Wastewater Treatment
Facility Plan
Larsen Winchester Sanitary District
Winnebago County, Wisconsin
December 2021

For:
Larsen Winchester
Sanitary District
Larsen, WI 54947

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TABLE OF CONTENTS

Wastewater Treatment Facility Plan
Larsen Winchester Sanitary District
Winnebago County, Wisconsin

Executive Summary

EXECUTIVE SUMMARY

A. GENERAL

The Larsen Winchester Sanitary District currently serves the unincorporated communities of Larsen within the Town of Clayton, and Winchester in the Town of Winchester in Winnebago County, Wisconsin. The District owns and operates a controlled discharge stabilization lagoon system wastewater treatment facility constructed in the late 1970's. The wastewater treatment facility currently operates under the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0031925-06-0 from the Wisconsin Department of Natural Resources (WDNR), which became effective on October 1, 2017 and expires on September 30, 2022. The next WPDES permit to be issued will include ammonia nitrogen and phosphorus effluent limits that the existing Larsen Winchester Wastewater Treatment Facility will be unable to meet on a consistent basis. In addition, the existing facility will be unable to accommodate wastewater flows generated by growth within the District.

The Larsen Winchester Sanitary District wastewater treatment facility was designed to treat an average daily flow of 48,300 gallons per day (gpd). Average daily flow to the plant from 2016 through 2020 was 47,400 gallons per day, and the plant currently serves approximately 310 users.

The WPDES permit includes a compliance schedule with future phosphorus effluent limits becoming effective in October of 2026. In lieu of submitting the Final Compliance Alternatives Plan by the WPDES permit due date of September 30 of 2021, WDNR encouraged the District to submit a Wastewater Treatment Facility Plan. The Plan will provide the necessary information regarding the Sanitary District's Wastewater Treatment Facility so they can establish priorities, plan, fund and implement required future wastewater treatment facility improvements to meet the new WPDES effluent limits.

B. DESIGN PARAMETERS

In accordance with Wisconsin Administrative Code Guidelines, the planning period for this study is 20 years and the design year is 2045.

Projected population, wastewater flow and wastewater loadings presented in the study for the design year 2045 are as follows. The design flows and loadings include projected growth within the existing District service area and commercial growth and residential connections in the vicinity of the USH 45 and CTH II interchange.

Design Year 2045 Projections

Average Daily Wastewater Flow	119,000 gallons per day
CBOD5 Wastewater Loading	332 pounds per day
TSS Wastewater Loading	390 pounds per day
NH3-N Wastewater Loading	59 pounds per day
Total P	8 pounds per day

C. METHODS CONSIDERED

A number of facility planning alternatives were considered and discussed in the study, including the following:

- Regionalization
- WWTP Upgrade with Controlled Discharge
- WWTP Upgrade with Continuous Discharge
- WWTP Upgrade with Alternate Outfall Location
- Subsurface Discharge
- Adaptive Management
- Water Quality Trading
- Phosphorus Variances

Many of these alternatives are determined to be not practical or cost-effective and are not considered further. Four alternatives are analyzed in greater detail including Regionalization with the Fox West WWTP and three alternatives to upgrade the existing wastewater treatment facility with a continuous discharge system. A mechanical wastewater treatment plant, a LemTec system and modifications of the existing lagoon system were considered for the plant upgrade.

Capital construction costs, operation and maintenance costs, advantages and disadvantages are provided for each alternative. To determine the cost effectiveness of the alternatives, equivalent annual costs are calculated. The interest rate and time period utilized in the cost effectiveness analysis is 3.125 percent and 20 years.

Results of the cost-effective analysis are as shown below.

Cost Summary for Facility Planning Alternatives – Total Annual Cost

Alternative	Alternative No. 1 Regionalization Fox West WWTP	Alternative No. 2 Mechanical WWTP	Alternative No. 3 LemTec WWTP	Alternative No. 4 Pond Modifications
Capital Cost	$8,707,017	$8,380,371	$6,074,529	$6,092,469
Equivalent Annual Cost	$592,077	$569,865	$413,068	$414,288
Additional OM&R Cost	$257,000	$258,500	$216,000	$218,500
Total Annual Cost	**$849,077**	**$828,365**	**$629,068**	**$632,788**

D. CONCLUSIONS

Based on results of the cost-effective analysis, Alternative No.3 proposing construction of a LemTec system provides the most cost-effective and reliable means for Larsen Winchester Sanitary District to meet proposed WPDES effluent limits.

A chemical feed system is recommended to be installed to optimize phosphorus removal. It is also recommended the District apply for a Multi-Discharger Variance (MDV) to extend the timeline for compliance with low-level phosphorus limits, so an additional phosphorus tertiary treatment process would not be needed at this time.

To adequately assess the needs and desires of the community, public comments must be received. A public hearing should be held to discuss the contents of this Wastewater Treatment Facility Plan.

In order to make the wastewater improvements affordable for the citizens within the study area, some form of financial assistance program or method of financing the improvements will be necessary. A few of the options available are discussed in the study, including available debt options, Community Development Block Grant funds, the Clean Water Fund Program, and USDA Rural Development funds. Funding improvements through the WDNR Clean Water Fund Program appears to be the best funding alternative.

The District is required to meet new effluent limits by October of 2026.

In order to meet the current WPDES schedule summarized above, and to apply for WDNR Clean Water Funds (CWF SFY 2024), the following schedule is proposed:

- January 2022: Submit Facility Plan to WNDR
- October 2022: Submit Intent to Apply for WDNR Clean Water Funds SFY 2024
- September 2023: Submit Plans and Specifications to WDNR for Review
- September 2023: Submit CWF Application for WDNR Clean Water Funds SFY 2024.
- 2024: Bidding and Commence Construction
- October 2026: Compliance with WPDES Phosphorus Effluent Limits

A proposed fast track schedule would be as follows:

- October 2021: Submit Intent to Apply for WDNR Clean Water Funds SFY 2023 This task is complete.
- January 2022: Submit Facility Plan to WNDR
- September 2022: Submit Plans and Specifications to WDNR for Review
- September 2022: Submit CWF Application for WDNR Clean Water Funds SFY 2023.
- 2023: Bidding and Commence Construction
- October 2026: Compliance with WPDES Phosphorus Effluent Limits

Wisconsin Department of Natural Resources has confirmed the Wisconsin State Revolving Fund programs (including the Clean Water Fund) will receive federal funds from the recently adopted Federal Infrastructure Bill. The revolving programs will be receiving significant additional funding over the next five years, and a large percentage of this funding will become principal forgiveness (grant) funds. WDNR has not finalized plans as to how the additional principal forgiveness will be allocated, but the agency verified the additional funding should be available for SFY 2023 projects.

SECTION 1

Introduction

SECTION 1

INTRODUCTION

A. PURPOSE

The Larsen Winchester Sanitary District encompasses approximately 480 acres of land within the Town of Winchester and approximately 155 acres of land within the Town of Clayton in the north part of Winnebago County, Wisconsin.

The Larsen Winchester Sanitary District wastewater treatment facility operates under a Wisconsin Pollutant Discharge Elimination System (WPDES) Permit from the Wisconsin Department of Natural Resources (WDNR) that became effective in October of 2017 and will expire in September of 2022. The future WPDES permit is expected to include ammonia nitrogen and phosphorus effluent limits which the existing Larsen Winchester Wastewater Treatment Facility will be unable to meet on a consistent basis. The permit also includes a schedule of proposed steps needed to plan for and implement wastewater treatment facility improvements to meet the phosphorus effluent limits.

The purpose of the Wastewater Treatment Facility Plan is to provide the Larsen Winchester Sanitary District with necessary information regarding the District's Wastewater Treatment Facility to allow them to establish priorities, plan, fund and implement required future wastewater treatment facility improvements to meet WPDES limits. The plan is prepared in accordance with Wisconsin Administrative Code Section NR 110 governing wastewater treatment facility planning. After the Sanitary District has reviewed and approved this report, a copy of the report will be submitted to the Wisconsin Department of Natural Resources for review and approval. The District must conduct at least one public hearing prior to submittal to WDNR for review.

B. REPORT ORGANIZATION

To adequately meet the purpose of this study described above, the report is organized into ten sections. A description of the existing facilities is provided in Section 2. Section 3 presents the design considerations and parameters used in the evaluation. Section 4 includes a description of wastewater treatment alternatives. Regionalization alternatives and wastewater treatment alternatives are discussed further in Sections 5 and 6. A cost analysis is provided in Section 7. Section 8 discusses Environmental Considerations. Section 9 includes information on funding options. Section 10 presents recommendations and an implementation plan.

SECTION 2

Existing Facilities

SECTION 2

EXISTING FACILITIES

A. GENERAL

The Larsen Winchester Sanitary District (LWSD) currently serves the unincorporated communities of Larsen within the Town of Clayton, and Winchester in the Town of Winchester in Winnebago County, Wisconsin. The District collects wastewater from approximately 310 users, and transports it to its wastewater treatment facility through a collection system comprised of 8-inch sanitary sewers constructed primarily in the late 1970's. The predominant land use within the communities of Larsen and Winchester is single family residential homes.

B. EXISTING WASTEWATER COLLECTION SYSTEM

The Larsen Winchester Sanitary Sewer System includes a total of approximately 4.65 miles (24,533 linear feet) of PVC 8-inch gravity sanitary sewer. The system also includes five (5) lift stations, 2.12 miles (11,232 linear feet) of 4-inch PVC forcemain and 0.76 miles (4,028 linear feet) of 6-inch PVC forcemain. System mapping is included in Appendix A.

Each of the five lift stations has two submersible pumps inside a 5-foot diameter lift station, and a separate 5-foot diameter valve vault/emergency pump manhole. The lift stations were originally designed in the late 1970's. Table 2.1 below includes information for each of the stations, as originally designed.

Table 2.1 Larsen Winchester Sanitary District Lift Station Information

Lift Station No.	Location	Design Pumping Rate Each Pump gpm	Total Dynamic Head Feet	Depth of Lift Station Feet	Emergency Generator On-Site	Controls	Forcemain
L.S. 1	CTH II east (Tele. Co.) Winchester	200	48	22.0	Yes	Floats	4,028' 6" FM
L.S. 2	CTH II west Winchester	80	23	11.3	No	Floats	570' 4" FM
L.S. 3	Ann Street Winchester	80	46	14.8	No	Floats	1,540' 4" FM
L.S. 4	Pine Drive Winchester	80	91	13.2	Yes	Floats	1,860' 4" FM
L.S. 5	CTH T Larsen	80	84	18.0	Yes	Floats	7,262' 4" FM

Loss of power, provided by Wisconsin Public Service, is generally not a problem within the Larsen Winchester Sanitary District service area. Three of the five lift stations have emergency generators. The District also owns a portable pump that can be connected in the emergency pump manhole at each station. Three of the stations have automatic dialers which call up to eight different numbers during alarm conditions. Each of the five stations has alarm lights.

The District's sanitary sewer responsibility ends at the property line. Customers are responsible for the sanitary sewer lateral, between the property line and the home or business.

C. EXISTING WASTEWATER TREATMENT FACILITY

The District owns and operates a controlled discharge stabilization lagoon system wastewater treatment facility located in the SW ¼ of Section 19, T20N, R16E, south of Grandview Road between Winchester and Larsen. The facility, constructed in the late 1970's, is designed to treat an average daily flow of 48,300 gallons per day. Influent flows to the plant from 2016 through 2020 average 47,400 gallons per day. The plant currently operates under the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0031925-06-0 which expires on September 30, 2022.

The lagoon system consists of primary and secondary cells with a total design volume of approximately 17 million gallons. Additional information on the lagoon cells is shown below:

Primary Lagoon Cell:

- Total Depth = 8 feet, 3 feet freeboard, 5 feet water depth
- Water Volume at Full Depth = 6.76 MG
- Water Volume with 2 feet of Sludge Storage = 4.06 MG
- Detention Time Total = 143 days at Existing Average Daily Flow
- Detention Time with 2 feet of Sludge Storage = 86 days at Current Average Daily Flow

Secondary Lagoon Cell:

- Total Depth = 9 feet, 3 feet freeboard, 6 feet water depth
- Water Volume at Full Depth = 10.31 MG
- Water Volume with 2 feet of Sludge Storage = 6.87 MG
- Detention Time Total = 218 days at Existing Average Daily Flow
- Detention Time with 2 feet of Sludge Storage = 145 days at Current Average Daily Flow

Effluent is discharged from the secondary cell to a tributary of the Arrowhead River on a semi-annual basis, typically for two weeks in November and May of each year. The discharge flow rate is limited by the WPDES permit to a daily maximum of 1.186 MGD, with an average daily discharge of 0.685 MGD. Appendix A includes original plan sheets for the lagoon system.

Customers are billed based on water usage measured by water meters installed in approximately 2008. Solar operated mixing devices were installed in the lagoon system in 2013 to increase the dissolved oxygen level. A baffle system was added to improve treatment and address rag issues in 2014.

D. EXISTING WASTEWATER FLOW DATA

Tables 2.2 and 2.3 below show the average monthly influent flow, and the maximum daily flow observed at the Larsen Winchester Sanitary District Wastewater Treatment Facility from 2016 through 2020. Tables 2.4 and 2.5 summarize peak factors for these same years.

