Lake Geneva Utility Commission

MUNICIPAL WATER AND WASTEWATER SERVICES

361 W Main Street
P.O. Box 187
Lake Geneva, WI 53147
262-248-2311
www.lgutilitycommission.com

Dennis Lyon – President
Josh Gajewski – Utility Director
Jeff Ecklund – Water Superintendent
Ken Bauman – Wastewater Superintendent

LAKE GENEVA UTILITY COMMISSION
MONDAY FEBRUARY 20, 2023 4:00 PM
COUNCIL CHAMBERS - CITY HALL, 626 GENEVA STREET

CITY HALL WILL BE OPEN TO THE PUBLIC DURING ALL MEETINGS. MEETINGS WILL BE HELD VIRTUALLY AS WELL AS IN PERSON. IF YOU WISH TO LISTEN OR WATCH THE MEETING YOU MAY DO SO BY USING THE FOLLOWING:

1. Links to the Lake Geneva Utility Commission's live video stream can be found at www.cityoflakegeneva.com/video
2. Television: Watch live broadcast of the meeting on Spectrum Cable Channel 25
3. Listen to audio via phone: (602) 333-2017 (Long distance rates may apply) (888) 204-5987 (Toll Free) **Access Code:** 9746153

AGENDA

1. Call Meeting to Order
2. Roll Call
3. Appointment of a Meeting Chairperson
4. Comments from the public as allowed by Wis. Statutes §19.84 (2), limited to items on this agenda except for public hearing items. Comments will be limited to 5 minutes.
5. Approve Utility Commission Minutes from January 16 and February 8, 2023 as prepared and distributed
6. Acknowledgement of Correspondence
7. Approval of January 2023 Financials
8. Approval of the January 2023 Bills
9. Directors Report
10. Discussion/Action on the Utilities Impact Fee Technical Memorandum prepared by Ruekert-Mielke
11. Discussion/Action on Amendment 1 to the Professional Services Agreement with MSA Professional Services for construction-related services for the Mariane Terrace and Pine Tree Lane Improvement Project
12. Discussion/Action on a Professional Services Agreement with MSA Professional Services for preliminary evaluation of utility-related improvements along the WisDOT STH 50 project corridor
13. Discussion/Action on the proposed utility improvements for Symphony Bay Phase 7 and issuance of an Owner Letter of Approval
14. Discussion/Action on the proposed Verizon Wireless improvements at Host Tower
15. Adjourn

Lake Geneva Utility Commission Minutes
Lake Geneva Utility Commission Meeting
Monday January 16, 2023, 4:00pm
Council Chambers, City Hall – 626 Geneva St

THIS MEETING WAS HELD BOTH VIRTUALLY AND IN PERSON

Call Meeting to Order – Lyon called the meeting to order at 4:02pm

Roll Call – Lyon, Klein, Howell, Hedlund, Nord, Binn & Stanczak

Staff in Attendance – Gajewski & Busch

Zoom Attendance: Joe DeYoung of MSA Professional Services & Randy Langer of Strand & Associates

Comments from the public as allowed by Wis. Statutes §19.84 (2), limited to items on this agenda except for public hearing items. Comments will be limited to 5 minutes.
None

Approve Utility Commission minutes from December 19, 2022, as prepared & distributed
Hedlund/Binn motion to approve. Passed unanimously.

Acknowledgement of correspondence
Gajewski informed the Commission that he had received notice from T-Mobile/Sprint that they would not be renewing their lease at Host Drive which expires in 2025. Discussion was had regarding the expected financial impact.

Approval of the December 2022 Financials
Hedlund/Stanczak motion to approve. Passed unanimously.

Approval of the December 2022 Bills
Hedlund/Howell motion to approve. Passed unanimously.

Director's Report
Gajewski reviewed the submitted Director's report and gave an update on the meter replacement program and preparation for the upcoming audit.
Hedlund/Binn motion to approve the submitted Director's report. Passed unanimously.

Discussion/Action on the potential award of the Hauled Waste Receiving Facility Project
Gajewski said the bid opening for this project was on January 10th 2023 and only one bid was submitted which was significantly higher than the estimated cost. Discussion followed. Langer said he had tried to drum up interest in the project but the feedback from contractors was that there is an abundance of work right now and so the interest in bidding on projects is low. Gajewski is of the opinion that there is no advantage to re-bidding the project right now and the best course of action is to put it on hold. Discussion regarding the financial outlay to date followed. Gajewski said the engineering would still be valid if we bid again at a later date, but code compliance would need to be checked. The project has not been submitted to WI DNR for review and we have not submitted to use Clean Water Loan funds. Langer pointed out that the bidder had indicated that there would be no additional costs if we were using Clean Water funds.
Lyon/Binn motion to reject the bid and place the project on hold as recommended by Utility staff. Passed unanimously.

Discussion/Action on the potential award of the 2023 Mariane Terrace and Pine Tree Improvements project
Gajewski reported that there were five bids received for this project. There are some items that still need to be worked out with Public Works for cost allocation and the bid came in higher than budgeted for the water main replacement portion but the extra amount can be funded from either undesignated funds or the capital improvement fund. The project still needs to go through FLR, PWC and Council for approval but he recommends authorizing the expenditure and passing it along to those boards for their approval. DeYoung supported this and recommended to award the bid to the lowest bidder, Asphalt Contractors. He went over the project timeline and the two alternatives included in the bid. One of the alternatives is an incentive for completion of the project before Memorial Day so moving this along in a timely manner is appropriate.
Hedlund/Howell motion to authorize the project expenditure for the Marianne Terrace and Pine Tree Lane improvement project and award the project to the low bidder, Asphalt Contractors. Passed unanimously.

Discussion/Action on the final payment request for Reservoir #3 roof project
This invoice was not included in the bill list. Gajewski said it is the final payment for the work completed on this project and he recommends payment. After discussion with the contractor during the project, there is a small scope of work expected to be performed in the spring to continue the membrane down the sides of the reservoir but that will be separate from the work completed to date.
Howell/Binn motion to approve the final pay request as presented. Passed unanimously.

Discussion/Action on a proposal for the replacement of VFD's for the wastewater treatment plant
Gajewski said that last year, we replaced three of our seven VFD's using the lowest of three quotes. The same company who supplied those, JMB, have quoted to replace the remaining four and have advised that the manufacturer will be raising their prices from February. The quote we have received is lower than the budgeted amount and Gajewski recommends that we go ahead and purchase them now.
Hedlund/Stanczak motion to approve the quote from JMB & Associates. Passed unanimously.

Lyon/Hedlund motion to go into Closed Session pursuant to Wis. Stat. 19.85 (1) (e) deliberating or negotiating the purchasing of public properties, the investing of public funds, or conducting other specified public business, whenever competitive or bargaining reasons require a closed session and to include Utility staff.

The Commission convened into closed session on a roll call vote at 4:31pm.

Howell/Binn motion to return to open session pursuant to Wisconsin Statutes 19.85 (2) and take action on any items discussed in closed session.

The Commission reconvened into open session on a roll call vote at 4:45pm

Hedlund/Howell motion to direct staff to proceed as discussed in closed session. Passed unanimously.

Adjourn
Howell/Hedlund motion to adjourn at 4:46pm. Passed unanimously.

THESE MINUTES ARE NOT OFFICIAL UNTIL APPROVED BY THE LAKE GENEVA UTILITY COMMISSION

Lake Geneva Utility Commission Minutes
Lake Geneva Utility Commission Special Meeting
Wednesday February 8, 2023, 4:00pm
Room 2A, City Hall – 626 Geneva St

THIS MEETING WAS HELD IN PERSON

Call Meeting to Order – President Lyon called the meeting to order at 4:00pm.

Roll Call – Lyon, Howell, Hedlund, Nord, & Binn. Klein arrived at 4:19pm.

Staff in Attendance – Gajewski

Comments from the public as allowed by Wis. Statutes §19.84 (2), limited to items on this agenda except for public hearing items. Comments will be limited to 5 minutes.
None

Lyon/Hedlund motion to go into Closed Session pursuant to Wis. Stat. 19.85 (1) (e) deliberating or negotiating the purchasing of public properties, the investing of public funds, or conducting other specified public business, whenever competitive or bargaining reasons require a closed session, specifically regarding negotiating the purchase of public property.

The Commission convened into closed session on a roll call vote at 4:02pm.

Howell/Binn motion to return to open session pursuant to Wisconsin Statutes 19.85 (2) and take action on any items discussed in closed session.

The Commission reconvened into open session on a roll call vote at 4:28pm.

Hedlund/Howell motion to continue with negotiations as discussed in closed session. Passed 6-0.

Adjourn
Hedlund/Binn motion to adjourn at 4:30pm. Passed 6-0.

THESE MINUTES ARE NOT OFFICIAL UNTIL APPROVED BY THE LAKE GENEVA UTILITY COMMISSION

LAKE GENEVA UTILITY COMMISSION

BUDGET COMPARISON THRU: 1 / 2023

FUND 61 - WASTEWATER UTILITY

REVENUES	**Current Period**	**YTD**	**2023 Budget**	**YTD vs Budget**	**YTD % of Budget** *8.3%*	**Prior YTD 2022**	**Prior YTD 5 Year Avg.**
INTEREST EARNED	19,397	19,397	69,600	-50,203	27.87%	229	1,304
CUSTOMER SALES	24,977	24,977	2,104,937	-2,079,960	1.19%	26,099	21,380
OTHER REVENUE	1,446	1,446	11,225	-9,779	12.88%	1,299	1,191
CAPITAL CONTRIBUTIONS	0	0	205,150	-205,150	0.00%	7,460	8,877
TOTAL REVENUES	**45,820**	**45,820**	**2,390,912**	**-2,345,092**	**1.92%**	**35,087**	**32,752**
EXPENSES							
TOTAL OUTSIDE SERVICES	14,212	14,212	408,455	-394,243	3.48%	11,846	14,551
TOTAL OPERATING EXPENSES	2,455	2,455	45,550	-43,095	5.39%	1,127	1,630
TOTAL INSURANCE	0	0	29,450	-29,450	0.00%	0	-1,023
TOTAL SALARY & BENEFITS	67,098	67,098	668,150	-601,052	10.04%	52,955	42,133
TOTAL LAB SUPPLIES	9,671	9,671	21,250	-11,579	45.51%	11,823	4,249
TOTAL MISCELLANEOUS EXPENSE	0	0	1,000	-1,000	0.00%	6	-12
TOTAL MAINTENANCE	2,161	2,161	301,600	-299,439	0.72%	5,286	1,449
TOTAL OPERATION & MAINTENANCE EXPENSES	**95,597**	**95,597**	**1,475,455**	**-1,379,858**	**6.48%**	**83,043**	**62,977**
REVENUES OVER O&M EXPENSES	**-49,776**	**-49,776**	**915,457**	**-965,233**		**-47,956**	**-30,225**
TOTAL CAPITAL OUTLAY	0	0	1,324,700	-1,324,700	0.00%	68,422	22,362
REVENUES OVER TOTAL EXPENSES	**-49,776**	**-49,776**	**-409,243**	**359,467**		**-116,377**	**-52,587**
TOTAL CASH TRANSFERS	7,460	7,460	-413,250	420,710	-1.81%	0	0
NET CHANGE IN CASH BALANCE	**-57,236**	**-57,236**	**4,007**	**-61,243**		**-116,377**	**-52,587**

FUND CASH AND INVESTMENT SUMMARY	Opening Balance	Period Activity	Ending Balance
Wastewater Utility Fund Cash	364,420	239,767	604,187
LGIP #10 - Capital Project Fund	2,827,644	10,239	2,837,882
LGIP #11 - Debt Service Fund	0	0	0
LGIP #12 - Impact Fee Fund	1,244,406	11,989	1,256,396
LGIP #13 - Equipment Replacement Fund	1,278,439	4,629	1,283,068
TOTAL WASTEWATER CASH AND INVESTMENT	**5,714,909**	**266,624**	**5,981,533**

LAKE GENEVA UTILITY COMMISSION

BUDGET COMPARISON THRU: 1 / 2023

FUND 62 - WATER UTILITY

REVENUES	Current Period	YTD	2023 Budget	YTD vs Budget	YTD % of Budget *8.3%*	Prior YTD 2022	Prior YTD 5 Year Avg.
INTEREST EARNED	11,060	11,060	61,200	-50,140	18.07%	126	721
CUSTOMER SALES	15,046	15,046	1,833,474	-1,818,428	0.82%	20,267	16,418
OTHER REVENUE	94,339	94,339	306,498	-212,159	30.78%	90,223	78,205
CAPITAL CONTRIBUTIONS	0	0	185,900	-185,900	0.00%	6,760	7,706
TOTAL REVENUES	**120,445**	**120,445**	**2,387,072**	**-2,266,628**	**5.05%**	**117,376**	**103,050**
EXPENSES							
TOTAL SOURCE OF SUPPLY - OPERATION	2,149	2,149	69,850	-67,701	3.08%	3,426	2,436
TOTAL SOURCE OF SUPPLY - MAINTENANCE	1,861	1,861	66,500	-64,639	2.80%	1,173	453
TOTAL PUMPING EXPENSE - OPERATION	555	555	83,500	-82,945	0.66%	716	453
TOTAL PUMPING EXPENSE - MAINTENANCE	781	781	45,950	-45,169	1.70%	301	209
TOTAL WATER TREATMENT - OPERATION	5,638	5,638	116,900	-111,262	4.82%	7,440	5,274
TOTAL WATER TREATMENT - MAINTENANCE	5,268	5,268	76,000	-70,732	6.93%	6,865	5,334
TOTAL TRANS. & DISTRIBUTION - OPERATION	4,964	4,964	63,900	-58,936	7.77%	2,601	1,756
TOTAL TRANS. & DISTRIBUTION - MAINTENANCE	24,573	24,573	194,150	-169,577	12.66%	25,485	6,230
TOTAL CUSTOMER ACCOUNTS	9,152	9,152	76,025	-66,873	12.04%	5,615	4,988
TOTAL ADMIN & GENERAL OPERATIONS	55,678	55,678	463,540	-407,862	12.01%	37,289	29,083
TOTAL OTHER EXPENSES	0	0	310,000	-310,000	0.00%	25,000	25,700
TOTAL OPERATION & MAINTENANCE EXPENSES	**110,620**	**110,620**	**1,566,315**	**-1,455,695**	**7.06%**	**115,911**	**81,917**
REVENUES OVER O&M EXPENSES	**9,824**	**9,824**	**820,757**	**-810,933**		**1,465**	**21,133**
TOTAL CAPITAL OUTLAY	-567	-567	576,000	-576,567	-0.10%	-2,885	4,218
REVENUES OVER TOTAL EXPENSES	**10,391**	**10,391**	**244,757**	**-234,366**		**4,350**	**16,915**
TOTAL CASH TRANSFERS	6,760	6,760	241,600	-234,840	2.80%	0	0
NET CHANGE IN CASH BALANCE	**3,631**	**3,631**	**3,157**	**474**		**4,350**	**16,915**

FUND CASH AND INVESTMENT SUMMARY	Opening Balance	Period Activity	Ending Balance
Water Utility Fund Cash	193,751	287,987	481,739
LGIP #1 - Capital Project Fund	1,657,929	6,003	1,663,932
LGIP #2 - Impact Fee Fund	605,177	8,973	614,149
LGIP #3 - Equipment Replacement Fund	785,522	2,844	788,366
TOTAL WATER FUND CASH AND INVESTMENT	**3,242,378**	**305,807**	**3,548,186**

Report Criteria:
Detail report.
Invoices with totals above $5000.00 included.
Paid and unpaid invoices included.
Invoice Detail.GL account (2 Characters) = "61","62"

Invoice Number	Invoice Date	Description	GL Account and Title		Net Invoice Amount
61					
STRAND ASSOCIATES INC					
0192350	01/12/2023	PROF SVCS 12/1/2022-12/31/20	61-00-00-10700	CONSTRUCTION WORK IN PROCESS	8,061.34
Total STRAND ASSOCIATES INC:					8,061.34
ALLIANT ENERGY					
280954000023	02/01/2023	HASKINS ST SEWER PLANT	61-00-00-52520	UTILTITY-ELECTRICITY-PLANT	15,012.56
Total ALLIANT ENERGY:					15,012.56
UNITED LABORATORIES					
INV370582	02/02/2023	LIFT/ZYME	61-00-00-93800	MAINT-LIFT STATIONS	9,632.40
Total UNITED LABORATORIES:					9,632.40
Total 61:					32,706.30
62					
CARLSON RACINE ROOFING					
31720	12/22/2022	RESV 3 ROOF PROJ-FINAL PYM	62-00-00-10700	CONSTRUCTION WORK IN PROCESS	5,868.00
Total CARLSON RACINE ROOFING:					5,868.00
MSA PROFESSIONAL SERVICES INC					
R07815009.0-3	01/11/2023	PINE TREE & MARIANE WATER	62-00-00-10700	CONSTRUCTION WORK IN PROCESS	5,337.55
Total MSA PROFESSIONAL SERVICES INC:					5,337.55
DOWN TO EARTH					
8007	01/17/2023	934 CAREY ST REPAIR MAIN B	62-00-00-67300	MAINT OF MAINS & VALVES	7,396.20
Total DOWN TO EARTH:					7,396.20
Total 62:					18,601.75
Grand Totals:					51,308.05

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount

Dated: _____

Mayor: _____

City Council: _____

_____

_____

_____

_____

_____

City Recorder: _____

Report Criteria:
Detail report.
Invoices with totals above $5000.00 included.
Paid and unpaid invoices included.
Invoice Detail.GL account (2 Characters) = "61","62"

Report Criteria:
Detail report.
Invoices with totals above $0.00 included.
Paid and unpaid invoices included.
Invoice Detail.GL account (2 Characters) = "61","62"

Invoice Number	Invoice Date	Description	GL Account and Title		Net Invoice Amount
61					
STRAND ASSOCIATES INC					
0192350	01/12/2023	PROF SVCS 12/1/2022-12/31/20	61-00-00-10700	CONSTRUCTION WORK IN PROCESS	8,061.34
0192962	02/02/2023	PROF SVCS 1/1/2023-1/20/2023	61-00-00-10700	CONSTRUCTION WORK IN PROCESS	2,155.87
Total STRAND ASSOCIATES INC:					10,217.21
NORTHERN LAKE SERVICE INC					
2300102	01/21/2023	WEEKLY NITROGEN TESTING	61-00-00-52100	LABORATORY SERVICES	272.42
2300734	02/08/2023	FIRST QTR SLUDGE	61-00-00-52100	LABORATORY SERVICES	702.35
2300776	01/31/2023	WEEKLY NITROGEN TESTING	61-00-00-52100	LABORATORY SERVICES	293.79
2301036	02/07/2023	FIRST QTR GW TESTING	61-00-00-52100	LABORATORY SERVICES	1,558.28
2301286	02/10/2023	WEEKLY NITROGEN TESTING	61-00-00-52100	LABORATORY SERVICES	293.79
2301356	02/13/2023	WEEKLY NITROGEN TESTING	61-00-00-52100	LABORATORY SERVICES	293.79
Total NORTHERN LAKE SERVICE INC:					3,414.42
WE ENERGIES					
4431503594	01/12/2023	HASKINS ST DEWATERING BLD	61-00-00-52500	UTILITY-GAS-PLANT	655.26
4431520922	01/12/2023	HASKINS ST WWTF-SEWER PL	61-00-00-52500	UTILITY-GAS-PLANT	1,018.81
4432176614	01/12/2023	HASKINS ST WEST BLDG-STOR	61-00-00-52500	UTILITY-GAS-PLANT	438.13
4467362163	02/09/2023	HASKINS ST WWTF-SEWER PL	61-00-00-52500	UTILITY-GAS-PLANT	895.01
4468446831	02/09/2023	HASKINS ST DEWATERING BLD	61-00-00-52500	UTILITY-GAS-PLANT	429.45
4468811314	02/09/2023	HASKINS ST WEST BLDG-STOR	61-00-00-52500	UTILITY-GAS-PLANT	403.58
4430045532	01/11/2023	EDGEWOOD DR LIFT STN	61-00-00-52505	UTILITY-GAS-COLLECTION SYSTEM	14.52
4434923614	01/16/2023	LAGRANGE DR LIFT STN	61-00-00-52505	UTILITY-GAS-COLLECTION SYSTEM	21.88
4437296500	01/16/2023	BIG FOOT LIFT STATION	61-00-00-52505	UTILITY-GAS-COLLECTION SYSTEM	20.45
4465850895	02/08/2023	EDGEWOOD DR LIFT STN	61-00-00-52505	UTILITY-GAS-COLLECTION SYSTEM	11.51
Total WE ENERGIES:					3,908.60
ALLIANT ENERGY					
143875000023	02/01/2023	191 HASKINS ST DEWATER BLD	61-00-00-52520	UTILTITY-ELECTRICITY-PLANT	363.07
280954000023	02/01/2023	HASKINS ST SEWER PLANT	61-00-00-52520	UTILTITY-ELECTRICITY-PLANT	15,012.56
507753000023	02/01/2023	361 W MAIN ST SIGN	61-00-00-52520	UTILTITY-ELECTRICITY-PLANT	36.10
974671000023	02/01/2023	361 MAIN ST HALLWAY	61-00-00-52520	UTILTITY-ELECTRICITY-PLANT	114.60
307955000023	02/01/2023	MAXWELL ST LIFT STN	61-00-00-52525	UTILTITY-ELECTRICITY-COLL SYS	27.76
327113000023	02/01/2023	BAYVIEW DR LIFT STN	61-00-00-52525	UTILTITY-ELECTRICITY-COLL SYS	53.33
599411000023	02/01/2023	361 STATE ROAD 120 BIG FOOT	61-00-00-52525	UTILTITY-ELECTRICITY-COLL SYS	269.13
962961000023	02/01/2023	EDGEWOOD DR LIFT STN	61-00-00-52525	UTILTITY-ELECTRICITY-COLL SYS	345.42
Total ALLIANT ENERGY:					16,221.97
SHI INTERNATIONAL CORP.					
B16409921	01/27/2023	ANNUAL FIREWALL SUPPORT 1	61-00-00-53050	COMPUTER EXPENSE	451.05
Total SHI INTERNATIONAL CORP.:					451.05
VELOCITY					
2023010	01/13/2023	OFFICE 365 SEATS AND CLOUD	61-00-00-53050	COMPUTER EXPENSE	124.25

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
Total VELOCITY:				124.25
CAPITAL ONE				
782356704510	12/22/2022	PRINTER	61-00-00-53100 OFFICE SUPPLIES EXPENSE	29.68
986152	01/05/2023	RETURN PRINTER	61-00-00-53100 OFFICE SUPPLIES EXPENSE	29.68-
Total CAPITAL ONE:				.00
CHARTER COMMUNICATIONS				
012395101112	01/19/2023	JAN INTERNET SVC	61-00-00-53100 OFFICE SUPPLIES EXPENSE	79.98
Total CHARTER COMMUNICATIONS:				79.98
MARTIN BUSINESS GROUP				
1293393	01/20/2023	SERVICE CONTRACT/COPIES	61-00-00-53100 OFFICE SUPPLIES EXPENSE	112.54
Total MARTIN BUSINESS GROUP:				112.54
ODP BUSINESS SOLUTIONS LLC				
287702235001	01/28/2023	BADGE HOLDERS	61-00-00-53100 OFFICE SUPPLIES EXPENSE	14.99
287704759001	01/30/2023	BADGE/LANYARD	61-00-00-53100 OFFICE SUPPLIES EXPENSE	3.76
Total ODP BUSINESS SOLUTIONS LLC:				18.75
AT&T				
262248865601	01/13/2023	JANUARY 2023 TELEPHONE BIL	61-00-00-53110 TELEPHONE EXPENSE	114.74
Total AT&T:				114.74
AT&T LONG DISTANCE				
816988240-01	01/04/2023	262-248-2394 DEC	61-00-00-53110 TELEPHONE EXPENSE	.13
Total AT&T LONG DISTANCE:				.13
FIRST NATIONAL BANK OF OMAHA				
554328630242	01/24/2023	VONAGE PHONE SVC 1/23/2023	61-00-00-53110 TELEPHONE EXPENSE	134.36
Total FIRST NATIONAL BANK OF OMAHA:				134.36
US CELLULAR				
0554312940	01/04/2023	WWTF MONTHLY PHONE BILL	61-00-00-53110 TELEPHONE EXPENSE	194.21
Total US CELLULAR:				194.21
PETTY CASH				
PC02092023	02/09/2023	CERTIFIED MAIL-KOEPPPEN &	61-00-00-53120 POSTAGE	6.45
Total PETTY CASH:				6.45
FIRST NATIONAL BANK OF OMAHA				
753370030264	01/24/2023	WWOA 2023 MEBERSHIP	61-00-00-53200 MEMBERSHIP FEES	60.00
Total FIRST NATIONAL BANK OF OMAHA:				60.00
BAUMAN, KEN				
BAUMAN01192	01/19/2023	REIMB WRWA-WATERWORKS D	61-00-00-53310 MEALS, LODGING, ETC	20.40

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
BAUMAN01192	01/19/2023	REIMB WRWA-WATERWORKS D	61-00-00-53320 CONFERENCES & SCHOOL	116.35
BAUMAN0210	02/10/2023	REIMBMWAA WINTER EXPO	61-00-00-53320 CONFERENCES & SCHOOL	70.00
Total BAUMAN, KEN:				206.75
KOEHN, MATTHEW				
KOEHN020323	02/03/2023	REIMB DNR TRAINING-DISINFE	61-00-00-53320 CONFERENCES & SCHOOL	165.00
Total KOEHN, MATTHEW:				165.00
HOME DEPOT CREDIT				
1020175	01/31/2023	SHOP EQUIP-PLANT MAINT-SILI	61-00-00-53500 OPERATIONS TOOLS & EQUIP	43.43
7524195	12/16/2022	HEAT GUN, SOLDER, SOLDERI	61-00-00-53500 OPERATIONS TOOLS & EQUIP	68.93
9520869	01/23/2023	PLUMBING SUPP-SEAL TAPE/M	61-00-00-53500 OPERATIONS TOOLS & EQUIP	27.51
Total HOME DEPOT CREDIT:				139.87
USA BLUE BOOK				
247191	01/25/2023	DISCHARGE HOSE/COUPLER/N	61-00-00-53500 OPERATIONS TOOLS & EQUIP	451.75
248998	01/26/2023	HOSE ADAPTER-PLANT MAINT/	61-00-00-53500 OPERATIONS TOOLS & EQUIP	35.77
Total USA BLUE BOOK:				487.52
BUMPER TO BUMPER AUTO PARTS				
662-468698	02/10/2023	AIR FILTER-BOBCAT MAINT	61-00-00-53520 OPERATIONS-VEHICLES	173.61
Total BUMPER TO BUMPER AUTO PARTS:				173.61
CINTAS CORP				
5141170200	01/17/2023	FIRST AID SUPPLIES	61-00-00-53900 FIRST AID & SAFETY SUPPLIES	132.43
Total CINTAS CORP:				132.43
HOME DEPOT CREDIT				
4520595	01/18/2023	MW TESTING SUPP-TOUGH TO	61-00-00-64000 LABORATORY SUPPLIES	42.96
Total HOME DEPOT CREDIT:				42.96
CAPITAL ONE				
782356704510	12/22/2022	CUTLERY, BOUNTY-KITCHEN S	61-00-00-65000 OTHER OPERATING SUPPLIES-KITCH	65.80
Total CAPITAL ONE:				65.80
KAPUR & ASSOCIATES INC				
113532	06/08/2022	GIS UPDATES	61-00-00-92300 OUTSIDE SERVICES EMPLOYED	522.00
Total KAPUR & ASSOCIATES INC:				522.00
RUEKERT & MIELKE INC				
145225	01/31/2023	IMPACT FEE/TECH MEMO-SVC	61-00-00-92300 OUTSIDE SERVICES EMPLOYED	1,203.65
Total RUEKERT & MIELKE INC:				1,203.65
AURORA HEALTH CARE				
1442693	01/08/2023	DOT CONSORTIUM FEE-GAJE	61-00-00-92600 EMPLOYEE BENEFITS	25.00

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
Total AURORA HEALTH CARE:				25.00
SECURIAN FINANCIAL GROUP				
FEB.2023 LIFE	01/19/2023	FEB LIFE INSURANCE 2023	61-00-00-92630 LIFE INSURANCE EXPENSE	7.56
Total SECURIAN FINANCIAL GROUP:				7.56
PFI FASHIONS INC				
105264	01/16/2023	2023 UNIFORMS-POLOS & FLE	61-00-00-92650 UNIFORM/CLOTHING EXPENSE	79.20
105265	01/17/2023	2023 UNIFORMS-CAPS	61-00-00-92650 UNIFORM/CLOTHING EXPENSE	143.20
105266	01/26/2023	2023 UNIFORMS-T SHIRTS & FL	61-00-00-92650 UNIFORM/CLOTHING EXPENSE	503.44
Total PFI FASHIONS INC:				725.84
DUNN LUMBER				
1311349	01/11/2023	BASKET STRAINER & PUTTY-LA	61-00-00-93500 MAINT-LAB BLDG	20.56
1320817	01/25/2023	JOINT WASHERS/STRAINER-LA	61-00-00-93500 MAINT-LAB BLDG	11.54
139337	01/11/2023	RETURN BASKET STRAINER &	61-00-00-93500 MAINT-LAB BLDG	7.33-
1320623	01/25/2023	COUPLINGS/ADAPTERS/HOSE	61-00-00-93501 MAINT-HEADWORKS BLDG	31.91
1321407	01/26/2023	NUTS & BOLTS-DIGESTER BLD	61-00-00-93502 MAINT-DIGESTER & AER/TRANS BLD	7.56
1326174	02/02/2023	NUTS & BOLTS-DIGESTER BLD	61-00-00-93502 MAINT-DIGESTER & AER/TRANS BLD	.69
Total DUNN LUMBER:				64.93
FIRST SUPPLY LLC				
3412103-00	01/23/2023	BALL VALVE-WATER PIPING MA	61-00-00-93502 MAINT-DIGESTER & AER/TRANS BLD	258.36
Total FIRST SUPPLY LLC:				258.36
HOME DEPOT CREDIT				
9617349	01/23/2023	WATER PIPING MAINT-ADAPTE	61-00-00-93502 MAINT-DIGESTER & AER/TRANS BLD	46.79
Total HOME DEPOT CREDIT:				46.79
DUNN LUMBER				
1327651	02/06/2023	PROCESS BLDG-BASEMENT PL	61-00-00-93503 MAINT-PROCESS BLDG	8.80
Total DUNN LUMBER:				8.80
HOME DEPOT CREDIT				
1020176	01/31/2023	PROCESS BLDG MAINT-PIPE H	61-00-00-93503 MAINT-PROCESS BLDG	69.11
621142	01/12/2023	SHOP BLDG MAINT-BIT SET, LE	61-00-00-93506 MAINT-VEHICLE STORAGE BLDGS	165.85
Total HOME DEPOT CREDIT:				234.96
CITY ELECTRIC				
LKG/082418	12/13/2022	BUSHING-GRIT PUMP ELECT M	61-00-00-93601 MAINT-HEADWORKS EQUIP	5.86
LKG/082476	12/15/2022	FUSE-HEADWORKS RAPTOR E	61-00-00-93601 MAINT-HEADWORKS EQUIP	209.00
Total CITY ELECTRIC:				214.86
HOME DEPOT CREDIT				
523973	12/13/2022	SPOTLIGHTS-HEADWORKS GR	61-00-00-93601 MAINT-HEADWORKS EQUIP	41.39
Total HOME DEPOT CREDIT:				41.39

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
LAKE GENEVA ELECTRIC MOTOR SRV				
LG ELECTRIC	01/25/2023	HEADWORKS-MAINT-GRIT PUM	61-00-00-93601 MAINT-HEADWORKS EQUIP	485.00
Total LAKE GENEVA ELECTRIC MOTOR SRV:				485.00
DUNN LUMBER				
1319650	01/24/2023	PVC SLIP CAP-DIGESTER EQIP	61-00-00-93602 MAINT-DIGESTERS EQUIP	2.93
Total DUNN LUMBER:				2.93
CITY ELECTRIC				
LKG/081761	11/09/2022	DITCH VFD PANEL MAINT-PRO	61-00-00-93603 MAINT-PROCESS EQUIP	395.01
Total CITY ELECTRIC:				395.01
HOME DEPOT CREDIT				
8011044	12/05/2022	ELEC TAPE-PROCESS-DITCH A	61-00-00-93603 MAINT-PROCESS EQUIP	221.14
Total HOME DEPOT CREDIT:				221.14
BUMPER TO BUMPER AUTO PARTS				
662-467938	01/20/2023	FUEL & OIL FILTER-BOBCAT MA	61-00-00-93700 MAINT-VEHICLES & EQUIP	32.75
Total BUMPER TO BUMPER AUTO PARTS:				32.75
ELKHORN NAPA AUTO PARTS				
291128	01/25/2023	AIR FILTERS-BOBCAT MAINT	61-00-00-93700 MAINT-VEHICLES & EQUIP	100.52
Total ELKHORN NAPA AUTO PARTS:				100.52
HOME DEPOT CREDIT				
9625410	12/14/2022	BALL VALVE/GALV NIPPLES-CA	61-00-00-93700 MAINT-VEHICLES & EQUIP	20.13
Total HOME DEPOT CREDIT:				20.13
ITU ABSORB TECH INC				
8067782	02/03/2023	SHOP RAGS	61-00-00-93700 MAINT-VEHICLES & EQUIP	32.20
Total ITU ABSORB TECH INC:				32.20
WELDERS SUPPLY CO				
10334952	01/11/2023	ANNUAL OXYGEN RENTAL-SHO	61-00-00-93700 MAINT-VEHICLES & EQUIP	180.00
Total WELDERS SUPPLY CO:				180.00
BUMPER TO BUMPER AUTO PARTS				
662-468011	01/23/2023	BATTERY-BIG FOOT LS GENER	61-00-00-93800 MAINT-LIFT STATIONS	126.99
Total BUMPER TO BUMPER AUTO PARTS:				126.99
DUNN LUMBER				
1317490	01/19/2023	FOAM & MOUSE TRAP-EDGEW	61-00-00-93800 MAINT-LIFT STATIONS	13.99
Total DUNN LUMBER:				13.99
UNITED LABORATORIES				
INV370582	02/02/2023	LIFT/ZYME	61-00-00-93800 MAINT-LIFT STATIONS	9,632.40

Invoice Number	Invoice Date	Description	GL Account and Title		Net Invoice Amount
Total UNITED LABORATORIES:					9,632.40
DIGGERS HOTLINE					
220 6 39101 P	01/16/2023	JAN 2023 PREPAYMENT 1,200	61-00-00-93810	MAINT-MAINS	640.00
Total DIGGERS HOTLINE:					640.00
HOME DEPOT CREDIT					
1625276	12/12/2022	ADAPTER & PIPE-CAMEL SEWE	61-00-00-93810	MAINT-MAINS	59.42
Total HOME DEPOT CREDIT:					59.42
USA BLUE BOOK					
247191	01/25/2023	MANHOLE COVER CUSHION G	61-00-00-93810	MAINT-MAINS	53.53
Total USA BLUE BOOK:					53.53
Total 61:					51,822.75
62					
CARLSON RACINE ROOFING					
31720	12/22/2022	RESV 3 ROOF PROJ-FINAL PYM	62-00-00-10700	CONSTRUCTION WORK IN PROCESS	5,868.00
Total CARLSON RACINE ROOFING:					5,868.00
MSA PROFESSIONAL SERVICES INC					
R07815009.0-3	01/11/2023	PINE TREE & MARIANE WATER	62-00-00-10700	CONSTRUCTION WORK IN PROCESS	5,337.55
Total MSA PROFESSIONAL SERVICES INC:					5,337.55
CORE & MAIN LP					
S222923	01/19/2023	6" REPAIR CLAMPS & 6" HYMAX	62-00-00-15000	MATERIAL-SUPPLIES	1,797.00
S245103	01/20/2023	1.5" METER FLANGES	62-00-00-15000	MATERIAL-SUPPLIES	480.00
S270423	01/26/2023	8" TEES & 8" MEGA FLANGE	62-00-00-15000	MATERIAL-SUPPLIES	1,536.00
S272049	01/26/2023	MEGA FLANGE - 8"	62-00-00-15000	MATERIAL-SUPPLIES	255.00
Total CORE & MAIN LP:					4,068.00
DORNER COMPANY					
504314	01/24/2023	BUTTERFLY VALVE-PLAT A FILT	62-00-00-15000	MATERIAL-SUPPLIES	3,086.65
Total DORNER COMPANY:					3,086.65
CORE & MAIN LP					
S160987	01/05/2023	LARGE DIAMETER METER GAS	62-00-00-34600	METERS	653.75
S222350	01/17/2023	METER GASKETS	62-00-00-34600	METERS	176.00
S243875	01/24/2023	2" OMNI METERS	62-00-00-34600	METERS	3,230.26
Total CORE & MAIN LP:					4,060.01
MARTELLE WATER TREATMENT					
24586	01/17/2023	SODIUM HYPOCHLORITE	62-00-00-60200	CHEMICALS	999.05
Total MARTELLE WATER TREATMENT:					999.05

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
ALLIANT ENERGY				
145511000023	02/01/2023	361 MAIN ST WELL 2	62-00-00-60300 MISC EXPENSES & UTILITY	766.55
327391000023	02/02/2023	WAVERLY ST WELL 4	62-00-00-60300 MISC EXPENSES & UTILITY	636.65
348370000023	02/01/2023	WAVERLY ST WELL 3	62-00-00-60300 MISC EXPENSES & UTILITY	692.48
972745000023	02/01/2023	HASKINS ST WELL 5	62-00-00-60300 MISC EXPENSES & UTILITY	498.33
Total ALLIANT ENERGY:				2,594.01
WE ENERGIES				
4431091639	01/12/2023	HASKINS ST WELLHOUSE #5	62-00-00-60300 MISC EXPENSES & UTILITY	167.67
4432636594	01/12/2023	WAVERLY ST WELLHOUSE #4	62-00-00-60300 MISC EXPENSES & UTILITY	90.10
4468106522	02/09/2023	HASKINS ST WELLHOUSE #5	62-00-00-60300 MISC EXPENSES & UTILITY	131.21
4468477222	02/09/2023	WAVERLY ST WELLHOUSE #4	62-00-00-60300 MISC EXPENSES & UTILITY	72.25
Total WE ENERGIES:				461.23
CITY ELECTRIC				
LKG/081321	10/20/2022	WELL #2 ELECTRICAL SUPPLIE	62-00-00-61400 WELLS MAINTENANCE	43.02
LKG/082974	01/12/2023	WELL #2 ELECTRICAL REPAIRS	62-00-00-61400 WELLS MAINTENANCE	323.98
LKG/082992	01/12/2023	WELL #2 ELECTRICAL REPAIRS	62-00-00-61400 WELLS MAINTENANCE	48.76
Total CITY ELECTRIC:				415.76
DUNN LUMBER				
1313084	01/13/2023	TAPE/BUSHINGS-WELL#2 ELEC	62-00-00-61400 WELLS MAINTENANCE	8.79
Total DUNN LUMBER:				8.79
HOME DEPOT CREDIT				
25204	01/12/2023	WELL #2 ELEC REPAIRS-TAPE	62-00-00-61400 WELLS MAINTENANCE	13.21
7024441	01/05/2023	WELL #2 ELEC REPAIRS-FLANG	62-00-00-61400 WELLS MAINTENANCE	67.66
Total HOME DEPOT CREDIT:				80.87
ALLIANT ENERGY				
347962000023	02/01/2023	DODGE ST BOOSTER	62-00-00-62300 PUMPING POWER PURCHASED	174.57
576425000023	02/01/2023	MAIN ST ENGINE ROOM	62-00-00-62300 PUMPING POWER PURCHASED	4,455.71
717061000023	02/01/2023	1401 CENTER ST BOOSTER	62-00-00-62300 PUMPING POWER PURCHASED	271.11
Total ALLIANT ENERGY:				4,901.39
WE ENERGIES				
4431754273	01/12/2023	WATER DEPT MAIN BLDG	62-00-00-62300 PUMPING POWER PURCHASED	1,513.59
4431883027	01/12/2023	CENTER ST BOOSTER STN	62-00-00-62300 PUMPING POWER PURCHASED	80.35
4468141600	02/09/2023	CENTER ST BOOSTER STN	62-00-00-62300 PUMPING POWER PURCHASED	62.58
4468824107	02/09/2023	WATER DEPT MAIN BLDG	62-00-00-62300 PUMPING POWER PURCHASED	1,154.39
Total WE ENERGIES:				2,810.91
GRAINGER				
9588121849	01/26/2023	PLAT A PIPE SUPPORTS	62-00-00-63300 MAINT PUMPING EQUIP	22.10
Total GRAINGER:				22.10
HOME DEPOT CREDIT				
20322	02/01/2023	PLANT A PIPING SUPP-ANCHO	62-00-00-63300 MAINT PUMPING EQUIP	58.40

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
Total HOME DEPOT CREDIT:				58.40
USA BLUE BOOK				
239562	01/18/2023	PRESSURE GAUGE-PLANT A B	62-00-00-63300 MAINT PUMPING EQUIP	236.95
Total USA BLUE BOOK:				236.95
MARTELLE WATER TREATMENT				
24586	01/17/2023	CHLORINE	62-00-00-64100 CHEMICALS	902.23
Total MARTELLE WATER TREATMENT:				902.23
ALLIANT ENERGY				
974671000023	02/01/2023	361 MAIN ST HALLWAY	62-00-00-64200 LABOR & EXPENSES (LAB)	114.61
Total ALLIANT ENERGY:				114.61
AMY'S SHIPPING EMPORIUM				
55412	01/18/2023	SHIPPING-LAB THERMOMETER	62-00-00-64200 LABOR & EXPENSES (LAB)	13.23
Total AMY'S SHIPPING EMPORIUM:				13.23
NORTHERN LAKE SERVICE INC				
2300173	01/21/2023	MANGANESE MONTHLLY	62-00-00-64200 LABOR & EXPENSES (LAB)	42.91
Total NORTHERN LAKE SERVICE INC:				42.91
USA BLUE BOOK				
239562	01/18/2023	LAB CHEMICALS, REAGANTS,	62-00-00-64200 LABOR & EXPENSES (LAB)	462.19
Total USA BLUE BOOK:				462.19
WI STATE LABORATORY OF HYGIENE				
734707	01/31/2023	MONTHLY FLUORIDE SPLIT SA	62-00-00-64200 LABOR & EXPENSES (LAB)	28.00
Total WI STATE LABORATORY OF HYGIENE:				28.00
HOME DEPOT CREDIT				
1021907	12/12/2022	CHEMICAL GLOVES	62-00-00-64300 MISC EXPENSE	14.97
Total HOME DEPOT CREDIT:				14.97
WISCONSIN EMERGENCY MGMT				
233886	01/13/2023	FACILITY 84305-WHOPRS 2022	62-00-00-64300 MISC EXPENSE	205.00
Total WISCONSIN EMERGENCY MGMT:				205.00
DUNN LUMBER				
1331579	02/10/2023	LED BULBS	62-00-00-65100 PLANT MAINTENANCE	6.85
Total DUNN LUMBER:				6.85
HOME DEPOT CREDIT				
3022915	12/20/2022	PAINT HARDNER & STAKES	62-00-00-65100 PLANT MAINTENANCE	24.86
8160737	01/24/2023	PLANT A BRACKETS	62-00-00-65100 PLANT MAINTENANCE	36.96

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
Total HOME DEPOT CREDIT:				61.82
AMAZON CAPITAL SERVICES				
89C4-DEC 202	01/01/2023	WATERPROOF WADERS FOR I	62-00-00-65200 MAINT WATER TREATMENT EQUIP	156.84
Total AMAZON CAPITAL SERVICES:				156.84
ALLIANT ENERGY				
098433000023	02/01/2023	750 WILD RIDGE DR WATER TO	62-00-00-66100 MAINT OPS-STANDPIPES	105.59
520171000023	02/01/2023	1887 DODGE ST TOWER	62-00-00-66100 MAINT OPS-STANDPIPES	73.96
Total ALLIANT ENERGY:				179.55
CITY ELECTRIC				
LKG/081890	11/15/2022	MULTI-METER-ELECTRICAL	62-00-00-66500 MISC EXPENSE LICENSE & TOOLS	85.95
Total CITY ELECTRIC:				85.95
HOME DEPOT CREDIT				
1020147	01/31/2023	WRENCHES, THREADED ROD	62-00-00-66500 MISC EXPENSE LICENSE & TOOLS	83.80
1025141	01/11/2023	WELL #2 ELEC REPAIRS-CABLE	62-00-00-66500 MISC EXPENSE LICENSE & TOOLS	95.98
5012105	01/27/2023	SNOW SHOVEL PLANT	62-00-00-66500 MISC EXPENSE LICENSE & TOOLS	12.98
5023626	12/28/2022	PIPE THREAD TAPE & TUBE CU	62-00-00-66500 MISC EXPENSE LICENSE & TOOLS	30.81
Total HOME DEPOT CREDIT:				223.57
FIRST NATIONAL BANK OF OMAHA				
052595830245	01/23/2023	SCADA CABINETS HEATING UN	62-00-00-67200 RESERVOIR & STANDPIPES	238.00
Total FIRST NATIONAL BANK OF OMAHA:				238.00
DIGGERS HOTLINE				
220 6 39101 P	01/16/2023	JAN 2023 PREPAYMENT 1,200	62-00-00-67300 MAINT OF MAINS & VALVES	320.00
Total DIGGERS HOTLINE:				320.00
DOWN TO EARTH				
8007	01/17/2023	934 CAREY ST REPAIR MAIN B	62-00-00-67300 MAINT OF MAINS & VALVES	7,396.20
8010	01/17/2023	BONNIE BRAE LANE-REPAIR M	62-00-00-67300 MAINT OF MAINS & VALVES	3,252.00
Total DOWN TO EARTH:				10,648.20
DIGGERS HOTLINE				
220 6 39101 P	01/16/2023	JAN 2023 PREPAYMENT 1,200	62-00-00-67500 MAINT SERVICES & CURB BOX	320.00
Total DIGGERS HOTLINE:				320.00
DUNN LUMBER				
1314341	01/16/2023	CABLE TIES, MARKERS, CAULK	62-00-00-67600 MAINT OF METERS	57.06
1315139	01/17/2023	PIPE BUSHING-METER TESTIN	62-00-00-67600 MAINT OF METERS	19.58
1315411	01/17/2023	CHAIN-LOCKING COMMERCIAL	62-00-00-67600 MAINT OF METERS	16.50
1316229	01/18/2023	GALV PIPE NIPPLES METER TE	62-00-00-67600 MAINT OF METERS	37.20
1316506	01/18/2023	VALVES & PIPING METER TESTI	62-00-00-67600 MAINT OF METERS	159.69
1317128	01/19/2023	GALV PIPE FOR METER SETTIN	62-00-00-67600 MAINT OF METERS	6.44
1328703	02/07/2023	NUTS/BOLTS - LARGE METERS	62-00-00-67600 MAINT OF METERS	9.18

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
Total DUNN LUMBER:				305.65
HOME DEPOT CREDIT				
7011344	12/16/2022	THERMOSTAT WIRE-METER IN	62-00-00-67600 MAINT OF METERS	91.27
Total HOME DEPOT CREDIT:				91.27
JEFFERSON FIRE & SAFETY INC				
IN148445	01/16/2023	ADAPTORS, FITTINGS LARGE	62-00-00-67600 MAINT OF METERS	301.18
Total JEFFERSON FIRE & SAFETY INC:				301.18
PFI FASHIONS INC				
105264	01/16/2023	2023 UNIFORMS-POLOS & FLE	62-00-00-90200 METER READING EXPENSE	230.00
105265	01/17/2023	2023 UNIFORMS-CAPS	62-00-00-90200 METER READING EXPENSE	143.20
105266	01/26/2023	2023 UNIFORMS-T SHIRTS & FL	62-00-00-90200 METER READING EXPENSE	1,057.56
105549	02/13/2023	2023 UNIFORMS-T SHIRTS & H	62-00-00-90200 METER READING EXPENSE	393.46
Total PFI FASHIONS INC:				1,824.22
PETTY CASH				
PC02092023	02/09/2023	CERTIFIED MAIL-KOEPPPEN &	62-00-00-90300 RECORDS & COLLECTION EXPENSE	6.44
Total PETTY CASH:				6.44
ARENZ, MICHAEL				
ARENZ021023	02/10/2023	REIMB MWAA EXPO/RES CROS	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	340.31
Total ARENZ, MICHAEL:				340.31
AT&T				
262248865601	01/13/2023	JANUARY 2023 TELEPHONE BIL	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	114.74
Total AT&T:				114.74
AT&T LONG DISTANCE				
816988240-01	01/04/2023	262-248-8617 DEC	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	.46
Total AT&T LONG DISTANCE:				.46
CHARTER COMMUNICATIONS				
010682401212	01/21/2023	WATER JANUARY INTERNET	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	119.98
Total CHARTER COMMUNICATIONS:				119.98
ECKLUND, JEFFREY				
ECKLUND0202	02/02/2023	REIMB WASTEWATER OPERN-	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	61.35
Total ECKLUND, JEFFREY:				61.35
FIRST NATIONAL BANK OF OMAHA				
554328630242	01/24/2023	VONAGE PHONE SVC 1/23/2023	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	134.36
555062930246	01/23/2023	WIAWWA-GAJEWSKI CEUS-ETH	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	70.00
Total FIRST NATIONAL BANK OF OMAHA:				204.36

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
HART, LANDON				
HART011923	02/02/2023	REIMB WRWA TRAUB-WATERW	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	150.49
HART012723	01/27/2023	REIMB DNR CERTIFICATION RE	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	45.00
Total HART, LANDON:				195.49
MARTIN BUSINESS GROUP				
1293393	01/20/2023	SERVICE CONTRACT/COPIES	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	112.55
Total MARTIN BUSINESS GROUP:				112.55
MUNICIPAL ENVIRONMENTAL GROUP				
MEG01312023	01/31/2023	2023 MEMBERSHIP FEE-MUNI E	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	782.10
Total MUNICIPAL ENVIRONMENTAL GROUP:				782.10
ODP BUSINESS SOLUTIONS LLC				
287702235001	01/28/2023	BADGE HOLDERS	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	15.00
287704759001	01/30/2023	BADGE/LANYARD	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	3.75
Total ODP BUSINESS SOLUTIONS LLC:				18.75
RACHWAL, TYLER				
RACHWAL011	01/16/2023	REIMB REGIS FEE-RESIDENTIA	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	61.35
Total RACHWAL, TYLER:				61.35
US CELLULAR				
0554312940	01/04/2023	WATER MONTHLY PHONE BILL	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	104.57
Total US CELLULAR:				104.57
VELOCITY				
2023010	01/13/2023	OFFICE 365 SEATS AND CLOUD	62-00-00-92100 OFFICE SUPPLIES & EXPENSE	124.25
Total VELOCITY:				124.25
KAPUR & ASSOCIATES INC				
113532	06/08/2022	GIS UPDATES	62-00-00-92300 OUTSIDE SERVICES EMPLOYED	391.50
Total KAPUR & ASSOCIATES INC:				391.50
RUEKERT & MIELKE INC				
145225	01/31/2023	IMPACT FEE/TECH MEMO-SVC	62-00-00-92300 OUTSIDE SERVICES EMPLOYED	1,203.65
Total RUEKERT & MIELKE INC:				1,203.65
AURORA HEALTH CARE				
1442693	01/08/2023	DOT CONSORTIUM FEE-GAJE	62-00-00-92600 EMPLOYEE PENSIONS & BENEFITS	25.00
Total AURORA HEALTH CARE:				25.00
SECURIAN FINANCIAL GROUP				
FEB.2023 LIFE	01/19/2023	FEB LIFE INSURANCE 2023	62-00-00-92630 LIFE INSURANCE EXPENSE	12.90
Total SECURIAN FINANCIAL GROUP:				12.90

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount
CINTAS CORP				
5141170109	01/17/2023	RESTOCK FIRST AID SUPPLIES	62-00-00-93000 MISCELLANEOUS GENERAL EXP	185.53
Total CINTAS CORP:				185.53
ADVANCE AUTO PARTS				
719330373833	02/06/2023	SPARK PLUG PARTNER SAW	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	7.72
719330385855	02/07/2023	OIL DRY, CARB CLEANER	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	48.88
Total ADVANCE AUTO PARTS:				56.60
DUNN LUMBER				
1320481	01/25/2023	EPOXY & BATTERIES-TREATME	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	22.90
1326136	02/02/2023	CLEANING SUPP-TILEX/CLORO	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	21.52
1327689	02/06/2023	FUEL MIX/GAS	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	31.85
Total DUNN LUMBER:				76.27
EQUIPARTS				
237386	02/14/2023	REPLACE BUBBLER	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	1,441.67
Total EQUIPARTS:				1,441.67
FIRST NATIONAL BANK OF OMAHA				
052270230092	01/09/2023	WINDOW WEATHERSTRIP	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	41.00
Total FIRST NATIONAL BANK OF OMAHA:				41.00
HOME DEPOT CREDIT				
5012091	01/27/2023	ZIP TIES	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	9.88
6173710	01/16/2023	FURNACE FILTERS	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	35.88
80243360	01/04/2023	COPPER LUG & PHOTO CTRL-E	62-00-00-93200 MAINTENANCE OF GENERAL PLANT	24.55
Total HOME DEPOT CREDIT:				70.31
BUMPER TO BUMPER AUTO PARTS				
06620465865	12/01/2022	WASHER FLUID	62-00-00-93300 TRANSPORTATION EXPENSE	26.94
Total BUMPER TO BUMPER AUTO PARTS:				26.94
Total 62:				57,333.98
Grand Totals:				109,156.73

Carlson Racine Roofing – 5,868.00
Appvd 1116/2023

Customer Refunds + 111.70
+ 29.09
+ 131.88
$103,561.40

Invoice Number	Invoice Date	Description	GL Account and Title	Net Invoice Amount

Dated: _____

Mayor: _____

City Council: _____

_____

_____

_____

_____

_____

City Recorder: _____

Report Criteria:
Detail report.
Invoices with totals above $0.00 included.
Paid and unpaid invoices included.
Invoice Detail.GL account (2 Characters) = "61","62"

Lake Geneva Utility Commission

MUNICIPAL WATER AND WASTEWATER SERVICES

361 W Main Street
P.O. Box 187
Lake Geneva, WI 53147
262-248-2311
www.lgutilitycommission.com

Dennis Lyon – President
Josh Gajewski – Utility Director
Jeff Ecklund – Water Superintendent
Ken Bauman – Wastewater Superintendent

TO: Lake Geneva Utility Commission
FROM: Josh Gajewski, Utility Director
SUBJECT: February 2023 Director's Report

OPERATIONS UPDATE

WATER OPERATIONS

Staff has continued testing 1 ½" and larger meters, and we have noted a considerable amount of the compound meters are not passing the low-end registration threshold. Additionally, we are noting that a considerable number of large meters were installed in locations with low historic use compared to the meter capacity, indicating a downsizing of the meter is appropriate. We believe these meters are a significant contribution toward our unaccounted-for water and will be compiling a comprehensive list of meters needing replacement.

