



2018 Project 6 Flood Prone Area Study

Wheaton, Illinois



Flood Study

ERA Project #180612

Prepared for:

City of Wheaton

October 5, 2018
Revised March 15, 2019

TABLE OF CONTENTS

2018 PROJECT 6 - FLOOD PRONE AREA STUDY

1.0	Introduction
1.1	Location and Intent of Study
1.2	Overview of Hydraulic and Hydrologic Analyses
2.0	Glendale Avenue Overland Flow Path
2.1	Problem Area Description
2.2	Flooding Impacts
3.0	Dorset Drive Depression at Dorset Park
3.1	Problem Area Description
3.2	Flooding Impacts
4.0	Dorset Drive Depression at Ridge Park
4.1	Problem Area Description
4.2	Flooding Impacts
5.0	Alternatives

List of Appendices

Exhibits

- Exhibit 1.a – Study Area Location Map (Glendale Ave Overland Flow Path)
- Exhibit 1.b – Study Area Location Map (Dorset Drive Depression at Dorset Park)
- Exhibit 1.c – Study Area Location Map (Dorset Drive Depression at Ridge Park)
- Exhibit 2.a – Hydrologic Parameters Exhibit (Glendale Sub-basin)
- Exhibit 2.b – Hydrologic Parameters Exhibit (Dorset Sub-basin)
- Exhibit 3.a – Critical Duration Existing Flooding Exhibit (Glendale Ave)
- Exhibit 3.b – Critical Duration Existing Flooding Exhibit (Dorset Park)
- Exhibit 3.c – Critical Duration Existing Flooding Exhibit (Ridge Park)
- Exhibit 4.a – 24-Hr Existing Flooding Exhibit (Glendale Ave)
- Exhibit 4.b – 24-Hr Existing Flooding Exhibit (Dorset Park)
- Exhibit 4.c – 24-Hr Existing Flooding Exhibit (Ridge Park)
- Exhibit 5.a – At-Risk Structures Buyout Exhibit (Glendale Ave)
- Exhibit 5.b – At-Risk Structures Buyout Exhibit (Dorset Drive)
- Exhibit 6 – Proposed Alternative 1 Exhibit
- Exhibit 7 – Proposed Alternative 2 Exhibit
- Exhibit 8 – Proposed Alternative 3 Exhibit
- Exhibit 9 – Proposed Alternative 4 Exhibit
- Exhibit 10 – Proposed Alternative 5 Exhibit
- Exhibit 11.a – Topographic Survey and Property Elevations (Glendale Ave)
- Exhibit 11.b – Dorset Park Area Property Elevations
- Exhibit 11.c – Ridge Park Area Property Elevations

- Exhibit 11.d – Dorset Park Topographic Survey
- Exhibit 11.e – Ridge Park Topographic Survey

Cost Estimates

Modeling

- Time of Concentration Calculations
- Electronic Copy of XPSWMM Model

At-risk Structure Determination Table

Buyout Valuations Table

Proposed Alternatives Water Surface Elevations

1.0 INTRODUCTION

1.1 LOCATION AND INTENT OF STUDY

The *2018 Project 6 Flood Prone Area Study* included three focused study areas – *Glendale Overland Flow Path*, *Dorset Drive Depression at Dorset Park*, and *Dorset Drive Depression at Ridge Park* - within two separate sub-basins within the City of Wheaton. The *Glendale Avenue Overland Flow Path* is located within an approximately 90-acre drainage sub-basin tributary to the Spring Brook watershed. Its study area is focused where the overland flow path along Glendale Avenue travels northwest through private property from the right-of-way approximately 600 feet north of the Glendale Avenue and Sawyer Avenue intersection as seen in Exhibit 1.a. The *Dorset Drive Depression at Dorset Park* is located within an approximately 315-acre drainage basin tributary to the Rott Creek watershed. Its study area is focused on the area immediately adjacent to the Dorset Park detention facility as seen in Exhibit 1.b. The *Dorset Drive Depression at Ridge Park* is in the same sub-basin as the Dorset Park depression. Its study area is focused on the area immediately adjacent to the Ridge Park detention facility as seen in Exhibit 1.c.

The City of Wheaton has experienced frequent flooding within the study areas and desires to analyze it to determine flood risk structures, determine the major causes of the flooding, and to develop a plan to improve the flooding conditions within the sub-basin in response to City Council Strategic Goal 2C. The existing deficiencies within the study area were analyzed using the stormwater modeling program, XPSWMM-2D. The program performs the hydrologic and hydraulic computations of conveyance, storage, and flood level parameters within the stormwater drainage system. The results of the model were used to evaluate the existing drainage and quantify flood risk structures. Several proposed alternative improvements were explored to reduce the frequency and severity of flooding.

1.2 OVERVIEW OF HYDROLOGIC AND HYDRAULIC ANALYSES

DATA COLLECTION AND ANALYSIS

HYDROLOGIC & HYDRAULIC ANALYSIS SETUP

Various sources were used to identify the location and determine the extent and frequency of stormwater drainage problems within the *2018 Project 6 Flood Prone Areas*. Readily available information was used to compile a computer model and assess the existing conditions of the drainage network. The computer model which performed the Hydrologic and Hydraulic computations was the proprietary software program called XPSWMM-2D. Two models were created since the Glendale Overland Flow Path study area was located in a different sub-basin than the other two focused study areas.

The following resources were used to construct a stormwater model in XPSWMM-2D:

- City of Wheaton Sewer Atlas Maps
- City and County GIS Data
 - DuPage County 2-ft contours
 - City Storm Sewer Information
- Survey data

- Rim/invert information for storm sewer
- Overland flow route topography
- Topographic shots of relevant building elevations, roadways, and rear yard grades
- Aerial Maps

A combination of the City's storm sewer atlases and GIS data was augmented with rim and invert survey information to construct the underground hydraulics within the XPSWMM-2D models. The storm sewer trunk line was modeled from the upper reaches of the sub-basins to adequate locations downstream of the study areas to get appropriate tailwater conditions. Detailed topographic survey was merged with the County's 2-ft contours to create a digital terrain model (DTM) which was used to create a 2D surface grid needed to perform hydraulic computations for overland flows. Exhibits 1.a-c show sewer networks that were analyzed for each sub-basin.

The area tributary to the storm sewer network was broken down into sub-catchments tributary to manholes within the storm sewer systems. Exhibit 2.a & 2.b shows this breakdown for each sub-basin. SCS curve numbers and time of concentration calculations were performed and assigned to each sub-catchment within the models. Illinois State Water Survey Bulletin 71 rainfall depth data and corresponding Huff rainfall distributions were used to perform a critical duration analysis to determine what storm duration is critical for each sub-basin. The duration that produced the greatest runoffs within the storm system was the 2-hour storm for both modeled sub-basins. For all analysis, the sub-basins were evaluated for the 2-hour critical duration and 24-hour: 1-, 5-, 10-, 25-, 50-, 100-, and 500-yr storm events.

For each storm event, the XPSWMM-2D modeling software was used to determine the extent of drainage issues within the sub-basins. The 2D model includes a DTM surface which depicts the topography of the sub-basins. When the hydraulic grade line rises above the rims of the storm sewer network, the model performs overland hydraulic calculations based on the topography of the area as it would in a real storm event. The model then can demonstrate the extents, water elevation, depth, and velocity of the water flowing over land after it surcharges the storm sewer system. The 2D model output was utilized to identify and quantify at risk structures based on surveyed building elevation information.

LIMITATIONS OF STUDY AND ASSUMPTIONS

The *2018 Project 6 Flood Prone Area Study* did not include the following items:

- Groundwater analysis
- Detailed topographic study of the entire project area
- Inlet capacity analysis
- Cost analysis of potential flood damages

The capacity of the sewer system assumes that all structures and pipes are clean and unobstructed. The *Study's* hydraulic and hydrologic model was developed using the best available information from the City of Wheaton's storm sewer atlas, as-built plans, survey information, GIS data, and two-foot County topography. The *Study's* accuracy is limited to the information found in these resources.

RESIDENT FEEDBACK

The City has previously performed a questionnaire requesting information from the residents on the type of flooding they may have experienced on their property. The City provided a map that shows which residents reported overland flooding within the Study area. The resident responses were very

helpful to provide anecdotal evidence of ponding concerns and overland flow route issues. This information was also used as a “reality check”, to verify the results the of the modeling.

2.0 GLENDALE AVENUE OVERLAND FLOW PATH

2.1 PROBLEM AREA DESCRIPTION

The *Glendale Avenue Overland Flow Path* travels along Glendale Avenue to a low point containing storm sewer where flows pond and overtop through the side yards of 558-655 Glendale Avenue. The sub-basin generally bounded by railroad tracks to the north and west, Sawyer Avenue to the south, and Vine Street to the east. The sub-basin has many undulations and is relatively steep with no storm sewer until it reaches the study area. Flows begin to concentrate in the Chesterfield Avenue right-of-way and continues to flow southwest along Glendale Avenue. It isn't until Glendale Avenue flattens out in front of the focused study area that significant ponding occurs. Approximately 90 acres is tributary to this location and the storm sewer does not have capacity for the incoming overland flows over the 10-year critical duration storm event. Any rain greater than a 10-year critical storm event causes the ponding in the roadway to overflow onto private properties and continue downhill westerly past residential structures.

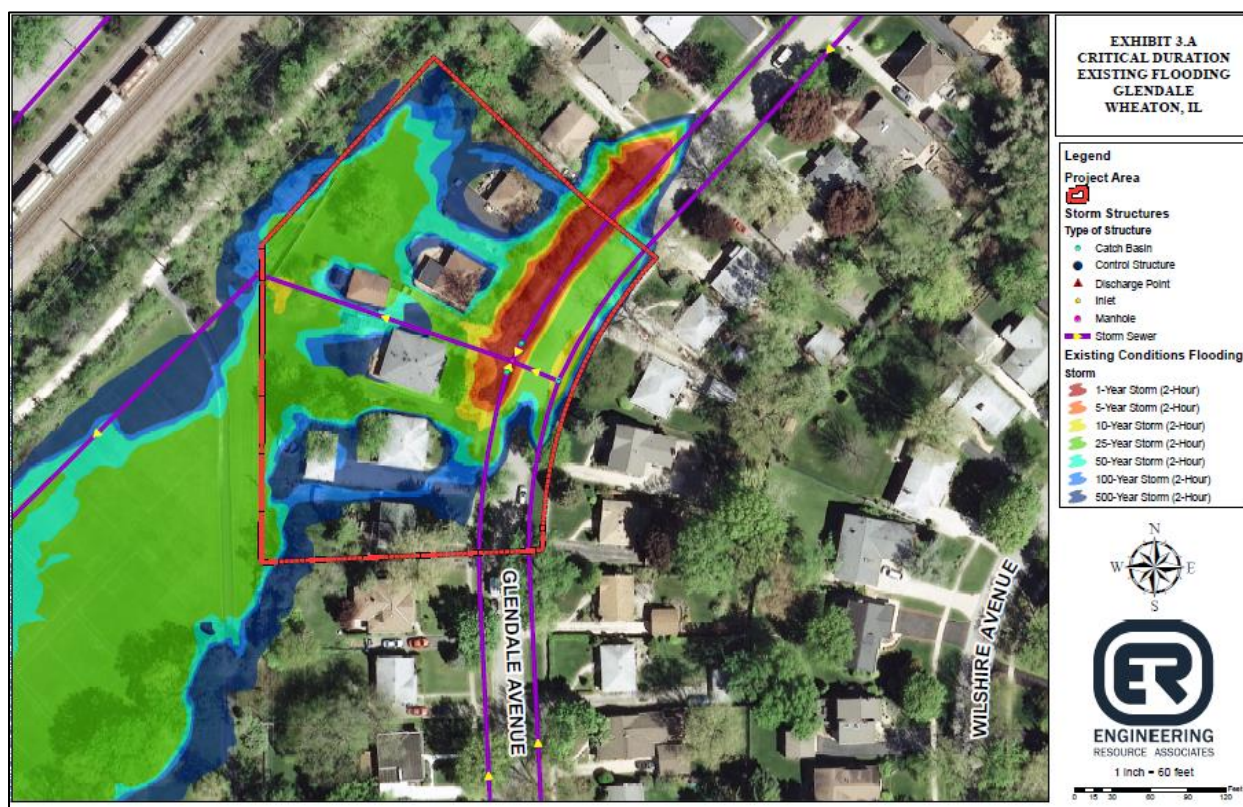


Exhibit 3.A: Glendale Avenue Overland Flow Path Existing Critical Duration Flooding Limits, N.T.S. (full scale drawing in Appendix)

2.2 FLOODING IMPACTS

Below are tables summarizing the list of at-risk structures within the *Glendale Avenue Overland Flow Path* for the 100-yr and 500-yr critical duration storm events. A structure was considered at-risk to

overland flooding when the maximum water surface elevation was higher than the top of foundation; higher than the bottom of a door, window, or other openings of a structure; or higher than the top of a window well. Only at-risk structures are included in the tables below. A comprehensive table of all structures analyzed for flood risk, including an analysis of the 2-hr and 24-hr critical duration 1-, 5-, 10-, 25-, 50-, 100-, and 500-yr storm events can be found in the Appendix. A summary of the number of flood risk structures within the *Glendale Avenue Overland Flow Path* for each storm event analyzed is shown in Table 1.

Table 1: Glendale Avenue Overland Flow Path – Number of Flood Risk Structures

	Storm Frequencies						
	1-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2-Hour (Critical Duration)	0	0	0	3	3	3	4
24-Hour	0	0	0	0	0	0	1

There are 4 at-risk structures for the 500-yr frequency critical duration event and 3 at-risk structures for the 100-yr frequency storm event as shown in Table 1. A list of at-risk structures is found in Table 2.

Table 2: Glendale Avenue Overland Flow Path - Critical Duration (2 hr) Flood Risk Structures

Address No.	Street	T/F Elev. (ft)	L/E Elev. (ft)	500-Year WSEL (ft)	100-Year WSEL (ft)	50-Year WSEL (ft)	10-Year WSEL (ft)
566	Glendale	752.30	751.53	752.25	751.87	751.77	750.86
558	Glendale	751.57	751.57	752.25	751.87	751.77	750.86
562	Glendale	751.69	751.44	752.25	751.87	751.77	750.86
572	Glendale	752.03	752.03	752.25	751.87	751.77	750.86

3.0 DORSET DRIVE DEPRESSION AT DORSET PARK

3.1 PROBLEM AREA DESCRIPTION

This focused study area is located in the depression on Dorset Drive adjacent to the Dorset Park detention facility. The depression is centered along Dorset Drive and includes the rear yards on the north side of Dorset Drive as well. The Dorset Park pond is undersized and overtops in the 10-year critical duration event. The pond, however, does not cause significant impacts to the depression on Dorset Drive. The pond's high-water level is several feet lower than the water level in the depression. Ponding at the depression is due to sewer capacity and lack of overland flow path. The ponding in the rear yards on the home on north side of Dorset Drive is approximately 2' higher than in the street.