Table 2.2 Average Influent Wastewater Flow 2016 Through 2020

Month	Monthly Average Influent Flow Year 2016 MGD	Monthly Average Influent Flow Year 2017 MGD	Monthly Average Influent Flow Year 2018 MGD	Monthly Average Influent Flow Year 2019 MGD	Monthly Average Influent Flow Year 2020 MGD
January	0.0658	0.0462	0.0359	0.0449	0.0506
February	0.0477	0.0501	0.0324	0.0266	0.0367
March	**0.0779**	0.0638	0.0314	0.0646	**0.0793**
April	0.0712	**0.0660**	0.0476	**0.0812**	0.0600
May	0.0477	0.0603	**0.0740**	0.0617	0.0436
June	0.0613	0.0400	0.0352	0.0503	0.0485
July	0.0493	0.0345	0.0307	0.0444	0.0299
August	0.0519	0.0274	0.0302	0.0292	0.0232
September	0.0580	0.0273	0.0644	0.0439	0.0255
October	0.0412	0.0327	0.0654	0.0511	0.0287
November	0.0488	0.0375	0.0580	0.0528	0.0269
December	0.0471	0.0358	0.0495	0.0663	0.0289
Average MGD	**0.0557**	**0.0435**	**0.0462**	**0.0514**	**0.0402**
Overall Average MGD	**0.0474**				

Table 2.3 Maximum Day Influent Wastewater Flow 2016 Through 2020

Month	Daily Maximum Influent Flow Year 2016 MGD	Daily Maximum Influent Flow Year 2017 MGD	Daily Maximum Influent Flow Year 2018 MGD	Daily Maximum Influent Flow Year 2019 MGD	Daily Maximum Influent Flow Year 2020 MGD
January	**0.0950**	0.0593	0.0464	0.0649	0.0696
February	0.0566	0.0624	0.0383	0.0289	0.0418
March	0.0914	0.0712	0.0383	0.1022	**0.1277**
April	0.0712	**0.0946**	0.0742	0.1022	**0.1277**
May	0.0477	**0.0946**	**0.1148**	0.0825	0.0784
June	0.0652	0.0440	0.0420	0.0760	0.0784
July	0.0601	0.0402	0.0317	0.0760	0.0476
August	0.0666	0.0325	0.0487	0.0347	0.0255
September	0.0947	0.0285	0.0895	0.0627	0.0354
October	0.0490	0.0365	0.0780	0.0627	0.0424
November	0.0561	0.0507	0.0656	**0.1088**	0.0424
December	0.0510	0.0507	0.0559	**0.1088**	0.0440

Table 2.4 Maximum Day Peak Factors

	Influent Flow Year 2016 MGD	Influent Flow Year 2017 MGD	Influent Flow Year 2018 MGD	Influent Flow Year 2019 MGD	Influent Flow Year 2020 MGD
Average Influent Flow MGD	0.0557	0.0435	0.0462	0.0514	0.0402
Max Day Flow MGD	0.0950	0.0946	0.1148	0.1088	0.1277
Peak Ratio	1.7	2.2	2.5	2.1	3.2
Average			**2.3**		

Table 2.5 Maximum Month Peak Factors

	Influent Flow Year 2016 MGD	Influent Flow Year 2017 MGD	Influent Flow Year 2018 MGD	Influent Flow Year 2019 MGD	Influent Flow Year 2020 MGD
Average Influent Flow MGD	0.0557	0.0435	0.0462	0.0514	0.0402
Max Month Flow MGD	0.0779	0.0660	0.0740	0.0812	0.0793
Peak Ratio	1.4	1.5	1.6	1.6	2.0
Average			**1.6**		

E. INFILTRATION AND INFLOW ANALYSIS

An infiltration/Inflow (I/I) Analysis is a necessary part of Facility Planning, as required by Wisconsin Administrative Code NR 110. The analysis determines if excess clearwater infiltration and inflow enters the sanitary sewer collection system.

Infiltration is defined as water other than wastewater entering a sewerage system from the ground through such sources as defective pipes, pipe joints, connections and manholes.

Inflow is water other than wastewater entering a sewerage system from sources such as roof leaders, cellar drains, yard drains, area drains, foundation drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash water, or drainage.

If I/I is considered to be excessive, WDNR may require a Sewer System Evaluation Survey (SSES) be conducted to identify the source of infiltration and inflow into the system. If I/I is demonstrated to be below certain threshold levels, the WDNR will consider the I/I to be non-excessive and separate I/I or SSES studies will not be required.

The infiltration threshold criterion is a dry weather flow less than or equal to 120 gallons per capita per day (gpcd). Dry weather flow is defined as the highest base flow plus infiltration occurring for a seven to 14-day dry weather period during a year. Table 2.6 below shows the average monthly influent wastewater flows and corresponding per capita flows from 2016 through 2020. Note that per capita flows are based on the estimated current population of 777 people. Average per capita flows range from 42 gpcd in August, to 84 gpcd in April, which is significantly less than the threshold of 120 gpcd noted above. This data indicates infiltration into the Larsen Winchester sanitary sewer system is non-excessive.

Table 2.6 Average Influent Wastewater Flows 2016 Through 2020

Month	Monthly Average Influent Flow MGD	Average Influent Flow Per Capita gpcd
January	0.0487	63
February	0.0387	50
March	0.0634	82
April	0.0652	84
May	0.0575	74
June	0.0471	61
July	0.0378	49
August	0.0324	42
September	0.0438	56
October	0.0438	56
November	0.0448	58
December	0.0455	59
Average	**0.0474**	**61**

The inflow threshold criterion requires the maximum daily flow during a storm be less than or equal to 275 gallons per capita per day (gpcd). Table 2.7 below shows the maximum daily flow each year from 2016 through 2020, along with the corresponding per capita flows. Per capita flows are based on the estimated current population of 777 people. Per capita maximum daily flows range from 121 in 2017 to 164 in 2020, which is significantly less than the threshold of 275 gpcd noted above. Based on this data, inflow into the Larsen Winchester sanitary sewer system is non-excessive.

Table 2.7 Maximum Daily Wastewater Flows 2016 Through 2020

Year	Maximum Daily Influent Flow MGD	Maximum Daily Influent Flow gpcd
2016	0.0950	122
2017	0.0946	121
2018	0.1148	148
2019	0.1088	140
2020	0.1277	164
Average	**0.1082**	**139**

The Larsen Winchester Sanitary District cleans, televises, and performs manhole inspections on 20% of their sewer system each year in accordance with the current Capacity, Management, Operations and Maintenance Plan to identify sources of I/I and make repairs.

F. EXISTING WASTEWATER SAMPLING AND EFFLUENT LIMITS

A copy of the current WPDES permit for the Larsen Winchester Wastewater Treatment Facility is included as Appendix B to this report. The permit includes effluent limits for BOD5, total suspended solids, dissolved oxygen, pH, fecal coliform, chloride, total phosphorus and total ammonia nitrogen as shown in Table 2.8 below.

Table 2.8 Existing WPDES Wastewater Effluent Limits

Parameter	Limit Type	Limit and Units
Flow Rate	Daily Max	1.186 MGD
Total BOD5	Weekly Average	45 mg/L
	Monthly Average	30 mg/L
Total Suspended Solids	Monthly Average	60 mg/L
Dissolved Oxygen	Daily Minimum	4.0 mg/L
pH Field	Daily Minimum	6.0 su
	Daily Maximum	9.0 su
Fecal Coliform		#/100 mL
Chloride Interim Limit	Weekly Average	570 mg/L
Total Phosphorus Interim Limit	Monthly Average	5.4 mg/L
Total Ammonia Nitrogen NH3-N	Daily Maximum	Limits Vary Depending on pH of Effluent
	Weekly Average	31 mg/L October-March 5.6 mg/L April-May 6.4 mg/L June-September
	Monthly Average	12 mg/L October-March 2.2 mg/L April-May 2.5 mg/L June-September

The current WPDES permit requires sampling and testing as summarized in Table 2.9.

Table 2.9 Existing WPDES Monitoring Requirements

Parameter	Sampling Point	Sample Frequency
Flow Rate	Influent	Daily
Total BOD5	Influent	2 per month
Total Suspended Solids	Influent	2 per month
Flow Rate	Effluent	Daily
Total BOD5	Effluent	3 per week
Total Suspended Solids	Effluent	3 per week
Dissolved Oxygen	Effluent	3 per week
pH Field	Effluent	Daily
Fecal Coliform		2 per discharge
Chloride	Effluent	2 per discharge
Total Phosphorus	Effluent	2 per discharge
Total Ammonia Nitrogen (NH3-N) Total	Effluent	2 per discharge

G. EXISTING WASTEWATER EFFLUENT DATA

Tables 2.10, 2.11 and 2.12 summarize effluent data collected from 2016 through 2020.

Table 2.10 Effluent BOD and TSS Data 2016 Through 2020

		Effluent BOD				Effluent TSS	
		Weekly	Weekly	Monthly	Monthly	Monthly	Monthly
Year	Discharge	Average	Permit Limit	Average	Permit Limit	Average	Permit Limit
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2016	Spring	17	45	17	30	23	60
	Fall	18	45	17	30	32	60
	Average	18		17		28	
2017	Spring	19	45	14	30	22	60
	Fall	18	45	15	30	62	60
	Average	19		15		42	
2018	Spring	20	45	32	30	135	60
	Fall	16	45	14	30	43	60
	Average	18		23		89	
2019	Spring	42	45	36	30	33	60
	Fall	5	45	4	30	7	60
	Average	24		20		20	
2020	Spring	5	45	9	30	19	60
	Fall	3	45	3	30	5	60
	Average	4		6		12	
Overall Averages		16		16		38	

(Shaded box) Indicates Exceedance of WPDES Permit Effluent Limit

Table 2.11 Effluent Chloride and Phosphorus Data 2016 Through 2020

		Effluent Chloride		Effluent Phosphorus	
		Weekly	Weekly	Monthly	Monthly
Year	Discharge	Average	Permit Limit	Average	Permit Limit
		mg/L	mg/L	mg/L	mg/L
2016	Spring	432	570	2.7	5.4
	Fall	458	570	2.5	5.4
	Average	445		2.6	
2017	Spring	457	570	4.3	5.4
	Fall	511	570	1.4	5.4
	Average	484		2.9	
2018	Spring	532	570	5.2	5.4
	Fall	439	570	2.5	5.4
	Average	486		3.9	
2019	Spring	376	570	2.9	5.4
	Fall	343	570	1.8	5.4
	Average	360		2.4	
2020	Spring	321	570	2.9	5.4
	Fall	389	570	1.2	5.4
	Average	355		2.1	
Overall Averages		426		2.7	

Table 2.12 Effluent Ammonia Nitrogen Data 2016 Through 2020

Year	Discharge	Weekly Average mg/L	Weekly Permit Limit mg/L	Monthly Average mg/L	Monthly Permit Limit mg/L	Daily Max mg/L	Daily Max Permit Limit mg/L
		Effluent Ammonia Nitrogen					
2016	Spring	7.3	5.6	13.6	2.2	7.3	9.9
	Fall	2.0	31.0	2.0	12.0	2.8	21.0
	Average	4.7		7.8		5.1	
2017	Spring	17.0	5.6	17.0	2.2	17.0	21.0
	Fall	6.9	31.0	5.7	12.0	6.9	18.0
	Average	12.0		11.4		12.0	
2018	Spring	12.5	5.6	12.5	2.2	15.0	21.0
	Fall	4.0	31.0	3.6	12.0	4.0	4.1
	Average	8.3		8.1		9.5	
2019	Spring	6.3	5.6	5.5	2.2	7.7	21.0
	Fall	7.3	31.0	9.3	12.0	9.4	21.0
	Average	6.8		7.4		8.6	
2020	Spring	6.2	5.6	6.2	2.2	6.2	9.9
	Fall	7.2	31.0	6.9	12.0	7.2	21.0
	Average	6.7		6.6		6.7	
Spring Averages		**9.9**	5.6	**11.0**	2.2		
Fall Averages		**5.5**	31.0	**5.5**	12.0		
Overall Averages		**7.7**		**8.2**		8.4	

[shaded box] Indicates Exceedance of WPDES Permit Effluent Limit

H. SUMMARY OF EFFLUENT LIMIT EXCEEDANCES

Note the following regarding exceedances to current WPDES effluent limits in the five-year period between the years of 2016 and 2020:

- Effluent BOD and TSS levels each exceeded WPDES limits twice.
- Effluent Chloride and Phosphorus did not exceed the interim limits.
- Effluent Ammonia Nitrogen consistently exceeded the weekly average and the monthly average limits in the spring (May discharge) of each year from 2016 through 2020.

SECTION 3

Design Considerations and Parameters

SECTION 3

DESIGN CONSIDERATIONS AND PARAMETERS

A. PLANNING PERIOD

It is generally not feasible to make numerous changes in the capacity of wastewater treatment facilities. Therefore, in accordance with Wisconsin Administrative Code Section 110, a wastewater treatment facility is typically designed to handle projected flows and loadings 20 years into the future. The design year for this study will be 2045 with proposed improvements to be constructed by 2025, as set forth in the schedule provided in WPDES Permit No. WI-0031925-06-0.

B. WASTEWATER FLOW PROJECTIONS

The Larsen Winchester Sanitary District currently serves 308 customers, 299 of which are residential. Larsen Winchester Sanitary District Boundaries and East Central Wisconsin Regional Planning Commission Sewer Service Area and Planning Area boundaries are shown in Appendix C.

The District recognizes that beyond growth expected to occur within their existing service area, there is a need for sewer service in the vicinity of the USH 45 and CTH II interchange within the Town of Winchester. Serving this area will require construction of a new lift station near the interchange. The proposed lift station will transfer wastewater through a forcemain to the existing Larsen Winchester sanitary sewer system near the intersection of CTH II and Steeple Hill Drive.

Facility planning wastewater flow projections for year 2045 are therefore based on three potential growth factors:

1. Population growth within the existing Larsen Winchester Sanitary District service area.
2. Commercial growth in the vicinity of the USH 45 and CTH II interchange
3. Existing residential development in the vicinity of the USH 45 and CTH II interchange expected to connect onto the new system served by new lift station.

Population projections and estimates for growth have been developed in conjunction with East Central Regional Planning Commission (ECWRPC). The growth areas near the USH 45 and CTH II interchange expected to develop prior to year 2045 are shown in Appendix D.

Parameters used to project wastewater flows are summarized in Tables 3.1, 3.2 and 3.3 below. A summary of projected wastewater flows for Design Year 2045 are summarized in Table 3.4.

Proposed lift stations and forcemains for the regionalization alternative to be discussed later in this study will be designed for a 40-year planning period, with a Design Year of 2065. Table 3.5 below summarizes design wastewater flows for Year 2065.

A spreadsheet of wastewater flow calculations for Years 2045 and 2065 is included in Appendix E.