We are preparing for the Mariane and Pine Tree water main project to start in early March. A public information meeting will be held on February 22nd in the Police Training Room, and the preconstruction meeting will be held earlier on the same day.

WASTEWATER OPERATIONS

Staff has been working to finalize the 2023 CCTV schedule and project area, which is currently anticipated to be completed early in the summer. A review of the 2022 televising records is underway and we have and will continue to notify customers where defects or obstructions of laterals were noted.

The final compliance responses were completed and submitted to the WDNR for review, which was required as part of their last compliance inspection report. We await the upcoming Groundwater Report and Permit Draft within the next two months or so, prior to the re-issuance of the WPDES permit.

OFFICE & ADMINISTRATION

Wastewater Operator Matt Koehn recently achieved Basic level certification through the Wisconsin DNR for all of his Wastewater certifications.

Staff continues to work on year-end reporting and preparing for the upcoming audit process. The initial date for fieldwork was postponed and we await an update from the Finance Department and the Auditor to reschedule the work. The PSC report data has been collected and entered in anticipation of that report being completed within the next two months.

Work on the Impact Fee revisions continued with staff at Ruekert-Mielke and a draft copy of the technical memorandum is anticipated to be discussed at the February meeting.

10. Impact Fee Technical Memorandum

In May of 2022, the Commission approved a scope of work to have Ruekert-Mielke prepare a technical memorandum for the Utility, related specifically to any existing system capacity deficiencies and any improvements that would be reasonably assumed to be necessary to provide service in areas of new growth. The details outlined in the technical memo have been utilized in the second portion of work related to evaluating the City's Impact Fees and rate structure. The draft memo has been provided for Commissioner review and input.

Action is recommended to accept the Utility Impact Fee Technical Memorandum from Ruekert-Mielke and recommend to the City that it be incorporated into the Public Facilities Needs Review and Impact Fee Study.

11. Amend. 1 – Professional Services Agreement - Mariane Tce. & Pine Tree Ln. Improvement Project

Staff requested MSA Professional Services to draft an amendment to the PSA, to include a scope of services for the upcoming construction management and related work for the Mariane and Pine Tree water main replacement project. A copy of the amendment is included in packets for Commissioner review.

Action is recommended to approve Amendment No. 1 to the Professional Services Agreement with MSA Professional Services for the Mariane Terrace and Pine Tree Lane Improvements.

12. Professional Services Agreement – STH 50 Utility Update – MSA Professional Services

Staff requested MSA to prepare a PSA to include a scope of work to review and analyze the potential utility projects that have been discussed at previous meetings for the STH 50 WisDOT project. The scope of work includes a preliminary review of potential water main sizing, sanitary sewer replacement, sanitary sewer extensions, and sanitary sewer sizing along the project limits. Additionally, staff requested additional work to update the water system model.

Action is recommended to approve the Professional Services Agreement with MSA Professional Services for the STH 50 Utility Updates as drafted.

13. Symphony Bay Phase 7 Proposed Utility Improvements

Utility improvement plans have been submitted as part of the subject phase of the development, which were subsequently reviewed by staff and engineering, with a letter of recommendation for approval being issued by Nielson, Madsen, and Barber. Both the plat and precise implementation plan for Phase 7 have been approved by Plan Commission and Council. A copy of the letter of recommended approval, along with a copy of the utility plan excerpts have been included in packets for Commissioner review.

Action is recommended to approve the proposed utility improvements for Symphony Bay Phase 7 and authorize the issuance of an Owner Letter of Approval.

14. Proposed Verizon Wireless Equipment Improvements – Host Dr. Tower

Staff received a submittal from Verizon Wireless to make modifications to the current cellular equipment installed on the Host Dr. Tower. The submittal was reviewed by staff and engineering, subsequently revised, and resubmitted by Verizon. A letter of recommended approval has been issued by Dixon Engineering. A copy of the plans and review letter has been included in packets for Commissioner review.

Action is recommended to approve the equipment improvements proposed by Verizon Wireless as submitted.

February 9, 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.
darnott@ruekert-mielke.com

Re: Utilities Impact Fee Technical Memorandum – DRAFT 4

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.

Center Elevated Tank
Center Booster Station
Dodge Elevated Storage
Well 4
Well 5
Well 2
Well 3
Dodge Booster Station
Water Treatment Plants A & B and Reserviors
Host Elevated Storage

I:\Projects\5161_LakeGeneva\10003 Impact Fee\Data\Fig1_WaterSysFac.mxd

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

N W E S

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)	Capacity (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.

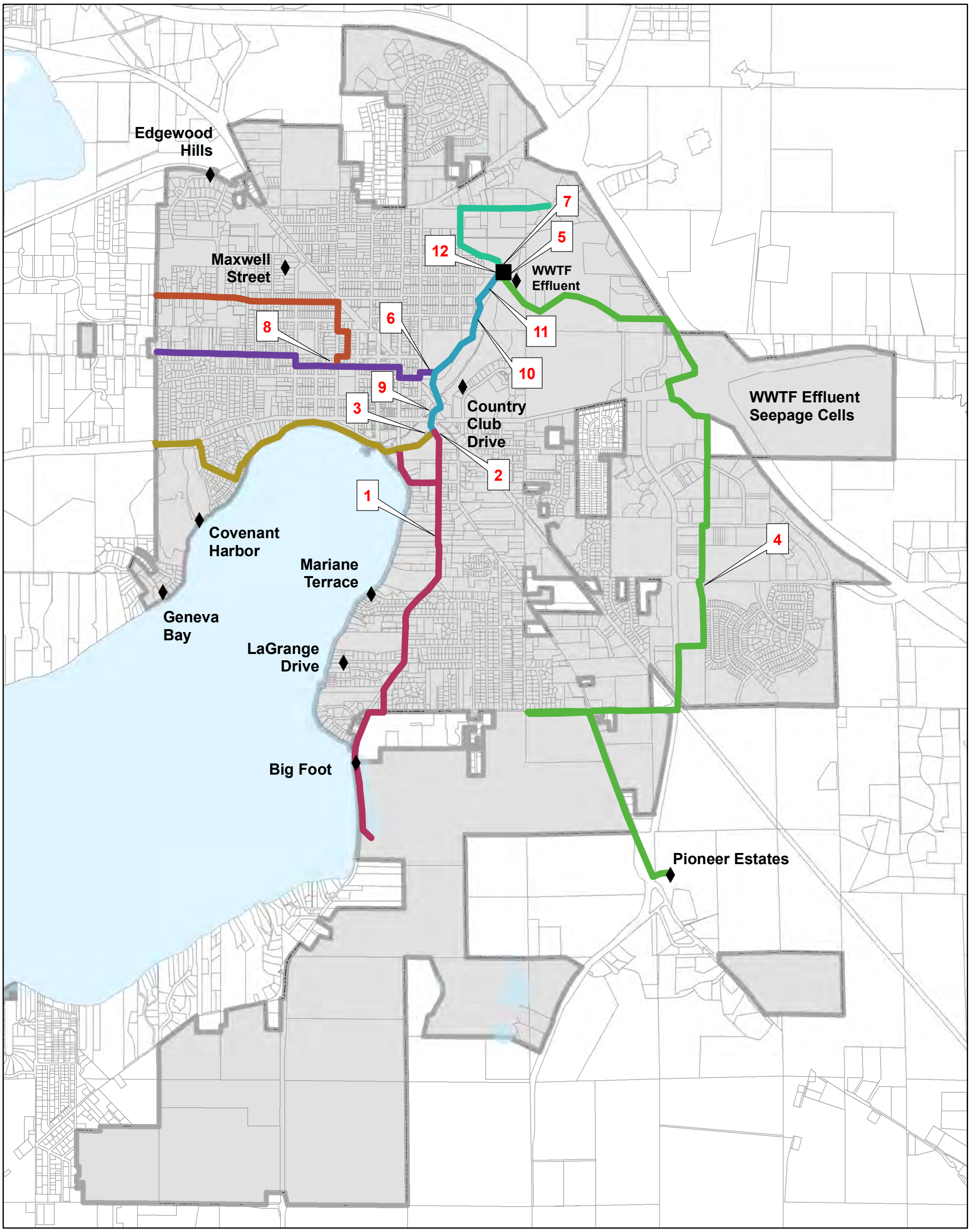
Table 6 Summary of Existing Pumping Stations

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

CITY OF LAKE GENEVA

N W E S

0 1,000 2,000 4,000

Feet

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		Assumptions/Notes
		(gpm/acre)	(gpd/acre)	
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

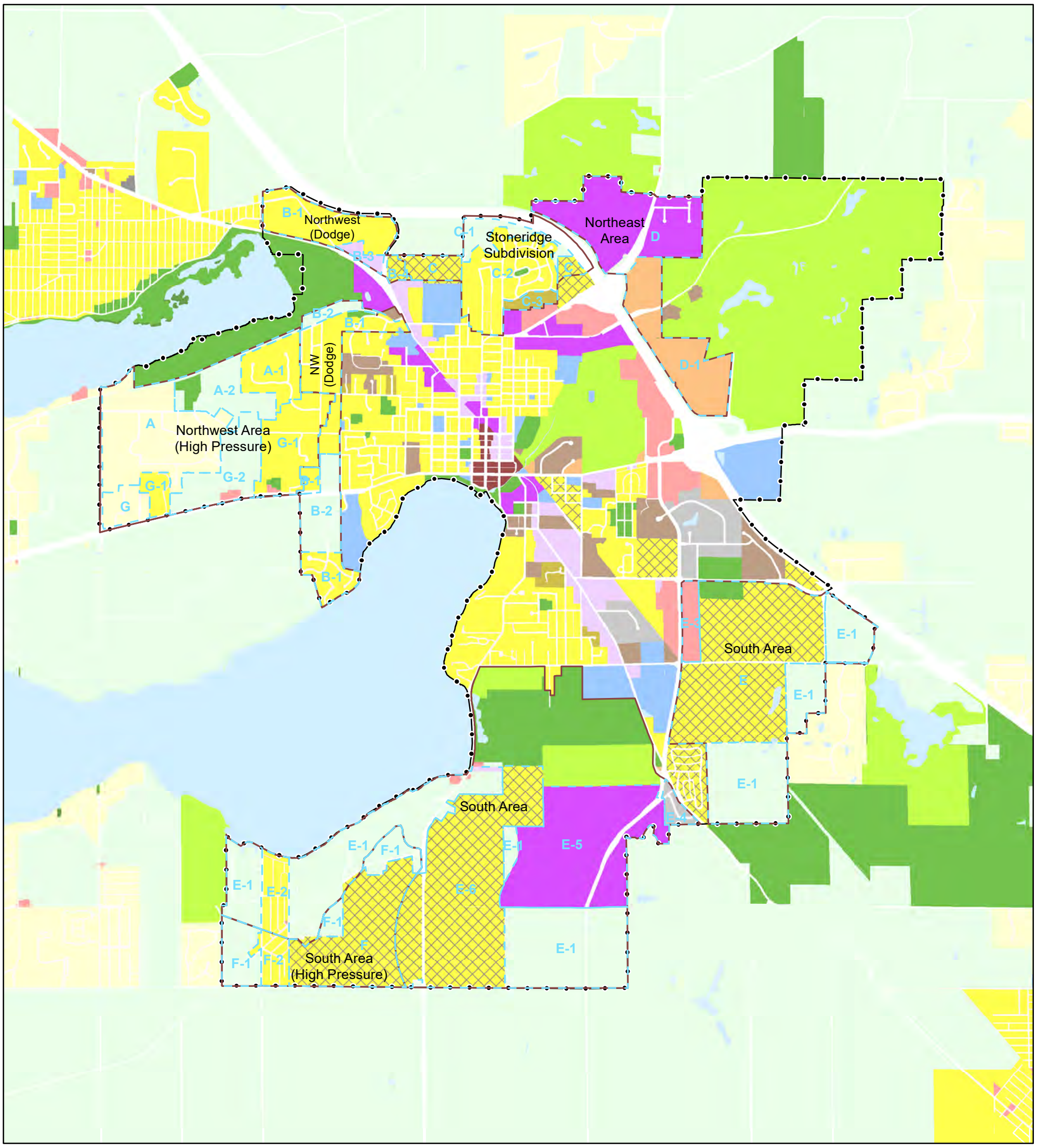
3 Study Areas

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.



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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

CITY OF LAKE GENEVA

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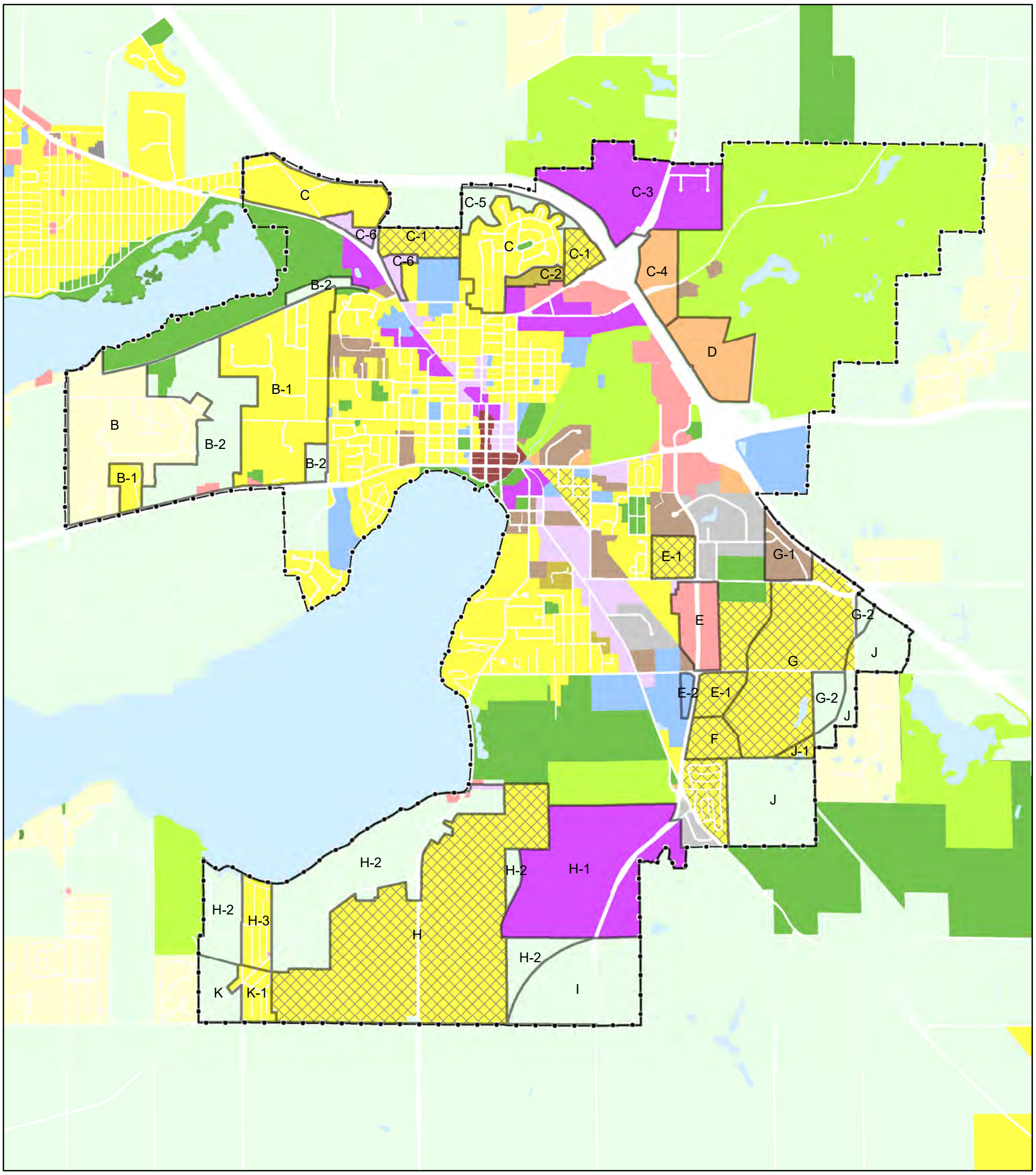

Date: November 2022

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

N W E S

0 1,500 3,000 6,000

Feet

CITY OF LAKE GENEVA

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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.

Treatment Plant B Improvements:
- Filters For Plant B (1,000 gpm)
- Process Piping
- Backwash Tank
- Backwash Pump
- (2) Vertical Turbine Pumps
- Suction Piping To Vertical Turbine Pumps
- Electrical and MCC
- Chemical Feed Equipment

Replace existing 10" watermain on Dodge St with new 12" watermain.

Center Elevated Tank

Center Booster Station

Well 5

Dodge Elevated Storage

210 GPM Booster Station

Well 4

Well 2

Well 3

Pressure Reducing Vault

Dodge Booster Station

Install a new 700 GPM Fire Pump at the Dodge Booster Station

Water Treatment Plants A & B and Reserviors

Host Elevated Storage

80 GPM Booster Station

240,000 Gallon Elevated Storage Tank (Location to be Determined)

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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

Wastewater Treatment Facilities Improvements:

- Add Second Influent Screen and Washer/Compactor
- Update Grit Removal Vortex Paddle Motor and Controls
- Provide Influent Pump Updates
- Add FOG Removal Tank
- Provide Additional Aeration Equipment At Oxidation Ditch
- Replace Weirs At Final Clarifier Splitter Box
- Provide Final Clarifier Improvements With Baffles
- Expand Effluent Pumping Capacity
- Provide Biosolids Processing Improvements

Replace Dodge Interceptor Sewer with new 12" diameter sewer pipe.

Replace north section of East Interceptor sewer with new 30" diameter sewer pipe.

Replace south section of East Interceptor sewer with new 24" diameter sewer pipe.

Replace Lake Shore Dr. Interceptor sewer with new 12" diameter sewer pipe.

County Road H
North State Rd 120
Sheridan Springs Rd
Grandview Dr
Edgewood Hills
Lake Forest Cir
Maxwell Street
WWTF Effluent
McDonald Rd
Country Club Drive
WWTF Effluent Seepage Cells
Covenant Harbor
Mariane Terrace
Geneva Bay
Townline Rd
LaGrange Drive
Big Foot
Pioneer Estates
South State Rd 120
S Lakeshore Drive

I:\Projects\5161_LakeGeneva\10003 Impact Fee\Data\Fig6_PropSanitarySysFac.mxd

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

N W E S

0 1,500 3,000 6,000

Feet

CITY OF LAKE GENEVA

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

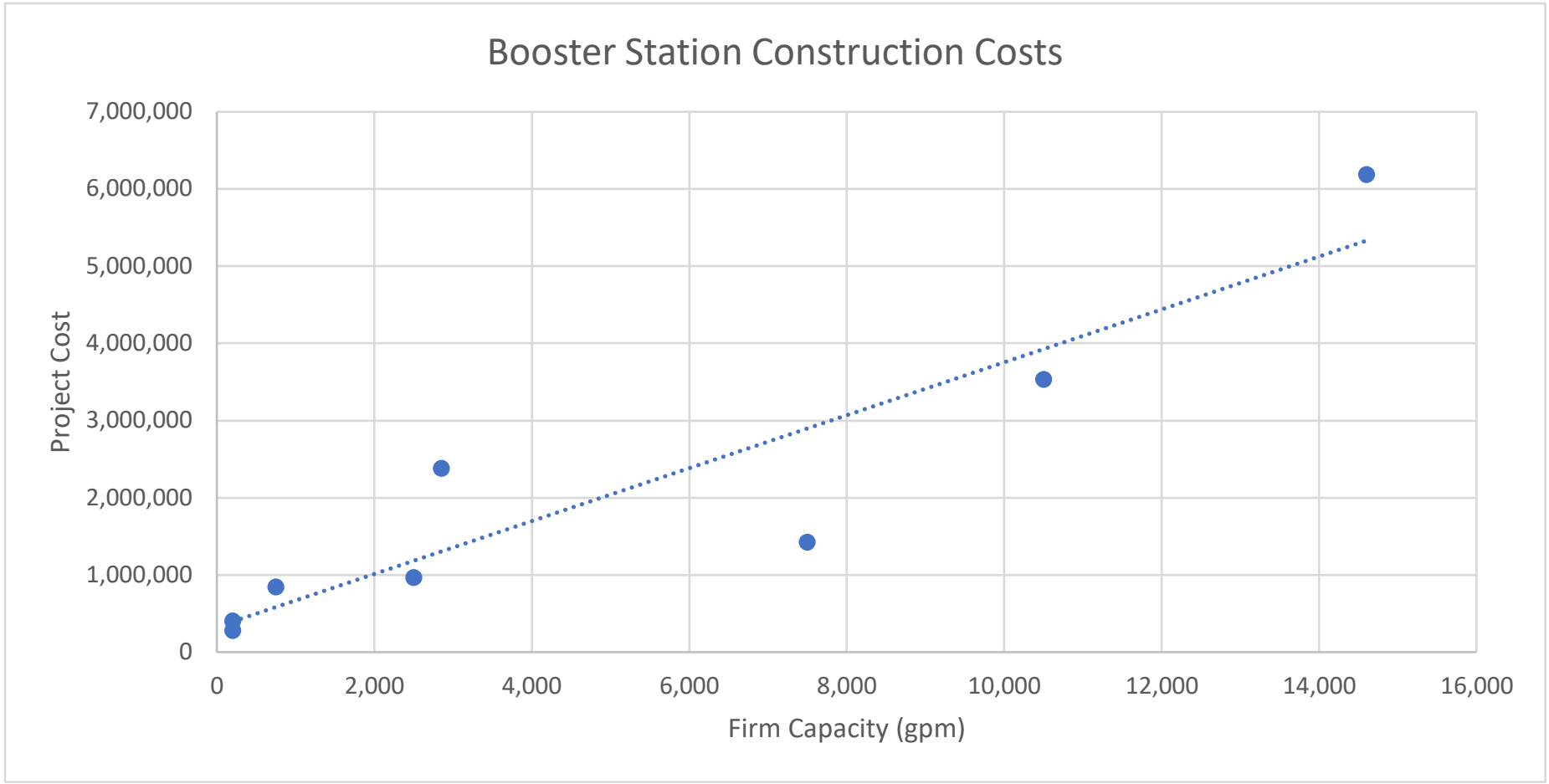
Interceptors Gravity Sewers					
23	Lake Shore Drive Interceptor Sewer - 12" Sewer Main	LF	2,800	$275	$770,000
24	East Interceptor Sewer - 24" Sewer Main	LF	11,200	$400	$4,480,000
25	East Interceptor Sewer - 30" Sewer Main	LF	6,700	$450	$3,015,000
26	Dodge St Interceptor Sewer - 12" Sewer Main	LF	8,300	$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**

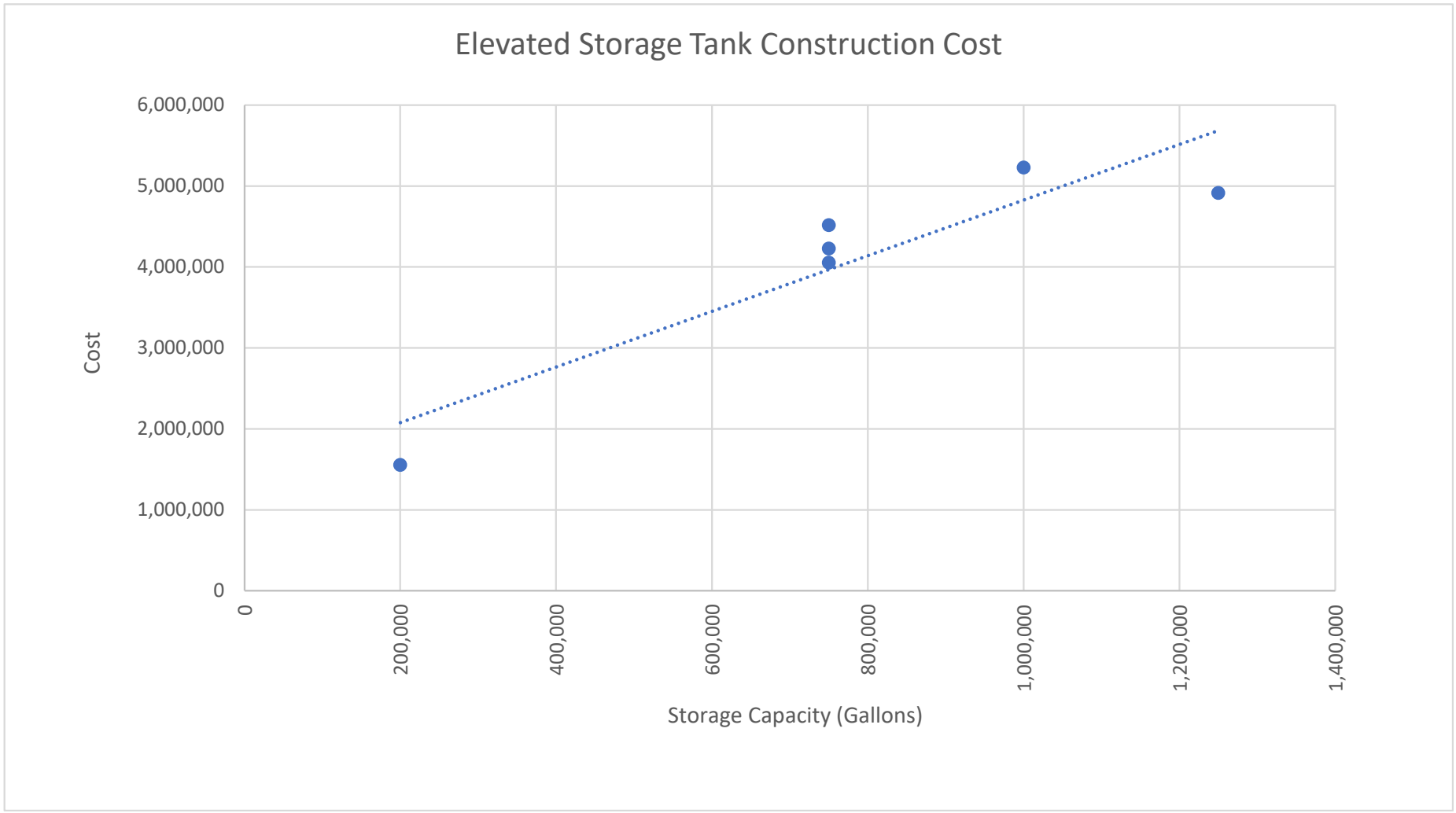
7 Summary and Conclusion

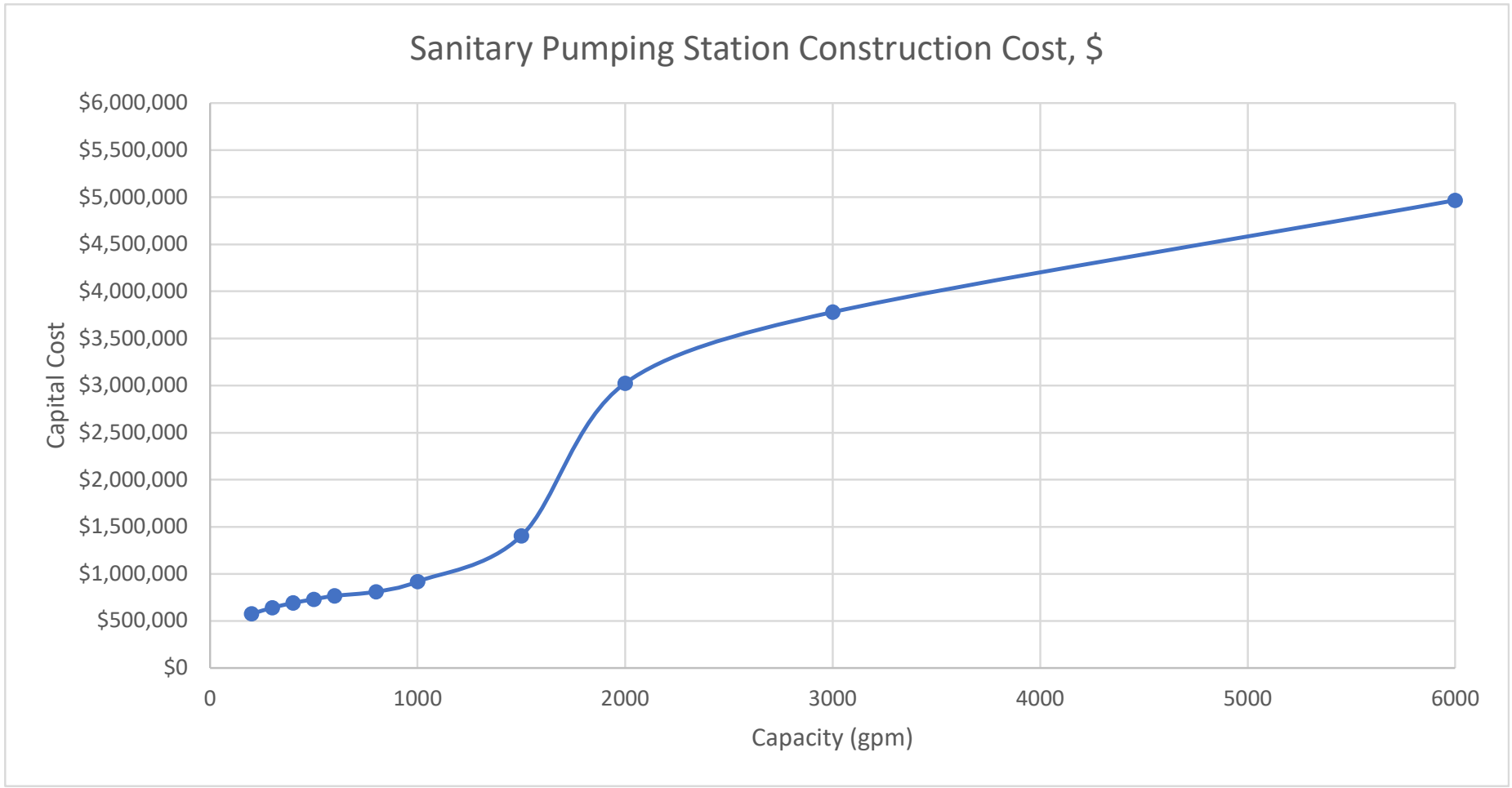
Using the City's projected land use, growth patterns, and applicable water demand and wastewater factors, the year 2042 population equivalent is 12,786. This equates to 6,003 additional RECs. The total cost for the water and wastewater systems are $21,094,000 and $33,401,000 respectively.

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

Amendment No. 1

To: **Lake Geneva Utility Commission**
Josh Gajewski
361 West Main Street
Lake Geneva, WI 53147

Date of Issuance: **2/14/2023**

MSA Project No.: **07815009**

This is an amendment to the Agreement dated 02/09/2023 and does acknowledge that MSA Professional Services, Inc. (MSA) is authorized to begin work on the following project amendment:

Project Name: 2023 MARRIANE TERRACE AND PINE TREE LANE IMPROVEMENTS

The project scope has changed due to: Construction related services for the watermain installation of Marianne Terrace / Pine Tree Lane

The scope of the work authorized is: Attachment B: Scope of Services

The schedule to perform the work is: Approximate Start Date: 2/14/2023
Approximate Completion Date: July 2024

The estimated fee / not to exceed for the work is: $36,250

Authorization for the work described above shall amend the Agreement between MSA and OWNER. Any attachments or exhibits referenced in this Amendment are made part of the Agreement. Payment for these services will be on a time and materials basis. A list of reimbursable expenses is included on the attached rate schedule.

Approval: MSA shall commence work on this project in accordance with your written authorization. This authorization is acknowledged by signature of the authorized representatives of the parties to this Amendment. A copy of this Amendment signed by the authorized representatives shall be returned for our files. If a signed copy of this Authorization is not received by MSA within seven days from the date of issuance, MSA may stop work on the project.

LAKE GENEVA UTILITY COMMISSION

Josh Gajewski
Utility Operator
Date:

361 W. Main Street
Lake Geneva, WI 53147
Phone: (262) 248-6644
Fax: (262) 248-4715

MSA PROFESSIONAL SERVICES, INC.

Joe DeYoung, P.E.
Regional Public Works Manager
Date: 02/14/23

1702 Pankratz Street
Madison, WI 53704
Phone: (608) 242-7779
Fax: (608) 242-5664

ATTACHMENT A:
RATE SCHEDULE

CLASSIFICATION	LABOR RATE
Architects	$115 – $175/hr.
Clerical	$ 80 – $125/hr.
CAD Technician	$ 95 – $150/hr.
Geographic Information Systems (GIS)	$ 75 – $146/hr.
Housing Administration	$ 82 – $125/hr.
Hydrogeologists	$127 – $160/hr.
Planners	$ 90 – $180/hr.
Principals	$175 – $369/hr.
Professional Engineers	$ 92 – $200/hr.
Project Manager	$ 150 – $242/hr.
Professional Land Surveyors	$ 87 – $180/hr.
Staff Engineers	$ 80 – $150/hr.
Technicians	$ 70 – $132/hr.
Wastewater Treatment Plant Operator	$ 80 – $ 100/hr.

REIMBURSABLE EXPENSES	
Copies/Prints	Rate based on volume
Specs/Reports	$10
Copies	$0.20/page
Plots	$0.15/sq.in.
Flash Drive	$10
GPS Equipment	$28/hour
Laser Level	$10/per day
Mailing/UPS	At cost
Mileage – Reimbursement (currently $0.56/mile)	Rate set by Fed. Gov.
Mileage – MSA Vehicle	$35 + $0.30 mile
Nuclear Density Testing	$25.00/day + $10/test
Organic Vapor Field Meter	$100/day
PC/CADD Machine	Included in labor rates
Robotic Survey Equipment	$37/hour
Stakes/Lath/Rods	At cost
Travel Expenses, Lodging, & Meals	At cost
Traffic Counting Equipment & Data Processing	At cost
Geodimeter	$30/hour

* Labor rates represent an average or range for a particular job classification. These rates are in effect until December 25, 2021.

ATTACHMENT B:
SCOPE OF SERVICES
City of Lake Geneva – 2023 Marianne Terrace and Pine Tree Lane Improvements

PROJECT DESCRIPTION

The City of Lake Geneva – 2023 Marianne Terrace and Pine Tree Lane Improvements project will commence in the early spring of 2023. This amended scope of services includes construction administration, construction observation, construction staking, and post-construction work; as related to the water utility; to finalize the project.

SCOPE OF SERVICES

MSA will provide services as set forth below.

1. **Construction Administration**
    - **Project Administration**
        - Manage and coordinate project team, budget and schedules. Maintain communication with Owner, Contractor, and other stakeholders on project.
    - **Preconstruction Meeting**
        - Attend and conduct one preconstruction meeting.
    - **Shop Drawing and Submittal Review**
        - Review shop drawings and submittals from contractor for compliance with specifications.
    - **Pay Applications Review**
        - Review Contractor submitted pay applications and provide recommendations to City Council.
    - **Change Order Review**
        - Review Contractor submitted change orders and provide recommendations to City Council.

2. **Construction Staking**
    - Provide construction line and grade staking for the watermain and appurtenances.
        - Water main staking. Assume two trips to the site to complete line and grade staking for water main and services (24 hours estimated, 2 trips).
        - Reimbursables: Reproduction, GPS, Mileage, Stakes and Lath

3. **Construction Observation (Assume 4 weeks of construction)**
    - Provides part time construction observation and documentation of major project components and critical operations consisting of:
        - An estimated 200 hours of construction observation and documentation by a professional engineer.
        - This includes observation for removals, water main, appurtenances and service installation and testing documentation.
        - Reimbursables: Reproduction, Postage, Fax, UPS, GPS, Mileage

4. **Post-Construction**
    - 11-Month walk-thru with Owner to review warranty items for the project.
    - Record drawings, daily reports, utility connection information and drawings.

- Reimbursables: Reproduction, Postage, Fax, UPS, GPS, Mileage

DELIVERABLES

MSA will provide the following deliverables:

1. Record Drawings: one (1) paper copy and one thumb drive of pertinent information for Owner's records.
2. Other construction documentation in .pdf format including water main/service records, daily reports, utility connection information, testing reports, and other pertinent documentation.

ESTIMATED FEES

MSA will not exceed fees without prior approval from the utility director or Utility council.

ADDITIONAL SERVICES

Services that are not included in the above Scope of Services can be provided under separate contract or by amending the scope and fee listed in this Agreement. Examples of additional services that may be needed or desired for completion of the project include:

1. Assistance with acquisition of real estate and/or temporary or permanent easements
2. Post-construction survey mapping and monumentation
3. Additional meetings not specifically listed in the scope.

PROJECT SCHEDULE

MSA anticipates the following estimated project schedule (subject to change):

Date	**Milestone**
March 2023	Start submittal reviews and preconstruction work
March / April 2023	Construction begins
June 2023	Construction ends (estimated)
July 2023	Final construction closeout (estimated)
August 2023	Project Closeout

OWNER'S RESPONSIBILITIES

- Owner will operate Owner's systems (hydrants, valves, manholes, etc.) as needed during construction.
- Owner will provide timely response to questions and review of engineering submittals (preliminary and final plans).

Professional Services Agreement

MSA Project Number: 07815010

This AGREEMENT (Agreement) is made today February 14, 2023 by and between LAKE GENEVA UTILITY COMMISSION (OWNER) and MSA PROFESSIONAL SERVICES, INC. (MSA), which agree as follows:

Project Name: City of Lake Geneva – STH 50 Utility Update

The scope of the work authorized is: See Attachment A: Scope of Services

The schedule to perform the work is: Approximate Start Date: February 2023
Approximate Completion Date: April 2023

The lump sum fee for the work is: $7,500

All services shall be performed in accordance with the General Terms and Conditions of MSA, which is attached and made part of this Agreement. Any attachments or exhibits referenced in this Agreement are made part of this Agreement. Payment for these services will be on a lump sum basis.

Approval: Authorization to proceed is acknowledged by signatures of the parties to this Agreement.

LAKE GENEVA UTILITY COMMISSION

Josh Gajewski
Utility Director
Date:

361 W. Main Street
Lake Geneva, WI 53147
Phone: (262) 248-6644
Email: jgajewski@lgutilities.org

MSA PROFESSIONAL SERVICES, INC.

Joe DeYoung
Regional Service Line Leader
Date: 02/16/23

1702 Pankratz Street
Madison, WI 53704
Phone: +1 (608) 242-6646
Email:jdyoung@msa-ps.com

ATTACHMENT A:
SCOPE OF SERVICES

PROJECT DESCRIPTION

The City of Lake Geneva – The Wisconsin Department of Transportation (WisDOT) is planning to reconstruct STH 50 through the City of Lake Geneva. As part of this project, the Lake Geneva Utility Commission (Commission) would like to implement upgrades to their water and sewer utilities within this corridor. The Commission has interest in specific areas within the project corridor due to age, condition, and other alignment concerns with the utilities. MSA has worked with the Commission to build comprehensive system models for the entire water and sewer network within the service area. MSA will evaluate these areas utilizing the calibrated models to make recommendations on pipe capacity/sizing, alignment, and connection points.

SCOPE OF SERVICES

1. **Phase I – Sanitary Sewer Evaluation**
    - **Existing 8" sewer on Elmwood Ave & Main St (STH 50).** This sewer is within the project corridor, and the Commission would like to evaluate capacity of this segment considering future development within this subsewershed.
    - **Sewer Crossings from Center St. to Country Club Dr.** There are several crossings within the project corridor on these blocks. The Commission plans to replace/realign these crossings and seeks recommendations on pipe capacity/sizing and alignment. These pipes feed into a 18"-21" interceptor that runs along the White River toward the Wastewater Treatment Facility (WWTF). This interceptor was identified as not having capacity to accommodate long term growth. Therefore, it's likely the pipes that cross STH50 need to be upsized.
    - **Accommodating potential growth from the west of the sewer service area.** The Commission would like to evaluate alternatives to provide adequate sewer service west of the City to existing and future development north and south of STH 50. It is possible that sewer service for the new service area could come through the STH 50 corridor, and it would be prudent to install any new utility structure as part of the DOT's project. MSA will conduct a qualitative analysis to evaluate up to three (3) service alternatives considering flows, pipe size, alignment, depth, and if any pump stations are required. Costs will be considered in the analysis, but cost estimates will not be developed as part of this scope. If it appears an alignment through the STH 50 corridor is prudent, a more detailed analysis will be completed as part of a future contract.
2. **Phase II – Watermain Evaluation**
    - **Existing watermain size along STH 50 from Forest Street to Warren Street**. The existing watermain in this segment is predominantly 6" diameter. The Commission would like to evaluate capacity of this segment (for fire flow and maximum day demand) considering future development west of the City limits.

- **Additional high pressure zone interconnection near Sky Lane Drive**. The Dodge high pressure zone (HPZ) has limited system feed connections from the low pressure zone. Turning off one valve near the Dodge and Miller Ct can shut off much of the south portion of the Dodge HPZ. The Commission would like to evaluate adding another pressure system interconnection near STH 50 and Sky Lane Drive.
- **Existing watermain size along STH 50 from Broad Street to the Water Treatment Plant**. The existing watermain in this segment is predominantly 10" diameter but is bounded by 12" watermain to the east and west. The Commission would like to evaluate the capacity (fire flow and maximum day demand) of this segment considering future development.
- **Out of date water model.** Over the last few years a number of watermain projects have been completed and the water model is out of date. The Commission would like to update the water model to provide better evaluation of the three concerns noted above.

DELIVERABLES

MSA will provide the following deliverables:

1. Memo with recommendation for the sizing and recommended improvements within the STH 50 corridor.
2. Provide updated information related to the water system
    a. Updated fireflow table (electronic copy)
    b. Updated fireflow contour map (electronic copy)

ADDITIONAL SERVICES

Services that are not included in the above Scope of Services can be provided under separate contract or by amending the scope and fee listed in this Agreement. Examples of additional services that may be needed or desired for completion of the project include:

1. Design services
2. Soil borings
3. Survey
4. Meeting coordination with council / utility commission (one meeting with results is anticipated with utility commission)

PROJECT SCHEDULE

MSA anticipates the following estimated project schedule (subject to change):

Date	Milestone
February 2023	Approval for scope of work
March / April 2023	Evaluation period
April Utility Commission	Recommendations provided to Commission

OWNER'S RESPONSIBILITIES

- Owner will provide information and access to utility maps for evaluation.

MSA PROFESSIONAL SERVICES, INC. (MSA)
GENERAL TERMS AND CONDITIONS OF SERVICES (PUBLIC)

1. **Scope and Fee.** The scope of Owner's Project (the "Project"), scope of MSA's services (the "Work"), and quoted fees for those services are defined in Attachment A. The scope and fee constitute a good faith estimate of the tasks and associated fees required to perform the services defined in Attachment A. This agreement upon execution by both parties hereto, can be amended only by written instrument signed by both parties. For those projects involving conceptual or process development service or involve renovation of an existing building or structure, activities often cannot be fully defined during initial planning. As the Project progresses, facts uncovered may reveal a change in direction which may alter the Work. MSA will promptly inform the OWNER in writing of such situations so that changes in this agreement can be made as required.

2. **Owner's Responsibilities**.

