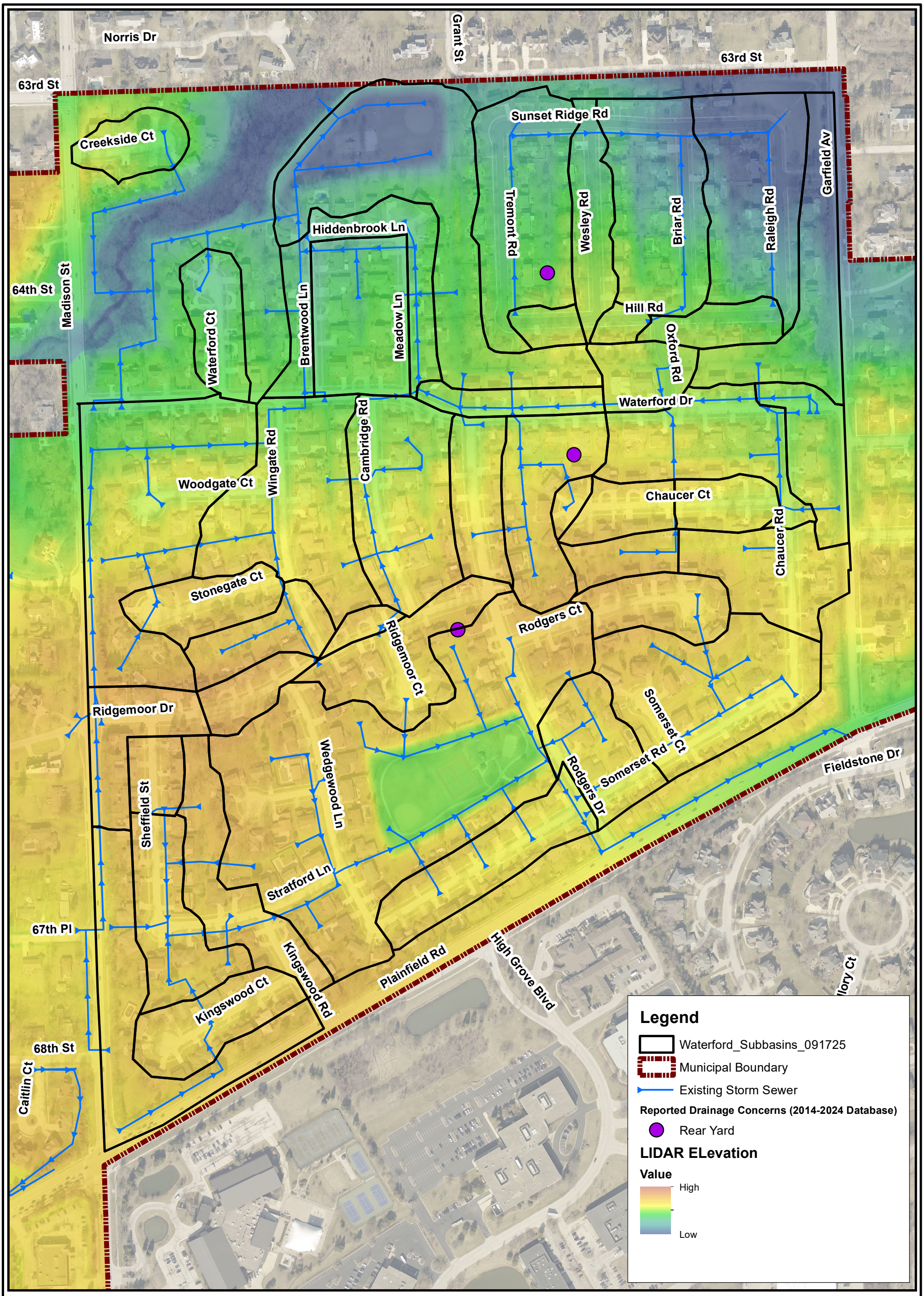
CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	N W E S
TITLE: **Proposed Option 3**	DATE: 08/20/25	EXHIBIT 5

APPENDIX 6

AREA 6 – WATERFORD SUBDIVISION

EXHIBITS



1 inch = 300 feet

DSGN.		CHKD.	

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9575 West Higgins Road, Suite 600
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(847) 823-0500 / FAX (847) 823-0520

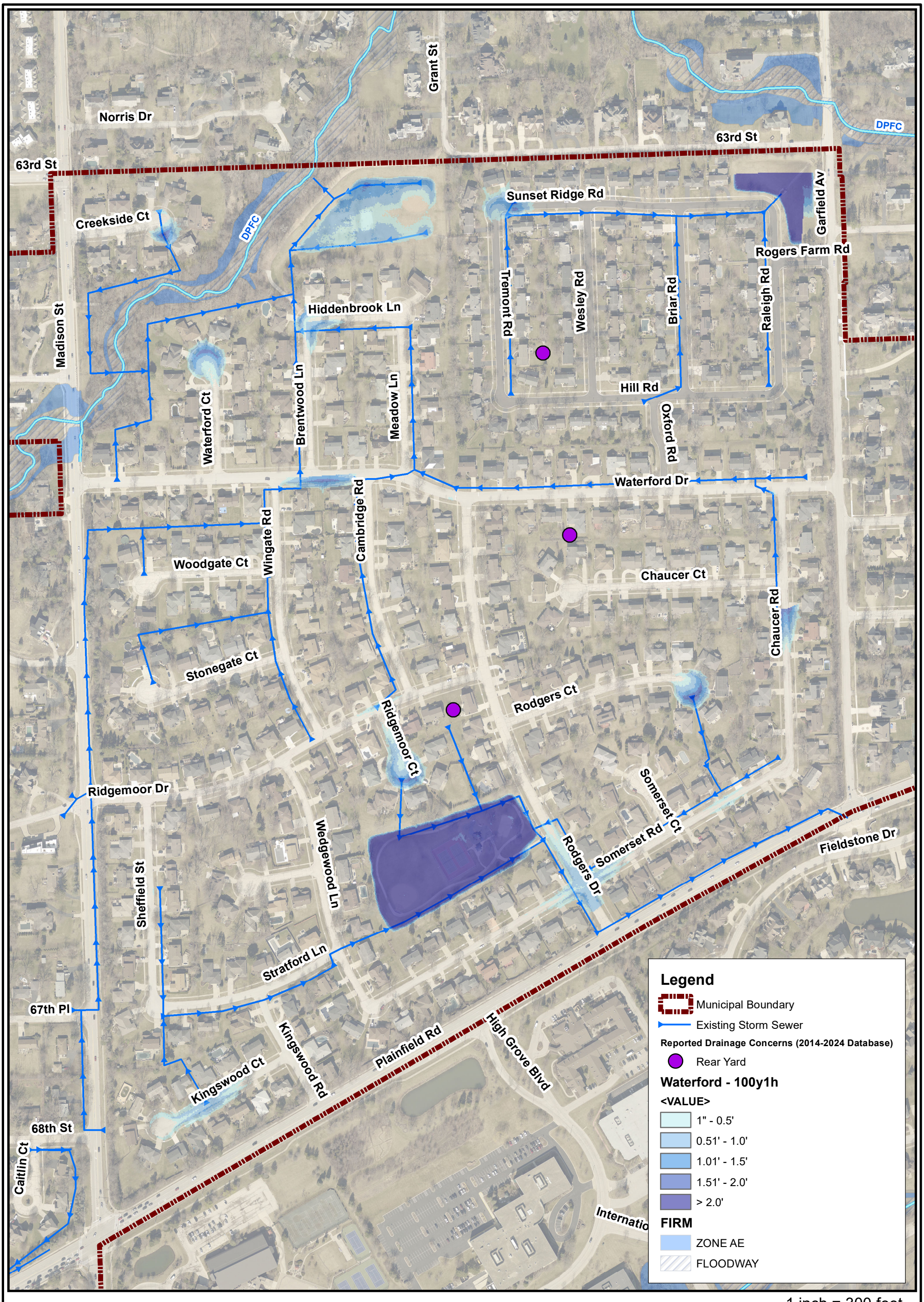
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Drainage Pattern & Subbasin Map**
Waterford Subdivision Study Area