Table 3.1 Parameters for Population Growth Within Existing Larsen Winchester Sanitary District

Parameters	Value
Number of Current Residential Customers, year 2020	299 residential customers
Persons Per Household - Based on U.S. Census Data and ECWRPC	2.6 persons per household
Estimated Current 2020 Population within LWSD	777 people = 299 residential cust. x 2.6 pple/household
Estimated Additional Homes within LWSD Boundary During Study Period	25 additional homes
Estimated Population Growth During Study Period	65 people = 25 additional homes x 2.6 pple/household
2045 Population Projection for Facility Planning	842 people = 777 people + 65 people
Current and Proposed Gallons Per Capita Per Day Average Daily Wastewater Flow	61 GPCD

Table 3.2 Parameters for Commercial Growth near the USH 45 and CTH II Interchange See Appendix D for Location of Growth Areas 1, 2 and 3

Parameters	Value
Potential Commercial Acres within Growth Areas 1, 2 and 3	133 Acres
Proposed Commercial Development within Growth Areas 1, 2, and 3	66.5 Acres 50% of Acreage Expected to Develop prior to Year 2045
Wastewater Generated	1000 gallons per acre per day

Table 3.3 Parameters for Existing Residential Development near the USH 45 and CTH II Interchange – See Appendix D for Location of Growth Areas 1, 2 and 3

Parameters	Value
Existing Residences within Growth Areas 1, 2 and 3	14 homes
Projected Residential Hook-ups to Proposed Lift Station Near USH 45/CTH II interchange – 50%	7 homes
Persons Per Household - Based on U.S. Census Data and ECWRPC	2.6 persons per household
2045 Population Projection for Facility Planning	18 people = 7 additional homes x 2.6 pple/household
Proposed Gallons Per Capita Per Day Average Daily Wastewater Flow	61 GPCD

Table 3.4 Total Proposed Wastewater Flows Design Year 2045

Average Daily Design Flow	Maximum Month Design Flow Peak Factor 1.6	Maximum Daily Design Flow Peak Factor 2.3	Maximum Hour Design Flow Peak Factor 4.0
0.1190 MGD	0.1904 MGD	0.2736 MGD	0.4759 MGD
83 gpm	132 gpm	190 gpm	330 gpm

Table 3.5 Total Proposed Wastewater Flows Design Year 2065 (Lift Station Design)

Average Daily Design Flow	Maximum Month Design Flow Peak Factor 1.6	Maximum Daily Design Flow Peak Factor 2.3	Maximum Hour Design Flow Peak Factor 4.0
0.1661 MGD	0.2658 MGD	0.3821 MGD	0.6646 MGD
115 gpm	185 gpm	265 gpm	462 gpm

C. WASTEWATER LOADING PROJECTIONS

Table 3.6 below summarizes estimated projected wastewater loadings for the Larsen Winchester Sanitary District for 2045 to be used for facility planning. Based on the Average Daily Design Flow shown in Table 3.4 above, and the 61-gallon per capita per day usage noted in Tables 3.1 and 3.3, the estimated equivalent population for Design Year 2045 is 1,950 people (119,000 gpd/61 gpcd). Design loadings shown below are based on WI Admin. Code NR 110.15(4)(b)(2) and standard practice.

Table 3.6 Wastewater Loading Projections for Design Year 2045 Based on NR 110

Parameter	Loading Parameter lb./capita/day	Design Loadings Year 2045 Pounds per Day
CBOD5	0.17	332
TSS	0.20	390
NH3-N	0.03	59
Total P	8 mg/L	8

Existing data for LWSD from 2016 through 2020 shows per capita loadings for both BOD5 and TSS to be 0.08 lb./capita/day. Design loadings of 0.10 lb./capita/day are used to calculate the loadings shown in Table 3.7 below for BOD and TSS to be conservative. Existing data is not available for influent NH3-N and Total P for LWSD.

Table 3.7 Wastewater Loading Projections for Design Year 2045 Based on Existing Data

Parameter	Loading Parameter lb./capita/day	Design Loadings Year 2045 Pounds per Day
CBOD5	0.10	195
TSS	0.10	195

D. WASTEWATER EFFLUENT LIMITS

Table 3.7 below summarizes the effluent limits provided by WDNR and expected to be included in a future WPDES permit to be issued to Larsen Winchester Sanitary District Wastewater Treatment facility. The complete memo from WDNR with proposed effluent limits is included in Appendix F.

WDNR provided proposed effluent limits for four different scenarios, including:

1. Controlled Discharge to the Current Discharge Location (unnamed tributary to the Arrowhead River).
2. Continuous Discharge to the Current Discharge Location (unnamed tributary to the Arrowhead River).
3. Controlled Discharge to the Arrowhead River (Approximately 1/3 mile downstream of existing discharge).
4. Continuous Discharge to the Arrowhead River (Approximately 1/3 mile downstream of existing discharge).

The proposed effluent limits for discharge at the Arrowhead River are at least as stringent or more stringent than at the current discharge location. There is no benefit to changing the discharge location to the Arrowhead River. Table 3.7 below summarized the proposed effluent limits for Scenarios 1 and 2 above, as compared to existing limits.

Table 3.8 WPDES Permit Wastewater Effluent Limits

			Existing Limits	Proposed Limits	
Parameter	**Units**		**Controlled Discharge**	**Controlled Discharge**	**Continuous Discharge**
Flow Rate	Daily Max	MGD	1.186	1.186	
BOD5	Weekly Avg.	mg/L	45	45	30
	Monthly Avg.	mg/L	30	30	20
TSS	Weekly Avg.	mg/L			30
	Monthly Avg.	mg/L	60	60	20
TSS – TMDL Based	Weekly Avg.	lbs/day			16.6
	Monthly Avg.	lbs/day			11.8
	Annual Avg.	lbs/year		2,940	
Dissolved Oxygen	Daily Min.	mg/L	4.0	4.0	4.0
pH	Daily Max.	s.u.	9.0	9.0	9.0
	Daily Min.	s.u.	6.0	6.0	6.0
Fecal Coliform					
May - September		#/100 mL	Monitor Only	Monitor Only	*Disinfection Required. See Below.
Chloride - Interim	Weekly Avg.	mg/L	570	500	500
Phosphorus - Interim	Monthly Avg.	mg/L	5.4	4.7	4.7
Phosphorus TMDL	Monthly Avg.		0.0225 mg/L		0.267 lbs/day
	6-Mo. Avg.		0.075 mg/L		0.089 lbs/day
	Annual Avg.			25 lbs/year	
Ammonia Nitrogen					
April - May	Weekly Avg.	mg/L	5.6	6.9	5.6
June - September	Weekly Avg.	mg/L	6.4	5.4	6.4
October - March	Weekly Avg.	mg/L	31	9.3	9.9
April - May	Monthly Avg.	mg/L	2.2	3.7	2.2
June - September	Monthly Avg.	mg/L	2.5	3.4	2.5
October - March	Monthly Avg.	mg/L	12	4.3	5.4
Daily Limits	pH Based	mg/L	See Table 3.8 Below		
Nitrite + Nitrate	Monitor Only				
Nitrogen, TK	Monitor Only				
Total Nitrogen	Monitor Only				

* No more than 10% of E. Coli bacteria samples collected in any calendar month may exceed 410 count/100 mL. Interim Limit Fecal Coliform 400 #/100 mL geometric mean. Final Limit E. Coli 126 #/100 mL geometric mean.

Table 3.9 WPDES Permit Wastewater Daily Ammonia Effluent Limits

	Current	Proposed
pH	Limits	Limits
6.0-6.1		83
6.1-6.2		82
6.2-6.3		80
6.3-6.4		78
6.4-6.5		75
6.5-6.6		72
6.6-6.7		69
6.7-6.8		65
6.8-6.9		60
6.9-7.0		56
7.0-7.1		51
7.1-7.2		46
7.2-7.3		40
7.3-7.4		35
7.4-7.5		31
7.5-7.6		26
7.6-7.7		22
7.7-7.8		19
7.8-7.9		16
7.9-8.0		13
8.0-8.1	21.0	11
8.1-8.2	18.0	8.8
8.2-8.3	15.0	7.3
8.3-8.4	12.0	6.0
8.4-8.5	9.9	5.0
8.5-8.6	8.2	4.1
8.6-8.7	6.8	3.4
8.7-8.8	5.7	2.8
8.8-8.9	4.8	2.4
8.9-9.0	4.1	2.0

Ammonia in water exists in two forms, the ammonium ion (NH4+), and the unionized ammonia (NH3). At a high pH, most of the ammonia in solution is in the unionized form (NH3), whereas at a low pH, the ammonia is mostly in the ionic form (NH4+). The unionized form (NH3) is most toxic to the aquatic organisms in the receiving body of water, and therefore, the daily maximum effluent permit limits issued by WDNR for ammonia are more stringent when the effluent pH is higher.

E. COMPLIANCE SCHEDULE

WDNR has indicated that the limits shown in Tables 3.7 and 3.8 would become effective when the new permit is issued in September of 2022.

The permit is expected to include a compliance schedule as shown in Table 3.10 below.

Table 3.10 Effluent Limit Compliance Schedule

Summary of Reports Due	Date
Progress Report on Plans and Specifications	September 30, 2022
Final Plans and Specifications	September 30, 2023
Commence Construction	December 31, 2023
Construction Upgrade Progress Report #1	December 31, 2024
Construction Upgrade Progress Report #2	December 31, 2025
Complete Construction	September 30, 2026
Effluent Limits Effective	October 1, 2026

F. PROPOSED TREATMENT FACILITY ABILITY TO MEET PROPOSED LIMITS

A major wastewater treatment plant upgrade is needed for Larsen Winchester Sanitary District to meet the proposed WPDES effluent limits, and to handle the proposed wastewater flows for Design Year 2045.

The current plant would be unable to comply with the proposed ammonia nitrogen and phosphorus limits.

SECTION 4

Description of Facility Planning Alternatives

SECTION 4

DESCRIPTION OF FACILITY PLANNING ALTERNATIVES

A. INTRODUCTION

The primary objective of facility planning is to identify and evaluate potential solutions to address wastewater management needs. Alternatives are considered and analyzed for their feasibility and cost effectiveness. Feasible alternatives must be implementable from a legal, institutional, financial, environmental and management standpoint. A cost analysis of feasible alternatives identifies solutions which are most cost effective in meeting WPDES permit limits.

B. REGIONALIZATION

Regionalization involves entering into an agreement with a neighboring community to pump wastewater to their facilities for treatment. The regionalization option eliminates the cost of constructing new wastewater treatment components. Operation and maintenance of treatment components would no longer be the responsibility of the Larsen Winchester Sanitary District.

Eight municipalities located within a 10-mile radius of the existing LWSD WWTP hold WPDES permits. Butte DesMorts Consolidated Sanitary District 1, North Lake Poygan Sanitary District, Dale Sanitary District, and Hortonville Sanitary District are small facilities which would likely not be able to accommodate the projected LWSD design flows.

In the Fox Valley area, the Fox West Regional WWTP is closer and more accessible than the Neenah Menasha WWTP.

Oshkosh WWTP and Winneconne also operate relatively large treatment plants. However, Oshkosh has indicated that their plant is near capacity for wet weather flows, and they have recently denied requests for regionalization with other near-by communities.

Winneconne WWTP operates an extended aeration mechanical wastewater treatment facility located at 203 South 3rd Street in Winneconne, Wisconsin. Initially, regionalization with the Village of Winneconne appeared feasible, until it became evident that access to a 15-inch sanitary sewer in the Winneconne sanitary sewer system would require approximately 9 miles of forcemain to transfer wastewater to the intersection of East Main Street and 13th Avenue in the Village of Winneconne. Additional costs involve modifying the Larsen Lift Station No. 5 and the Winchester Lift Station No. 1, constructing two new lift stations, and Winneconne joinder and conveyance fees. The extent of facilities needed for regionalization with Winneconne makes this alternative not cost effective. This option will not be considered further.

Section 5 of this report will consider regionalization with Fox West Regional WWTP.

C. WWTP UPGRADE WITH CONTROLLED DISCHARGE

Larsen Winchester Sanitary District operates a stabilization lagoon wastewater treatment facility. Effluent is discharged from the second lagoon cell to a tributary of the Arrowhead River on a semi-annual basis, typically for two weeks in November and May of each year. Because discharge is not continuous, this is a controlled discharge system.

Section 3 of this study reveals that the existing Larsen Winchester wastewater treatment facility will not be able to meet future WPDES stringent ammonia and phosphorus effluent limits. In addition, wastewater flows for design year 2045 will require an expansion to increase plant capacity.

Considering the treatment processes required to meet ammonia and phosphorus effluent limits, upgrading the existing plant while maintaining a controlled discharge is not practical. Upgrading the wastewater treatment facility while maintaining a controlled discharge system is not recommended as a viable facility planning alternative.

D. WWTP UPGRADE WITH CONTINUOUS DISCHARGE

In order to meet proposed LWSD WPDES effluent limits, a major wastewater treatment plant upgrade will be required, with a continuous discharge of effluent.

Section 6 of this report will discuss the options and recommendations for a WWTP upgrade with a continuous discharge to the tributary of the Arrowhead River.

E. WWTP UPGRADE WITH ALTERNATE OUTFALL LOCATION

Effluent limits to be included in a future LWSD WPDES permit will depend on where effluent is discharged to surface waters. The existing LWSD WWTP discharges to a tributary of the Arrowhead River.

WDNR has been approached regarding potential effluent limits if the discharge location is moved further downstream to the Arrowhead River. Information provided by WDNR indicates proposed effluent limits for discharge at the Arrowhead River are at least as stringent or more stringent than at the current discharge location. There is no benefit to changing the discharge location to this new location.

This option is not considered further as a viable facility planning alternative.

F. SUBSURFACE DISCHARGE

If effluent from the Larsen Winchester Wastewater Treatment Facility were discharged below ground instead of to surface waters, the WPDES permit would not include phosphorus effluent limits. Subsurface discharge is therefore considered an alternative for phosphorus compliance. Effluent from the plant would be required to meet BOD, TSS, pH, Ammonia, and Total Nitrogen effluent limits prior to subsurface discharge.

There are a number of subsurface discharge methods available to municipal wastewater systems. One of these options may be comparable to a large on-site wastewater mound system. In general, all subsurface discharge systems need to ensure a separation distance of 5 feet from the bottom of the discharge system to the highest anticipated groundwater elevation, and 5 feet or more to bedrock. Permeability rates are used for sizing. The application rate of wastewater cannot exceed the long-term infiltrative capacity of the soil. Discharge to clay soils with low permeability, or compacted soils is not allowed. Large amounts of land are needed. Multiple wastewater application areas are required to allow load and rest cycles. A separation distance of 250 feet is required from a land disposal system to a private well. A ground water monitoring system would need to be installed.

In general, soils in the area of LWSD are clay based with low permeability rates, making them not suitable for subsurface discharge. In addition, the volume of effluent generated presents a number of risks to the success of subsurface discharge in the Larsen Winchester area.

For the reasons noted above, subsurface discharge is not recommended as a viable facility planning alternative.

G. ADAPTIVE MANAGEMENT

Adaptive management is a WPDES compliance option recognized by the Wisconsin Department of Natural Resources which allows owners of point and nonpoint sources of phosphorus to work together to improve water quality and to meet water quality standards.

The Adaptive Management alternative would require the Larsen Winchester Sanitary District to be responsible for meeting the target phosphorus concentration in a designated section of the receiving stream. Under this alternative, permit holders agree to implement practices to improve water quality within their facility and within their watershed. Adaptive Management requires in-stream monitoring and modeling to quantify expected phosphorus load reductions. This option would require a significant undertaking by the Sanitary District with considerable risk and cost of professional services.

In addition, adaptive management would focus on meeting phosphorus limits, but would not address the more stringent ammonia limits of future WPDES permits, or the capacity issues of the current lagoon system.

Therefore, this alternative is not considered as a feasible facility planning alternative.