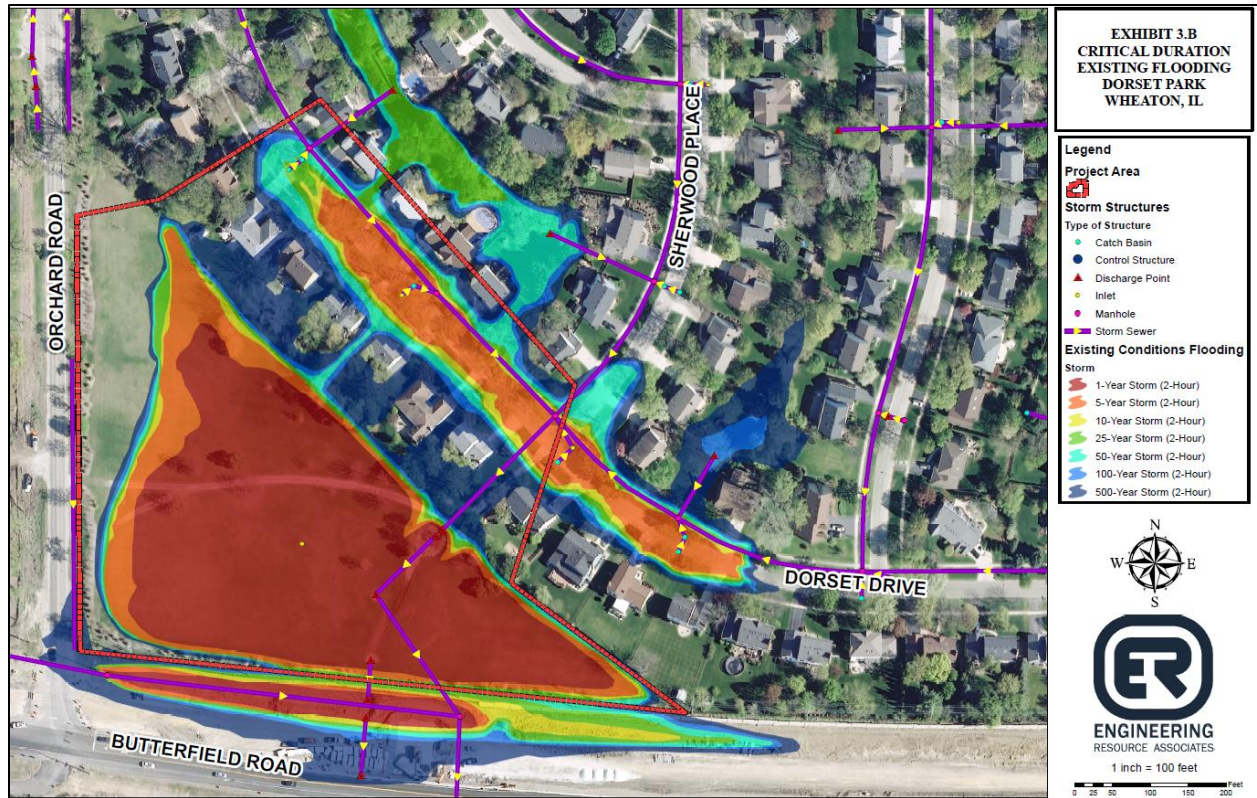


Exhibit 3.B: Dorset Drive Depression at Dorset Park Existing Critical Duration Flooding Limits, N.T.S. (full scale drawing in Appendix)

3.2 FLOODING IMPACTS

Below are tables summarizing the list of at-risk structures within the *Dorset Drive Depression at Dorset Park* for the 100-yr and 500-yr critical duration storm events. A structure was considered at-risk to overland flooding when the maximum water surface elevation was higher than the top of foundation; higher than a door, window, or other openings of a structure; or higher than the top of a window well. A comprehensive table of structures analyzed for risk, including structures found to not be at risk, can be found in the Appendix. A summary of the number of flood risk structures within the *Dorset Drive Depression at Dorset Park* for each storm event analyzed is shown in Table 3.

Table 3: Dorset Drive Depression at Dorset Park – Number of Flood Risk Structures

	Storm Frequencies						
	1-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2-Hour (Critical Duration)	0	0	0	2	4	5	12
24-Hour	0	0	0	0	0	0	10

There are twelve at-risk structures for the 500-yr frequency critical duration event and five at-risk structures for the 100-yr frequency storm event as shown in Table 3. A list of at-risk structures is found in Table 4.

Table 4: Dorset Drive Depression at Dorset Park - Critical Duration (2 hr) Flood Risk Structures

Address No.	Street	T/F Elev. (ft)	L/E Elev. (ft)	500-Year WSEL (ft)	100-Year WSEL (ft)	50-Year WSEL (ft)	10-Year WSEL (ft)
2036	Dorset	747.99	747.29	748.11	747.05	746.71	746.09
2042	Dorset	747.92	747.27	748.11	747.05	746.71	746.09
2048	Dorset	747.14	746.54	748.11	747.05	746.71	746.09
2054	Dorset	747.84	747.29	748.11	747.05	746.71	746.09
2060	Dorset	748.07	747.38	748.11	747.05	746.71	746.09
2066	Dorset	748.07	747.62	748.11	747.05	746.71	746.09
2039	Dorset	749.19	748.88	749.21	748.95	748.83	0
2047	Dorset	748.97	748.62	749.21	748.95	748.83	0
2053	Dorset	749.16	748.61	749.21	748.95	748.83	0
2057	Dorset	749.30	748.75	749.21	748.95	748.83	0
1186	Dorset	748.42	747.84	748.1	747.07	746.95	746.77
2054	Sherwood	749.63	749.11	749.14	748.91	748.78	0

Note: A zero WSEL value represents no surface flooding

4.0 DORSET DRIVE DEPRESSION AT RIDGE PARK

3.1 PROBLEM AREA DESCRIPTION

This focused study area is located in the depression on Dorset Drive adjacent to the Ridge Park detention facility. The depression is centered along Dorset Drive and includes the rear yards on the north side of Gladstone Drive as well. The Ridge Park pond is undersized and overtops in the 10-year critical duration event. When the pond is at overtopping stages, the water surface elevations of the pond is at the same elevation as the depression in the roadway.

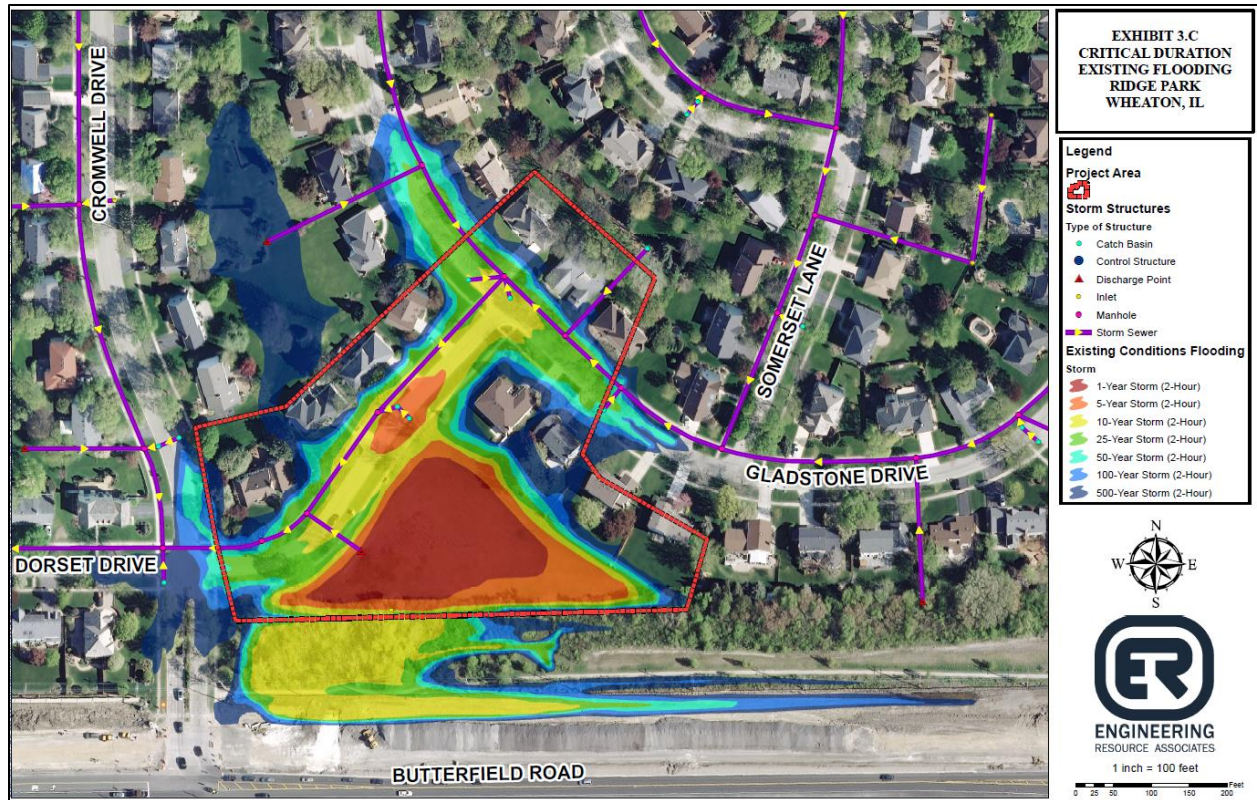


Exhibit 3.C: Dorset Drive Depression at Ridge Park Existing Critical Duration Flooding Limits, N.T.S. (full scale drawing in Appendix)

3.2 FLOODING IMPACTS

Below are tables summarizing the list of at-risk structures within the *Dorset Drive Depression at Ridge Park* for the 100-yr and 500-yr critical duration storm events. A structure was considered at-risk to overland flooding when the maximum water surface elevation was higher than the top of foundation; higher than a door, window, or other openings of a structure; or higher than the top of a window well. A comprehensive table of structures analyzed for risk, including structures found to not be at risk, can be found in the Appendix. A summary of the number of flood risk structures within the *Dorset Drive Depression at Ridge Park* for each storm event analyzed is shown in Table 5.

Table 5: Dorset Drive Depression at Ridge Park – Number of Flood Risk Structures

	Storm Frequencies						
	1-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2-Hour (Critical Duration)	0	0	0	0	0	0	3
24-Hour	0	0	0	0	0	0	1

There are 3 at-risk structures for the 500-yr frequency critical duration event and zero at-risk structures for the 100-yr frequency storm event as shown in Table 3. A list of at-risk structures is found in Table 6.

Table 6: Dorset Drive Depression at Ridge Park - Critical Duration (2 hr) Flood Risk Structures

Address No.	Street	T/F Elev. (ft)	L/E Elev. (ft)	500-Year WSEL (ft)	100-Year WSEL (ft)	50-Year WSEL (ft)	10-Year WSEL (ft)
2064	Gladstone	756.03	755.68	755.85	755.47	755.19	754.06
2049	Gladstone	756.95	756.29	756.39	755.98	755.19	754.06
2055	Gladstone	756.75	756.29	756.39	755.98	755.19	754.06

5.0 ALTERNATIVES

The alternatives below were developed for two of the three project areas as Dorset Drive at Ridge Park had no structures impacted in the 100-year critical storm.

Property Buyouts of All At-Risk

This alternative considers buying out all 100-year at-risk structures and turning the lots into open space. There are 8 structures at-risk for 100-yr overland flooding. Please see Exhibits 5.a & 5.b for the maps of all 100-yr at-risk structures. Based on 2018 Milton Township Assessor's information it is anticipated that a complete 100-yr buyout would cost an estimated \$3,804,834.00 in total with \$1,355,607.00 for Glendale Avenue buyouts and \$2,449,227.00 for Dorset Drive at Dorset Park buyouts. A 3x multiplier was added to the Township's assessed value and ten percent cost was added to the multiplied value to cover demolition and restoration costs. A loss of property tax was not considered in this tabulation of property buyouts. A tabulation of property buyouts can be found in the Appendix.

Alternative 1: Glendale Avenue Overland Flow Path Improvements

This alternative provides swale improvements between the 100-yr at-risk structures along Glendale Avenue and results in no downstream impacts. Approximately 58 cfs of peak flow travels through the side yards of 558-566 Glendale Avenue. By improving 4 side yard swales, all 100-yr at-risk structures are eliminated. This alternative is estimated to cost \$132,600. An exhibit of the proposed conditions can be seen in Exhibit 6. A detailed cost estimate for this alternative can be found in the Appendix.

Alternative 2: Glendale Avenue Sewer Improvements

This alternative provides an additional storm sewer through the north side yard at 566 Glendale Avenue. By installing a 42" storm sewer in this corridor, enough capacity is added to eliminate all 100-year at-risk structures. This design location considers the location of the existing 30" storm sewer, sanitary sewer at the rear of the lot, trees, structures and overhead wires. This alternative is estimated to cost \$170,600. An exhibit of the proposed conditions can be seen in Exhibit 7. A cost estimate for this alternative can be found in the Appendix.

Alternative 3: Dorset Drive Rear Yard Storm Sewer Installation

The 100-yr at risk structures adjacent to Dorset Park is caused by rear-yard ponding on the north side of Dorset Drive. This alternative looks to reduce the elevation of the rear yard ponding by installing a rear yard catch basin and connecting it to the storm sewer in the right-of-way. By providing a 21" storm sewer to the rear yards 4 out of 5 of the 100-yr at-risk structures are protected from overland flooding. This alternative is estimated to cost \$438,200, which includes the buyout cost for the one remaining

100-year at-risk home (2048 Dorset). An exhibit of the proposed conditions can be seen in Exhibit 8. A cost estimate for this alternative can be found in the Appendix. There are no impacts to the Dorset Park detention facility water surface elevation due to this proposed alternative.

Alternative 4: Dorset Drive Storm Sewer and Overland Flow Path Improvements

This alternative includes the installation of the rear yard storm sewer system as identical to Alternative 3 as well as 215' of swale. This alternative also makes overland flow path improvements through the outlet from Dorset Drive to the Dorset Park detention facility. It also upsizes two lengths of storm sewer on Dorset Drive to eliminate all 100-year at-risk structures. This alternative is estimated to cost \$374,400. An exhibit of the proposed conditions can be seen in Exhibit 9. A detailed cost estimate for this alternative can be found in the Appendix. There is only an increase of 0.01' to the high-water-level of the Dorset Park detention facility which is considered negligible for future permitting purposes.

Alternative 5: Dorset Drive Rear Yard Swale, Right-of-way Storm Sewer and Overland Flow Path Improvements

This alternative is identical to Alternative 4, except that the storm sewer from the rear-yards on Dorset Drive is replaced with swale improvements. This alternative also makes overland flow path improvements through the outlet from Dorset Drive to the Dorset Park detention facility. It also upsizes two lengths of storm sewer on Dorset Drive to eliminate all 100-year at-risk structures. This alternative is estimated to cost \$330,900. An exhibit of the proposed conditions can be seen in Exhibit 10. A detailed cost estimate for this alternative can be found in the Appendix. There is only an increase of 0.03' to the high-water-level of the Dorset Park detention facility which is considered negligible for future permitting purposes.