DATE: 09/17/25

EXHIBIT 16



1 inch = 300 feet

DSGN.		CHKD.	

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(847) 823-0500 / FAX (847) 823-0520

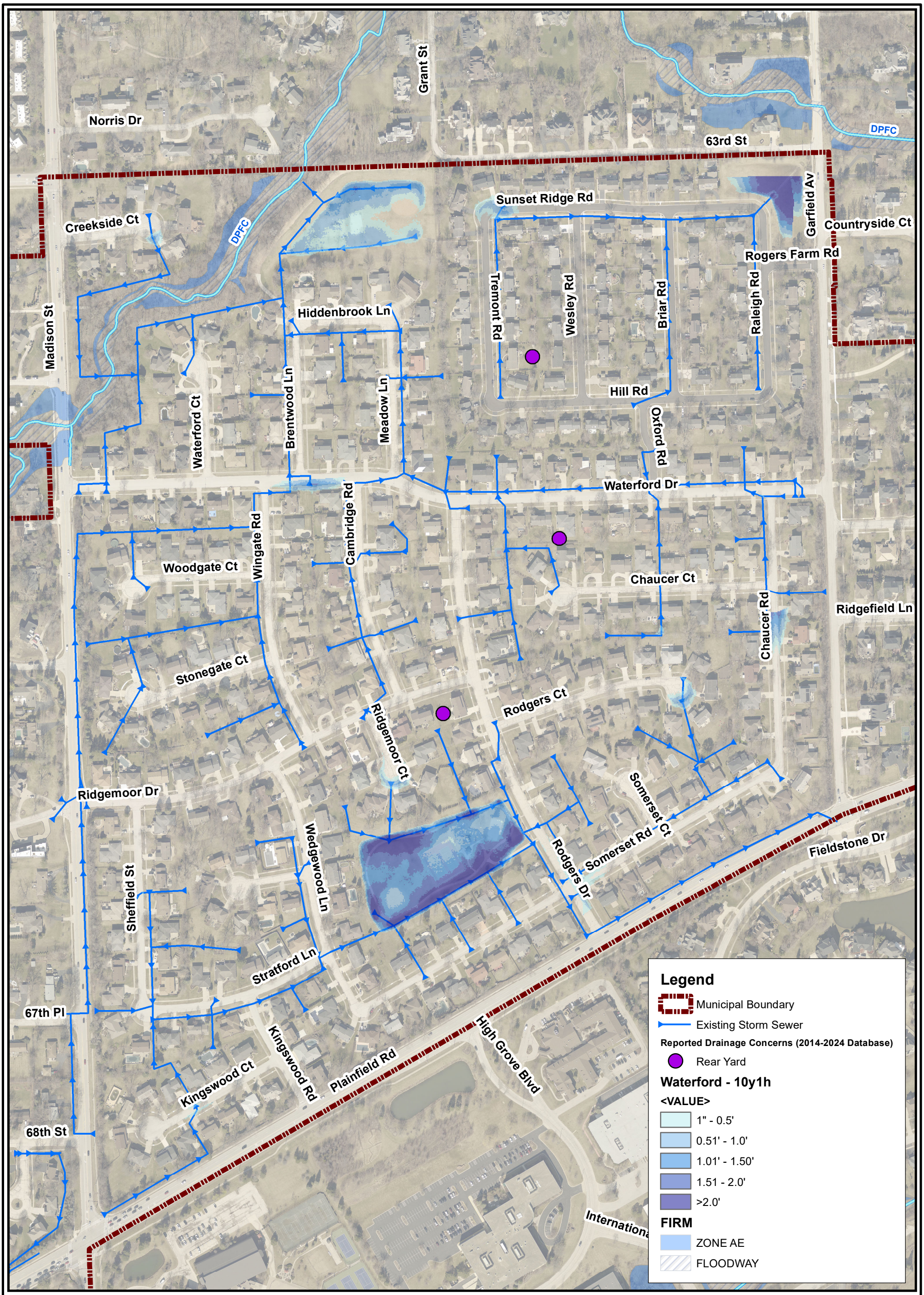
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **100-year, 1-hour Inundation Waterford Subdivision Study Area**

DATE: 09/11/25

EXHIBIT 17a



1 inch = 300 feet

DSGN.		CHKD.	

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(847) 823-0500 / FAX (847) 823-0520

