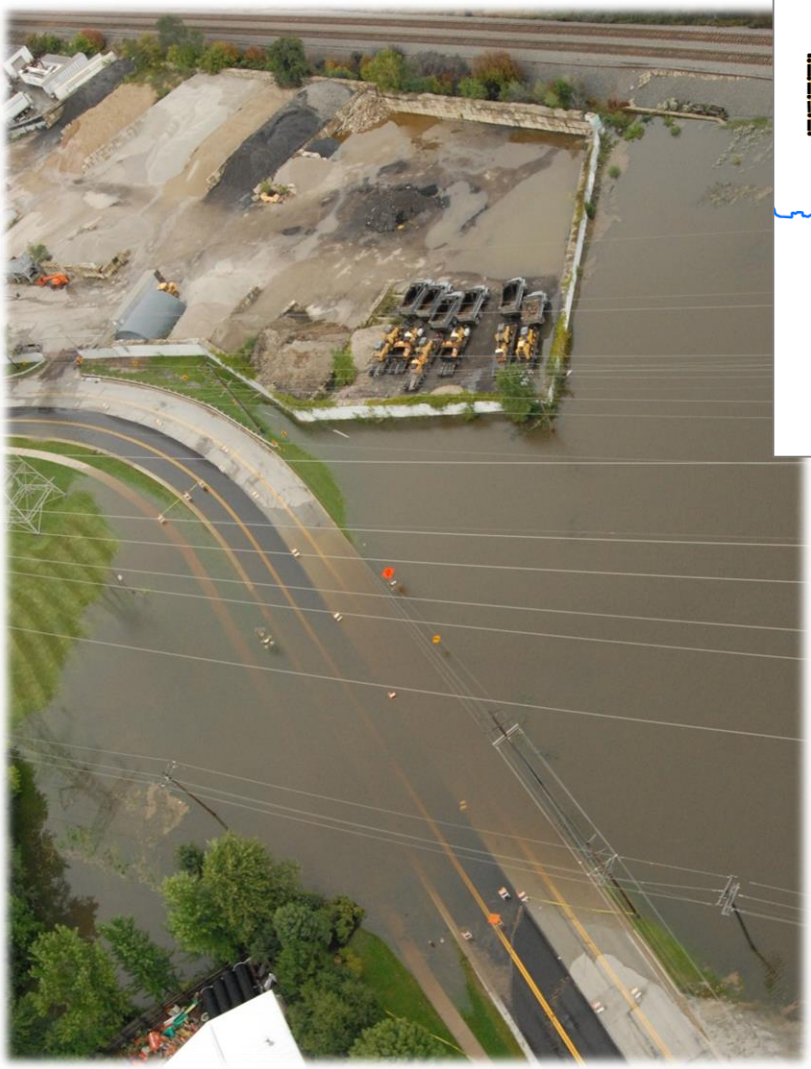
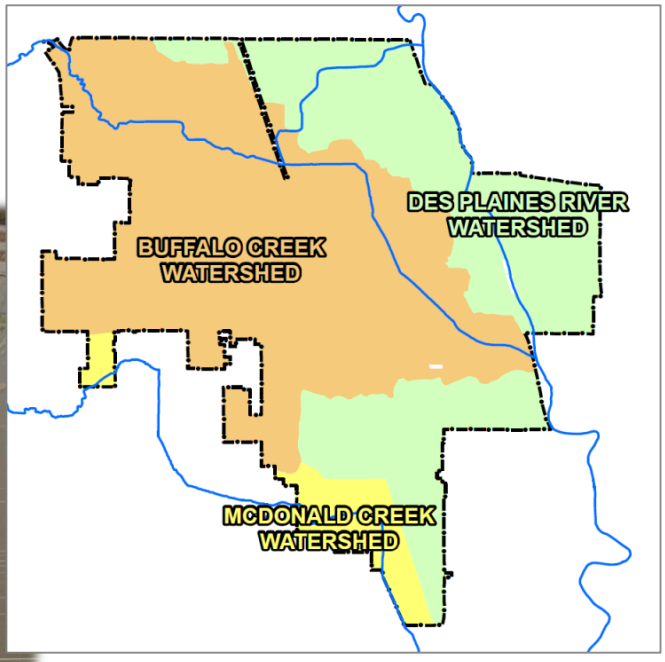
VILLAGE OF WHEELING

STORMWATER MASTER PLAN

2015





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EXECUTIVE SUMMARY

This Stormwater Master Plan (SWMP) was initiated by the Village of Wheeling (Village) to effectively address stormwater issues and flooding throughout the Village. The purpose of the SWMP is to present the findings of detailed analyses, provide justification for stormwater improvement projects in a prioritized manner, and provide documentation to the Village to initiate a stormwater utility fee to help fund stormwater projects. The SWMP focuses on issues with local storm sewer systems, riverine floodplains, and water quality.

The methodology for analyzing stormwater issues varies depending on the size and severity of the problem area. The SWMP is intended to be an all-inclusive stormwater resource for the Village's use when addressing stormwater issues. The SWMP incorporates previous stormwater improvement concepts and floodplain mapping prepared by Christopher B. Burke Engineering, Ltd. (CBBEL). This report addresses all issues related to stormwater including identification of flood damage areas and water quality problems, adequacy of storm sewer systems and hydraulic structures, and areas of riverine erosion.

The SWMP identifies proposed improvement projects in advance to be used for reference when funding opportunities become available. Stormwater improvement projects are located within problem areas identified by Village Staff. The initial assessment of the Village's stormwater problems revealed eleven (11) individual study areas to be addressed in the SWMP. Two study areas have been identified as critical repeat flooding problems which required detailed hydrologic and hydraulic modeling analyses. The areas which required detailed modeling are the Dunhurst Subdivision and the Echo Lake / Ridgefield Drainage Area. Both these study areas along with the nine (9) other study areas can be seen in Figure 1.

Other study areas were assessed with stormwater analyses. These analyses include evaluation of previous conceptual modeling of flood reduction improvements, HEC-RAS modeling of Buffalo Creek, Hydraflow storm sewer modeling, and hydrologic and hydraulic calculations. All study areas include at least one recommendation for flood improvements and an estimated cost for each project. Because the Village experienced multiple storm events approximately equivalent to the 100-year storm event, the improvement projects are designed to protect for the 100-year storm where possible, but 10-year storm designs were provided at locations where cost considerations or standard engineering practice were drivers. Table 1 summarizes the projects evaluated and associated costs.

Table 1 – Executive Summary Table

Flood Area	Stormwater Issue	Description	Recommended Improvement Alternative	Improvement Alternative Description	Estimated Cost	Project Classification
East Dunhurst	Residential and Street Flooding	A Depressional area along Wayne Place and Bridget Place results in residential and street flooding.	Alternative 1C	Acquire 1 residential parcel to provide overland flow route to drain depressional flood area during large storms.	$1.5 million	High
South Dunhurst	Residential and Street Flooding	Depressional flooding and overland flow through houses occurs on Audrey Court, Isa Drive, Bernice Court, Green Drive, and Merle Lane.	Alternative 2	Contruct new sewer system and flood storage at Mark Twain Elementary School to reduce flooding for the 100-year storm	$6.6 million	Medium
West Dunhurst	Residential and Street Flooding	A Depressional area along Norman Lane results in residential and street flooding.	Residential buyouts	Due to high cost of identified stormwater projects for this area residential buyouts are recommended. Identify high-risk previously flooded houses for potential residential buyout.	TBD	Low
North Wheeling Road	Street Flooding (2 locations)	Wheeling Road overtops frequently north of Mercantile Ct during storm events when Buffalo Creek is high.	Alternative 4	Raise Wheeling Road 2 feet from current low spot to prevent tailwater flooding from Buffalo Creek.	$1.0 million	High
South Wheeling Road	Street Flooding	A depressional flood area exists on Wheeling Road south of Exchange Court.	Alternative 5	Provide relief sewer with backwater prevention that drains to Echo Lake to prevent water ponding on Wheeling Road.	$485,000	High
Echo Lake and Ridgefield	Pond Overtopping, Street Flooding, Water Quality Concerns	The three ponds south of Echo Lake are interconnected flowing south to north into Echo Lake. Past storm events result in these ponds overtopping their banks and flooding nearby residential streets. Bank erosion during storm events has resulted in pond sedimentation.	Alternative 7A	Reduce flooding for the 100-year storm by creating 20 acre-feet of flood storage by lowering the NWL in Polo Run Pond, the North and South Ridgefield Ponds, and excavate a new storage volume at the Sandpebble Apartments. Stablize pond banks in the North and South Ridgefield Ponds.	$6.9 million	Medium

Flood Area	Stormwater Issue	Description	Recommended Improvement Alternative	Improvement Alternative Description	Estimated Cost	Project Classification
Jackson Drive & Lakeside Villas	Residential and Street Flooding	Houses along Jackson Dr have flooded on several occasions due to overland flow from west to east through residential yards. Flooding has occurred along Lakeview Dr and Hunter Dr inundating several apartments. Improvement projects in the Lakeside Villas Apartment Complex have reduced the occurrence of flooding.	Alternative 8 Phase 1	Jackson Drive pump station discharging to Hintz Road trunk sewer	$1.5 million	Medium
			Alternative 8 and two 45"x29" S.S. with Tahoe Modifications	Proposed relief sewers and additional storage	$9.3 million	Low
Jeffery Avenue and Manchster Drive	Street Flooding	Poor residential sewer drainage between Jeffery Avenue and Manchester Drive resulting in street flooding.	Alternative 10	Proposed sewer system designed for the 10-year flood	$9.0 million	Low
Sunrise Drive	Street Flooding	Stormwater drainage collects in a depressional "bowl" on the west end of Sunrise Dr.	Alternative 11	Proposed relief sewer draining Sunrise depression	$283,000	Low
Oliver Wendell Holmes Middle School Preperty	Street and Yard Flooding	The drainage ditches along Wolf Rd adjacent to the Oliver Wendell Holmes Middle School exceed their capacity during large events flooding the school's property	No improvement recommended.	Must maintain existing flood storage.	-	-
Arlington Club Lake	Pond Overtopping, Street Flooding, Water Quality Concerns	Arlington Club lake has overtopped flooding Arlington Dr and eroding a grassed overflow path downstream.	Alternative 12	Proposed curb and reinforced spillway from parking lot to prevent erosion during pond overtopping.	$117,000	Low
Valley Stream Drive	Residential and Street Flooding	Large storm events result in Buffalo Creek overtopping its banks and flooding a residential area in the northwest corner of the Town. Flooded areas include homes and streets along Valley Stream Dr, Saint Armand Ln, Beverly Dr, Woodland Dr, Cedar Dr, Pebble Dr, and Wilshire Dr.	No improvement recommended at this time	Alternative 13 is a large scale flood control project and is only recommended if outside funding sources are obtained.	-	High
Buffalo Creek Bank Stabilization	Streambank Erosion	Several sections of Buffalo Creek have eroded over time. Phase1 was completed in 2010	Alternative 14	Phase 2 of streambank stabilization along Buffalo Creek	$3.6 million	Medium
NPDES Assesment	EPA compliance	As an MS4 community, the NPDES program in the Village should be assessed.	NPDES program improvement	All current NPDES activities were assess and updated/improved as necesssary to meet the minimum requirements.	$476,000/year	Required

CHAPTER 1 PROJECT OVERVIEW

1.1 INTRODUCTION

The Village of Wheeling (Village) mainly consists of residential, industrial, and commercial properties with a total area of 8.8 square miles and a population of approximately 38,000 people. The Village began seeing an increase in manufacturing plants in the 1960s which led to the development of residential neighborhoods. Most residential subdivisions in the Village were constructed with separate storm and sanitary sewer systems. This report focuses exclusively to issues pertaining to stormwater issues in the Village and does not address sanitary issues.

The Village is dedicated to addressing the management of stormwater quality and quantity. Stormwater management falls under the Village's Engineering Division with necessary approval for new stormwater projects granted by the Board of Trustees. The Village encourages progressive engineering design to manage stormwater quantity while enforcing pollution prevention to improve stormwater quality.

To effectively address these priorities, the Village retained Christopher B. Burke Engineering, Ltd. (CBBEL) to develop this Stormwater Master Plan (SWMP). This SWMP reflects the latest priorities for stormwater management in the Village. This SWMP addresses existing and anticipated problems related to floodplain management, stormwater runoff, and localized flooding, and highlights water quality priorities while focusing on the Village's responsibilities as a Municipal Separate Storm Sewer System (MS4) community.

1.2 PURPOSE AND SCOPE

The initial purpose of this SWMP was to develop and analyze stormwater improvement projects, and provide recommendations that will:

- Mitigate existing flood/drainage problems,
- Prevent or minimize future flood damages,
- Help preserve the natural and beneficial function of the drainage system, and
- Help preserve and enhance stormwater quality.

The ultimate goal of the SWMP is to provide a framework which the Village can use to develop a stormwater utility fee, and implement a stormwater improvement program. The SWMP identifies significant stormwater related issues in the Village relating to both flood damages and water quality problem areas. An analysis of each problem has been performed to identify potential improvement projects. The location of all problem areas identified as part of the SWMP is shown in Figure 1. The methodology to analyze each problem area varies based on the size and severity of the stormwater issues at that location. Table 2 provides a brief description of the stormwater issue at each study area and the methodology to analyze the problem.

The SWMP provides detailed modeling analyses for the Dunhurst Subdivision and Echo Lake and Ridgefield study areas which have both experienced repeated flood events. These areas have

been analyzed using advanced XPSWMM 2D modeling. The detailed modeling will be used to identify optimal locations and sizes for drainage improvements to reduce flood damages. The other nine (9) study areas have been analyzed with other methods including evaluation of previous conceptual modeling of flood reduction improvements, HEC-RAS modeling of Buffalo Creek, Hydraflow storm sewer modeling, and hydrologic and hydraulic calculations. The SWMP identifies proposed improvement projects to be used when grant or funding opportunities become available and for developing the appropriate stormwater utility fee. Chapters of this SWMP can be used to supplement funding requests or grant applications as they become available.

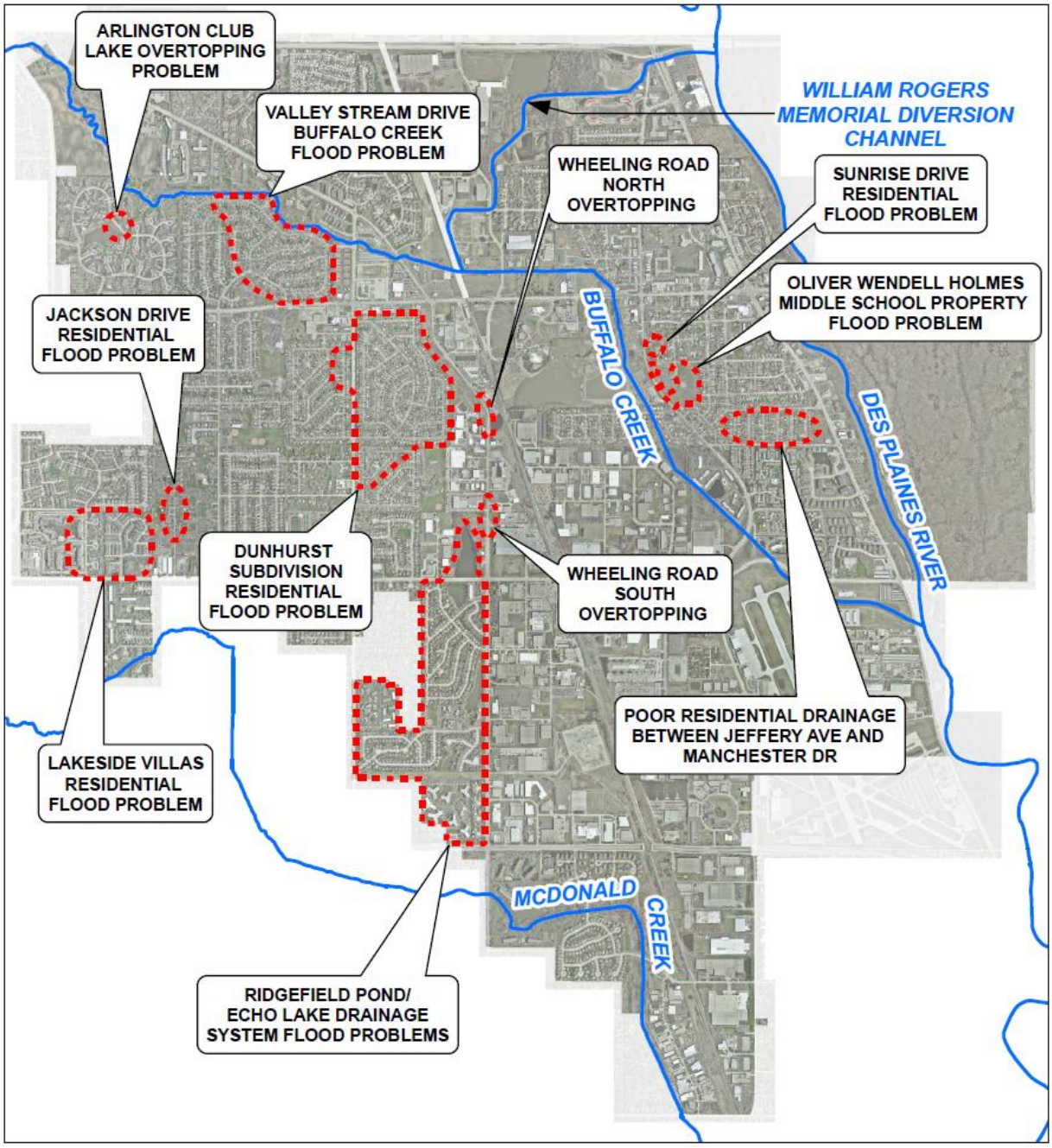

Figure 1. Problem Location Map

Table 2. Stormwater Problem Summary

Flood Area	Stormwater Issue	Description	Analysis Methodology
Dunhurst Subdivision	Residential and Street Flooding	The large residential area south of Dundee Rd and west of Wheeling Rd has poor stormwater drainage resulting in multiple flood events. Streets and homes impacted in three defined problem areas (East Dunhurst, West Dunhurst, & South Dunhurst)	XPSWMM stormwater modeling
Wheeling Road	Street Flooding (2 locations)	Wheeling Road overtops frequently during storm events at two locations: north of Mercantile Ct and south of Exchange Ct	XPSWMM (Analyzed in sequence with Dunhurst Subdivision flood analysis)
Echo Lake and Ridgefield	Pond Overtopping, Street Flooding, Water Quality Concerns	The three ponds south of Echo Lake are interconnected flowing south to north into Echo Lake. Past storm events result in these ponds overtopping their banks and flooding nearby residential streets. Bank erosion during storm events has resulted in pond sedimentation.	XPSWMM stormwater modeling
Arlington Club Lake	Pond Overtopping, Street Flooding, Water Quality Concerns	Arlington Club lake has overtopped flooding Arlington Dr and eroding a grassed overflow path downstream	Review of plans and field visit
Jackson Drive	Residential and Street Flooding	Houses along Jackson Dr have flooded on several occasions due to overland flow from west to east through residential yards.	XPSWMM stormwater modeling (completed in 2009)
Lakeside Villas	Apartment and Street Flooding	Flooding has occurred along Lakeview Dr and Hunter Dr inundating several apartments. Improvement projects in the Lakeside Villas Apartment Complex have reduced the occurrence of flooding.	XPSWMM stormwater modeling (completed in 2009)
Jeffery Avenue and Manchster Drive	Street Flooding	Poor residential sewer drainage bewteen Jeffery Avenue and Manchester Drive resulting in street flooding.	Hydraflow sewer modeling
Sunrise Drive	Street Flooding	Stormwater drainage collects in a depressional "bowl" on the west end of Sunrise Dr.	Stormwater calculation
Oliver Wendell Holmes Middle School Property	Street and Yard Flooding	The drainage ditches along Wolf Rd adjacent to the Oliver Wendell Holmes Middle School exceed their capacity during large events flooding the school's property	Field visit and office calculation
Valley Stream Drive	Residential and Street Flooding	Large storm events result in Buffalo Creek overtopping its banks and flooding a residential area in the northwest corner of the Town. Flooded areas include homes and streets along Valley Stream Dr, Saint Armand Ln, Beverly Dr, Woodland Dr, Cedar Dr, Pebble Dr, and Wilshire Dr.	Utilized existing Buffalo Creek HEC-RAS modeling (completed in 2011)
Buffalo Creek	Streambank Erosion	Several sections of Buffalo Creek have eroded over time. Phase 1 was completed in 2010.	Field visit

1.3 VILLAGE STAFF AND PUBLIC INVOLVEMENT

Participation from Village staff, decision-makers, and the public is essential to understanding the flooding and drainage issues and to craft improvements to effectively address these problems. A project team consisting of members of Village Staff, a Village Trustee, and CBBEL met throughout the development of the SWMP. The primary role of the project team was to provide input identifying drainage issues and complaints experienced throughout the Village. The extent and nature of known flooding problems in the Village were identified through various means including: discussions with Village staff, site visits accompanied by Village staff, and high water level maps provided by the Village.

CHAPTER 2 FLOODPLAIN MANAGEMENT ASPECTS

There are four regulated water courses in the Village: Des Plaines River, Buffalo Creek, McDonald Creek, and the William Rogers Memorial Diversion Channel. Figure 2 shows the four streams along with each corresponding Village drainage area. There is no drainage area represented for the Williams Rogers Memorial Diversion Channel because it was constructed as a relief overflow from Buffalo Creek to the Des Plaines River during larger flows. The majority of area in the Village drains to Buffalo Creek which enters the Village in the northwest corner and flows southeast until its confluence with the Des Plaines River just east of the Chicago Executive Airport. There is approximately 18.4 square miles of Buffalo Creek tributary area upstream of the Village. The Des Plaines River is a major waterway draining through the eastern portion of the Village. There is approximately 326.5 square miles of upstream tributary area to the Des Plaines in Wisconsin and northern Illinois. McDonald Creek flows through the southern portion of the town. Although there is minimal tributary area to McDonald Creek within Village limits, there is approximately 6.1 square miles of tributary area to the west. McDonald Creek drains into the Des Plaines River south of the Village.

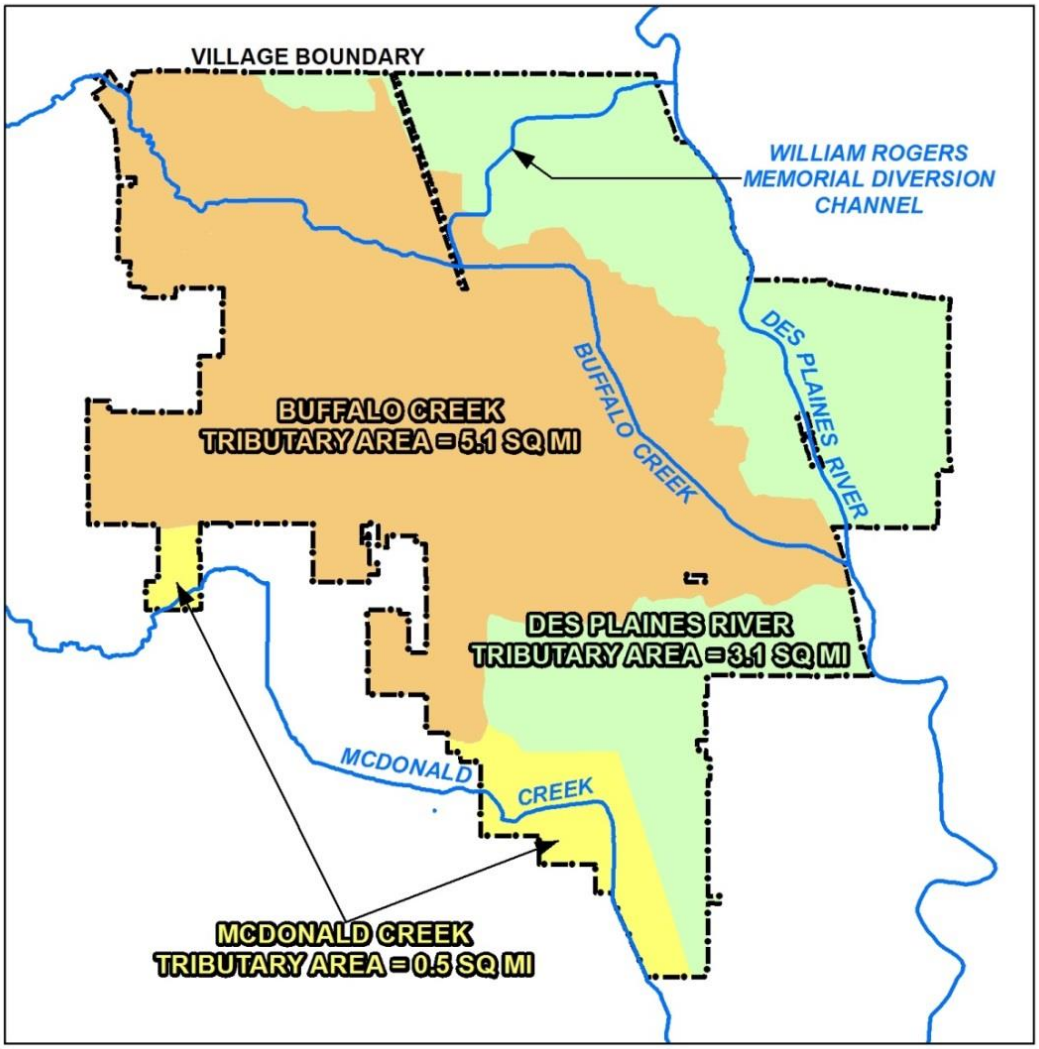

Figure 2. Flood Problem Location Map

2.1 FLOODPLAIN ANALYSIS

A Geographic Information System (GIS) evaluation was performed to determine the number of structures within the 100-year regulatory floodplain. A GIS shapefile of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) 100-year regulatory floodplain was obtained and the Village provided a building footprints shapefile within the Village limits. A query was performed to determine the number of structures either completely or partially contained within the 100-year floodplain. Of the 6,947 structures identified in the Village, 1109 of them, or 16%, were determined to be within the 100-year floodplain. Table 3 below breaks down the number of structures that are located within each watercourse's floodplain.

Table 3. Village Floodplain Summary

Stream	Floodplain Area (acre)	Number of Structures
Des Plaines River	278	62
Buffalo Creek	675	968
McDonald Creek	79	4
William Rogers Memorial Diversion Channel	156	63
Local*	44	18
Total	1,232	1,109

*Designates structures located within floodplain area outside the floodplain for a regulated water course

As seen in Table 3, the majority of structures reside in the Buffalo Creek 100-year floodplain. The next section focuses on the modeling techniques used to map the 100-year floodplain for Buffalo Creek. Specifically, the intention is to compare the FEMA FIRM 100-year floodplain to the 100-year floodplain developed in the Municipal Water Reclamation District of Greater Chicago (MWRD) Detailed Watershed Plan (DWP) for the Lower Des Plaines River as it relates to buildings within each floodplain. The MWRD DWP was developed in 2009 and provided comprehensive hydrologic and hydraulic modeling of the Des Plaines River and its tributary streams including Buffalo Creek. Differences between the two Buffalo Creek floodplains can be attributed to different hydraulic modeling approaches which are described in this memorandum.

2.2 BUFFALO CREEK FLOODPLAIN MODELING

The current regulatory floodplain for Buffalo Creek through the Village is based on modeling performed for a 2007 LOMR. The Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) developed hydrologic and hydraulic models which were used in the LOMR. A steady-state HEC-RAS hydraulic model was developed and used to map the revised floodplain for Buffalo Creek. This model is the current regulatory hydraulic model.

The regulatory hydraulic model developed by IDNR was used as the basis for Buffalo Creek modeling in the MWRD DWP. The model was updated to perform unsteady hydraulic simulations. Unsteady modeling uses hydrographs directly from hydrologic models, as opposed to just the peak flows which are used when performing steady state hydraulic simulations. Unsteady modeling yields unique stage-flow hydrographs at each cross section along the modeled reach. In steady state modeling, users define the flowrate at each cross section, and the result is a corresponding water surface elevation at that location.

Another difference between the two hydraulic models is the inclusion of a flow diversion for the unsteady model. Buffalo Creek flows northwest to southeast through the Village until its confluence with the Des Plaines River. Buffalo Creek is confined to a single channel during normal flow conditions, but when the creek rises to flood stage, a split flow condition can potentially occur. The split flow begins at the intersection of Valley Stream Drive and Saint Armand Lane, where floodwater can overtop the roadway and flow south. Additional overflow locations along the south bank of Buffalo Creek also can potentially contribute flood water. As seen in Figure 3, the split flow is conveyed south along Wheeling Road and inundates the residential area to the west. Floodwater then collects in a depressional area located northeast of the intersection of Wheeling Road and Mercantile Ct. Floodwater flows east out of the pond through a culvert under the Canadian National Railroad (CNRR) into Heritage Park where the split flow converges with the main floodplain for Buffalo Creek.

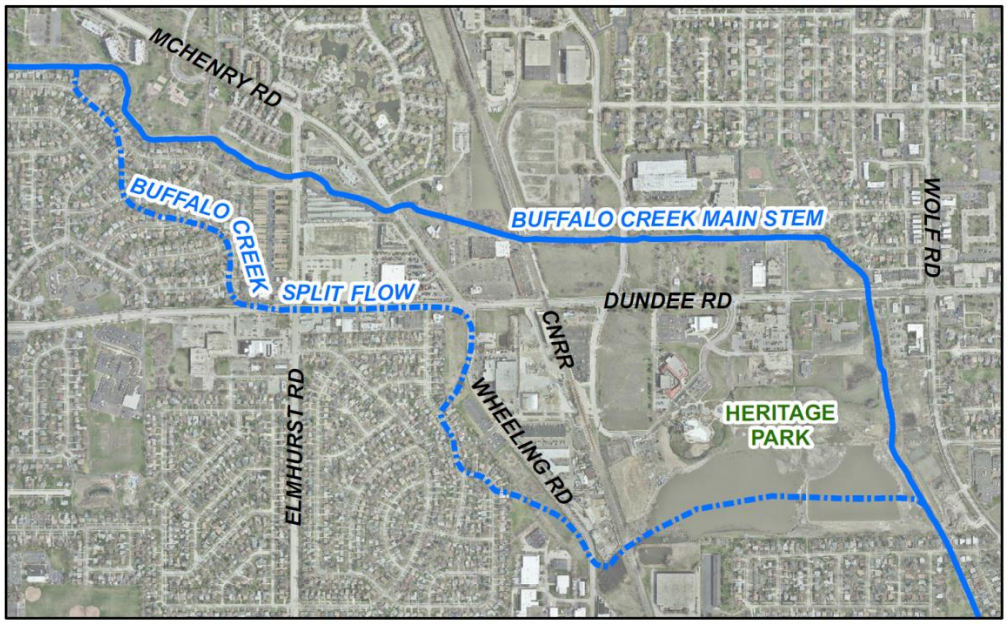

Figure 3. Buffalo Creek Split Flow

The FEMA regulatory model simulates the floodplain into the area which the creek overtops by extending the cross sections south, and specifying a storage floodplain. The MWRD DWP study models the split flow as two separate reaches with multiple lateral overflow locations, allowing water to overtop the south bank of Buffalo Creek and flow south. Separate reaches allow the hydraulic model to compute unique floodplain elevations at corresponding locations along Buffalo Creek and the split flow floodplain. Unsteady hydraulic modeling and the modeled split flow condition result in consistently lower floodplain elevations in the MWRD study when compared with the regulatory model. Therefore, the MWRD study contains fewer buildings within the Special Flood Hazard Area (SFHA) than the FIRM. The next section describes the number of SFHA buildings within each floodplain and the methodology used to determine these numbers.

2.2 SFHA BUILDINGS ANALYSIS

A building footprint GIS shapefile was obtained from the Village contains all structures including residential garages and sheds also known as accessory structures. These structures generally do not require stand-alone flood insurance policies and therefore were not included in this analysis. After reviewing multiple residential properties in the Village, it can be safely assumed that almost all of residential homes have a footprint area greater than 1,000 square feet. A query was developed to eliminate the accessory structures, or structures with a footprint area less than 1,000 square feet, from the analysis.

Next, a GIS spatial query was created to determine the number of buildings in each floodplain. The query revealed 968 SFHA buildings within the FEMA FIRM 100-year floodplain, and 308 SFHA buildings within the MWRD 100-year floodplain. If the modeling performed in the MWRD DWP were accepted as-is by FEMA and become the regulatory model, there is the potential for approximately 660 homes to be removed from the regulatory floodplain. The majority of these SFHA buildings are located along the split flow floodplain located south of Buffalo Creek. For instance, 324 SFHA buildings eligible for potential removal are located in the Dunhurst Subdivision east of Elmhurst Road between Dundee Road and Hastings Road. Exhibit 1 has been provided to compare the two floodplains and their corresponding SFHA buildings.

CHAPTER 3 HISTORY OF FLOODING

The Village has experienced multiple flood events over the years, both riverine and local, since its origination. In the past 5 years, the Village has had two major flood events in July 2011 and April 2013. The July 2011 storm consisted of short, high-intensity rainfall producing nearly 5 inches of rain over two hours. While there was a rise in Buffalo Creek for this event, local depressional and overland flooding from inadequate drainage was the major problem during this storm. Several study areas outlined in this SWMP experienced significant flooding during the July 2011 event.

The April 2013 storm consisted of a large rainfall depth over a longer period of time. Approximately 4.3 inches of rain fell over 24 hours within the Village, with larger rainfall depths reported in other areas of the Buffalo Creek Watershed. While this storm did produce street flooding from local sources, the main source of flooding was overtopping along Buffalo Creek. One of the hardest-hit areas from riverine flooding during the April 2013 event was the Valley Stream Drive residential neighborhood.

CHAPTER 4 NPDES ASSESMENT

The Village is an operator of a Municipal Separate Storm Sewer System (MS4) as defined by the Illinois Environmental Protection Agency's (IEPA) National Pollution Discharge Elimination System (NPDES) Phase II program. The Village has applied for and obtained coverage under the IEPA's General NPDES Permit No. ILR40, the General NPDES Permit for Discharges from Small Municipal Separate Storm Sewer Systems. Conditions of this permit require the Village to develop and implement a program to meet 6 Minimum Control Measures aimed at reducing or preventing the discharge of pollutants to the Village's MS4. The 6 Minimum Control Measures are as follows:

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post Construction Site Runoff Control
6. Pollution Prevention and Good Housekeeping

CBBEL has reviewed the Village's NPDES program, and evaluated the Best Management Practices (BMP) and activities selected to meet the requirements of each minimum control measure. Based on the review and evaluation process, CBBEL has identified deficiencies, recommended changes and/or enhancements to the program based on the current IEPA ILR40 Permit requirements and those in the proposed ILR40 permit due to be released in 2015. As a supplement to this evaluation, CBBEL has also provided an estimated cost associated with each BMP or activity. Provided below in Table 4 is a summary of the Village's BMPs and activities and those recommended for future compliance, the estimated cost for existing activities and the proposed cost based on the compliance audit.

Table 4. NPDES Cost Summary

BMP/ACTIVITY	DESCRIPTION	ESTIMATED COST / YEAR		
		Existing	Proposed	One Time
Minimum Control Measure #1				
Distributed Paper Material	Article in newsletter - 2x per year	$350	$350	
Minimum Control Measure #2				
Other Public Involvement	Contact number on website	250	250	
Minimum Control Measure #3				
Sewer Map Preparation	Updated storm sewer atlas	1,000	0	
Update and develop GIS based map	Transfer storm sewer and receiving stream information to GIS	0	7,500	100,000
Regulatory Control Program	Enforce the Illicit Discharge and Connection Ordinance	1,500	1,500	
Review and update ordinance	Update ordinance to maintain permit compliance	0	1,000	
Illicit Discharge Tracing Procedures	Trace reports of illicit discharges	2,500	2,500	
Review and update tracing procedures	Update tracing procedures to maintain compliance	0	1,000	
Illicit Source Removal Procedures	Remove illicit discharges	1,000	10,000	
Review and update removal procedures	Evaluate and update removal procedures to maintain compliance	0	1,000	
Visual Dry Weather Screening	Annual inspections of outfalls	7,500	7,500	
	Wheeling Drainage Ditch (Buffalo Creek)			
	McDonald Creek			
	Des Plaines River			
Inspection updates	Revise procedures to inspect all outfalls annually	0	25,000	
Waterway Inspections	Annual inspection of local waterways and receiving streams	4,800	12,000	
Sampling	Buffalo Creek	350	350	
Update sampling	Increase frequency to quarterly and expand to all receiving streams	0	10,000	
Minimum Control Measure #4				
Regulatory Control Program	Enforce existing ordinances regulating construction activities	500	2,000	
Review and update ordinance	Update ordinance to maintain permit compliance	0	1,200	
Erosion and Sediment Control BMPs	Enforce requirements for BMPs	400	2,400	
Review and update requirements	Update BMPs to maintain permit compliance	0	1,500	
Other Waste Control Program	Modify/amend ordinance	500	1,500	
Review and update ordinance	Update ordinance to maintain permit compliance	0	1,200	
Site Plan Review Procedures	Development plan review	102,000	102,000	
Review and update requirements	Update plan review procedures to maintain permit compliance	0	1,200	
Site Inspection/Enforcement Procedures	Inspect development site for compliance	8,000	32,000	
Review and update requirements	Update inspection procedures to maintain permit compliance	0	1,200	
Minimum Control Measure #5				
Regulatory Control Program	Enforce existing ordinances regulating post construction activities	400	2,400	
Review and update ordinance	Update ordinance to maintain permit compliance	0	1,200	
Long Term O&M Procedures	Modify/amend ordinance	1,000	18,000	
Review and update requirements	Update O&M procedures to maintain permit compliance	0	1,500	
Pre-Construction Review of BMP Designs	Modify/amend ordinance	4,200	18,000	
Review and update requirements	Update review procedures to maintain permit compliance	0	1,500	
Site Inspections During Construction	Inspect development site for compliance	6,500	12,500	
Review and update requirements	Update inspection procedures to maintain permit compliance	0	1,500	
Post-Construction Inspections	Inspect development site for compliance	1,000	7,500	
Review and update requirements	Update inspection procedures to maintain permit compliance	0	1,500	
Minimum Control Measure #6				
Employee Training Program	Conduct employee training	5,000	5,000	
Expand training	Expand continuing education and training program to additional departments	0	10,000	
Inspection and Maintenance Program	Inspection of municipal facilities	4,000	12,500	
Municipal Operations Storm Water Control	Program to prevent pollution from Village activities	5,000	10,000	
Prepare SWPPPs for additional sites	SWPPPs have been prepared for select site - expand to all sites	0	25,000	
Municipal Facility Site Inspections	Annual inspection of municipal sites - 4 sites	1,800	1,800	
	Recommend Quarterly and ALL Village Facilities	0	7,200	
Street Sweeping	Sweeping of Village streets to clear debris	17,500	50,000	
Structure Cleaning	Cleaning debris and other potential pollutants from stormwater structures	10,000	15,000	
Televising	Televising portions of the separate storm sewer system	7,500	10,000	
Jetting/Flushing Storm Sewers	Cleaning debris and other potential pollutants from stormwater pipes	25,000	30,000	
Recordkeeping Requirements				
Annual Facility Inspection Report	Yearly report on status of meeting permit goals and milestones	1,500	1,500	
Stormwater Management Program Plan	Prepare and post a web-friendly version of the Village's SMPP	0	4,000	
Website Modifications/Updates	Modify website to meet permit requirements	0	2,500	
	TOTAL	**$221,050**	**$476,250**	**$100,000**

CHAPTER 5 APPROACH TO FLOODING ISSUES

The Village has multiple local flooding problems in addition to the riverine flooding discussed in Chapter 2. These local flooding problems vary in size and severity. Local flooding generally results from inadequate conveyance from depressional areas. Some depressional areas in the Village lack adequate overland flow routes and drain solely by storm sewer. During large storm events, storm sewers often lack the capacity to convey the resulting flows, and water begins to flood streets and sometimes residential structures. The current regulatory standard for stormwater design dictates that 10-year storm runoff is conveyed entirely within storm sewers, and overland flow routes are designed to handle any excess runoff up to the 100-year storm event. Certain problem areas analyzed as part of the XPSWMM detailed modeling analysis were shown to have less than 5-year storm capacity. The lack of adequate storm sewer capacity and overland flow routes in these areas have resulted in repeated flooding occurrences during heavy rains.

In total, nine (9) of the eleven (11) study areas addressed as part of this SWMP are impacted by local flooding issues. Two flooding problems are located in the Buffalo Creek regulatory floodplain and are generally only impacted by riverine flooding. These two problem areas are within the Valley Stream Drive and the Oliver Wendell Holmes study areas. The local flooding issues were analyzed with either stormwater modeling or stormwater calculations to determine the existing condition flooding impacts. Improvement projects are proposed for the study areas and were designed to reduce the risk of flooding for storm events up to the 100-year storm. Improvement projects analyzed as part of the SWMP include:

- Upsizing storm sewers for increased conveyance
- Creating new overland flow routes
- Excavating stormwater storage
- Lowering the Normal Water Level in existing ponds to create additional stormwater storage volume
- Creating grassed swales to capture and detain surface ponding

CHAPTER 6 DUNHURST STUDY AREA

The Dunhurst subdivision drainage area is generally located south of Dundee Road and west of Wheeling Road. The drainage area at the outlet under the CNRR is approximately 378 acres and is located entirely within the Village limits. There are multiple sewer systems located within the Dunhurst study area that ultimately combine to outlet to Heritage Park through 60-inch and 48-inch reinforced concrete pipes (RCP) under the CNRR. The frequent flooding problems in this study area are located in residential areas and west of Wheeling Road. Residential flooding for this study area is the result of inadequate sewer capacity and lack of overland flow routes during large storm events. The outlet for the drainage area is also subject to tailwater effects from Buffalo Creek, limiting flow out of the system when the creek is high. An XPSWMM model was developed to analyze this study area for existing conditions and the development of improvement alternatives. The Dunhurst Study Area was divided into the following five (5) sub-areas: East Dunhurst, West Dunhurst, South Dunhurst, North Wheeling Road, and South Wheeling Road.

6.1 MODELING APPROACH

The Dunhurst study area was analyzed using XPSWMM computer software, which is a proprietary program based on the US Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM). XPSWMM is a dynamic hydrologic and hydraulic modeling program that is ideal for analyzing urban stormwater management systems. XPSWMM simulates rainfall-runoff responses for user specified storm events (hydrologic component) and analyzes the performance of the stormwater management system (hydraulic component).

The drainage area for the entire study area was broken down into smaller subbasins. Forty-eight (48) subbasins were delineated using the Village's 1-foot aerial topography. The average area for the subbasins is eight (8) acres. The hydrologic parameters that define each subbasin were determined based on methodology outlined in *TR-55*: *Urban Hydrology for Small Watersheds* (U.S. Department of Agriculture, 1986). In the XPSWMM model, the following information was input for each subbasin:

- Drainage Area
- Runoff Curve Number (RCN)
- Time of Concentration (Tc)

The RCN was defined based on the current land use using Village provided aerial photography for each of the subbasins. The RCN value calculated for each subbasin is based on the ratio of impervious to pervious area in each subbasin. The Tc is a calculation of the longest time it takes a drop of water to reach the outlet of the subbasin. A hydrologic map with subbasin delineations and hydrologic parameters is included as Exhibit 2.