H. WATER QUALITY TRADING

Water Quality Trading (WQT) is also a compliance option recognized by the Wisconsin Department of Natural Resources. This option provides point sources with the flexibility to acquire pollutant reductions from other sources in the watershed to offset their point source load. Implementation of WQT must result in an overall reduction in pollutant load within the watershed. This alternative would allow Larsen Winchester Sanitary District to purchase water quality credits from other dischargers located within the same watershed sub-basin. Credits can be purchased from landowners, other municipalities, WWTF's, or other entities which generate excess pollutant reductions from sources such as agriculture, urban stormwater or wastewater.

Water Quality Trading can be used for total phosphorus, total suspended solids, temperature, nitrogen and other pollutants. Watershed circumstances play a major role in determining if Water Quality Trading is a cost-effective alternative.

To determine the feasibility, steps include calculating the pollutant offset needed, identifying a credit broker and potential credit generators, and assessing the availability of credit to cover the District's needs. WDNR anticipates developing and implementing a successful trading strategy may take 3 to 5 years to find credit generators, develop contracts, select and implement management practices, and begin generating credits.

Water quality trading should occur between credit users and generators in the same 12-digit Hydrologic Unit Code watershed (HUC 12). Larsen Winchester Sanitary District would need to focus their search for trading partners within the Lake Poygan 12 Digit Subwatershed HUC 040302022105, Subbasin No. 51 – Arrowhead River. Ideally, trading would be most effective upstream of the LWSD WWTP discharge point. The maps in Appendix G show the location of the watershed, as well as the location of the sanitary district.

Considering that the District is at the top of the watershed, finding cost effective trading partners would be difficult. In addition, this option would also require costly upgrades to the plant to optimizing phosphorus removal and address upcoming WPDES ammonia limits and capacity issues.

Water Quality Trading does not appear to be a feasible facility planning option and will not be considered further.

I. PHOSPHORUS VARIANCES

In April of 2014, the Wisconsin Legislature authorized the concept of phosphorus variances to effluent limits through the approval of Act 378. Based on this Act, the Department of Administration (DOA) and the Wisconsin Department of Natural Resources (WDNR) made a determination that substantial and widespread adverse social and economic impacts would be required for point sources to implement major facility upgrades to meet phosphorus limits. Therefore, WDNR developed a phosphorus effluent limit variance program.

If the Sanitary District proves to the WDNR that compliance options are too costly and would result in an economic hardship to the community, they can request an economic variance to allow the community to take economically viable steps toward compliance.

The multi-discharger variance (MDV) for phosphorus approved by WDNR in 2017 extends the timeline for complying with low-level phosphorus limits. In exchange, point sources commit to steps to reduce effluent phosphorus, as well as helping to address nonpoint sources of phosphorus from farm fields, cities or natural areas by implementing projects designed to improve water quality.

An MDV is an opportunity for point sources to make meaningful strides towards water quality improvements in a more economically effective manner. MDV is not a permanent compliance solution. WDNR will re-evaluate approval of the MDV each permit re-issuance.

In order for an existing point source to be eligible for an MDV, they must provide documentation for their facility showing a major facility upgrade will be required to comply with their phosphorus limit, and they must meet primary and secondary substantial indicators. The primary screening process assesses the economic impact the phosphorus standards impose based on median household income. Secondary screening evaluates the wider community's socio-economic well-being and ability to adapt to changes accompanying implementation of the phosphorus standards.

Based on the criteria above, WDNR MDV eligibility screening indicates as a community within Winnebago County, the Larsen Winchester Sanitary District projected household user charge must be greater than 1% of their Median Household Income once phosphorus compliance costs are factored in in order to be eligible for an MDV.

If a facility is unable to obtain a multi-discharger variance, they may apply for an individual variance. Variances may be approved based on one or more of six factors listed in Wisconsin Statutes s. 283.15(4) and are often difficult to obtain.

Meeting future phosphorus limits is not the only factor to be considered, as the existing plant will be unable to meet future ammonia effluent limits, and will be unable to handle projected wastewater flows for design year 2045.

Therefore, a phosphorus variance may be considered in addition to wastewater treatment plant improvements, but variances alone are not considered as a feasible facility planning alternative.

J. EVALUATION OF NEED TO INCLUDE SEPTAGE RECEIVING FACILITIES

Wisconsin State Statutes require that if a municipality is planning for a treatment facility upgrade which will result in a capacity increase of 20% or more, they are required to evaluate the need to include septage receiving facilities and additional treatment capacity specifically for septage.

Septage is a general term for the contents removed from septic tanks, portable vault toilets, privy vaults, holding tanks, grease traps, very small wastewater treatment plants, or semi-public facilities receiving wastewater from domestic sources. Non-domestic wastes are not included in the definition.

Compared to typical domestic wastewater from a municipal sanitary sewer collection system, septage is high in organic, grease, and solids concentrations. Substantial quantities of phosphorus, ammonia nitrogen, bacterial growth inhibitors, and cleaning materials may be present in septage depending on the source. Characteristics of septage may vary widely from load to load depending on the source.

There are a number of factors which make inclusion of septic receiving facilities at the Larsen Winchester Wastewater Treatment Facility not feasible. In general, design wastewater flows are relatively small, and the treatment components sensitive. Factors include:

- Septage is normally considered treatable at a wastewater treatment plant. However, it may create a shock loading or have other adverse impacts on the plant processes and effluent quality. Sensitivity of the treatment plant process to daily fluctuations in loadings brought about by the addition of septage must be considered.
- High concentrations of bacterial growth inhibitors typically found in septage from some portable vault toilets and recreational dump station holding tanks would create a problem with the treatment process.
- Slug septage loadings of BOD, ammonia or phosphorus may cause process upset, pass through to effluent, odor nuisance or other problems.
- A facility accepting septage must have the ability to control feed rates of septage to the plant during off peak loading periods, requiring available WWTP operator staff when the septage is received.

- Significant space requirements for unloading and traffic flow may also be an issue.
- Screening, grit and grease removal would be required just to address septage.
- Laboratory and staffing capabilities which are not currently available would be needed to determine the septage strength and/or toxicity.
- Washdown water would be needed to clean the septage receiving station. Water is currently not available at the site.

The Town of Winchester has approximately 660 households, and the Town of Clayton has approximately 1,500 households for a total of approximately 2,160 households. Approximately 310 of these households (14%) are currently served by the Larsen Winchester Sanitary District, and approximately 1,850 (85%) of the households in the two towns are not served by the District. These homes have private on-site wastewater treatment systems. Winnebago County requires septic tanks to be pumped every three years. Holding tanks are only allowed if the owner can demonstrate site restrictions, and these are pumped when full. There are a number of private companies in the Fox Valley area to provide this service within the Town of Clayton and Winchester areas.

Large wastewater treatment facilities in the Fox Valley area which are more suitable for septage disposal include the Grand Chute-Menasha (Fox West) Wastewater Treatment Facility, the Neenah-Menasha Wastewater Treatment Facility, the Appleton Wastewater Treatment Facility, Heart of the Valley Wastewater Treatment Facility, and Oshkosh Wastewater Treatment Facility.

K. SUMMARY

Facility planning identifies and evaluates potential solutions to address wastewater management needs. Section 4 of this Facility Plan discusses a number of potential wastewater management alternatives, and identifies those to be studied further, and those which are not considered viable.

In summary, the following alternatives are not feasible and will not be considered further:

- WWTP Upgrade with Controlled Discharge
- WWTP Upgrade with Alternate Outfall Location
- Subsurface Discharge
- Adaptive Management
- Water Quality Trading

Regionalization with the Fox West Regional Wastewater Treatment Facility is considered a viable alternative and will be discussed further in Section 5.

Upgrading the wastewater treatment facility and changing to a continuous discharge facility will be discussed further in Section 6. Obtaining a Phosphorus Multi-Discharger Variance in conjunction with a WWTP upgrade will also be discussed further in Section 6.

SECTION 5

Regionalization Alternative

SECTION 5

REGIONALIZATION ALTERNATIVE

A. INTRODUCTION

As noted in Section 4, regionalization involves entering into an agreement with a neighboring community to pump wastewater to their facilities for treatment. The regionalization option eliminates the cost of constructing and operating new wastewater treatment components.

The discussion below considers regionalization with Fox West Regional WWTP.

B. REGIONALIZATION WITH FOX WEST REGIONAL WWTP

Fox West Regional WWTP operates a mechanical wastewater treatment facility located at 1965W Butte Des Morts Beach Road in Neenah, Wisconsin under WPDES Permit WI-0024686. The Facility serves the Village of Fox Crossing Sanitary District, Town of Grand Chute Sanitary District #2, Town of Greenville and portions of the Towns of Neenah and Clayton. Fox West Regional Wastewater Treatment Plant includes the following major unit processes:

- Fine Screening
- Raw Sewage Pumping
- Grit Removal
- Primary Clarification
- Integrated Fixed Film Activated Sludge
- Secondary Clarification
- Ultraviolet Disinfection
- Gravity Belt Thickener for Sludge
- Auto-Thermal Thermophilic Aerobic Digestion
- Belt Filter Presses for Sludge Dewatering
- Hauled-in Waste Receiving Station

Wastewater flow received at the plant averages between 6 and 7 million gallons per day. Plant performance is currently excellent. Fox West Regional Sewerage Commission plans to meet new total phosphorus effluent limits through continued optimization of the existing plant.

Figure 5.1 that follows shows how wastewater is proposed to be transported from the communities of Winchester and Larsen to the Fox West Regional Treatment Facility. Table 5.1 below summarizes the proposed improvements.

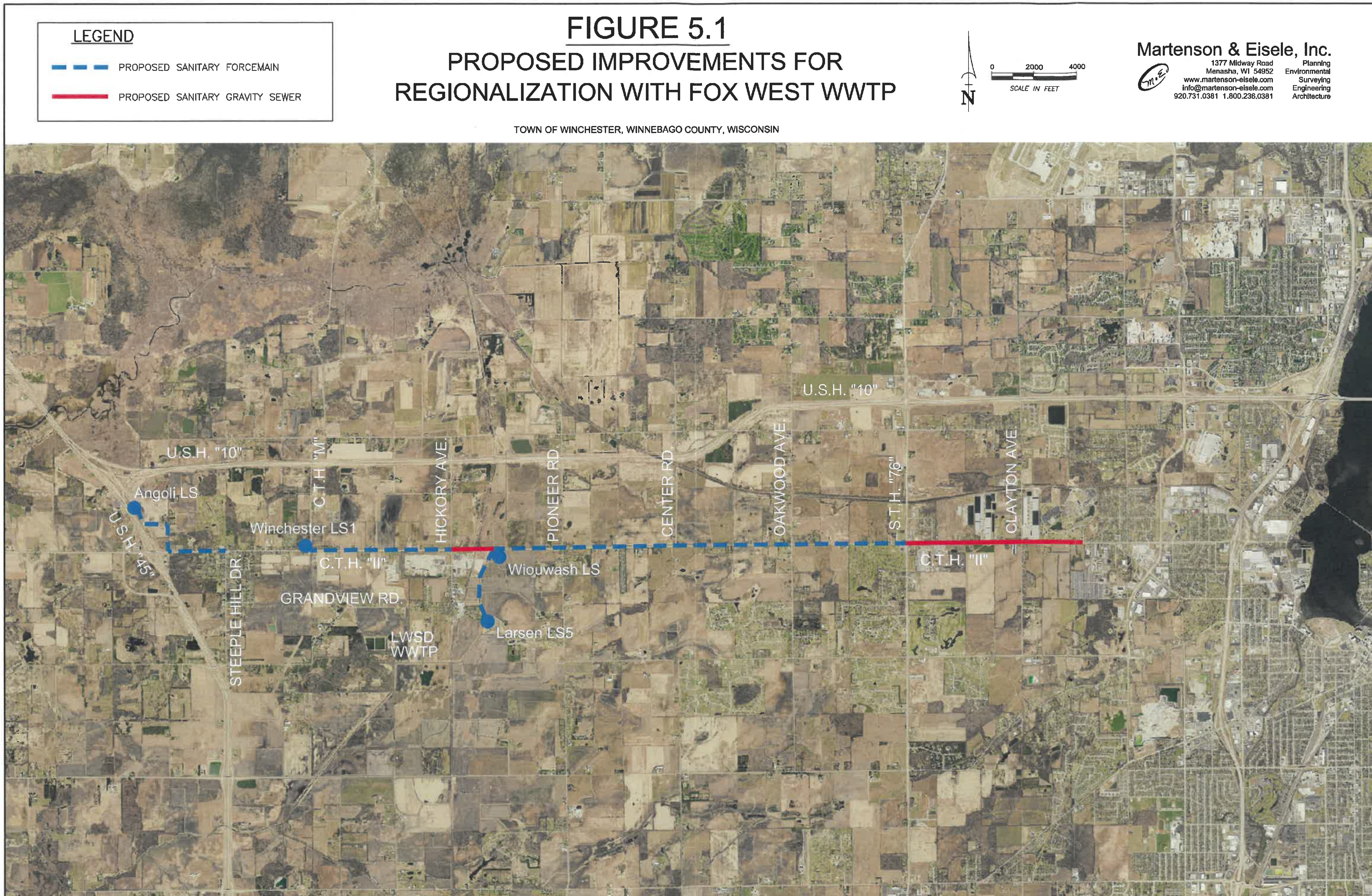


FIGURE 5.1
PROPOSED IMPROVEMENTS FOR REGIONALIZATION WITH FOX WEST WWTP

TOWN OF WINCHESTER, WINNEBAGO COUNTY, WISCONSIN

Table 5.1 Proposed Improvements for Regionalization with the Fox West Regional Wastewater Treatment Facility

Lift Station	LS Improve-ments	Pump Rate gpm	Total Dynamic Head feet	Wetwell Diameter Feet	Forcemain Size Inches	Forcemain Length Feet/Miles	Forcemain Discharge Location
Angoli Way Lift Station No. 6	New Lift Station	285	153	6	6	5,100 / 1.0	Steeple Hill Drive / CTH II
Winchester Lift Station No. 1 CTH M	Modify Existing Lift Sta. New Pumps	400	94	5 Existing	6	5,200 / 1.0	East of Hickory Avenue / CTH II
Larsen Lift Station No. 5 Grandview	Modify Existing Lift Sta. New Pumps	80	30	5 Existing	4	4,100 / 0.8	Wiouwash Lift Station
Wiouwash CTH I Lift Station No. 7	New Lift Station	500	182	8	10	20,100 / 3.8	STH 76 T. Clayton

The sequence of wastewater lift stations is summarized below:

- New Angoli Way LS No. 6 pumps wastewater east to existing 8-inch gravity sewer at the intersection of Steeple Hill Drive and CTH II. This new lift station would serve development in the area of the CTH II and USH 45 intersection.
- Existing Winchester LS No. 1 would be modified to pump wastewater east along CTH II to a proposed sanitary sewer east of Hickory Avenue. LS No. 1 would continue to serve Winchester, including the new development near the CTH II and USH 45 intersection.
- Existing Lift Stations 2, 3 and 4 within Winchester would continue to operate as they currently are.
- A new 8-inch gravity sanitary sewer would transport wastewater from the Winchester LS No. 1 discharge point east of Hickory Avenue to the new Wiouwash LS No. 7.
- Existing Larsen LS No. 5 would be modified to pump wastewater north along the Wiouwash Trail to the new Wiouwash LS No. 7. LS No. 5 would continue to serve the community of Larsen.
- The new Wiouwash LS No. 7 would pump wastewater along CTH II to a new 12-inch sanitary sewer at the intersection of CTH II and STH 76. The new LS No. 7 would be the main station to transport all LWSD wastewater to Fox West WWTP.
- A new 12-inch gravity sanitary sewer would transport wastewater along CTH II in the Town of Clayton to an existing 12-inch sewer near Kimberly Clark within the Village of Fox Crossing.
- Existing Fox Crossing sanitary sewers would transport wastewater to the Fox West Regional Wastewater Treatment Facility.