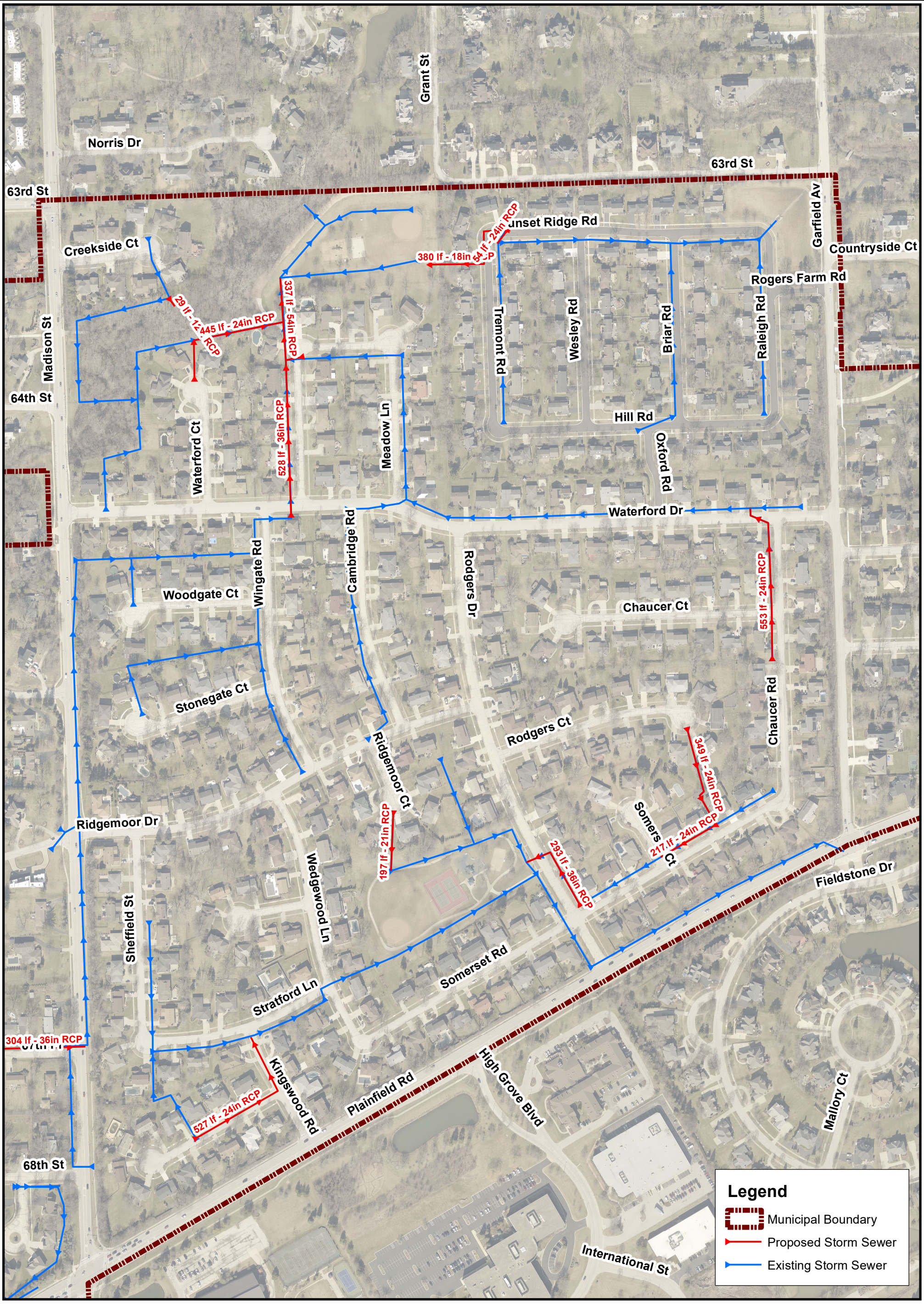
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **10-year, 1-hour Inundation Waterford Subdivision Study Area**

DATE: 09/17/25

EXHIBIT 17b



1 inch = 300 feet

DSGN.		CHKD.	

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(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects**
Waterford Subdivision Study Area

