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Master Plan Update for

# T.H. 59/60 Realignment

City of Worthington, Minnesota

March 18, 2015

BMI Project No. F13.106371

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**Prepared by:**

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## CERTIFICATION

**T.H. 59/60 Master Plan Update**

**For**

**Sanitary Sewer, Water Distribution System, & Stormwater Drainage**

City of Worthington  
Worthington, Minnesota  
BMI Project No. F13.106371

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By: Gregory A. Mitchell  
Gregory A. Mitchell  
License No. 23467

Date: 20 March 2015



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## INTRODUCTION

In accordance with the City of Worthington's request, we have prepared this update to the sanitary sewer, water distribution, and storm water drainage master plans in the reconfigured development area that resulted from the recent realignment of T.H. 59/60 near County Road 57 along the south edge of Worthington, Minnesota. We have also included a brief transportation plan to advise stakeholders of potential concerns as this area develops.

The developable area has been broken into three sub-areas for discussion purposes in this report and are labeled A, B, & C. See Figure 1 in Appendix A for sub-area locations.

Due to the potential for development to begin near the T.H. 59/60 and C.R. 57 intersection, we have prepared both an ultimate and an initial utility layout. The initial layout is referred to as Phase 1. The Phase 1 layout depicts the minimum requirements to provide sanitary sewer and water services to Area A. See Figures 1 and 2 in Appendix A for Ultimate and Phase 1 utility layouts. Costs estimates for both have been included Appendix B of this report.

## LAYOUT

An ultimate development and street layout was prepared for the area created between the former and realigned T.H. 59/60 corridors. This area consists of approximately 118 acres excluding the former dredge fill site and existing businesses located west of South Lake Street. Four existing residential properties are included within this area. It is anticipated that this future growth area will be commercial and/or light industry.

Figure 1 shows the proposed ultimate layout. Existing street corridors consist of C.R. 57 which intersects T.H. 59/60 in two locations, South Lake Street and the former T.H. 59/60 segment parallel with the railroad tracks which extend from C.R. 57 and intersect with First Avenue SW. Due to the existing property layout and previously developed highway/street infrastructure, it is anticipated that these corridors will be maintained. To accommodate access along the development area, three new streets are proposed for the ultimate layout.

C.R. 57 will be maintained as the main arterial, as it is now, when the site is fully developed. Since this corridor infrastructure already exists, it is anticipated that initial development will begin along its fringes. South Lake Street, the former T.H. 59/60 segment parallel to the railroad tracks, and the new streets within the development will be collector streets that will serve the interior sites. The former T.H. 59/60 segment parallel to the railroad tracks should be maintained with this development because it provides a link between First Avenue SW and C.R. 57, and ultimately to T.H. 59/60. As development proceeds, consideration could be given to reconfiguring the intersection of C.R. 57 and the former T.H. 59/60 segment to allow through traffic on C.R. 57 and requiring the west leg on the former T.H. 59/60 to stop. Once a connection is made by a new street extension from First Street SW to C.R. 57, the former T.H. 59/60 segment could be eliminated depending on infrastructure maintenance costs and the benefit of access provided to the adjacent properties.

The layout also includes proposed lot lines for typical commercial and/or light industry lots. Target lot widths range from 200-300 feet and lot depths range from 250-450 feet. Actual lot sizes and layout will be dependent on development requirements.



## SANITARY SEWER

The sanitary sewer for this area is part of the Master Plan South District. The original South District area is indicated as 127 acres. The proposed service area is 182 acres. This includes the additional growth area created by realigning T.H. 59/60 as well as adjusting four previously identified areas that will not develop due to wetlands and a designated park area. See Figure 3 in Appendix A.

The lift station located along Sherwood Street and existing 10" diameter pipe serves the currently developed properties, which includes the businesses along the south side of C.R. 57. In 2000 the sanitary sewer was extended by constructing an 8" diameter PVC pipe 154 feet south in the South Lake Street corridor and then extending west to C.R. 57. This overall system will provide service for the revised growth area.

Flow capacities for the sewer main facilities have been calculated using a generally accepted design unit flow rate for Industrial/ Commercial land uses of 1,200 gal per acre per day. Information provided from previous flow calculations in the South District area indicated a flow rate of 1,030 gallons per acres per day, which confirms the design rate. A peak hour factor of 3.0 was used to compute the peak flow. Based on this information, the maximum service areas were computed and are shown in the table below:

Maximum Service Areas Based on Pipe at Minimum Grade				
Pipe Diameter (inches)	15	12	10	8
Min Slope (%)	0.15%	0.22%	0.28%	0.40%
Flow, Q (cfs)	2.502	1.671	1.159	0.764
Flow, Q (gpm)	1,123	750	520	343
Flow, Q (gpd)	1,617,120	1,080,000	748,800	493,920
Design Flow (gal/ac/day)	1,200	1,200	1,200	1,200
Peak Hour Factor	3	3	3	3
Peak Flow (gal/ac/day)	3,600	3,600	3,600	3,600
<b>Max Service Area (acres)</b>	<b>449</b>	<b>300</b>	<b>208</b>	<b>137</b>

Figure 3 also shows the proposed sanitary sewer layout for the revised growth area which has been separated into service areas A, B and C. Each service area discharges to a different location of the existing sanitary sewer system. The modified existing service areas 1-4 of the sanitary sewer system are also shown. The existing service area has been modified from the original South District to exclude the park (Buss Field) and the remaining undevelopable land east of the park.

Service Area A is located west of C.R. 57 and consists of 43.0 acres. This area discharges to the 8" diameter sanitary sewer located in C.R. 57. Estimated sewer depths range from 9-19 feet.

Service area B is located between C.R. 57 and South Lake Street, and consists of 55.9 acres. This area discharges to the 8" diameter sanitary sewer located in South Lake Street. Estimated sewer depths range from 11-18 feet.

Service area C is located on the easterly side of the growth area and discharges to the existing 8" diameter sanitary sewer stubbed to the east. This area consists of 20.3 acres. Estimated sewer depths for this section range from 6-8 feet which may require special consideration for development in this area, and possibly include site embankment, individual grinder pumps, lift station or insulated sewer services.

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In addition to the revised growth area, there is also capacity for additional development south of T.H. 59/60 near C.R. 57. Based on the maximum service areas computed for the revised growth area, there are approximately 33 acres available for development, assuming the same industrial/ commercial land use. Estimated sewer depths range from 8-14 feet. The majority of the development in this area would need to occur west of C.R. 57 to maintain adequate sewer depths without requiring additional pumping. Total service area for the expanded South District would then be 215 acres.

Prior to expanding development in the revised growth area, the capacity of the existing lift station located at Sherwood Street should be evaluated to determine any necessary upgrades to handle the additional sanitary sewer flows from the future development. The estimated peak flow rate is 540 gpm. Also, as development progresses it is important for the City to monitor the water usage of the businesses that locate in the area. If the water usage rate in the development exceeds 1,200 gal per acre per day, the existing sewer piping near the lift station will need to be upsized. If the usage is less, the area served by this sewer could possibly be expanded.

## **WATER DISTRIBUTION SYSTEM**

The existing computerized water distribution model was updated to the latest version of Bentley's WaterCad. A variety of layout options were analyzed with respect to water velocity, friction headloss, pressures and available fire flow. The modeled fire flows were run up to a maximum of 3,500 gpm. The computer model indicates that higher flows are available in some areas, but at some point they become unrealistic because there are not enough hydrants or fire equipment is adequate to deliver such high rates. The minimum fire flow available at any given point in a system should not be less than 500 gpm at a residual pressure of 20 psi. This represents the amount of water required to provide for two standard hose streams on a fire in a typical residential area for residential dwellings with spacing more than 100 feet. The distance between buildings and the corresponding fire flow is summarized in the table below.

<b>Recommended Residential Fire Flows</b>	
<b>Distance Between Buildings (Feet)</b>	<b>Needed Fire Flow (gpm)</b>
More than 100	500
31-100	750
11-30	1000
Less than 11	1500

For commercial, industrial and institutional customers, the maximum amount of available fire flow that a City is required to provide is 3,500 gallons per minute for a duration of three hours. However, depending on type of construction, building spacing, type of use and fire protection, the customer may require less. Two different size water main loops were analyzed in the computer model as shown below:

Scenario 1: 8 Inch watermain throughout proposed service area, including looped connection to Flower Lane.

Scenario 2: 10 Inch watermain routed through proposed service area, including looped connection to Flower Lane. Remainder of watermain to be sized at 8 inches.

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Since the properties that will be served will primarily be commercial and/or industrial, a larger available fire flow is recommended than for residential fire flows. The analysis indicates that if Scenario 2 (a 10 inch loop) is constructed through the proposed service area, fire flows will increase by approximately 1,000 gpm along the primary loop in comparison with a proposed 8 inch looped water main. In addition, on the south side of T.H. 59/60 along C.R. 57 (Plotts Avenue), the available fire flow with Phase 1 completed will be approximately 1,300 gpm at a residual pressure of 20 psi, increasing to slightly over 1,800 gpm once the 10 inch watermain is completed.

To provide redundancy, increase available fire flows and improve water quality by allowing better water circulation through the system, a water main loop should be constructed under 1st Avenue SW and connect the proposed system expansion along Flower Lane to South Shore Drive.

## STORMWATER DRAINAGE

The current land use of the proposed development area is largely agricultural with homesteads and a 9 acre industrial area. Existing drainage patterns are broken into 4 distinct outfall locations as shown in Figure 4 of Appendix A:

1. Lake Okabena: Approximately 22 acres currently drain through a culvert under old T.H. 59/60 which discharges into Lake Okabena. The land use within the catchment is agricultural with two homesteads.
2. County Road 57: Approximately 30 acres drains to a depression 600' north of the intersection of C.R. 57 and the new T.H. 59/60 corridor. This depression is located on both the East and West side of C.R. 57. It is serviced by an existing private agricultural tile that conveys runoff south across T.H. 59/60 before the tile is routed East to the water quality basins that were constructed as part of the T.H. 59/60 project. Larger storm events, in excess of the ponding capacity, overflows to the south along C.R. 57 then northeast along T.H. 59/60.
3. Dredge Outfall: Approximately 38 acres of agricultural, industrial and wetland area drains to the dredge fill site, which is now a wetland. A storm sewer pipe running east down C.R. 57 provides an outfall for the area.
4. T.H. 59/60 Outfall: Approximately 69 acres of agricultural fields and MnDOT right-of-way drain to the newly constructed water quality basins constructed at the intersection of T.H. 59/60 and C.R. 57. The median and westbound ditches provide the primary conveyance system for this area prior to discharging into the water quality basins. There is also a 12" drain tile system in the MnDOT ditch that can convey low flows.