(a) Project Scope and Budget

The OWNER shall define the scope and budget of the Project and, when applicable, periodically update the Project budget, including that portion allocated for the cost of the Work. The Project budget shall include contingencies for design, development, and, when required by the scope of the Project, construction of the Project. The OWNER shall not significantly increase or decrease the overall Project scope or schedule, the portion of the budget allocated for the cost of the Work, or contingencies included in the overall budget or a portion of the budget, without the agreement of MSA to a corresponding change in the Project scope, quality, schedule, and compensation of MSA.

(b) Designated Owner Representative

The OWNER shall identify a Designated Representative who shall be authorized to act on behalf of the OWNER with respect to the Project. OWNER's Designated Representative shall render related decisions in a timely manner so as to avoid unreasonable delay in the orderly and sequential progress of MSA's services. MSA shall not be liable for any error or omission made by OWNER, OWNER's Designated Representative, or OWNER's consultant.

(c) Tests, Inspections, and Reports

When required by the scope of the Project, the OWNER shall furnish tests, inspections, and reports required by law or the Contract Documents, such as planning studies; preliminary designs; structural, mechanical, or chemical tests; tests for air, water, or soil pollution; and tests for hazardous materials.

(d) Additional Consultants

MSA's consultants shall be identified in Attachment A. The OWNER shall furnish the services of other consultants other than those designated in Attachment 1, including such legal, financial, accounting, and insurance counseling services as may be required for the Project.

(e) OWNER Provided Services and Information

MSA shall be entitled to rely on the accuracy and completeness of services and information furnished by the OWNER, Designated OWNER Representative, or Consultant. MSA shall use reasonable efforts to provide prompt written notice to the OWNER if MSA becomes aware of any errors, omissions, or inconsistencies in such services or information.

3. **Billing.** MSA will bill the OWNER monthly with net payment due upon receipt. Balances due past thirty (30) days shall be subject to an interest charge at a rate of 12% per year from said thirtieth day. In addition, MSA may, after giving seven days written notice, suspend service under any agreement until the OWNER has paid in full all amounts due for services rendered and expenses incurred, including the interest charge on past due invoices.

4. **Costs and Schedules.** Costs (including MSA's fees and reimbursable expenses) and schedule commitments shall be subject to change for delays caused by the OWNER's failure to provide specified facilities or information or for delays caused by unpredictable occurrences including, without limitation, fires, floods, riots, strikes, unavailability of labor or materials, delays or defaults, by suppliers of materials or services, process shutdowns, pandemics, acts of God or the public enemy, or acts of regulations of any governmental agency.

Temporary delays of services caused by any of the above which result in additional costs beyond those outlined may require renegotiation of this agreement.

5. **Access to Site.** Owner shall furnish right-of-entry on the Project site for MSA and, if the site is not owned by Owner, warrants that permission has been granted to make planned explorations pursuant to the scope of services. MSA will take reasonable precautions to minimize damage to the site from use of equipment, but has not included costs for restoration of damage that may result and shall not be responsible for such costs.

6. **Location of Utilities.** Owner shall supply MSA with the location of all pre-existent utilities and MSA has the right to reasonably rely on all Owner supplied information. In those instances where the scope of services require MSA to locate any buried utilities, MSA shall use reasonable means to identify the location of buried utilities in the areas of subsurface exploration and shall take reasonable precautions to avoid any damage to the utilities noted. However, Owner agrees to indemnify and defend MSA in the event of damage or injury arising from damage to or interference with subsurface structures or utilities which result from inaccuracies in information of instructions which have been furnished to MSA by others.

7. **Professional Representative.** MSA intends to serve as the OWNER's professional representative for those services as defined in this agreement, and to provide advice and consultation to the OWNER as a professional. Any opinions of probable project costs, reviews and observations, and other recommendations made by MSA for the OWNER are rendered on the basis of experience and qualifications and represents the professional judgment of MSA. However, MSA cannot and does not warrant or represent that proposals, bid or actual project or construction costs will not vary from the opinion of probable cost prepared by it.

8. **Construction.** When applicable to the scope of the Project, the OWNER shall contract with a licensed and qualified Contractor for implementation of construction work utilizing a construction contract based on an EJCDC construction contract and general conditions appropriate for the scope of the Project and for the delivery method. In the construction contract, the OWNER shall use reasonable commercial efforts to require the Contractor to (1) obtain Commercial General Liability Insurance with contractual liability coverage insuring the obligation of the Contractor, and name the OWNER, MSA and its employees and consultants as additionally insureds of that policy; (2) indemnify and hold harmless the OWNER, MSA and its employees and consultants from and against any and all claims, damages, losses, and expenses ("Claims"), including but not limited to reasonable attorney's fees and economic or consequential damages arising in whole or in part out of the negligent act or omission of the contractor, and Subcontractor or anyone directly or indirectly employed by any of them. This agreement shall not be construed as giving MSA, the responsibility or authority to direct or supervise construction means, methods, techniques, sequence, or procedures of construction selected by the contractors or subcontractors or the safety precautions and programs incident to the work, the same being the sole and exclusive responsibility of the contractors or subcontractors.

9. **Standard of Care.** In conducting the services, MSA will apply present professional, engineering and/or scientific judgment, which is known as the "standard of care". The standard of care is defined as that level of skill and care ordinarily exercised by members of the same profession practicing at the same point in time and in the same or similar locality under similar circumstances in performing the Services. The OWNER acknowledges that "current professional standards" shall mean the standard for professional services, measured as of the time those services are rendered, and not according to later standards, if such later standards purport to impose a higher degree of care upon MSA.

MSA does not make any warranty or guarantee, expressed or implied, nor have any agreement or contract for services subject to the provisions of any uniform commercial code. Similarly, MSA will not accept those terms and conditions offered by the OWNER in its purchase order, requisition, or notice of authorization to proceed, except as set forth herein or expressly agreed to in writing. Written acknowledgement of receipt, or the actual performance of services subsequent to receipt of such purchase order, requisition, or notice of authorization to proceed is specifically deemed not to constitute acceptance of any terms or conditions contrary to those set forth herein.

10. **Municipal Advisor**. MSA Professional Services, Inc. is not acting as a 'Municipal Advisor' to the owner pursuant to Section 15B of the Exchange Act. For financial advice related to the corresponding project, the client is encouraged to discuss their finances with internal and/or external advisors and experts before making decisions incurring debt and/or supporting those obligations. MSA desires to serve each client well by providing the best information publicly available and is providing information as part of its engineering responsibilities to

inform client options. The information is not intended to provide financial advice or recommendations and is not bound by the formal Municipal Advisor fiduciary duty.

11. **Conduct Expectations.** Owner and MSA understand their respective obligations to provide a safe, respectful work environment for their employees. Both parties agree that harassment on the job (unwelcome verbal, physical or other behavior that is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

12. **Electronic Documents and Transmittals**. Owner and MSA agree to transmit and accept project related correspondence, documents, text, data, drawings and the like in digital format in accordance with MSA's Electronic Data Transmittal policy. Each party is responsible for its own cybersecurity, and both parties waive the right to pursue liability against the other for any damages that occur as a direct result of electronic data sharing.

13. **Building Information Modelling (BIM).** For any projects, and not limited to building projects, utilizing BIM, OWNER and MSA shall agree on the appropriate level of modelling required by the project, as well as the degree to which the BIM files may be made available to any party using the Electronic Document Transmittal provisions of section 12 of this Agreement.

14. **Construction Site Visits.** If the scope of services includes services during the Construction Phase, MSA shall make visits to the site as specified in Attachment A– Scope of Services. MSA shall not, during such visits or as a result of such observations of Contractor's work in progress, supervise, direct or have control over Contractor's work nor shall MSA have authority over or responsibility for the means, methods, techniques, sequences or procedures of construction selected by Contractor, for safety precautions and programs incident to the work of Contractor or for any failure of Contractor to comply with laws, rules, regulations, ordinances, codes or orders applicable to Contractor's furnishing and performing the work. Accordingly, MSA neither guarantees the performance of any Contractor nor assumes responsibility for any Contractor's failure to furnish and perform its work in accordance with the Contract Documents.

15. **Termination.** This Agreement shall commence upon execution and shall remain in effect until terminated by either party, at such party's discretion, on not less than thirty (30) days' advance written notice. The effective date of the termination is the thirtieth day after the non-terminating party's receipt of the notice of termination. If MSA terminates the Agreement, the OWNER may, at its option, extend the terms of this Agreement to the extent necessary for MSA to complete any services that were ordered prior to the effective date of termination. If OWNER terminates this Agreement, OWNER shall pay MSA for all services performed prior to MSA's receipt of the notice of termination and for all work performed and/or expenses incurred by MSA in terminating Services begun after MSA's receipt of the termination notice. Termination hereunder shall operate to discharge only those obligations which are executory by either party on and after the effective date of termination. These General Terms and Conditions shall survive the completion of the services performed hereunder or the Termination of this Agreement for any cause.

This agreement cannot be changed or terminated orally. No waiver of compliance with any provision or condition hereof should be effective unless agreed in writing and duly executed by the parties hereto.

16. **Betterment.** If, due to MSA's error, any required or necessary item or component of the Project is omitted from the construction documents, MSA's liability shall be limited to the reasonable costs of correction of the construction, less what OWNER'S cost of including the omitted item or component in the original construction would have been had the item or component not been omitted. It is intended by this provision that MSA will not be responsible for any cost or expense that provides betterment, upgrade, or enhancement of the Project.

17. **Hazardous Substances.** OWNER acknowledges and agrees that MSA has had no role in identifying, generating, treating, storing, or disposing of hazardous substances or materials which may be present at the Project site, and MSA has not benefited from the processes that produced such hazardous substances or materials. Any hazardous substances or materials encountered by or associated with Services provided by MSA on the Project shall at no time be or become the property of MSA. MSA shall not be deemed to possess or control any hazardous substance or material at any time; arrangements for the treatment, storage, transport, or disposal of any hazardous substances or materials, which shall be made by MSA, are made solely and exclusively on OWNER's behalf for OWNER's benefit and at OWNER's direction. Nothing contained within this Agreement shall be construed or interpreted as requiring MSA to assume the status of a generator, storer, treater, or disposal facility as defined in any federal, state, or local statute, regulation, or rule governing treatment, storage, transport, and/or disposal of hazardous substances or materials.

All samples of hazardous substances, materials or contaminants are the property and responsibility of OWNER and shall be returned to OWNER at the end of a project for proper disposal. Alternate arrangements to ship such samples directly to a licensed disposal facility may be made at OWNER's request and expense and subject to this subparagraph.

18. **Insurance.** MSA will maintain insurance coverage for: Worker's Compensation, General Liability, and Professional Liability. MSA will provide information as to specific limits upon written request. If the OWNER requires coverages or limits in addition to those in effect as of the date of the agreement, premiums for additional insurance shall be paid by the OWNER. The liability of MSA to the OWNER for any indemnity commitments, or for any damages arising in any way out of performance of this contract is limited to such insurance coverages and amount which MSA has in effect.

19. **Reuse of Documents.** Reuse of any documents and/or services pertaining to this Project by the OWNER or extensions of this Project or on any other project shall be at the OWNER's sole risk. The OWNER agrees to defend, indemnify, and hold harmless MSA for all claims, damages, and expenses including attorneys' fees and costs arising out of such reuse of the documents and/or services by the OWNER or by others acting through the OWNER.

20. **Indemnification.** To the fullest extent permitted by law, MSA shall indemnify and hold harmless, OWNER, and OWNER's officers, directors, members, partners, consultants, and employees (hereinafter "OWNER") from reasonable claims, costs, losses, and damages arising out of or relating to the PROJECT, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of MSA or MSA's officers, directors, members, partners, employees, or Consultants (hereinafter "MSA"). In no event shall this indemnity agreement apply to claims between the OWNER and MSA. This indemnity agreement applies solely to claims of third parties. Furthermore, in no event shall this indemnity agreement apply to claims that MSA is responsible for attorneys' fees. This agreement does not give rise to any duty on the part of MSA to defend the OWNER on any claim arising under this agreement.

To the fullest extent permitted by law, OWNER shall indemnify and hold harmless, MSA, and MSA's officers, directors, members, partners, consultants, and employees (hereinafter "MSA") from reasonable claims, costs, losses, and damages arising out of or relating to the PROJECT, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of the OWNER or the OWNER's officers, directors, members, partners, employees, or Consultants (hereinafter "OWNER"). In no event shall this indemnity agreement apply to claims between MSA and the OWNER. This indemnity agreement applies solely to claims of third parties. Furthermore, in no event shall this indemnity agreement apply to claims that the OWNER is responsible for attorneys' fees. This agreement does not give rise to any duty on the part of the OWNER to defend MSA on any claim arising under this agreement.

To the fullest extent permitted by law, MSA's total liability to OWNER and anyone claiming by, through, or under OWNER for any cost, loss or damages caused in part or by the negligence of MSA and in part by the negligence of OWNER or any other negligent entity or individual, shall not exceed the percentage share that MSA's negligence bears to the total negligence of OWNER, MSA, and all other negligent entities and individuals.

21**. Accrual of Claims**. To the fullest extent permitted by Laws and Regulations, all causes of action arising under this Agreement will be deemed to have accrued, and all statutory periods of limitation will commence, no later than the date of Substantial Completion; or, if Engineer's services do not include Construction Phase services, or the Project is not completed, then no later than the date of Owner's last payment to Engineer.

22. **Dispute Resolution.** OWNER and MSA desire to resolve any disputes or areas of disagreement involving the subject matter of this Agreement by a mechanism that facilitates resolution of disputes by negotiation rather than by litigation. OWNER and MSA also acknowledge that issues and problems may arise after execution of this Agreement which were not anticipated or are not resolved by specific provisions in this Agreement. Accordingly, both OWNER and MSA will endeavor to settle all controversies, claims, counterclaims, disputes, and other matters in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect, unless OWNER and MSA mutually agree otherwise. Demand for mediation shall be filed in writing with the other party to this Agreement. A demand for mediation shall be made

within a reasonable time after the claim, dispute or other matter in question has arisen. In no event shall the demand for mediation be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations. Neither demand for mediation nor any term of this Dispute Resolution clause shall prevent the filing of a legal action where failing to do so may bar the action because of the applicable statute of limitations. If despite the good faith efforts of OWNER and MSA any controversy, claim, counterclaim, dispute, or other matter is not resolved through negotiation or mediation, OWNER and MSA agree and consent that such matter may be resolved through legal action in the court having jurisdiction as specified in section 29 of this Agreement.

23. **Exclusion of Special, Indirect, Consequential and Liquidated Damages.** MSA shall not be liable, in contract or tort or otherwise, for any special, indirect, consequential, or liquidated damages including specifically, but without limitation, loss of profit or revenue, loss of capital, delay damages, loss of goodwill, claim of third parties, or similar damages arising out of or connected in any way to the Project or this contract.

24. **Limitation of Liability.** Neither MSA, its Consultants (if any), nor their employees shall be jointly, severally, or individually liable to the OWNER in excess of the amount of the insurance proceeds available.

25. **Successors and Assigns**. The successors, executors, administrators, and legal representatives of Owner and Engineer are hereby bound to the other party to this Agreement and to the successors, executors, administrators and legal representatives (and said assigns) of such other party, in respect of all covenants, agreements, and obligations of this Agreement. Neither party may assign, sublet, or transfer any rights under or interest (including, but without limitation, claims arising out of this Agreement or money that is due or may become due) in this Agreement without the written consent of the other party, which shall not be unreasonable withheld, except to the extent that any assignment, subletting, or transfer is mandated by law.

26. **Notices**. Any notice required under this Agreement will be in writing, and delivered: in person (by commercial courier or otherwise); by registered or certified mail; or by e-mail to the recipient, with the words “Formal Notice” or similar in the e-mail’s subject line. All such notices are effective upon the date of receipt.

27. **Survival.** Subject to applicable Laws and Regulations, all express representations, waivers, indemnifications, and limitations of liability included in this Agreement will survive its completion or termination for any reason.

28. **Severability**. Any provision or part of the Agreement held to be void or unenforceable under any Laws or Regulations will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and MSA.

29. **No Waiver**. A party’s non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Agreement.

30. **State Law.** This agreement shall be construed and interpreted in accordance with the laws of the State of Wisconsin.

31. **Jurisdiction.** OWNER hereby irrevocably submits to the jurisdiction of the state courts of the State of Wisconsin for the purpose of any suit, action or other proceeding arising out of or based upon this Agreement. OWNER further consents that the venue for any legal proceedings related to this Agreement shall be Sauk County, Wisconsin.

32. **Understanding.** This agreement contains the entire understanding between the parties on the subject matter hereof and no representations. Inducements, promises or agreements not embodied herein (unless agreed in writing duly executed) shall be of any force or effect, and this agreement supersedes any other prior understanding entered into between the parties on the subject matter hereto.

Nielsen Madsen + Barber
CIVIL ENGINEERS AND LAND SURVEYORS

November 14, 2022

Mr. Fred Walling
Building and Zoning Administrator
City of Lake Geneva
626 Geneva Street
Lake Geneva, WI 53147

RE: Symphony Bay Phase 7
Construction Plans and Storm Water Management Plan Review
City of Lake Geneva

Dear Mr. Walling:

We have reviewed the Symphony Bay Phase 7 Construction Plans dated November 11, 2022; the Symphony Bay Phase 7 Storm Water Management Report dated November 1, 2022; and the Symphony Bay Encore Final Plat dated November 1, 2022; prepared by Kapur & Associates, Inc.

Our previous review comments have been addressed, and we recommend approval of the plans, SWMP, and plat.

Please feel free to contact me if you have any questions.

Sincerely,

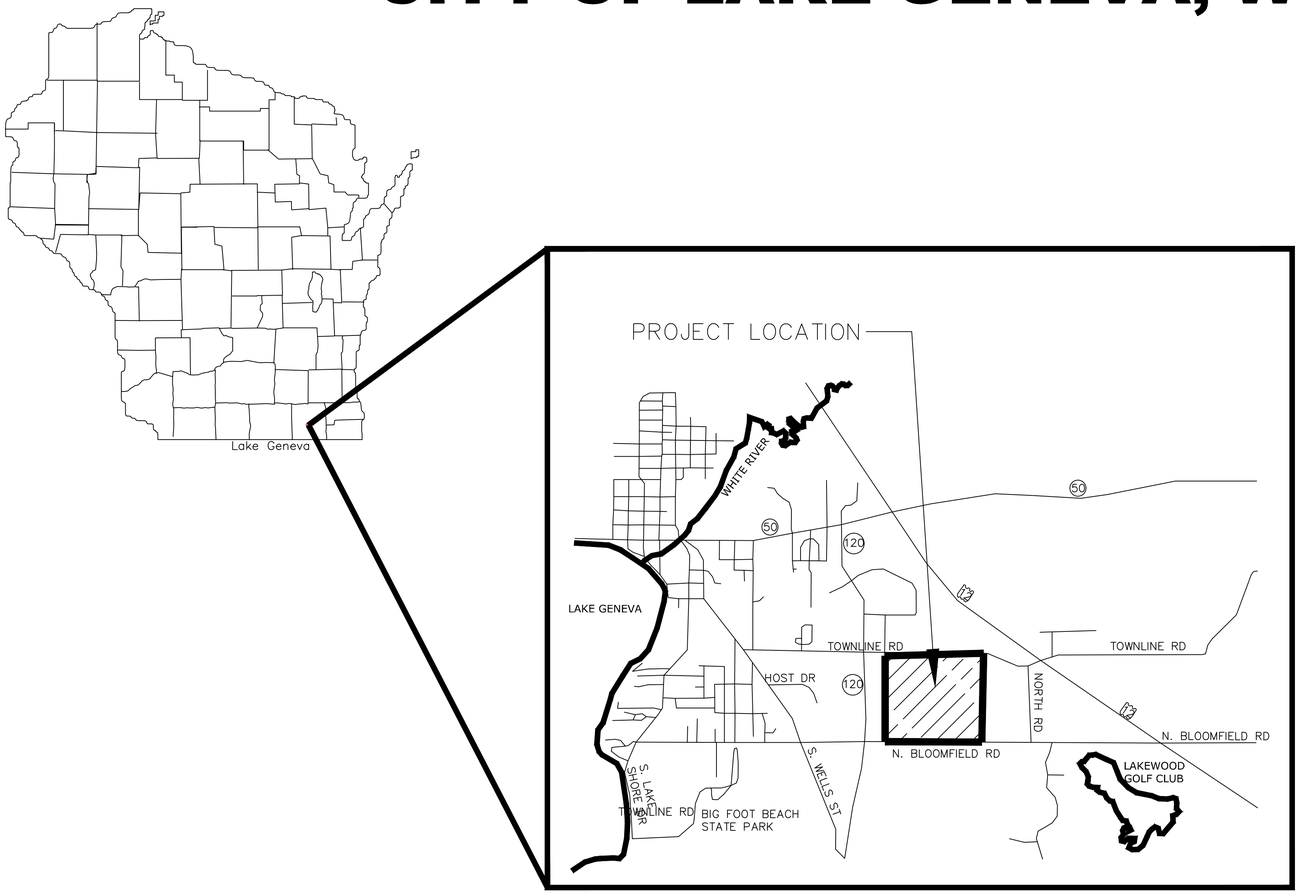
Mark R. Madsen, P.E., P.L.S.

Cc: Naomi Rauch, Kapur & Associates

File: Z:\2016\2016.0011.03\Design Documents\Correspondence\Municpality\Approval\2016.0011.03 Symphony Bay Approval.docx

1458 Horizon Blvd, Suite 200, Racine, WI 53406
Ph: (262) 634-5588 * Fax: (262) 634-5024
www.nmbsc.net

SYMPHONY BAY PHASE 7
CITY OF LAKE GENEVA, WISCONSIN



INDEX TO DRAWINGS

SHEET NO.	TITLE
1.0 – 1.10	TITLE AND DETAILS
2.0	OVERALL PHASING PLAN
2.1 – 2.3	GRADING PLAN
3.0 – 3.5	ROAD AND STORM
4.0 – 4.2	SANITARY AND WATER

BENCH MARKS

PROJECT BENCH MARKS NGVD 1929:

1) ELEV. 896.40'
FOUND CHSLD. CROSS IN TOP OF NE FLANGE BOLT OF HYD. 2.3' ABV. GRD. NORTH SIDE OF TOWNLINE ROAD

2) ELEV. 897.99'
SET RR SPIKE SW FACE 40" MAPLE 0.7' ABV. GRD. SOUTH SIDE OF NORTH BLOOMFIELD ROAD.

EXISTING TOPOGRAPHY IS BASED ON FIELD SURVEY TAKEN ON 04/10/07 BY KAPUR & ASSOCIATES, INC.

LAND OWNER:
SOUTHLAND FARMS LLC
875 TOWNLINE ROAD
LAKE GENEVA, WI 53147

CALL DIGGERS' HOTLINE
1-800-242-8511
TOLL FREE TO OBTAIN LOCATION OF UNDERGROUND UTILITIES BEFORE YOU DIG. WISCONSIN STATUTE 182.0715 REQUIRES MIN. OF 3 WORK DAYS BEFORE YOU EXCAVATE

*PRIOR TO CONSTRUCTION, A PRE-CONSTRUCTION CONFERENCE MUST BE HELD AT THE LAKE GENEVA UTILITY COMMISSION. THE PRECONSTRUCTION CONFERENCE SHALL BE SCHEDULED AND MODERATED BY THE DESIGNING ENGINEER OF RECORD.

**ROADWAY AND UTILITY IMPROVEMENTS SHALL GENERALLY CONFORM TO THE STATE OF WISCONSIN STANDARD SPECIFICATIONS FOR HIGHWAY AND STRUCTURE CONSTRUCTION, 2016 EDITION AS AMENDED, SEWER AND WATER CONSTRUCTION IN WISCONSIN, SIXTH EDITION AS AMENDED, AND SPECIAL PROVISIONS DEVELOPMENT STANDARDS FOR PRIVATE DEVELOPMENTS FOR THE CITY OF LAKE GENEVA AND LAKE GENEVA UTILITY COMMISSION DATED SEPT. 11 2007 AS AMENDED, UNLESS OTHERWISE NOTED ON THE PLAN SET.

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

all in

SHEET:
TITLE SHEET

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
1.0

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg

EROSION CONTROL NOTES

TEMPORARY DITCH CHECK – SEDIMENT LOGS TO BE USED. NO HAY/STRAW BALES SHALL BE USED. USE PRODUCT FROM WISDOT PAL LIST, CURRENT EDITION.

REMOVAL OF EROSION CONTROL DEVICES AND MOBILIZATION FOR SUCH REMOVAL, WILL BE INCIDENTAL TO THEIR RESPECTIVE ITEMS.

ANY DEVIATION FROM THESE NOTES BY THE CONTRACTOR MUST BE APPROVED BY ENGINEER.

CONTRACTOR MUST CONFORM WITH ANY STATE, FEDERAL, AND LOCAL PERMITS, ORDINANCES AND/OR REGULATIONS AND WITH THE CONDITIONS INCLUDED IN THIS PLAN SET. EROSION CONTROL MEASURES SHALL BE INSTALLED, MAINTAINED AND REMOVED IN CONFORMANCE WITH THE WISCONSIN DNR STORMWATER MANAGEMENT TECHNICAL STANDARDS, WITH THE DETAILS AND NOTES LISTED IN THIS PLAN SET, AND ADJUSTED TO FIT FIELD CONDITIONS ON AN AS NEEDED BASIS.

PROJECT PERMITS, APPROVED PROJECT PLANS, THE CONTRACTOR'S DAILY LOG BOOK, AND WEEKLY EROSION CONTROL INSPECTION REPORTS MUST BE KEPT ON SITE IN AN ACCESSIBLE LOCATION.

EROSION CONTROL MEASURES AS SPECIFIED IN PLANS SHALL BE INSTALLED PRIOR TO ANY GRADING OR LAND DISTURBANCE. EROSION CONTROL MEASURES SHALL NOT BE REMOVED UNTIL THE AREAS THEY SERVE HAVE ESTABLISHED VEGETATIVE COVER (I.E. 80% VEGETATIVE GROWTH OR AS OTHERWISE AUTHORIZED BY REGULATORY AGENCIES). APPLY APPROPRIATE SOIL CONSERVATION MEASURES TO PROTECT PROJECT AREA AND ADJACENT LANDS. ALL EROSION CONTROL MEASURES SHALL BE ADJUSTED TO MEET FIELD CONDITIONS AT THE TIME OF CONSTRUCTION. EROSION CONTROL MEASURES INCLUDE BUT MAY NOT BE LIMITED TO SILT FENCE, EROSION EELS, TURBIDITY BARRIER, INLET PROTECTION, MULCHING, AND RAPID GROWTH VEGETATION.

INSPECT ALL EROSION CONTROL MEASURES PRIOR TO COMMENCING GRADING OR ANY OTHER LAND DISTURBING ACTIVITIES. EROSION CONTROL MEASURES SHALL BE INSPECTED AT A MINIMUM BE INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EVERY PRECIPITATION EVENT THAT PRODUCES ½ INCH OF RAIN OR MORE DURING A 24 HOUR PERIOD. MAINTENANCE SHALL BE IN ACCORDANCE WITH THE WDNR STORMWATER MANAGEMENT TECHNICAL STANDARDS AND THE ENGINEER'S PLANS AND AS DEEMED NECESSARY BY THE REGULATORY AGENCIES. EROSION CONTROL MAINTENANCE WILL BE AN ONGOING PROCESS THROUGHOUT THE DURATION OF CONSTRUCTION. THE CONTRACTOR SHALL MAINTAIN A DAILY LOG BOOK ON SITE NOTING INSPECTION DATES AND TIMES, REPAIRS NECESSARY AND REPAIRS MADE. EROSION CONTROL MEASURES ARE TO BE IN WORKING AND EFFECTIVE CONDITION AT THE END OF EACH WORKING DAY.

TEMPORARY SEED: FOLLOW WISCONSIN DNR NR151 STANDARD FOR USE OF TEMPORARY SEED. TEMPORARY SEED SHALL BE USED WHEN LAND DISTURBING CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED AND WILL NOT RESUME FOR A PERIOD EXCEEDING 7 CALENDAR DAYS.

IF TEMPORARY STORAGE IS REQUIRED FOR ANY EXCESS SOIL OR SPOIL MATERIAL, PERIMETER CONTROL AND TEMPORARY STORAGE AND STABILIZATION WILL BE NECESSARY WITHIN 7 DAYS, PER WISCONSIN DNR TECHNICAL STANDARDS.

DEWATERING PLAN

TO FACILITATE CONSTRUCTION AT THE PROJECT SITE, DEWATERING MAY TAKE PLACE BY THE SELECTED CONTRACTOR. CONTRACTOR TO FOLLOW THESE INSTRUCTIONS WHILE PERFORMING DEWATERING ACTIVITIES ON–SITE.

NOTE: THESE INSTRUCTIONS DO NOT APPLY TO WATER BEING DISCHARGED DIRECTLY TO GROUNDWATER OR KARST FEATURES OR WELL DEWATERING SYSTEMS. CONTRACTOR SHALL COORDINATE ACCORDINGLY FOR OTHER DEWATERING ACTIVITIES AS DEEMED NECESSARY WITH THE WDNR.

1. THE CONTRACTOR SHALL ENSURE THAT THE DEWATERING PRACTICES CARRIED OUT MEET OR EXCEED WNDR TECHNICAL STANDARD NUMBER 1061.

2. A PAN OR OTHER CONTAINMENT DEVICE SHALL BE PLACED UNDERNEATH THE PUMP TO CAPTURE ANY SPILLS. OILS, GASOLINE, ETC. SHALL NOT BE STORED WITHIN WETLANDS, NEAR THE STORMWATER POND, OR OTHER ON–SITE WATER AREAS.

3. A TYPE 2 GEOTEXTILE BAG THAT IS NO SMALLER THAN 100 SQUARE FEET; HAS A MAXIMUM APPARENT OPENING SIZE OF 0.212 mm; HAS A GRAB TENSILE STRENGTH OF 300 LBS; MULLEN BURST OF 580 PSI; PERMEABILITY OF 0.2 CM/SEC; FABRIC WEIGHT OF 12 OZ SHALL BE USED. THE GEOTEXTILE BAG AREA AND DOWNGRADE FLOW AREA SHALL CONSIST OF VEGETATED AND UNDISTURBED SOILS.

4. POLYMER APPROVED BY THE WDNR MEETING WDNR TECHNICAL STANDARD 1051 MAY BE USED IN COMBINATION WITH THE DEWATERING BAG IF THE DEWATERING BAG IS NOT DOING AN ADEQUATE JOB ALONE OF FILTERING SEDIMENTS. THE CONTRACTOR SHALL SUPPLY TOXICITY TESTING DATA TO THE WDNR BEFORE USE ON–SITE FOR WDNR APPROVAL. POLYMER SHALL NOT BE DIRECTLY APPLIED TO SURFACE WATER. CONTRACTOR SHALL OBTAIN THE POLYMER MATERIAL SAFETY DATA SHEETS (MSDS) FOR THE SELECTED POLYMER, MANUFACTURER'S INFORMATION AND WDNR USE RESTRICTIONS (SEE TECHNICAL STANDARD 1051) AND KEEP ALL THIS INFORMATION ON–SITE. CONTRACTOR SHALL ADHERE TO MANUFACTURER AND WDNR'S APPLICATION RATES FOR THE POLYMER. THE APPLICATION RATE SHALL NOT EXCEED THE WDNR USE RESTRICTION, EVEN IF THIS IS THE RECOMMENDED RATE BY THE MANUFACTURER. THE CONTRACTOR SHALL TAKE STEPS TO ENSURE THAT THE POLYMER IS NOT SPILLED. THE MANUFACTURER'S RECOMMENDED CLEANUP PROCEDURES SHALL BE FOLLOWED IN THE EVENT OF A SPILL.

5. A TARP MAY BE UTILIZED UNDERNEATH THE TYPE 2 GEOTEXTILE BAG AND JUST DOWN SLOPE OF THE BAG TO DISCOURAGE EROSION AND SCOUR.

6. A FLOATING SUCTION HOSE OR OTHER FLOTATION METHOD SHALL BE UTILIZED WHEN PUMPING FROM AN AREA WITH STANDING WATER TO AVOID SUCKING SEDIMENT FROM GRADE.

7. IF TURBID WATER IS LEAVING THE GEOTEXTILE BAG, THE CONTRACTOR SHALL SHUT OFF THE PUMP TO ALLOW SEDIMENTS TO SETTLE INTO THE BAG. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR DETERMINING THE SEDIMENT CAPACITY OF THE GEOTEXTILE BAG USING GOOD COMMON SENSE. SEDIMENT LEVELS CONTAINED IN THE BAG SHALL BE MONITORED TO MEASURE THE LOSS OF STORAGE CAPACITY OVER TIME. THE CONTRACTOR SHALL PROPERLY DISPOSE OF THE GEOTEXTILE BAG IN A WASTE RECEPTACLE ONCE IT IS NO LONGER USED.

8. DURING DEWATERING ACTIVITIES THE CONTRACTOR SHALL MONITOR DEWATERING PRACTICES AND KEEP A LOG OF THE FOLLOWING:

   A. DISCHARGE DURATION AND SPECIFIED PUMPING RATE.

   B. OBSERVED WATER TABLE AT TIME OF DEWATERING.

   C. MAINTENANCE ACTIVITIES

   D. NAME AND QUANTITY OF POLYMER USED. PRODUCT TYPE.

   E. APPLICATION RATE OF POLYMER IN POUNDS/ACRE FEET OF WATER.

   F. DATE AND TIME APPLIED.

   G. WEATHER CONDITIONS DURING APPLICATION.

   H. METHOD OF APPLICATION.

THIS LOG NEEDS TO BE KEPT ON SITE FOR WDNR REGULATORY REVIEW. COPIES OF THIS DOCUMENTATION SHOULD BE KEPT IN THE CONTRACTOR'S MONITORING LOG AND MADE AVAILABLE UPON REQUEST.

REVIEW THE FOLLOWING FOR MORE INFORMATION:

WDNR TECHNICAL STANDARD 1061 FOR DEWATERING –
http: //dnr.wi.gov/runoff/pdf/stormwater/techstds/erosion/Dewatering_1061.pdf

WDNR TECHNICAL STANDARD 1051 FOR POLYMER –
http: //dnr.wi.gov/runoff/pdf/stormwater/techstds/erosion/Dewatering_1061.pdf

EROSION CONTROL MEASURES

1. CONTRACTOR TO INSTALL AND MAINTAIN EROSION CONTROL MEASURES AS INDICATED ON THIS PLAN AND PER THE LATEST WDNR TECHNICAL STANDARDS. TECHNICAL STANDARDS MAY BE VIEWED ONLINE AT: http://dnr.wi.gov/runoff/stormwater/techstds.htm

2. INLETS AND CATCH BASINS SHALL BE PROTECTED WITH INLET FILTERS THAT ARE PHASED IN WITH CONSTRUCTION TO REDUCE SEDIMENT FROM ENTERING THESE AREAS PER WDNR TECHNICAL STANDARD 1060 AS FOLLOWS:

   A. ALL FABRIC BARRIERS SELECTED FOR INLET/CATCH BASIN PROTECTION DEVICES SHALL BE SELECTED FROM THE LIST OF APPROVED FABRICS CERTIFIED FOR INLET PROTECTION, GEOTEXTILE FABRIC, TYPE FF IN THE CURRENT EDITION OF THE WDOT PRODUCT ACCEPTABILITY LIST, TO OBTAIN THE PAL, PLEASE REFER TO THIS WEBSITE: http://www.dot.wisconsin.gov/business/engrserv/pal.htm

   B. INLET PROTECTION SHALL BE AT A MINIMUM INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EVERY PRECIPITATION EVENT OF ½ INCH OR GREATER DURING A 24–HOUR PERIOD.

   C. PLACEMENT OF SPOIL MATERIAL, DEBRIS, SOILS, ETC. ON TOP OF INLETS/CATCH BASINS, EVEN IF TEMPORARY, IS STRICTLY DISCOURAGED AND PROHIBITED.

   D. SEDIMENT DEPOSITS SHALL BE REMOVED AND THE INLET PROTECTION DEVICE RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED BETWEEN 1/3 TO ½ THE DESIGN DEPTH OF THE DEVICE, OR WHEN THE DEVICE IS NO LONGER FUNCTIONING PER MANUFACTURER'S SPECIFICATIONS. ALL SEDIMENT COLLECTED SHALL BE PROPERLY DISPOSED OF TO PREVENT DISCHARGE INTO AREA WATERWAYS AND WETLANDS.

   E. DUE CARE SHALL BE TAKEN TO ENSURE SEDIMENT DOES NOT FALL INTO THE INLETS/CATCH BASINS AND IMPEDE THE INTENDED FUNCTION OF THE DEVICE. ANY MATERIAL FALLING INTO THE INLET/CATCH BASIN SHALL BE REMOVED AND PROPERLY DISPOSED OF PER NOTE D ABOVE.

   F. INLET FILTERS MAY BE REMOVED AND PROPERLY DISPOSED OF UPON COMPLETION OF CONSTRUCTION, HAULING OR MOVEMENT OF CONSTRUCTION EQUIPMENT THROUGHOUT THE SITE, AND ONCE THE SITE IS ADEQUATELY STABILIZED, UNLESS AS OTHERWISE NOTIFIED BY THE WDNR.

3. THE CONSTRUCTION SITE PERIMETER SHALL BE PROTECTED AS SHOWN ON THE PLAN SHEET PRIOR TO THE START OF CONSTRUCTION TO INTERCEPT AND REDUCE THE FLOW OF SEDIMENT–LADEN SHEET FLOW RUNOFF FROM THE CONSTRUCTION SITE PER WDNR TECHNICAL STANDARD 1056. SEDIMENT LOGS MAY BE USED IN LIEU OF SILT FENCE:

   A. SILT FENCE ENDS SHALL BE EXTENDED UPSLOPE TO PREVENT WATER FROM FLOWING AROUND THE ENDS OF THE FENCE AS SHOWN ON THE PLAN SHEET.

   B. INSTALLED SILT FENCE SHALL BE A MINIMUM 14 INCHES HIGH AND SHALL NOT EXCEED 28 INCHES IN HEIGHT MEASURED FROM THE INSTALLED GROUND ELEVATION.

   C. SILT FENCE SHALL BE SUPPORTED BY EITHER STEEL OR WOOD SUPPORT POSTS.

   D. THE MAXIMUM SPACING OF POSTS FOR NONWOVEN SILT FENCE SHALL BE 3 FEET OR FOR WOVEN FABRIC 8 FEET.

   E. SILT FENCE SHALL HAVE A SUPPORT CORD AT THE TOP OF THE FENCE.

   F. WHERE JOINTS ARE NEEDED, EACH END OF THE FABRIC SHALL BE SECURELY FASTENED TO A POST. THE POSTS SHALL BE WRAPPED AROUND EACH OTHER TO PRODUCE A STABLE AND SECURE JOINT OR SHALL BE OVERLAPPED THE DISTANCE BETWEEN TWO POSTS.

   G. A MINIMUM OF 20 INCHES OF THE POSTS SHALL EXTEND INTO THE GROUND AFTER INSTALLATION.

   H. SILT FENCE SHALL BE ANCHORED BY SPREADING AT LEAST 8 INCHES OF THE FABRIC IN A 4 INCH WIDE BY 6 INCH DEEP TRENCH, OR 6 INCH DEEP V–TRENCH ON THE UPSLOPE SIDE OF THE FENCE. THE TRENCH SHALL BE BACKFILLED AND COMPACTED. TRENCHES SHALL NOT BE EXCAVATED ANY WIDER OR DEEPER THAN NECESSARY FOR PROPER INSTALLATION.

   I. ON THE TERMINAL ENDS OF THE SILT FENCE THE FABRIC SHALL BE WRAPPED AROUND THE POST SUCH THAT THE STAPLES ARE NOT VISIBLE.

   J. GEOTEXTILE FABRIC SPECIFICATIONS SHALL MEET VALUES ESTABLISHED IN TECHNICAL STANDARD 1056.

   K. SILT FENCE SHALL BE REMOVED ONCE THE SITE IS ADEQUATELY STABILIZED.

   L. WHEN PLACING SILT FENCE NEAR TREES, CARE SHALL BE TAKEN TO MINIMIZE DAMAGE TO THE ROOT SYSTEM BY AVOIDING COMPACTION AND ROOT CUTTING WITHIN 1.5 FEET MULTIPLIED BY THE INCH DIAMETER OF THE TREE.

   M. THE CONTRACTOR MAY FURTHER STRENGTHEN THE SILT FENCE BY USING HAY BALES ON THE DOWN SLOPE SIDE AS NEEDED.

   N. SILT FENCE SHALL AT A MINIMUM BE INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EVERY PRECIPITATION EVENT THAT PRODUCES ½ INCH OF RAIN OR MORE DURING A 24 HOUR PERIOD.

   O. DAMAGED OR DECOMPOSED SILT FENCE, UNDERCUTTING, OR FLOW CHANNELS AROUND THE END OF BARRIERS SHALL BE REPAIRED OR CORRECTED.

   P. SEDIMENT SHALL BE PROPERLY DISPOSED OF ONCE THE DEPOSITS REACH ½ THE HEIGHT OF THE FENCE TO PREVENT DISCHARGE INTO AREA WATERWAYS AND WETLANDS.

4. DITCH CHECKS ARE TO BE USED TO REDUCE THE VELOCITY OF WATER FLOWING IN CHANNELS AS SHOWN IN THE PLANS. DITCH CHECKS SHALL BE CONSTRUCTED FROM ENGINEERED PRODUCTS FOUND ON THE WISCONSIN DEPARTMENT OF TRANSPORTATION EROSION CONTROL PRODUCT ACCEPTABILITY LIST (PAL). DITCH CHECKS ARE TO BE INSTALLED IN THE AREAS SHOWN IN THE PLANS PER WDNR TECHNICAL STANDARD 1062 AS FOLLOWS:

   A. DITCH CHECKS ARE TO BE INSTALLED TO A MINIMUM HEIGHT OF 10 INCHES AND SHALL NOT EXCEED A MAXIMUM HEIGHT OF 16 INCHES FOR MANUFACTURED OR BIODEGRADABLE MATERIALS.

   B. DITCH CHECKS MUST BE INSTALLED WITH THE CENTER LOWER THAN THE SIDES FORMING A WEIR. IF THIS IS NOT DONE, STORMWATER FLOWS ARE FORCED TO THE EDGE OF THE DITCH CHECK, THUS PROMOTING SCOUR, OR OUT OF THE CHANNEL CAUSING EXCESSIVE EROSION.

   C. AT A MINIMUM, INSTALL ONE DITCH CHECK FOR EVERY TWO FEET OF DROP IN THE CHANNEL.

   D. DITCH CHECKS SHALL BE PLACED SUCH THAT THE RESULTANT PONDING WILL NOT CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT AREAS.

   E. DITCH CHECKS SHALL BE UTILIZED DURING ROUGH GRADING AND SHALL BE REMOVED ONCE THE FINAL GRADING AND CHANNEL STABILIZATION IS APPLIED.

   F. CHANNEL EROSION MAT SHALL BE PLACED AT THE BASE OF THE DITCH CHECK, AND EXTENDED A MINIMUM OF 6 FEET, TO PREVENT SCOUR AND WASHING OUT OF THE TOE OF THE DITCH CHECK.

   G. DITCH CHECKS INSTALLED IN GRASS LINED CHANNELS MAY KILL THE VEGETATION IF WATER IS PONDED FOR EXTENDED PERIODS. PROPER MAINTENANCE IS REQUIRED TO KEEP AREAS ABOVE AND BELOW THE DITCH CHECK STABILIZED.

5. SEEDING AND MULCHING TECHNIQUES SHALL BE USED ON AREAS OF EXPOSED SOIL WHERE THE ESTABLISHMENT OF VEGETATION IS DESIRED. TEMPORARY SEEDING APPLIES TO DISTURBED AREAS THAT WILL NOT BE BROUGHT TO FINAL GRADE OR ON WHICH LAND–DISTURBING ACTIVITIES WILL NOT BE PERFORMED FOR A PERIOD GREATER THAN 7 CALENDAR DAYS, REQUIRING VEGETATIVE COVER FOR LESS THAN ONE YEAR. SEED AND MULCH SHALL BE UTILIZED THROUGHOUT THE DURATION OF CONSTRUCTION TO ESTABLISH TEMPORARY VEGETATION TO HELP REDUCE EROSION PER WDNR TECHNICAL STANDARDS 1059 AND 1058 RESPECTIVELY AS FOLLOWS:

   A. TEMPORARY SEEDING REQUIRES A SEEDBED OF LOOSE SOIL TO A MINIMUM DEPTH OF 2 INCHES.

   B. FERTILIZER APPLICATION IS NOT GENERALLY REQUIRED FOR TEMPORARY SEEDING. HOWEVER, ANY APPLICATION OF FERTILIZER OR LIME SHALL BE BASED ON SOIL TESTING.

   C. THE SOIL SHALL HAVE A PH RANGE OF 5.5 TO 8.0.

   D. ALL SEED SHALL CONFORM TO THE REQUIREMENTS OF THE WISCONSIN STATE STATUTES AND OF THE ADMINISTRATIVE CODE CHAPTER ATCP 20.01 REGARDING NOXIOUS WEED SEED CONTENT AND LABELING.

   E. SEED SHALL NOT BE USED LATER THAN ONE YEAR AFTER THE TEST DATE ON THE LABEL.

   F. IN THE SUMMER–SPRING, CONTRACTOR SHALL USE OATS APPLIED AT 131 LBS/ACRE FOR TEMPORARY SEEDING PURPOSES. IN THE FALL THE CONTRACTOR SHALL USE ANNUAL RYEGRASS APPLIED AT 80 LBS/ACRE OR WINTER WHEAT APPLIED AT 131 LBS/ACRE. THE CONTRACTOR SHALL USE STRAW MULCH APPLIED AT 1.5 TONS/ACRE. DORMANT SEED SHALL BE USED WHEN SOIL TEMPERATURE IS CONSISTENTLY BELOW 53 DEGREES FAHRENHEIT (TYPICALLY NOV. 1 UNTIL SNOW COVER ANNUALLY). NEVER PLACE SEED ON TOP OF SNOW. IF COVER IS NEEDED AFTER SNOW FALL, CONTRACTOR MAY CHOOSE TO USE A DRY, NONTOXIC TYPE B SOIL STABILIZER PER MANUFACTURER'S SPECIFICATIONS AS REQUIRED BY THE WDNR.

   G. SEEDING SHALL NOT TAKE PLACE WHEN THE SOIL IS TOO WET.

   H. CONTRACTOR MAY CONSIDER WATERING TO HELP ESTABLISH THE SEED. WATER APPLICATION RATES SHALL BE CONTROLLED TO HELP PREVENT RUNOFF AND EROSION.

   I. DURING CONSTRUCTION, AREAS THAT HAVE BEEN SEEDED AND MULCHED SHALL AT A MINIMUM BE INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EVERY PRECIPITATION EVENT THAT PRODUCES ½ INCH OF RAIN OR MORE DURING A 24 HOUR PERIOD. INSPECT WEEKLY DURING THE GROWING SEASON UNTIL VEGETATION IS DENSELY ESTABLISHED OR THE SOD IS LAID. REPAIR AND RESEED AREAS THAT HAVE EROSION DAMAGE AS NECESSARY.

   J. CONTRACTOR IS TO LIMIT VEHICLE TRAFFIC AND OTHER FORMS OF COMPACTION IN AREAS THAT ARE SEEDED AS MUCH AS POSSIBLE. RE–SEED DRIVEN OVER AREAS AS NEEDED.

   K. MULCH SHOULD BE PLACED WITHIN 24 HOURS OF SEEDING.

   L. MULCHING OPERATIONS SHALL NOT TAKE PLACE DURING PERIODS OF EXCESSIVELY HIGH WINDS THAT WOULD PRECLUDE THE PROPER PLACEMENT OF MULCH.

   M. MULCH THAT IS DISPLACED SHALL BE REAPPLIED AND PROPERLY ANCHORED. MAINTENANCE SHALL BE COMPLETED AS SOON AS POSSIBLE WITH CONSIDERATION TO SITE CONDITIONS.

   N. DEPENDING ON DURATION OF CONSTRUCTION, THE CONTRACTOR MAY NEED TO RE–SEED AND RE–STABILIZE THE TOPSOIL STOCKPILE AS NECESSARY TO DISCOURAGE SEDIMENT AND EROSION.

6. A COPY OF EROSION CONTROL INSPECTION REPORTS AND THE APPROVED EROSION CONTROL PLANS SHALL BE KEPT ON SITE.

7. CONTRACTOR SHALL INSPECT AND MAINTAIN ALL EROSION CONTROL PRACTICES BY THE END OF EACH WORKDAY. ANY SEDIMENT REMOVAL OR REPAIR OF FAILING PRACTICE MUST BE CORRECTED IMMEDIATELY.

8. TRACKING PAD(S) IS/ARE ANTICIPATED FOR THE COMPLETION OF THIS CONTRACT. LOCAL ROADS SHALL BE KEPT CLEAN AND SWEPT AT THE END OF EACH WORKDAY IF SEDIMENT ACCUMULATES.