Costs associated with regionalization with the Fox West Regional Wastewater Treatment Facility include the following:

- Construction of two new lift stations
- Modification of two existing lift stations
- New forcemain and sanitary sewers
- Intermunicipal Agreement Costs for Village of Fox Crossing
- Conveyance Fees for transporting wastewater through Village of Fox Crossing sewers.
- Fox West Sewerage Commission Joinder Agreement Fee
- Treatment and maintenance costs associated with the Fox West WWTP.

The costs discussed above are included as Alternative 1 in Section 7 – Cost Effective Analysis.

SECTION 6

Wastewater Treatment Alternatives

SECTION 6

WASTEWATER TREATMENT ALTERNATIVES

A. INTRODUCTION

As noted in Section 2, Larsen Winchester Sanitary District owns and operates a controlled discharge stabilization lagoon system wastewater treatment facility located south of Grandview Road between Winchester and Larsen. The lagoon system consists of primary and secondary cells with a total design volume of approximately 17 million gallons. Effluent is discharged from the second cell to a tributary of the Arrowhead River on a semi-annual basis, in November and May of each year.

More stringent nutrient effluent limits are being imposed on wastewater treatment facilities by regulatory agencies. Nitrogen and phosphorus are essential to the growth of algae and other biological organisms in surface water. Excessive nutrients can cause eutrophication, a process where aggressive growth of algae and other plants depletes oxygen, creates dead zones in water, destroys aquatic life, and depletes healthy fauna and flora. In addition, ammonia is highly toxic to fish and amphibious life at dilute concentrations.

Section 3 of this study notes that the existing wastewater treatment facility would not be able to meet proposed ammonia and phosphorus WPDES effluent limits and will need to be upgraded to handle the proposed wastewater flows for Design Year 2045.

Section 6 considers potential options to upgrade the existing Larsen Winchester Sanitary District wastewater treatment facility.

B. TREATMENT TECHNOLOGIES FOR REMOVAL OF AMMONIA NITROGEN

Nitrification is an aerobic biological treatment process to remove ammonia nitrogen in wastewater. Nitrification is a two-step process where ammonia (NH3) is converted to nitrite (NO2) and then to nitrate (NO3), eventually promoting the release of nitrogen gas into the atmosphere in a separate denitrification process. The nitrification process is carried out by a specific group of bacteria collectively referred to as nitrifying bacteria or nitrifiers. These bacteria are much more sensitive to environmental conditions than carbonaceous bacteria which are responsible for BOD removal. The nitrifying bacteria responsible for nitrification require the following:

- Proper biomass concentrations
- Specific environmental conditions including temperature and pH
- Enough residence time in the treatment process
- Significantly more air/oxygen than is required to treat biochemical oxygen demand (BOD) only.
- Nitrification requires over four times the amount of oxygen which is required for BOD removal.

The most common treatment processes used for biological nitrification at mechanical wastewater treatment plants include:

- Conventional Activated Sludge.
- Extended Aeration to provide longer hydraulic and solids residence times.
- Sequencing Batch Reactor (SBR) using the same process as conventional and extended aeration activated sludge treatment process, except that the aeration and clarification processes take place in the same reactor basin. This process is more compact in size but may be more difficult to operate.
- Fixed Film processes such as trickling filter, rotating biological contractors (RBCs), or moving bed bioreactors (MBBRs). These processes all involve treatment by microorganisms which attach to fixed media.
- Membrane Bioreactor consisting of three main components, including anoxic basins, pre-aeration basins and membrane bioreactor basins. This treatment process is relatively more expensive and operator intensive.

A plant upgrade to enhance the biological nitrification process is typically required for removal of ammonia at a lagoon wastewater treatment facility to meet Wisconsin effluent limits. Tertiary treatment is normally used to accomplish this, involving submerged media processes which encourage growth of nitrifying bacteria on various types of submerged media.

Common tertiary treatment ammonia removal systems for lagoons includes:

- SAGR system by Nexom - Submerged Attached Growth Reactor consisting of a fully aerated coarse gravel bed reactor.
- LPR by LemTec - Lemna Polishing Reactor consisting of submerged attached growth plastic media modules in an aerated structure.
- NitrOx by Triplepoint - Two-stage nitrification reactor including covered aerated tanks with biofilm carrying media.

C. TREATMENT TECHNOLOGIES FOR REMOVAL OF PHOSPHORUS

Wastewater treatment facilities may employ chemical precipitation, biological removal, or physical removal to remove phosphorus from wastewater.

Chemical precipitation is the most common process used to remove phosphorus from wastewater, and normally involves using iron and aluminum coagulants. Phosphorus in wastewater is found as dissolved/soluble phosphorus or in the particulate filterable form. The goal of chemical precipitation is to convert soluble phosphorus to particulate phosphorus, so the pollutant will settle out or be filtered out. Chemical addition and settling alone will not be adequate to meet the proposed LWSD phosphorus effluent limits. Additional tertiary filtration will be required.

A biological method, known as Enhanced Biological Phosphorus Removal (EBPR) is sometimes used to remove phosphorus at large mechanical wastewater treatment activated sludge facilities. EBPR is the biological uptake of phosphorus by selected microorganisms called phosphorus-accumulating organisms (PAOs). While the actual uptake of phosphorus occurs under aerobic conditions with oxygen present, PAOs must first be conditioned within an anaerobic tank, where nitrate and oxygen are absent. Biological methods are most often used at large mechanical plants.

Physical removal usually involves a tertiary process to filter out phosphorus which has been converted to the particulate form through chemical treatment. Physical removal is often accomplished through sand filtration and membrane technologies.

Chemical methods of removing phosphorus are used more often than biological methods, as they have generally proven to be more effective in treatment and cost. As noted above, physical removal through tertiary filtration will be required to meet stringent phosphorus effluent limits.

It is important to emphasize that treatment processes used to remove phosphorus are different than the treatment processes used to remove ammonia.

Tertiary treatment phosphorus removal systems and potential suppliers which may apply to lagoon systems include:

- Up-flow Sand Filters
  - Dynasand Filter by Parkson Corporation
  - BluePro Filter by Nexom
- Cloth Media Disk Filters
  - Aqua MiniDisk Filters by Aqua-Aerobics Systems, Inc.
  - Kruger Hydrotech Filter by Veolia Water Solutions & Technologies
  - AquaPyr by GreatPyr Resources LLC
  - Infini-D Disk Filter by Nexom
- Membrane Filters
  - Ultrablox Silicon Carbide Membrane Filter by Ovivo USA, LLC

Up-Flow Sand Filters

An up-flow, deep bed granular media filter allows filtration of liquid suspensions of phosphorus. Feed water is passed upward through the sand bed and exits the sand filter as clean water. At the same time, sand can be removed from the bottom, cleaned by a washing system and returned to the top of the sand bed. The filter is continuously backwashed as the wastewater and sand travel in opposite directions. Suspended solids are captured by the downward moving sand as the influent flows upward through the bed exiting at the top of the filter over a weir. Backwashed wastewater is returned to the head of the plant.

Up-flow sand filters are either installed as cylindrical metal tanks in an approximate 20-foot high building, or in deep underground concrete tanks. Chemical feed (typically ferric chloride) is added prior to the filter and may also be required at the head of the plant. Depending on the hydraulics, pumping to the system may be required.

Disk Filters

A disk filtration system is a tertiary treatment process utilizing cloth filter media installed on multiple disks, which typically rotate, to filter solids from the wastewater. Disks are installed into prefabricated steel or cast-in-place concrete tanks. During operation, chemically conditioned secondary effluent enters the filtration tank and passes through the cloth filter media. Flow through the disks is restricted as solids accumulate on the cloth media, triggering a backwash cycle.

Prefabricated steel tanks and chemical feed equipment are installed within a building. Depending on the hydraulics, pumping to the system may be required.

Membrane Filters

Used in drinking water for many years, membranes are increasingly being used for wastewater treatment to meet strict effluent limits. Wastewater is pushed or pulled through a series of membrane modules creating a physical barrier to capture contaminants. These systems are often very compact. The membranes require cleaning with a series of chemicals usually once per week. The system may come as a package installed within a building.

Chemical Feed System

Most tertiary treatment systems require addition of chemicals to convert dissolved phosphorus to a particulate form which is filtered out. These chemicals generally include multivalent metal ions such as alum and ferric chloride, or various polymers. Rare earth salt solutions should also be considered.

Chemical feed systems normally include a small building to house small chemical feed pumps and bulk chemical storage containers within a concrete containment or curbing. At the head of the WWTP, chemicals may be discharged to a mixing tank, manhole, or raw sewage wet well. An inline mixer may be added in piping prior to the discharge point. Addition of chemicals will result in an increase of sludge within the ponds.

D. REMOVAL OF CHLORIDES

Removing chlorides from wastewater requires a specialized and expensive means of treatment such as a reverse osmosis membrane system. Disposing of the waste stream with even more concentrated chlorides also poses a problem. Managing sources of chlorides before they get into the wastewater influent is the best means to handle this issue, and the Larsen Winchester Sanitary District will continue to follow reduction measures.

This Wastewater Treatment Facility Plan does not address the WPDES chloride limits, but rather focuses on improvements needed to meet the ammonia and phosphorus effluent limits. It should be noted that regulatory agencies may continue to implement lower chloride levels in the future.

E. PROPOSED IMPROVEMENTS FOR LARSEN WINCHESTER WASTEWATER TREATMENT FACILITY

Three wastewater treatment facility plan alternatives are proposed as summarized below.

Alternative 2: Construction of a Mechanical Plant
Alternative 3: Construction of a LemTec Treatment System
Alternative 4: Modify Existing Lagoon System.

Each of these alternatives proposes improvements at the existing wastewater treatment site which will operate as a continuous discharge system.

Each of the three alternatives above will involve common proposed improvements. These are as follows:

- Gas and Electric Service: Improvements to the WWTP will require gas and electric services be constructed to the WWTP site by Wisconsin Public Service Company.
- Chemical Feed System for Phosphorus Removal: Construct a chemical feed system consisting of pumps, tanks and piping to feed ferric chloride, alum, or other to optimize removal of phosphorus.
- Building to House Blowers, Chemical Feed Equipment, Controls, Generator: Construct a building to house blowers and chemical feed pumps, tanks and piping. The building will also house the main electrical components, controls, and an emergency generator.
- Tertiary Treatment for Phosphorus: Construct a tertiary treatment system consisting of either up-flow sand filters or a disk filtration system to be determined based on cost in final design. Construct these improvements within a building, with pumping facilities as necessary.
- Disinfection: Provide disinfection prior to the discharge of effluent.
- Electrical, Controls and Generator: Electrical and control improvements, along with installation of a generator will be required to operate the system.
- Site Improvements: Additional improvements at the WWTP site will include piping and modification to control structures, fencing, erosion control, surface restoration and additional site work.
- Angoli Lift Station #6: In order to serve proposed development at the intersection of USH 45 and CTH II, this alternative includes construction of Lift Station #6 near the west end of Angoli Way. A 6-inch forcemain is proposed to transport wastewater from the lift station to an existing gravity sewer at the CTH II and Steeple Hill Drive intersection.
- Modifications to Winchester Lift Station #1: The pumps in the existing Winchester Lift Station No. 1 will be replaced to accommodate the additional flow from the Angoli Lift Station.

Wastewater treatment improvements are proposed for Alternatives 3, 4 and 5 based on Wisconsin Administrative Code Section NR110.24 requiring a 4-foot separation distance from the maximum ground water elevation to the bottom of the pond, or a 2-foot separation if a synthetic liner is provided. A 10-foot separation distance is required from the bottom of the pond to bedrock.

A geotechnical investigation was performed to provide data for six 26-foot deep soil borings at the existing LWSD WWTP site. The results of the geotechnical investigation are included in Appendix H. No bedrock was encountered in any of the borings. Note the following regarding groundwater encountered in the borings.

- **Boring #1 (NW):** No water encountered. Redox soils at Elevation 760.0 due to perched water condition of clay underlain by a loamy sand layer.
- **Boring #2 (NE):** No water encountered.
- **Boring #3 (East Central):** No water encountered.
- **Boring #4 (SE):** Water Encountered at Elevation 749.6.
- **Boring #5 (South Central):** Water Encountered at Elevation 754.4 is not representative of findings in other southern Borings 4 and 6, and is a result of perched water present in a loamy sand layer above clay.
- **Boring #6 (SW):** Water Encountered at Elevation 750.6.

F. ALTERNATIVE 2 – CONSTRUCTION OF A MECHANICAL WASTEWATER TREATMENT PLANT

Alternative 2 proposes construction of a mechanical plant, including an orbal oxidation ditch with 5-foot channel widths wrapped around a 25-foot diameter final clarifier. Sludge holding and storage tanks, and a UV Disinfection Channel, are also proposed. A control building will house an influent sampler, lab equipment, a mechanical bar screen, chemical tanks and pumps, sludge pumps and controls.

The plant would be located east of the existing Cell #2. At this time, Alternative 2 proposes to leave the existing lagoon cells in place, potentially to be used for excess flow storage. Actual placement of the system would require a wetland delineation at the site.

G. ALTERNATIVE 3 – CONSTRUCTION OF A LEMTEC WASTEWATER TREATMENT SYSTEM

Alternative 3 involves construction of a LemTec Biological Treatment Process by Lemna Environmental Technologies, Inc. This is a three-stage process, including an aerobic process within aeration cells, solids management within a settling zone, and tertiary treatment for ammonia and phosphorus removal.

This alternative proposes to convert the north third of the existing Cell #2 into two earthen basins each with a 12-foot water depth. The existing Primary Lagoon Cell would be abandoned in place. The remainder of the existing Secondary Lagoon Cell would be taken out of service and graded to drain.