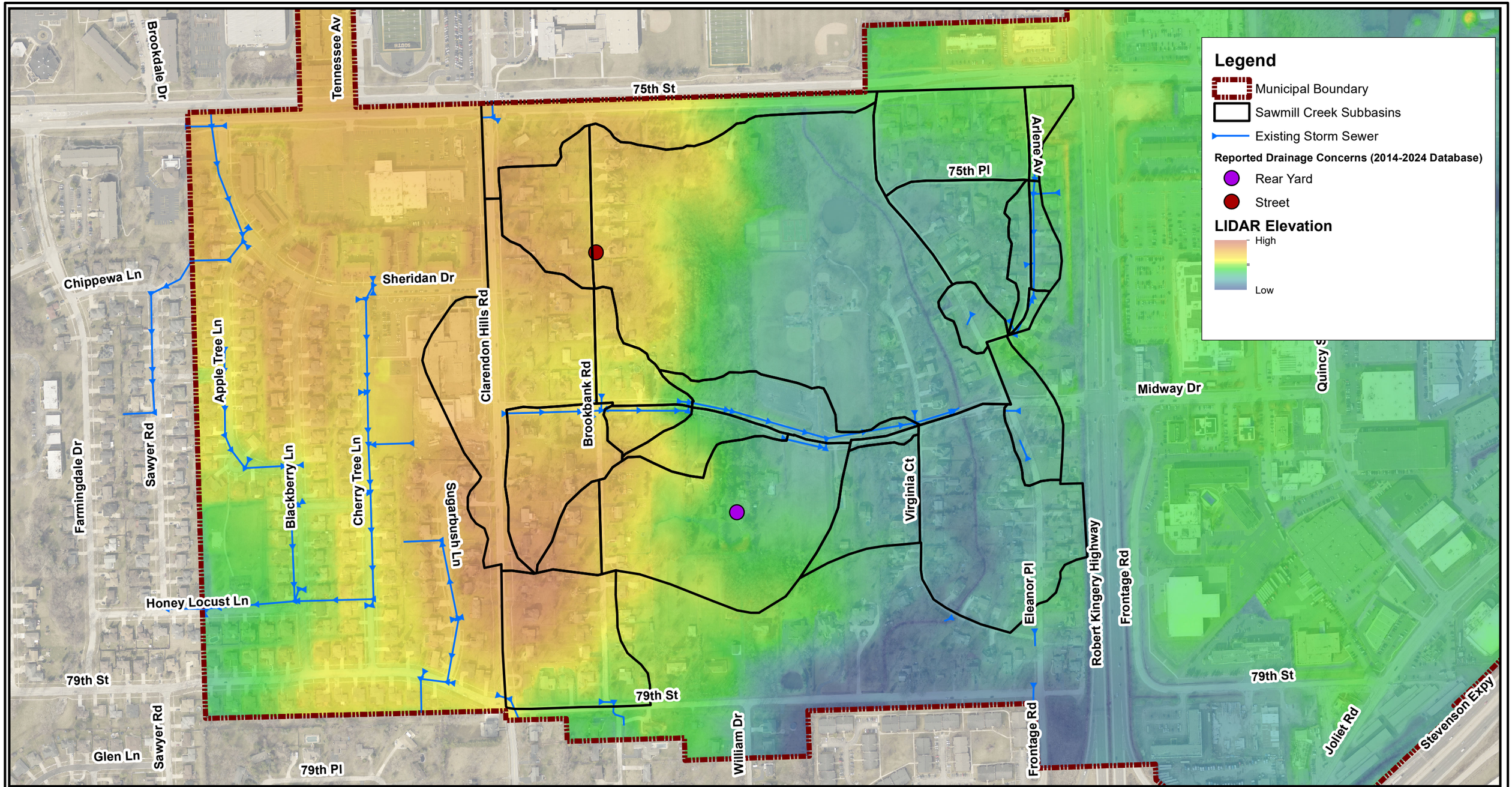
DATE: 09/11/25

EXHIBIT 18

APPENDIX 7

AREA 7 – SAWMILL CREEK

EXHIBITS



1 inch = 400 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 19_Sawmill Creek Study Area Drainage Pattern.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
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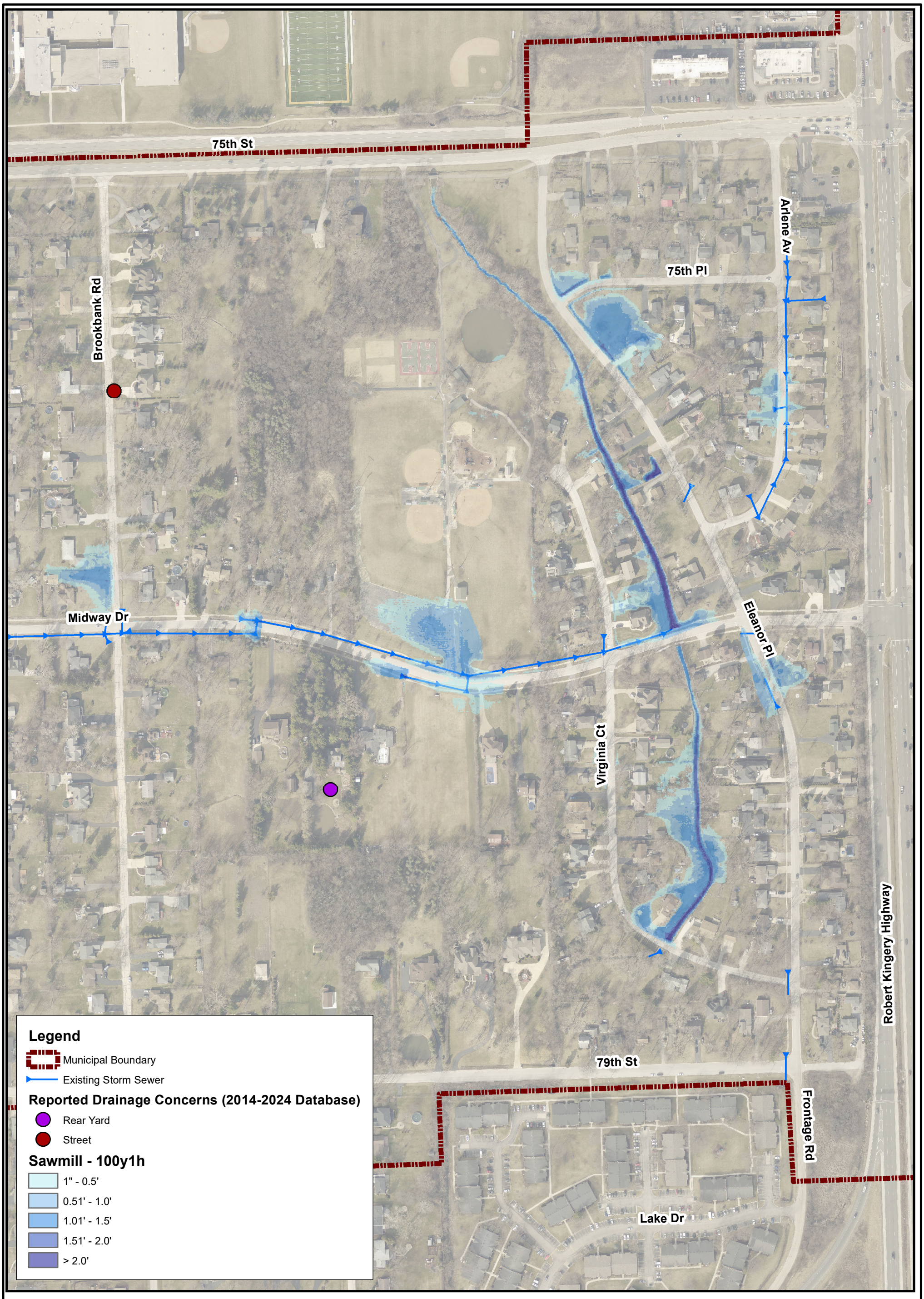
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook	PROJECT NO.: 24-0485	
TITLE: **Drainage Pattern and Subbasin Map Sawmill Creek Study Area**		DATE: 09/11/25
		EXHIBIT 19



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 20_Sawmill Study Area Inundation.mxd

1 inch = 250 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
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(847) 823-0500 / FAX (847) 823-0520

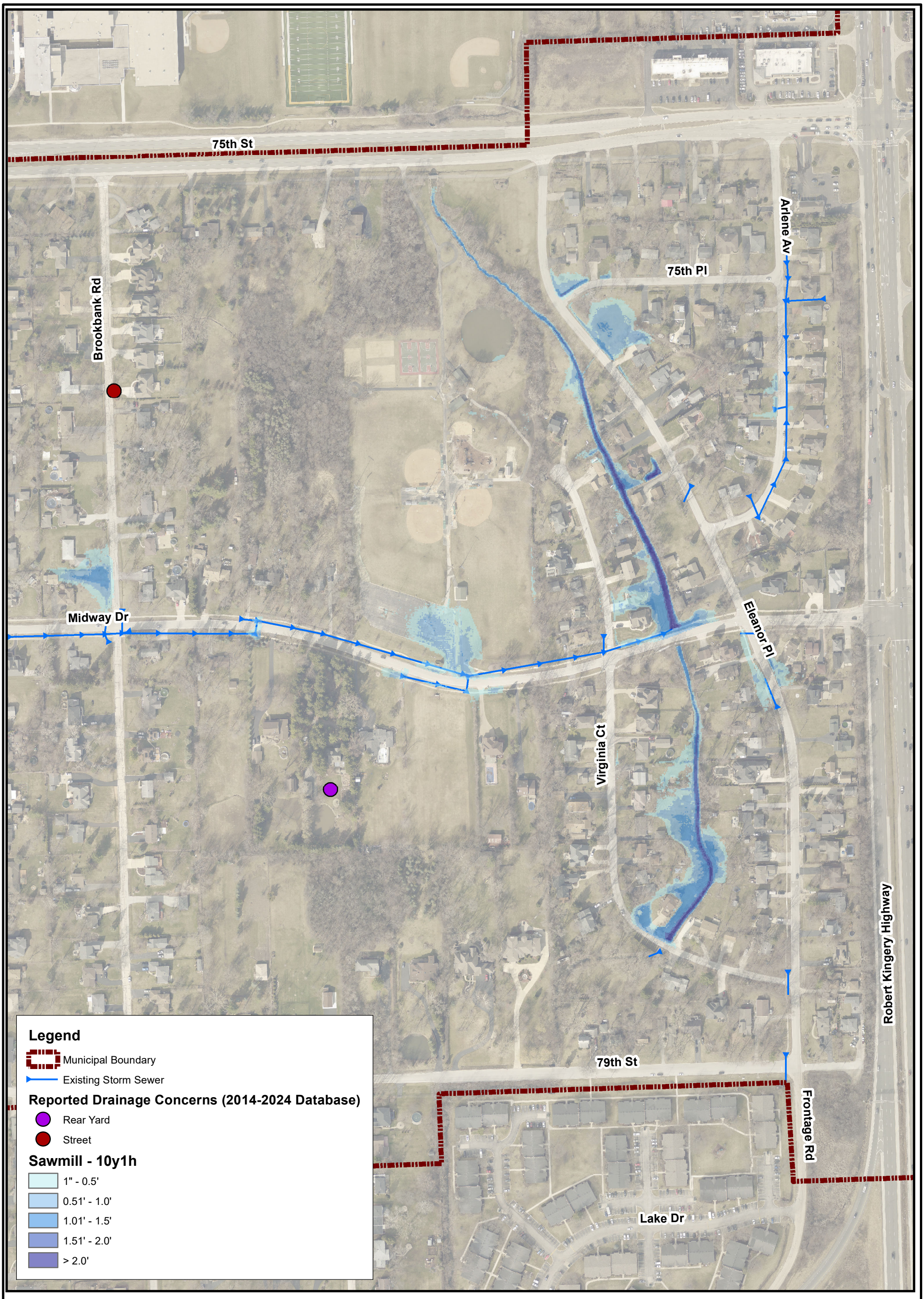
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **100-year, 1-hour Inundation Area Sawmill Study Area**

