City of Lake Geneva, 626 Geneva St, Lake Geneva, WI 53147- 262.248.3673- www.cityoflakegeneva.gov

CITY OF LAKE GENEVA BOARD OF PARK COMMISSIONERS
TUESDAY, OCTOBER 17, 2023 - 6:30 PM
LAKE GENEVA CITY HALL; COUNCIL CHAMBERS (MAIN LEVEL)

Members:

Committee Members: Cindy Forster Feuredi, Brian Olsen, David Quickel, Barbara Philipps, Peggy Schneider, Ann Esarco, Denise Wendell, Alderperson Linda Frame and Mayor Charlene Klein

AGENDA

1. Call to order – Cindy Feuredi
2. Roll Call
3. Comments from the public as allowed by Wis. Stats. §19.84(2), limited to items on this agenda, except for public hearing items. Comments will be limited to 5 minutes
4. Approval of the September 19, 2023 Board of Park Commissioners meeting minutes as prepared and distributed
5. YMCA Quarterly Update
6. Department of Public Works Update
7. Discussion/Recommendation regarding Impact Fee Use for New Parks
8. Next Meeting Date & Time
9. **Adjournment**

CITY OF LAKE GENEVA BOARD OF PARK COMMISSIONERS
Minutes
Tuesday, September 19, 2023 - 6:30 PM

LAKE GENEVA CITY HALL; COUNCIL CHAMBERS (MAIN LEVEL)

Call to order 6:30 pm by President Cindy Fueredi

Committee Members Present: Cindy Forster Fueredi, Peggy Schneider, Ann Esarco, Denise Wendell, Alderperson Linda Frame and Mayor Charlene Klein, David Quickel (arrived 6:34pm)

Committee Members Not Present: Brian Olsen, Barbara Philipps

Others Present: None

Comments from the public: None

Approval of July 18, 2023 minutes of the Board of Park Commissioner, Motion by Feuredi, Wendell, approved unanimously with notation that typo of YMCA present individuals should be Mike, not Mile. Correction requested.

Approval of August 15, 2023 minutes of the Board of Park Commissioners Motion: Fueredi, Klein - approved unanimously

Operations report by Neil Waswo, Department of Public Works. Written report submitted Motion: Klein, Fueredi - approved unanimously.

Discussion of Park Impact Fees no requirement to spend funds until December 31, 2024, at that time, we must spend $17,000 to $20,000. See wish list below.

Forward list of possible impact fee expenditures to legal counsel or advisers to determine allowable items: Motion Klein, Schneider - approved unanimously.

Amend agenda to include the following, Klein, Frame – approved unanimously.

Veterans Park discussion regarding maintenance focusing mostly on safety. Upgrade to park area for incoming Never Say Never Park impacts decision. Motion to Schneider, Quickel, approved unanimously.

Recommend City Council to honor John Swanson with plaque and John Swanson day to honor his work with the Dream Team over the last 22 years. Motion Quickel, Frame approved unanimously.

Adjourn 7:37 Wendel, Fueredi approved unanimously.

October 17, 2023 @ 6:30pm
Adjournment Cindy Fueredi /Linda Frame

<u>List of impact fees expenditure possibilities</u>
Adaptive equipment at existing parks
Bleachers and shade screens at Veteran’s Park
Disability accessibility at all parks
Wedding venues locations at parks
Picnic tables along river walk at Hillmoor
Pedestrian plan for all to navigate from downtown to schools and grocery stores
Move dog park to Four Seasons
Bridge maintenance along Hillmoor Walk way

City of Lake Geneva
Department of Public Works
1065 Caret St,
Lake Geneva, WI 53147
262.248.6644

To: Park Board Committee
From: Neil Waswo, Superintendent, Public Works
RE: October 2023 Report

OPERATIONS UPDATE

PARK OPERATIONS

- Painted and stained outlook at Donian Park
- Resurfaced the West End bathroom floor
- There were 8 shelter rentals and the Alzheimer Walk in the month of September
- Completed bike path repair next to Curtis St.
- Been working on spot sidewalk replacement in parks
- Tree crews have started the fall tree planting in the Parks, Cemetery, and ROW
- Tree crews finished pruning lakefront parks
- Crews cleaned up and reedbed tree rings in parks
- Flat Iron Park has been plugged and reseeded
- Received two more park bench donations
- With the latest rains; grass is still growing so we are still at full force mowing
- All seasonal help has left for the season
- All shelters have been pressured washed
- Had additional staff for the Labor Day weekend to monitor the parks and restrooms
- Started ROW brush mowing and mowing around ponds
- Repaired parking lot lighting at Veteran's Park

CITY OF LAKE GENEVA BOARD OF PARK COMMISSIONERS
Minutes
Tuesday, August 15, 2023 - 6:30 PM

LAKE GENEVA CITY HALL; COUNCIL CHAMBERS (MAIN LEVEL)

Call to order 6:30 pm by President Cindy Feuredi

Committee Members Present: Cindy Forster Feuredi, Peggy Schneider, Ann Esarco, Denise Wendell, Alderperson Linda Frame and Mayor Charlene Klein

Committee Members Not Present: David Quickel, Brian Olsen, Barbara Philipps

Others Present: Neil Waswo, Department of Public Works

Comments from the public:
Brandon Queen, Logan Krebs, Jessica Hart – Pond View Estates residents that want to beautify the area near the water tower off Dodge St. Residents would like to cut down weeds, add water feature, cut down algae.

Discussion followed regarding the Pond View Estates area, suggested that residents approach the Department of Public Works.

Approval of July 18, 2023 minutes of the Board of Park Commissioner, carried forward for September meeting as minutes not present for review.

Operations report by Neil Waswo, Department of Public Works.

Veterans Park discussion regarding maintenance focusing mostly on safety. Upgrade to park area for incoming Never Say Never Park impacts decision.
Mayor Klein/Denise Wendell motion to carry issue forward to next meeting. Unanimous approval.

Ann Esarco/Linda Frame motion to carry issue forward to next meeting. Unanimous approval.

September 19, 2023 @ 6:30pm
Adjournment Linda Feuredi/Linda Frame

Public Facilities Needs Assessment and Impact Fee Study

PREPARED FOR:

City of Lake Geneva

626 Geneva St

Lake Geneva, WI 53147

PREPARED BY:

Ruekert & Mielke, Inc.

4630 S. Biltmore Lane

Madison, WI 53718

Public Facilities Needs Assessment and Impact Fee Study

March 2, 2023

Ruekert · Mielke

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PUBLIC FACILITIES NEEDS ASSESSMENT AND IMPACT FEE STUDY

PURPOSE AND BACKGROUND

Impact fees are designed to recover the costs of public facilities needed to serve new growth. The city of Lake Geneva (Lake Geneva) enacted impact fees in 2004, and since then, it has met some of the needs created by new growth.

This study by Ruekert & Mielke, Inc. (R/M) and Lake Geneva updates the existing fees for the parks and recreation facilities, the water system facilities, and the sanitary sewer system facilities. It proposes adding fees for department of public works facilities and library facilities.

This study is a public facility needs assessment under Wisconsin Statutes § 66.0617(4). This study develops and recommends impact fees that comply with the impact fee standards in Wis. Stat. § 66.0617(6).

State statutes grant much latitude to municipalities in how they spend impact fee funds. As the footnotes to Wis. Stat. § 66.0617 explain, the law "allows a municipality to impose impact fees for a general type of facility without committing itself to any particular proposal before charging the fees."

Therefore, the level of detail provided in prior studies is not needed in this current study and may even give the impression that Lake Geneva does not have flexibility in its spending of impact fee funds. The footnotes to the statutes make explicit that a "municipality must be allowed flexibility to deal with the contingencies inherent in planning." The project details in this study represent Lake Geneva's best planning at this time, but Lake Geneva reserves its statutory right to alter its planning to best suit evolving needs after this study is finished.

As required by the Wisconsin statutes, each section contains an inventory of existing facilities, a list of future projects, the service standards, existing deficiencies, and the calculation of the impact fee. The study also contains the required analysis on the effect of the impact fees on housing affordability.

Before this impact fee study was created, a feasibility analysis was conducted to determine whether to conduct a full impact fee study for facilities that currently do not have impact fees. This analysis includes detailed explanations of impact fees, examples, and best practices. This analysis can be found in Appendix A.

GENERAL

The growth forecast and service area give a common framework for developing impact fees for specific facility types.

Growth Forecast

Lake Geneva's comprehensive plan based its residential forecast on the Wisconsin Department of Administration's (DOA) forecast. The table below starts with 2020 population because of the reliability of US Census data, and then it applies the same annual growth rate as the DOA's 2020 to 2040 forecast for the period of 2022 to 2042. Since the 20-year growth remains the same, the net increase is also the same with 790 people in this forecast.

Table 1 - Population Forecast

Year	Residential Population	Change Since 2022
2020	8,227	
2022	8,304	
2027	8,502	198
2032	8,699	395
2037	8,897	593
2042	9,094	790

The 2020 number of residential units below comes from US Census data divided by the average number of people per household per the US Census (2.13), rounded to the nearest whole number. To determine the total number of future housing units, the comprehensive plan included a forecast of seasonal residences. Since those units require infrastructure to serve them, they are included in the forecast numbers below. This forecast for 2022 to 2042 assumes the same net change in housing units as the comprehensive plan does for 2020 to 2040.

Table 2 - Residential Unit Forecast

Year	Residences	Change Since 2020
2020	3,862	
2022	3,975	
2027	4,257	282
2032	4,496	521
2037	4,594	619
2042	4,622	647

This forecast assumes an annual growth rate for residential units of approximately 0.8 percent. If Lake Geneva grows at a significantly higher or lower rate, especially over the course of several years, Lake Geneva should update its impact fees to reflect this change.

The housing-unit forecast is used to calculate fees that are charged to residential development. To divide new-growth costs between residential and nonresidential development, equalized values have been used. The equalized values from the 2021 Statement of Changes in Equalized Values from the Wisconsin Department of Revenue determine the allocation of costs between residential and non-residential development.

Table 3 - Growth Share

Type of Development	2021 Equalized Value	Share of Total
Residential	$ 1,219,585,800	**75.2%**
Nonresidential *	$ 401,599,200	**24.8%**
	$ 1,621,185,000	**100.0%**

* Nonresidential = Commercial + Manufacturing

Since residential development is approximately three-quarters of the equalized value, approximately three-quarters of the cost of new-growth projects are allocated to residential housing units, with the remainder allocated to nonresidential development. (This cost allocation between residential and nonresidential development pertains only to facilities that serve both kinds of development. This cost allocation would not apply to facilities that serve only residential development, such as libraries.)

To allocate certain costs among the industrial, institutional, and commercial developments, a forecast of incremental building space was created. Nonresidential development would be charged a cost per square foot of gross building area. First, total nonresidential development was taken from row F in Figure 5.7 of the City's comprehensive plan, which shows a net increase of 106 nonresidential acres from 2020 to 2040. The 106 acres is then converted to square footage by multiplying it by 43,560, which yields approximately 4.6 million square feet. To convert total square footage to gross floor area, the 4.6 million square feet is multiplied by the gross-floor-area-to-total-area ratio, which is 0.25. This ratio comes from the City's zoning ordinance and is called the Max Floor Surface Ratio there. Applying this ratio yields a total forecast of building floor area of approximately 1.15 million square feet for the next 20 years.

Table 4: Forecast Incremental Building Floor Area

Land Use	Development (Acres)	Development (sq ft)	Gross-Floor-Area-to-Total-Area Ratio	**Forecast Incremental Building Floor Area (sq ft)**
Nonresidential	106	4,617,360	0.25	**1,154,340**

This square footage will be used in later sections to determine a cost per square foot for nonresidential development.

Service Area

Wis. Stat. § 66.0617(4)(a)2 requires Lake Geneva to base impact fees on an explicitly identified service area. The service area for this study is the entire city of Lake Geneva. This area includes any areas that Lake Geneva annexes within the forecast period.

PARKS AND RECREATION FACILITIES

Lake Geneva plans to continue to impose impact fees to fund parks and recreation facilities described in the 2004 impact fee study.

The inventory of city-owned parks in the table below comes from Section 2.7 of Lake Geneva's Comprehensive Outdoor Recreation Plan (CORP).

Table 5 - Parks Inventory

Nature Preserves	Area (Acres)	Mini Parks	Area (Acres)
Fermano Park	6.4	Oak Hill Tot Lot	0.1
Dodge Water Tower Pond Park	2.7	Westgate Tot Lot	0.7
Donian Wetland Preserve	4.1	Subtotal	0.8
Edgewood Hills Park	3.2		
Mary Koutsky Four Season Nature Preserve	66.7	**Special Use Parks**	**Area (Acres)**
Hidden Woods	12.0	Lake Geneva Bocce Ball Park	0.5
Home Depot Park	4.4	Riviera Beach and Plaza	2.1
Mill Park	3.0	White River Park	39.7
Price-Fremont Park	4.6	Subtotal	42.3
Subtotal	107.1		
		Community Parks	**Area (Acres)**
		Dunn Field	14.1
Neighborhood Parks	**Area (Acres)**	Library/Elm Park	7.1
Cobb Park	4.9	Veterans Park	25.0
Flat Iron Park	1.8	Subtotal	46.2
Rushwood Park	3.3		
Seminary Park	3.0		
Subtotal	13.0	**Grand Total (Acres)**	**209.4**

Lake Geneva recently purchased the 190.4-acre Hillmoor Golf Course. It is also included in Lake Geneva's park inventory, although it is undeveloped; i.e., facilities will need to be added to develop it into parkland.

The CORP identifies two regional existing deficiencies in Section 5.2, which are features that need to be added to specific areas in Lake Geneva underserved by parks. One is identified as Site A, parcel ZSR 0169, a 43.4-acre forested site owned by Lake Geneva. The CORP recommends adding public access, a multi-use path, and perhaps mountain-biking trails or a pump track to Site A. Another area is identified as Site B, an area that is underserved by all the park types. The plan recommends adding a neighborhood park. Since they are existing deficiencies, neither of these can be funded with impact fees.

The CORP also identifies other specific areas where parkland is needed to meet the needs of future growth. One is referred to as Site C, an area where residential growth is expected to occur. The CORP recommends a community park being developed there, one that includes a cricket field. The CORP also recommends that Lake Geneva purchases more land "adjacent to existing parks" and that "could be used to expand recreational opportunities" as the population grows. However, the CORP recommends that Lake Geneva gains new land for parks through its parkland dedication policy (Section 66-97(a)(1) of Lake Geneva's subdivision ordinance) and through fees in lieu of land dedication.

The CORP does recommend funding the development of parkland facilities through impact fees, and this study incorporates that recommendation. Facilities for parks include the buildings, parking lots, contouring, landscaping, and structures such as playgrounds and sports fields needed to provide residents with amenities that are comparable to ones at the existing parks.

Developing parkland does include adding facilities at the recently purchased Hillmoor Golf Course. Section 6.1 of the CORP identifies a cost of $1,437 per housing unit to meet the future parkland-development needs. Since this plan was created a year ago, this amount was adjusted based on the Consumer Price Index (CPI) to capture the effect of inflation, which has been significant recently, topping 9 percent per year. The adjusted cost per housing unit is approximately $1,567. The adjusted cost per housing unit was multiplied by the number of forecast dwelling units from Table 2 to produce the cost below.

Table 7 - Future Parks Projects

Project	Cost
Develop Parkland (approx. 20 acres)	$ 1,014,256

Table 6.3 from the CORP includes costs for recommended park improvements. Most of these are to rectify existing deficiencies such as providing ADA-compliant facilities while others are identified as likely to be funded from other sources such as Knowles-Nelson Stewardship grants, so their costs are not included in the amount to be recovered through impact fees.

Section 4.1 of the CORP defines Lake Geneva's standard for parkland as the ratio of population to parkland. Using the current population of 8,304 and the current inventory of 209.4 acres produces a service standard of 25.2 acres per 1,000 residents. Applying that standard to the forecast population produces a Future Goal of 229.3 acres, which indicates a need for approximately 20 acres of new parkland. Since there are no existing deficiencies on a city-wide basis, and the projected future parkland purchases and development do not exceed the total forecast need, the entire cost of these projects can be attributed to new growth. The standard for developing parkland uses all the preceding assumptions in this paragraph.

Table 8 - Service Standards for New Parks Projects

Category	Service Standard (acres per 1,000 Population)	Current Population	Current Goal (acres)	Future Population Estimate	Future Goal (acres)
Developed Parkland (acres)	25.2	8,304	209.4	9,094	229.3

Category	Current Inventory (acres)	Current Deficiency (acres)	Additions (acres)	New Growth Additions (acres)	Portion Eligible for Impact Fees
Developed Parkland (acres)	209.4	-	19.9	19.9	100.0%

The existing park impact fee fund balance of approximately $100,000 must be subtracted from the costs eligible for impact fees because Lake Geneva has already collected funds to be spent on parks for new growth but not spent those dollars. The net cost of approximately $900,000 can then be divided by the forecast number of residential unit growth to determine a fee per new residential unit. (The costs for parks can be recovered only from residential development because nonresidential development does not directly benefit from parks.) See table below.

Table 9 - Parks Impact Fees		
Residential Unit Growth *		647
Costs Eligible for Impact Fees **	$	1,014,256
Less Existing Park Fund Balance ***		103,751
Costs to be Charged through Impact Fees	$	910,504
Recommended Fee per Residential Unit	**$**	**1,407**

* Source: Table 2
** Source: Table 7
*** Source: City staff

Despite reducing projected costs for new parks by approximately $4 million from the 2004 study, the new fee would be a substantial increase over the current fee of $230. That is because the forecast for residential equivalent units was set at over 23,000 in the prior study. In other words, while the net cost has declined substantially, it would be spread out among far fewer residential units. However, R/M believes the residential forecast in this study is more accurate given the development possibilities within Lake Geneva.

DEPARTMENT OF PUBLIC WORKS FACILITIES

Lake Geneva does not have impact fees for its Department of Public Works (DPW) facilities, but it has several needs for which it could impose impact fees to meet the needs of new growth. The table below provides the inventory for the DPW.

Table 10 - DPW Facilities Inventory
45 Miles of Roadways
Street Lighting
Traffic Signals located Downtown, Edwards Blvd, Hwy 12 ramps, and Interchange North
City Storm Sewer System
City Owned Sidewalks
City Bike Trail System
Riviera Ballroom
Riviera Beach
Boat Launch
Oak Hill Cemetery
Pioneer Cemetery
21 City Parks and Natural Areas
22 Public Restrooms
230+ Garbage Receptacles
Geneva Lake Lakefront
Approximately 7,000 trees
DPW Main Shop & Office Building Space (18,000 square feet)
DPW Repair Shop Building Space (5,000 square feet)
Building 3 -- off-season equipment storage, paint booth, & sign shop (17,000 square feet)
Salt Shed (1,575 square feet)

The DPW has several impending projects that will be used to meet the needs of new growth. These future projects are listed below, along with their estimated costs.

Table 11 - Proposed DPW Projects

Project	Size (square feet)	Cost Estimates
Traffic Signal at Williams and George Streets		$ 200,000
Traffic Signal at Broad and Geneva Streets		200,000
Traffic Signal at Center and Geneva Streets		200,000
DPW Main Shop Expansion (10,000 square feet addition)	10,000	1,552,500
DPW Repair Shop Expansion (5,000 square feet addition)	5,000	776,250
DPW Office Expansion (1,500 square feet addition)	1,500	388,125
Salt Shed Expansion (2,500 square feet addition)	2,500	300,000
Purchases of Land Adjacent to Curent Facilities for Expansions		900,000
Total		$ 4,516,875

The cost estimates are based on industry sources and DPW experience.

The basis for the service standards depends on the type of project. For traffic signals, the standard is based on what is referred to as Warrant #1 in a manual produced by Wisconsin's Department of Transportation (WisDOT), the Wisconsin Manual on Uniform Traffic Control Devices. This warrant lays out minimum traffic volumes to determine whether a signal is needed. In the case of a main street, at least 600 vehicles per hour for at least 8 hours is the threshold, whereas for side streets, at least 200 vehicles per hour is the threshold. The warrant also provides criteria for a signal if high traffic volume on the major street does not allow enough gaps for side-street traffic. The minimum thresholds for at least 8 hours are 900 vehicles per hour for main streets and 100 vehicles per hour for side streets. According to the traffic counts from WisDOT's Traffic Counts website, none of these thresholds has been met for any of the streets at the intersections where a traffic light is being proposed, but the DPW anticipates that development will increase traffic above these thresholds within the next 20 years at these three intersections. Therefore, this cost is eligible for impact fees.

The standards for both the DPW facility space and the salt shed are based on the expertise of Lake Geneva staff, expressed in a ratio of square feet of facility space to population. The DPW facility space for the main shop, the repair shop, and the office are grouped together into one standard. The analysis that uses these standards shows that there are no Existing Deficiencies with the current facilities, but only some of the proposed Additions can be attributed to new growth during the forecast period. The share of each project that can be recovered through impact fees is the New Growth Share percentage in the lower right of the table.

Table 12 - DPW and Salt Shed Facility Service Standards

Category	Standard for per 1,000 Residences	Current Residences	Current Goal
DPW Facility Space (sq ft)	10,063	3,975	40,000
Salt Shed (sq ft)	396	3,975	1,575

Facility	Inventory	Existing Deficiency	Additions	Additions to Meet Future Needs *	New Growth Share
DPW Facility Space (sq ft)	40,000	-	16,500	6,511	39.5%
Salt Shed (sq ft)	1,575	-	2,500	256	10.3%

* Excludes portion of projects that exceeds standards

The next table provides the calculation of the impact fees. It draws the estimated costs from the table above on the proposed projects. The New Growth Share is one hundred percent for the traffic signals. The New Growth Share for the DPW facility and salt shed come from the table above. Since the land will be used for the DPW facility space, the same standard was applied to determine what percent of the land is eligible for impact fees, which is approximately 39.5 percent. The estimated cost is multiplied by the New Growth Share for each project to produce the New Growth Cost, which is then totaled for all the projects. This total is the cost to be recovered through impact fees. Unlike park and library fees, fees for the DPW can be recovered from nonresidential development, so the total recoverable cost is split between residential and nonresidential growth. This percentage split comes from Table 3. Then for residences, the total to be recovered from each residence is determined by dividing the residential share of costs by the forecast number of residential units, which comes from Table 2. For nonresidential development, the charge per 1,000 square feet of building floor area comes from dividing the nonresidential share of costs by the total forecast incremental building floor area, which comes from Table 4 above.

Table 13 - DPW Impact Fees

	Estimated Cost	New Growth Share	New Growth Cost
Traffic Signal at Williams and George Streets	$ 200,000	100.0%	$ 200,000
Traffic Signal at Broad and Geneva Streets	200,000	100.0%	200,000
Traffic Signal at Center and Geneva Streets	200,000	100.0%	200,000
DPW Facility Expansion	2,716,875	39.5%	1,072,099
Salt Shed Expansion	300,000	10.3%	30,765
Purchases of Land Adjacent to Curent Facilities for Expansions	900,000	39.5%	355,147
Costs to be Charged through Impact Fees	$ 4,516,875		$ 2,058,010

Share of Costs	%	$
Residential	75.2%	$ 1,548,200
Nonresidential	24.8%	509,809
Total	100.0%	$ 2,058,010

Residential Forecast	
New Residential Units	647
Recommended Fee per Residence	**$ 2,393**
Subtotal Forecast Residential Fees	$ 1,548,200

Nonresidential Forecast

Forecast Incremental Building Floor Area (sq ft)	**Recommended Fee per 1,000 Sq Ft**
1,154,340	**$ 442**

Subtotal Forecast Nonresidential Fees	$ 509,809
Total Forecast Fees	$ 2,058,010

If Lake Geneva proceeds with these fees, it will need to fund part of the costs for the DPW facility expansion, salt shed expansion, and land acquisition from other sources.

LIBRARY FACILITIES

The library serves thousands of people inside Lake Geneva and thousands more outside the city. In fact, most registered borrowers live outside the city limits. The table below shows circulation for the library split by city versus non-city use. 2019 data was used due to the pandemic.

Table 14 - Library Use

	Circulation	
City resident circulation	72,233	51%
Non-city resident circulation	69,261	49%
Total circulation	141,494	100%

The 2004 report noted that the library may expand at some future date but did not provide further analysis. The table below provides an inventory of the library at present.

Table 15 - Library Facility Inventory	
	Area (Square Feet)
Library Facility Space	15,400

The standards that are explained later in this section were used to size the future facility, which is assumed to be a smaller, satellite location used to supplement the current facility. The cost is based on average industry costs per foot.