In the proposed condition, the land use is anticipated to be predominantly industrial. In addition to the change in land use, service roads are anticipated so that all lots within the development have access to public transportation infrastructure. Industrial land use and expansion of the city roadway system within the development creates additional runoff as a result of increased impervious area. Based on typical industrial developments, we have assumed the comprehensive impervious area for both the roadways and the industrial parcels to be 85%. Given these conditions, we have analyzed three options to handle the increased runoff, as listed below:

1. Route runoff to T.H. 59/60 water quality basins:

This option includes a storm sewer main constructed in the city roadway right-of-way that is designed to serve the entire development. Storm sewer pipe is sized to convey the 10-year design event. In order to utilize the storm sewer main for roadway and development drainage, the industrial lots must be either graded to direct surface runoff to the roadway or construct private storm sewer connections to allow for storm sewer connections that service individual lots.

Portions of the development do not naturally drain to the proposed main storm sewer collector.

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These areas include portions of lots adjacent to T.H. 59/60 and lots adjacent to the dredge site wetland. Figure 5 in Appendix A shows the anticipated service area for the storm sewer main and pipe sizes required to convey the 10 year design event.

For storm events larger than the 10-year rainfall, surface overflow routing will be needed to limit localized flooding within the development. It is anticipated that overflow routing can be accomplished by grading overflow swales for large storm events along lot lines as the development is constructed.

A preliminary cost estimate has been completed for the storm sewer improvements associated with Option 1. Total preliminary costs are approximately \$1.14 million.

2. Maintain Lake Okabena drainage, route remainder of development to T.H. 59/60 basins:

This option includes constructing a stormwater basin to serve approximately 18 acres of the industrial park that currently drains to Lake Okabena. The remainder of the development will be served by a main storm sewer collector pipe and routed to the T.H. 59/60 water quality basins. Figure 6 in Appendix A shows the two service areas as well as pond and pipe sizes for the development.

The storm sewer main pipe sizes decreased slightly as a result of continuing the existing drainage patterns to Lake Okabena. A preliminary cost estimate shows a reduction in storm sewer costs when compared to Option 1 of approximately \$170,000.

3. Maintain Lake Okabena drainage, attenuate flows out of the C.R. 57 low point:

This option includes constructing stormwater basins in the Lake Okabena and C.R. 57 watersheds. The Lake Okabena pond will utilize existing infrastructure to outlet to the lake. The C.R. 57 ponds will utilize the constructed storm sewer for events less than or equal to the 10 year event. For larger events, the C.R. 57 ponds will utilize culverts to maintain overflow drainage to the T.H. 59/60 ditch and eventually to the T.H. 59/60 water quality basins.

Storm sewer main pipe sizes decreased as a result of the Lake Okabena Pond and the flow attenuation at the C.R. 57 low point. As a result of the pipe size decreases, estimated storm sewer costs decreased approximately \$205,000. Figure 7 in Appendix A shows the preliminary locations of the ponds at C.R. 57 and the storm sewer sizes required to service the remainder of the development for the 10 year design event.

The National Wetlands Inventory (NWI) indicates that some areas within the development may be wetlands. See Figure 8 in Appendix A for NWI locations. A delineation is recommended to verify the existence and boundaries of any wetlands within the development area. Pending the results of the delineation, possible changes to lot layouts and storm sewer treatment options may need to be completed in order to minimize wetland impacts.

Due to proposed surface grades, a portion of the development just south of the Dredge site wetland will not be captured by the storm sewer system. Because direct discharge from industrial land use to a wetland is generally prohibited under the Wetland Conservation Act (WCA), treatment measures upstream of the wetland may be needed pending the results of the delineation. These treatment measures may shrink lot sizes in this area.

The dredge site wetland currently has an outlet pipe that runs along the south side of C.R. 57 before it discharges into a county ditch. A portion of the existing Shine Brothers property also discharges to this storm sewer pipe. The existing sizes of the outfall pipe are known but the exact manhole locations and elevations have not been surveyed. Not knowing the existing pipe slopes limits the ability to analyze the existing pipe capacity. The existing pipe capacity may be adequate for the expected land use change within the watershed, but a survey of the existing pipe infrastructure should be completed to verify the pipe capacities. Existing pipe depths may also limit access from the undeveloped areas.

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As part of the T.H. 59/60 project, the city coordinated the acquisition of additional right-of-way for pond expansion so that all water quality treatment for the proposed development can take place in the T.H. 59/60 basins. The preliminary modeling done to date has only estimated the size of these basins by scaling pond contours from construction plans. Surface models completed by MnDOT should be acquired by the city so that the existing size of the ponds can be analyzed and excavation quantities can be determined for the pond expansion.

To accommodate the development of the 5-acre parcel northwest of the intersection of T.H. 59/60 and C.R. 57 it is recommended that an onsite detention basin be created to manage the additional runoff created by development. See Figure 9 in Appendix A. The system would also utilize the existing tile system and MnDOT ditches to convey the mitigated flows to the regional treatment basin. The dry onsite retention basin must be sized to ensure that flood elevations and flows leaving the site do not exceed the flows generated by the existing condition. Existing drainage patterns will largely be maintained and the regional treatment basin constructed as a part of the T.H. 59/60 Bypass will still be utilized for stormwater treatment. Costs for the onsite treatment including contingency and engineering are estimated at \$58,000. This cost is also reflected in the Phase 1 cost estimate in Appendix B.

## **TRANSPORTATION PLAN**

Traffic volumes for the Worthington Master Plan were projected using a combination of MnDOT AADT information as well as the physical development site area. The ITE Trip Generation Handbook was used to determine the amount of new trips generated as a result of the industrial park, assuming full build-out within the 20 year projection time period. It was assumed that the parcels within this site that are currently developed will remain developed and will not convert to industrial park within the projection time period.

Figure 10 in Appendix A shows projected 2033 AADTs for the major road segments within the project area. 2011 traffic volumes were taken from the MnDOT AADT map for T.H. 59/60 both north and south of the proposed development as well as for South Lake Street - the main roadway connecting downtown Worthington with the site. These values were projected out to 2013 and then 2033 using the traffic factor projection for Nobles County of 1.3 (30% growth in the next 20 years). Industrial park trips were then assigned to each road segment based on the site geometry and the likelihood that a driver entering the site from a particular direction will access parcels using the shortest, most convenient route and that they will most likely leave the site using the same route as they entered.

We anticipate that the two entrances to the industrial park off T.H. 59/60 will need some form of additional traffic control in the future (possibly signals). The intersection between South Lake Street and Old 60 may need something as well, although probably only some form of stop control.

## **RECOMMENDATIONS**

The City of Worthington can utilize the findings listed in this report to plan for an orderly development of the parcels of land that lie between the new and former T.H. 59/60 corridor. The utility services and roadway extensions can be constructed as the need or as development interest arises.

The sanitary sewer service sub-areas allow flexibility for service to be provided to a portion of the development in any sequence. The service needs of the area can be met using 8 inch diameter PVC sewer pipe. Final layout of the sewer lines and manhole locations will be established during the final design phase of the project. As stated previously it is important for the City to monitor the water usage of the development as it progresses to ensure that the wastewater flow assumptions utilized in this report are appropriate for the businesses that locate in the area.

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The water distribution system is recommended to utilize a 10 inch diameter loop to provide suitable fire protection to the area and beyond. Other lateral watermain in the development area can be 8 inch diameter. It is also recommended to loop the 10 inch main along Flower Lane to South Shore Drive. Other loops can be connected to existing watermain on South Lake Street and C.R. 57.

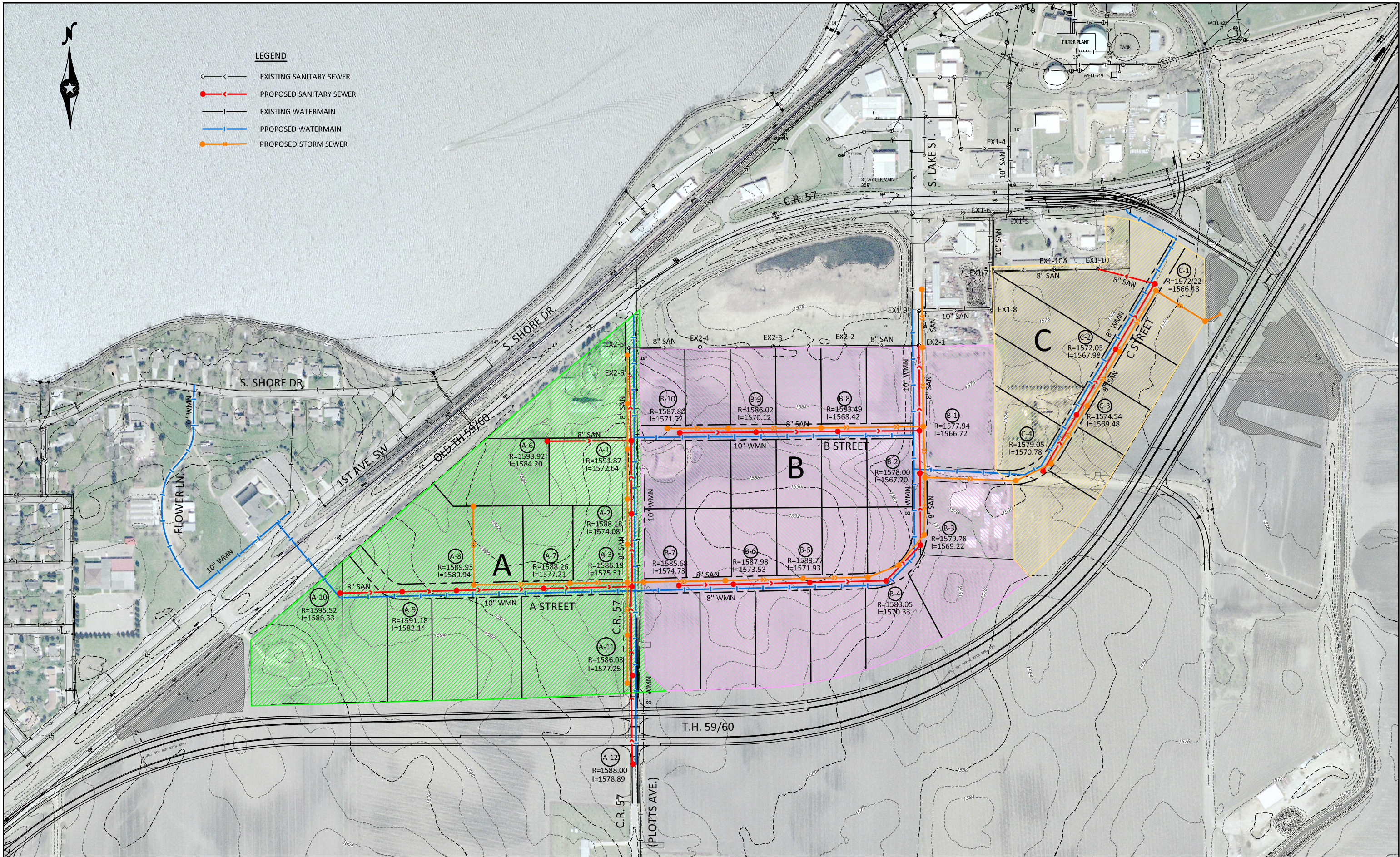
For the storm sewer system in this area, Options 1 – 3 are all viable alternatives for serving the area. Option 1 is the most expensive at \$1.14M but it involves an expansion of the previously constructed water quality basin along T.H. 59/60 so it doesn't impact the developable land area. Options 2 & 3 offer some cost savings from smaller pipe diameters, but also require some land to create the necessary water quality basins. The City will need to evaluate the cost/ benefit of each option when proceeding with future utility installations.