DATE: 09/11/25

EXHIBIT 20a



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 20_Sawmill Study Area Inundation.mxd

1 inch = 250 feet

DSGN.		CHKD.	

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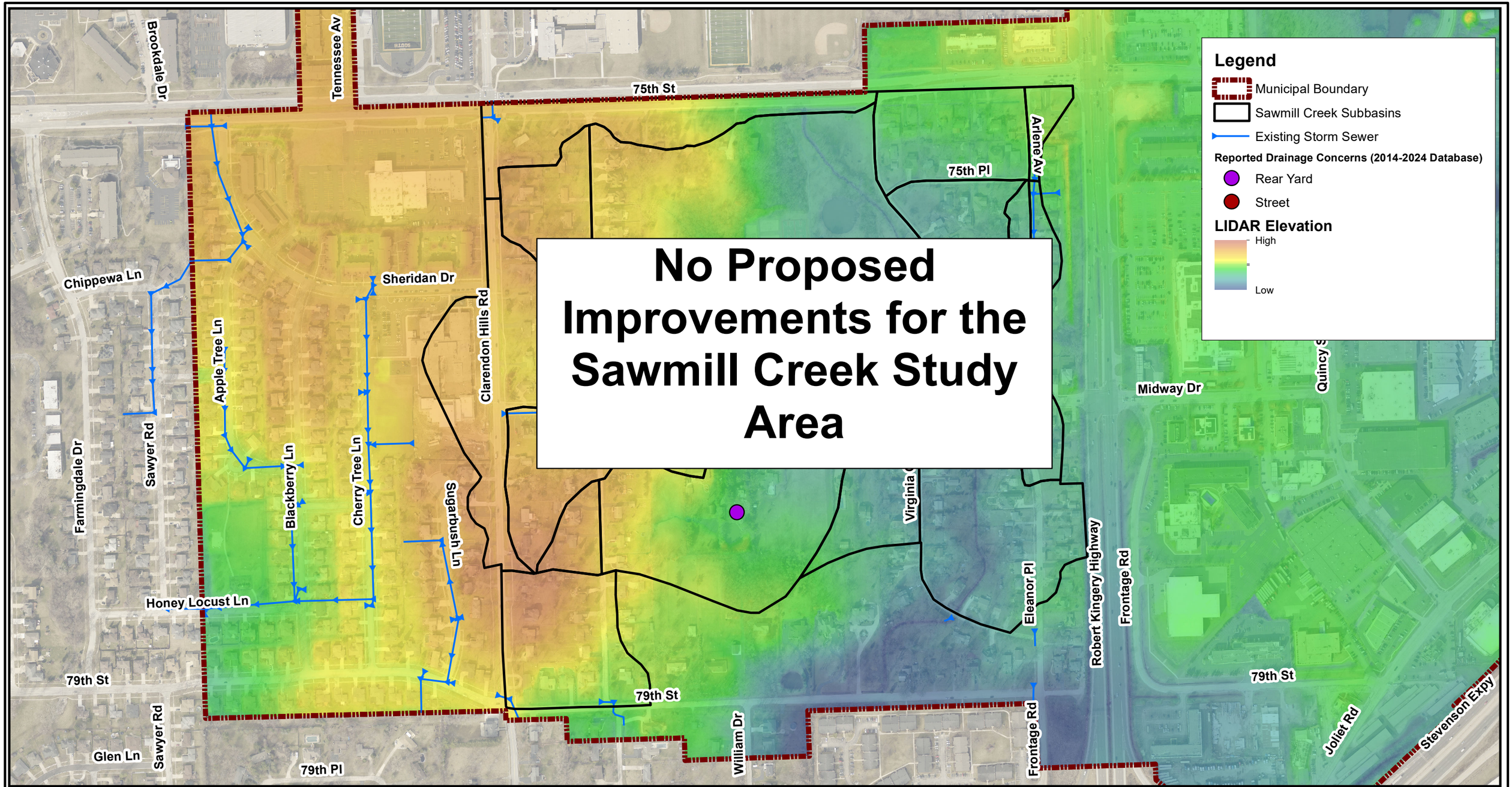
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **100-year, 1-hour Inundation Area Sawmill Study Area**

DATE: 09/11/25

EXHIBIT 20b



1 inch = 400 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 21_Sawmill Creek Study Area Proposed Improvement Projects.mxd

DSGN.		CHKD.	