Table 16 - Library Facility Capital Projects		
Project: Library Satellite Location	Area (Square Feet)	Cost
Facility Space	4,616	$ 984,844

The Wisconsin Department of Public Instruction's (DPI's) Public Library Space Needs document is typically used as the standard for library facility space. This document provides detailed information to determine how much space is needed based on the total need from books, periodicals, reader seating, staff workspace, general meeting room space, special-use space, and more.

The following table uses the DPI standards to determine the total facility space needed, both now and at the end of the forecast period. The total facility space needed is based on the total population served. The standards first look at how many holdings the facility should have, and then how much space is needed because of those holdings. Then the standards are used to determine how much general space, special-use space, and non-assignable space is needed. These subtotals are added together as Total Gross Area Needed. Then it is compared to the existing Inventory. Since more space is needed than what the facility currently has, there is an Existing Deficiency of approximately 2,376 square feet. The Existing Deficiency is subtracted from the Future Project to determine Future Need. The New Growth Share is the Future Need divided by Future Project. The City Share of New Growth is the New Growth Share multiplied by the percentage of the facility that will serve Lake Geneva's population (approximately 56 percent).

Table 17 - Library Service Standards

	City	Outside City	Total	
Current Population Served	8,304	6,610	14,914	
Future Population Served *	9,094	7,256	16,350	

Type of Holding	Holding Standard **	Standard Unit	Recommended Current Holdings	Recommended Future Holdings
Book Volumes	3.5	per person	52,199	57,225
Periodicals	9.3	per 1,000 people	139	152
Audio Recordings	0.22	per person	3,281	3,597
Video Recordings	0.48	per person	7,159	7,848

Collection	Standard ***	Standard Unit	Recommended Current Space (sq ft)	Recommended Future Space (sq ft)
Books	0.1	sq ft / volume	5,220	5,723
Periodicals (display)	1	sq ft / title	139	152
Audio and Video	0.1	sq ft / item	328	360
Subtotal Collection Space			5,687	6,234
General Space				
Reader Seating	0.086	sq ft / seat (2.87 seats per 1,000 pop)	1,284	1,408
Staff Work Space	125	sq ft / workstation	1,000	1,500
General Meeting Room Space	0.086	sq ft / seat (2.87 seats per 1,000 pop)	1,284	1,408
Subtotal General Space			7,971	9,142
Special Use	0.17	1 sq ft / 6 sq ft of general space	1,328	1,524
Total Assignable Space			9,299	10,666
Subtotal Non-assignable Space	0.30	3 sq ft / 10 sq ft of assignable space	2,790	3,200
Total Gross Area Needed		sq ft	17,776	20,100
Inventory		sq ft	15,400	
Existing Deficiency		sq ft	2,376	
Future Project		sq ft	4,700	
Future Need		sq ft	2,324	
New Growth Share			49%	
City Share of New Growth			56%	
New Growth Share for City Only			**27.5%**	

* Future population outside of City grown at same rate as rate within City (appr. 10%)
** Based on Public Library Space Needs: A Planning Outline, Wisconsin Department of Public Instruction, 2009.
*** Based on Public Library Space Needs: A Planning Outline, Wisconsin Department of Public Instruction, 2018.

To create an impact fee, the portion of the new facility eligible for being charged to new growth within the city – approximately 28 percent of the total cost – is divided by the number of new residential units in the forecast period, which comes from Table 2.

Table 18 - Library Impact Fees		
Residential Unit Growth		647
New Project Costs	$	1,002,779
New Growth Share for City Only		27.5%
Costs Eligible for Impact Fees *	$	275,791
Recommended Fee per Residential Unit	**$**	**426**

If Lake Geneva proceeds with these fees, it will need to fund the remaining 72 percent from other sources. If Lake Geneva were to proceed with a significantly different plan, then the fees should be updated to reflect those changes.

SANITARY SEWER SERVICE FACILITIES

Lake Geneva plans to continue to impose impact fees to fund facilities improvements for the sanitary sewer utility. It began charging these fees in 2004.

The inventory for the sanitary sewer utility includes the pumping stations and interceptors listed below. The interceptors range in size from 8 to 21 inches in diameter, and they are made of a variety of materials, including PVC, clay, reinforced concrete pipe, and vitrified clay pipe.

Table 19 - Sanitary Sewer Inventory	
Pumping Station	Firm Capacity (gallons/minute)
LaGrange Drive	100
Country Club Drive	143
Covenant Harbor	105
Edgewood Hills	150
Geneva Bay	108
Mariane Terrace	100
Maxwell Street	50
Bigfoot	325
Pioneer Estates	198
Location of Existing Interceptors	
Dodge Street	
East	
George Street	
Lake North Central	
Lake North	
Lake Shore Drive	
North	
Wastewater Treatment Facility	
Parameter	Design Capacity
Ave. Monthly Flow Rate (Million Gallons/Day)	2.5
Peak Hourly Flow Rate (Million Gallons/Day)	5.2
Ave. Daily Biochemical Oxygen Demand (BOD) loading (pounds)	3,900
Ave. Daily Total Suspended Solids (TSS) loading (pounds)	4,100
Ave. Daily Total Kjeldahl Nitrogen (TKN) (pounds)	400

The utility owns and operates all the collector mains throughout Lake Geneva that feed into the interceptor mains listed above. These collector mains are typically 8 inches in diameter. The utility owns and operates the wastewater treatment facility (WWTF) at the east end of Haskins Street. The WWTF contains influent screening, a grit removal system, influent submersible pumping, organic treatment in an oxidation ditch, two 65-foot diameter suction header type clarifiers, a 20-inch force main, and seepage cells in the far eastern section of Lake Geneva. Appendix B, the Utilities Impact Fee Technical Memorandum, provides more detail on the existing sanitary sewer system facilities.

The utility will have to undertake several projects to meet the needs of new growth due to increased flow and pollutants. These projects include numerous changes at the WWTF additional interceptor sewers and force mains, upgrades to existing pump stations, and the addition of 9 new pumping stations. Figure 6 in Appendix B shows the locations of the proposed projects. The list below comes from Table 25 of the technical memo. The design parameters for each of the items are used as the standards, and these parameters come from the text in Section 5 of the technical memo.

Table 20 - Sanitary Sewer Facility Capital Projects

Number	Item	Standard	Unit	Quantity	Unit Price	Total
WWTF						
1	Screen Equipment Mechanical and Electrical	Peak Hourly Flow Rate	EA	1	$325,000	$325,000
2	Screenings Washer and Compactor Equipment Mechanical and Electrical	Peak Hourly Flow Rate	EA	1	$130,000	$130,000
3	Grit Removal Paddle, Motor, VFD and Controls	Peak Hourly Flow Rate	LS	1	$35,000	$35,000
4	Influent Pumping - Replace End Pumps With 25 Hp, 1,200 GPM Pumps at 51 Ft. TDH. Update	Peak Hourly Flow Rate	EA	2	$65,000	$130,000
5	Influent Pumping - Replace End Pump Discharge Piping From 6-Inch to 10-Inch	Peak Hourly Flow Rate	LS	1	$13,000	$13,000
6	Influent Pumping - Replace End Pump Discharge Piping Tees at Main Header	Peak Hourly Flow Rate	EA	2	$5,000	$10,000
7	Influent Pumping - Replace Middle Pump Impeller To Get 900 GPM Pumps at 51 Ft. TDH.	Peak Hourly Flow Rate	EA	1	$6,000	$6,000
8	Influent Pumping - Replace Middle Pump To Get 900 GPM Pumps at 51 Ft. TDH.	Peak Hourly Flow Rate	EA	1	$38,000	$38,000
9	FOG Tank - Excavation and Backfill	TSS Treatment Capacity	LS	1	$18,000	$18,000
10	FOG Tank - Concrete	TSS Treatment Capacity	CY	60	$1,200	$72,000
11	FOG Tank - Skimmer	TSS Treatment Capacity	LS	1	$80,000	$80,000
12	FOG Tank - Electrical and Controls	TSS Treatment Capacity	LS	1	$40,000	$40,000
13	FOG Tank - Mechanical Connections and Valves	TSS Treatment Capacity	LS	1	$30,000	$30,000
14	FOG Tank - Misc. Metals and Grating	TSS Treatment Capacity	LS	1	$45,000	$45,000
15	Oxidation Ditch - New Aerators	BOD Treatment Capacity	LS	1	$405,000	$405,000
16	Splitter Box Weir Replacement	Peak Hourly Flow Rate	EA	2	$8,000	$16,000
17	Final Clarifier - Stamford Baffles	TSS Treatment Capacity	EA	2	$42,000	$84,000
18	Final Clarifier - Baffle System at Feedwell	TSS Treatment Capacity	EA	2	$62,000	$124,000
19	Effluent Pumps - Replace Bowl Assembly to Increase Pump Output to 2,400 GPM. Increase Motor Size to 100 Hp. Add VFDs and Update Controls	Peak Hourly Flow Rate	LS	3	$68,100	$204,300
20	Biosolids Volute Press and Dryer - Demolition, Equipment, and Mechanical	BOD Treatment Capacity	LS	1	$3,224,000	$3,224,000
21	Biosolids Volute Press and Dryer - Electrical and Controls	BOD Treatment Capacity	LS	1	$170,000	$170,000
22	Biosolids Volute Press and Dryer - Building Updates (Internal Walls, Lighting, HVAC)	BOD Treatment Capacity	LS	1	$130,000	$130,000
				SUBTOTAL		$5,329,300
				SUBTOTAL PRORATED		$4,976,220
Interceptors Gravity Sewers						
23	Lake Shore Drive Interceptor Sewer - 12" Sewer Main	Peak Hourly Flow Rate	LF	2,800	$275	$770,000
24	East Interceptor Sewer - 24" Sewer Main	Peak Hourly Flow Rate	LF	11,200	$400	$4,480,000
25	East Interceptor Sewer - 30" Sewer Main	Peak Hourly Flow Rate	LF	6,700	$450	$3,015,000
26	Dodge St Interceptor Sewer - 12" Sewer Main	Peak Hourly Flow Rate	LF	8,300	$275	$2,282,500
				SUBTOTAL		$10,547,500
Pumping Stations and Force Mains						
27	S Lakeshore Dr Lift Station (468 gpm)	Peak Hourly Flow Rate	LS	1	$730,000	$730,000
28	S Lakeshore Dr - 6" Force Main	Peak Hourly Flow Rate	LF	3,400	$130	$442,000
29	Townline Rd Lift Station (268 gpm)	Peak Hourly Flow Rate	LS	1	$630,000	$630,000
30	Townline Rd - 6" Force Main	Peak Hourly Flow Rate	LF	1,300	$130	$169,000
31	McDonald Rd Lift Station (122 gpm)	Peak Hourly Flow Rate	LS	1	$550,000	$550,000
32	Grandview Dr Lift Station (108 gpm)	Peak Hourly Flow Rate	LS	1	$550,000	$550,000
33	Lake Forest Cir Lift Station (99 gpm)	Peak Hourly Flow Rate	LS	1	$550,000	$550,000
34	Sheridan Springs Rd Lift Station (67 gpm)	Peak Hourly Flow Rate	LS	1	$500,000	$500,000
35	North State Rd 120 - Lift Station (675 gpm)	Peak Hourly Flow Rate	LS	1	$790,000	$790,000
36	North State Rd 120 - 8" Force Main	Peak Hourly Flow Rate	LF	2,700	$150	$405,000
37	Park Dr Lift Station (152 gpm)	Peak Hourly Flow Rate	LS	1	$560,000	$560,000
38	South State Rd 120 - Lift Station (756 gpm)	Peak Hourly Flow Rate	LS	1	$800,000	$800,000
39	South State Rd 120 - 8" Force Main	Peak Hourly Flow Rate	LF	2,200	$150	$330,000
40	Bigfoot Lift Station Lift Station - Upgrade to 516 gpm	Peak Hourly Flow Rate	LS	1	$730,000	$730,000
41	Pioneer Estates Lift Station - Upgrade to 1,072 gpm	Peak Hourly Flow Rate	LS	1	$920,000	$920,000
42	Pioneer Estates Lift Station - 10" Force Main	Peak Hourly Flow Rate	LF	3,300	$170	$561,000
				SUBTOTAL		$9,217,000
		ALL PROJECTS SUBTOTAL				$24,740,720
		ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)				$8,660,000
		TOTAL PROJECT COSTS				$33,400,720
		ALL PROJECTS SUBTOTAL PRORATED				$24,387,640
		ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)				$8,660,000
		TOTAL PROJECT COSTS PRORATED				$33,047,640

The technical memo projects future flow and pollutant loadings based on Lake Geneva's comprehensive plan for land development. In Table 27 of the technical memo, 27 different areas are analyzed to develop a total forecast that was then used to develop the list of recommended projects. Section 2.6 of the technical memo analyzes the current capacity of the wastewater treatment system, and it identified one existing deficiency. Most of the capacity for a second identical screen in the treatment facility provides needed redundancy, so only approximately 22 percent of the cost for items 1 and 2 are included in the prorated subtotal. This prorated subtotal is used to calculate the total eligible cost that can be recovered through impact fees. The rest of the proposed projects have been sized to accommodate the demand projected to occur during the forecast period, so the full amount of these project costs is eligible for impact fees.

To calculate the impact fee, the number of residential equivalent units (REUs) must be determined. Since sewer use generally parallels water use, and the average residential water demand is known due to metering, the water forecast is used to determine the number of sanitary-sewer REUs during the forecast period. The increase of over 800,000 gallons of water demand per day needs to be compared to current residential consumption. Dividing the annual residential demand by the number of customers and then by the number of days in the year yields the current average residential daily demand. Dividing the forecast incremental demand by the residential daily demand yields the number of new REUs. The impact fee can then be calculated by dividing the total eligible sanitary sewer project costs by the number of new REUs. The balance in the sanitary sewer impact fee fund must first be deducted from the project costs, however, because this amount is money Lake Geneva has collected but not yet spent on sanitary sewer projects to serve new growth.

Table 21 - Sanitary Sewer Impact Fees

Residential Demand (gallons) *		159,873,000
Residential Customers *		4,150
Average Daily Demand (gallons)		106
Forecast Incremental Daily Increase (gallons) **		831,104
New REUs		7,874
Total Project Costs	$	33,400,720
Less Existing Sanitary Sewer Impact Fee Fund Balance ***		1,092,393
	$	32,308,327
Impact Fee per REU	**$**	**4,103**

* Source: 2021 PSC Annual Report, Schedule W-2

** Source: Appendix B, Table 11

*** Source: City Staff

The proposed fee is a substantial increase over the current fee per REU of $1,865, which was adopted in 2004. Although project costs for new growth are approximately $10 million less than what they were estimated to be in 2004, the forecast for REUs has declined from approximately 23,000 to approximately 7,900 as shown in Table 21. R/M believes this new forecast is more accurate given the types and quantities of land development that are projected in Lake Geneva's comprehensive plan.

Lake Geneva has imposed sanitary sewer impact fees based on the size of the meter. The table below provides a breakdown of fees based on meter equivalencies calculated using the maximum operating range of the water meters within Lake Geneva's system. These equivalencies resemble the ones calculated off actual average water use at each meter size. The proposed equivalencies are in some cases higher than the current equivalencies, but the proposed equivalencies are most reflective of both actual use and potential use for each meter size.

Table 22 - Sanitary Sewer Impact Fees by Meter Size

Meter Size	Meter Equivalency	Impact Fee
5/8"	1.0	$ 4,103
3/4"	1.0	$ 4,103
1"	1.6	$ 6,565
1.5"	5.7	$ 23,387
2"	5.7	$ 23,387
3"	14.3	$ 58,672
4"	28.6	$ 117,344
6"	57.1	$ 234,277
8"	77.1	$ 316,335
10"	114.3	$ 468,964

WATER SUPPLY FACILITIES

Lake Geneva plans to continue to impose impact fees to fund facilities improvements for the water utility. It began charging these fees in 2004.

The inventory for the water utility includes the four wells, the booster pumps, the storage facilities, and treatment facilities listed below. The water distribution system has three pressure zones. Water from each well is treated through chlorination and pumped to one of three reservoirs at the treatment site. The water utility's inventory also includes approximately 330,000 feet of main varying in diameter size from 4 inches to 16 inches made of unlined cast iron, PVC, and other materials. Appendix B and the water utility's annual reports to the Public Service Commission both contain more detail on the system.

Table 23 - Water Inventory

Well and Booster Station Pump Capacity

SUPPLY SOURCE	Supply Capacity		Booster Pump Capacity	
SUPPLY SOURCE	Gallons per minute (gpm)	Millions of gallons per day (MGD)	Gallons per minute (gpm)	Millions of gallons per day (MGD)
HOST PRESSURE ZONE				
Wells				
Well 2	1,000	1.44		
Well 3	1,180	1.70		
Well 4	1,350	1.94		
Well 5	1,400	2.02		
Booster Pumps				
Plant A 1-A			1,800	2.59
Plant A 2-A			1,125	1.62
Plant A 3-A			1,200	1.73
Plant B 1-B			1,000	1.44
Plant B 2-B			1,300	1.87
Total Pumping Supply Capacity	**4,930**	**7.10**	**6,425**	**9.25**
Less: Largest Supply Unit	1,400	2.02	1,800	2.59
Reliable Supply: Host Pressure Zone	**3,530**	**5.08**	**4,625**	**6.66**
DODGE PRESSURE ZONE				
Booster Pumps				
Dodge St. Booster Station #1			910	1.31
Dodge St. Booster Station #2			910	1.31
Total Pumping Supply Capacity			**1,820**	**2.62**
Less: Largest Supply Unit			910	1.31
Reliable Supply: Dodge Pressure Zone			**910**	**1.31**
CENTER PRESSURE ZONE				
Booster Pumps				
Fire Pump [1]			*500*	*0.72*
Booster Pump #1			120	0.17
Booster Pump #2			120	0.17
Total Pumping Supply Capacity			**240**	**0.35**
Less: Largest Supply Unit			120	0.17
Reliable Supply: Center Pressure Zone			**120**	**0.17**

[1] *The fire pump is not considered as part of the reliable supply*

Water Storage Capacity

Storage Facility Name	Description	Capacity (gal)	Year Constructed	Pressure Zone
Tower #1 – Dodge Tower	Elevated Storage Tank	200,000	1970	Dodge
Tower #2 – Host Tower	Elevated Storage Tank	1,500,000	1996	Host
Tower #3 – Center Tower	Elevated Storage Tank	200,000	2006	Center
Reservoir #1	Ground Reservoir	98,750	1917	-
Reservoir #2	Ground Reservoir	160,500	1917	-
Reservoir #3	Ground Reservoir	300,000	1970	-

Water Treatment Capacity

Treatment Facility	Capacity (gpm)	Capacity (MGD)
Treatment Plant A		
Filter #1-B	600	0.86
Filter #2-B	600	0.86
Filter #3-B	600	0.86
Treatment Plant B		
Filter #1-A	1,000	1.44
Total Treatment Capacity	**2,800**	**4.03**
Less: Largest Filter Unit	1,000	1.44
Reliable Treatment Capacity	**1,800**	**2.59**
Existing Maximum Day Demand	1,660	2.39
Reliable Treatment Capacity Excess or (Deficit)	**140**	**0.20**

The design parameters, which are here used as service standards, are maximum day demand for supply facilities and treatment facilities while maximum hour demand is used for the distribution facilities that are proposed to meet new growth. The service standard for supply facilities is the total need for equalizing storage, fire storage, and reserve storage. The technical analysis in Appendix B indicates the water main for the Host Tower is undersized for current needs, so this main is an existing deficiency.

With average daily demand projected to increase by over 800,000 gallons, Lake Geneva will need to undertake several projects to meet the needs of new growth. With much growth anticipated in the south and northwest, Lake Geneva needs to create two new pressure zones, which will each require a new booster station. The northwest area will not need additional storage because hydropneumatic tanks could be used to sustain pressure on the system, but it will require pressure reducing vaults to avoid excessive pressures throughout the distribution system. The south area will need a storage tank of 240,000 gallons. New mains will also be required to accommodate the needs of new growth. Figure 5 in Appendix B shows the locations of the proposed projects. These projects have been sized to accommodate the demand projected to occur during the forecast period, so the full amount of the project costs is eligible for impact fees. The exception is the portion of the proposed water main at the Host Tower that is to remedy an existing deficiency; this cost is excluded from the prorated subtotals below. Since mains are sized and priced based on standard increments, the full cost for the Host Tower main is excluded. The cost for one of the pressure reducing vaults is also excluded, not because it is an existing deficiency but because it is assumed that it will be paid for by a developer who elects to develop that particular small region.

Table 24 - Water Facility Capital Projects					
Number	Item	Unit	Quantity	Unit Price	Total
Water Mains and Distribution					
1	10" Water Main - Northwest Area	LF	18,300	$180	$3,294,000
2	14" Water Main - Northeast Area	LF	5,600	$230	$1,288,000
3	10" Water Main - South Area	LF	16,600	$180	$2,988,000
4	12" Water Main - South Area	LF	8,500	$200	$1,700,000
5	14" Water Main - South Area	LF	6,500	$250	$1,625,000
6	18” water mains from the Host Tower	LF	1,400	$280	$392,000
7	12” water mains from the Dodge Booster Station	LF	2,100	$200	$420,000
SUBTOTAL			SUBTOTAL		$11,707,000
SUBTOTAL PRORATED			SUBTOTAL PRORATED		$11,315,000
Booster Stations and Storage					
7	500 gpm Fire Pump - Dodge Booster Station	EA	1	$40,000	$40,000
8	230,000 gal Elevated Storage Tank - South Pressure Zone	LS	1	$1,830,000	$1,830,000
9	60 gpm Booster Station - South Pressure Zone	LS	1	$600,000	$600,000
10	210 gpm Booster Station - Northwest Pressure Zone	LS	1	$700,000	$700,000
11	Pressure Reducing Vaults - Northwest Area (PRV Zones)	LS	1	$125,000	$125,000
			SUBTOTAL		$3,295,000
			SUBTOTAL PRORATED		$3,170,000
Treatment System					
12	Filters For Plant B (1,000 gpm)	LS	1	$430,000	$430,000
13	Extra Installation Effort (Knock Out Wall)	LS	1	$20,000	$20,000
14	Process Piping	LS	1	$115,000	$115,000
15	BW Tank	LS	1	$70,000	$70,000
16	BW Pump	LS	1	$10,000	$10,000
17	Vertical Turbine Pumps	EA	2	$96,000	$192,000
18	Suction Piping To Vertical Turbine Pumps	LS	1	$165,000	$165,000
19	Electrical and MCC	LS	1	$120,000	$120,000
20	Chemical Feed Equipment	LS	1	$18,000	$18,000
			SUBTOTAL		$1,140,000
			SUBTOTAL PRORATED		$1,140,000
	ALL PROJECTS SUBTOTAL				$15,625,000
	ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)				$5,469,000
	TOTAL PROJECT COSTS				$ 21,094,000
	ALL PROJECTS SUBTOTAL PRORATED				$15,108,000
	ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)				$5,288,000
	TOTAL PROJECT COSTS PRORATED				$ 20,396,000

The forecast for demand and REUs is the same as in the sanitary sewer section. The total project cost comes from the table above.

Table 25 - Water Impact Fees		
Residential Demand (gallons) *		159,873,000
Residential Customers *		4,150
Average Daily Demand (gallons)		106
Forecast Daily Increase (gallons) **		831,104
New REUs		7,874
Total Project Costs	$	20,396,000
Less Existing Water Impact Fee Fund Balance ***		475,145
	$	19,920,855
Impact Fee per REU	$	2,530

* Source: 2021 PSC Annual Report, Schedule W-2

** Source: Appendix B, Table 11

*** Source: City Staff

The proposed fee is a substantial increase over the current fee of $1,690, which was adopted in 2004. Although project costs are approximately $20 million less than what they were estimated to be in 2004, the forecast for REUs has declined from approximately 23,000 to approximately 7,900.

The table below applies the same meter equivalencies as the sewer impact fees to develop impact fees at each meter size.

Table 26 - Water Impact Fees by Meter Size		
Meter Size	Meter Equivalency	Impact Fee
5/8"	1.0	$ 2,530
3/4"	1.0	$ 2,530
1"	1.6	$ 4,048
1.5"	5.7	$ 14,420
2"	5.7	$ 14,420
3"	14.3	$ 36,176
4"	28.6	$ 72,352
6"	57.1	$ 144,452
8"	77.1	$ 195,048
10"	114.3	$ 289,157

HOUSING AFFORDABILITY

Most households in Lake Geneva find housing affordable. Lake Geneva's median household income of $59,162 falls below Wisconsin's median household income of $67,080.

The information above provides context for evaluating the effect of impact fees on housing affordability. The table below shows the annual cost of a $232,000 home, the estimated average value of a house in Lake Geneva.