The hydraulic elements of the model, including storm sewer diameters, lengths, materials, slopes, etc., were obtained from the Village's GIS database. Because the GIS database is currently under development by Village Staff, and therefore some portions of the study area are yet to be completed, other sources were used to supplement this information, including:

- Manhole invert depths obtained by Village Staff
- As-built drawings for sewers on IDOT roadways
- Field investigations with Village Staff

In addition to the sewer network, overland flow and depressional storage that can cause flooding must be modeled. If a sewer does not have sufficient capacity to convey the tributary runoff, the system surcharges out of the manhole rim. To effectively analyze the interaction between the sewer system and the overland element of the model, XPSWMM 2D hydraulic surface modeling was utilized. The hydrology and subsurface hydraulics are analyzed using the standard 1D methods while the catch basins act as the connection between the 1D and 2D surface interface. The surface is modeled using a Digital Elevation Model (DEM) created from a detailed Lidar dataset. When storm sewers exceed capacity, the excess stormwater enters the 2D model surface and flood water moves naturally as determined by the DEM. This method provides a more accurate analysis of flood depths and limits along overland flow routes and depressional storage areas as well as providing vivid graphics for presentation of flooding.

6.2 DUNHURST EXISTING CONDITIONS

Due to the limited capacity of the existing storm sewer and lack of designated overland flow routes, there are five (5) known flooding locations within the Dunhurst study area. Three (3) flood areas are located within residential neighborhoods and the other two (2) are depressions on Wheeling Road that results in ponding during large storm events. Based on existing conditions modeling, the Dunhurst study area has between the 2- and 5-year storm event level of flood protection. The critical duration for the Dunhurst watershed was determined to be the 2-hour storm event. The 100-year 2-hour event has a rainfall depth of 4.47 inches which is very similar to the July 22-23, 2011 storm event when 4.96 inches of rain fell over 2.5 hours. Village staff agreed that the flooding seen for the July 22-23, 2011 closely matched the existing conditions depicted in Figure 4 and Exhibit 3. The five (5) problem areas within the Dunhurst study area were each analyzed independently. Each is discussed separately below, and at least one improvement was developed to help mitigate flooding in each area.

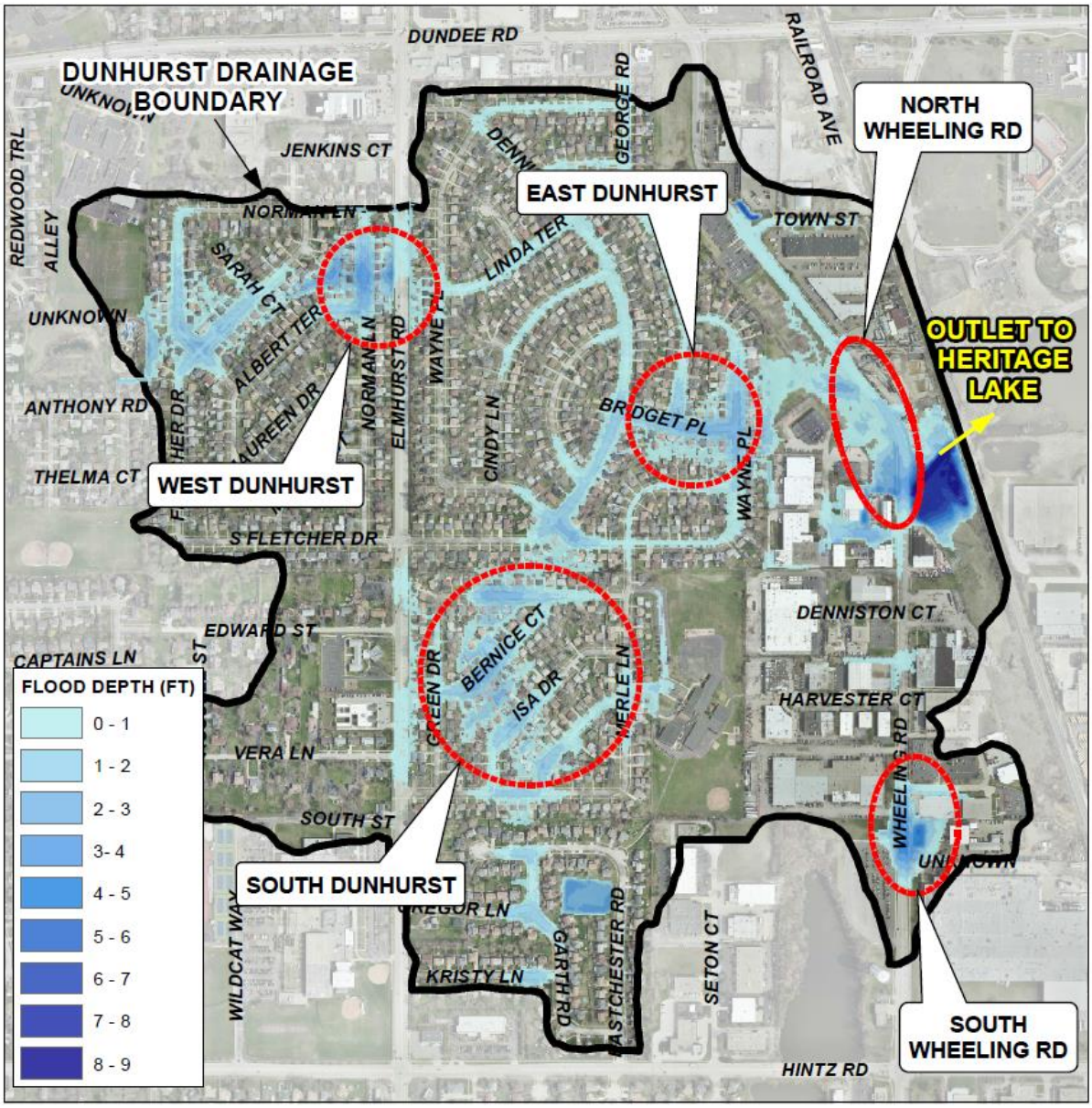

Figure 4. Dunhurst 100-YR Flood Map

6.2.1 East Dunhurst

One of the critical flooding problems in the Dunhurst study area exists at a depression at the intersection of Wayne Place and Bridget Lane. A back-pitched 36-inch trunk sewer flows west to east down Bridget Place and continues east through the side yard of two residences along Wayne Place. Once past the residential parcels, the 36-inch sewer enlarges to a 48-inch sewer and flows south, then east and outlets to the ditch on ComEd property on the east side of Wheeling Rd. The ditch then flows to the 2 culvert pipes under the CNRR into Heritage Lake.

From the modeling analysis, the 36-inch storm sewer at Wayne Place surcharges for events greater than and including the 5-year storm. The overland flow route from the Wayne Place flood area is between the houses east of the road as seen in Figure 5. The spill crest for the overland flow is approximately 2 feet higher than the catch basin rim elevation along Wayne Place. During the 100-year storm this depression fills to a depth of approximately 3.1 feet at the catch basin, making the road impassable and also risks flooding the nearby residences. There are approximately thirty-one (31) at-risk residences in the Wayne Place flood area. An "at-risk" structure is defined as having the majority of the structure within the 100-year inundation area as defined by 1-foot aerial topography. For this study, the number of at-risk structures was estimated based only on 1-foot aerial topography. As the Village proceeds with implementing the projects, low entry or first floor elevations can be surveyed as required and compared to the WSEL in the model to make an accurate assessment.

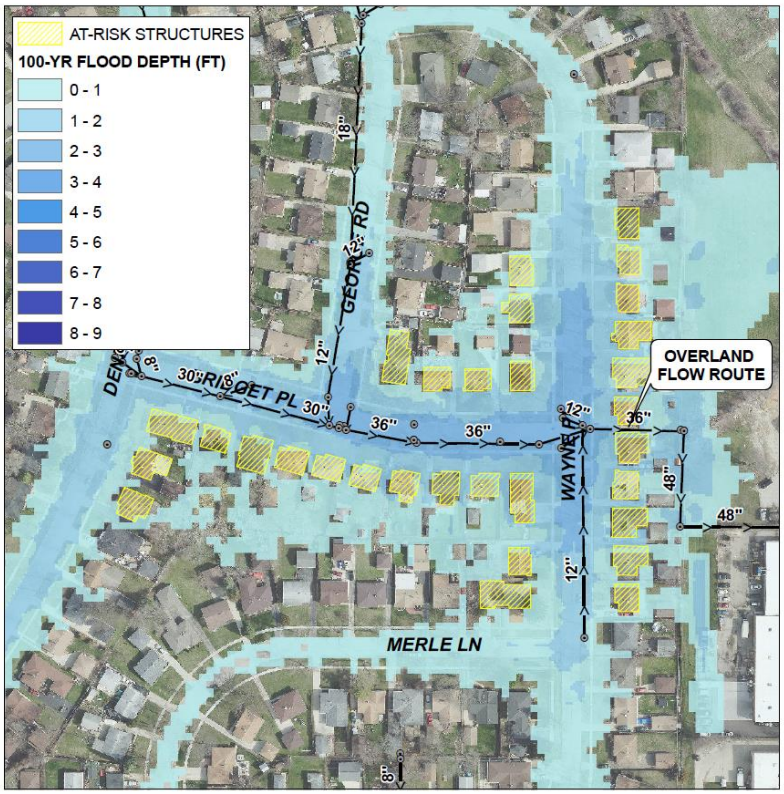

Figure 5. East Dunhurst Flood Problem

Storm sewer conveyance from the Wayne Place depression can also be limited by tailwater effects from Heritage Lake when Buffalo Creek is high. According to the FEMA Flood Insurance Study (FIS) for Cook County, the 10- and 100-year floodplain elevations for Buffalo Creek at Heritage Lake are 640.5 and 642.6, respectively. The catch basin rim elevation draining the depressional flood area on Wayne Place is elevation 642.5. The 10- and 100-year Buffalo Creek tailwater is above the crown of the trunk sewer draining Wayne Place as depicted in Figure 6. If local rainfall is occurring during the tailwater condition, the only flow from the problem area is driven by head. Head is the difference between two WSELs that are hydraulically connected.

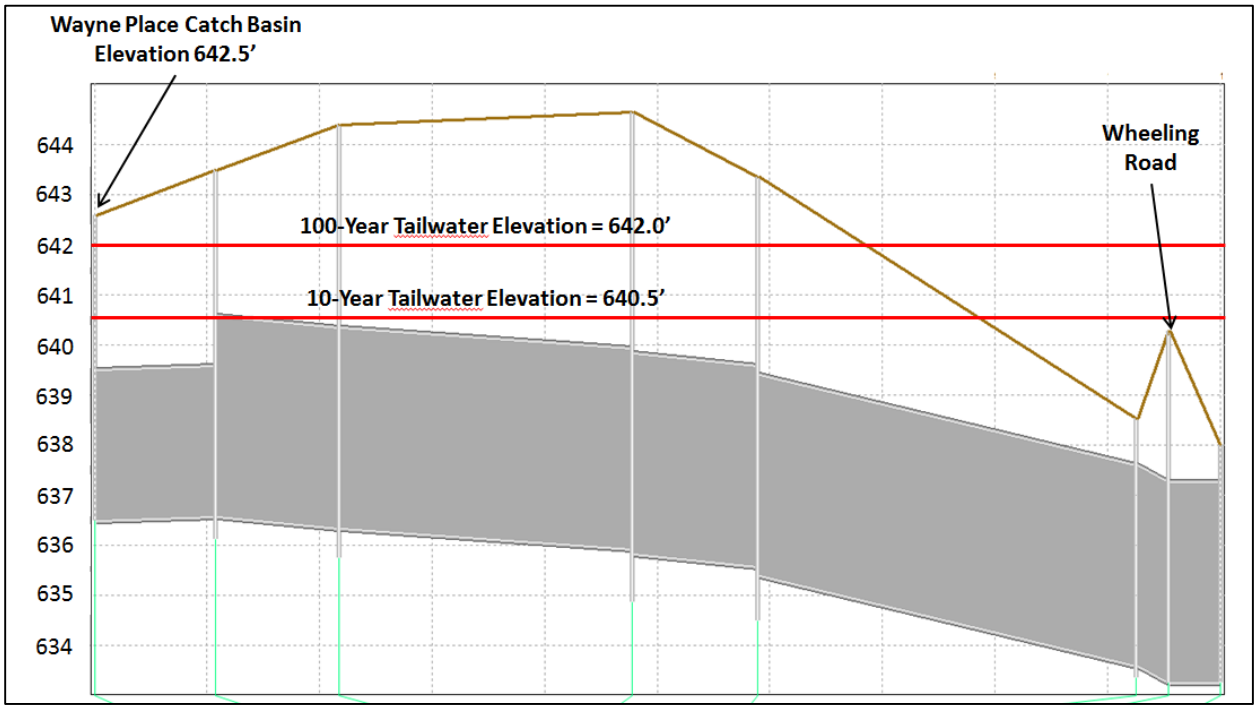

Figure 6. East Dunhurst Trunk Sewer Profile

6.2.2 West Dunhurst

Another area affected by depressional flooding is west of Elmhurst Road along Norman Lane just north of Albert Terrace. A 54-acre drainage area to Elmhurst Road in northwest portion of the Dunhurst watershed drains to the east through a system of storm sewers. The storm sewers in this area drain to a junction on Norman Lane just north of Albert Terrace. From there, the runoff drains to the east between two houses through a single 33-inch storm sewer. During large storm events when the storm sewer exceeds its capacity, water ponds at the depression along Norman Lane as depicted in Figure 7. During the 100-year critical storm, water overflows to the east between the houses, and ponding depths in the road exceed 3 feet making the road

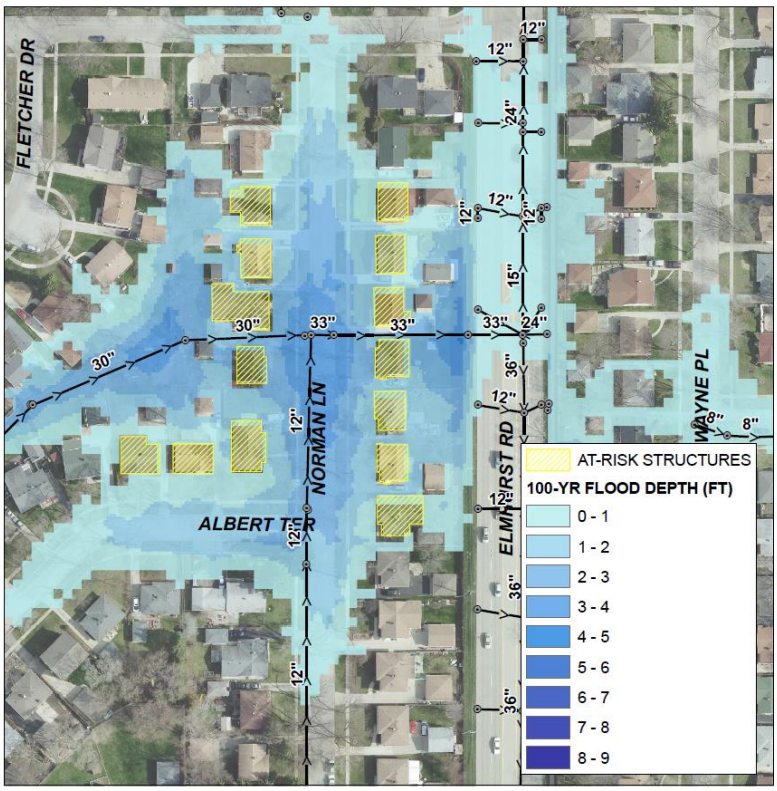

Figure 7. West Dunhurst Flood Problem

impassible. There are approximately fourteen (14) residences at-risk of flooding during the 100-year storm event.

6.2.3 South Dunhurst

The South Dunhurst problem area consists of depressional flooding locations along Audrey Court, Isa Drive, Bernice Court, and Green Drive. The storm sewer draining the South Dunhurst area runs northwest, perpendicular to the streets with depressional flood areas. The overland flow path for this study area follow the existing sewer alignment, flowing between houses adjacent to the storm sewer as shown on Figure 8. In addition to the floodwater generated in the South Dunhurst study area, a 48-inch storm sewer along Elmhurst Road surcharges contributing additional overland flow east to Bernice Court. The 48-inch Elmhurst Road storm sewer is owned by IDOT and flows into a smaller 33-inch storm sewer heading east as seen in Exhibit 3. We assume that this storm sewer has been designed to provide storage and limit flow into the Village owned storm sewer flowing west to east through the rear yards. Approximately 27 cfs (100-year, 2-hour) flows into the South Dunhurst problem area from the surcharging IDOT storm sewer contributing the depressional flooding. During the 100-year storm event, depressional flooding in South Dunhurst makes most roads impassable and poses a flood threat to approximately thirty-hour (34) residences.

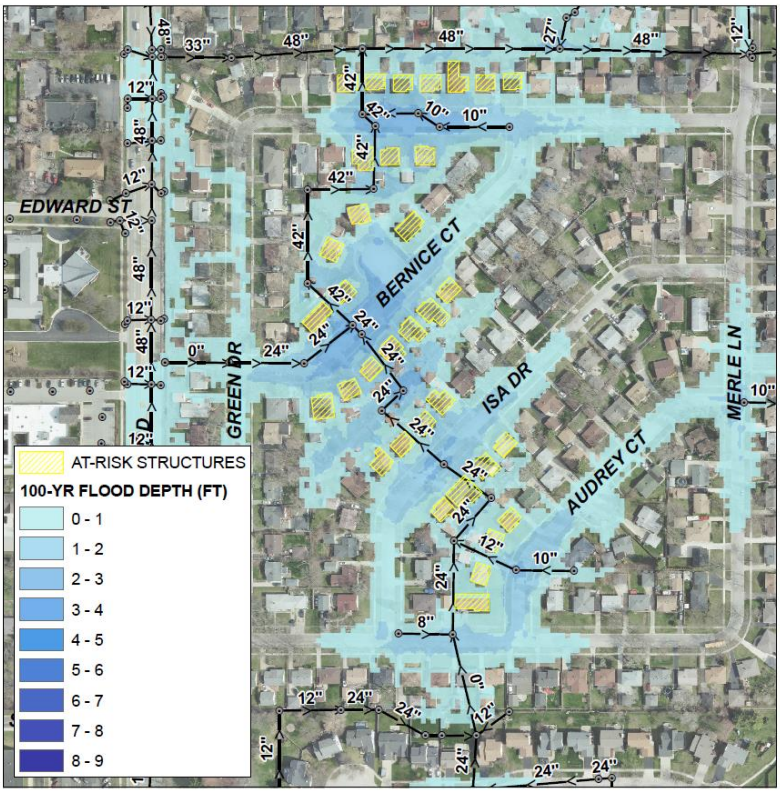

Figure 8. South Dunhurst Flood Problem

6.2.5 North Wheeling Road

There is a sag along Wheeling Road just north of the intersection with Mercantile Ct. The low point along the sag is located in the same area where the 48-inch culvert under Wheeling Road discharges to the open channel, upstream of the railroad crossing. Flooding at this sag can be caused by two different sources: overland flow from the East Dunhurst study area and tailwater from Heritage Lake. As previously mentioned, Heritage Lake drains to Buffalo Creek through a 60-inch pipe. When Buffalo Creek rises, this hydraulic connection causes Heritage Lake to rise, and in turn, causes a rise in the open channel on ComEd property. The low point in the sag is at elevation 640.3, while the 10- and 100-year WSELs in Buffalo Creek at this location are 640.5

and 642.6, respectively, according to the FEMA FIS. These high tailwater elevations compounded by local flooding has resulted in multiple closures of Wheeling Road at this location.

6.2.5 South Wheeling Road

Another sag exists along Wheeling Road just south of Exchange Street. This area drains solely by storm sewer because the bottom of the sag is 5-feet lower than the nearest overflow location. The storm sewer conveys runoff north along Wheeling Road eventually discharging to the open channel adjacent to the North Wheeling Road flood problem. During the 100-year storm, the sewer is limited in its capacity to convey runoff downstream and water ponds at the sag. Results from the XPSWMM model show that flooding can reach 4-feet deep from the lowest point during the 100-year storm. During past large historical storm events, the combination of the North and South Wheeling Road flooding has resulted in the closure of a stretch of 1500-foot roadway between the two areas. Exhibit 3 shows the extent of flooding at the two Wheeling Road flooding locations during the 100-year storm.

A summary of all the flooding problems in the Dunhurst study area is provided in Table 5 below.

Table 5. Existing Conditions Summary – Dunhurst Study Area

Problem Area	Number of Homes Within 100-YR Inundation Area	Maximum 100-YR Depth of Flooding (FT)	Length of Roadway with >1 Foot of Flooding (FT)
East Dunhurst	31	3.1	1650
West Dunhurst	14	3.9	750
South Dunhurst	34	3.2	1850
North Wheeling Road	0	3.0	625
South Wheeling Road	0	4.1	475

6.3 DUNHURST PROPOSED CONDITIONS

Improvement projects were developed to address the local flooding at the five problem locations. The proposed improvement projects were designed to provide a 100-year level of protection for each of the five problem areas. The drainage improvements proposed in the Dunhurst study area consist of: upsizing of existing storm sewers, constructing relief sewers, backflow prevention measures, and creating gravity drained flood storage in open space. The sections below outline the improvement alternatives proposed for each problem area.

6.3.1 Alternative 1A – East Dunhurst Increased Storm Sewer Conveyance

As shown on Exhibit 4, Alternative 1A proposes to increase conveyance from the problem area along Wayne Place by replacing the existing 36-inch storm sewer with three 4-foot by 4-foot Reinforced Concrete Box Culverts (RCBC). In order to convey flow to the RCBCs, high capacity inlet grates are required at the depression. The Three (3) RCBCs converge on the east side of the houses in a 12-foot by 4-foot RCBC. The proposed RCBC flows east following the alignment of the existing 48-inch pipe. The RCBC increases to a 14-foot by 4-foot approximately 700-feet downstream to handle additional runoff from the ComEd property to the north. A 15-foot by 4-foot RCBC is proposed under Wheeling Road to account for additional flow from the 48-inch storm sewer to the south. The proposed RCBC outlets to the existing drainage ditch on ComEd property east of Wheeling Road. The drainage ditch flows northeast until it outlets to Heritage Lake through culverts under the CNRR. Under existing conditions, there is a 48-inch and 60-inch pipe that conveys flow under the railroad. An additional 60-inch culvert is required to handle the increased flow from the conveyance improvements proposed upstream. As explained above, the Buffalo Creek 10- and 100-year flood elevations at Heritage Lake inundate Wheeling Road. If tailwater flooding is to be minimized, then a backflow preventer can be installed at the downstream culvert ends.

The proposed 60-inch culvert will increase the flow to Heritage Lake which ultimately drains to Buffalo Creek through an existing 60-inch storm sewer. The complexity of the hydraulics at this location would require merging the XPSWMM and HEC-RAS models as one means to evaluate downstream impacts, which is beyond the scope of this study. However, an alternate means of evaluating and mitigating downstream flow increases was explored. The total increase in flow volume from Alternative 1A compared to existing conditions is approximately 12 acre-feet. A graphical depiction of the proposed increase in flow volume is shown in Figure 9 below. This increased flow volume must be accounted for to prevent negative downstream impacts and to meet the permitting requirements of the MWRD. New flood storage volume is required to offset the increase in flow volume created by the proposed upstream flood improvement project.

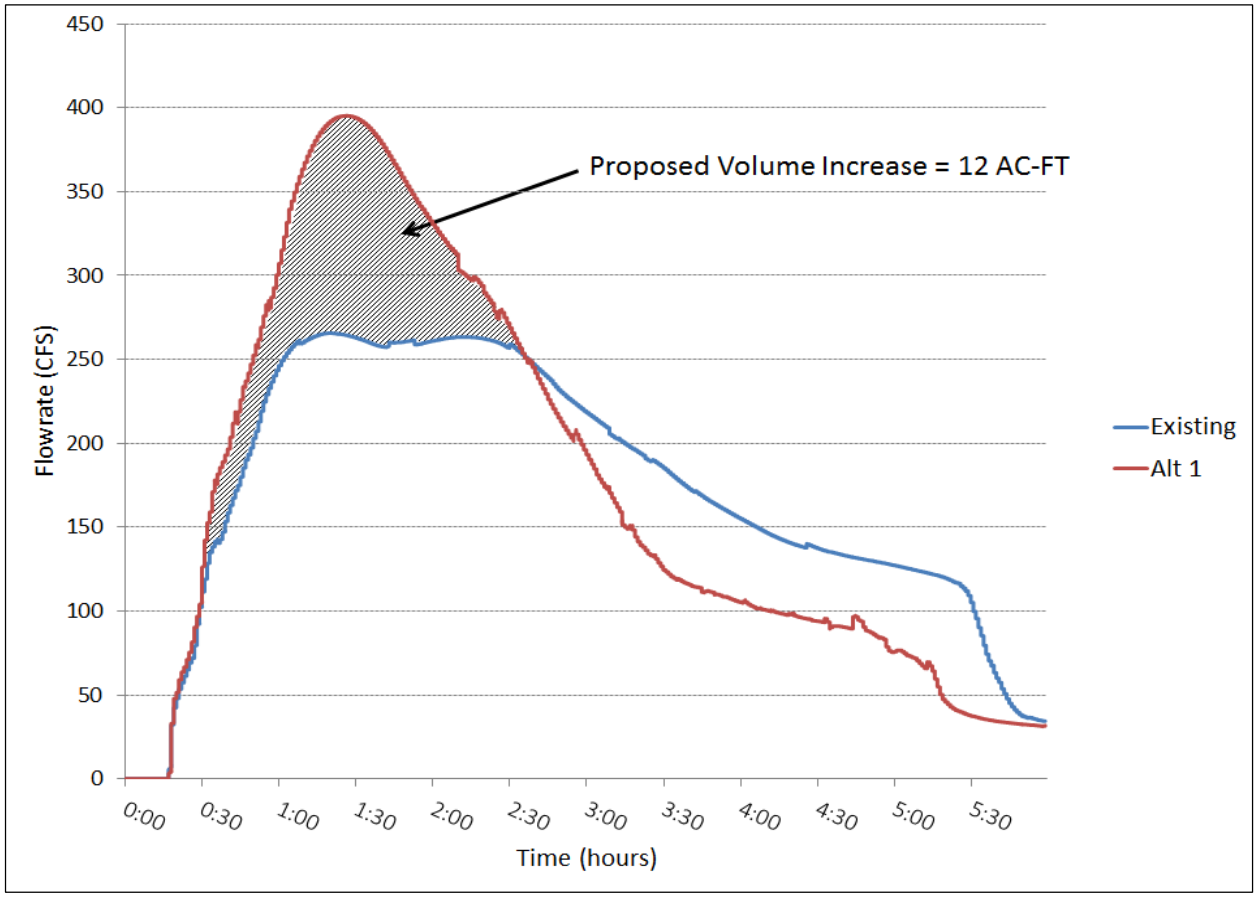

Figure 9. Canadian Nation Railroad Culvert Crossing – Existing vs. Proposed Hydrograph Comparison

To mitigate for the increased flow volume, the Village has the ability to pump down the Normal Water Level (NWL) in Heritage Lake by 2 feet below the design NWL. The footprint of the NWL for Heritage Lake is approximately 15 acres. Therefore, in theory, approximately 30 acre-feet of storage volume could become available if there is a minimum of 2-foot water depth throughout the entire Lake. However, based on Village staff input, this is not the case and the volume of 30 acre-feet is not achievable. Based on a field visit to Heritage Lake performed on October 8, 2014, areas of the Lake appeared to be extremely shallow with a crane standing in one section of the Lake. According to Village staff, the bottom of Heritage Lake consists of a peaty, slushy material that cannot be easily dredged. The concern is that if the Lake is dredged, the sideslope bank surrounding the Lake may become unstable and re-deposit sediment into the bottom. A bathometry survey of the Lake bottom is necessary to determine if the required 12-acre-feet of storage volume is available.

In addition, an analysis was performed to determine if the proposed 60-inch culvert under the railroad would by itself cause downstream impacts using the more detailed MWRD model which includes the split flow condition which is conveyed through this culvert. When Buffalo Creek reaches its 100-year water level it overtops the bank near Valley Stream Drive and flows south overtopping Dundee Road as seen in Exhibit 1. The floodplain continues south along Wheeling Rd eventually draining through the railroad culvert crossing. An unsteady HEC-RAS modeling

analysis was performed to demonstrate how the proposed 60-culvert affects the 100-year floodplain elevation. Based on the analysis, there are no downstream impacts for the 100-year storm with the addition of the proposed 60-inch pipe.

Alternative 1A provides a reduction of the 100-year WSEL at the deepest point in the depression of 3.2 feet. Proposed condition XPSWMM modeling still shows overland flow draining down Bridget Place to the depression, but it is collected by the proposed high capacity inlet grates and conveyed into the RCBCs. The proposed overland flow depth along Bridget Place is approximately 1-foot deep and generally confined to the streets. Exhibit 8 shows the proposed 100-year inundation area resulting from Alternative 1A.

Alternative 1A is not recommended due to its high cost and construction impacts on houses along the east side of Dunhurst Road.

The estimated cost of Alternative 1A is $6.2 million

6.3.2 Alternative 1B – East Dunhurst Increased Storm Sewer Conveyance

Alternative 1B is identical to Alternative 1A with the exception of the most upstream section of proposed pipe. Exhibit 5 shows the proposed layout of Alternative 1B. As previously described, Alternative 1A proposes three 4-foot by 4-foot RCBCs to be constructed between the houses along the east side of Wayne Pl. Alternative 1B proposes to construct a single 12-foot by 4-foot RCBC in lieu of the 3 RCBCs. In order to construct the large single RCBC, a buyout of one residential parcel is required along the east side of Wayne Pl. The downstream pipe sizes and storage requirements discussed in Section 4.3.1 remain the same. Exhibit 8 shows the proposed 100-year inundation area for Alternative 1B.

Alternative 1B is not recommended because it provides the same benefits as Alternative 1C at a higher cost.

The estimated cost of Alternative 1B is $4.8 million

6.3.3 Alternative 1C – East Dunhurst Proposed Overflow Outlet

Alternative 1C provides 100-year flood benefits by increasing conveyance from problem area by providing an overflow outlet. Similar to Alternative 1B, Alternative 1C requires the buyout of one residential property along east Wayne Pl. Based on the existing grade along Wayne Place, this alternative requires the buyout of one of five residential parcels to construct the overflow outlet. For storms greater than the 5-year storm event the overflow outlet will be utilized, providing relief to the existing 36-inch storm sewer currently draining the problem area. The overflow will drain east into a grassed channel for 1,150 feet. The channel is proposed with 3:1 sideslopes to minimize its width on ComEd property. The channel flows east into ComEd property and is collected at a proposed culvert inlet west of Wheeling Rd. Exhibit 6 shows the proposed layout of Alternative 1C. The Village will have to obtain permission from ComEd to construct the channel through their property. A proposed 10-foot by 4-foot RCBC is proposed to drain east under Wheeling Rd into the existing drainage ditch on ComEd property. An additional 60-inch pipe is proposed under the CNRR to handle the additional flow from the conveyance

improvements upstream. Similar to Alternatives 1A and 1B, Alternative 1C contributes an additional 12 acre-feet of flow volume to Heritage Lake. The Lake will have to be pumped down to mitigate for the additional flow volume. Exhibit 8 shows the proposed conditions flood reduction benefits provided by Alternative 1C.

Alternative 1C is recommended because it provides an overland outlet for the 100-year flooding that should have been originally constructed during the Dunhurst Subdivision development. Alternative 1C also has a considerably lower cost when compared to Alternatives 1A, 1C, and 1D.

The estimated cost of Alternative 1C is $1.5 million

6.3.4 Alternative 1D – East Dunhurst Relief Storm Sewer

Alternative 1D proposes to provide a relief sewer to convey floodwater from the depression at Wayne Place and Bridget Place during the 100-year storm as shown on Exhibit 7. This alternative is intended to minimize impacts to private property and stay within the Village's existing storm sewer easements. In order to do so, this alternative requires significantly more storm sewer resulting in a higher project cost. A proposed 12-foot by 4-foot RCBC follows Wayne Place south and curves west with the street. The sewer then turns south down Merle Lane where is intersects an existing 48-inch pipe running west to east. From here the proposed sewer is upsized to a 96-inch pipe replacing the existing 48-inch pipe. The proposed sewer then intersects a 33-inch sewer flowing south to north down Wheeling Rd and flows north replacing the existing sewer with a 12-foot by 5-foot RCBC. Flow then outlets through a proposed 15-foot by 4-foot RCBC to the existing ComEd drainage ditch east of Wheeling Rd. Like the previous 3 alternatives, a 60-inch pipe is proposed to convey the additional created by the improvement project.

This improvement reduces the 100-year storm elevation at Wayne place by 2.2 feet, which is less than the previous 3 alternatives. The longer stretch of storm sewer results in a higher Hydraulic Grade Line (HGL) in the problem area which results in approximately 1-foot of street flooding for the 100-year strom. The conveyance improvements proposed in Alternative 1D produce slightly higher flowrates through the railroad culvert crossing than Alternatives 1A, 1B, and 1C. This higher flow results in a higher flow volume conveyed to Heritage Lake. The total increase in flow volume from Alternative 1A compared to existing conditions is approximately 15 acre-feet.

Alternative 1D is not recommended because it requires a much longer stretch of proposed storm sewer than other alternatives resulting in a higher cost, and additional volume at Heritage Lake.

The estimated cost of Alternative 1D is $10.2 million

A summary of all the alternatives proposed to improve flooding in the East Dunhurst area is provided in Table 6.

Table 6. Alternative 1 Summary – East Dunhurst

Alternative	100-YR Flood Depth Reduction (FT)	Number of At- Risk Homes Removed from 100-YR Inundation Area	Required Downstream Storage Volume (AC-FT)	Estimated Cost (in millions)	Recommended
1A	3.2	31	12	$6.2	No
1B	3.2	31	12	$4.8	No
1C	**3.6**	**31**	**12**	**$1.5**	**Yes**
1D	2.2	31	15	$10.2	No

6.3.5 Alternative 2 – South Dunhurst Proposed Sewer Conveyance and Storage

Alternative 2 is intended to provide 100-year flood reduction benefits to the South Dunhurst problem area with a proposed storm sewer system and stormwater storage. The flood storage for this alternative is proposed in the open space (currently, it is a grassed field) at the north end of the Mark Twain Elementary School property. Agreement from the school is required to construct flood storage on the school property. As seen on Exhibit 9, proposed storm sewers will collect water from the existing catch basins in the flood areas. The storm sewers are proposed to be constructed under the streets and convey water north and east to the proposed stormwater storage basin. Proposed storm sewer sizes for this alternative range from 30-inch pipes at the laterals to a 48-inch pipe discharging into the proposed stormwater storage basin. The stormwater storage is intended to displace most of the flood volume on Bernice Court, Isa Drive, Audrey Court, and Merle Lane. With this alternative there is still 27 cfs surcharging from the IDOT storm sewer on Elmhurst Road

A restricted 18-inch outlet pipe with a backflow preventer allows the stormwater storage basin to fill to the design High Water Level (HWL) elevation of 644.5, providing 12 acre-feet of storage volume. The existing ground has an average elevation of 649.5 feet, which requires excavation of 5 feet of overburden to the HWL and an additional 6 feet to a flat wetland bottom at elevation 638.5. This improvement reduces flooding on these streets by approximately 1.2 feet, removing nearly all homes from the 100-year inundation area. A summary of the benefits for this improvement is provided in Table 7. Exhibit 8 shows the proposed conditions flood reduction provided by Alternative 1C. Because this improvement provides storage within the system and does not increase the flowrates downstream, additional conveyance or mitigation improvements downstream of the project area not required.

Table 7. Alternative 2 Summary – South Dunhurst

Street Name	Catch Basin Elevation (FT)	Existing 100-Year HWL Elevation (FT)	Proposed 100-Year HWL Elevation (FT)	Existing 100-Year Flood Depth (FT)	Proposed 100-Year Flood Depth (FT)	WSEL Reduction (FT)
Audrey Court	647.5	650.0	649.5	2.5	2.0	0.5
Isa Drive	647.4	649.6	648.2	2.2	0.8	1.4
Bernice Court	646.3	649.4	648.0	3.0	1.6	1.4
Green Drive	646.4	649.0	647.5	2.6	1.1	1.4
Merle Lane	649.7	651.0	648.0	1.4	0.0 (-1.7)	1.4
			Average =	2.3	0.8	1.2

Alternative 2 is recommended because it provides significant benefits to the affected flooding areas

The estimated cost of Alternative 2 is $6.6 million

6.3.6 Alternative 3A – West Dunhurst Proposed Relief Sewer

Alternative 3A proposes to reduce flooding along Norman Lane by providing a relief sewer to convey floodwater to the south and east (Exhibit 11). An 68-inch by 43-inch elliptical pipe is proposed to flow south along Norman Lane for 300 feet to maintain a minimum cover depth over the pipe. The proposed elliptical sewer then becomes a 54-inch circular pipe and flows south down Norman Lane until Dennis Lane where the sewer heads east. The proposed pipe heads briefly down Elmhurst Road and then flows east down an existing sewer easement between residential rear yards. There is currently an existing 48-inch sewer through the existing sewer easement which is replaced by a proposed 72-inch pipe. The proposed 72-inch pipe flows for 2,600 feet until it reaches Wheeling Road, from there, a proposed 8-foot by 5-foot RCBC under Wheeling Road convey flows and outlets to the existing ComEd drainage ditch. An additional 60-inch culvert pipe is proposed under the railroad to handle the increased flowrate from the conveyance improvements. It should be noted that all projects include only one additional 60-inch pipe under the railroad. This improvement reduces the flooding in the Norman Lane depression by 3.8 feet resulting in minimal street ponding during the 100-year storm. The conveyance improvements in Alternative 3A send an additional 20 acre-feet of flow volume compared to existing conditions.

Alternative 3A is not recommended because it provides benefit to only a few structures at a very large cost, and send an impractically large to manage volume of water downstream.

The estimated cost of Alternative 3A is $10.1 million

6.3.7 Alternative 3B – West Dunhurst Proposed Relief Sewer

Alternative 3B differs slightly from Alternative 3A proposing a different route for the relief sewer (Exhibit 12). This alternative is intended to avoid a section of existing sewer replacement and a tight construction workspace through the rear yards. The sewer route for Alternative 3B is the same as Alternative 3A until the intersection of Dennis Road and Elmhurst Road. The 54-inch relief sewer on Dennis Road continues to head east on Dennis Road past Elmhurst Road. The proposed sewer flows southeast on Wayne Place, south on Merle, and then continues on the same proposed alignment described in Alternative 3A. The hydraulic impacts at the railroad outlet are the same as Alternative 3A. The proposed conditions flood reduction benefits are the same for both Alternative 3A and 3B and are shown on Exhibit 13.

Alternative 3B is also not recommended because it provides benefit to only a few structures at a very large cost. In lieu of Alternative 3A or 3B, it is recommended that the Village investigate buyouts of homes in the area that have experienced severe flooding.

The estimated cost of Alternative 3B is $10.0 million

6.3.8 Alternative 4 – Raise North Wheeling Road

Alternative 4 proposes to raise Wheeling Road 2 feet from the low point just north of Merchantile Court. The proposed limits for raising the road can be seen in Exhibit 14. The low point in the sag on North Wheeling Road is elevation 640. Raising the low point in the road 2 feet brings the road up to elevation 642 which is equal to the 100-year tailwater elevation in Buffalo Creek. This improvement provides 1.5 feet of freeboard from the 10-year tailwater elevation of 640.5.

Alternative 4 is recommended because it will allow vehicles, specificall emergency, to drive on Wheeling Road when Buffalo Creek is high. It is recognized that during unusually large events, only emergency vehicle may be able to use the road.

The estimated cost of Alternative 4 is $1.0 million

6.3.9 Alternative 5 – Proposed Relief Sewer

Alternative 5 proposes to drain the existing flood depression on South Wheeling Road with a relief sewer draining to Echo Lake. A weir wall structure is proposed to allow drainage to Echo Lake only when water is close to ponding on the road. The elevation of the low point along South Wheeling Road is 643 and the weir wall crest elevation is proposed at elevation 642. The existing storm sewer draining this area to the north will remain and be the primary source of drainage for the depression. Because the 100-year HWL elevation in Echo Lake is 653.5, backflow prevention is proposed on the relief sewer to prevent water from backing up on the road when Echo Lake is high. The configuration for the Alternative 5 improvement can be seen in Exhibit 15.

Alternative 5 is recommended because it reduces flooding on south Wheeling Road during large storm events.

The estimated cost of Alternative 5 is $485,000

CHAPTER 7 ECHO LAKE & RIDGEFIELD STUDY AREA

The Echo Lake and Ridgefield study area is the second area chosen by the Village to be analyzed using detailed XPSWMM 2D modeling for this SWMP. A flood and water quality analysis were performed to develop improvement projects for this study area. The drainage area is generally located between Hintz Road and Palatine Road west of Wheeling Road. Drainage in the study area flows from south to north through a system of 4 cascading ponds connected by storm sewers. The most downstream pond in the study area is Echo Lake which ultimately drains to Buffalo Creek through a storm sewer flowing east down Hintz Road. The drainage area to Echo Lake is approximately 982 acres.

7.1 MODELING APPROACH

The study area used the same modeling approach as the Dunhurst model discussed in Section 4.1. An additional component used to create the Echo Lake and Ridgefield model was as-built sewer plans for different subdivisions in the study area including:

- Ridgefield Subdivision
- Ridgefield Lanes Subdivision
- Polo Run Subdivision

The study area for this model was broken down into 83 subbasins with an average subbasin area of 5 acres (Exhibit 16). As seen in Figure 10, a large 561 acre tributary area to the west drains to Echo Lake. This tributary area was accounted for using an inflow hydrograph generated from the Jackson Drive and Lakeside Villas modeling. The model was calibrated based on high water marks provided by the Village at the 4 ponds for the September 13-14, 2008 storm event. The model was calibrated within 1.0 feet of the surveyed high water marks within each of the 4 ponds as seen in Table 8. The critical duration for the Echo Lake and Ridgefiled study area is the 24-hour storm.