The roadway infrastructure to serve this area can be designed for bituminous or concrete pavement utilizing the forecasted traffic volumes included on Figure 9 in Appendix A. The intersections with T.H. 59/60 will require further study and coordination with Mn/DOT during the preliminary design phase of any planned improvements. Future streets intersecting with C.R. 57 will also require further study and coordination with Nobles County during preliminary design to determine what types of controls are necessary to promote safe vehicular operations.



## APPENDIX A - FIGURES

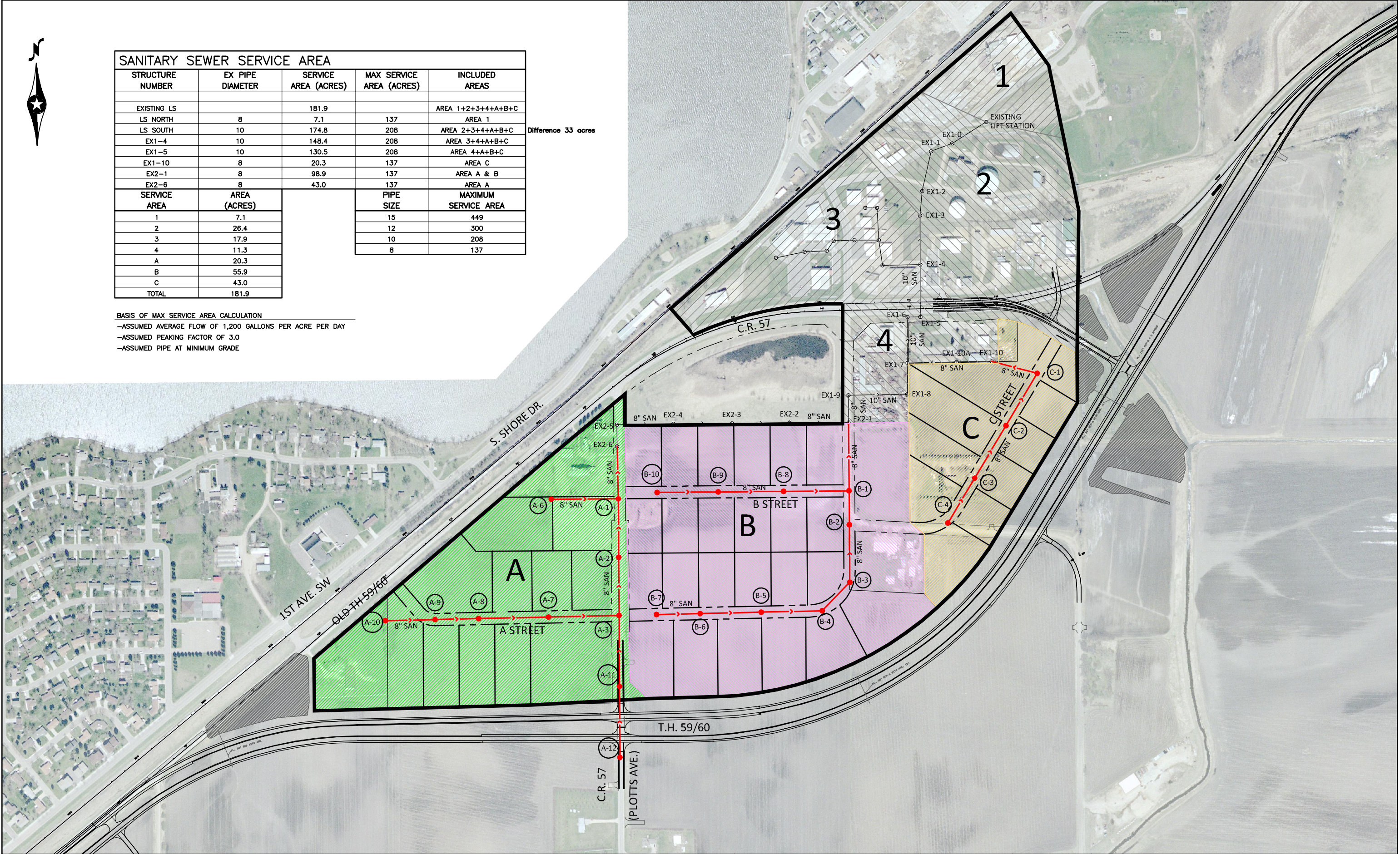










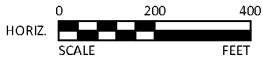
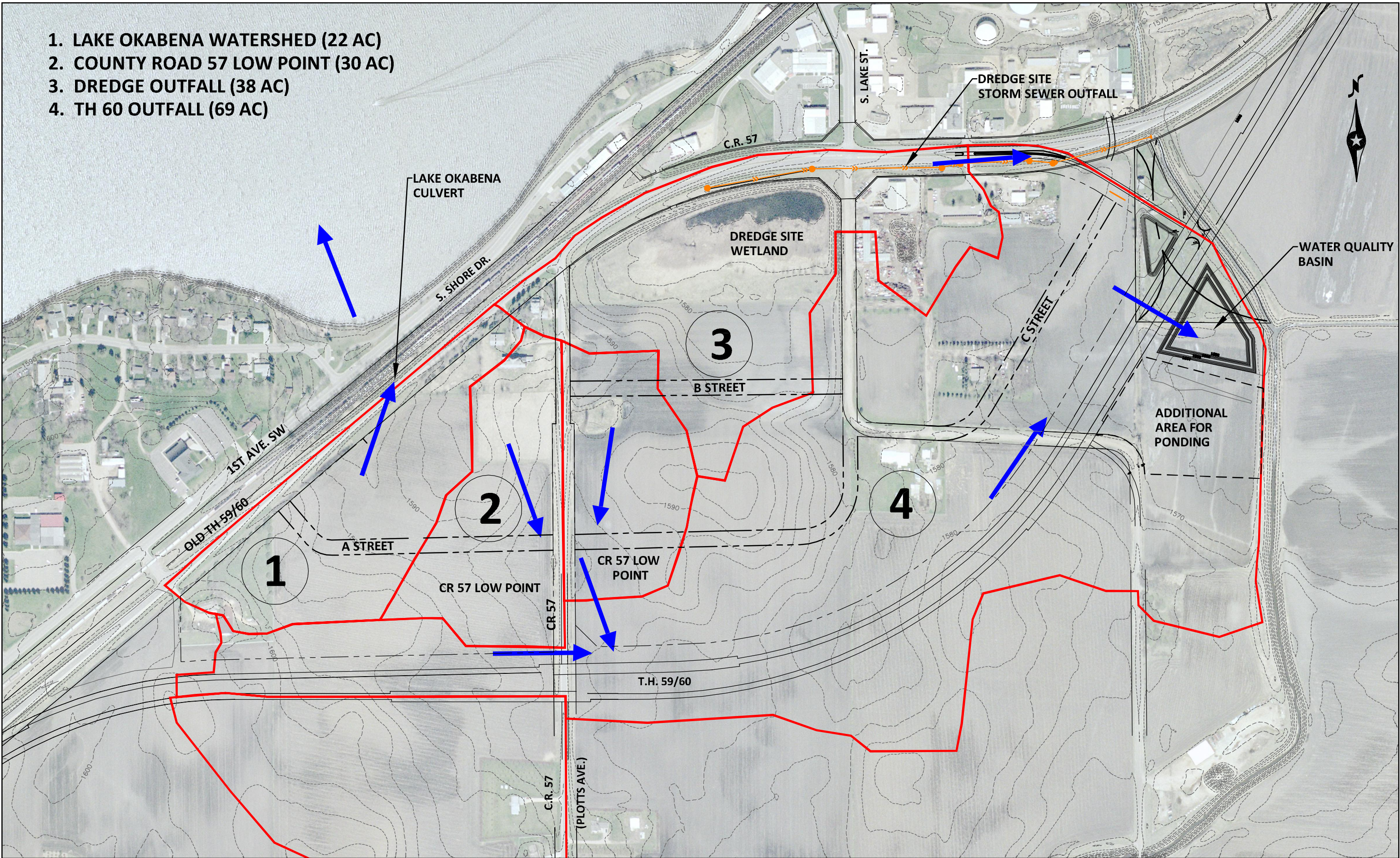


SANITARY SEWER SERVICE AREA				
STRUCTURE NUMBER	EX PIPE DIAMETER	SERVICE AREA (ACRES)	MAX SERVICE AREA (ACRES)	INCLUDED AREAS
EXISTING LS		181.9		AREA 1+2+3+4+A+B+C
LS NORTH	8	7.1	137	AREA 1
LS SOUTH	10	174.8	208	AREA 2+3+4+A+B+C
EX1-4	10	148.4	208	AREA 3+4+A+B+C
EX1-5	10	130.5	208	AREA 4+A+B+C
EX1-10	8	20.3	137	AREA C
EX2-1	8	98.9	137	AREA A & B
EX2-6	8	43.0	137	AREA A
SERVICE AREA	AREA (ACRES)		PIPE SIZE	MAXIMUM SERVICE AREA
1	7.1		15	449
2	26.4		12	300
3	17.9		10	208
4	11.3		8	137
A	20.3			
B	55.9			
C	43.0			
TOTAL	181.9			