Appendix

Exhibits

Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 1A Study Area Location Map.mxd User Name: cfovarp Date: 1/15/2019



**EXHIBIT 1.A
STUDY AREA
LOCATION MAP
GLENDALE
OVERLAND FLOW PATH
WHEATON, IL**

Legend

Project Area

Storm Structures

Type of Structure

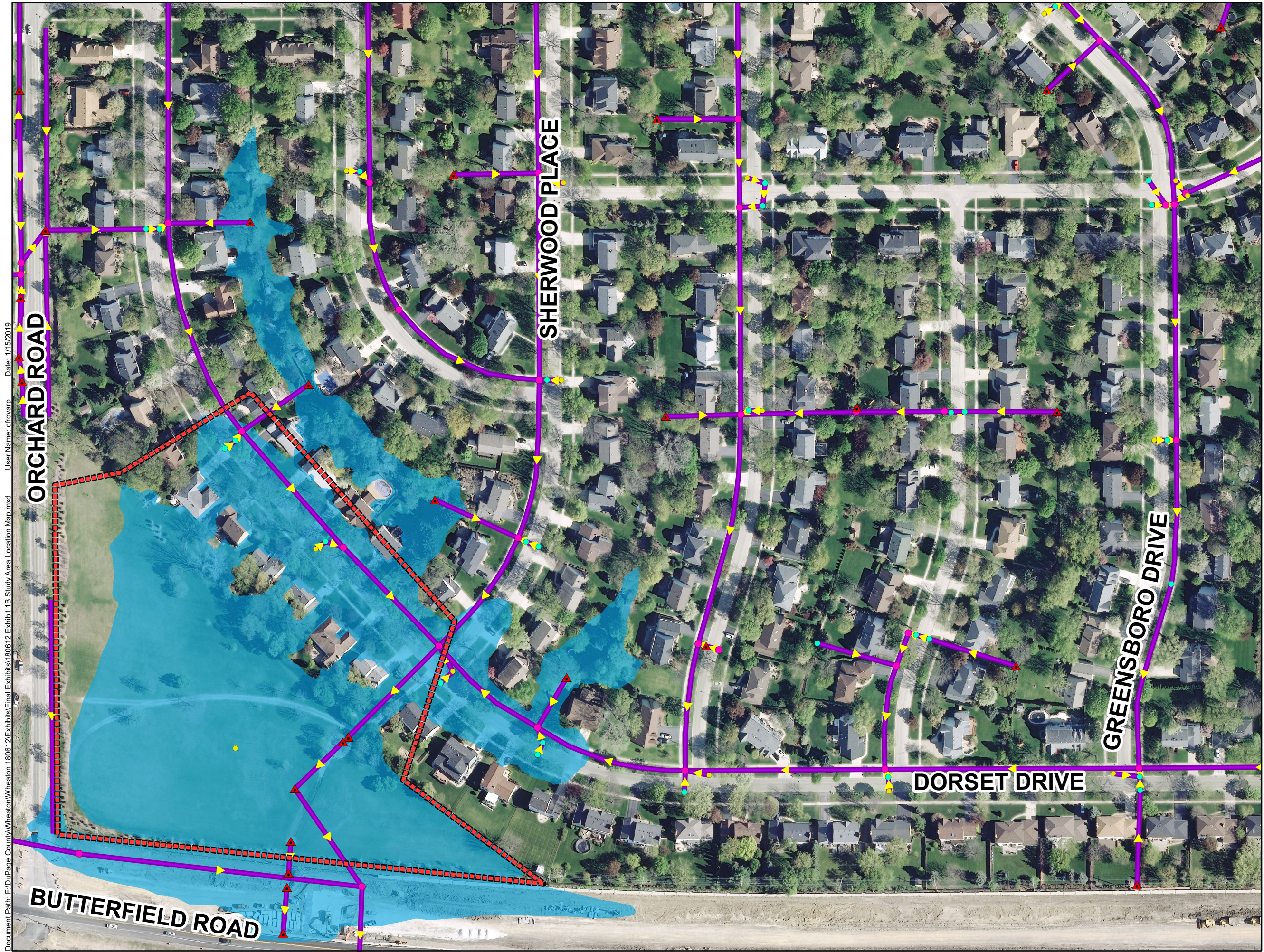
- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding
 500-Year, 2-Hour Flood Limits

ENGINEERING
RESOURCE ASSOCIATES

1 inch = 120 feet

Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 1B Study Area Location Map.mxd User Name: cfovarp Date: 1/15/2019



**EXHIBIT 1.B
STUDY AREA
LOCATION MAP
DORSET PARK
OVERLAND FLOW MAP
WHEATON, IL**

Legend

Project Area



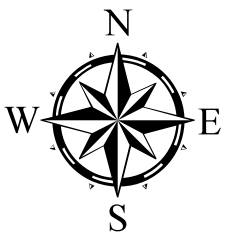
Storm Structures

Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

- 500-Year, 2-Hour Flood Limits



**ENGINEERING
RESOURCE ASSOCIATES**

1 inch = 150 feet

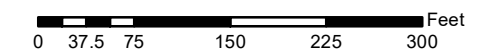


EXHIBIT 1.C
STUDY AREA
LOCATION MAP
RIDGE PARK
OVERLAND FLOW PATH
WHEATON, IL

Legend

Project Area

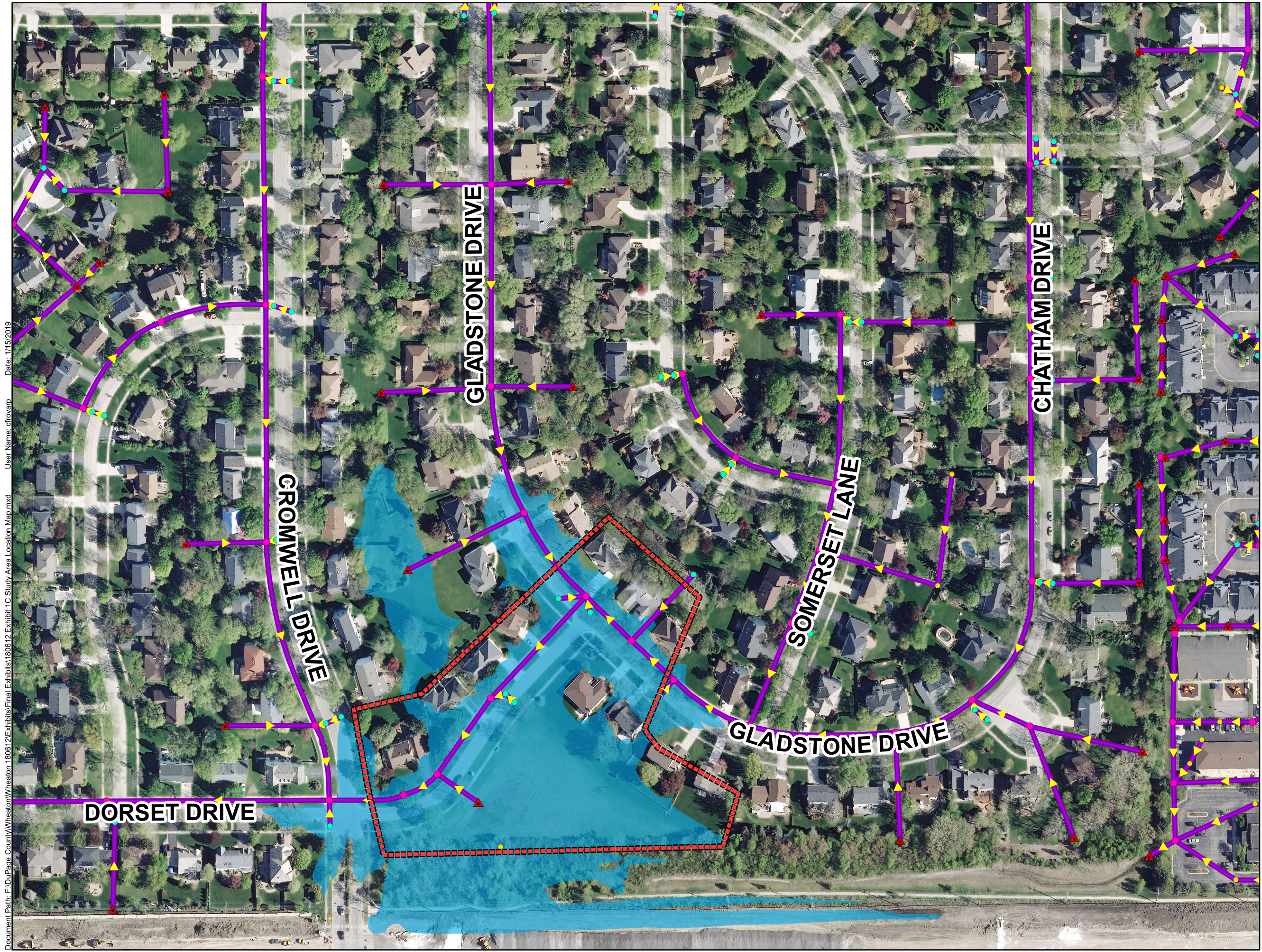

Storm Structures

Type of Structure

-  Catch Basin
-  Control Structure
-  Discharge Point
-  Inlet
-  Manhole
-  Storm Sewer

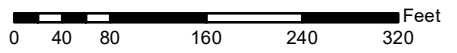
Existing Conditions Flooding

-  500-Year, 2-Hour Flood Limits



ENGINEERING
RESOURCE ASSOCIATES

1 inch = 160 feet



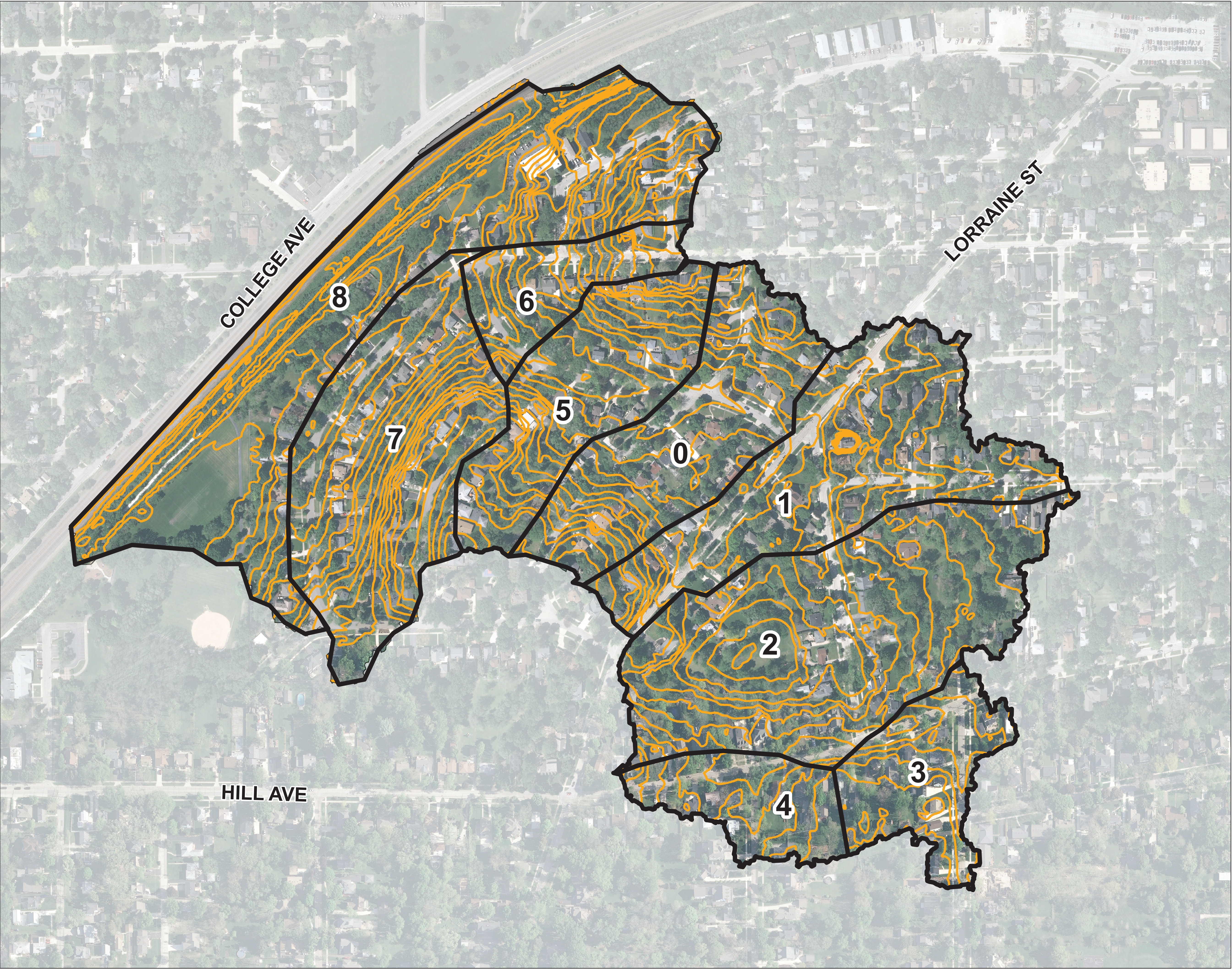


EXHIBIT 2.a
Hydrologic
Parameters
Glendale Subbasin
Wheaton, IL

Legend

Subcatchments

Contours

ID	Acres	CN	TC
0	9.24	82	10
1	12.32	82	23
2	17.01	82	46
3	4.96	82	19
4	3.95	82	33
5	7.93	82	28
6	3.84	82	12
7	12.71	82	21
8	21.29	82	29

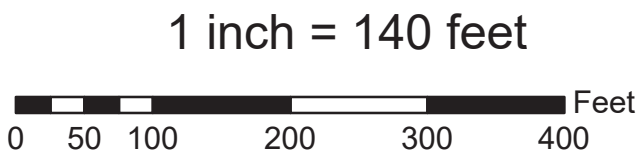


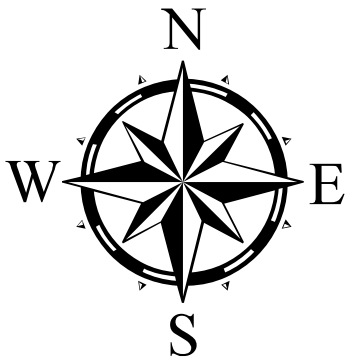
EXHIBIT 2.b
Hydrologic
Parameters
Dorset Subbasin
Wheaton, IL

Legend

Subcatchments

Contours

ID	Acres	CN	TC
1	17.91	83	5
2	14.31	83	5
3	10.76	83	5
4	4.97	83	8
5	12.64	83	5
6	15.68	83	13
7	5.69	83	7
8	6.56	83	5
9	14.77	83	20
10	4.64	83	5
11	3.55	83	12
12	2.98	83	11
13	2.32	83	5
14	9.61	83	6
15	10.52	83	12
16	4.45	83	8
17	17.74	83	8
18	17.24	83	7
19	33.88	82	8
20	26.59	83	10
21	2.53	83	6
22	2.35	83	7
23	2.75	83	6
24	15.51	83	7
25	14.34	83	7
26	18.58	83	16
27	8.27	78	11
28	4.09	80	9



1 inch = 200 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 3A Critical Duration Existing Conditions Wheaton.mxd
User Name: cfrovap
Date: 1/15/2019



**EXHIBIT 3.A
CRITICAL DURATION
EXISTING FLOODING
GLENDALE
WHEATON, IL**

Legend

Project Area

Storm Structures

Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

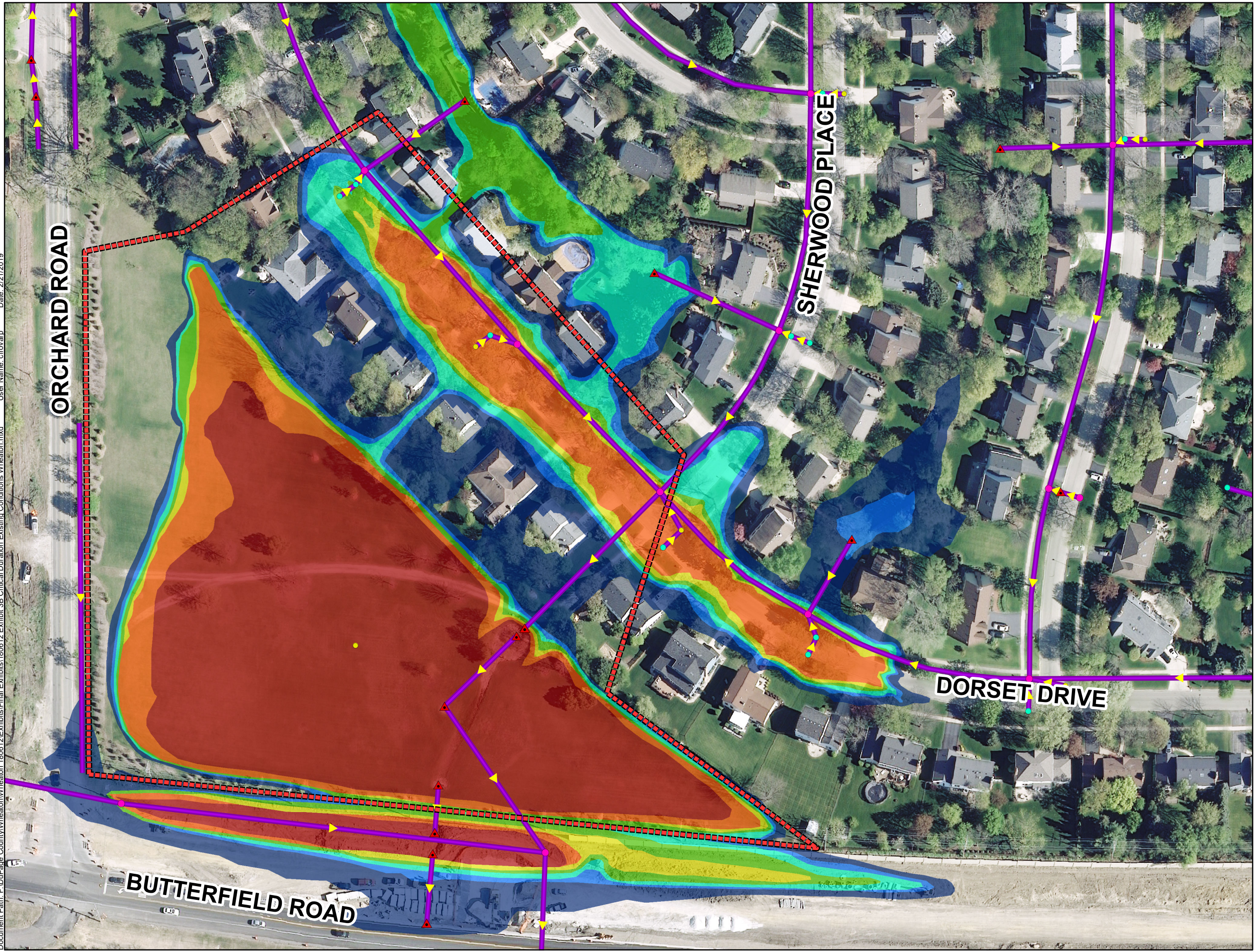
Storm

- 1-Year Storm (2-Hour)
- 5-Year Storm (2-Hour)
- 10-Year Storm (2-Hour)
- 25-Year Storm (2-Hour)
- 50-Year Storm (2-Hour)
- 100-Year Storm (2-Hour)
- 500-Year Storm (2-Hour)