Table 8. Calibration Summary Table – Echo Lake & Ridgefield Study Area

Pond	September 13-14, 2008 Storm		
	Surveyed High Water Mark (FT)	Modeled High Water Mark XPSWMM (FT)	Difference (FT)
Polo Run	653.46	653.65	0.19
South Ridgefield	649.63	649.53	-0.10
North Ridgefield	647.55	647.59	0.04
Echo Lake	643.46	643.32	-0.14

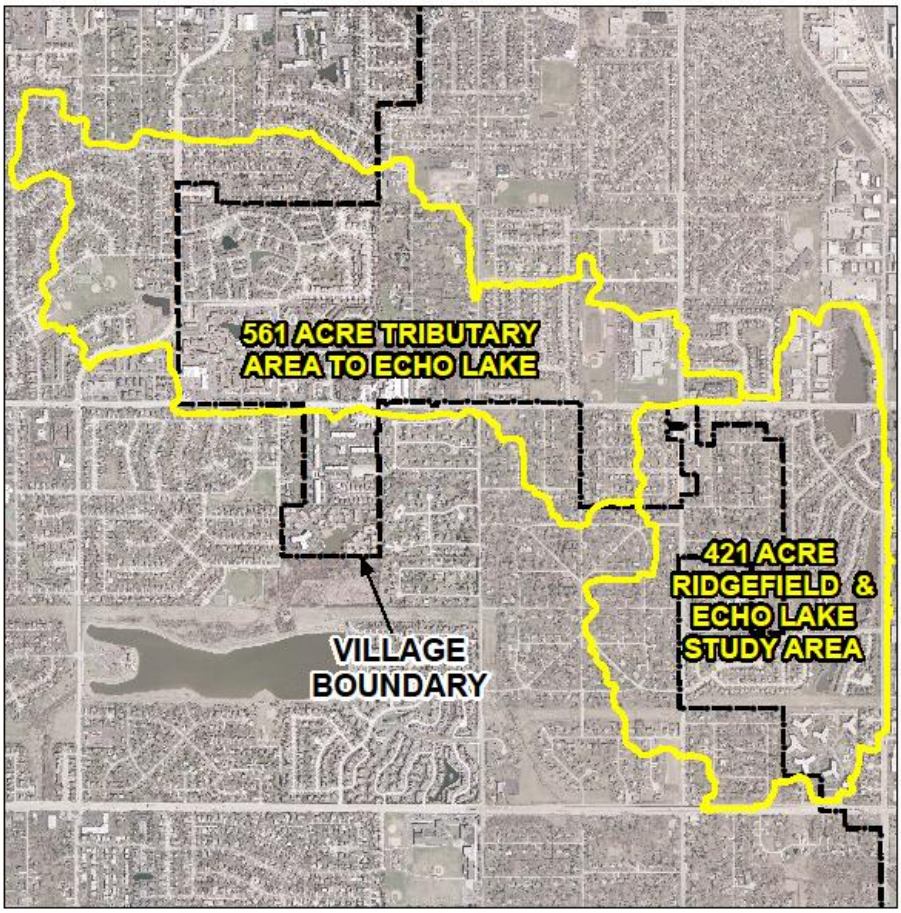

Figure 10. Echo Lake Drainage Area

7.2 ECHO LAKE & RIDGEFIELD EXISTING CONDITIONS

The Echo Lake and Ridgefield study area was analyzed with XPSWMM. The southernmost portion of the study area is the Sandpebble Apartments at the northwest corner of Wheeling Road and Palatine Road. Storm sewers collect runoff from the apartment property and direct the flow to a parking lot on the north end of the property. During large storm events water collects in a low-lying area in the parking lot and the grassed area to the south. Water has ponded high enough to damage vehicles in the parking lot. The low elevation at the storm manhole in the depression is 650.2 and the average elevation of the low parking spaces in the parking lot is 650.5. The results of the XPSWMM modeling show the 10-year elevation to be 652.8 and the 100-year elevation to be 653.8. The depression drains to Polo Run Pond to the north through a 21-inch storm sewer. During the 100-year storm, floodwater ponds high enough to overflow the depression and drain north through the ComEd ROW into the Polo Run Subdivision Pond causing a level pool between the two storage areas as seen in Figure 11 & Exhibit 17. The Polo Run pond has a NWL elevation of 647 and fills to elevation 653.2 for the 100-year storm. There is another low-lying depression just north of the Polo Run Pond along Bridle Trail that floods during the 100-year storm event. The low elevation at the storm manhole in this depression is 650.2. In past storm events, cars in the south parking lots along Bridle Trail have been damaged by floodwater. Table 9 below provides a summary of the flooding problems in the Sandpebble and Polo Run properties.

Table 9. Existing Conditions Summary – Echo Lake & Ridgefield Study Area

Problem Area	Low Storm Manhole Elevation (FT)	10-YR Flood Elevation (FT)	100-YR Flood Elevation (FT)	10-YR Flood Depth (FT)	100-YR Flood Depth (FT)
Sandpebble Parking Lot	650.2	652.8	653.8	2.6	3.6
Polo Run Subdivision (Bridle Trail)	650.2	652.8	653.8	2.6	3.6

As stormwater moves north through the system, flooding problems are generally limited to minor street flooding. A storm sewer drains from the Polo Run Pond into the South Ridgefield pond along Wheeling Rd. The South Ridgefield Pond has a NWL elevation of 643.4 and fills to a HWL elevation of 651.7. The sewer system continues north draining into the North Wheeling pond. This pond has a NWL elevation at 641.9 and reaches a HWL of 648.9. The final pond in the system is Echo Lake with a NWL elevation at 639 and a HWL of 643.8.

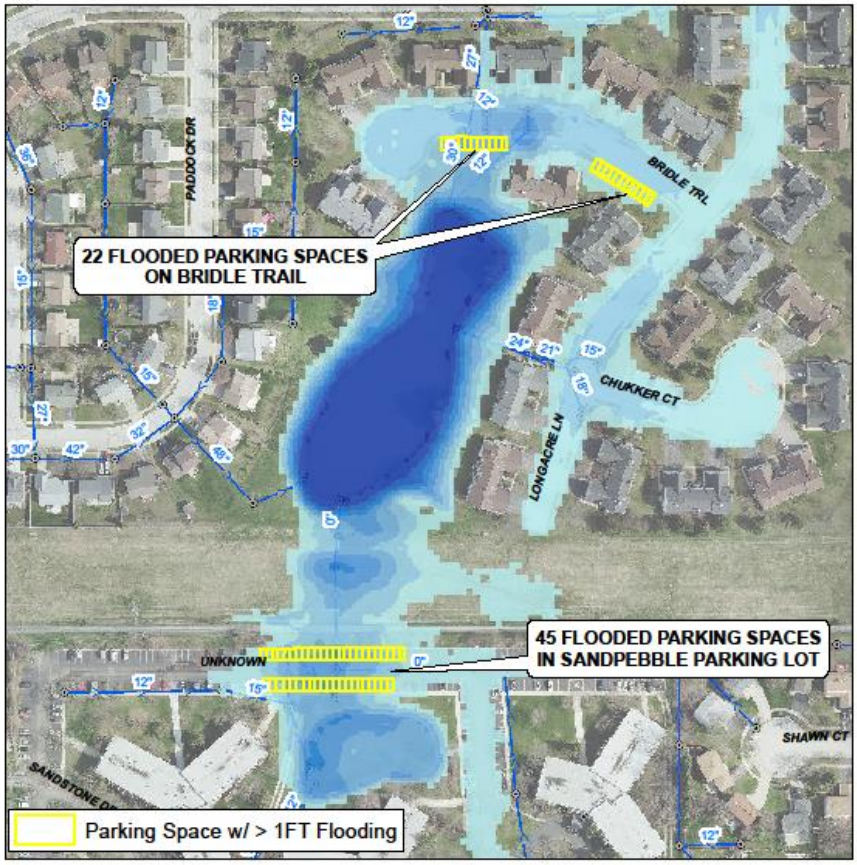

Figure 11. Sandpebble & Bridle Trail Flood Problem (100 Year Storm)

7.3 ALTERNATIVE 6 – ECHO LAKE & RIDGEFIELD SOUTH FLOOD STORAGE AND CONVEYANCE IMPROVEMENTS

Alternative 6 proposes additional flood storage and conveyance to divert floodwater away from the depressional flooding area along Bridle Trail and the Sandpebble parking lot for the 10-year storm event. The objective of this alternative is to reduce flooding depths to below 1-foot. Based on the existing condition modeling, the existing 21-inch storm sewer flowing south between the parking lot and Polo Run Pond is inadequate to convey the 10-year storm. Additionally, the 10-year storm WSEL in Polo Run Pond is approximately 1-foot higher than the low point in the parking lot depression, so simply upsizing the 21-inch storm sewer to increase conveyance will not mitigate the flooding problem. Additional storage must be provided to lower the HWL in Polo Run, in addition to increasing conveyance from the parking lot to Polo Run Pond.

Additional storage for this alternative is provided in two locations: the grassed area south of the Sandpebble parking lot and within the existing Polo Run Pond. The proposed flood storage south of the parking lot would provide 2.2 acre-feet of storage volume. The NWL in Polo Run pond will be lowered 3.2 feet from the existing NWL elevation of 647 to a proposed NWL elevation of 644. Lowering the NWL along with minor grading along the shoreline produces 5.4 acre-feet of additional flood storage volume. Because the lower NWL will result in a shallower pond depth, dredging or conversion of the pond to a dry bottom basin will be required. The total storage volume provided for this alternative is 8.6 acre-feet. In order to lower the NWL in Polo Run pond, a proposed 12-inch storm sewer is required to drain from the north end of the pond at elevation 644. The proposed storm sewer will drain directly into the South Ridgefield Pond with an outlet invert elevation of 643.5. Exhibit 18 shows the improvements proposed in Alternative 6.

The Sandpebble Pond collects runoff from the southern portion of the watershed and conveys it north through a 36-inch storm sewer. Additional catch basins are proposed at the parking lot depression to tie into the 36-inch storm sewer as it continues north to Polo Run Pond. The benefit of the proposed improvement is a 1.7 foot reduction in WSEL in the Sandpebble parking and along Bridle Trail for the 10-year storm event. As seen in Exhibit 19, there are minimal flood reduction benefits with this Alternative for the 100-year storm. A summary of the proposed conditions for Alternative 6 is provided in Table 10.

Table 10. Alternative 6 Proposed Conditions Summary – Echo Lake & Ridgefield Study Area

Problem Area	Existing 10-Year Flood Depth (FT)	Proposed 10-Year Flood Depth (FT)	Flood Depth Reduction (FT)
Sandpebble Parking Lot	2.6	0.9	1.7
Polo Run Subdivision (Bridle Trail)	2.6	0.9	1.7

Alternative 6 is not recommended because it does not provide any significant flood benefit for the 100-year storm.

The estimated cost of Alternative 6 is $2.6 million

7.4 ALTERNATIVE 7 – ECHO LAKE & RIDGEFIELD COMPREHENSIVE FLOOD STORAGE AND CONEYANCE IMPROVEMENTS

Alternative 7 proposes to lower the NWL of the 4 interconnected ponds to create additional flood storage. The objective of this alternative is to provide a 100-year flood improvement at the problem areas while providing water quality benefits with pond bank stabilization. The proposed water quality improvements associated with Alernative 7 are discussed in Section 7.7. To lower the NWL in all the ponds, new storm sewers connecting the ponds must replace the existing storm sewers to drain the ponds at a lower elevation. Exhibit 20 shows the improvements proposed as part of Alternative 7.

The first proposed stormwater storage basin is provided in the grassed area south of the Sandpebble parking lot depression. The proposed Sandpebble stormwater basin requires excavation of 6.5 feet from the existing ground to create 2.4 acre-feet of storage volume. A 36-inch pipe drains north from the pond and collects floodwater from the parking lot depression. From the parking lot, a 48-inch pipe drains north into the Polo Run Pond. The Polo Run pond will be lowered 4.2 feet from the existing NWL with minor grading proposed along the pond banks providing 6.8 acre-feet of additional storage volume. Since there is a significant reduction of the NWL in the Polo Run Pond with the proposed condition, it is recommended to convert this pond to either a dry- or wetland bottom pond.

A proposed 48-inch pipe drains north from the Polo Run Pond and increases to a 54-inch at Equestrian Drive draining into the South Ridgefield Pond. The South Ridgefield Pond is proposed to be lowered 1.4 feet creating 5.2 acre-feet of additional storage. A proposed 27-inch pipe drains north from South Ridgefield Pond and increases to a 36-inch pipe at Willowbrook Lane. The 36-inch pipe flows northwest through the residential rear yards, replacing the existing 36-inch storm sewer. When the proposed pipe reaches Weeping Willow Drive, a 42-inch storm sewer is proposed to drain northeast into North Ridgefield Pond. The North Ridgefield pond will be lowered 1.9 feet creating 5.5 acre-feet of additional storage. Water quality improvements are proposed in Section 7.7 to address the shallow Ridgefield pond depths that will result from lowering the NWL. A summary of all pond improvement for Alternative 7 is provided in Table 11.

As seen in Exhibit 21, Alternative 7 provides significant flood benefits in the two problem areas identified in the study area. At the Sandpebble Parking Lot, the 10- and 100-year flood reductions are 6.4 feet and 2.9 feet, respectively. These reductions nearly eliminate parking lot flooding for the 10-year event and reduce the flooding depth to approximately 1-foot along all impacted parking spaces for the 100-year storm. Similarly, the 10- and 100-year flood reductions at Bridle Trail are of 6.5 feet and 3.0 feet, respectively.

Table 11. Alternative 7 Proposed Conditions Summary – Echo Lake & Ridgefield Study Area

Pond	Additional Storage Volume (AC-FT)	Existing NWL Elevation (FT)	Proposed NWL Elevation (FT)	Existing 100-YR HWL Elevation (FT)	Proposed 100-YR HWL Elevation (FT)	100-YR WSEL Reduction (FT)
Sandpebble	2.4	650.0	643.5	653.8	650.9	2.9
Polo Run	6.8	647.2	643.0	653.8	650.9	2.9
South Ridgefield	5.2	643.4	642.0	651.7	650.7	1.0
North Ridgefield	5.5	641.9	640.0	648.8	648.7	0.1
Echo Lake	0.0	639.0	639.0	643.8	643.8	0.0

Alternative 7 is recommended because it enhances water quality in the Ridgefield Pond System while providing significant flooding benefits at the two problem areas.

The estimated cost of Alternative 7 is $6.9 million

7.5 ECHO LAKE & RIDGEFIELD TOBERMAN WATER QUALITY ANALYSIS AND IMPROVEMENT PROJECT

In 2011, the engineering firm, Norman J. Toberman & Associates, LLC (Toberman) performed an analysis to address the water quality and existing aesthetics in the two Ridgefield Ponds on behalf of the Ridgefield Homeowners Association. This section summarizes the findings and recommendations in the Toberman Report: *Project Report for Proposed Ridgefield Shoreline & Pond Improvements*. In the report, Toberman proposes to maintain the existing permitted storage requirements within both ponds and does not propose any flood reduction improvements.

According to the report, the original ponds were constructed in 1984 with an average depth of 5-7 feet and average 3:1 bank slope. The ponds are located within historical flood prone areas and were required to maintain existing floodplain storage and provide additional retention volume for the Ridgefield Subdivision. Currently, the shorelines for both ponds have small, poor quality trees and brush, and homes along the west shoreline have manicured grass up to the ponds' edge. The ponds' edge is heavily eroded and nearly vertical in some locations. Tobermann attributes this erosion to residential sump discharge pipes, buried storm sewer pipes and animal related burrow holes.

Today, the eroded banks have become a major source of water quality concerns and siltation in both ponds. Siltation has led to shallow pond depths that increase water turbidity, temperature fluctuation, and lowers dissolved oxygen content. This environment promotes for weed growth and algae blooms and an overall poorly functioning aquatic environment. The weeds can die and create for a potential storm sewer obstruction and/or ongoing maintenance problem.

As is the case with many residential ponds, surface runoff contributes contaminants to the ponds such as oils, grease, lawn fertilizers, road salts, etc. The siltation and contaminant deposition has caused a 1.5 to 2.5 foot loss in average pond depth from the original construction. According to a 1999 Rust Environmental Study for the ponds, from 1984 to 1999 the ponds lost 58% of their water volume below the normal water level due to siltation from eroded banks.

Toberman concluded that the best way to improve water quality and to avoid dredging due to the high cost was through native plantings to promote bank stabilization. The report recommends the bank stabilization through use of Filtrexx Soxx, a media used to establish native plant growth along the highly eroded shorelines. Along with stabilizing the pond banks, the Filtrexx Soxx with native planting will act as a buffer to prevent sediments from entering the ponds as it occurs today. Toberman states that it is not necessary for either pond to be completely dredged at this time since the water depth appears to be adequate to discourage plant bottom nuisance and has not shown further degradation over the past 13 years.

The Toberman improvement project is not recommended because, by itself, it does not provide flood benefits for the Echo Lake & Ridgefield study area.

The estimated cost of the Toberman improvement project was $1,045,000 in 2011.

7.6 ECHO LAKE & RIDGEFIELD 2014 EVALUATION

As discussed in Section 7.5, Toberman completed, on behalf of the Ridgefield Homeowners Association, a detailed pond depth and shoreline erosion study along with plans and details describing recommended approaches to shoreline stabilization. These plans were prepared based on the assumption that the pond NWLs would not be modified.

The Toberman plans, dated 11/21/11 (32 pages), were evaluated to determine if they would be appropriate for use based on the proposed NWL lowering. It was determined that the plans would require modification to be compatible with the proposed NWL lowering.

The Toberman plans offer two types of stabilization practices, a hardscape/riprap solution, and a softscape/native planting solution. If the softscape solution were to be pursued in the event the ponds NWLs is not lowered, it is suggested that consideration be given to the steepness of the slopes proposed in relation to the life of the Filltrexx sock product, and to concerns regarding water quality and freeze thaw action discussed in more detail below. It is suggested to revisit the design prior to implementation to ensure longevity of the softscape installation.

As pointed out by Toberman, the shorelines of the ponds are eroded and nearly vertical in a number of locations (Figure 12). It is important to understand the processes which cause the bank failures to occur. Based on the available information, the shorelines of the ponds were originally graded to 3:1 to 4:1 slopes. The slopes were established with lawn grass and routinely mown. Lawn grass does not have a deep root system and will generally not provide sufficient protection of the shoreline from erosion. However, if the slopes were less steep the lawn grass would be less likely to fail. One issue, that is in many cases over looked, is the quality of the water that is present which can have a significant impact on the ability for vegetation to be established and thrive. It is likely, given the urban nature of this area, that the pond water has high chloride (salt) concentrations from winter deicing. Lawn grass is generally not tolerant of high salt concentrations, and when combined with frequent inundation, steep slopes, freeze-thaw and fluctuating water levels it is understandable why the bank failures occurred. The lawn grass dies and erosion of the toe of slope begins. As the bare earth face grows taller, larger cleavages of soil occur, accelerating mass wasting.

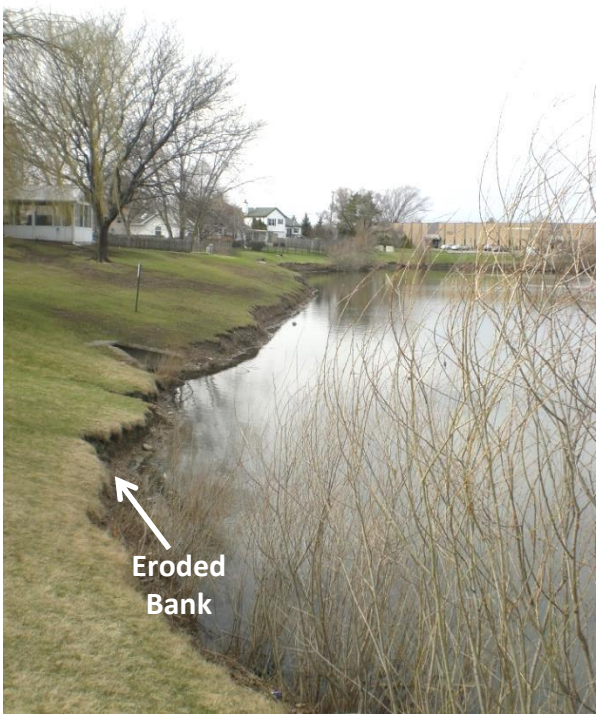

Figure 12. North Ridgefield Pond Bank

In winter, during rain or snow melt, water levels rise in the ponds. The adjoining soil becomes saturated. If water levels drop and the ground freezes, significant mass wasting can occur. Native plant communities typically have much deeper root systems which help to bind the soil to overcome these erosive actions. Lawn grass and bare soil provide essentially no protection from significant erosion during these events. The next section discusses two options for Ridgefield Pond shoreline stabilization to be completed in conjunction with the Alternative 7 flood improvement project.

7.7 ECHO LAKE & RIDGEFIELD PROPOSED WATER QUALITY IMPROVEMENTS

As documented by Toberman the ponds are fairly shallow due to sedimentation. The ponds average depth is about 3.5 feet deep. Lowering the NWL by 2 feet in each pond will result in a water depth of about 1.5 feet. This depth is problematic. The depth is too deep to establish wetland vegetation, too shallow to support fish, will likely have poor water quality and be prone to algal blooms.

This situation would not affect the flood control benefits, but would likely result in an unacceptable appearance. Consequently the flood control improvements proposed in Alternative 7 are not proposed to occur without mitigation to improve the shorelines. The following describes the recommended mitigation alternatives to compliment Alternative 7.

7.7.1 Alternative 7A

As shown in the Figure 13 below, Alternative 7A consists of filling in the eroded portions of the bank with soil. The material would be placed at a 4:1 slope down to the NWL. At the NWL, a 5 to 8 foot wide planting wetland shelf would be constructed. The wetland planting shelf and side slope would be planted with native vegetation to minimize the risk of future erosion. A portion of each pond would be excavated to create an open water area, and the depth of the excavation would vary. The goal would be to balance the excavation and grading within the pond to prevent the need for offsite disposal. The excavated material would be used as the backfill to fill in the eroded shoreline and to create the wetland planting shelf. This typical cross section has been used at a number of other project sites, in urban areas and has been successful. The native plantings to be installed would be salt tolerant species.

The native vegetation would be established through the installation of seed on the side slopes and seed and live plants on the wetland shelf. The side slopes would be covered with erosion control blanket. The shelf can be hydro-mulched.

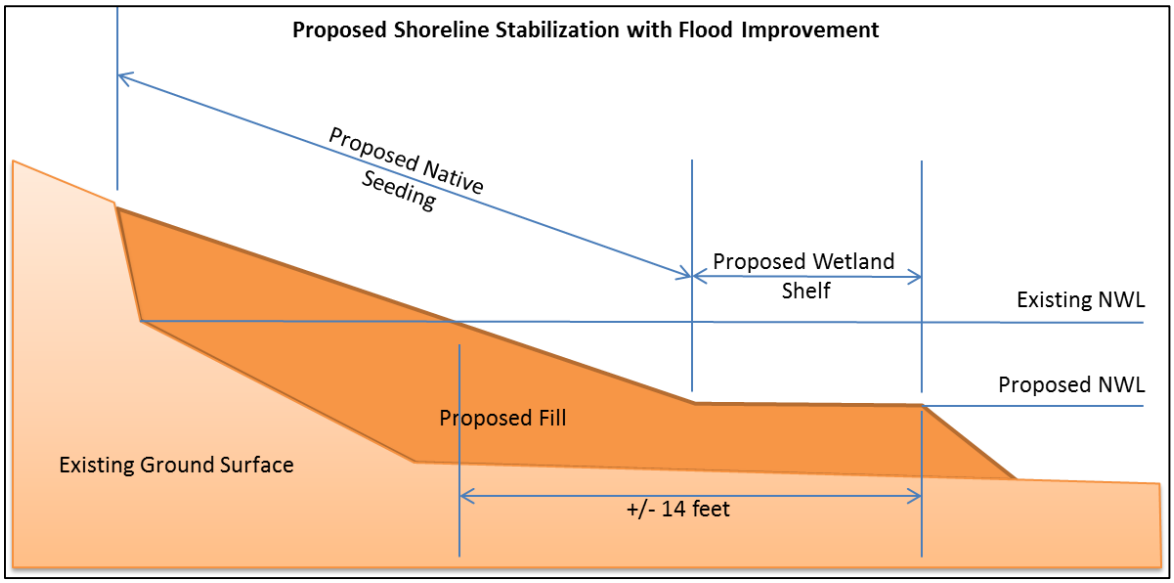

Figure 13. Alternative 7A Bank Stabilization Schematic

7.7.2 Alternative 7B

If a wetland shelf is not acceptable to the adjoining residents, it is recommended to use riprap for shore protection. Dredging a deeper open water area in the pond would also be recommended however; in this case the spoil material would have to be disposed of offsite. The Phase 1 – Option A: Typical Riprap Bank Stabilization Detail provided in the Toberman plans would be representative of the recommended riprap treatment. A screen capture of the detail is provided below Figure 14.

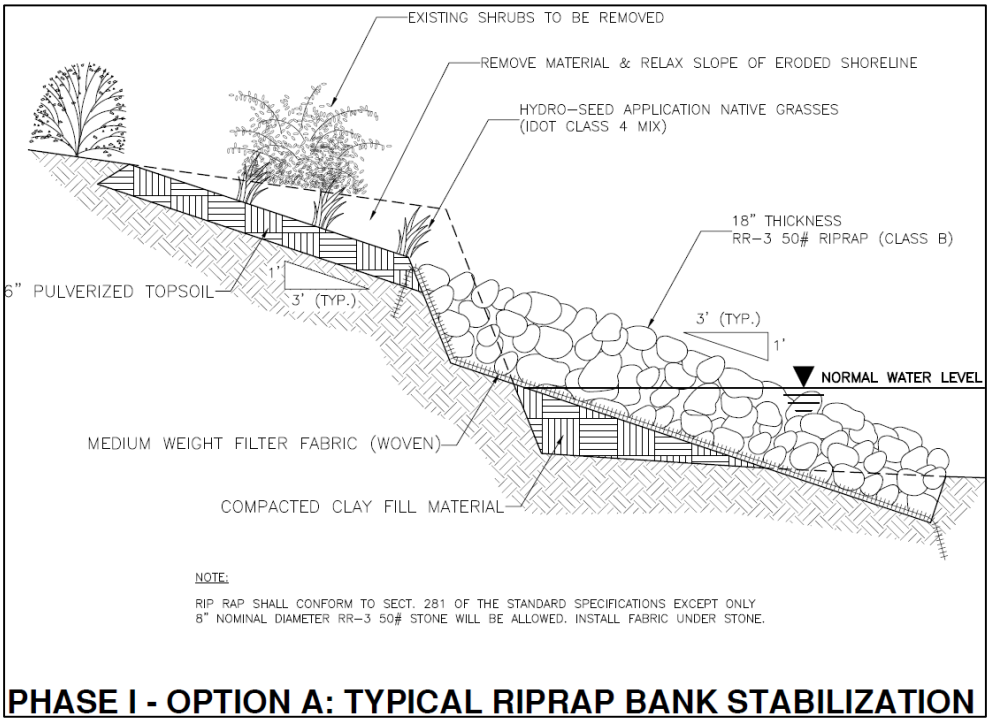

Figure 14. Alternative 7A Bank Stabilization Schematic

CHAPTER 8 JACKSON DRIVE & LAKESIDE VILLAS STUDY AREA

The Village retained CBBEL in 2009, following the September 2008 storm event, to address flooding problems in The Jackson Drive and Lakeside Villas study area. CBBEL performed an analysis to identify the cause of the flooding problems and improvement alternatives to help mitigate flooding. This CBBEL study was summarized in the "Lakeside Villas / Jackson Drive Flood Analysis" report dated October 2009. This Chapter is intended to summarize the findings in that report.

8.1 JACKSON DRIVE & LAKESIDE VILLAS PROBLEM DESCRIPTION

Nearly 8 inches of rain fell over the Village from September 12th to September 14th in 2008. In general, storm sewers were filled to capacity and surcharged, inundating streets and yards. The Lakeside Villas and Jackson Drive residential areas were the most affected areas in the Village, where homes and businesses were inundated or isolated due to flooding up to several feet deep. During the event, the Wheeling Public Works Department staff worked continuously for 3 days to pump water at both locations to minimize the flooding, however, the stormwater volume far exceeded the available pumping capacity. The September 2008 storm event was one of the largest in recent history for some of the communities in northeastern Illinois. Prior to this most recent storm event, there had been other storm events that produced significant flooding within the watershed. The area began to be significantly affected by flooding in the 1970's. The extent of the September 2008 inundation within the problem study area is shown on Exhibit 22.

8.2 JACKSON DRIVE & LAKESIDE VILLAS WATERSHED DESCRIPTION

The Lakeside Villas and Jackson Drive flooding areas are located within the Village; however the watershed drains areas from the Villages of Arlington Heights, Buffalo Grove, and unincorporated Cook County. The watershed up to Schoenbeck Road includes the following developments:

- Tahoe Village
- Malibu Cove Subdivision
- Mallard Lake (Zale's Subdivision)
- Lakeside Villas
- Jackson Drive
- Cambridge subdivision of Arlington Heights
- Cambridge subdivision of Buffalo Grove (University Drive area)

The study area extends downstream to Elmhurst Road where a drain tile from Jackson Drive connects to the storm sewer system. Approximately 540 acres are tributary to the drain tile prior to connecting to the storm sewer at Elmhurst Road.

8.3 JACKSON DRIVE & LAKESIDE VILLAS STUDY METHODOLOGY

The stormwater system of the study area is composed of detention basins, interconnecting storm sewer systems and overland flow paths. The flooding analysis was completed using information obtained from the Village of Wheeling (permit documents, aerial 1-foot topography and surveyed storm sewer information), public meetings feedback, received flood questionnaires, and the hydrologic and hydraulic modeling program XP-SWMM.

Bulletin 70 rainfall data and the September 2008 rainfall data were used in this study to evaluate project alternatives. The model was calibrated to the September 13-14, 2008 storm event using high water marks (HWM) provided by the Village. Within the study area, the 100-year flood elevation ranges from 0.2 feet to 1.7 feet higher than the September 2008 storm event.

8.4 JACKSON DRIVE & LAKESIDE VILLAS PROPOSED CONDITIONS

A combination of storage areas and conveyance improvements will be necessary to help address the flooding at Jackson Drive and Lakeside Villas. An option to minimize flooding issues within Lakeside Villas and Jackson Drive would be to increase the available storage within the existing basins by lowering the Normal Water Level (NWL) and/or excavating the basins. By lowering the connecting storm sewers to the extent feasible as allowed by downstream conditions, additional gravity drained storage can be created. Based on this approximate assessment, and after discussions with Village staff, lowering two existing detention basins located within the Tahoe Village development was evaluated to determine the benefits of this option.

In addition to considering the possibility of altering existing detention basins, four different locations were identified where new stormwater storage volume can be created by excavation, and what conveyance improvements would be necessary to convey the stormwater in and out of the storage facility. The locations of the alternatives sites are shown on Exhibit 23, and the alternatives are listed in the next sections.

8.4.1 Alternative 8 – Jackson Drive Basin

This alternative storage basin is located within two adjacent parcels, a developed property and an adjacent vacant lot on Jackson Drive.

8.4.2 Alternative 9 – Increase Longtree Basin

This alternative storage basin is located north of Hintz Road between Schoenbeck Road and Longtree Drive. The Cook County Highway Department Right of Way (ROW) setback reduces the available footprint for storage on the site.

Concept storage volumes and conveyance descriptions for the alternatives are summarized in the Table 12 below. Assumptions used in determining the storage volumes include:

- Pumped discharge to dewater basins
- 10-foot setbacks from the property lines to the side slopes
- Cook County stormwater facility setbacks from the Hintz Road right-of-way
- 4:1 side slopes
- Suitable groundwater and geotechnical conditions
- No major utility conflicts

Table 12. Summary of Potential Storage Volumes for Alternative Sites – Jackson Drive & Lakeside Villas Study Area

Alternative	Description	NWL[1]	HWL[2]	Gravity Outlet	Bounce	Storage Increase	Total Storage
		(ft)	(ft)	(ft)	(ft)	(ac-ft)	(ac-ft)
8	Jackson Dr. Basin	642	662	658	20	**20**	20
9	Incr. Longtree storage 14 ft deeper	638	658	654	20	**18**	21.5

[1] Normal Water Level

[2] High Water Level

8.5 JACKSON DRIVE & LAKESIDE VILLAS RESULTS SUMMARY

Seven alternatives were studied in detail to minimize flooding at Lakeside Villas and Jackson Drive. The alternatives are summarized below, and include:

- Tahoe Basins Modification
- Alternative 8 (Proposed Jackson Drive Basin and Conveyance Improvements) with Tahoe Basins Modification
- Alternative 8 (Proposed Jackson Drive Basin and Conveyance Improvements) without Tahoe Basins Modification
- Alternative 9 (Longtree Basin Expansion and Conveyance Improvements) with Tahoe Basins Modification
- Alternative 9 (Longtree Basin Expansion and Conveyance Improvements) without Tahoe Basins Modification
- A combination of Alternatives 8 and 9
- Alternative 8 with two 45”x29” elliptical pipes from Jackson Drive to the Longtree Basin

Tahoe Basins Modification: This alternative proposed to lower the NWL of Tahoe Basins #1 and #2 to increase the available storage upstream of Lakeside Villas and reduce the flow rate into Lakeside Basin #4. The alternative by itself reduces flood elevations at Lakeside Villas by approximately 0.5 feet and does not benefit Jackson Drive.

Alternative 8: Proposed Jackson Drive Basin and Conveyance Improvements. This alternative reduced flooding at Lakeside Villas by more than 2 feet. However, the proposed basin would overtop during the September 2008 event and while the flood elevations at Jackson Drive are reduced, they are not reduced substantially.

Alternative 9: Longtree Basin Expansion and Conveyance Improvements. This alternative reduced flooding at Lakeside Villas by less than 2 feet. The proposed basin is shown overtopping with the increased conveyance. Similarly, the flood elevations at Jackson Drive are reduced, but they are not reduced substantially.

Alternative 8 and 9: The storage volume concepts for Alternative 8 and Alternative 9 were combined. Alternatives 1 and 4 are shown on Exhibits 24A and 24B.

45”x29” elliptical pipes from Jackson Drive to Longtree Basin: The flooding at Lakeside Villas is significantly improved by adding storage at Tahoe Village and at a new basin (Alternative 8 with Tahoe). However, Jackson Drive flooding is not measurably improved by either Alternative 8 or Alternative 9 alone. Increased conveyance appears to have a more significant benefit to Jackson Drive. Therefore, adding two large elliptical pipes, 45”x25”, from Jackson Drive to the Longtree Basin were evaluated. This had a measurable benefit at Jackson Drive. The issue with this alternative is that it would need to tie into the 18 inch drain tile and surcharging would occur at the Longtree Basin. The high water elevation would not be affected because of the volume that would be stored at the Alternative 8 storage basin, but it is not a preferred hydraulic design.

A summary of the opinion of probable construction costs and associated flood reductions for all six alternatives is included in the Table 13 below. No land acquisition costs are included.

Table 13. Summary of Potential Storage Volumes for Alternative Sites – Jackson Drive & Lakeside Villas Study Area

Alternative Description	Opinion of Probable Construction Cost	Lakeside Villas		Jackson Drive		Comments
		Reduction	Elevation	Reduction	Elevation	
	($)	(feet)	(feet)	(feet)	(feet)	
Alternative 8 w/o Tahoe Modifications	$5,600,000	-1.70	669.16	0.01	663.54	Jackson Drive sees little benefit
Alternative 8 with Tahoe Modifications	$8,600,000	-2.45	668.41	-0.03	663.50	Jackson Drive sees little benefit
Alternative 9 w/o Tahoe Modifications	$5,400,000	-1.40	669.46	-0.01	663.52	Least flood reductions of all alternatives
Alternative 9 with Tahoe Modifications	$8,400,000	-1.69	669.17	-0.08	663.45	Jackson Drive sees little benefit
Alternative 8 and 9 with Tahoe Modifications	$14,000,000	-2.96	667.90	-0.50	663.47	Most expensive
Alternative 8 and two 45"x29" S.S. with Tahoe Modifications	**$9,300,000**	**-3.02**	**667.84**	**-0.96**	**662.57**	**Best in terms of flood reductions.** **Cook County may have concerns about increasing flows to the drain tile**

8.5 JACKSON DRIVE & LAKESIDE VILLAS CONCLUSION

All alternatives have a significant benefit to Lakeside Villas, but only the last two listed in Table 13 have a measurable benefit to Jackson Drive. However, the costs associated with the last two alternatives are the highest of the six. Significant easements will be required for all conveyance improvements, and land acquisition is not included in the costs above. **Alternative 8 with two 45”x29” pipes (to the Longtree Basin) appears to offer the best balance of benefits and costs, but could be difficult to permit with Cook County or MWRD**.

CHAPTER 9 JEFFREY AVENUE & MANCHESTER DRIVE STUDY AREA

This study area is located between Jeffrey Avenue and Manchester Drive west of Milwaukee Avenue and east of Wolf Road. This study area was analyzed due to frequent street flooding from lack of adequate storm sewer drainage.

9.1 JEFFREY AVENUE & MANCHESTER DRIVE ANALYSIS APPROACH

Hydraflow sewer modeling was used to analyze a proposed sewer system to drain the problem area. Hydraflow is a sewer analysis model that uses the Rational Method (hydrology) to calculate runoff and Manning's equation (hydraulics) to calculate the resultant depth. Due to the limited sewer data for the Jeffrey Avenue and Manchester Drive study area, an existing conditions analysis was not performed. A proposed storm sewer network was designed for the study area based on the 10-year storm event assuming no existing storm infrastructure.

9.2 JEFFREY AVENUE & MANCHESTER DRIVE EXISTING CONDITIONS

Overland flow in the study area generally drains north to south and east to west along the roadways. The study area generally has well defined overland flow routes with the exception of one depression at the southeast corner of the study area along Manchester Drive. Intermittent lateral sewers drain south to a trunk sewer flowing east on Manchester Drive beginning at Crescent Drive and draining to the Des Plaines River as seen in Exhibit 25. A townhouse complex to the south also drains to the trunk sewer along Manchester Drive. The drainage area from the townhouses appears to be detained; therefore the flow from this area is assumed to be minimal. The trunk sewer is a 42-inch pipe as it exits the study area collecting flow from storm sewers along Milwaukee Avenue before its ultimate outlet to the Des Plaines River.

Figure 15. Jeffery Avenue & Manchester Drainage Area Map

The 100-year tailwater from the Des Plaines River at the 42-inch trunk sewer outlet location is elevation 641.5, and the 10-year tailwater is elevation 639.3. The FEMA 100-year regulatory floodplain in the study area is depicted in Figure 15. The bottom of the hydraulically connected depression at the intersection of Manchester Drive and Park Avenue is approximately at elevation 639.5, resulting in 2 feet of flooding. There are 2 homes mapped in the 100-year regulatory floodplain adjacent to the depression. According to the Wheeling 1-foot topography, the overflow elevation is approximately equal to the 100-year elevation of 641.5. Local flooding due to lack of storm sewer conveyance at the outlet can also pose a flooding risk along with riverine flooding. The next section discusses the appropriate sewer design for the study area.

9.2 ALTERNATIVE 10 - JEFFREY AVENUE & MANCHESTER DRIVE PROPOSED CONDITIONS

The current standard for residential stormwater design is that that 10-year storm event runoff be conveyed entirely within storm sewers, and overland flow routes are designed to handle any excess runoff up to the 100-year storm event. A proposed conditions Hydraflow model was developed to design a new storm sewer system for the study area based on this standard. Storm sewers in the proposed condition were designed to flow in the direction of existing overland flow routes. Catch basins for the proposed sewer network were designed to collect overland stormwater along the streets approximately every 300 feet. 29 subbasins were delineated to drain to proposed catch basins. Similar to the existing conditions, a proposed trunk sewer flows west to east along Manchester and outlets to the Des Plaines River. The outlet storm sewer is a 72-inch pipe and is proposed with a backflow preventer to minimize riverine flooding and tailwater effects on the proposed sewer system. Exhibit 26 shows the proposed storm sewer system proposed in Alternative 10.

Alternative 10 is recommended.

The estimated cost of Alternative 10 is $9.0 million

CHAPTER 10 SUNRISE DRIVE STUDY AREA

The Sunrise Drive study area is located just east of Wolf Road between Center Avenue and Highland Avenue. This study area was analyzed to improve a depressional flooding area just west of the dead end on Sunrise Drive. The depression and the surrounding houses are located in the Buffalo Creek 100-year floodplain.

10.1 ANALYSIS APPROACH

For this analysis, a stormwater calculation was used to calculate existing flowrates into the depression. The Rational Method Equation was used to calculate the flowrate to the existing problem area. The Rational Method calculates flowrate based on land type, rainfall intensity, and drainage area for areas less than 250 acres.

10.2 SUNRISE DR FLOOD ANALYSIS

The drainage area to the depressional flooding location is 7.1 acres. Runoff generally flows northeast to southwest collecting in a depression in the rear yards of houses along Wolf Road as seen in Exhibit 27. Based on the existing conditions analysis for this area, the 10-year maximum flowrate to the depression is 13.9 cfs, and the 100-year flowrate is 23.6 cfs. Since there is no existing sewer outlet for this depression, it can take a significant amount of time for the depression to dry following a rain event. In addition to the local flooding in the Sunrise Drive study area, riverine flooding from Buffalo Creek also presents a risk to the homes in the study area. The 100-year regulatory floodplain elevation at this location is 642.6. Based on the 1-foot topography, a large porition of the drainage area seen in Figure 16 is below the 100-year floodplain elevation in Buffalo Creek. According to the FEMA FIRM, there are 14 homes in the study area mapped in the 100-year floodplain.

Figure 16. Sunrise Drive Flooding Problem

10.3 ALTERNATIVE 11 – SUNRISE DRIVE PROPOSED RELIEF SEWER

This proposed condition analysis addresses the local depressional flooding near Sunrise Drive and does not provide protection from Buffalo Creek riverine flooding. As seen in Exhibit 28, Alternative 11 proposes to drain the 10-year flow from the depression with a 24-inch relief sewer. The relief sewer is proposed with backflow prevention at the outlet to protect the depression from tailwater effects in Buffalo Creek.

Alternative 11 is recommended because it provides relief to a depressional flooding area that otherwise can take days to drain.

The estimated cost of Alternative 11 is $283,000

CHAPTER 11 OLIVER WENDELL HOLMES MIDDLE SCHOOL STUDY AREA

Oliver Wendell Holmes Middle School is located at the southeast corner of Highland Avenue and Wolf Rd. This study area is just south of the Sunrise Drive study area discussed in Chapter 10. The area surrounding the middle school is located in the Buffalo Creek 100-year regulatory floodplain, but the school building sits on high ground above the 100-year floodplain as seen in Figure 17 and Exhibit 29. During large storm events, Village Staff has witnessed local flooding at the intersection of Highland Avenue and Wolf Road.

Figure 17. Oliver Wendell Holmes Flood Map

The flooding within this area is primarily due to Buffalo Creek floodplain inundation. The ball fields provide significant floodplain storage, but the school building is above the BFE and has not been reported to flood. It is critical that floodplain storage be maintained as the Wolf Road improvements are implemented.

CHAPTER 12 ARLINGTON CLUB POND STUDY AREA

The Arlington Club townhouse complex is located in the northwest area of the Village, east of Buffalo Grove Road and south of the Horcher Farm property. There are two equalized ponds in the Arlington Club subdivision east and west of Arlington Drive connected by twin 48-inch pipes. Drainage to these ponds consists of a 67.5-acre area within the Arlington Club subdivision and a 171.1-acre area from Buffalo Grove to the west. Drainage from the Village of Buffalo Grove flows west to east and is conveyed through a culvert crossing at Buffalo Grove Road to the Arlington Club west pond. A delineation of the drainage area to the ponds is included in Exhibit 30.

The outlet for the east pond is a 33-inch pipe which drains to a small channel into Buffalo Creek. During large storm events, the east pond often exceeds its capacity overtopping Arlington Club road and flowing into the parking lot to the east. From here water flows north off the parking lot and into the outlet channel, eroding the grassed sidelope. If this erosion continues, the parking lot is at risk of deteriorating and failing along the north edge. Figure 18 illustrates the pond overtopping problem.