BASIS OF MAX SERVICE AREA CALCULATION  
-ASSUMED AVERAGE FLOW OF 1,200 GALLONS PER ACRE PER DAY  
-ASSUMED PEAKING FACTOR OF 3.0  
-ASSUMED PIPE AT MINIMUM GRADE



- 1. LAKE OKABENA WATERSHED (22 AC)
- 2. COUNTY ROAD 57 LOW POINT (30 AC)
- 3. DREDGE OUTFALL (38 AC)
- 4. TH 60 OUTFALL (69 AC)



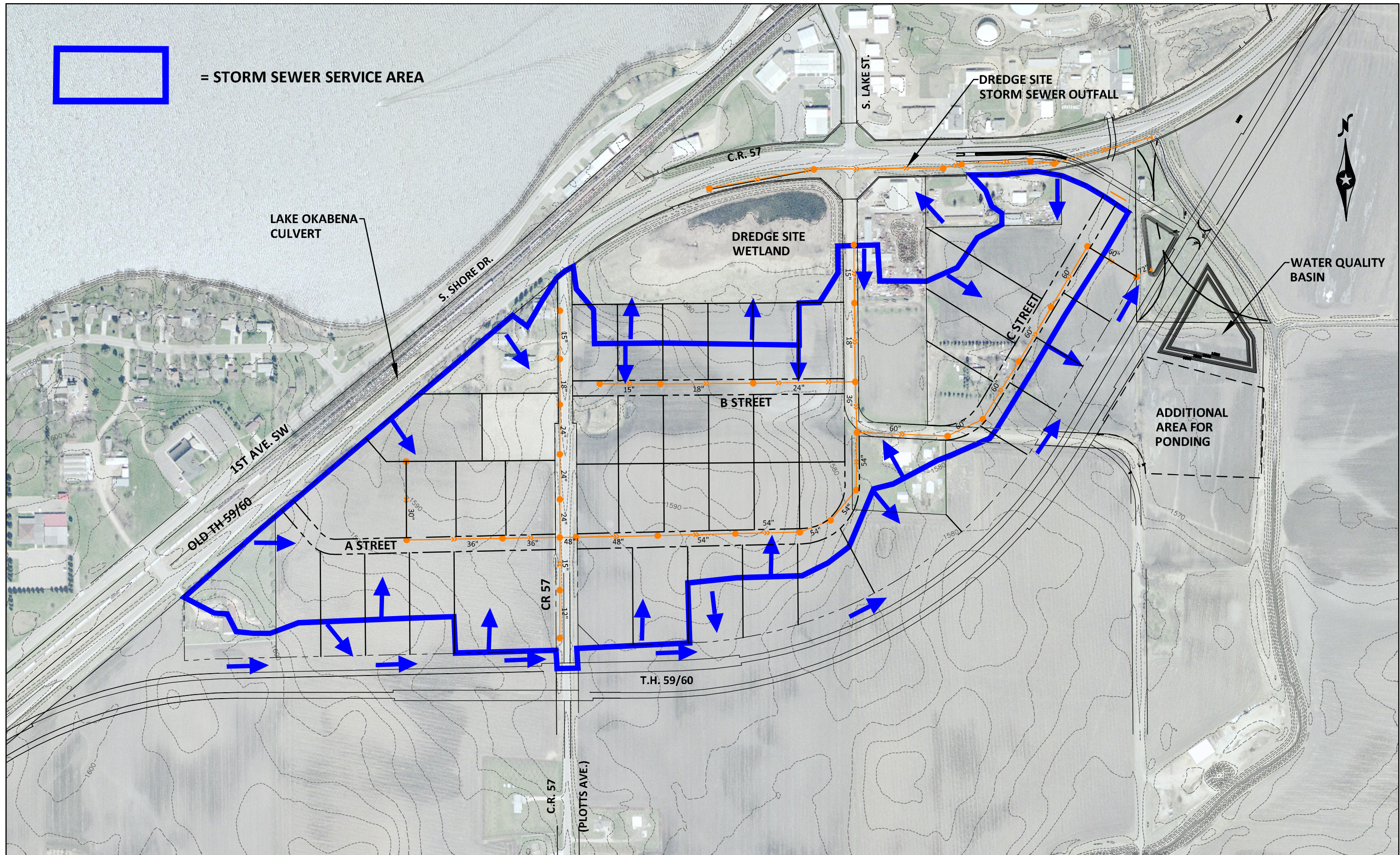
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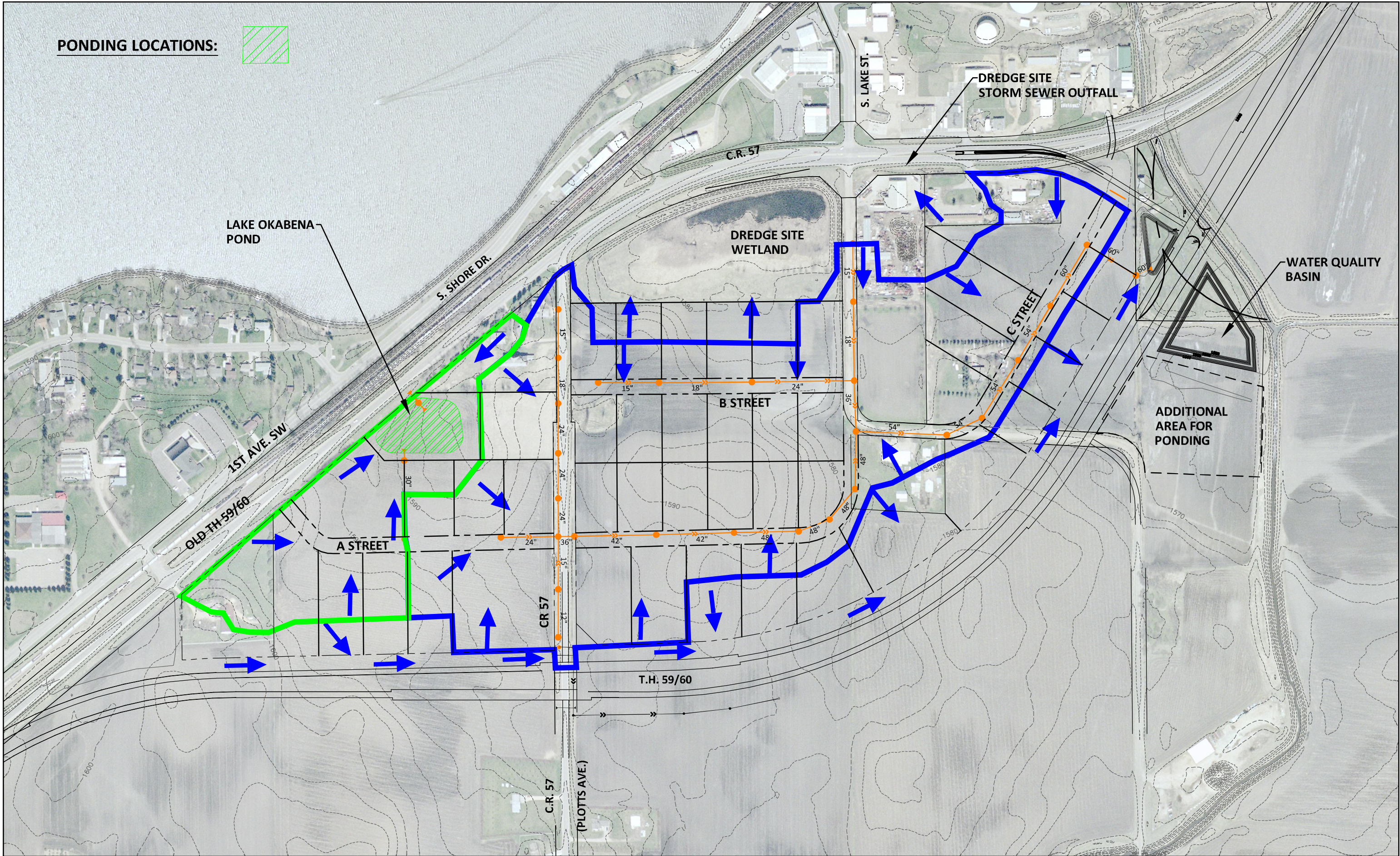
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CHASKA, MN RAMSEY, MN MAPLEWOOD, MN BAXTER, MN ROCHESTER, MN  
AMES, IA SPENCER, IA DES MOINES, IA FARGO, ND

CITY OF WORTHINGTON, MINNESOTA	FIGURE  4
T.H. 59/60 MASTER PLAN UPDATE	
EXISTING DRAINAGE PATTERNS	









PONDING LOCATIONS:



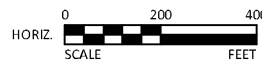
LAKE OKABENA  
POND

DREDGE SITE  
STORM SEWER OUTFALL

DREDGE SITE  
WETLAND

WATER QUALITY  
BASIN

ADDITIONAL  
AREA FOR  
PONDING



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CHASKA, MN RAMSEY, MN MAPLEWOOD, MN BAXTER, MN ROCHESTER, MN  
AMES, IA SPENCER, IA DES MOINES, IA FARGO, ND