REGIONAL UTILITY CONTACTS –FOR INFORMATIONAL PURPOSES ONLY

CITY OF LAKE GENEVA UTILITY DIRECTOR
361 W. MAIN STREET
LAKE GENEVA, WI 53147
JOSH GAJEWSKI (262) 248–2311
JGAJEWSKI@LGUTILITIES.ORG

CITY OF LAKE GENEVA – DPW
1065 CAREY STREET
LAKE GENEVA, WI 53147
TOM EARLE (262) 248–6644
TEARLE@CITYOFLAKEGENEVA.COM

AT&T
MATT VAN BOVEN
MV3658@ATT.COM
OFFICE (262)–636–0514
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ALLIANT ENERGY
400 KOOPMAN LANE
ELKHORN, WI 53121
CURT EILERTSON (262) 741–0935
CURTISSEILERTSON@ALLIANTENERGY.COM

WE ENERGIES GAS
700 SOUTH KANE ST. BURLINGTON, WI 53105
SCOTT HOLSTEIN (262) 763–1084
SCOTT.HOLSTEIN@WE–ENERGIES.COM

TIME WARNER CABLE
STEVE STORM
WIS.ENGINEERING@TWCABLE.COM
OFFICE (414)–908–4789

MEMBER ONE CALL SYSTEMS INTERNATIONAL

TO OBTAIN LOCATION OF PARTICIPANTS' UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN

CALL DIGGERS HOTLINE

1–800–242–8511

TOLL FREE

TELEFAX 1–800–338–3860

TDD(FOR HEARING IMPAIRED)1–800–542–2289

WISCONSIN STATUTE 182.0175 (1974) REQUIRES MINIMUM OF 3 WORK DAYS

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

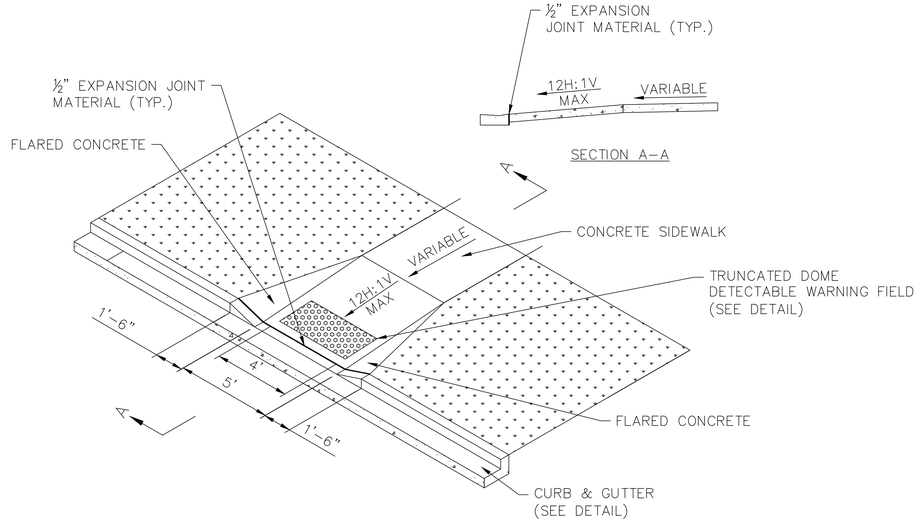
all in

SHEET:
DETAILS

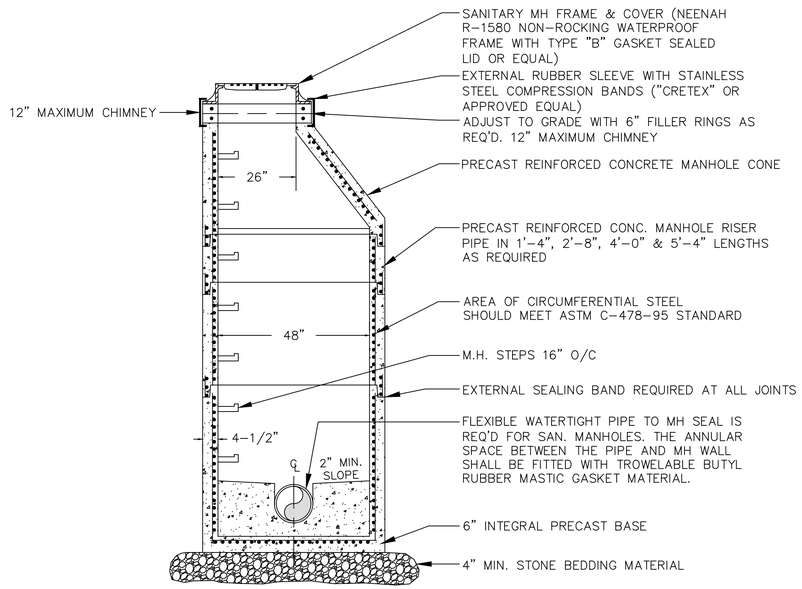
PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
1.2

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg



ACCESSIBILITY RAMP DETAIL WITH TRUNCATED DOME DETECTABLE WARNING FIELD



SANITARY MANHOLE DETAIL

SANITARY MANHOLE NOTES:

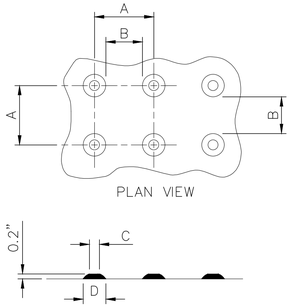
1.) PRECAST CONCRETE ADJUSTING RINGS TO BE REINFORCED WITH ONE HOOP OF STEEL CENTERED WITHIN THE RING. WHERE NECESSARY, RINGS SHALL BE GROOVED TO RECEIVE STEP.

2.) CONCRETE AND STEEL REINFORCEMENT SHALL CONFORM TO DESIGNATION C–478 REQUIREMENTS OF ASTM SPECIFICATIONS.

3.) JOINTS SHALL BE WATERTIGHT AND SHALL BE MADE USING RUBBER GASKETS OR BUTYL RUBBER MASTIC MATERIAL.

4.) 4" MIN. BEDDING MATERIAL REQUIRED UNDER MANHOLE BASE AND BACKFILLED STRUCTURE WITH GRANULAR BACKFILL MATERIAL.

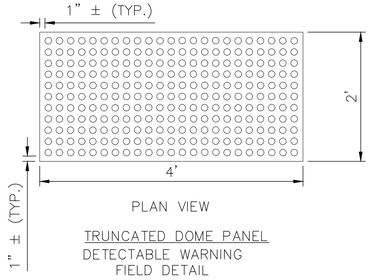
5.) SEE STANDARD SPECIFICATIONS, FILE NO. 12 FOR PRECAST MANHOLE AND FILE NO. 13 FOR MANHOLE INVERTS.



	MIN.	MAX.
A	1.6"	2.4"
B	0.65"	1.5"
C	*	*
D	0.9"	1.4"

*THE C DIMENSION IS 50% TO 65% OF THE D DIMENSION.

TRUNCATED DOMES
DETECTABLE WARNING
PATTERN DETAIL



TRUNCATED DOME PANEL
DETECTABLE WARNING
FIELD DETAIL

GENERAL NOTES

TRUNCATED DOME DETECTABLE WARNING FIELD SHALL CONSIST OF CAST IRON OR STAINLESS STEEL PLATES WITH A FEDERAL YELLOW POWDER–COATED FINISH, SUCH AS THOSE MANUFACTURED BY NEENAH FOUNDRY. IF 24"x48" PLATES ARE NOT AVAILABLE, TWO 24"x24" PLATES SHALL BE USED. THE DETECTABLE WARNING FIELD SHALL BE LOCATED SO THAT IT IS CENTERED IN THE CURB RAMP WITH THE EDGE NEAREST THE BACK OF CURB A MINIMUM OF 6" AND A MAXIMUM OF 8" AWAY FROM THE BACK OF CURB. IN LOCATIONS WHERE THE RAMP IS SKEWED TO THE CURB, THE DETECTABLE WARNING FIELD IS TO RUN PERPENDICULAR TO THE DIRECTION OF TRAVEL, WITH THE EDGE NEAREST THE BACK OF CURB 4" AWAY FROM THE BACK OF CURB.

PAINTED TRUNCATED DOME DETECTABLE WARNING FIELD

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

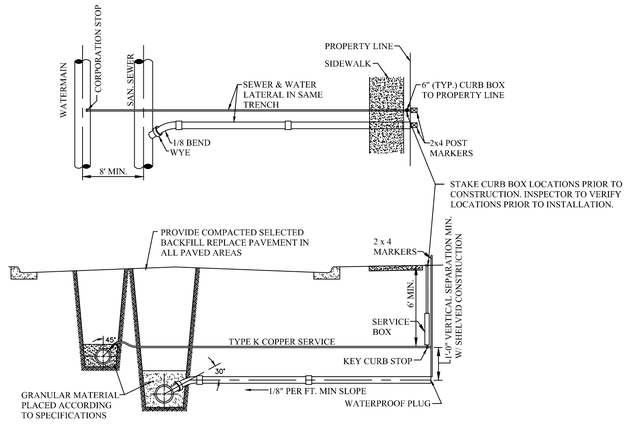
all in

SHEET:
DETAILS

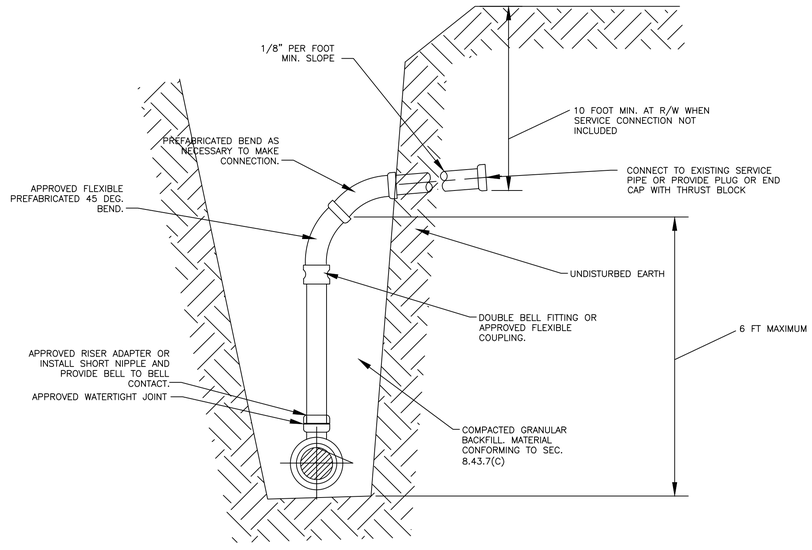
PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
1.5

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg



SEWER LATERALS < 14' DEEP AND WATER LATERAL CONNECTION
NTS



SEWER LATERALS > 14' DEEP CONNECTION
NTS

LOT #	GRADE AT INV OF SEWER	FINISH GRADE AT ROW	SANITARY MAIN DIA. INCHES	LATERAL LENGTH FT	IE @ ROW	FYG	TF	LATERAL INVERT AT MAIN AFTER WYE	RISER HEIGHT FT	ELEVATION AT RISER	SLOPE	NOTES
700	870.20	893.32	8.00	30.0	883.3	894.5	895.1	871.04	11.00	882.37	3.10%	
701	870.50	892.44	8.00	30.1	883.3	894.2	894.9	871.33	11.00	882.67	2.21%	
702	870.74	891.75	8.00	30.0	882.6	893.5	894.1	871.58	10.00	881.91	2.23%	
703	870.98	890.99	8.00	30.1	881.8	892.7	893.4	871.82	9.00	881.15	2.24%	
704	871.20	890.24	8.00	30.1	881.1	892.0	892.6	872.04	8.00	880.37	2.29%	
705	871.48	889.57	8.00	35.5	880.4	891.3	891.9	872.31	7.00	879.64	2.13%	
706	871.65	888.94	8.00	37.9	879.7	890.6	891.3	872.48	6.00	878.81	2.31%	
707	871.85	888.25	8.00	32.9	878.9	890.0	890.7	872.68	5.00	878.02	2.79%	
708	872.09	887.65	8.00	26.7	878.1	889.4	890.0	872.92	4.00	877.26	3.25%	
709	872.27	887.03	8.00	30.0	878.0	888.7	889.4	873.11	4.00	877.44	1.77%	
710	872.47	886.48	8.00	30.0	877.2	888.1	888.7	873.31	3.00	876.64	2.02%	
711	872.54	886.42	8.00	30.0	876.6	887.8	888.4	873.38	2.00	875.71	3.03%	
712	872.89	886.69	8.00	30.0	877.0	888.1	888.8	873.72	2.00	876.05	3.04%	
713	873.17	886.78	8.00	30.0	877.1	888.1	888.8	874.01	2.00	876.34	2.58%	
714	873.37	886.21	8.00	30.0	877.1	887.9	888.6	874.21	2.00	876.54	1.94%	
715	873.57	885.54	8.00	30.0	876.4	887.3	887.9	874.41	1.00	875.74	2.18%	
716	873.78	885.12	8.00	31.2	875.5	886.6	887.3	874.61	0.00	N/A	2.89%	
717	874.78	885.53	8.00	30.0	876.2	886.9	887.5	875.61	0.00	N/A	2.00%	
718	874.81	885.61	8.00	30.0	876.2	886.9	887.5	875.64	0.00	N/A	1.95%	
719	875.23	886.79	8.00	30.0	877.1	888.1	888.8	876.06	0.00	N/A	3.48%	
720	875.26	886.87	8.00	30.0	877.1	888.1	888.8	876.09	0.00	N/A	3.42%	
721	875.68	888.04	8.00	30.0	878.6	889.4	890.0	876.51	1.00	877.84	2.45%	
722	875.71	888.13	8.00	30.0	878.6	889.4	890.0	876.55	1.00	877.88	2.38%	
723	877.72	889.31	8.00	30.0	879.6	890.7	891.3	878.55	0.00	N/A	3.59%	
724	877.81	889.39	8.00	30.0	879.7	890.7	891.3	878.64	0.00	N/A	3.42%	
725	879.10	890.57	8.00	30.0	880.9	891.9	892.6	879.93	0.00	N/A	3.35%	
726	879.19	890.65	8.00	30.0	881.0	891.9	892.6	880.02	0.00	N/A	3.18%	
727	880.48	891.83	8.00	30.0	882.2	893.2	893.8	881.31	0.00	N/A	3.10%	
728	880.57	891.91	8.00	30.0	882.3	893.2	893.8	881.41	0.00	N/A	2.93%	
729	881.88	893.01	8.00	33.9	883.7	894.5	895.2	882.71	0.00	N/A	2.81%	
730	882.02	893.13	8.00	34.6	883.7	894.5	895.2	882.85	0.00	N/A	2.54%	
731	895.77	907.37	8.00	30.0	897.5	908.4	909.0	896.60	0.00	N/A	2.94%	
732	895.96	907.44	8.00	29.8	897.6	908.4	909.0	896.79	0.00	N/A	2.58%	
736	891.24	903.22	8.00	28.1	895.1	906.0	906.7	892.08	2.00	894.41	2.37%	
737	889.22	901.46	8.00	30.0	892.2	903.4	904.0	890.06	1.00	891.39	2.68%	
738	887.29	899.67	8.00	30.0	890.3	901.7	902.3	888.12	1.00	889.45	2.77%	
739	885.40	897.92	8.00	30.0	888.6	900.3	901.0	886.23	1.00	887.57	3.45%	
740	883.42	895.53	8.00	25.3	888.1	899.2	899.9	884.25	3.00	887.58	2.22%	
741	881.31	892.59	8.00	30.0	884.2	895.0	895.7	882.15	1.00	883.48	2.35%	
742	881.22	892.50	8.00	30.0	884.1	895.0	895.7	882.05	1.00	883.39	2.51%	
743	879.80	891.20	8.00	30.0	881.5	892.4	893.1	880.63	0.00	N/A	2.98%	
744	879.70	891.12	8.00	30.0	881.5	892.4	893.1	880.54	0.00	N/A	3.15%	
745	878.41	889.94	8.00	30.0	880.2	891.2	891.8	879.25	0.00	N/A	3.22%	
746	878.32	889.86	8.00	30.0	880.2	891.2	891.8	879.16	0.00	N/A	3.39%	
747	877.06	888.71	8.00	30.0	878.9	889.9	890.6	877.90	0.00	N/A	3.41%	
748	875.88	888.60	8.00	30.0	879.0	889.9	890.6	876.71	1.00	878.05	3.07%	
749	875.46	887.42	8.00	30.0	877.5	888.7	889.3	876.29	0.00	N/A	4.07%	
750	875.43	887.34	8.00	30.0	877.5	888.7	889.3	876.26	0.00	N/A	4.12%	
751	875.00	886.18	8.00	30.0	876.6	887.4	888.1	875.84	0.00	N/A	2.59%	
752	874.97	886.08	8.00	30.0	876.6	887.4	888.1	875.81	0.00	N/A	2.65%	
753	874.55	884.89	8.00	30.0	875.8	886.8	887.4	875.39	0.00	N/A	1.45%	
754	874.50	884.71	8.00	31.3	875.8	886.8	887.4	875.33	0.00	N/A	1.51%	
755	874.13	885.60	8.00	30.0	876.0	887.3	887.9	874.96	0.00	N/A	3.49%	
756	874.31	885.56	8.00	30.0	875.8	886.7	887.3	875.14	0.00	N/A	2.21%	
757	874.62	885.84	8.00	30.0	876.2	887.2	887.9	875.46	0.00	N/A	2.60%	
758	874.97	886.43	8.00	30.0	876.7	887.8	888.5	875.80	0.00	N/A	3.01%	
759	875.32	887.03	8.00	30.0	877.2	888.4	889.1	876.15	0.00	N/A	3.42%	
760	875.67	887.63	8.00	30.0	877.7	889.0	889.7	876.50	0.00	N/A	3.83%	
761	877.09	888.23	8.00	30.0	878.7	889.6	890.3	877.93	0.00	N/A	2.48%	
762	877.67	888.83	8.00	30.0	879.2	890.1	890.7	878.50	0.00	N/A	2.28%	
763	878.24	889.43	8.00	30.0	879.8	890.7	891.3	879.07	0.00	N/A	2.32%	
764	878.81	890.07	8.00	30.0	880.5	891.5	892.2	879.65	0.00	N/A	2.78%	
765	879.45	891.30	8.00	30.0	882.4	893.5	894.1	880.28	1.00	881.62	2.67%	
766	879.85	892.40	8.00	26.8	883.6	894.7	895.3	880.69	2.00	883.02	2.35%	
767	881.84	893.61	8.00	30.0	884.7	895.7	896.4	882.67	1.00	884.00	2.42%	
768	883.40	894.94	8.00	29.3	886.2	897.1	897.7	884.24	1.00	885.57	2.15%	
769	884.86	896.26	8.00	30.0	887.9	898.9	899.6	885.69	1.00	887.02	2.77%	
770	886.84	898.17	8.00	30.0	889.9	901.0	901.7	887.68	1.00	889.01	2.95%	
771	886.95	898.27	8.00	30.0	888.8	900.0	900.7	887.78	0.00	N/A	3.38%	
772	884.99	896.39	8.00	30.0	886.9	898.3	898.9	885.82	0.00	N/A	3.71%	
773	882.53	894.52	8.00	31.9	885.9	897.3	897.9	883.56	1.00	884.69	3.69%	
774	878.30	889.49	8.00	30.0	880.0	891.3	891.9	879.13	0.00	N/A	2.96%	
775	878.14	889.68	8.00	50.1	880.2	891.1	891.8	878.97	0.00	N/A	2.40%	
776	878.22	889.29	8.00	47.0	880.4	891.0	891.7	879.06	0.00	N/A	2.81%	
777	878.05	888.78	8.00	58.3	880.0	890.8	891.4	878.88	0.00	N/A	1.88%	
778	875.22	886.85	8.00	30.0	879.1	890.0	890.7	876.05	2.00	878.38	2.41%	
779	872.33	886.51	8.00	30.0	877.2	888.2	888.9	873.16	3.00	876.50	2.49%	
780	872.59	887.38	8.00	30.9	878.5	889.5	890.2	873.43	4.00	877.76	2.44%	
781	871.63	888.79	8.00	22.6	880.2	891.1	891.7	872.47	7.00	879.80	1.92%	
782	870.10	890.12	8.00	30.0	881.0	892.0	892.7	870.93	9.00	880.27	2.48%	
783	870.36	890.96	8.00	29.9	882.0	892.8	893.4	871.20	10.00	881.53	1.71%	
784	870.60	891.71	8.00	29.9	882.3	893.0	893.7	871.43	10.00	881.77	1.73%	

SANITARY SEWER LATERALS TABLE

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

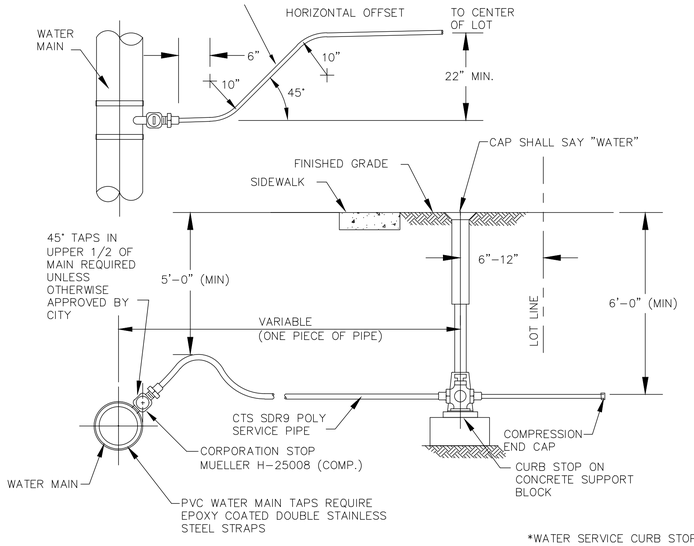
all in

SHEET:
DETAILS

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
1.6

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg



WATER MAIN SERVICE LATERAL
NTS

*WATER SERVICE CURB STOP SHALL BE H-25155 MUELLER

*WATER SERVICE CURB BOX SHALL BE H-10300 MUELLER (1-1/4 UPPER) WITH EXTENSION ROD

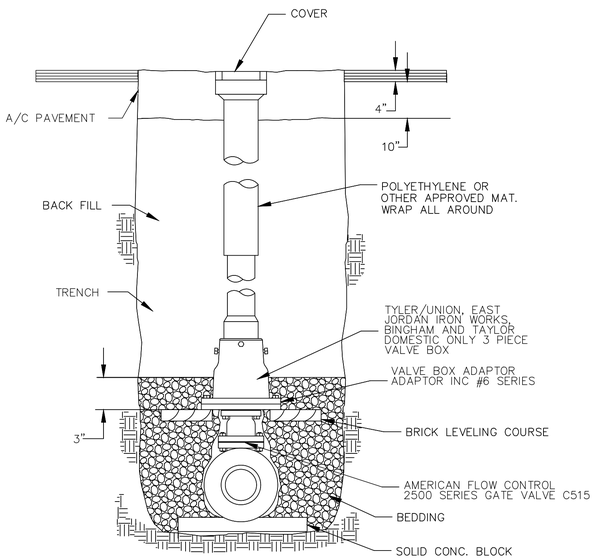
CITY OF LAKE GENEVA UTILITY COMMISSION MATERIAL REQUIREMENTS

WATER:

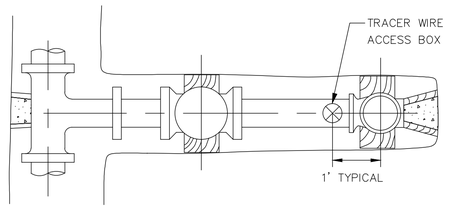
PVC: 4"-12" C900 DR18 PVC WATER MAIN
PVC: 14"-36" C905 DR18 PVC WATER MAIN
TRACER WIRE: 10 GAUGE COPPERHEAD COPPERCLAD WIRE OR EQUAL
SPLICE KITS: COPPERHEAD 3WB-01 OR EQUAL
TRACER WIRE TERMINATION BOX: BINGHAM & TAYLOR P2B200NFG12W2T
DUCTILE IRON PIPE: CL53 WALL THICKNESS AWWA C151
GATE VALVE: AMERICAN FLOW CONTROL 2500 SERIES VALVE C515
BUTTERFLY VALVE (NOT LESS THAN 12"): MUELLER COMPANY B3211 SERIES BUTTERFLY VALVE
VALVE BOX: TYLER/UNION, EAST JORDAN IRON WORKS, BINGHAM AND TAYLOR DOMESTIC ONLY 3 PIECE VALVE BOX
VALVE BOX ADAPTOR: ADAPTOR INC #6 SERIES VALVE BOX ADAPTOR
HYDRANTS: 5-1/4" WATEROUS/AMERICAN FLOW CONTROL WB67 PACER, WITH FACTORY INSTALLED STORZ NOZZLE, FEDERAL SAFETY YELLOW, 6" MJ INLET, WITH 2- 2-1/2" NST HOSE NOZZLES, WITH 1-1/2" PENTAGON NUT, COUNTERCLOCKWISE OPENING
SERVICE FITTINGS: MUELLER COMPANY C110 COMPRESSION OR FORD METER BOX Q JOINT SERIES ONLY
MJ FITTINGS: C153 MECHANICAL JOINT FITTINGS MANUFACTURED BY STAR PIPE PRODUCTS, TYLER/UNION AND SIGMA CORP - DOMESTIC ONLY - NO IMPORT FITTINGS ALLOWED
MJ RESTRAINTS: EBAA IRON SERIES 2000PV FOR PVC (RED WITH BLUE NUTS), 1100 SERIES FOR DUCTILE IRON (BLACK WITH BLUE NUTS), AND 1100OX FOR CAST IRON (GRAY WITH BLUE NUTS) ONLY
WATER SERVICES: 1"- 2" CTS SDR9 POLY TUBING
CORP STOP: MUELLER COMPANY B25008 ALL SIZES **CURB STOP:** MUELLER COMPANY B25155 ALL SIZES
CURB BOX: MUELLER COMPANY H10300 (1-1/4 UPPER) WITH EXTENSION ROD

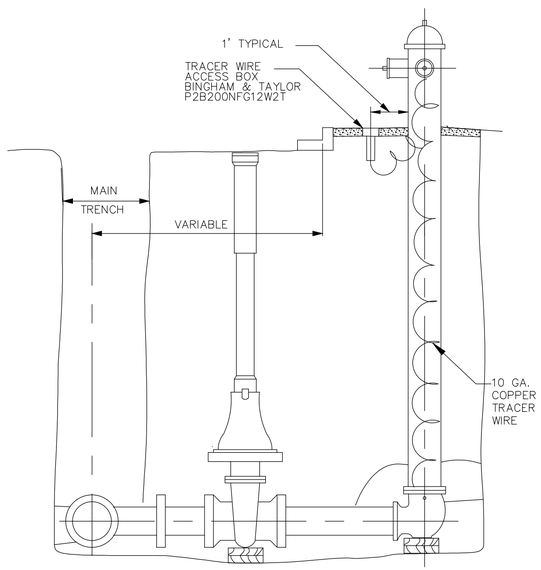
*****FOR THE USE OF ANY MATERIAL CATEGORY NOT LISTED ABOVE, PLEASE CONTACT THE UTILITY COMMISSION FOR SPECIFIC REQUIREMENTS.**

*****PLEASE REFER TO THE CITY OF LAKE GENEVA DEVELOPMENT STANDARDS FOR SPECIFICATIONS ON THE INSTALLATION REQUIREMENTS OF THE ABOVE LISTED UTILITY MATERIALS.**



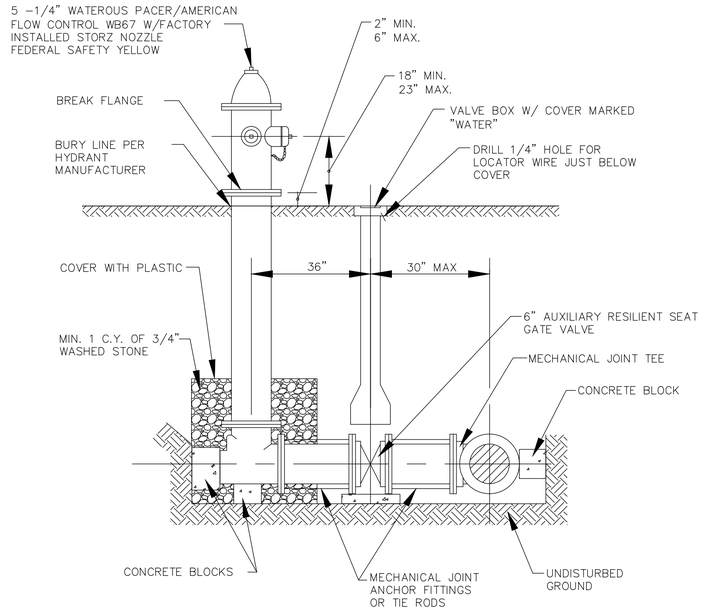
VALVE BOX DETAIL
NTS





TRACER WIRE ACCESS BOX LOCATION DETAIL
NTS

NOTE:
SPLICE TRACER WIRE AT HYDRANT & TERMINATE



NOTES:
1. FIRE HYDRANTS SHALL BE MARKED WITH AN "X" ON THE NORTHERN MOST FLANGE BOLT AND THE ELEVATION OF THE BOLT RECORDED ON THE RECORD DRAWING FOR THE PROJECT.

2. ALL HYDRANTS SHALL HAVE A BURY DEPTH OF 6'6".

3. ACCEPTABLE FORMS OF BLOCKING SHALL BE ANY TWO COMBINATIONS OF THE METHODS 1, 2 OR 3 SHOWN BELOW. AUXILIARY VALVES MUST USE METHODS 1 AND 3 TO CONNECT TO THE WATER MAIN.
1. THREADED RODS AND NUTS SHALL BE "CORTEN STEEL".
2. BLOCKING AGAINST UNDISTURBED EARTH.
3. RETAINING GLANDS.

WATER MAIN FIRE HYDRANT DETAIL
NTS

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:
all in

SHEET:
DETAILS

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
1.7

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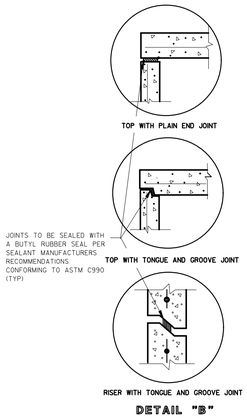
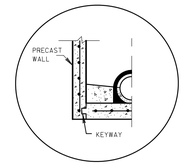
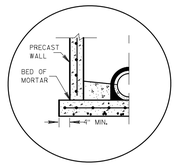


DETAIL "B"



PRECAST REINFORCED CONCRETE WITH INTEGRAL BASE OPTION



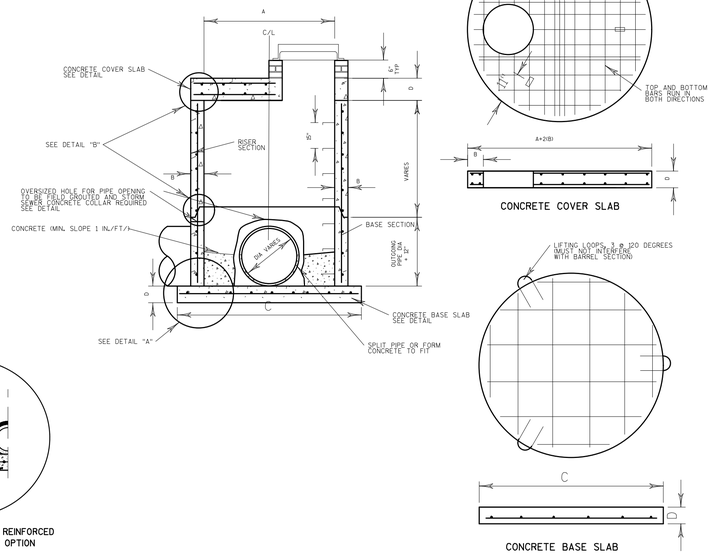
SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

DETAIL "A"

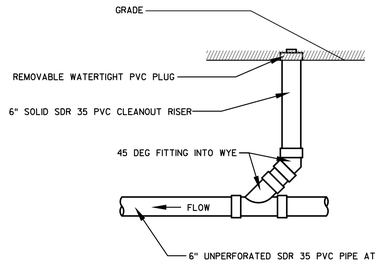
	A	B	C	D
MANHOLE 9-FT SPECIAL	108"	10"	132"	12"

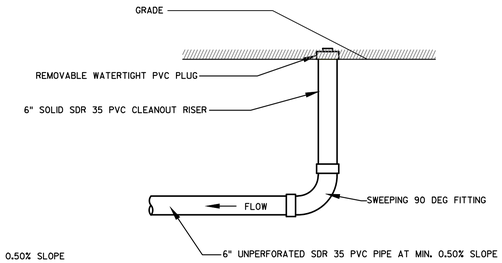
NOTES

1) REINFORCING COMPLIES WITH ASTM C-478.
2) STEPS PLACED AT 15". STEPS COMPLY WITH ASTM C-478.
3) RISER & SLABS DESIGN FOR HS20 LOADING.



MANHOLE 9-FT SPECIAL





REFER TO STORM SEWER PLANS FOR LOCATIONS OF CLEANOUTS FOR 6" UNPERFORATED PIPE UNDERDRAIN

6" STORM CLEANOUT – INLINE

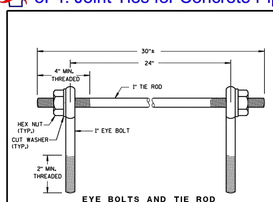
6" STORM CLEANOUT – END

STORM SEWER FIELD INLETS, CATCH BASINS, MANHOLES, FRAMES, COVERS, AND GRATES

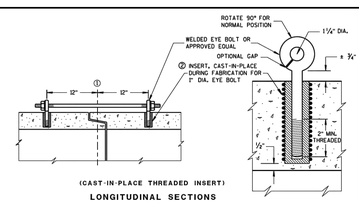
NOTES:

1. STORM SEWER CATCH BASINS SHALL HAVE 2-FOOT SUMPS
2. STORM SEWER CATCH BASINS FOR 2X3 FT SHALL FOLLOW SDD 8A 9-1.
3. STORM SEWER CATCH BASINS FOR 4-FT, 5-FT AND 6-FT SHALL FOLLOW SDD 8A 8-1.
4. STORM SEWER FIELD INLETS FOR 2X3 FT AND 4-FT SHALL FOLLOW SDD 8C 7-1 AND 8C 6-1.
5. STORM SEWER FIELD INLETS FOR 5-FT AND STORM SEWER MANHOLES 4-FT, 5-FT, 6-FT, 7-FT, AND 8-FT SHALL FOLLOW SDD 8B 9-1.
6. STORM SEWER FIELD INLETS SHALL USE FRAME AND GRATE NEENAH FOUNDRY R-2560-E1 OR APPROVED EQUAL.
7. STORM SEWER CATCH BASINS SHALL USE FRAME AND GRATE NEENAH FOUNDRY R-3067-L OR APPROVED EQUAL.
8. STORM SEWER MANHOLES SHALL USE FRAME AND GRATE NEENAH FOUNDRY R-1580 OR APPROVED EQUAL.
9. SDD = WISCONSIN DEPARTMENT OF TRANSPORTATION STANDARD DETAIL DRAWINGS AND CAN BE FOUND AT: http://wisconsindot.gov/rdwy/sdd/sd-08-00toc.pdf

8F4: Joint Ties for Concrete Pipe



EYE BOLTS AND TIE ROD



LONGITUDINAL SECTIONS

EYE BOLT AND TIE ROD ASSEMBLY (ALTERNATE NO. 1)

GENERAL NOTES

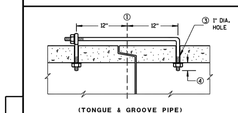
DETAILS OF CONSTRUCTION, MATERIALS, AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND APPLICABLE SPECIAL PROVISIONS.

CONCRETE CULVERT AND STORM SEWER PIPE SHALL BE TIED TOGETHER IN THE MANNER ILLUSTRATED BY THIS DETAIL AT LOCATIONS DESIGNATED IN THE STANDARD SPECIFICATIONS AND THE PLAN. THE CONTRACTOR MAY USE EITHER ALTERNATE 1, 2 OR 3 FOR DRAINAGE STRUCTURES. ONLY ALTERNATE 1 AND 3 MAY BE USED FOR CATTLE PASSES, UNLESS OTHERWISE STATED IN THE CONTRACT. THE MATERIALS, FABRICATION AND WORK NECESSARY TO TIE THE PIPE BY THIS DETAIL WILL BE CONSIDERED INCIDENTAL TO THE PIPE AND APRON ENDWALLS IF REQUIRED.

DETAILED DRAWINGS FOR PROPOSED ALTERNATE DESIGNS FOR JOINT TIES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

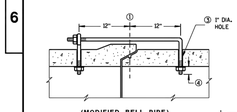
JOINT TIES TO BE HOT-DIP GALVANIZED PER ASTM A 153.

① ¾" OF TONGUE AND GROOVE OR BELL AND SPIGOT JOINTS.
② THE INSIDE OF THE THREADED INSERTS SHALL BE CLEAN TO ALLOW THE INSERTION OF THREADED EYE BOLTS.
③ HOLES SHALL BE CAST-IN-PLACE OR DRILLED 12 INCHES FROM ¾" OF TONGUE AND GROOVE.
④ BOLT PROJECTION INSIDE OF PIPE SHALL NOT EXCEED 2 INCHES.
⑤ OPENING TO BE ROD DIAMETER PLUS 1 INCH.
⑥ LENGTH ADEQUATE TO EXTEND TO WITHIN ½" INCH OF THE INNER SURFACE OF THE PIPE.



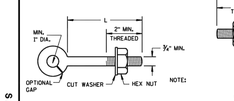
(TONGUE & GROOVE PIPE)

EYE BOLT DIMENSION TABLE		
PIPE SIZE	L + LENGTH	
	TONGUE & GROOVE PIPE	MODIFIED BELL PIPE
18" TO 24"	4 ½"	6 ½"
30"	5"	7"
36"	5 ½"	7"
42"	6"	
48"	6 ½"	
60"	7 ½"	
66"	8"	



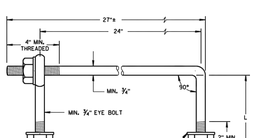
(MODIFIED BELL PIPE)

LONGITUDINAL SECTION



EYE BOLT

NOTE: TWO EYE BOLTS MAY BE USED WITH A 30" LONG THREADED ROD IN LIEU OF THE 90° BENT TIE ROD.



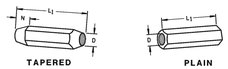
EYE BOLT AND TIE ROD

(JOINT TIES FOR 18" TO 66" DIA. CONCRETE PIPE)

EYE BOLT AND TIE ROD ASSEMBLY (ALTERNATE NO. 2)

ADJUSTABLE TIE ROD TABLE				
PIPE DIAMETER	TIE ROD DIAMETER	D	L1	N
12"-60"	⅝	⅝	5	½
66"-84"	¾	¾	5	½
90"-108"	1	1	7	1 ⅛

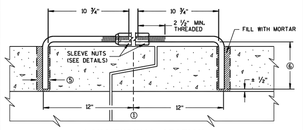
DIMENSIONS SHOWN ARE IN INCHES



TAPERED PLAIN

RIGHT AND LEFT THREADS

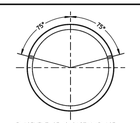
SLEEVE NUTS



LONGITUDINAL SECTION

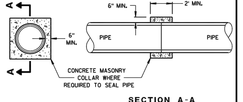
(JOINT TIES FOR 12" TO 108" DIA. CONCRETE PIPE)

ADJUSTABLE TIE ROD (ALTERNATE NO. 3)



PLACEMENT OF (2) CAST-IN-PLACE INSERTS OR HOLES DURING FABRICATION FOR PIPE SECTIONS REQUIRING TIE RODS

TRANSVERSE SECTION



SECTION A-A

CONCRETE COLLAR DETAIL

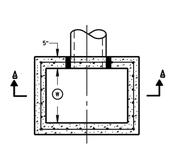
JOINT TIES FOR CONCRETE PIPE AND CONCRETE COLLAR DETAIL

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

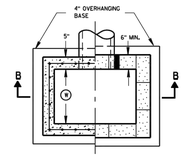
APPROVED 6-5-202 /S/ Jerry M. Zogg
DATE ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

SDD. 8 F 4-7

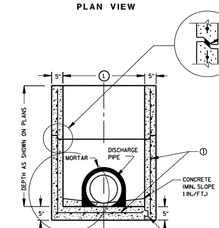
8C7: Inlets 2x2-FT, 2x2.5-FT, 2x3-FT, & 2.5x3-FT



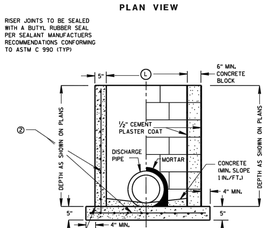
PLAN VIEW



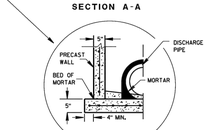
PLAN VIEW



SECTION A-A



SECTION B-B



SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

INLETS 2X2-FT, 2X2.5-FT, 2X3-FT AND 2.5X3-FT

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER, THE CONTRACTOR SHALL NOT ORDER AND DELIVER PRECAST INLET UNITS REQUIRED FOR THE PROJECT UNTIL A LIST OF SIZES IS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR PROPOSED ALTERNATE DESIGNS FOR UNDERGROUND DRAINAGE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PROVIDING THAT SUCH ALTERNATE DESIGNS MAKE PROVISION FOR EQUIVALENT CAPACITY AND STRENGTH.

ALL PRECAST INLET UNITS SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF ASTM C 913.

ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 3X3-L", "CATCH BASINS 4-B", "INLETS 2X3-W", ETC. THE FIRST NUMBERS DESIGNATES THE SIZE OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.

BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.

ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

PRECAST REINFORCED RISERS SHALL HAVE A TONGUE AND GROOVE JOINT WITH TONGUE UP OR DOWN.

4" OVERHANGING BASES ARE REQUIRED FOR CAST-IN-PLACE REINFORCED CONCRETE AND CONCRETE BLOCK INSTALLATIONS. 4" OVERHANG IS REQUIRED WHEN SEPARATE PRECAST BASE IS PROVIDED. OVERHANG IS NOT REQUIRED ON PRECAST STRUCTURES WITH AN INTEGRAL OR MONOLITHIC BASE.

MAXIMUM INSIDE PIPE DIAMETER DETERMINED BY 3 INCH CLEARANCE ON EACH SIDE OF THE OUTSIDE WALL OF THE PIPE. SEE DETAIL "A". ASSUMES PIPE ENTERS PERPENDICULAR TO THE STRUCTURE.

① FOR PRECAST INLETS PROVIDE REINFORCING STEEL IN ACCORDANCE TO ASTM C 913.

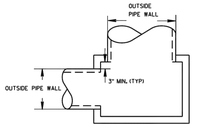
② CONTRACTOR TO PROVIDE DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER FOR STEEL REINFORCING DESIGN FOR CAST-IN-PLACE STRUCTURES.

INLET COVER MATRIX

INLET SIZE		INLET COVER TYPE		ALL A'S	ALL B'S	BW	F	ALL H'S	S	T	V	WM
	WIDTH (B OR F1)	LENGTH (A OR F2)										
2X2-FT	2	2		X	X			X			X	
2X2.5-FT	2	2.5				X		X	X	X	X	X
2X3-FT	2	3					X					
2.5X3-FT	2.5	3				X						

PIPE MATRIX

INLET SIZE	MAXIMUM INSIDE PIPE DIAMETER	
	WIDTH (IN)	LENGTH (IN)
2X2-FT	12	12
2X2.5-FT	12	18
2X3-FT	12	24
2.5X3-FT	18	24



DETAIL "A"

INLETS 2X2-FT, 2X2.5-FT, 2X3-FT AND 2.5X3-FT

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED 6-5-202 /S/ Jerry M. Zogg
DATE ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

SDD. 8 C 7-1

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT: SYMPHONY BAY PHASE 7

LOCATION: CITY OF LAKE GENEVA, WI

CLIENT: FAIRWYN

RELEASE: CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

all in

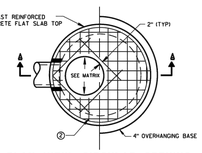
SHEET: DETAILS

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER: 1.8

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg

8A8: Catch Basins 3-FT, 4-FT, 5-FT & 6-FT Diameter



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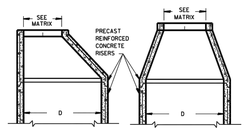
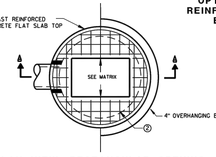
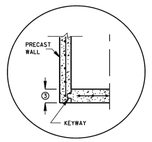


OPTIONAL PRECAST REINFORCED CONCRETE ECCENTRIC TOP

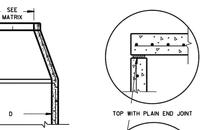
OPTIONAL PRECAST REINFORCED CONCRETE CONCENTRIC TOP



PLAN VIEW RECTANGULAR OPENING



PRECAST REINFORCED CONCRETE WITH INTEGRAL BASE OPTION



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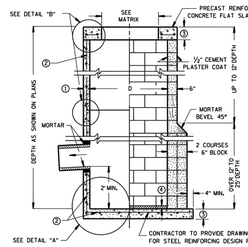
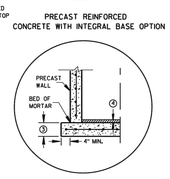
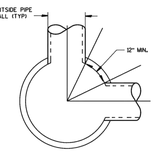


SECTION A-A



SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

DETAIL "A"



DETAIL "C"

PRECAST REINFORCED CONCRETE WITH MONOLITHIC BASE

CONCRETE BLOCK WITH CAST-IN-PLACE OR PRECAST REINFORCED CONCRETE BASE ⑦

CATCH BASINS 3-FT, 4-FT, 5-FT AND 6-FT DIAMETER

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER, THE CONTRACTOR SHALL NOT ORDER AND DELIVER PRECAST CATCH BASIN UNITS REQUIRED FOR THE PROJECT UNTIL A LIST OF SIZES IS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR PROPOSED ALTERNATE DESIGNS FOR UNDERGROUND DRAINAGE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PROVIDING THAT SUCH ALTERNATE DESIGNS MAKE PROVISION FOR EQUIVALENT CAPACITY AND STRENGTH.

ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 3X3-L", "CATCH BASINS 4-B", "INLETS 2X3-H", ETC. THE FIRST NUMBERS DESIGNATE THE SIZE OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.

BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.

PRECAST REINFORCED CONCRETE CONE TOPS (ECCENTRIC OR CONCENTRIC) OR PRECAST REINFORCED FLAT SLAB TOPS MAY BE USED ON CONCRETE BLOCK STRUCTURES. THE TOPS SHALL BE INSTALLED ON A BED OF MORTAR.

ECCENTRIC CONE TOPS MAY BE USED ON ALL STRUCTURES, AND CONCENTRIC CONE TOPS SHALL BE USED ONLY ON STRUCTURES 5 FEET OR LESS IN DEPTH, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

STEPS MEETING AASHTO M199 AND THE FOLLOWING REQUIREMENTS SHALL BE INSTALLED IN ALL STRUCTURES OVER 5 FEET IN DEPTH: 16 INCH C-C MAXIMUM SPACING; PROJECT A MINIMUM CLEAR DISTANCE OF 4 INCHES FROM THE WALL AT THE POINT OF EMBEDMENT; MINIMUM LENGTH OF 10 INCHES; MINIMUM WALL EMBEDMENT OF 3 INCHES; FERROUS METAL STEPS NOT PAINTED OR TREATED TO RESIST CORROSION SHALL HAVE A MINIMUM CROSS SECTIONAL DIMENSION OF 1 INCH.

STEPS OF APPROVED POLYPROPYLENE PLASTIC COATED REINFORCEMENT BAR ARE ACCEPTABLE. REINFORCING BAR MUST BE A MINIMUM OF ½ INCH AND MEET THE REQUIREMENTS OF ASTM A615.

CERTIFICATION SHALL BE PROVIDED THAT INSTALLED STEPS WHEN TESTED IN ACCORDANCE WITH SECTION 10 OF AASHTO T280 CAN WITHSTAND A VERTICAL LOAD OF 800 LBS. AND A HORIZONTAL LOAD OF 400 LBS.

ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

ALL PRECAST INLET UNITS SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF AASHTO DESIGNATION M199.

PRECAST REINFORCED RISERS SHALL HAVE A TONGUE AND GROOVE JOINT WITH TONGUE UP OR DOWN.

CONCRETE BLOCK WILL NOT BE PERMITED FOR STRUCTURES GREATER THAN 4 FEET IN DIAMETER.

4" OVERHANGING BASES ARE REQUIRED FOR ALL CONCRETE BLOCK INSTALLATIONS. 4" OVERHANG IS REQUIRED WHEN SEPARATE PRECAST BASE IS PROVIDED. OVERHANG IS NOT REQUIRED ON PRECAST STRUCTURES WITH AN INTEGRAL OR MONOLITHIC BASE.

FOR ADDITIONAL CONFIGURATIONS, MAINTAIN A MINIMUM OF 12 INCHES AS MEASURED FROM THE INSIDE OF THE STRUCTURE WALL BETWEEN THE OUTSIDE PIPE WALLS OF ADJACENT PIPES. SEE DETAIL "C".