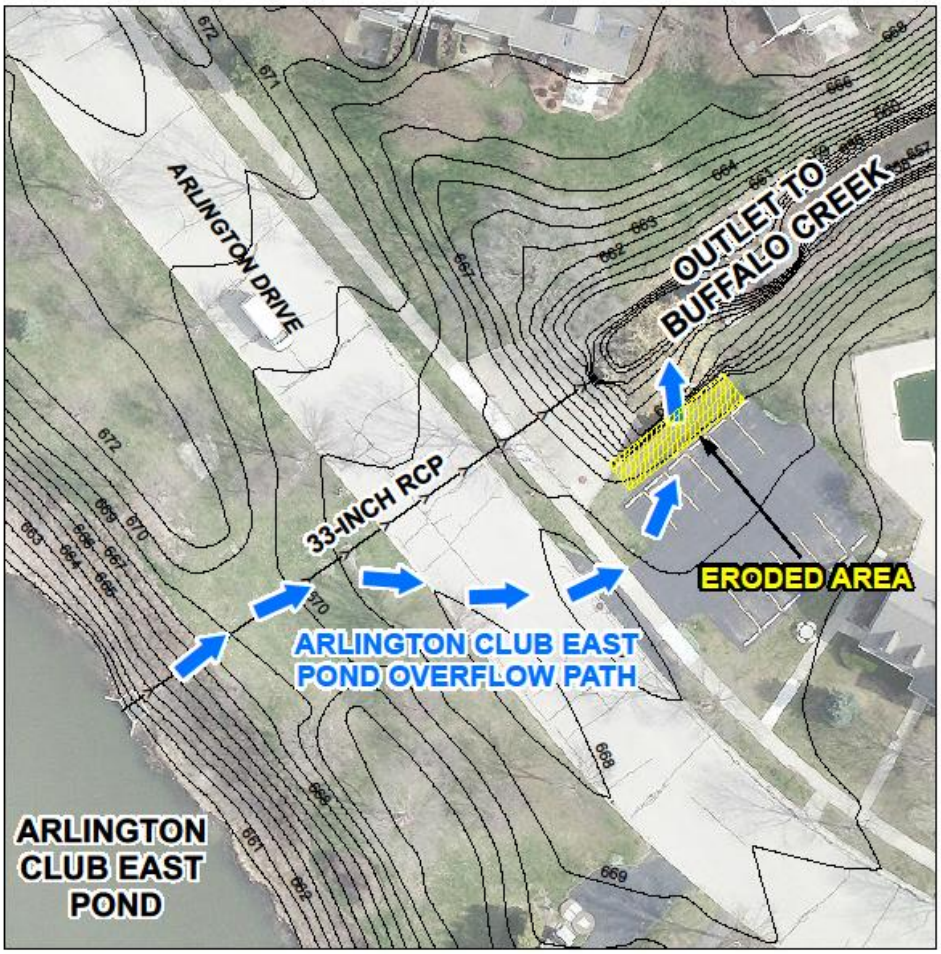

Figure 18. Arlington Club Pond

12.1 ALTERNATIVE 12 – ARLINGTON CLUB POND PROPOSED SPILLWAY

It is recommended that a reinforced spillway be constructed on the east side of the parking lot. A curb is proposed along the north edge of the parking lot to divert the water east into the spillway. A schematic of the proposed improvement can be seen in Exhibit 31.

Alternative 12 is recommended to prevent erosion and potential damage to the Arlington Club Parking lot.

The estimated cost of Alternative 12 is $117,000

CHAPTER 13 VALLEY STREAM DRIVE STUDY AREA

The Valley Stream Drive Study Area is located in the northwest portion of the Village, northwest of Elmhurst Road and Dundee Road. Flooding in this study area occurs when Buffalo Creek exceeds its channel banks and overtops into the residential area to the south. The flooded area is mapped regulatory 100-year regulatory floodplain in the FIRM. Therefore, at-risk houses in this study area that have mortgages are required to pay flood insurance.

As discussed in Chapter 2, CBBEL completed the Detailed Watershed Plan for the Lower Des Plaines River Watershed (DWP) for the MWRD. Included in the DWP was an analysis of the Des Plaines River through Cook County and all the tributary streams. Unsteady HEC-RAS modeling was used to analyze the existing conditions for each sub-watershed and propose improvement projects to achieve benefits on a watershed level. Buffalo Creek was analyzed as part of the DWP and a detailed mapping of the 100-year floodplain was performed. A map including the FEMA 100-year regulatory floodplain and the MWRD 100-year floodplain and the associated at-risk structures in the Valley Stream Drive study area is included as Figure 19.

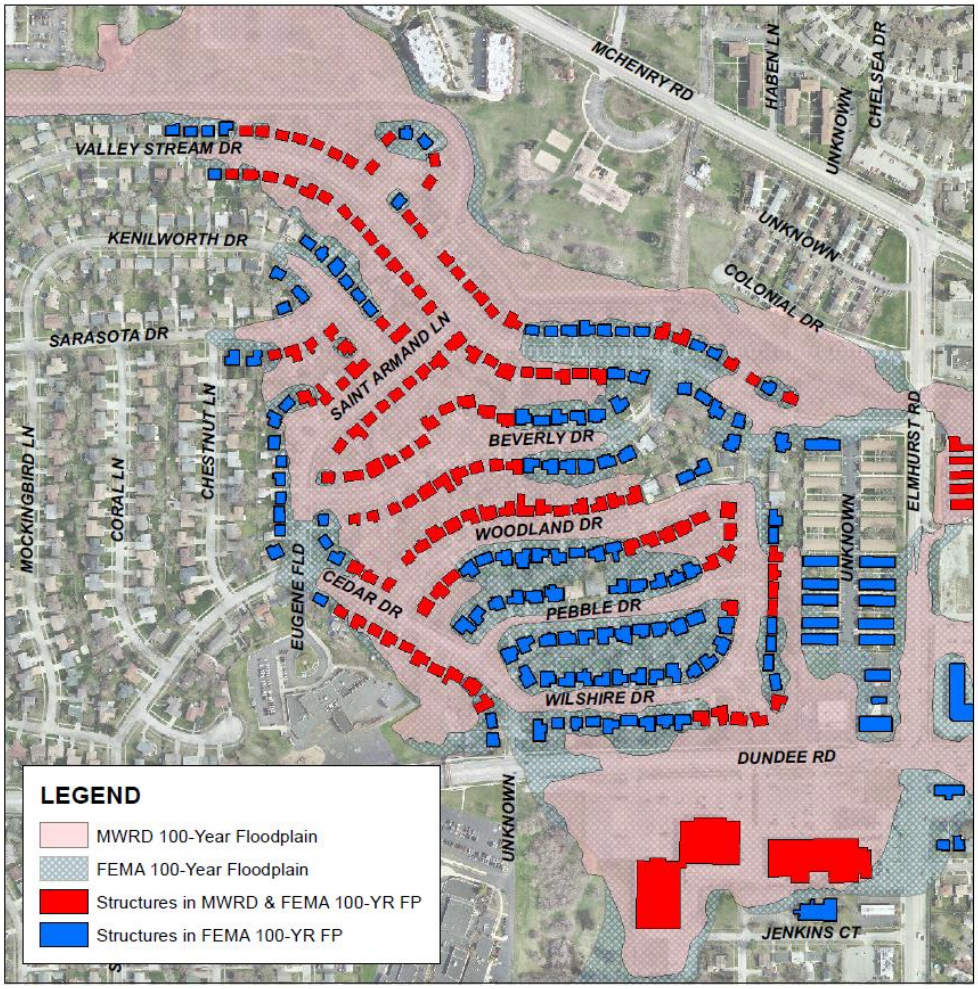

Figure 19. Valley Stream Drive Flood Map

As seen in the Figure 19 and Exhibit 32, the floodplains developed from both studies present a significant risk to low structures in the study area. A proposed improvement for the flooding is presented in the next section.

13.1 ALTERNATIVE 13 – VALLEY STREAM DRIVE / BUFFALO CREEK PROPOSED STORAGE AND FLOODWALL

Alternative 13 is a large scale project originally proposed as part of the MWRD DWP to provide benefits along Buffalo Creek through the Village. The project would include providing 310 acre-feet of flood storage volume on the east side of Buffalo Creek within the privately owned Horcher Farm Property located south of Aptakisic Road and east of Buffalo Grove Road in the Village with approximately 4,125 feet of floodwall (to provide freeboard). This alternative results in a reduction in flood elevations from the projects site to the confluence with the Des Plaines River and would remove 106 structures from the MWRD 100-year inundation area. Specifically, this project removes all structures currently in the Valley Stream Drive study area 100-year regulatory floodplain. Exhibit 33 shows the improvements proposed as part of Alternative 13

Alternative 13 is not recommended as part of the SWMP due to its the high cost. The Village requires outside partners and sources of funding for a project of this magnitude.

The estimated cost of Alternative 13 is $61.6 million.

CHAPTER 14 BUFFALO CREEK STREAMBANK STABILIZATION PROJECT

In 2005, the Village retained CBBEL to perform a comprehensive streambank stability study of Buffalo Creek within the corporate limits, and the comprehensive study of the stability of the stream bank and stream bed of Buffalo Creek was completed in July 2005 (Buffalo Creek Comprehensive Study Stream Bank/Stream Bed Stability).

The watershed area of Buffalo Creek (EPA Waterbody Identification Code ILGL30, Segment GS01) draining through the study area is approximately 30.3 square miles. The watershed generally consists of urbanized areas downstream of the Buffalo Creek Reservoir and mixed urban and rural areas upstream of the reservoir. The Buffalo Creek Watershed encompasses portions of Lake Zurich, Kildeer, Deer Park, Long Grove, Palatine, Unincorporated Lake County, Arlington Heights, Buffalo Grove, Wheeling, and Unincorporated Cook County. Most of the watershed was developed prior to the implementation of stormwater Best Management Practices implemented along streams. As a result, large increases in the volume and velocity of stormwater runoff entering the reach occurred. The Buffalo Creek Flood Reservoir, releasing stormwater after large precipitation events, provides additional water. Due to frequent, short-duration heavy precipitation events which often occur during this period, the creek can be flashy. These frequent flood events and the long continuous release of water from the reservoir are major factors in the erosion of the stream banks.

The watershed is substantially developed, with relatively low sediment yields expected through tributary storm sewer systems; therefore it is assumed that much of the present sediment within the channel is contributed by bank erosion. The major source of stream pollution is from the sedimentation that follows the geotechnical failure of the near vertical side slopes of the streambank. This erosion problem is exacerbated by the predominance of turf grass and exotic woody shrubs, and a lack of herbaceous vegetation on the vertical banks.

Based on the Comprehensive Study, several bio-engineering and structural techniques were recommended to stabilize the streambanks. The different techniques were chosen according to the severity of the erosion and the most cost effective methods available to address it. The stabilization techniques that were chosen were based on three degrees of severity of erosion/property encroachment described in the Buffalo Creek Comprehensive Stream Bank/Stream Bed Stability Study (Appendix 3), where stream bank erosion is divided into 3 categories: slight, moderate, and severe.

- Slight Erosion: The effort required to stabilize or improve the condition of the bank is minimum. Such activities may include the removal of existing non-native vegetation and urban waste and debris and possibly implementing bio-engineered techniques.

- Moderate Erosion: Stabilization efforts include those items listed for slight erosion as well as structural techniques required to arrest the undercutting of the banks.
- Severe Erosion: Stabilization efforts will require predominantly structural techniques because of the severity of the cut and the imminent threat to adjacent infrastructure.

The bio-engineering and structural techniques that are recommended to stabilize the streambanks are as follows: Vegetated Gabion Baskets, Stone Toe with Vegetated Slopes, Debris Removal, and Riparian Enhancement.

- Vegetated Gabion Basket: This structural technique is targeted for use in areas of moderate and severe erosion as a structural component to rebuild a slope where there is not enough land available to regrade the slopes. The cages will be filled with both rock, topped with a soil/aggregate mix, and seeded with native vegetation to provide stormwater run-off treatment and to mask the baskets. The inside of the basket will be lined with filter fabric to prevent soil loss. Correct installation of gabion baskets involves some excavation of the stream bank to prevent protrusion of the gabion into the bank full channel.
- Stone Toe with Vegetated Slope: This bio-engineered technique will be used where bank erosion is slight to severe, but not where re-grading will enter a utility easement and/or private property. This technique involves the re-grading of the streambank and placement of stone up the slope to the level of the stream-forming flow. Emergent plugs will be planted within the stream channel to provide aquatic habitat. Plantings will placed in the transition zone between the stone toe and the regraded slope. The native vegetation will provide additional treatment of stormwater run-off will masking the stone toe.
- Debris Removal: Debris removal will occur where erosion is not a major problem, but garbage has accumulated and is impeding the flow of water.
- Riparian Enhancement: Riparian enhancement entails the use of slight grading to reconnect the floodplain with Buffalo Creek, removing the invasive vegetation, and seeding and planting deep-rooted native vegetation. Riparian enhancement is utilized to provide additional treatment of stormwater run-off and to improve habitat quality.

Since the original study was completed, a number of reaches have been stabilized by the Village. Phase 1 occurred along the section of Buffalo Creek that follows Valley Stream Drive during 2008-2010. Also, when the Heritage Park Flood Control Project was constructed by MWRD, the section between just south of Dundee Road and Jeffery Avenue was redone. The costs associated with those reaches were removed from the 2005 study recommendations. Table 14 below summarizes the remaining reaches in need of stabilization and the estimated costs.

Table 14. Summary of Buffalo Creek Stabilization Treatments

Reach	Length	Erosion	ACTION (TREATMENT)	ESTIMATE OF PROBABLE COST	PRIORITY
1	3,100	slight	none	0	Low
2	1,000	moderate	Regrade, Stone toe, Vegetate Debris Removal	223,307	Medium
3	750	moderate	Gabion, Regrade, Stone toe, Vegetate, Debris Removal, Riparian Enhancement	199,221	Medium
4	1,700	severe	Gabion, Regrade, Stone toe, Vegetate, Debris Removal, Riparian Enhancement	**completed by Village in 2010**	High
5 & 6	650	moderate / severe	Gabion, Regrade, Stone toe, Vegetate, Debris Removal	**completed by Village in 2010**	High
7	200	moderate	Gabion, Regrade, Stone toe, Vegetate, Debris Removal	**completed by Village in 2010**	High/Medium
8	750	slight/ moderate	Gabion, Regrade, Stone toe, Vegetate	**completed by Village in 2010**	High/Medium
9	850	slight/ moderate	Regrade, Stone toe, Vegetate	186,889	Medium
10 & 11	950	severe	Gabion, Regrade, Stone toe, Vegetate, Debris Removal	533,079	High
12	1,200	slight	Gabion, Regrade, Stone toe, Vegetate	233,008	High/Low
13	850	slight	Gabion,Regrade, Stone toe, Vegetate,Debris Removal	57,028	High
14-16	1,750	slight	Debris Removal, Riparian Enhancement	94,588	Low
17 - 19	750	moderate / severe	Gabion,Regrade, Stone toe, Vegetate, Debris Removal	279,754	High
20	650	moderate / severe	Gabion, Riparian Enhancement	102,378	High
21	600	moderate / severe	Regrade, Stone toe, Vegetate,Debris Removal, Riparian Enhancement	**completed by MWRDGC in 2014**	High
22 &23	1,100	moderate / severe	Gabion, Regrade, Stone toe, Vegetate, Riparian Enhancement	**completed by MWRDGC in 2014**	Low
24	350	slight	Debris Removal	980	Medium
25	1,000	slight	Regrade, Stone toe, Vegetate, Debris Removal, Riparian Enhancement	215,901	Low
26	1,600	slight	Regrade, Stone toe, Vegetate	168,874	Low
27&28	1,400	slight/ moderate	Gabion, Regrade, Stone toe, Vegetate, Debris Removal, Riparian Enhancement	642,390	High
29	200	slight	Regrade, Stone toe, Vegetate	21,091	Medium
30 & 31	700	slight	Lined Apron	1,208	High
32	3,100	slight	Sill and Pool Riffle Complexes	33,810	High
TOTAL	**25,200**		**STABILIZATION ESTIMATE**	**$2,994,000**	
			SURVEYING, ENGINEERING, & WETLAND PERMITTING	**$599,000**	
			TOTAL PROJECT ESTIMATE	**$3,593,000**	

CHAPTER 15 FINANCING OF STORMWATER IMPROVEMENT PROJECTS

The Village intends to utilize the SWMP as a guide to address stormwater issues by selecting improvement projects that mitigate existing problems. In order to fund recommended stormwater projects, the Village has subsequently established a stormwater utility fee. The concept of the stormwater utility fee is to collect from both residents and businesses based on the amount of impervious area. Other communities in the area have recently been successful in establishing a stormwater utility fee to help fund stormwater improvement related projects, including: Rolling Meadows, Downers Grove, Highland Park, and others.

As previously mentioned, the stormwater utility fee is based on impervious area on a given parcel. The impervious area is directly related to the amount of stormwater runoff produced by a specific lot which flows downstream through sewers and overland flow to downstream properties and receiving streams. An equivalent residential unit (ERU) was developed to help quantify the amount of runoff leaving a property and is the basis for the amount paid through the utility fee on a monthly basis. The ERU is calculated based on the average impervious area on a single family residential parcel. All single family residential parcels in the Village will be charged at a rate for one ERU per month. Impervious areas for businesses and industries in the Village will be calculated to determine the number of ERUs within a specific non-residential parcel. The Village has performed a calculation to determine that one ERU is equivalent to 3,000 square feet. This is the average amount of impervious area for an average parcel lot size of 6,500 square feet. The impervious area for all parcels in the village is established by the Village through the use of geographic information systems (GIS) analysis, aerial photographs, mapping information, site examination and other available information, and will be periodically updated based on available information.

CBBEL has recommended improvement projects in the SWMP and developed estimated implementation costs for each project. The sum of all recommended improvement projects in the SWMP is $50.1 million. A comprehensive summary table is provided as Exhibit 34. The table provides the cost for all improvement projects and also provides a project classification for all recommended stormwater improvement projects. The project classification was developed using criteria developed by Village staff to assess the most critical stormwater issues. The project classification should serve as a guide for selection of improvement projects. Table 15 describes the criteria that define the project classification. In order to begin funding these projects, the Village passed Ordinance #4966 which generally states that, starting January 1, 2016, the monthly fee assessed for one ERU is $2. The Village has indicated that the fee is subject to review and change on a yearly basis depending on the budget for improvement projects of the following year. The stomwater utility fees will be used to fund operation, maintenance, expansion and rehabilitation of the stormwater infrastructure as deemed appropriate by the Village board.

Table 15. Project Classification Criteria

Project Classification	Criteria
"High"	Improvement project provides benefits for structures within the existing flood area - cost of project does not exceed $100,000 per structure benefitting from the project
	Reduces flooding along arterial roads providing life and safety access routes
	Project located in area of planned construction project (i.e. roadway construction)
	Project may receive a “High” ranking if it originally falls under a lower ranking, but the HOA contributes a significant amount towards the cost
"Medium"	Improvement project provides benefits for structures within the existing flood area – cost of improvement between $100,000 and $350,000 per home benefitting from project
	Project reduces flooding in areas of previous vehicle damage or loss
	Project may receive a “Medium” classification if it originally falls under a lower classification, but the HOA contributes a significant amount towards the cost
	Minimizes the use of significant staff resources (i.e. pumping)
"Low"	Improvement project provides benefits for structures within the existing flood area – cost of improvement between $100,000 and $350,000 per home benefitting from project
	Project reduces flooding in areas of previous vehicle damage or loss
	Project may receive a “Medium” classification if it originally falls under a lower classification, but the HOA contributes a significant amount towards the cost
	Minimizes the use of significant staff resources (i.e. pumping)

0 800 1,600 3,200
Feet
1 inch = 800 feet

SW AREA:
324 RESIDENTIAL SFHA BUILDINGS ELIGIBLE FOR POTENTIAL FLOODPLAIN REMOVAL

LEGEND

- SFHA BUILDINGS WITHIN BOTH MWRD & FIRM FLOODPLAINS (308 BUILDINGS)
- SFHA BUILDINGS WITHIN FIRM FLOODPLAIN ONLY (660 BUILDINGS)
- MWRD 100-YR FLOODPLAIN
- EFFECTIVE FIRM 100-YR FLOODPLAIN
- WHEELING TOWN BOUNDARY

CHRISTOPHER B. BURKE ENGINEERING LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=800'
GIS USER:	MBURKE
MODEL:	ArcGIS 10.1
FILE NAME	N:\Wheeling\130631\GIS\Exhibits\Report Exhibits\EX1 - Comparison of Buffalo Creek Effective FIRM & MWRDGC Study 100-Year Floodplain.mxd
PLOT DATE	12/15/2014

TITLE:
COMPARISON OF EFFECTIVE FIRM & MWRD STUDY 100-YEAR FLOODPLAINS ALONG BUFFALO CREEK IN WHEELING, IL

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 1

0 250 500 1,000
Feet
1 inch = 250 feet

SB 1
AREA = 4.1AC
CN = 83
Tc = 24

SB 2
AREA = 6AC
CN = 83
Tc = 26

SB 3
AREA = 6.5AC
CN = 83
Tc = 29

SB 4
AREA = 9.2AC
CN = 83
Tc = 22

SB 5
AREA = 3.8AC
CN = 83
Tc = 20

SB 6
AREA = 2.7AC
CN = 83
Tc = 11

SB 7
AREA = 6.3AC
CN = 83
Tc = 26

SB 8
AREA = 5.6AC
CN = 83
Tc = 25

SB 9
AREA = 6.4AC
CN = 83
Tc = 27

SB 10
AREA = 4.6AC
CN = 83
Tc = 21

SB 11
AREA = 3.3AC
CN = 83
Tc = 15

SB 12
AREA = 3.3AC
CN = 83
Tc = 22

SB 13
AREA = 12.6AC
CN = 83
Tc = 32

SB 14
AREA = 6.4AC
CN = 83
Tc = 14

SB 15
AREA = 1.8AC
CN = 83
Tc = 12

SB 16
AREA = 5.3AC
CN = 83
Tc = 12

SB 17
AREA = 1.2AC
CN = 83
Tc = 14

SB 18
AREA = 3.1AC
CN = 83
Tc = 17

SB 19
AREA = 7.6AC
CN = 83
Tc = 17

SB 20
AREA = 9.3AC
CN = 83
Tc = 19

SB 21
AREA = 2.1AC
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Tc = 14

SB 22
AREA = 3.4AC
CN = 83
Tc = 17

SB 23
AREA = 4.4AC
CN = 83
Tc = 14

SB 24
AREA = 3.1AC
CN = 83
Tc = 19

SB 25
AREA = 9.3AC
CN = 84
Tc = 28

SB 26
AREA = 11.1AC
CN = 92
Tc = 24

SB 27
AREA = 5.1AC
CN = 94
Tc = 14

SB 28
AREA = 10.9AC
CN = 92
Tc = 14

SB 29
AREA = 3.2AC
CN = 83
Tc = 16

SB 30
AREA = 5.4AC
CN = 83
Tc = 23

SB 31
AREA = 4.4AC
CN = 83
Tc = 23

SB 32
AREA = 6.9AC
CN = 83
Tc = 30

SB 33
AREA = 5.6AC
CN = 83
Tc = 17

SB 34
AREA = 3.3AC
CN = 83
Tc = 15

SB 35
AREA = 2.9AC
CN = 83
Tc = 12

SB 36
AREA = 25AC
CN = 91
Tc = 25

SB 37
AREA = 4.1AC
CN = 94
Tc = 5

SB 38
AREA = 10.3AC
CN = 82
Tc = 20

SB 39
AREA = 9.6AC
CN = 94
Tc = 5

SB 40
AREA = 13.3AC
CN = 81
Tc = 29

SB 41
AREA = 25.6AC
CN = 91
Tc = 25

SB 42
AREA = 6AC
CN = 85
Tc = 21

SB 43
AREA = 4.4AC
CN = 94
Tc = 6

SB 44
AREA = 1.5AC
CN = 83
Tc = 13

SB 45
AREA = 54.3AC
CN = 83
Tc = 74

SB 46
AREA = 20.4AC
CN = 84
Tc = 22

SB 47
AREA = 23.3AC
CN = 82
Tc = 25

SB 48
AREA = 2.3AC
CN = 83
Tc = 17

LEGEND

- Dunhurst Subbasin Boundary
- Storm Manholes
- Storm Sewers
- Village Boundary

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Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF WHEELING

No.	DATE	NATURE OF REVISION
FILE NAME:		
DATE:		

DSN. MJB
CHKD. ELG
SCALE
GIS USER
MODEL ArcGIS 9.2

TITLE:
DUNHURST SUBBASIN MAP

PROJ. NO. 13-0631
SHEET 1 OF 1
DRAWING NO.
EXH 2

N

0 250 500 1,000

Feet

1 inch = 250 feet

FLOOD DEPTH = 3.9'

FLOOD DEPTH = 3.1'

FLOOD DEPTH = 1.8'

FLOOD DEPTH = 2.6'

FLOOD DEPTH = 3.1'

FLOOD DEPTH = 1.4'

FLOOD DEPTH = 2.2'

FLOOD DEPTH = 2.5'

FLOOD DEPTH = 4.0'

WEST DUNHURST

EAST DUNHURST

NORTH WHEELING ROAD

SOUTH DUNHURST

SOUTH WHEELING ROAD

LEGEND

- Storm Manholes
- Storm Sewers
- At-Risk Structures
- Dunhurst Watershed Boundary
- Village Boundary

100YR 2HR

Depth (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3- 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9

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CLIENT:

VILLAGE OF WHEELING

No.	DATE	NATURE OF REVISION

DSN.	MJB
CHKD.	ELG
SCALE	
GIS USER	
MODEL	ArcGIS 9.2
FILE NAME:	
DATE:	

TITLE:

DUNHURST STUDY AREA EXSTING CONDITIONS

PROJ. NO. 13-0631

SHEET 1 OF 1

DRAWING NO.

EXH 3

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CLIENT:

VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

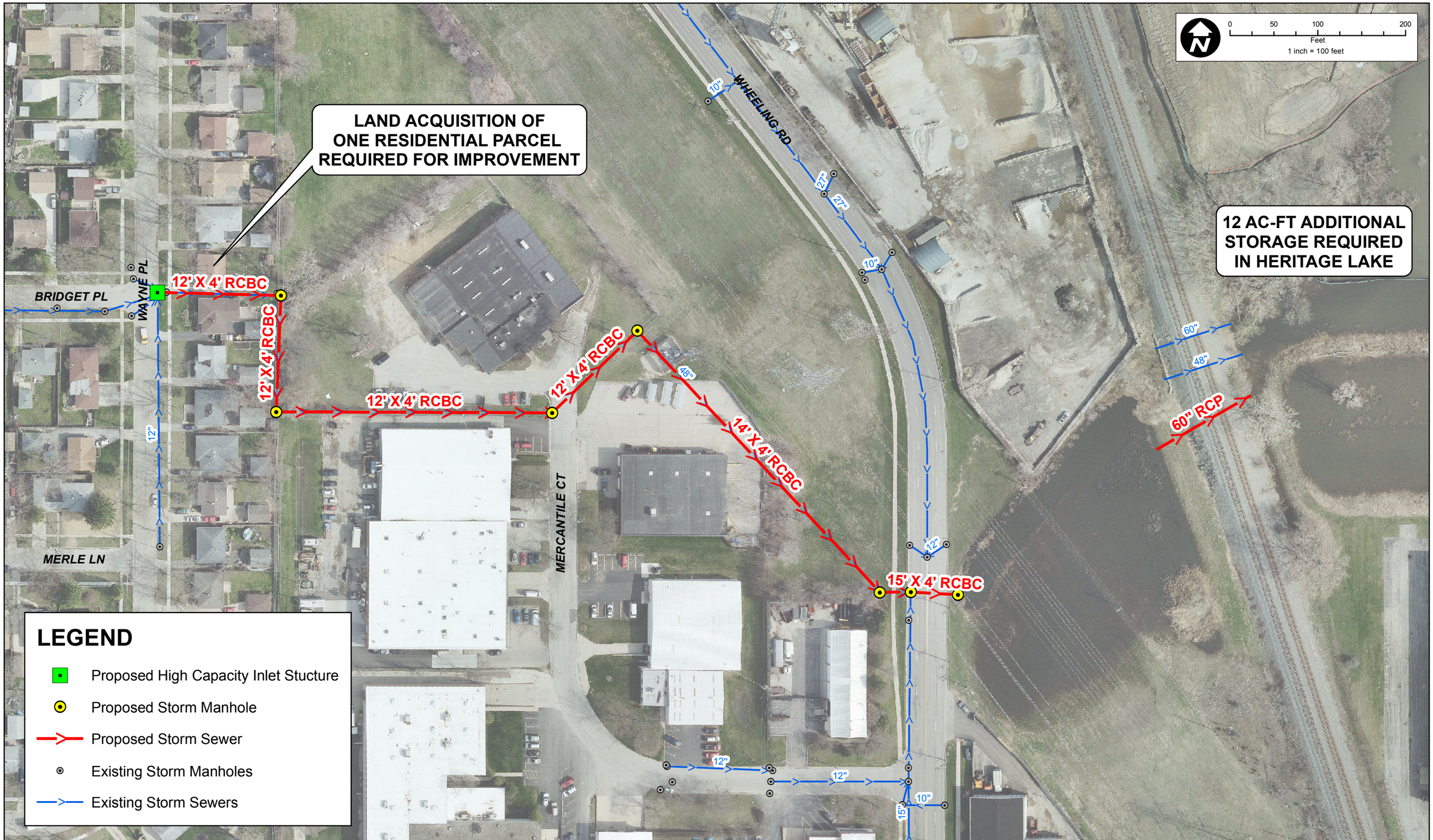
FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:

ALTERNATIVE 1A
EAST DUNHURST INCREASED STORM SEWER CONVEYANCE

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 4



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Rosemont, Illinois 60018
(847) 823-0500

CLIENT:

VILLAGE OF WHEELING

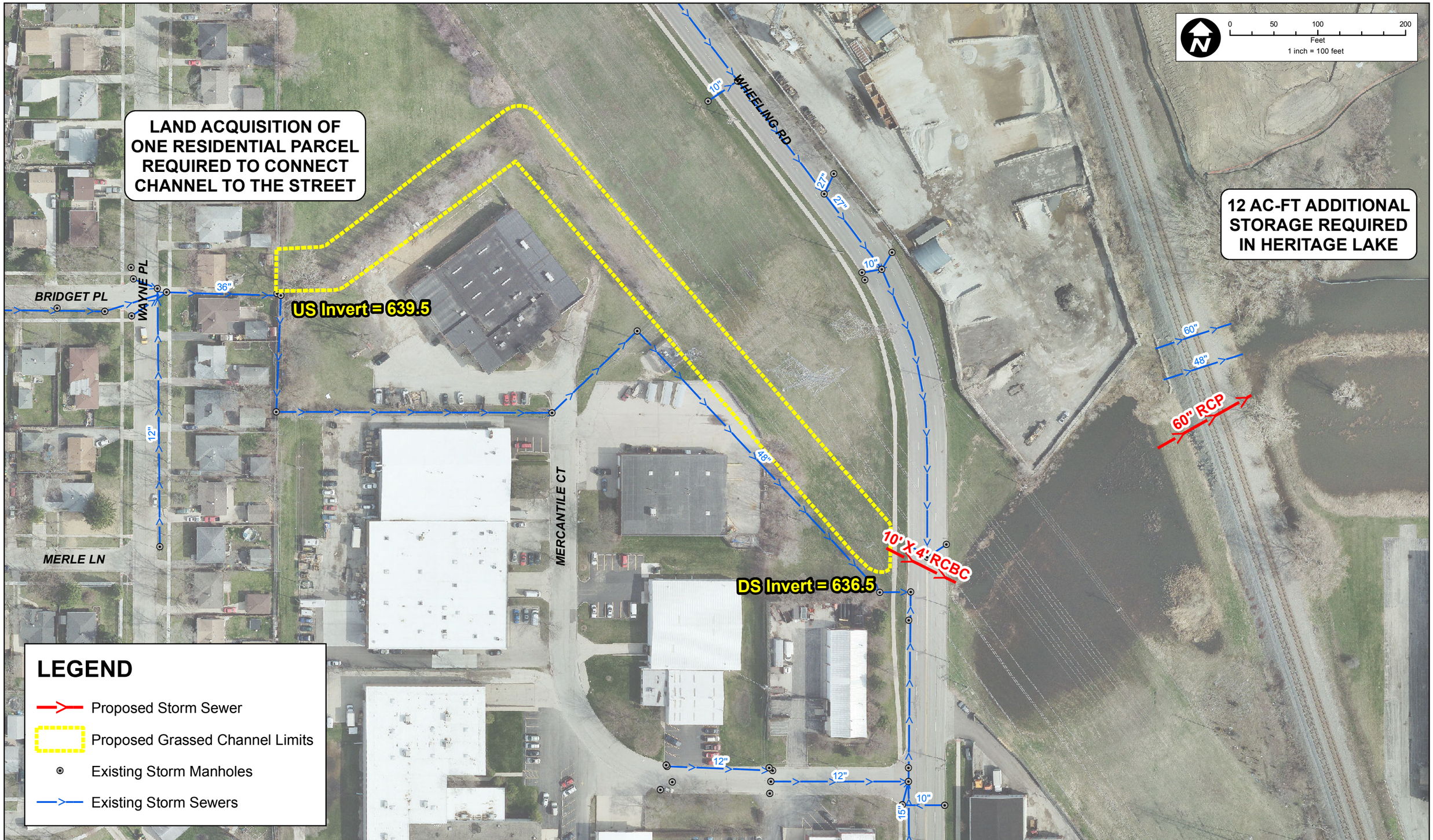
NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:

ALTERNATIVE 1B
EAST DUNHURST INCREASED
STORM SEWER CONVEYANCE

PROJ. NO.	13-0631
DATE:	
SHEET	1 OF 1
DRAWING NO.	**EXH 5**



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(847) 823-0500

CLIENT: **VILLAGE OF WHEELING**

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE: **ALTERNATIVE 1C EAST DUNHURST PROPOSED OVERFLOW OUTLET**

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 6

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CLIENT:

VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

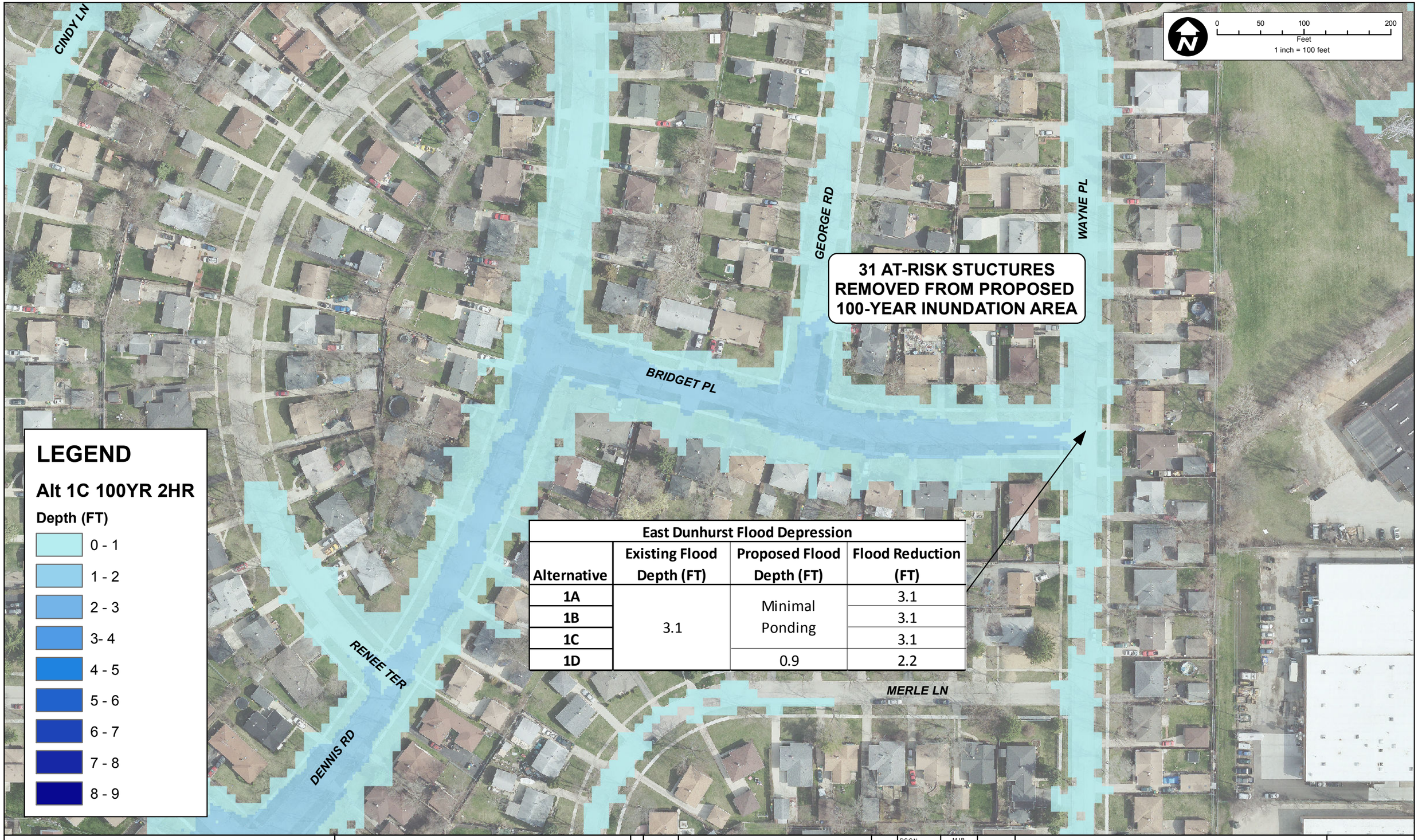
FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:

ALTERNATIVE 1D
EAST DUNHURST RELIEF
STORM SEWER

PROJ. NO. 13-0631
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH 7



East Dunhurst Flood Depression			
Alternative	Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
1A	3.1	Minimal Ponding	3.1
1B			3.1
1C			3.1
1D		0.9	2.2

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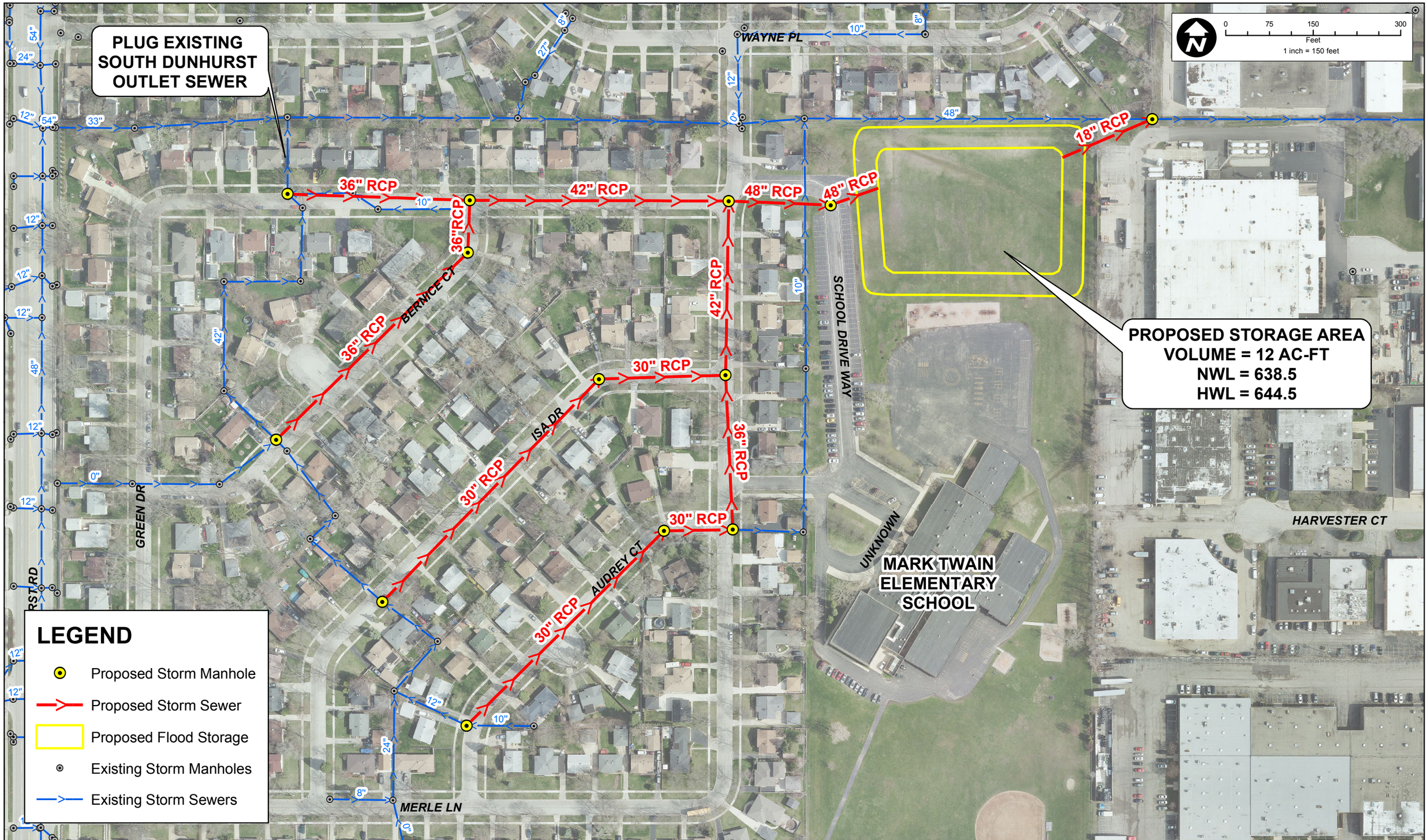
CLIENT:
VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
ALTERNATIVE 1
EAST DUNHURST
PROPOSED CONDITIONS

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 8



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CLIENT:

VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

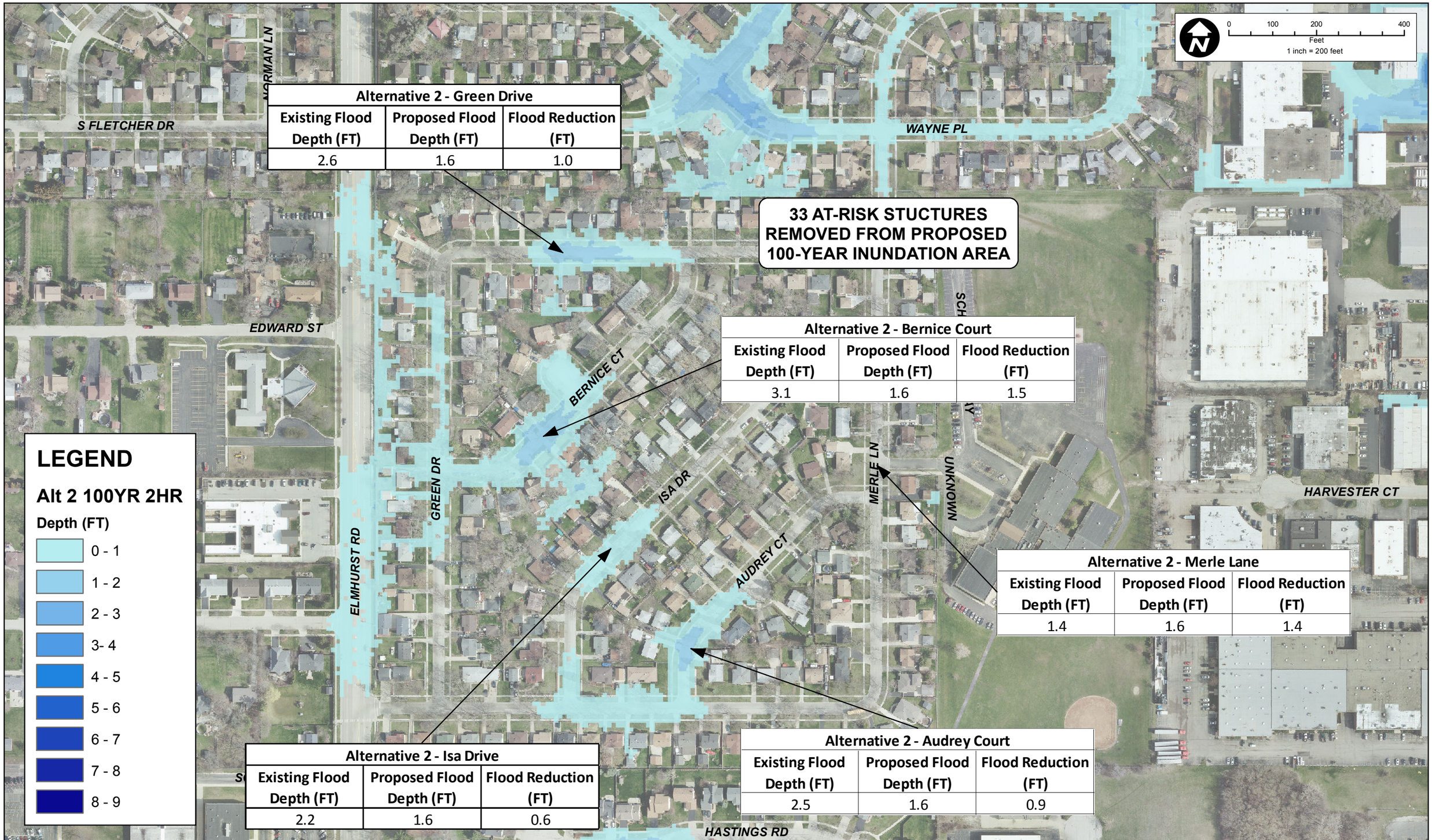
FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:

ALTERNATIVE 2
SOUTH DUNHURST PROPOSED SEWER CONVEYANCE AND STORAGE

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 9



Alternative 2 - Green Drive		
Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
2.6	1.6	1.0

Alternative 2 - Bernice Court		
Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
3.1	1.6	1.5

Alternative 2 - Merle Lane		
Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
1.4	1.6	1.4

Alternative 2 - Isa Drive		
Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
2.2	1.6	0.6

Alternative 2 - Audrey Court		
Existing Flood Depth (FT)	Proposed Flood Depth (FT)	Flood Reduction (FT)
2.5	1.6	0.9

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CLIENT:
VILLAGE OF WHEELING

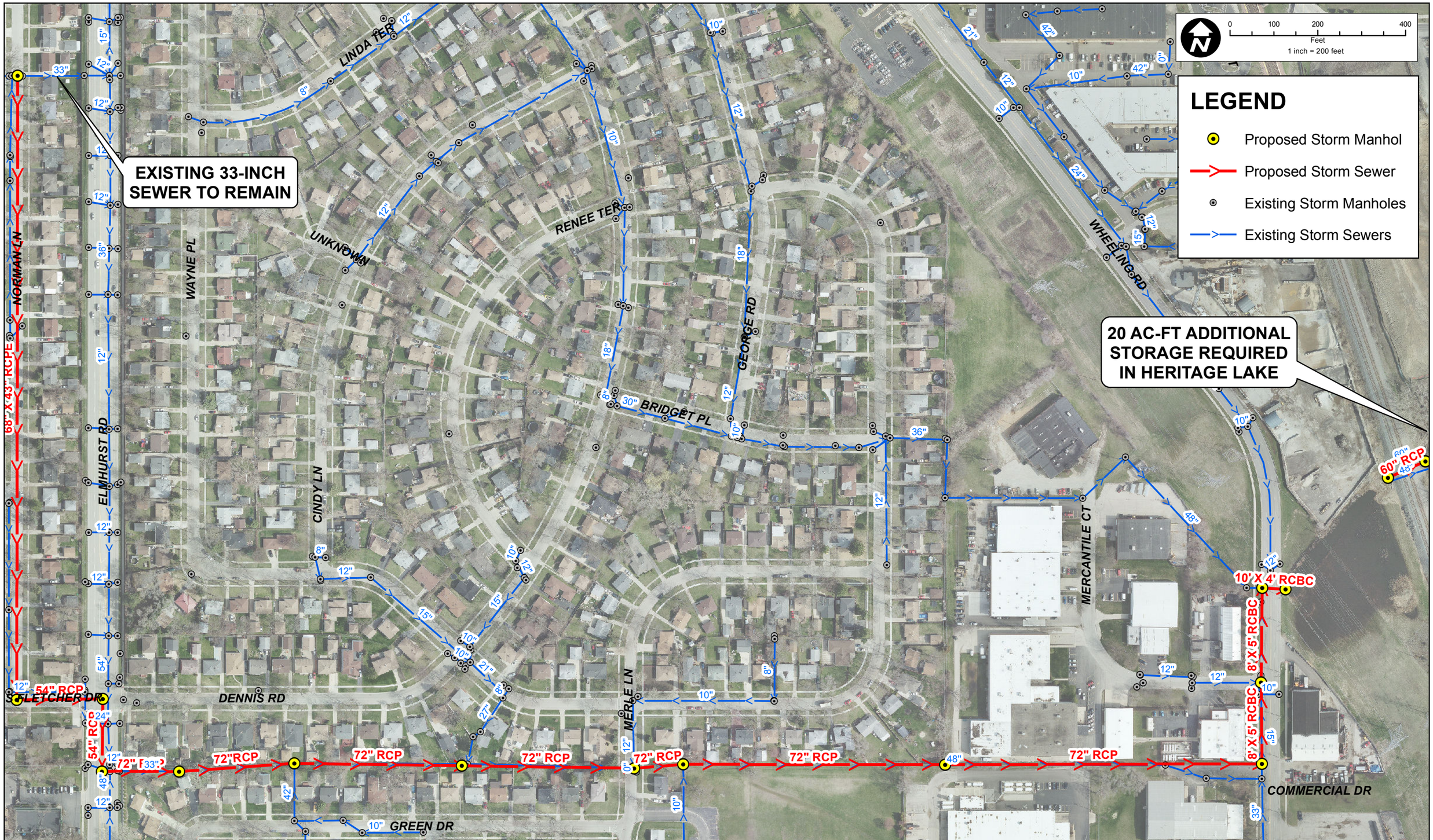
NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
ALTERNATIVE 2
SOUTH DUNHURST
PROPOSED CONDITIONS

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 10



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Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
ALTERNATIVE 3A
WEST DUNHURST
PROPOSED RELIEF SEWER

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 11

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CLIENT:

VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:

ALTERNATIVE 3B
WEST DUNHURST
PROPOSED RELIEF SEWER

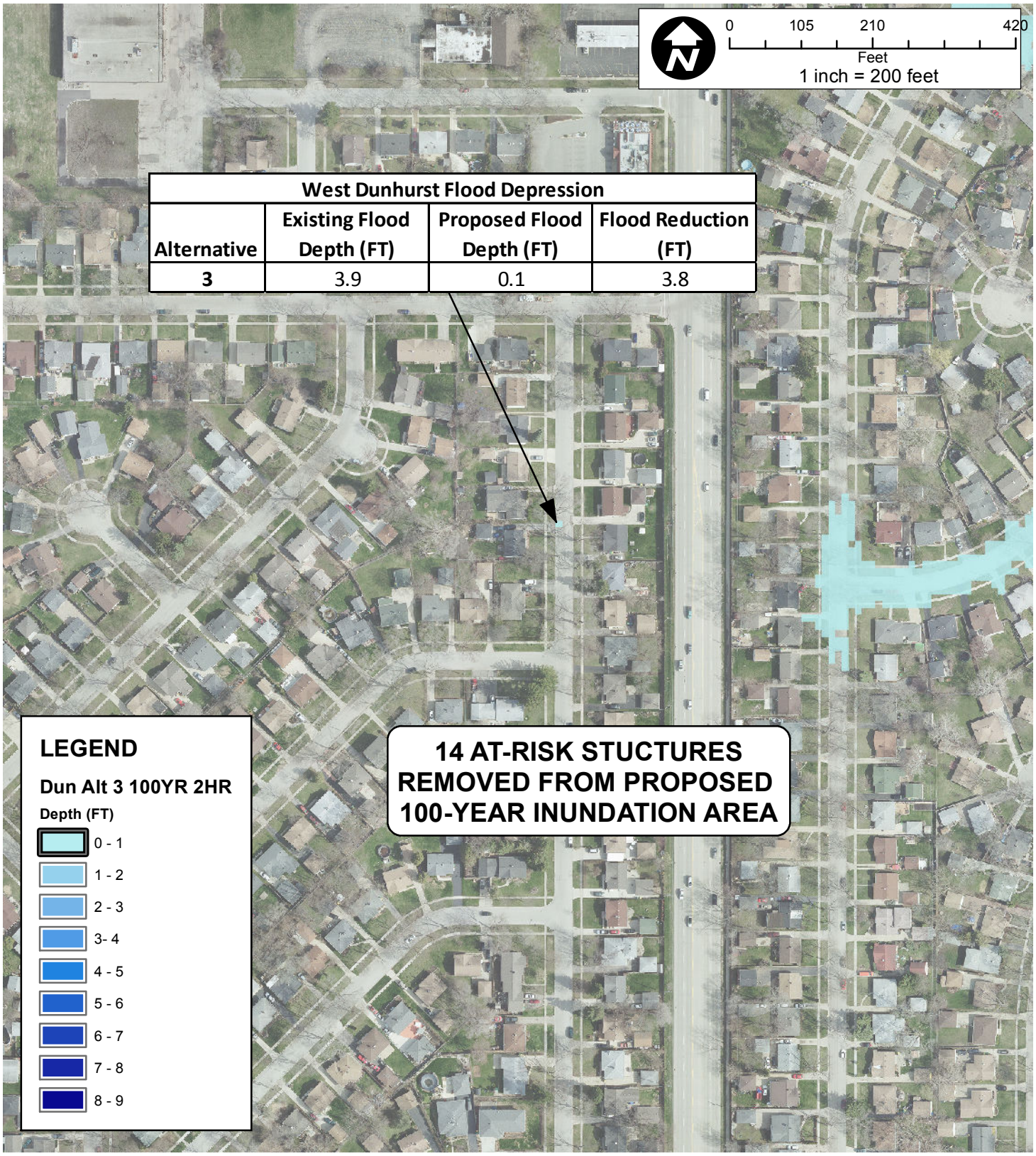
PROJ. NO. 13-0631

DATE:

SHEET 0 OF 0

DRAWING NO.

EXH 12



DSGN.	MJB	CHKD.	ELG

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

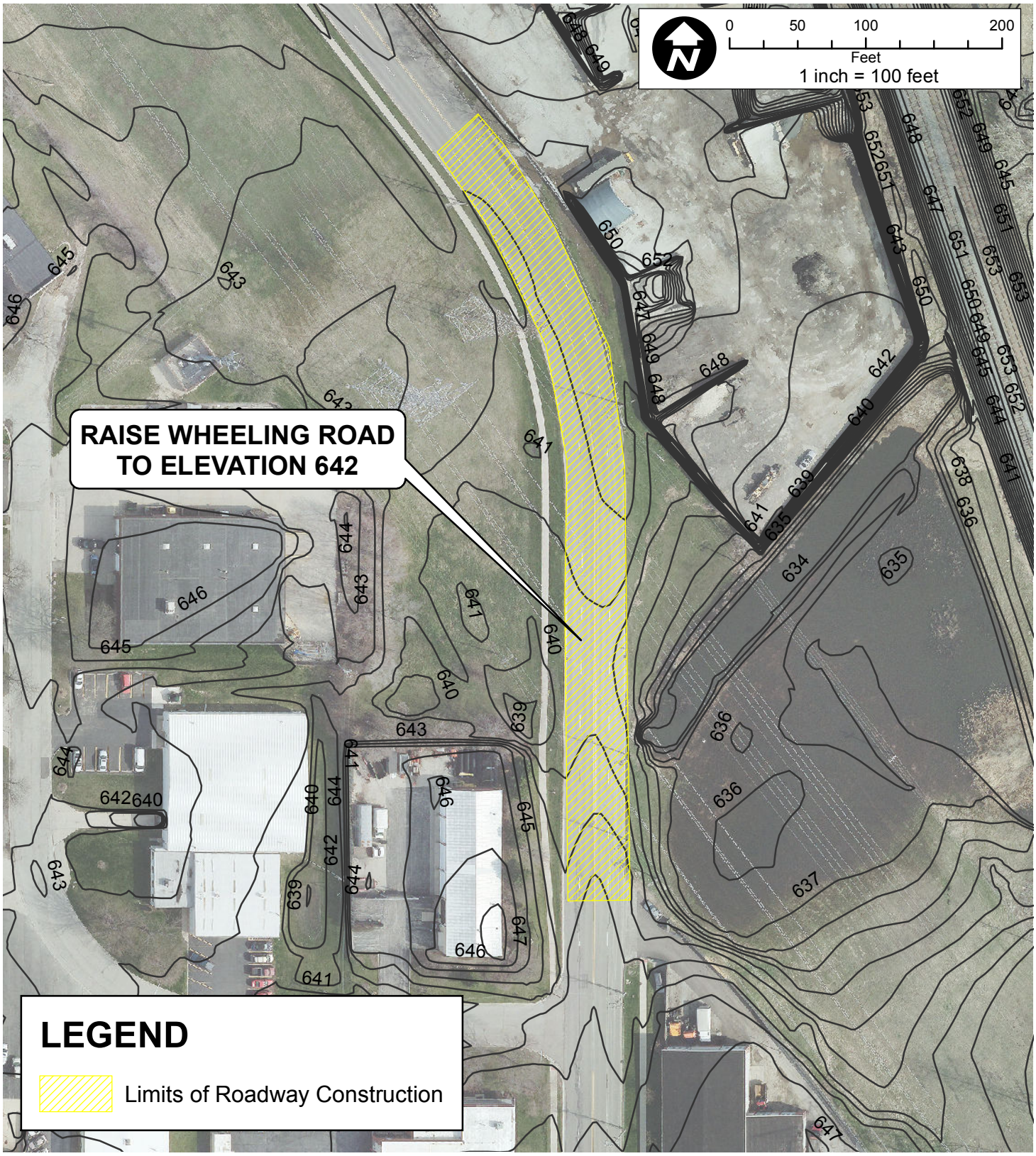
CLIENT: ***VILLAGE OF WHEELING***

JOB#: 13-0631

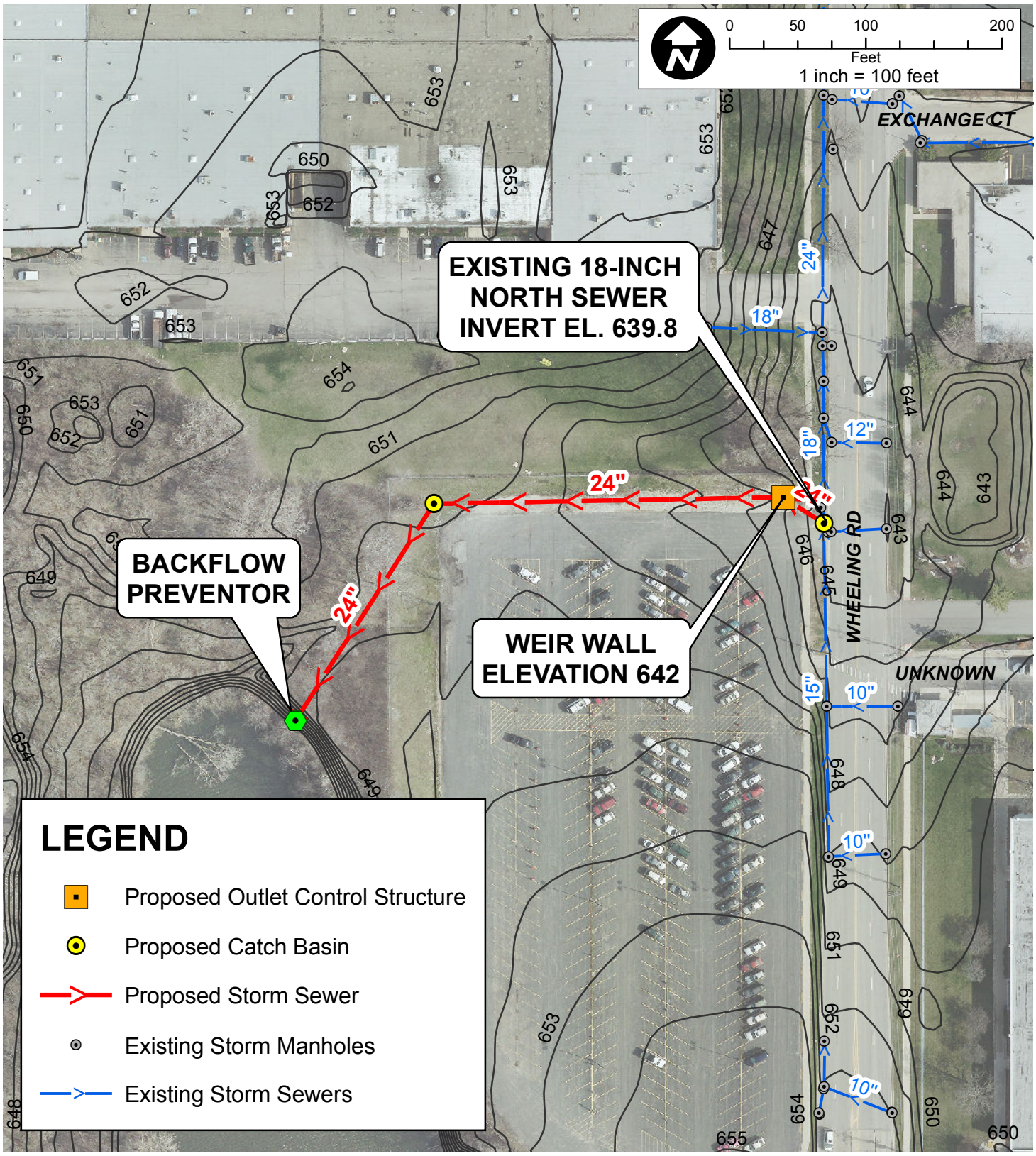
TITLE: ***ALTERNATIVE 3 WEST DUNHURST PROPOSED CONDITIONS***

DATE: 11/25/14

EXH 13



	DSGN. MJB	CHKD.	ELG
Christopher B. Burke Engineering, Ltd. 9575 West Higgins Road, Suite 600 Rosemont, IL 60018 (847) 823-0500 / FAX (847) 823-0520	CLIENT ***VILLAGE OF WHEELING***	JOB# 13-0631	N W E S
	TITLE ***ALTERNATIVE 4 RAISE NORTH WHEELING RD***		DATE 11/25/14
			EXH 14



DSGN. MJB	CHKD. ELG		
Christopher B. Burke Engineering, Ltd. 9575 West Higgins Road, Suite 600 Rosemont, IL 60018 (847) 823-0500 / FAX (847) 823-0520	CLIENT **VILLAGE OF WHEELING**	JOB# 13-0631	N W E S
	TITLE **ALTERNATIVE 5 SOUTH WHEELING ROAD PROPOSED RELIEF SEWER**	DATE 11/25/14	**EXH 15**

N

0 250 500 1,000

Feet

1 inch = 250 feet

SB 82
AREA = 35AC
CN = 86
Tc = 15

ECHO LAKE

NORTH RIDGEFIELD POND

SOUTH RIDGEFIELD POND

POLO RUN POND

SANDPEBBLE DETENTION POND

SB 1 AREA = 3.6AC CN = 83 Tc = 22
SB 2 AREA = 1.6AC CN = 82 Tc = 15
SB 3 AREA = 0.8AC CN = 82 Tc = 19
SB 4 AREA = 2.3AC CN = 83 Tc = 21
SB 5 AREA = 2.8AC CN = 83 Tc = 28
SB 6 AREA = 1AC CN = 83 Tc = 16
SB 7 AREA = 2.6AC CN = 83 Tc = 28
SB 8 AREA = 0.7AC CN = 85 Tc = 23
SB 9 AREA = 1AC CN = 83 Tc = 27
SB 10 AREA = 5AC CN = 83 Tc = 29
SB 11 AREA = 2.6AC CN = 82 Tc = 19
SB 12 AREA = 1.1AC CN = 83 Tc = 19
SB 13 AREA = 2AC CN = 82 Tc = 26
SB 15 AREA = 1AC CN = 83 Tc = 16
SB 16 AREA = 1.1AC CN = 87 Tc = 17
SB 17 AREA = 2.3AC CN = 83 Tc = 20
SB 18 AREA = 2.4AC CN = 82 Tc = 23
SB 19 AREA = 3.6AC CN = 83 Tc = 32
SB 20 AREA = 2.5AC CN = 83 Tc = 25
SB 21 AREA = 2.7AC CN = 83 Tc = 24
SB 22 AREA = 1.2AC CN = 83 Tc = 22
SB 23 AREA = 1.7AC CN = 80 Tc = 33
SB 24 AREA = 2.6AC CN = 83 Tc = 18
SB 25 AREA = 1.2AC CN = 83 Tc = 16
SB 26 AREA = 1.7AC CN = 83 Tc = 21
SB 27 AREA = 2.1AC CN = 83 Tc = 22
SB 28 AREA = 1.5AC CN = 83 Tc = 20
SB 29 AREA = 2.4AC CN = 83 Tc = 20
SB 30 AREA = 4.7AC CN = 83 Tc = 35
SB 31 AREA = 10.5AC CN = 82 Tc = 23
SB 32 AREA = 15.2AC CN = 82 Tc = 41
SB 33 AREA = 30.5AC CN = 84 Tc = 59
SB 34 AREA = 29AC CN = 83 Tc = 51
SB 35 AREA = 58.6AC CN = 83 Tc = 40
SB 36 AREA = 3.4AC CN = 92 Tc = 22
SB 37 AREA = 6.4AC CN = 83 Tc = 25
SB 38 AREA = 6AC CN = 83 Tc = 34
SB 39 AREA = 9.6AC CN = 85 Tc = 23
SB 40 AREA = 5.4AC CN = 89 Tc = 22
SB 41 AREA = 1.2AC CN = 83 Tc = 21
SB 42 AREA = 0.5AC CN = 83 Tc = 13
SB 43 AREA = 3.5AC CN = 83 Tc = 20
SB 45 AREA = 2.2AC CN = 92 Tc = 20
SB 46 AREA = 2.6AC CN = 92 Tc = 17
SB 47 AREA = 1.8AC CN = 83 Tc = 22
SB 48 AREA = 1.2AC CN = 83 Tc = 17
SB 49 AREA = 3.5AC CN = 83 Tc = 19
SB 50 AREA = 2AC CN = 83 Tc = 29
SB 51 AREA = 2.6AC CN = 83 Tc = 21
SB 53 AREA = 1.4AC CN = 83 Tc = 24
SB 54 AREA = 0.9AC CN = 83 Tc = 14
SB 55 AREA = 1.4AC CN = 83 Tc = 17
SB 56 AREA = 1.6AC CN = 83 Tc = 18
SB 58 AREA = 2.1AC CN = 83 Tc = 17
SB 59 AREA = 2.2AC CN = 89 Tc = 26
SB 60 AREA = 5.1AC CN = 78 Tc = 5
SB 61 AREA = 2.4AC CN = 83 Tc = 22
SB 62 AREA = 2.5AC CN = 83 Tc = 29
SB 63 AREA = 1AC CN = 83 Tc = 22
SB 64 AREA = 1.5AC CN = 79 Tc = 21
SB 66 AREA = 7.5AC CN = 78 Tc = 39
SB 67 AREA = 3.7AC CN = 83 Tc = 23
SB 68 AREA = 3.6AC CN = 83 Tc = 19
SB 69 AREA = 5.7AC CN = 83 Tc = 19
SB 70 AREA = 4.9AC CN = 83 Tc = 19
SB 71 AREA = 8.5AC CN = 83 Tc = 27
SB 72 AREA = 7.9AC CN = 90 Tc = 23
SB 73 AREA = 24.6AC CN = 83 Tc = 54
SB 74 AREA = 15AC CN = 83 Tc = 5
SB 75 AREA = 0.6AC CN = 83 Tc = 3
SB 76 AREA = 0.7AC CN = 83 Tc = 13
SB 77 AREA = 0.4AC CN = 83 Tc = 10
SB 78 AREA = 0.4AC CN = 83 Tc = 5
SB 79 AREA = 0.5AC CN = 83 Tc = 4
SB 80 AREA = 9.3AC CN = 81 Tc = 5
SB 81 AREA = 0.4AC CN = 83 Tc = 2

LEGEND

- Echo Lake Subbasins
- Storm Manholes
- Storm Sewers
- Village Boundary

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(847) 823-0500

CLIENT: **VILLAGE OF WHEELING**

No.	DATE	NATURE OF REVISION
FILE NAME:		
DATE:		

DSN. MJB
CHKD. ELG
SCALE
GIS USER
MODEL ArcGIS 9.2

TITLE: **ECHO LAKE & RIDGEFIELD SUBBASIN MAP**

PROJ. NO. 13-0631
SHEET 1 OF 1
DRAWING NO. **EXH 16**

0 200 400 800
Feet
1 inch = 200 feet

100-YEAR FLOOD IMPACTS

22 FLOODED PARKING SPACES ON BRIDLE TRAIL

45 FLOODED PARKING SPACES IN SANDPEBBLE PARKING LOT

Parking Space w/ > 1FT Flooding

1 inch = 100 feet

10-YEAR FLOOD IMPACTS

8 FLOODED PARKING SPACES ON BRIDLE TRAIL

32 FLOODED PARKING SPACES IN SANDPEBBLE PARKING LOT

Parking Space w/ > 1FT Flooding

1 inch = 100 feet

ECHO LAKE
EXISTING NWL = 639.00
10-YR HWL = 642.18
100-YR HWL = 643.79

NORTH RIDGEFIELD POND
EXISTING NWL = 641.90
10-YR HWL = 644.80
100-YR HWL = 648.86

SOUTH RIDGEFIELD POND
EXISTING NWL = 643.43
10-YR HWL = 646.43
100-YR HWL = 651.71

POLO RUN POND
EXISTING NWL = 647.20
10-YR HWL = 652.77
100-YR HWL = 653.82

10-YR FLOOD DEPTH = 2.61
100-YR FLOOD DEPTH = 3.65

10-YR FLOOD DEPTH = 2.58
100-YR FLOOD DEPTH = 3.62

BRIDLE TRAIL

SANDPEBBLE PARKING LOT

LEGEND

- Storm Manholes
- Storm Sewers
- Echo Lake & Ridgefield Watershed Boundary
- Village Boundary

100YR 24HR

Depth (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3- 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9

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CLIENT:
VILLAGE OF WHEELING

No.	DATE	NATURE OF REVISION

DSN. MJB
CHKD. ELG
SCALE
GIS USER
MODEL ArcGIS 9.2
FILE NAME:
DATE:

TITLE:
ECHO LAKE & RIDGEFIELD STUDY AREA EXISTING CONDITIONS

PROJ. NO. 13-0631
SHEET 1 OF 1
DRAWING NO. **EXH 17**

0 75 150 300
Feet
1 inch = 150 feet

SOUTH RIDGEFIELD POND

PROPOSED
INVERT EL = 643.5

POLO RUN POND
EX NWL EL = 647.2
PR NWL EL = 644
ADDITIONAL VOL = 5.4 AC-FT

PROPOSED SANDPEBBLE POND
EX GROUND EL = 650
PR NWL EL = 644.5
ADDITIONAL VOL = 2.2 AC-FT

EL 644
EL 651
EL 644.5
EL 651

PEAR TREE LN
PLEASANT RUN DR
EQUESTRIAN DR
BRIDLE TRL
CHUKKER CT
LONGACRE LN
PADDOCK
DERBY ST
WHEELING RD
GILMAN AVE
SANDSTONE DR
SANDPEBBLE DR
UNKNOWN

LEGEND

- Proposed Storm Manhole
- Proposed Storm Sewer
- Proposed Grading
- Existing Storm Manholes
- Existing Storm Sewers

DSGN.	MJB	CHKD.	ELG

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CLIENT: VILLAGE OF WHEELING

PROJECT NO.: 13-0631

TITLE: ALTERNATIVE 6 - ECHO LAKE & RIDGEFIELD SOUTH STORAGE AND CONVEYANCE IMPROVEMENTS

DATE: 12/2/14

EX 18

0 75 150 300
Feet
1 inch = 150 feet

South Ridgefield Pond			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	646.43	646.39	0.04
100YR 24HR	651.71	650.87	0.84

Bridle Trail			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.77	651.06	1.71
100YR 24HR	653.82	653.61	0.21

Polo Run Pond			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.77	651.11	1.66
100YR 24HR	653.82	653.61	0.21

Sandpebble Parking Lot			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.78	651.13	1.65
100YR 24HR	653.82	653.61	0.21

LEGEND

Alt 6 10YR 24HR

Depth (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3- 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9

DSGN. MJB CHKD. ELG

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CLIENT: VILLAGE OF WHEELING

PROJECT NO. 13-0631

TITLE: ALTERNATIVE 6 - ECHO LAKE & RIDGEFIELD PROPOSED CONDITIONS (10-YEAR)

DATE 12/2/14

EX 19

0 150 300 600
Feet
1 inch = 300 feet

NORTH RIDGEFIELD POND
EX NWL EL = 641.9
PR NWL EL = 640
ADDITIONAL VOL = 5.5 AC-FT

SOUTH RIDGEFIELD POND
EX NWL EL = 643.4
PR NWL EL = 642
ADDITIONAL VOL = 5.2 AC-FT

POLO RUN POND
EX NWL EL = 647.2
PR NWL EL = 643.5
ADDITIONAL VOL = 6.8 AC-FT

SANDPEBBLE POND
EX GROUND EL = 650
PR NWL EL = 643.5
ADDITIONAL VOL = 2.4 AC-FT

LEGEND

- Proposed Storm Manhole
- Proposed Storm Sewer
- Pond Contours
- Existing Storm Manholes
- Existing Storm Sewers

DSGN.	MJB	CHKD.	ELG

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Rosemont, Illinois 60018
(847) 823-0500

CLIENT: **VILLAGE OF WHEELING**

PROJECT NO.: 13-0631

TITLE: **ALTERNATIVE 7 - ECHO LAKE & RIDGEFIELD COMPREHENSIVE STORAGE AND CONVEYANCE IMPROVEMENTS**

DATE: 12/2/14

EX 20

0 150 300 600
Feet
1 inch = 300 feet

Echo Lake			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	642.18	642.18	0.00
100YR 24HR	643.79	643.76	0.03

North Ridgefield Pond			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	644.81	644.85	-0.04
100YR 24HR	648.86	648.72	0.14

South Ridgefield Pond			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	646.43	646.01	0.42
100YR 24HR	651.71	650.71	1.00

Bridle Trail			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.77	646.20	6.57
100YR 24HR	653.82	650.86	2.96

Polo Run Pond			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.77	646.50	6.27
100YR 24HR	653.82	650.90	2.92

Sandpebble Parking Lot			
Storm	Existing WSEL (FT)	Proposed WSEL (FT)	WSEL Reduction (FT)
10YR 24HR	652.78	646.37	6.41
100YR 24HR	653.82	650.92	2.90

LEGEND

Alt 7 100YR 24HR

Depth (FT)

- 0 - 1
- 1 - 2
- 2 - 3
- 3- 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9

HINTZ RD
SETON CT
REEF CT
TIDE CT
ELEANOR DR
TANGLEWOOD DR
WEEPING WILLOW DR
WILLOWBROOK DR
RIDGEFIELD LN
NOEL AVE
WHEELING RD
ALICE ST
OAK AVE
DRAKE AVE
PROSPECT DR
HONEYSUCKLE DR
SHADY TREE LN
DRAKE TER
OAK AVE
PEAR TREE LN
UNKNOWN
PLEASANT RUN DR
UNKNOWN
UNKNOWN
UNKNOWN
GILMAN AVE
EQUESTRIAN DR
BRIDLE TRL
LONGACRE LN
DERBY ST
CHUKKER CT
UNKNOWN
UNKNOWN
SHAWN CT

DSGN.	MJB	CHKD.	ELG

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Rosemont, Illinois 60018
(847) 823-0500

CLIENT: VILLAGE OF WHEELING

PROJECT NO.: 13-0631

TITLE: ALTERNATIVE 7 - ECHO LAKE & RIDGEFIELD PROPOSED CONDITIONS (100-YEAR)

DATE: 12/2/14

EX 21

DRAFT

LEGEND

APPROXIMATE SEPTEMBER 13–14, 2008 FLOODING AT LAKESIDE VILLAS/ JACKSON DRIVE

UNINCORPORATED COOK COUNTY

VILLAGE OF BUFFALO GROVE

VILLAGE OF ARLINGTON HEIGHTS

VILLAGE OF WHEELING

WATERSHED BOUNDARY

BUFFALO GROVE BASIN

TAHOE #1

TAHOE #2

MALIBU

JACKSON DRIVE FLOODING AREA

MILLER POND ARLINGTON HEIGHTS

LAKEVIEW DRIVE

MALLARD LAKE

SPRINGVIEW (DRY-BOTTOM POND)

LAKESIDE #4

LAKESIDE #3

LAKESIDE #2

LAKESIDE #1

DEPRESSIONAL STORAGE

LONGTREE BASIN

BUFFALO GROVE ROAD

OLD BUFFALO GROVE ROAD

LAKEVIEW DRIVE

JACKSON DRIVE

SCHOENBECK ROAD

ELMHURST ROAD

HINTZ ROAD

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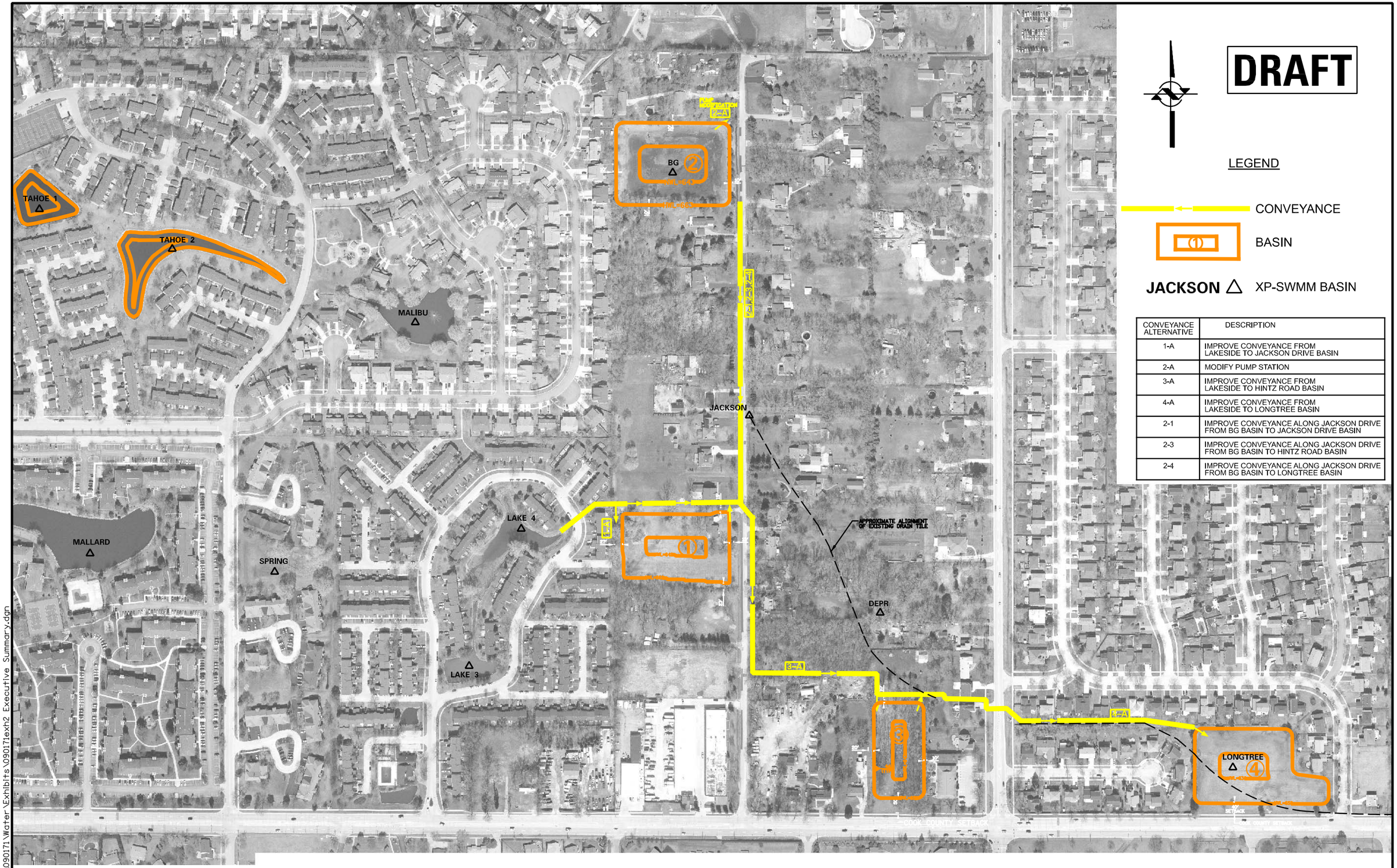
CLIENT: VILLAGE OF WHEELING		TITLE: JACKSON DRIVE AND LAKESIDE VILLAS WATERSHED		DSGN: ETE	DATE: 12/7/2009
PROJECT NO. 09-0171	SCALE: 1"=600'			DWN: EAT	EX 22



CONVEYANCE ALTERNATIVE	DESCRIPTION
1-A	IMPROVE CONVEYANCE FROM LAKESIDE TO JACKSON DRIVE BASIN
2-A	MODIFY PUMP STATION
3-A	IMPROVE CONVEYANCE FROM LAKESIDE TO HINTZ ROAD BASIN
4-A	IMPROVE CONVEYANCE FROM LAKESIDE TO LONGTREE BASIN
2-1	IMPROVE CONVEYANCE ALONG JACKSON DRIVE FROM BG BASIN TO JACKSON DRIVE BASIN
2-3	IMPROVE CONVEYANCE ALONG JACKSON DRIVE FROM BG BASIN TO HINTZ ROAD BASIN
2-4	IMPROVE CONVEYANCE ALONG JACKSON DRIVE FROM BG BASIN TO LONGTREE BASIN

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Rosemont, Illinois 60018 (847) 823-0500

CLIENT:	VILLAGE OF WHEELING	TITLE:	CONCEPT ALTERNATIVE STORAGE SITES AND CONVEYANCE IMPROVEMENTS
PROJECT NO.	09-0171	SCALE:	1"=300'
DSGN:	ETE	DATE:	12/11/2009
DWN:	EAT		EX 23

LEGEND

ALTERNATIVE #1

ALTERNATIVE #4

DRAFT

TAHOE 1

TAHOE 2

MALIBU

BG

DEPR

LAKE 4

LAKE 3

MALLARD

SPRING

LAKEVIEW DRIVE

LAKESIDE CIRCLE DRIVE

JACKSON DRIVE

SCHOENBECK ROAD

HINTZ ROAD

LONGTREE

JUNCTION BOX

24" RCP DITCH

24" RCP

36" RCP

SLOPED INLET GRATE 10'x10'

24" TO INLET GRATE

ALT. #1 PROPOSED BASIN

PUMP STATION

APPROXIMATE ALIGNMENT OF EXISTING DRAIN TILE

EXISTING 24" RCP

36" RCP; EQUIVALENT ELLIPTICAL 15"x29"

SOME REGRADING FOR OVERLAND FLOW

REGRADING

36" S.S. EQUIVALENT ELLIPTICAL 15"x29"

EXISTING 24" S.S.

BYPASS 18" RCP TO CONNECT TO EXISTING 18" S.E. CORNER OF SITE

ALT. #4 BASIN EXPANSION

PUMP STATION

N:\Wheeling\090171\Water\Exhibits\090171exh3 Executive Summary.dgn

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Rosemont, Illinois 60018 (847) 823-0500

CLIENT: VILLAGE OF WHEELING		TITLE: ALTERNATIVE #1 AND ALTERNATIVE #4 CONCEPT PLAN	DSGN: ETE
PROJECT NO. 09-0171	SCALE: 1"=300'		DWN: EAT
			DATE: 12/10/2009
			EX 24

LEGEND

ALTERNATIVE #1

DRAFT

JUNCTION BOX

BG

TAHOE 1

TAHOE 2

MALIBU

24" RCP

SCHOENBECK ROAD

JACKSON

LAKEVIEW DRIVE

SLOPED INLET GRATE 10'x10'

LAKE 4

24" TO INLET GRATE

36"

JUNCTION BOX

ALT. #1 PROPOSED BASIN

PUMP STATION

APPROXIMATE ALIGNMENT OF EXISTING DRAIN TILE

MALLARD

SPRING

DEPR

EXISTING 24" RCP

SOME REGRADING FOR OVERLAND FLOW

EXISTING 24" S.S.