The first earthen basin would be sectioned off with a baffle to create an aerated complete mix cell with three days of detention time, and an aerated partial mix cell with 8 days of detention time. The basin would be covered with a modular insulated cover system to allow the lagoon to maintain a consistent wastewater temperature to optimize BOD removal and nitrification and eliminate algae growth.

The second earthen basin will provide solids management and is baffled to provide a flocculation zone and a settling zone. This basin would also be covered with a modular insulated cover system.

Phosphorus removal is enhanced with a chemical dosing system and mixers in a rapid mixing structure between the two earthen cells.

A Lemna Polishing Reactor (LPR) is proposed following the second earthen cell for ammonia removal. The LPR is a submerged, attached-growth media technology including submerged attached growth plastic media modules in an aerated concrete structure.

Lemna notes that the LemTec system proposes a smaller footprint than traditional lagoons and offers lower capital and operating costs than mechanical treatment processes.

The bottom of the LemTec system would be at elevation 751.25. The proposed LemTec system is adjacent to the location of Borings #2 and #3 where no water or bedrock was encountered.

UV disinfection will be provided prior to discharge.

H. ALTERNATIVE 4 – MODIFY THE EXISTING LAGOON SYSTEM

Alternative 4 proposes conversion of the existing Secondary Lagoon Cell for treatment. Tertiary treatment would be added for ammonia removal, and chemical feed equipment would be added to assist in phosphorus removal. The following is proposed.

- Primary Lagoon Cell: Abandon in place.
- Secondary Lagoon Cell: Convert the north two-thirds of the cell to an aerated zone. Excavate the bottom to increase the water depth from 6-feet to 8-feet within the aerated zone (Bottom of aerated zone at elevation 755.25. Bottom of settling zone at elevation 757.25). Use the excavated material to fill the southeast corner of the cell. Convert the southwest corner of the cell to a settling zone. Install a baffle to separate the aerated zone from the settling zone.
- Tertiary Treatment for Ammonia: Construct a tertiary treatment system in the southeast corner of the Secondary Lagoon Cell, consisting of one of the following to be determined in final design based on cost, and District preference:
    1. SAGR system by Nexom - Submerged Attached Growth Reactor consisting of a fully aerated coarse gravel bed reactor.
    2. LPR by LemTec - Lemna Polishing Reactor consisting of submerged attached growth plastic media modules in an aerated structure.
    3. NitrOx by Triplepoint - Two-stage nitrification reactor including covered aerated tanks with biofilm carrying media.
- Construct a building for blowers, controls and chemical feed in the southeast corner of the Secondary Lagoon Cell in the area that has been filled.
- Provide UV disinfection prior to discharge.

I. PHOSPHORUS TREATMENT AND VARIANCES

The cost-effective analysis following in Section 7 includes implementing tertiary treatment for phosphorus for each of the Alternatives 2, 3, and 4 discussed above.

As an alternative to construction of a costly phosphorus tertiary treatment unit, the District may apply for a phosphorus variance.

As discussed in Section 4 of this report, the multi-discharger variance (MDV) for phosphorus extends the timeline for complying with low-level phosphorus limits. It is not a permanent compliance solution. If granted, the District would be required to reduce their phosphorus load each permit term and implement a watershed project. The watershed project could involve making payments to the County Land and Water Conservation Department to implement projects for them. The proposed chemical feed system would be utilized to meet the interim limit.

The WDNR website includes an MDV eligibility screening process. The screening indicates as a community within Winnebago County, the Larsen Winchester Sanitary District projected household user charge must be between 1% and 2% of their Median Household Income (once phosphorus compliance costs are factored in) in order to qualify. Current data provided by WDNR for SFY 2022 projects indicates the Town of Clayton and Town of Winchester have median household incomes (MHI) of $88,846 and $83,897 respectively. The Winchester CDP (community of Winchester) MHI is $79,167. MDV eligibility will be discussed further in Section 10 of this report.

SECTION 7

Cost Effective Analysis

SECTION 7

COST EFFECTIVE ANALYSIS

A. GENERAL

The estimated costs for each of the wastewater treatment alternatives summarized in Sections 5 and 6 of this report will include both construction costs, and operation and maintenance and costs. In determining the cost-effectiveness of the various alternatives, costs will be presented in terms of equivalent annual costs. The interest rate and time period utilized in the cost-effectiveness analysis is 3.125 percent (discount rate for Federal Fiscal Year 2021 as required by WDNR) and 20 years, respectively.

B. ESTIMATED PROJECT COSTS

Preliminary project cost estimates presented herein are based on 2021 construction costs. Various material and equipment manufacturers and suppliers were contacted for information affecting cost estimates. Published and unpublished data on costs for similar kinds of construction were also utilized.

As previously stated, the estimated costs are for 2021. Increases in construction cost due to inflation are not considered. The cost estimates presented here are meant to be used as a guideline in the decision-making process. Once a treatment alternative is selected and preparation of final drawings and specifications is underway, more refined cost estimates become available.

Appendix I includes capital cost estimate tables and operation and maintenance cost estimate tables for each of the four Alternatives.

C. TOTAL ANNUAL COSTS

Table 7.1 summarizes the total annual cost for each of the four treatment alternatives. The initial capital cost is annualized with a 3.125 percent interest rate and a 20-year planning period for the cost effectiveness analysis. According to the results, Alternative No.3, proposing construction of a LemTec system provides the most cost-effective means for Larsen Winchester Sanitary District to meet proposed WPDES effluent limits.

Table 7.1
Cost Summary for Facility Planning Alternatives – Total Annual Cost

Alternative	Alternative No. 1 Regionalization Fox West WWTP	Alternative No. 2 Mechanical WWTP	Alternative No. 3 LemTec WWTP	Alternative No. 4 Pond Modifications
Capital Cost	$8,707,017	$8,380,371	$6,074,529	$6,092,469
Equivalent Annual Cost	$592,077	$569,865	$413,068	$414,288
Additional OM&R Cost	$257,000	$258,500	$216,000	$218,500
Total Annual Cost	**$849,077**	**$828,365**	**$629,068**	**$632,788**

SECTION 8

Environmental Considerations

SECTION 8

ENVIRONMENTAL CONSIDERATIONS

A. INTRODUCTION

Section 8 of this study provides environmental considerations for Facility Planning in conjunction with the requirements of Wisconsin Administrative Code Section NR110.09(3). Environmental Assessment requirements include:

- Description of Existing Environment Without the Project
- Description of the Future Environment Without the Project
- Evaluation of Environmental Impacts for Alternatives Considered
- Environmental Impacts of the Recommended Improvements
- Steps to Minimize Adverse Effects

The description below of the existing and future environment without the project includes the entire Towns of Clayton and Winchester.

Compliance alternatives considered in this Study include regionalization and WWTP upgrade options, which involve large and varied project study areas within these two Towns. Evaluation of alternatives and discussion on the proposed improvements will further define the study area directly affected.

Physical, biological, cultural, and other environmental effects are evaluated.

An Abandonment Plan is also included in this section in accordance with the requirements of Wisconsin Administrative Code Section NR110.09(2).

B. CURRENT PHYSICAL ENVIRONMENTAL CONDITIONS WITHIN THE TOWNS OF CLAYTON AND WINCHESTER

Towns of Clayton and Winchester General Information

The Town of Winchester is located in northwest Winnebago County, Wisconsin, Township 20 North, Range 15 East. It is comprised primarily of family farming operations and residential development. The township includes approximately 36 square miles and is home to about 1,700 people. The Town of Winchester shares borders with Outagamie County (N), the Town of Wolf River (W), the Town of Winneconne (S), and the Town of Clayton (E).

The Town of Clayton is located in northwest Winnebago County, Wisconsin, Township 20 North, Range 16E. The Town's website describes this community as a progressive rural community with a population of 4,186 which is experiencing substantial growth due to its proximity to Appleton, Neenah and Oshkosh. It is approximately 36 square miles and is currently a residential and agricultural community, with potential for commercial development along the USH 10 corridor. The Town of Clayton shares borders with Outagamie County (N), The Town of Winchester (W), Town of Vinland (S) and Village of Fox Crossing (E).

USH 10 runs east-west through the north central part of the Towns of Clayton and Winchester. State Highway 76 runs north-south through the eastern part of the Town of Clayton and USH 45 runs north-south through the Town of Winchester. The remainder of these towns are served by town and county roads, the majority of which are paved.

The Wiouwash Trail is a 41-mile long crushed stone Rail-Trail path running north and south through the Town of Clayton from Oshkosh to Hortonville. The Friendship Trail is an 18.4-mile long asphalt, boardwalk and crushed stone trail running east and west through the Town of Clayton from Harrison to past Larsen near USH 10. Each of these trails is an important resource for hiking, biking, cross-country skiing, snowmobiling, horseback riding, and other recreation.

Water Resources

Wisconsin Department of Natural Resources Surface Water Data Viewer (SWDV) provides information on current water resources within the Towns of Clayton and Winchester.

Surface Water:

SWDV maps included in Appendix J show the Rat River located in the north portion of the Town of Winchester and the northwest corner of the Town of Clayton. The Rat River runs southwest into the Wolf River which flows into Lake Winneconne. In accordance with Clean Water Designations, this river is classified as a warm water sports fish/warm water forage fish waterway.

The Arrowhead River is located in the southwest corner of the Town of Clayton and the southeast corner of the Town of Winchester as shown in SWDV maps included in Appendix J. The Arrowhead River runs southwest toward Lake Winneconne. In accordance with Clean Water Designations, this river is classified as a warm water sports fish/warm water forage fish waterway.

Lake Winneconne is a priority navigable waterway located at the southwest corner of the Town of Winchester. This is a recreational area with fisheries management. Clean Water Designations identifies this river as a warm water sports fish/warm water forage fish waterway.

In accordance with requirements of the Federal Clean Water Act, every two years the Wisconsin Department of Natural Resources updates the list of waterbodies which are not meeting water quality standards and require the development of Total Maximum Daily Load Studies with plans to restore water quality.

In the WDNR Final 2020 Impaired Waters and Restoration Waters List, the Rat River within Winnebago County is listed as impaired with low dissolved oxygen and elevated water temperatures and polluted with total phosphorus. This list also includes Arrowhead River within Winnebago County as impaired with a degraded biological community and polluted with total phosphorus. A Total Maximum Daily Load (TMDL) has been approved by USEPA for each of these waterways but has not been prioritized.

Wetlands:

SWDV maps are included in Appendix J showing the location of mapped wetlands in the Towns of Clayton and Winchester. In general, there are more mapped wetlands in the Town of Winchester as compared to the Town of Clayton.

Flood Plains

Flood Insurance Rate Maps (FIRM) from FEMA are included in Appendix J, including Map Numbers 55139C0065E, 55139C0070E, 55139C0075E, 55139C0095E and 55139C00100E. These maps were created on March 17, 2003.

The maps show flood zones along Lake Winneconne, and the Rat and Arrowhead Rivers.

Topography

Within the Town of Clayton, drainage south of CTH II and west of State Highway 76 runs southwest toward the Arrowhead River, and drainage north of CTH II and west of State Highway 76 runs northwest toward the Rat River. Drainage east of STH 76 runs east toward Little Lake Butte Des Morts and Lake Winnebago.

In general, the north part of the Town of Winchester flows toward the Rat River, and the south part of the Town flows toward the Arrowhead River or directly toward Lake Winneconne.

Appendix J includes topographic maps of the Towns of Winchester and Clayton.

Soils

Soils in the Town of Clayton are primarily Kewaunee, Manawa and Hortonville type, consisting of well drained to somewhat poorly drained, nearly level to sloping soils with loamy or clayey subsoil underlain by loamy or clayey glacial till.

Soils within the Town of Winchester and along the Arrowhead River are primarily Zittau and Poy soils. These consist of somewhat poorly drained and poorly drained, nearly level and gently sloping soils with clayey subsoil underlain by sandy material.

Soils along the Rat River are primarily Houghton and Willette very poorly drained, nearly level organic soils.

C. CURRENT BIOLOGICAL ENVIRONMENTAL CONDITIONS WITHIN THE TOWNS OF CLAYTON AND WINCHESTER

Natural and Wildlife Areas

The Rat River Wildlife Area is a 4,000-acre property located approximately 2 miles north of the community of Winchester, managed by the State of Wisconsin. This area extends into the northwest corner of the Town of Clayton as well. It is managed to provide opportunities for public hunting, fishing, trapping and other outdoor recreation while protecting the qualities of the native communities and species found on the property.

The Lower Wolf River Bottomland Natural Resource Area/Winchester Meadows State Natural Area owned by the State of Wisconsin WDNR is located near the southwest corner of the Town of Winchester. This 444-acre area is located within Sections 19 and 30, T20N, R15E. It features a large, open sedge meadow marsh situated in an extensive depression northwest of Lake Winneconne. The site includes a diverse flora and is notable for its lack of invasives. Four rare birds are also present. The area provides recreational activities as well.

Threatened and Endangered Species

The Wisconsin Department of Natural Resources Natural Heritage Inventory Portal provided a preliminary assessment of threatened and endangered species within the Towns of Clayton and Winchester. The assessment included in Appendix J shows that these Towns overlap the Karner Blue Butterflies and Rusty Patched Bumble Bees High Potential Range and Zone.

The Karner Blue Butterfly is listed as Federally Endangered and State Special Concern. Maps showing the High Potential Range for this butterfly are generally in the far northwest corner of Winnebago County west of the Towns of Winchester and Clayton, and outside of the area included in Facility Planning.

The Rusty Patched Bumble Bee is also listed as Federally Endangered and State Special Concern. It is extremely rare in Wisconsin. The bee relies on diverse and abundant flowering plant species in proximity to suitable overwintering sites for hibernating queens, which include, but are not limited to non-compacted and often sandy soils or woodlands but does not include wetlands. The Towns of Winchester and Clayton are not within areas identified as High or Low Potential Zones for this species.

D. CURRENT CULTURAL RESOURCES WITHIN THE TOWNS OF CLAYTON AND WINCHESTER

Land Use

As noted above, land use within the Towns of Clayton and Winchester are primarily residential and agricultural. Potential for future commercial development exists along the USH Highway 10 corridor within the Town of Clayton, and near the USH 45 and CTH II intersection in the Town of Winchester.

Ethnic and Cultural Groups

No significant ethnic or cultural groups are present within the Towns of Clayton and Winchester.

Cultural Resources

Archaeological and historical resources specific to proposed improvements will be discussed below, as including a discussion of these resources within the entire Towns of Clayton and Winchester is not relevant regarding environmental impacts.

E. CURRENT AIR QUALITY AND NOISE LEVEL CONSIDERATIONS WITHIN THE TOWNS OF CLAYTON AND WINCHESTER

With very little existing commercial and industrial development in the Towns of Clayton and Winchester, air quality and noise levels are not an issue.