① MINIMUM WALL THICKNESS SHALL BE 4 INCHES FOR 3-FT, 5 INCHES FOR 4-FT, 6 INCHES FOR 5-FT AND 7 INCHES FOR 6-FT DIAMETER PRECAST CATCH BASINS.

② FOR PRECAST CATCH BASINS PROVIDE REINFORCING STEEL IN ACCORDANCE TO AASHTO M199.

③ PRECAST FLAT SLAB TOPS AND BASES WITH A DIAMETER OF 48" AND LESS SHALL HAVE A MINIMUM THICKNESS OF 6"; PRECAST FLAT SLAB TOPS AND BASES WITH A DIAMETER LARGER THAN 48" SHALL HAVE A MINIMUM THICKNESS OF 8".

④ 7" CONCRETE KEY POURED AFTER INSTALLATION, 2' SUMP MEASURED FROM TOP OF KEY.

CATCH BASIN COVER OPENING MATRIX

CATCH BASIN SIZE	INLET COVER TYPE	ALL A'S	ALL B'S	B#	C	F	ALL H'S	S	T	V	W#	Z
	OPENING SIZE (FT)											
3-FT	2X2	X		X				X		X		
	2 DIA.				X							X
	2X2	X		X				X		X		
4-FT-6-FT	2X2.5				X			X	X	X	X	
	2 DIA.					X						X
	2X3						X					
	2.5X3					X						

PIPE MATRIX

CATCH BASIN SIZE	MAXIMUM INSIDE PIPE DIAMETER FOR TWO PIPES	
	180° SEPARATION (IN)	90° SEPARATION (IN)
3-FT	15	12
4-FT	24	18
5-FT	36	24
6-FT	42	30

CATCH BASINS 3-FT, 4-FT, 5-FT AND 6-FT DIAMETER

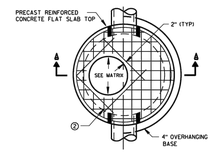
CATCH BASINS 3-FT, 4-FT AND 6-FT DIAMETER

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

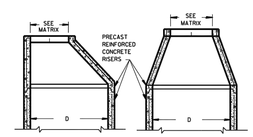
APPROVED
6/5/2012 — DATE
/S/ Jerry H. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

S.D.D. 8 A 8-1

8B9: Manholes 3-FT, 4-FT, 5-FT, 6-FT, 7-FT, & 8-FT Diameter

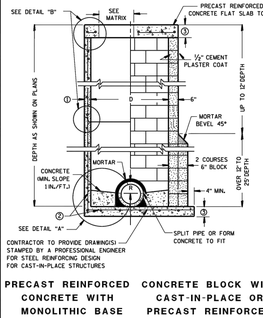


PLAN VIEW CIRCULAR OPENING

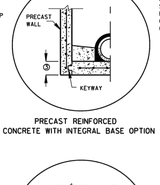


OPTIONAL PRECAST REINFORCED CONCRETE ECCENTRIC TOP

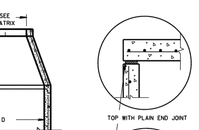
OPTIONAL PRECAST REINFORCED CONCRETE CONCENTRIC TOP



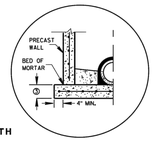
SECTION A-A



PRECAST REINFORCED CONCRETE WITH INTEGRAL BASE OPTION

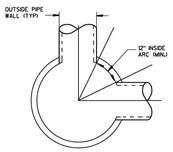


DETAIL "B"



SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

DETAIL "A"



DETAIL "C"

PRECAST REINFORCED CONCRETE WITH MONOLITHIC BASE

CONCRETE BLOCK WITH CAST-IN-PLACE OR PRECAST REINFORCED CONCRETE BASE ⑦

MANHOLES 3-FT, 4-FT, 5-FT, 6-FT, 7-FT AND 8-FT DIAMETER

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER, THE CONTRACTOR SHALL NOT ORDER AND DELIVER PRECAST MANHOLE UNITS REQUIRED FOR THE PROJECT UNTIL A LIST OF SIZES IS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR PROPOSED ALTERNATE DESIGNS FOR UNDERGROUND DRAINAGE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PROVIDING THAT SUCH ALTERNATE DESIGNS MAKE PROVISION FOR EQUIVALENT CAPACITY AND STRENGTH.

ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 3X3-L", "CATCH BASINS 4-B", "INLETS 2X3-H", ETC. THE FIRST NUMBERS DESIGNATE THE SIZE OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.

BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.

PRECAST REINFORCED CONE TOPS (ECCENTRIC OR CONCENTRIC) OR PRECAST REINFORCED FLAT SLAB TOPS MAY BE USED ON CONCRETE BLOCK STRUCTURES. THE CONE TOPS SHALL BE INSTALLED ON A BED OF MORTAR.

ECCENTRIC CONE TOPS MAY BE USED ON ALL STRUCTURES, AND CONCENTRIC CONE TOPS SHALL BE USED ONLY ON STRUCTURES 5 FEET OR LESS IN DEPTH, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

STEPS MEETING AASHTO M199 AND THE FOLLOWING REQUIREMENTS SHALL BE INSTALLED IN ALL STRUCTURES OVER 5 FEET IN DEPTH: 16 INCH C-C MAXIMUM SPACING; PROJECT A MINIMUM CLEAR DISTANCE OF 4 INCHES FROM THE WALL AT THE POINT OF EMBEDMENT; MINIMUM LENGTH OF 10 INCHES; MINIMUM WALL EMBEDMENT OF 3 INCHES; FERROUS METAL STEPS NOT PAINTED OR TREATED TO RESIST CORROSION SHALL HAVE A MINIMUM CROSS SECTIONAL DIMENSION OF 1 INCH.

STEPS OF APPROVED POLYPROPYLENE PLASTIC COATED REINFORCEMENT BAR ARE ACCEPTABLE. REINFORCING BAR MUST BE A MINIMUM OF ½" AND MEET THE REQUIREMENTS OF ASTM A615.

CERTIFICATION SHALL BE PROVIDED THAT INSTALLED STEPS WHEN TESTED IN ACCORDANCE WITH SECTION 10 OF AASHTO T280 CAN WITHSTAND A VERTICAL LOAD OF 800 LBS. AND A HORIZONTAL LOAD OF 400 LBS.

ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

CONCRETE BLOCK WILL NOT BE PERMITED FOR STRUCTURES GREATER THAN 4 FEET IN DIAMETER.

PRECAST REINFORCED RISERS SHALL HAVE A TONGUE AND GROOVE JOINT WITH TONGUE UP OR DOWN.

ALL PRECAST MANHOLE UNITS SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF AASHTO DESIGNATION M 199.

4" OVERHANGING BASES ARE REQUIRED FOR ALL CONCRETE BLOCK INSTALLATIONS. 4" OVERHANG IS REQUIRED WHEN SEPARATE PRECAST BASE IS PROVIDED. OVERHANG IS NOT REQUIRED ON PRECAST STRUCTURES WITH AN INTEGRAL OR MONOLITHIC BASE.

FOR ADDITIONAL CONFIGURATIONS, MAINTAIN A MINIMUM OF 12 INCHES AS MEASURED FROM THE INSIDE OF THE STRUCTURE WALL BETWEEN THE OUTSIDE PIPE WALLS OF ADJACENT PIPES. SEE DETAIL "C".

① MINIMUM WALL THICKNESS SHALL BE 4 INCHES FOR 3-FT, 5 INCHES FOR 4-FT, 6 INCHES FOR 5-FT, 7 INCHES FOR 6-FT, 8 INCHES FOR 7-FT AND 9 INCHES FOR 8-FT DIAMETER PRECAST MANHOLES.

② FOR PRECAST MANHOLES PROVIDE REINFORCING STEEL IN ACCORDANCE TO AASHTO M199.

③ PRECAST FLAT SLAB TOPS AND BASES WITH A DIAMETER OF 48" AND LESS SHALL HAVE A MINIMUM THICKNESS OF 6"; PRECAST FLAT SLAB TOPS AND BASES WITH A DIAMETER LARGER THAN 48" SHALL HAVE A MINIMUM THICKNESS OF 8".

MANHOLE COVER OPENING MATRIX

MANHOLE COVER TYPE	C	ALL J'S	K	L	M
OPENING SIZE (FT)					
2 DIA.	X	X		X	
3 DIA.			X		X

PIPE MATRIX

MANHOLE SIZE	MAXIMUM INSIDE PIPE DIAMETER FOR TWO PIPES	
	180° SEPARATION (IN)	90° SEPARATION (IN)
3-FT	15	12
4-FT	24	18
5-FT	36	24
6-FT	42	36
7-FT	48	36
8-FT	60	42

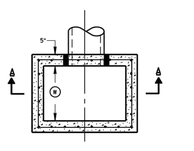
MANHOLES 3-FT, 4-FT, 5-FT, 6-FT, 7-FT AND 8-FT DIAMETER

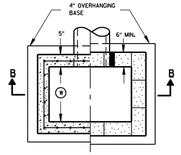
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

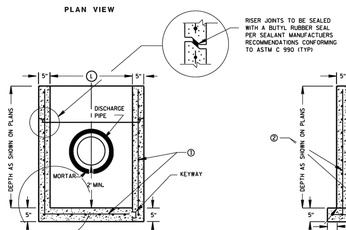
APPROVED
6/5/2012 — DATE
/S/ Jerry H. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

S.D.D. 8 B 9-1

8A9: Catch Basins 2x3-FT & 2.5x3-FT



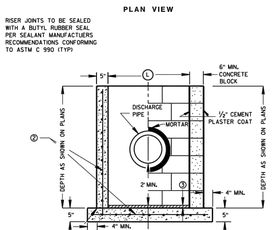




PRECAST REINFORCED CONCRETE WITH MONOLITHIC BASE

PRECAST REINFORCED CONCRETE WITH INTEGRAL BASE ①

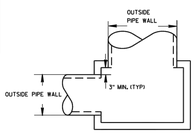
SECTION A-A



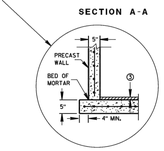
CAST-IN-PLACE REINFORCED CONCRETE

CONCRETE BLOCK ON CAST-IN-PLACE WITH PRECAST REINFORCED CONCRETE BASE ①

SECTION B-B



DETAIL "A"



SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

CATCH BASINS 2X3-FT AND 2.5X3-FT

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER, THE CONTRACTOR SHALL NOT ORDER AND DELIVER PRECAST CATCH BASIN UNITS REQUIRED FOR THE PROJECT UNTIL A LIST OF SIZES IS FURNISHED BY THE ENGINEER.

ALL PRECAST CATCH BASIN UNITS SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF ASTM C 913.

ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 3X3-L", "CATCH BASINS 4-B", "INLETS 2X3-H", ETC. THE FIRST NUMBERS DESIGNATES THE SIZE OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.

BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.

ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

PRECAST REINFORCED RISERS SHALL HAVE A TONGUE AND GROOVE JOINT WITH TONGUE UP OR DOWN.

4" OVERHANGING BASES ARE REQUIRED FOR CAST-IN-PLACE REINFORCED CONCRETE AND CONCRETE BLOCK INSTALLATIONS. 4" OVERHANG IS REQUIRED WHEN SEPARATE PRECAST BASE IS PROVIDED. OVERHANG IS NOT REQUIRED ON PRECAST STRUCTURES WITH AN INTEGRAL OR MONOLITHIC BASE.

MAXIMUM INSIDE PIPE DIAMETER DETERMINED BY 3" CLEARANCE ON EACH SIDE OF THE OUTSIDE WALL OF THE PIPE. SEE DETAIL "A". ASSUMES PIPE ENTERS PERPENDICULAR TO THE STRUCTURE.

① FOR PRECAST CATCH BASINS PROVIDE REINFORCING STEEL IN ACCORDANCE TO ASTM C 913.

② CONTRACTOR TO PROVIDE DRAWING(S) STAMPED BY A PROFESSIONAL ENGINEER FOR STEEL REINFORCING DESIGN FOR CAST-IN-PLACE STRUCTURES.

③ 7" CONCRETE KEY POURED AFTER INSTALLATION. 2'-SUMP MEASURED FROM TOP OF KEY.

CATCH BASIN COVER MATRIX

CATCH BASIN SIZE	INLET COVER TYPE		F	ALL H'S
	WIDTH ⑤ (FT)	LENGTH ⑤ (FT)		
2X3-FT	2	3		X
2.5X3-FT	2.5	3	X	

PIPE MATRIX

CATCH BASIN SIZE	MAXIMUM INSIDE PIPE DIAMETER FOR TWO PIPES	
	WIDTH (IN)	LENGTH (IN)
2X3-FT	12	24
2.5X3-FT	18	24

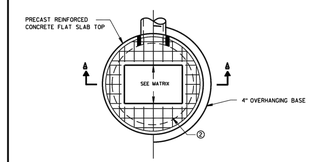
CATCH BASINS 2X3-FT AND 2.5X3-FT

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

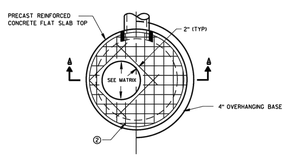
APPROVED
6/5/2012 — DATE
/S/ Jerry H. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

S.D.D. 8 A 9-1

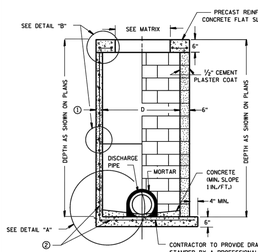
8C6: Inlets 3-FT & 4-FT Diameter



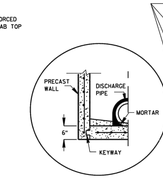
PLAN VIEW RECTANGULAR OPENING



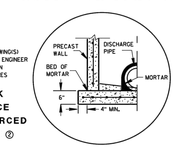
PLAN VIEW CIRCULAR OPENING



SECTION A-A

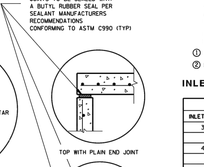


PRECAST REINFORCED CONCRETE WITH INTEGRAL BASE OPTION

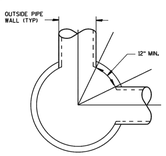


SEPARATE PRECAST REINFORCED CONCRETE BASE OPTION

DETAIL "A"



DETAIL "B"



DETAIL "C"

PRECAST REINFORCED CONCRETE WITH MONOLITHIC BASE

CONCRETE BLOCK WITH CAST-IN-PLACE OR PRECAST REINFORCED CONCRETE BASE ②

CIRCULAR INLETS W/ FLAT TOP

INLETS 3-FT AND 4-FT DIAMETER

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER, THE CONTRACTOR SHALL NOT ORDER AND DELIVER PRECAST INLET UNITS REQUIRED FOR THE PROJECT UNTIL A LIST OF SIZES IS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR PROPOSED ALTERNATE DESIGNS FOR UNDERGROUND DRAINAGE STRUCTURES SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PROVIDING THAT SUCH ALTERNATE DESIGNS MAKE PROVISION FOR EQUIVALENT CAPACITY AND STRENGTH.

ALL DRAINAGE STRUCTURES ARE DESIGNATED ON THE PLANS AS "MANHOLES 3X3-L", "CATCH BASINS 4-B", "INLETS 2X3-H", ETC. THE FIRST NUMBERS DESIGNATE THE SIZE OF THE STRUCTURE, AND THE FOLLOWING LETTER DESIGNATES THE TYPE OF COVER TO BE USED TO COMPRISE THE COMPLETE UNIT.

BASES SHALL BE PLACED ON A BED OF MATERIAL AT LEAST 6 INCHES IN DEPTH, WHICH MEETS THE REQUIREMENTS OF GRANULAR BACKFILL. THIS BEDDING SHALL BE COMPACTED AND PROVIDE UNIFORM SUPPORT FOR THE ENTIRE AREA OF THE BASE.

ALL BAR STEEL REINFORCEMENT SHALL BE EMBEDDED 2 INCHES CLEAR UNLESS OTHERWISE SHOWN OR NOTED.

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PRECAST REINFORCED RISERS SHALL HAVE A TONGUE AND GROOVE JOINT WITH TONGUE UP OR DOWN.

4" OVERHANGING BASES ARE REQUIRED FOR ALL CONCRETE BLOCK INSTALLATIONS. 4" OVERHANG IS REQUIRED WHEN SEPARATE PRECAST BASE IS PROVIDED. OVERHANG IS NOT REQUIRED ON PRECAST STRUCTURES WITH AN INTEGRAL OR MONOLITHIC BASE.

FOR ADDITIONAL CONFIGURATIONS, MAINTAIN A MINIMUM OF 12 INCHES AS MEASURED FROM THE INSIDE OF THE STRUCTURE WALL BETWEEN THE OUTSIDE PIPE WALLS OF ADJACENT PIPES, SEE DETAIL "C".

① MINIMUM WALL THICKNESS SHALL BE 4-IN FOR 3-FT DIAMETER AND 5-IN FOR 4-FT DIAMETER PRECAST INLETS.

② FOR PRECAST CATCH BASINS PROVIDE REINFORCING STEEL IN ACCORDANCE TO AASHTO M199.

INLET COVER OPENING MATRIX

INLET SIZE	INLET COVER TYPE	ALL A'S	ALL B'S	B#	C	F	ALL H'S	S	T	V	W#	Z
	OPENING SIZE (FT)											
3-FT	2 DIA.				X							X
	2X2	X		X				X		X		
4-FT	2 DIA.				X							X
	2X2	X		X				X		X		
	2X2.5				X			X	X	X	X	
	2X3						X					
	2.5X3					X						

PIPE MATRIX

PIPE SIZE	MAXIMUM INSIDE PIPE DIAMETER FOR TWO PIPES	
	180° SEPARATION (IN)	90° SEPARATION (IN)
3-FT	15	12
4-FT	24	18

INLETS 3-FT AND 4-FT DIAMETER

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
6/5/2012 — DATE
/S/ Jerry H. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

S.D.D. 8 C 6-1

kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY PHASE 7

LOCATION:
CITY OF LAKE GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

SEAL:

all in

SHEET:
DETAILS

PROJECT MANAGER: DMJ
PROJECT NUMBER: 15.0201.07
DATE: 9-1-2022

SHEET NUMBER:
1.9

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_TITLE_DETAILS_PH7.dwg

PHASE 1-6

PHASE 7

kapur

7711 N. Port Washington Road
Milwaukee, Wisconsin 53217

kapurinc.com

PROJECT:

SYMPHONY BAY
PHASE 7

LOCATION:

CITY OF LAKE
GENEVA, WI

CLIENT:

FAIRWYN

RELEASE:

CONSTRUCTION
SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

NORTH ARROW:

SCALE: 1" = 150'

0 75 150 225

SEAL:

all in

SHEET:

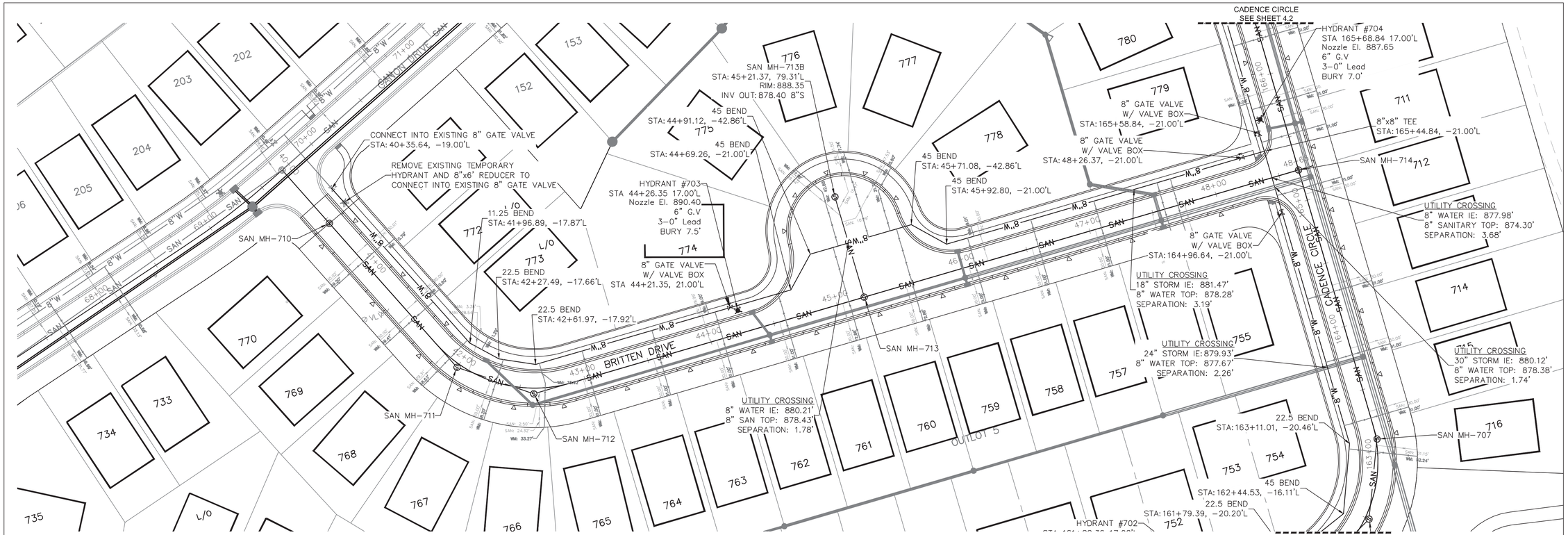
OVERALL
PHASING PLAN

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:

2.0

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_PHASING_PH7.dwg



kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY
PHASE 7

LOCATION:
CITY OF LAKE
GENEVA, WI

CLIENT:
FAIRWYN

RELEASE:
CONSTRUCTION
SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

NORTH ARROW:

SCALE: HOR: 1" = 40'
VER: 1"=4'
0' 20' 40' 60'

SEAL:

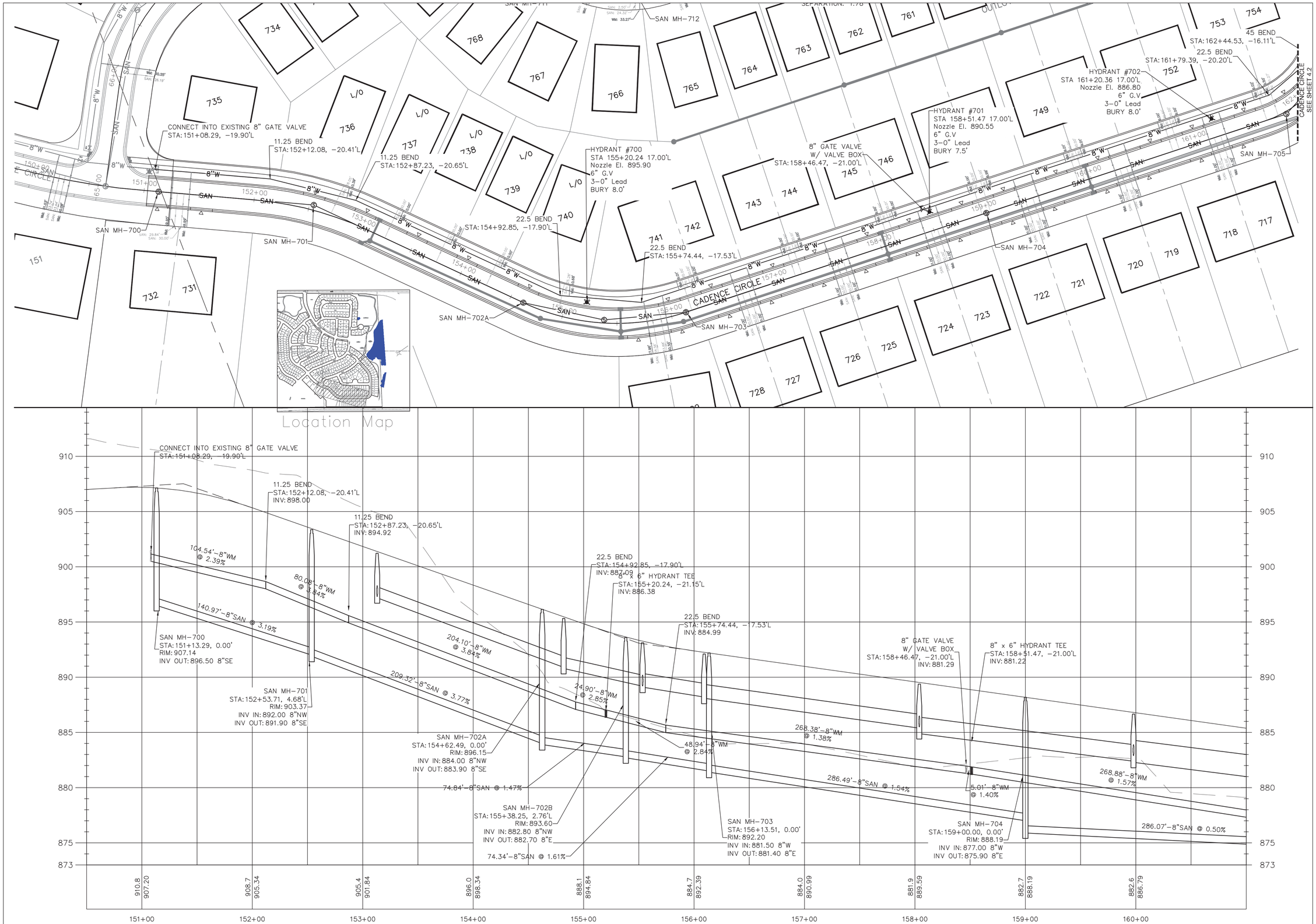
all in

SHEET:
SANITARY AND
WATER BRITTEN
DRIVE

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
4.0

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_DSGN-PH7.dwg



kapur

7711 N. Port Washington Road
Milwaukee, Wisconsin 53217

kapurinc.com

PROJECT:

SYMPHONY BAY
PHASE 7

LOCATION:

CITY OF LAKE
GENEVA, WI

CLIENT:

FAIRWYN

RELEASE:

CONSTRUCTION
SET

REVISIONS:

#	DATE	DESCRIPTION
1	9/1/22	CITY SUBMITTAL
2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

NORTH ARROW:

SCALE: HOR: 1" = 40'
VER: 1"=4'

0 20 40 60

SEAL:

all in

SHEET:

SANITARY AND
WATER
CADENCE CIRCLE

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:

4.1

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_DSGN-PH7.dwg

CADENCE CIRCLE
SEE SHEET 4.1

BRITTEN DRIVE
SEE SHEET 4.0

UTLOT 5

HYDRANT #702
STA 161+20.36 17.00'L
Nozzle El. 886.80
6" G.V
3-0" Lead
BURY 8.0'

22.5 BEND
STA: 161+79.39, -20.20'L

SAN MH-705

45 BEND
STA: 162+44.53, -16.11'L

22.5 BEND
STA: 163+11.01, -20.46'L

SAN MH-706

SAN MH-707

UTILITY CROSSING
30" STORM IE: 880.12'
8" WATER TOP: 878.38'
SEPARATION: 1.74'

UTILITY CROSSING
18" STORM IE: 881.47'
8" WATER TOP: 878.28'
SEPARATION: 3.19'

UTILITY CROSSING
24" STORM IE: 879.93'
8" WATER TOP: 877.67'
SEPARATION: 2.26'

8" GATE VALVE
W/ VALVE BOX
STA: 164+96.64, -21.00'L

UTILITY CROSSING
8" WATER IE: 877.98'
8" SANITARY TOP: 874.30'
SEPARATION: 3.68'

45 BEND
STA: 45+71.08, -42.86'L

45 BEND
STA: 45+92.80, -21.00'L

8" GATE VALVE
W/ VALVE BOX
STA: 48+26.37, -21.00'L

8" GATE VALVE
W/ VALVE BOX
STA: 165+58.84, -21.00'L

HYDRANT #705
STA 168+22.61 17.00'L
Nozzle El. 891.10
6" G.V
3-0" Lead
BURY 8.0'

22.5 BEND
STA: 167+94.54, -17.54'L

22.5 BEND
STA: 166+82.12, -17.12'L

SAN MH-716

SAN MH-715

SAN MH-714

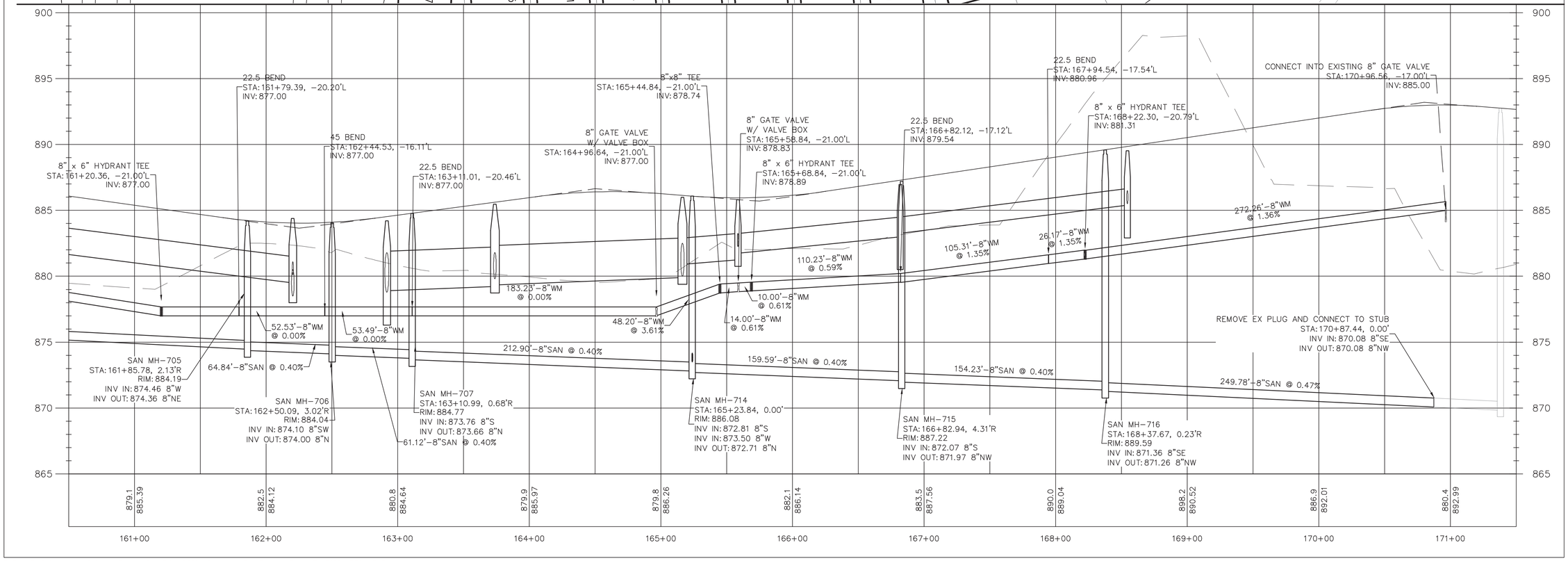
HYDRANT #704
STA 165+68.84 17.00'L
Nozzle El. 887.65
6" G.V
3-0" Lead
BURY 7.0'

8"x8" TEE
STA: 165+44.84, -21.00'L

REMOVE EX PLUG AND CONNECT TO STUB

CADENCE CIRCLE

721 720 719 718 717 749 750 751 752 753 754 755 756 757 758 759 777 778 780 781 782 783 784 700 NE ONLY W/O 701 W/O 702 W/O 703 NW ONLY 704 705 706 707 708 709 710 711 712 715



kapur
7711 N. Port Washington Road
Milwaukee, Wisconsin 53217
kapurinc.com

PROJECT:
SYMPHONY BAY
PHASE 7

LOCATION:
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REVISIONS:

#	DATE	DESCRIPTION
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2	11/1/22	CITY SUBMITTAL
3	11/11/22	CITY SUBMITTAL

NORTH ARROW:

SCALE: HOR: 1" = 40'
VER: 1"=4'
0 20 40 60

SEAL:

all in

SHEET:
SANITARY AND
WATER
CADENCE CIRCLE

PROJECT MANAGER:	DMJ
PROJECT NUMBER:	15.0201.07
DATE:	9-1-2022

SHEET NUMBER:
4.2

FILENAME: D:\Walworth_Co\Lake Geneva_City\Priv\150201_Symphony Bay\Design_Phase 7\150201_DSGN-PH7.dwg

DIXON
ENGINEERING & INSPECTION SERVICES FOR THE COATING INDUSTRY

4811 S. 76th Street
Suite 109
Greenfield, WI 53220
Telephone: (414) 529-1859
Fax: (414) 282-7830

February 11, 2023

RE: Lake Geneva Utility Commission
Verizon 133352 - FUZE# 16825805
Host Composite Tank
Review #2 (Final)

Mr. Josh Gajewski
Utility Director
Lake Geneva Utility Commission
361 Main Street
Lake Geneva, WI 53147

Dear Mr. Gajewski:

Dixon Engineering, Inc. (DIXON) has reviewed the revised design drawings for the Verizon upgrade on the Host composite tank located in Lake Geneva, Wisconsin. The document reviewed includes:

- The revised design drawings for the project were completed by Edge Consulting Engineers, Inc. and they are dated January 27, 2023 (Rev. 1).

This is the second review by DIXON for this project. In the first review DIXON had a list of items to be addressed labeled A to S. The following is a comment regarding each of the items as they were addressed in the revised design drawings.

A. No changes are required for this comment.

B. No changes are required for this comment.

C. The revised design drawings are **NOT** stamped and signed by a Licensed Professional Engineer in the State of Wisconsin.

D. This item has been addressed.

E. This item has been addressed.

F. No changes are required for this comment.

G. This item has been addressed.

H. This item has been addressed.

I. This item has been addressed.

J. No changes are required for this comment.

K. No changes are required for this comment.

L. No changes are required for this comment.

M. No changes are required for this comment.

N. No changes are required for this comment.

O. This item has been addressed.

P. This item has been addressed.

Q. This item has been addressed.

R. These items have been addressed.

S. This item has been addressed.

DIXON does not find any reasons for further review of these design drawings or structural documents. If completed per the approved design drawings, the upgrade antenna installation for Verizon will not affect the Host composite tank with respect to OSHA (safety), tank operations, or water quality.

DIXON has to schedule and lead a preconstruction meeting at the site prior to the start of any work on the project. During the installation portion of the project, DIXON has two installation inspections contracted to be completed for this project.

If you have any questions, you can call me at 920-470-0957.

FOR DIXON ENGINEERING, INC.,

Joseph T. Hoban, P.E.
Vice President

c: Chris Kreiner, DIXON
Kayla Mulcahy, DIXON

SCOPE OF WORK

TOWER SCOPE

REMAIN/RELOCATE

	QTY.	EQUIPMENT	ACTION
ANTENNA(S)/EQUIP.	6	PANEL ANTENNA(S)	TO REMAN
	6	RADIO UNIT(S)	TO REMAN
TRANSMISSION CABLE(S)	3	HYBRID CABLE(S)	TO REMAN

DECOMISSION

ANTENNA(S)/EQUIP.	3	PANEL ANTENNA(S)	TO BE REMOVED
	3	RAYCAP SPD(S)	TO BE REMOVED
	6	DIPLEXERS(S)	TO BE REMOVED
TRANSMISSION CABLE(S)	12	1-5/8" COAX	TO BE REMOVED

TO BE INSTALLED

ANTENNA(S)/EQUIP.	3	AIR6449 ANTENNA/ RADIO(S)	TO BE INSTALLED
	3	4408 RADIO/ ANTENNA(S)	TO BE INSTALLED
	3	RAYCAP SPD(S)	TO BE INSTALLED
	3	REMOTE RADIO(S)	TO BE INSTALLED

COMPOUND SCOPE

	QTY.	EQUIPMENT	ACTION
CABLE ROUTE:	-	ICE BRIDGE HANGERS	ADEQUATE - TO REMAIN
	-	SHELTER COAX PORT	ADEQUATE - TO REMAIN

SHELTER INTERIOR SCOPE

DECOMISSION

EQUIPMENT:	3	RAYCAP SPD(S)	TO BE REMOVED
	6	RADIO(S)	TO BE REMOVED
	6	DIPLEXERS(S)	TO BE REMOVED

TO BE INSTALLED

EQUIPMENT:	2	RAYCAP SPD(S)	TO BE INSTALLED

SPECIAL REQUIREMENTS

EXISTING ANTENNA MOUNTS TO BE RELOCATED (TYP. OF 3)

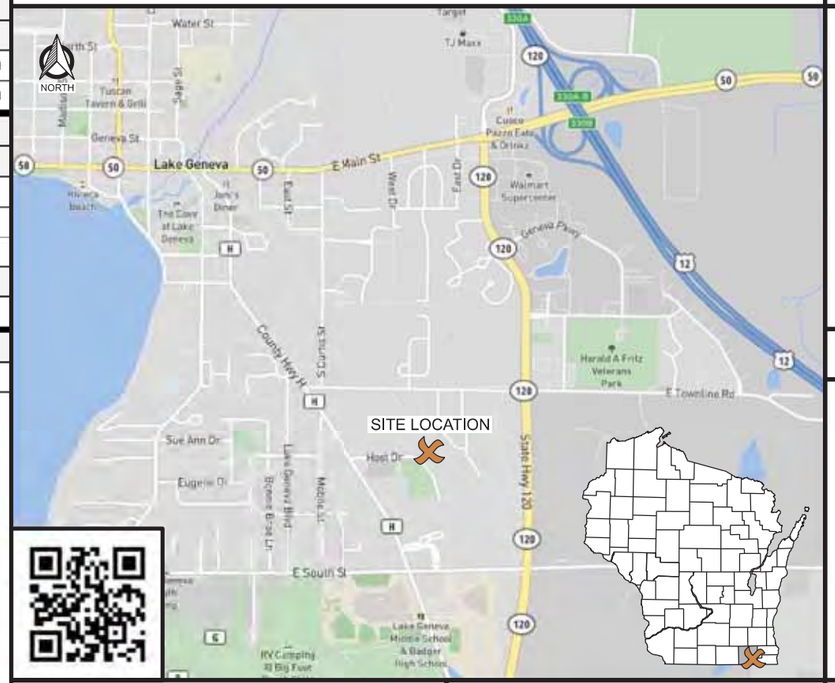
NOTE PER THE CITY OF LAKE GENEVA:

GIVEN THE TIMING OF THE YEAR AND WEATHER, THE UTILITY WILL NOT ALLOW COATING APPLICATION TO TAKE PLACE ON AREAS THAT MAY BE NOTED DURING POST-CONSTRUCTION INSPECTIONS. ADDITIONALLY, THE UTILITY WILL CREATE A PUNCH LIST OF COATING NEEDS AND PROVIDE THE CARRIER WITH AN ESTIMATED COST TO REPAIR THE AREAS USING THE CONTRACTOR THAT ORIGINALLY APPLIED THE COATING SYSTEM TO THE TANK, TO ENSURE THE PREPARATION AND APPLICATION OF COATINGS ARE PERFORMED TO INDUSTRY STANDARDS. THE COST OF THOSE REPAIRS WILL BE PROVIDED TO THE CARRIER FOR REVIEW AND POTENTIAL COMPLETION, AS THEY MAY BE FOUND NECESSARY

verizon

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN
ANTENNA MOD DRAWINGS
126' WATER TOWER

SITE LOCATION MAP



DIRECTORY

CLIENT:
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008
CONTACT: ADAM CASTELLO
EMAIL: adam.castello@verizonwireless.com

ENGINEER:
EDGE CONSULTING ENGINEERS, INC.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
CONTACT: DUSTIN BROOKS
PHONE: 608.644.1449

SITE ACQUISITION:
LCC TELECOM SERVICES, LLC
10700 W. HIGGINS, SUITE 240
ROSEMONT, IL 60018
CONTACT: AIDA PORTES
EMAIL: aportes@lcctelecom.com

PROJECT INFO

SITE LOCATION:
1003 HOST DRIVE
LAKE GENEVA, WI 53147

SITE LOCATION #: 113352

FCC #: 1208512

TOWER OWNER:
CITY OF LAKE GENEVA UTILITY COMMISSION
P.O. BOX 187
LAKE GENEVA, WI 53147
CONTACT: JEFF ECKLUND
PHONE: 262.248.2311

SITE COORDINATES (PER FUZE):
LAT: 42°-34'-45.1"
LONG: 88°-25'-01.9"
GROUND ELEVATION (NAVD 88): 941.5'

SHEET INDEX

NO.:	SHEET TITLE
G-001	TITLE SHEET
G-002	GENERAL NOTES
C-102	ENLARGED SITE PLAN
A-101	EQUIPMENT SHELTER LAYOUT
T-001	EQUIPMENT SPECIFICATIONS
T-002	MOUNTING SPECIFICATIONS
T-201	SITE ELEVATION
T-301	ANTENNA AND EQUIPMENT CONFIGURATION
T-501	ANTENNA AND EQUIPMENT SUMMARY
T-502	PLUMBING DIAGRAM
T-503	CABLING DETAILS
T-504	CABLE ROUTING
T-901	SITE PHOTOS
E-501	GROUNDING DETAILS
R-001	EME COMPLIANCE REPORT *
R-002	EME COMPLIANCE REPORT *
*	MOUNT ANALYSIS BY OTHERS
*	COMPLETED BY OTHERS

CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS/CONDITIONS ON SITE. IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO PERFORMING ANY WORK OR BE RESPONSIBLE FOR THE SAME.

STRUCTURAL

TOWER ANALYSIS:
KRECH OJARD & ASSOCIATES, INC.
REPORT #: 222001.11
DATED: 09/21/2022
CONCLUSION: CAPABLE OF SUPPORTING CHANGE IN LOADING

MOUNT ANALYSIS:
KRECH OJARD & ASSOCIATES, INC.
REPORT #: 22001.11
DATED: 09/21/2022
CONCLUSION: CAPABLE OF SUPPORTING CHANGE IN LOADING

TOWER INVENTORY:
EDGE CONSULTING ENGINEERS, INC.
REPORT #: 32470 DATED: 5/16/22

CONTRACTOR TO REVIEW STRUCTURAL REPORT IN ITS ENTIRETY. ANY DISCREPANCIES OR DISAGREEMENTS BETWEEN THE REPORT AND THESE PLANS SHOULD BE RESOLVED PRIOR TO CONSTRUCTION.

ONE CALL SYSTEMS INTERNATIONAL

TO OBTAIN LOCATION OF PARTICIPANTS' UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN, CALL DIGGERS HOTLINE

TOLL FREE: 1-800-242-8511
FAX A LOCATE: 1-800-242-5811

WI STATUTE 182.0175 (1974) REQUIRES MIN. OF 3 WORK DAYS NOTICE BEFORE YOU EXCAVATE

ENGINEER SEAL:

WISCONSIN
DUSTIN A. BROOKS
47220-6
MADISON, WI
02-14-23
PROFESSIONAL ENGINEER

I HEREBY CERTIFY THAT THIS PLAN SET WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION OTHER THAN THE EXCEPTIONS NOTED IN THE SHEET INDEX, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.

SIGNATURE:

DATE: 02-14-23

CONSULTANT:
Edge
Consulting Engineers, Inc.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
608.644.1449 VOICE
608.644.1549 FAX
www.edgeconsult.com

CLIENT:
verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

TITLE SHEET
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	G-001

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GENERAL PAINT NOTES:

SURFACE PREPARATION (EXTERIOR & DRY INTERIOR):

- ABRASIVE BLAST CLEAN ALL NEW STEEL COMPONENTS TO AN SSPC-SP6 "COMMERCIAL BLAST CLEANING" CONDITION PRIOR TO APPLICATION OF PRIMER COAT
- AFTER WELDING OR CUTTING, CLEAN ALL DAMAGED SURFACES IN ACCORDANCE WITH SSPC-SP3 "POWER TOOL CLEANING" CONDITION PRIOR TO APPLICATION OF PRIME COAT

COATING (EXTERIOR):

- THE EXTERIOR PAINT REPAIR SYSTEM WILL BE ONE PRIME COAT OF TNEMEC SERIES N140, ONE INTERMEDIATE COAT OF TNEMEC SERIES N140, AND ONE TOPCOAT OF TNEMEC SERIES 1074U. PAINT THE EXTERIOR TO MATCH THE EXISTING TOPCOAT COLOR
- THE THREE-COAT SYSTEM WILL BE APPLIED AT 3.0 - 4.0 MILS PER COAT, TO A THICKNESS OF 9.0 - 12.0 MILS

COATING (DRY INTERIOR0:

- THE DRY INTERIOR PAINT REPAIR SYSTEM WILL BE TWO COATS OF TNEMEC SERIES N140. PAINT THE DRY INTERIOR TO MATCH THE EXISTING TOPCOAT COLOR
- THE TWO-COAT SYSTEM WILL BE APPLIED AT 3.0 - 4.0 MILS PER COAT, TO A THICKNESS OF 6.0 - 8.0 MILS

NOTES:

- FOLLOW ALL PAINT MANUFACTURERS RECOMMENDATIONS WHEN USING THEIR PRODUCTS

THIS SPACE INTENTIONALLY LEFT BLANK

CONSULTANT:

Edge
Consulting Engineers, Inc.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
608.644.1449 VOICE
608.644.1549 FAX
www.edgeconsult.com

CLIENT:

verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

GENERAL NOTES

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	G-002

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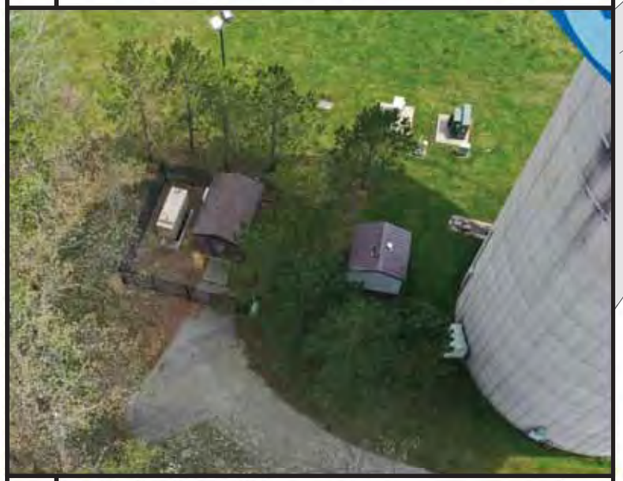
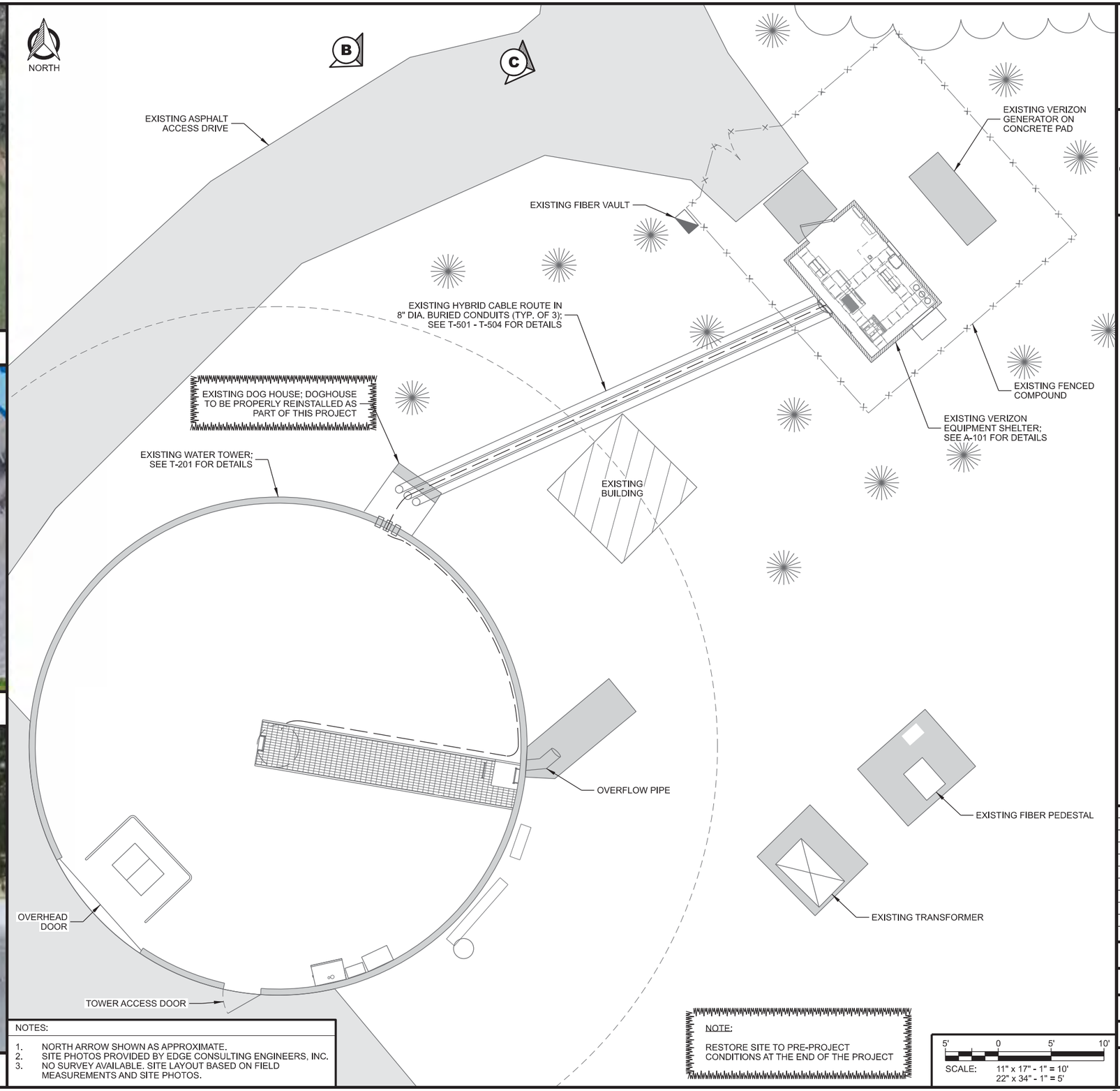
A COMPOUND AERIAL OVERVIEW



B COMPOUND OVERVIEW

C EQUIPMENT SHELTER



NOTES:

1. NORTH ARROW SHOWN AS APPROXIMATE.
2. SITE PHOTOS PROVIDED BY EDGE CONSULTING ENGINEERS, INC.
3. NO SURVEY AVAILABLE. SITE LAYOUT BASED ON FIELD MEASUREMENTS AND SITE PHOTOS.