**ENGINEERING
RESOURCE ASSOCIATES**

1 inch = 60 feet

Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 3B Critical Duration Existing Conditions Wheaton.mxd User Name: cfrovap Date: 2/21/2019



**EXHIBIT 3.B
CRITICAL DURATION
EXISTING FLOODING
DORSET PARK
WHEATON, IL**

Legend

Project Area



Storm Structures

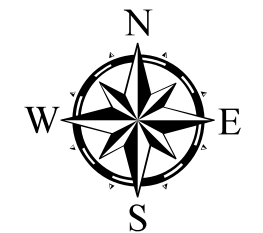
Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

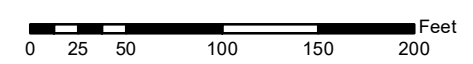
Storm

- 1-Year Storm (2-Hour)
- 5-Year Storm (2-Hour)
- 10-Year Storm (2-Hour)
- 25-Year Storm (2-Hour)
- 50-Year Storm (2-Hour)
- 100-Year Storm (2-Hour)
- 500-Year Storm (2-Hour)

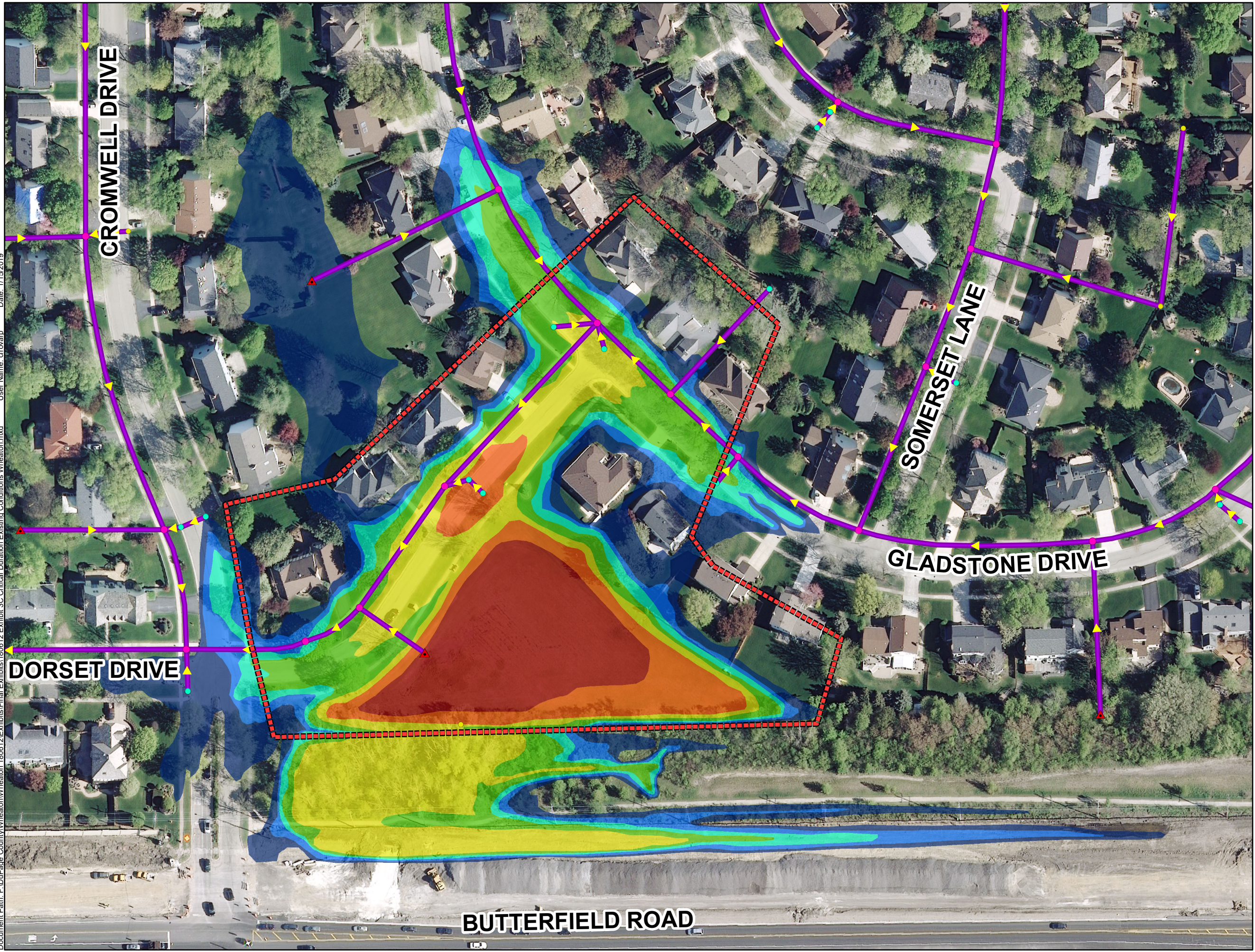


**ENGINEERING
RESOURCE ASSOCIATES**

1 inch = 100 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 3C Critical Duration Existing Conditions Wheaton.mxd User Name: cdrovamp Date: 11/15/2019



**EXHIBIT 3.C
CRITICAL DURATION
EXISTING FLOODING
RIDGE PARK
WHEATON, IL**

Legend

Project Area

Storm Structures

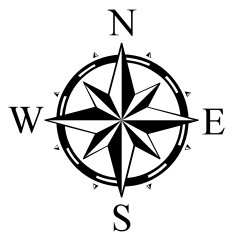
Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

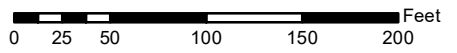
Storm

- 1-Year Storm (2-Hour)
- 5-Year Storm (2-Hour)
- 10-Year Storm (2-Hour)
- 25-Year Storm (2-Hour)
- 50-Year Storm (2-Hour)
- 100-Year Storm (2-Hour)
- 500-Year Storm (2-Hour)

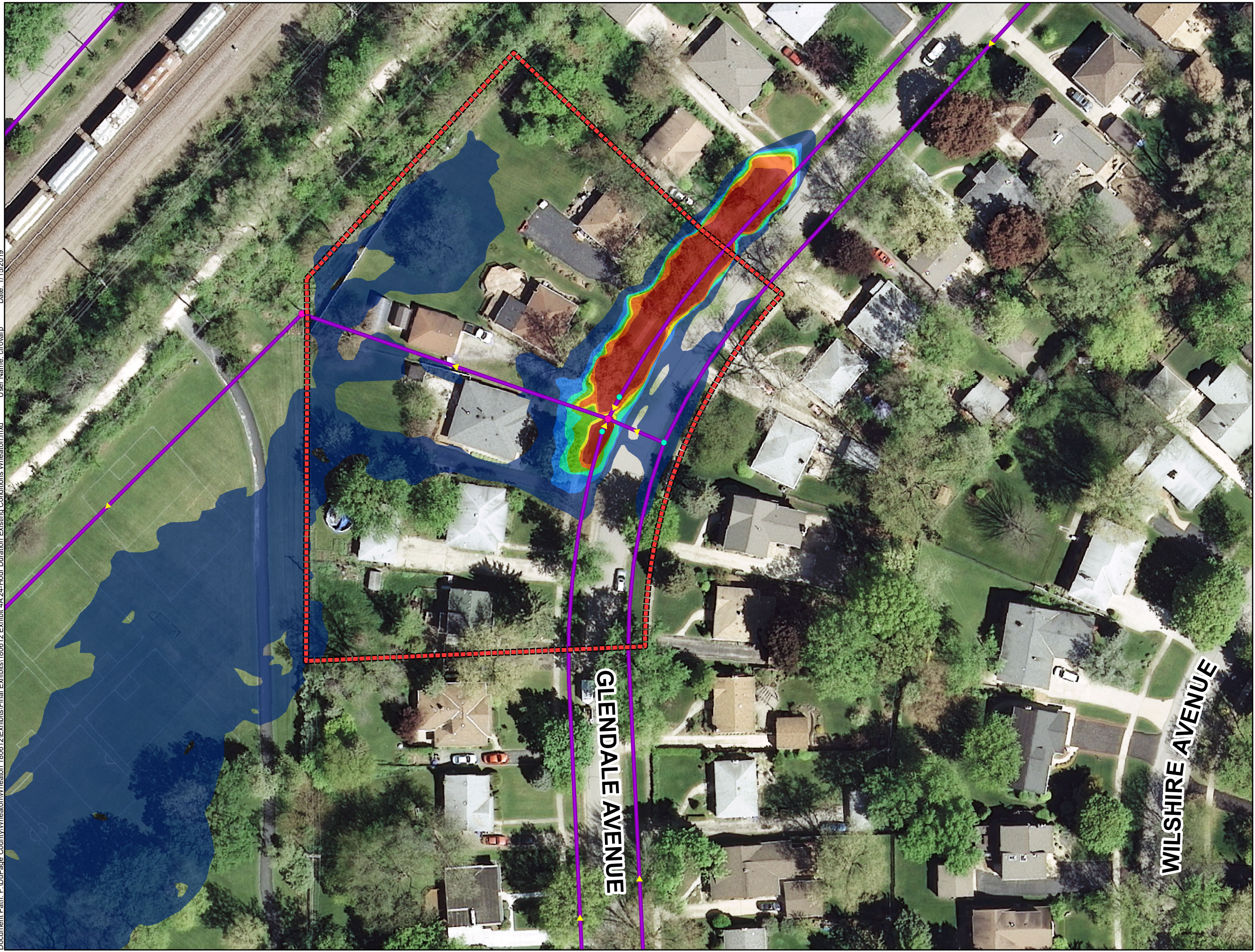


**ENGINEERING
RESOURCE ASSOCIATES**

1 inch = 100 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 4A 24-Hour Duration Existing Conditions Wheaton.mxd User Name: cfrovap Date: 1/15/2019



**EXHIBIT 4.A
24-HOUR DURATION
EXISTING FLOODING
GLENDALE
WHEATON, IL**

Legend

Project Area



Storm Structures

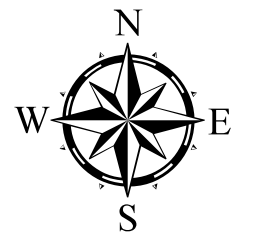
Type of Structure

-  Catch Basin
-  Control Structure
-  Discharge Point
-  Inlet
-  Manhole
-  Storm Sewer

Existing Conditions Flooding

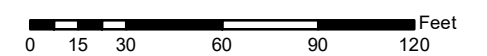
Storm

-  1-Year Storm (24-Hour)
-  5-Year Storm (24-Hour)
-  10-Year Storm (24-Hour)
-  25-Year Storm (24-Hour)
-  50-Year Storm (24-Hour)
-  100-Year Storm (24-Hour)
-  500-Year Storm (24-Hour)



ENGINEERING
RESOURCE ASSOCIATES

1 inch = 60 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 4B 24-Hour Duration Existing Conditions Wheaton.mxd User Name: cfrovap Date: 1/15/2019

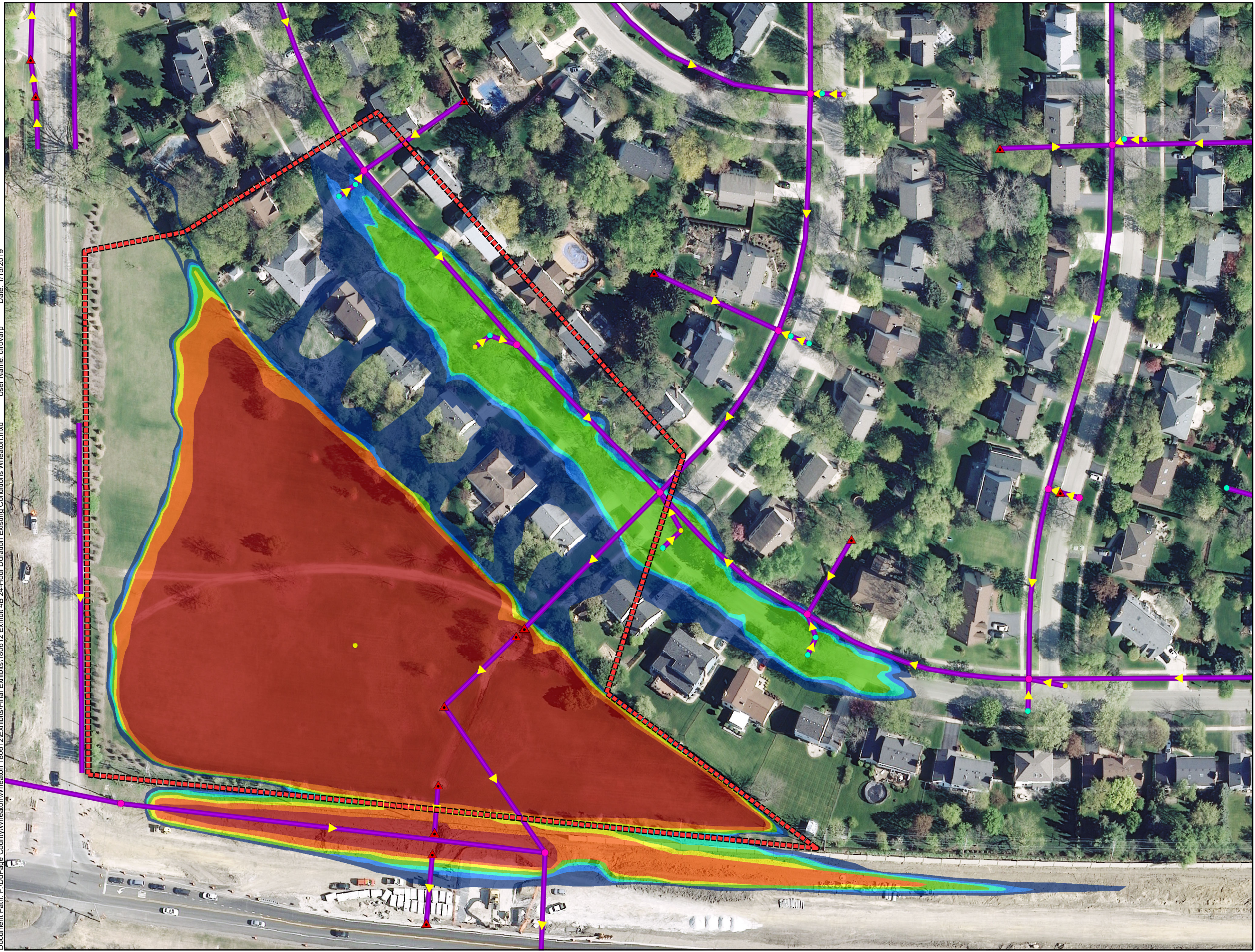


EXHIBIT 4.B
24-HOUR DURATION
EXISTING FLOODING
DORSET PARK
WHEATON, IL

Legend

Project Area



Storm Structures

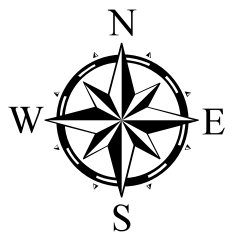
Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

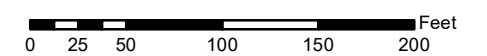
Storm

- 1-Year Storm (24-Hour)
- 5-Year Storm (24-Hour)
- 10-Year Storm (24-Hour)
- 25-Year Storm (24-Hour)
- 50-Year Storm (24-Hour)
- 100-Year Storm (24-Hour)
- 500-Year Storm (24-Hour)