Traffic along Highways USH 10, USH 45 and STH 76 contributes to decreased air quality and increased noise levels.

F. CURRENT WATER AND SANITARY SEWER SERVICES

The majority of residents within the Towns of Clayton and Winchester use private wells and on-site wastewater treatment systems for water and wastewater services.

The Town of Clayton is currently constructing municipal water and sanitary sewer services connecting to the Village of Fox Crossing and the Fox West Wastewater Treatment facility to serve the Highway 10 corridor east of STH 76. The communities of Larsen and Winchester are served by the Larsen Winchester Wastewater Treatment facility.

G. FUTURE ENVIRONMENTAL CONDITIONS WITHOUT THE PROJECT

Commercial Development

Commercial development is expected along the Highway 10 corridor in the Town of Clayton, and near the USH 45 and CTH II intersection in the Town of Winchester, with or without a Larsen Winchester Sanitary District improvements project. The following concerns are generally associated with development:

- Construction related impacts are primarily short-term effects. The contractor is responsible for meeting erosion and sediment control measures in accordance with Winnebago County ordinances.
- Stormwater runoff pollution and flooding issues are a concern as development occurs. In order to minimize stormwater runoff pollution and flooding issues, the Towns of Winchester and Clayton abide by the Erosion Control and Stormwater Management Ordinances enforced by Winnebago County.
- Traffic will increase with an increase in commercial and industrial development, contributing to decreased air quality and increased noise levels.
- As development occurs along the Highway 10 corridor in Clayton, wastewater will be transported to the Fox West Wastewater Treatment facility.
- The existing Larsen Winchester Sanitary District wastewater treatment facility does not have the capacity to accommodate significant increases in wastewater flows. Without LWSD wastewater treatment improvements, commercial development in Winchester would be served by on-site wastewater treatment facilities, with added potential for groundwater contamination.
- Additional water wells will be required to serve new development in the Town of Winchester, creating an increased risk of contamination. Development along the Highway 10 corridor in the Town of Clayton will be served by a municipal water system.

Existing Larsen Winchester Sanitary District Wastewater Treatment Facility

Without implementing improvements, the existing Larsen Winchester Sanitary District wastewater treatment facility will be unable to meet future WPDES permit effluent limits for ammonia and phosphorus.

H. ENVIRONMENTAL IMPACTS OF FACILITY PLAN ALTERNATIVES

Table 8.1 below summarizes potential environmental impacts for the Facility Plan Alternatives. Sections 5 and 6 of this report describe the proposed improvements for each alternative in detail.

Table 8.1 Summary of Potential Environmental Impacts of Facility Planning Alternatives

	Alternative No. 1 Regionalization with Fox West WWTP	**Alternatives No. 2, 3, and 4 LWSD WWTP Improvements**
General	Utility work will be primarily within existing roadway ROW and will be restored to original condition upon completion.	Improvements will be primarily at the existing WWTP site, or within existing roadway ROW
Physical Impacts	1. Construction along Wiouwash Trail may require that a 0.75-mile section be shut down for approximately one month. 2. Navigable Waterway Crossings (3): 10" forcemain in CTH II ROW east of Wiouwash Trail and east of Pioneer Road. 12" Sewer in CTH II ROW west of Clayton Ave. 3. No long-term effects on surface or groundwater quality, or scenic or aesthetic resources. 4. No loss of prime agricultural land or disruption of ag activities.	1. Construction of buildings and new treatment units may require fill to be placed. A wetland delineation may be required to avoid filling within wetlands. 2. No long-term effects on surface or groundwater quality, or scenic or aesthetic resources. 3. No loss of prime agricultural land or disruption of ag activities.
Biological Impacts	Disturbed vegetation will be restored to original condition.	Disturbed vegetation will be restored to original condition.
Cultural Impacts	None	None
Other Considerations	1. Temporary construction noise and traffic disruption. 2. Erosion control measures will be in place for sediment control. 3. Construction of Angoli Way Lift Station will encourage commercial development near USH 45 and CTH II intersection.	1. Temporary construction noise and traffic disruption. 2. Erosion control measures will be in place for sediment control. 3. Construction of Angoli Way Lift Station will encourage commercial development near USH 45 and CTH II intersection.
WPDES Surface Discharge of WWTP Effluent	LWSD WWTP will be abandoned and no longer discharge to tributary to Arrowhead River. Discharge will be from existing Fox West WWTP.	LWSD effluent discharge to a tributary to Arrowhead River will remain, with increased flows due to proposed development.

I. SUMMARY OF PRIMARY AND SECONDARY IMPACTS OF PROPOSED IMPROVEMENTS

<u>General Description</u>

Proposed improvements include construction of a LemTec treatment system at the site of the existing wastewater treatment facility. In addition, lift station and collection system improvements are proposed.

Primary impacts result directly from construction activities and facility operations. Secondary impacts are indirect and occur because the project causes changes which would not occur without the project.

Primary Impacts

Construction related impacts are short-term effects resulting from construction activities. Mitigation measures for these impacts are the responsibility of the contractor. The Construction plans and specifications will provide guidance, including erosion control requirements, to minimize construction related environmental impacts. WDNR permit requirements will also be followed.

Plans and specifications will include a detailed Construction Sequence to ensure that untreated wastewater is not discharged from the system.

Secondary Impacts

Secondary impacts are generally associated with development occurring as the wastewater treatment plant capacity is increased, and the collection system is expanded. Induced growth is controlled with proper planning and zoning at the Town and County level.

Operation Impacts

Proper operation and maintenance of the modified Larsen Winchester Wastewater Treatment Facility will result in discharge of high-quality effluent.

J. ABANDONMENT PLAN

WDNR recognizes that abandonment of a wastewater treatment unit process is an alteration which may affect the quality or quantity of effluent and must be reviewed for environmental concerns in accordance with Wisconsin Administrative Code Section NR110.09(2). Construction of the LemTec system at the existing wastewater treatment site will require the existing lagoon system to be abandoned.

The proposed LemTec wastewater treatment system will convert the existing two-celled controlled discharge stabilization lagoon system to a continuous discharge system. Existing Primary Cell #1 will be repurposed to remain in place as a pond. The portion of the Secondary Cell #2 which will not be converted to a new treatment system will be graded to drain. Sludge will be removed from both ponds prior to construction.

During construction, the Primary Cell #1 will be used for treatment while effluent from the Secondary Cell #2 is discharged and the cell is modified. Upon completion of construction and proper treatment, wastewater effluent will be discharged from Primary Cell #1. Influent wastewater will be directed to the modified treatment system occupying the Secondary Cell #2.

Note the following environmental considerations for the abandonment plan.

Groundwater Considerations - Wisconsin Administrative Code Section NR110.24 requires a 4-foot separation distance from the maximum ground water elevation to the bottom of the pond. A geotechnical investigation was done at the LWSD WWTP site in October of 2021 including six 26-foot deep borings (see Appendix H).

- The Primary Cell #1 will be abandoned in place.
  - -Top of the berm Elevation 766.5
  - -Bottom of the pond Elevation 758.5.
  - -Soil Boring B-6 in the vicinity of Cell #1 Groundwater Elevation 750.6
  - -Soil Boring B-5 in the vicinity of Cell #1 Groundwater Elevation 754.4 (perched)
  - -7.9 feet from bottom of abandoned Cell #1 to high groundwater in Boring B-6.
  - -4.1 feet from bottom of abandoned Cell #1 to perched groundwater in Boring B-5
- The portion of the Secondary Cell #2 which will not be used for treatment will be graded to drain.
- No groundwater was encountered in the borings adjacent to the proposed LemTec system.

Bedrock Considerations - Wisconsin Administrative Code Section NR110.24 requires a 10-foot separation distance from bedrock to the bottom of the pond. No bedrock was encountered in the geotechnical investigation at the WWTP site performed in October of 2021.

Stormwater Management – The abandoned Cell #1 will effectively act as stormwater management device for rainwater entering the cell. An overflow weir will be constructed to allow stormwater to exit the pond to the adjacent waterway. Three feet of freeboard will be maintained in the abandoned Cell #1.

Removal of Sludge – In accordance with NR 110.09(2)(r), sludge is required to be removed from the abandoned lagoons within 2 years of repurpose. Sludge will be removed from both cells prior to construction.

Future Land Use- The abandoned lagoon cell and the proposed treatment system will remain within the property boundaries of the wastewater treatment plant site owned by Larsen Winchester Sanitary District. The site is fenced with a locked gate.

Cost Effectiveness- Removing berms and regrading to abandon the existing lagoon cells will require significant grading, erosion control and restoration costs. For this reason, Cell #1 is proposed to remain as a repurposed pond. Cell #2 will be regraded to drain in order to provide fill needed for construction.

K. PERMITTING AND RELATIVE AGENCIES

The following agencies will be contacted during the design phase of the project, and permits will be acquired as needed.

- WDNR, with relative permits as required
  - Waterway
  - Wetland
  - Endangered Resources
  - Stormwater
  - Sanitary Sewer Extension and Lift Station
- Winnebago County Highway Department and Zoning Department
- Wisconsin Department of Transportation
- Town of Winchester
- Town of Clayton
- East Central Wisconsin Regional Planning Commission

SECTION 9

Funding Options

SECTION 9

FUNDING OPTIONS

A. GENERAL

There are a number of debt types that are used by municipalities to finance the capital costs of improvements projects. General obligation notes and bonds, revenue bonds, special assessment bonds, and hybrid revenue bonds are typical debt types. General obligation bonds are repaid primarily by property tax revenue. Revenue bonds are repaid by user charges from specified activities such as sewer charges. Special assessment bonds are levied against benefitted properties. Hybrid revenue bonds are a combination of user charge revenue and special assessment revenue.

Loan and grant funds for wastewater system improvements are available from various State of Wisconsin agencies. Many of the funding options available from these state agencies are dependent on the municipality's Median Household Income (MHI). Data regarding Median Household Income for 2018 (to be used for WI SFY 2022 projects) is available on the Wisconsin Department of Natural Resources web site. The Median Household Income for the State of Wisconsin is $59,209, and 80% of the State Median Household Income (a threshold used for the Clean Water Fund Hardship Financial Assistance program) is $47,367.

Data available from the WDNR website indicates that the Median Household Income for the Town of Clayton as a whole is $88,846, and for the Town of Winchester as a whole is $83,897. The community of Winchester, shown as a Census Designated Place (CDP), is $79,167. CDP data is not available for Larsen. With these figures are being above the State MHI, the Sanitary District may not be eligible for some of the options discussed below.

B. COMMUNITY DEVELOPMENT BLOCK GRANTS FOR PUBLIC FACILITIES

The Community Development Block Grant (CDBG) Public Facilities Program strives to improve community buildings and infrastructure, including wastewater treatment and sanitary sewer systems. Municipalities with a population less than 50,000 are eligible for Community Development Block Grant funds for installation, upgrade or expansion of municipal wastewater systems. CDBG funds must be used to primarily benefit low-to-moderate income (LMI) individuals. Funds are administered through the Wisconsin Department of Administration, and are awarded through an annual competitive process, with applications due in May.

All awards are in the form of a grant with a local match. The program currently offers 2/3 funding with a 1/3 local match. Award criteria is based on documentation of need, household incomes, household utility rates, ability to pay, matching funds, project readiness, and relationships to other activities taking place in the community. Also considered are efforts to secure funding from the WDNR Environmental Improvement Fund and USDA Rural Development.

In order to be eligible for CDBG funds, the applicant must document that the project will serve an area with 51% low-to-moderate income residents. Current data on the Wisconsin Department of Administration website shows that the Town of Clayton includes 18.05% LMI households, and the Town of Winchester includes 20.66% LMI households. Therefore, it is unlikely that the Larsen Winchester Sanitary District would be eligible for Community Development Block Grant funds.

An income survey may be done if the municipality believes it can provide data that the project service area includes 51% LMI residents.

C. CLEAN WATER FUND PROGRAM

Any municipality or sanitary district is eligible to apply for low interest loans or hardship grants through the Clean Water Fund Program (CWFP) to construct or modify municipal wastewater systems to maintain compliance with existing effluent limits or to meet new or changed effluent limits. Eligible project costs include planning, design and construction. This program is administered by the Wisconsin Department of Natural Resources.

Additional subsidization in the form of Principal Forgiveness has been an aspect of the Clean Water Fund Program since the American Recovery and Reinvestment Act (ARRA) was passed in 2009. Principal Forgiveness (PF) is provided by the federal government to assist municipalities that would experience significant hardship raising the revenue necessary to finance needed infrastructure projects. PF is used to reduce the size of a loan, thus reducing annual principal and interest payments. The PF allocation methodology is structured to allocate PF funds to the highest-priority CWFP projects in municipalities with the greatest financial need, primarily determined by median household income (MHI) and population. Principal Forgiveness grants are typically given to municipalities or utility districts with low income and high user costs and are a maximum of 70% of the project cost. Note that Larsen Winchester Sanitary District is currently eligible for 15% CWF principal forgiveness based on their population.

Priority Principal Forgiveness is an incentive that may be awarded in addition to regular Principal Forgiveness. Three categories of Priority PF for the Clean Water Fund Program include regionalization, phosphorus reduction and energy efficiency. To be eligible for Priority Principal Forgiveness, the municipality must first meet the eligibility requirements for regular PF.

Note the following regarding Priority PF for Regionalization

- Priority PF will be awarded in the amount of $2,000,000 for the elimination of a WWTP discharge.
- A proposed or executed intermunicipal agreement must be submitted with the Clean Water Fund Application. The intermunicipal agreement must include all municipalities involved in the regionalization project and must have a term for at least the life of the loan.

Note the following that apply to LWSD regarding Priority PF for Phosphorus Reduction:

- Currently discharge less than 150 pounds of phosphorus per month.
- Serves a population of less than 10,000.
- Located in an implemented TMDL area for phosphorus.
- Discharge to surface waters.
- Involves phosphorus reduction-related upgrades to the WWTP. Phosphorus Reduction PF is only calculated on the phosphorus reduction related WWTP upgrade costs.
- PF incentive will be equal to 50% of the phosphorus reduction-related project costs, as determined by WDNR, up to a cap of $1,000,000.
- For projects necessary to meet an interim limit for phosphorus that is less stringent than the final limit, the PF incentive will be equal to 25% for the phosphorus reduction-related project costs, as determined by WDNR, up to a cap of $500,000.
- There is a lifetime cap of $1,000,000 in Phosphorus Reduction PF for any one municipality.