NOTE:

RESTORE SITE TO PRE-PROJECT CONDITIONS AT THE END OF THE PROJECT

5' 0 5' 10'

SCALE: 11" x 17" - 1" = 10'
22" x 34" - 1" = 5'

CONSULTANT:

Edge
Consulting Engineers, Inc.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
608.644.1449 VOICE
608.644.1549 FAX
www.edgeconsult.com

CLIENT:

verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

ENLARGED SITE PLAN

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	C-102

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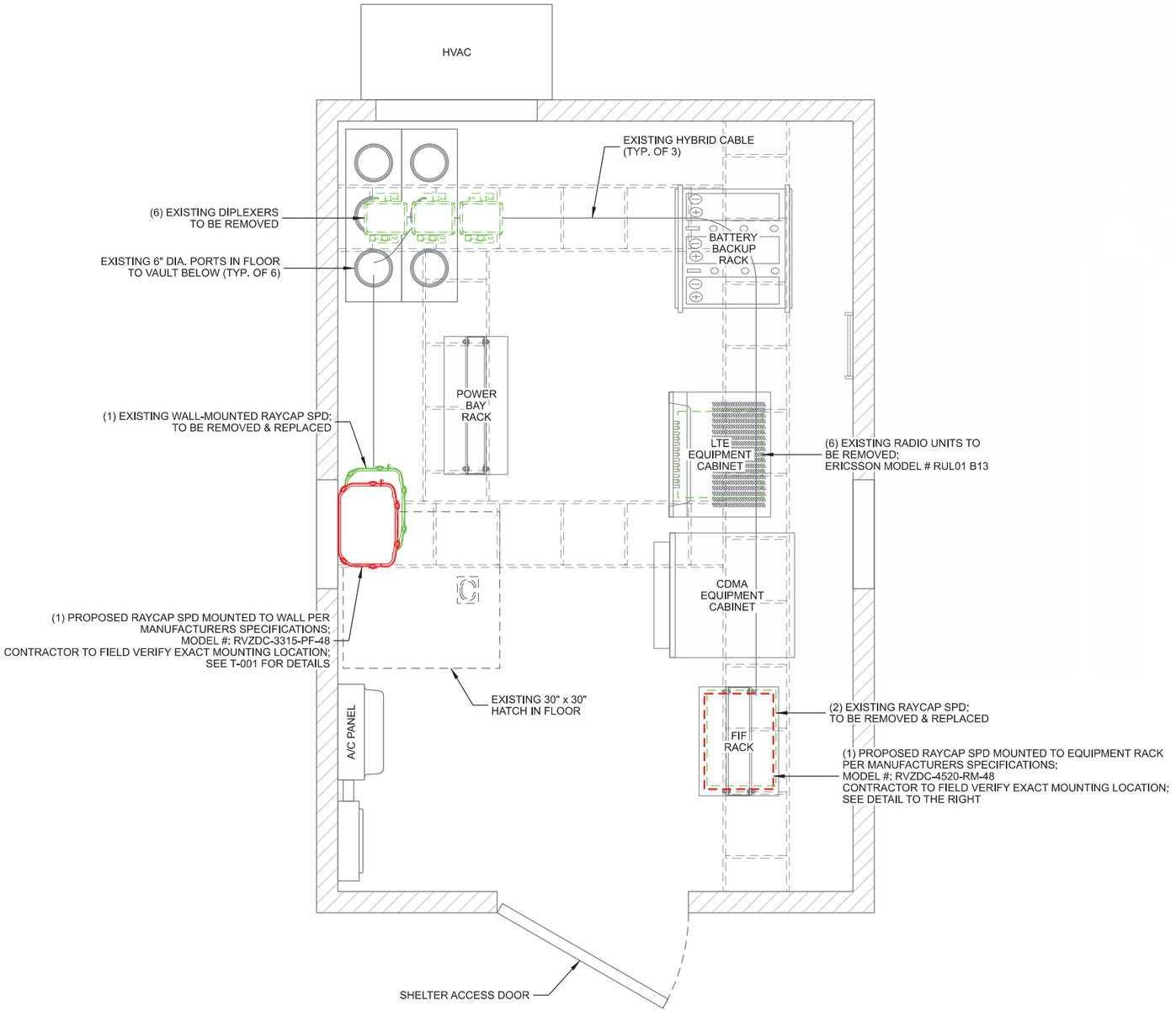
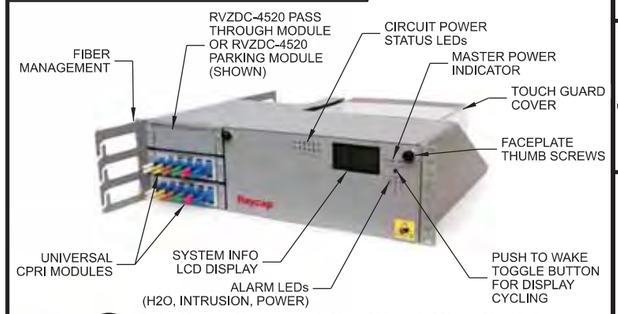


A **SHELTER INTERIOR LAYOUT**

SCALE: 11" x 17" - 1/2" = 1'-0"
22" x 34" - 1" = 1'-0"

MANUFACTURER: RAYCAP
MODEL: RCMDC-4520-RM-48
DIMENSIONS: 5.18" x 18.32" x 15.80" (H x W x D)
WEIGHT: 22.10 LBS
RACK SPACE: 3RU

RACK MOUNTED DISTRIBUTION SURGE PROTECTION FOR (12) RRH DC CIRCUITS.



B **RACK MOUNTED SURGE PROTECTOR**

C **EXISTING RACK MOUNTED RAYCAP SPD**

D **EXISTING WALL MOUNTED RAYCAP SPD**

CONSULTANT:
Edge Consulting Engineers, Inc.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
608.644.1449 VOICE
608.644.1549 FAX
www.edgeconsult.com

CLIENT:
verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

EQUIPMENT SHELTER LAYOUT

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	**A-101**

k:\32400\32470\Design\CAD\CD\Plot\A-101.dgn

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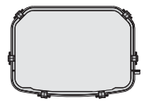
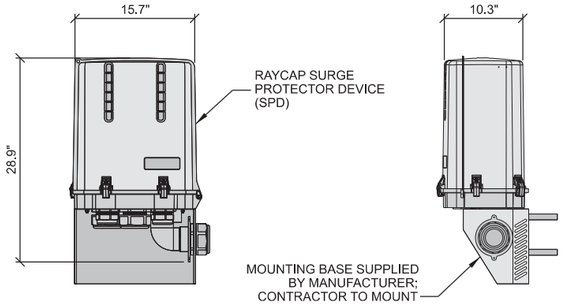
MANUFACTURER: RAYCAP
MODEL: RVZDC-3315-PF-48
DIMENSIONS: 28.9" x 15.7" x 10.3" (H x W x D)
WEIGHT: 32 LBS



PLAN VIEW

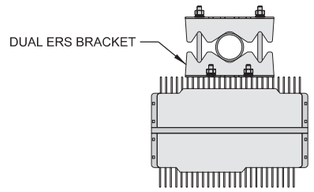


FRONT VIEW

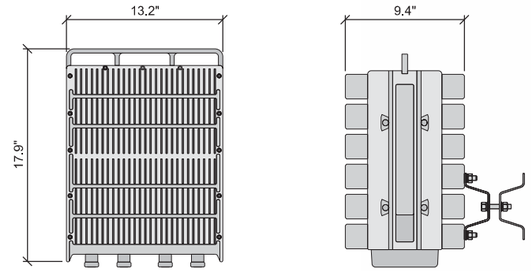
SIDE VIEW

A **RAYCAP SURGE PROTECTOR DEVICE (SPD)**

MANUFACTURER: ERICSSON
MODEL: RADIO 4449
DIMENSIONS: 17.9" x 13.2" x 9.4" (H x W x D)
WEIGHT: 70.5 LBS



PLAN VIEW



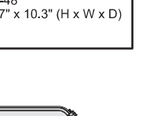
FRONT VIEW

SIDE VIEW

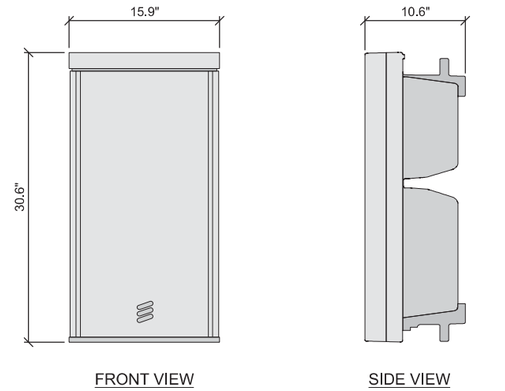
B **ERICSSON RADIO 4449**

THIS SPACE INTENTIONALLY LEFT BLANK

MANUFACTURER: ERICSSON
MODEL: AIR6449
DIMENSIONS: 30.6" x 15.9" x 10.6" (H x W x D)
WEIGHT: 82.7 LBS.



PLAN VIEW



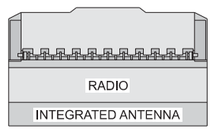
FRONT VIEW

SIDE VIEW

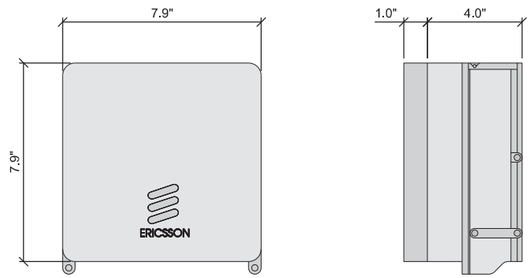
D **ERICSSON AIR6449**

MANUFACTURER: ERICSSON
MODEL: RADIO 4408
DIMENSIONS: 7.9" x 7.9" x 4.0" (H x W x D)
WEIGHT: 11.0 LBS.

MANUFACTURER: ERICSSON
MODEL: ANTENNA 6524
DIMENSIONS: 7.9" x 7.9" x 1.0" (H x W x D)
WEIGHT: 1.8 LBS.



PLAN VIEW



FRONT VIEW

SIDE VIEW

E **ERICSSON RADIO 4408 WITH INTEGRATED ANTENNA**

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CLIENT:
verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

EQUIPMENT SPECIFICATIONS

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	**T-001**

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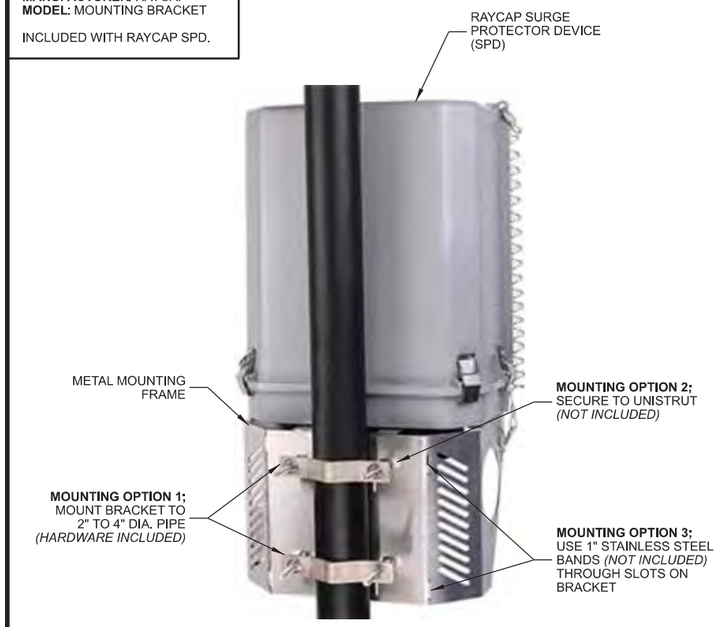
MANUFACTURER: RAYCAP
MODEL: MOUNTING BRACKET

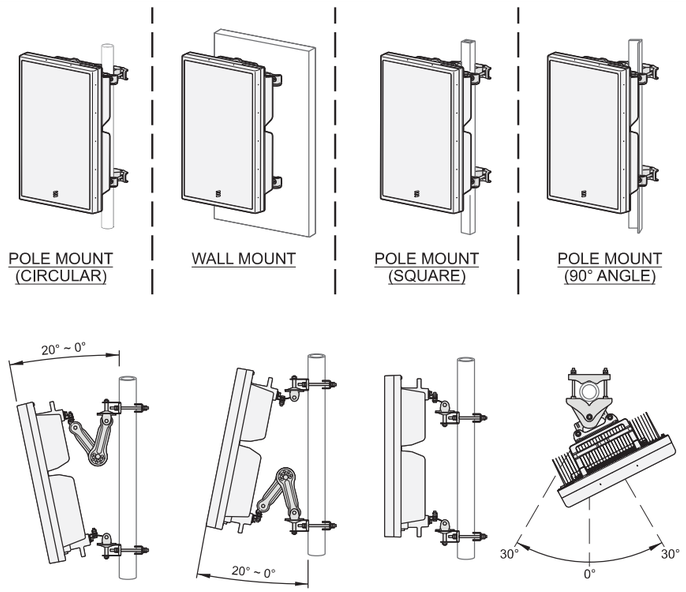
INCLUDED WITH RAYCAP SPD.



A RAYCAP SURGE PROTECTOR DEVICE (SPD) MOUNT

MANUFACTURER: ERICSSON
MODEL: SXK 109 2064/1 (SWIVEL ANGLE)
SXK 109 2065/1 (SWIVEL ANGLE AND TILT ANGLE)
WEIGHT: 9.7 LBS. (SWIVEL ANGLE)
13.0 LBS. (SWIVEL ANGLE AND TILT ANGLE)

POLE	CICULAR	SQUARE	90° ANGLE
MIN. OUTER DIMENSION	3" DIA.	2" x 2"	2" x 2"
MAX. OUTER DIMENSION	4.5" DIA.	3.15" x 3.15"	3.15" x 3.15"



B ERICSSON SWIVEL MOUNT KIT

MANUFACTURER: ERICSSON
MODEL: SXK 109 1973/2
WEIGHT: 3.75 LBS

BRACKET FOR ATTACHING TWO STANDARD OR HEAVY ERS UNITS WITH A HOLE PATTERN OF CC 30 MM AND/OR CC 80 MM., EITHER TO A POLE, WALL, ANGLE TOWER OR SQUARE TUBE.

BOLTS FOR ATTACHING TWO ERS UNITS ARE SUPPLIED IN THE PACKAGE.

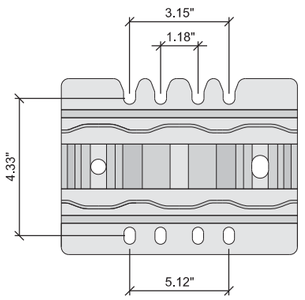


PLATE MOUNTING PATTERN

DUAL RADIO ATTACHMENT

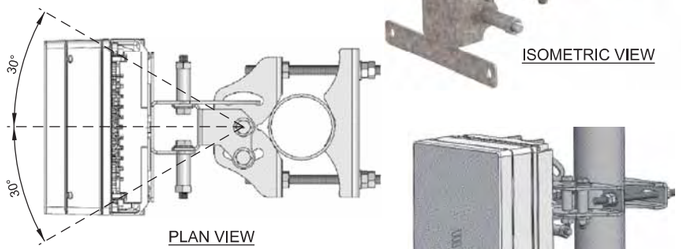
ISOMETRIC VIEW

C DUAL ERS BRACKET

MANUFACTURER: ERICSSON
MODEL: SXK 109 2165/1
WEIGHT: 6 LBS

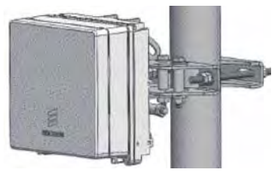
BRACKET FOR ATTACHING MICRO ERS UNITS TO A POLE, WALL, ANGLE TOWER OR SQUARE TUBE.

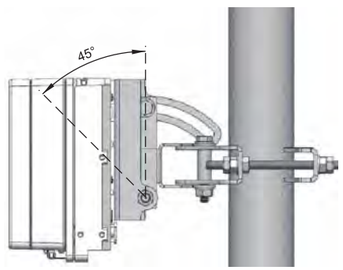
TO BE USED WITH MICRO ERS RADIOS



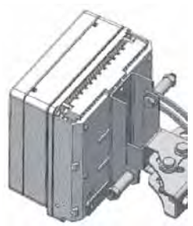
PLAN VIEW

ISOMETRIC VIEW





SIDE VIEW



D MICRO ERS TILT BRACKET

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CLIENT:
verizon
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d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

MOUNTING SPECIFICATIONS
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	**T-002**

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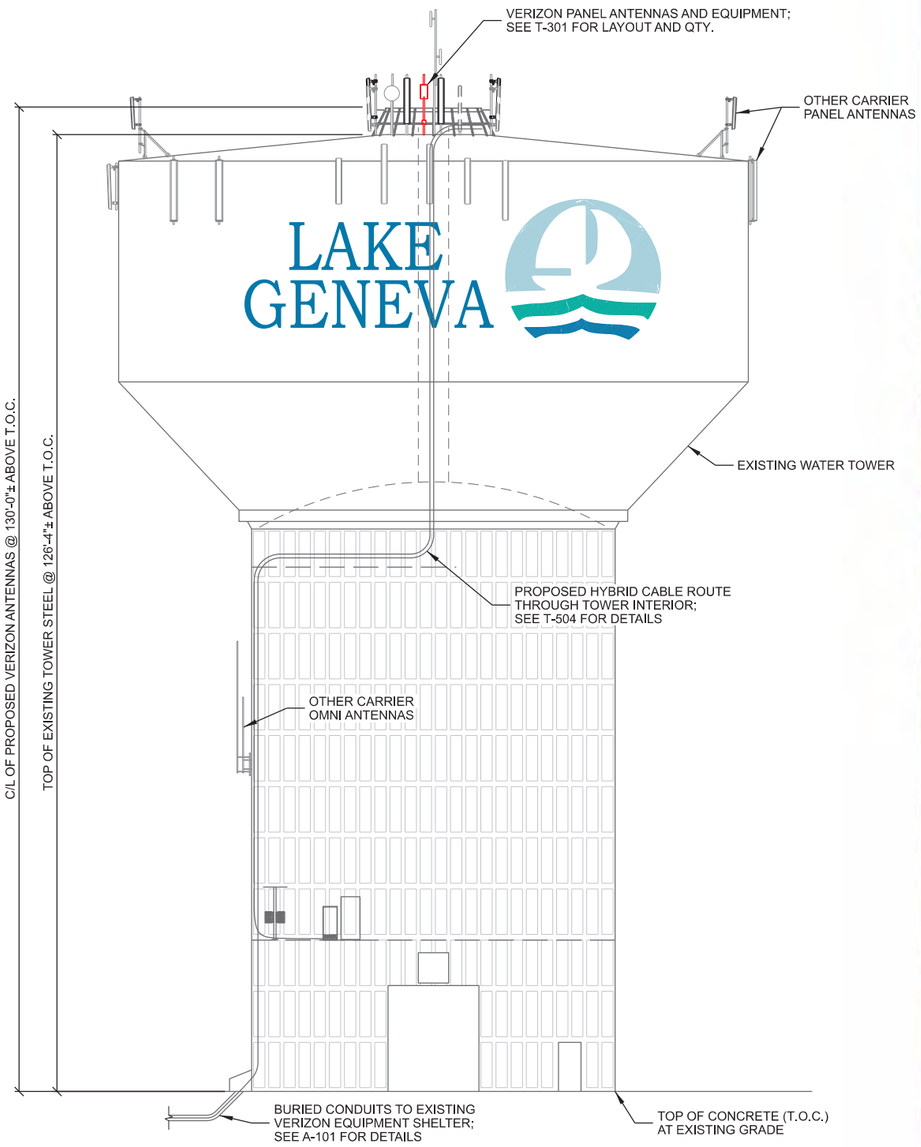
RF EMISSION REPORT REQUIRED

☒ YES ☐ NO

Date: 06/28/2022

NOTE:

ANY NEW ANGLE ADAPTORS OR PIPE CLAMPS THAT MIGHT BE ADDED NEED TO BE ATTACHED WITH RUBBER STRIPS TO PREVENT METAL ON METAL CONTACT



NOTES:

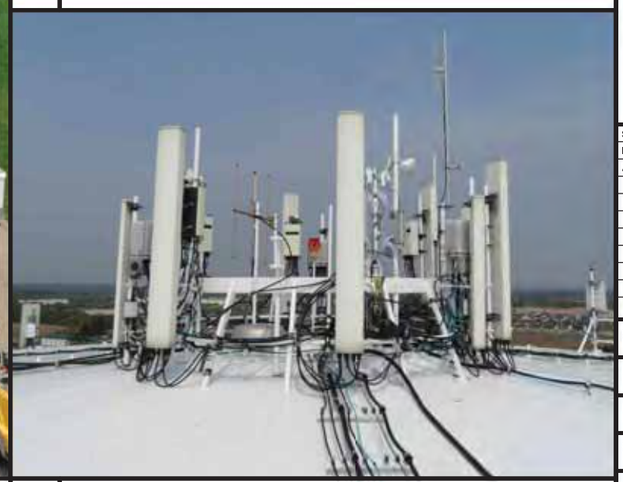
1. CONTRACTOR TO VERIFY HEIGHT AND DIRECTION OF ANTENNAS WITH PROJECT MANAGER AND FINAL RF DESIGN.
2. CONTRACTOR TO VERIFY LIGHTNING ROD EXTENDS 2' MIN. ABOVE ALL ANTENNAS & EQUIPMENT.
3. REFER TO STRUCTURAL REVIEW NOTE ON G-001.

A SITE ELEVATION

B EXISTING SITE ELEVATION

C VERIZON ALPHA SECTOR ANTENNAS

D VERIZON BETA SECTOR ANTENNAS



E VERIZON GAMMA SECTOR ANTENNAS

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d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

SITE ELEVATION
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	T-201

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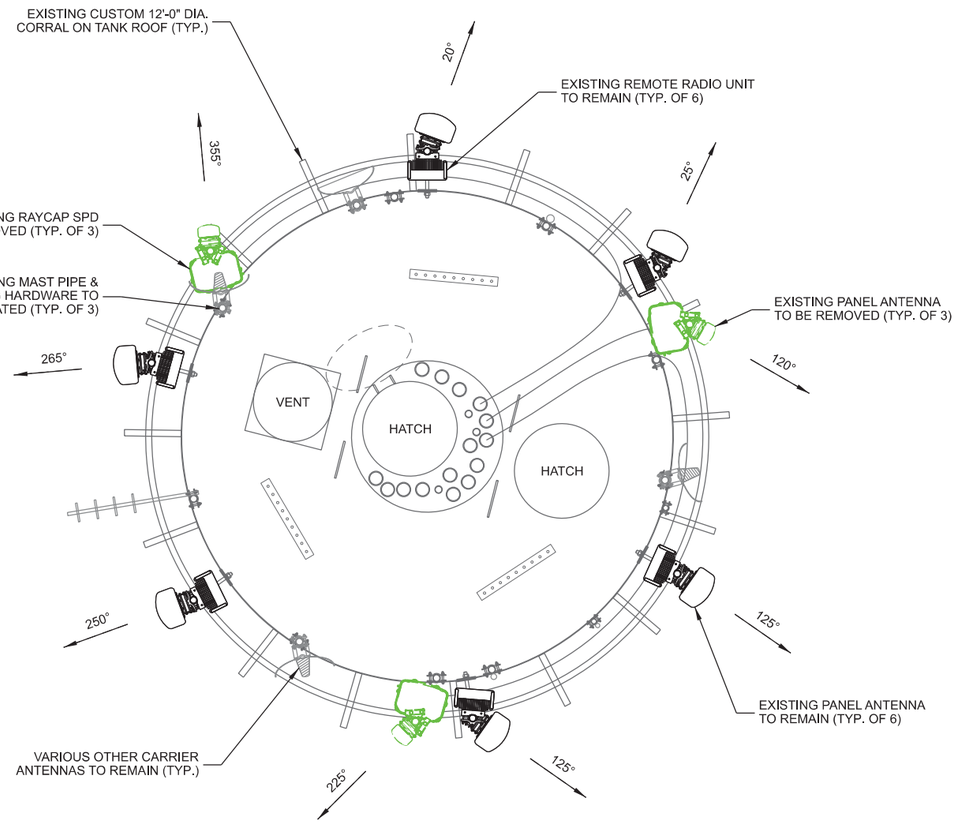
NORTH



VERIZON ANTENNAS @ 132.0'

NOTE:
1. ALL ANTENNA AZIMUTHS TO BE FROM TRUE NORTH.

A EXISTING ANTENNA LAYOUT

SCALE: 11" x 17" - 1/4" = 1'-0"
22" x 34" - 1/2" = 1'-0"

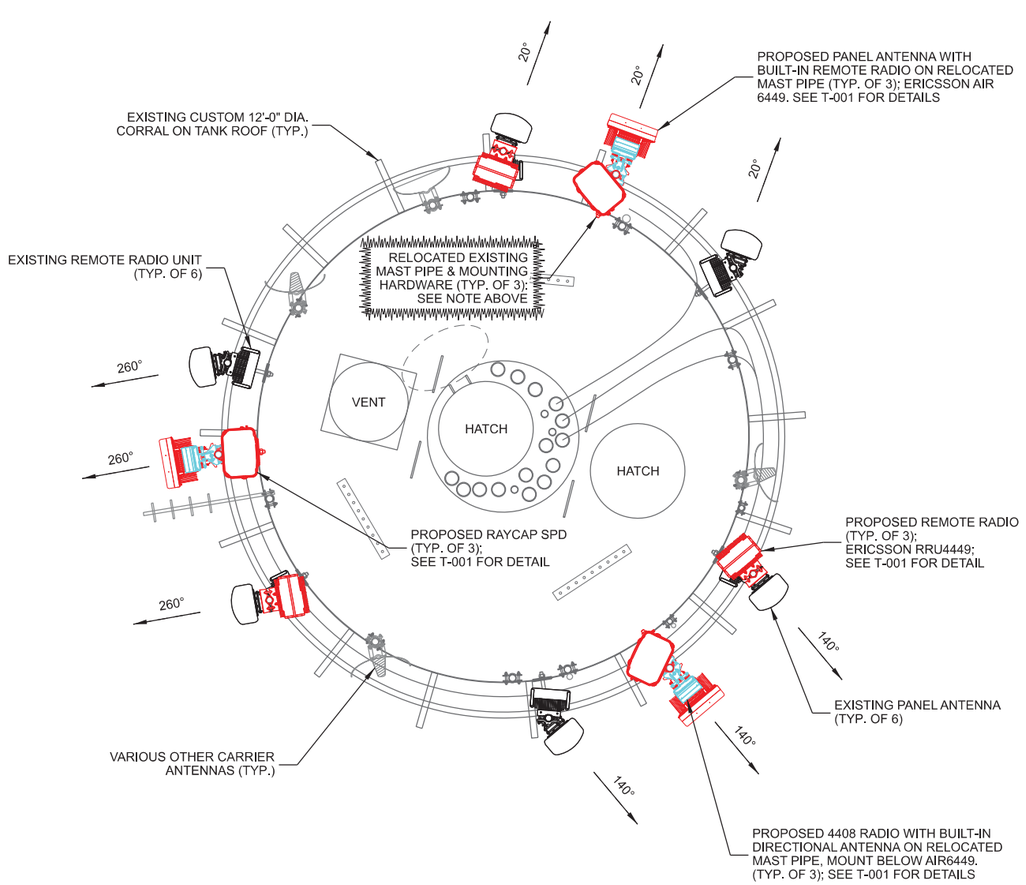
NORTH

NOTE:

ANY NEW ANGLE ADAPTORS OR PIPE CLAMPS THAT MIGHT BE ADDED NEED TO BE ATTACHED WITH RUBBER STRIPS TO PREVENT METAL ON METAL CONTACT

NOTES:

REPAIR ANY DAMAGED COATING ON THE RAILING CAUSED BY THE REMOVAL OF MOUNTS. FIELD VERIFY EXACT LOCATION TO PREVENT INTERFERENCE W/ EXISTING EQUIPMENT. NEW HOLES IN THE HANDRAIL NEED TO BE PUNCHED OUT AND NOT DRILLED OUT. DRILLING GENERATES SMALL METAL FILINGS THAT TEND TO ADD RUST STAIN ON THE ROOF OF THE TANK, THEREFORE NO DRILLING WILL BE PERMITTED. AFTER THE HOLES ARE PUNCHED, THE INSIDES OF ALL PUNCHED OUT HOLES NEED TO BE PAINTED.



VERIZON ANTENNAS @ 132.0'

NOTES:
1. ALL ANTENNA AZIMUTHS TO BE FROM TRUE NORTH. 2. CONTRACTOR TO ROTATE ANTENNAS AS NECESSARY TO MATCH PROPOSED ANTENNA AZIMUTHS.

B PROPOSED ANTENNA LAYOUT

SCALE: 11" x 17" - 1/4" = 1'-0"
22" x 34" - 1/2" = 1'-0"

CONSULTANT:
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verizon
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d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

ANTENNA AND EQUIPMENT CONFIGURATION

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	T-301

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Antenna Summary

Added

700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	RET	4xRx	Inst. Type	Quantity	Item ID
				LTE		ERICSSON	KRE105281/1	130	130.3	20(19) 140(20) 260(21)	false	false	PHYSICAL	3	
					5G	Ericsson	AIR6449	130	131.3	20(0001) 140(0002) 260(0003)	false	false	PHYSICAL	3	

Removed

700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	RET	4xRx	Inst. Type	Quantity	Item ID
	CDMA					ANDREW	HBX-9016DS-VTM	130	133.1	0(D1) 120(D2) 240(D3)	false	false	PHYSICAL	3	

Retained

700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	RET	4xRx	Inst. Type	Quantity	Item ID
LTE	LTE 5G	LTE	LTE			COMMSCOPE	NHH-65C-R2B	130	134	20(0001) 20(01) 140(0002) 140(02) 260(0003) 260(03)	false	false	PHYSICAL	6	NHH-65C-R2B

Added: 6 | Removed: 3 | Retained: 6

A ANTENNA SUMMARY

verizon fuze | RFDS

WEST > Upper Midwest > Illinois/Wisconsin > Wisconsin > HOST WT

RF Submit by: , - - 4/13/2022, 7:53:00 AM

EE Submit by: Fitzgerald, Kelly - kelly.fitzgerald@verizonwireless.com - 1/19/2023,

NOTE:

1. RF DESIGN DETAILED ON THIS SHEET PROVIDED BY VERIZON AND IS INCLUDED FOR CONVENIENCE ONLY. FINAL RF DESIGN TO BE VERIFIED WITH VERIZON PRIOR TO CONSTRUCTION. IF SIGNIFICANT CHANGES OR DISCREPANCIES ARE IDENTIFIED, CONTACT ENGINEER PRIOR TO INSTALLATION.

Equipment Summary

Added

Equipment Type	Location	700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Cable Length	Cable Size	Install Type	Quantity	Item ID
RRU	Tower					LTE		Ericsson	4408 B48 DC			PHYSICAL	3	KRC161746/1
RRU	Tower	LTE						Ericsson	4449			PHYSICAL	3	KRC161749/1
RRU	Tower						5G	Ericsson	AIR6449			PHYSICAL	3	
OVP Box	Tower							RAYCAPINC-001	3315-ALM-RS485			PHYSICAL	3	3315-ALM-RS485
OVP Box	Tower							RAYCAPINC-001	RVZDC-3315-PF-48			PHYSICAL	3	RVZDC-3315-PF-48
OVP Box	Shelter							RAYCAPINC-001	RVZDC-3315-PF-48			PHYSICAL	1	
OVP Box	Shelter							RAYCAPINC-001	RVZDC-4520-RM-48			PHYSICAL	1	RVZDC-4520-RM-48
Cell Site Routers	Shelter							TELECTINC-001	125GMT15			PHYSICAL	1	125GMT15
Upconverter	Ground (Outdoor)							JMA WIRELESS	PB-19-SYS-16-BB			PHYSICAL	1	PB-19-SYS-16-BB
Upconverter	Ground (Outdoor)							JMA WIRELESS	PB-PSU-162-BB			PHYSICAL	6	PB-PSU-162-BB
Upconverter	Ground (Outdoor)							JMA WIRELESS	PB-PSU-COV-BB			PHYSICAL	2	PB-PSU-COV-BB

Removed

Equipment Type	Location	700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Cable Length	Cable Size	Install Type	Quantity	Item ID
Coaxial Cables	Tower							Coax	Coax		1 5/8"	PHYSICAL	12	
OVP Box	Tower							RAYCAPINC-001	RC2DC -3315 - PF - 48			PHYSICAL	3	
RRU	Shelter	LTE						Ericsson	RUL01 B13			PHYSICAL	6	
OVP Box	Shelter							RAYCAPINC-001	RC2DC -3315 - PF - 48			PHYSICAL	1	
OVP Box	Shelter							Raycap	RCMDC-2260-RM-48			PHYSICAL	2	

Retained

Equipment Type	Location	700	1900	AWS	AWS3	CBRS	L-Sub6	Make	Model	Cable Length	Cable Size	Install Type	Quantity	Item ID
Hybrid Cable	Tower							Commscope	HFT1206-24SV2-XXX			PHYSICAL	3	
RRU	Tower		LTE					Ericsson	RRUS32 B2			PHYSICAL	3	
RRU	Tower			LTE	LTE			Ericsson	RRUS32 B66A			PHYSICAL	3	

B EQUIPMENT SUMMARY

NOTE:

1. RF DESIGN DETAILED ON THIS SHEET PROVIDED BY VERIZON AND IS INCLUDED FOR CONVENIENCE ONLY. FINAL RF DESIGN TO BE VERIFIED WITH VERIZON PRIOR TO CONSTRUCTION. IF SIGNIFICANT CHANGES OR DISCREPANCIES ARE IDENTIFIED, CONTACT ENGINEER PRIOR TO INSTALLATION.

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CLIENT:
verizon
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d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

ANTENNA AND EQUIPMENT SUMMARY

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	**T-501**

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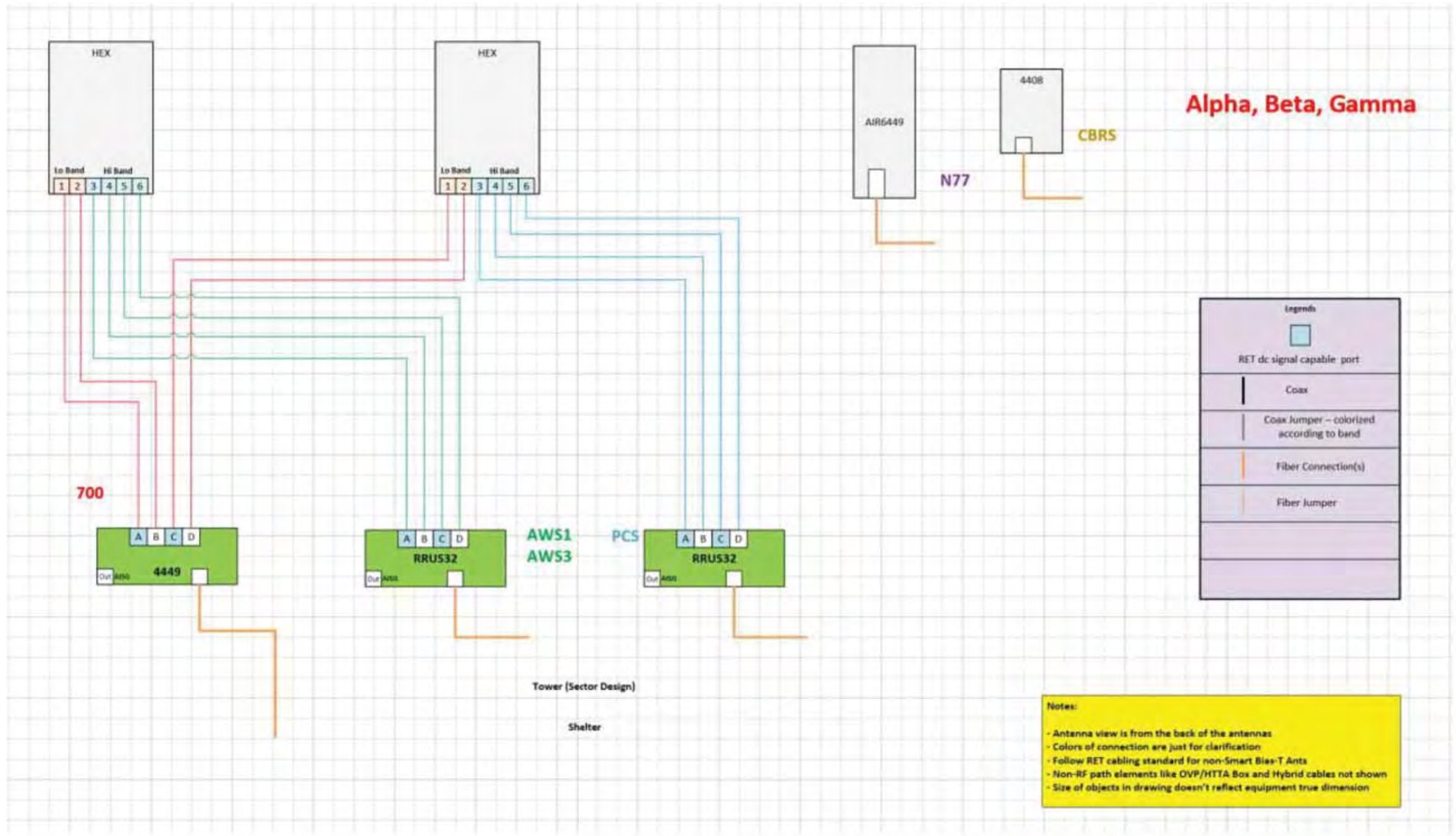

NOTE:

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A PLUMBING DIAGRAM

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1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

PLUMBING DIAGRAM
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	T-502

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HYBRID CABLE LENGTH	
EXISTING HYBRID CABLE QUANTITY	3

EXISTING HYBRID CABLES TO REMAIN;
NO NEW HYBRIDS REQUIRED

JUMPER CABLE LENGTH CHECK	
IS THE DISTANCE FROM SURGE PROTECTOR TO RADIO UNIT LESS THAN 30'?	
ALPHA SECTOR	YES
BETA SECTOR	YES
GAMMA SECTOR	YES

NOTE:

1. IF CABLING LENGTH EXCEEDS MAXIMUM ALLOWED LENGTH CONTRACTOR SHALL CONTACT CLIENT AND ENGINEER TO RESOLVE PRIOR TO CONSTRUCTION.

A **CABLE LENGTHS**

Raycap Layout - (6) OVP per Sector

POWER

3	HB/FD MIMO	6	Spare
2	HB	5	CBRS
1	LB	4	C-Band

FIBER

1	2	3	4	5	6
LB	HB	HB / FD MIMO	Spare	CBRS	Spare
7	8	9	10	11	12
C-Band (1)	C-Band (2)	C-Band (3)	Spare	Spare	Spare

B **SURGE PROTECTOR LAYOUT**

THIS SPACE INTENTIONALLY LEFT BLANK

CONSULTANT:
Edge
Consulting Engineers, Inc.
624 WATER STREET
PRAIRIE DU SAC, WI 53578
608.644.1449 VOICE
608.644.1549 FAX
www.edgeconsult.com

CLIENT:
verizon
CHICAGO SMSA LIMITED PARTNERSHIP
d/b/a VERIZON WIRELESS
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CABLING DETAILS
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

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PLOT DATE	2/14/2023
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SET TYPE	FINAL
SHEET NUMBER	T-503

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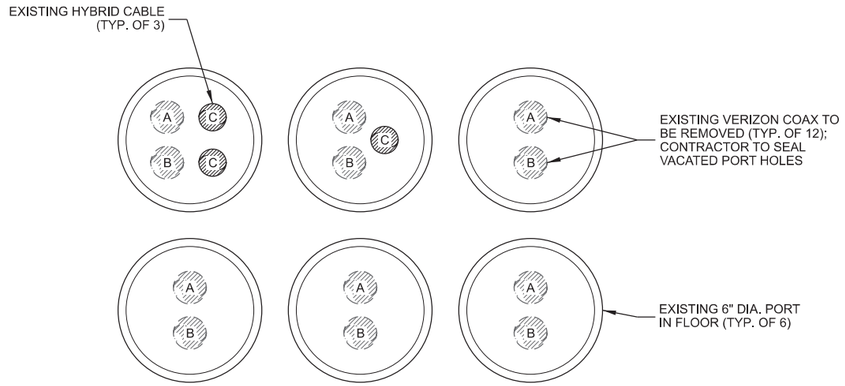
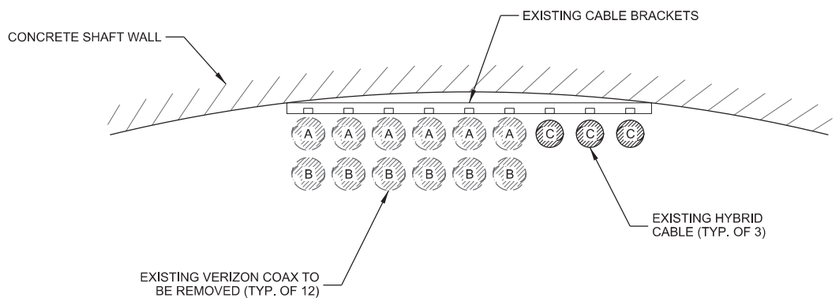


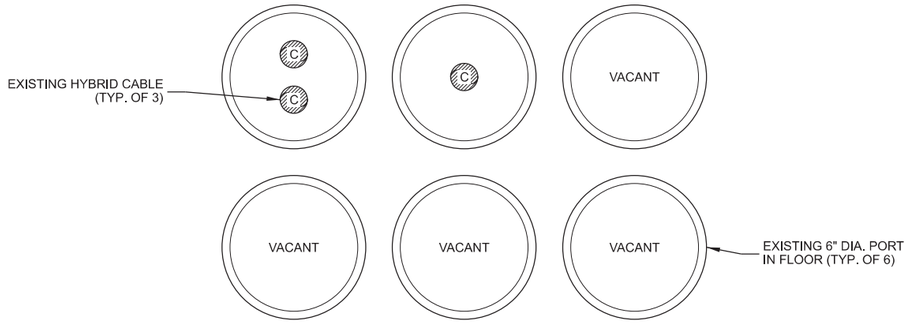
A EXISTING SHELTER COAX PORT (INTERIOR VIEW)



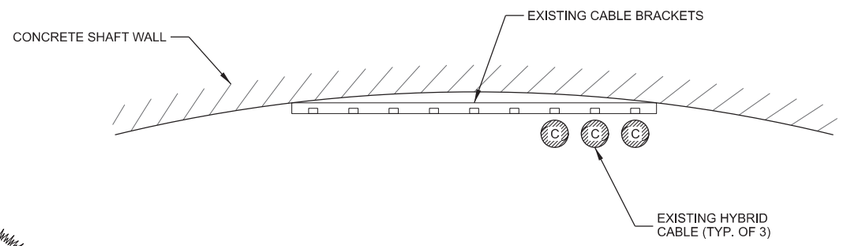
B EXISTING TOWER CABLE LAYOUT

COAX SYMBOL	(#) SIZE	MOUNTING TYPE	CARRIER / OWNER	TECHNOLOGY
A	(6) 1-5/8"	TOWER INTERIOR	VERIZON	CDMA
B	(6) 1-5/8"	TOWER INTERIOR	VERIZON	LTE
C	(3) HYBRID	TOWER INTERIOR	VERIZON	HYBRID

OTHER CARRIER CABLES
OMITTED FROM LAYOUT
FOR SIMPLICITY



C PROPOSED SHELTER COAX PORT (INTERIOR VIEW)



D PROPOSED TOWER CABLE LAYOUT

COAX SYMBOL	(#) SIZE	MOUNTING TYPE	CARRIER / OWNER	TECHNOLOGY
A	-	-	-	-
B	-	-	-	-
C	(3) HYBRID	TOWER INTERIOR	VERIZON	HYBRID

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CABLE ROUTING
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

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CV	02/14/23	REV. 2

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PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	T-504

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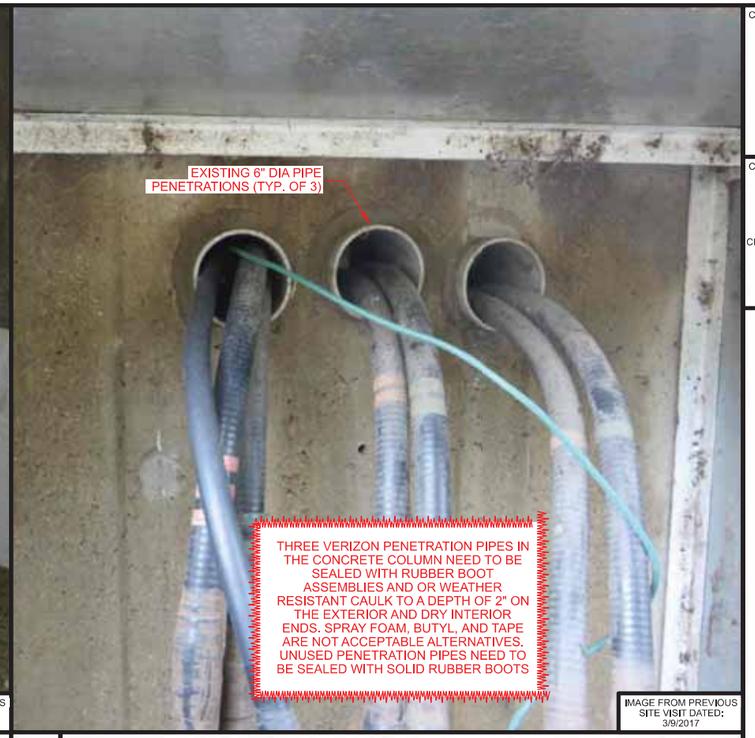
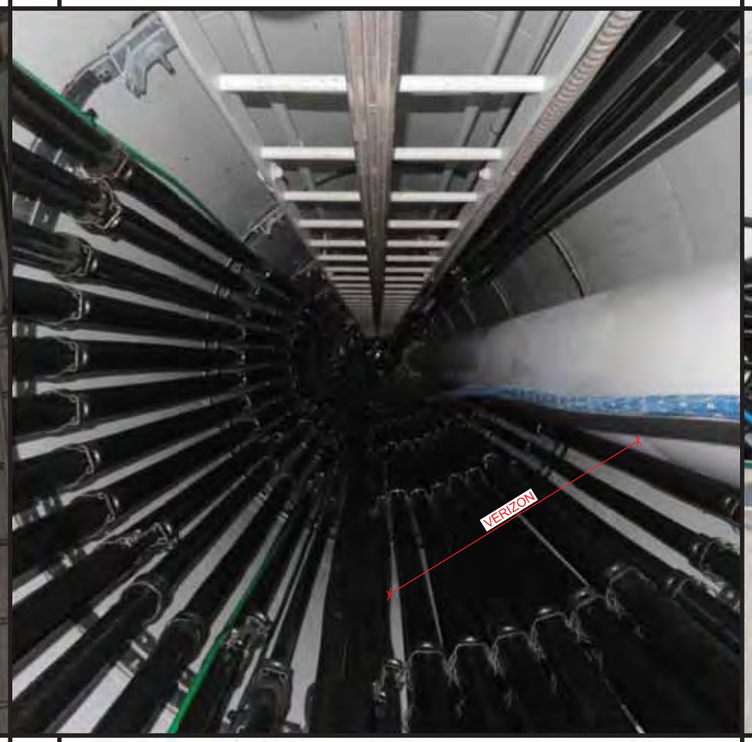
A SHELTER COAX PORT (SHELTER INTERIOR)