ENGINEERING
RESOURCE ASSOCIATES

1 inch = 100 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\Exhibit 4C 24-Hour Duration Existing Conditions Wheaton.mxd
User Name: cfrovap
Date: 1/15/2019

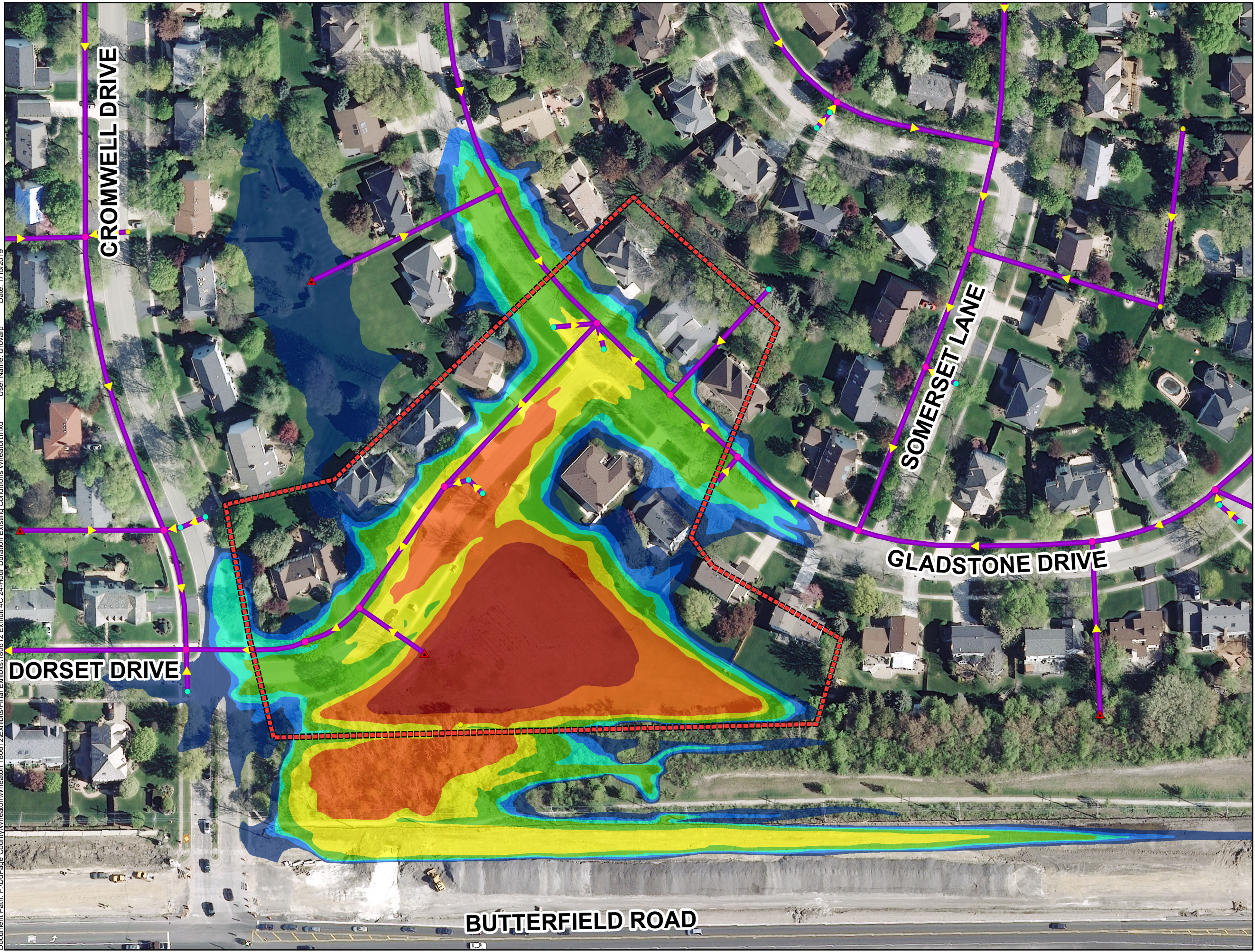


EXHIBIT 4.C
24-HOUR DURATION
EXISTING FLOODING
RIDGE PARK
WHEATON, IL

Legend

Project Area

Storm Structures

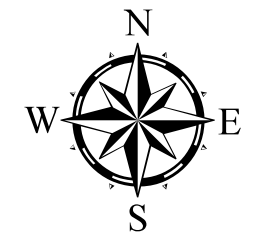
Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Existing Conditions Flooding

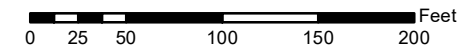
Storm

- 1-Year Storm (24-Hour)
- 5-Year Storm (24-Hour)
- 10-Year Storm (24-Hour)
- 25-Year Storm (24-Hour)
- 50-Year Storm (24-Hour)
- 100-Year Storm (24-Hour)
- 500-Year Storm (24-Hour)



ENGINEERING
RESOURCE ASSOCIATES

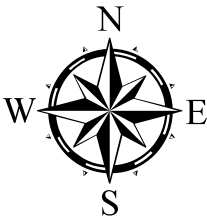
1 inch = 100 feet



**EXHIBIT 5.A
AT-RISK
STRUCTURES
GLENDALE
WHEATON, IL**

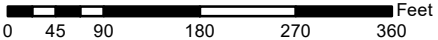
Legend

- Unaffected Structures
- At-Risk Structures (3)



**ENGINEERING
RESOURCE ASSOCIATES**

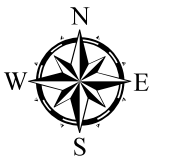
1 inch = 180 feet



**EXHIBIT 5.B
AT-RISK
STRUCTURES
DORSET PARK
WHEATON, IL**

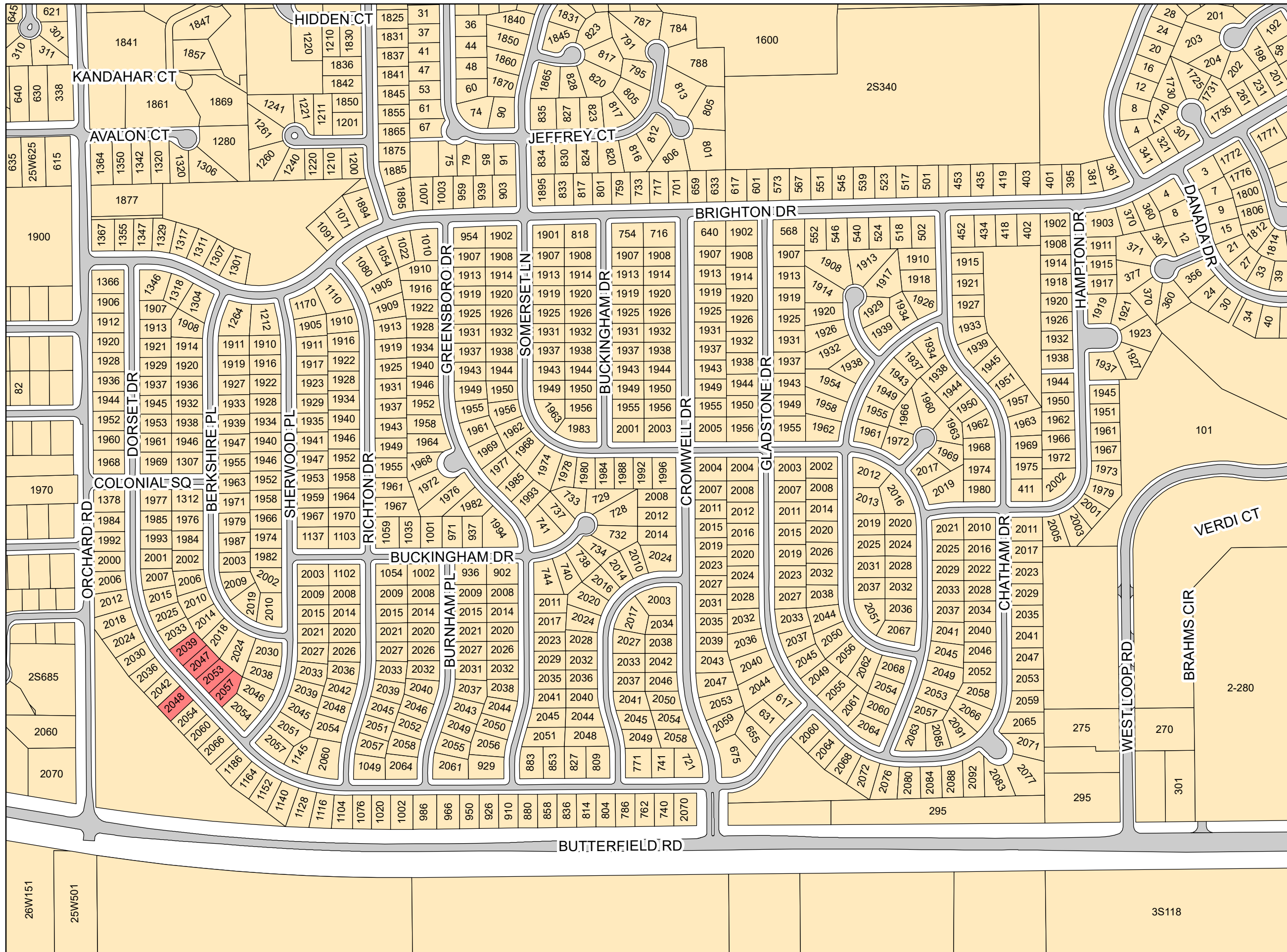
Legend

- Unaffected Structures
- At-Risk Structures (5)



**ENGINEERING
RESOURCE ASSOCIATES**

1 inch = 400 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 6 Proposed Alternative 1.mxd Date: 12/31/2018 User Name: cfovarp



**EXHIBIT 6
PROPOSED
ALTERNATIVE 1
GLENDALE
WHEATON, IL**

Legend

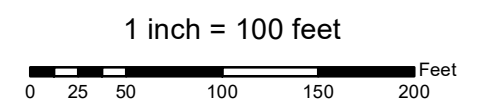
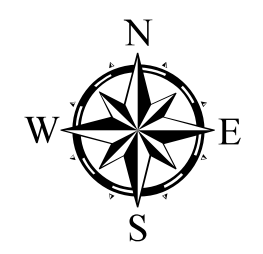
Project Area

Existing Storm Structures

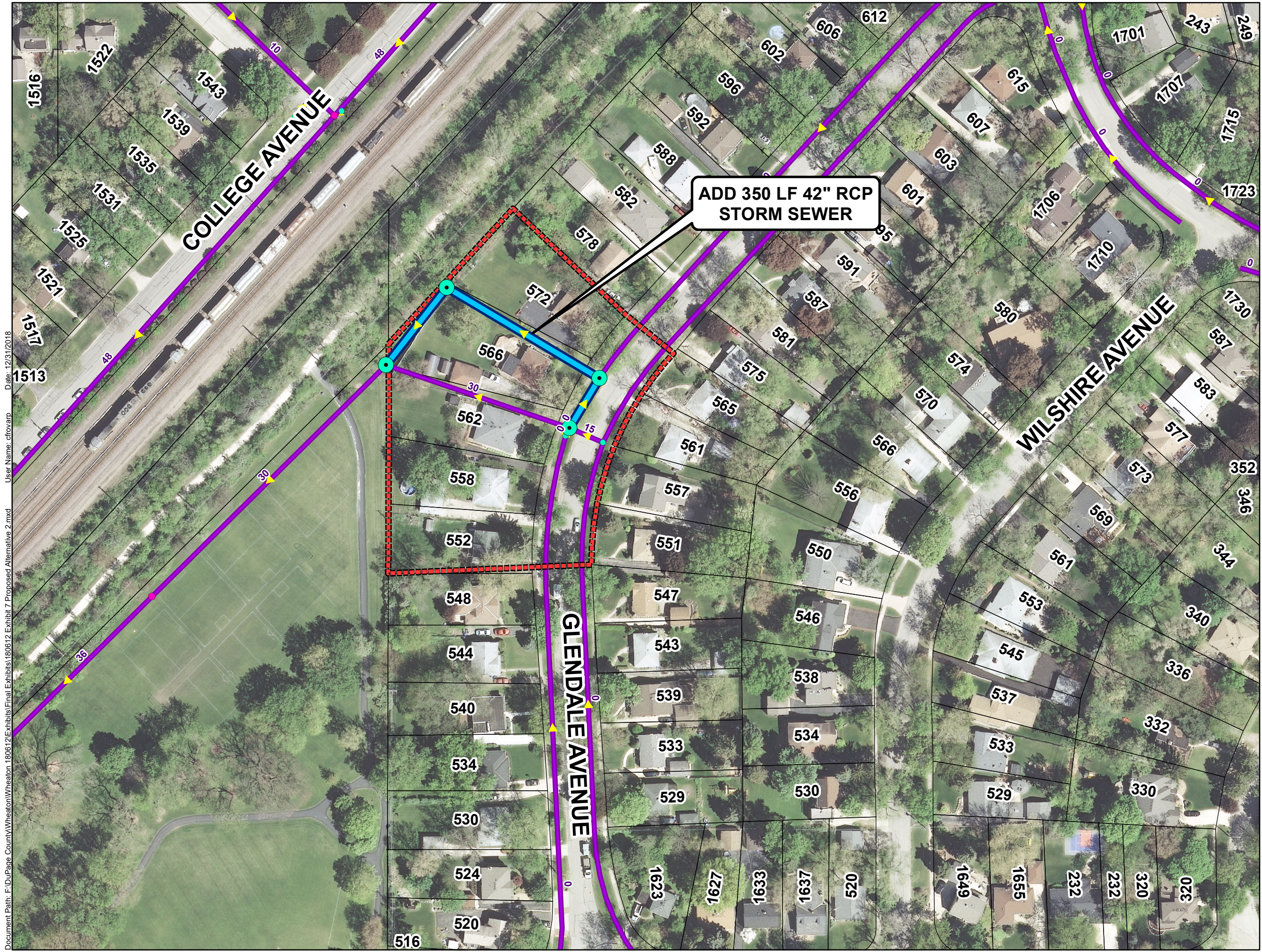
Type of Structure

- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer

Proposed Swales



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 7 Proposed Alternative 2.mxd Date: 12/31/2018 User Name: cfovarp



**EXHIBIT 7
PROPOSED
ALTERNATIVE 2
GLENDALE
WHEATON, IL**

Legend

Project Area

 Project Area

Proposed Storm Structure

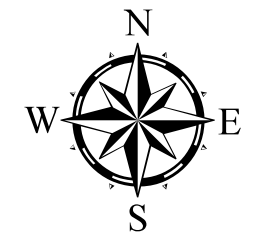
 Storm Structure

 Storm Sewer

Existing Storm Structures

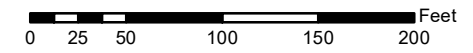
Type of Structure

-  Catch Basin
-  Control Structure
-  Discharge Point
-  Inlet
-  Manhole
-  Storm Sewer



ENGINEERING
RESOURCE ASSOCIATES

1 inch = 100 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 8 Proposed Alternative 3.mxd
User Name: cfrovap
Date: 12/31/2018