LAKE 3

LONGTREE

LAKEVIEW DRIVE

LAKESIDE CIRCLE DRIVE

JACKSON DRIVE

HINTZ ROAD

N:\Wheeling\090171\Water\Exhibits\090171exh3-A Executive Summary.dgn

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Rosemont, Illinois 60018 (847) 823-0500

CLIENT: VILLAGE OF WHEELING		TITLE: ALTERNATIVE #1 AND ALTERNATIVE #4 CONCEPT PLAN	DSGN: ETE
PROJECT NO. 09-0171	SCALE: 1"=300'		DWN: EAT
			DATE: 12/10/2009
			EX 24A

LEGEND

ALTERNATIVE #4

DRAFT

JUNCTION BOX

24" RCP DITCH

BG

TAHOE 1

TAHOE 2

MALIBU

SCHOENBECK ROAD

LAKEVIEW DRIVE

36" RCP

JACKSON

JUNCTION BOX

36" RCP

SLOPED INLET GRATE 10'x10'

LAKE 4

24" TO INLET GRATE

APPROXIMATE ALIGNMENT OF EXISTING DRAIN TILE

MALLARD

SPRING

DEPR

36" RCP EQUIVALENT ELLIPTICAL (45"x29")

LAKE 3

LAKEVIEW DRIVE

LAKESIDE CIRCLE DRIVE

JACKSON DRIVE

REGRADING

36" R.C.P. EQUIVALENT ELLIPTICAL (45"x29")

BYPASS 18" RCP TO CONNECT TO EXISTING 18" S.E. CORNER OF SITE

JUNCTION BOX

LONGTREE

ALT. #4 BASIN EXPANSION

JUNCTION BOX

PUMP STATION

HINTZ ROAD

N:\Wheeling\090171 Water\Exhibits\090171exh3-B Executive Summary.dgn

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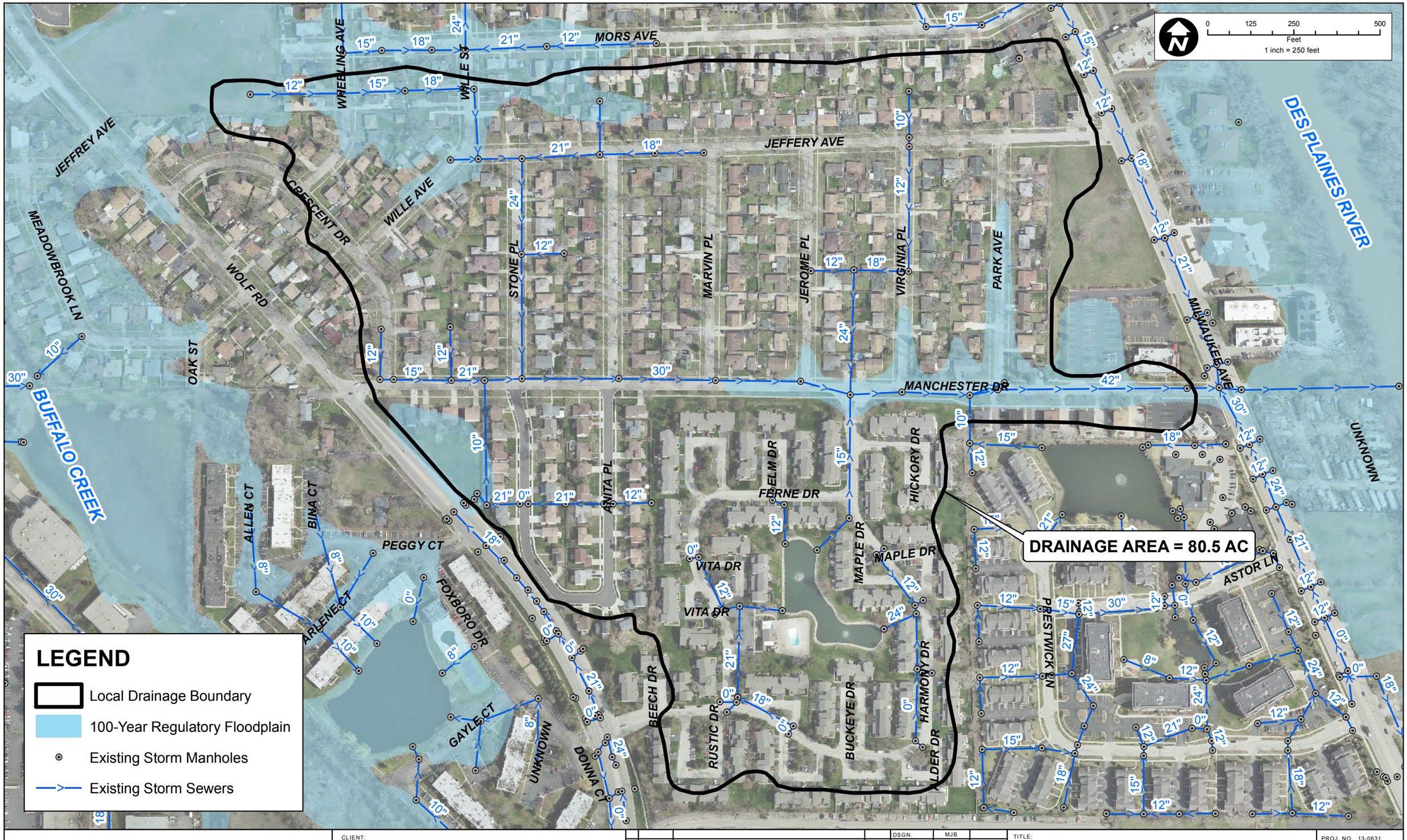
Rosemont, Illinois 60018 (847) 823-0500

CLIENT: VILLAGE OF WHEELING		TITLE: ALTERNATIVE #1 AND ALTERNATIVE #4 CONCEPT PLAN	DSGN: ETE
PROJECT NO. 09-0171	SCALE: 1"=300'		DWN: EAT
			DATE: 12/10/2009
			EX 24B



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Rosemont, Illinois 60018
(847) 823-0500

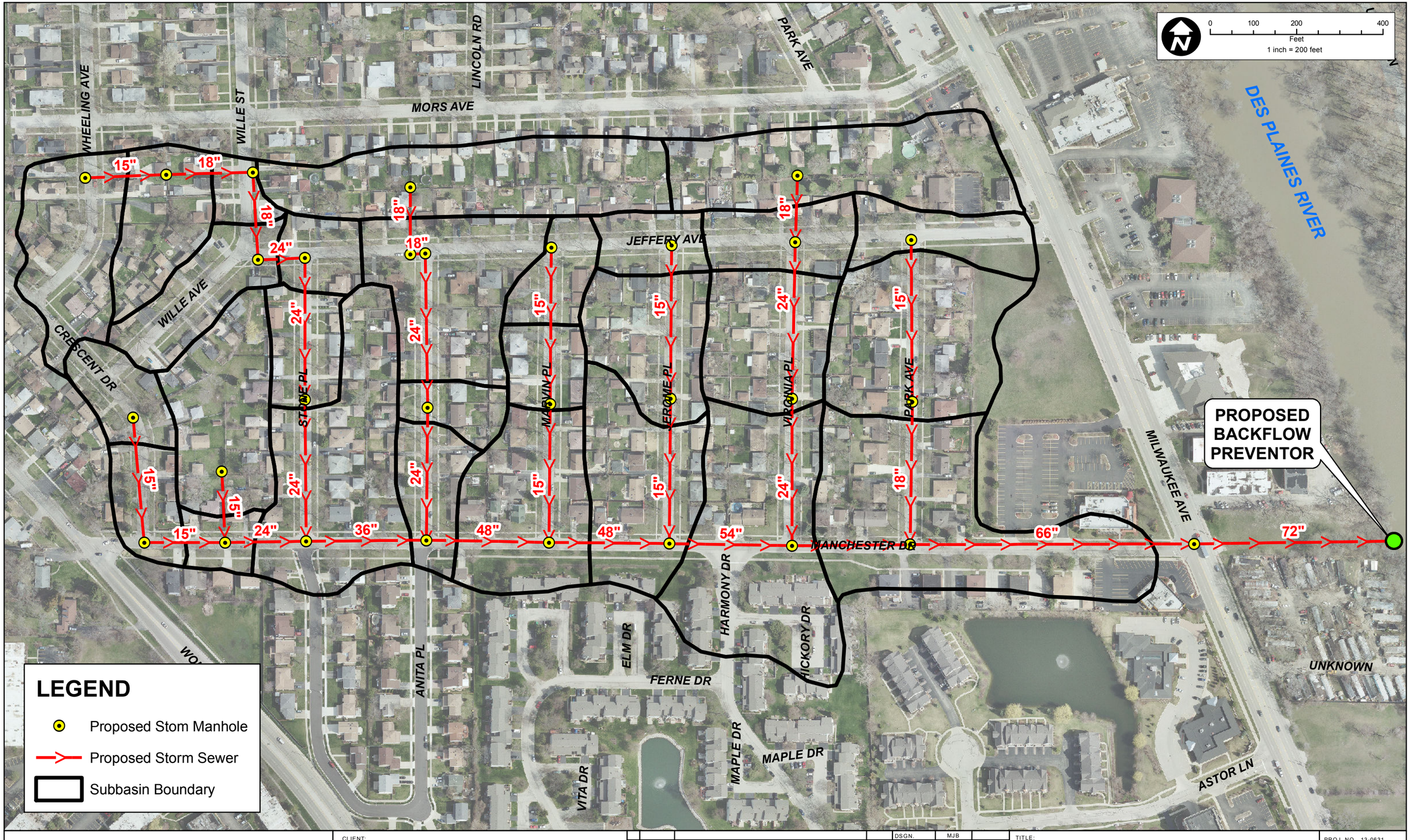
CLIENT: **VILLAGE OF WHEELING**

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE: **JEFFERY AVENUE & MANCHESTER DRIVE EXISTING CONDITIONS**

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO. **EXH 25**



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CLIENT:

VILLAGE OF WHEELING

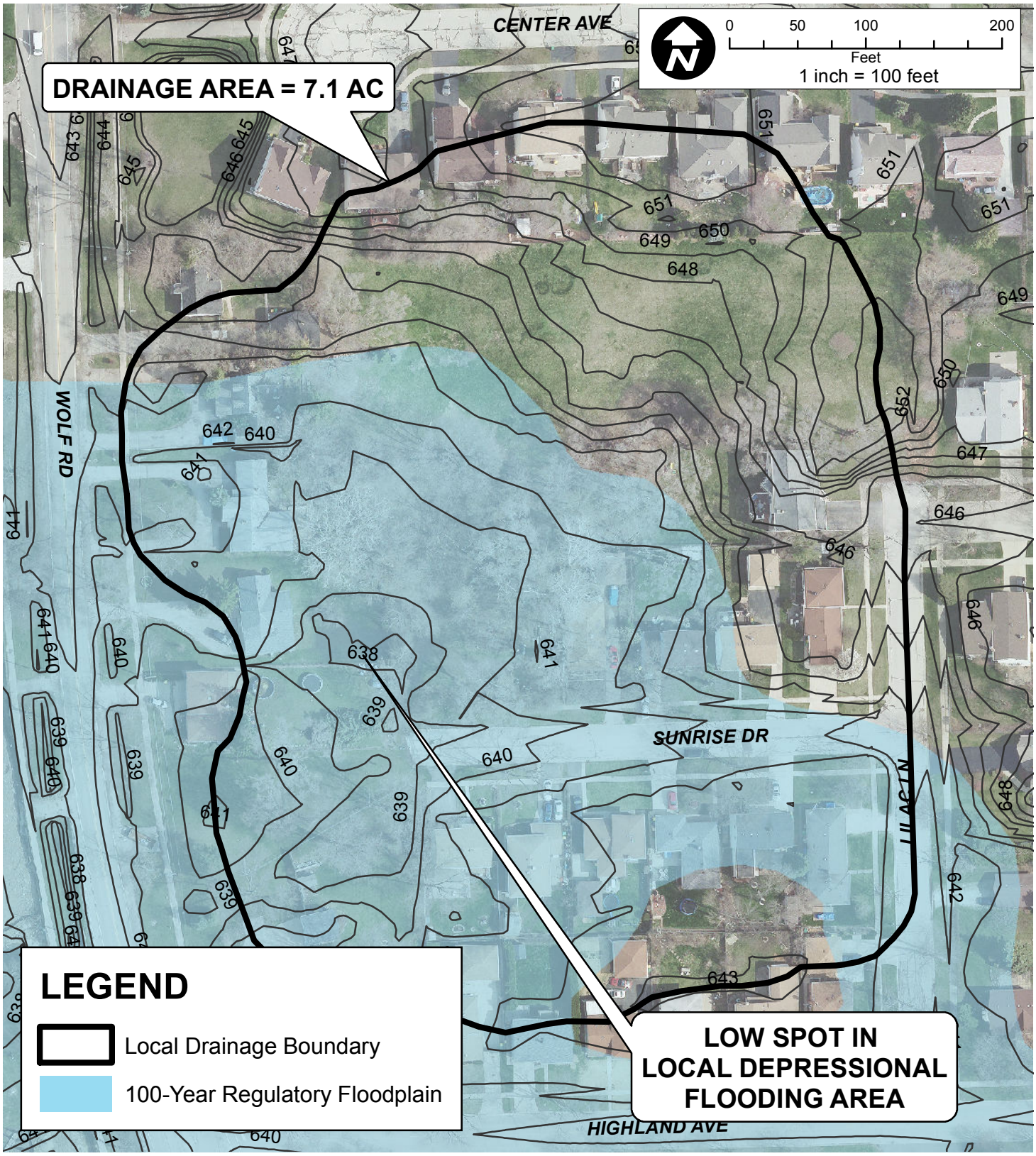
NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

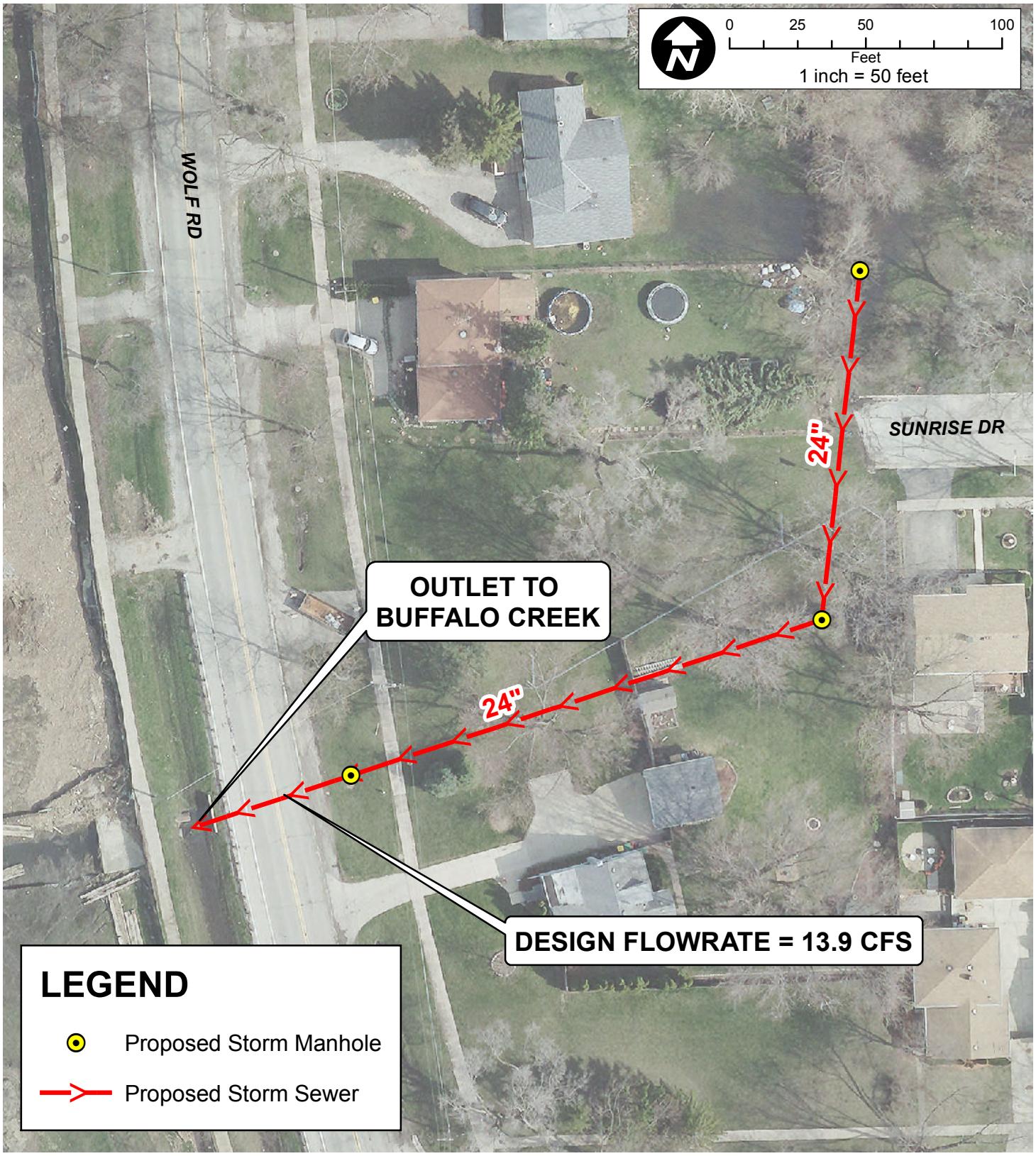
TITLE:

ALTERNATIVE 10 - JEFFERY AVENUE & MANCHESTER DRIVE PROPOSED STORM SEWER SYSTEM (10-YEAR)

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 26



		DSGN. MJB	CHKD. ELG
Christopher B. Burke Engineering, Ltd. 9575 West Higgins Road, Suite 600 Rosemont, IL 60018 (847) 823-0500 / FAX (847) 823-0520	CLIENT ***VILLAGE OF WHEELING***	JOB# 13-0631	N W E S
	TITLE ***SUNRISE DRIVE EXISTING CONDITIONS***		DATE 12/1/14
			EXH 27



DSGN.	MJB	CHKD.	ELG

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

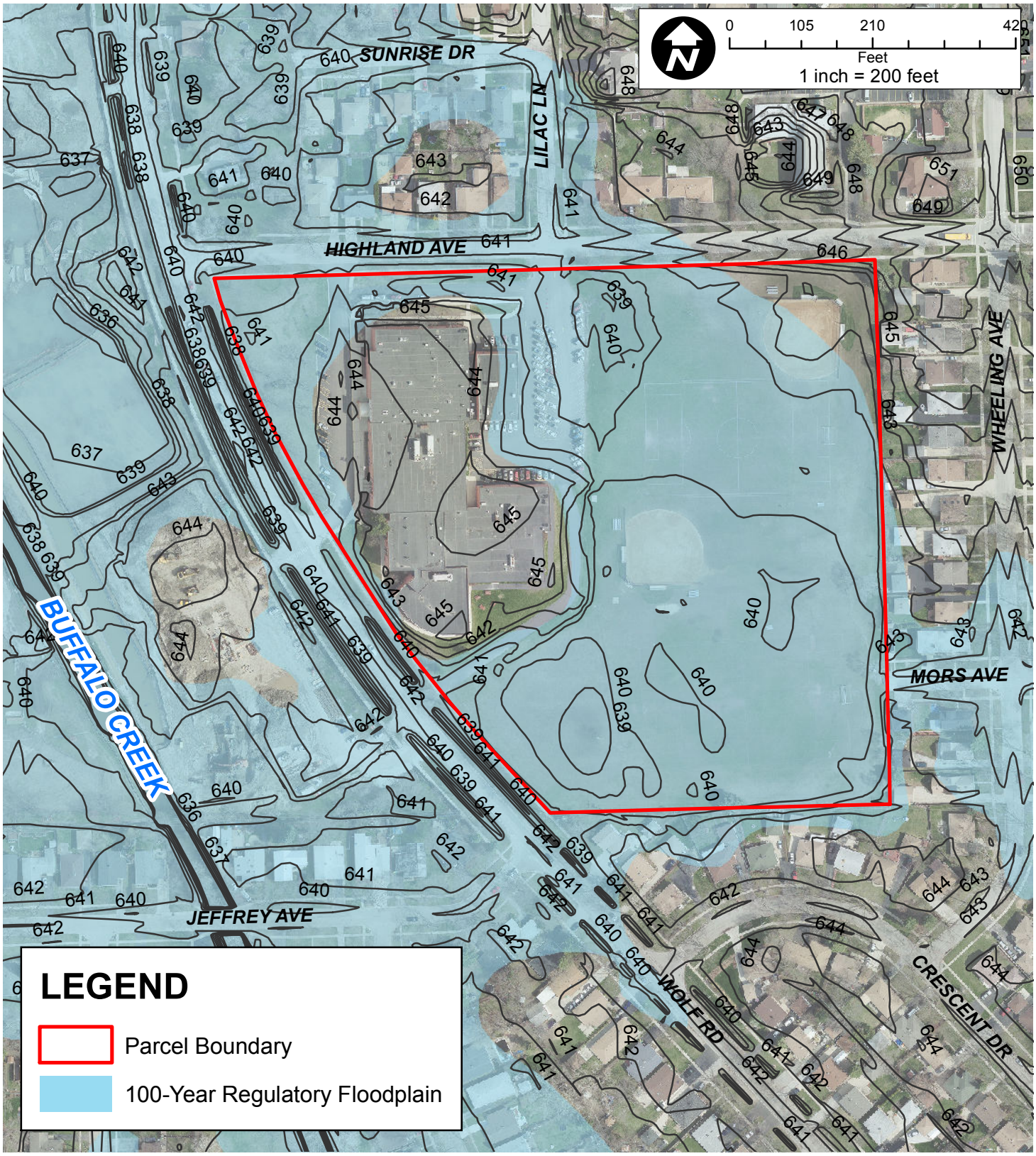
CLIENT: ***VILLAGE OF WHEELING***

JOB#: 13-0631

TITLE: ***ALTERNATIVE 11 SUNRISE DRIVE PROPOSED RELIEF SEWER***

DATE: 12/1/14

EXH 28



DSGN.	MJB	CHKD.	ELG

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

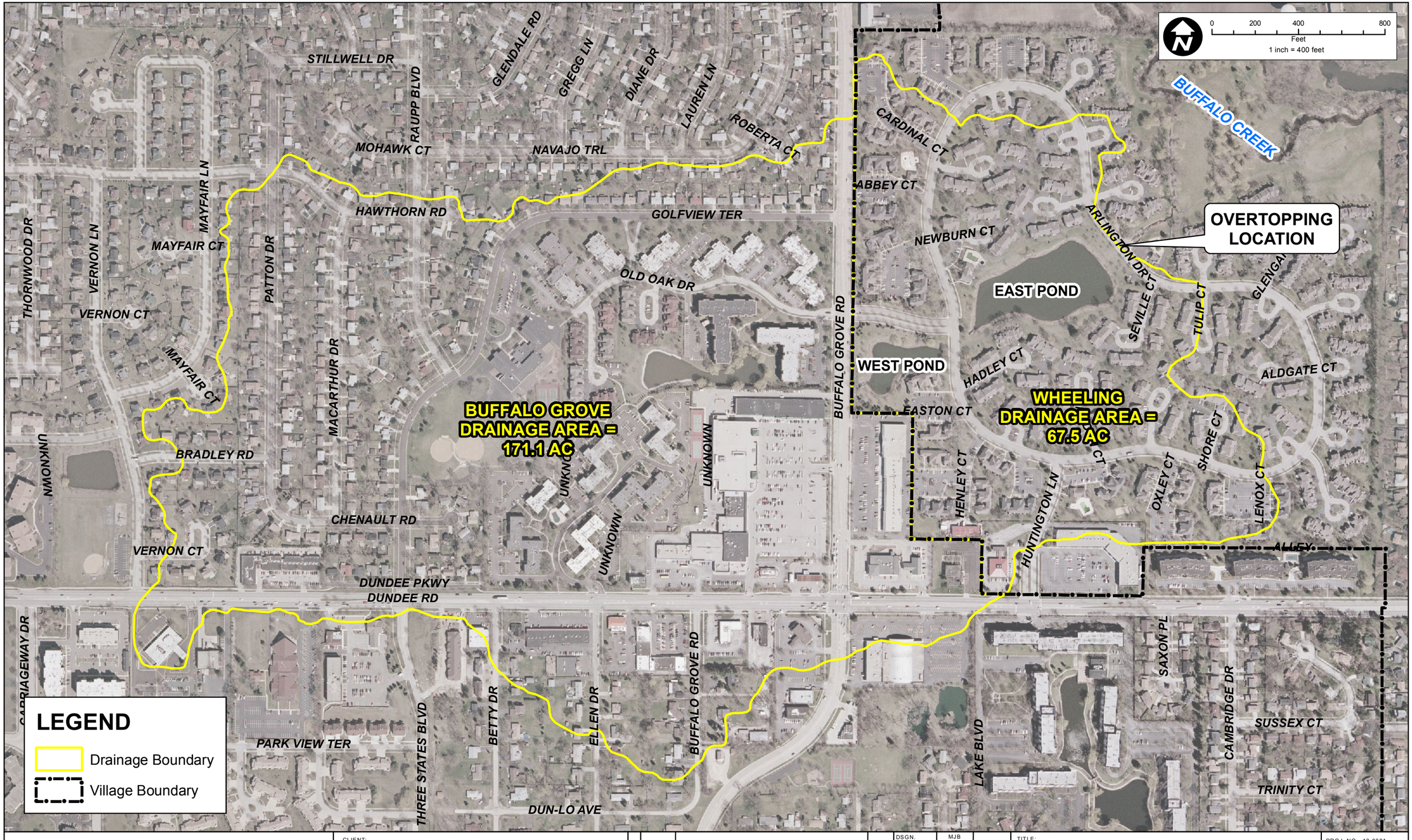
CLIENT **VILLAGE OF WHEELING**

JOB# 13-0631

TITLE **OLIVER WENDELL HOLMES MIDDLE SCHOOL EXISTING CONDITIONS**

DATE 12/1/14

EXH 29



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CLIENT:
VILLAGE OF WHEELING

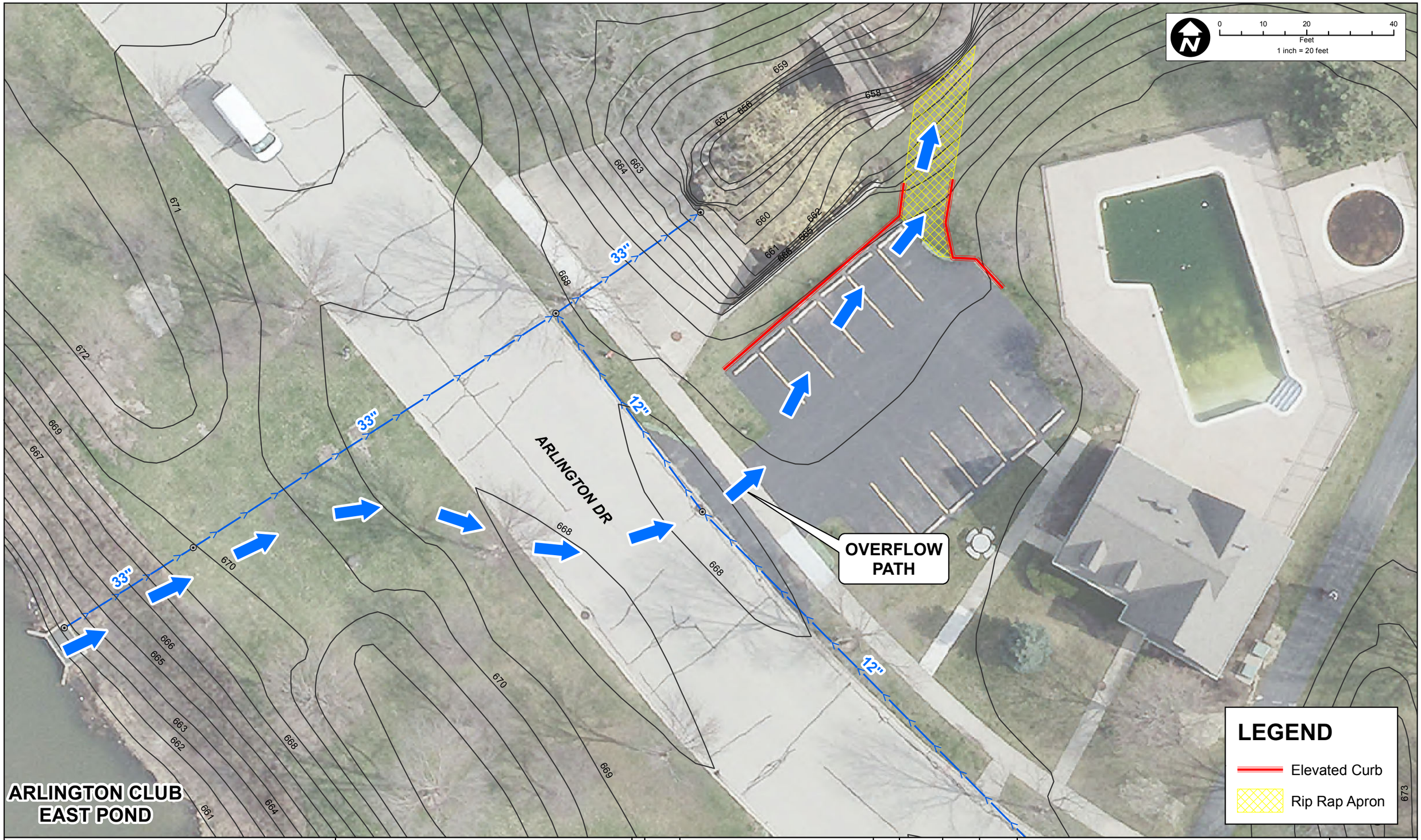
NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
ARLINGTON LAKE CLUB POND EXISTING CONDITIONS

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 30



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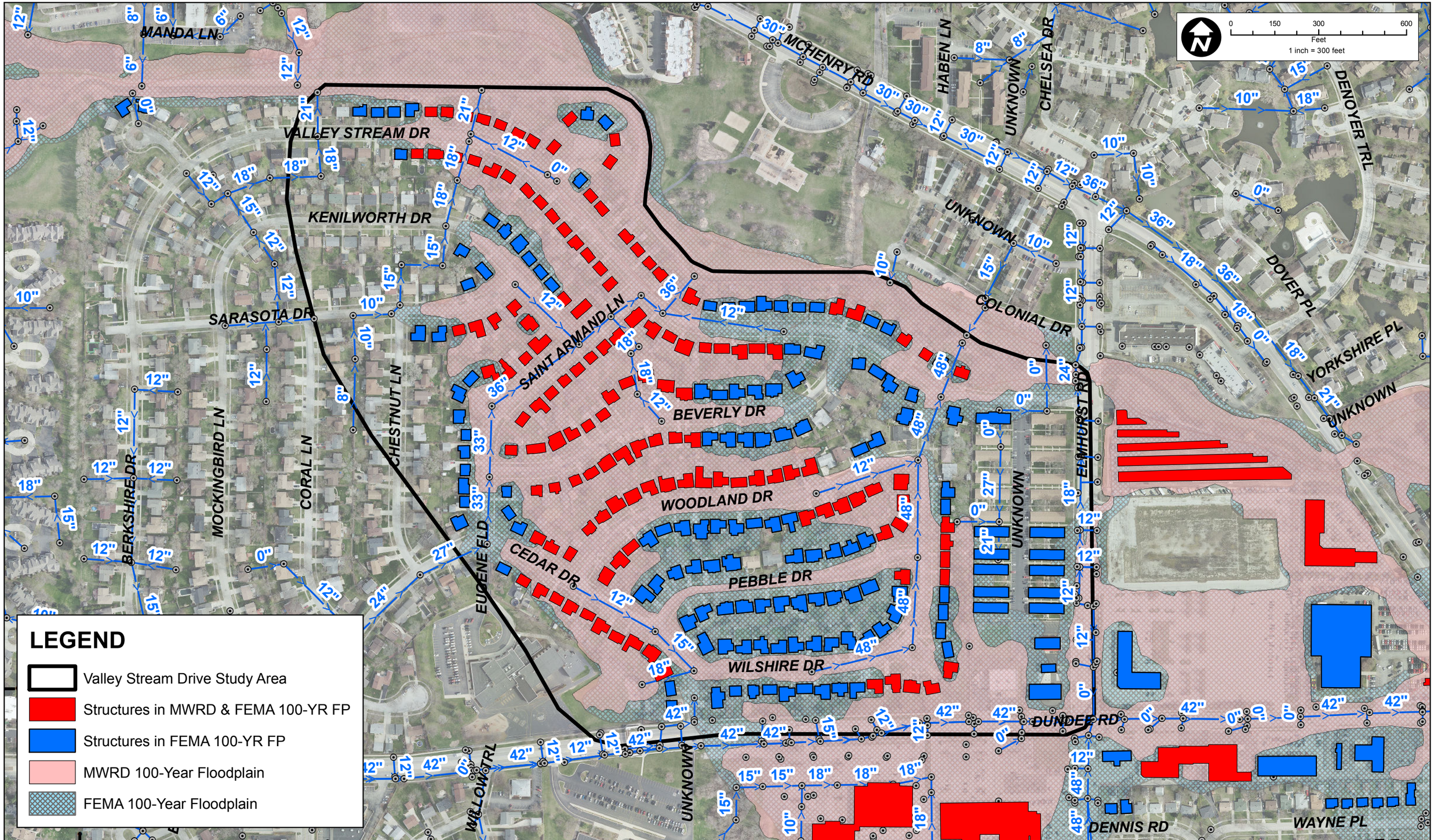
CLIENT:
VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
ALTERNATIVE 12
ARLINGTON CLUB POND
PROPOSED SPILLWAY

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 31



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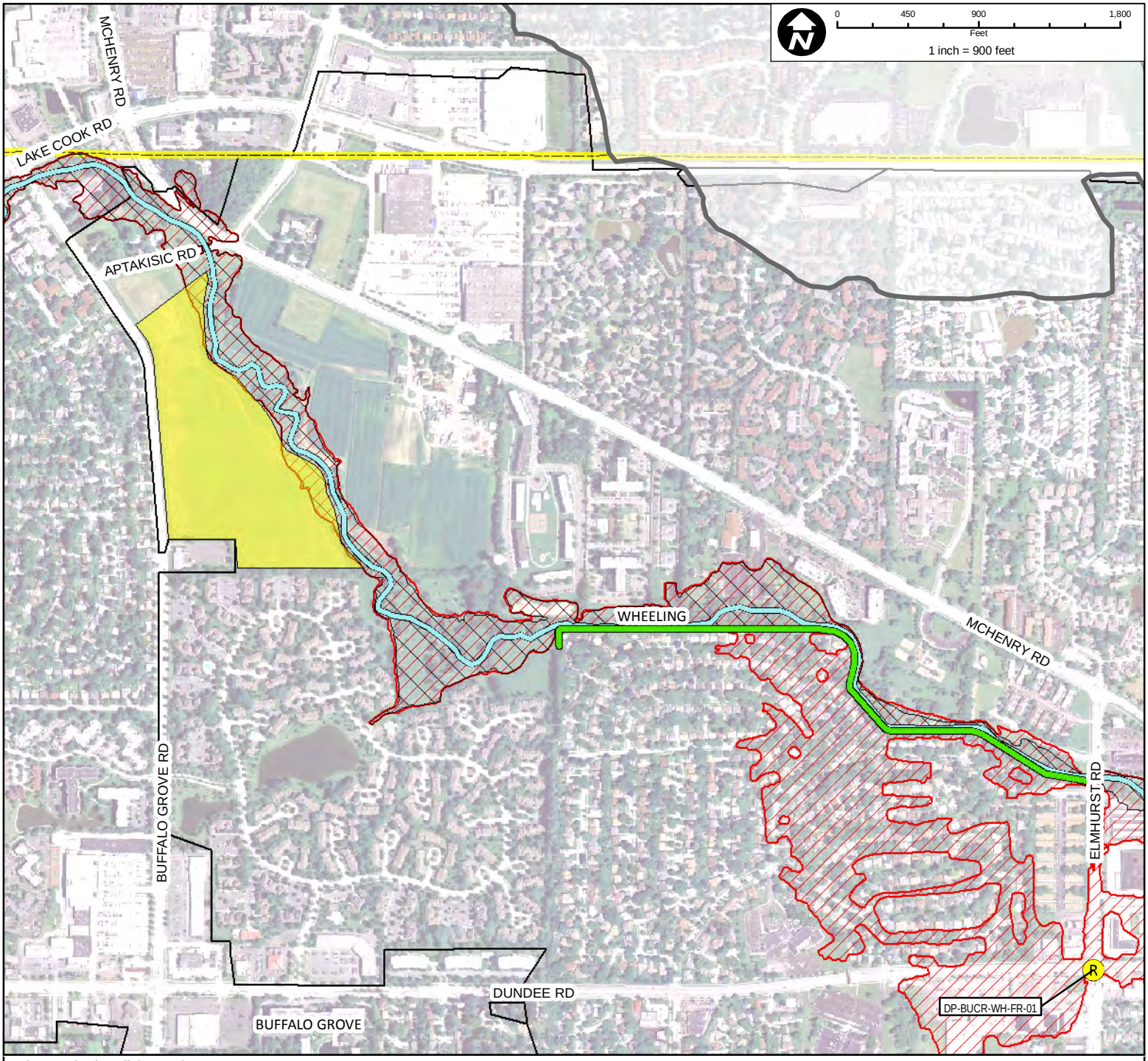
CLIENT:
VILLAGE OF WHEELING

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	MJB
DWN.	MJB
CHKD.	ELG
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
VALLEY STREAM DRIVE EXISTING CONDITIONS

PROJ. NO. 13-0631
DATE:
SHEET 1 OF 1
DRAWING NO.
EXH 32



Subwatershed: Buffalo Creek

Alternative: BUCR-5

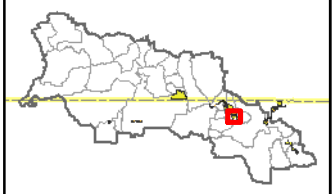
Alternatives Description: 4,000 feet of floodwall from 4,000 feet upstream of Elmhurst Road to the upstream face of Elmhurst Road. Provide 310 A-F of flood storage on un-developed private property in Wheeling.

Concept Level Cost: $61,687,084
Benefits: $1,925,650
B/C Ratio: 0.03

Legend

- 100-Year Storm Event Flood Inundation Without Project
- 100-Year Storm Event Flood Inundation With Project
- Reservoir
- Culvert/Bridge Modification
- Channel Improvements
- Levee/Floodwall
- Approximate Creek Channel Location
- Municipal Boundary
- Watershed Boundary

Problem Areas
- (M) Modeled
- (R) Regional



CLIENT:
METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TITLE:
LOWER DES PLAINES RIVER DETAILED WATERSHED PLAN
BUFFALO CREEK WATERSHED
PROPOSED ALTERNATIVE **13**

PROJ. NO.	08-0043
DATE:	03-23-2010
SHEET	1 OF 1
DRAWING NO.	**EX 33**

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DSGN.	DRW	4-10	SCALE: 500'		
DWN.			GIS USER	DRW	
CHKD.			PLOT DATE		
FILE:					

Map Document: (Z:\MWRDGC\08-0043 Phase B\Water\Buffalo\exhibits\Detailed Watershed Plan Sheets 2.mxd)
8/24/2010 -- 2:44:20 PM

EXH 34 - Wheeling Stormwater Master Plan
Comprehensive Summary Table

Flooding Problem Area	Location	Drains to	Affected Structures[1]	Improvement Alternative	Reduction in WSEL (FT) at Lowest Point	Storage Displaced (AC-FT)[3]	Benefits	Cons	Estimated Cost	Recommended	Relative Ranking
East Dunhurst Local Flooding	Wayne Pl & Bridget Pl	Heritage Lake	30 Residential Lots during 100-year storm	1A	3.4	7.6	Flood alleviation to 30 at-risk residential structures	Construction feasibility through residential driveways and garages. Utility conflicts.	$6.2 million	No	
				1B	3.4	7.6	Flood alleviation to 30 at-risk residential structures	Requires residential parcel buyout. Utility conflicts.	$4.8 million	No	
				1C	2.8	7.6	Flood alleviation to 30 at-risk residential structures	Requires residential parcel buyout. Utility conflicts. ComEd ROW easements.	$1.5 million	Yes	High
				1D	2.2	7.6	Flood alleviation to 30 at-risk residential structures	Utility conflicts.	$10.2 million	No	
South Dunhurst Local Flooding	Green Dr, Bernice Ct, Isa Dr, Audrey Ct	Heritage Lake	25 Residential Lots during 100-year storm	2	1.4	11.7	Flood alleviation to 21 at-risk residential structures	Land acquisition & utility conflicts	$6.6 million	Yes	Medium
West Dunhurst Local Flooding	Norman Ln & Albert Terr	Heritage Lake	11 Residential Lots during 100-year storm	3A	3.8	7.3	Flood alleviation to 11 at-risk residential structures	Cost prohibitive for benefits realized. Construction feasibiltiy through rear yards. Utility conflicts.	$10.1 million	No	
				3B	3.8	7.3	Flood alleviation to 11 at-risk residential structures	Cost prohibitive for benefits realized. Utility conflicts.	$10.0 million	No	
Wheeling Rd Overtopping	North Wheeling Rd	Heritage Lake	Road impassible from street flooding during large storm events	4	3.1	-	Wheeling Road passable during wet conditions	-	$1.0 million	Yes	High
	South Wheeling Rd	Heritage Lake	Road impassible from street flooding during large storm events	5	4.1	-	Wheeling Road passable during wet conditions	Diverts stormwater to different watershed.	$485,000	Yes	High
Echo Lake / Ridgefield Local Flooding	Sandpebble Apartments & Bridle Trail	Hintz Rd Trunk Sewer	10-YR: 25 Parking spaces in Sandpebble parking lot	6	2.9 (Sandpebble)	2.0 (Sandpebble)	25 parking spaces protected during 10-YR storm	Temporary easement through ComEd ROW. Land acquisition of Sandpebble apartment property	$2.6 million	No	
		Hintz Rd Trunk Sewer	100-YR: 40 Parking spaces in Sandpebble parking lot, Roadway flooding on Bridle Tr	7	2.5 (Bridle Tr) & 1.6 (Sandpebble)	1.1 (BridleTr) 2.8 (Sandpebble)	30 Parking spaces with reduced flood dept < 1ft. Roadway flooding on Bridle Trail significantly reduced (<0.5ft)	Cost prohibitive for benefits realized. Utility conflicts.	$6.9 million	Yes	Medium
Jackson Dr & Lakeside Villas Local Flooding	Residences along Jackson Dr & Lakeside Villas	Hintz Rd Trunk Sewer	Road impassible from street flooding during large storm events. Also poses risk of residential flooding	8 (Phase 1)	-	-	Pump will significantly reduce Jackson Drive depression inundation time	Cook County must accept flow increases in their Hintz Rd storm sewer, which drains to Echo Lake.	$1.5 million	Yes	Medium
				8	1.7	-	Flood alleviation to multi-family and single-family units	Land acquisition , easements	$5.6 million[2]	No	
				9	1.7	-	Flood alleviation to multi-family and single-family units	Land acquisition , easements	$5.4 million[2]	No	
				8 (w/ Tahoe Modifications and Relief Sewer)	3	-	Flood alleviation to multi-family and single-family units	Land acquisition , easements. Cook County must accept flow increases in their Hintz Rd storm sewer, which drains to Echo Lake.	$9.3 million[2]	Yes	Low
Jeffrey and Manchester Local Flooding	Jeffrey Ave & Manchester Dr	Des Plaines River	Local street flooding from lack of storm infrastructure. 4 homes in Des Plaines 100-year regulatory floodplain	10	-	-	Provides new storm sewer infrastrucutre designed for the 10-year storm event. Backflow preventor should reduce flooding when Des Plaines River is high.	-	$9.0 million	Yes	Low
Sunrise Dr Local Flooding	West Sunrise Dr	Buffalo Creek	5 residential yards within the depressional area	11	2.0	0.8	Provides drainage for depressional area that stays wet following storm events.	-	$283,000	Yes	Low
Oliver Wendell Holmes Middle School Property Flooding	Wolf Rd & Highland Ave	Buffalo Creek	School propoerty (School strucuture is above 100-yr floodplain elevation)	-	-	-	-	-	-	-	
Valley Stream Dr Riverine Flooding	Between Valley Stream Dr & Dundee Rd	Buffalo Creek	260 homes in 100-year regulatory floodplain	12	1.0	45.0	Removes 260 homes currently in the 100-year regulatory FEMA floodplain required to pay premium flood insurance rates	Very large scale project at municiple level. Outside funding required.	$61.6 million[2]	No	Low
Arlington Club Lake Overtopping	Arlington Dr between Acorn Ct & Seville Ct	Buffalo Creek	Earth erosion compromising integrity of adjacent parking lot	13	-	-	Provides suitable overflow route for excess stormwater. Prevents erosion next to parking lot.	-	$117,000	Yes	Low
Buffalo Creek Regulatory Floodplain Re-Mapping	Buffalo Creek floodplain in Wheeling	Des Plaines River	660 structures located in 100-year regulatory FEMA floodplain, but not in MWRD strudy 100-year floodplain	14	-	-	660 structures are no longer required to pay premium rates for flood insurance	-	$200,000	Yes	High
Buffalo Creek Streambank Stabilization	Buffalo Creek through the Village	Buffalo Creek	Homes adjacent to Buffalo Creek	Phase 2 & 3	-	-	Water quality benefits and stream stabilization	-	$3.6 million	Yes	Low
SWPP NPDES Compliance	-	-	-	15	N/A	N/A	Required as part of NPDES	-	$9.6 million[4] ($476,000/year)	Required	Required

[1]Estimated from aerial topography. Low entry elevation not taken.

[2]Cost based on 2009 estimate updated with 2015 values

[3]Storage estimated at Heritage Lake by pumping down NWL by 2 ft is 19 ac-ft (Assuming 50% of Heritage Lake is 6-inches deep)

[4]$9.6 million based on multiplying the yearly cost over 20 years

Total Cost = **$50.0 million** Over 20 Years

NOTES: No buyouts were evaluated at this time. Dunhurst costs do not include dam and pumping scenario, assuming Heritage Lake cannot be pumped to handle increased flows.