B CONDUIT STUB-UP ENCLOSURE AT TOWER BASE

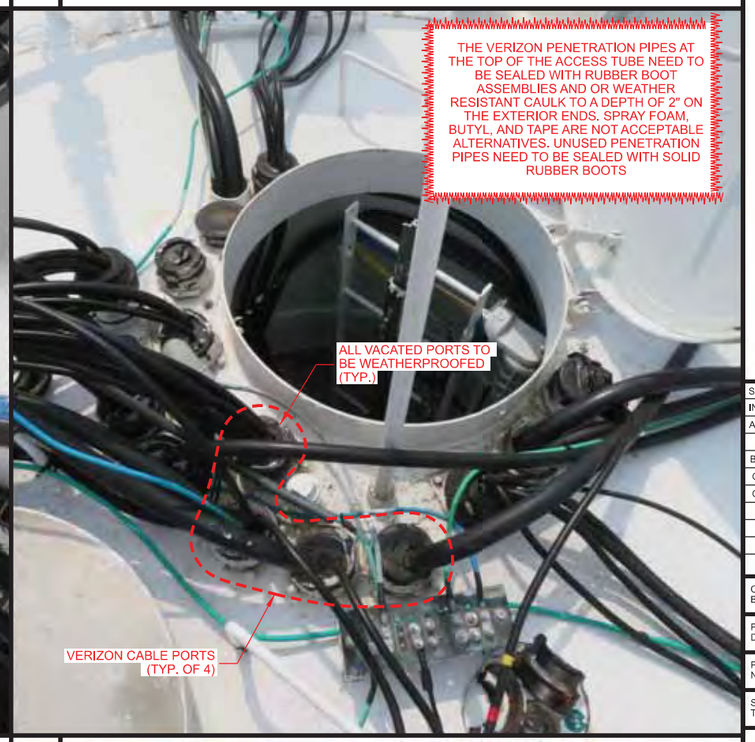


C LOWER TOWER SHAFT PENETRATIONS

D VERTICAL CABLE ROUTE IN TOWER SHAFT



E CABLE ROUTE IN ACCESS TUBE (LOOKING DOWN)



F CABLE ROUTING AT TOWER ROOF

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d/b/a VERIZON WIRELESS
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TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

SITE PHOTOS

HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:

INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	T-901

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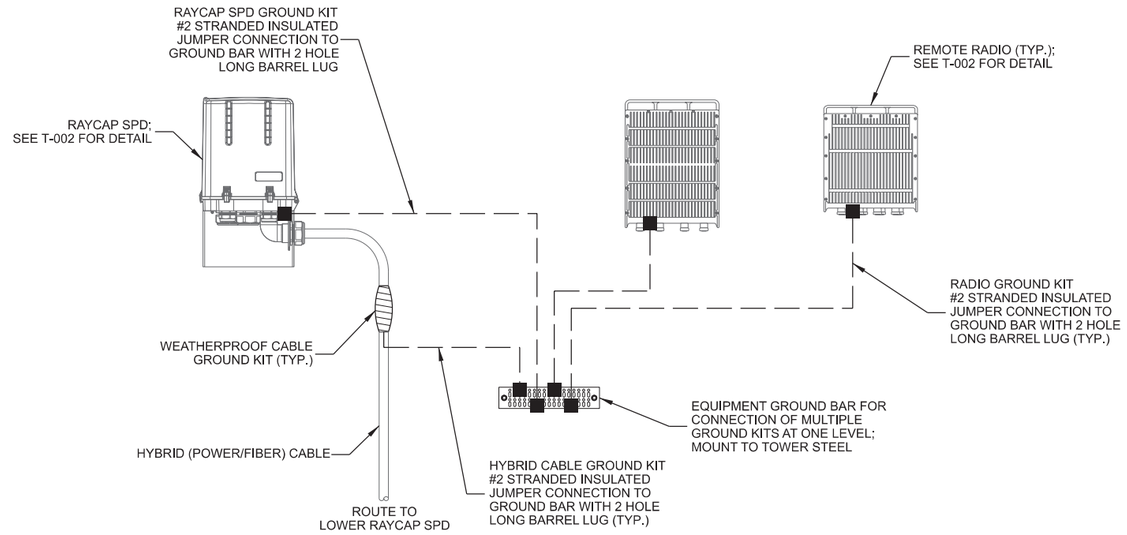
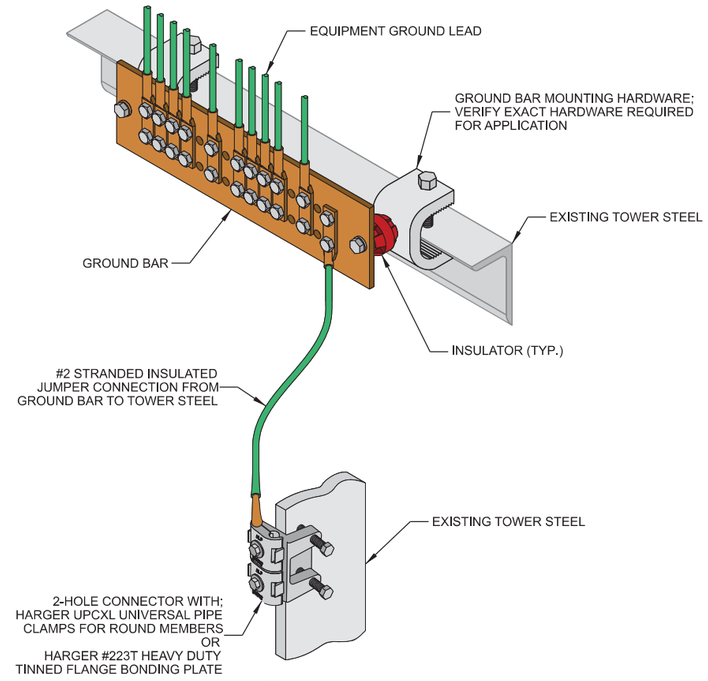


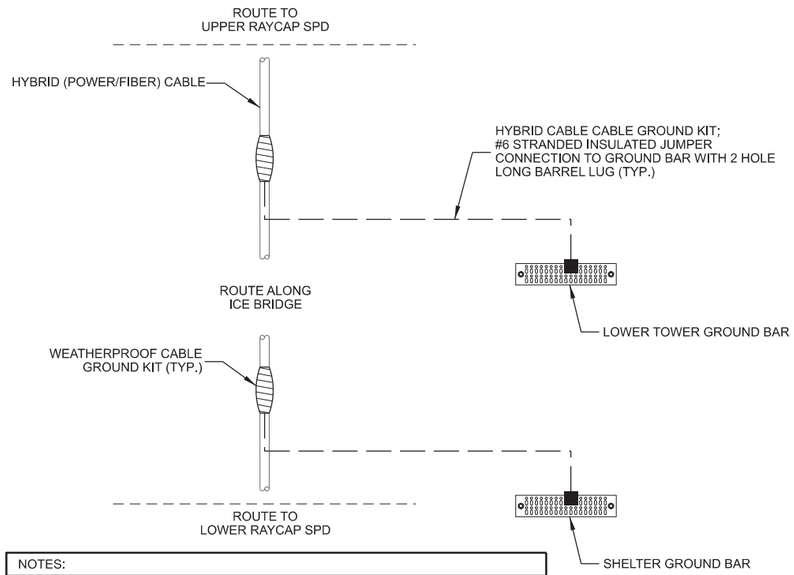
NOTES:

1. ALL CABLING AND/OR GROUNDING RUNS SHALL BE INSTALLED IN A NEAT AND ORDERLY FASHION AS DICTATED BY EXITING CONDITIONS.
2. CONTRACTOR SHALL INSTALL PER LATEST EDITION OF THE N.E.C.
3. SCHEMATIC DETAIL ONLY. REFER TO ANTENNA AND EQUIPMENT CONFIGURATION FOR EQUIPMENT QUANTITY AND LOCATION. CONTRACTOR TO VERIFY GROUND BAR CAPACITY AND DETERMINE IF NEW GROUND BAR REQUIRED PRIOR TO CONSTRUCTION.

A UPPER EQUIPMENT GROUNDING



C GROUND BAR



NOTES:

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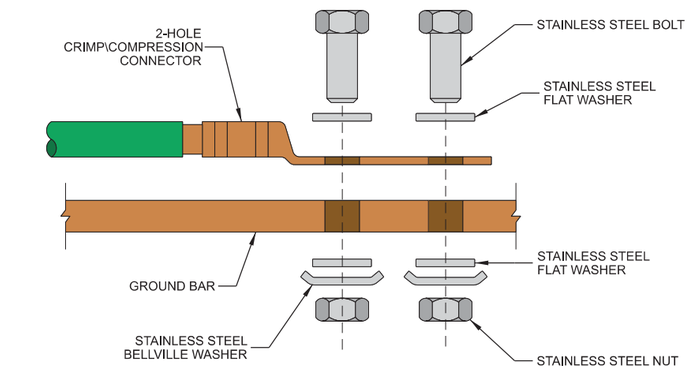
2. CONTRACTOR SHALL INSTALL PER LATEST EDITION OF THE N.E.C.
3. SCHEMATIC DETAIL ONLY. CONTRACTOR TO VERIFY GROUND BAR CAPACITY AND DETERMINE IF NEW GROUND BAR REQUIRED PRIOR TO CONSTRUCTION.

B LOWER CABLE GROUNDING



NOTES:

1. ALL OUTDOOR HARDWARE (BOLTS, SCREWS, NUTS, WASHERS) SHALL BE 18-8 STAINLESS STEEL TYPE GRADE. INDOORS, GRADE 5 STEEL HARDWARE MAY BE USED.
2. CHOOSE BOLT LENGTH TO ALLOW THE EXPOSURE OF AT LEAST TWO THREADS.
3. BACK TO BACK LUG CONNECTIONS ARE AN ACCEPTABLE PRACTICE WHEN BONDED TO A GROUND BAR OR STEEL OBJECTS.
4. AT CONNECTIONS MADE TO STEEL OR ANY OTHER DISSIMILAR METALS, A DRAGON TOOTH WASHER MEETING VZW PRACTICES SHALL BE USED BETWEEN THE CONNECTOR AND STEEL.
5. IF NOT USING DRAGON TOOTH WASHERS, THOROUGHLY REMOVE A SECTION OF PAINT OR COATING APPROXIMATELY THE SAME SIZE AS CONNECTOR. REMOVE THE PAINT FROM SURFACE USING A DREMEL TYPE TOOL.
6. USE AN APPROVED ANTI-OXIDATION COMPOUND ON ALL GROUNDING CONNECTIONS. A COPPER COSMOLINE GREASE BASED COMPOUND (NO OX-ID) SHALL BE USED ON ALL COPPER TO COPPER CONNECTIONS. A ZINC BASED (GREY COLORED) COMPOUND SHALL BE USED ON ALL COPPER TO STEEL CONNECTIONS.
7. WHEN BONDING TO A METALLIC OBJECT WHERE ACCESS IS LIMITED TO ONLY ONE SURFACE, DRILLING & TAPPING OR SELF DRILLING SCREWS ARE THE PREFERRED AND ACCEPTABLE MEANS OF CONNECTION. SHEET METAL SCREWS SHALL NOT BE USED.

D GROUNDING LUG

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d/b/a VERIZON WIRELESS
1701 GOLF ROAD
TOWER 2, SUITE 400
ROLLING MEADOW, IL 60008

GROUNDING DETAILS
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
INT.	DATE:	DESCRIPTION:
ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
CV	01/27/23	REV. 1
CV	02/14/23	REV. 2

CHECKED BY	DAB
PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	E-501

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verizon

Radio Frequency Exposure
FCC Compliance Assessment

☒ Pre-Activation ☐ Post-Activation

SITE-SPECIFIC-INFORMATION			
Site Name	HOST WT	Multi-Licensee Facility	Yes
Street Address	1003 Host Drive	Is Verizon a Significant Contributor To Co-Locator Areas Requiring Mitigation?	Yes
City, State, Zip	Lake Geneva, Wisconsin 53147		
Verizon's Max % MPE (Measured - Occupational)	N/A	Verizon's Max % MPE (Predictive - Occupational)	2,682.9900 Occupational
Structure Type	Water Tank	Assessment Date	N/A
Broadcast (AM/FM/TV) Co-Locators	Yes	Assessment Purpose	Modification
Total Access Points	1	Total Report Revisions	0
Original Report Date	June 28, 2022	Report Revision Date	N/A
Compliance Status	Mitigation Required		

VERIZON'S WORST-CASE RF EMISSIONS IN ACCESSIBLE AREAS AT THIS FACILITY	
☐	BELOW the General Population MPE limit
☐	ABOVE the General Population MPE limit and BELOW the Occupational MPE limit
☐	ABOVE the Occupational MPE limit and BELOW 10x the Occupational MPE limit
☒	ABOVE 10x the Occupational MPE limit

Final Compliant Configuration	GUIDELINES	NOTICE	CAUTION	WARNING	NOC INFO	BARRIER/MARKER
Access Point(s)	☒ [1]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐
Alpha	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐
Beta	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐
Gamma	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐

NOTE: The table above represents EVERY compliance item that MUST be implemented at this location; Also in Sec. 4 (B)

Additional Compliance Requirements:

There are no barriers recommended on this site. Signage is recommended at the access points and/or the Verizon antennas as noted in the table above. To reduce the risk of exposure and/or injury, EBI recommends that access to the water tank or areas associated with the active antenna installation be restricted and secured where possible.

Consultant Legal Name	EBI Consulting	**Phone/Fax**	781-273-2500
Address	21 B Street, Burlington, MA 01803		

2. Existing Site Characteristics

a. Structure

Physical Description	This project involves the installation of twelve (12) wireless telecommunication antenna(s) on a water tank in Lake Geneva, Wisconsin. The site is a 126'4" Water tower. It was noted that there were three adjacent structures that could potentially be impacted by the antennas at this site. These adjacent structures were included in the modeling analysis.
Single-Family Home	☐ YES ☒ NO
Latitude (NAD 83)	42° 34' 45.10" N
Longitude (NAD 83)	-88° 25' 1.90" W
Total Analyzed Elevations (Roof Levels)	4 (See antenna table below)

b. Accessibility

Did the property owner or agent of the property owner (e.g. a security guard) grant you access to the rooftop?	N/A
If not - were you required to be escorted by Verizon personnel in order to gain access?	N/A
Were you required to provide any proof of identity to gain access?	N/A
What specific documents were required in order to gain access?	N/A
All access points locked at time of assessment?	N/A
All access points alarmed at time of assessment?	N/A
Were there any broken locks or inoperable alarms on any of the access points to the rooftop?	N/A
Were there any access issues caused by either the property owner or agent of the property owner?	N/A
Additional Notes: This assessment is a pre-activation report. No site visit was conducted.	

c. Existing Verizon Observations

Existing Observations	GUIDELINES	NOTICE	CAUTION	WARNING	NOC INFO	BARRIER/MARKER
Access Point(s)	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ N/A
Alpha	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ N/A
Beta	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ N/A
Gamma	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☐ N/A

NOTE: The table above represents EXISTING compliance items implemented at this location.

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SITE COMPLIANCE REPORT
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

SUBMITTAL:		
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ADS	6/3/22	REV. A
BJN	09/28/22	REV. 0
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PLOT DATE	2/14/2023
PROJECT NUMBER	32470
SET TYPE	FINAL
SHEET NUMBER	R-001

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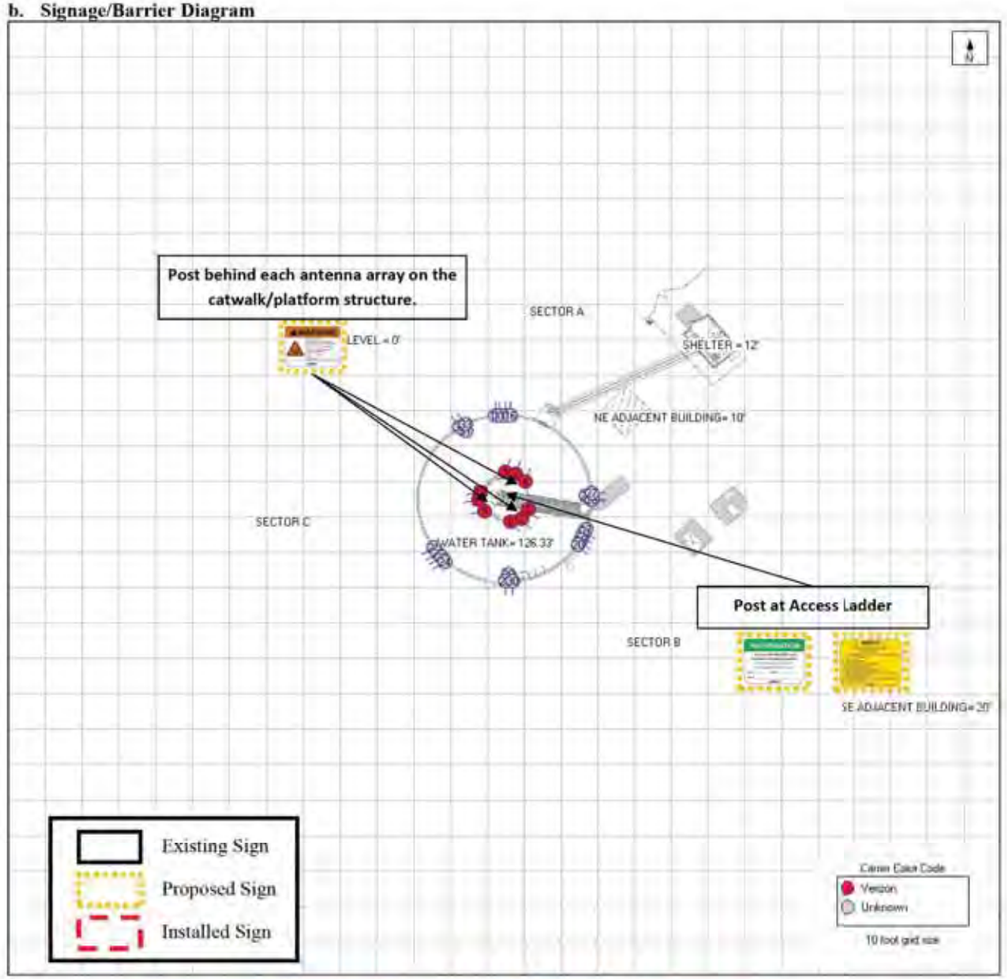
b. Signage/Barrier Diagram



Final Compliant Configuration	GUIDELINES	NOTICE	CAUTION	WARNING	NOC INFO	BARRIER/MARKER
Access Point(s)	☒ [1]	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐
Alpha	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐
Beta	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐
Gamma	☐ [N/A]	☐ [N/A]	☐ [N/A]	☒ [1]	☐ [N/A]	☐

NOTE: The table above represents EVERY compliance item that MUST be implemented at this location.

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c. Signage/Barrier Installation Detail

Mitigation Actions Required/Taken	GUIDELINES		NOTICE		CAUTION		WARNING		NOC INFO		BARRIER/MARKER	
Access Point(s)	☒	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	
Alpha	☐	☐	☐	☐	☐	☐	☒ [1]	☐	☐	☐	☐	
Beta	☐	☐	☐	☐	☐	☐	☒ [1]	☐	☐	☐	☐	
Gamma	☐	☐	☐	☐	☐	☐	☒ [1]	☐	☐	☐	☐	
	ADD	REM	ADD	REM	ADD	REM	ADD	REM	ADD	REM	ADD ONLY	

NOTE: The table represents either the signage/barriers installed / removed OR items required by the market (if mitigation is not installed by consultant/vendor).

SPECIAL MITIGATION INSTRUCTIONS	
Items to be Installed	• Install GUIDELINES and NOC INFO signs on the Access Ladder to the top of the Water Tank. • Install WARNING signs on the back of the antenna arrays in all Sectors.
Items to be Removed	N/A
Items to be Repaired/Replaced	N/A
Access Requirements	To reduce the risk of exposure and/or injury, EBI recommends that access to the water tank or areas associated with the active antenna installation be restricted and secured where possible.

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SITE COMPLIANCE REPORT
HOST WT (FUZE: 16825805)
LAKE GENEVA, WISCONSIN

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SET TYPE	FINAL
SHEET NUMBER	R-002

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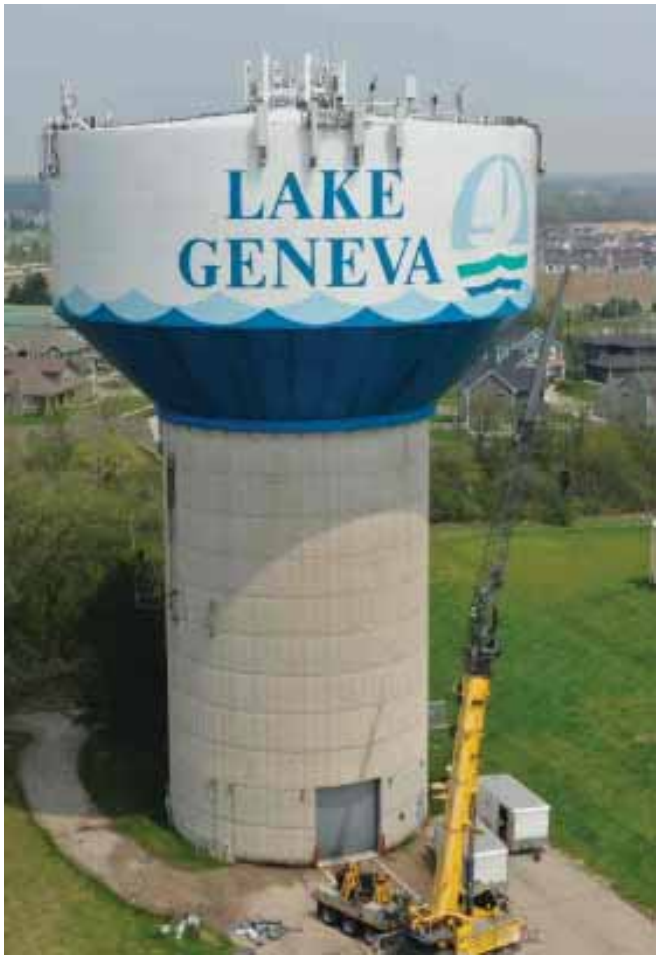
HOST WT

1003 Host Drive

Lake Geneva, Wisconsin

STRUCTURAL MOUNT ANALYSIS REPORT FOR VERIZON (#113352)

September 21, 2022
KOA PROJECT NO.: 222001.11
Edge Consulting Engineers, Inc. Project No: 32470



PREPARED BY:
SARAH BROST
KRECH OJARD & ASSOCIATES, INC.
101 PUTNAM ST.
EAU CLAIRE, WI 54703
715-552-7374

PROFESSIONAL SEAL:

VERIZON INSTALLATION SUMMARY:

Verizon is proposing to install new antennas and equipment at Host water tower site. The proposed antennas and equipment are listed below and noted in the Verizon RFDS dated 4/13/2022.

VERIZON MOUNT ANALAYSIS SUMMARY:

The proposed Verizon antennas will be installed on the existing corral located on the roof of the tank reservoir. The corral was analyzed based on the loading and requirements per the TIA-222-H. With the proposed antennas installed, the existing corral and mounting system is stressed to 100% of its allowable design stress, with the controlling members being the 1" diameter solid rods that attach the mount pipes back to the top railing.

The existing corral and mount system are capable of safely resisting the resultant forces from the change in loading.

Proposed Final Verizon Antenna and Equipment Summary:

- (3) Ericsson AIR6449 (RAD = 130')
- (6) Commscope NNH-65C-R2B (Rad = 130')
- (3) Ericsson KRE105281/1 w/ 4408 (RAD = 130')
- (3) Ericsson 4449
- (6) RRUS32
- (3) Raycap 3315 w/ ALM
- (3) Hybrid Cables

Existing Other Carrier Equipment to remain:

The following list of existing other carriers on the corral was provided in the mapping report. There are assumed to be no additional antennas or equipment on the tank platform besides those listed below.

Equipment Mounted to Corral:

- (1) 26" Diameter Dish Antenna (RAD = 130')
- (3) Airmax AM-M-V5G-T1 (RAD = 132')
- (5) 16" Diameter Dish (RAD = 132')
- (1) 10' Dipole (Center @ 132')
- (1) Laird Y1503 (Center @ 132')
- (1) 24" Diameter Dish (RAD = 134')

ASSUMPTIONS:

- Any reinforcement or modifications are assumed to be fully installed and functional.
- Minimum Steel Grades for Railing Members have been assumed to be the following and have not been verified:
    - Mounting pipes and round pipes of corral are ASTM A53, Gr. B;
    - 2" square Tube Steel is Gr. 46ksi, w/ ¼" thickness
    - 7" top plate flat railing member is Gr. 36 ksi
    - 1" diameter round solid mount pipe attachment member is ASTM A572, Gr. 50
- All welds are assumed to have been performed to current welding standards and are assumed to develop their full capacity and to be in good condition. All bolts and bolt-like anchors are assumed to be fully tightened, fastened or bonded to the manufacturers' specifications and are assumed to have full capacity.
- The information provided to Krech Ojard & Associates for analysis is assumed accurate and up to date.
- The tower is assumed to be properly maintained and monitored and this analysis cannot be a considered a condition assessment of the tower. No accommodations are taken for damaged, rusted, deteriorated, or otherwise compromised member conditions.
-

If it is determined that any of these assumptions are not accurate, this analysis is void and an additional analysis should be performed.

REFERENCED DOCUMENTS:

- Edge Consulting Engineers, Inc. Antenna MOD Drawings dated 6/3/22 (REV A)
- Verizon RFDS dated 4/13/2022
- Previous Verizon installation mount analysis report by Fullerton Engineering Design dated September 7, 2017
- Previous Verizon installation tank analysis report by Fullerton Engineering Design dated September 1, 2017
- Tower Inventory by Edge Consulting Engineers, Inc. dated 5/11/2022
- Lake Geneva 1.5MG Tank Drawings/Book by Landmark Structures, Inc. dated 1995

KRECH OJARD
Consulting Engineers

PROJECT NAME:	Host Water Tower		
DESCRIPTION:	TIA Loading		
PREPARED BY:	KAJ	PROJECT NO.:	222002.11
REVIEWED BY:		DATE:	8/8/2022

Wind Loading Criteria

Basic Wind Speed:	V_{ult} =	107	mph	K_d =	0.95	(Table 2-2 TIA-222-H)
Exposure:	C			K_{zt} =	1.00	
Risk Category:	II			K_e =	0.98	
Gust Factor:	G =	1.0	(Per TIA Section 16.6)	K_s =	1.00	
				K_a =	0.90	(Per TIA Section 16.6)

Ice Loading Criteria

Wind Speed on Ice:	V_i =	40	mph
Design Ice Thickness:	t_i =	1.5	in
Ice Importance Factor:	I_i =	1.0	

Service Loading Criteria

Basic Wind Speed: V = 60 mph (Per TIA Annex 2.8.3) Service Load Factor: $LF = V^2/Vult^2 =$ 0.314

Equipment & Antennas

Description	y (ft)	n	h (in)	b (in)	d (in)	Weight (approx lbs)	Aspect Ratio	Flat or Round	C_f	q_z (psf)	W (psf)	V (lb)	W_i (psf)	Ice Weight (lbs)	V_i (lb)
Dish Antenna	130.00	1	26.00	26.00	17.00	50.00	1.000	Flat	1.30	32.88	42.74	157.6	6.0	126.2	36.0
Airmax AM-M-V5G-TI	132.00	3	28.39	5.87	2.98	8.20	4.836	Flat	1.36	32.99	44.99	52.1	6.3	41.4	12.9
Dish Antenna	132.00	5	16.00	16.00	8.00	30.00	1.000	Flat	1.30	32.99	42.88	59.9	6.0	49.7	15.7
LAIRG FG9026	132.00	1	65.00	1.25	1.25	28.80	52.000	Round	1.20	32.99	39.58	35.1	5.5	39.8	12.3
10' DIPOLE	132.00	1	120.00	3.00	3.00	306.25	40.000	Round	1.20	32.99	39.58	99.0	5.5	125.6	30.6
LAIRD Y1503	132.00	1	42.00	24.00	1.00	5.00	1.750	Flat	1.31	32.99	43.29	53.8	6.1	189.7	52.4
2' OMNI	134.00	1	24.00	1.00	1.00	20.00	24.000	Flat	1.97	33.09	65.08	10.8	9.1	13.2	7.7
Dish Antenna	135.00	3	8.00	8.00	4.00	15.00	1.000	Flat	1.30	33.14	43.09	15.0	6.0	13.7	5.5
VZW: Commscope NHH-65C-R2B	132.00	6	96.00	11.90	7.10	80.00	8.067	Flat	1.44	32.99	47.35	375.7	6.6	262.4	70.1
VZW: Ericsson RRUS32	133.00	6	24.49	12.05	7.01	60.00	2.032	Flat	1.32	33.04	43.52	89.2	6.1	67.4	18.3
VZW: Raycap RC3DC-3315-PF-48	133.00	3	24.00	15.70	10.30	32.00	1.529	Flat	1.31	33.04	43.24	113.1	6.0	86.4	22.1
VZW: Ericsson KRE105281 w/4408	130.30	3	8.00	8.00	4.00	13.00	1.000	Flat	1.30	32.90	42.76	19.0	6.0	14.9	5.4
VZW: Ericsson AIR6449	131.30	3	30.6	15.9	10.6	83	1.925	Flat	1.32	32.95	43.34	146.4	6.1	111.8	27.7
VZW: Ericsson 4449	133.00	3	9.25	13.19	14.96	70.00	0.701	Flat	1.30	33.04	42.95	36.4	6.0	35.2	8.8

Support Members

Description	y (ft)	n	h (in)	b (in)	d (in)	Weight (approx lbs)	Aspect Ratio	Flat or Round	C_f	q_z (psf)	W (psf)	V (lb)	W_i (psf)	Ice Weight (lbs)	V_i (lb)
2-3/8" Mount Pipe	135.4		8.97	2.375	2.375	-	3.777	Round	0.75	33.16	24.75	3.7	3.5	8.0	1.7
FB 7X1/4 W/ FB 6X3/16 (Top Railing)	129.9		2.47	0.4375	7	-	5.646	Round	0.78	32.87	25.56	0.2	3.6	3.8	0.6
P 1-7/8 (Mid Railing)	127.87		2.77	1.875	1.875	-	1.477	Flat	1.31	32.77	42.86	1.5	6.0	2.1	1.4
SB 2	129.9		3.75	2	2	-	1.875	Round	0.71	32.87	23.49	1.2	3.3	3.0	0.9
1" Rod	129.9		0.88413	1	1	-	0.884	Flat	1.30	32.87	42.74	0.3	6.0	0.5	0.8

Note: Self weight, ice weight, wind (V) and wind on ice (Vi) are in units per antenna/equipment/member

Antenna Support Load Combinations

Reference: TIA-222-H

Service Loads:

1. 1.0 DL + 1.0 WLm (w/ 60 MPH wind speed)

Note: Wind speed used in conjunction with maintenance loads below is 30MPH. Service wind speed is 60 MPH. Conservatively use 60 MPH with maintenance loads.

Basic Strength Limit States Load Combinations:

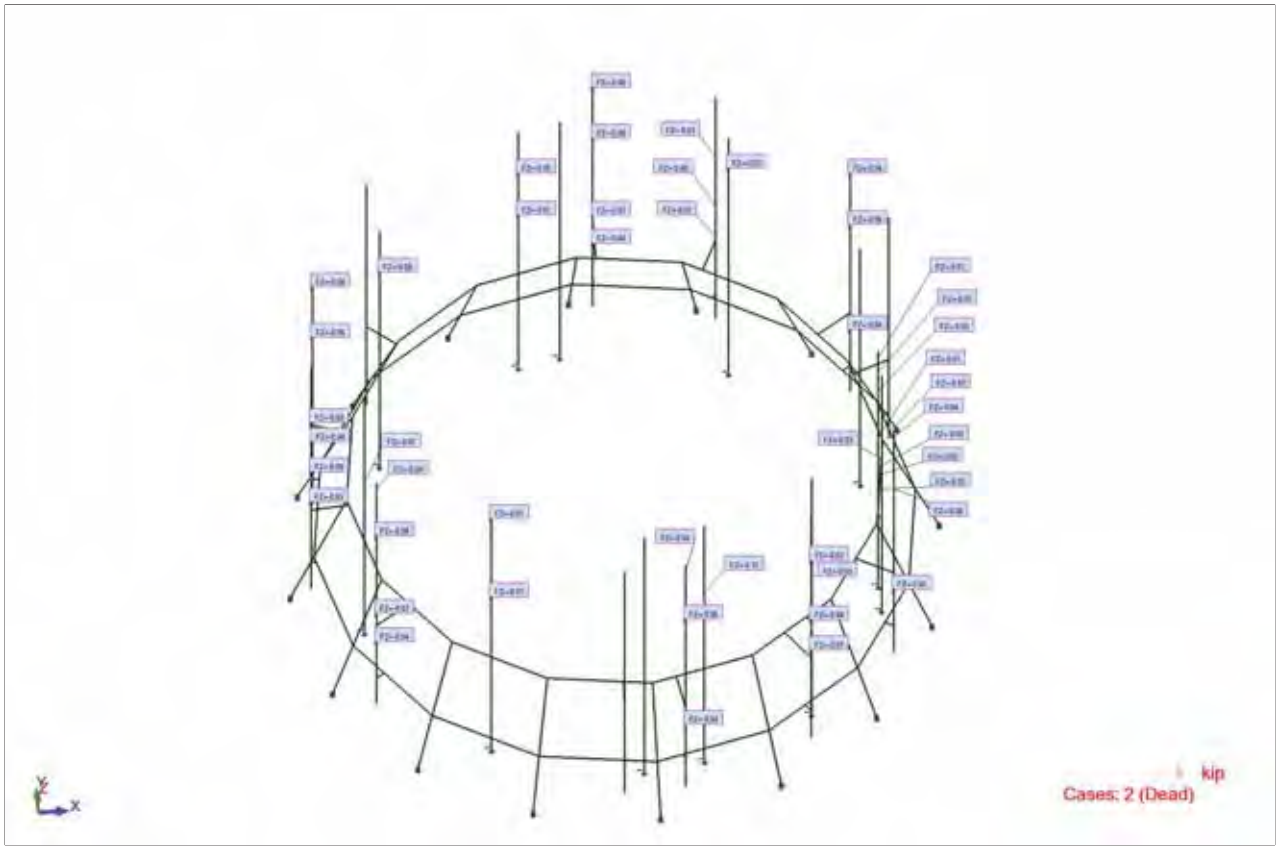
1. 1.4DL
2. 1.2 DL + 1.0 WL
3. 0.9DL + 1.0WL
4. 1.2DL + 1.0ICE + 1.0WLice

Additional Mounting System Strength Combos per TIA 16.4.2:

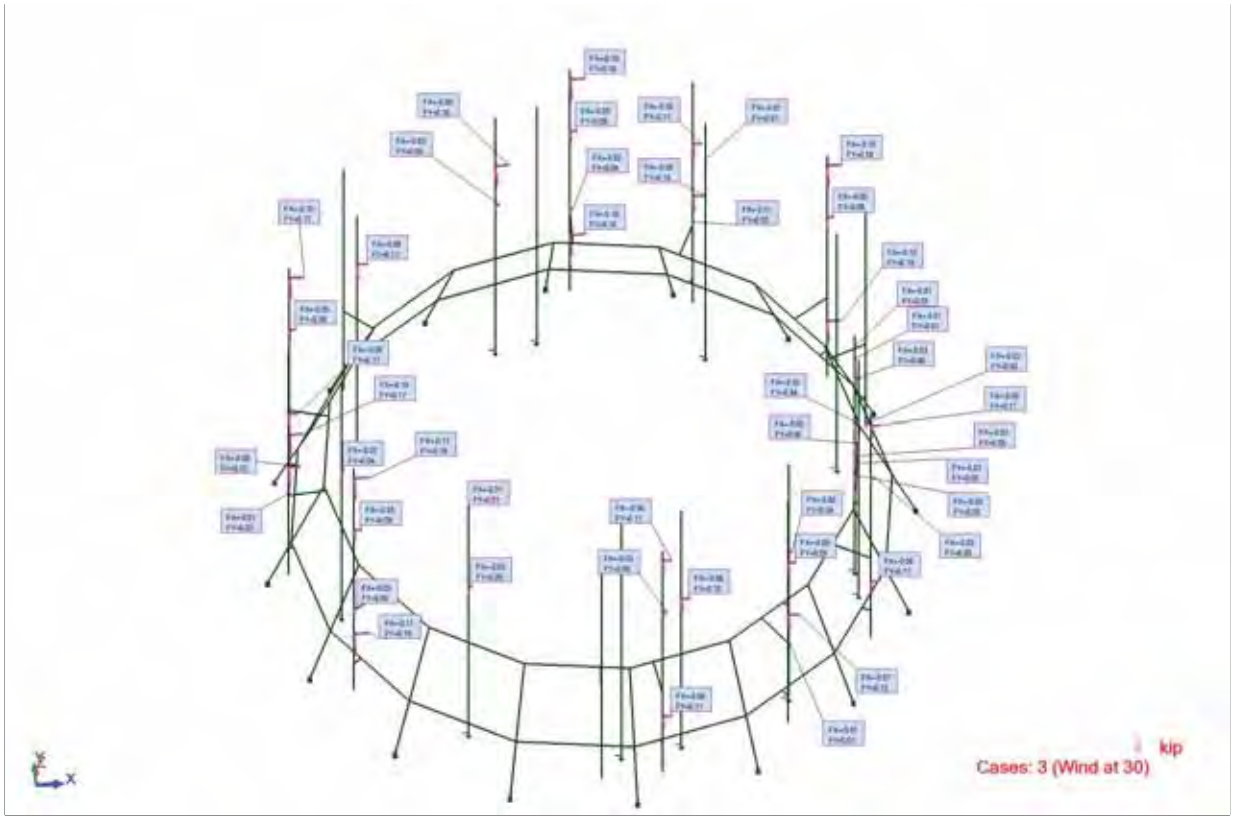
Lm = 500 lb. maintenance load on mounting pipe
Lv = 250 maintenance load on horizontal members

2. 1.2DL + 1.5Lm + 1.0 Wlm
3. 1.2Dl + 1.5Lv

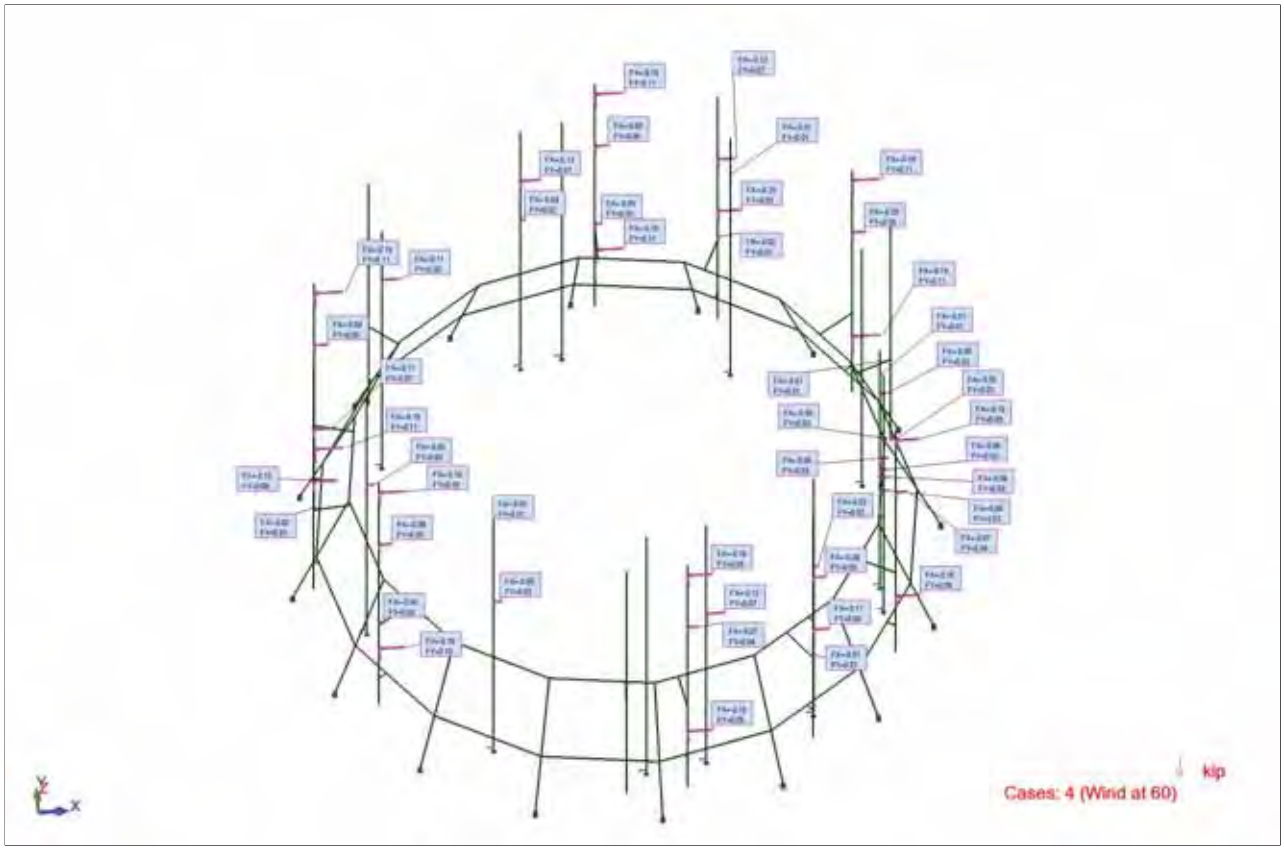
View - Cases: 2 (Dead)



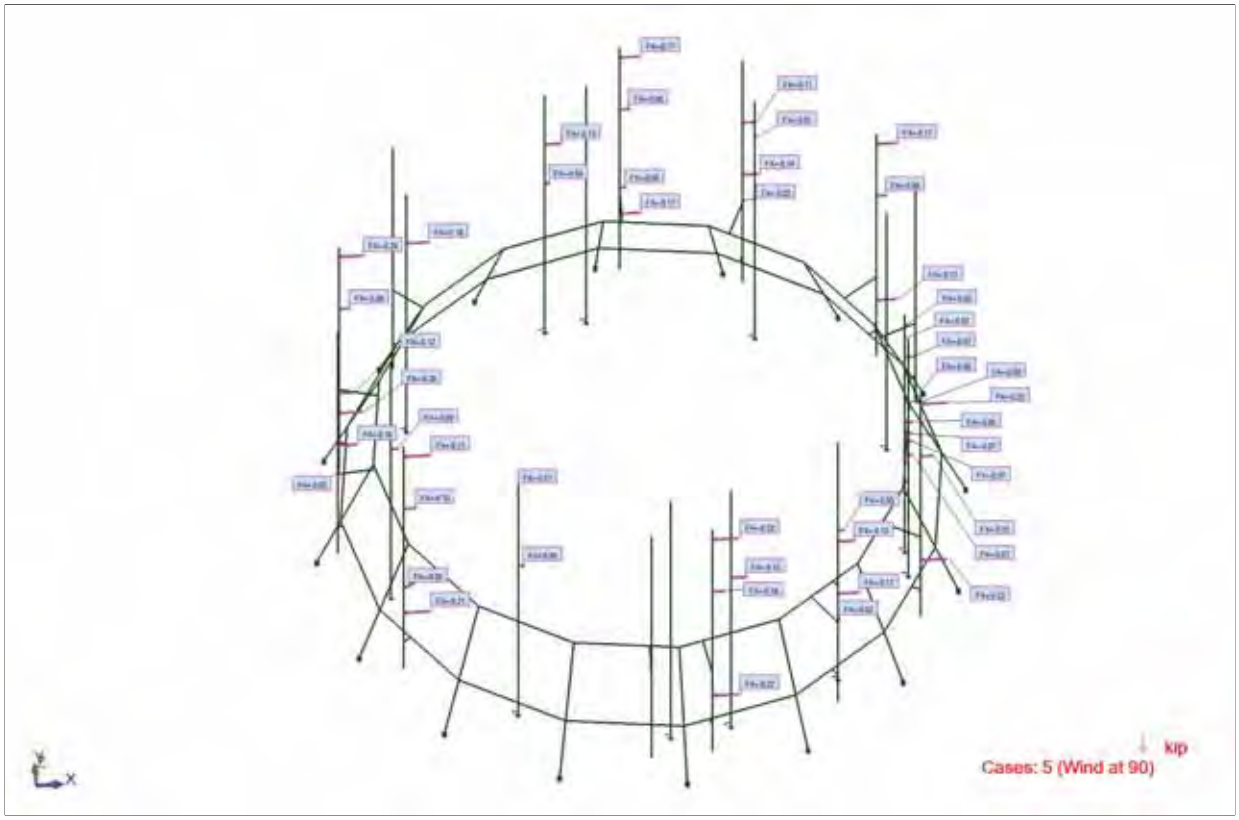
View - Cases: 3 (Wind at 30)



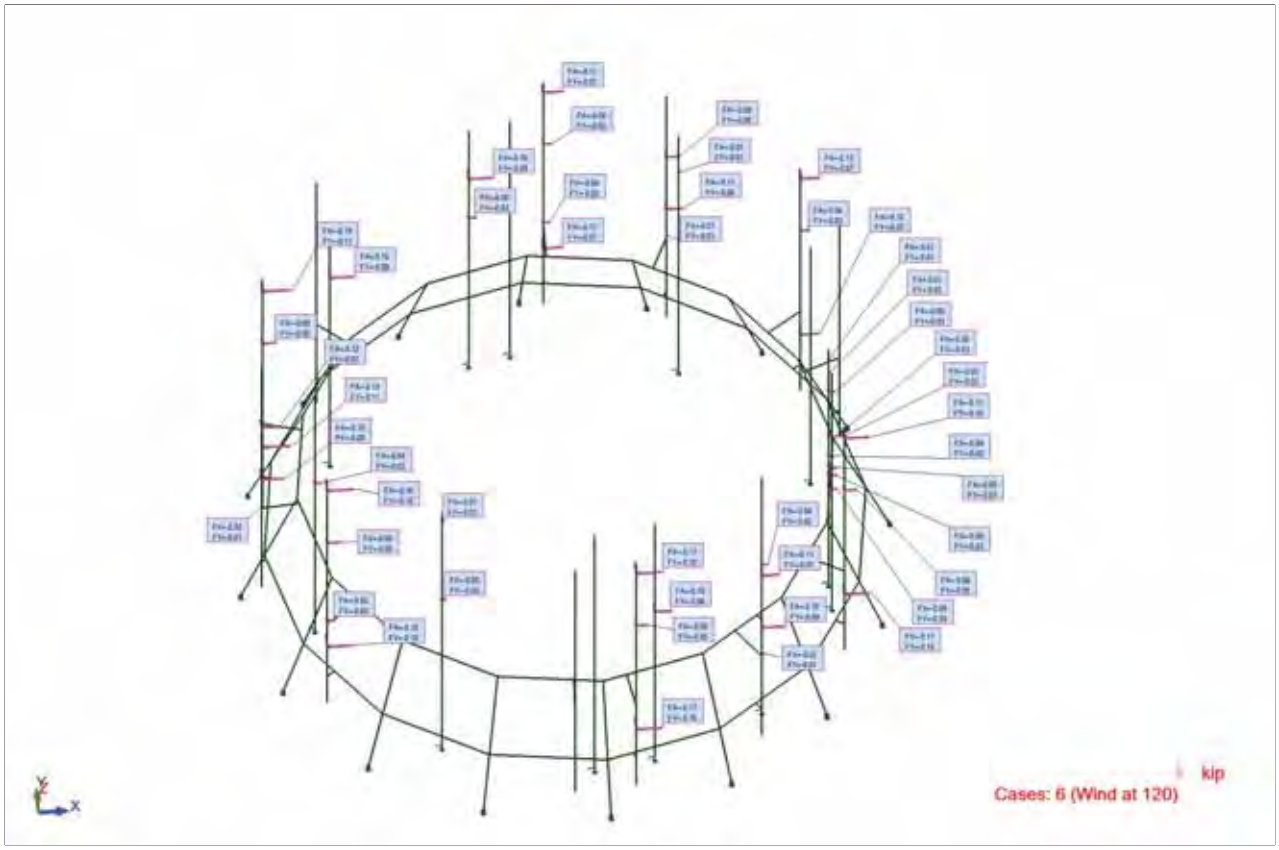
View - Cases: 4 (Wind at 60)