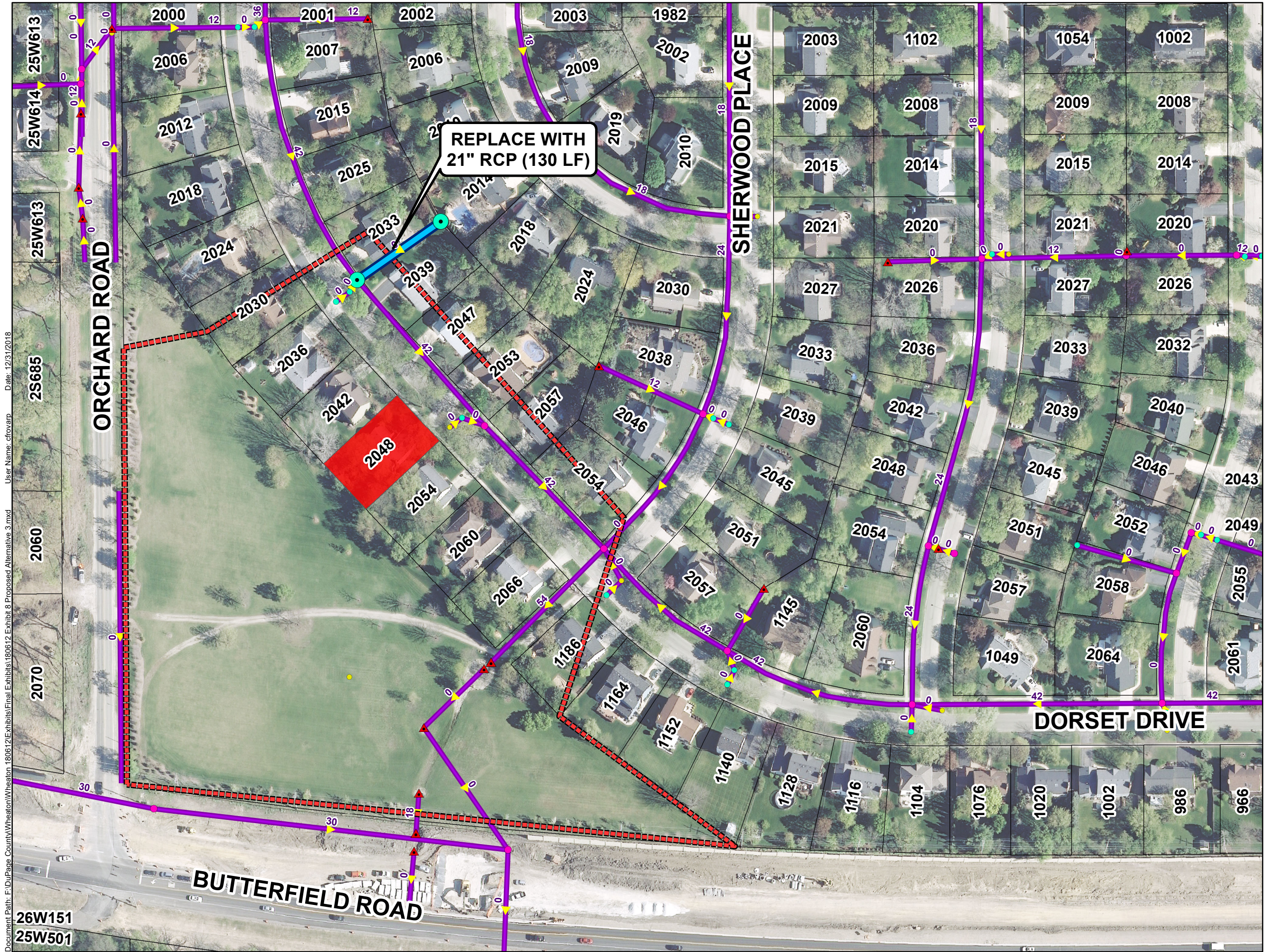


EXHIBIT 8
PROPOSED
ALTERNATIVE 3
DORSET PARK
WHEATON, IL

Legend

Project Area

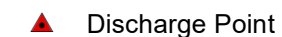


Proposed Storm Structure

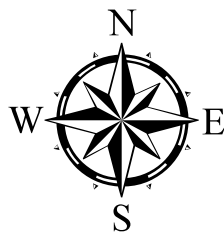


Existing Storm Structures

Type of Structure

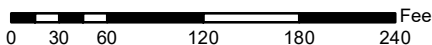


Proposed Buyout



ENGINEERING
RESOURCE ASSOCIATES

1 inch = 120 feet



Document Path: F:\DuPage County\Wheaton\Wheaton 180612\Exhibits\Final Exhibits\180612 Exhibit 9 Proposed Alternative 4.mxd User Name: cfovarp Date: 2/21/2019

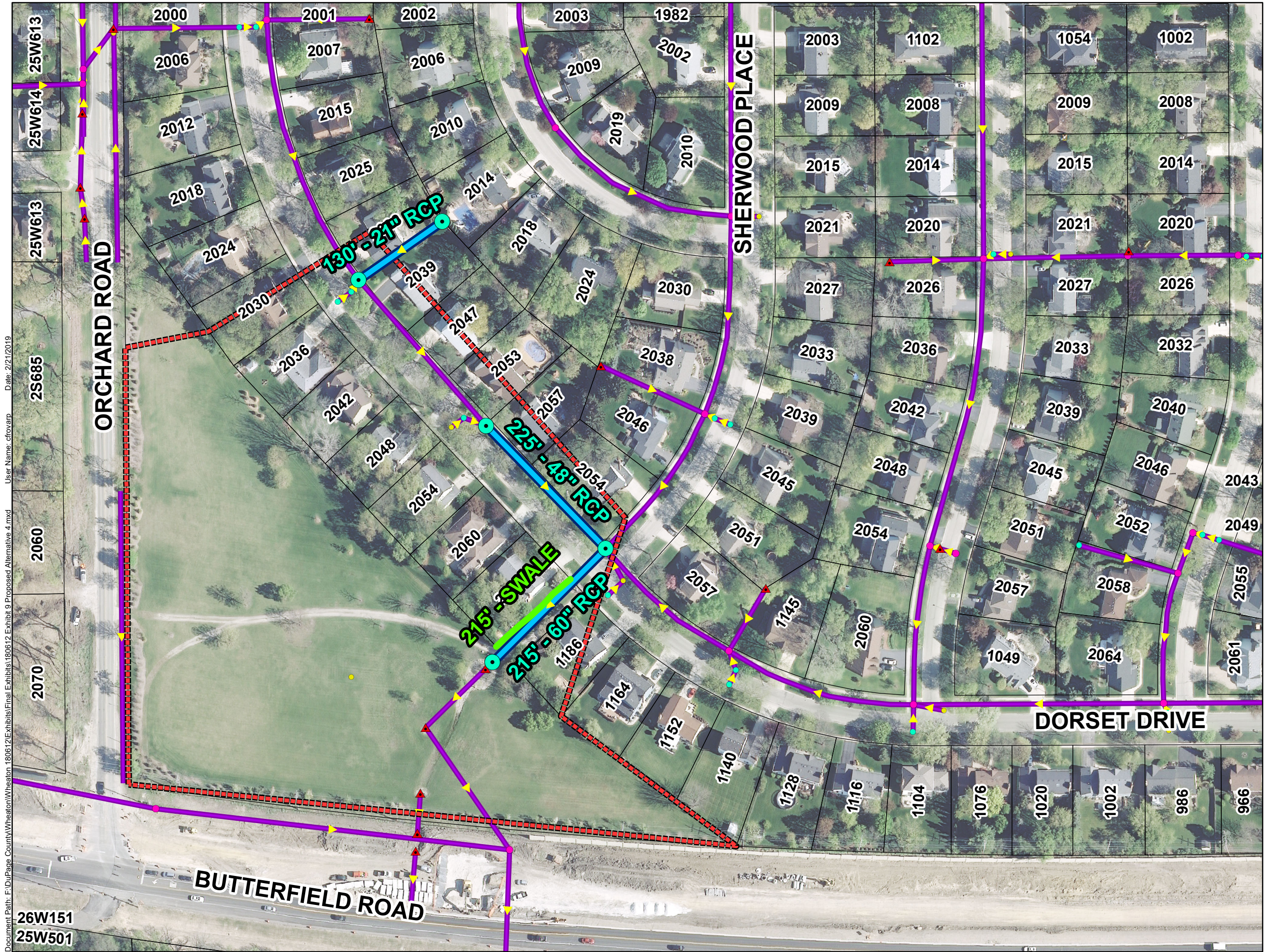


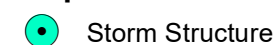
EXHIBIT 9
PROPOSED
ALTERNATIVE 4
DORSET PARK
WHEATON, IL

Legend

Project Area



Proposed Storm Structure

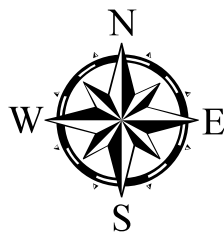


Proposed Swales

Existing Storm Structures

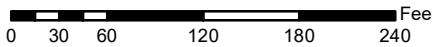
Type of Structure

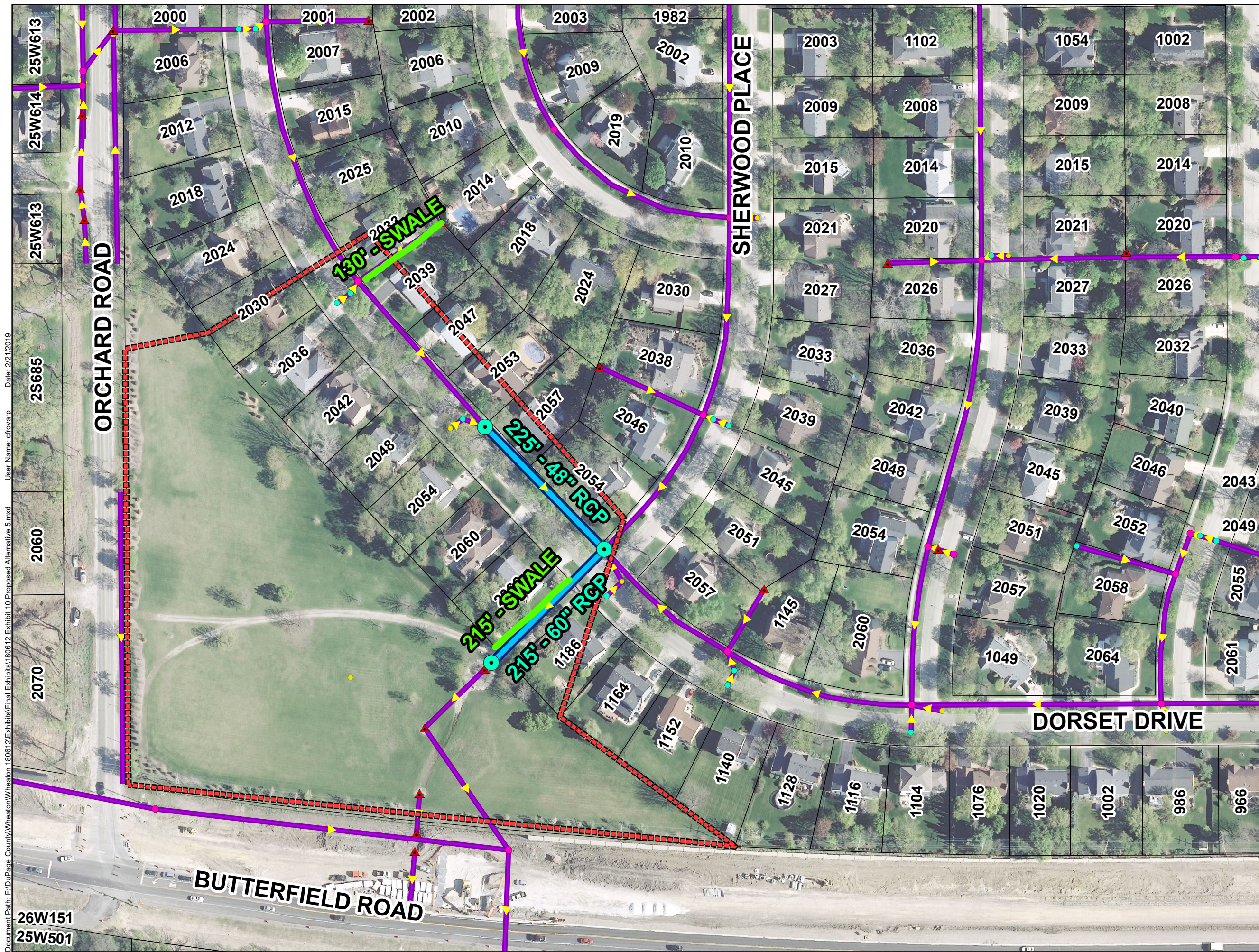
- Catch Basin
- Control Structure
- Discharge Point
- Inlet
- Manhole
- Storm Sewer



ENGINEERING
RESOURCE ASSOCIATES

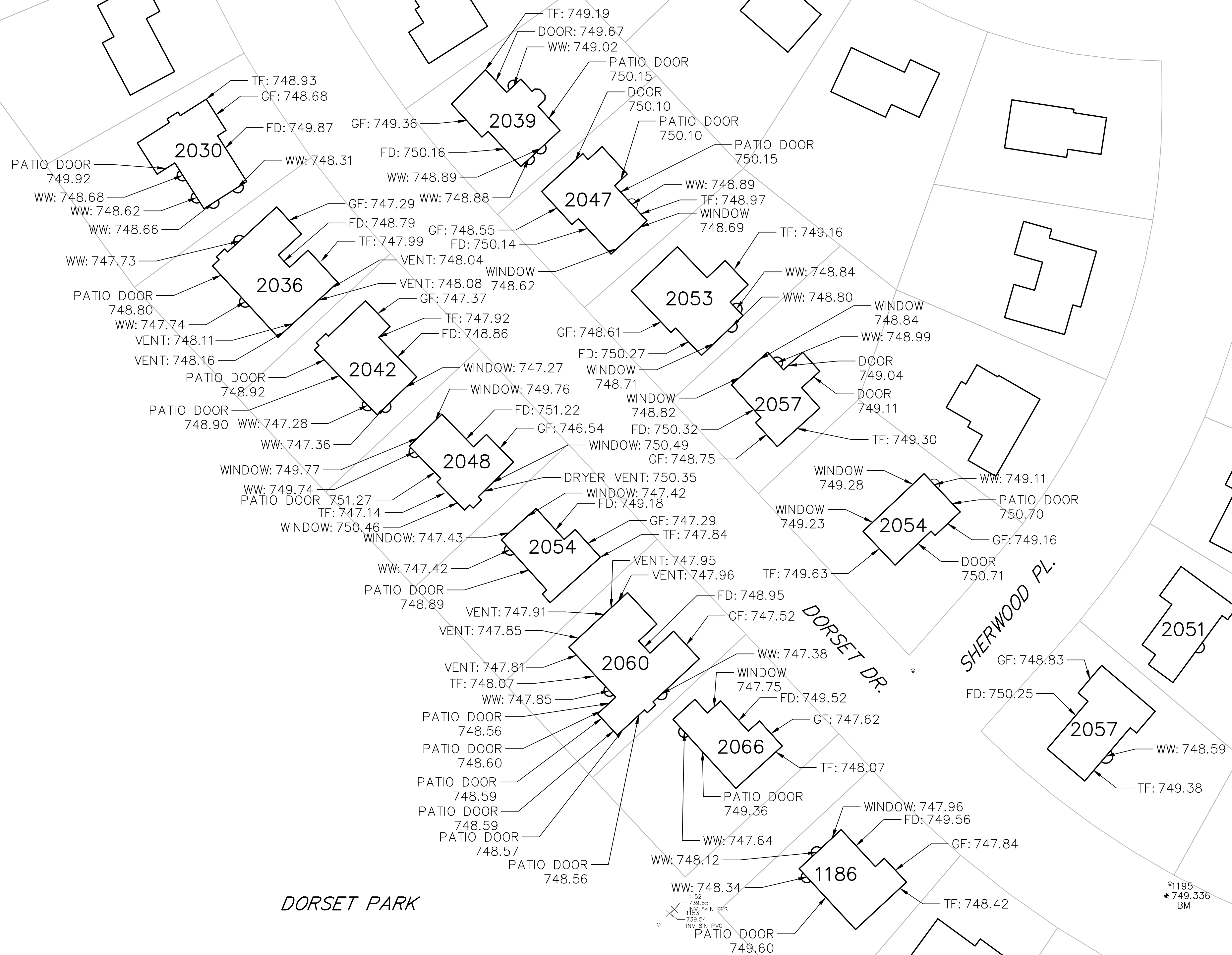
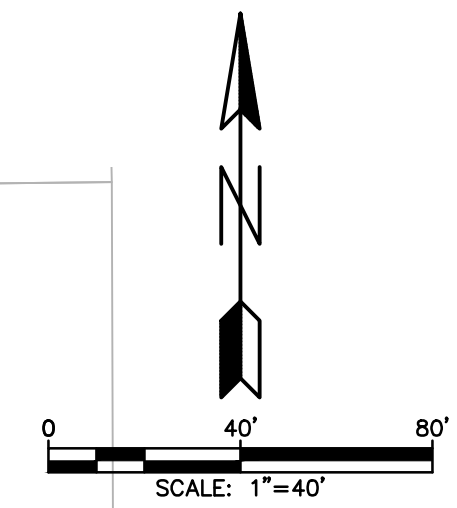
1 inch = 120 feet