Table 27 - Availability of Affordable Housing

	Without Impact Fees	With Proposed Impact Fees
Home Price	$ 232,000	$ 242,859
Principal and Interest *	$ 18,509	$ 19,375
Taxes **	$ 3,967	$ 4,153
Annual Housing Cost	$ 22,476	$ 23,528
Annual Income Required ***	$ 74,919	$ 78,426
Additional Annual Income Required		$ 3,507
Required Percent Increase		4.7%

* Assumes a 30-year fixed mortgage at 6.9% annual interest
** Assumes the following tax rate: 1.71%
*** Assumes debt payments are no more than 30% of income

SUMMARY AND NEXT STEPS

To fund the facilities needed by growth soon, we recommend revising the City's impact fees. The table below summarizes the proposed fees.

Table 28 - Summary of Impact Fees

Type of Impact Fee	Residential Dwelling Unit	Nonresidential Development (per 1,000 sq ft)
Proposed Fees		
Parks	$1,407	N/A
DPW	$2,393	$442
Library	$426	N/A
Sanitary Sewer (per REU)	$4,103	$4,103
Water (per REU)	$2,530	$2,530
Total of Proposed Fees	**$10,859**	**$7,074**
Existing Fees		
Water (per REU)	$1,690	$1,690
Sewer (per REU)	$1,865	$1,865
Parks	$230	N/A
Total Existing Fees	**$3,785**	**$3,555**
Increase from Existing Fees	**$7,074**	**$3,519**
Increase from Existing Fees	**187%**	**99%**

According to state statute, municipalities must now provide developers with explanations of how the impact fees being collected will be spent. R/M recommends that Lake Geneva provides a written or electronic copy of this study to satisfy this statutory requirement.

To move forward with new impact fees, the following steps need to take place:

1) This study is presented to Lake Geneva's City Council.

2) The City Council directs that a public hearing be held to hear public comment on this public facilities needs assessment and the proposed impact fees.

3) An ordinance is drafted to implement the recommended impact fees.

4) A Class 1 notice is published in the newspaper to provide the public 20 days' notice prior to the public hearing as required under Wisconsin Statutes 66.0617(4)(3)(b). The needs assessment must be available 20 days prior to the public hearing to allow the public sufficient time to review.

5) A public hearing is held to hear public comment on the needs assessment and the proposed ordinance to impose public facilities impact fees.

6) After the public hearing, the City Council may adopt the proposed ordinance as recommended or adopt the ordinance with amendments.

R/M encourages Lake Geneva to periodically update its impact fees to ensure they reflect the best growth forecasts, as well as the best capital cost and project estimates. Revisiting the fees every 3 to 5 years can help a community adjust its plans for new growth to provide the correct level of funding and avoid changing rates as drastically as would be the case if the community waited longer to update its fees.

APPENDIX A: IMPACT FEE FEASIBILITY ANALYSIS

August 30, 2022

To: Lake Geneva City Council
From: Ed Maxwell, M.B.A, and Bridgot Gysbers of Ruekert & Mielke, Inc.
Re: Impact Fee Feasibility Analysis

IMPACT FEES

The following sections explain impact fees, including their purpose, requirements and restrictions on them, a simplified example, and best practices.

Purpose of Impact Fees

Impact fees can provide a needed source of funding for infrastructure. These fees are designed to enact the adage "growth pays for growth." Their purpose is to charge new development for the infrastructure needed to serve that development. State statutes dictate their use while best practices can help municipalities make the most of these fees and avoid common pitfalls.

Requirements and Restrictions

Requirements to impose impact fees in Wisconsin Statutes § 66.0617 include the following:

- Conduct a public needs assessment that
    - Defines the service area
    - Provides service standards to determine the infrastructure needs
    - Includes an inventory of existing public facilities
    - Identifies existing deficiencies (lack of facilities for the current population)
    - Lists facilities needed to serve new growth, along with cost estimates
    - Estimates the effect of the impact fees on the availability of affordable housing
- Make the public needs assessment available to the public for at least 20 days before the public hearing
- Issue a Class 1 notice about the new public needs assessment
- Hold a public hearing.

To keep imposing impact fees, Wis. Stat. § 66.0617 require the following:

- Explain to developers what the fees will be used for when the fees are collected
- Segregate the funds
- Spend the money only on the capital costs for which the fees were imposed
- Refund the money to the original payer if the money is not spent within 8 years (10 years for sewer infrastructure)
- Specify a procedure within the municipal ordinances for developers to contest the fees.

Impact fees cannot be used for

- Vehicles
- Operation and maintenance expenses
- Infrastructure to serve the needs of the current population (existing deficiencies)
- Infrastructure to serve needs beyond the forecast period
- Infrastructure to comply with current law (e.g. American with Disabilities Act)
- Infrastructure that will serve new growth outside of the municipality
- Facilities that are not listed in Wis. Stat. § 66.017(1)(f)1 such as cemeteries, community centers, and electric utilities.

Other Items of Note

- The cost for land can be included, as can legal, engineering, and design costs for the new public facilities.
- Fees must be reduced proportionate to new funding sources for the same projects. For instance, if the municipality wins a grant or levies a special assessment on a project for which impact fees are being charged, the impact fees should be reduced proportionate to the amount of this new funding.
- Fees must also bear a “rational relationship” to the need for the new public facilities required to serve new development.
- Municipalities can pay debt for new-growth projects with impact fees. That means that the fees can go toward debt payments for the life of the loan.

Example

To illustrate how impact fees are formed, let’s look at a simple example. Happyville anticipates a lot of residential growth. To figure out how much developers might pay for parks to serve the new growth, Happyville puts together an impact fee study. Let’s say the National Recreation and Park Association recommends 1 acre of parkland per 100 residents. Happyville has 700 residents. That means Happyville should have 7 acres. However, its current inventory for parks is 3 acres. This means Happyville has an existing deficiency of 4 acres.

The growth forecast shows that Happyville will add 300 more residents. Therefore, the future need for the community is a total of 10 acres. Happyville plans to buy 8 acres of land and develop it into parkland. After the land purchase, Happyville will have a total of 11 acres of parks, which is 1 more than what the standard says it needs. The 1 “excess” acre that will serve needs beyond the forecast period cannot be paid for with impact fees. Nor can the 4 acres that will meet an existing deficiency. That means of the 8 acres being purchased, only 3 are eligible to be paid for with impact fees. (8 acres minus 4 acres for an existing deficiency minus 1 “excess” acre = 3 acres.)

Of the total project cost, 37.5 percent is eligible to be paid for with impact fees (3 divided by 8 = 37.5 percent). Each acre is estimated to cost $100,000 for a total of $800,000, so $300,000 can be collected in impact fees.

The impact fee for parks is the eligible project cost divided by the forecast number of new residential units. Happyville anticipates each new home will be occupied by 2 people each. Therefore, there will be 150 new homes in the forecast period. (300 new residents divided by 2 people/home = 150 new homes.) $300,000 divided by 150 new homes equals an impact fee of $2,000.

<u>Takeaways and Best Practices</u>

- <u>Impact fees seldom pay for entire projects</u>.
- Thus, <u>municipalities should develop a plan for how to pay for the rest of the projects</u>.
- Otherwise, they may end up not following through on the projects and refunding the money. Issuing refunds may prove very challenging.
- Municipalities should follow through on their plans for serving new growth.
- <u>Debt</u> provides a way for municipalities to spread out the cost recovery for new growth beyond 8 years.
- Certain kinds of impact fees (parks, library) can be charged <u>only to residential development</u>. The rest can be charged to all kinds of development.

<u>FEASIBILITY ANALYSIS</u>

Each section that follows looks at a particular service the City offers, estimates the potential for impact fees, recommends whether to perform a full impact fee study for this service, and explains the recommendation. A full impact fee study would calculate the exact fee that could be charged using a growth forecast, applicable service standard, precise current inventory, and project cost values. The feasibility analysis uses high-level estimates for each of the preceding items to provide an opinion on whether it may be appropriate to implement impact fees, and if so, why and for what facilities.

The last instance that impact fees were evaluated for City services was the January 26, 2004 Impact Fee Needs Assessment and Feasibility Report. The statutes governing impact fees have added numerous requirements since that report was completed.

LIBRARY

The library occupies approximately 14,000 square feet and serves thousands of people inside the City and thousands more outside the City. In fact, most registered borrowers live outside the City limits. The table below shows both circulation and borrowing for the library. 2019 data was used due to the pandemic.

Table 1 - Library Use

Circulation		
City resident circulation	72,233	51%
Non-city resident circulation	69,261	49%
Total circulation	141,494	100%
Registered borrowers		
City residents	4,626	41%
Non-city residents	6,610	59%
Total borrowers	11,236	100%

The 2004 report noted that the library may expand at some unspecified future date but did not provide further analysis.

The library can offer little in terms of parking, given that it has only 5 30-minute stalls in front of the building. All other parking along Main and Wrigley Streets are paid parking spaces. During the summer, the issue is even worse – sometimes those going to the library cannot find open spaces near the building. For regular daily use, 50 parking spots would be closer to adequate, especially when the library offers programs that draw 100 or more people.

Parking stands out as a significant need. However, it is an existing deficiency. While future growth will likely generate more need, much of this need will not be eligible for impact fees since it will come from people outside the City. At best, a tiny fraction of the cost of parking stalls would be eligible for impact fees. Therefore, Ruekert & Mielke, Inc. (R/M) does not recommend the City explore impact fees for library parking. The City can consider other ways to provide more parking for the library.

Library space itself may merit further investigation. A smaller satellite location could allow the library to grow and offer service in a different part of the City. Another possibility is that the library could include its satellite location in a new public safety

building being considered by the fire and police departments. Such an arrangement may provide significant cost savings. The library is undertaking review and revision of its strategic plan this fall to further explore its facility needs.
The Wisconsin Department of Public Instruction's (DPI's) Public Library Space Needs document is typically used as the standard for library facility space. This document provides detailed information to determine how much space is needed based on the total need from books, periodicals, reader seating, staff workspace, general meeting room space, special-use space, and more. The table below shows some of the standards from the DPI's document and the holdings recommended based on these standards.

Table 2 - Select Library Service Standards and Recommended Holdings

Type of Holding	Holdings Standard	Standard Unit	Recommended Current Holdings	Recommended Future Holdings
Book Volumes	4.2	per person	47,191	53,839
Periodicals	10.9	per 1,000 people	122	140
Audio Recordings	0.35	per person	3,933	4,487
Video Recordings	0.5	per person	5,618	6,409

Preliminary application of the DPI standards indicates the current facility comes close to matching the standards' recommendation for space. That means there are little if any existing deficiencies. This in turn means that a significant portion of any new facility would be to serve new growth. However, some of that new growth is outside the City, so that portion would not be eligible for impact fees. Depending on the assumptions made about growth outside the City, likely at least half of the facility would not be eligible.

If the City understands and accepts that half or more of a new satellite facility would probably need to be funded some other way, then R/M recommends that it moves ahead with a full impact fee study for that facility.

FIRE DEPARTMENT

The fire department serves the entire City, as well as approximately half of the Town of Geneva, or about 2,000 people outside the City throughout an area almost twice as large as the City. The department provides fire suppression, emergency medical services, public education, and various rescue services.

The 2004 report recommended implementing fees to pay for either expanding the current fire station or building a second satellite station, which was "anticipated to be necessary in either 2008 or 2009." These fees were implemented, but the building project was not undertaken within time limits established by the state statutes, so the money was refunded, and the fees were eliminated.

The current space of approximately 10,800 square feet was remodeled. Space used for meeting and training was reduced to about a quarter of its prior size to create a dorm bunk room to sleep 4 personnel and a dayroom approximately 455 square feet large. Offices were rearranged to create shared workspace for 3 personnel in 1 office and 2 in another. A records room, storage room, uniform room, and gym were constructed in the existing basement. A storage building approximately 2,400 square feet was constructed to house out-of-season and large apparatuses that do not fit elsewhere.

The fire department currently rents space at two other locations. Station 2, located in the water tower, houses a few vehicles. The annex building, which is shared with the police department, houses other vehicles and equipment. The table below lists the fire-department facilities and which equipment and vehicles are stored in each of them.

Table 3 - Fire Department Inventory

Station 1 (730 Marshall St) ~ 10,800 square feet	Station 2 (Water Tower 1003 Host Dr) ~ 1,600 square feet
Inside garage:	1 engine
3 ambulances	1 pull behind rescue snow sled
2 engines	1 john boat
1 tower ladder	
1 ford explorer	Annex Building (1065 Carey St) ~ 2,800 square feet
1 boat	1 command vehicle
1 rehab vehicle	1 UTV
1 brush truck	Outside storage:
Outside storage:	1 30’ trailer
2 staff vehicles	
1 utility pickup truck	
1 chief vehicle while on duty	

The most applicable standard for fire departments relates population to facility square footage. Like the library, the fire department serves a significant portion of the population outside the City limits. Any facility space to serve new growth for that population would be excluded from impact fees.

However, the department has expressed that it will need more facility space to serve new growth, and it is conducting a study on a public safety building with the police department. Impact fees would likely be able to pay for a portion of a new public safety building. If this building were to replace the existing facility, fees could not pay for the portion of the building that would replace the building. In other words, the fees could pay only for the incremental size increase, and then only a portion of that cost, depending on the assumptions regarding growth outside the City limits and how large the overall building is.

If the City understands and accepts that a significant portion of a new facility would need to be funded some other way, then R/M recommends that it moves ahead with a full impact fee study for that facility.

POLICE

The police department serves the entire City, enforcing the law, as well as fostering safety awareness and civic responsibility. Additionally, the department's communications center dispatches fire and emergency medical services to the portion of the Town of Geneva served by the fire department.

The 2004 report does not mention the police department.

The current facilities include space in City Hall. This space is used for offices, locker rooms, cold storage, training, and more. The department has 3 places for storage and vehicles, including a garage at City Hall and 2 barns at 1065 Carey Street. The Carey Street space is rented and is shared with the fire department. See the table below.

Table 4 - Police Department Inventory

Garage/Storage ~ 10,800 sq ft	PD Building (626 Geneva St) ~ 17,300 sq ft
Garage at main facility ~ 6,570 sq ft Old property barn ~ 2,400 sq ft New property barn ~ 1,840 sq ft	Includes locker rooms, cold storage, & training rooms
Total Space	~ 28,100 square feet

The facility space at City Hall does not suffice for current needs. The department could use approximately 15 percent more space. This existing deficiency needs to be addressed through means other than impact fees. Additionally, future growth will need to be addressed as well. The department expects to add 4 officers in the next 2 years to fill the void created by lack of part-time staff.

The department would like to consolidate its operations under one roof for efficiency and effectiveness. To explore this option, as well as to explore adding space for existing deficiencies and for future growth, the department is conducting a study on a public safety building with the fire department.

The most appropriate standard relates population served to facility square footage. As explained in the prior section, the fees would not be able to pay for any portion of a new public safety building that would be replacing an existing facility. They also would not be able to pay for existing deficiencies, which the department does have. Despite those two facts, a portion of new facilities for the department could likely be funded by impact fees.

If the City understands and accepts that a substantial part of the cost of a new facility would need to be funded by other means, then R/M recommends that it authorizes a full impact fee study for that facility.

DEPARTMENT OF PUBLIC WORKS

The Department of Public Works (DPW) maintains much of the City's infrastructure. The department also handles snow plowing, street sweeping, brush and leaf pickup, the City's recycling program that composts organic materials; assists with festivals and parades; and cares for nearly 7,000 trees.

The 2004 study provides a paragraph listing inventory and notes that there are no existing deficiencies. No analysis is provided, and no future growth projects are listed.

The following feasibility analysis focuses only on the DPW facilities that are both eligible for impact fees and that will be paid for through municipal funding. For instance, tourist centers, organic-waste facilities, and cemeteries are not eligible according to the state statutes. Although eligible, storm water infrastructure was not included because developers pay for it and then donate it to the City. While parks are included in the DPW's responsibilities, parks already have established impact fees and will be addressed in the full impact fee study. The table below inventories the facilities the DPW maintains.

Table 5 - DPW Facilities Inventory
45 Miles of Roadways
Street Lighting
Traffic Signals located Downtown, Edwards Blvd, Hwy 12 ramps, and Interchange North
City Storm Sewer System
City Owned Sidewalks
City Bike Trail System
Riviera Ballroom
Riviera Beach
Boat Launch
Oak Hill Cemetery
Pioneer Cemetery
21 City Parks and Natural Areas
22 Public Restrooms
230+ Garbage Receptacles
Geneva Lake Lakefront
Approximately 7,000 trees
DPW Main Shop Building Space (18,000 square feet)
DPW Repair Shop Building Space (5,000 square feet)
DPW Office Building Space (450 square feet)
Salt Shed Expansion (1,575 square feet)

Conversations with the department have revealed that several facilities are near or at capacity. Growth will require expansions for these facilities, which will in turn require land purchases. Additionally, meeting the needs of future growth will require facilities that currently do not exist in certain locations, such as traffic signals at several intersections. The table below lists the new facilities and the facility expansions needed to meet the needs generated by new growth.

Table 6 - Proposed DPW Projects
Traffic Signal at Williams and George Streets
Traffic Signal at Broad and Geneva Streets
Traffic Signal at Center and Geneva Streets
Bloomfield Road Improvements
Edwards Street Lighting from Main Street to Bloomfield Road
Relocation of City Boat Launch
Lean-to on North Side of 1070 Carey Street Facility for Equipment Storage
DPW Main Shop Expansion (5,000 square feet addition)
DPW Repair Shop Expansion (5,000 square feet addition)
DPW Office Expansion (1,500 square feet addition)
Salt Shed Expansion (2,500 square feet addition)
Purchases of Land Adjacent to Curent Facilities for Expansions

The standard for the building facilities and land would relate population to square footage. Given that the 20-year Department of Administration forecast for the City indicates growth above 15 percent, a significant portion but not all these project costs would be eligible for impact fees. The other projects could be evaluated using threshold standards, which attribute 100 percent of costs to new growth once a certain point on a measure is surpassed. For instance, once traffic reaches a certain level on a road, exceeding a certain threshold, then a threshold standard would indicate that a project is needed for new growth, and all the costs could be attributed to the new growth. However, some projects may need to be evaluated using a population-based standard. Each project would be evaluated individually.

Because there are so many projects needed to accommodate new growth, R/M recommends that the City continue to explore impact fees for the DPW, although a portion of the costs for these projects will not be eligible for impact fees.

SUMMARY

R/M recommends pursuing impact fees for the areas described above. If the Council authorizes a full impact fee study for these areas, it should do so understanding that impact fees will not pay for the full amount of all the new-growth projects. However, authorizing an impact fee study does not commit the City to enacting those fees, nor to do following through on these projects within a given timeframe. The Council would have to adopt the fees after the study is finished before any obligations are taken on.

March 1, 2023

To: Mr. Josh Gajewski
City of Lake Geneva
Utility Commission Director
626 Geneva Street
Lake Geneva, WI 53147

From: Dave Arnott, P.E. (WI, IL)
Team Leader / Senior Project Manager
Ruekert & Mielke, Inc.
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Re: Utilities Impact Fee Technical Memorandum

1 Introduction

The City of Lake Geneva is undertaking a comprehensive effort to update its impact fees. Impact fees can provide a needed source of funding for infrastructure. These fees are designed to enact the adage "growth pays for growth." Their purpose is to charge new development for the infrastructure needed to serve that development. State statutes dictate their use while best practices can help municipalities make the most of these fees and avoid common pitfalls.

The previous impact fee assessment was conducted in 2004 and included consideration of public works, library, fire protection, parks and recreation, and utilities. The City has changed considerably since the 2004 impact assessment was conducted. Even in the past 5 years, the City has changed significantly with more than 400 homes being constructed. The purpose of this memorandum is to provide a basis for impact fees the City will implement for capacity expansions of the water and wastewater infrastructure to accommodate growth. This includes but is not limited to the following types of water infrastructure: wells, well pumps, well chemical addition, water mains, reservoir capacity, water treatment capacity, booster pumps at the treatment facility, booster stations for the high-pressure zones, and elevated storage tank storage volume. For wastewater, it includes trunk sewers, pumping stations, force mains, and wastewater treatment capacity. Water mains greater than or equal to 10-inches in diameter are included in this study. It is assumed that smaller diameter mains would be paid for by developers. For wastewater for gravity flow, it is assumed that interceptor sewers are 10 to 21-inches in diameter. There are some spans of interceptor sewers that are 8-inches in diameter. It is assumed that smaller diameter sewers (8-inch and smaller) would be paid for by developers. For force mains, it is assumed that this this study covers pipes that are equal to or greater than 6-inches in diameter and that smaller diameter force mains would be paid for by developers.

This assessment includes the planning year 2042. Existing and planned land use for the City was obtained from its Comprehensive Plan last updated in 2017.

2 Background

2.1 City Background

The City of Lake Geneva is located in southeastern Walworth County. The City is located on the eastern shore of Geneva Lake. The City's 2020 population was 8,340 according to City estimates. The City owns and operates water treatment and distribution infrastructure and wastewater collection and treatment infrastructure. The City's existing water service areas extend to the Town of Lyon for the Grand Geneva Resort and Spa. Water is also provided to the Pioneer Estates Mobile Home Park in the Town of

Bloomfield and part of the Town of Lyons for the Golf Hills subdivision, and parts of the Town of Lyons for the Lake Geneva Youth Camp and Wilmot Boulevard. The City's wastewater service area also includes part of the Town of Bloomfield for the Pioneer Estates Mobile Home Park, part of the Town of Geneva for Coachmann's Terrace, and parts of the Town of Linn for the Lake Geneva Youth Camp and the Geneva Inn.

The predominant existing land uses in and around the City are Single Family Residential, Neighborhood Mixed Use, Central Business District, with some Multi-Family Residential. Public parks and recreational use of land are important as the City surrounds the eastern and northern parts of the east end of Geneva Lake. The City emphasizes high quality commercial and residential architecture making it an attractive city. In the summer months, the area in and around the City is a prime location for tourism. The City values high quality and long-term planning. Green space and environmental protection are principles for planning and development in and around the City.

The main transportation arterials are STH 12 in the northwest-southeast direction, CTH 120 in the north-south directions, and STH 50 in the east-west direction.

The City's predominant businesses are tourism and resort based. However, there are other areas that make up the economic base such as manufacturing, construction, professional services, and small-scale retail. The Lake Geneva Public School District is also a key employer in the area. According to the City's Comprehensive Plan updated in 2017, the top occupational groups are manufacturing at 23.1 %, education, health, and social services at 17.4%, and arts, entertainment, recreation, accommodation and food services at 15.7%.

2.2 Recent Development

They are several large residential developments that are in preliminary or intermediate construction stages. The Stoneridge development is on the north side of the City in an area with increased elevation. The Vistas of Lake Geneva development is on the west side of the City and consists of residential growth. The Symphany Bay development is in the southeast part of the City. This development will consist of the Planned Neighborhood land use of which residential development will be a large part. The City has completed some planning for this development already. At full build out, this development will likely require an expansion of the East Interceptor trunk sewer. This development along with other planned development in the south part of the planning area may require replacing the existing private Pioneer Estates pumping station with a larger, City-owned sanitary pumping station. All three developments are platted but not dedicated to the City yet.

There may be plans for a large commercial development northeast of STH 12 and east of CTH 120. A formal proposal for this development has not been brought forward to the City.

2.3 Water System

The City's water system is supplied by four wells. The wells are enumerated as Wells Nos. 2, 3, 4, and 5. The total reliable supply capacity, with the largest source out of service, is 3,530 gallons per minute (gpm) or 5.1 million gallons per day (MGD). The water distribution system has three pressure zones: the Dodge pressure zone, the Host pressure zone, and the Center pressure zone. The Dodge and Host Zones are separated by main valves. The Center Zone is separated by a pressure reducing valve. The Dodge and Center pressure zones are supplied by booster stations that are fed from the Host pressure zone. The wells and treatment facilities are located within the Host pressure zone.