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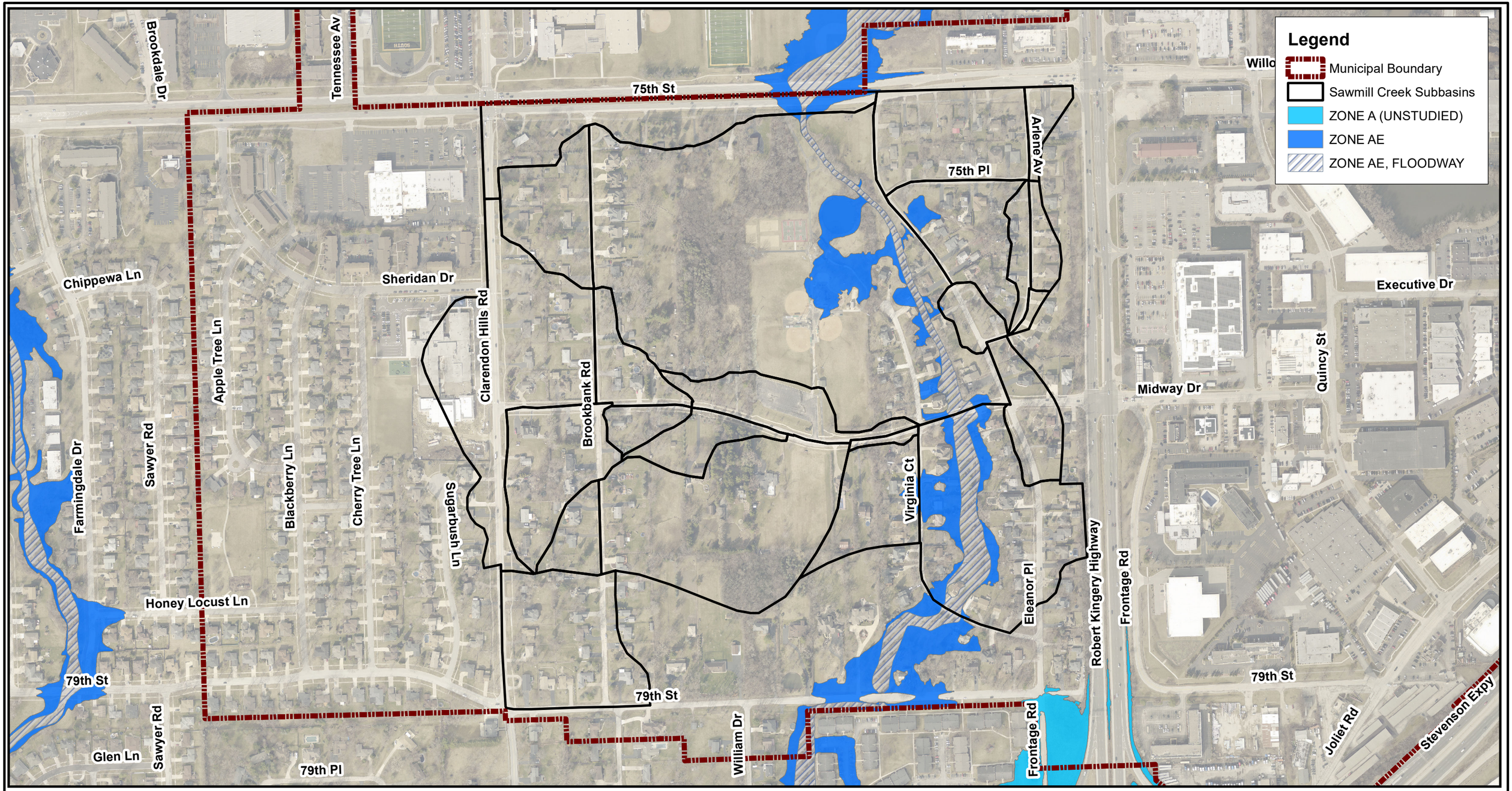
CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	
TITLE		DATE
Proposed Improvement Projects Sawmill Creek Study Area		09/11/25
		EXHIBIT 21



1 inch = 400 feet

N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 25_Sawmill Creek with FIRM.mxd

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
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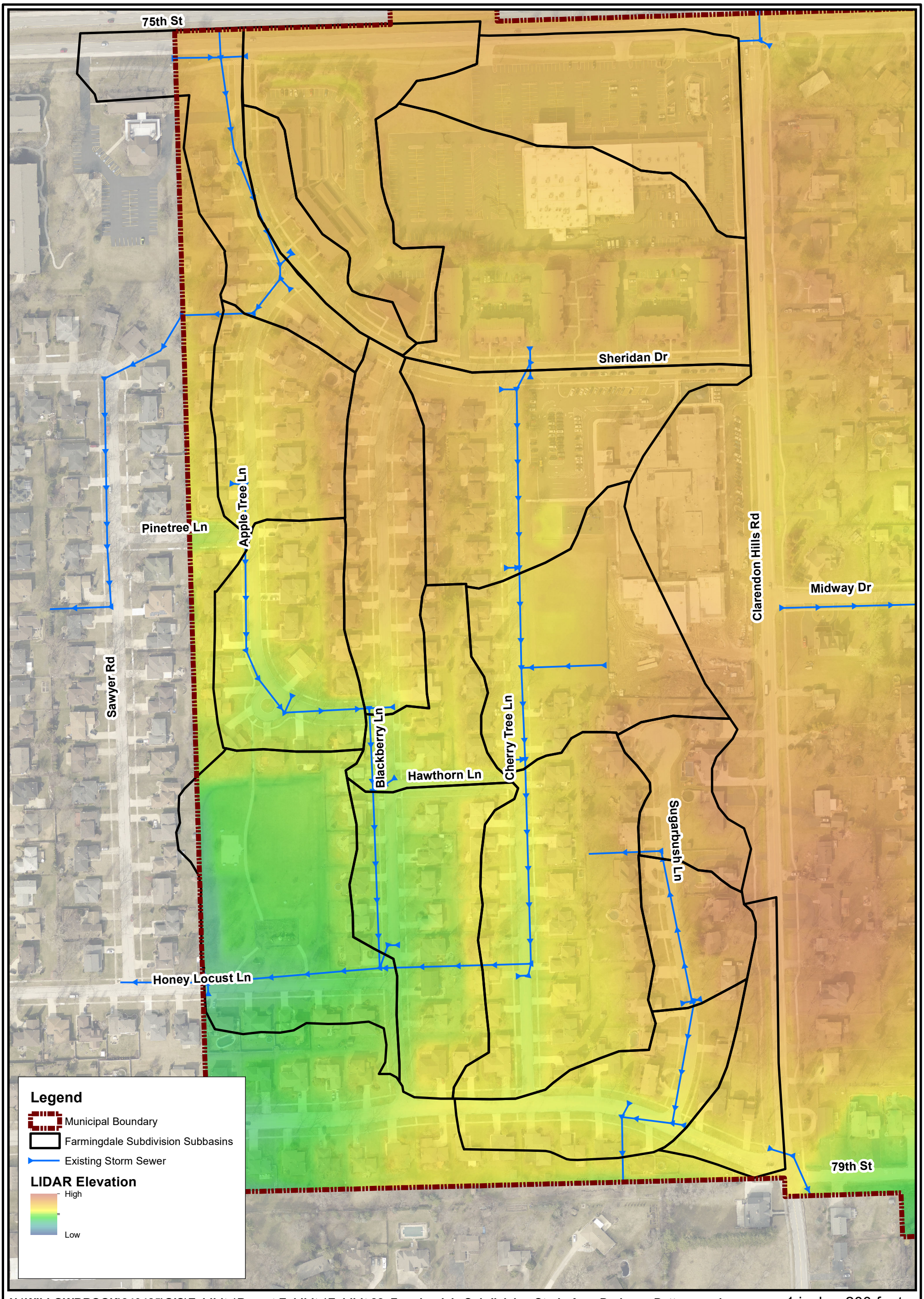
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	
TITLE		DATE
FEMA FIRM **Sawmill Creek Study Area**		09/11/25
		EXHIBIT 25