REVISIONS:						DRAWN BY: RT CHECKED BY: PA APPROVED BY: SU	ENGINEERING RESOURCE ASSOCIATES 35701 WEST AVENUE, SUITE 150 WARRENVILLE, ILLINOIS 60555 PHONE (630) 393-3060 FAX (630) 393-2152 10 S. RIVERSIDE PLAZA , SUITE 875 CHICAGO, ILLINOIS 60606 PHONE (312) 474-7841 FAX (312) 474-6099 2416 GALEN DRIVE CHAMPAIGN, ILLINOIS 61821 PHONE (217) 351-6268 FAX (217) 355-1902	FLOOD PRONE AREA STUDIES 2018 PROJECT I CITY OF WHEATON, ILLINOIS	TITLE: EXHIBIT 11.a	SCALE: 1"=30'
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION					DATE: October, 2018
										JOB NO: 180612
										SHEET ___ OF ___



REVISIONS:					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:	RT
CHECKED BY:	PA
APPROVED BY:	SU

**ENGINEERING
RESOURCE ASSOCIATES**

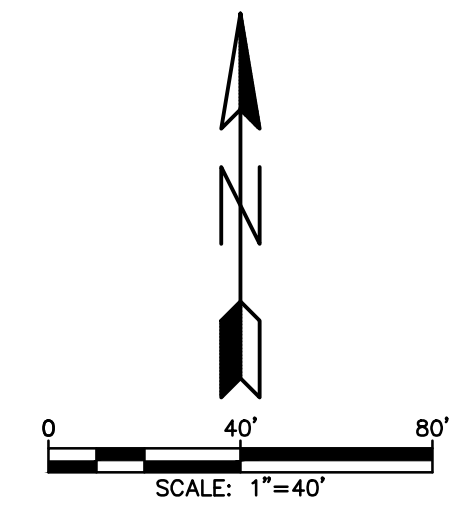
3S701 WEST AVENUE, SUITE 150
WARRENVILLE, ILLINOIS 60555
PHONE (630) 393-3060
FAX (630) 393-2152

10 S. RIVERSIDE PLAZA, SUITE 875
CHICAGO, ILLINOIS 60606
PHONE (312) 474-7841
FAX (312) 474-6099

2416 GALEN DRIVE
CHAMPAIGN, ILLINOIS 61821
PHONE (217) 351-6268
FAX (217) 355-1902

FLOOD PRONE AREA STUDIES
2018 PROJECT I
CITY OF WHEATON, ILLINOIS

TITLE:	EXHIBIT 11.b
SCALE:	1"=40'
DATE:	October, 2018
JOB NO:	180612
SHEET	__ OF __



1192
X 747.60
INV 44IN RCP

REVISIONS:						DRAWN BY: RT CHECKED BY: PA APPROVED BY: SU	ENGINEERING RESOURCE ASSOCIATES 3S701 WEST AVENUE, SUITE 150 WARRENVILLE, ILLINOIS 60555 PHONE (630) 393-3060 FAX (630) 393-2152 10 S. RIVERSIDE PLAZA, SUITE 875 CHICAGO, ILLINOIS 60606 PHONE (312) 474-7841 FAX (312) 474-6099 2416 GALEN DRIVE CHAMPAIGN, ILLINOIS 61821 PHONE (217) 351-6268 FAX (217) 355-1902	FLOOD PRONE AREA STUDIES 2018 PROJECT I CITY OF WHEATON, ILLINOIS	TITLE: EXHIBIT 11.c	SCALE: 1"=40'
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION					DATE: October, 2018
										JOB NO: 180612
										SHEET __ OF __

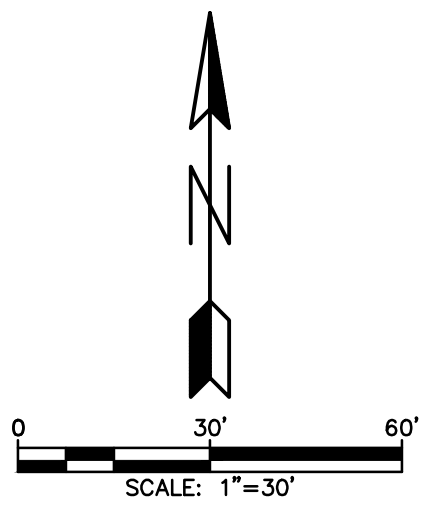
H: \\180612.00_FloodProneAreaStudies-2018\\Project\\CADD\\180612_Exhibits.dwg Updated by: radams 3/12/2019

DORSET PARK DETENTION AREA					
ELEVATION	AREA (sq ft)	AREA (acres)	AVERAGE AREA (acres)	STAGE VOLUME (acre-feet)	CUMULATIVE VOLUME (acre-feet)
739.00	15.31	0.000	0.000	0.000	0.00
740.0	31490.75	0.723	0.362	0.362	0.36
741.0	108435.67	2.489	1.606	1.606	1.97
742.0	143579.68	3.296	2.893	2.893	4.86
743.0	167435.66	3.844	3.570	3.570	8.43
743.7	184055.62	4.225	4.035	2.865	11.30
Total AC-FT					11.30



REVISIONS:						DRAWN BY: A.J.	CHECKED BY: M.M.	APPROVED BY: M.M.		35701 WEST AVENUE, SUITE 150 WARRENVILLE, ILLINOIS 60055 PHONE (630) 393-3060 FAX (630) 393-2152	10 S. RIVERSIDE PLAZA, SUITE 875 CHICAGO, ILLINOIS 60606 PHONE (312) 474-7841 FAX (312) 474-6099	2416 GALEN DRIVE CHAMPAIGN, ILLINOIS 61821 PHONE (217) 351-6268 FAX (217) 355-1902	FLOOD PRONE AREA STUDIES 2018 PROJECT CITY OF WHEATON, ILLINOIS	TITLE:	EXHIBIT 11.D	SCALE: 1"=50' DATE: December, 2018 JOB NO: 180612 SHEET OF
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION											

RIDGE PARK DETENTION AREA					
ELEVATION	AREA (sq ft)	AREA (acres)	AVERAGE AREA (acres)	STAGE VOLUME (acre-feet)	CUMULATIVE VOLUME (acre-feet)
748.00	9.27	0.000	0.000	0.000	0.00
749.0	3668.79	0.084	0.042	0.042	0.04
750.0	21211.94	0.487	0.286	0.286	0.33
751.0	33961.05	0.780	0.633	0.633	0.96
752.0	43188.88	0.991	0.886	0.886	1.85
752.93	50087.67	1.150	1.071	0.996	2.84
Total AC-FT					2.84



REVISIONS:					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY: A.J.

CHECKED BY: M.M.

APPROVED BY: M.M.

ENGINEERING
RESOURCE ASSOCIATES

35701 WEST AVENUE, SUITE 150
WARRENVILLE, ILLINOIS 60555
PHONE (630) 393-3060
FAX (630) 393-2152

10 S. RIVERSIDE PLAZA, SUITE 875
CHICAGO, ILLINOIS 60606
PHONE (312) 474-7841
FAX (312) 474-6099

2416 GALEN DRIVE
CHAMPAIGN, ILLINOIS 61821
PHONE (217) 351-6268
FAX (217) 355-1902

FLOOD PRONE AREA STUDIES
2018 PROJECT
CITY OF WHEATON, ILLINOIS

TITLE:		EXHIBIT 11.E	
SCALE: 1"=30'			
DATE: December, 2018			
JOB NO: 180612			
SHEET: 1 OF 1			

H: \\180612.00_FloodProneAreaStudies-2018Project\CADD\180612 Detention Pond As-Built.dwg Updated by: crowsp 2/21/2019

Cost Estimates



ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

www.eraconsultants.com

3S701 West Avenue, Suite 150
Warrenville, IL 60555

phone 630.393.3060
fax 630.393.2152

PROJECT: Flood Prone Area Studies - 2018 Project IV
LOCATION: Wheaton, DuPage County, IL
PROJECT #: 180612

BY: PSA
DATE: 10/04/2018
REV. DATE: 11/30/2018

COST ESTIMATE

Alternative 1: Glendale Avenue Overland Flow Path

SUMMARY OF QUANTITIES			ESTIMATE OF COST	
ITEM	UNIT	QUANTITY	UNIT PRICE	COST
RESTORATION (SEED & BLANKET)	ACRE	0.19	\$ 350,000	\$ 65,886
GRADING AND SHAPING DITCHES	FOOT	820	\$ 20	\$ 16,400
PAVEMENT PATCHING, DRIVEWAY	SQ YD	40	\$ 200	\$ 8,000
MOBILIZATION	L SUM	1	\$ 10,000	\$ 10,000
TRAFFIC CONTROL AND PROTECTION	L SUM	1	\$ 2,000	\$ 2,000
			SUBTOTAL	\$ 102,286
			ENGINEERING (10%)	\$ 10,229
			CONTINGENCY (20%)	\$ 20,000
			TOTAL	\$ 132,600



ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

www.eraconsultants.com

3S701 West Avenue, Suite 150
Warrenville, IL 60555

phone 630.393.3060
fax 630.393.2152

PROJECT: Flood Prone Area Studies - 2018 Project IV
LOCATION: Wheaton, DuPage County, IL
PROJECT #: 180612

BY: PSA
DATE: 10/04/2018
REV. DATE: 11/30/2018

COST ESTIMATE

Alternative 2: Glendale Avenue Storm Sewer

SUMMARY OF QUANTITIES			ESTIMATE OF COST	
ITEM	UNIT	QUANTITY	UNIT PRICE	COST
RESTORATION (SEED & BLANKET)	ACRE	0.08	\$ 350,000	\$ 28,122
STORM SEWER, 42" OPEN CUT	FOOT	350	\$ 120	\$ 42,000
CATCH BASIN, 3' DIAMETER	EACH	2	\$ 4,037	\$ 8,075
MANHOLES, 6' DIAMETER	EACH	4	\$ 8,000	\$ 32,000
TRENCH BACKFILL	CU YD	260	\$ 45	\$ 11,700
PAVEMENT PATCHES, 6 INCH	SQ YD	18	\$ 200	\$ 3,556
MOBILIZATION	L SUM	1	\$ 5,000	\$ 5,000
TRAFFIC CONTROL AND PROTECTION	L SUM	1	\$ 2,000	\$ 2,000
			SUBTOTAL	\$ 132,452
			ENGINEERING (10%)	\$ 13,245
			CONTINGENCY (20%)	\$ 26,000
			TOTAL	\$ 171,700



ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

www.eraconsultants.com

3S701 West Avenue, Suite 150
Warrenville, IL 60555

phone 630.393.3060
fax 630.393.2152

PROJECT: Flood Prone Area Studies - 2018 Project IV
LOCATION: Wheaton, DuPage County, IL
PROJECT #: 180612

BY: PSA
DATE: 10/04/2018
REV. DATE: 11/30/2018

COST ESTIMATE

Alternative 3: Dorset Drive Storm Sewer & Buyout

SUMMARY OF QUANTITIES			ESTIMATE OF COST	
ITEM	UNIT	QUANTITY	UNIT PRICE	COST
RESTORATION (SEED & BLANKET)	ACRE	0.03	\$ 350,000	\$ 10,847
STORM SEWER, 21" OPEN CUT	FOOT	135	\$ 75	\$ 10,125
CATCH BASIN, 3' DIAMETER	EACH	1	\$ 4,037	\$ 4,037
MANHOLES, 4' DIAMETER	EACH	2	\$ 4,500	\$ 9,000
TRENCH BACKFILL	CU YD	2	\$ 45	\$ 90
PAVEMENT PATCHES, 6 INCH	SQ YD	5	\$ 400	\$ 2,000
MOBILIZATION	L SUM	1	\$ 5,000	\$ 5,000
TRAFFIC CONTROL AND PROTECTION	L SUM	1	\$ 2,000	\$ 2,000
			SUBTOTAL	\$ 43,099
			BUYOUTS	\$ 381,744
			ENGINEERING (10%)	\$ 4,310
			CONTINGENCY (20%)	\$ 9,000
			TOTAL	\$ 438,200



ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

www.eraconsultants.com

3S701 West Avenue, Suite 150
Warrenville, IL 60555

phone 630.393.3060
fax 630.393.2152

PROJECT: Flood Prone Area Studies - 2018 Project IV
LOCATION: Wheaton, DuPage County, IL
PROJECT #: 180612

BY: PSA
DATE: 10/04/2018
REV. DATE: 11/30/2018

COST ESTIMATE

Alternative 4: Dorset Drive Storm Sewer

SUMMARY OF QUANTITIES			ESTIMATE OF COST	
ITEM	UNIT	QUANTITY	UNIT PRICE	COST
RESTORATION (SEED & BLANKET)	ACRE	0.03	\$ 350,000	\$ 10,847
GRADING AND SHAPING DITCHES	FOOT	215	\$ 20	\$ 4,300
STORM SEWER, 21" OPEN CUT	FOOT	135	\$ 75	\$ 10,125
STORM SEWER, 48" OPEN CUT	FOOT	225	\$ 130	\$ 29,250
STORM SEWER, 60" OPEN CUT	FOOT	215	\$ 270	\$ 58,050
CATCH BASIN, 3' DIAMETER	EACH	1	\$ 4,037	\$ 4,037
MANHOLES, 4' DIAMETER	EACH	2	\$ 4,500	\$ 9,000
MANHOLES, 6' DIAMETER	EACH	3	\$ 8,000	\$ 24,000
TRENCH BACKFILL	CU YD	400	\$ 45	\$ 18,000
PAVEMENT PATCHES, 6 INCH	SQ YD	500	\$ 200	\$ 100,000
MOBILIZATION	L SUM	1	\$ 15,000	\$ 15,000
TRAFFIC CONTROL AND PROTECTION	L SUM	1	\$ 5,000	\$ 5,000
			SUBTOTAL	\$ 287,609
			ENGINEERING (10%)	\$ 28,761
			CONTINGENCY (20%)	\$ 58,000
			TOTAL	\$ 374,400



ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

www.eraconsultants.com

3S701 West Avenue, Suite 150
Warrenville, IL 60555

phone 630.393.3060
fax 630.393.2152

PROJECT: Flood Prone Area Studies - 2018 Project IV
LOCATION: Wheaton, DuPage County, IL
PROJECT #: 180612

BY: PSA
DATE: 10/04/2018
REV. DATE: 11/30/2018

COST ESTIMATE

Alternative 5: Dorset Drive Swales and Storm Sewer

SUMMARY OF QUANTITIES			ESTIMATE OF COST	
ITEM	UNIT	QUANTITY	UNIT PRICE	COST
GRADING AND SHAPING DITCHES	FOOT	345	\$ 20	\$ 6,900
STORM SEWER, 48" OPEN CUT	FOOT	225	\$ 130	\$ 29,250
STORM SEWER, 60" OPEN CUT	FOOT	215	\$ 270	\$ 58,050
MANHOLES, 6' DIAMETER	EACH	3	\$ 8,000	\$ 24,000
TRENCH BACKFILL	CU YD	360	\$ 45	\$ 16,200
PAVEMENT PATCHES, 6 INCH	SQ YD	500	\$ 200	\$ 100,000
MOBILIZATION	L SUM	1	\$ 15,000	\$ 15,000
TRAFFIC CONTROL AND PROTECTION	L SUM	1	\$ 5,000	\$ 5,000
			SUBTOTAL	\$ 254,400
			ENGINEERING (10%)	\$ 25,440
			CONTINGENCY (20%)	\$ 51,000
			TOTAL	\$ 330,900