CITY OF WORTHINGTON, MINNESOTA

T.H. 59/60 MASTER PLAN UPDATE

STORM SEWER SERVICE AREA - OPTION 2

FIGURE

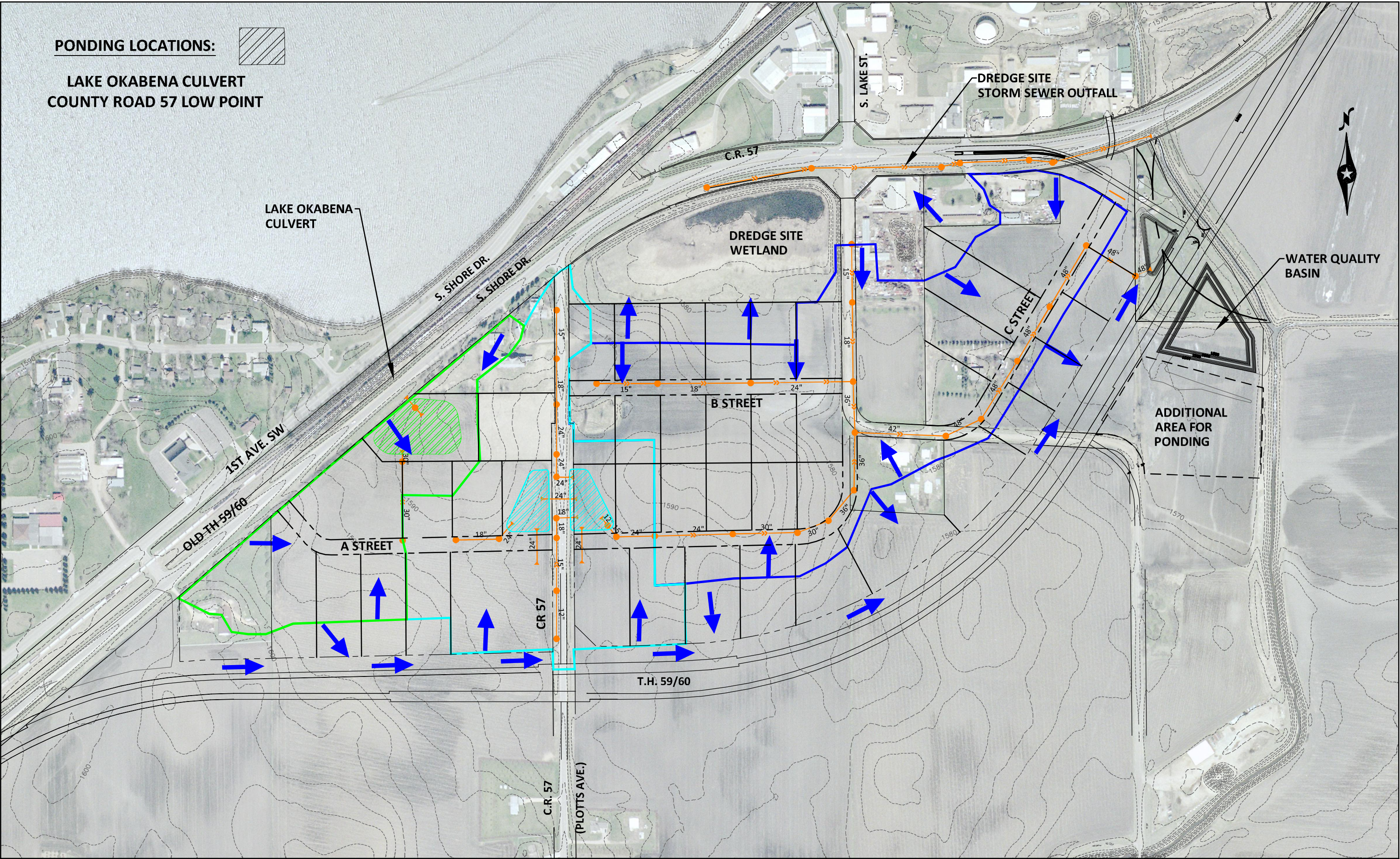
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PONDING LOCATIONS:



LAKE OKABENA CULVERT  
COUNTY ROAD 57 LOW POINT







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AMES, IA SPENCER, IA DES MOINES, IA FARGO, ND