APPENDIX 8

AREA 8 – FARMINGDALE SUBDIVISION

EXHIBITS



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 22_Farmingdale Subdivision Study Area Drainage Pattern.mxd

1 inch = 200 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

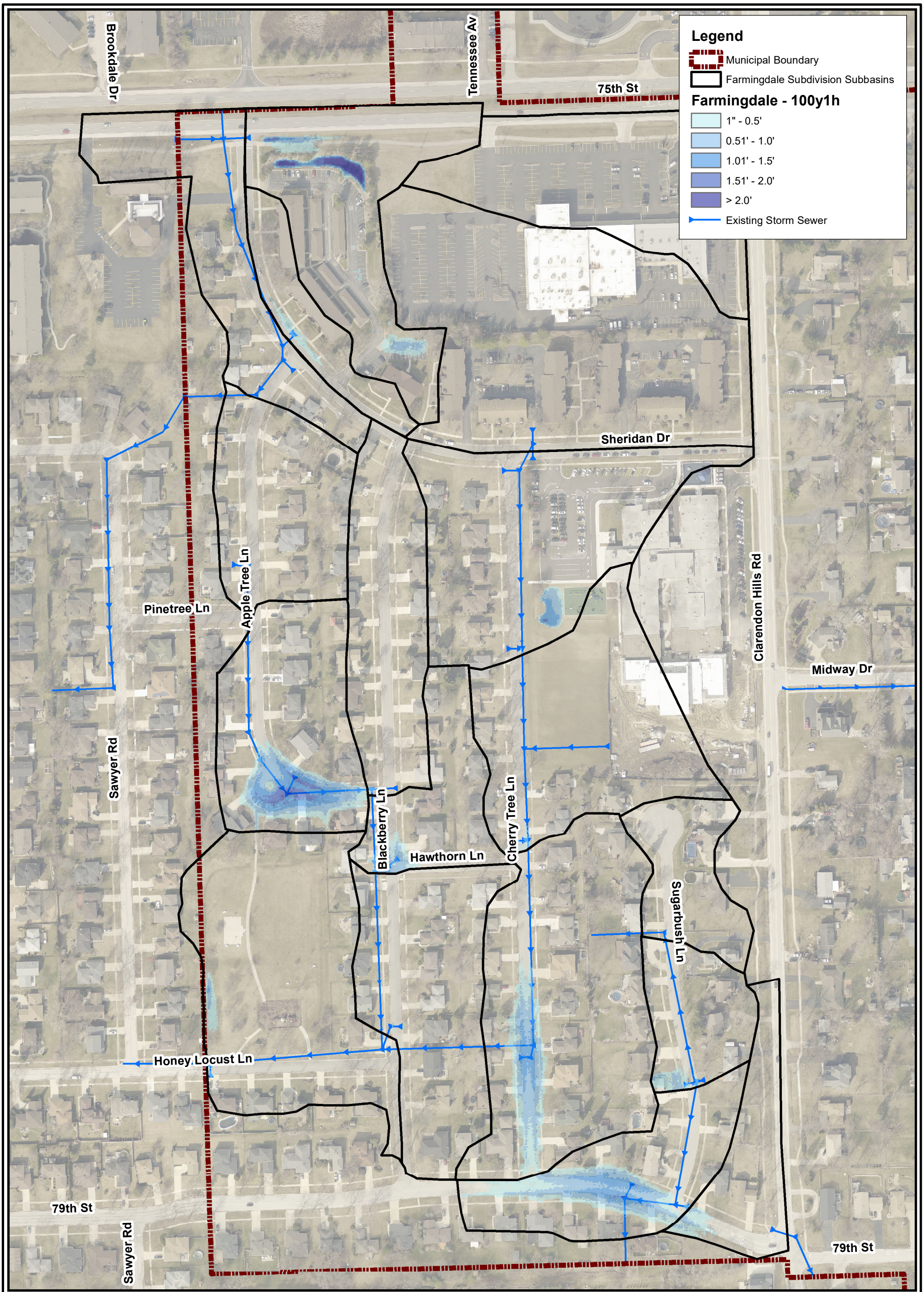
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Drainage Pattern & Subbasin Map**
Farmingdale Subdivision Study Area

DATE: 09/11/25

EXHIBIT 22



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 25_Farmingdale Subdivision Inundation.mxd