June 9, 2015

Appendix 1
Cost Estimates

Dunhurst Improvement (100 Yr)	$6,206,000					Alt-1A
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$2,444,000**	**39%**
4'x4' Box Culvert	Ft	540	$750	$405,000		
12'x4' Box Culvert	Ft	650	$1,200	$780,000		
14'x4' Box Culvert	Ft	410	$1,800	$738,000		
15'x4' Box Culvert	Ft	80	$2,500	$200,000		
60" RCP	Ft	120	$500	$60,000		
Inlets/12" Laterals	Ea	12	$4,000	$48,000		
Manholes/Risers	Ea	14	$12,000	$168,000		
End Sections	Ea	3	$15,000	$45,000		
Utility Resotration					**$171,000**	**3%**
Water Main Relocate	Ft	240	$375	$90,000		
Sanitary Sewer Relocate	Ft	240	$275	$66,000		
Wat/San Services Adjustments	Ea	5	$3,000	$15,000		
Grounds Restoration					**$230,154**	**4%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	489	$66	$32,274		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	0	$26	$0		
Curb/Gutter Restore	Ft	250	$24	$6,000		
Sidewalk/ADA restore	Sq Ft	200	$16	$3,200		
Landscape Restore	Sq Yd	4740	$6	$28,440		
Tree Impacts	Ft	1360	$20	$27,200		
Driveway Restore	Sq Ft	3000	$35	$105,000		
Parking Lot / Entrance Restore	Sq Ft	701	$40	$28,040		
Miscellaneous					**$2,181,960**	**35%**
Temp Haul Rd	Ft	600	$110	$66,000		
Temp Sed/Eros Control	Sq Yd	4740	$4	$18,960		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	6.0%	$2,845,154	$170,710		
Temp Shoring	Ft	960	$900	$864,000		
Maintenance of Traffic	L Sum	2.0%	$2,845,154	$56,910		
Construction Layout	L Sum	1.0%	$2,845,154	$28,460		
CCDD Testing/Disposal Fees	L Sum	1.0%	$2,845,154	$28,460		
Private Utility Adjustments	L Sum	3.0%	$2,845,154	$85,360		
Mobilization	L Sum	4.0%	$2,845,154	$113,810		
Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
Contingency	L Sum	25.0%	$2,845,154	$711,290		
Acquisition / Engineering / Management					**$1,178,640**	**19%**
Property Acquisition / Building Demolition	Sq Ft	540	$30	$16,200		
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	5130	$20	$102,600		
Land Acquisition - Construction Easement	Sq Ft	5440	$10	$54,400		
Design Engineering	L Sum	7.5%	$5,027,114	$377,040		
Permitting	L Sum	2.5%	$5,027,114	$125,680		
Construction Observation	L Sum	8.0%	$5,027,114	$402,170		
Administration Village	L Sum	2.0%	$5,027,114	$100,550		
Note:				**Grand Total**	**$6,205,754**	
Ex 48" Stm Sew avoids the following util's						
30" Water Main on Wheeling Rd						
Gas linse cross Wheeling from Cel Tower to Conc Plant				Price per Pr Stm Sew Foot	$3,878.60	

Dunhurst Improvement (100 Yr)	$4,795,000					Alt-1B
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$2,203,000**	**46%**
12'x4' Box Culvert	Ft	830	$1,200	$996,000		
14'x4' Box Culvert	Ft	410	$1,800	$738,000		
15'x4' Box Culvert	Ft	80	$2,500	$200,000		
60" RCP	Ft	120	$500	$60,000		
Inlets/12" Laterals	Ea	2	$4,000	$8,000		
Manholes/Risers	Ea	13	$12,000	$156,000		
End Sections	Ea	3	$15,000	$45,000		
Utility Resotration					**$93,000**	**2%**
Water Main Relocate	Ft	120	$375	$45,000		
Sanitary Sewer Relocate	Ft	120	$275	$33,000		
Wat/San Services Adjustments	Ea	5	$3,000	$15,000		
Grounds Restoration					**$152,034**	**3%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	689	$66	$45,474		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	240	$26	$6,240		
Curb/Gutter Restore	Ft	350	$24	$8,400		
Sidewalk/ADA restore	Sq Ft	100	$16	$1,600		
Landscape Restore	Sq Yd	5980	$6	$35,880		
Tree Impacts	Ft	1320	$20	$26,400		
Driveway Restore	Sq Ft	0	$35	$0		
Parking Lot / Entrance Restore	Sq Ft	701	$40	$28,040		
Miscellaneous					**$1,156,150**	**24%**
Temp Haul Rd	Ft	600	$110	$66,000		
Temp Sed/Eros Control	Sq Yd	5980	$4	$23,920		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	6.0%	$2,448,034	$146,890		
Maintenance of Traffic	L Sum	2.0%	$2,448,034	$48,970		
Construction Layout	L Sum	1.0%	$2,448,034	$24,490		
CCDD Testing/Disposal Fees	L Sum	1.0%	$2,448,034	$24,490		
Private Utility Adjustments	L Sum	3.0%	$2,448,034	$73,450		
Mobilization	L Sum	4.0%	$2,448,034	$97,930		
Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
Contingency	L Sum	25.0%	$2,448,034	$612,010		
Acquisition / Engineering / Management					**$1,190,560**	**25%**
Property Acquisition / Building Demolition	Sq Ft	8010	$30	$240,300		
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	5500	$20	$110,000		
Land Acquisition - Construction Easement	Sq Ft	11940	$10	$119,400		
Design Engineering	L Sum	7.5%	$3,604,184	$270,320		
Permitting	L Sum	2.5%	$3,604,184	$90,110		
Construction Observation	L Sum	8.0%	$3,604,184	$288,340		
Administration Village	L Sum	2.0%	$3,604,184	$72,090		
Note:				**Grand Total**	**$4,794,744**	
Ex 48" Stm Sew avoids the following util's						
30" Water Main on Wheeling Rd						
Gas linse cross Wheeling from Cel Tower to Conc Plant			Price per Pr Stm Sew Foot		$3,866.73	

Dunhurst Improvement (100 Yr)	$1,449,000					Alt-1C
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$259,000**	**18%**
10'x4' Box Culvert	Ft	100	$1,150	$115,000		
60" RCP	Ft	120	$500	$60,000		
Inlets/12" Laterals	Ea	0	$4,000	$0		
Manholes/Risers	Ea	2	$12,000	$24,000		
End Sections	Ea	4	$15,000	$60,000		
Utility Resotration					**$48,000**	**3%**
Water Main Relocate	Ft	60	$375	$22,500		
Sanitary Sewer Relocate	Ft	60	$275	$16,500		
Wat/San Services Adjustments	Ea	3	$3,000	$9,000		
Grounds Restoration					**$161,010**	**11%**
Earth Excavation	Cu Yd	2210	$35	$77,350		
Pvmt Recon over Pr Stm Sew	Sq Yd	200	$66	$13,200		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	0	$26	$0		
Curb/Gutter Restore	Ft	150	$24	$3,600		
Sidewalk/ADA restore	Sq Ft	120	$16	$1,920		
Landscape Restore	Sq Yd	6990	$6	$41,940		
Tree Impacts	Ft	1150	$20	$23,000		
Driveway Restore	Sq Ft	0	$35	$0		
Parking Lot / Entrance Restore	Sq Ft	0	$40	$0		
Miscellaneous					**$347,310**	**24%**
Temp Haul Rd	Ft	600	$110	$66,000		
Temp Sed/Eros Control	Sq Yd	6990	$4	$27,960		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	10.0%	$468,010	$46,810		
Maintenance of Traffic	L Sum	2.0%	$468,010	$9,370		
Construction Layout	L Sum	1.0%	$468,010	$4,690		
CCDD Testing/Disposal Fees	L Sum	1.0%	$468,010	$4,690		
Private Utility Adjustments	L Sum	3.0%	$468,010	$14,050		
Mobilization	L Sum	4.0%	$468,010	$18,730		
Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
Contingency	L Sum	25.0%	$468,010	$117,010		
Acquisition / Engineering / Management					**$632,780**	**44%**
Property Acquisition / Building Demolition	Sq Ft	8010	$30	$240,300		
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	10300	$20	$206,000		
Land Acquisition - Construction Easement	Sq Ft	2340	$10	$23,400		
Design Engineering	L Sum	7.5%	$815,320	$61,150		
Permitting	L Sum	2.5%	$815,320	$20,390		
Construction Observation	L Sum	8.0%	$815,320	$65,230		
Administration Village	L Sum	2.0%	$815,320	$16,310		
Note:				**Grand Total**	**$1,448,100**	
Ex 48" Stm Sew avoids the following util's						
30" Water Main on Wheeling Rd						
Gas linse cross Wheeling from Cel Tower to Conc Plant			Price per Pr Stm Sew Foot		$14,481.00	
10' Bottom, 3H:1V side slope overflow channel w/ 10' bottom						
48" remains in place, not in conflict with channel						

Dunhurst Improvement (100 Yr)	$10,196,000					Alt-1D
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$4,165,000**	**41%**
12'x4' Box Culvert	Ft	1160	$1,200	$1,392,000		
96" RCP	Ft	1400	$1,000	$1,400,000		
12'x5' Box Culvert	Ft	400	$1,650	$660,000		
15'x4' Box Culvert	Ft	80	$2,500	$200,000		
60" RCP	Ft	120	$500	$60,000		
Inlets/12" Laterals	Ea	36	$4,000	$144,000		
Manholes/Risers	Ea	22	$12,000	$264,000		
End Sections	Ea	3	$15,000	$45,000		
Utility Resotration					**$597,500**	**6%**
Water Main Relocate	Ft	610	$375	$228,750		
Sanitary Sewer Relocate	Ft	610	$275	$167,750		
Wat/San Services Adjustments	Ea	67	$3,000	$201,000		
Grounds Restoration					**$1,043,910**	**10%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	3700	$66	$244,200		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	1520	$26	$39,520		
Curb/Gutter Restore	Ft	1690	$24	$40,560		
Sidewalk/ADA restore	Sq Ft	2700	$16	$43,200		
Landscape Restore	Sq Yd	3860	$6	$23,160		
Tree Impacts	Ft	296	$20	$5,920		
Driveway Restore	Sq Ft	210	$35	$7,350		
Parking Lot / Entrance Restore	Sq Ft	16000	$40	$640,000		
Miscellaneous					**$2,442,040**	**24%**
Temp Haul Rd	Ft	600	$110	$66,000		
Temp Sed/Eros Control	Sq Yd	3860	$4	$15,440		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$5,806,410	$232,260		
Maintenance of Traffic	L Sum	2.0%	$5,806,410	$116,130		
Construction Layout	L Sum	1.0%	$5,806,410	$58,070		
CCDD Testing/Disposal Fees	L Sum	1.0%	$5,806,410	$58,070		
Private Utility Adjustments	L Sum	3.0%	$5,806,410	$174,200		
Mobilization	L Sum	4.0%	$5,806,410	$232,260		
Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
Contingency	L Sum	25.0%	$5,806,410	$1,451,610		
Acquisition / Engineering / Management					**$1,947,110**	**19%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	7200	$20	$144,000		
Land Acquisition - Construction Easement	Sq Ft	15340	$10	$153,400		
Design Engineering	L Sum	7.5%	$8,248,450	$618,640		
Permitting	L Sum	2.5%	$8,248,450	$206,220		
Construction Observation	L Sum	8.0%	$8,248,450	$659,880		
Administration Village	L Sum	2.0%	$8,248,450	$164,970		
Note:				**Grand Total**	**$10,195,560**	
Assumes 25% of WM and San is in conflict						
Ex 48" Stm Sew avoids the following util's						
30" Water Main on Wheeling Rd			Price per Pr Stm Sew Foot		$3,353.80	
Gas linse cross Wheeling from Cel Tower to Conc Plant						
Not modeled.						

Dunhurst Improvement (100 Yr w/ Alt 3)	$6,560,000					Alt-2
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$918,775**	**14%**
36" RCP	Ft	300	$120	$36,000		
42" RCP	Ft	750	$160	$120,000		
48" RCP	Ft	270	$200	$54,000		
36" RCP	Ft	795	$120	$95,400		
30" RCP	Ft	780	$100	$78,000		
18" RCP	Ft	765	$75	$57,375		
Inlets/12" Laterals	Ea	46	$4,000	$184,000		
Manholes/Risers	Ea	22	$12,000	$264,000		
End Sections	Ea	2	$15,000	$30,000		
						14%
Utility Resotration					**$904,750**	
Water Main Relocate	Ft	875	$375	$328,125		
Sanitary Sewer Relocate	Ft	875	$275	$240,625		
Wat/San Services Adjustments	Ea	112	$3,000	$336,000		
						30%
Grounds Restoration					**$1,962,465**	
Earth Excavation	Cu Yd	33249	$35	$1,163,715		
Pvmt Recon over Pr Stm Sew	Sq Yd	8000	$66	$528,000		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	3650	$26	$94,900		
Curb/Gutter Restore	Ft	460	$24	$11,040		
Sidewalk/ADA restore	Sq Ft	500	$16	$8,000		
Landscape Restore	Sq Yd	9520	$6	$57,120		
Native Shorline Stabilization	Ft	1350	$40	$54,000		
Tree Impacts	Ft	367	$20	$7,340		
Driveway Restore	Sq Ft	410	$35	$14,350		
Parking Lot / Entrance Restore	Sq Ft	600	$40	$24,000		**24%**
Miscellaneous					**$1,555,480**	
Temp Haul Rd	Ft	0	$110	$0		
Temp Sed/Eros Control	Sq Yd	9520	$4	$38,080		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$3,785,990	$151,440		
Maintenance of Traffic	L Sum	2.0%	$3,785,990	$75,720		
Construction Layout	L Sum	1.0%	$3,785,990	$37,860		
CCDD Testing/Disposal Fees	L Sum	1.0%	$3,785,990	$37,860		
Private Utility Adjustments	L Sum	3.0%	$3,785,990	$113,580		
Mobilization	L Sum	4.0%	$3,785,990	$151,440		
Contingency	L Sum	25.0%	$3,785,990	$946,500		
						19%
Acquisition / Engineering / Management					**$1,218,310**	
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	7500	$20	$150,000		
Land Acquisition - Construction Easement	Sq Ft	0	$10	$0		
Design Engineering	L Sum	7.5%	$5,341,470	$400,620		
Permitting	L Sum	2.5%	$5,341,470	$133,540		
Construction Observation	L Sum	8.0%	$5,341,470	$427,320		
Administration Village	L Sum	2.0%	$5,341,470	$106,830		
Note:				**Grand Total**	**$6,559,780**	
Assumes 25% of WM and San is in conflict						
Dry Bottom Basin						
Flap gate included in basin's manhole				Price per Pr Stm Sew Foot	$1,792.29	

	Dunhurst Improvement (100 Yr)	$10,086,000					Alt-3A
	Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
	Storm Sewer System					**$3,595,000**	**36%**
	68"x43" RCEP	Ft	1500	$300	$450,000		
	54" RCP	Ft	400	$200	$80,000		
	72" RCP	Ft	2600	$700	$1,820,000		
	8'x5' Box Culvert	Ft	400	$1,100	$440,000		
	10'x4' Box Culvert	Ft	80	$1,150	$92,000		
	60" RCP	Ft	120	$500	$60,000		
	Inlets/12" Laterals	Ea	50	$4,000	$200,000		
	Manholes/Risers	Ea	34	$12,000	$408,000		
	End Sections	Ea	3	$15,000	$45,000		
	Utility Resotration					**$821,250**	**8%**
	Water Main Relocate	Ft	945	$375	$354,375		
	Sanitary Sewer Relocate	Ft	945	$275	$259,875		
	Wat/San Services Adjustments	Ea	69	$3,000	$207,000		
	Grounds Restoration					**$1,129,770**	**11%**
	Earth Excavation	Cu Yd	0	$35	$0		
	Pvmt Recon over Pr Stm Sew	Sq Yd	5500	$66	$363,000		
	Resurface lane adjacent to Pr Stm Sew	Sq Yd	2180	$26	$56,680		
	Curb/Gutter Restore	Ft	280	$24	$6,720		
	Sidewalk/ADA restore	Sq Ft	700	$16	$11,200		
	Landscape Restore	Sq Yd	5720	$6	$34,320		
	Tree Impacts	Ft	490	$20	$9,800		
	Driveway Restore	Sq Ft	230	$35	$8,050		
	Parking Lot / Entrance Restore	Sq Ft	16000	$40	$640,000		
	Miscellaneous					**$2,345,350**	**23%**
	Temp Haul Rd	Ft	600	$110	$66,000		
	Temp Sed/Eros Control	Sq Yd	5720	$4	$22,880		
	As-Built Drawings	L Sum	1	$3,000	$3,000		
	Dewatering	L Sum	4.0%	$5,546,020	$221,850		
	Maintenance of Traffic	L Sum	2.0%	$5,546,020	$110,930		
	Construction Layout	L Sum	1.0%	$5,546,020	$55,470		
	CCDD Testing/Disposal Fees	L Sum	1.0%	$5,546,020	$55,470		
	Private Utility Adjustments	L Sum	3.0%	$5,546,020	$166,390		
	Mobilization	L Sum	4.0%	$5,546,020	$221,850		
	Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
	Contingency	L Sum	25.0%	$5,546,020	$1,386,510		
	Acquisition / Engineering / Management					**$2,194,610**	**22%**
	Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	13200	$20	$264,000		
	Land Acquisition - Construction Easement	Sq Ft	27340	$10	$273,400		
	Design Engineering	L Sum	7.5%	$7,891,370	$591,860		
	Permitting	L Sum	2.5%	$7,891,370	$197,290		
	Construction Observation	L Sum	8.0%	$7,891,370	$631,310		
	Administration Village	L Sum	2.0%	$7,891,370	$157,830		
	IDOT Permit / Assoc Work	L Sum	1.0%	$7,891,370	$78,920		
	Note:				**Grand Total**	**$10,085,980**	
	Assumes 25% of WM and San is in conflict						
	Ex 48" Stm Sew avoids the following util's						
	30" Water Main on Wheeling Rd			Price per Pr Stm Sew Foot		$1,977.64	
	Gas linse cross Wheeling from Cel Tower to Conc Plant						

Dunhurst Improvement (100 Yr)	$9,999,000					Alt-3B
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$3,035,000**	**30%**
68"x43" RCEP	Ft	1500	$300	$450,000		
54" RCP	Ft	1960	$200	$392,000		
72" RCP	Ft	1400	$700	$980,000		
8'x5' Box Culvert	Ft	400	$1,100	$440,000		
10'x4' Box Culvert	Ft	80	$1,150	$92,000		
60" RCP	Ft	120	$500	$60,000		
Inlets/12" Laterals	Ea	54	$4,000	$216,000		
Manholes/Risers	Ea	30	$12,000	$360,000		
End Sections	Ea	3	$15,000	$45,000		
Utility Resotration					**$1,194,750**	**12%**
Water Main Relocate	Ft	1335	$375	$500,625		
Sanitary Sewer Relocate	Ft	1335	$275	$367,125		
Wat/San Services Adjustments	Ea	109	$3,000	$327,000		
Grounds Restoration					**$1,411,970**	**14%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	9300	$66	$613,800		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	3580	$26	$93,080		
Curb/Gutter Restore	Ft	400	$24	$9,600		
Sidewalk/ADA restore	Sq Ft	1100	$16	$17,600		
Landscape Restore	Sq Yd	3740	$6	$22,440		
Tree Impacts	Ft	370	$20	$7,400		
Driveway Restore	Sq Ft	230	$35	$8,050		
Parking Lot / Entrance Restore	Sq Ft	16000	$40	$640,000		
Miscellaneous					**$2,375,670**	**24%**
Temp Haul Rd	Ft	600	$110	$66,000		
Temp Sed/Eros Control	Sq Yd	3740	$4	$14,960		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$5,641,720	$225,670		
Maintenance of Traffic	L Sum	2.0%	$5,641,720	$112,840		
Construction Layout	L Sum	1.0%	$5,641,720	$56,420		
CCDD Testing/Disposal Fees	L Sum	1.0%	$5,641,720	$56,420		
Private Utility Adjustments	L Sum	3.0%	$5,641,720	$169,260		
Mobilization	L Sum	4.0%	$5,641,720	$225,670		
Rail Road Permit/Fee	L Sum	1	$35,000	$35,000		
Contingency	L Sum	25.0%	$5,641,720	$1,410,430		
Acquisition / Engineering / Management					**$1,981,080**	**20%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	7200	$20	$144,000		
Land Acquisition - Construction Easement	Sq Ft	15340	$10	$153,400		
Design Engineering	L Sum	7.5%	$8,017,390	$601,310		
Permitting	L Sum	2.5%	$8,017,390	$200,440		
Construction Observation	L Sum	8.0%	$8,017,390	$641,400		
Administration Village	L Sum	2.0%	$8,017,390	$160,350		
IDOT Permit / Assoc Work	L Sum	1.0%	$8,017,390	$80,180		
Note:						
Assumes 25% of WM and San is in conflict				**Grand Total**	**$9,998,470**	
Ex 42" Stm Sew maintained in backyards (Elmhurst to Merle)						
Ex 48" Stm Sew avoids the following util's						
30" Water Main on Wheeling Rd			Price per Pr Stm Sew Foot		$1,831.22	
Gas linse cross Wheeling from Cel Tower to Conc Plant						

Wheeling Rd Improvement (10 Yr)	$485,000					Alt-5
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$116,600**	**24%**
24" RCP	Ft	520	$80	$41,600		
Inlets/12" Laterals	Ea	3	$4,000	$12,000		
Manholes/Risers	Ea	4	$12,000	$48,000		
End Sections	Ea	1	$15,000	$15,000		
Utility Resotration					**$25,500**	**5%**
Water Main Relocate	Ft	30	$375	$11,250		
Sanitary Sewer Relocate	Ft	30	$275	$8,250		
Wat/San Services Adjustments	Ea	2	$3,000	$6,000		
Grounds Restoration					**$25,376**	**5%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	20	$66	$1,320		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	168	$26	$4,368		
Curb/Gutter Restore	Ft	12	$24	$288		
Sidewalk/ADA restore	Sq Ft	150	$16	$2,400		
Landscape Restore	Sq Yd	500	$6	$3,000		
Tree Impacts	Ft	100	$20	$2,000		
Driveway Restore	Sq Ft	0	$35	$0		
Parking Lot / Entrance Restore	Sq Ft	300	$40	$12,000		
Miscellaneous					**$72,010**	**15%**
Temp Haul Rd	Ft	0	$110	$0		
Temp Sed/Eros Control	Sq Yd	500	$4	$2,000		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$167,476	$6,700		
Maintenance of Traffic	L Sum	2.0%	$167,476	$3,350		
Construction Layout	L Sum	1.0%	$167,476	$1,680		
CCDD Testing/Disposal Fees	L Sum	1.0%	$167,476	$1,680		
Private Utility Adjustments	L Sum	3.0%	$167,476	$5,030		
Mobilization	L Sum	4.0%	$167,476	$6,700		
Contingency	L Sum	25.0%	$167,476	$41,870		
Acquisition / Engineering / Management					**$244,690**	**51%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	6240	$20	$124,800		
Land Acquisition - Construction Easement	Sq Ft	6240	$10	$62,400		
Design Engineering	L Sum	7.5%	$239,486	$17,970		
Permitting	L Sum	6.5%	$239,486	$15,570		
Construction Observation	L Sum	8.0%	$239,486	$19,160		
Administration Village	L Sum	2.0%	$239,486	$4,790		
Note:				**Grand Total**	**$484,176**	
			Price per Pr Stm Sew Foot		$931.11	

Echo Lake / Ridgefield Improvement (10 Yr)	$2,393,000					Alt-6
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$321,180**	**13%**
36" RCP	Ft	339	$120	$40,680		
12" RCP	Ft	750	$70	$52,500		
Inlets/12" Laterals	Ea	12	$4,000	$48,000		
Manholes/Risers	Ea	10	$12,000	$120,000		
End Sections	Ea	4	$15,000	$60,000		
Utility Resotration					**$63,000**	**3%**
Water Main Relocate	Ft	60	$375	$22,500		
Sanitary Sewer Relocate	Ft	60	$275	$16,500		
Wat/San Services Adjustments	Ea	8	$3,000	$24,000		
Grounds Restoration					**$766,294**	**32%**
Earth Excavation	Cu Yd	16208	$35	$567,280		
Pvmt Recon over Pr Stm Sew	Sq Yd	120	$66	$7,920		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	120	$26	$3,120		
Curb/Gutter Restore	Ft	180	$24	$4,320		
Sidewalk/ADA restore	Sq Ft	450	$16	$7,200		
Landscape Restore	Sq Yd	16054	$6	$96,324		
Native Shorline Stabilization	Ft	1860	$40	$74,400		
Tree Impacts	Ft	20	$20	$400		
Driveway Restore	Sq Ft	30	$35	$1,050		
Parking Lot / Entrance Restore	Sq Ft	107	$40	$4,280		
Miscellaneous					**$557,126**	**23%**
Temp Haul Rd	Ft	270	$110	$29,700		
Temp Sed/Eros Control	Sq Yd	16054	$4	$64,216		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$1,150,474	$46,020		
Maintenance of Traffic	L Sum	2.0%	$1,150,474	$23,010		
Construction Layout	L Sum	1.0%	$1,150,474	$11,510		
CCDD Testing/Disposal Fees	L Sum	1.0%	$1,150,474	$11,510		
Private Utility Adjustments	L Sum	3.0%	$1,150,474	$34,520		
Mobilization	L Sum	4.0%	$1,150,474	$46,020		
Contingency	L Sum	25.0%	$1,150,474	$287,620		
Acquisition / Engineering / Management					**$684,860**	**29%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	10875	$20	$217,500		
Land Acquisition - Construction Easement	Sq Ft	10875	$10	$108,750		
Design Engineering	L Sum	8.5%	$1,707,600	$145,150		
Permitting	L Sum	2.5%	$1,707,600	$42,690		
Construction Observation	L Sum	8.0%	$1,707,600	$136,610		
Administration Village	L Sum	2.0%	$1,707,600	$34,160		
Note:				**Grand Total**	**$2,392,460**	
Basins are to be dry bottom						
Pond survey included in Design Engineering						
				Price per Pr Stm Sew Foot	$2,196.93	

Echo Lake Chain of Lakes Improvement (100 Yr)	$6,286,000					Alt-7
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$991,850**	**16%**
36" RCP	Ft	30	$120	$3,600		
48" RCP	Ft	609	$200	$121,800		
54" RCP	Ft	720	$200	$144,000		
27" RCP	Ft	240	$95	$22,800		
36" RCP	Ft	180	$120	$21,600		
42" RCP	Ft	990	$160	$158,400		
18" RCP	Ft	150	$75	$11,250		
Inlets/12" Laterals	Ea	20	$4,000	$80,000		
Manholes/Risers	Ea	26	$12,000	$312,000		
End Sections	Ea	8	$15,000	$120,000		
Utility Resotration					**$493,900**	**8%**
Water Main Relocate	Ft	686	$375	$257,250		
Sanitary Sewer Relocate	Ft	686	$275	$188,650		
Wat/San Services Adjustments	Ea	16	$3,000	$48,000		
Grounds Restoration					**$1,630,538**	**26%**
Earth Excavation	Cu Yd	16208	$35	$567,280		
Lake Excavation/Grading	Cu Yd	8667	$50	$433,350		
Pvmt Recon over Pr Stm Sew	Sq Yd	840	$66	$55,440		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	840	$26	$21,840		
Curb/Gutter Restore	Ft	480	$24	$11,520		
Sidewalk/ADA restore	Sq Ft	1050	$16	$16,800		
Landscape Restore	Sq Yd	25108	$6	$150,648		
Native Shorline Stabilization	Ft	8590	$40	$343,600		
Rip-rap outlet/shoreline stabilization	Sq Yd	300	$40	$12,000		
Tree Impacts	Ft	420	$20	$8,400		
Driveway Restore	Sq Ft	60	$35	$2,100		
Parking Lot / Entrance Restore	Sq Ft	189	$40	$7,560		
Miscellaneous					**$1,683,992**	**27%**
Temp Haul Rd	Ft	770	$110	$84,700		
Temp Sed/Eros Control	Sq Yd	25108	$4	$100,432		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	6.0%	$3,116,288	$186,980		
Movable Water Filled Coffer Dams	L Sum	6.0%	$3,116,288	$186,980		
Maintenance of Traffic	L Sum	2.0%	$3,116,288	$62,330		
Construction Layout	L Sum	1.0%	$3,116,288	$31,170		
CCDD Testing/Disposal Fees	L Sum	1.0%	$3,116,288	$31,170		
Private Utility Adjustments	L Sum	3.0%	$3,116,288	$93,490		
Mobilization	L Sum	4.0%	$3,116,288	$124,660		
Contingency	L Sum	25.0%	$3,116,288	$779,080		
Acquisition / Engineering / Management					**$1,485,330**	**24%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	10875	$20	$217,500		
Land Acquisition - Construction Easement	Sq Ft	28375	$10	$283,750		
Design Engineering	L Sum	8.0%	$4,800,280	$384,030		
Permitting	L Sum	2.5%	$4,800,280	$120,010		
Construction Observation	L Sum	8.0%	$4,800,280	$384,030		
Administration Village	L Sum	2.0%	$4,800,280	$96,010		
Note:				**Grand Total**	**$6,285,610**	
Basins are to be dry bottom						
Pond/Lake survey included in Design Engineering						
Lake bottoms lowered 2' ave.				Price per Pr Stm Sew Foot	$10,321.20	

Manchester Dr Proposed Storm Sewer Improvement	$8,891,000					Alt-10
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$2,845,060**	**32%**
15" RCP	Ft	2605	$72	$187,560		
18" RCP	Ft	1100	$75	$82,500		
24" RCP	Ft	2300	$80	$184,000		
36" RCP	Ft	300	$120	$36,000		
48" RCP	Ft	600	$200	$120,000		
54" RCP	Ft	300	$200	$60,000		
66" RCP	Ft	600	$625	$375,000		
72" RCP	Ft	550	$700	$385,000		
Inlets/12" Laterals	Ea	128	$4,000	$512,000		
Manholes/Risers	Ea	74	$12,000	$888,000		
End Sections	Ea	1	$15,000	$15,000		
Utility Resotration					**$1,503,750**	**17%**
Water Main Relocate	Ft	1575	$375	$590,625		
Sanitary Sewer Relocate	Ft	1575	$275	$433,125		
Wat/San Services Adjustments	Ea	160	$3,000	$480,000		
Acquisition / Engineering / Management					**$935,200**	**11%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	7300	$66	$481,800		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	7300	$26	$189,800		
Curb/Gutter Restore	Ft	1110	$24	$26,640		
Sidewalk/ADA restore	Sq Ft	3300	$16	$52,800		
Landscape Restore	Sq Yd	2110	$6	$12,660		
Tree Impacts	Ft	1015	$20	$20,300		
Driveway Restore	Sq Ft	4320	$35	$151,200		
Parking Lot / Entrance Restore	Sq Ft	0	$40	$0		
Miscellaneous					**$2,125,110**	**24%**
Temp Haul Rd	Ft	0	$110	$0		
Temp Sed/Eros Control	Sq Yd	2110	$4	$8,440		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$5,284,010	$211,370		
Maintenance of Traffic	L Sum	2.0%	$5,284,010	$105,690		
Construction Layout	L Sum	1.0%	$5,284,010	$52,850		
CCDD Testing/Disposal Fees	L Sum	1.0%	$5,284,010	$52,850		
Private Utility Adjustments	L Sum	3.0%	$5,284,010	$158,530		
Mobilization	L Sum	4.0%	$5,284,010	$211,370		
Contingency	L Sum	25.0%	$5,284,010	$1,321,010		
Engineering / Management					**$1,481,840**	**17%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	0	$20	$0		
Land Acquisition - Construction Easement	Sq Ft	0	$10	$0		
Design Engineering	L Sum	7.5%	$7,409,120	$555,690		
Permitting	L Sum	2.5%	$7,409,120	$185,230		
Construction Observation	L Sum	8.0%	$7,409,120	$592,730		
Administration Village	L Sum	2.0%	$7,409,120	$148,190		
Note:				**Grand Total**	**$8,890,960**	
				Price per Pr Stm Sew Foot	$1,139.14	

Sunset Improvement (10 Yr)	$283,000					Alt-11
Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
Storm Sewer System					**$116,600**	**41%**
24" RCP	Ft	370	$80	$29,600		
36" RCP	Ft	100	$120	$12,000		
Inlets/12" Laterals	Ea	3	$4,000	$12,000		
Manholes/Risers	Ea	4	$12,000	$48,000		
End Sections	Ea	1	$15,000	$15,000		
Utility Resotration					**$25,500**	**9%**
Water Main Relocate	Ft	30	$375	$11,250		
Sanitary Sewer Relocate	Ft	30	$275	$8,250		
Wat/San Services Adjustments	Ea	2	$3,000	$6,000		
Grounds Restoration					**$7,266**	**3%**
Earth Excavation	Cu Yd	0	$35	$0		
Pvmt Recon over Pr Stm Sew	Sq Yd	20	$66	$1,320		
Resurface lane adjacent to Pr Stm Sew	Sq Yd	20	$26	$520		
Curb/Gutter Restore	Ft	36	$24	$864		
Sidewalk/ADA restore	Sq Ft	150	$16	$2,400		
Landscape Restore	Sq Yd	227	$6	$1,362		
Tree Impacts	Ft	40	$20	$800		
Driveway Restore	Sq Ft	0	$35	$0		
Parking Lot / Entrance Restore	Sq Ft	0	$40	$0		
Miscellaneous					**$63,698**	**23%**
Temp Haul Rd	Ft	0	$110	$0		
Temp Sed/Eros Control	Sq Yd	227	$4	$908		
As-Built Drawings	L Sum	1	$3,000	$3,000		
Dewatering	L Sum	4.0%	$149,366	$5,980		
Maintenance of Traffic	L Sum	2.0%	$149,366	$2,990		
Construction Layout	L Sum	1.0%	$149,366	$1,500		
CCDD Testing/Disposal Fees	L Sum	1.0%	$149,366	$1,500		
Private Utility Adjustments	L Sum	3.0%	$149,366	$4,490		
Mobilization	L Sum	4.0%	$149,366	$5,980		
Contingency	L Sum	25.0%	$149,366	$37,350		
Acquisition / Engineering / Management					**$69,650**	**25%**
Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	0	$20	$0		
Land Acquisition - Construction Easement	Sq Ft	1850	$10	$18,500		
Design Engineering	L Sum	7.5%	$213,064	$15,980		
Permitting	L Sum	6.5%	$213,064	$13,850		
Construction Observation	L Sum	8.0%	$213,064	$17,050		
Administration Village	L Sum	2.0%	$213,064	$4,270		
Note:				**Grand Total**	**$282,714**	
Assumed existing easements						
				Price per Pr Stm Sew Foot	$764.09	

	Arlington Club Pond Spillway Improvement	$117,000					Alt-12
	Element	**Units**	**Quantity**	**Unit Price**	**Line Price**	**Element Price**	**% Of Total**
	Storm Sewer System					**$0**	**0%**
	12" RCP	Ft	0	$70	$0		
	Inlets/12" Laterals	Ea	0	$4,000	$0		
	Manholes/Risers	Ea	0	$12,000	$0		
	End Sections	Ea	0	$15,000	$0		
	Utility Resotration					**$0**	**0%**
	Water Main Relocate	Ft	0	$375	$0		
	Sanitary Sewer Relocate	Ft	0	$275	$0		
	Wat/San Services Adjustments	Ea	0	$3,000	$0		
	Grounds Restoration					**$8,162**	**7%**
	Earth Excavation	Cu Yd	16	$35	$560		
	Pvmt Recon over Pr Stm Sew	Sq Yd	0	$66	$0		
	Sidewalk/ADA restore	Sq Ft	200	$16	$3,200		
	Curb/Gutter Restore	Ft	100	$24	$2,400		
	Rip-rap outlet/shoreline stabilization	Sq Yd	35	$40	$1,400		
	Landscape Restore	Sq Yd	67	$6	$402		
	Tree Impacts	Ft	10	$20	$200		
	Driveway Restore	Sq Ft	0	$35	$0		
	Parking Lot / Entrance Restore	Sq Ft	0	$40	$0		
	Miscellaneous					**$6,578**	**6%**
	Temp Haul Rd	Ft	0	$110	$0		
	Temp Sed/Eros Control	Sq Yd	67	$4	$268		
	As-Built Drawings	L Sum	1	$3,000	$3,000		
	Dewatering	L Sum	4.0%	$8,162	$330		
	Maintenance of Traffic	L Sum	2.0%	$8,162	$170		
	Construction Layout	L Sum	1.0%	$8,162	$90		
	CCDD Testing/Disposal Fees	L Sum	1.0%	$8,162	$90		
	Private Utility Adjustments	L Sum	3.0%	$8,162	$250		
	Mobilization	L Sum	4.0%	$8,162	$330		
	Contingency	L Sum	25.0%	$8,162	$2,050		
	Acquisition / Engineering / Management					**$101,290**	**87%**
	Land Acquisition - Perm Easement: New/Widen Ex	Sq Ft	4400	$20	$88,000		
	Land Acquisition - Construction Easement	Sq Ft	0	$10	$0		
	Design Engineering	L Sum	30.0%	$14,740	$4,430		
	Permitting	L Sum	20.0%	$14,740	$2,950		
	Construction Observation	L Sum	30.0%	$14,740	$4,430		
	Administration Village	L Sum	10.0%	$14,740	$1,480		
					Grand Total	**$116,030**	

Appendix 2
Buffalo Creek Streambank Stabilization

Buffalo Creek Comprehensive Study

Stream Bank/Stream Bed Stability

Prepared for

Village of Wheeling
255 Dundee Road
Wheeling, IL 60090

Prepared by

Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road
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1. INTRODUCTION

This document represents an evaluation of the stream bank and stream bed stability of Buffalo Creek/Wheeling Ditch within the limits of the Village of Wheeling, Cook County, Illinois. The study area included all stretches of Buffalo Creek from West Aptakisic Road at the upstream limit of the creek in the Village to the confluence with the Des Plaines River at Palwaukee Airport, shown in the location map in Tab 4.

This study assesses the current condition and stability of the creek's stream bed and banks, and provides planning level recommendations and estimated costs for corrective actions. A description of the existing conditions of the creek is included in Tab 2, and the recommended corrective actions are summarized in Tab 3. The objectives of the recommended actions are as follows:

- Reduce and/or eliminate erosion of Buffalo Creek stream banks.
- Reduce and/or eliminate down cutting of the stream bed where practicable.
- Reduce non-point source pollutants including sediments generated from stream bank erosion and in-stream sediment movement.
- Enhance water quality and improve aquatic habitat to increase the aquatic biodiversity.

Concept level plans summarizing the type and location of recommended action are shown overlaid on aerial photographs in Tab 5. This plan was laid out by stream reach of similar geomorphic and erosion conditions. Photographic documentation of the conditions is shown in Tab 7.

2. EXISTING CONDITIONS

The existing condition was assessed during field visits by Christopher B. Burke Engineering, Ltd. (CBBEL) staff on April 29, 2005 and May 2 and 3, 2005. The descriptions for each reach begin at the upstream end at West Aptakisic Road and follow by reach through the confluence with the Des Plaines River.

Reach 1 – West Aptakisic Road to the Limit of the Hoercher Farm Property

Buffalo Creek is currently incised with evidence of meander scars within its flood plain. Down cutting, as a result of off-site urbanization, has caused a reduction in stream stability through this reach. Our recommendation is to maintain a 100-foot buffer on either side of the creek and allow the creek to seek a new equilibrium within its current flood plain. No additional measures are anticipated. This section of the creek should be considered for greenway corridor status, if the land on either side is further developed.

Reach 2 – Includes Open Space Area Adjacent to the Park Point Condominium Complex

The channel is moving side to side with areas of moderate erosion on the stream banks. Minor stream bank restoration using stone toe with re-grade and a native vegetation buffer at least 25 feet wide should be considered throughout this reach.

Reach 3 – Also on Property Owned by the Park Point Condominium Complex and includes a walking bridge

This area has significant undercut banks and exposed abutments as well as steeper exposed slopes and a failed retaining wall complex. Structural stabilization should be considered for protection of the walking bridge. Slope re-grade with stone toe should be used for the rest of the reach.

Reach 4 – Straight Stretch of Channel with steep largely unstable banks adjacent to residences on the South Bank

The southern banks are severely eroded and are close to several residences. Many homeowners have attempted to stabilize sections of this reach through placement of broken concrete and concrete cylinders. The replacement of the homemade stabilization and placement of structural walls, possibly gabion baskets, is recommended for this reach. Gabion baskets, ranging from two 3-foot to three 3-foot baskets, will be required throughout the reach. The northern banks are moderately eroded and are not immediately adjacent to residences; however, the slopes are heavily vegetated with non-native woody plants. The removal of the non-native canopy and understory followed by the re-grading and vegetation of the slopes and placement of a stone toe is recommended.

Reaches 5 and 6 - Includes a Steep 10 to 16 Foot High Cut Bank

This reach is geotechnically unstable due to stream conditions, as well as, conditions along the slope. A structural wall is recommended adjacent to the condominium complex, and a combination of structural wall and a terrace are possibilities in the park area immediately adjacent to the project.

Reach 7 – Begins with a Significant Homeowner Constructed Structural Wall

This reach has moderate erosion due to a homeowner constructed wall and woody debris in the channel. The recommended stabilization techniques is the use of double high gabion walls on the south side and stone toe with re-grade on the north side of the channel.

Reach 8

This reach has areas of slight to moderate erosion. The north bank is open and could be re-graded with a stone toe at the base for protection. A portion of this reach could also use stone toe with re-grade on the southern bank. The straight-of-way banks are steep and undercut and require structural stabilization with Gabions at least one stack high.

Reach 9

This reach has slight to moderate erosion. The northern banks have been partially cleared. We recommend continued clearing on both banks, leaving large trees and removing non-native understory species which would allow for partial re-grade and planting with native vegetation to stabilize the bank. Stone toe would further stabilize the bank at the water's edge.

Reaches 10 and 11 – Existing Gabion Wall

The existing gabion wall was not carried far enough downstream and has allowed a large undercut bank to develop. This Gabion wall was constructed of stones too small for the Gabion baskets, and there has been significant loss of stone from the baskets. CBBEL recommends that this Gabion wall be removed and replaced with a Gabion wall that goes the entire length of Reach 10 on the north bank. We also recommend that stone toe with re-grade be used throughout the rest of the reach to stabilize the creek. The ditch through this reach has highly erosive, high organic matter content soils. On the south side there are storage buildings that come very close to the edge of the stream. This area will require structural stabilization.

Reach 12

The western half of this reach has slight erosion and is an open space that is largely stable on a channel straight-of-way. It is an opportunity for the Village to highlight the use of riparian buffers. So we recommend a minimum of 25 feet of riparian buffer on either side of the creek. The southern bank of the eastern half of the reach is adjacent to a shopping center and has severe erosion that is threatening infrastructure.

Through this reach, structural stabilization will be required. The rear access of the shopping area is already exhibiting erosion and stress failure of the parking lot, as a result of the eroded stream banks. A geotechnical structural stabilization of the parking lot is necessary to prevent further loss of real property at this site.

Reach 13

This reach has slight erosion in the form of cut banks that are fully vegetated with root wads. Additionally, there is a considerable amount of debris in the channel. We recommend dead and dying trees, that may fall over, as well as, general waste and debris that may impact the channel be removed.

Reaches 14 - 16

These reaches have slight stream bank erosion, but have accumulated waste and debris. CBBEL recommends that this area undergo waste and debris removal followed by the installation of a riparian buffer at least 25 feet wide on either side, using native shrub inter planting on either side of the currently wooded creek.

Reach 17

The north side of Reach 17, an outside bend, is severely eroded and is threatening to disrupt both utilities and property fences. CBBEL recommends structural stabilization, gabion baskets, for those portions of Reach 17 and 19 to stabilize the banks. The rest of the banks within Reaches 17, 18 and 19 can be stabilized with stone toe, re-graded and vegetated with native plantings. The approach to Dundee Road is a severely eroded cut bank that is threatening to undercut an adjacent parking lot.

Reach 20

The first 180 feet on the east bank of this reach has moderate to severe erosion that is threatening infrastructure. The remaining banks have slight to moderate erosion and are adjacent to open space. We recommend structural stabilization, gabion baskets, for the first 180 feet of the east bank. The remainder of the reach should be stabilized with a riparian buffer and native vegetation. In addition, the

project offers an opportunity for wetland mitigation that will be necessary for permitting, in this project in the form of enhancement of the large wetland on the east side of the channel.