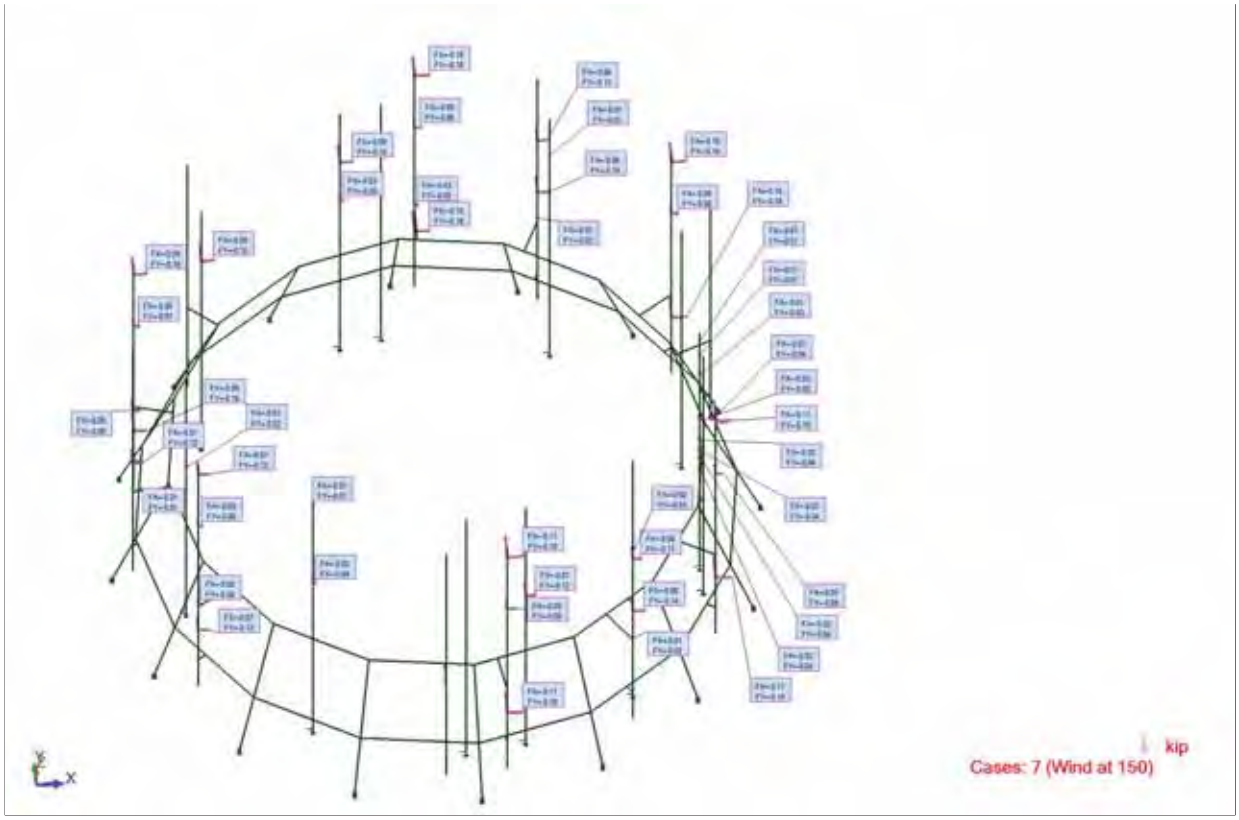
View - Cases: 5 (Wind at 90)



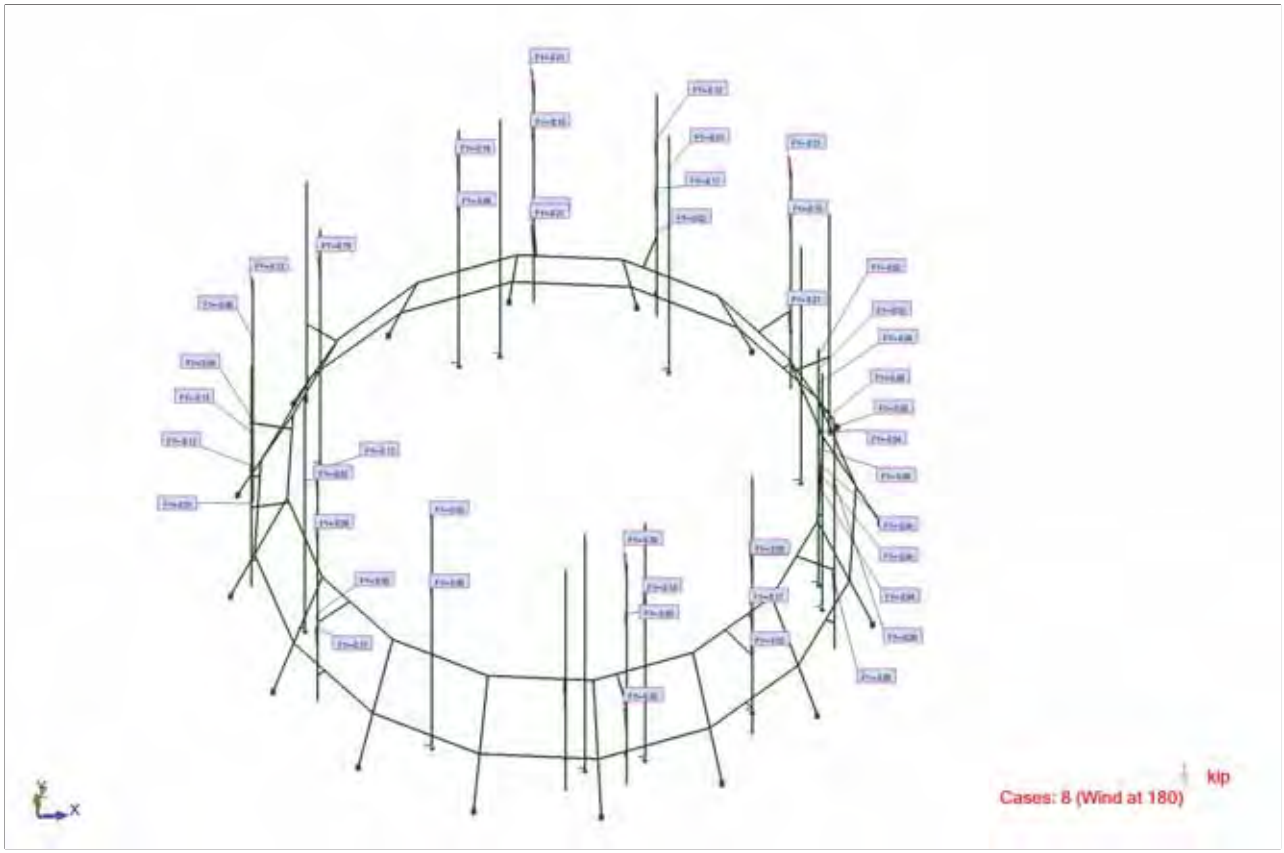
View - Cases: 6 (Wind at 120)



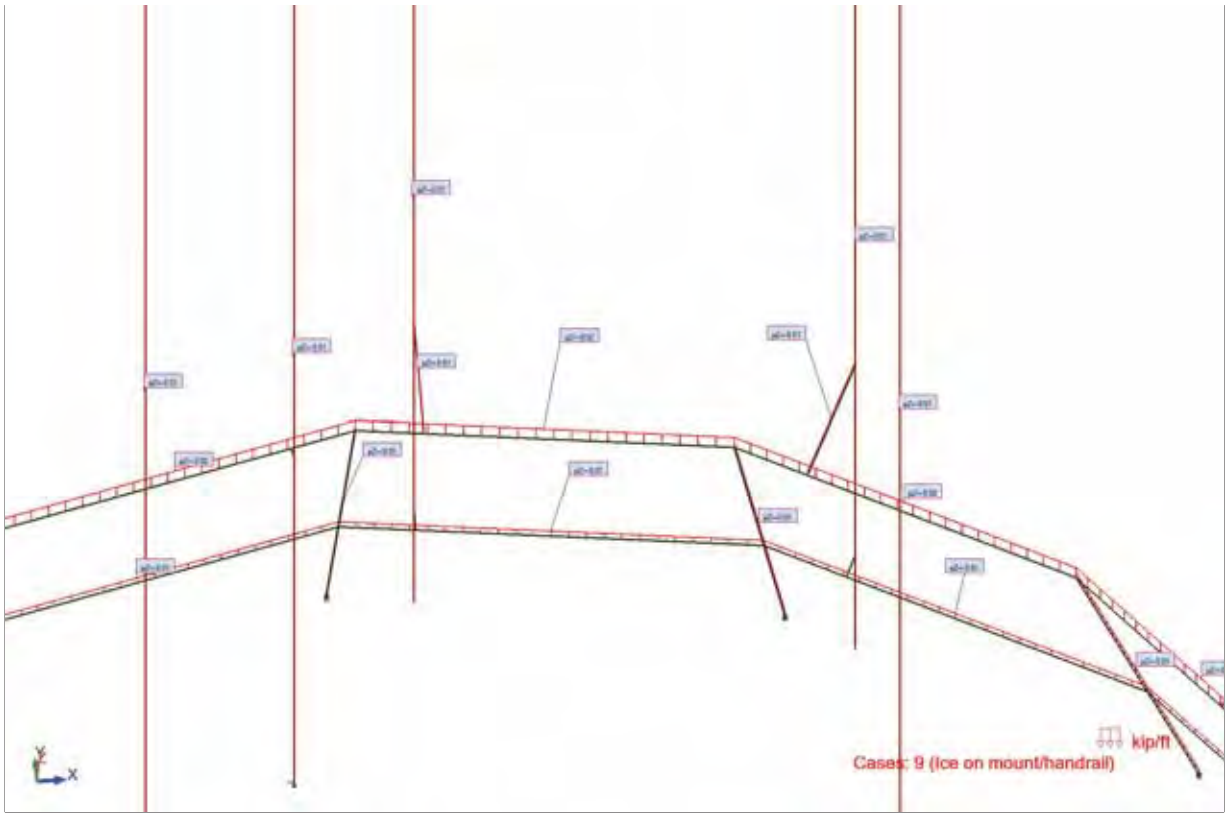
View - Cases: 7 (Wind at 150)



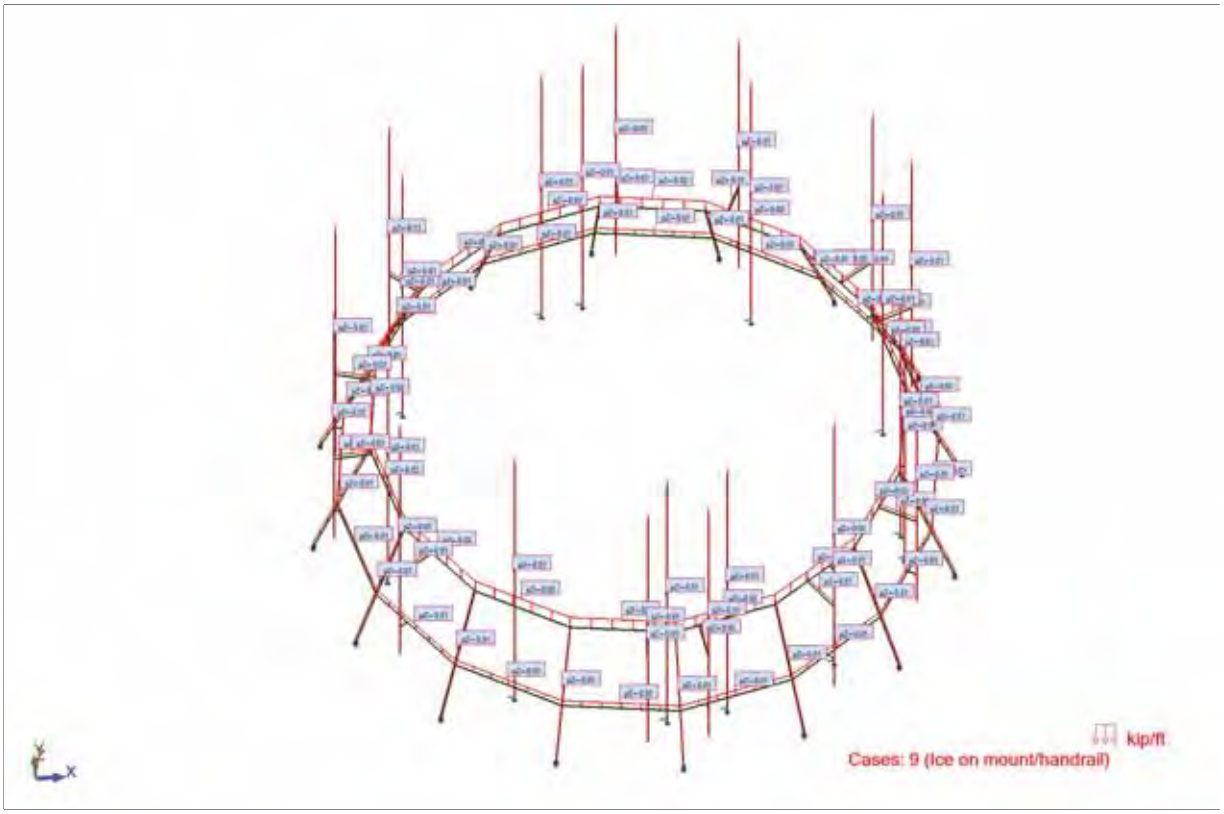
View - Cases: 8 (Wind at 180)



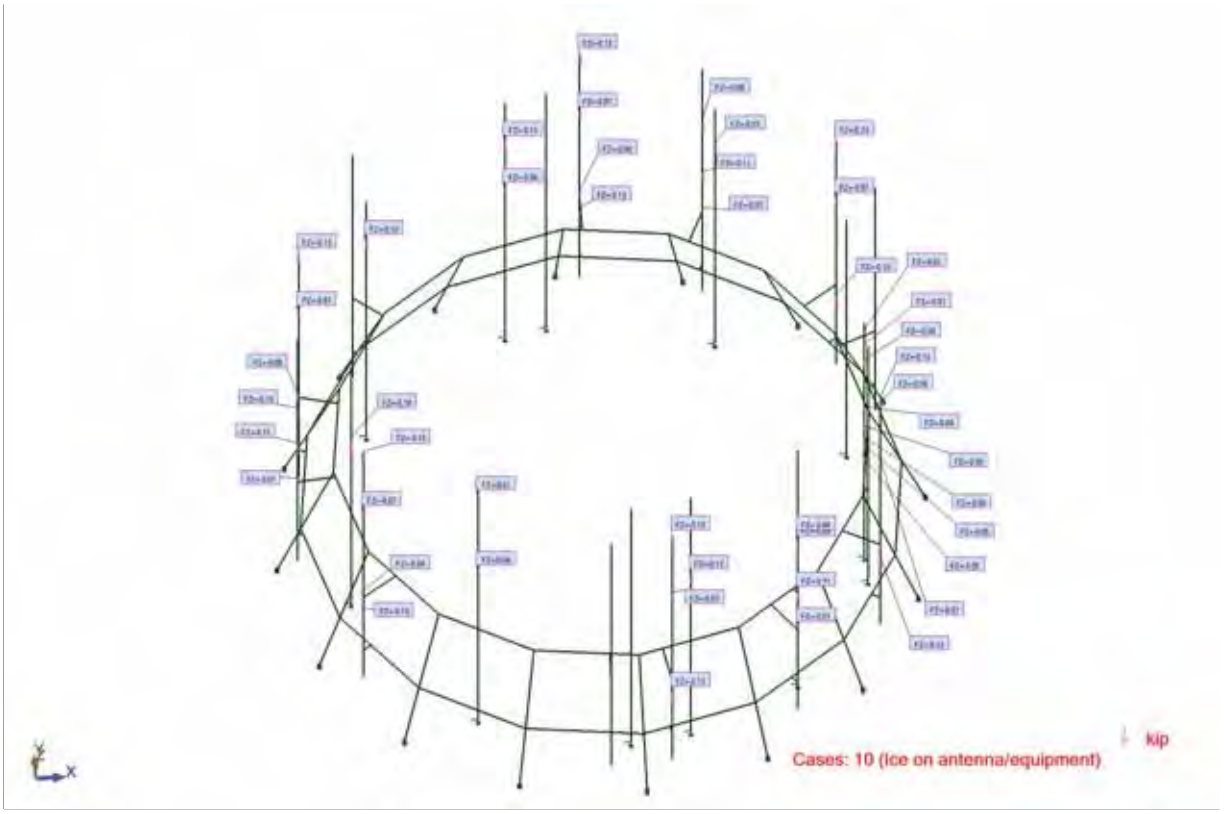
View - Cases: 9 (Ice on mount/handrail)



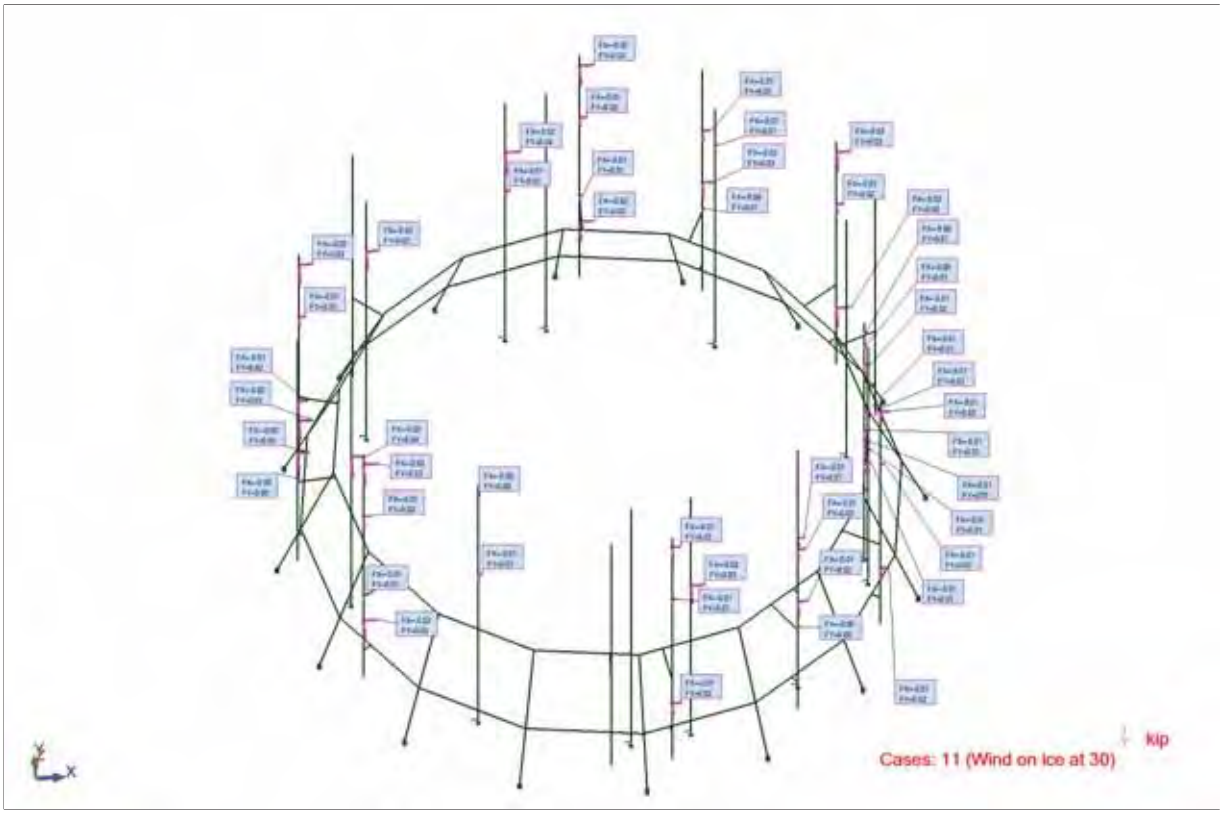
View - Cases: 9 (Ice on mount/handrail) - Full Rail



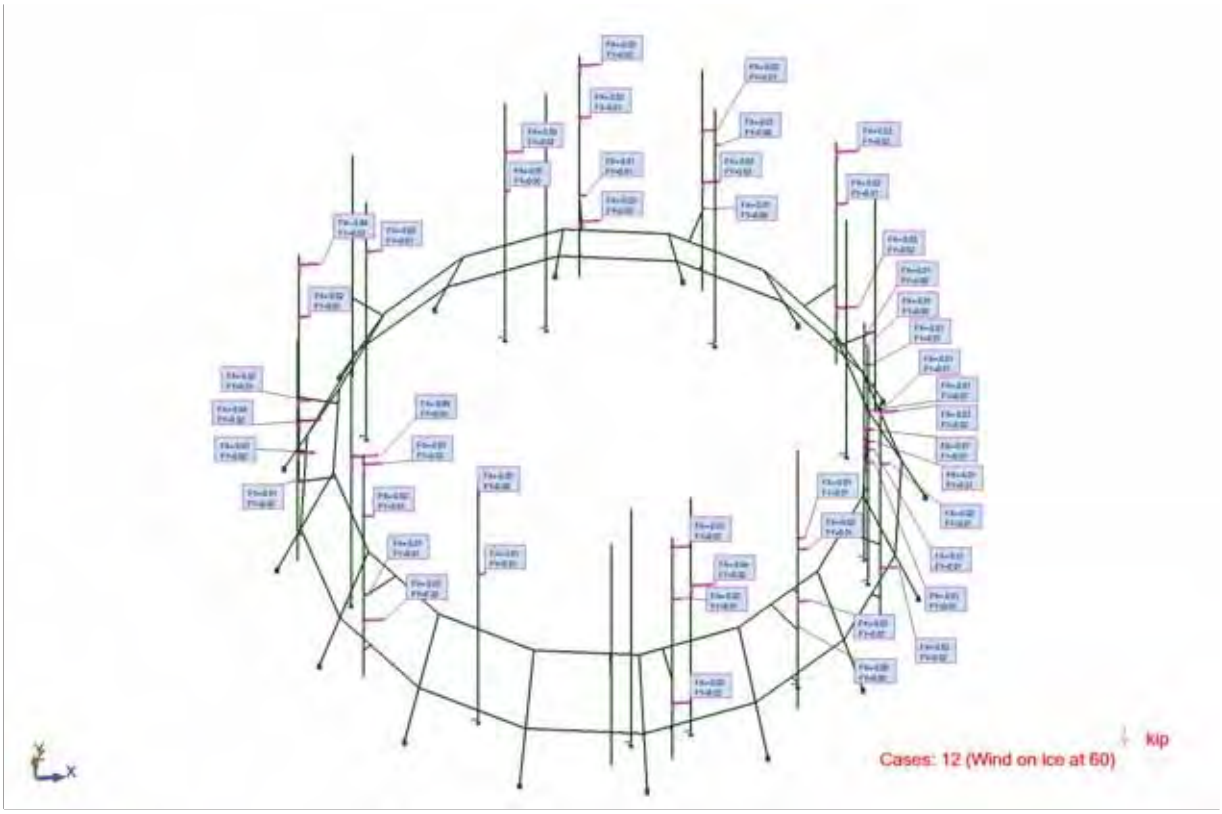
View - Cases: 10 (Ice on antenna/equipment)



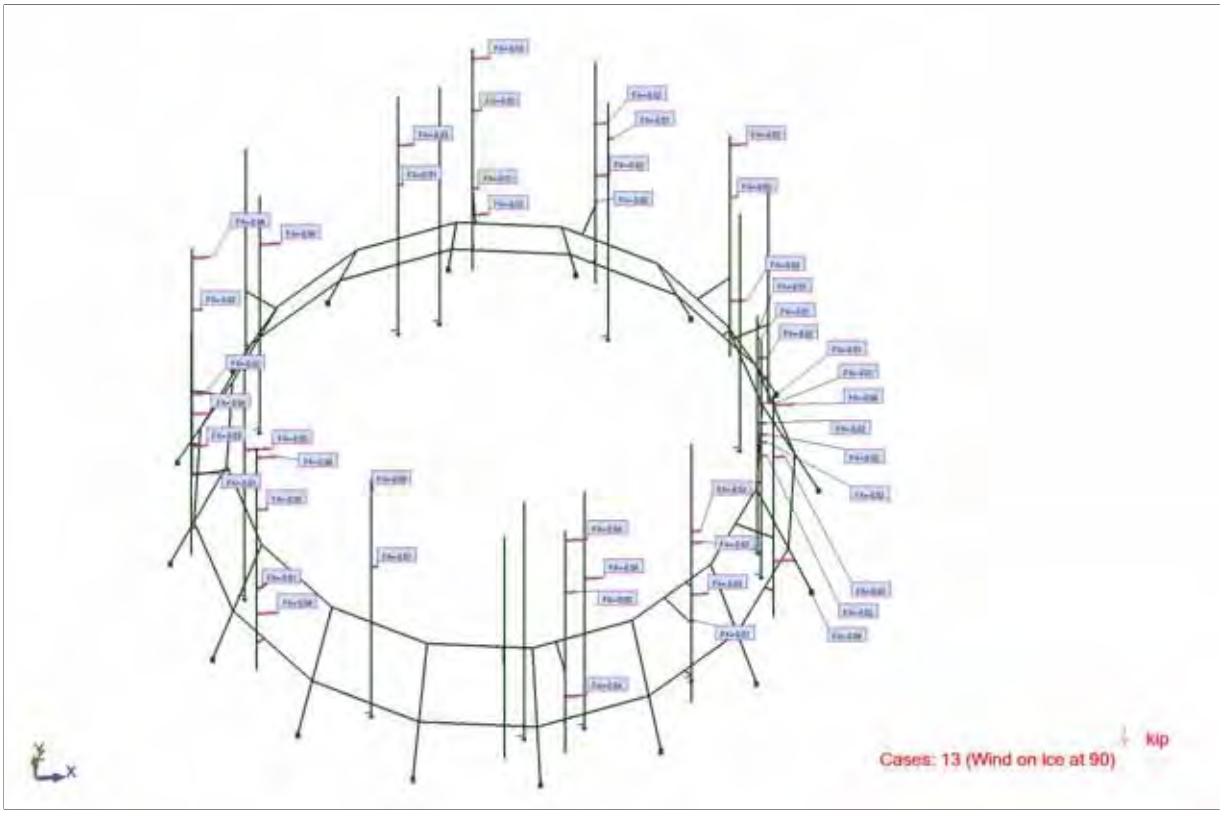
View - Cases: 11 (Wind on ice at 30)



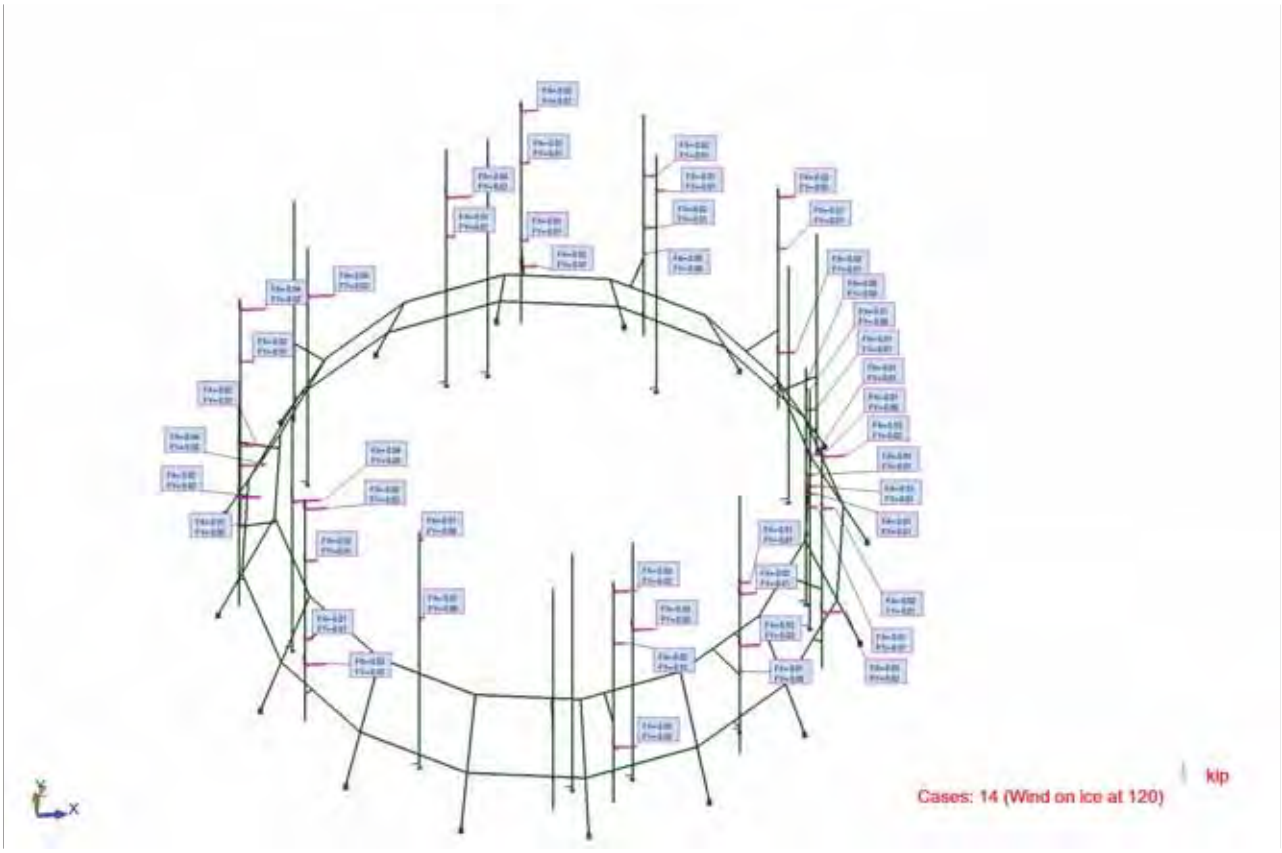
View - Cases: 12 (Wind on ice at 60)



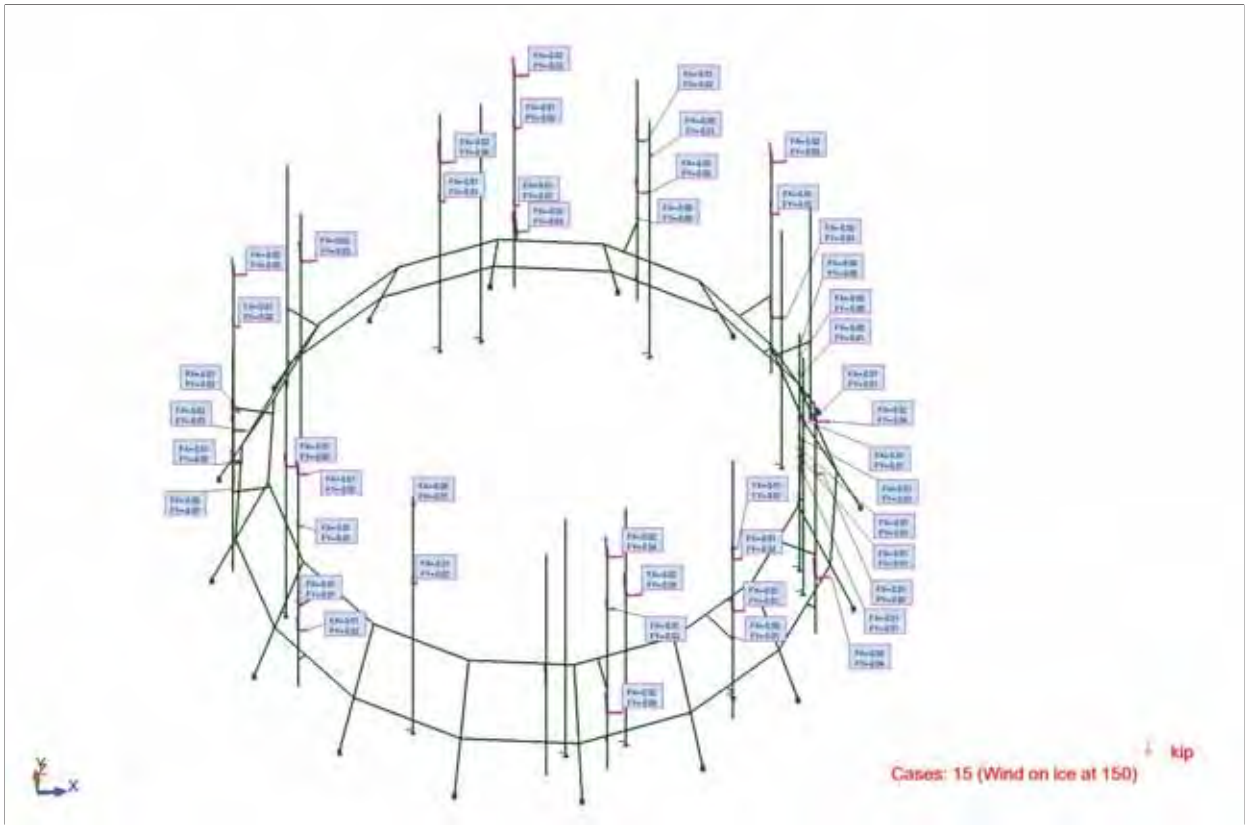
View - Cases: 13 (Wind on ice at 90)



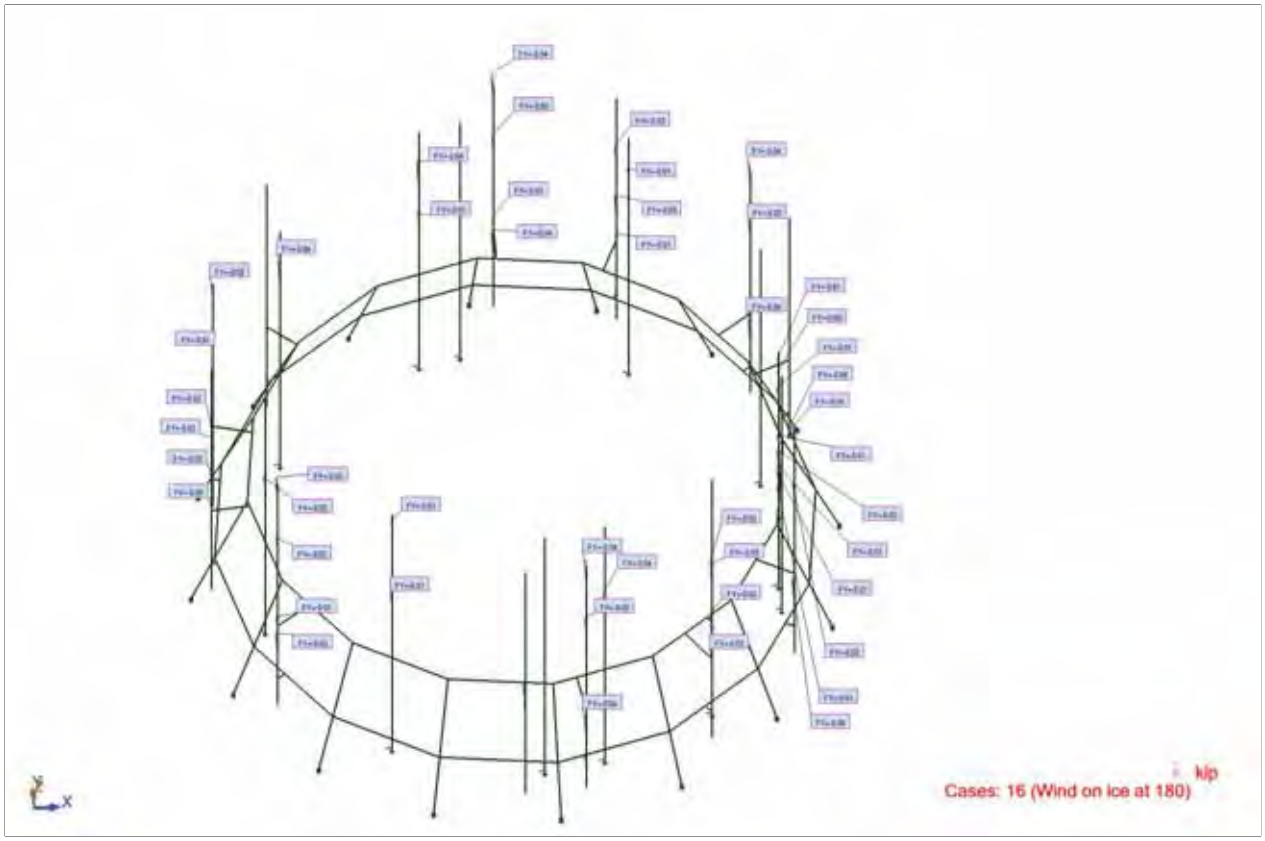
View - Cases: 14 (Wind on ice at 120)



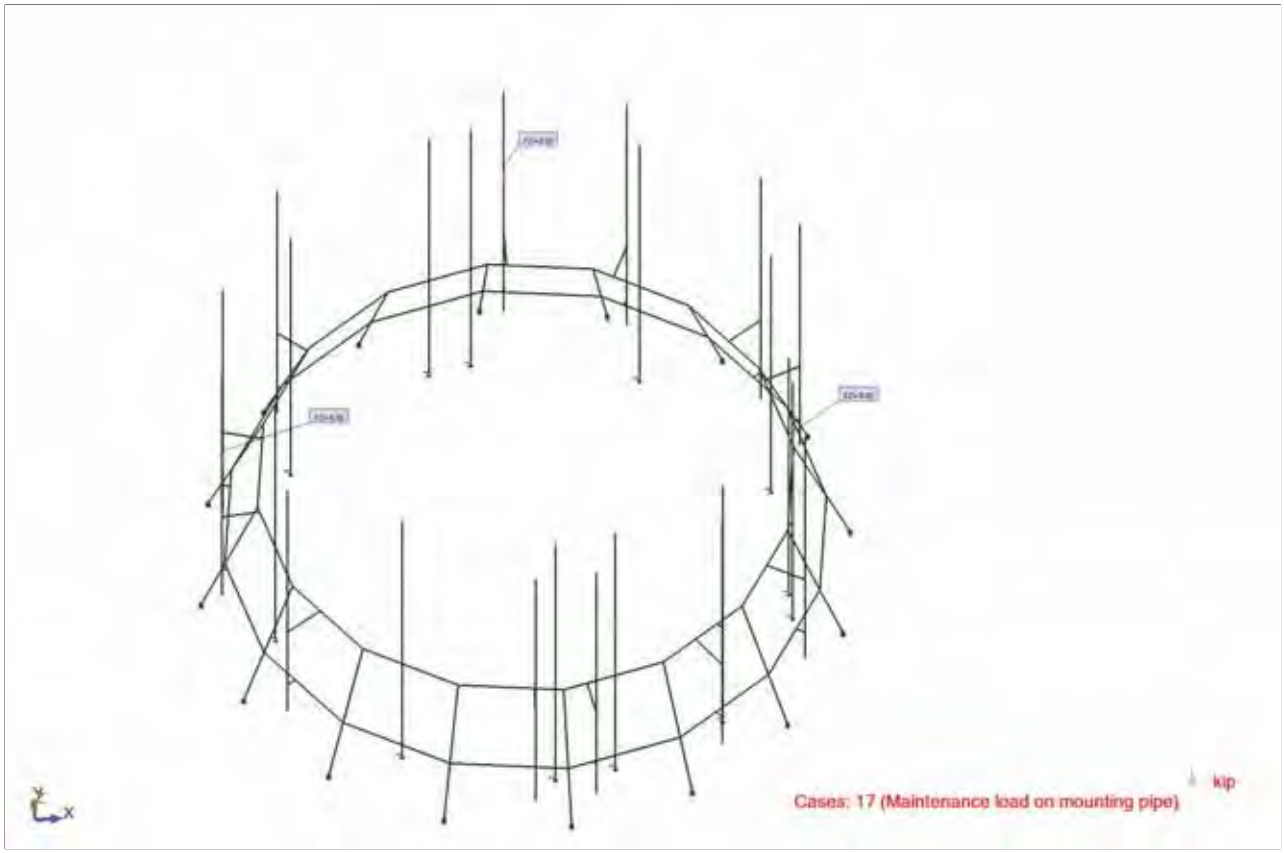
View - Cases: 15 (Wind on ice at 150)



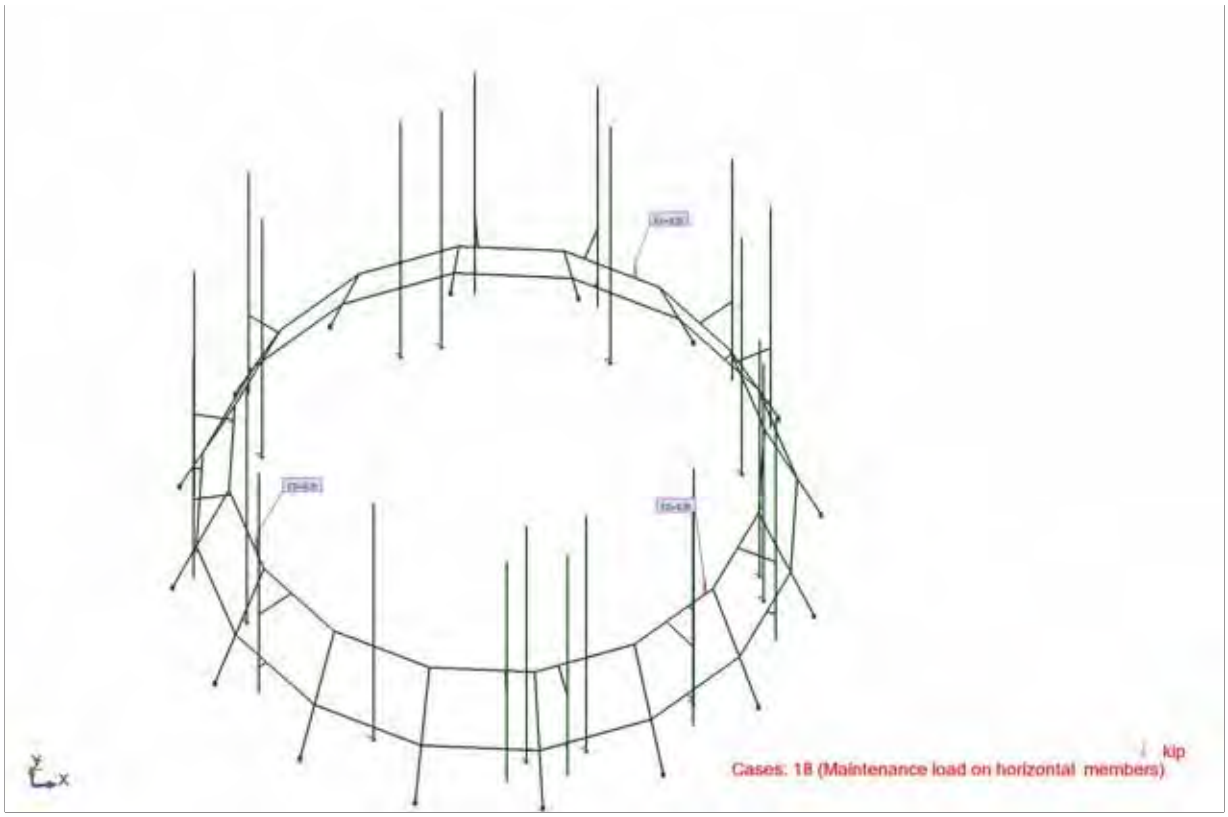
View - Cases: 16 (Wind on ice at 180)



View - Cases: 17 (Maintenance load on mounting pipe)



View - Cases: 18 (Maintenance load on horizontal members)



STEEL STRESS RATIO'S:

2% OVER ACCEPTABLE BY ENGINEERING JUDEMENT

Member	Section	Material	Lay	Laz	Ratio	Case
82 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	47.17	47.17	1.02	30 1.2SW+1.2D-Wm30
85 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	47.42	47.42	0.92	23 1.2SW+1.2D+Wm150
84 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	45.81	45.81	0.89	28 1.2SW+1.2D-Wm90
167 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.89	20 1.2SW+1.2D+Wm60
87 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	47.28	47.28	0.87	19 1.2SW+1.2D+Wm30
80 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	45.08	45.08	0.84	29 1.2SW+1.2D-Wm60
78 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.82	27 1.2SW+1.2D-Wm120
119 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.81	19 1.2SW+1.2D+Wm30
180 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.81	23 1.2SW+1.2D+Wm150
237 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.81	23 1.2SW+1.2D+Wm150
218 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.81	20 1.2SW+1.2D+Wm60
81 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	45.01	45.01	0.73	23 1.2SW+1.2D+Wm150
153 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.60	19 1.2SW+1.2D+Wm30
206 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.51	0.57	28 1.2SW+1.2D-Wm90
246 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	47.25	47.25	0.56	27 1.2SW+1.2D-Wm120
244 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	45.54	45.54	0.55	29 1.2SW+1.2D-Wm60
124 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.55	21 1.2SW+1.2D+Wm90
198 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.54	26 1.2SW+1.2D-Wm150
129 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.52	28 1.2SW+1.2D-Wm90
230 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.52	20 1.2SW+1.2D+Wm60
204 Mid Rail	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.52	20 1.2SW+1.2D+Wm60
210 Mid Rail	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.50	23 1.2SW+1.2D+Wm150
172 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.47	23 1.2SW+1.2D+Wm150
252 Connection	Bar_1"diam solid_Gr.50	STEEL A572-50	42.90	42.90	0.46	19 1.2SW+1.2D+Wm30
107 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.51	236.62	0.46	20 1.2SW+1.2D+Wm60
254 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.45	27 1.2SW+1.2D-Wm120
248 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.45	22 1.2SW+1.2D+Wm120
162 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.51	236.62	0.44	19 1.2SW+1.2D+Wm30
245 MT Post	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.43	19 1.2SW+1.2D+Wm30
105 Mid Rail	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.42	29 1.2SW+1.2D-Wm60
178 Mid Rail	Pipe1-1/2SCH40	STEEL	53.19	53.19	0.41	28 1.2SW+1.2D-Wm90
160 Mid Rail	Pipe1-1/2SCH40	STEEL	53.21	53.21	0.40	29 1.2SW+1.2D-Wm60
76 Mid Rail	Pipe1-1/2SCH40	STEEL	53.21	53.21	0.39	23 1.2SW+1.2D+Wm150
191 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.37	24 1.2SW+1.2D+Wm180
188 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.51	0.36	25 1.2SW+1.2D-Wm180
224 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.51	236.62	0.35	29 1.2SW+1.2D-Wm60
109 Top Rail	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.35	19 1.2SW+1.2D+Wm30
37 Mid Rail	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.35	29 1.2SW+1.2D-Wm60
183 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.35	25 1.2SW+1.2D-Wm180
48 Mid Rail	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.34	26 1.2SW+1.2D-Wm150
116 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.33	28 1.2SW+1.2D-Wm90
202 MT Post	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.32	20 1.2SW+1.2D+Wm60

43 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.19	53.19	0.31	30 1.2SW+1.2D-Wm30
142 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.27	19 1.2SW+1.2D+Wm30
195 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.26	23 1.2SW+1.2D+Wm150
112 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.51	0.23	21 1.2SW+1.2D+Wm90
241 Mid Rail	OK	P 1.875	STEEL A36	24.56	24.56	0.23	24 1.2SW+1.2D+Wm180
156 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.20	24 1.2SW+1.2D+Wm180
73 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.19	20 1.2SW+1.2D+Wm60
221 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.19	23 1.2SW+1.2D+Wm150
176 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.18	23 1.2SW+1.2D+Wm150
186 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.17	25 1.2SW+1.2D-Wm180
89 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.17	22 1.2SW+1.2D+Wm120
71 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.17	20 1.2SW+1.2D+Wm60
139 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.16	27 1.2SW+1.2D-Wm120
233 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.16	20 1.2SW+1.2D+Wm60
158 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.15	20 1.2SW+1.2D+Wm60
214 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.15	26 1.2SW+1.2D-Wm150
134 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.51	0.14	21 1.2SW+1.2D+Wm90
100 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.14	22 1.2SW+1.2D+Wm120
212 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.14	26 1.2SW+1.2D-Wm150
208 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.13	29 1.2SW+1.2D-Wm60
39 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.19	53.19	0.13	29 1.2SW+1.2D-Wm60
240 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	44.60	44.60	0.13	25 1.2SW+1.2D-Wm180
148 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.21	53.21	0.12	28 1.2SW+1.2D-Wm90
200 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.12	28 1.2SW+1.2D-Wm90
170 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	137.29	137.29	0.11	25 1.2SW+1.2D-Wm180
86 Connection	OK	Bar_1"diam solid_Gr.50	STEEL A572-50	44.77	44.77	0.11	25 1.2SW+1.2D-Wm180
132 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.11	28 1.2SW+1.2D-Wm90
228 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.10	41 0.9SW+0.9D-Wm60
150 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.51	236.62	0.10	23 1.2SW+1.2D+Wm150
40 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.10	22 1.2SW+1.2D+Wm120
50 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.21	53.21	0.10	24 1.2SW+1.2D+Wm180
193 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.09	24 1.2SW+1.2D+Wm180
45 Mid Rail	OK	Pipe1-1/2SCH40	STEEL	53.20	53.20	0.09	28 1.2SW+1.2D-Wm90
242 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.09	24 1.2SW+1.2D+Wm180
137 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.08	31 0.9SW+0.9D+Wm30
235 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.08	27 1.2SW+1.2D-Wm120
146 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.08	30 1.2SW+1.2D-Wm30
6 Top Rail	!	FBFB 7.025x6.01875x9	STEEL A36	15.50	236.54	0.07	27 1.2SW+1.2D-Wm120
122 Legs	OK	HSS2X2X.250	STEEL A500-46	63.90	63.90	0.06	22 1.2SW+1.2D+Wm120
90 Connection	OK	Bar_1"diam solid_Gr.50	STEEL A572-50	46.30	46.30	0.05	45 1.2SW+1.2D+lm+la+Wi90
103 Connection	OK	Bar_1"diam solid_Gr.50	STEEL A572-50	42.44	42.44	0.04	50 1.2SW+1.2D+lm+la-Wi150
164 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.03	45 1.2SW+1.2D+lm+la+Wi90
126 MT Post	OK	Pipe2STD	STEEL A53 Gr.B	130.10	130.10	0.03	46 1.2SW+1.2D+lm+la+Wi120