1 inch = 200 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
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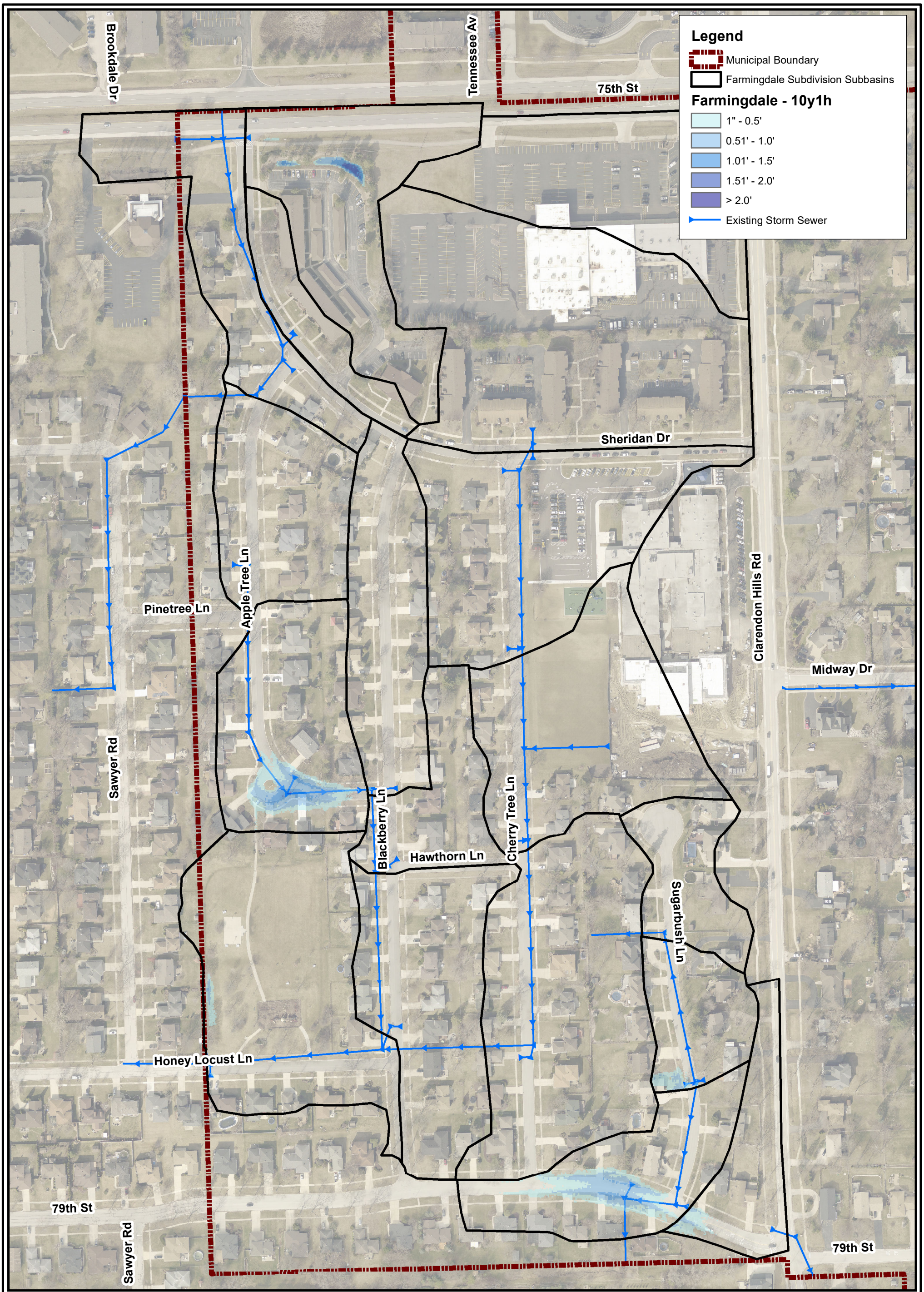
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT	PROJECT NO.	
Village of Willowbrook	24-0485	N W E S
TITLE	**DATE**	
Proposed Improvement Projects Farmingdale Subdivision 100-year, 1-hour Inundation Boundary	09/11/25	EXHIBIT 23a



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 25_Farmingdale Subdivision Inundation.mxd

1 inch = 200 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

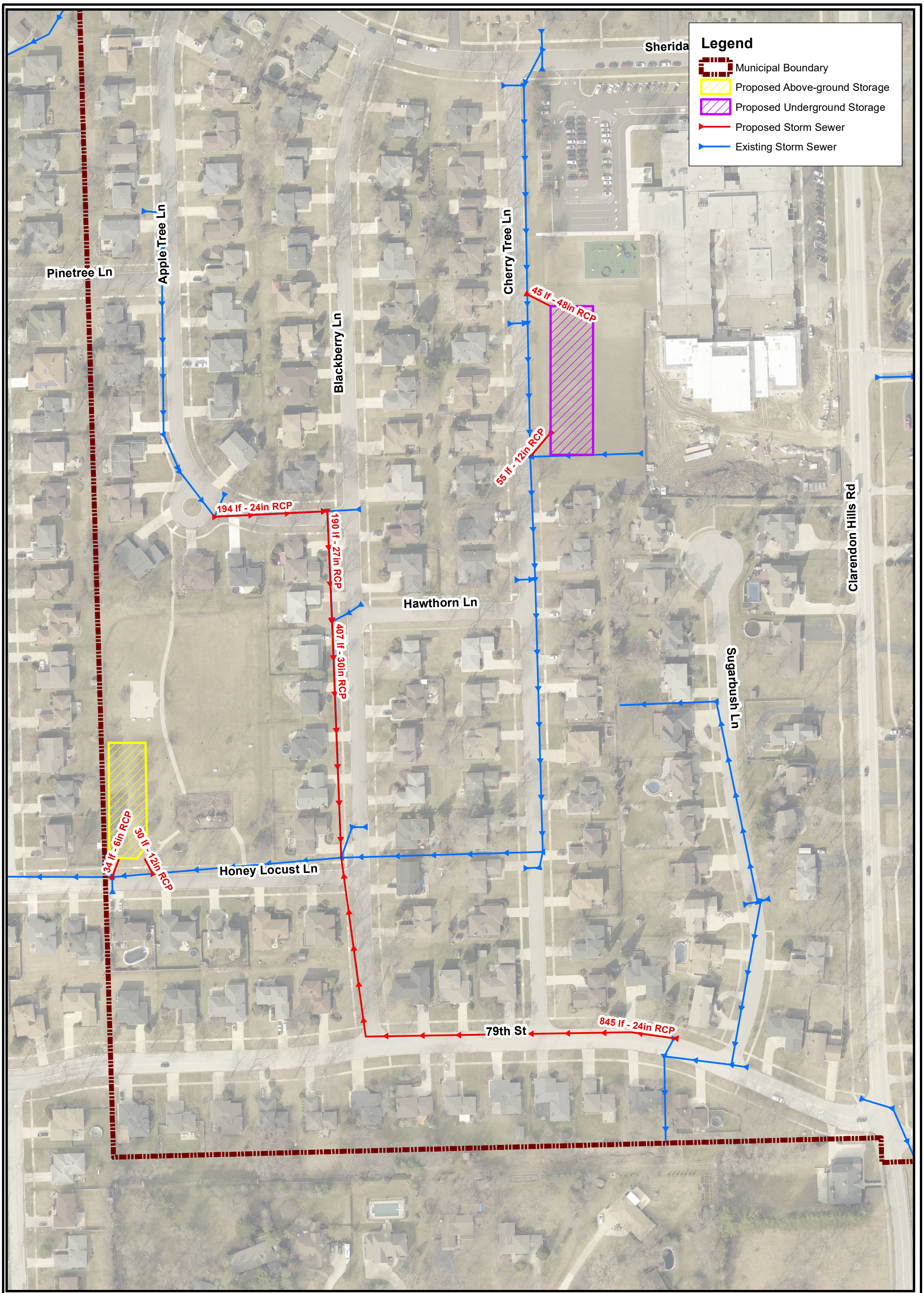
CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects**
Farmingdale Subdivision
10-year, 1-hour Inundation Boundary

DATE: 09/11/25

EXHIBIT 23b



N:\WILLOWBROOK\240485\GIS\Exhibits\Report Exhibits\Exhibit 24_Farmingdale Proposed Improvement Projects.mxd

1 inch = 150 feet

DSGN.		CHKD.	

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road, Suite 600
Rosemont, IL 60018
(847) 823-0500 / FAX (847) 823-0520

CLIENT: Village of Willowbrook

PROJECT NO.: 24-0485

TITLE: **Proposed Improvement Projects**
Farmingdale Subdivision

DATE: 09/11/25

EXHIBIT 24