CITY OF WORTHINGTON, MINNESOTA

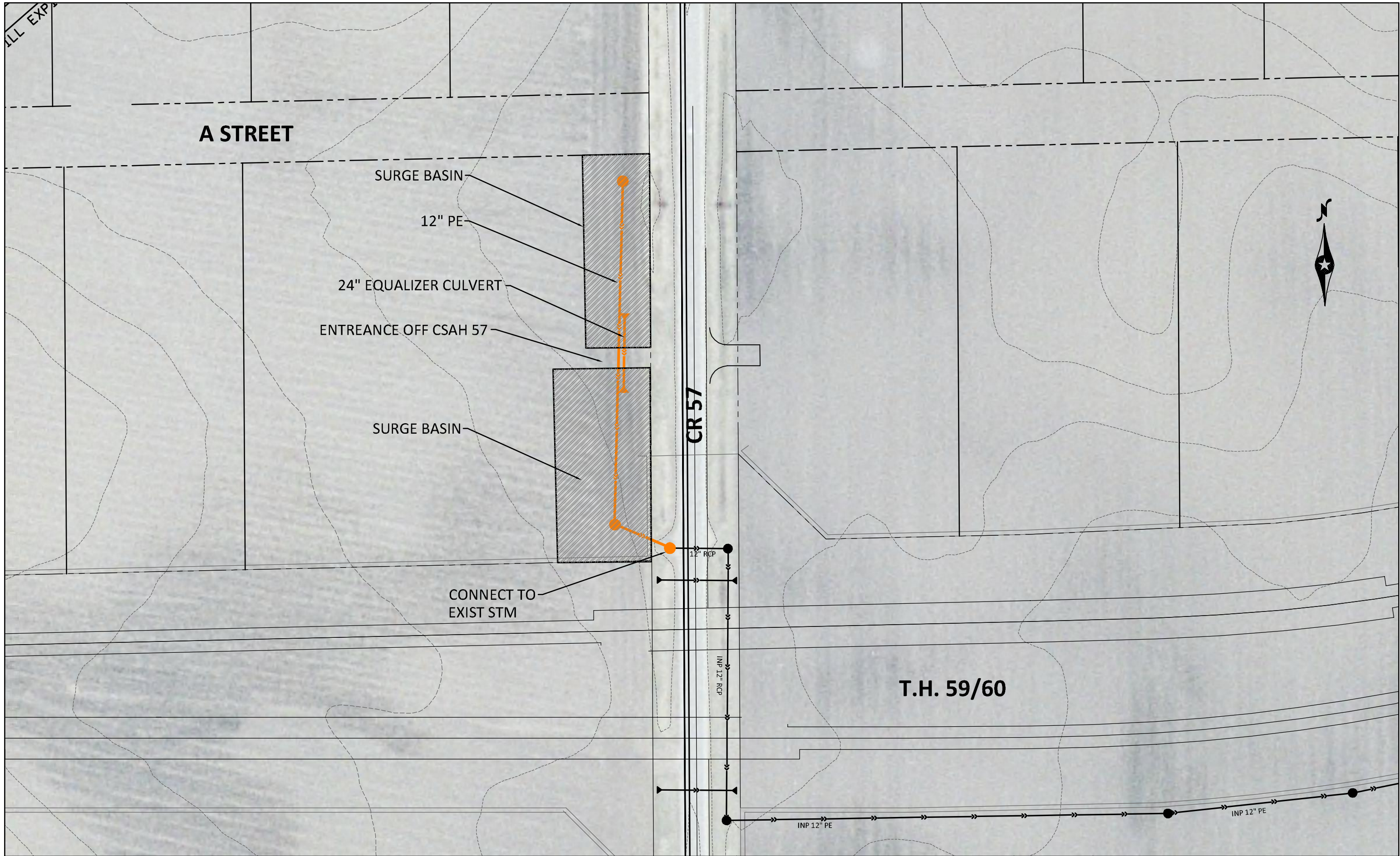
T.H. 59/60 MASTER PLAN UPDATE

NATIONAL WETLANDS INVENTORY

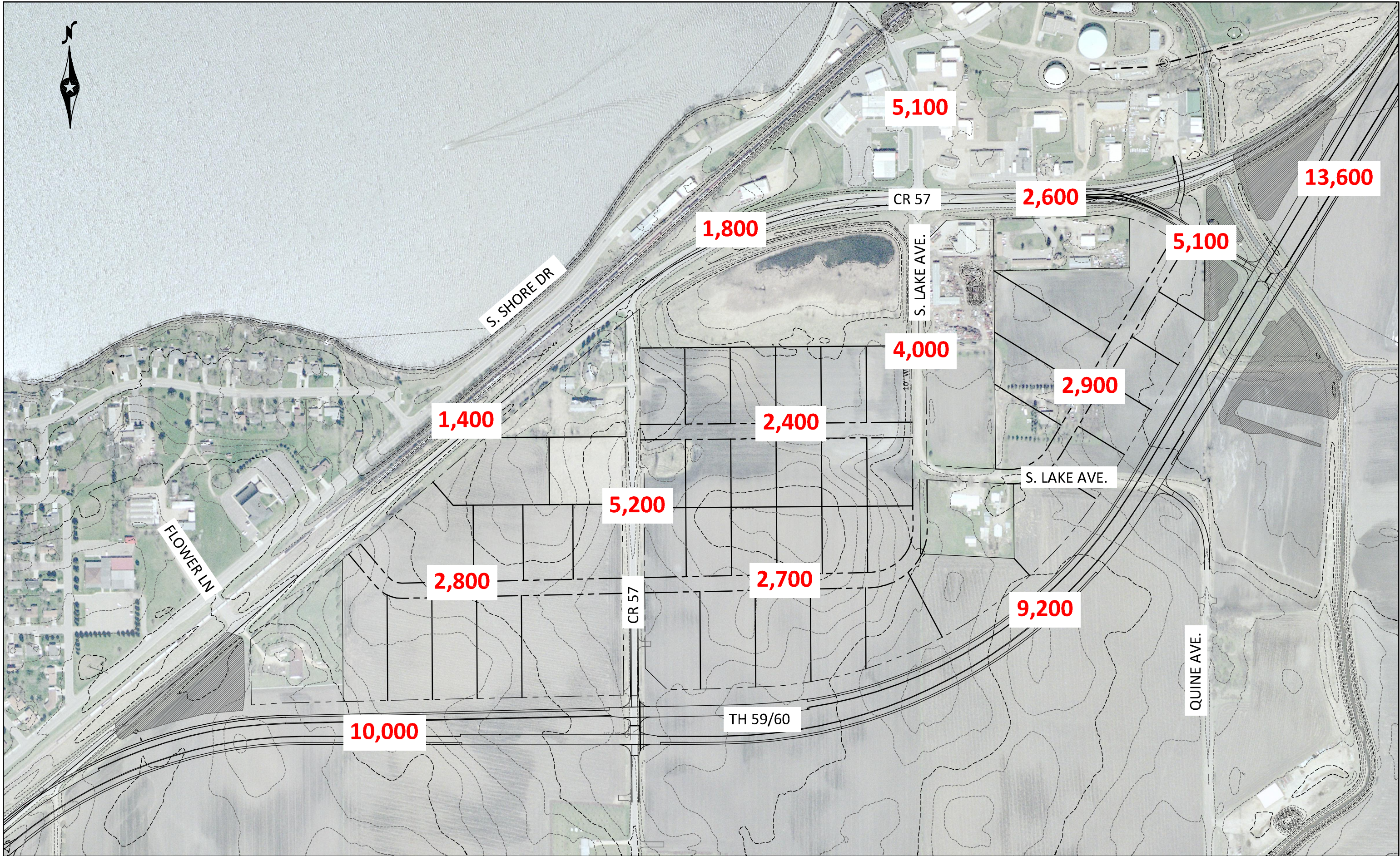
FIGURE

8

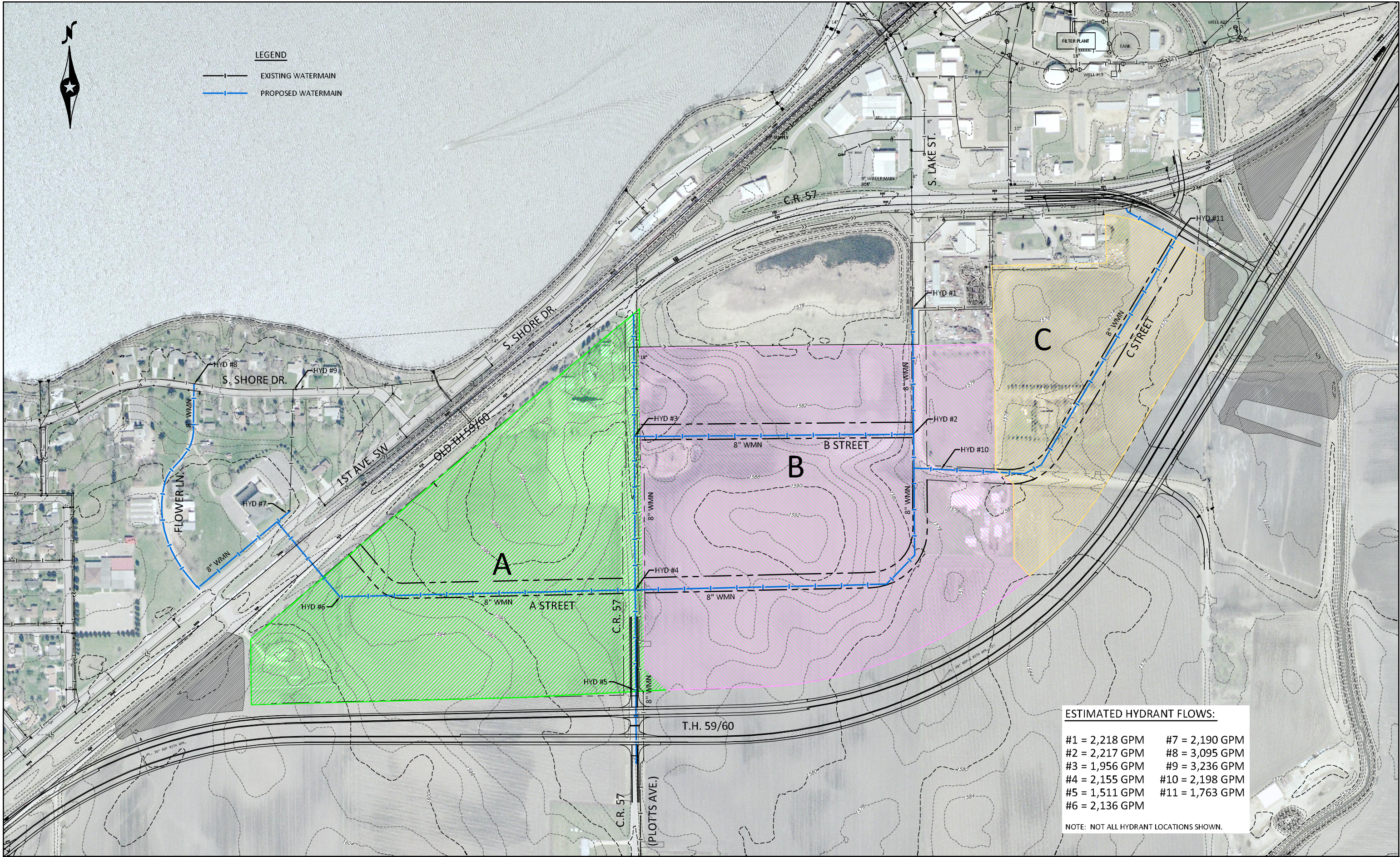






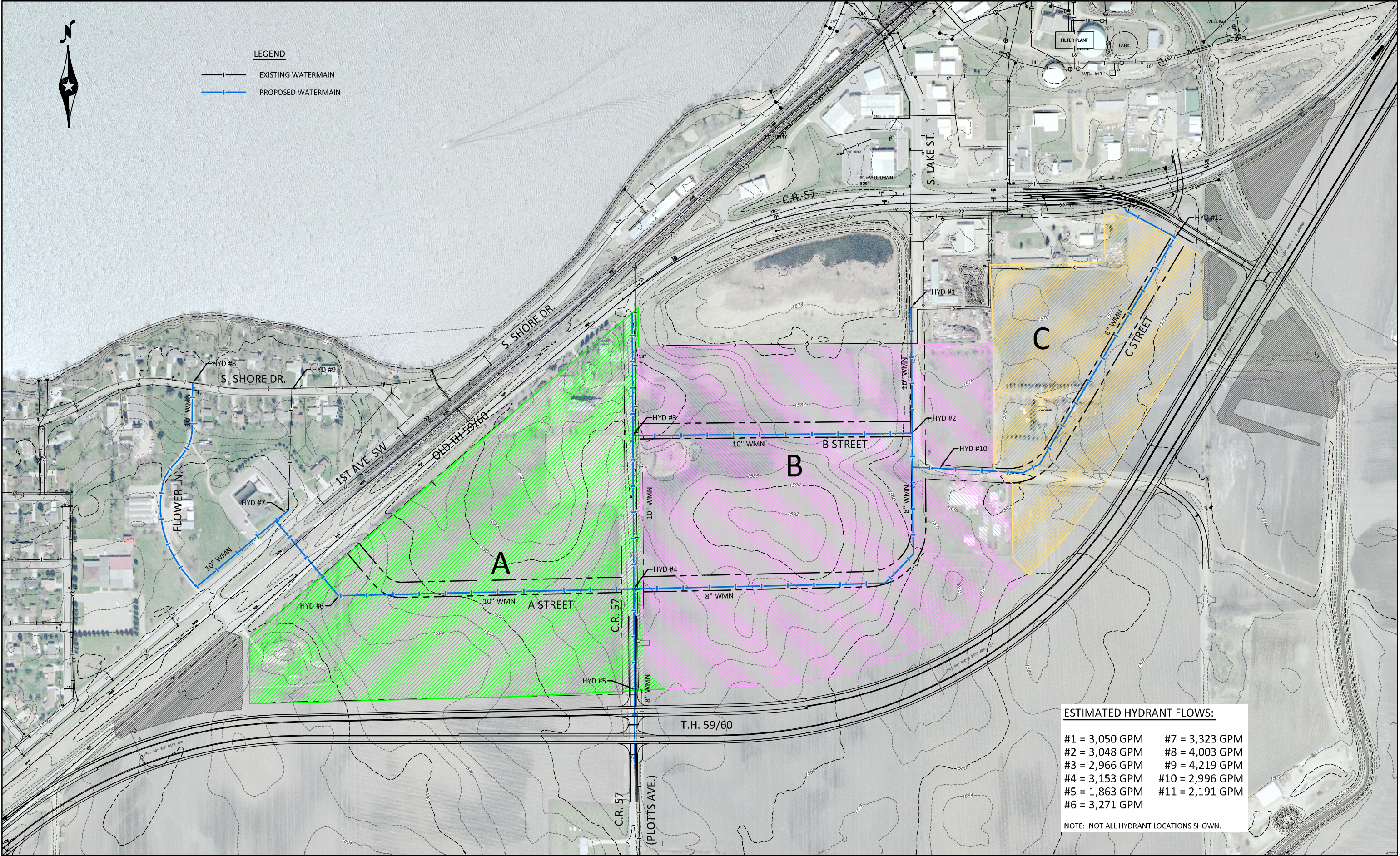






ESTIMATED HYDRANT FLOWS:	
#1 = 2,218 GPM	#7 = 2,190 GPM
#2 = 2,217 GPM	#8 = 3,095 GPM
#3 = 1,956 GPM	#9 = 3,236 GPM
#4 = 2,155 GPM	#10 = 2,198 GPM
#5 = 1,511 GPM	#11 = 1,763 GPM
#6 = 2,136 GPM	
NOTE: NOT ALL HYDRANT LOCATIONS SHOWN.	





ESTIMATED HYDRANT FLOWS:	
#1 = 3,050 GPM	#7 = 3,323 GPM
#2 = 3,048 GPM	#8 = 4,003 GPM
#3 = 2,966 GPM	#9 = 4,219 GPM
#4 = 3,153 GPM	#10 = 2,996 GPM
#5 = 1,863 GPM	#11 = 2,191 GPM
#6 = 3,271 GPM	
NOTE: NOT ALL HYDRANT LOCATIONS SHOWN.	





## **APPENDIX B -**

## **COST ESTIMATE**

<b>PRELIMINARY COST ESTIMATE - PHASE 1</b>					
<b>LINE NO</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>UNIT PRICE</b>	<b>TOTAL QUANTITY</b>	<b>TOTAL COST</b>
1	8" SANITARY SEWER	LF	\$ 35.00	1,400.00	\$ 49,000.00
2	6" SANITARY SEWER SERVICE	LF	\$ 25.00	150.00	\$ 3,750.00
3	SANITARY SERVICE WYE	EA	\$ 250.00	3.00	\$ 750.00
4	48" SANITARY MANHOLE	LF	\$ 300.00	55.00	\$ 16,500.00
5	SANITARY MANHOLE CASTING	EA	\$ 1,000.00	4.00	\$ 4,000.00
6	6" WATERMAIN	LF	\$ 30.00	30.00	\$ 900.00
7	10" WATERMAIN	LF	\$ 40.00	3,000.00	\$ 120,000.00
8	HYDRANT	EA	\$ 3,500.00	3.00	\$ 10,500.00
9	6" GATE VALVE & BOX	EA	\$ 1,500.00	3.00	\$ 4,500.00
10	10" GATE VALVE & BOX	EA	\$ 2,500.00	3.00	\$ 7,500.00
11	WATERMAIN FITTINGS	LBS	\$ 10.00	800.00	\$ 8,000.00
12	TURF RESTORATION	ACRE	\$ 2,500.00	2.00	\$ 5,000.00
13	BITUMINOUS PAVEMENT	TON	\$ 120.00	150.00	\$ 18,000.00
14	AGGREGATE BASE	TON	\$ 25.00	400.00	\$ 10,000.00
15	MOBILIZATION	LS	\$ 15,000.00	1.00	\$ 15,000.00
16	TRAFFIC CONTROL	LS	\$ 5,000.00	1.00	\$ 5,000.00
17	EROSION CONTROL	LS	\$ 10,000.00	1.00	\$ 10,000.00
18	STORM SEWER & STORMWATER MANAGEMENT	LS	\$ 45,000.00	1.00	\$ 45,000.00
19	MISCELLANEOUS CONSTRUCTION	LS	\$ 10,000.00	1.00	\$ 10,000.00
SUBTOTALS					\$ 343,400.00
10% CONTINGENCY					\$ 34,300.00
CONSTRUCTION TOTAL					\$ 377,700.00
ENGINEERING (18% ASSUMED)					\$ 68,000.00
<b>TOTAL</b>					<b>\$ 445,700.00</b>