Modeling and Calculations

Hydrology Calculations



phone 630.393.3060
fax 630.393.2152

OLS

ASSUMPTIONS: Manning's Roughness Coeff., n
grass areas: 0.024
paved areas: 0.011

		Site Runoff																																					
Sheet Flow	Unit	Dorset 1	Dorset 2	Dorset 3	Dorset 4	Dorset 5	Dorset 6	Dorset 7	Dorset 8	Dorset 9	Dorset 10	Dorset 11	Dorset 12	Dorset 13	Dorset 14	Dorset 15	Dorset 16	Dorset 17	Dorset 18	Dorset 19	Dorset 20	Dorset 21	Dorset 22	Dorset 23	Dorset 24	Dorset 25	Dorset 26	Dorset 27	Dorset 28	Glendale 0	Glendale 1	Glendale 2	Glendale 3	Glendale 4	Glendale 5	Glendale 6	Glendale 7	Glendale 8	
Manning's Roughness Coeff., n		0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Flow Length, L (L ≤ 300 ft)	ft	213	100	295	25	231	56	300	244	123	300	166	300	284	200	263	300	300	300	300	300	300	236	250	300	300	300	300	300	60	206	287	135	275	300	68	139	255	
2-yr 24-hr Rainfall, P ₂	in	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.04
Upstream Elevation	ft	768.00	773.00	766.00	779.00	764.00	760.00	760.00	758.00	756.00	750.00	756.00	757.00	756.00	756.00	755.00	755.00	757.00	763.00	763.00	754.00	751.00	748.00	758.50	758.00	760.00	758.00	748.00	791.00	791.00	786.00	789.00	788.00	791.00	793.00	771.00	792.00		
Downstream Elevation	ft	763.00	768.00	758.00	776.00	760.00	759.50	758.00	756.00	753.00	749.00	753.00	756.00	755.00	754.00	753.00	754.00	753.00	754.00	755.00	759.00	747.50	749.00	745.00	753.00	753.00	758.00	752.00	744.00	787.00	777.00	782.00	786.00	782.00	777.00	791.00	768.00	772.00	
Land Slope, s	ft/ft	0.0235	0.0500	0.0271	0.1200	0.0173	0.0089	0.0067	0.0082	0.0244	0.0033	0.0181	0.0033	0.0035	0.0100	0.0114	0.0033	0.0067	0.0100	0.0267	0.0133	0.0217	0.0085	0.0120	0.0183	0.0167	0.0067	0.0200	0.0133	0.0667	0.0680	0.0139	0.0222	0.0218	0.0467	0.0294	0.0216	0.0784	
T ₁ = [0.007 (nL) ^{0.8}] / [P ₂ ^{0.5} s ^{0.4}]	hr	0.07	0.03	0.08	0.01	0.08	0.03	0.14	0.11	0.04	0.19	0.06	0.19	0.18	0.09	0.10	0.19	0.14	0.12	0.08	0.11	0.09	0.11	0.10	0.10	0.10	0.14	0.09	0.11	0.10	0.27	0.66	0.30	0.53	0.42	0.15	0.31	0.30	
Shallow Concentrated Flow																																							
Surface Description (u or p)		u	p	u	p	u	p	p	u	n/a	u	n/a	u	n/a	n/a	n/a	u	u	u	u	u	u	n/a	n/a	u	u	u	u	u	p	p	u	p	p	u	p	p	u	
Flow Length, L	ft	143	394	288	241	242	368	447	81		820		108				43	60.5	113	131	283	55.5			59	127	795	300	450	719	712	828	251	156	512	721	546	1406	
Upstream Elevation	ft	763.00	768.00	758.00	776.00	776.00	759.50	758.00	756.00		749.00		756.00				754.00	753.00	754.00	755.00	759.00	747.50			753.00	753.00	758.00	752.00	744.00	787.00	777.00	782.00	786.00	782.00	777.00	791.00	768.00	772.00	
Downstream Elevation	ft	756.00	755.00	755.00	766.00	758.00	757.00	755.00	755.00		741.50		749.00				753.50	747.00	750.00	754.00	757.00	747.00			751.50	752.00	749.00	750.00	739.00	768.00	771.00	765.00	777.00	779.00	763.00	758.00	751.00	749.00	
Watercourse Slope, s	ft/ft	0.0490	0.0330	0.0104	0.0415	0.0083	0.0068	0.0067	0.0123		0.0091		0.0648				0.0116	0.0992	0.0354	0.0076	0.0071	0.0090			0.0254	0.0079	0.0113	0.0067	0.0111	0.0264	0.0084	0.0205	0.0359	0.0192	0.0273	0.0458	0.0311	0.0164	
Average Velocity, V	fps	3.57	3.69	1.65	4.14	1.47	1.68	1.67	1.79		1.54		4.11				1.74	5.08	3.04	1.41	1.36	1.53			2.57	1.43	1.72	1.32	1.70	3.30	1.87	2.31	3.85	2.82	2.67	4.35	3.59	2.06	
T ₁ = L / 3600 V	hr	0.01	0.03	0.05	0.02	0.05	0.06	0.07	0.01	0.0	0.15	0.0	0.01	0.0	0.0	0.0	0.01	0.00	0.01	0.03	0.06	0.01	0.0	0.0	0.01	0.02	0.13	0.06	0.07	0.06	0.11	0.10	0.02	0.02	0.05	0.05	0.04	0.19	
Channel Flow																																							
Cross Sectional Flow Area, a	ft ²	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Wetted Perimeter, p _w	ft																																						
Hydraulic Radius, r = ^a / _{p_w}	ft																																						
Channel Slope, s	ft/ft																																						
Manning's Roughness Coeff., n	ft/ft																																						
Velocity, v = (1.49*r ^(2/3) *s ^(1/2))/n	fps																																						
Flow Length, L	ft																																						
T ₁ = L / 3600 V	hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
T ₂ = T ₁ + T ₁																																							
Use in Model (5 min. minimum)	min	5	5	8	5	8	5	13	7	5	20	5	12	11	5	6	12	8	8	7	10	6	7	6	7	7	16	9	11	10	23	46	19	33	28	12	21	29	

Electronic Copy of XPSWMM Model

(CD Here)

At-risk Structure Determination Table

Area	Score	Report	Area	Address	Street	T/F	L/E	Low Entry Description	1 2hr	Above T/F	Above L/E	5 2 hr	Above T/F	Above L/E	10 2hr	Above T/F	Above L/E	25 2hr	Above T/F	Above L/E	50 2hr	Above T/F	Above L/E	100 2 hr	Above T/F	Above L/E	500 2 hr	Above T/F	Above L/E	1 24hr	Above T/F	Above L/E	5 24 hr	Above T/F	Above L/E	10 24hr	Above T/F	Above L/E	25 24hr	Above T/F	Above L/E	50 24hr	Above T/F	Above L/E	100 24 hr	Above T/F	Above L/E	500 24 hr	Above T/F	Above L/E	
Dorset	Yes		2030 Dorset	748.93	748.31	Window well	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	No	No	0	No	No	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	No	No
Dorset	Yes		2036 Dorset	747.99	747.29	Garage floor	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	No	Yes			
Dorset	Yes		2042 Dorset	747.92	747.27	Window sill	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	No	YES			
Dorset	Yes		2048 Dorset	747.14	746.54	Garage floor	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	YES	747.05	No	YES	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	YES	YES			
Dorset	Yes		2054 Dorset	747.84	747.29	Garage floor	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	YES	YES			
Dorset	Yes		2060 Dorset	748.07	747.38	Window well	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	No	YES			
Dorset	Yes		2066 Dorset	748.07	747.62	Garage floor	0	No	No			746.05	No	No		746.09	No	No	746.33	No	No	746.71	No	No	747.05	No	No	748.11	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	747.91	No	YES			
Dorset	Yes		2039 Dorset	749.19	748.88	Window well	0	No	No			0	No	No		0	No	No	748.68	No	No	748.83	No	No	748.95	No	YES	749.21	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	748.86	No	No			
Dorset	Yes		2047 Dorset	748.97	748.62	Window sill	0	No	No			0	No	No		0	No	No	748.68	No	YES	748.83	No	YES	748.95	No	YES	749.21	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	748.86	No	YES			
Dorset	Yes		2053 Dorset	749.16	748.61	Garage floor	0	No	No			0	No	No		0	No	No	748.68	No	YES	748.83	No	YES	748.95	No	YES	749.21	YES	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	748.86	No	YES			
Dorset	Yes		2057 Dorset	749.30	748.75	Garage floor	0	No	No			0	No	No		0	No	No	748.68	No	No	748.83	No	YES	748.95	No	YES	749.21	No	YES	0	No	No	0	No	No	746.01	No	No	746.05	No	No	746.22	No	No	748.86	No	YES			
Dorset	Yes		1186 Dorset	748.42	747.84	Garage floor	0	No	No			746.69	No	No		746.77	No	No	746.85	No	No	746.95	No	No	747.07	No	No	748.1	No	YES	0	No	No	0	No	No	746.68	No	No	746.71	No	No	746.73	No	No	747.92	No	YES			
Ridge	Yes		675 Dorset	756.34	755.86	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Ridge	Yes		655 Dorset	756.57	756.00	Garage floor	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Ridge	Yes		631 Dorset	756.76	756.31	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Ridge	Yes		617 Dorset	757.20	756.79	Garage floor	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Dorset	Yes		2057 Sherwood	749.38	748.59	Window well	0	No	No			0	No	No		0	No	No	0	No	No	747.69	No	No	747.79	No	No	748.4	No	No	0	No	No	0	No	No	0	No	No	0	No	No	746.74	No	No	746.78	No	No	747.91	No	No
Dorset	Yes		2054 Sherwood	749.63	749.11	Window well	0	No	No			0	No	No		0	No	No	0	No	No	748.78	No	No	748.91	No	No	749.14	No	YES	0	No	No	0	No	No	0	No	No	0	No	No	746.2	No	No	748.61	No	No	748.75	No	No
Ridge	Yes		2060 Gladstone	756.48	756.10	Garage floor	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Ridge	Yes		2064 Gladstone	756.03	755.68	Garage floor	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	YES	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	YES
Ridge	Yes		2068 Gladstone	757.23	756.77	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.47	No	No	755.85	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.53	No	No	755.77	No	No
Ridge	Yes		2072 Gladstone	757.84	757.54	Garage floor	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.71	No	No	755.87	No	No	756.16	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	755.63	No	No	755.87	No	No
Ridge	Yes		2049 Gladstone	756.95	756.29	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.98	No	No	756.39	No	YES	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	756.05	No	No	756.11	No	No
Ridge	Yes		2055 Gladstone	756.75	756.29	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.98	No	No	756.39	No	YES	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	756.05	No	No	756.11	No	No
Ridge	Yes		2061 Gladstone	757.16	756.81	Window well	751.3	No	No			753.2	No	No		754.06	No	No	754.7	No	No	755.19	No	No	755.98	No	No	756.39	No	No	751.21	No	No	753.69	No	No	754.2	No	No	755.03	No	No	755.33	No	No	756.05	No	No	756.11	No	No
Glendale	Yes		566 Glendale	752.30	751.51	Window well	750.4	No	No			750.6	No	No		750.86	No	No	751.64	No	YES	751.77	No	YES	751.87	No	YES	752.25	No	YES	750.12	No	No	750.21	No	No	750.31	No	No	750.41	No	No	750.55	No	No	750.76	No	No	751.35	No	No
Glendale	Yes		558 Glendale	751.57	751.57	Window sill	750.4	No	No			750.6	No	No		750.86	No	No	751.64	YES	YES	751.77	YES	YES	751.87	YES	YES	752.25	YES	YES	750.12	No	No	750.21	No	No	750.31	No	No	750.41	No	No	750.55	No	No	750.76	No	No	751.35	No	No
Glendale	Yes		562 Glendale	751.69	751.44	Window well	750.4	No	No			750.6	No	No		750.86	No	No	751.64	No	YES	751.77	YES	YES	751.87	YES	YES	752.25	YES	YES	750.12	No	No	750.21	No	No	750.31	No	No	750.41	No	No	750.55	No	No	750.76	No	No	751.35	No	No
Glendale	Yes		572 Glendale	752.03	752.03	Window well	750.4	No	No			750.6	No	No		750.86	No	No	751.64	No	No	751.77	No	No	751.87	No	No	752.25	YES	YES	750.12	No	No	750.21	No	No	750.31	No	No	750.41	No	No	750.55	No	No	750.76	No	No	751.35	No	No

Buyout Valuations Table

100-yr Buyout Valuations

Area	Address	Street	FCV (from County)	Multiplier and Demo
Dorset	2048	Dorset	\$ 115,680.00	\$ 381,744.00
Dorset	2039	Dorset	\$ 153,390.00	\$ 506,187.00
Dorset	2047	Dorset	\$ 154,090.00	\$ 508,497.00
Dorset	2053	Dorset	\$ 173,010.00	\$ 570,933.00
Dorset	2057	Dorset	\$ 146,020.00	\$ 481,866.00
Glendale	566	Glendale	\$ 100,460.00	\$ 331,518.00
Glendale	558	Glendale	\$ 221,050.00	\$ 729,465.00
Glendale	562	Glendale	\$ 89,280.00	\$ 294,624.00

Proposed Alternative Water Surface Elevations

Proposed Alternative WSELs

Study Area	Address	Street	Top of Foundation	Lowest Entry	Low Entry Description	EXISTING HWL at Critical Duration (100 YR 2 HR)	ALTERNATIVE 1 HWL at Critical Duration (100 YR 2 HR)	ALTERNATIVE 2 HWL at Critical Duration (100 YR 2 HR)	ALTERNATIVE 3 HWL at Critical Duration (100 YR 2 HR)	ALTERNATIVE 4 HWL at Critical Duration (100 YR 2 HR)	ALTERNATIVE 5 HWL at Critical Duration (100 YR 2 HR)2
Dorset	2030	Dorset	748.93	748.31	Window well	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2036	Dorset	747.99	747.29	Garage floor	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2042	Dorset	747.92	747.27	Window sill	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2048	Dorset	747.14	746.54	Garage floor	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2054	Dorset	747.84	747.29	Garage floor	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2060	Dorset	748.07	747.38	Window well	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2066	Dorset	748.07	747.62	Garage floor	747.05	n/a	n/a	746.81	746.25	746.32
Dorset	2039	Dorset	749.19	748.88	Window well	748.95	n/a	n/a	748.50	748.45	747.70
Dorset	2047	Dorset	748.97	748.62	Window sill	748.95	n/a	n/a	748.50	748.45	747.70
Dorset	2053	Dorset	749.16	748.61	Garage floor	748.95	n/a	n/a	748.50	748.45	747.70
Dorset	2057	Dorset	749.30	748.75	Garage floor	748.95	n/a	n/a	748.50	748.45	747.70
Dorset	1186	Dorset	748.42	747.84	Garage floor	747.07	n/a	n/a	746.81	746.25	746.33
Dorset	2057	Sherwood	749.38	748.59	Window well	747.79	n/a	n/a	746.81	746.25	746.33
Dorset	2054	Sherwood	749.63	749.11	Window well	748.91	n/a	n/a	746.81	746.25	746.33
Glendale	566	Glendale	752.30	751.53	Window well	751.87	751.25	Below Rim	n/a	n/a	n/a
Glendale	558	Glendale	751.57	751.57	Window sill	751.87	751.25	Below Rim	n/a	n/a	n/a
Glendale	562	Glendale	751.69	751.44	Window well	751.87	751.25	Below Rim	n/a	n/a	n/a
Glendale	572	Glendale	752.03	752.03	Window well	751.87	751.25	Below Rim	n/a	n/a	n/a
Ridge	675	Dorset	756.34	755.86	Window well	755.47					
Ridge	655	Dorset	756.57	756.00	Garage floor	755.47	No alternative for home adjacent to Ridge Park since not at risk in 100-yr critical duration.				
Ridge	631	Dorset	756.76	756.31	Window well	755.47					
Ridge	617	Dorset	757.20	756.79	Garage floor	755.47					
Ridge	2060	Gladstone	756.48	756.10	Garage floor	755.47					
Ridge	2064	Gladstone	756.03	755.68	Garage floor	755.47					
Ridge	2068	Gladstone	757.23	756.77	Window well	755.47					
Ridge	2072	Gladstone	757.84	757.54	Garage floor	755.87					
Ridge	2049	Gladstone	756.95	756.29	Window well	755.98					
Ridge	2055	Gladstone	756.75	756.29	Window well	755.98					
Ridge	2061	Gladstone	757.16	756.81	Window well	755.98					