Note the following regarding Priority PF for Energy Efficiency:

- Eligible municipalities must be the recipient of an energy efficiency incentive from Focus on Energy.
- Energy Efficiency Priority PF will be awarded as a one-to-one match of the Focus on Energy incentive up to a cap of $50,000 per project.
- Award is based on availability and will be allocated on a first-come, first served basis.

The application process involves submitting an Intent to Apply (ITA) and a Priority Evaluation and Ranking Form (PERF) to WDNR by October 31st for the following state fiscal year funding cycle. The WDNR publishes a project priority list the following spring. The applicant then submits an application by September 30th if requesting principal forgiveness funds.

Current interest rates for the Clean Water Fund program range from 0.891% to 1.595% depending on the municipality's median household income and the loan term. Board of Commissioners of Public Lands Small Loan Program funds are sometimes available in conjunction with the Clean Water Fund loan program.

Wisconsin Department of Natural Resources has confirmed that the Wisconsin State Revolving Fund programs (including the Clean Water Fund) will receive federal funds from the recently adopted Federal Infrastructure Bill. The revolving programs will be receiving significant additional funding over the next five years, and a large percentage of this funding will become principal forgiveness (grant) funds. WDNR has not finalized plans as to how the additional principal forgiveness will be allocated, but the agency verified that the additional funding should be available for SFY 2023 projects.

D. USDA RURAL DEVELOPMENT

USDA Rural Development provides loans and grants to construct, improve, or modify municipal wastewater systems to municipalities and utility districts with a population up to 10,000. Priority is given to municipalities with a population less than 5,500, projects serving low-income communities, and projects necessary to alleviate a health or sanitary problem.

Median household income level, user rates and debt repayment ability apply to grant eligibility. Low interest loans for 100% of the project amount are also available, for a loan term of 40 years. The interest rate is based on the need for the project and the median household income of the area to be served, and currently range from 1.375% to 2.250%.

Applications are accepted throughout the fiscal year of October 1 through September 30th.

SECTION 10

Recommendations and Implementation Plan

SECTION 10

RECOMMENDATIONS AND IMPLEMENTATION PLAN

A. GENERAL

In previous sections of this report, each alternative is considered in terms of cost, environmental and operational considerations. The ranking of alternatives according to monetary costs is relatively straight forward because of the quantitative nature of the evaluation. The monetary evaluation indicates upgrading the existing wastewater treatment facility with construction of a LemTec system is the most cost-effective method to meet future WPDES permit effluent limits.

B. PUBLIC PARTICIPATION

Wastewater treatment facilities are designed for the benefit of the residents within the service area. To adequately assess the needs and desires of a community, public comments must be received.

Municipalities must conduct at least one public hearing as required by Wisconsin Administrative Code NR 110.09. The hearing must be advertised in the newspaper. It is recommended a mailing be sent to Sanitary District customers informing them of the hearing.

A copy of the Facility Plan report should be available for public review before the hearing and at the hearing.

Prior to issuing a Facility Plan approval letter, the Department will issue a news release and allow a minimum two-week period for public comments. The Department will consider all comments received as part of the decision-making process.

C. RECOMMENDED ALTERNATIVE

Upgrading the existing wastewater treatment facility with construction of a LemTec treatment system is the recommended facility planning alternative to meet the proposed WPDES permit effluent limits. The system will be operated as a continuous discharge system.

WDNR considers alternative costs within 10% of each other to be essentially equal in monetary value due to normal cost estimating variability. Alternative 3 proposing a LemTec system and Alternative 4 proposing Pond Modifications have estimated annual costs within 10% of each other. However, the LemTec system is recommended over Pond Modifications because this alternative is expected to be more reliable and easier to manage.

Figure 10.1 includes a schematic drawing of the proposed LemTec system improvements.

A chemical feed system is recommended to be installed to optimize phosphorus removal. It is also recommended the District apply for a Multi-Discharger Variance (MDV) to extend the timeline for compliance with low-level phosphorus limits, so an additional phosphorus tertiary treatment process would not be needed at this time.

The estimated cost per user information shown in Appendix K indicates if tertiary treatment is constructed, proposed sewer user rates would be between 1.8% and 1.9% of the estimated median household income for Winchester CDP. As a community within Winnebago County, the Larsen Winchester Sanitary District projected household user charge must be between 1% and 2% of their Median Household Income (including phosphorus compliance costs) in order to qualify for an MDV.

Application for the multi-discharger variance should be submitted in conjunction with the WPDES permit renewal application in April of 2022.

D. ARRANGEMENTS FOR IMPLEMENTATION

Institutional Responsibility

The Larsen Winchester Sanitary District has the legal authority to construct and operate the proposed facility improvements and to request grant and/or loan participation from various agencies if so desired.

Current Larsen Winchester Sanitary District Sewer Utility Rates

The current Larsen Winchester Sanitary District Sewer Utility Rates include a fixed meter fee based on the meter size and type of customer. Customers are billed on a quarterly basis.

Quarterly fixed fees are as follows:

5/8" Residential:	$15.00
1-1/4" Commercial:	$24.00
2" Commercial:	$45.00

In addition, the District charges a sewer usage fee of $5.00 per 1,000 gallons of wastewater discharged.

Sewer Utility Rate Evaluation

Appendix K includes sewer user rate evaluation spreadsheets. The spreadsheets project an estimated cost per sewer system user based on the figures included in the Cost-Effective Analysis Section 7 of this report.

Appendix K also details parallel cost percentage calculations which identifies the portion of the project eligible for low-interest loan funds through the Clean Water Fund Program. The portion of the project which is not eligible for a low interest loan may be funded with Clean Water Funds at the Market Interest Rate, currently 2.7%. Costs associated with improvements to unsewered areas and with improvements to provide reserve capacity beyond 10 years from the project completion date are not eligible for low-interest loan funds.

Three scenarios are presented in the Sewer Utility Rate Evaluation, including:

- Scenario 1: Construction of Full Project
- Scenario 2: Construction of Full Project without Tertiary Treatment for Phosphorus (Assumes LWSD obtains a Multi-Discharger Variance)
- Scenario 3: Construction of Project without Tertiary Treatment for Phosphorus and without the Angoli Way Lift Station (Assumes LWSD obtains a Multi-Discharger Variance)

In addition, estimated costs per user are provided assuming:

- Improvements will be funded 100% with Clean Water Loan Funds with 15% Principal Forgiveness.
- Improvements will be funded with $500,000 of LWSD funds, and the remainder with Clean Water Loan Funds with 15% Principal Forgiveness.
- With the possibility of additional Principal Forgiveness funds becoming available to the Clean Water Fund program through the Federal Infrastructure Bill, estimated costs per user are also shown with 30% Principal Forgiveness in the spreadsheets in Appendix K.

Table 10.1 includes a summary of estimated costs per user per year. The estimated current annual charge per user is $258.60.

Table 10.1 Summary of Estimated Costs Per User Per Year

	100% Loan Funds With 15% Principal Forgiveness	**$500,000 LWSD Contribution and Remainder Loan Funds with 15% Principal Forgiveness**
Scenario 1	$1,516	$1,428
Scenario 2	$1,180	$1,091
Scenario 3	$976	$881

All of the proposed estimated required costs per user per year are above 1% of the median household income for the Winchester community.

Financial Responsibility

In order to make the wastewater improvements affordable for the citizens within the study area, some form of financial assistance program or method of financing the improvements will be necessary. A few of the options available are discussed in Section 9 of this study. WDNR Clean Water Fund program funds should be pursued as a funding option for the proposed improvements.

E. IMPLEMENTATION SCHEDULE

WDNR has set the following deadlines for Report Due for Total Phosphorus Compliance in the current WPDES permit.

- September 30, 2018: Operational Evaluation Report
- September 30, 2019: Compliance Alternatives Status
- September 30, 2020: Preliminary Compliance Alternatives Plan
- September 30, 2021: Final Compliance Alternatives Plan
- September 30, 2022: Progress Report on Plans and Specifications
- September 30, 2023: Final Plans and Specifications
- December 31, 2023: Treatment Plant Upgrade to Meet WQBELs
- December 31, 2024: Construction Upgrade Progress Report #1
- December 31, 2025: Construction Upgrade Progress Report #2
- September 30, 2026: Construction Complete
- October 1, 2026: WQBELs Effective

In order to meet the current WPDES schedule summarized above, and to apply for WDNR Clean Water Funds (CWF SFY 2024), the following schedule is proposed:

- January 2022: Submit Facility Plan to WNDR
- October 2022: Submit Intent to Apply for WDNR Clean Water Funds SFY 2024
- September 2023: Submit Plans and Specifications to WDNR for Review
- September 2023: Submit CWF Application for WDNR Clean Water Funds SFY 2024.
- 2024: Bidding and Commence Construction
- October 2026: Compliance with WPDES Phosphorus Effluent Limits

A proposed fast track schedule would be as follows:

- October 2021: Submit Intent to Apply for WDNR Clean Water Funds SFY 2023 This task is complete.
- January 2022: Submit Facility Plan to WNDR
- September 2022: Submit Plans and Specifications to WDNR for Review
- September 2022: Submit CWF Application for WDNR Clean Water Funds SFY 2023.
- 2023: Bidding and Commence Construction
- October 2026: Compliance with WPDES Phosphorus Effluent Limits

F. VARIABLES AFFECTING PROPOSED IMPROVEMENTS

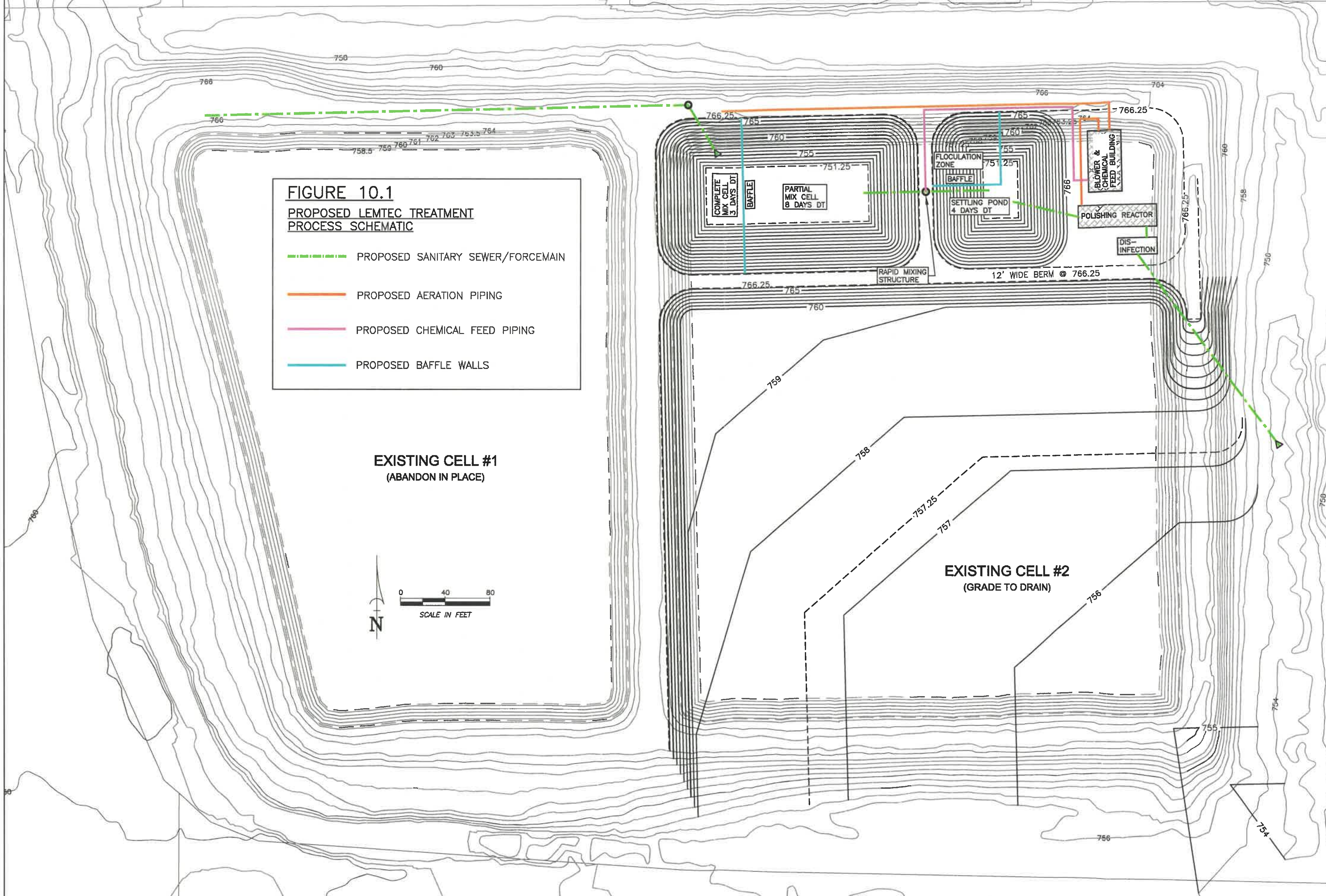
As noted earlier, Wisconsin Department of Natural Resources has confirmed the Wisconsin State Revolving Fund programs (including the Clean Water Fund) will receive federal funds from the recently adopted Federal Infrastructure Bill. The revolving programs will be receiving significant additional funding over the next five years, and a large percentage of this funding will become principal forgiveness (grant) funds. WDNR has not finalized plans as to how the additional principal forgiveness will be allocated, but the agency verified the additional funding should be available for SFY 2023 projects.

Recommendations of this study include upgrading the existing wastewater treatment plant with a LemTec system and applying for a multi-discharger phosphorus variance to extend the timeline for compliance with low-level phosphorus limits.

Depending on the funding available, the District may choose to wait on construction of the Angoli Lift Station improvements to serve existing and proposed development in the currently unsewered area near the intersection of CTH II and USH 45 on the west side of Winchester. Likewise, depending on available funding, the District may choose to construct both the Angoli Lift Station Improvements and the tertiary treatment for phosphorus. Decisions will be made based on available funding and projected sewer user rates.

It is recommended the LemTec system be sized to handle the full projected wastewater flows for Design Year 2045 as noted in Section 3, regardless of whether the Angoli Lift Station is constructed with the WWTP upgrade project or is delayed. During the design phase of the project, consideration will be given to using the abandoned Cell #1 as an equalization basin in conjunction with the LemTec system.

LWSD WWTP FACILITY PLANNING



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FIELDWORK	APPROVED MJM	CHECKED ALM	DRAWN BY CRC

REFER TO COVER SHEET FOR REVISION DESCRIPTIONS

NO.	DATE	NO.	DATE	NO.	DATE	NO.	DATE

LWSD WWTP FACILITY PLANNING

TOWN OF WINCHESTER, WINNEBAGO COUNTY, WISCONSIN

SCALE	DATE
BAR SCALE	11-16-2021

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FIGURE-10.1