## PRELIMINARY COST ESTIMATE - AREA A

LINE NO	DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	TOTAL COST
<b>STREET CONSTRUCTION (40' WIDE - 6" BITUMINOUS &amp; 12" AGGREGATE BASE)</b>					
1	MOBILIZATION	LS	\$ 19,000.00	1.00	\$ 19,000.00
2	TRAFFIC CONTROL	LS	\$ 10,000.00	1.00	\$ 10,000.00
3	COMMON EXCAVATION	CY	\$ 8.00	3,800.00	\$ 30,400.00
4	SUBGRADE EXCAVATION	CY	\$ 10.00	300.00	\$ 3,000.00
5	AGGREGATE BACKFILL	CY LV	\$ 12.00	420.00	\$ 5,040.00
6	AGGREGATE BASE	TONS	\$ 25.00	5,100.00	\$ 127,500.00
7	6" BITUMINOUS PAVEMENT	TONS	\$ 120.00	2,800.00	\$ 336,000.00
8	CONCRETE CURB & GUTTER	LF	\$ 15.00	2,800.00	\$ 42,000.00
9	4" PE UNDERDRAIN	LF	\$ 10.00	2,800.00	\$ 28,000.00
10	GEOTEXTILE FABRIC	SY	\$ 2.00	1,500.00	\$ 3,000.00
11	PAVEMENT REMOVAL	SY	\$ 7.00	1,950.00	\$ 13,650.00
12	SEEDING	AC	\$ 2,500.00	2.50	\$ 6,250.00
				<b>Subtotal:</b>	<b>\$ 623,840.00</b>
<b>SANITARY SEWER CONSTRUCTION</b>					
13	MOBILIZATION	LS	\$ 7,000.00	1.00	\$ 7,000.00
14	8" SANITARY SEWER	LF	\$ 35.00	3,200.00	\$ 112,000.00
15	8" TRENCHLESS SANITARY SEWER W/ CASING	LF	\$ 160.00	300.00	\$ 48,000.00
16	6" SANITARY SEWER SERVICE	LF	\$ 25.00	650.00	\$ 16,250.00
17	SANITARY SERVICE WYE	EA	\$ 250.00	13.00	\$ 3,250.00
18	48" SANITARY MANHOLE	LF	\$ 300.00	110.00	\$ 33,000.00
19	SANITARY MANHOLE CASTING	EA	\$ 1,000.00	10.00	\$ 10,000.00
20	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	100.00	\$ 3,000.00
				<b>Subtotal:</b>	<b>\$ 232,500.00</b>
<b>WATERMAIN CONSTRUCTION</b>					
21	MOBILIZATION	LS	\$ 12,500.00	1.00	\$ 12,500.00
22	6" WATERMAIN	LF	\$ 30.00	100.00	\$ 3,000.00
23	8" WATERMAIN	LF	\$ 35.00	500.00	\$ 17,500.00
23	10" WATERMAIN	LF	\$ 40.00	4,500.00	\$ 180,000.00
24	8" TRENCHLESS WATERMAIN W/ CASING	LF	\$ 150.00	300.00	\$ 45,000.00
25	HYDRANT	EA	\$ 3,500.00	10.00	\$ 35,000.00
26	6" GATE VALVE & BOX	EA	\$ 1,500.00	10.00	\$ 15,000.00
27	10" GATE VALVE & BOX	EA	\$ 2,500.00	15.00	\$ 37,500.00
28	WATER SERVICE	EA	\$ 3,500.00	13.00	\$ 45,500.00
29	WATERMAIN FITTINGS	LBS	\$ 10.00	1,600.00	\$ 16,000.00
30	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	200.00	\$ 6,000.00
				<b>Subtotal:</b>	<b>\$ 413,000.00</b>

STORM SEWER CONSTRUCTION					
31	MOBILIZATION	LS	\$ 10,000.00	1.00	\$ 10,000.00
32	12" RCP STORM SEWER	LF	\$ 40.00	420.00	\$ 16,800.00
33	15" RCP STORM SEWER	LF	\$ 45.00	465.00	\$ 20,925.00
34	18" RCP STORM SEWER	LF	\$ 50.00	210.00	\$ 10,500.00
35	24" RCP STORM SEWER	LF	\$ 55.00	615.00	\$ 33,825.00
36	30" RCP STORM SEWER	LF	\$ 60.00	365.00	\$ 21,900.00
37	36" RCP STORM SEWER	LF	\$ 70.00	705.00	\$ 49,350.00
38	48" RCP STORM SEWER	LF	\$ 85.00	75.00	\$ 6,375.00
39	48" STORM MANHOLE	EA	\$ 3,000.00	7.00	\$ 21,000.00
40	60" STORM MANHOLE	EA	\$ 4,000.00	2.00	\$ 8,000.00
41	72" STORM MANHOLE	EA	\$ 5,000.00	3.00	\$ 15,000.00
42	CATCH BASIN	EA	\$ 2,000.00	10.00	\$ 20,000.00
43	MANHOLE CASTINGS	EA	\$ 1,000.00	12.00	\$ 12,000.00
44	CATCH BASIN CASTING	EA	\$ 1,000.00	10.00	\$ 10,000.00
45	STORMWATER POND	LS	\$ 50,000.00	1.00	\$ 50,000.00
46	EROSION CONTROL	LS	\$ 20,000.00	1.00	\$ 20,000.00
				<b>Subtotal:</b>	<b>\$ 325,675.00</b>
SUBTOTALS					\$ 1,595,015.00
10% CONTINGENCY					\$ 159,500.00
CONSTRUCTION TOTAL					\$ 1,754,515.00
ENGINEERING (18% ASSUMED)					\$ 315,800.00
<b>TOTAL</b>					<b>\$ 2,070,315.00</b>

NOTE: THIS ESTIMATE INCLUDES COSTS FOR THE 10" WATERMAIN AND APPURTENANCES FOR THE SEGMENT IN B STREET AND SOUTH LAKE STREET TO THE POINT OF CONNECTION WITH THE EXISTING SYSTEM.

## PRELIMINARY COST ESTIMATE - AREA B

LINE NO	DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	TOTAL COST
<b>STREET CONSTRUCTION (40' WIDE - 6" BITUMINOUS &amp; 12" AGGREGATE BASE)</b>					
1	MOBILIZATION	LS	\$ 47,000.00	1.00	\$ 47,000.00
2	TRAFFIC CONTROL	LS	\$ 5,000.00	1.00	\$ 5,000.00
3	COMMON EXCAVATION	CY	\$ 8.00	11,200.00	\$ 89,600.00
4	SUBGRADE EXCAVATION	CY	\$ 10.00	750.00	\$ 7,500.00
5	AGGREGATE BACKFILL	CY LV	\$ 12.00	1,050.00	\$ 12,600.00
6	AGGREGATE BASE	TONS	\$ 25.00	14,900.00	\$ 372,500.00
7	6" BITUMINOUS PAVEMENT	TONS	\$ 120.00	6,600.00	\$ 792,000.00
8	CONCRETE CURB & GUTTER	LF	\$ 15.00	9,120.00	\$ 136,800.00
9	4" PE UNDERDRAIN	LF	\$ 10.00	9,120.00	\$ 91,200.00
10	GEOTEXTILE FABRIC	SY	\$ 2.00	4,460.00	\$ 8,920.00
11	SEEDING	AC	\$ 2,500.00	3.50	\$ 8,750.00
				<b>Subtotal:</b>	<b>\$ 1,571,870.00</b>
<b>SANITARY SEWER CONSTRUCTION</b>					
12	MOBILIZATION	LS	\$ 6,000.00	1.00	\$ 6,000.00
13	8" SANITARY SEWER	LF	\$ 35.00	3,200.00	\$ 112,000.00
14	6" SANITARY SEWER SERVICE	LF	\$ 25.00	1,000.00	\$ 25,000.00
15	SANITARY SERVICE WYE	EA	\$ 250.00	20.00	\$ 5,000.00
16	48" SANITARY MANHOLE	LF	\$ 300.00	140.00	\$ 42,000.00
17	SANITARY MANHOLE CASTING	EA	\$ 1,000.00	10.00	\$ 10,000.00
18	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	100.00	\$ 3,000.00
				<b>Subtotal:</b>	<b>\$ 203,000.00</b>
<b>WATERMAIN CONSTRUCTION</b>					
19	MOBILIZATION	LS	\$ 6,000.00	1.00	\$ 6,000.00
20	6" WATERMAIN	LF	\$ 30.00	40.00	\$ 1,200.00
21	8" WATERMAIN	LF	\$ 35.00	2,300.00	\$ 80,500.00
22	HYDRANT	EA	\$ 3,500.00	4.00	\$ 14,000.00
23	6" GATE VALVE & BOX	EA	\$ 1,500.00	4.00	\$ 6,000.00
24	8" GATE VALVE & BOX	EA	\$ 2,500.00	6.00	\$ 15,000.00
25	WATER SERVICE	EA	\$ 3,500.00	20.00	\$ 70,000.00
26	WATERMAIN FITTINGS	LBS	\$ 10.00	550.00	\$ 5,500.00
27	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	100.00	\$ 3,000.00
				<b>Subtotal:</b>	<b>\$ 201,200.00</b>