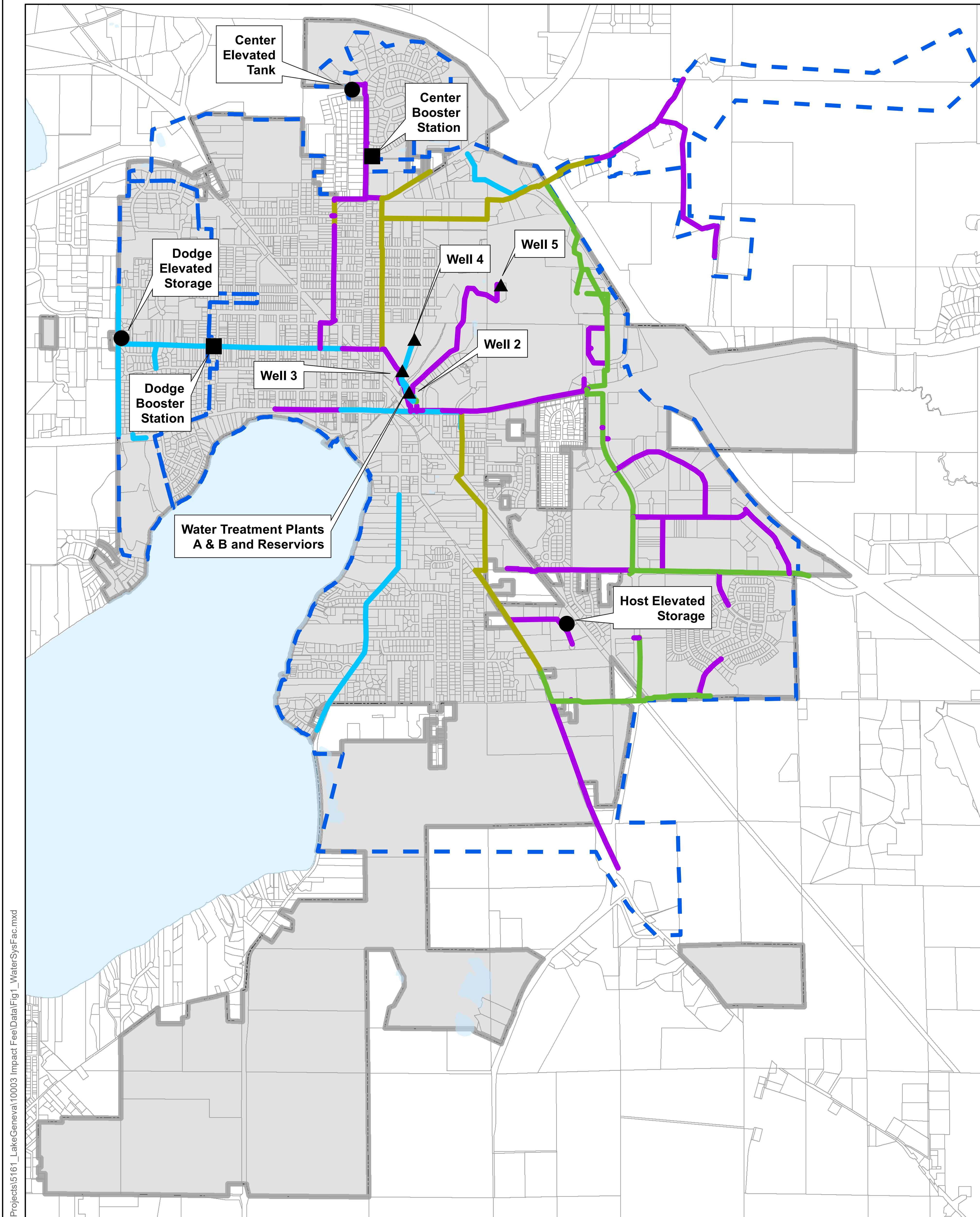
Water from each well is chlorinated and then pumped to one of three reinforced concrete reservoirs at the water treatment site. The reservoirs have slat tray aerators at the top. There are two redundant treatment plants – Plant A and Plant B. The plants operate in parallel staggered mode. Each plant can draw water from any of the three reservoirs. At each treatment plant, iron removal is performed using chlorination with sodium hypochlorite and rapid sand filtration. Sodium hypochlorite is injected at each well site, allowing the iron oxidation process to start. Plant A was constructed in 1957 and consists of three pressure filter vessels which operate together. Plant B was constructed in 1975 and includes one large pressure filter vessel. After filtration, the water is then chlorinated using gas chlorine for disinfection, fluoridated, and treated with polyphosphate for corrosion inhibition. Each water plant has its own set of vertical turbine booster pumps for distribution to the City's system. The booster pumps draw from the reservoir system, pump water through the pressure filter(s), and to the distribution system. Plant A and Plant B each have three booster pumps.

Booster stations are used to pump water from the Host pressure zone to the Dodge and the Center pressure zones which are higher in elevation. Three elevated storage tanks are used throughout the distribution system, one in each pressure zone. The Host zone elevated storage tank is a composite-type and has a volume of 1.5 million gallons (MG). The Center High Pressure zone has a spheroid type elevated storage tank with a volume of 0.2 MG. It is supplied by a booster station off Center Street with three end suction pumps. The Dodge High Pressure zone is a spheroid-type elevated storage tank with a volume of 0.2 MG. This storage tank was raised by 30 feet in 2020 to provide the required pressure for the Vistas development in the northwest corner of the City. The increased pressure will also accommodate planned development west of the City. It is supplied by a booster station on Dodge Street with two end suction pumps.

Figure 1 shows the existing water system with mains greater than or equal to 10-inches in diameter, wells, reservoirs, treatment plants A and B, booster stations, elevated storage tanks, pressure zones, and the overall water service area.

2.4 Water System Existing Capacities

Table 1 shows the well and booster pump station capacity at the wells and in each pressure zone with the reliable supply flow rates. Table 2 shows the water storage capacity in each pressure zone. Table 3 shows the reliable supply analysis with the supply pumps in the Host Zone and the booster pumps in the Dodge and Center zones. There is an excess of supply in each pressure zone. Table 4 shows the existing treatment capacity analysis. Table 5 shows the existing storage analysis. Under existing demand conditions, all three storage reservoirs have excess storage. There are a number of footnotes at the bottom of Table 5 with the assumptions of the analysis.



Date: November 2022

Water Facilities

- Booster Station
- Water Tower
- Well

Main Size

- 10"
- 12"
- 14"
- 16"
- Water Pressure Zones
- City Limits

Figure 1

Existing Water Distribution System Mains and Facilities

Water and Wastewater Utilities Impact Fee Study

0 1,000 2,000 4,000

Feet

CITY OF LAKE GENEVA

Ruekert·Mielke

Table 1: Well and Booster Station Pump Capacity Summary

SUPPLY SOURCE	Supply Capacity (gpm)	Supply Capacity (MGD)	Booster Pump Capacity (gpm)	Booster Pump Capacity (MGD)
HOST PRESSURE ZONE				
Wells				
Well 2	1,000	1.44		
Well 3	1,180	1.70		
Well 4	1,350	1.94		
Well 5	1,400	2.02		
Booster Pumps				
Plant A 1-A			1,800	2.59
Plant A 2-A			1,125	1.62
Plant A 3-A			1,200	1.73
Plant B 1-B			1,000	1.44
Plant B 2-B			1,300	1.87
Total Pumping Supply Capacity	**4,930**	**7.10**	**6,425**	**9.25**
Less: Largest Supply Unit	1,400	2.02	1,800	2.59
Reliable Supply: Host Pressure Zone	**3,530**	**5.08**	**4,625**	**6.66**
DODGE PRESSURE ZONE				
Booster Pumps				
Dodge St. Booster Station #1			910	1.31
Dodge St. Booster Station #2			910	1.31
Total Pumping Supply Capacity			**1,820**	**2.62**
Less: Largest Supply Unit			910	1.31
Reliable Supply: Dodge Pressure Zone			**910**	**1.31**
CENTER PRESSURE ZONE				
Booster Pumps				
Fire Pump [1]			*500*	*0.72*
Booster Pump #1			120	0.17
Booster Pump #2			120	0.17
Total Pumping Supply Capacity			**240**	**0.35**
Less: Largest Supply Unit			120	0.17
Reliable Supply: Center Pressure Zone			**120**	**0.17**

[1]The fire pump is included when considering fire storage, but it is not considered as part of the reliable supply capacity.

Table 2: Water Storage Capacity Summary

Storage Facility Name	Description	Capacity (gal)	Year Constructed	Pressure Zone
Tower #1 – Dodge Tower	Elevated Storage Tank	200,000	1970	Dodge
Tower #2 – Host Tower	Elevated Storage Tank	1,500,000	1996	Host
Tower #3 – Center Tower	Elevated Storage Tank	200,000	2006	Center
Reservoir #1	Ground Reservoir	98,750	1917	-
Reservoir #2	Ground Reservoir	160,500	1917	-
Reservoir #3	Ground Reservoir	300,000	1970	-

Table 3: Supply Analysis

Supply Requirements	Capacity (gpm)	(MGD)
HOST PRESSURE ZONE		
Existing Average Day Demand	1,040	1.50
Existing Maximum Day Demand	1,660	2.39
Existing Reliable Supply Capacity	3,530	5.08
Reliable Supply Capacity Excess or (Deficit)	**1,870**	**2.69**
Utilization of Reliable Capacity in Existing Demands	47%	
DODGE PRESSURE ZONE		
Existing Average Day Demand[1]	63	0.09
Existing Maximum Day Demand[1]	214	0.31
Existing Reliable Supply Capacity	910	1.31
Reliable Booster Capacity Excess or (Deficit)	**696**	**1.00**
Utilization of Reliable Capacity in Existing Demands	24%	
CENTER PRESSURE ZONE		
Existing Average Day Demand[2]	4	0.01
Existing Maximum Day Demand[2]	18	0.03
Existing Reliable Supply Capacity	120	0.17
Reliable Booster Capacity Excess or (Deficit)	**102**	**0.15**
Utilization of Reliable Capacity in Existing Demands	15%	

[1] Average and Maximum Day Demands for the Dodge Pressure Zone are taken from 2018 pumping records

[2] Average and Maximum Day Demands for the Center Pressure Zone are estimated based on pressure zone acreage and existing land use

Table 4: Treatment Capacity Analysis

Treatment Facility	Capacity (gpm)	Capacity (MGD)
Treatment Plant A		
Filter #1-A	600	0.86
Filter #2-A	600	0.86
Filter #3-A	600	0.86
Treatment Plant B		
Filter #1-B	1,000	1.44
Total Treatment Capacity	**2,800**	**4.03**
Less: Largest Filter Unit	1,000	1.44
Reliable Treatment Capacity	**1,800**	**2.59**
Existing Maximum Day Demand	1,660	2.39
Reliable Treatment Capacity Excess or (Deficit)	**140**	**0.20**
Utilization of Reliable Treatment in Existing Demands	**92%**	

Table 5: Storage Analysis

Storage Requirements	Dodge Storage Tank[4]	Center Storage Tank	Host Storage Tank
Pressure Zone	Dodge	Center	Host
Total Available Storage (gallons)	200,000	200,000	1,500,000
Population Equivalent	1,189	98	19,586
Average Use (gpd)	90,954	7,492	1,497,732
Peaking Factor (Average Day: Maximum Day)	3.4	2.7	1.6
Maximum Day Demand (gpd)	308,000	19,881	2,390,000
Equalizing Storage (gallons)[1]	47,000	3,000	359,000
Required Fire Storage (gallons)[2]	180,000	180,000	630,000
Reserve Storage (gallons)[3]	41,000	33,000	175,000
Subtotal Capacity Recommended (gallons)	**268,000**	**216,000**	**1,164,000**
Less: Excess Available for pumping for Fire Flow	83,533	71,903	336,650
Total Recommended Storage (gallons)	**184,467**	**144,097**	**827,350**
Percent Storage Utilization:	92.2%	72.0%	55.2%
Storage Excess or (Deficit):	**15,533**	**55,903**	**672,650**

[1] Equalizing Storage Volume estimated at 15% of maximum day demand (Peak Hour estimated at 1.6 times Maximum Day Demand).

[2] Assumes a fire flow of 3,500 gpm with a duration of 3 hours for commercial areas, and a flow of 1,500 gpm with a duration of 2 hours for residential areas.

[3] Reserve storage provides start/stop range for pump operation and an emergency reserve storage supply. Assumed to be 15% of total storage volume.

[4] Average use, maximum day use, and the peaking factor for the Dodge pressure zone are taken from 2018 pumping records

2.5 Wastewater System

The wastewater system is comprised of the collection system and the treatment system.

In the collection system, there are seven interceptors ranging in size from 8-inch to 21-inch. The interceptor sewers have a variety of pipe materials including PVC, clay, reinforced concrete pipe, and vitrified clay pipe. The sewers the City considers interceptors are: Dodge Street, East, George Street, Lake North Central, Lake North, Lake Shore Drive, and North. Collector sewers, typically sized at 8-inch diameter, feed into the interceptors. There are nine pumping stations in the collection system. The privately owned Pioneer Estates pumping station is in the Town of Bloomfield and serves the Pioneer Estates Mobile Home Park southeast of the City. The pumping stations are the submersible duplex type with an exterior control panel and disconnects. Most pump stations do not have a permanent standby generator. The City uses several portable trailer-mounted generators for standby power. The electrical control panel at the stations has a plug-in receptacle for the portable generators. The pump station firm capacities are shown in Table 6 below.

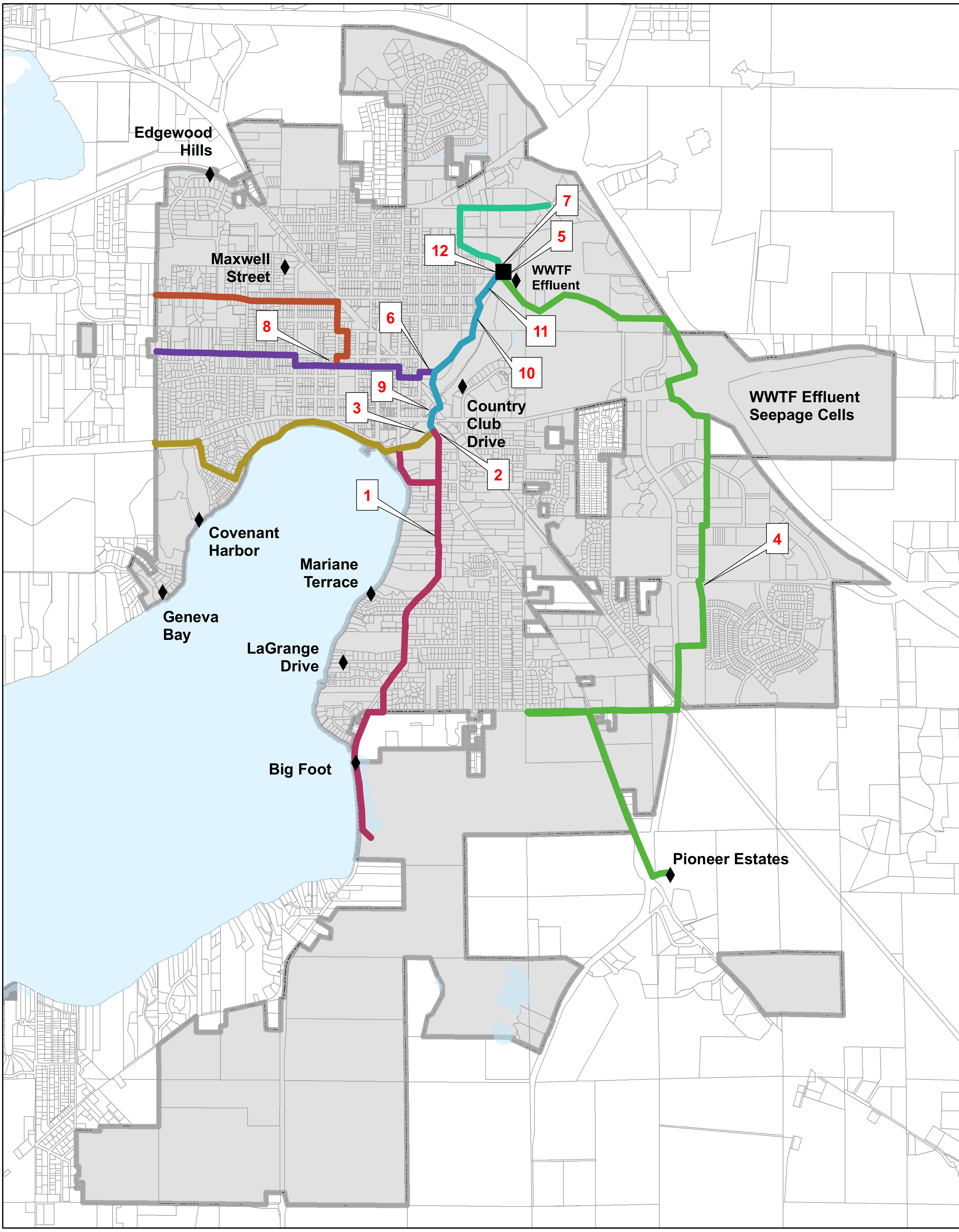
Table 6 Summary of Existing Pumping Stations

Pumping Station	Firm Capacity / Pressure
LaGrange Drive	100 gpm at 114 ft. TDH
Country Club Drive	143 gpm at 37 ft. TDH
Covenant Harbor	105 gpm at 21.3 ft. TDH
Edgewood Hills	150 gpm at 71 ft. TDH
Geneva Bay	108 gpm at 21 ft. TDH
Mariane Terrace	100 gpm at 31 ft. TDH
Maxwell Street	50 gpm at 40 ft. TDH
Bigfoot	325 gpm at 150 ft. TDH
Pioneer Estates	198 gpm

All wastewater is directed to the wastewater treatment facility (WWTF) located at the east end of Haskins Street. The WWTF processes consist of influent screening to remove rags and debris, a grit removal system with an induced vortex at the center of a spherical tank, influent submersible pumping, organic treatment in a three-channel oxidation ditch in the Orbal© configuration, and final clarification with two 65-foot diameter suction header type clarifiers. The final clarifier effluent is directed to a pumping station at the WWTF where it is pumped through a 20-inch diameter, approximate 5,500-foot long, force main to a series of seepage cells at the far east edge of the City. At the seepage cells, the effluent seeps into the ground and recharges the groundwater. The geologic formations at this location allow the water to seep deep under the ground surface.

The solids process consists of waste activated sludge (WAS) routed to a gravity thickener/aerobic digestion process. Here, the biosolids are further aerobically digested in four tanks. The supernatant is routed back the head end of the WWTF. Solids are thickened in the tanks from approximately 0.8 % solids by weight to 2.5% solids by weight. Solids are then pumped to a belt press where cake with approximately 17% solids by weight is formed. Filtrate from the press is routed back the head end of the WWTF. The belt press and biosolids cake is stored in a metal pole-building type storage building.

Figure 2 shows the interceptors sewers and pumping stations in the collection system along with the WWTF, the WWTF effluent force main, and the seepage cells. Private pumping stations, except for the Pioneer Estates station, are not shown in Figure 2.



Date: November 2022

12 Sewer Capacity Analysis Point
Wastewater Treatment Facility
Pumping Station
Dodge Street Interceptor
East Interceptor
George Street Interceptor
Lake North Central Interceptor
Lake North Interceptor
Lake Shore Drive Interceptor
North Interceptor
City Limits

Figure 2

Existing Wastewater Collection System and Facilities

Water and Wastewater Utilities Impact Fee Study

0 1,000 2,000 4,000
Feet

CITY OF LAKE GENEVA

Ruekert·Mielke

2.6 Wastewater System Existing Capacities

An assessment was done for the remaining capacities for the wastewater flow rates and WWTF influent pollutant loadings. In this approach, the design capacities were first identified. The actual capacities were then derived. The difference between the two is the remaining capacity.

A representative storm on September 11th and 12th, 2022, was considered for peak hour flows at the WWTF. This storm is considered an approximate 25-year event with 4.96 inches of rain falling in approximately 24 hours reported on September 12th based on a National Weather Service rain gage at the WWTF. The recurrence interval was derived from the National Oceanic and Atmospheric Administration Point Precipitation Frequency Estimates. The recurrence interval is likely lower as the distribution of rainfall was more spread out (greater than 24 hours) than indicated by local reporting. WWTF influent flow meter records indicate a peak hour flow rate of 3.62 MGD took place on September 11th. The recurrence interval for this storm is likely between a 25-year and 10-year event.

Monthly Discharge Monitoring Reports and annual Compliance Maintenance Annual Report data was used to compile WWTF records of flow rates and pollutant loadings.

The WWTF flow rate and pollutant loading capacities are shown in Table 7 below. The table reflects the WWTF re-rating values implemented in 1997.

Table 7: WWTF Existing Capacity Summary

Parameter	Design Value	Present Value	Existing Capacity	Percent of Design Capacity
Ave. Monthly Flow Rate (MGD)	2.50	1.18	1.32	47
Peak Hourly Flow Rate (MGD)	5.20	3.62	1.58	70
Ave. Daily Biochemical Oxygen Demand (BOD) loading (pounds)	3,900	2,223	1,667	57
Ave. Daily Total Suspended Solids (TSS) loading (pounds)	4,100	2,709	1,391	66
Ave. Daily Total Kjeldahl Nitrogen (TKN) (pounds)	400	340	60	85

For estimated average day and peak hour flow rates at various points in the interceptor sewer system, existing land use and flow factors for land use were derived from an initial assumption of 80 gallons per capita per day (gpcd) of base flow, 2.13 people per home from the 2020 US Census, and other flow factor assumptions. For each land use, a flow factor per acre was identified and multiplied by the upstream acres and the flow factor for a particular land use type. Wisconsin Administrative Code (WAC) NR110.15 peak hour factors based on upstream population, were used to convert the wastewater base flow rates to peak hour flow rates. GIS information from the City was used to determine existing land use types and areas.

The flow factor results in Table 8 are the result of an iterative process of checking the predicated existing flow rates using the flow factors and land use areas from existing development, against the 2020 and 2021 monthly average flow rate value of 1.18 MGD. In this end, monthly average flow rates of the predicted method and the actual data from 2020 and 2021 generally agree. In addition, the flow factors in this analysis generally agree with flow factors used in previous sanitary sewer studies the City has conducted.

The land uses, associated flow factors, and assumptions, are shown in Table 8 below.

Table 8: Land Use RECs per Acre and Flow Factors

Land Use	RECs/acre	Average Daily Flow (gpm/acre)	Average Daily Flow (gpd/acre)	Assumptions/Notes
Agriculture & Vacant	0.5	0.06	85	Assumes 1 unit per 2 acres
Central Business District	5.9	0.69	1,000	Assumes 1000 gal per acre per day
Government/Institutional - Retreat Center	0.8	0.09	136	Assume 60 residents and 25 staff per table 3.4 of USEPA Onsite Wastewater Treatment Systems Manual
Government/Institutional - Other	1.2	0.14	200	Assumes 200 gal per acre per day. Includes churches, government offices, etc.
Government/Institutional - School	5.4	0.63	914	55 total acres per GIS, assumes 25 gallons per student per day
Industrial	2.6	0.31	450	Assumes 450 gal per acre per day
Multi-Family Residential	2.9	0.35	500	Assumes 500 gal per acre per day
Planned Business	2.9	0.35	500	Assumes 500 gal per acre per day
Planned Mixed Use	2.9	0.35	500	Assumes 500 gal per acre per day
Planned Mixed Use (Hotel)	7.0	0.83	1,200	Assumes 29 guests and 4 staff per acre, 40 and 10 gpd per guest and staff per table 3.4 of USEPA Onsite Wastewater Treatment Systems Manual
Planned Neighborhood	2.5	0.30	426	Assumes 2.5 units per acre
Planned Office	1.2	0.14	204	Assumes 20 employees per acre and 13 gallons per day per employee per table 3.4 of USEPA Onsite Wastewater Treatment Systems Manual
Single Family Exurban	1.0	0.12	170	Assumes 1 unit per acre
Single Family Residential	3.0	0.36	511	Assumes 3 units per acre
Two-family/Townhouse Residential	4.0	0.47	682	Assumes (2) 2-unit townhomes per acre
Planned Neighborhood (1 house/acre)	1.0	0.12	170	Assumes 1 unit per acre

The interceptor sewers were analyzed at the points as shown in Figure 2. Interceptor sewer capacities were calculated based on sewer size, pipe material, Mannings N values for an associated pipe material, and slopes. City data was used for the interceptor sewer sizes and inverts. Where missing City data was encountered between two known invert locations, interpolation was used to estimate a logical value. For the Lake Shore Drive Interceptor, there was very little invert elevation information. For this interceptor, an assumed minimum slope based on WAC for an associated pipe size was used per Table 1 of the DNR-NR 110 code.

The interceptor sewer capacities, estimated existing peak hour flow rates, and remaining capacities at various points are summarized in Table 9 below. The locations where the peak flow and pipe capacity were estimated are generally the endpoint of the interceptors before they join another interceptor. To give a more complete analysis of the collection system, up to ten upstream manhole spans were also considered for each interceptor. The minimum of the upstream manhole span capacity is included in Table 9.