Reach 21

Reach 21 is largely a wooded reach with moderate to severely eroded banks. The banks are being partially stabilized by the root systems of the trees except at the downstream end of the reach where concrete has been poured on the bank. The east bank has been cleared of the understory and some overstory in recent months. We recommend a continuation of the understory and overstory thinning, and the removal of the concrete to allow for the re-grading and vegetating of the slopes and the placement of a stone toe.

Reaches 22 and 23

Reaches 22 and 23 are in Heritage Park and have moderate to severely eroded banks. The Park District maintains turf grass to the edge of the creek. In sections, it appears that topsoil has been dumped over the bank and subsequently seeded to temporarily mend the slumping banks. We recommend that the dumping of soil and re-seeding of banks be stopped because it is not a sound stabilization practice, and it requires a Section 404 permit from the United States Army Corps of Engineers. We recommend the installation of a stone toe, the re-grading of the slopes followed by the installation of a native riparian buffer planting along most of these reaches. We recommend that the areas adjacent to the pedestrian receive structural stabilization, gabion baskets, to protect its footings.

Reach 24

Reach 24 has previously been stabilized with articulated concrete mattress, which is not currently permittable, and has accumulated waste and debris. We recommend waste and debris removal.

Reach 25

Reach 25 is largely stable, exhibiting only slight to moderate erosion. We currently recommend only waste and debris removal for this reach; however, it would benefit from stone toe with a re-grade and a native vegetation buffer.

Reach 26

Reach 26 has slight erosion and should be developed with riparian buffer and native vegetation and the large basin on the north side of the creek should be used for wetland mitigation and wetland enhancement as part of this project.

Reaches 27 and 28

Reaches 27 and 28 are exhibiting slight to moderate erosion of their banks. The southern bank is adjacent to open space, whereas the northern bank is adjacent to residential infrastructure. We recommend structural stabilization, gabion baskets, adjacent to the residential infrastructure. We recommend waste and debris removal and understory clearing for the southern bank; however, it would benefit from stone toe with a re-grade and a native vegetation buffer.

Reach 29

Reach 29 has rip-rap stabilization on the southern bank. This stabilization should be matched on the northern bank.

Reaches 30 and 31

Reaches 30 and 31 have rip-rap stabilized banks except in the area adjacent to the condominium pond. We recommend that the pond outfall receive stone stabilization.

Reach 32

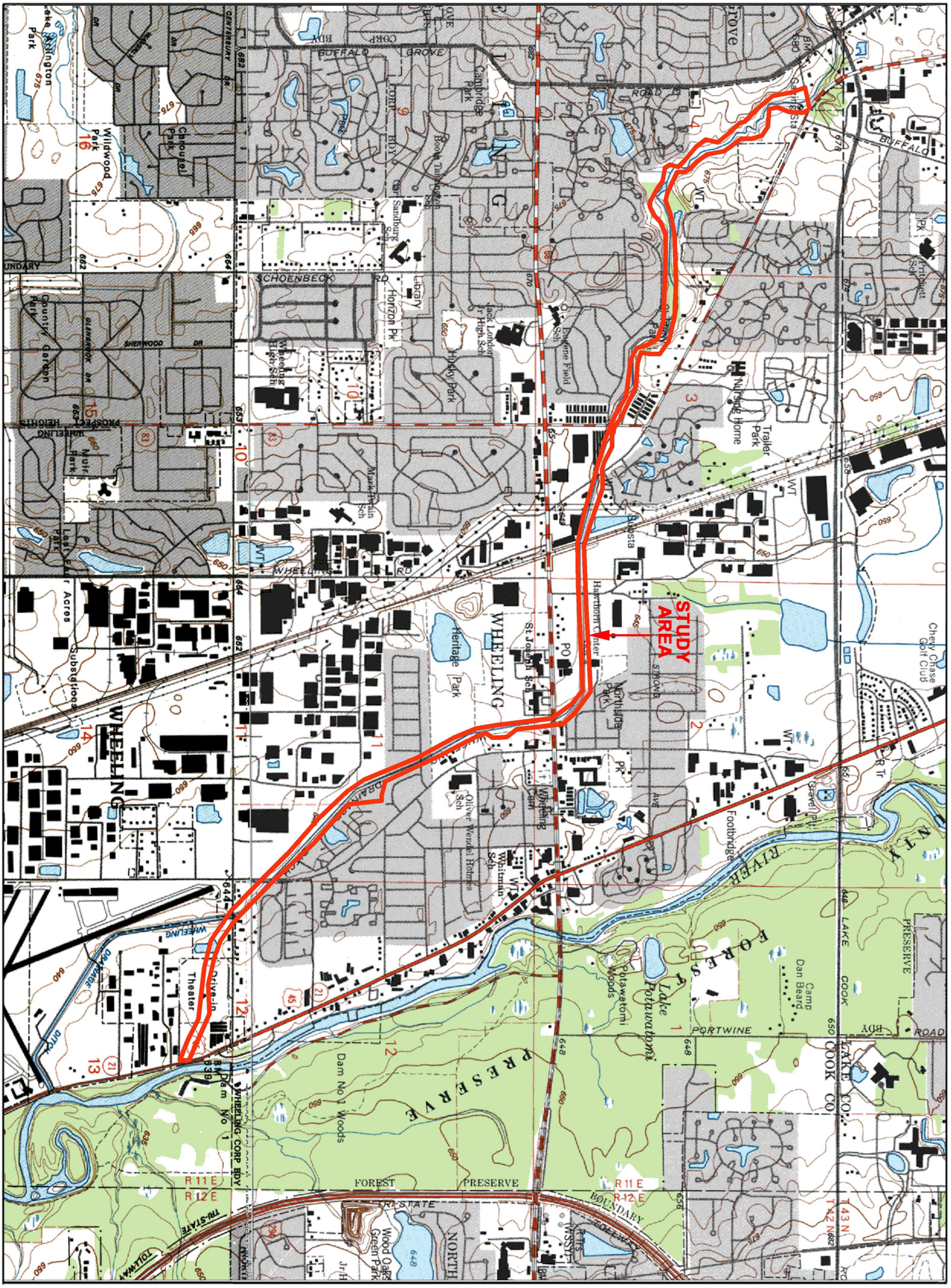
Reach 32 is a recently reconstructed channel. As part of the reconstruction and flood control project, the banks were widened, conveyance increased and the channel partially stabilized. This evaluation observed that the channel bottom is soft and migrating and agrading in several places. We recommend the use of rock sills to eliminate the stream channel movement.

3. SUMMARY

The stream bank and stream bed evaluation of Buffalo Creek Wheeling Ditch evaluated 25,200 feet of stream from West Aptakisic Road to the confluence of Buffalo Creek with the Des Plaines River through the Village of Wheeling.

The following Table summarizes each reach with regards to the severity of erosion, recommended action, estimated cost, and priority. Priority is based on the erosion condition with respect to adjacent infrastructure.

Reach	Length	Erosion	ACTION (TREATMENT)	ESTIMATE OF PROBABLE COST	PRIORITY
1	3100	slight	none	0	Low
2	1000	moderate	Regrade, Stone toe, Vegetate/ Debris Removal	159,505	Medium
3	750	moderate	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal/ Riparian Enhancement	142,301	Medium
4	1700	severe	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal/ Riparian Enhancement	703,588	High
5 & 6	650	moderate / severe	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal	415,477	High
7	200	moderate	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal	77,982	High/Medium
8	750	slight / moderate	Gabion/ Regrade, Stone toe, Vegetate	195,201	High/Medium
9	850	slight / moderate	Regrade, Stone toe, Vegetate	133,492	Medium
10 & 11	950	severe	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal	380,771	High
12	1200	slight	Gabion/ Regrade, Stone toe, Vegetate	166,434	High/Low
13	850	slight	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal	40,734	High
14 - 16	1750	slight	Debris Removal/ Riparian Enhancement	67,563	Low
17 - 19	750	moderate / severe	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal	199,824	High
20	650	moderate / severe	Gabion/ Riparian Enhancement	73,127	High
21	600	moderate / severe	Regrade, Stone toe, Vegetate/ Debris Removal/ Riparian Enhancement	106,812	High
22 &23	1100	moderate / severe	Gabion/ Regrade, Stone toe, Vegetate/ Riparian Enhancement	180,723	Low
24	350	slight	Debris Removal	345	Medium
25	1000	slight	Regrade, Stone toe, Vegetate/ Debris Removal/ Riparian Enhancement	154,215	Low
26	1600	slight	Regrade, Stone toe, Vegetate	120,624	Low
27&28	1400	slight / moderate	Gabion/ Regrade, Stone toe, Vegetate/ Debris Removal/ Riparian Enhancement	458850	High
29	200	slight	Regrade, Stone toe, Vegetate	15,065	Medium
30 & 31	700	slight	Lined Apron	863	High
32	3100	slight	Sill and Pool/Riffle Complexes	24,150	High
TOTAL	**25,200**		STABILIZATION ESTIMATE	**3,817,642**	
			SURVEYING, ENGINEERING, & WETLAND PERMITTING	**572,646**	
			TOTAL PROJECT ESTIMATE	**4,390,289**	



SOURCE: USGS 7.5' TOPO MAP ARLINGTON HEIGHTS AND WHEELING QUADRANGLES 1993

PLSS DESCRIPTION- SECTIONS 2, 3, 4, 11, 12 AND 13, TOWNSHIP 42N, RANGE 11E

EXHIBIT 1	DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING , Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 (847) 823-0520

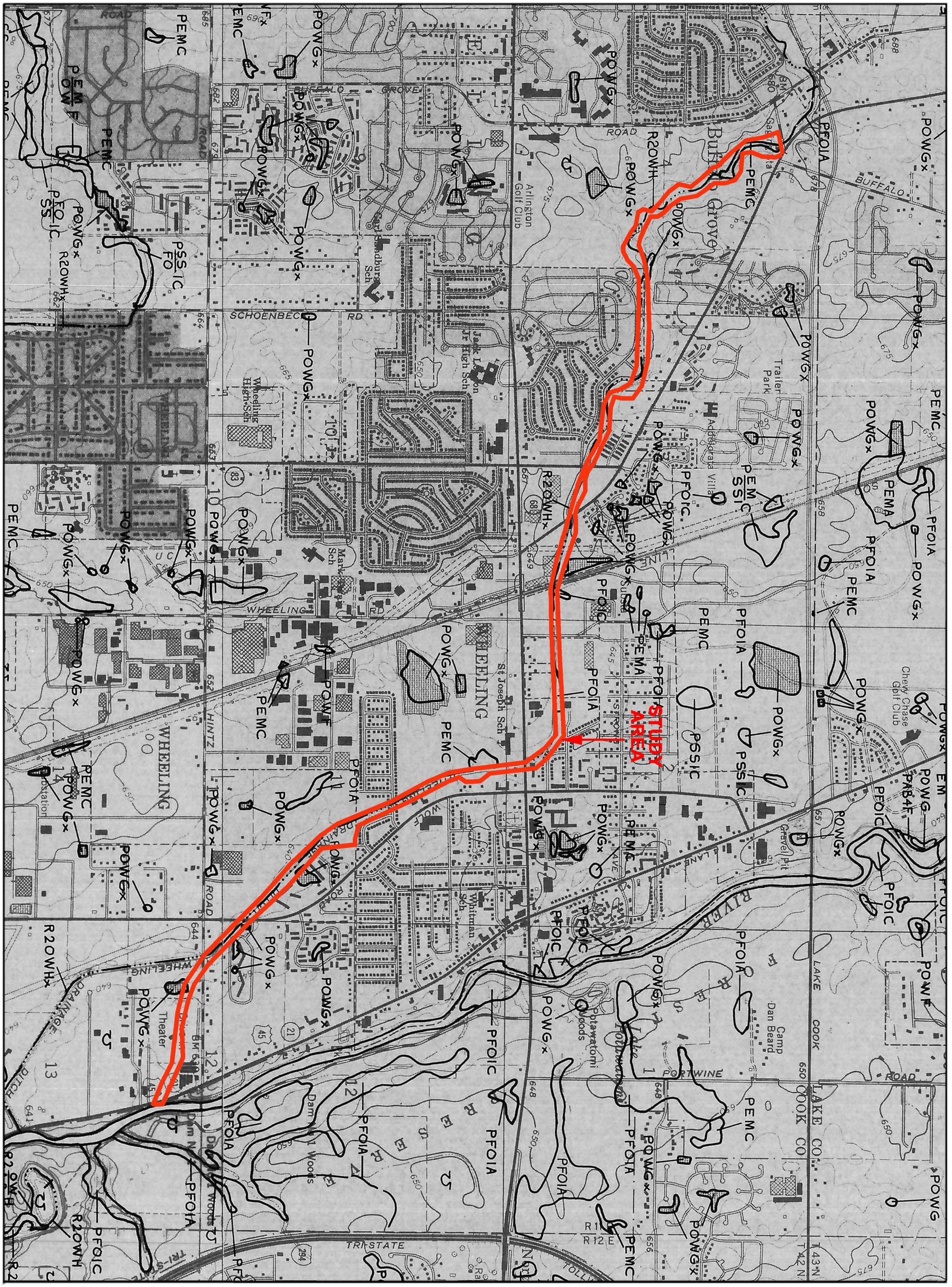
CLIENT: VILLAGE OF WHEELING

TITLE: LOCATION MAP

JOB NO. 04-728

DATE: 07-18-05

SCALE: 1" = 1,600'



SOURCE: U.S. FISH AND WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY MAP, WHEELING QUADRANGLE 1981

LEGEND

R2OWHx-RIVERINE, LOWER PERENNIAL, OPEN WATER/UNKNOWN BOTTOM, PERMANENTLY FLOODED, EXCAVATED
R2OWH-RIVERINE, LOWER PERENNIAL, OPEN WATER/UNKNOWN BOTTOM, PERMANENTLY FLOODED
PEMC-PALUSTRINE, EMERGENT, SEASONAL FLOODED
PF01A-PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, TEMPORARY
PFO1C-PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED
POWGx-PALUSTRINE, OPEN WATER/UNKNOWN BOTTOM, INTERMITTENTLY EXPOSED, EXCAVATED

EXHIBIT 2	DSGN.	EAP	CHKD.	PDK

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9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 (847) 823-0520

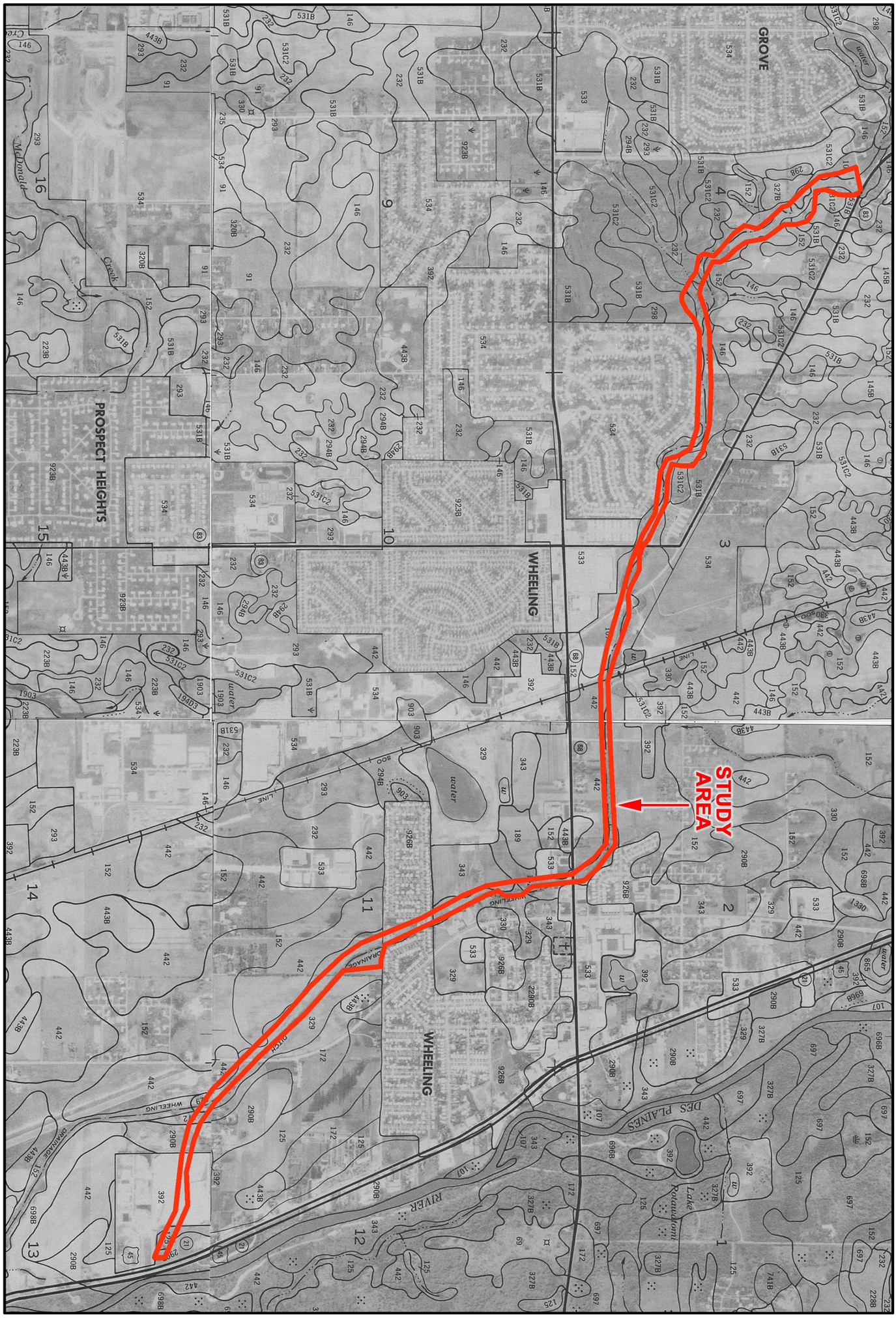
CLIENT: VILLAGE OF WHEELING

TITLE: NWI MAP

JOB NO. 04-728

DATE: 07-18-05

SCALE: 1" = 1,600'



SOURCE: USDA-SCS DUPAGE AND PARTS OF COOK COUNTIES, IL SOIL SURVEY, MAY 1979

EXHIBIT 3	DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING , Ltd.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 (847) 823-0520

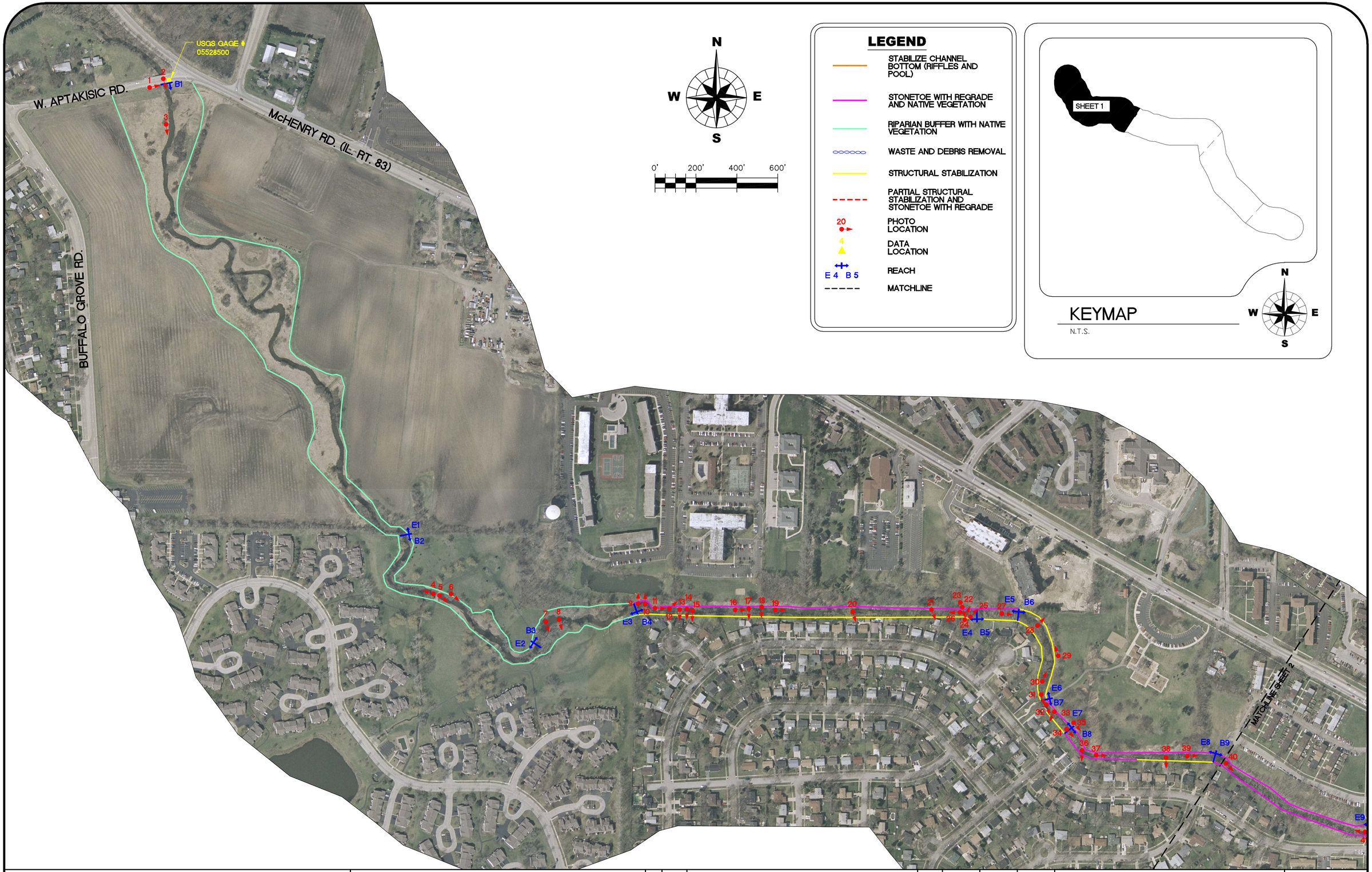
CLIENT: VILLAGE OF WHEELING

TITLE: SOIL SURVEY

JOB NO. 04-728

DATE: 07-18-05

SCALE: 1" = 1,600'



N
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0' 200' 400' 600'

LEGEND

- STABILIZE CHANNEL BOTTOM (RIFFLES AND POOL)
- STONETOE WITH REGRADE AND NATIVE VEGETATION
- RIPARIAN BUFFER WITH NATIVE VEGETATION
- WASTE AND DEBRIS REMOVAL
- STRUCTURAL STABILIZATION
- PARTIAL STRUCTURAL STABILIZATION AND STONETOE WITH REGRADE
- PHOTO LOCATION (20)
- DATA LOCATION (4)
- REACH (E 4 B 5)
- MATCHLINE

KEYMAP
N.T.S.

N
W E
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CHRISTOPHER B. BURKE ENGINEERING, LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0520

CLIENT :

VILLAGE OF WHEELING
255 DUNDEE RD.
WHEELING, IL 60090
(847) 459-2624

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	PDK	
DWN.	EAP	
CHKD.	PDK	
SCALE :	1" = 200'	
FILE NAME:	04-728-DATA LOCATIONS EX.DWG	

TITLE :

BUFFALO CREEK STABILIZATION

PROJECT REACHES - PHOTO POINTS

PROJECT NO. 04-728
DATE : 05-05-2005
SHEET 1 OF 4
DRAWING NO.
EX4A

N:\DWG\2004\04-728\dwg\04-728-data locations Ex.dwg, EX4A, 4/3/2006 1:28:39 PM, emiller

N
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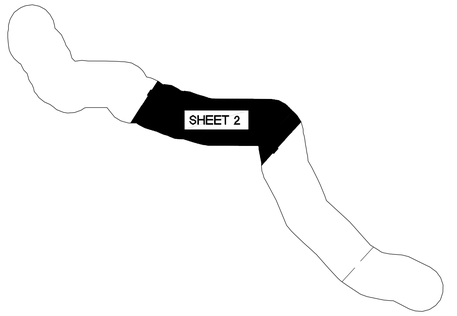
0' 200' 400' 600'

LEGEND

- STABILIZE CHANNEL BOTTOM (RIFFLES AND POOL)
- STONETOE WITH REGRADE AND NATIVE VEGETATION
- RIPARIAN BUFFER WITH NATIVE VEGETATION
- WASTE AND DEBRIS REMOVAL
- STRUCTURAL STABILIZATION
- PARTIAL STRUCTURAL STABILIZATION AND STONETOE WITH REGRADE
- 20 — PHOTO LOCATION
- 4 — DATA LOCATION
- E 4 B 5 — REACH
- MATCHLINE



KEYMAP

N.T.S.

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MATCHLINE SHEET 1

McHENRY RD. (IL. RT. 83)

WISCONSIN CENTRAL RAILROAD

NORTHGATE PKWY.

ELMHURST RD.

DUNDEE RD.

MATCHLINE SHEET 3

E8 B9 40 E9 B10 41 42 E10 B11 43 44 45 46 47 48 49 E11 B12 50 51 52 53 E12 B13 54 55 E13 B14 56 E14 B15 57 58 E15 B16 59 60 E16 B17 61 62 63 64 E17 B18 E18 B19 65 66 67 68 69 E19 B20 70 71 72 73 74 75 E20 B21 76

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(847) 823-0520

CLIENT :

VILLAGE OF WHEELING
255 DUNDEE RD.
WHEELING, IL 60090
(847) 459-2624

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	PDK	
DWN.	EAP	
CHKD.	PDK	
SCALE :	1" = 200'	
FILE NAME:	04-728-DATA LOCATIONS EX.DWG	

TITLE :

BUFFALO CREEK STABILIZATION

PROJECT REACHES - PHOTO POINTS

PROJECT NO. 04-728
DATE : 05-05-2005
SHEET 2 OF 4
DRAWING NO.
EX4B

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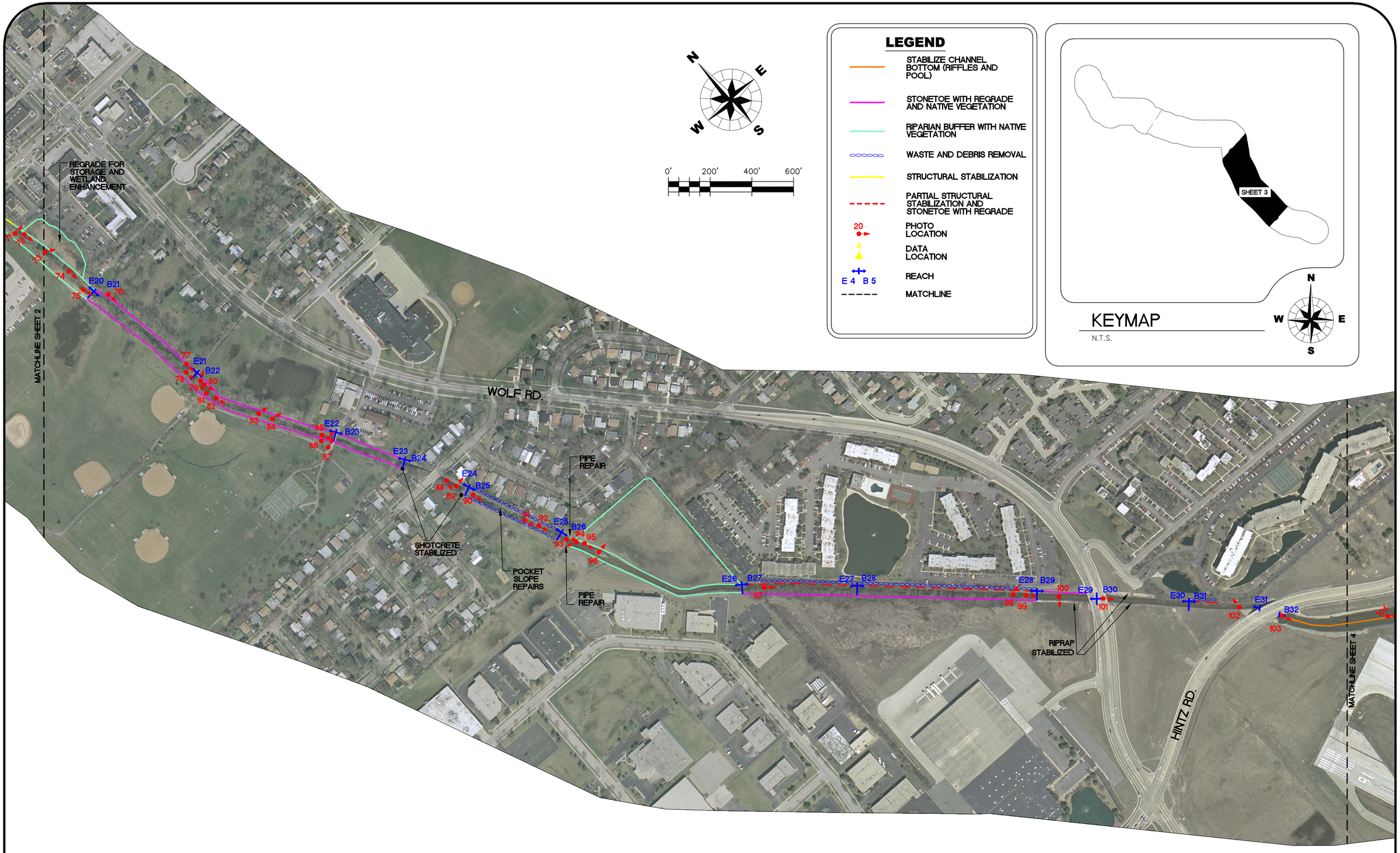

LEGEND

- STABILIZE CHANNEL BOTTOM (RIFFLES AND POOL)
- STONETOE WITH REGRADE AND NATIVE VEGETATION
- RIPARIAN BUFFER WITH NATIVE VEGETATION
- WASTE AND DEBRIS REMOVAL
- STRUCTURAL STABILIZATION
- PARTIAL STRUCTURAL STABILIZATION AND STONETOE WITH REGRADE
- 20 PHOTO LOCATION
- 4 DATA LOCATION
- E 4 B 5 REACH
- MATCHLINE

KEYMAP

N.T.S.

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
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CLIENT :

VILLAGE OF WHEELING
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WHEELING, IL 60090
(847) 459-2624

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	PDK	
DWN.	EAP	
CHKD.	PDK	
SCALE :	1" = 200'	
FILE NAME:	04-728-DATA LOCATIONS EX.DWG	

TITLE :

BUFFALO CREEK STABILIZATION

PROJECT REACHES - PHOTO POINTS

PROJECT NO. 04-728
DATE : 05-05-2005
SHEET 3 OF 4
DRAWING NO.
EX5A

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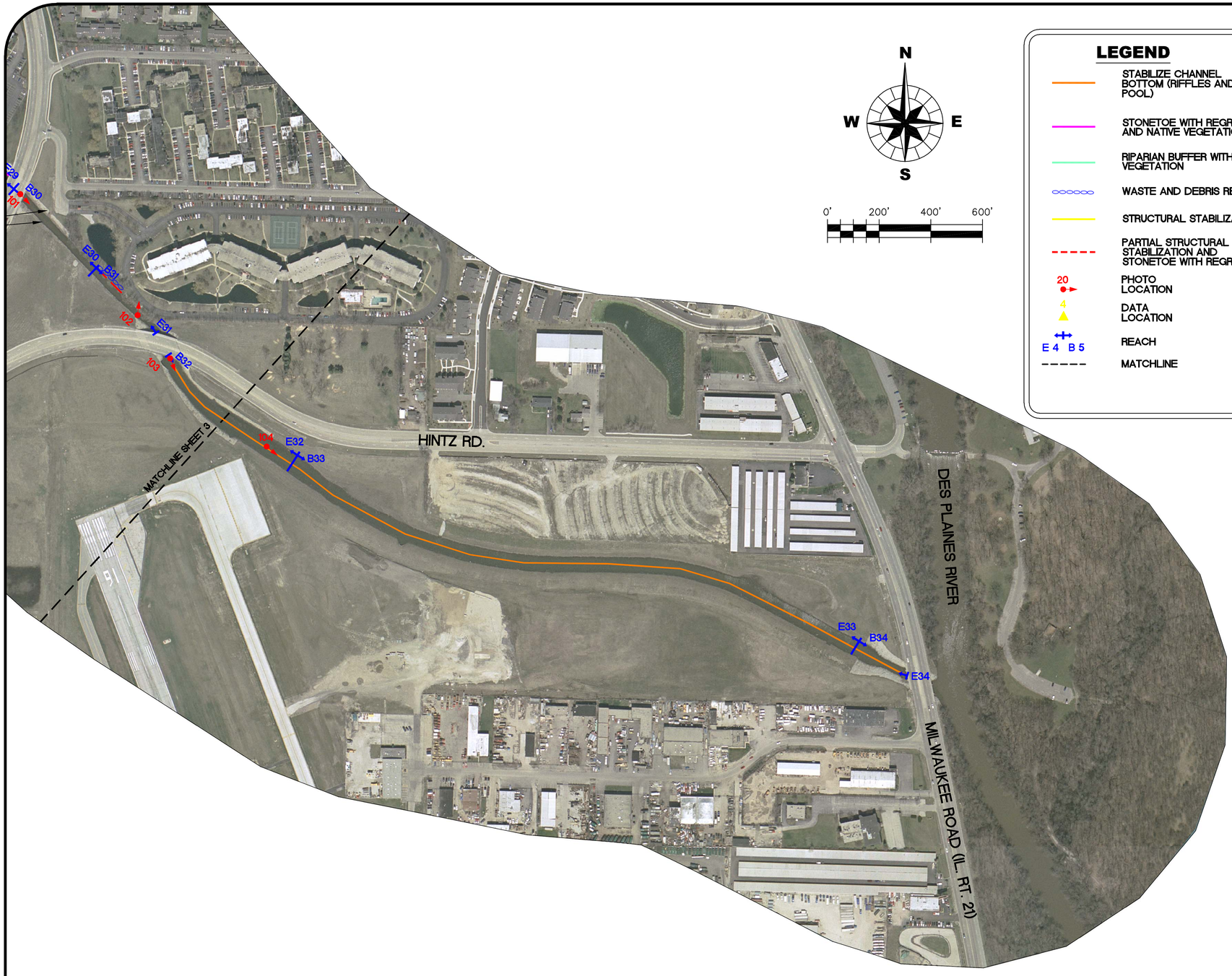

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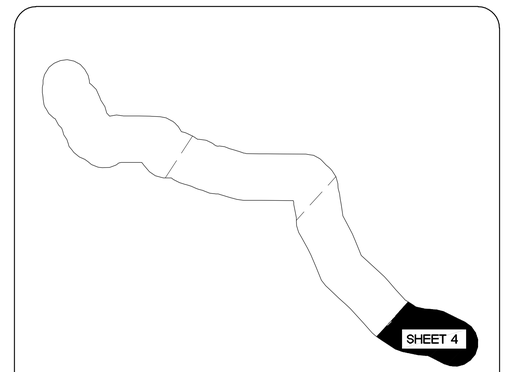
0' 200' 400' 600'

LEGEND

- STABILIZE CHANNEL BOTTOM (RIFFLES AND POOL)
- STONETOE WITH REGRADE AND NATIVE VEGETATION
- RIPARIAN BUFFER WITH NATIVE VEGETATION
- WASTE AND DEBRIS REMOVAL
- STRUCTURAL STABILIZATION
- PARTIAL STRUCTURAL STABILIZATION AND STONETOE WITH REGRADE
- 20 — PHOTO LOCATION
- 4 — DATA LOCATION
- E 4 B 5 — REACH
- MATCHLINE



KEYMAP

N.T.S.

N
W E
S

CHRISTOPHER B. BURKE ENGINEERING, LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0520

CLIENT :

VILLAGE OF WHEELING
255 DUNDEE RD.
WHEELING, IL 60090
(847) 459-2624

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	PDK	
DWN.	EAP	
CHKD.	PDK	
SCALE :	1" = 200'	
FILE NAME:	04-728-DATA LOCATIONS EX.DWG	

TITLE :

BUFFALO CREEK STABILIZATION

PROJECT REACHES - PHOTO POINTS

PROJECT NO. 04-728
DATE : 05-05-2005
SHEET 4 OF 4
DRAWING NO.
EX5B

N:\DWG\2004\04-728\dwg\04-728-data locations EX.dwg, EX5B, 4/3/2006 1:30:46 PM, emiller

PHOTO 1

PHOTO 2

PHOTO 3

REACH 1

DSGN.	EAP	CHKD.	PDK

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CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8A

PHOTO 4

PHOTO 5

PHOTO 6

REACH 2

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8B

PHOTO 7

PHOTO 8

REACH 3

PHOTO 9

PHOTO 10

REACH 4

DSGN.	EAP	CHKD.	PDK

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CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

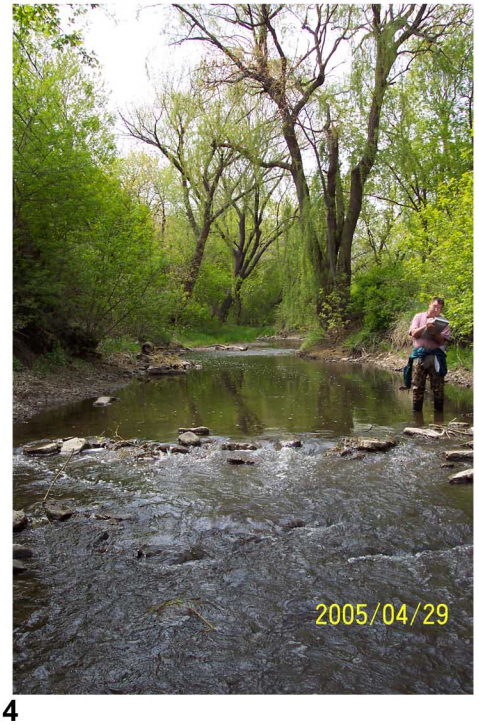
DATE: 05-05-05

EXHIBIT 8C

PHOTO 11

PHOTO 12

PHOTO 13



REACH 4

PHOTO 14

DSGN.	EAP	CHKD.	PDK

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Rosemont, Illinois 60018
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CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8D

PHOTO 15

PHOTO 16

PHOTO 17

PHOTO 18

REACH 4

DSGN.	EAP	CHKD.	PDK

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(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8E

PHOTO 19

PHOTO 20

PHOTO 21

PHOTO 22

REACH 4

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8F

PHOTO 23

PHOTO 24

PHOTO 25

PHOTO 26

REACH 4

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8G

PHOTO 27

REACH 5

PHOTO 28

PHOTO 29

REACH 6

DSGN.	EAP	CHKD.	PDK

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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8H

PHOTO 30

PHOTO 31

REACH 6

PHOTO 32

PHOTO 33

REACH 7

DSGN.	EAP	CHKD.	PDK

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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8I

PHOTO 34

PHOTO 35

REACH 7

PHOTO 36

PHOTO 37

REACH 8

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8J

PHOTO 38

PHOTO 39

REACH 8

PHOTO 40

PHOTO 41

REACH 9

DSGN.	EAP	CHKD.	PDK

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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8K

PHOTO 42

PHOTO 43

REACH 10

PHOTO 44

PHOTO 45

REACH 11

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8L

PHOTO 46

PHOTO 47

PHOTO 48

REACH 11

DSGN.	EAP	CHKD.	PDK

CHRISTOPHER B. BURKE ENGINEERING, LTD.
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

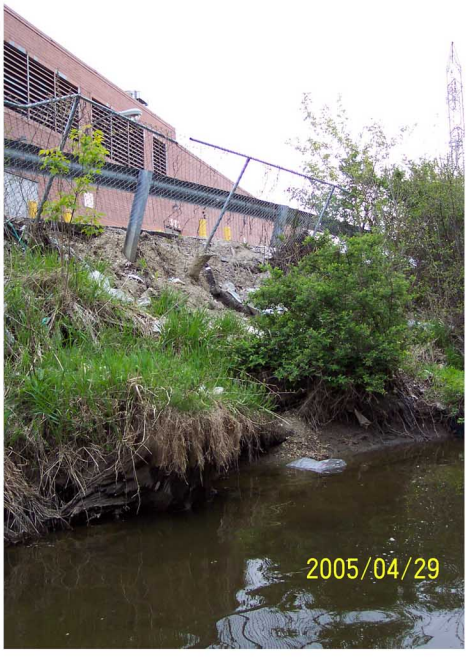
EXHIBIT 8M

PHOTO 49

PHOTO 50

PHOTO 52

PHOTO 51



REACH 12

DSGN.	EAP	CHKD.	PDK

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9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8N

REACH 12

PHOTO 53

REACH 13

PHOTO 54

PHOTO 55

DSGN.	EAP	CHKD.	PDK

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Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT: VILLAGE OF WHEELING

JOB#: 04-728

N

TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8O

REACH 14 PHOTO 56

PHOTO 57

PHOTO 58

PHOTO 59

REACH 15

DSGN.	EAP	CHKD.	PDK

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9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500 / FAX (630) 443-0533

CLIENT VILLAGE OF WHEELING

JOB# 04-728

N

TITLE

PHOTO LOCATIONS

DATE 05-05-05

EXHIBIT 8P

PHOTO 60

REACH 16

PHOTO 61

PHOTO 62

REACH 17

PHOTO 63

DSGN.	EAP	CHKD.	PDK

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JOB#: 04-728

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TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8Q

PHOTO 64

REACH 18

PHOTO 65

PHOTO 66

REACH 19

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8R

PHOTO 67

PHOTO 68

PHOTO 69

REACH 19

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8S

PHOTO 70

PHOTO 71

PHOTO 72

REACH 20

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8T

PHOTO 73

PHOTO 74

PHOTO 75

REACH 20

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8U

PHOTO 76

PHOTO 77

PHOTO 78

REACH 21

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8V

PHOTO 79

PHOTO 80

PHOTO 81

PHOTO 82

REACH 22

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8W

PHOTO 83

PHOTO 84

PHOTO 85

REACH 22

DSGN.	EAP	CHKD.	PDK

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TITLE: PHOTO LOCATIONS

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EXHIBIT 8X

REACH 23

PHOTO 86

PHOTO 87

REACH 24

PHOTO 88

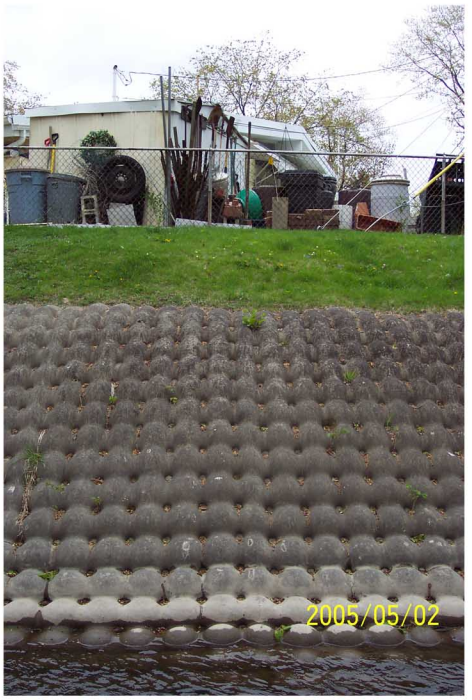

PHOTO 89

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EXHIBIT 8Y

PHOTO 90

PHOTO 91

PHOTO 92

REACH 25

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8Z

PHOTO 93

PHOTO 94

PHOTO 95

PHOTO 96

REACH 26

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8AA

PHOTO 97

REACH 27

PHOTO 98

PHOTO 99

REACH 28

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8BB

PHOTO 100
REACH 29

PHOTO 101
REACH 30

REACH 31

PHOTO 102

DSGN.	EAP	CHKD.	PDK

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EXHIBIT 8CC

PHOTO 103

PHOTO 104

REACH 32

DSGN.	EAP	CHKD.	PDK

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TITLE: PHOTO LOCATIONS

DATE: 05-05-05

EXHIBIT 8DD