STORM SEWER CONSTRUCTION					
28	MOBILIZATION	LS	\$ 16,000.00	1.00	\$ 16,000.00
29	12" RCP STORM SEWER	LF	\$ 40.00	200.00	\$ 8,000.00
30	15" RCP STORM SEWER	LF	\$ 45.00	550.00	\$ 24,750.00
31	18" RCP STORM SEWER	LF	\$ 50.00	790.00	\$ 39,500.00
32	24" RCP STORM SEWER	LF	\$ 55.00	470.00	\$ 25,850.00
33	36" RCP STORM SEWER	LF	\$ 70.00	235.00	\$ 16,450.00
34	48" RCP STORM SEWER	LF	\$ 85.00	375.00	\$ 31,875.00
35	54" RCP STORM SEWER	LF	\$ 110.00	1,250.00	\$ 137,500.00
36	60" RCP STORM SEWER	LF	\$ 130.00	420.00	\$ 54,600.00
37	48" STORM MANHOLE	EA	\$ 3,000.00	5.00	\$ 15,000.00
38	72" STORM MANHOLE	EA	\$ 5,000.00	1.00	\$ 5,000.00
39	84" STORM MANHOLE	EA	\$ 6,000.00	5.00	\$ 30,000.00
40	120" STORM MANHOLE	EA	\$ 8,000.00	1.00	\$ 8,000.00
41	CATCH BASIN	EA	\$ 2,000.00	10.00	\$ 20,000.00
42	MANHOLE CASTINGS	EA	\$ 1,000.00	12.00	\$ 12,000.00
43	CATCH BASIN CASTING	EA	\$ 1,000.00	10.00	\$ 10,000.00
44	STORMWATER POND	LS	\$ 50,000.00	1.00	\$ 50,000.00
45	EROSION CONTROL	LS	\$ 20,000.00	1.00	\$ 20,000.00
				<b>Subtotal:</b>	<b>\$ 524,525.00</b>
SUBTOTALS					\$ 2,500,595.00
10% CONTINGENCY					\$ 250,100.00
CONSTRUCTION TOTAL					\$ 2,750,695.00
ENGINEERING (18% ASSUMED)					\$ 495,100.00
<b>TOTAL</b>					<b>\$ 3,245,795.00</b>

NOTE: IF AREA B IS DEVELOPED BEFORE AREA A, COSTS WILL NEED TO BE ADJUSTED TO INCLUDE THE 10" WATERMAIN AND APPURTENANCES IN B STREET & SOUTH LAKE STREET, TO THE POINT OF CONNECTION WITH THE ESISTING SYSTEM.

## PRELIMINARY COST ESTIMATE - AREA C

LINE NO	DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	TOTAL COST
<b>STREET CONSTRUCTION (40' WIDE - 6" BITUMINOUS &amp; 12" AGGREGATE BASE)</b>					
1	MOBILIZATION	LS	\$ 14,000.00	1.00	\$ 14,000.00
2	TRAFFIC CONTROL	LS	\$ 1,000.00	1.00	\$ 1,000.00
3	COMMON EXCAVATION	CY	\$ 8.00	3,350.00	\$ 26,800.00
4	SUBGRADE EXCAVATION	CY	\$ 10.00	250.00	\$ 2,500.00
5	AGGREGATE BACKFILL	CY LV	\$ 12.00	350.00	\$ 4,200.00
6	AGGREGATE BASE	TONS	\$ 25.00	4,500.00	\$ 112,500.00
7	6" BITUMINOUS PAVEMENT	TONS	\$ 120.00	2,000.00	\$ 240,000.00
8	CONCRETE CURB & GUTTER	LF	\$ 15.00	2,740.00	\$ 41,100.00
9	4" PE UNDERDRAIN	LF	\$ 10.00	2,740.00	\$ 27,400.00
10	GEOTEXTILE FABRIC	SY	\$ 2.00	1,340.00	\$ 2,680.00
11	SEEDING	AC	\$ 2,500.00	1.50	\$ 3,750.00
				<b>Subtotal:</b>	<b>\$ 475,930.00</b>
<b>SANITARY SEWER CONSTRUCTION</b>					
12	MOBILIZATION	LS	\$ 2,500.00	1.00	\$ 2,500.00
13	8" SANITARY SEWER	LF	\$ 35.00	1,270.00	\$ 44,450.00
14	6" SANITARY SEWER SERVICE	LF	\$ 25.00	500.00	\$ 12,500.00
15	SANITARY SERVICE WYE	EA	\$ 250.00	10.00	\$ 2,500.00
16	48" SANITARY MANHOLE	LF	\$ 300.00	25.00	\$ 7,500.00
17	SANITARY MANHOLE CASTING	EA	\$ 1,000.00	4.00	\$ 4,000.00
18	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	50.00	\$ 1,500.00
				<b>Subtotal:</b>	<b>\$ 74,950.00</b>
<b>WATERMAIN CONSTRUCTION</b>					
19	MOBILIZATION	LS	\$ 4,000.00	1.00	\$ 4,000.00
20	6" WATERMAIN	LF	\$ 30.00	30.00	\$ 900.00
21	8" WATERMAIN	LF	\$ 35.00	1,690.00	\$ 59,150.00
22	HYDRANT	EA	\$ 3,500.00	3.00	\$ 10,500.00
23	6" GATE VALVE & BOX	EA	\$ 1,500.00	3.00	\$ 4,500.00
24	8" GATE VALVE & BOX	EA	\$ 2,500.00	3.00	\$ 7,500.00
25	WATER SERVICE	EA	\$ 3,500.00	10.00	\$ 35,000.00
26	WATERMAIN FITTINGS	LBS	\$ 10.00	550.00	\$ 5,500.00
27	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	75.00	\$ 2,250.00
				<b>Subtotal:</b>	<b>\$ 129,300.00</b>

UPDATED MASTER PLAN T.H. 59/ 60

CITY OF WORTHINGTON, MN

BMI PROJECT NO. F13.106371

3/20/2015

H:\WGTM\F13106371\4\_Design\_Calculations\Cost Estimates\[2015-3-19 106371 UPDATED Prelim Estimate.xls]AREA C

STORM SEWER CONSTRUCTION					
28	MOBILIZATION	LS		1.00	\$ -
29	12" RCP STORM SEWER	LF	\$ 40.00	120.00	\$ 4,800.00
30	60" RCP STORM SEWER	LF	\$ 130.00	1,375.00	\$ 178,750.00
31	72" RCP STORM SEWER	LF	\$ 150.00	80.00	\$ 12,000.00
32	96" STORM MANHOLE	EA	\$ 7,000.00	4.00	\$ 28,000.00
33	120" STORM MANHOLE	EA	\$ 8,000.00	2.00	\$ 16,000.00
34	72" APRON	EA	\$ 3,000.00	1.00	\$ 3,000.00
35	CATCH BASIN	EA	\$ 2,000.00	6.00	\$ 12,000.00
36	MANHOLE CASTINGS	EA	\$ 1,000.00	6.00	\$ 6,000.00
37	CATCH BASIN CASTING	EA	\$ 1,000.00	6.00	\$ 6,000.00
38	EROSION CONTROL	LS	\$ 10,000.00	1.00	\$ 10,000.00
				<b>Subtotal:</b>	<b>\$ 276,550.00</b>
SUBTOTALS					\$ 956,730.00
10% CONTINGENCY					\$ 95,700.00
CONSTRUCTION TOTAL					\$ 1,052,430.00
ENGINEERING (18% ASSUMED)					\$ 189,400.00
<b>TOTAL</b>					<b>\$ 1,241,830.00</b>

## PRELIMINARY COST ESTIMATE - EXTRA OPTIONS

LINE NO	DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	TOTAL COST
<b>C.R. 57 STREET IMPROVEMENTS</b>					
1	MOBILIZATION	LS	\$ 20,000.00	1.00	\$ 20,000.00
2	TRAFFIC CONTROL	LS	\$ 5,000.00	1.00	\$ 5,000.00
3	COMMON EXCAVATION	CY	\$ 8.00	4,400.00	\$ 35,200.00
4	SUBGRADE EXCAVATION	CY	\$ 10.00	300.00	\$ 3,000.00
5	AGGREGATE BACKFILL	CY LV	\$ 12.00	400.00	\$ 4,800.00
6	AGGREGATE BASE	TONS	\$ 25.00	5,850.00	\$ 146,250.00
7	6" BITUMINOUS PAVEMENT	TONS	\$ 120.00	2,600.00	\$ 312,000.00
8	CONCRETE CURB & GUTTER	LF	\$ 15.00	3,580.00	\$ 53,700.00
9	4" PE UNDERDRAIN	LF	\$ 10.00	3,580.00	\$ 35,800.00
10	GEOTEXTILE FABRIC	SY	\$ 2.00	1,750.00	\$ 3,500.00
11	PAVEMENT REMOVAL	SY	\$ 7.00	4,780.00	\$ 33,460.00
12	SEEDING	AC	\$ 2,500.00	1.25	\$ 3,125.00
SUBTOTAL					\$ 655,835.00
10% CONTINGENCY					\$ 65,600.00
CONSTRUCTION TOTAL					\$ 721,435.00
ENGINEERING (18% ASSUMED)					\$ 129,900.00
<b>TOTAL</b>					<b>\$ 851,335.00</b>
<b>C.R. 57 STREET IMPROVEMENTS SAVINGS IF COMBINED WITH AREA A IMPROVEMENTS</b>					
1	AGGREGATE BASE	TONS	\$ 25.00	1,200.00	\$ 30,000.00
2	6" BITUMINOUS PAVEMENT	TONS	\$ 120.00	700.00	\$ 84,000.00
3	PAVEMENT REMOVAL	SY	\$ 7.00	1,950.00	\$ 13,650.00
ESTIMATED TOTAL					\$ (127,650.00)
<b>10" WATERMAIN EXTENSION LOOP TO FLOWER LANE</b>					
1	MOBILIZATION	LS	\$ 5,000.00	1.00	\$ 5,000.00
2	6" WATERMAIN	LF	\$ 30.00	40.00	\$ 1,200.00
3	10" WATERMAIN	LF	\$ 35.00	1,750.00	\$ 61,250.00
4	10" TRENCHLESS WATERMAIN W/ CASING	LF	\$ 160.00	300.00	\$ 48,000.00
5	HYDRANT	EA	\$ 3,500.00	4.00	\$ 14,000.00
6	6" GATE VALVE & BOX	EA	\$ 1,500.00	4.00	\$ 6,000.00
7	10" GATE VALVE & BOX	EA	\$ 2,500.00	6.00	\$ 15,000.00
8	WATER SERVICE	EA	\$ 3,500.00	4.00	\$ 14,000.00
9	WATERMAIN FITTINGS	LBS	\$ 10.00	500.00	\$ 5,000.00
10	TRENCH FOUNDATION MATERIAL	TON	\$ 30.00	100.00	\$ 3,000.00
SUBTOTAL					\$ 172,450.00
10% CONTINGENCY					\$ 17,200.00
CONSTRUCTION TOTAL					\$ 189,650.00
ENGINEERING (18% ASSUMED)					\$ 34,100.00
<b>TOTAL</b>					<b>\$ 223,750.00</b>



- Civil & Municipal Engineering
- Water & Wastewater Treatment
- Transportation Planning & Engineering Services
  - Aviation Services
- Water Resources Engineering
  - Landscape Architecture
- Environmental Review Services
- Cultural Resource Management
  - Land Surveying
- Geographic Information System Services
  - Project Funding & Financing