Table 9: Interceptor Sewer Existing Capacity Summary

Pipe At Location					
Location	**Interceptor Sewer**	**Diameter (in)**	**Existing Estimated Peak Hour Flow Rate (cfs)**	**Estimated Minimum Pipe Capacity (cfs)**	**Existing Remaining Capacity cfs)**
1	Lake Shore Drive	8	0.61	0.90	0.29
2	Lake Shore Drive	12	0.72	9.75	9.02
3	Lake North	14	0.99	2.50	1.51
4	East	18	1.25	6.33	5.08
5	East	21	2.52	5.01	2.49
6	Dodge Street	12	0.91	7.19	6.28
7	North	18	0.28	4.30	4.02
8	George Street	8	0.39	1.27	0.87
9	Lake North Central	18	1.66	6.20	4.53
10	Lake North Central	21	1.99	8.78	6.79
11	Lake North Central	21	2.17	32.31	30.14
12	Lake North Central	30	4.55	11.60	7.05

Pipe W/ Min Capacity Upstream of Location					
Location	**Interceptor Sewer**	**Pipe Diameter (in)**	**Existing Estimated Peak Hour Flow Rate (cfs)**	**Estimated Pipe Capacity (cfs)**	**Existing Remaining Capacity cfs)**
1	Lake Shore Drive	8	0.61	0.90	0.29
2	Lake Shore Drive	8	0.72	2.2	1.52
3	Lake North	14	0.99	1.93	0.94
4	East	18	1.25	4.3	3.05
5	East	21	2.52	2.92	0.40
6	Dodge Street	8	0.91	0.6	(0.35)
7	North	10	0.28	2.50	2.22
8	George Street	8	0.39	0.8	0.41
9	Lake North Central	18	1.66	6.20	4.53
10	Lake North Central	18	1.99	3.6	1.65
11	Lake North Central	21	2.17	5.01	2.84
12	Lake North Central	30	4.55	11.6	7.05

Pump station runtimes during the September 11th and 12th storm were not available. For each pumping station, the average daily total pump runtime along with pumping rates from City records were used. A peaking factor of 5:1 was used to derive the existing peak hour flow rates at each pumping station. This value was then compared against the station firm pumping capacity.

For the force mains, the capacities were derived using a velocity of 6 feet per second. At this velocity, the water hammer phenomenon where water can separate in the pipeline upon a sudden stop in pumping caused by a pump failure of loss of normal utility power, is minimized. The relevant pumping station and force main information is included in Table 10. The results show that in general, there is a significant amount of remaining capacity at the pumping stations and force mains.

Table 10 Pumping Station and Force Main Capacity Summary

Pump Station (Firm Capacity)[1]	Average Pumping Rate (gpm)	Peak Hour Pumping Rate (gpm)[3]	Remaining Peak Hour Capacity (gpm)	Percent of Firm Pump Capacity	Force main size (inch)/capacity (gpm)	Force Main Add'l Capacity (gpm)	Percent of Force Main Design Capacity
Bigfoot (325 gpm)	29.1	145.6	179	45%	6" / 530 gpm	384	27%
Country Club Drive (143 gpm)	20.8	104.2	39	73%	4" / 240 gpm	136	43%
Covenant Harbor (105 gpm)	6.4	32.2	73	31%	4" / 240 gpm	208	13%
Edgewood Hills (150 gpm)	6.8	33.8	116	23%	4" / 240 gpm	206	14%
Geneva Bay (108 gpm)	1.0	4.9	103	5%	4" / 240 gpm	235	2%
LaGrange Drive (100 gpm)	8.5	42.5	58	42%	4" / 240 gpm	198	18%
Mariane Terrace (100 gpm)	5.6	27.9	72	28%	4" / 240 gpm	212	12%
Maxwell Street (50 gpm)	0.4	1.8	48	4%	4" / 240 gpm	238	1%
Pioneer Estates (159 gpm)[2]	31.7	158.6	0	100%	N/A	0	100%

[1] From 2018 lift station pumping records

[2] Lift station operation history is not available for Pioneer Estates Lift Station. The Pioneer Estates Lift Station serves approximately 268 homes, or 571 people and has a average flow of 45,680 gpd, assuming 80 gpcd, and has a peak hour demand of 159 gpm, assuming a peaking factor of 5. The firm capacity is assumed to be equal to the peak hour demand.

[3] Assuming a peaking factor of 5:1

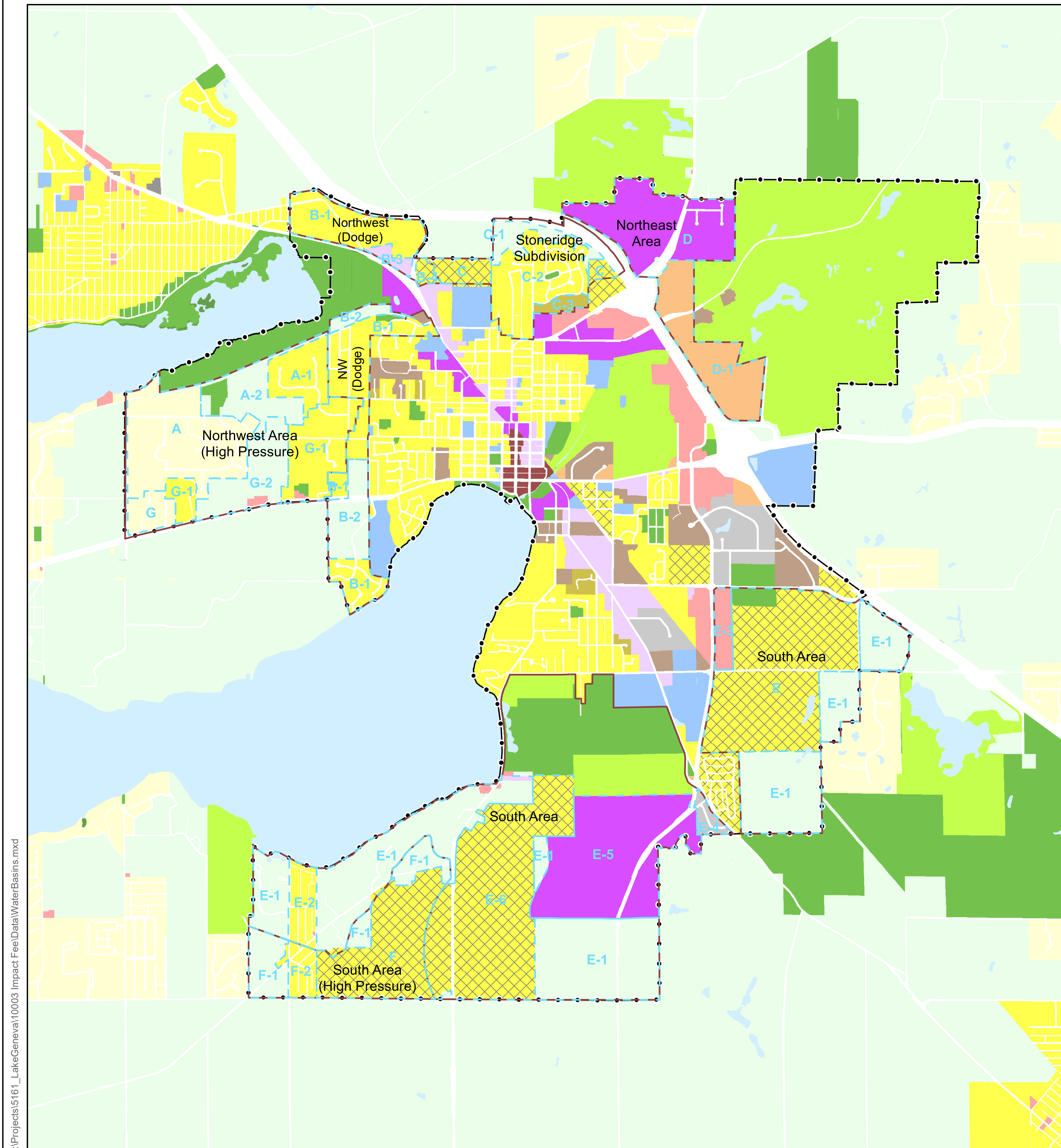
3 Study Areas

The study area was determined by the existing corporate boundary of the City, existing service areas for water and wastewater and considering what could be developed or served by water and sewer in the next 20 years. The same study area was used for water and wastewater. Areas already served by water and wastewater were included in the study area but were not included in the analysis. Areas that are unlikely for development (e.g., environmental corridors and wetlands) were included in the gross area but were not included in the growth analysis. The Grand Geneva resort was included in the overall study area since it is served by City water, but not included in the growth analysis since it is already served. For wastewater, this area is served by its own private on-site wastewater treatment system.

For water, the overall area was broken up into the existing and future likely pressure zones based on topography with the higher elevation areas requiring a high pressure zone. These were the Northwest High Pressure, the Stoneridge Subdivision High Pressure Zone, the Northeast Pressure Zone, the South Zone and the South High Pressure Zone. Each pressure zone was denoted with a letter. Within each pressure zone, the areas were further broken up by similar land use type and denoted with a number after the letter. Each area with similar land use type in each pressure zone were denoted with the same letter and number combination. Figure 3 shows the water pressure zones, subareas, and land uses.

For wastewater, the overall study area was broken up by sewershed with a unique letter identifier. Within each sewershed, areas of similar land use were grouped together and further denoted with a number after the letter. Figure 4 shows the wastewater sewersheds, subareas, and land uses.

The land uses considered in this study are consistent with the City's amended Comprehensive Plan completed in 2017. These are listed in the previous Table 8 along with the flow factors and assumptions.



Date: February 2023

Figure 3

Water System Study Area

Water and Wastewater Utilities Impact Fee Study

Future Land Use
- Single Family Exurban
- Single Family Residential
- Two-Family/Townhouse Residential
- Multi-Family Residential
- Planned Neighborhood
- Planned Office
- Neighborhood Mixed Use
- Planned Mixed Use
- Planned Business
- Central Business District
- Government/Institutional
- Industrial
- Planned Industrial
- Public Park & Recreation
- Private Recreation
- Agriculture & Vacant
- Wetland
- Water
- Study Area
- Sub-Basins

N W E S

0 1,500 3,000 6,000
Feet

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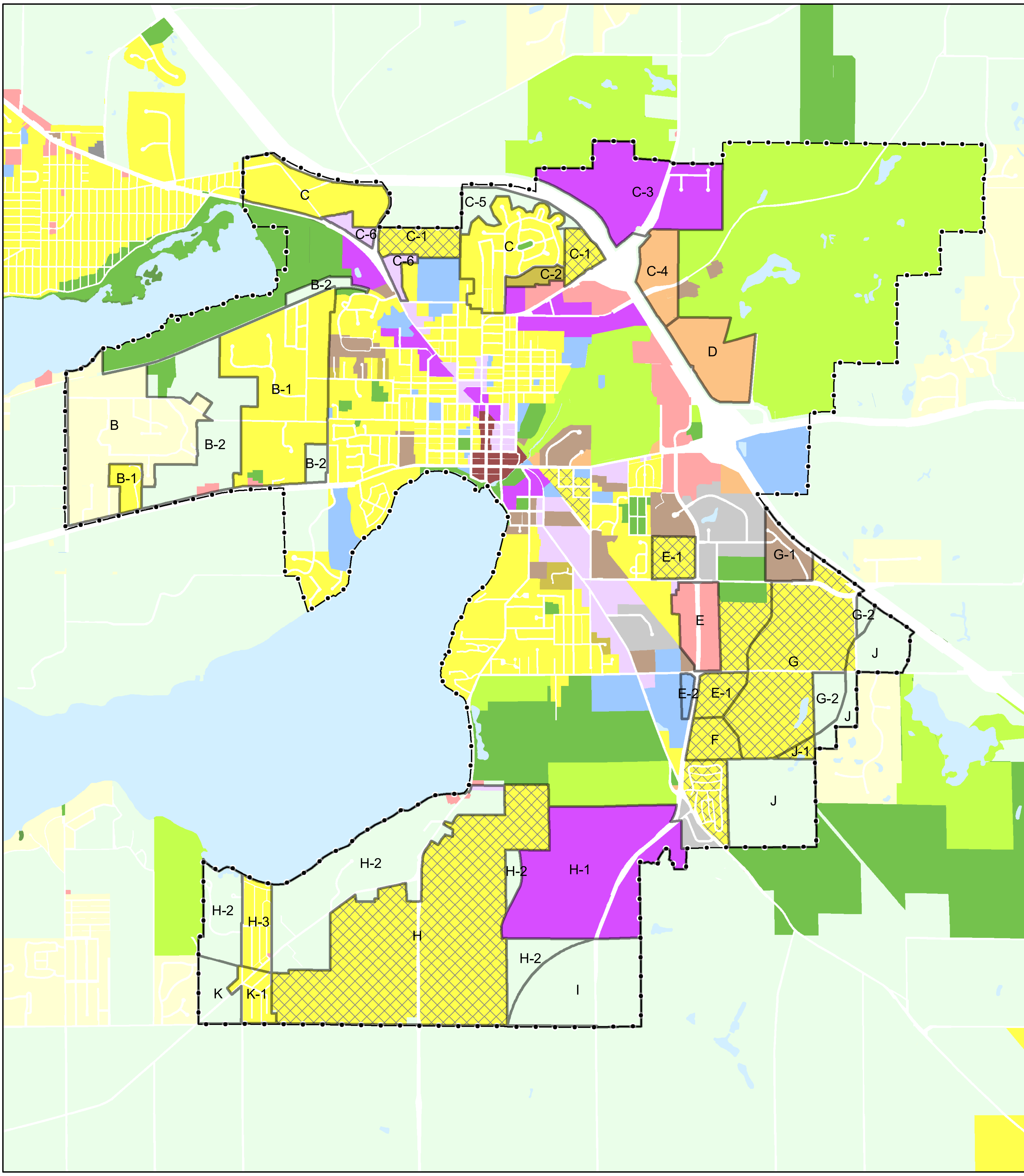

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Date: November 2022

Figure 4

Wastewater System Study Area

Water and Wastewater Utilities Impact Fee Study

Future Land Use

- Single Family Exurban
- Single Family Residential
- Two-Family/Townhouse Residential
- Multi-Family Residential
- Planned Neighborhood
- Planned Office
- Neighborhood Mixed Use
- Planned Mixed Use
- Planned Business
- Central Business District
- Government/Institutional
- Industrial
- Planned Industrial
- Public Park & Recreation
- Private Recreation
- Agriculture & Vacant
- Wetland
- Water
- Study Area
- Wastewater SubBasins

0 1,500 3,000 6,000

Feet

4 Water System Expansion

In Section 2.3, the water system was analyzed to determine the capacity of the existing water system. This section analyzes how much more system capacity is needed to accommodate future developments. The water demands, supply and storage capacities, and treatment capacity are analyzed in the following subsections.

4.1 Water System Demands

The City's water consumption was estimated using the utility's WEGS (Water, Electric, Gas, and Sewer) reports as published by the PSC (Public Service Commission). The total pumped volume of water pumped from all sources for 2021 was 546.7 MG, or 1.498 MGD. The 2021 WEGS shows that the total water sold to residential customers in the year 2021 was 159,873,000 gallons. With 4,150 residential customers, it was found that the average residential customer uses 106 gallons per day (gpd). Per the 2020 US Census, each household contains approximately 2.13 people, therefore, the average resident is estimated to use 50 gpd of water. However, to account for the fact that a considerable number of residences in the City are occupied only part of the year, the per capita daily water demand was increased to 65 gpd for the planning and sizing of future facilities. This level is consistent with per capita water usage levels from other similar communities in Wisconsin. This is the water demand that was used to project future incremental demand from future developments.

For all land use types, approximations were made to estimate the number of Residential Equivalent Connections (RECs) per acre. For example, based on the total water sold to multifamily customers, it was estimated that multifamily land use is equal to 2.9 RECs per acre. Other land uses with their respective RECs/acre and assumptions are included in Table 8.

The water study areas are summarized by future land use type in Table 11. The total number of RECs within each study area was found by multiplying the developable acreage of each land use type by the RECs/acre in Table 8. The population equivalent was then found by multiplying the number of RECs in each study area by 2.13 people per household. The average water demand from each study area was estimated assuming 65 gpcd (gallons per capita per day, or gallons per population equivalent per day). It was also assumed that 15% of the total water pumped, in addition to consumer demand, would be the result of non-revenue water and distribution system leakage. All study areas and their estimated average daily water consumption are summarized in Table 11.

To estimate the total future water demand with the study areas fully developed, the estimated water consumption for the study areas of 0.978 MGD was added to the existing daily demand of 1.498 MGD to get a total daily water demand of 2.476 MGD. Maximum Day Demand was estimated by applying a peaking factor that is based on population.

Table 11: Future Water Demand by Study Area

Water Study Area	Land Use	Total Area (acres)	Developable Area (acres)[1]	RECs per acre	Total RECs	Population Equivalent	Usage (gpd)	Non-Revenue Demand (gpd)[2]	Average Demand (gpd)
Northwest Area (PRV Pressure Zone)									
A	Single Family Exurban	257	180	1.0	180	383	24,907	4,395	29,303
A-1	Single Family Residential	78	55	3.0	165	351	22,783	4,020	26,803
A-2	Agriculture & Vacant	103	72	0.5	36	77	4,986	880	5,866
	SUBTOTAL	**438**	**307**		**380**	**810**	**52,676**	**9,296**	**61,972**
Northwest Area (Dodge Pressure Zone)									
B-1	Single Family Residential	307	215	3.0	645	1,374	89,288	15,757	105,044
B-2	Agriculture & Vacant	98	69	0.5	34	73	4,743	837	5,580
B-3	Planned Mixed Use	14	10	2.9	29	63	4,072	719	4,791
B-4	Planned Neighborhood	11	8	2.5	20	43	2,781	491	3,272
	SUBTOTAL	**431**	**302**		**729**	**1,552**	**100,885**	**17,803**	**118,688**
Stoneridge Area (Center Pressure Zone)									
C	Planned Neighborhood	46	32	2.5	80	171	11,114	1,961	13,075
C-1	Agriculture & Vacant	43	30	0.5	15	32	2,098	370	2,468
C-2	Single Family Residential	160	112	3.0	336	716	46,537	8,212	54,749
C-3	Two-family/Townhouse Residential	18	12	4.0	49	105	6,842	1,207	8,050
	SUBTOTAL	**267**	**187**		**481**	**1,024**	**66,591**	**11,751**	**78,342**
Northeast Area (Host Pressure Zone)									
D	Planned Mixed Use (Hotel)	238	166	7.0	1,171	2,494	162,121	28,610	190,731
D-1	Planned Office	167	117	1.2	141	300	19,469	3,436	22,905
	SUBTOTAL	**405**	**283**		**1,312**	**2,794**	**181,590**	**32,045**	**213,636**
South Area (Host Pressure Zone)									
E	Planned Neighborhood	463	324	2.5	810	1,726	112,198	19,800	131,998
E-1	Agriculture & Vacant	876	613	0.5	307	653	42,469	7,494	49,963
E-2	Single Family Residential	54	38	3.0	114	242	15,755	2,780	18,536
E-3	Planned Business	35	25	2.9	72	154	9,996	1,764	11,760
E-4	Planned Industrial	20	14	2.6	36	77	4,993	881	5,875
E-5	Planned Mixed Use	363	254	2.9	746	1,590	103,331	18,235	121,565
E-6	Planned Neighborhood (1 house/acre)	482	338	1.0	338	719	46,732	8,247	54,979
	SUBTOTAL	**2,294**	**1,606**		**2,423**	**5,161**	**335,475**	**59,201**	**394,676**
South Area (New Pressure Zone)									
F	Planned Neighborhood (1 house/acre)	230	161	1.0	161	343	22,269	3,930	26,199
F-1	Agriculture & Vacant	112	78	0.5	39	83	5,427	958	6,384
F-2	Single Family Residential	39	27	3.0	81	172	11,194	1,975	13,169
	SUBTOTAL	**380**	**266**		**281**	**598**	**38,890**	**6,863**	**45,752**
Northwest Area (New Pressure Zone)									
G	Single Family Exurban	40	28	1.0	28	59	3,853	680	4,533
G-1	Single Family Residential	157	110	3.0	329	702	45,609	8,049	53,658
G-2	Agriculture & Vacant	114	80	0.5	40	85	5,535	977	6,512
	SUBTOTAL	**311**	**218**		**397**	**846**	**54,997**	**9,705**	**64,703**
	TOTAL	**4,526**	**3,168**		**6,003**	**12,786**	**831,104**	**146,665**	**977,769**

[1] Developable acres assumed to be 70% of total acres

[2] Non-revenue water and system leakage is assumed to be 15% of the total Average Demand.

4.2 Supply and Storage Analysis

The City's existing facilities including wells, booster stations, storage facilities, distribution system, and treatment system, were analyzed to determine whether they have the capacity to support the future developments and to determine how much more capacity is needed.

In Table 12, it is found that the existing reliable capacity of the wells of 3,530 gpm is sufficient to provide for the estimated future Maximum Day Demand of 2,743 gpm with an excess reliable supply of 787 gpm. The reliable booster capacity of Dodge booster station, which feeds the Dodge pressure zone, also surpasses the Maximum Day Demand with an excess capacity of 429 gpm. At full build-out of the future development, the Center booster station is expected to have a maximum day demand of 129 gpm, resulting in a deficit of 9 gpm in the booster station capacity. This 9-gpm deficit can be resolved through minor modifications to the booster station and is not included in the cost estimates for the impact fees.

It was found that two new pressure zones, one in the Northwest Area and one in the South Area, will be necessary in the future, each with new booster stations. The new pressure zone in the South Area is represented by the “F” subbasins in Table 11 and in Figure 3. The South Area New Pressure Zone will need a new booster station with a reliable supply of at least 88 gpm that will be supplied from the Host Pressure Zone.

The Dodge Tower was recently raised by 30 ft to a water surface elevation of 1,109 ft. Therefore, the highest ground elevation that can be served within the Dodge Pressure Zone with a static water pressure of 35 psi is 1,028 ft. However, the elevations Northwest Area range from 850 ft to 1,060 ft. Therefore, it was found that a new high-pressure zone will be necessary to serve the areas that exceed 1,020 ft in elevation.

The new pressure zone in the Northwest Area is represented by the “G” subbasins Table 11 and in Figure 3. The northwest portion of the Northwest Area drops in elevation as it approaches Lake Como. This area will require a Pressure Reducing Vault (PRV) to avoid excessive pressures throughout the distribution system. Therefore, a Northwest PRV Zone (“A" subbasins) is included that will be fed from the Northwest High Pressure Zone. The booster station for the Northwest Pressure Zone will be served from the existing Dodge Pressure Zone and will need a capacity at least 201 gpm.

Two PRV’s will be necessary to delineate the PRV Zone: one PRV (PRV-1) to serve water subbasins A and A-2, and another (PRV-2) to serve subbasin A-1. PRV-1 will be installed on the future 10-inch water main on McDonald Rd and is included in the cost estimate. PRV-2 will be installed on a future 8-inch water main on Lake Forest Ln and is not included in the cost estimate because it is assumed to be paid for directly by developers.

Table 12: Future Supply Analysis

Supply Requirements	Capacity (gpm)		Capacity (MGD)
Host Pressure Zone			
Future Average Demand	1,719		2.48
Peaking Factor		1.60	
Future Maximum Day Demand	2,743		3.95
Existing Reliable Supply	3,530		5.08
Reliable Supply Capacity Excess or (Deficit)	**787**		**1.13**
Utilization of Reliable Supply in Future Demands		**78%**	
Dodge Pressure Zone (Northwest Area)			
Future Average Day Demand	234		0.34
Peaking Factor		2.06	
Future Maximum Day Demand	481		0.69
Existing Reliable Booster Capacity	910		1.31
Reliable Booster Capacity Excess or (Deficit)	**429**		**0.62**
Utilization of Reliable Booster Capacity in Future Demands		**53%**	
Center Pressure Zone (Stoneridge Subdivision)			
Future Average Day Demand	54		0.08
Peaking Factor		2.37	
Future Maximum Day Demand	129		0.19
Existing Reliable Booster Capacity	120		0.17
Reliable Booster Capacity Excess or (Deficit)	**(9)**		**(0.01)**
Utilization of Reliable Booster Capacity in Future Demands		**107%**	
South Area Pressure Zone (New Pressure Zone)			
Future Average Day Demand	32		0.05
Peaking Factor		2.46	
Reliable Booster Station Capacity Needed [1]	**78**		**0.11**
Northwest Pressure Zone (New Pressure Zone) [2]			
Future Average Day Demand	88		0.13
Peaking Factor		2.28	
Reliable Booster Station Capacity Needed [1]	**201**		**0.29**

[1] Assumed to be equal to Maximum Day Demand

[2] The Northwest New High Pressure zone (the "G" subbasins) will need a new booster station. The new booster station will be be supplied from the existing Dodge Pressure Zone. The Northwest New High Pressure zone will also supply the Northwest PRV Zone (the "A" subbasins)

The storage capacities were analyzed to determine the minimum amount of equalizing storage, fire storage, and reserve storage. The equalizing storage is assumed to be equal to 15% of the Maximum Day Demand. The fire storage volume assumes a fire flow of 1,500 gpm with a duration of 2 hours (180,000 gallons) for storage tanks that serve only residential areas, namely the Dodge and the Center towers as well as the future storage tank in South Area. The Host Tower serves a variety of residential, commercial, and industrial areas, therefore, a fire flow rate of 3,500 gpm with a duration of 3 hours (630,000 gallons) was used to size the fire storage. The reserve storage is assumed to be 15% of the total storage capacity.

Water systems are required to be able to provide the minimum fire storage under Maximum Day Demand conditions. Therefore, any supply capacity more than the Maximum Day Demand can be deducted from the fire flow storage. For example, the Host Tower has an excess supply capacity of 787 gpm. With a fire flow duration of 3 hours, the total excess pumping volume available for fire flow is 141,616 gallons. The Center pressure zone has a 500-gpm fire pump that is included in this calculation, providing 60,000 gallons pumping available for fire flow. For the South Area (High Pressure), which is a new pressure zone, the reliable supply capacity is assumed to be equal to the Maximum Day Demand.

The total recommended storage capacities for the new elevated storage tank in the South Area (High Pressure) as well as for each of the existing elevated storage tanks are included in Table 13. It was found that the Center Tower and the Host Tower have enough storage capacity to meet all future development within the study areas. The Dodge Tower will need an additional 83,537 gallons of storage to meet the demands of the future developments. Rather than adding another elevated storage tank, this storage deficit may be resolved by increasing the fire flow pumping capacity of the booster station. With a fire flow duration of one hour, a 700-gpm fire pump would provide 84,000 gallons of pumping volume available for fire flow, eliminating the need for additional storage. Site impovements may be needed for the additional fire pump.

However, the City has indicated that through past water modeling activities, it has been found that the supply main to the Dodge Booster is flow-limiting. With the addition of a 700-gpm fire pump, the total reliable fire pumping capacity would be 1,610 gpm. To accommodate the added flow, the supply main along Dodge Drive should be upsized from 10-inch to 12-inch. After this upgrade, installing a 700-gpm fire pump would provide an additional 84,000 gallons available for fire flow. This would lower the minimum recommended storage capacity enough to allow the existing 200,000-gallon storage tank to meet future demands.

The South Area (High Pressure) will require a new elevated storage tank with a minimum storage capacity of 232,000 gallons and a new booster station with a reliable capacity of 78 gpm. For cost estimating, a nominal storage volume of 240,000 gallons was used.

It was determined that the Northwest Area (High Pressure) will not require its own elevated storage facility. Hydropneumatic tanks could be used to sustain pressure on the system and to provide pump protection for a much lower cost than an elevated storage tank.

Table 13: Future Storage Analysis

	New Storage Facility	Existing Elevated Storage Tanks		
	South Area (High Pressure)	Dodge Tower (Northwest Area)	Center Tower (Stoneridge Study Area)	Host Tower
Future Population Equivalent	598	4,398	1,024	32,372
Average Use (gpd)	45,752	336,316	78,342	2,475,500
Peaking Factor (Average Day: Maximum Day)	2.5	2.1	2.4	1.6
Maximum Day Demand (gpd)	112,461	692,845	185,730	3,950,271
Equalizing Storage (gallons)[1, 2]	17,000	104,000	28,000	593,000
Required Fire Storage (gallons)[3]	180,000	180,000	180,000	630,000
Reserve Storage (gallons)[4]	35,000	51,000	37,000	216,000
Subtotal Capacity Recommended (gallons)	232,000	335,000	245,000	1,439,000
Less: Excess Available for pumping for Fire Flow (gallons)[5]	-	51,463	60,000	141,616
Total Recommended Storage (gallons)	**232,000**	**283,537**	**185,000**	**1,297,384**
Total Available Storage (gallons):		**200,000**	**200,000**	**1,500,000**
Percent Storage Utilization:		**141.8%**	**92.5%**	**86.5%**
Storage Capacity Excess or (Deficit):		**(83,537)**	**15,000**	**202,616**

[1] Assumes supply equals maximum day demand for new storage facilities.

[2] Equalizing Storage Volume estimated at 15% of maximum day demand (Peak Hour estimated at 1.6 times Maximum Day Demand).

[3] Assumes a fire flow of 3,500 gpm with a duration of 3 hours for commercial areas, and a flow of 1,500 gpm with a duration of 2 hours for residential areas.

[4] Reserve storage provides start/stop range for pump operation and an emergency reserve storage supply. Assumed to be 15% of total storage volume.

[5] If the reliable pumping capacity is greater than the maximum day demand, then the excess can be considered as available for fire flow pumping. The total excess pumpage volume over the fire flow duration can be subtracted from the total recommended storage capacity. The Center Booster Station has a 500-gpm fire flow pump that is included as excess pumping.

4.3 Distribution System

The future developments described in this report will significantly increase the flow rates through the distribution system and will require the construction of new water mains to provide water to the study areas. Several key locations throughout the distribution system were analyzed to determine if the existing distribution piping has enough capacity for the future development. The locations that were analyzed include the elevated storage discharge/feed piping, the discharge piping from the treatment system, and the discharge piping from the booster stations. The results are summarized in Table 14.

In Table 14, the pipe capacity is analyzed under both existing and future flow conditions. The elevated storage tank discharge piping was analyzed in fire flow conditions, where the supply pumping is supplying its respective reliable capacity and the reservoir is supplying fire flow. The flow at the Center booster station is assumed to be supplying its reliable supply capacity of 120 gpm plus 500 gpm from the existing fire pump totaling at 620 gpm. The Dodge Booster Station does not currently have a fire pump, but a fire pump is recommended in this report. Therefore, the Dodge Booster station is assumed to be supplying its reliable capacity of 910 gpm under existing conditions, but under future demand conditions, the station is assumed to be supplying both reliable supply capacity of 910 gpm and 700 gpm of fire pumping, resulting in a future flow of 1,610 gpm.

Per the AWWA (American Water Works Association) Manual M-32, it is recommended that the velocity within water mains not exceed 5 ft/s and that the head loss not exceed 7 ft. per 1,000 ft. of pipe (7 ft/1,000 ft). From this analysis, it is recommended that the 12-inch supply piping for the Host Tower be replaced with 18-inch piping to meet both future and existing fire flow demands. This is an existing deficiency of the water system. It is also recommended that the 10-inch discharge piping from the Dodge Booster Station be replaced with 12-inch piping to accommodate demand from future developments.

New 10-inch, 12-inch, and 14-inch water mains will be necessary to provide water to the study areas. The Northwest area will require approximately 16,900 LF (linear feet) of 10-inch water mains. The Northeast Area will require approximately 5,600 LF of 10-inch water mains. And the South Area will require 16,600 LF of 10-inch, 8,500 LF of 12-inch, and 6,500 LF of 14-inch water mains. All water distribution piping smaller than 10 inches that is required for the future developments is assumed to be paid directly by the developers.

Table 14: Water Main Capacity Analysis

	Elevated Storage Tank Feed/Discharge Piping					
Pipe Location/Description	**Host Tower Feed/Discharge Line**		**Dodge Tower Feed/Discharge Line**		**Center Tower Feed/Discharge Line**	
Pipe Diameter (in)	12		16		12	
Hazen Williams Coefficient	130		130		130	
Calculations	**Existing**	**Future**	**Existing**	**Future**	**Existing**	**Future**
Fire flow (gpm)	3,500	3,500	1,500	1,500	1,500	1,500
Velocity (ft/s) [1]	9.9	4.4	2.4	2.4	4.3	4.3
Headloss (ft/1000 ft of pipe) [1]	25.7	3.6	1.3	1.3	5.4	5.4
Recommended Pipe Size (in)	**18**		-		-	

	Supply/Booster Station Discharge Piping			
Pipe Location/Description	**Dodge Booster Station Discharge**		**Center Booster Station Discharge**	
Pipe Diameter (in)	10		12	
Pipe Material	PVC		PVC	
Hazen Williams Coefficient	130		130	
Calculations	**Existing**	**Future [3]**	**Existing**	**Future**
Booster Station Capacity Including Fire Pump(s) (gpm) [2]	910	1,610	620	630
Velocity (ft/s) [1]	3.7	4.6	1.8	1.8
Headloss (ft/1000 ft of pipe) [1]	5.2	6.1	1.0	1.1
Recommended Pipe Size (in)	**12**		-	

[1] Per AWWA Manual M-32, it is recommended that the velocity in water mains not exceed 5 ft/s and that the headloss does not exceed 7 ft per 1000 ft of pipe.

[2] Equal to the supply/booster flow during Maximum Day Demand. Includes the existing fire pump flow of 500 gpm for Center Booster Station, and 500 gpm from the future recommended fire pump at the Dodge Booster Station

[3] The future supply capacity for the Dodge Booster Station includes a future 700-gpm fire pump to increase the pumping capacity during a fire event. This allows for reduced fire storage (see Note 5 of Table 13).

4.4 Treatment Analysis

The City's existing water treatment facilities were analyzed, and it was determined that the treatment system will require an additional 943 gpm of treatment capacity to meet future demands, as summarized in Table 15.

Table 15: Treatment Capacity Analysis Under Future Demand Conditions

Treatment Facility	Capacity (gpm)	Capacity (MGD)
Treatment Plant A		
Filter #1-B	600	0.86
Filter #2-B	600	0.86
Filter #3-B	600	0.86
Treatment Plant B		
Filter #1-A	1,000	1.44
Total Treatment Capacity	**2,800**	**4.03**
Less: Largest Filter Unit	1,000	1.44
Reliable Treatment Capacity	**1,800**	**2.59**
Future Maximum Day Demand	2,743	3.95
Reliable Treatment Capacity Excess or (Deficit)	**(943)**	**(1.36)**
Utilization of Reliable Treatment in Future Demands	**152%**	

Alternatives for iron removal were explored to increase the capacities of the treatment processes. Lake Geneva's existing iron removal facilities consist of hypochlorination and pressure sand filtration. Other iron removal alternatives discussed in this section include the following methods:

- Oxidation & Filtration
- Iron removal using lime-softening
- Ion exchange
- Biological Filtration

4.4.1 Lime Softening

Iron can also be effectively removed through the lime softening process. This process includes adding lime (calcium hydroxide) to the raw water which raises the pH. When the pH is raised, calcium carbonate and other dissolved solids, including iron, are less soluble and begin to precipitate. The precipitated solids are allowed to settle and are removed from the water.

While effective at removing iron, lime softening is not a recommended alternative for iron removal for Lake Geneva due to high capital costs, and because of the impacts to water chemistry. The settling process requires a sedimentation basin that would provide a minimum of 2 hours of settling time for groundwater (Wisconsin DNR NR 811.57 (1)). The process would also require sludge removal equipment used for removing the settled solids. The lime softening process also would soften the water, making it more corrosive to distribution piping and water stabilization would be required. Therefore, due to the high cost of new facilities and equipment, iron removal using lime softening is not recommended for Lake Geneva.

4.4.2 Ion Exchange

Ion exchange may be used to remove iron where the concentration is less than 0.5 mg/L. Ion exchange is commonly used in water treatment for water softening and demineralization. In the ion exchange process, the water flows through a resin where less-soluble ions in the water are exchanged for more soluble ions that are found in the resin. In iron removal, the ion exchange resin can be fouled if any iron is allowed to oxidize before passing through the resin.

Most ion exchange applications for removal of iron are point-of-use treatment systems for single-family residences and industrial water. Ion exchange is not as commonly used in municipal treatment due to cost. At a large scale, ion exchange is typically more expensive than other treatment alternatives. In addition, the City's raw water iron concentration is significantly higher than 0.5 mg/L. For these reasons, ion exchange is not a recommended treatment alternative for iron removal for Lake Geneva.

4.4.3 Biological Filtration

Another emerging technology for iron removal is biological filtration. The biological filtration process is hydraulically similar to the pressure filtration process, however, rather than using a chemical process to form a precipitate that is filtered out, the iron is oxidized by bacteria. The oxidized iron is then retained in the filter. Biological iron filtration is a proprietary patented system by Infilco Degremon, Inc under the name of Ferazur®. Infilco Degremon also produces a biological manganese filter under the name Mangazur®.

For the process to function, the environment within the filter vessel is conditioned to foster growth of iron-oxidizing bacteria and cannot be done with all groundwater. The water quality characteristics that are necessary to foster the growth of the iron-oxidizing bacteria are listed below:

- PH: 6.5 - 7.2
- Temperature: 50° to 77°F)
- Dissolved Oxygen: 1 to 3 mg/L (usually achieved through aeration)
- Water must be free of the following:
    - Chlorine
    - Hydrogen Sulfide
    - Heavy metals
    - Ammonium nitrogen
    - Phosphates
    - Organics
    - Hydrocarbon (benzene, methane, etc.)

Biological filtration, where feasible, can offer lower capital and operating costs than comparable physical/chemical processes because it produces less waste and often allows for a filter loading rate that is higher than most conventional filters. The waste that is produced by biological filters is more compact than waste that is produced by chemical oxidation resulting in less waste product and longer filter run times between backwashes. Typically, biological filters can have a filter loading rate that ranges from 8-24 gpm/ft^2, which is higher than most conventional filter media.

Biological filtration is not a recommended alternative unless Lake Geneva's existing iron removal facilities need to be replaced in entirety. However, if Lake Geneva's existing iron removal facilities cannot be expanded to meet future demands, biological filtration may be considered. If biological filtration is feasible with the raw-water characteristics of Lake Geneva's groundwater, the biological filtration alternative may offer higher treatment capacity without the need for larger facilities or expanding the treatment building. Biological filtration may also require less capital and operational costs than conventional oxidation-filtration facilities. This option is not recommended unless the existing iron filtration facilities cannot be retrofitted or expanded to meet future demands.

4.4.4 Oxidation and Filtration

The oxidation-filtration process for iron removal includes using an oxidizing agent to oxidize iron, causing it to precipitate. The precipitated material is then filtered from the water. The process typically involves the following steps:

1. **Oxidation:** An oxidizing agent, such as oxygen, chlorine, potassium permanganate, etc., is added to the raw water.

2. **Detention**: Detention allows for contact time between the iron and the oxidizing agent. The soluble iron is oxidized and forms a filterable precipitate. Minimum contact time can vary greatly depending on the oxidizing agent and the raw water quality.
3. **Clarification**: A clarification process is sometimes used to allow the precipitated iron to settle where it is removed as a sludge. Clarification is typically not necessary where the iron concentration is below 5-10 mg/L.
4. **Filtration**: A pressure filter is used to filter out the precipitated iron compounds. Typical filter media includes sand, or a variation of manganese dioxide coated media.

Different variations of oxidizing agents and filter types are discussed below. Table 16 shows several different oxidizing agents that can be used for iron removal. Oxidizing agents that are commonly used in municipal water treatment facilities are oxygen and chlorine. Lake Geneva's existing iron removal process includes oxygen as an oxidant which is injected using slat tray aerators in the storage reservoirs, and the addition of chlorine using hypochlorite injection at the wells.

Potassium permanganate, ozone, and chlorine dioxide offer much faster reaction times, but when used to remove iron alone, they are not typically as economical as chlorine or oxygen. Potassium permanganate provides the most benefit when it is used to remove manganese. Ozone and chlorine dioxide are also powerful oxidizing agents that can be used for iron removal, but they are typically more expensive than potassium permanganate and chlorine due to chemical costs of chlorine dioxide, and equipment costs of ozonation equipment.

Table 16: Oxidizing Agents for Iron Removal (adapted from "Iron and Manganese Removal Handbook, AWWA 2015)

Oxidant	Dosage Required (mg oxidant per mg Fe^{2+})	pH	Reaction Time for Iron Oxidation
Oxygen (aeration)[1]	0.14	> 7.5	15 min
Chlorine[1]	0.64	> 8.0	15-30 min
Potassium Permanganate[2]	0.94	> 5.5	<20 sec
Ozone	0.43	-	Instantaneous
Chlorine Dioxide	1.2	> 5.5	10 sec

[1]Used in Lake Geneva's existing iron removal process
[2]Significantly longer reaction time when iron is complexed with natural organic matter

After the oxidation process, the oxidized iron is filtered out through a media filter. There are several different alternatives for filter media that are commonly used, including sand, greensand, manganese dioxide-coated sand, manganese dioxide ore, and Anthrasand. Sand filters are perhaps the most economical way to remove iron, providing low maintenance and high removal rates. Greensand, which is a glauconite mineral that is coated in manganese dioxide, can also be used for iron removal but it provides the most benefit when used in the removal of manganese. Greensand media requires the injection of potassium permanganate to continuously regenerate its manganese dioxide coating, making it more expensive than conventional sand filters in both capital and operational costs. Another alternative, manganese dioxide-coated sand, provides higher filter loading rates than a typical sand filter and does not require the injection of potassium permanganate to regenerate the coating. Manganese dioxide-coated sand provides about 2-4 times the filter loading rate of a conventional sand filter. Other filter media alternatives include manganese dioxide (pyrolusite) ore and Anthrasand. These alternatives exhibit similar filtration characteristics as manganese-coated sand. Table 17 presents a summary of each of the filter media.

Table 17: Filter Media Alternatives

Filter Media	Description/Notes	Typical Filter Loading Rate
Sand	Sand, appropriately sized for filtration. Most economical option.	3 gpm/ft^2
Greensand or Greensand Plus	Greensand is a sand-like glauconite coated in a layer of manganese dioxide. Requires the use of potassium permanganate to regenerate the coating. Greensand Plus is a synthetic version of greensand that is not derived from glauconite. Greensand Plus was created due to a limited supply of glauconite.	Up to 3 gpm/ft^2
Manganese Dioxide-Coated Sand	Exhibits properties similar to Greensand. Does not require regeneration using potassium permanganate. More available than greensand	6-12 gpm/ft^2
Manganese Dioxide Ore (Pyrolusite)	Pyrolusite is naturally occurring manganese dioxide. Often requires air scouring in the backwash process. More expensive than manganese dioxide-coated sand.	Up to 15 gpm/ft^2
Anthrasand	Base material of anthracite coal and silica sand, coated in manganese dioxide.	Based on pilot testing

Lake Geneva's existing filters are pressure sand filters. The filters provide adequate iron removal. However, the system has a reliable treatment capacity of 1,800 gpm (2.59 MGD), which is sufficient to supply the design maximum day demand of 1,660 gpm (2.39 MGD). The future developments discussed in this study are expected to raise the maximum day demand to 2,743 gpm (3.95 MGD). The treatment system must be expanded to meet these demands.

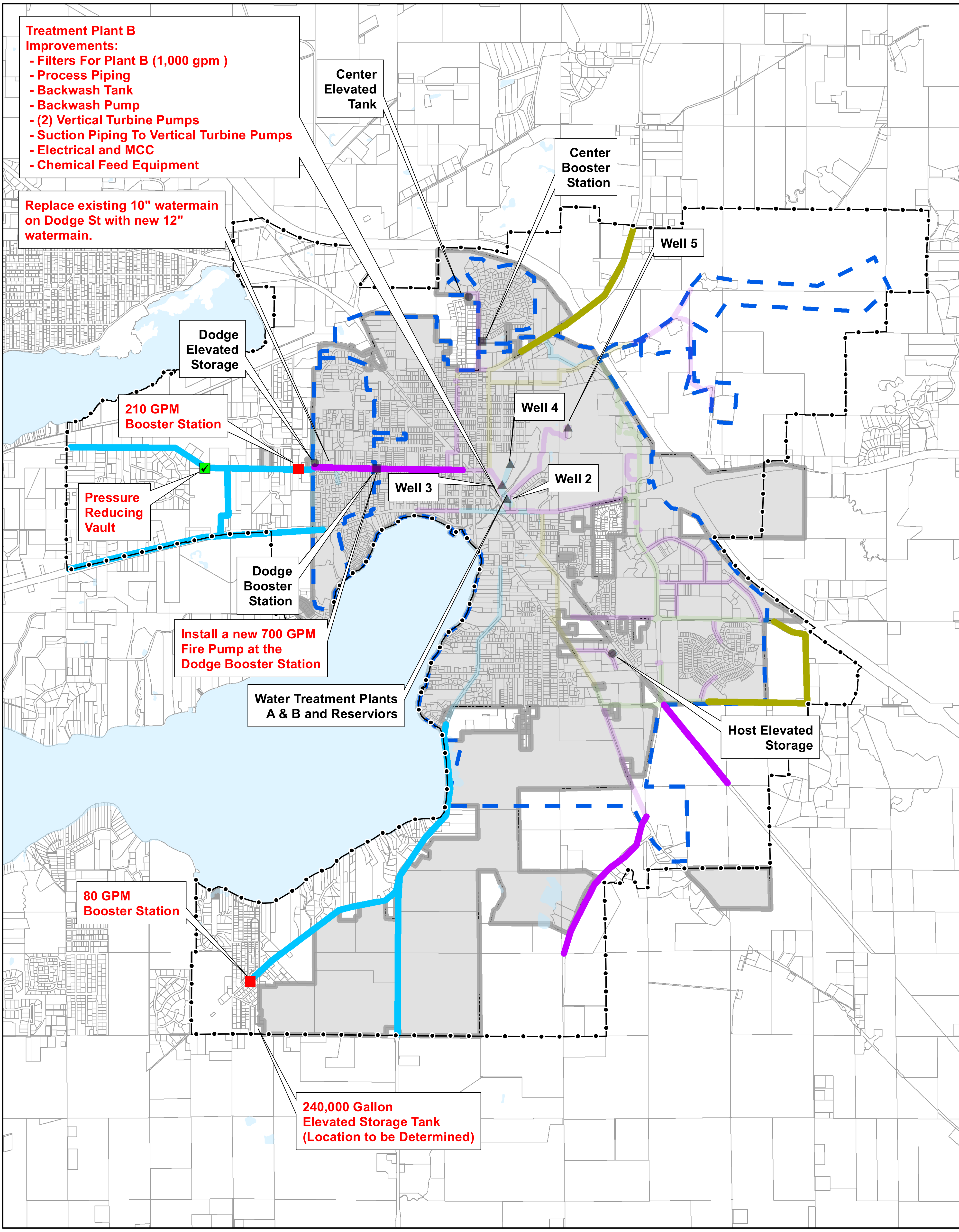
It is recommended that Lake Geneva expand its treatment system by installing new filter vessels at Plant B with manganese dioxide coated sand media. This type of filter media typically provides much higher filter loading rates that conventional sand media. Therefore, a conventional sand filter system would typically be much larger than a manganese dioxide coated sand filter system with a comparable capacity. The new filters vessels would operate in parallel with the existing one large pressure filter and provide the needed redundancy. The new system would consist of new independent suction piping from the reservoirs, two new vertical turbine booster pumps sized with 150 Hp motors, the pressure vessels, associated electrical work, and associated discharge process piping modifications at the connection to the main transmission main from the existing pressure filter at Plant B. The new filters would have a higher pressure drop across the filters compared to the existing filter since they would be operating at increased hydraulic loading rate. There is space in the existing building at Plant B for the additional pressure vessels, piping, and electrical components required.

4.4.5 Summary of Recommended Water System Improvements

The improvements to the water system facilities that are recommended to accommodate future development are summarized in Table 18 below. Figure 5 shows the proposed water system improvements.

Table 18: Recommended Water System Improvements

Location/Study Area	Description
Water Mains and Distribution	• 1,400 LF of 18” Water Mains From the Host Tower • 2,100 LF of 12” Water Mains From the Dodge Booster Station • 16,900 LF of 10" Water Main - Northwest Area • 5,600 LF of 10" Water Main - Northeast Area • 16,600 LF of 10" Water Main - South Area • 8,500 LF of 12" Water Main - South Area • 6,500 LF of 14" Water Main - South Area
Booster Stations and Storage	• 700 gpm Fire Pump – Dodge Booster Station • 240,000-gal Elevated Storage Tank – South Pressure Zone • 80 gpm Booster Station – South Pressure Zone • 210 gpm Booster Station – Northwest Pressure Zone
Treatment System, Plant B	• Filters with Manganese Dioxide-Coated Sand Media with Associated Mechanical and Electrical Work. • Two Additional Vertical Turbine Filter Feed Pumps with Associated Mechanical and Electrical Work and Suction Piping From Reservoirs.



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Date: January 2023

Existing Water Facilities
- Booster Station
- Water Tower
- Well

Exisiting Water Mains
- 10"
- 12"
- 14"
- 16"
- Water Pressure Zones

Proposed
- Booster Station
- Pressure Reducing Vault

Future Water Mains
- 10"
- 12"
- 14"
- Study Area
- City Limits

Figure 5

Proposed Water Distribution System Mains and Facilities

Water and Wastewater Utilities Impact Fee Study

N W E S

0 1,500 3,000 6,000

Feet

CITY OF LAKE GENEVA

Ruekert·Mielke

5 Wastewater System Expansion

5.1 WWTF

Wastewater at the WWTF was estimated with the same flow factors that were used in the existing capacity analysis as shown in Table 8. The flow factors were multiplied by the planned areas of different types of development as shown in Figure 2. Table 19 shows the RECs, population equivalent, and average flow for each sewer study area.

Table 19: Future Wastewater Demand by Study Area

Sewer Study Area	Land Use	Total Area (acres)	Developable Area (acres)[1]	RECs per acre	Total RECs	Population Equivalent[2]	Average Flow (gpd)[3]
B	Single Family Exurban	295	207	1.0	207	440	35,211
B-1	Single Family Residential	345	241	3.0	724	1,543	123,419
B-2	Agriculture & Vacant	240	168	0.5	84	179	14,290
C	Single Family Residential	278	195	3.0	584	1,244	99,551
C-1	Planned Neighborhood	79	55	2.5	138	294	23,498
C-2	Two-family/Townhouse Residential	18	12	4.0	50	106	8,445
C-3	Planned Mixed Use (Hotel)	232	162	7.0	1,142	2,432	194,544
C-4	Planned Office	65	46	1.2	55	116	9,318
C-5	Agriculture & Vacant	42	29	0.5	15	31	2,505
C-6	Planned Mixed Use	29	20	2.9	59	125	10,010
D	Planned Office	102	72	1.2	86	183	14,643
E	Planned Business	72	50	2.9	148	315	25,200
E-1	Planned Neighborhood	75	53	2.5	131	280	22,395
E-2	Government/Institutional - Other	10	7	1.2	8	18	1,400
F	Planned Neighborhood	40	28	2.5	71	150	12,017
G	Planned Neighborhood	315	221	2.5	552	1,175	93,993
G-1	Multi-Family Residential	48	33	2.9	98	208	16,625
G-2	Agriculture & Vacant	43	30	0.5	15	32	2,576
H	Planned Neighborhood (1 house/acre)	713	499	1.0	499	1,063	85,047
H-1	Planned Mixed Use	363	254	2.9	745	1,587	126,980
H-2	Agriculture & Vacant	451	316	0.5	158	336	26,904
H-3	Single Family Residential	55	39	3.0	116	248	19,824
I	Agriculture & Vacant	196	137	0.5	69	146	11,701
J	Agriculture & Vacant	249	174	0.5	87	186	14,856
J-1	Planned Neighborhood	10	7	2.5	18	38	3,071
K	Agriculture & Vacant	52	37	0.5	18	39	3,113
K-1	Single Family Residential	38	27	3.0	80	171	13,705
	TOTAL	**4,456**	**3,119**		**5,956**	**12,686**	**1,014,843**

Notes
1. Use 70% of gross area for net developable area.
2. Use 2.13 people per household based on 2020 Census.
3. Use 80 gpcd for ave. daily flow per REC.

For the WWTF flow rates monthly average and peak hour rates were considered. The existing and incremental average daily flow rates are added together to determine the projected monthly average flow rates. The existing peak hour to monthly average flow rate ratio is 3.1:1. This is a relatively low peaking factor and is reflective of the significant lining work that the City has completed throughout the collection system in the last 20 years. To be conservative, a slightly higher peaking factor of 3.2:1 is used to calculate the projected peak hour flow rate. It is understood that the City will have to continue its successful program to monitor and address inflow and infiltration to maintain this low peaking factor into the future.

For pollutant loading, the following per capita pollutant loading rates were used:

BOD: 0.17 pounds per day (from WAC NR1110.15 (4)(b))

TSS: 0.20 pounds per day (from WAC NR1110.15 (4)(b))

TKN: 0.03 pounds per day (from an assumed per capita daily volume of 80 gallons and a typical concentration of 38 mg/L)

The per capita loadings were multiplied by the projected incremental population equivalent value of 12,686 and added to the existing loadings to derive the projections for full development in the area.

The existing, incremental, and total flow rates and pollutant loadings for the WWTF are summarized in Table 20.

Table 20: WWTF Projected Flow Rates and Loadings

Parameter	Design Value	Existing	Projected Incremental Flow Rate or Loading	Projected Total Flow Rate or Loading	Excess/(Deficit) Compared to Design Value
Ave. Monthly Flow Rate (MGD)	2.50	1.18	1.01	2.19	0.31
Peak Hourly Flow Rate (MGD)	5.20	3.62	3.25	6.87	(1.67)
Ave. Daily Biochemical Oxygen Demand (BOD) loading (pounds)	3,900	2,223	2,157	4,380	(480)
Ave. Daily Total Suspended Solids (TSS) loading (pounds)	4,100	2,709	2,537	5,246	(1,146)
Ave. Daily Total Kjeldahl Nitrogen (TKN) (pounds)	400	340	322	662	(262)

Numerous unit processes will need to be upgraded at the WWTF. Some facilities need upgrades because the design flow rates will be exceeded, and others because the pollutant loadings will be exceeded. Other upgrades are required for the hydraulics with the higher peak hour flow rate through the WWTF. The following sections detail the parts of the WWTF that need to be expanded.

The WWTF presently has an influent perforated plate screen rated for 5.2 MGD. At flow rates greater than this, the velocity of the water through the perforations is great enough that solids can be pulled through the screen instead of remaining on the upstream side. Space for a second screen to be operated in parallel with the existing screen is provided in a channel that is presently blocked off and used as a manual screen when the existing screen is non-operable because of maintenance. The second screen will have a washer/compactor at the first-floor level of the headworks building that will be like the existing washer/compactor at this floor level for the existing screen. Both washer/compactors will discharge to the existing dumpster. The cleaned and compressed screenings will be disposed of in a landfill.

The existing grit removal process consists of a concrete channel downstream of the screening process leading to a cylindrical tank. In this tank, centrifugal forces, induced with a motorized paddle, act to separate grit and heavier particles from the lighter particles and clear water. The grit and heavier particles accumulate in the center of the tank while the lighter particles and clear water accumulate at the edge of the channel. Another channel at a tangent to the cylindrical tank, allows the de-gritted water to flow downstream to the influent pumping wet well. A self-priming pump conveys the grit from the center of the cylindrical tank to a grit washer at the finished floor level. The existing concrete channels and cylindrical tanks cannot be expanded because of space constraints. The peak hour flow rate is the governing condition when removing grit since at this condition most grit is transported from the collection system to the WWTF. To accommodate the increased peak hour flow rate to 6.87 MGD, a larger motor will be added to the paddle assembly to increase its rotational speed. A variable speed drive assembly will be used with the paddle motor. New controls will be set up so that the paddle speed is proportional to the instantaneous flow rate through the headworks. It is assumed that the grit washer will not have to be upgraded to handle the increased temporary grit loading during/after higher intensity rainfall events.

Influent pumping consists of six submersible pumps with a firm capacity of 5.2 MGD. The two pumps at the end of the wet well have 15 Hp motors and are rated for 600 gpm. The four middle wet well pumps are rated for 900 gpm and have 20 Hp motors. Two of these pumps were replaced in the last couple of years and have a little excess capacity. For the projected peak hour flow rate 6.87 MGD, several upgrades will be needed for the pumps and piping. The two end-pumps will be replaced with a 1,200-gpm pump rating with 25 Hp motors. The 6-inch discharge piping from these two pumps will be replaced with 10-inch piping. The tees at the top 16-inch header will be replaced with the new size pump discharge pipe. The two center pumps that are newer will need larger impellers. New motors are not required for these pumps. The other two center pumps will be replaced with new pumps with 25 Hp motors. Each pump discharge pressure will be approximately 51 feet at the projected peak hour flow rate. With these changes, and with one larger 25-Hp pump motor out of service, the firm capacity will be 6.87 MGD.

The WWTF has historically had poor settling of biosolids from the high fats, oils, and grease (FOG) content of its wastewater from the many restaurants in service during the tourism season. A FOG removal tank is proposed downstream of the headworks and upstream of the oxidation ditch. This will improve the biosolids settling performance and eliminate the need for a third final clarifier. The tank would measure 10 feet by 25 feet by 12 feet deep and would be constructed of reinforced concrete. Wastewater would flow through the tank and FOG would collect at the surface. A tube skimming device would be used where a tube in a rotational loop, would be introduced to wastewater surface where FOG accumulates. The tube surface would attract FOG and carry it out of the wastewater to a skimming device where the FOG is collected in a dumpster for final disposal. This process would happen continuously as the tube loop rotates in and out of the FOG tank. The tank would be mostly covered with grating to allow access if needed. Plug valves upstream and downstream of the tank would isolate the tank when it would not be in service in the colder months (November through April) when tourism is not prevalent in the City and the FOG content in the wastewater is decreased. The tube skimmer device would be located under a metal shelter with a roof for protection from rainfall.

At the oxidation ditch, two new replacement aerators would be installed to provide more aeration capacity for the higher pollutant loadings. This additional aeration capacity would increase the BOD and TKN removal capacity, taking into account the higher seasonal loadings in the summer months. The new replacement aerators would be located at the north end of the ditch with a 50-Hp unit that spans the outer and middle channels, and the south end of the ditch with a 25-Hp unit that spans only the outer channel. The actual upgrade at the oxidation ditch will likely be more extensive than these upgrades to replace aeration equipment that is approaching the end of its service life. These costs are not included in the analysis.

The splitter box just upstream of the two final clarifiers has two approximately 6 foot long straight-edged weirs. The weirs at the splitter must be increased in length to keep the head above the weirs at its present maximum design with the higher peak hour flow rate. Each weir will be replaced with a fingered weir with a length of 14 feet to maintain the existing hydraulic grade-line through the facility.

The WWTF has occasional higher solids content in the effluent. The City has also questioned if preliminary clarifiers are needed to achieve better settling performance. A review of the sizing of the final clarifiers indicates that the existing clarifier hydraulic loading rate with two clarifiers on-line under peak hour flow rate conditions, is well under the WAC design code requirement of a maximum of 1,200 gallons per day per ft^2 of clarifier area. With the oxidation ditch activated sludge WWTF process type of Lake Geneva, preliminary clarifiers are not needed. Preliminary clarifiers are typically used in the conventional activated sludge process where it is important to remove a portion of the organic influent loading before the main activated sludge treatment process. Having preliminary clarifiers would produce primary biosolids that the WWTF is not equipped to manage. Primary biosolids are typically digested with an anaerobic process that the existing WWTF does not have. It would be very expensive to add an anaerobic digestion system at the WWTF. In addition, primary clarifiers are not appropriate to be added to the WWTF to improve the solids settling as they do not fit into the existing treatment scheme.

To improve the solids settling and to position the WWTF for future growth with increased flow rates, the existing clarifier feed wells can be retrofitted with a series of baffles to promote more contact of the solids in this area. The feed well is the area that the mixed liquor from the oxidation ditch is first introduced to in the final clarifiers. Presently, the clarifiers do not have these baffles at the feed wells. With the baffles, more contact of solids will occur within the mixed liquor and larger flocs of solids will be formed. These larger flocs will settle faster improving the performance of the overall final clarifier system.

Another improvement to the existing final clarifiers would be the addition of Stamford baffles. These are baffles on the outer wall of the clarifiers meant to diffuse density currents that can cause solids to carry solids up along the wall and flow to the inboard launder. The baffles help prevent this phenomenon by dissipating the energy along the wall. The baffles have proved to be successful in other WWTFs with occasional higher solids content in their effluent.

The clarifier influent well baffle system and the Stamford baffles along the outer walls will also help the WWTF manage the future needed performance of the final clarifier system with higher hydraulic and solids loading. A third final clarifier and the associated new splitter box and underground piping are not included as future WWTF improvements. The clarifier influent well baffle system and the Stamford baffles are included as future WWTF improvements.

The final clarifier effluent flows to a clear well where three vertical turbine type effluent pumps convey the treated water through a 20-inch force main to seepage cells on the far east part of the City. The effluent pumps are rated at 2,200 gpm at 92 feet TDH and have 75 Hp motors. For the projected peak hour flow with one pump out of service, the pumps need to be upsized to 2,400 gpm at approximately 94 feet TDH with 100 Hp motors. Given the age of the pumps and the unknown feasibility of the pump head being compatible with a larger motor, we recommend that the pumps be replaced in kind . The pumps will also be outfitted with variable frequency drives and new controls to maintain an approximate constant clear well water level. As the flow rate increases to the clear well, the pumping rate will increase through the use of the pump motor variable frequency drives; as the flow rate decreases, the pump rate will decrease using the drives. With the new pump controls and programming, the high level of the clear well will decrease approximately one foot to improve the hydraulics of the final clarifier effluent flowing the final clarifier effluent launders to the clear well.

To help with the WWTF hydraulics between the oxidation ditch and the final clarifiers, it is assumed the RAS pumping rate will be decreased during the projected peak hour flow rate instead of the typical 1:1 flow rate match of the RAS to the forward flow. It is assumed that at the peak hour flow rate, the RAS flow rate would be 2,000 gpm (instead of 4,800 gpm).

City staff have also indicated that the solids process at the WWTF with the belt filter press is a constraint in the overall solids handling and management process. The City reports that the output from the press is limited to approximately 16% solids by weight. The dewatered cake is stored in a building with limited storage capacity, little air movement and no sunlight. No additional drying takes place in the building. With time, the biosolids cake from the belt press slumps down and becomes water-logged, limiting the storage volume in the building. To address this issue with new growth in the City, a new sludge dewatering device is proposed. The dewatering device is a newer technology using a series of volutes to compress liquid biosolids into cake at 17-19% solids. This is higher than the solids content from the existing belt press. In addition, a biosolids dryer/dehumidifier is proposed to be added to the solids process after dewatering to dry the biosolids to above 90% solids. The dryer will greatly reduce the storage volume required and maximize the use of the existing building. It is assumed the volute press and dryer would fit within the existing pole building. This equipment is included in the future WWTF improvements.

5.2 Pumping Stations and Force Mains

The future flow rates within the sewer collection system were estimated using the area flow rates by land use type summarized in Table 8. The average flow rate coming from each sewer study area was estimated by multiplying the total developable acreage by the number RECs per acre for the corresponding land use type. Assuming 2.13 people per REC and an average sewer flow of 80 gallons per capita per day, the average flow for each study area was estimated and is summarized in Table 18. The total average flow that is expected to come from the future development of the sewer study areas is 1.01 MGD.

The study areas were analyzed to determine pumping station needs. Flows to existing and future pump stations were estimated using the area flow factors shown in Table 8. The peak hour flow rate to each pumping station was found using peaking factors as listed in Table 2 of the DNR Code NR110.

The future development within the study areas will contribute more flow to the Pioneer and Bigfoot pumping stations. The Bigfoot pump station, which has a capacity of 325 gpm, will receive flows from H, H-2, H-3, K, and K-1 and will require an additional 115 gpm to meet future demands. The Pioneer pump station, which is estimated to have a capacity of 198 gpm, will receive sewer flows from E-1, E-2, F, G, G-1, G-2, H-1, I, and J and will be completely replaced with a new 1,100 gpm facility. The future developments are expected to necessitate the construction of nine new pumping stations, as summarized in Table 21.

Table 21: Future Pumping Station Capacity Analysis

Pump Station	New Upstream Areas Served	Developable Area (acres)	Land Use	RECs	Average Flow (gpm)	Peaking Factor	Future Peak Hour Flow (gpm)	Force Main Diameter (in)	Force Main Length (ft)
NEW PUMP STATIONS									
S Lakeshore Dr	H-3, K, K-1, and a Portion of H-2	263.8	Single Family Residential	791	93.7	5	468	6	3,400
Townline Rd	G, G-2, J	181.3	Planned Neighborhood	453	53.6	5	268	6	1,300
McDonald Rd	B	206.6	Single Family Exurban	207	24.5	5	122	4	4,300
Grandview Dr	Portion of B-1	60.8	Single Family Residential	182	21.6	5	108	4	2,800
Lake Forest Cir	Portion of B-1	55.7	Single Family Residential	167	19.8	5	99	4	2,300
Sheridan Springs Rd	C-1	45.6	Planned Neighborhood	114	13.5	5	67	4	1,300
North State Rd 120	C-3	162.1	Planned Mixed Use (Hotel)	1,142	135.1	5	675	8	2,700
Park Dr	Portion of C, and C-6	85.9	Single Family Residential	258	30.5	5	152	4	4,100
South State Rd 120	H-1	435.3	Planned Mixed Use	1,277	151.1	5	756	8	2,200

Pump Station (Existing Firm Capacity)	Existing Average Flow (gpm)	New Upstream Areas Served	RECs	Future Average Flow (gpm)	Peaking Factor	Future Peak Hour Flow (gpm)	New Force Main Diameter (in)	New Force Main Length (ft)
EXISTING PUMP STATIONS[1]								
Bigfoot Pump Station	29.1	H, H-2, H-3, K, K-1	1,118	103.2	5	516	N/A[2]	N/A[2]
Pioneer Estates (198 gpm)[1]	31.7	E-1, E-2, F, G, G-1, G-2, H-1, I, J	2,080	214.5	5	1,072	10	3,300

1 Only the existing pump stations that will need modifications to accommodate future developments are shown in this table.

2 The Bigfoot Pump Station has a force that is 6-inches in diameter which has enough capacity to accommodate planned developments

5.3 Interceptor Sewers

The interceptor sewers were analyzed under future flow conditions using the Manning open flow equation in the same manner that they were analyzed under existing flow conditions, as summarized in Table 9. This analysis was used to determine whether the interceptor sewers have enough capacity for the future development.

In 2019 and 2020, MSA Professional Services, Inc. performed two in-depth sewer studies using a hydraulic model. Recommendations from these two studies are incorporated into the recommendations that result from the analysis done as a part of this study. It was found that three interceptor sewers need to be replaced with larger piping.

The sewer analysis done in this study was done using a “snapshot” method, where the interceptor sewers were analyzed at multiple locations throughout the collection system. The flow at each location was estimated by quantifying the contributing acreage of each land use type and multiplying that by the flow-area factors shown in Table 8. The “snapshots” were completed in general at the end of each interceptor sewer. For longer interceptors, such as the East, Lake Shore Drive, and Dodge Street interceptors, an analysis was done at the mid-point of the pipes. At each location where the pipe capacity was analyzed, up to ten more upstream pipe-lengths were also analyzed. To be conservative, the same peak hour flow rate was used for each upstream manhole segment.

A sewer study that was done by MSA Professional Services (MSA) in 2019 included a sewer system model of the entire sewer collection system. This model was calibrated using flow metering to improve the accuracy of the model. This study concludes that the existing sewer collection system has enough capacity to accommodate all existing sewer flows, the Symphony Bay development area (sewer study areas G-1, G-2 and half G and J) and 25% of the Southeast development area (sewer study areas E-1, F, J-1, and half of G and J). This study does not make recommendations as to which sewer interceptors should be upsized to meet future sewer flows.

A second sewer study by MSA in 2020 focused on the Southeast development area and the East Interceptor Sewer. This study concluded that the East interceptor sewer does not have enough capacity to meet expected peak flows from the future development. This MSA study recommends that the south segment of the East interceptor be upsized from an 18-in to a 24-in diameter, and that the north segment be upsized from a 21-in to a 27-in diameter.

Through the “snapshot” sewer analysis, as summarized in Table 22, it was found that portions of the Lake Shore Drive, East, and Dodge interceptors do not have enough capacity to meet future flows. It is recommended to replace parts of these interceptors with larger diameter sewers to accommodate the projected sewer flows. The “snapshot” analysis shows that only a portion of the East Interceptor needs to be replaced, however, because a more detailed analysis was done in the past where MSA recommended full replacement, it is assumed that a full replacement of this interceptor is required. The recommended diameters for these interceptor sewers are listed in Table 22.

Table 22: Interceptor Sewer Existing Capacity Summary

Pipe At Location						
Location	**Interceptor Sewer**	**Diameter (in)**	**Future Estimated Peak Hour Flow Rate (cfs)**	**Estimated Pipe Capacity (cfs)**	**Future Remaining Capacity (cfs)**	**Recommended Pipe Size (in)**
1	Lake Shore Drive	8	1.13	0.90	(0.23)	12
2	Lake Shore Drive	12	0.88	9.75	8.87	-
3	Lake North	14	1.27	2.50	1.23	
4	East[1]	18	2.78	6.33	3.55	24
5	East[1]	21	3.72	5.01	1.29	30
6	Dodge Street	12	1.44	7.19	5.74	12
7	North	18	1.72	4.30	2.58	
8	George Street	8	0.47	1.27	0.80	
9	Lake North Central	18	2.23	6.20	3.97	
10	Lake North Central	21	2.47	8.78	6.32	
11	Lake North Central	21	2.60	32.31	29.71	
12	Lake North Central	30	7.30	11.60	4.30	

Pipe W/ Min Capacity Upstream of Location						
Location	**Interceptor Sewer**	**Pipe Diameter (in)**	**Future Estimated Peak Hour Flow Rate (cfs)**	**Estimated Pipe Capacity (cfs)**	**Future Remaining Capacity (cfs)**	**Recommended Pipe Size (in)**
1	Lake Shore Drive	8	1.13	0.90	(0.23)	12
2	Lake Shore Drive	8	0.88	2.2	1.37	-
3	Lake North	14	1.27	1.93	0.66	-
4	East[1]	18	2.78	4.3	1.52	24
5	East[1]	21	3.72	2.92	(0.81)	30
6	Dodge Street	8	1.44	0.6	(0.89)	12
7	North	10	1.72	2.50	0.78	-
8	George Street	8	0.47	0.8	0.33	-
9	Lake North Central	18	2.23	6.20	3.97	-
10	Lake North Central	18	2.47	3.6	1.17	-
11	Lake North Central	21	2.60	5.01	2.41	-
12	Lake North Central	30	7.30	11.6	4.30	-

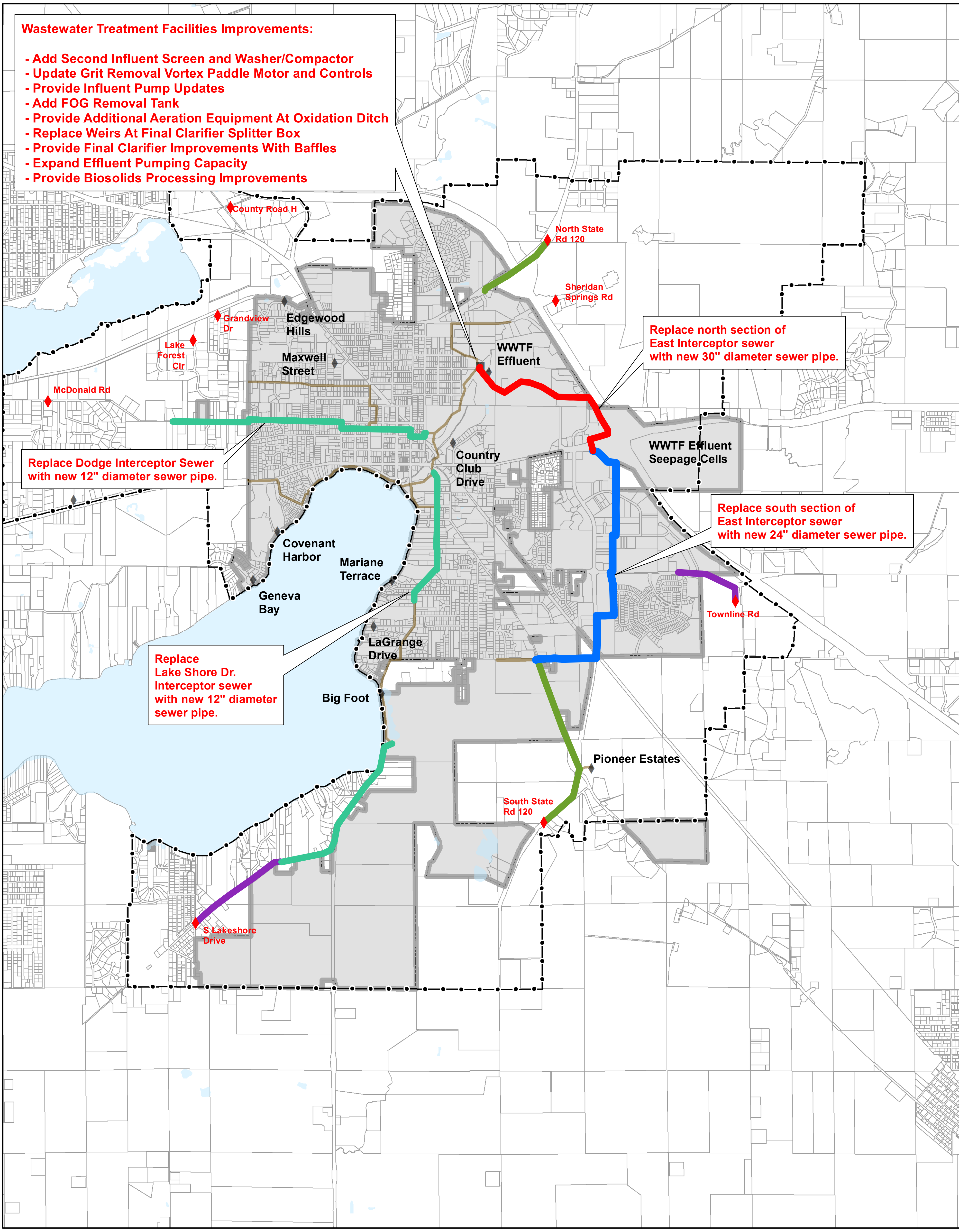
[1] A detailed analysis of the East Interceptor Sewer was performed by MSA Professional Services in 2020. Recommendations of improvements to the East Interceptor are taken from the study done by MSA.

5.4 Summary of Recommended Wastewater System Improvements

The improvements to the wastewater facilities and utilities that are recommended to accommodate future development are summarized in Table 23 below. Figure 6 shows the proposed wastewater system improvements.

Table 23: Recommended Wastewater System Improvements

Location/Study Area	Description
WWTF	• Add Second Influent Screen and Washer/Compactor • Update Grit Removal Vortex Paddle Motor and Controls • Provide Influent Pump Updates With Replacement Pumps and Impeller Change-Outs • Add FOG Removal Tank Downstream of Headworks • Provide Additional Aeration Equipment at Oxidation Ditch • Replace Weirs At Final Clarifier Splitter Box To Achieve Greater Weir Length • Add Stamford Baffles and Feed Well Baffle System At Final Clarifiers • Replace Effluent Pumps With New , Motors, and Controls. • Provide Biosolids Processing Improvements with Volute Press and Dryer
Interceptors and Gravity Sewers (>=10-inch)	• Lake Shore Drive Interceptor Sewer – 2,800 LF of 12" Sewer Main • East Interceptor Sewer – 11,200 LF of 24" Sewer Main • East Interceptor Sewer – 6,700 LF of 30" Sewer Main • Dodge St Interceptor Sewer – 8,300 LF of 12" Sewer Main
Pumping Stations and Force Mains (>=6-inch)	• S Lakeshore Dr Pump Station (468 gpm) • S Lakeshore Dr – 3,400 LF of 6" Force Main • Townline Rd Pump Station (268 gpm) • Townline Rd – 1,300 LF of 6" Force Main • McDonald Rd Pump Station (122 gpm) • Grandview Dr Pump Station (108 gpm) • Lake Forest Cir Pump Station (99 gpm) • Sheridan Springs Rd Pump Station (67 gpm) • North State Rd 120 Pump Station (675 gpm) • North State Rd 120 – 2,700 LF of 8" Force Main • Park Dr Pump Station (152 gpm) • South State Rd 120 Pump Station (756 gpm) • South State Rd 120 – 2,200 LF of 8" Force Main • Bigfoot Pump Station – Upgrade to 516 gpm • Pioneer Estates Pump Station – Upgrade to 1,072 gpm • Pioneer Estates Pump Station – 3,300 LF of 10" Force Main



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Date: November 2022

Proposed Pump Station

Proposed Sewer Main

12"

24"

30"

Proposed Forcemains

6"

8"

Wastewater Treatment Facility

Pumping Station

Existing Interceptors

Study Area

City Limits

Figure 6

Proposed Wastewater Collection System and Facilities

Water and Wastewater Utilities Impact Fee Study

CITY OF LAKE GENEVA

0 1,500 3,000 6,000

Feet

Ruekert · Mielke

6 Costs

For construction costs, Ruekert/Mielke, Inc. (R/M) has developed cost curves from previous bid out water and wastewater projects indexed to current year costs. These were developed for water booster stations based on pumping capacity and elevated storage tanks in the spheroid configuration based on storage volume. For the booster stations cost curve, a buried structure is assumed for very small capacities while a building is assumed for intermediate to larger capacities. For the one additional booster station required in the City, an additional factor was added to account for a small building instead of having it in a buried steel structure. With this change, the new booster station would be similar to other small booster stations in the City.

For wastewater, a pumping station cost curve was developed based on pumping capacity. It is assumed that each pumping station is the submersible type with a small building for controls and a standby generator. These curves were used to identify costs for Lake Geneva with the projected conditions. The cost curves are included in Appendix A.

For utilities, unit costs were used based on bid prices and quantities from recent R/M historical records adjusted for current conditions. For new facilities at the water and wastewater treatment facilities, custom costs were developed based on coordination with manufacturers and contractors for specific requirements.

A 35% factor was used for engineering, legal and contingencies after the construction cost was identified. Tables 24 and 25 show the water and wastewater system costs, respectively.

Some costs for both the water and wastewater systems are prorated to take into account that there is an existing deficiency, or that a particular equipment item is partly for redundancy and partly for capacity expansion. For example, an existing water system deficiency that was identified during the analysis is the reservoir fill line for the Host Tower. The fill line is 12-inches in diameter, which does not have the capacity to convey the fire flow of 3,500 gpm without significant pressure loss. The total cost of the existing water system deficiencies is estimated to be about $392,000. This cost is not included in the total project costs.

In the wastewater system it is logical from an operational standpoint, to provide a second identical screen to provide redundancy and to meet the peak hour rate requirement. For facilities with an average daily flow of over 2.0 MGD, it is common to have a second screen for redundancy. In this case, by adding the second screen rated at 5.2 MGD, the extra capacity is 6.87 MGD – 5.20 MGD = 1.67 MGD. The remaining capacity of the screen (3.53 MGD) is for operational redundancy with is important as WWTF's increase in size. Therefore, 22.4 % (1.67 MGD/5.2 MGD) of the full cost of the second screen is included in the analysis.

Table 24: Water System Improvement Costs

Number	Item	Unit	Quantity	Unit Price	Total
Water Mains and Distribution					
1	10" Water Main - Northwest Area	LF	18,300	$180	$3,294,000
2	14" Water Main - Northeast Area	LF	5,600	$230	$1,288,000
3	10" Water Main - South Area	LF	16,600	$180	$2,988,000
4	12" Water Main - South Area	LF	8,500	$200	$1,700,000
5	14" Water Main - South Area	LF	6,500	$250	$1,625,000
6	18" water mains from the Host Tower [1]	LF	1,400	$280	$392,000
7	12" water mains from the Dodge Booster Station	LF	2,100	$200	$420,000
				SUBTOTAL	$11,707,000
				SUBTOTAL PRORATED	**$11,315,000**
Booster Stations and Storage					
7	700-gpm Fire Pump - Dodge Booster Station	EA	1	$40,000	$40,000
8	240,000 gal Elevated Storage Tank - South Pressure Zone	LS	1	$1,830,000	$1,830,000
9	80 gpm Booster Station - South Pressure Zone	LS	1	$600,000	$600,000
10	210 gpm Booster Station - Northwest Pressure Zone	LS	1	$700,000	$700,000
11	Pressure Reducing Vaults - Northwest Area (PRV Zones)	LS	1	$125,000	$125,000
				SUBTOTAL	$3,295,000
				SUBTOTAL PRORATED [2]	**$3,170,000**
Treatment System					
12	Filters For Plant B (1,000 gpm)	LS	1	$430,000	$430,000
13	Extra Installation Effort (Knock Out Wall)	LS	1	$20,000	$20,000
14	Process Piping	LS	1	$115,000	$115,000
15	BW Tank	LS	1	$70,000	$70,000
16	BW Pump	LS	1	$10,000	$10,000
17	Vertical Turbine Pumps	EA	2	$96,000	$192,000
18	Suction Piping To Vertical Turbine Pumps	LS	1	$165,000	$165,000
19	Electrical and MCC	LS	1	$120,000	$120,000
20	Chemical Feed Equipment	LS	1	$18,000	$18,000
				SUBTOTAL	**$1,140,000**
				SUBTOTAL PRORATED [2]	**$1,140,000**
				SUBTOTAL	**$15,625,000**
				ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)	**$5,469,000**
				TOTAL PROJECT COSTS	**$21,094,000**

Table 25: Wastewater System Improvement Preliminary Cost Estimate

Number	Item	Unit	Quantity	Unit Price	Total
WWTF					
1	Screen Equipment Mechanical and Electrical	EA	1	$325,000	$325,000
2	Screenings Washer and Compactor Equipment Mechanical and Electrical	EA	1	$130,000	$130,000
3	Grit Removal Paddle, Motor, VFD and Controls	LS	1	$35,000	$35,000
4	Influent Pumping - Replace End Pumps With 25 Hp, 1,200 GPM Pumps at 51 Ft. TDH. Update Controls.	EA	2	$65,000	$130,000
5	Influent Pumping - Replace End Pump Discharge Piping From 6-Inch to 10-Inch	LS	1	$13,000	$13,000
6	Influent Pumping - Replace End Pump Discharge Piping Tees at Main Header	EA	2	$5,000	$10,000
7	Influent Pumping - Replace Middle Pump Impeller To Get 900 GPM Pumps at 51 Ft. TDH.	EA	1	$6,000	$6,000
8	Influent Pumping - Replace Middle Pump To Get 900 GPM Pumps at 51 Ft. TDH.	EA	1	$38,000	$38,000
9	FOG Tank - Excavation and Backfill	LS	1	$18,000	$18,000
10	FOG Tank - Concrete	CY	60	$1,200	$72,000
11	FOG Tank - Skimmer	LS	1	$80,000	$80,000
12	FOG Tank - Electrical and Controls	LS	1	$40,000	$40,000
13	FOG Tank - Mechanical Connections and Valves	LS	1	$30,000	$30,000
14	FOG Tank - Misc. Metals and Grating	LS	1	$45,000	$45,000
15	Oxidation Ditch - New Aerators	LS	1	$405,000	$405,000
16	Splitter Box Weir Replacement	EA	2	$8,000	$16,000
17	Final Clarifier - Stamford Baffles	EA	2	$42,000	$84,000
18	Final Clarifier - Baffle System at Feedwell	EA	2	$62,000	$124,000
19	Effluent Pumps - Replace Pumps With Firm of 2,400 GPM. Increase Motor Size to 100 Hp. Add VFDs and Update Controls	EA	3	$68,100	$204,300
20	Biosolids Volute Press and Dryer - Demolition, Equipment, and Mechanical	LS	1	$3,224,000	$3,224,000
21	Biosolids Volute Press and Dryer - Electrical and Controls	LS	1	$170,000	$170,000
22	Biosolids Volute Press and Dryer - Building Updates (Internal Walls, Lighting, HVAC)	LS	1	$130,000	$130,000
				SUBTOTAL	$5,329,300
				SUBTOTAL PRORATED	**$4,976,220**

Table 25: Wastewater System Improvement Preliminary Cost Estimate

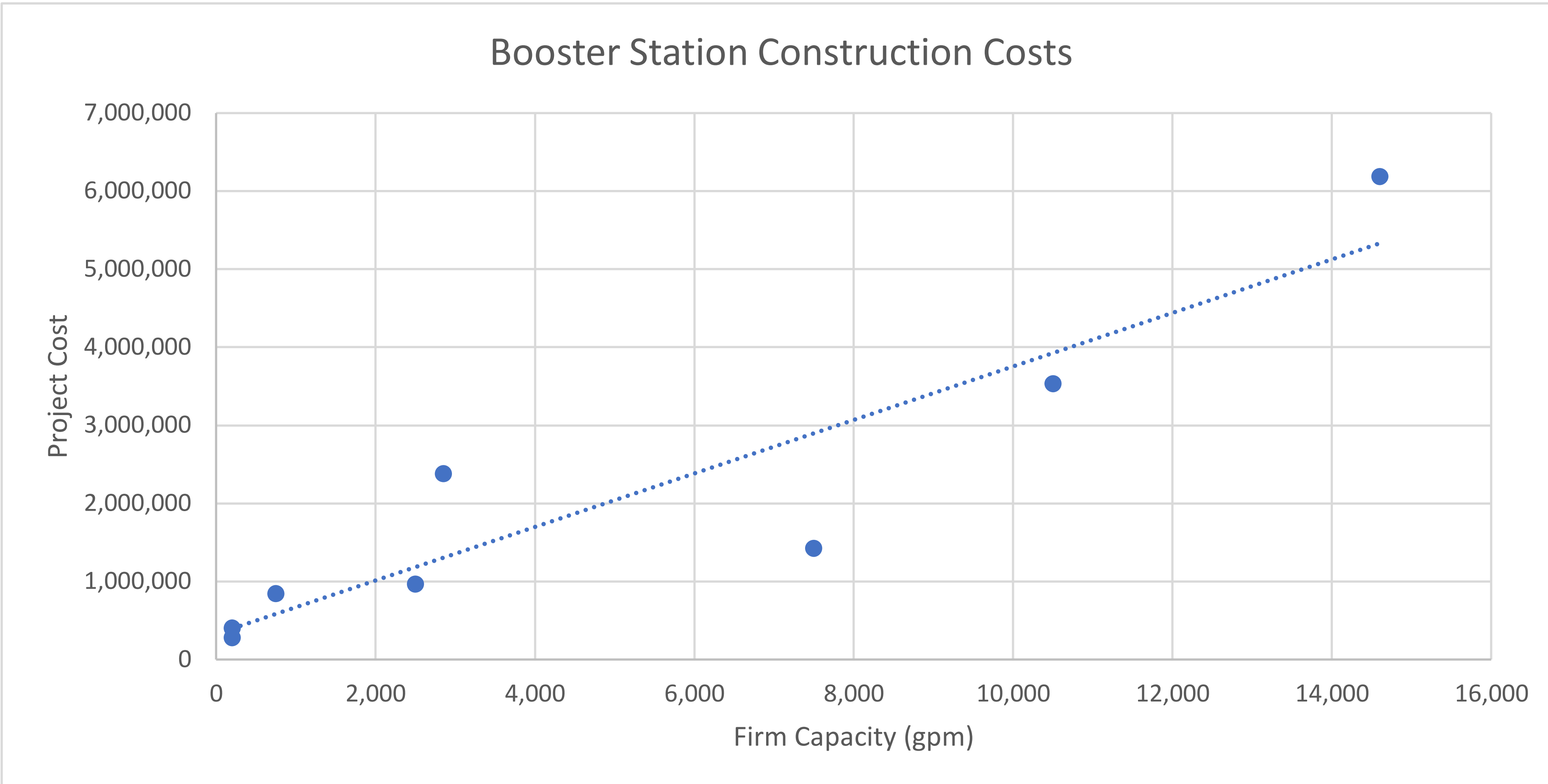
Interceptors Gravity Sewers					
23	Lake Shore Drive Interceptor Sewer - 12" Sewer Main	LF	2,800	$275	$770,000
24	East Interceptor Sewer - 24" Sewer Main	LF	11,200	$400	$4,480,000
25	East Interceptor Sewer - 30" Sewer Main	LF	6,700	$450	$3,015,000
26	Dodge St Interceptor Sewer - 12" Sewer Main	LF	8,300	$275	$2,282,500
				SUBTOTAL	**$10,547,500**
Pumping Stations and Force Mains					
27	S Lakeshore Dr Lift Station (468 gpm)	LS	1	$730,000	$730,000
28	S Lakeshore Dr - 6" Force Main	LF	3,400	$130	$442,000
29	Townline Rd Lift Station (268 gpm)	LS	1	$630,000	$630,000
30	Townline Rd - 6" Force Main	LF	1,300	$130	$169,000
31	McDonald Rd Lift Station (122 gpm)	LS	1	$550,000	$550,000
32	Grandview Dr Lift Station (108 gpm)	LS	1	$550,000	$550,000
33	Lake Forest Cir Lift Station (99 gpm)	LS	1	$550,000	$550,000
34	Sheridan Springs Rd Lift Station (67 gpm)	LS	1	$500,000	$500,000
35	North State Rd 120 - Lift Station (675 gpm)	LS	1	$790,000	$790,000
36	North State Rd 120 - 8" Force Main	LF	2,700	$150	$405,000
37	Park Dr Lift Station (152 gpm)	LS	1	$560,000	$560,000
38	South State Rd 120 - Lift Station (756 gpm)	LS	1	$800,000	$800,000
39	South State Rd 120 - 8" Force Main	LF	2,200	$150	$330,000
40	Bigfoot Lift Station Lift Station - Upgrade to 516 gpm	LS	1	$730,000	$730,000
41	Pioneer Estates Lift Station - Upgrade to 1,072 gpm	LS	1	$920,000	$920,000
42	Pioneer Estates Lift Station - 10" Force Main	LF	3,300	$170	$561,000
				SUBTOTAL	**$9,217,000**
				SUBTOTAL	**$24,740,720**
				ENGINEERING, ADMINISTRATIVE, LEGAL AND CONTINGENCIES (35%)	**$8,660,000**
				TOTAL PROJECT COSTS	**$33,400,720**

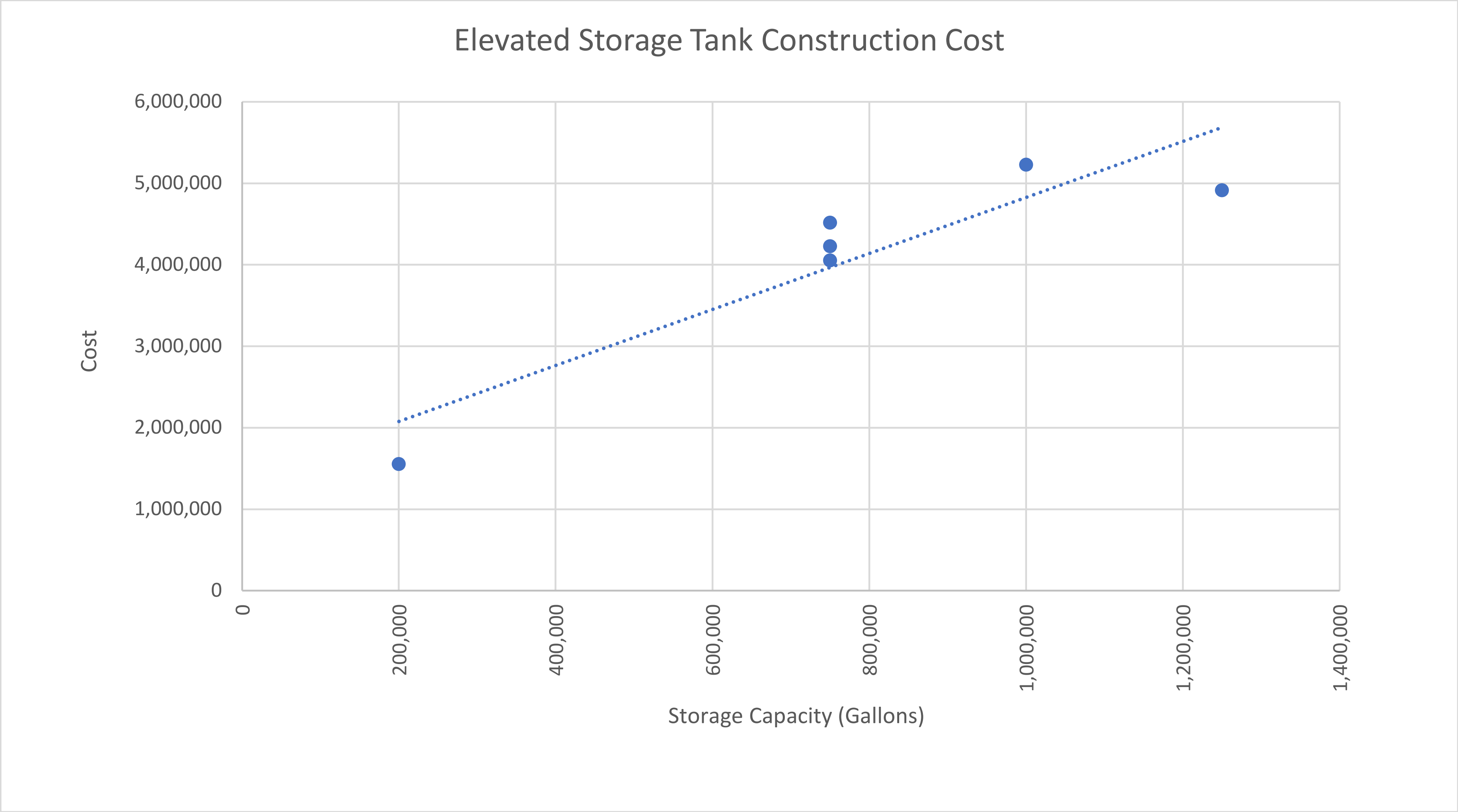
7 Summary and Conclusion

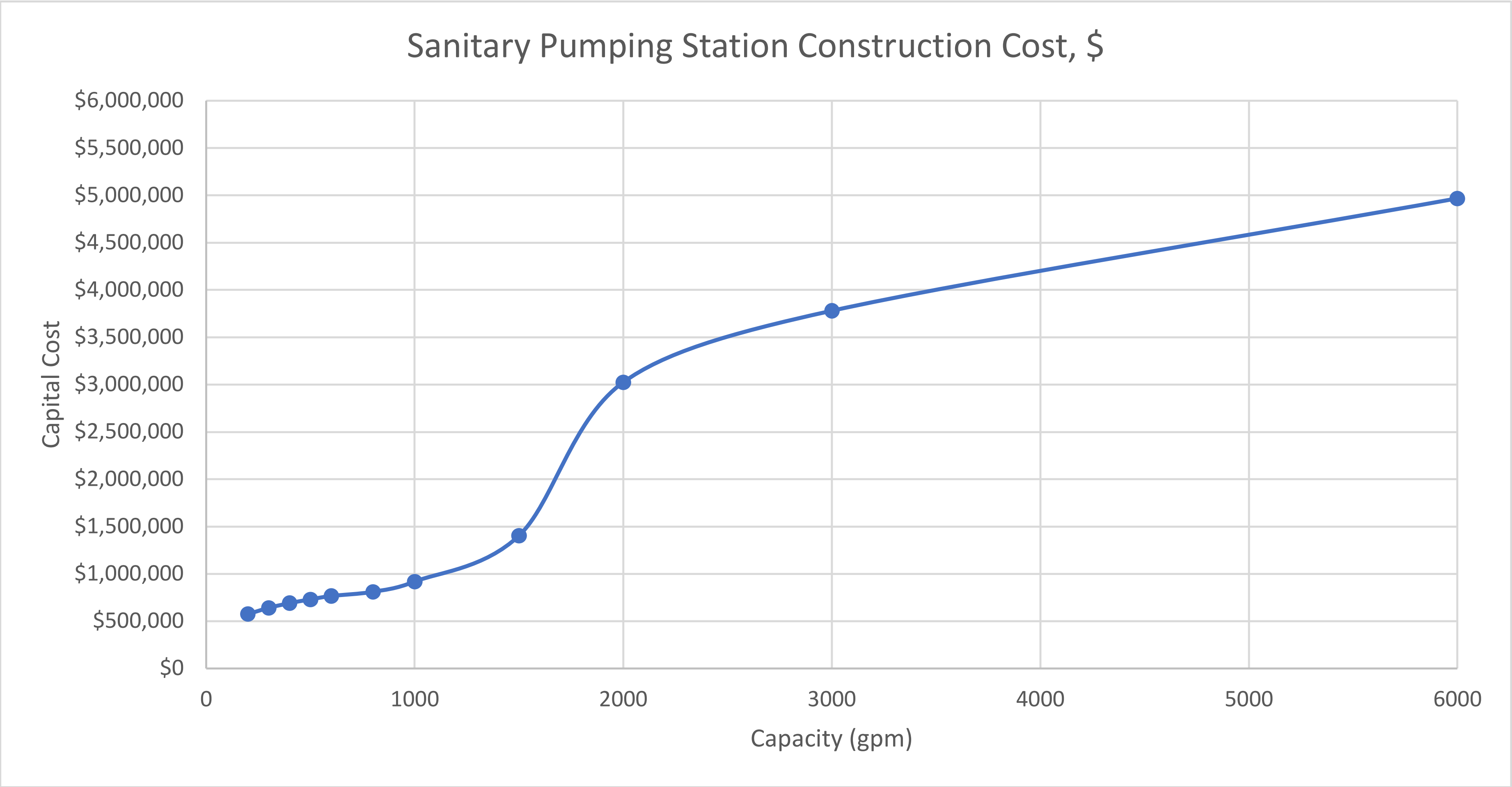
Using the City's projected land use, growth patterns, and applicable water demand and wastewater factors, the year 2042 population equivalent is 12,786. This equates to 6,003 additional RECs. The total cost for the water and wastewater systems are $21,094,000 and $33,401,000 respectively.

Appendix A

Cost Curves: Lift Stations, Booster Stations, and Elevated Storage Tanks


Booster Station Construction Costs
Project Cost
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
Firm Capacity (gpm)


Elevated Storage Tank Construction Cost
Cost
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
0
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
Storage Capacity (Gallons)



Sanitary Pumping Station Construction Cost, $
Capital Cost
$6,000,000
$5,500,000
$5,000,000
$4,500,000
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
0
1000
2000
3000
4000
5000
6000
Capacity (gpm)